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CQ

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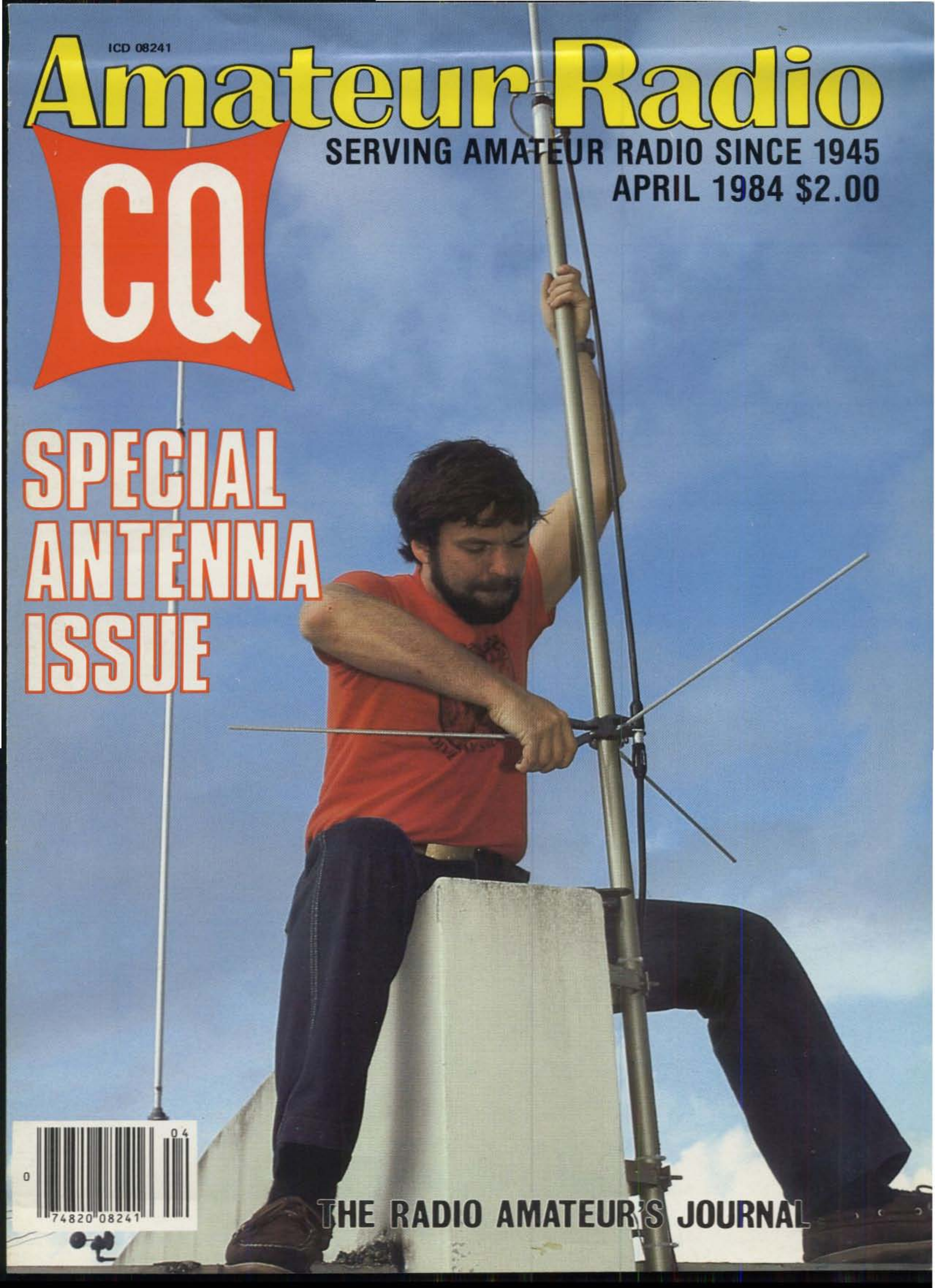

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THE RADIO AMATEUR'S JOURNAL

TS-930S

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

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

TS-930S FEATURES:

- 160-10 Meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC, on SSB, CW, FSK, and AM. UP conversion digital PLL circuit.
- Excellent receiver dynamic range. Typical two-tone dynamic range, 100 dB (20 meters, 50-kHz spacing, 500 Hz CW bandwidth).
- All solid-state 28 volt operated final amplifier. Lowest IM distortion. Power input 250 W on SSB/CW/FSK, 80 W on AM. SWR/ Power meter.
- Available with AT-930 automatic antenna tuner built-in, or as an option. Covers 80-10 meters, including WARC bands.
- CW full break-in. CMOS logic IC, plus reed relay. Switchable to semi break-in.
- Dual digital VFO's, 10-Hz steps, includes band information.
- Eight memory channels. Stores frequency and band data. Internal battery memory back-up, est. 1 yr. life. (Battery not Kenwood supplied.)
- Dual mode noise blanker. NB-1, with threshold control, for "pulse" noise. NB-2 for "woodpecker."
- SSB IF slope tuning, allows independent adjustment of the low and/or high frequency slopes of the IF passband.
- CW VBT and pitch control. VBT tunes out interfering signals. CW pitch control shifts IF pass-band and beat frequency. "Narrow-Wide" filter switch.
- Tuneable, peak-type audio filter for CW.
- AC power supply built-in.
- Fluorescent tube digital display (100 Hz resolution, modifiable to 10 Hz) with digitalized sub-scale, in 20-kHz steps.
- RF speech processor.
- One year limited warranty.
- SSB monitor circuit.

Optional Accessories:

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

TS-430S

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

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

TS-430S FEATURES:

- 160-10 meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC. UP-conversion digital PLL circuit.
- USB, LSB, CW, AM, and FM (optional) all mode.
- Compact lightweight design. Only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm); only 14.3 lbs. (6.5 kg.).
- Superior receiver dynamic range with Dyna-Mix high sensitivity direct mixing system.
- 10-Hz step dual digital VFO's. Operate independently, include band and mode information. Dial torque adjustable. Step switch for 10-Hz or 100-Hz steps. A=B switch shifts "B" VFO to "A" VFO frequency and mode, or vice versa. VFO LOCK switch. RIT for VFO or memory. UP/ DOWN manual scan with optional UP/DOWN microphone.
- Eight memories store frequency, mode, and band data. 8th memory stores RX/TX frequencies independently.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- Memory Scan.
- Programmable automatic band scan width.
- IF shift circuit for minimum QRM.
- Tuneable notch filter, built-in.
- Narrow-wide filter selection on SSB and CW (filter optional).
- Speech processor, built-in.
- All solid state. Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Operates on 12 VDC or on 120 VAC, or 220/240 VAC with optional PS-430 AC power supply.
- Fluorescent tube digital display indicates frequency to 100 Hz (10 Hz modifiable).
- All-mode squelch circuit, built-in.
- Built-in noise blanker.
- RF attenuator (20 dB).
- VOX circuit, plus semi break-in with side-tone.

Optional accessories:

- PS-430, PS-30 or KPS-21 AC power supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket.
- AT-250 automatic antenna tuner, 160-10 m, incl. WARC.
- AT-130 compact antenna tuner, 80-10 m, incl. WARC.
- FM-430 FM unit.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand mic.
- MC-55 (8P) mobile mic.
- MC-60A deluxe desk mic.
- MC-80 desk top UP/DOWN mic.
- MC-85 multi-function desk mic.

KENWOOD

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

TS-830S

"Top-notch"...VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Noise-blanker threshold level control.
- Built-in digital display, (fluorescent tube), with analog dial.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

NEW

TS-530SP

"Cents-ational"...notch, IF shift, digital display, narrow-wide filter switch

The TS-530SP SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

TS-530SP FEATURES:

- 160-10 meters, LSB, USB, CW, all amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- IF shift tunes out interfering signals.
- Audio notch filter, tunable, for minimum QRM.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- Wide receiver dynamic range.
- Two 6146B's in final, allows 220W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.

TS-130SE

Compact, solid-state HF, 80-10 m, incl. WARC.

- 200 W PEP, 160 W DC.
- Digital display.
- IF shift, narrow/wide filter. switch. (Filters opt.)
- Speech processor, VOX.
- RF attenuator, noise blanker.
- CW semi break-in w/sidetone.
- Final amp. protection circuit.
- Size: 3-3/4 H x 9-1/2 W x 11-9/16 D.

Optional accessories:

- PS-30, KPS-21 Power supplies.
- SP-120 External speaker.
- VFO-120 remote VFO.
- AT-130 antenna tuner.
- YK-88C (500Hz), YK-88CN (270Hz) CW filters.
- YK-88SN (1.8 kHz) SSB filter.
- MB-100 mobile mtg. bracket.

KENWOOD

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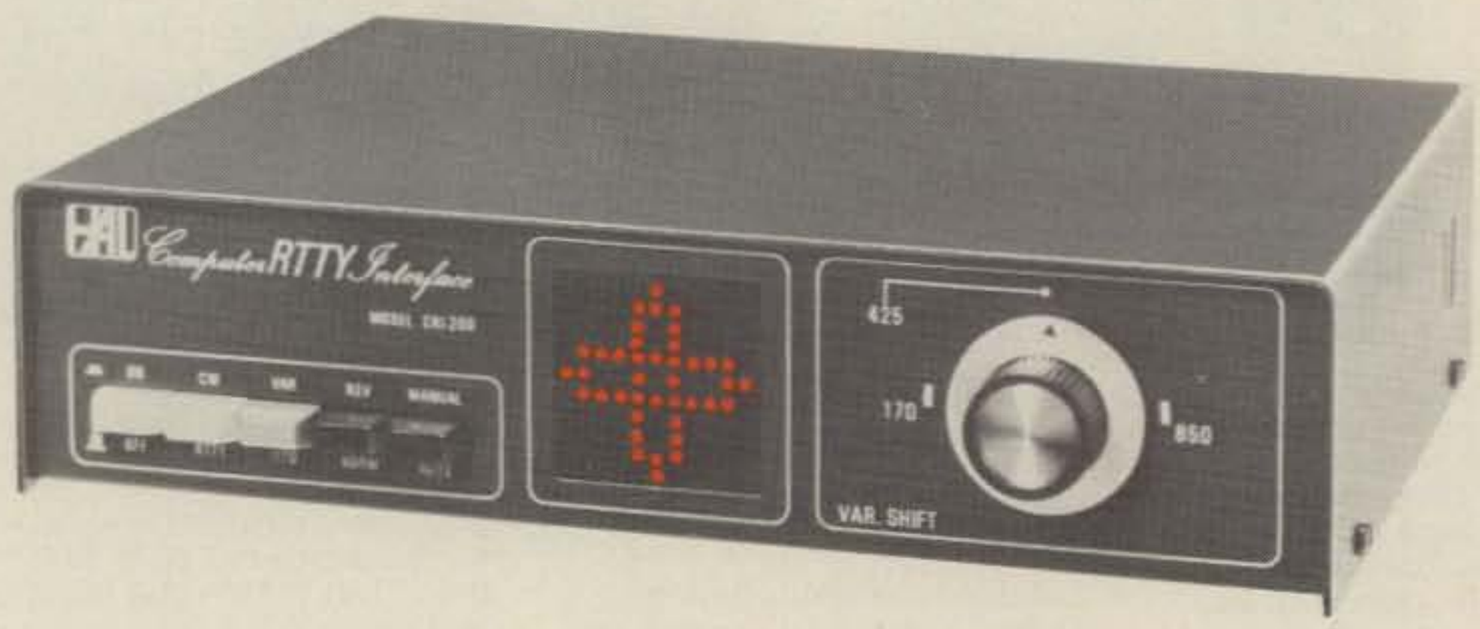
WORK ALL THE SIGNALS—NOT JUST THE STRONG ONES

CRI-200
LED Matrix
Tuning Indicator
$299.00*



Give your computer a break with the "front-end" performance it needs for good RTTY and CW copy. Why settle for "make-do" RTTY performance of one-tone filters or phase locked loops? Our interfaces give you the solid RTTY and CW performance you need. Want to be sure you are "on-frequency" and not "walking around the band"? We have two different models of tuning indicators to put you on frequency. The deluxe CRI-200 features a matrix of LED's to give a scope-type ellipse tuning display. The CRI-100 has the familiar crossed line display, again using LED's. Best of all, the indicators are built-in—NOT add-ons. Take advantage of our many years of experience in high-tech RTTY and CW—put a HAL ahead of your computer.

- Full two-tone mark and space RTTY demodulation
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- Matrix LED-scope tuning indicator (CRI-200)
- 800 Hz CW receive input filter (700–1000 Hz int. adj.)
- Plus or minus CW Key output to transmitter
- Computer interface for RS232C or TTL
- Relay isolated PTT switch circuit
- AFSK transmit tones AND FSK output
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- Standard computer I/O connector
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- Small and attractive cabinet (10″W × 2.4″H × 7″D)
- Includes 120V/60 Hz power supply—no batteries!
- User-friendly controls
- Compatible with HAL ARQ1000 for AMTOR

Best of all, the HAL CRI-100 and CRI-200 are NOT dependent upon special software or a specific computer. Flexibility is the key word—it's your choice for your favorite program and computer. If you are looking for both low cost and high performance, come to HAL, your real RTTY place. See the CRI-100 and CRI-200 at your favorite HAL dealer. Write or call us for our latest RTTY catalog.

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CQ The Radio Amateur's Journal

ON THE COVER: Barry Gorodetzer, N4IFE, reminds us that antenna weather is upon us. It's time to put up the new ones and repair what winter has done. Photo by Larry Mulvehill, WB2ZPI.

APRIL 1984 **VOL. 40, NO. 4**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

The old familiar song "April in Paris" has been changed to "April in Dayton." Parisians, as well as everyone else, flock to Dayton (even though nothing seems to rhyme with Dayton) for the Hamfest. Singing and tap-dancing aside, however, this annual bash promises to be even bigger this year. From the pre-show info I've seen, there will be more exhibitors and more exhibition space due to enlarged and improved facilities. I've heard that the fleamarket will be open on Friday and that the problems that arose last year have been taken care of. So, it does promise to be a great "April in Dayton."

As I've said in the past, one of the satisfying things about being an editor is the opportunity to write editorials. By that I don't mean a continual barrage of heavy earth-shattering discourses and revelations, but rather the chance to share some of the everyday fun aspects of our hobby. We do have the ability to enjoy ourselves away from the operating desk of "Command Central."

One feature of my editorials that most people seem to enjoy is "Travels With *CQ*." I know some folks who don't, of course, but most of you do. Obviously, most of you can't get to all of the hamfests that we do, but it really is the best way of seeing what's out there. It's not only looking at and touching the latest equipment and checking out fleamarkets (purely an academic interest under the heading of research); it's also the best way to meet your fellow ham. Most of us get stuck in some sort of rut or groove in that we like a particular aspect of amateur radio to the exclusion of everything else. A hamfest is a perfect chance to broaden our outlook on amateur radio, meet new people, and most of all have fun. It's also the best chance to see someone walking around with four or five HTs on his belt.

A long time ago I realized that most hams don't write letters. We communicate and yet we don't communicate. At hamfests, though, everyone has the chance to come by the *CQ* booth and let us know what he likes and what he doesn't like. It's a chance to exchange ideas, ask questions, and put a face behind the name and call. It really personalizes amateur radio. Hamfests and electronic fleamarkets also help the local clubs gain publicity for themselves and amateur radio, and potential new members can come and check out the club and/or amateur radio itself. There's nothing more inviting than seeing a bunch of people having a good time.

The one area where we seem to be lacking is food. The food at most hamfests leaves a lot to be desired. The biggest seller apparently is the "grease-dog," an edible chemically produced skin containing hot grease artificially colored to resemble meat (of a nondescript nature). One bite and the grease squirts out to inundate your tie, shirt, and sweater. The salt, starch, and carbohydrate intake at most hamfests is alarmingly high, and I'm afraid that some of us are "expanding our horizons" in several directions at the same time. If anything needs to be improved, this is it.

This smiling face belongs to Mark Barettella, KA2ORK/J3. If you read Mark's story in our January issue as well as the world press coverage, you know that Mark was the hero of the Grenada rescue. He had to leave his rig behind when he was evacuated, and the generous folks at ICOM presented him with a new 720A and PS15 power supply to take back when he resumed his medical studies.

At the end of January Dick and I flew to Chicago for the Wheaton Hamfest, a one-day affair that had always been held the same weekend as the Miami Hamfest. This year there was a one-week gap and we finally got out there. Let me say that it was everything people said it was. It was big, it was busy, and most of all it was concentrated. When we arrived in Chicago it was snowing and cold. It was hard to think that people would get out of their warm homes to come out for a one-day event on a really cold day. At 8 a.m. the doors opened and the people piled in. From that time until about 3 p.m. when the show wound down, there was a continuous stream of people (between 7000 and 8000) looking, shopping, and buying.

As we set up the *CQ* booth, N9AKD stopped by and asked me if I was the one who had written about swapping an HT to Lew McCoy for the Unimat lathe. I said I was, and he went to his car and brought back several accessories for the lathe as a gift for me. What better way to start off the day! One of our newer advertisers, Liss Radio Publishing, had the adjacent booth, and they were gold-stamping their personalized logbooks with the buyer's name and call. They do look nice.

Outside of it being a bit warm in the commercial exhibit area, it was a perfect day. Dick managed to find a load of porcelain insulators and a quantity of copper antenna wire to bring back. There will be long wires galore in Northport this summer. I feel sorry for all the folks in the Chicago area who didn't show up. They missed a great day.

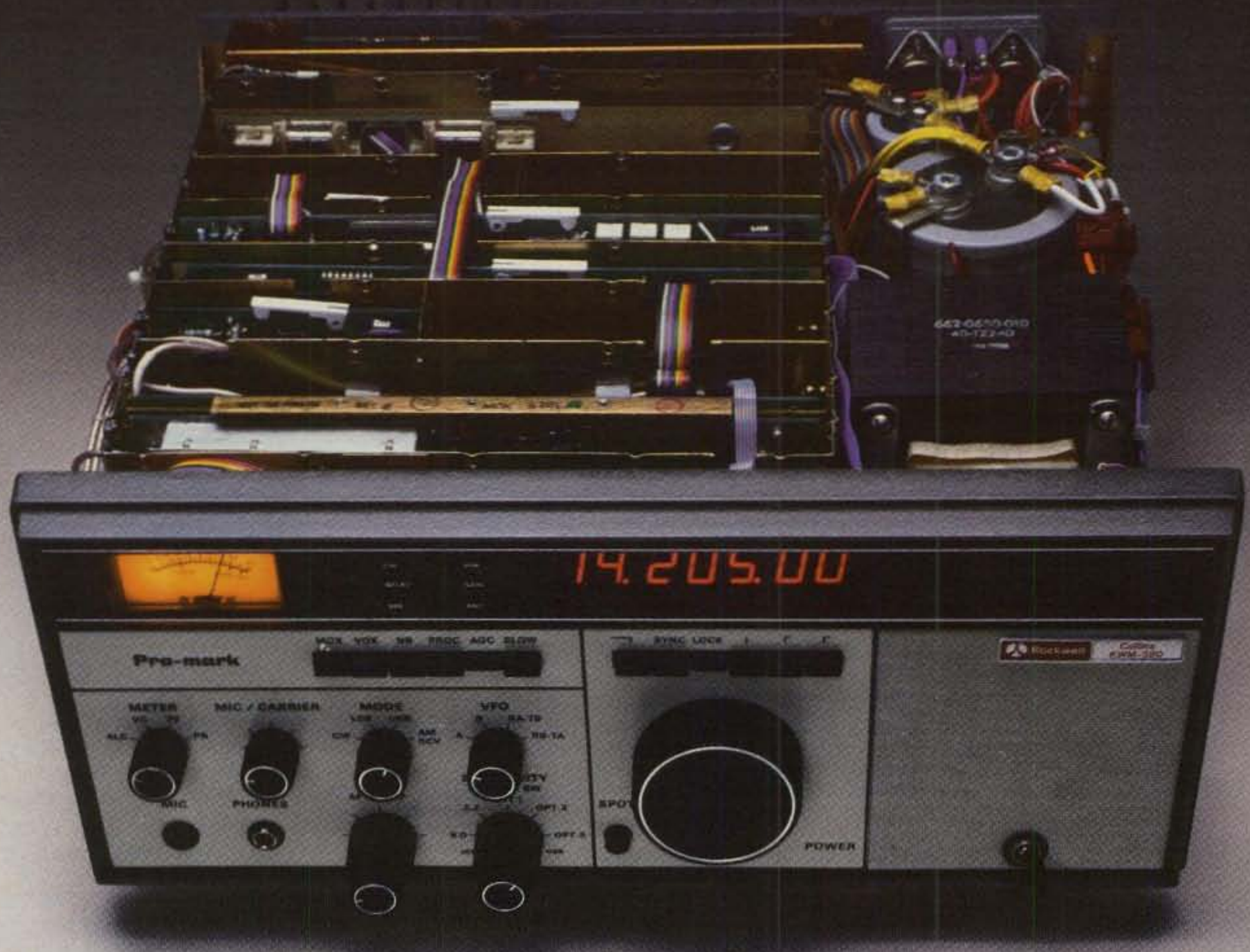
The following weekend we all headed for Miami. Dick, Jack and his wife, Ruth, and I went south for the warm weather and hospitality. Lew McCoy joined us there for the Tropical Hamboree weekend. The weather was beautiful and the people were very friendly. There's a good-size fleamarket, and again Dick was the winner in finding antenna stuff. I figured that by now you were tired of reading about my antenna project, so we'll concentrate on Dick's for a while. All of the ARRL crew was politicking, as the elections are coming up in March. Evelyn Gauzens, W4WYR, put together a good show and kept everything moving. She even arranged for an alternative to the grease-dog, namely a Greek food concession. The salads and pastries were delicious.

Two weeks later the intrepid *CQ* staff was found wandering around the annual LIMARC Fleamarket. Although we didn't have a *CQ* booth at this one, most of us found our way to the fleamarket at one time or another during the day. This is the yearly big, local event, and it's a good chance to have an eyeball QSO with some old friends. Yes, for those who follow this event, it did get cold and it did rain, but as this was the indoor winter fleamarket it really didn't matter. There was some great stuff around (not too many bargains), and I did get to meet with some old friends I hadn't seen in a while.

In about two weeks we'll be off to the Orlando Hamfest, and the week after that we'll be at the annual Charlotte Hamfest. Our traveling schedule is heavy once again this year, and if the first three events of the year are any indication, many of you are getting out there, too.

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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Smart enough to be user friendly means the newest Santec radios are more useful in your hands. Without sacrificing features and functions you really want, you can have an easier to use, yet smarter handheld from the broad line of models for the most popular VHF and UHF bands 144, 220, and 440 MHz. Plenty of accessory items are available for the Santec radios to make your personal application of Santecnology (TM) the smoothest yet. And don't forget the transistor and semiconductors in all Santec products are guaranteed for two full years.

Santec's smarter handhelds help the user by providing widest frequency coverage for MARS and CAP operations as well as amateur radio. Any value of offset on 10 KHz steps can be set and stored in any memory location, thus requiring only one memory per transceive frequency pair. Single stroke memory recall of all 10 memories and the required offset means no more switch flipping when repeater frequencies are changed. Because lower power output from the transmitter helps the user to get longer service times on each battery charge, Santec provides three switchable power levels from the full power level of 4 watts plus down to a midrange of around one watt and a battery conserving 100mw. The Santec user gets plenty of helpful information from the complete display on the large size LCD frequency display using six digits plus the offset direction and memory number. Mode of scan, PLL lock and the receiver and transmitter indicator are all usable at the same time without any extra effort. All the neat features you expect plus a good, solid performing transceiver section with excellent sensitivity and high quality audio make Santec your best choice for a handheld transceiver.

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FM MOBILE TRANSCEIVERS

FM-2033

2m 25W Mobile Maxpack

- Liquid Crystal Display with soft orange lighting for direct sunlight viewing plus night viewing.
- Repeater Offsets (+, −, S) Stored in memory along with the frequency information.
- WIDE frequency coverage for MARS and CAP capability (142-149.995 MHz)
- New chrome front with soft pearl gray cabinet for today's auto decor.
- Memories with valid data scanned, blanks are skipped.
- Repeater reverse switch for monitoring repeater's input frequency.

Coming Soon
50 MHz—FM-6033
440 MHz—FM-7033
220 MHz—FM-4033

The KDK FM-2033 represents a significant advance in user convenience and simplicity of operation for the user. The KDK '33' series provides excellent readability in any lighting condition for the operating frequency and the memory channel in use. Warm orange background LCD displays improve readability by providing easy-on-the-eyes contrast.

Simplicity of operation has always been the mark of the KDK design team and the FM-2033 is no exception. From the single knob frequency and memory selection to the automatic recall from memory of the desired repeater offset, the FM-2033 provides relaxed, comfortable mobile operation.

Once the 10 memory frequencies have been selected, a single knob is all that is required for operation on the standard simplex or repeater channels. Using the audible beep as the end-of-memory marker allows setting to a particular channel without even looking at the radio.

In the scan mode, scanning for a busy memory or pre-programmed band scan keeps you up to date on the happenings in the area. Very busy frequencies can be skipped by using the up key on the TM-2 microphone. If a full 10 memories are not used, the unused ones can be marked for scan skip so that no time is wasted checking them.

The FM-2033 provides a clean 25 watt output signal across 142–149.995 MHz to operate in balance with most repeaters and provide quieting for simplex operations. MARS (Navy too!) and CAP frequencies are also accommodated even with their unusual repeater splits.

You want convenience, reliability and easy operation for your mobile station and a tough-to-beat dollar value, right? Then check out the FM-2033 at your local dealer TODAY or send QSL for specifications. We think you will want one for yourself.

Specifications are nominal and are subject to change. All KDK transceivers meet or exceed FCC regulations regarding spurious emissions.

THL CORP.

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AMPS • PREAMPS • COUPLERS

The helpful line of handsome products.

The THL line of amplifiers, pre-amps, antenna couplers and transceivers provides a broad line of solutions to help solve life's problems of needing "just a little more." Whatever it might be, look to THL helpful products to aid in solving the problem. THL can make your signal stronger, your receiving better and can make your HF transmitter happier with the match to the antenna. THL amplifies to a level of 160 Watts on VHF and 90 Watts on UHF. Using THL amplifiers, handy radios can talk like mobiles with low power input models which provide 30, 100 or 160 Watts of output. Models for 10-14 Watts input power or 25 Watt output mobiles are available.

The THL line of antenna couplers provides fine quality hand crafted antenna matching networks for both low power applications and larger power amplifiers running the legal limit. The THL antenna coupler series has full features like built-in antenna switching for changing antennas or by-passing the coupler and an accurate V.S.W.R./power output indicator on all models. Sturdy construction and honestly rated components and capabilities make the THL series of tuners your best choice.

THL has introduced a unique 440 MHz handheld product, the MICRO-7 utility transceiver. This transceiver can be on the air for less than you would ever guess. THL now has 1 dB GAS-FET pre-amplifier for the 2 m and the 70 cm bands. See your THL dealer for details.

Put The Helpful Line to work helping you. Drop us a QSL type card with your name and address for a full catalog of THL products and specifications.

Bottom row: HL-160V25 25W in 150W out 2m • HL-160V - 3 or 10W in for 160W out 2m • HL-90U 10W in 90W out UHF • HC-2000 2KW antenna tuner • Second Row: HL-110 3 or 10W in 100W out 2m • HL-82V 10 in 80W out 2m • HL-45U 10W in 45W out UHF • HC-400 200W antenna tuner and VSWR Power Meter • Third Row: HL-30V economy HT amp 3W in 30W out 2m • HL-32V 3W in 15 or 30W out 2m SSB or FM portables • HL-20U .2 or 3W in 20W out UHF • HC-200 the Economy-With-Quality HF antenna tuner. An HRA2 GAS-FET preamp sits atop the HC-200 • Also shown is the MICRO-7 Utility UHF transceiver and headset.

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Announcing

• **Foundation for Amateur Radio Scholarships** -Licensed radio amateurs may compete for one or more of the 15 scholarships being offered for the academic year 1984–85. Applicants must be enrolled or accepted in an accredited university, college, or technical school on a full-time basis. Most scholarships require the applicant to hold an FCC General class license or the equivalent. Additional information and an application may be requested by a letter or QSL/postcard postmarked prior to May 31, 1984, sent to FAR Scholarships, 6903 Rhode Island Ave., College Park, MD 20740.

• **Special-Event Station WB8QZZ** - The Xenia Weather Amateur Radio Net will operate WB8QZZ from 1500–0300 UTC on Saturday, March 31, and 1500–2300 UTC on Sunday, April 1. Frequencies will be s.s.b. 7.275, 14.275, 21.375 (± 10 kHz); 2 meter f.m.; and 146.52 simplex or the X-WARN repeater 147.165/765. Send QSL and s.a.s.e. to N8CYS (*Callbook* address) for commemorative QSL.

• **Quarter-Century Wireless Association Banquet** - The Dayton-Cincinnati Chapter of the Quarter-Century Wireless Association will hold its annual banquet during the Dayton Hamvention on Friday, April 27, at Neil's Heritage House Restaurant in Dayton. Tickets are $12.50. Contact Doug Horner, W8PH, 186 Golfwood Dr., Dayton, OH 45449, or call 513-859-3210.

• **International 160 Meter Operators Gathering** - This event will take place during the Dayton Hamvention, April 27–28, at Stouffer's Dayton Plaza Hotel, Dayton, OH. There will be slide presentations. For further details contact Joyce or Barry Boothe, 705 May Court, Channahon, IL 60410.

• **Nebraska City ARC Special-Event Station** - KØTIK and members of the Nebraska City ARC will operate from the Nebraka State Arbor Lodge from 2400 UTC April 23 to 0600 UTC April 29. Operation will be in the General portion of the phone and c.w. bands on 80–10 meters. For a commemorative certificate send $1.00 and s.a.s.e. to John K. Nihart, KAØOKI, 7731 Holdrege, Lincoln, NE 68505.

• **W5RAS From the Crockett National Forest** - The Bryan ARC will operate W5RAS from 1800 to 0600 UTC on April 28 to commemorate the contributions of Davy Crockett in the fight for Texas's independence. Operation will be on 80–2 meters in the phone bands. For a certificate send $1.00 and s.a.s.e. to KA5OIT, 2203 Franklin, Bryan, TX 77801.

• **Chicago ARC Open House** - The Chicago ARC will have an open house on Wednesday, April 4 from 7–10 p.m. at the Edgebrook Golf Course Field House, 6100 N. Central Ave., Chicago, IL. There will be a film and demonstrations of amateur radio. Additional information is available by calling 312-545-3622.

• **Gloucester County ARC's W2MMD** - On May 4–5 from 1700–1700Z W2MMD will be on the air to celebrate the club's 25th anniversary. Phone operation will be in the lower portion of the General bands 10–80, and c.w. in the Novice bands. For a certificate send a QSL to GCARC, P.O. Box 370, Pitman, NJ 08071.

• **Hopkins Country ARC Special Event** - WB4JRO will be operating from Harps Hill, Kentucky, from 1700–1700Z May 5–6, putting Harps Hill on the air for the first time. Frequencies will be phone 3.925, 7.250, 21.370; c.w. 3.725, 7.125, 21.125. A certificate is available from WB4JRO for $1.00.

• **Sun Day Special Event** - The Florida Solar Energy Center and the Indian River ARC will sponsor this multimedia event demonstrating solar heating, cooling, cooking, and electrical development and production at Cape Canaveral, FL. A certificate and newsletter is available from FSEC, 300 State Rd. 401, Cape Canaveral, FL 32920. W4NLX will operate on s.s.b. 7.240, 14.240, 21.370, 28.518; c.w. 7.040, 14.040, 21.040, 28.003; f.m. 146.28/88.

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

April 7, **Cherryville Repeater Association Hamfest,** Flemington, NJ. Contact Cherryville Repeater Association, Box 338 Main St., Quakertown, NJ 08868.

April 7–8, **Missouri State ARRL Convention,** Kansas City, MO. Contact PHD Amateur Radio Association, P.O. Box 11, Liberty, MO 64068 (phone 816-781-7313).

April 8, **Rock River ARC Hamfest,** Amboy, IL. Contact Shirley Webb, KA9HGZ, 618 Orchard St., Dixon, IL 61021 (phone 815-284-3811).

April 8, **Madison Swapfest,** Madison, WI. Contact MARA, P.O. Box 3403, Madison, WI 53704.

April 8, **Denison Repeater Association Fleamarket,** Denison, IA. Contact Gene, NØDQS, at 712-263-4782, or Jim, KAØHFR, at 712-677-2404.

April 13–15, **SCDXC International DX Convention,** Visalia, CA. Contact Fried Heyn, WA6WZO, 962 Cheyenne St., Costa Mesa, CA 92626.

April 14, **ARRL Michigan State Convention and Muskegon Hamfest,** Muskegon, MI. Contact MAARC, P.O. Box 691, Muskegon, MI 49443.

April 14, **Wellesley ARS Auction,** Wellesley, MA. Contact Kevin P. Kelly, WA1YHV, 7 Lawnwood Place, Charleston, MA 02129.

April 14–15, **Pikes Peak ARA Electronic Exhibition and Trade Show,** Colorado Springs, CO. Contact Pikes Peak ARA, P.O. Box 16521, Colorado Springs, CO 80935.

April 14–15, **ARRL Mississippi State Convention/Capital City Hamfest,** Jackson, MS. Contact Carol Kemp, NA5Y, 3581 Beaumont Dr., Pearl, MS 39208 (phone 601-939-7612).

April 15, **Raleigh ARS Hamfest and Fleamarket,** Raleigh, NC. Contact RARS, P.O. Box 19127, Raleigh, NC 27619 (phone N4HQZ at 919-876-4073).

April 15, **Computer and Electronics Swap Meet,** Elmhurst, IL. Contact Micro International, Dept. M, P.O. Box 774, Highland Park, IL 60035 (phone 312-530-1552).

April 28, **Inland Empire Swapfest,** Spokane, WA. Contact Jan Thiemann, KA7DDU, Inland Empire Swapfest, 2201 N. Craig Rd., Spokane, WA (phone 509-244-5212).

April 29, **Pioneer Valley Radio Association Fleamarket,** East Hartford, CT. Contact Jon Patz, KA1FYL, 34 Whiting Lane, West Hartford, CT 06119 (phone 203-232-8772).

May 2, **Chicago ARC Evening Mini-Hamfest,** Chicago, IL. Contact CARC, 5631 W. Irving Park Rd., Chicago, IL 60634, with s.a.s.e. (phone 312-545-3622).

May 4–6, **Cochise ARA Hamfest,** St. David, AZ. Contact CARA, Att: KB7HB, P.O. Box 1855, Sierra Vista, AZ 85636.

May 5, **Ozaukee Radio Club Swapfest,** Cedarburg, WI. Contact Ozaukee Radio Club Swapfest, P.O. Box 13, Port Washington, WI 53074 (s.a.s.e.).

May 5, **Southern Tier ARCs Hamfest,** Owego, NY. Contact C. England, KF2X, RD #1, Box 144, Vestal, NY 13850 (s.a.s.e.).

May 5–6, **Greenville, SC Hamfest,** American Legion Fairgrounds, north of Greenville, SC. Contact Phil Mullins, WD4KTG, P.O. Box 99, Simpsonville, SC 29681.

May 5–6, **Columbia Hamfest,** Columbia MO. Contact Columbia Hamfest '84, Ben C. Smith, Route 1, Prairie Home, MO 65068 (phone 816-427-5319).

May 6, **Centralia Wireless Association Hamfest,** Centralia, IL. Contact Bud King, WB9QEG, at 618-532-6606, or write to Central Wireless Association, P.O. Box 1166, Centralia, IL 62801 (s.a.s.e.).

May 6, **Kankakee Hamfest,** Kankakee, IL. Contact KARS Hamfest, 1377 Circle Dr. NW, Kankakee, IL 60901 (phone Don Kerouac before 5 p.m. at 815-937-2750).

May 6, **Suffolk County Radio Club Fleamarket,** Melville, NY. Contact Richard Tygar, AC2P, at 516-643-5956 evenings.

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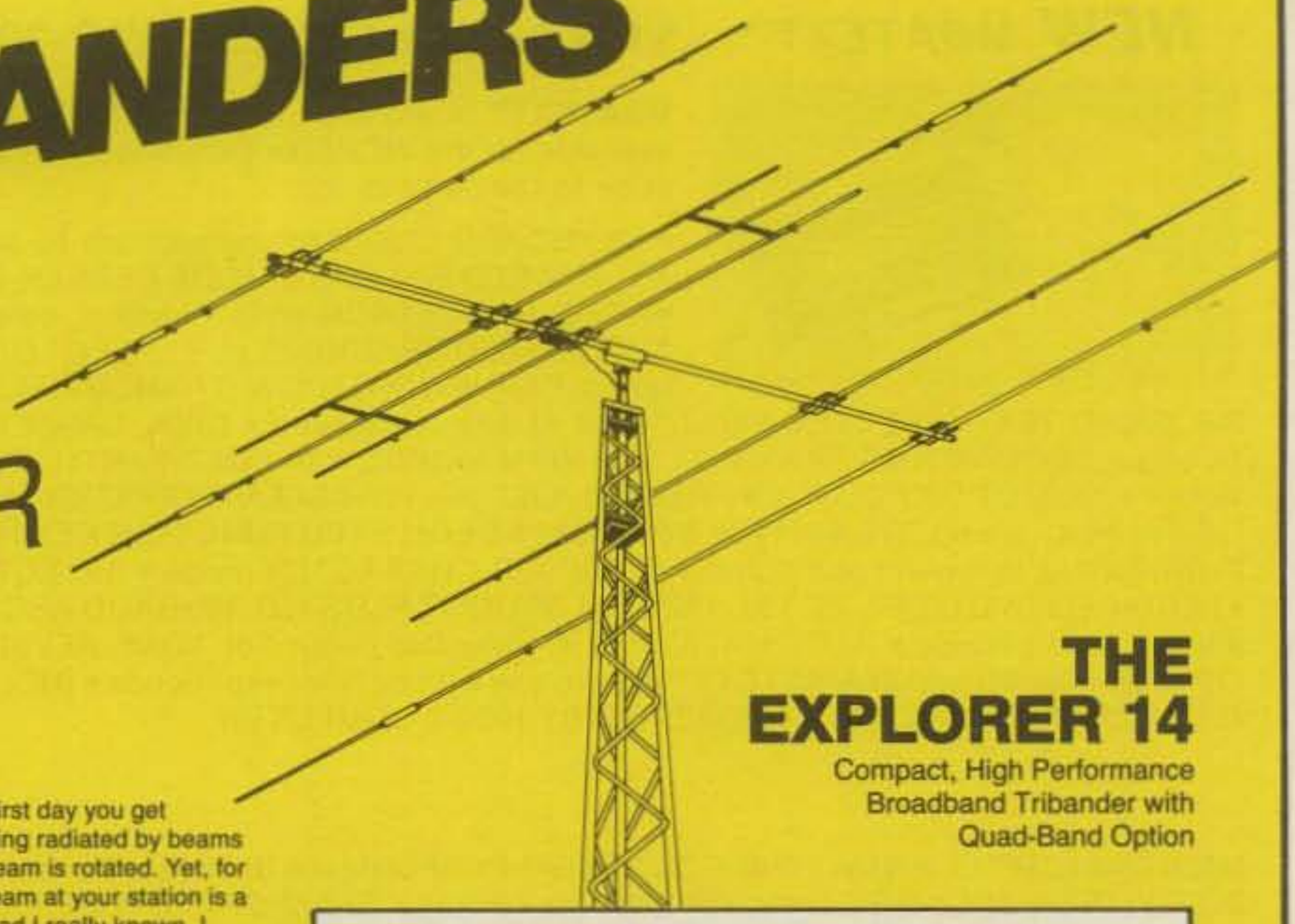


There is nothing like a beam!

You hear about the importance of the antenna system from the first day you get involved in amateur radio. You hear the big signals on the air being radiated by beams and you hear those same signals virtually disappear when the beam is rotated. Yet, for whatever the reason, getting on the air for the first time with a beam at your station is a down-right exhilarating experience. The universal reaction is "Had I really known, I would have installed a beam years ago".

The gain of a beam multiplies the effective radiated power of your transmitter just like an amplifier. More importantly, it amplifies the signal from the station being beamed. Off the sides and back of the antenna, the effective radiated power of those kilowatts on/near your frequency are reduced to manageable QRP levels.

A well-designed beam is by far the best performance buy you can make and it doesn't use any electricity. Further, if you buy a good one, it will last longer than some of the electronics gear in your shack. In terms of cost per hour of enjoyment, a beam antenna is among the least expensive major station components.

As sunspot cycle 21 winds down over the next few years the priority for a good beam shifts from "great to have" to "essential!" To maximize your station capability on the high bands choose one of these super broadband arrays.

THE EXPLORER 14

The same compact size as the well-known TH3Mk3 it replaces. The driven element uses an open sleeve dipole which is a concept that we call PARA-SLEEVE (Patent Pending). The para-sleeve design achieves the broadband performance objective. The forward gain and front to back ratio is very impressive, especially when compared with other antenna designs in the same size class. 43 lbs. (19.5 kg) of superb performance on a 14 ft. (4.3 m) boom. Turning radius 17 ft. (5.3 m) and 7.5 sq. ft. (.69 m²) of surface area. The EX 14 is the ideal choice where space is limited. Great for roof mount or on smaller towers. Optional QK7-10 kit adds your choice of either 30 or 40 meters to the driven element.

FIVE ELEMENT THUNDERBIRD TH5Mk2

Broadbanding is achieved with our unique dual driven element system. Five elements on the 19 foot boom (5.8 m), with four active elements on each of the three bands. 72 lbs. (32 kg) of rugged antenna with 7.4 sq. ft. (.68 m²) of surface area. Turning radius is a manageable 18.4 ft. (5.6 m).

SEVEN ELEMENT THUNDERBIRD TH7DX

This is a broadband successor to the legendary TH6DXX. Five active elements on 10 meters and four elements on both 15-20 meters. The TH7DX represents the ultimate in high-performance arrays whether you're comparing other large tribander's or stacked monobander's. 76 lbs. (35 kg) with a surface area of 9.4 sq. ft. (.87 m), a 24 ft. (7.3 m) boom and a turning radius of 20 ft. (6.1 m). If you own a TH6DXX, a conversion kit is available which includes the second driven element, the completely new matching system, a full set of stainless steel hardware, and of course, step by step instructions. After conversion, your TH6DXX is a TH7DX, exactly.

FEATURES COMMON TO EX 14, TH5Mk2, and TH7DX:

- Separate Hy-Q traps for each frequency. Factory assembled and individually resonated to insure uniform performance.
- Handles maximum legal power with a respectable margin of safety.
- Unique broadband beta match assures efficient energy transfer and places the entire antenna structure at dc ground.
- BN 86 balun supplied as standard.
- Top quality stainless steel hardware supplied at no added cost.
- Super strong, taper swaged 6063-T832 thick-wall aluminum tubing used throughout.
- Unique Hy-Gain die cast aluminum boom to mast bracket. Accepts mast diameters up to 2½" (63 mm).
- Twist and slip proof die formed heavy gauge aluminum element to boom brackets.
- All tubing deburred and cleaned for ease of assembly.
- Only one set of dimensions for complete coverage of all three bands below 2:1 SWR.
- Designed to survive winds of 100 mph (160 km/hr).

THE EXPLORER 14

Compact, High Performance Broadband Tribander with Quad-Band Option

The value of a Directional Antenna was one of my early "discoveries". Over the years, I have built or bought numerous Quads and Yagis. I have never been so impressed as I am with my TH7DX. I enjoy QRP but now have a problem convincing folks that I am only running 5 watts! The TH7DX is a superb antenna, both from a performance and a structural point of view.

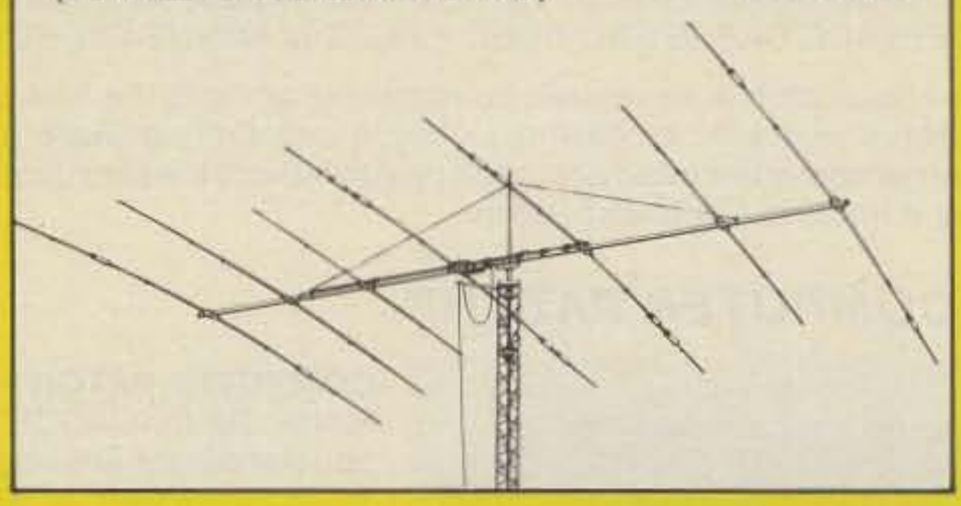
Congratulations!

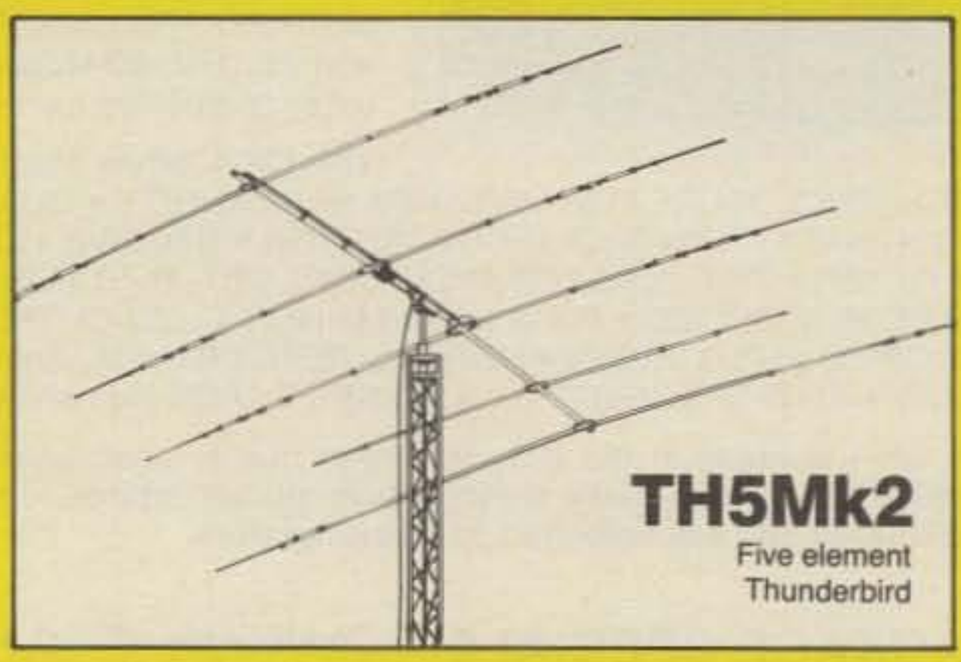
Jack Falker
W8KR

(W8KR has worked all countries but two!)

TH7DX

Seven element Thunderbird





TH5Mk2

Five element Thunderbird

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"Heavy Duty" is Relative!

HDR300

In our lineup of rotators, the CD45 II is rated as medium duty. Some of our worthy competitors offer similar rotators which they rate as "heavy duty" and, within their product line, they are. But if you compare all rotators, it's a different picture. Here is a comparison of our CD45 II, our HAM IV and the Alliance HD73 (Specifications as stated by the manufacturer).

	HD73	CD45 II	HAM IV
Output Torque	400 in. lbs.	600 in. lbs.	800 in. lbs.
Gears	Plastic and Steel	All Steel	All Steel
Control Box Weight	3.8 lbs.	6.8 lbs.	6.8 lbs.
Rotor Unit Weight	6.5 lbs.	8.5 lbs.	10.5 lbs.
Direction Indicator Potentiometer	Carbon	Precision wire wound	Precision wire wound
Rotation Limiter	Mechanical stop only	Limit switches with mechanical stop	Limit switches with mechanical stop
Braking Power	1600 in. lbs. "Windmilling"	800 in. lbs. "Holding"	5000 in. lbs. "Holding"
Antenna Size Rating	10.7 sq. ft.	8.5 sq. ft.	15 sq. ft.

Wind load rating is an important specification too. Unfortunately, there is no standard method of measurement. For example, a long boom antenna with an unbalanced wind load is a much tougher problem than the calculated square area of the antenna would suggest. So we take a conservative "worst case" approach and rate the CD45 II at 8.5 square feet. Yet, the HD73, a lighter unit, is rated at 10.7 square feet. You be the judge.

Here is a complete listing of Hy-Gain rotators and the typical antenna systems that each will comfortably and reliably manage.

AR40—Primarily used for small to medium size VHF and UHF beams. Can also be used with a 10 or 15 meter, 3 element Yagi.

CD45 II—Recommended for a 3 element tribander such as our Explorer 14. Will also manage a medium sized VHF stack and is a good choice for the Azimuth rotator on a good sized satellite system.

HAM IV—A favorite for long boom tribanders such as our TH7DX. Would also be a good choice for an Explorer 14 stacked with a VHF DX antenna or a satellite system.

HAM SP—A modified Ham IV with a special control unit for a blind operator. Single knob directional control system includes a compass rose with braille markings. An audible beep indicates rotator start and stop.

T2X—The well-known Tail Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF "weak signal" array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

HDR300—This 5000 inch pound torquer is our idea of heavy duty. This is the choice for stacked HF "Long Johns" or the full sized 3 element 40 meter monsters. A favorite too for the giant VHF "weak signal" systems where the 1° rotator control and indicator accuracy is a must.

CHOOSING THE RIGHT MODEL—The mistake most commonly made is selecting a rotator for the antenna being installed at the time and not looking forward to the antenna system that you ultimately plan. A rotator that is not over-loaded will deliver many years of reliable service. So, when you choose yours, plan ahead and buy the model that will handle the ultimate load. If in doubt, drop us a note. We will share our experience with you. Long term, you will save money.

AR40

CD45 II

HAM IV

T2X

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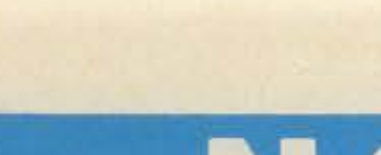

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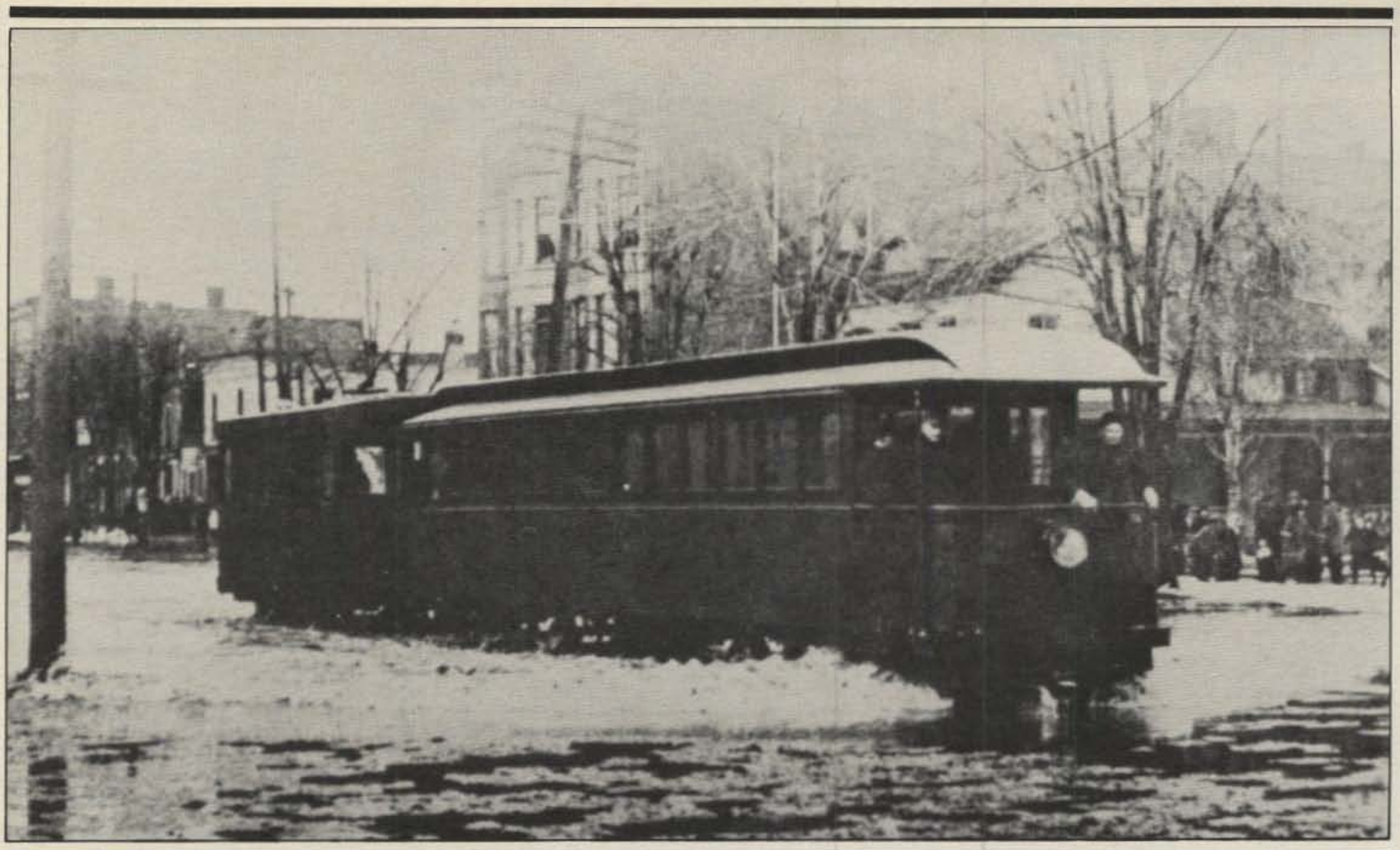

An area of some 100 sq. km was flooded as a result of the malfunction in the fluidic computer. (After H. Christiansen, "LSE," Western Reserve Historical Society, 1978.)

In this article Professor Heisseluft reviews the development of the fluidic computer and the devastating consequences of its first test.

Fluidic-Logic Circuits and Their Early Application to Amateur Radio

BY PROFESSOR EMIL HEISSELUFT*

LAUTON INSTITUTE,
GROSSMAUL-AN DER DONAU, AUSTRIA

We hear much today about digital logic and personal computers. And while the technology today is dominated by electronic devices, there was a time when scientists and engineers alike thought a concept known as "fluid logic" would be useful for device control. Two such scientists were Professor Emil Heisseluft and his mentor, Professor Jerzy Ostermond-Tor, D.O.S.E. Working together at the Lauton Institute in the late 1950s, these world-recognized scientists developed and tested the world's first fluidic computer. The consequences, unfortunately, were catastrophic, and ultimately led to the devasting Grossmaul-an Der Donau flood of early 1960. Here is the story of this remarkable—but terrifying—experiment. —K2EEK

Those of us who work with digital systems take electronic OR, NOR, AND, and NAND gates for granted. But if it hadn't been for a freak accident in Grossmaul-an Der Donau, Austria, in early 1960, most computer-based control devices today would use a concept known as "fluid logic." Given the computer mania that is currently sweeping over this world, I thought it might be interesting, dear readers, to look at some early experiments I performed, together with Professor Ostermond-Tor, on air-and fluid-logic circuits. If truth be known, I truly believe that but for a tragic accident during a test of our

**Professor Heisseluft is currently secluded in his country villa, where he is working on his new book,* Swamped Fluidic Controls. *Correspondence to the Professor may be directed c/o CQ, 76 N. Broadway, Hicksville, NY 11801.*

prototype fluid computer, the Professor and I would have been awarded the prestigious Order of the Great Austrian Frogmouth†, and the world today would be using significantly more fluid-logic systems.

Fluid Logic—The Basics (ref. 1)

In fluid-logic circuits the state of the circuit is determined either by passing or blocking the flow of a stream of compressed air of some other fluid (for example, water). This is completely analogous to electronic logic circuits in which current flow is either ON ("1") or OFF ("0").

A typical air-logic circuit is shown in fig. 1. Here the fluid enters at the top (SUPPLY) and is diverted to one of the two OUTPUT channels by the states of the CONTROL lines. In operation, the fluid flow will be routed through one output channel until a new control state causes the flow to flip to the other output channel. The control channels, for example, might monitor certain production processes, with the output flow used to start or stop processes in the machinery being monitored.

The advantages obtained in using fluid-logic circuits are many. Basic logic circuits such as that shown in fig. 1 can easily be made by etching channels into plastic wafers, with the channels arranged to form OR, NOR, AND, and NAND gates. These gates, in turn, can be stacked and interconnected using tubing, thereby forming complex logic systems. True, compressed air or other fluids do not move as fast as an electronic current, but in applications that require simple logic and slow-to-moderate switching speeds, fluid-logic circuits may be preferred. In addition, these circuits are inexpensive, are more tolerant of physical and mechanical stress, and use virtually no power.

The Lauton Fluid-Logic Experiment

Dr. Ostormond-Tor recognized the advantages of using fluid logic for systems control late in the 1950s, and he asked me—his student—to help in developing a fluid-logic computer. To say I was honored is an understatement, for the Professor was one of the foremost physical scientists of the day. Tor—as we fondly called him—was also OE4X (and ex-YM4XR before World War II) and an active DXer. Tor reasoned that it should be possible to build a fluid-logic antenna control system that would continually orient his 20 meter, 5-element, monoband stealth Yagi (ref. 2) so that it presented minimum area to the wind. The antenna, which had a 16 meter boom and was

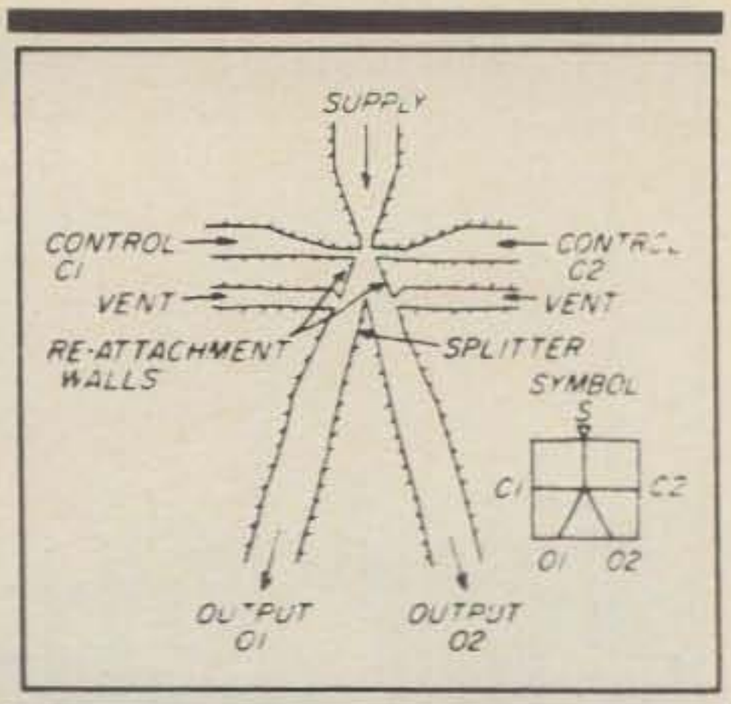

Fig. 1– In a typical bistable air-logic gate the jet stream (supply), routed along one output channel, "remembers" the logic state until a new control signal causes it to reattach itself to the opposite wall. (After IEEE Spectrum, December 1982.)

mounted 22 meters above the roof of Tor's apartment building, was highly susceptible to damage from the winds that were channeled down the Danube River basin. In fact, more than a few people were startled one windy day when an invisible element fell from the antenna and skewered a Volkswagon Beetle on the street below!

In any event, I immediately set about cutting the logic gates out of linoleum blocks, and by gluing the appropriate pairs together, I was able to fashion the NAND gates needed for the control system. These gates were stacked one on top of the other, and they were interconnected with 0.5 cm rubber tubing. We decided to use pressurized water as the fluid-logic medium, with the control tubes (also made from 0.5 cm tubing) run directly to the antenna tower. Here the wind pressure itself produced the "signals" that would control the switching of the SUPPLY lines, and, subsequently, the operation of the relays that controlled the prop-pitch motor.

The fluid-logic computer, of course, was an ungainly affair, and looked as if it could better be used to distill brandy from wine than to control a motor. But we believed it would work and hurriedly put it into operation during the early months of 1960, a time when the winds of winter were causing many problems throughout the land.

The Test . . . And Its Consequences

Plan as we did, the fluid-logic control system did not work at first. The system had many leaks that had to be plugged, and more than a few linoleum blocks had to be recut before the system even began to function. But function it did, despite the occasional triggering of an output by air bubbles in the water lines. And for almost a month, Tor's antenna rode out the winds like a stately schooner on a troubled sea.

And then it happened! Tor's daughter,

---

† *The Frogmouth, which is of the* Order Caprimulgiformes, *is a species of bird found worldwide (except in the far north). The bird, which is soft-plumaged, is distinguished by its weak feet and very large mouth.—ed.*

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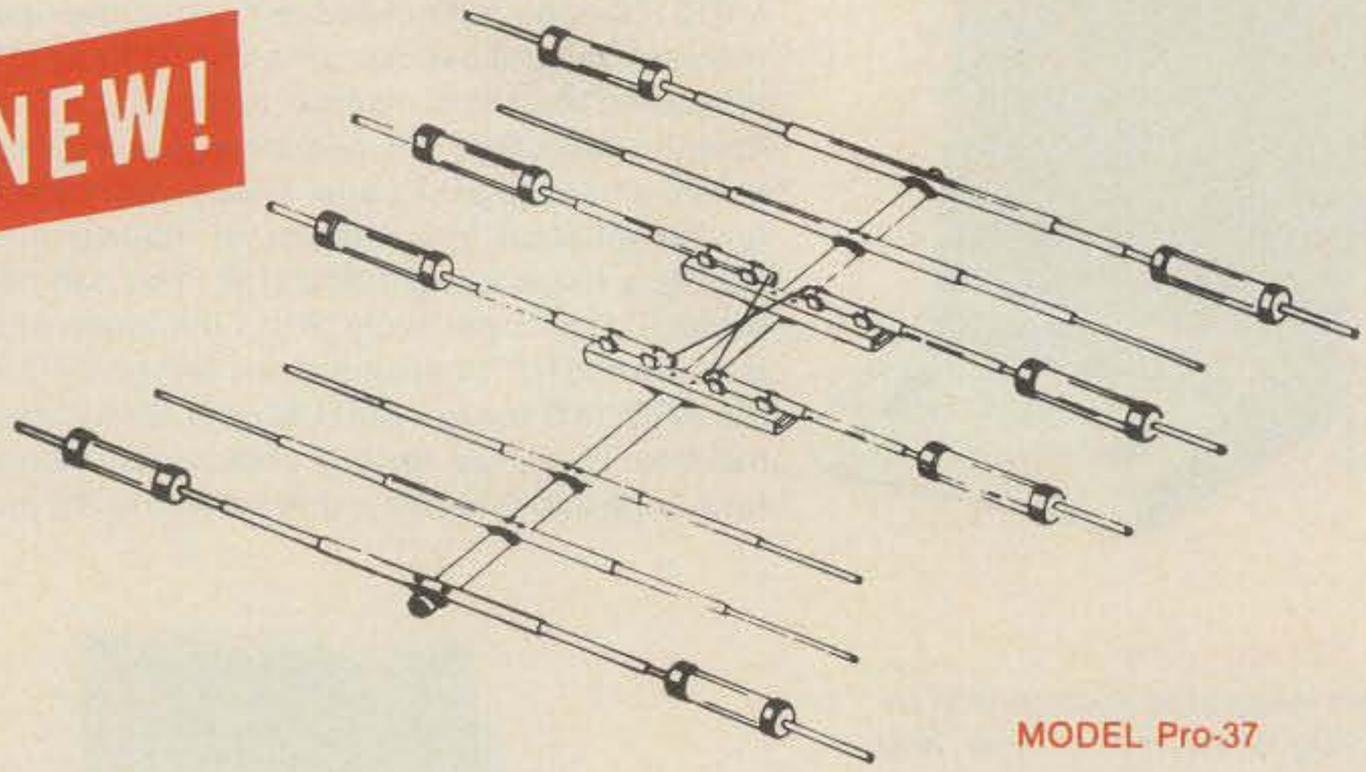

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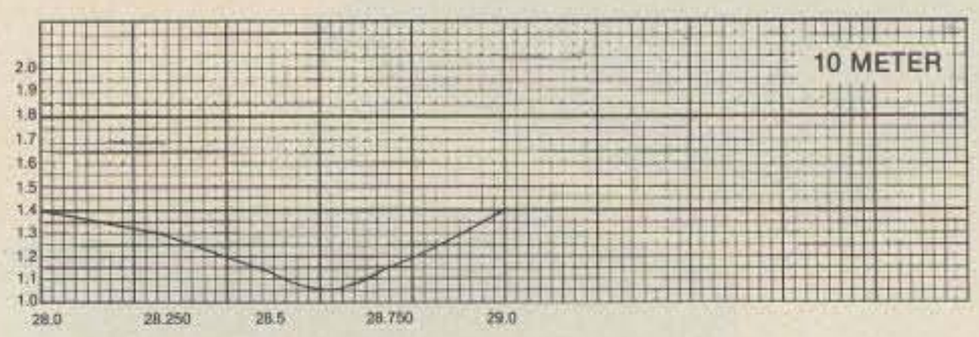

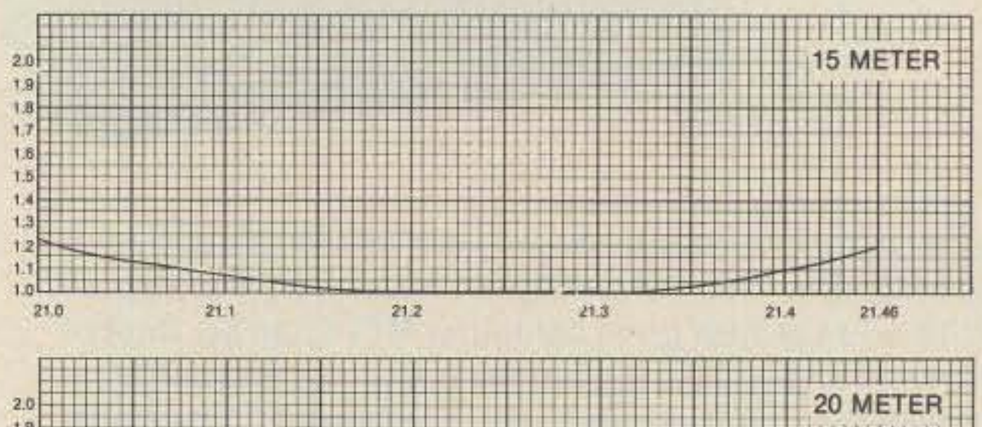

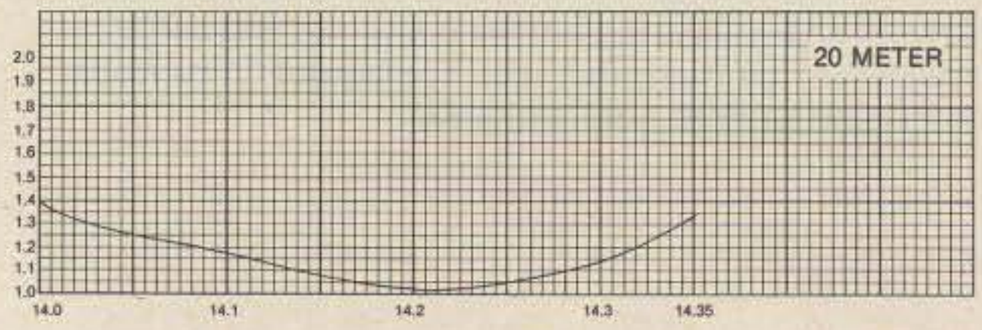

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It was weeks before the old opera house (right in picture) was pumped out and the suds removed. (After H. Christiansen, "LSE," Western Reserve Historial Society, Cleveland, OH, 1978.)

who had been away at school, returned home for an early Easter vacation. This lovely young woman, Sonya by name, was like a breath of fresh air due in no small part to the long bubble baths she took each morning. At first we were only dimly aware that when Sonya drew her bath, the water pressure in the old apartment building dropped and the fluid-logic computer slowed down. We were, however, able to compensate for this effect, and it wasn't long before Tor and I settled back to congratulate ourselves on our abil ity to master the theory of fluidic computers.

There was one thing we had not counted on, however: Sonya's careless use of her bubble bath powder. And there, dear readers, was the making of a catastrophe. Ond day, as Sonya finished her bath, the sudsy bath water, instead of flowing down the drain, proceeded to work into a frothy, thick lather. Soon billows of rich, pink suds were pouring out of every toilet, sink, and tub in the building, and in a way that I cannot explain to this day, they even made their way into the fluid-logic computer. Here the sudsing action was amplified by the computer's switching action, and before long the supply lines burst, sending a high-pressure stream of water and suds cascading throughout the building and over the balcony. The computer, of course, was out of control, and with the prop-pitch motor thrown into a frenzy, the 5-element stealth Yagi fell to the roof with a thunderous crash.

Meanwhile, on the street—or should I say beneath the street—the storm drains became blocked by the thick, bubbly lather that was issuing forth from the building. And it wasn't long before these drains, already overloaded by the runoff of melting snow, were no longer able to handle the flow. Higher and higher the water rose, turning the gutters into raging torrents. Soon the street was flooded, and a wall of water began racing towards the Danube River. Nothing was spared; streetcars, trucks, and automobiles bobbed about like toys in a tub of water, and more than a few went to a watery grave in the Danube. To this day the devastation is fixed in the minds of those who were there, and they still refer to it as the great Grossmaul-an Der Donau flood of 1960.

It took weeks to clean up the mess. And while the accident was blamed on a burst water main in the basement of Tor's building (who were we, after all, to disabuse the authorities of their findings?!), Tor and I quickly disassembled the fluid-logic computer and disposed of its components under cover of darkness. The stealth Yagi was eventually rebuilt and used in our spread-spectrum experiments of 1961 (ref.3). Sonya, who now showers in the morning, went on to receive her PhD in bioelectronics, and she is now the Director of the Lauton Institute's prestigious Genetic Engineering and Research Center (GERC) (ref. 4). As for Tor, he retired to his laboratory, where together with his beautiful assistant, Heidi, he went on to perform the experiments that led to the D.O.S.E. he received on December 31, 1968 (ref.5). CQ

References

(1) Anon., "Whatever Happened to Fluid Logic?" *IEEE Spectrum*, December 1982.

(2) Heisseluft, E., "Applications of Stealth Technology to the Design of Invisible Antennas," *CQ*, April 1981.

(3) Heisseluft, E., "Wideband Modulation (WBM) Techniques," *CQ*, April 1979.

(4) Heisseluft, E., "The Threat to Molecular Electronics from Microbes Produced by Genetic Engineering," *CQ*, April 1982.

(5) Heisseluft, E., "D.O.S.E. Awarded to Prof. Ostermond-Tor," *CQ*, April 1969.

Here's the antenna to dream about, or at the very least to wish you had been there to pick up the same bargain. Rumor has it that there are still about 100 of them out there somewhere, so there is still hope.

What Looks Like A Birdcage For A 2000 Pound Canary?

(A 3.5 to 30 MHz Discage Antenna, That's What)

BY LARRY STRAIN*, N7DF

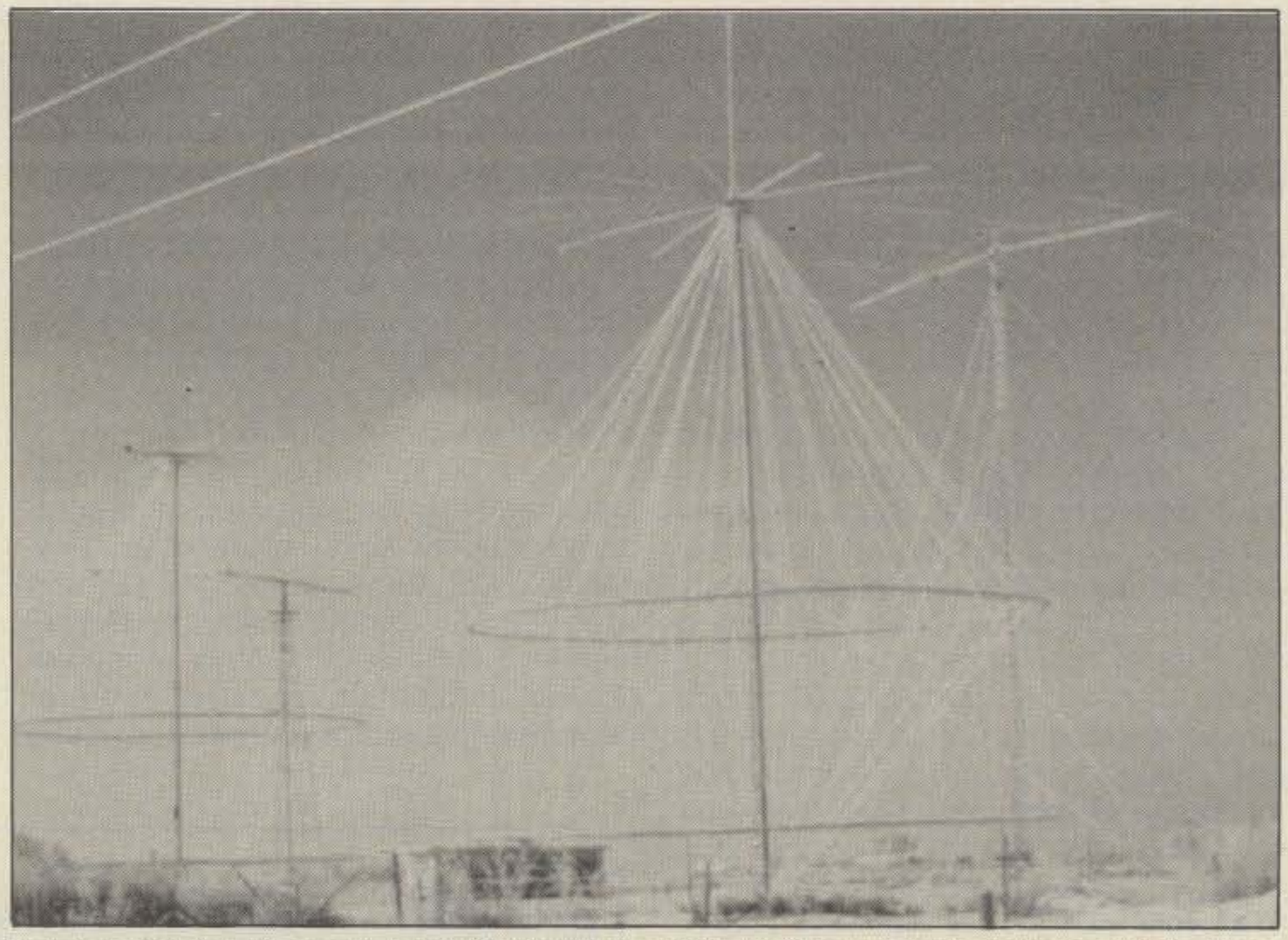
When every third operator contacted in a contest asks what antenna is being used one begins to get that nice feeling that at last a good antenna system has been found.

This was, essentially, what was realized within the first few months after erecting a military-surplus antenna that had been acquired, through a Department of Defense direct bid sale, at the QTH of N7DF, in Utah. The antenna was designated in the accompanying technical manual as: "Antenna 237W-1X . . . a transportable, omnidirectional antenna that covers the frequency of 3.5 MHz to 30 MHz and combines an elevated discone antenna and a folded cage monopole antenna into one structure." The description is relatively straightforward, for a military technical manual, but the "portability" of a 55 foot tall, 48 foot diameter antenna that weighs nearly a ton is a matter of opinion!

Since there were adequate monoband Yagis already up for 40 through 10 meters, the upper region of the antenna's range was of little interest. The technical manual indicated that "the folded cage monopole mode of operation covers the frequency range of 3.5 MHz to 6 MHz," so plans were made to concentrate its use on 80 meters.

For the folded cage monopole mode of operation, the disc on the top of the cage was originally shorted to the top of the cage via a 55 foot length of coax that was switched to ground at the bottom of the mast. This resulted in poor operation of the antenna, in practice, and it has been reported that an Air Force advisory bulletin prohibited use of the antenna in folded cage monopole mode after several 20 kw transmitters had been "smoked" at missile bases when this mode of operation was used. The best solution for use of the antenna in folded cage monopole mode turned out to be simply to strap the top hat disc directly to the top of the cage. By doing this, any phase problems that might have been present due to the length of the coax were eliminated. It was also found that this permitted extension of the lower usable frequency to include the 160 meter band.

The antenna, as modified, presented a relatively good direct match on 80 meters with the 400 pF fixed shunt capacitor provided. Replacement of the fixed capacitor with an air variable of 600 pF maximum capacitance permitted adjustment to a perfect 1:1 v.s.w.r. match over the



This is what the discages look like in place at the N7DF contest station in Utah. Note that the near discage has a trapped vertical mounted on the top.

*P.O. Box 125, Holton, KS 66436

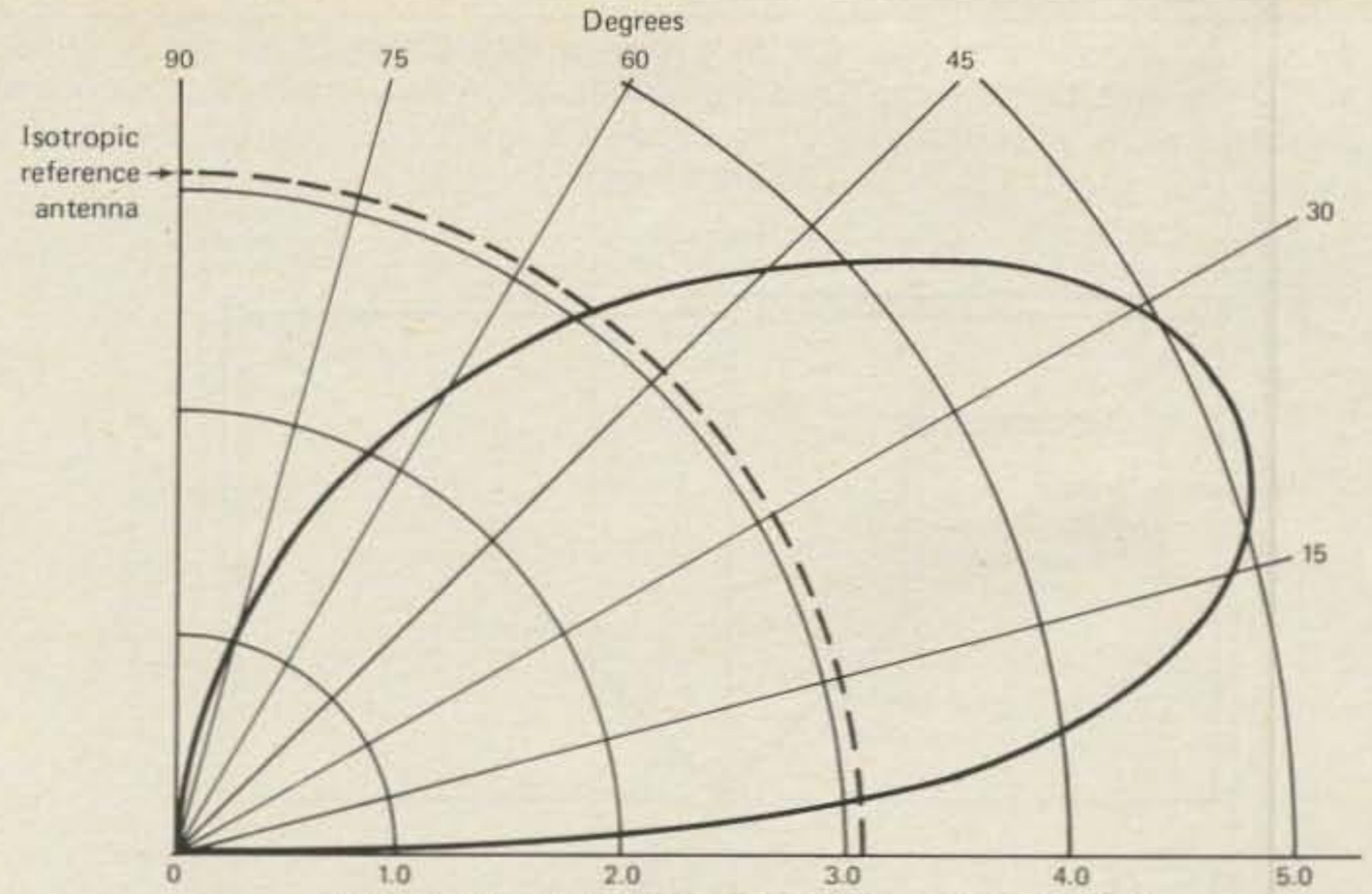


Fig. 1– A voltage pattern plot at 3.5 MHz as supplied by the manufacturer. The lobe is shown centered at 20°.

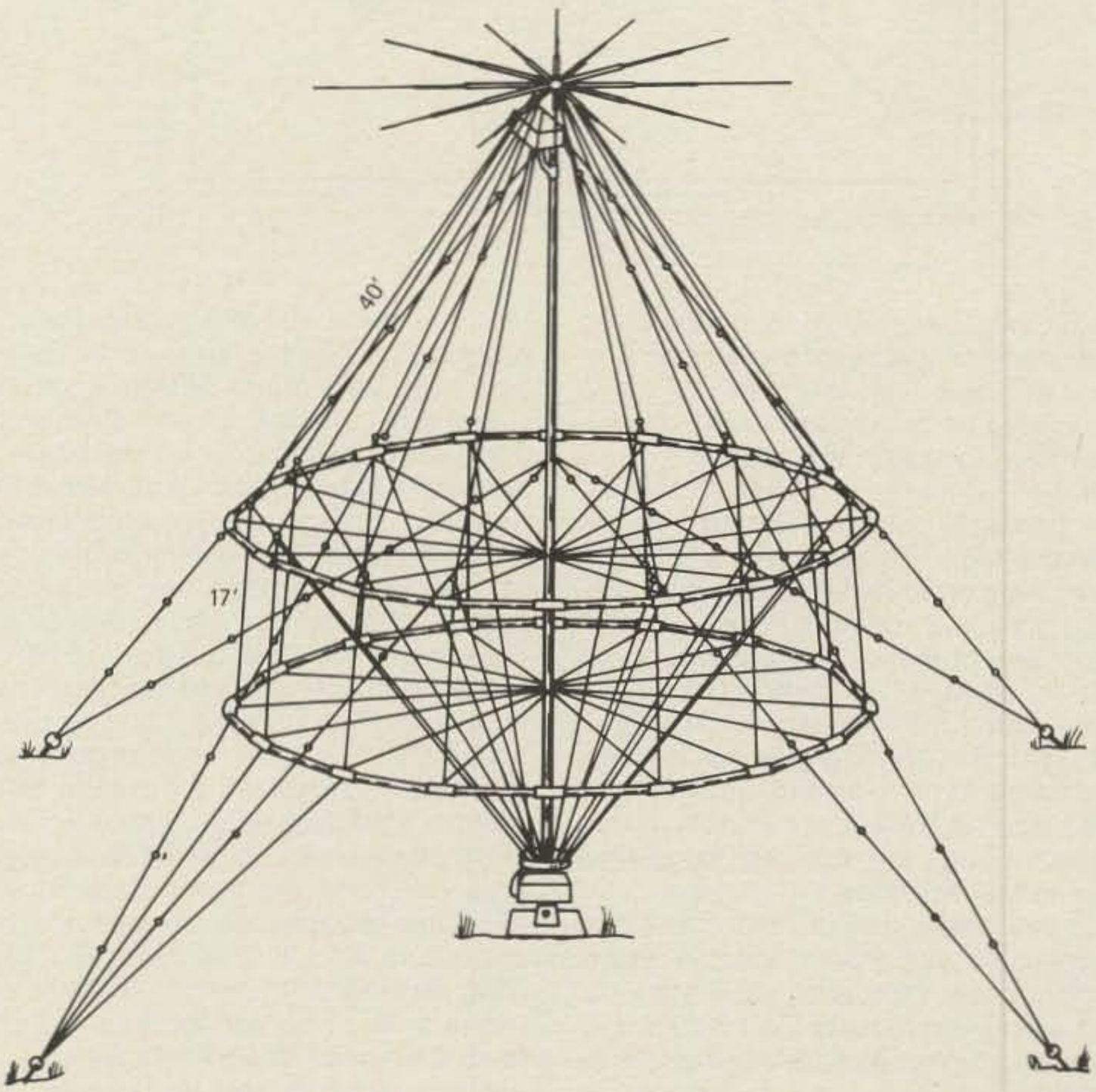


Fig. 2– A line drawing of the Collins Radio 237W-1X antenna.

entire 80 meter band. A small series inductor was required to achieve resonance on 160 meters. Once again a perfect 1:1 v.s.w.r. match was achievable with a shunt capacitor forming an L-network. This time the value of the capacitor had to be increased to around 2200 pF, however.

In both cases of operation the presence of an extensive ground-plane system was mandatory. At least 10 quarter-wavelength radials were required before a match to 50 ohm coax could be achieved. Significant improvement in performance was readily noticeable as the number of radials was increased up to a total of 80. Beyond that point, increasing the number to 120 seemed to have no noticeable effect except to increase the hazards of traveling through the backyard.

The antenna evidences a single, very low-angle radiation lobe in the vertical plane. Collins Radio, the manufacturer,

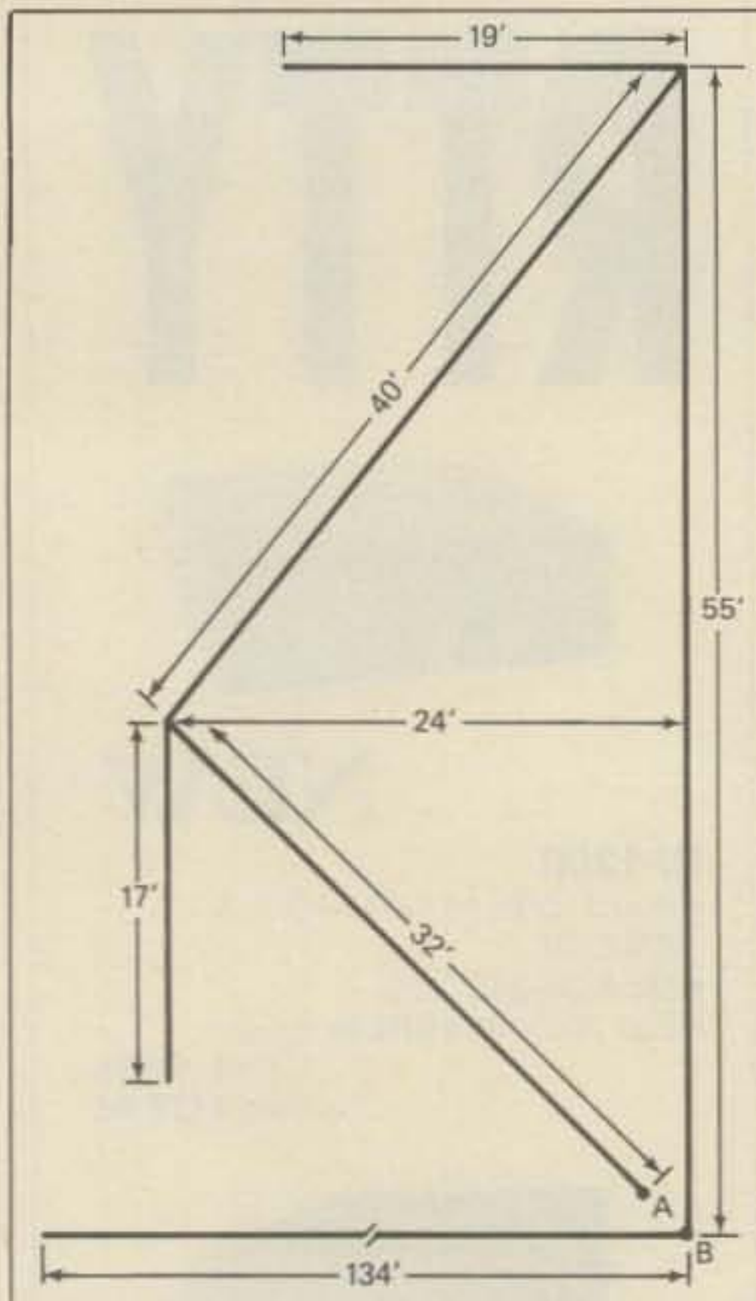
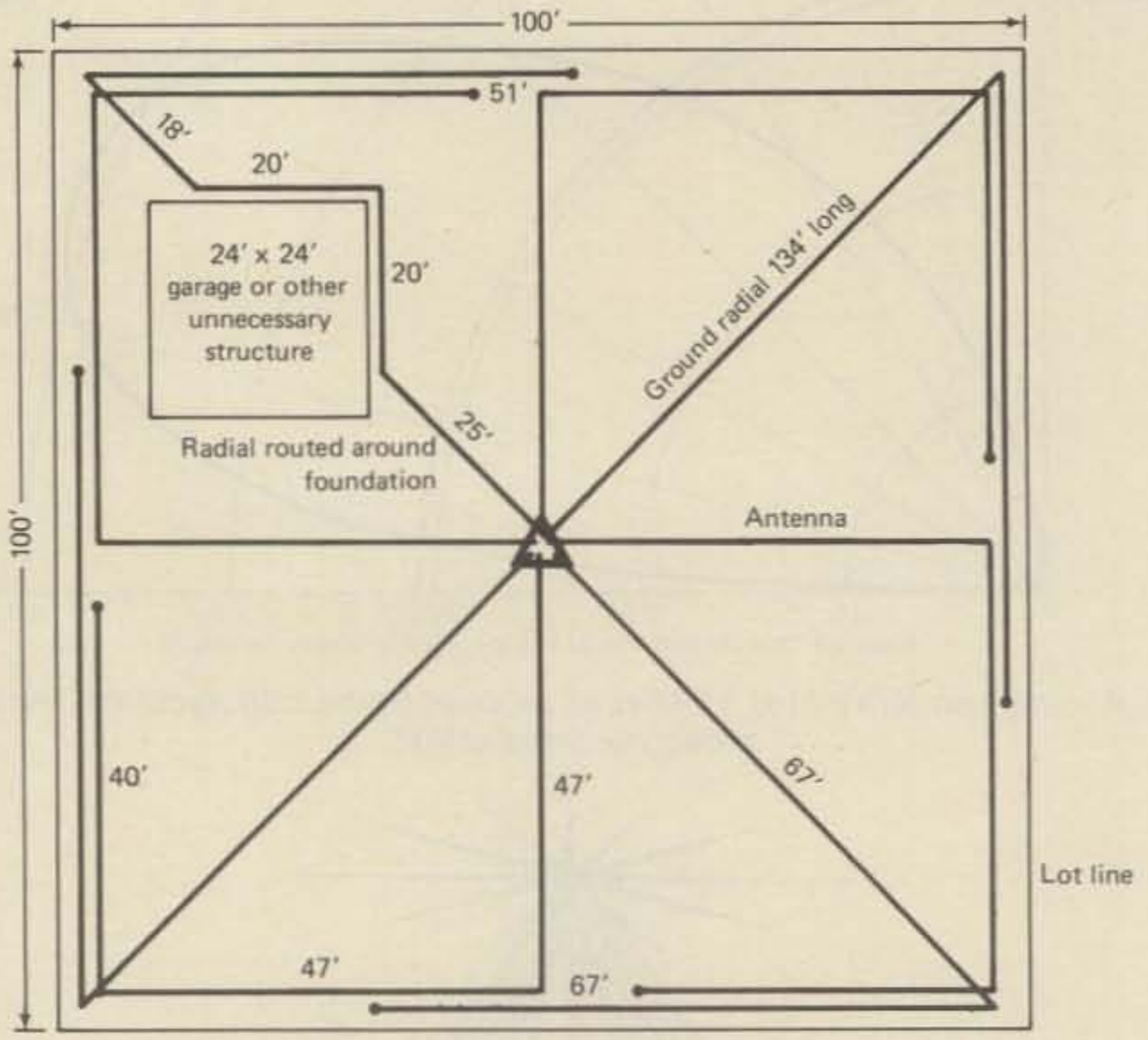


Fig. 3– One of the 24 discage radiating elements. The feedpoints are between A *and* B.

Fig. 4– A diagram showing how 134 foot ground radials can be folded to fit on a 100' × 100' lot. The author assures us that unnecessary structures such as houses and garages may not even need to be removed if the radials can be routed around the foundations.



provides a voltage pattern plot (fig. 1) that shows this lobe as centering on 20 degrees above the horizon. Tests have confirmed this pattern, but indicate that the actual lobe for the modified antenna may be somewhat lower and narrower. It is significant to note that there are no minor lobes at higher angles, whatsoever. From this information, and actual on-the-air tests, the antenna has been proven to be a superlative DX performer on 80 and 160 meters.

Unfortunately, only a total of twelve of these antennas have been saved from the salvager's scrap furnaces. Although over 2000 were built by Collins Radio for the military, at a final cost of over $30,000 each, all but a dozen were sold for scrap metal. Of these few remaining antennas only five remain in operational condition. Fortunately, these are owned by amateurs and are currently being used in contest stations and for DXing. (Note: There are unconfirmed reports that the military still has about 100 antennas of this type in use in various spots around the world.)

Since the lack of availability and high cost of these antennas makes it impossible for other amateurs to acquire them, an effort has been made to redesign one so it can be built by the average amateur out of readily available materials. Fig. 2 shows a line drawing of the commercial antenna. In this view the antenna itself can be seen to consist of two cones fitted together base-to-base with a set of spacers holding the cage open. Phasing stubs hang from the joining point for the two cones and are held open by a second set of spacers. There are 20 four-cage wires in all, each consisting of three parts. The top hat "disc" consists of 12 pipes mounted on a round plate which is insulated from the top of the cage.

In fig. 3 is shown, in schematic detail, one complete radiating element of the antenna with dimensions. As can be seen, the ground radial system is an integral part of the antenna. In order to construct one of these antennas (which we call a "discage" to contract the complete name of "discone-cage monopole") for the average amateur, the only requirements are a 55 foot tall tower with a fair-size Yagi beam, or tribander, on top and a lot large enough to string out the ground radials. In tests it has been found that the radials can be folded back on themselves with little noticeable loss in performance. Thus, a lot 100 feet by 100 feet can accommodate the antenna. Fig. 4 shows a typical plan view of such an installation.

The cage itself is composed of copper-weld wires attached at the top of the tower and held out by plastic rope. Polypropylene hay-baler twine has been found to serve very well for the purpose of guying out the wires, and it is much more economical than nylon rope in the large quantities needed. (One-half mile of baler twine costs about $12.50 at a farm supply store.)

In fig. 5 a detail of one of the cage elements as staked out is shown. The wire down the side of the tower is very important. The tower itself does not provide an adequate ground return path for the antenna currents, and at high power arcing will occur inside the joints of the tower legs if separate return wires are not provided. Similarly, the ground strap from the center of the boom on the beam is necessary to avoid placing r.f. across the rotor and damaging it by internal arcing.

The feed for this antenna couldn't be simpler; a shunt capacitor across the base is all that is required. Voltage on the capacitor is very low, but since it will be outdoors, at least 600 volt spacing is recommended even when it is enclosed in a watertight housing. A range of up to 600 pF is required to permit use of either 50 or 75 ohm coax to feed on 80 meters. For 160 meters a roller coil and a capacitor of around 2200 pF are needed. Up to 1000 pF of this capacitance can be fixed, but capacitors used must be capable of handling very high r.f. currents. Transmitting micas or fixed air capacitors should be used. Of course, a single air variable (or vacuum variable) can be used for the whole 2200 pF if desired. The roller coil should be 3 to 4 inches inside diameter with 6 to 8 turns per inch. Such coils are readily available from surplus electronics retailers or at most amateur radio flea-markets. In this size range 6 to 10 turns of the coil will be required to tune the antenna for 160 meters at the low end of the band. Tapping a fixed coil for the proper match is possible but is very tedious. By careful adjustment of the coil and capacitor combination, which is a simple L-match configuration, a useful bandwidth of at least 75 kHz is possible with a single setting.

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A double-pole double-throw relay can permit bandswitching from 80 to 160 meters by remote control (see fig. 6). The control line should be shielded and bypassed to prevent r.f. from being carried back into the shack where it can cause all kinds of havoc.

Tuning the cage for 160 can be a bit tricky. First the 600 pF variable connected to the coax center conductor should be adjusted to a 1:1 match at the center of the band segment on 80 meters where most operation will take place. A bandwidth of 150 kHz with 1.5:1 or lower should be possible on 80 meters with 40 or more radials out. The relay must be in the normally open position for this adjustment. To switch the antenna to 160 meters, the relay must be energized. With the roller coil set at 8 turns in the circuit, the second air variable is adjusted for lowest v.s.w.r. at the center of the band segment on 160 where operation is desired. The coil is then adjusted for lowest v.s.w.r., as is the capacitor once again. This back-and-forth adjustment is repeated as many times as needed until a match is achieved. At the proper match point the v.s.w.r. will dip very sharply to 1:1. Often as little as 1/10 turn of the coil will make a significant change. This should give a usable bandwidth of 75 kHz with the values specified. Do not attempt to extend the range by tuning out high v.s.w.r. with an antenna tuner at the transmitter. This can cause arcing of the coil with accompanying harmonic and spurious radiation.

Now the antenna can be switched from 80 to 160 simply by switching the relay on or off from the house.

If the tower to be used as a support is more than 55 feet high, the cage should be located at the top of the tower. In this case the ground plane under the cage will become an elevated cone of wires. Of course, the stake-out points for the cage wires will be different. Although this configuration has not been tried out by the author, theory indicates that its performance might surpass that of the ground-level cage.

In all cases of guyed towers, the guy wires must be insulated from the tower and the ground and broken up into nonresonant lengths by insulators. Collins Radio used 8½ foot spacing between their insulators on the guy wires on the commercial antenna. The best solution, however, would be use of Phillystran® or other nonconductive material for guy lines.

Placing the 80/160 meter discage on a tower with high-band beams on top has shown no noticeable effect on the operation of the beam antennas. CQ

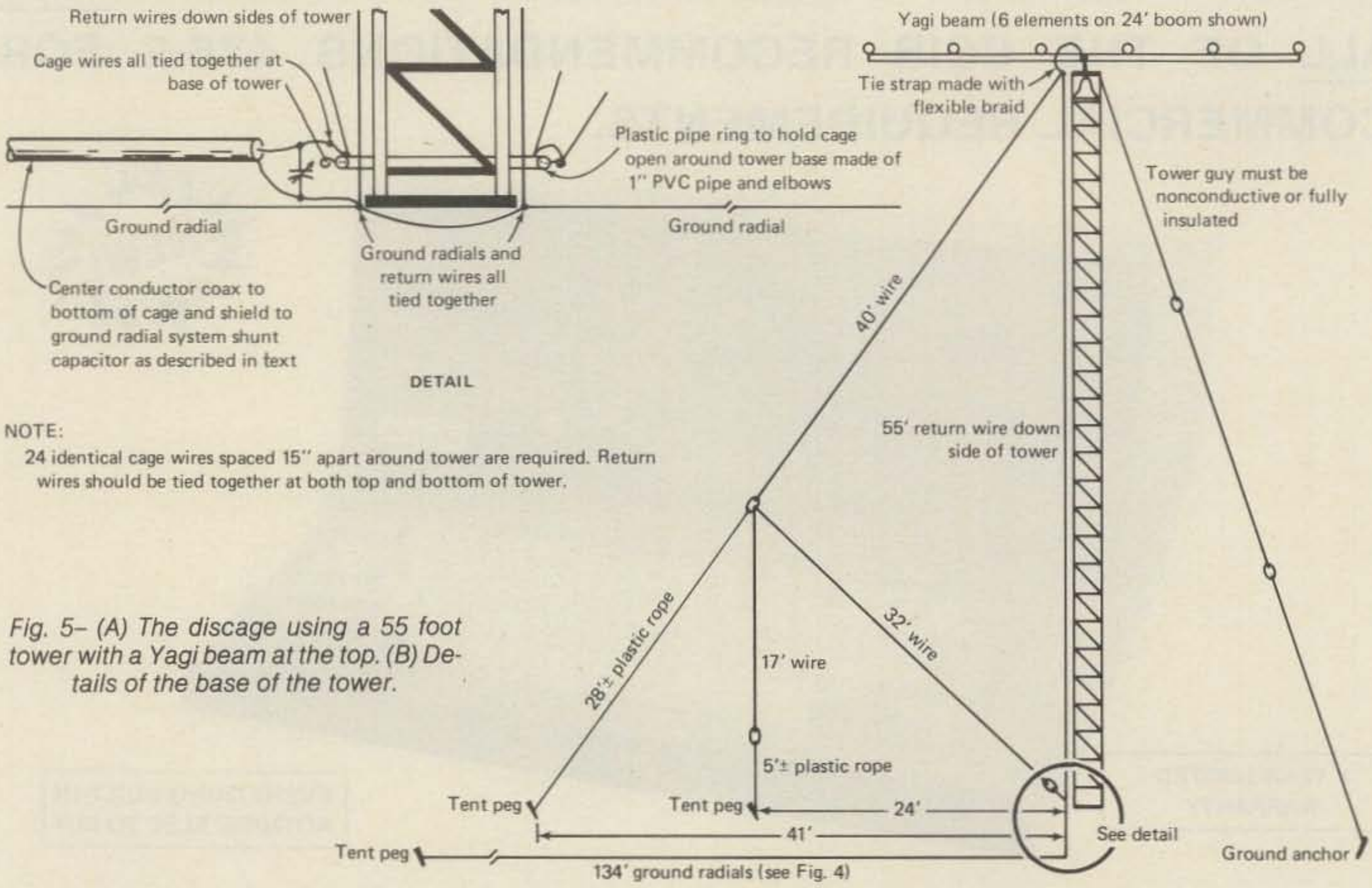

Fig. 5– (A) The discage using a 55 foot tower with a Yagi beam at the top. (B) Details of the base of the tower.

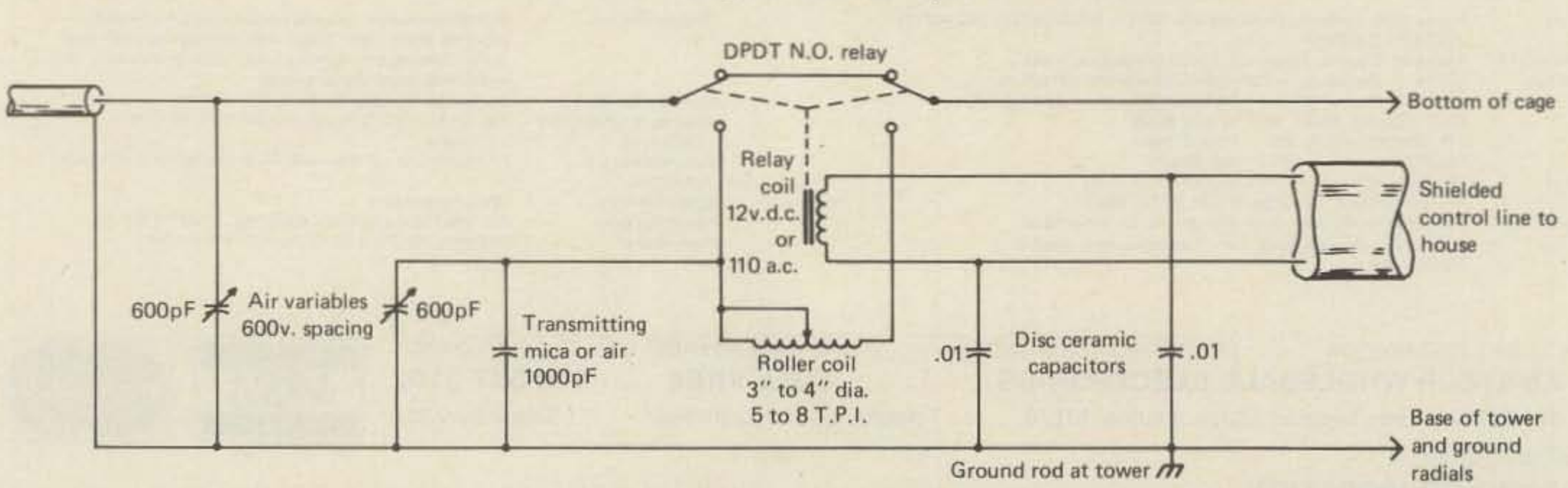

Fig. 6– The circuit for the bandswitching antenna matcher. The relay is shown in the 80 meter position. The entire assembly should be in a watertight box placed at the tower base.

Is it more efficient to collect return currents from vertical antennas as displacement currents rather than as conduction currents? K8CFU says yes and tells us why he thinks so based on his studies of radials.

Improving Vertical Antenna Efficiency

A Study of Radial Wire Ground Systems

BY ARCH DOTY*, K8CFU

The following article was presented in part as a feature of the Proceedings of The Radio Club of America, Inc., *Vol. 57, Number 2, October 1983. The author, Arch Doty, K8CFU, presented what you are about to read as part of an afternoon symposium commemorating the 75th Diamond Jubilee anniversary of The Radio Club of America. We thank Arch and The Radio Club of America for making it available to CQ readers.* —K2EEK

Approximately 50,000 miles of bare wire has been buried in the United States as radials under commerical and amateur radio station antennas in an effort to provide the most efficient artificial ground systems possible.

A recently concluded research program indicates that buried bare-wire radials do NOT provide optimum performance. Rather, the investigation indicates that wires comprising an artificial ground system should be elevated for maximum efficiency, and if it is necessary to bury these wires for practical or esthetic reasons, **insulated** wire should be used.

Theoretical Considerations

The vertical antenna is versatile. It can be constructed in a wide range of heights; it can consist of a thin wire or a thick tower; it can be top loaded, bottom loaded, capacitively loaded, or inductively loaded; its feed impedance can be varied to a convenient value by a number of methods.

The main problem with verticals is that to work efficiently they must be used with a good (electrical) ground system. This ground must meet three basic requirements which can be described, in somewhat simplified form, as:

(1) The ground must efficiently collect the "return currents" from the antenna. When r.f. energy is fed to a vertical antenna, displacement currents flow from the antenna through surrounding space and toward the earth below. To complete the circuit, and allow these currents to flow, they must be collected from or near the earth and returned to the feed point at the base of the antenna.

Considerable losses will be incurred if these currents must pass through the earth, as the earth presents a high resistance to r.f. current flow. Even sea water, which has quite high conductivity (low resistance), cannot compare with a "perfect," or metallic, ground.

One special type of antenna, the so-called "ground plane," operates independently from the ground. This antenna uses two or more ¼-wavelength radial wires or rods located at the base of a vertical radiator. However, in this arrangement the radials are, in effect, a portion of the radiating element rather than an artificial ground system.

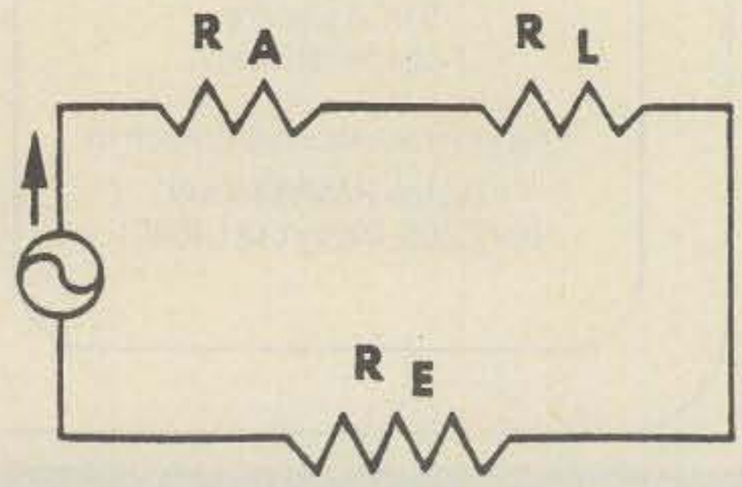

Fig. 1– Equivalent circuit representing current flow.

Other antenna systems utilizing vertical radiators must include some method for collecting and returning currents from the antenna. The method that has been most commonly used is to allow the return currents to enter the earth, and then to collect them with an array of buried "radial" wires. In past years there has also been occasional use of elevated arrays of radials under vertical antennas (counterpoise and ground screens) designed to intercept return currents before they enter the earth or to collect them after they have entered the earth through the capacitive relationship between the radials and the ground.

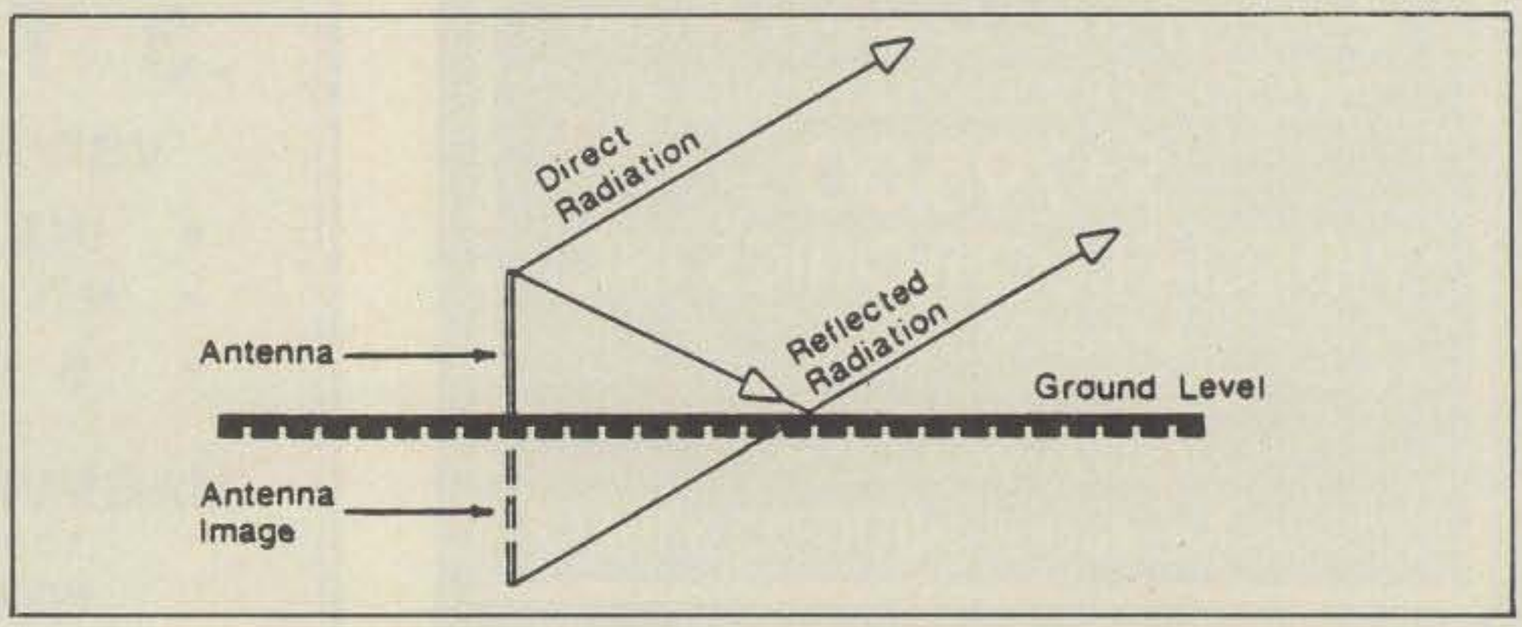

Fig. 2– Radiation patterns of a vertical antenna.

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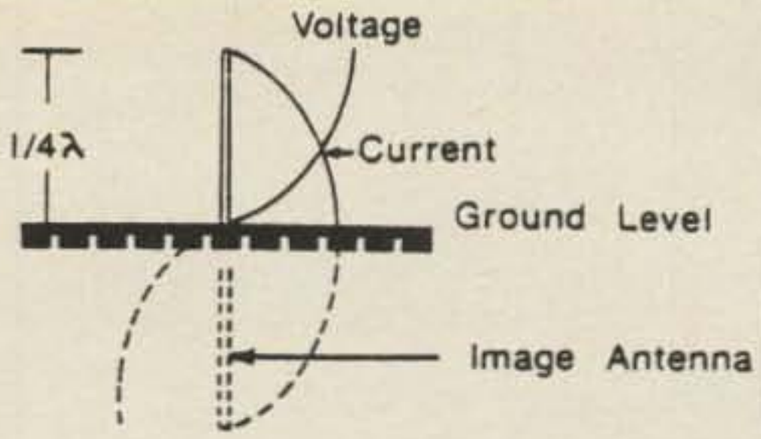

Fig. 3– The image antenna component of a vertical antenna.

(2) The antenna's return currents must be conducted through the ground system to the base of the vertical radiator with minimum losses. Once the return currents have been collected, they must be returned to the base of the antenna. The complete circuit through which these currents flow can be considered as shown in fig. 1, where:

Ra = radiation resistance
R1 = conductor resistance
Re = ground resistance

(It should be noted that Re relates only to those return currents that enter the earth, and are then collected by buried wires as conduction currents.)

(3) The ground must provide a distinct (electrically) reflecting surface under the vertical antenna. Some of the radiation from a vertical antenna is directed below the horizon, and will thus impinge on the surface of the earth. This radiation will be reflected from the earth's surface, and may combine with the direct radiation from the vertical to assist in establishing the radiation pattern of the antenna array as shown in fig. 2. In calculating and comprehending the radiation pattern from a vertical antenna it is convenient to consider that a portion of this radiation is coming from an "image antenna," as indicated.

Fig. 3 shows that the image antenna is an exact reproduction of the vertical antenna as it would look if the earth's surface were a perfect "electrical mirror." Unfortunately, the surface of the earth is far from being a good electrical conductor, as noted earlier. A good artificial ground system should assist in correcting this situation by presenting a good reflecting surface.

Past and Current Practice

At the present time there are approximately 5,000 a.m. broadcasting stations in the United States. Calculation shows that if each of these stations has followed FCC recommendations and installed a minimum of 120 radial wires (each at least ¼ wavelength long) under its vertical transmitting antenna, there are more than 137,000,000', or 26,000 miles, of such wires buried in this country.

In addition, many of this country's 400,000 amateur radio operators have buried systems of radial wires under their antennas. These range from modest arrays to the 25,000' of wire "planted" in the California dessert by an ambitious experimenter there.

Assuming that the efforts of amateurs over the past 60 years have equalled those of the commercial station owners, it can be estimated that more than 50,000 miles of bare wire has been buried in this country under vertical transmitting antennas in the belief that it will provide the most efficient "artificial ground" system possible.

The mole-like endeavors of the radio station owners have not been without good justification. Rather, they have been based on the results of a landmark research effort undertaken almost 50 years ago.

Throughout history one finds examples of "classic" works that dwarf contemporary efforts in the same field of endeavor. In antenna technology the paper on ground systems for vertical antennas by Dr. George Brown and his compatriots[1] is acknowledged to be a true "classic" in its field. Dr. Brown's work stands apart, and even recent tests utilizing instrumentation far more sensitive than anything available in the 30's can find no fault with it. The stature of this work, however, had two unfortunate, although probably unavoidable, results:

1. The overpowering completeness and excellence of the study had the effect of discouraging further research in the particular area that it covered.
2. The Federal Communications Com-

mission was so impressed by the work that it used it as the basis for requirements on the number of "ground system" radial wires that each Standard Broadcast Station is required to have.

The only problem with these events is that the research on which they are based considered only one of the several possible configurations of artificial ground systems—the one using buried wires.

The Recent Research Program

For more than 60 years there have been several alternatives to the buried-wire type of ground system. These have included the elevated "ground" systems of the counterpoise and ground screen types.

Little early data was published on the characteristics of these systems, and apparently no research was conducted on them after publication of Dr. Brown's paper until the extensive tests conducted at Fletcher, North Carolina, in 1981 and 1982.[71,72] Although the Fletcher tests were comprehensive and involved over 16,000 measurements, they, as Brown's work, covered only certain variations of the several possible artificial ground systems—in this case elevated counterpoise and ground screen arrays. These tests clearly showed that these elevated ground system were unusually efficient—perhaps more so than equivalent buried-wire systems.

The Fletcher tests, however, did not compare the relative performance of buried bare-wire radials vs. elevated insulated-wire radials. And, an extensive review of the literature showed no record of such a comparison in the past. Thus, in order to obtain data on the relative performance of the different types of radial ground systems, a test program was carried out in late 1982 using the instrumentation and techniques developed in the earlier Fletcher counterpoise/ground screen tests. In this program several thousand measurements were made of the magnitude and distribution of return currents carried by:

- Elevated/insulated radial wires.
- Insulated wires lying on the surface of the ground.
- Buried bare-wire radials.

In the tests the radial wires terminated at the base of a 90-degree vertical antenna and were the sole means of collecting the return currents. The tests wre made at 1805 kHz. The following combinations of radial wires were tested:

Single Wires

Elevated Wires: 180′, 135′, 90′ & 45′ long
Wires on the Ground: 180′, 135′, 90′ & 45′ long
Buried Wires: 180′, 135′, 90′ & 45′ long

Multiple Wires

180′ buried wire below 180′, 135′, 90′ & 45′ elevated wires
180′ elevated wire above 180′, 135′, 90′ & 45′ buried wires
180′ wire on the ground over 180′, 135′, 90′ & 45′ buried wires
180′ buried wire below 180′, 135′, 90′ & 45′ wires lying on the ground

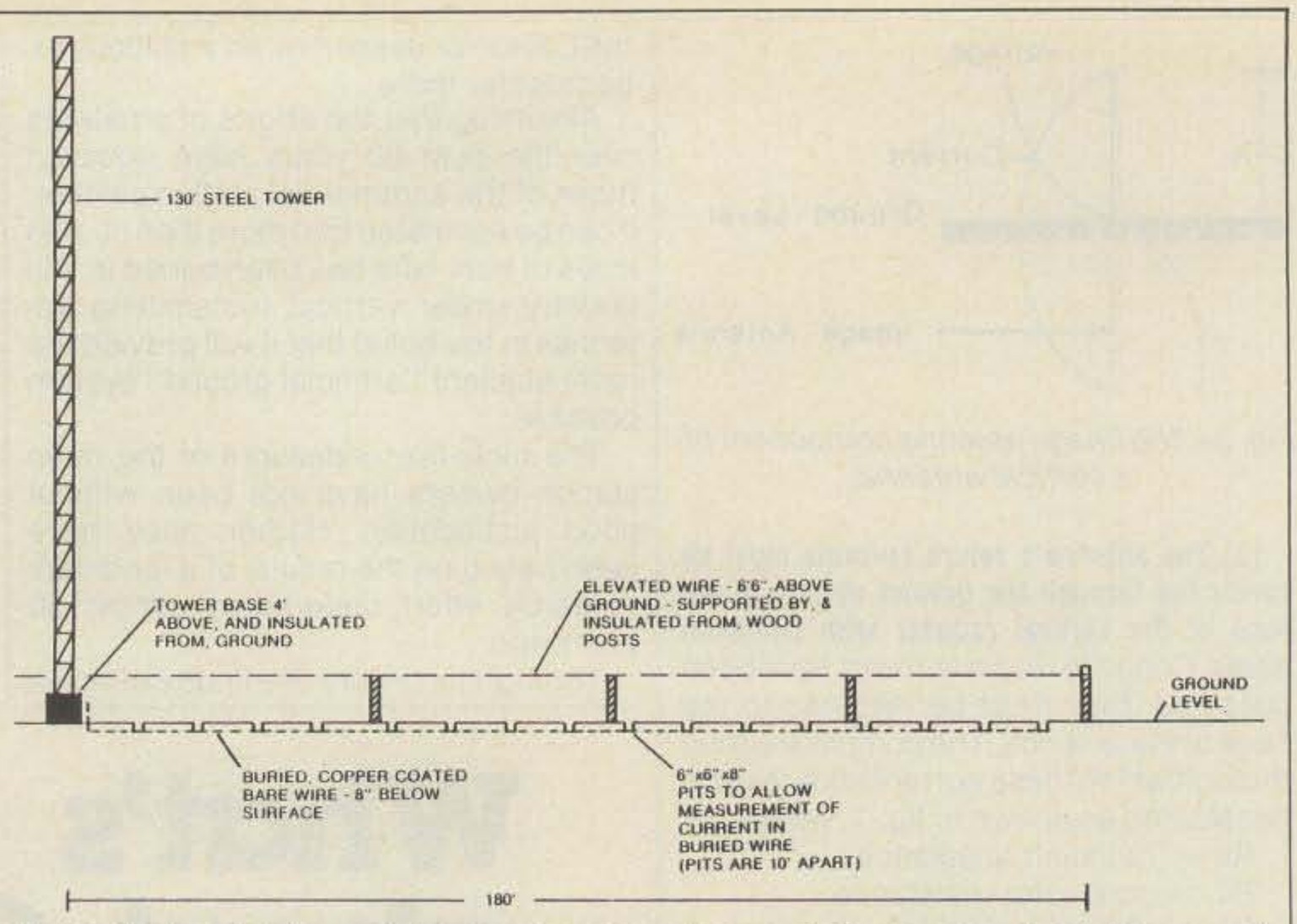

Fig. 4– Test setup for radial current measurements of above ground, on the ground, and buried wires.

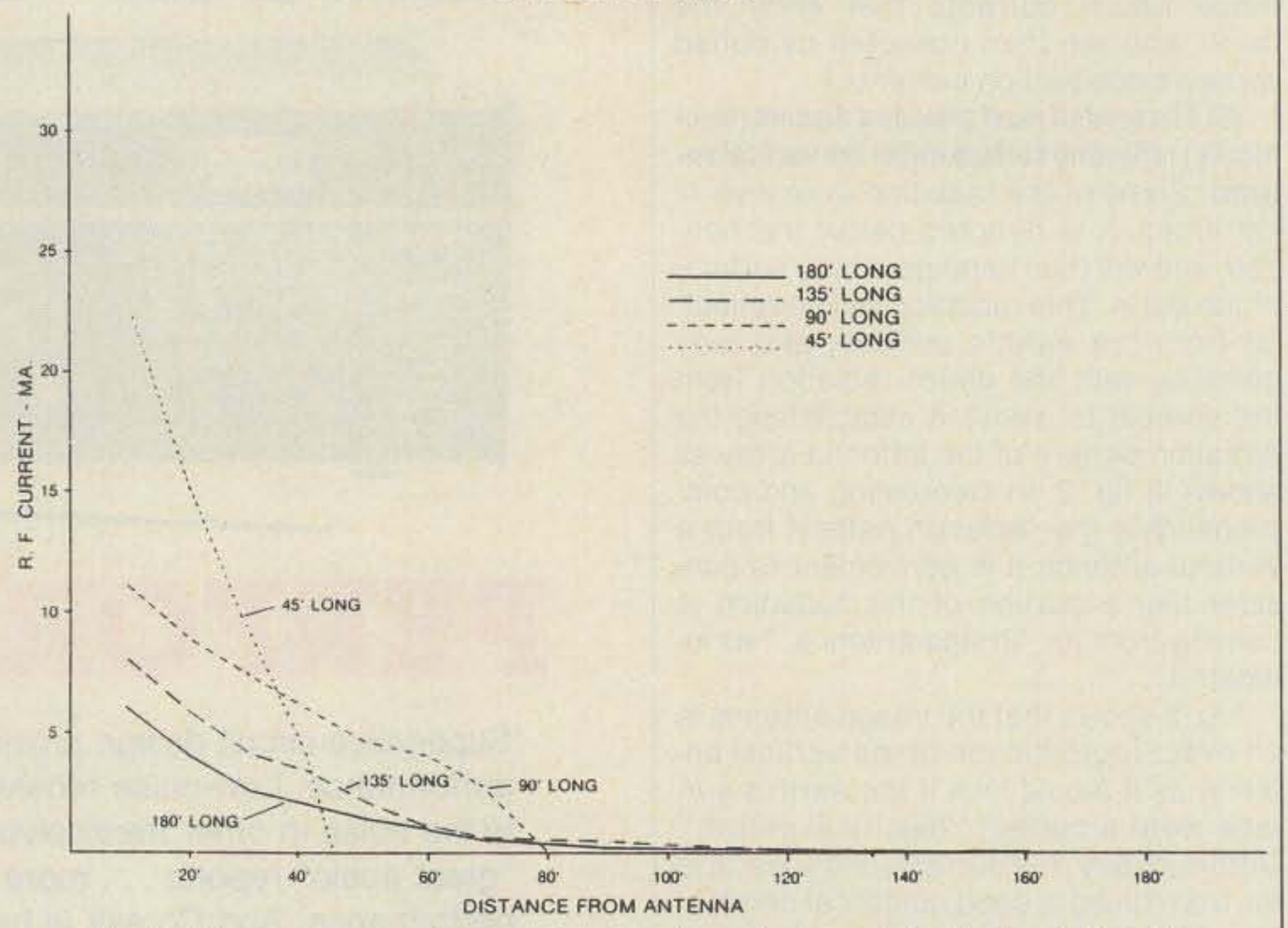

Fig. 5– Measurement of current return in a single radial wire buried at 8″.

Radial current measurements were made every 10′ on each of the various wire lengths listed above.

In the tests the "elevated" wires were 6′6″ above ground level, the "on the ground" wires were lying loosely on the earth, and the "buried" radials were 8″ below the earth's surface, as shown in fig. 4.

Location of the "elevated" and "on the ground" wires was directly above the "buried" wire.

The results of this series of tests were compared and supplemented by data from the 1981–1982 tests. This was possible since the earlier tests were conducted on the same site, and the same instrumentation and testing techniques were employed. The following observations are based on these studies:

I: The currents in buried, non-insulated, radial wires are concentrated near the base of the antenna and decrease at a generally constant rate as the distance from the antenna increases. This is shown in fig. 5 and confirms what has been described in the literature for several decades.

II: As shown in fig. 6, the distribution of return currents in elevated or insulated radial wires having lengths less than approximately 0.20 wavelength is the same as that found in buried wires.

III: Fig. 7 shows that the distribution of

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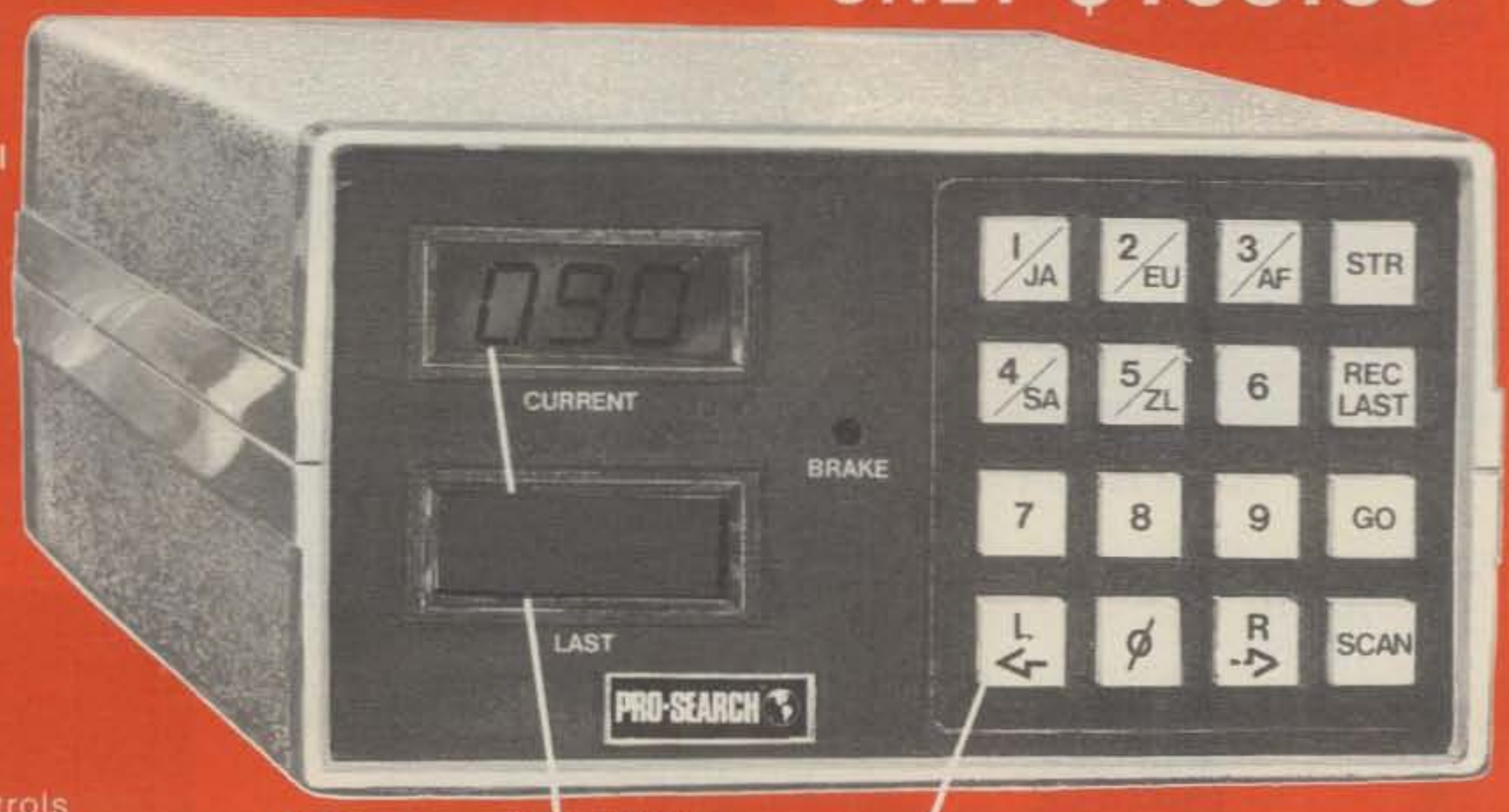

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return currents collected by elevated wires *can* be distinctly different from that found in buried "radial" wires. Extensive testing showed that this phenomena exists as long as the elevated wire is more than approximately 0.20 wavelength long.

In these elevated wires the current level is at a moderate level near the antenna, rises very slightly, remains at an almost constant level for a considerable distance, and then gradually decreases to zero.

This same current distribution pattern was consistently found in similar elevated radials tested in the very comprehensive previous Fletcher test program. It has also been observed in the counterpoise radials of another research antenna extensively tested this year at a different location.

Note: The current distribution pattern of these elevated radial wires results in lower losses (R1 in fig. 1) than those caused by the high level of currents adjacent to the antenna when buried radials are used. In practice, the high level of current found near the base of the antenna with buried radials has resulted in heating (I squared R) losses so high as to set grass afire near the base of a vertical antenna!

IV: Fig. 7 also illustrates that currents found in insulated radial wires lying on the ground are similar to those found in elevated wires. Again, tests showed that this effect occurs so long as the radial is longer than approximately 0.20 wavelength.

Note: Thus, this type of radial provides the same advantages over buried bare-wire radials as discussed above for elevated wires.

V: Elevated ground systems—counterpoise or ground screen—are extremely efficient in intercepting return currents directly from the antenna before they can reach the ground. As shown in fig. 8, there are very small currents in the ground under elevated wires connected to collect such currents. Those currents that *do* exist in the ground are conducted to the elevated wires as displacement currents.

The new test program has indicated that a properly dimensioned elevated ground system, or a radial system using insulated wire, operates more efficiently (with less losses) in collecting return currents from a vertical antenna than does a buried bare-wire ground system.

One of the reasons for the low efficiency of buried bare wires is that the return currents that they collect must pass through the ground for a greater or lesser distance before they reach the location of a radial wire. There are relatively high ohmic losses in this process, as the earth through which the currents must flow has finite resistance. This situation becomes serious near the antenna, where the return currents in buried radials are concentrated, and (I squared R) losses become high.

In contrast, elevated and/or insulated radial wires collect the majority of the currents that they carry directly from the antenna, and the balance as displacement currents from the earth below the wires. The losses incurred in the passage of these return (displacement) currents to the elevated wires in each case involves only the relatively low losses involved in their transference through the dielectric between the wire and the antenna or the ground—air.

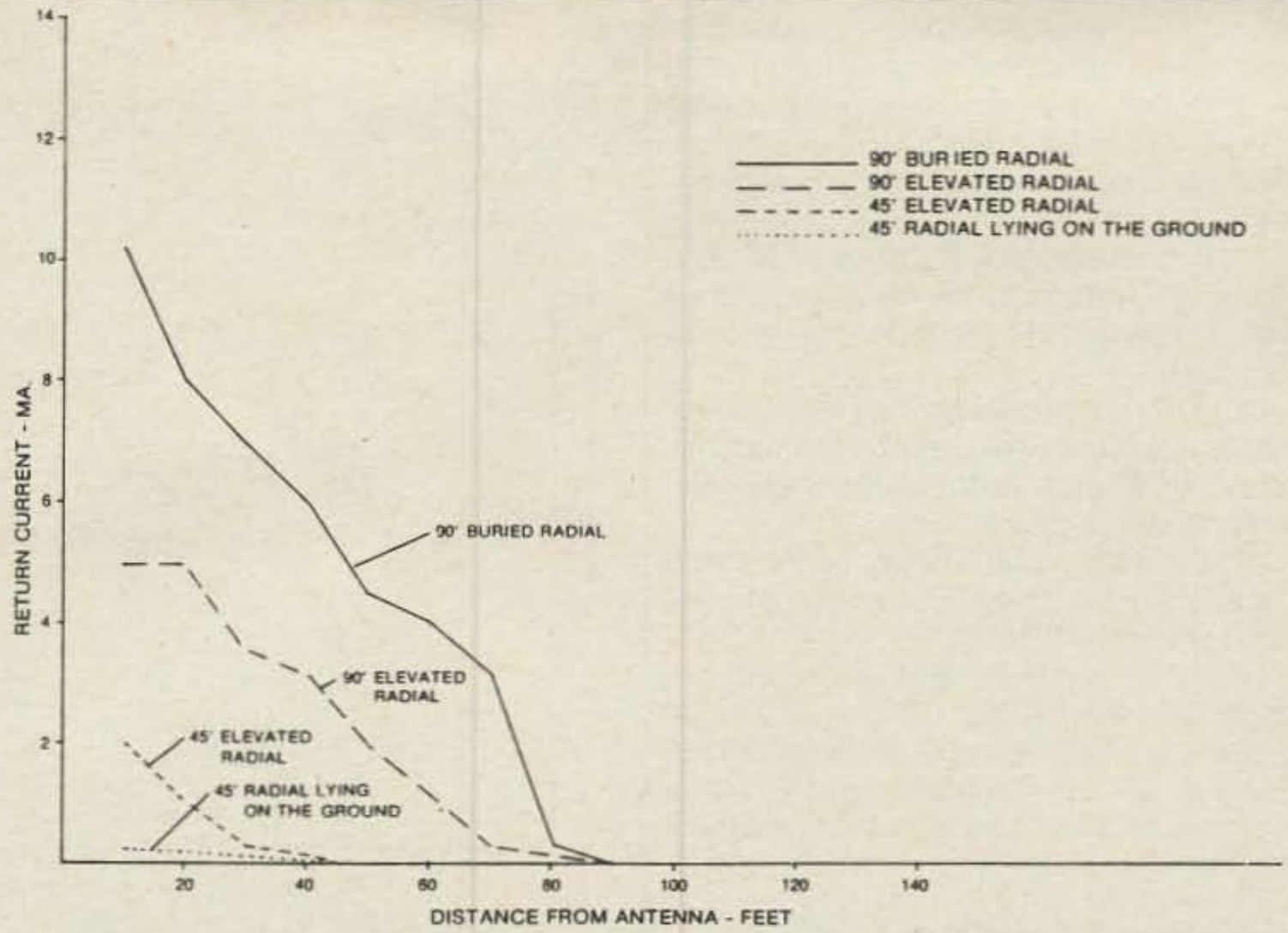

Fig. 6– Return current distribution in short radials.

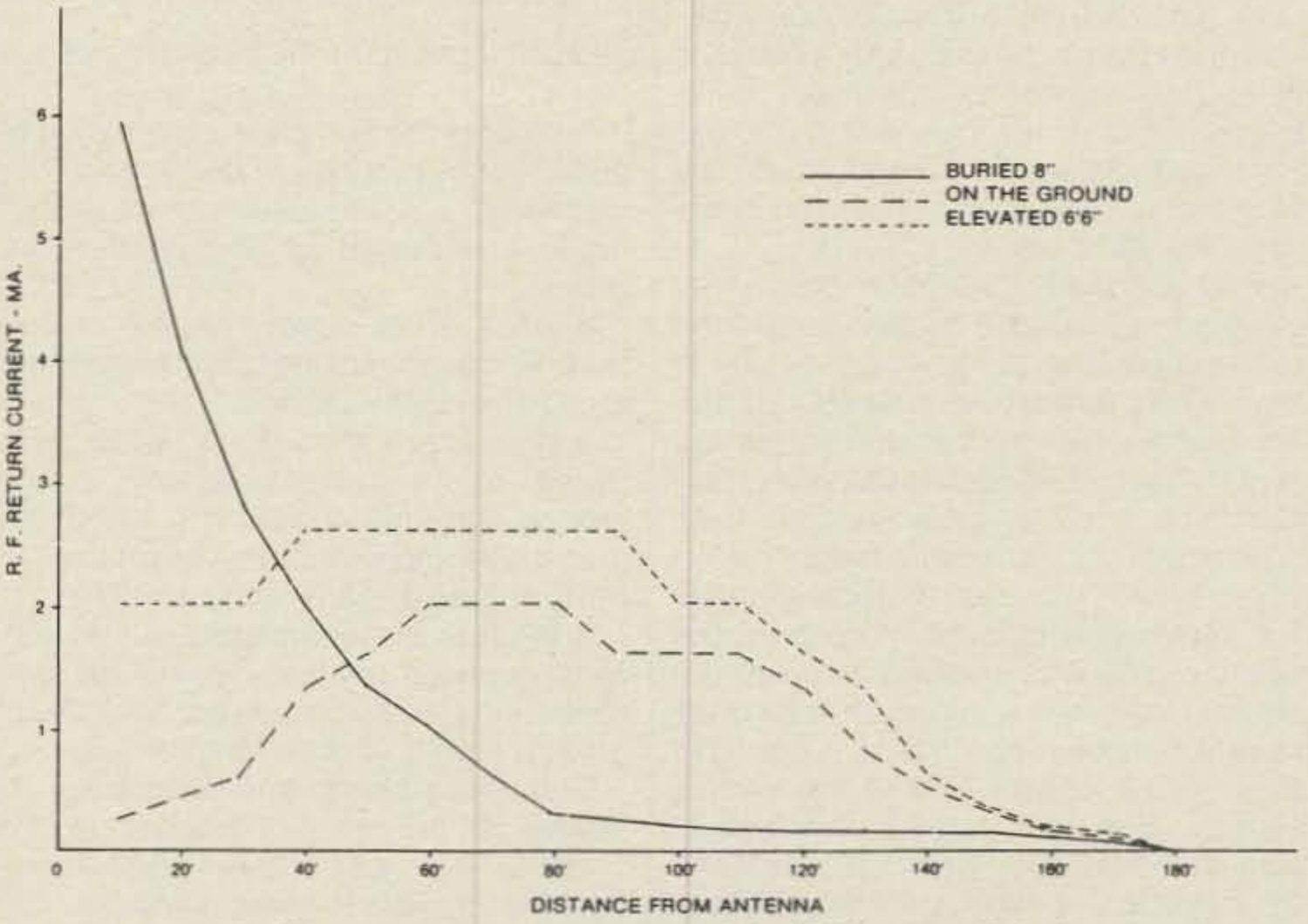

Fig. 7– The return current measured in 180' long radial wires.

Conclusions

From the results of the most recent test program it can be concluded that elevated, or buried but insulated, radial wire arrays fulfill the theoretical requirements of artificial ground systems better than the buried (bare) wire arrays that have been most commonly used in the past. The primary reason for this high efficiency can be best expressed: *It is more efficient to collect return currents from vertical antennas as displacement currents rather than as conduction currents.*

Recommendations

From the above new data some specific recommendations can be derived concerning radial wires used as the ground system for a vertical antenna. The results of the newer test program have also prompted further analysis of the earlier, and far more extensive, series of tests. Several additional recommendations have resulted from this analysis. The

combined recommendations resulting from the several Fletcher research programs can simply be summarized thus:

1. Radial wires should not be buried if they are to collect return currents from a vertical antenna with maximum efficiency.

2. If possible, elevated radials should be used. These can be insulated (i.e., a counterpoise) or grounded (a ground screen).

3. If it is not possible to use elevated radials, insulated wire lying on the ground, or buried as close to the surface as possible, should be used.

4. Elevated radial wires, or insulated radials at ground level, should be at least 0.20 wavelength long.

5. If the above recommendations are followed, 50 radials utilizing insulated wire should provide the same effectiveness as an artificial ground system for a vertical antenna as 120 buried radials of non-insulated wire.

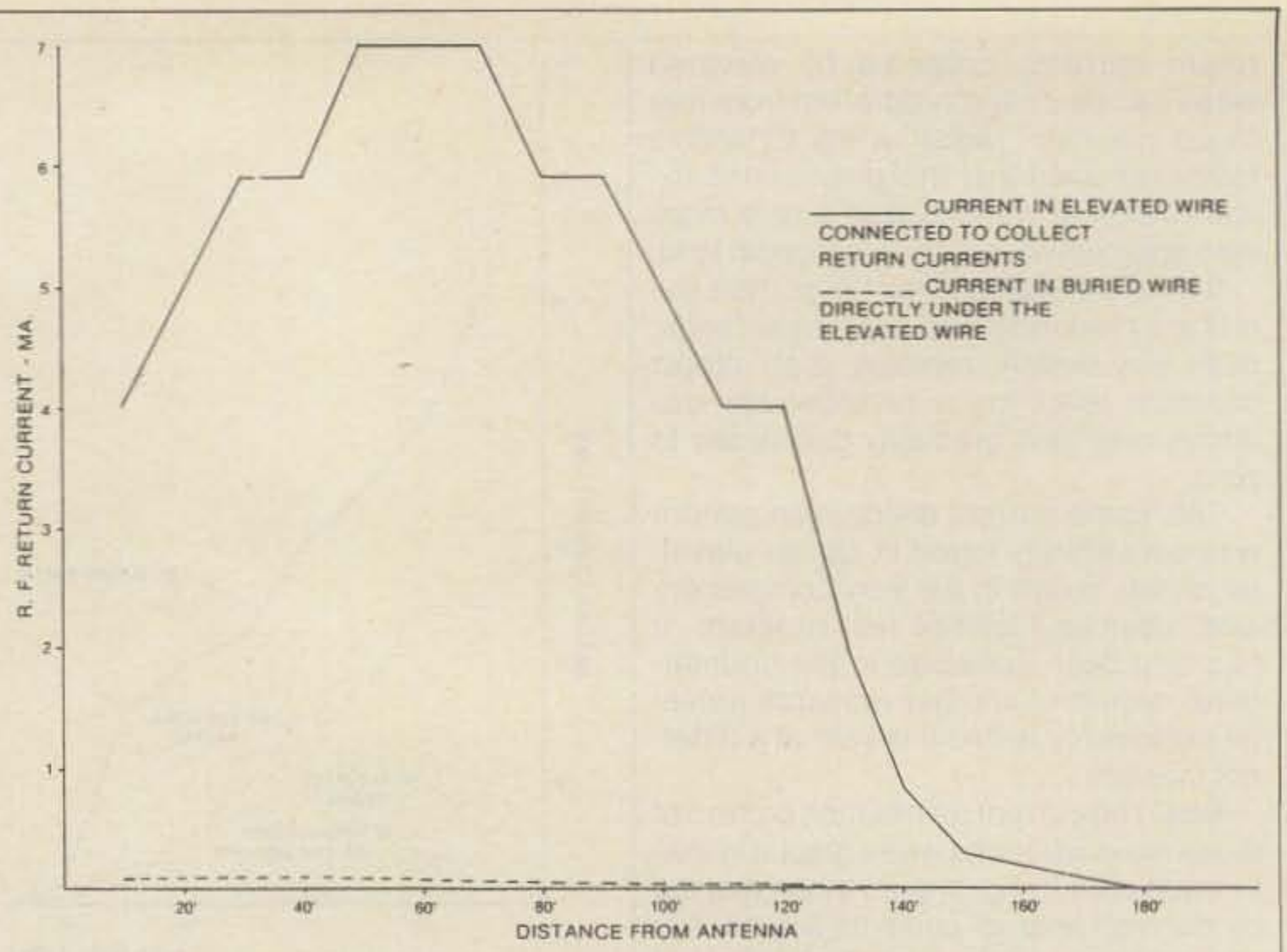

Fig. 8– Return currents in elevated and buried wires.

Unresolved Questions

Any test program—and even ones that have included more than 20,000 measurements, as in the case of the Fletcher tests—leaves some questions unresolved or raises new considerations. The Fletcher tests are no exception, as they have left a number of unresolved questions. For example:

- What is the full scientific reason why elevated or insulated radial-wire ground systems perform as well as they do? In this regard, it must be remembered that the counterpoise and ground screen arrays that provided such outstanding performance in the original Fletcher tests used a total of 7500′ of wire radials covering an area 200′ x 300′, or approximately 1.4 acres. This sounds impressive, but what actually was involved, to present it another way, was a miniscule total of 31 square feet of wire surface suspended over 60,000 square feet of the earth's surface. How is it that this thin web of wire can have the "capture area" and other properties that allow it to be so successful in filling the theoretical considerations described at the beginning of this paper?
- What is the complete explanation of the effect of ground conductivity on the magnitude and distribution of return currents in elevated or insulated radial wires?
- What is the density pattern of currents in the ground under and beyond the artificial ground system?
- What correlation, if any, is there between return current density in the ground, ground conductivity, and the magnitude and distribution of return currents in the adjacent radial wires?
- What is the complete analysis—including phase relationship—of the currents in elevated/insulated radials of greater than 0.20 wavelength?

The researchers who have been involved in the various phases of the Fletcher tests can't give truly comprehensive answers to these questions, and several years of study of the available literature—which spans 60 years—has not been much help. It is hoped that publication of this data will encourage others to search for the answers to these questions and will help in enlarging the knowledge of artificial ground systems.

Acknowledgement

This paper is dedicated to the late Edmund A. Laport. Without his encouragement, friendship, support, and an occasional prod, this research would not have been completed.

Sincere thanks, also, to those who have spent their personal time reading and providing expert and constructive criticism of this paper. This includes Harry J. Mills, K4HU, John A. Frey, W3ESU, and Richard B. Frey, K4XU.

References

1. Brown, Lewis, and Epstein, "Ground Systems As A Factor in Antenna Efficiency," Proceedings of the IRE, June 1937.

2. Laport, E.A., *Radio Antenna Engineering*, New York: McGraw Hill Book Co., 1952, pp. 48–54, 115–117, 187.

3. *Reference Data for Radio Engineers*, Sixth Edition, Indianapolis: Howard Sams & Co., 1979, Sections 27–7, 30–7, and 30–8.

4. Brown, G.H., "The Phase and Magnitude of Earth Currents Near Radio Transmitting Antennas," Proceedings of the IRE, Feb. 1935.

5. Sevick. J., "Measuring Ground Conductivity," *QST*, March 1981, pp. 38, 39.

6. Electrical Communications System Engineering Radio, Dept. of the Army, TM 11–486–6, 1956.

7. Henny, K., *Principles of Radio*, New York: John Wiley and Son, 1938, p. 461.

8. Schelkunoff and Friis, *Antennas, Theory and Practice*, New York: John Wiley and Son, 1952.

9. Sevick, J., "Short Ground Radial Systems for Short Verticals," *QST*, April 1977, pp. 30–33.

10. Carr, "Ground Currents Measuring," *Ham Radio*, June 1979.
11. Bruning, "Ground Resistance and its Measurement," *QST*, May 1951, p. 22.
12. "Radio Frequency Power Measurement," NBS Circular 536, 1953.
13. "IEEE Standard Test Procedures for Antennas," IEEE, 1979, Sect. 17.
14. Laport, E.A., Private Communications, 1979, 1980, 1981, 1982, 1983.
15. Greer, P.A., *Radio Broadcast Ground Systems*, Smith Electronics Inc., 1972.
16. Martin, C.A., & Carter, P.S., *Low Frequency Antennas*, New York: McGraw Hill Book Co., 1961, Chapter 19.
17. *The Radio Amateur's Handbook*, Twelfth Edition, ARRL, 1935.
18. Nilson and Hornung, *Practical Radio Communication*, New York: McGraw Hill Book Co., 1935.
19. "Antennas and Radio Propagation," Department of the Army, 1935.
20. Schure, *Antennas*, New York: John F. Rider, Publisher, 1957, pp. 23 & 73.
21. *The ARRL Antenna Book*, ARRL, 1968, pp. 200, 201.
22. Lee, P.H., *Vertical Antenna Handbook*, New York: Cowan Publishing Co., 1974, pp. 21–23.
23. Orr and Cowan, *Beam Antenna Handbook*, Wilton, Conn.: Radio Publications, Inc., 1980, pp. 92, 93.
24. Leo, "Vertical Antenna Ground Systems," *Ham Radio*, May 1974, pp. 30–35.
25. Sherwood, "Ground Screen—an Alternative to a Buried Radial System," *Ham Radio*, May 1977, pp. 22–24.
26. Vance, Sr. "The Ground Plane Antenna," *Ham Radio*, Jan. 1977, pp. 26–28.
27. Asch, "A Counterpoise Investigation," *QST*, Dec. 1924.
28. Brown, Lewis, and Epstein, "Ground Systems as a Factor in Antenna Efficiency," Proceedings of the IRE, June 1937.
29. Bruning, J.M., "Ground Resistance and its Measurement," *QST*, May 1951.
30. Stanley, "Optimum Ground Systems for Vertical Antennas," *QST*, Dec. 1976, pp. 13–15.
31. Abbott, F.R., "Design of Optimum Buried-Conductor R.F. Ground System," Proceedings of the IRE, July 1952, pp. 846–852.
32. "Ground Systems," *N.A.B. Radio Engineering Handbook*, Sect. 2–91 thru 2–93.
33. Burghard, G.E., "Station 1BCG," *QST*, Feb. 1922, pp. 29–33.
34. "Antenna Ideas Here," *QST*, Jan. 1921, p. 25.
35. Rawson, H.E., "Speaking of Grounds," *QST*, Feb. 1920, pp. 14, 15.
36. "Grounds," *QST*, Jan. 1921, pp. 6–7.
37. "8XK, Pittsburgh, Pa.," *QST*, Sept. 1920, pp. 32–34.
38. Cunningham, E., Private communications, 1981.
39. Kruse, "Transmission Experiments at 8AQO," Part 1, *QST*, Sept. 1924, pp. 15–20.
40. *Ibid.*, Part II, *QST*, Oct. 1924, pp. 28–31.
41. Boothe, B., Additional notes on the Minooka Special, unpublished, Dec. 1974.
42. "1HAA, Marion, Mass.," *QST*, Oct. 1920, pp. 35, 36.
43. Spencer, L., "John L. Reinartz," *Ham Radio*, Aug. 1981, pp. 10–18.
44. FCC Rules and Regulations, Part 73, Subpart A, 1972.
45. Head, H.T., "Medium Frequency Broadcast Antennas," *Antenna Engineering Handbook*, New York: McGraw Hill, 1961, Chapter 20.

46. Frey, R.B., Private communication, Aug. 1981.
47. Hills, R.C., "The Ground Beneath Us," Radio Society of Great Britain Bulletin, June 1966, pp. 375–385.
48. *Reference Data For Radio Engineers*, Sixth Edition, Indianapolis Ind.: Howard Sams & Co., 1979, Chapter 28–3.
49. De Santis, Campbell, and Schwering, "An Array Technique for Reducing Ground Losses in the VHF Range," IEEE Transactions on Antennas and Propagation, Vol. AP 21, No. 6, Nov. 1973.
50. International Electrotechnical Commission, International Special Committee on Radio Interference (CISPR), Document CISPR/D, WG 1 (Minozuma, Japan) 12, June 24, 1980.
51. "Practical Ground Systems for Radio Communications," *Radio Magazine*, Feb. 1964.
52. "Efficient Short Wave Transmitting," *QST*, Jan. 1917.
53. Conklin, E.H., "Ground Systems for Efficiency," *Radio Magazine*, Dec. 1937, p. 17.
54. Conklin, E.H., "The Effect of Average Ground on Antenna Radiation," *Radio Magazine*, March 1938, p. 36.
55. Hawker, P., "Technical Topics", Radio Society of Great Britain Bulletin, July 1981, pp. 626–627.
56. *Ibid.* March 1981, p. 235.
57. *Ibid.* Nov. 1981, p. 1033.
58. McLaughlin, N.R., "Are You a Worm Warmer?" *Radio Magazine*, July 1937, pp. 69–73.
59. McLaughlin, N.R., "The Worm Turn Cold," *Radio Magazine*, Feb. 1938, p. 29.
60. Sweeting and Davis, "Electrically Short H.F. Aerial Systems," Conference Proceedings No. 263, NATO, 1976.
61. Gill, E.B.W., "A Simple Method of Measuring Electrical Earth-Constants," Proceedings of the Royal Society (?), Vol. 96, Part III, 1948.
62. Scherer, W.M., "An R.F. Magnetometer and Field Strength Meter," Part I, *CQ*, April 1971, pp. 16–20.
63. *Ibid.*, Part II, *CQ*, May 1971, pp. 23–27.
64. "All About Grounds," *73 Magazine*, 1979.
65. Elison, J.H., "Vertical Antenna Design in Theory and Practice," *CQ*, July 1960, pp. 48, 49, 116, 124.
66. Beverage, H.H. "A Scientifically Constructed Amateur Station," Radio Corporation of America, Catalog, 1921.
67. Wait, J.R. and W.A. Pope, "Input Resistance of L.F. Unipole Aerials," *Wireless Engineer*, May 1955, pp. 131–138.
68. Maley, S.W. and R.J. King, "Impedance of a Monopole Antenna With a Radial-Wire Ground System on an Imperfectly Conducting Half-Space—Part I," *Journal of Research of the National Bureau of Standards*, Vol. 66D, No. 2, March–April 1962, pp. 175–180.
69. *Ibid.*, Part II, *Radio Science Journal of Research NBS/USNC-URSI*, Vol. 68D, No. 2, Feb. 1964, pp. 157–163.
70. *Ibid.*, Part III, Vol. 68D, No. 3, March 1964, pp. 287–301.
71. Doty, Frey, and Mills, "Characteristics of the Counterpoise and Elevated Ground Screen," Professional Program, Session 9, Southcon '83 (IEEE), January 1983.
72. Doty, Frey, and Mills, "Efficient Ground Systems for Vertical Antennas." *QST*, February 1983, pp. 20–25. CQ

What would an Antenna Special be without food for thought? W5JJ presents some basic information on traveling-wave antennas for us to think about.

Traveling-Wave Antennas

BY CARL C. DRUMELLER*, W5JJ

Most radio amateurs think of antennas in terms of resonant radiators, of which the Hertz and the Marconi are the better known. Of these, the half-wave Hertz is typical. With it, radio frequency energy is fed (usually) into the mid-point, from which point it flows outward to the two ends. There the incident wave encounters an open circuit, which results in a reflected wave being generated. This reflected wave flows back toward the feed-point. Because of phasor relationship between the voltage components and the current components of the incident and the reflected waves, an interference pattern is established over the length of the half-wave antenna. This interference pattern results in the familiar *E* and *I* curves so often used to depict the standing waves on a half-wave resonant radiator.

There is another type of radiator, the traveling-wave antenna, that does not depend upon resonance for optimum operation. It therefore may be used over a broad spectrum of frequencies, in some instances as great as 10 to 1, with no change in physical dimensions. Not being resonant, it does not have standing waves. Because of this its current distribution is uniform over its length, except for steady diminishing as the far end is approached.[1] Several versions of the traveling-wave antenna are in more or less common use. These are the terminated rhombic, the terminated Vee, long helical beams, the disc-cone, and the long-wire. That term, *long-wire*, is used here in its correct meaning—that of a radiator many wavelengths long at its operating frequency.[2] The long-wire version is the one most easily constructed and the best suited for explanation. It, therefore, will be the subject of this article.

Before discussing electromagnetic waves, let's review wave motion in water. Visualize, if you will, a large circular pond, one holding water in a placid, totally undisturbed state. Now let there be a stone dropped into the water at the pond's center. In your mind's eye, observe the waves formed by this disturbance, considering only those traveling in a straight line through a narrow corridor from the center toward the distant shore. Note that as the waves extend toward the distant shore, their magnitude becomes progressively less and less until the waves become too small to be detected by conventional means and therefore may be disregarded.

Now let's return to the electromagnetic spectrum, to that portion containing the h.f. bands used by radio amateurs. We'll base this study of electromagnetic waves on their behavior when radiated from a designated type of radiator. This radiator will be a long, thin conductor extending out in a straight line at a constant height over uniform earth. This conductor will have a low but finite ohmic resistance and will be many wavelengths long at the frequency to be considered. One end will be fed radio frequency energy from a generator. The other end will be an open circuit. There will be no ground and no terminating resistor.

As alternating current from the generator traverses the conductor, it causes a field to be established about it—several fields, in fact. Let's deal first with the "near field," or Fresnel zone. This zone has two fields, the electromagnetic and the electrostatic, which have a phase (or time) difference of 90°. The induction or electromagnetic field is in phase with the current in the radiator.[3] The induction field is of importance only in the immediate vicinity of the radiator. Its lines of force build up and collapse back into the conductor twice each cycle.[4] We will disregard the near field and go to consideration of the "far field," or Fraunhofer region. In this region the electromagnetic (or H) field and the electrostatic (or E) field are in time coincidence. That is, they are in phase. The two fields, however, are at right-angles to one another and also to the direction of wave propagation.[5] They oscillate in phase, and the ratio of their amplitudes remains constant. The two fields vary in magnitude and reverse in direction in consonance with the current from the generator. It is these two fields that are used in radio communication.

As these fields expand and contract twice each cycle, not all of the energy contained therein is returned. Much of it is "lost" to space. That, of course, is what is desired! This means that each successive wave along the conductor will have a bit less amplitude. (Remember the waves on the pond?) This "loss" of amplitude is quite rapid in relation to wavelengths traveled.[1] Because of this, no terminating resistor is needed.

Just how rapid the "loss" of amplitude is is dependent upon (among other things) the diameter (or cross-section) of the radiator. If the conductor is sufficiently large, so much of the energy will be radiated that the length need be only about two wavelengths to avoid any significant reflections.

Like all long-wire antennas, the traveling-wave antenna has a multiplicity of lobes. The direction of the electric field reverses for each lobe. These lobes tend to slant toward the far end of the radiator. The longer the antenna, the greater the slant. Measured from a reference line at right-angles to the radiator, for five wavelengths the slant is 68°; for ten wavelengths it's 78°. These lobes account for the directivity.

Traveling-wave antennas are effective for both transmission and reception. One version, the Beverage, is perhaps the very best antenna for reception of "long-wave" (MF and LF) signals under conditions of heavy atmospherics.

One might sum up the good and bad points of the traveling-wave antenna in a concise listing.

Advantages

a. Broad frequency response.
b. Directional.
c. Simple to build; no critical dimensions.
d. Highly efficient.

Disadvantages

a. Needs much space for installation.
b. Directivity not easily changed.
c. Radiation resistance difficult to compute.[2]

The traveling-wave antenna has its place in the roster of amateur radio antenna systems. Don't overlook it!

References

1. Kraus, John D. *Antennas*, 1950 edition.
2. Jasik, Henry. *Antenna Engineering Handbook.*
3. Terman, Frederick E. *Radio Engineering*, 1937 edition.
4. Griffith, B. Whitfield, Jr. *Radio-Electric Transmission Fundamentals*, 1962 edition.
5. Radio Society of Great Britain, *Radio Communication Handbook*, vol. 2, 1977 edition.

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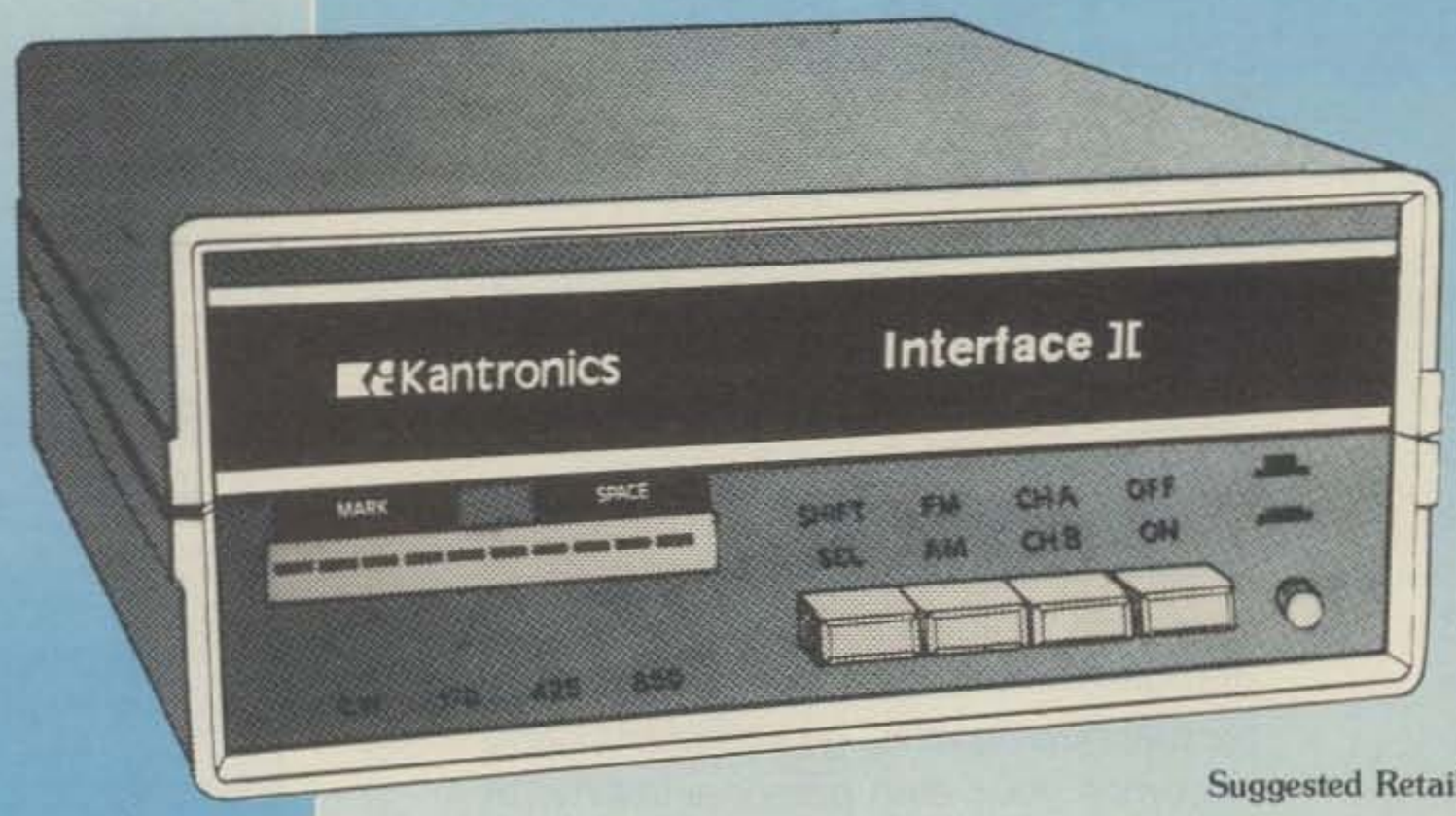

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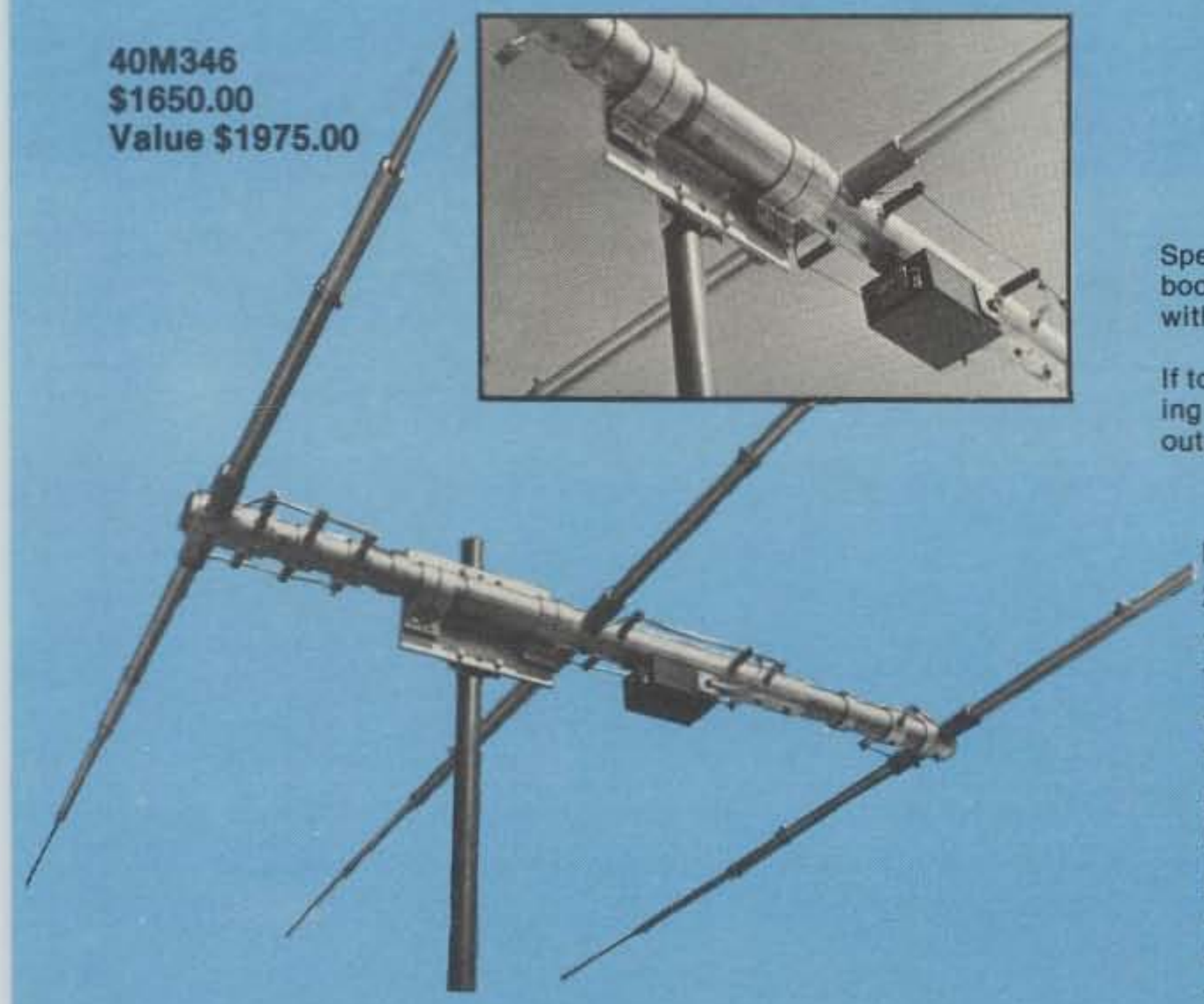

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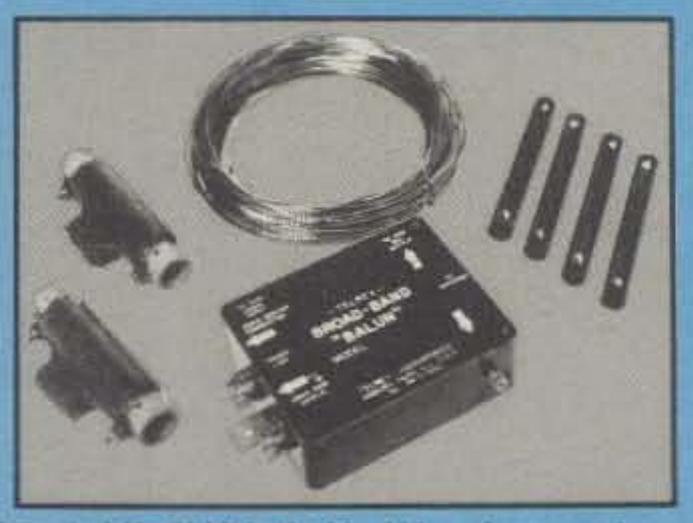

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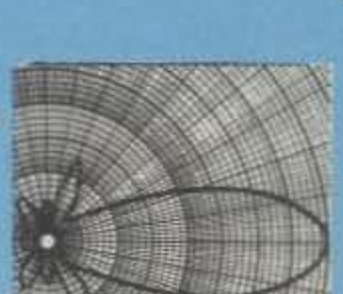

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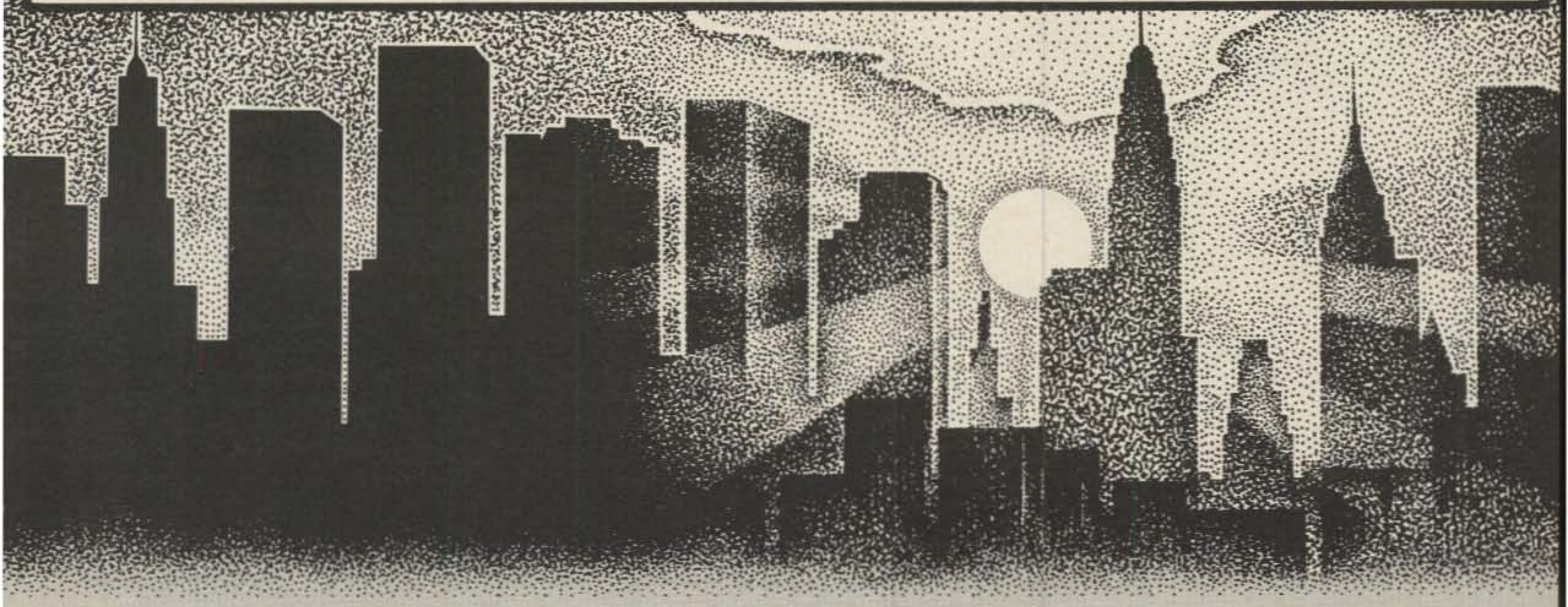


The Grounded Half-Quad Loop An All-Band Antenna

BY JOHN P. TYSKEWICZ*, W1HXU

The informative articles by VE2CV and W1FB on the Half-Delta Loop† demonstrated that a relatively small and effective antenna can be made for the low-frequency bands. In my situation, as with most city lots, a full-size low-band dipole must run a zig-zag course, but the Half-Delta Loop would still exceed my boundary lines. A bit of arithmetic, however, solved the dilemma. By utilizing a Half-Quad Loop configuration, the antenna would fit into place with room to spare and would be fed directly as if it were a pure Marconi.

The radiated field of the Half-Delta is dominantly vertically polarized and must emit from the vertical λ/6 tower or wire. The Half-Quad with two λ/8 and spaced verticals therefore appeared to be the better buy.

Not having a scale-model testing range and instruments to determine the scale factor, azimuthal pattern, and impedance, my experiment was to be done at full size on an "all or nothing" basis. The high and low impedances would have to shift for themselves. During a cold and drizzly rain *(the best antenna weather—ed.)*, our zig-zag 80–40 meter dipole was lowered to the wet ground, carefully packaged, and put on "stand by." An assortment of used No. 14 copper wire was spliced and soldered together for the new flat-top and drop wires (for good luck, one must always use a part from an old antenna to make a better new antenna—Moriarty's Law).

VE2CV found that the physical length of the λ/2 Delta Loop is longer than the normal electrical dimension. This end effect proved to be smaller for the λ/2 Quad Loop as erected and shown in fig. 1.

At one time I had had a λ/4 40 meter wire suspended from the tree. Still in place is a 40" high, iron-pipe ground post and about 800' of buried wire in the form of 20 random-length pieces radially disposed about a 270° perimeter. The other 90° segment is presently occupied by a hostile neighbor and his vegetable garden. One radial wire, which happens to be insulated No. 14 house-wire, extends to the ground rod near the house, and its wire enters via a feed-through wall insulator originally installed for Zepp feeders. The other feed-through insulator is used for the "hot" antenna wire. The indoor transmatch should be close to the feed-through connectors.

The back-guyed wood mast attached to the house extends to 35', and a better substitute for a tree is a bonded metal tower or mast. The only above-ground improvement is to use taller masts, as the Quad is fundamentally vertically polarized. This will shorten the flat-top and ground space.

Table I lists three antenna modifications and respective resonant frequencies as measured with a grid dip meter when coupled to a jumper coil (1" diame-

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

†J. Belrose, "The Half-Delta Loop: A Grounded, Vertically Polarized Antenna, Ham Radio, May 1982. J. Belrose and D. DeMaw, "The Half-Delta Loop: A Critical Analysis and Practical Deployment, QST, September 1982.

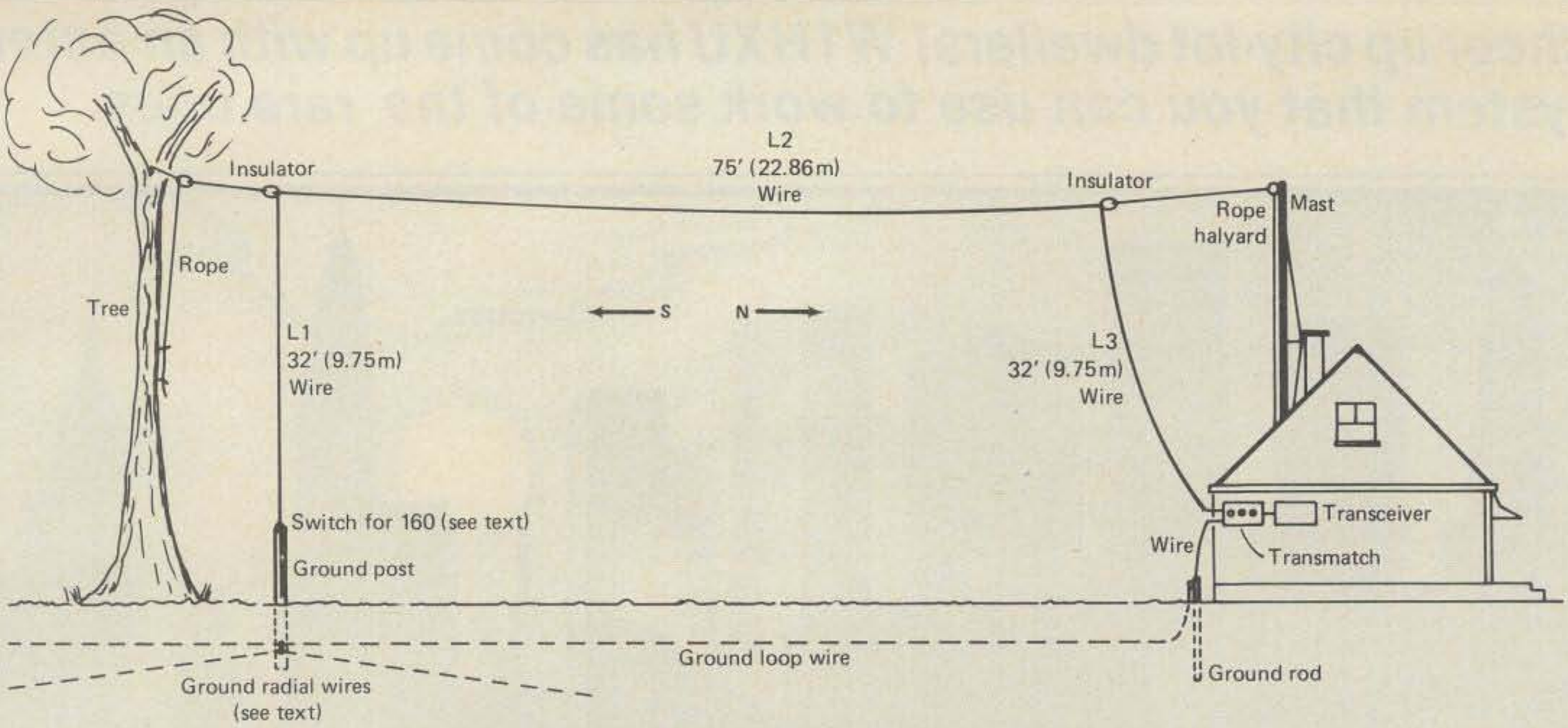


Fig. 1– The GHQ antenna installation at W1HXU.

L-1	L-2	L-3	Harmonic Resonances (MHz) Grid-Dip Meter Readings							
32′	82′	32′	**3.33**	6.65	10.1	13.4	16.8	19.8	24.0	26.6
32′	75′	32′	**3.50**	7.10	10.8	14.2	17.9	21.1	24.4	28.3
32′	70′	32′	**3.63**	7.35	11.2	14.8	18.6	21.9	25.3	29.4

Table I– Resonance with three different wire lengths.

ter, 5 turns). The coil was connected across the indoor feed-through terminals with the transmatch disconnected. L-1 and L-3 remained constant and a dimensional change was made to L-2. L-1 includes the ground post and L-3 includes the 2′ feed-through to the transmatch.

The first test with 146′ of wire put us outside the low end of the bands. On the second try with 139′ of wire we did it and made the third test to get another point on the curve.

As with the Half-Delta Loop the higher-order resonant frequencies are not integral multiples of the fundamental frequency. For "all-band" operation the base frequency must be close to 3.50 MHz. Fortunately, this low-Q wire when connected to my home-made "antenna tuner" of the low-pass type similar to the Drake line loads up nicely for 75 meter phone.

A good r.f. output indicator and rapid tune-up aid is an r.f. ammeter, and also a field strength meter consisting of a 2 meter vertical dipole and an IN34 diode detector installed in the attic with a RG58 line leading to the O-I d.c. milliammeter in the shack.

Another r.f. ammeter was inserted in the ground return line at the transmatch, and its reading was 50% of the antenna current. At the moment the significance of this underground-to-antenna current ratio is not clear, but it could be useful to determine the quality of the ground-plane image.

The one-band operator can apply our corrected handbook formula for his trivia net frequency.

$$L\ (\text{feet}) = \frac{486}{f\ (\text{MHz})}$$

or

$$L\ (\text{meters}) = \frac{148}{f\ (\text{MHz})}$$

Now comes the bottom line: The spotty 10 meter band was open, and on the first call with 100 watts I got an S8 from a JA2. I then switched to 15 and got an S9 from JG3 land; then a UK4 after a 2X2 call on 20. The following evening during a pile-up on 40 I got a short RST exchange with a UK2, and 26 hours later on 80 a G2 completed the round-up.

By installing a high-voltage-rated ground disconnect switch on top of the ground post, the Half-Quad Loop can be converted to a λ/4 Marconi for 160.

This spliced up bunch of wire is the neatest, best, and simplest "all-band" antenna that I have used in the past half-century. CQ

The evolution of the Zimbeams is off and running again. K4JZB carries his experiments on phased-beam antennas to a new high. They're easy to make, fun to use, and best of all, they work.

THE "ZIMBEAM" PHASED-BEAM ANTENNAS

BY ROBERT F. ZIMMER*, K4JZB

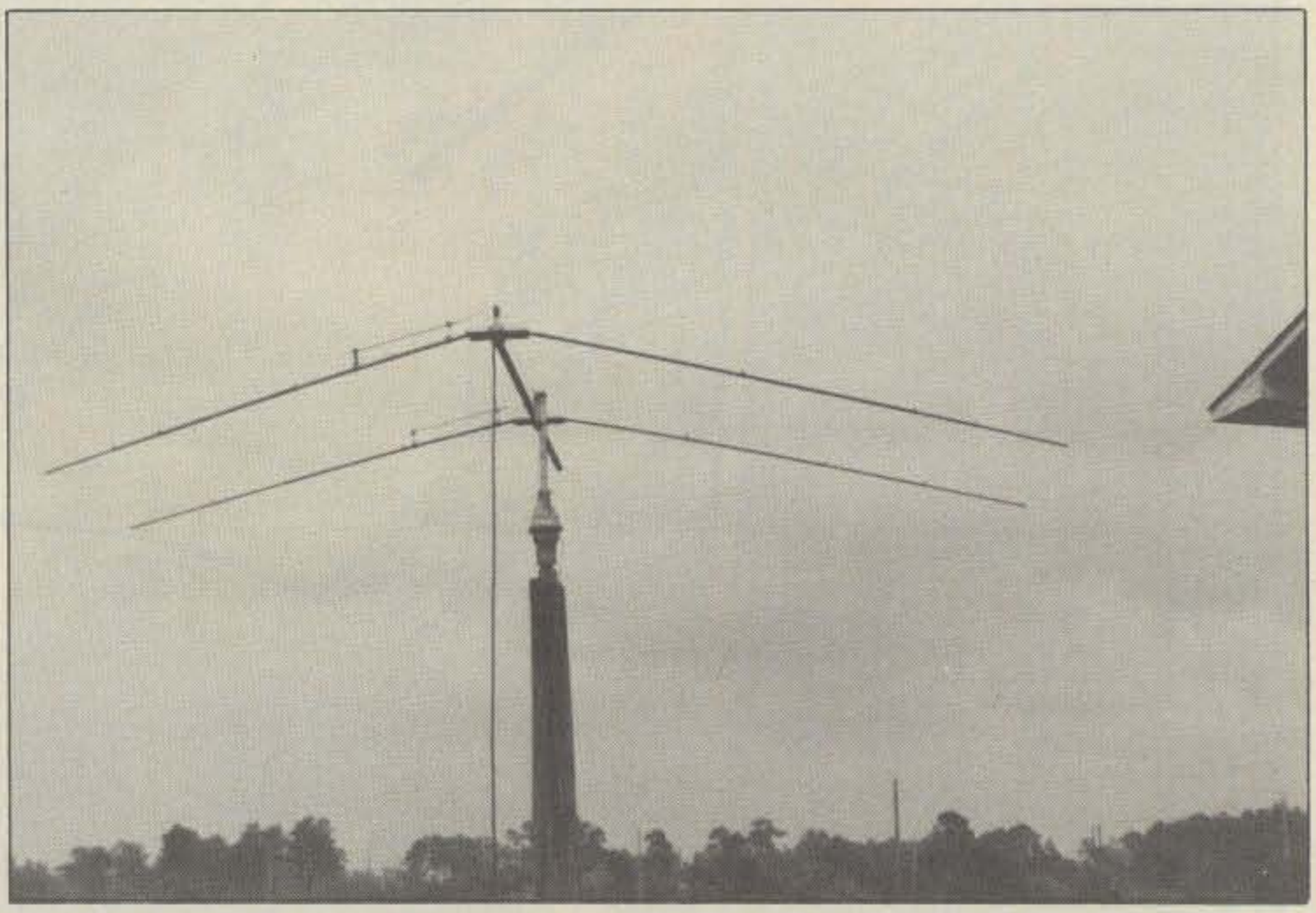
A project was set up to see if a practical and reproducible, all-driven phased-beam antenna could be designed and built. I felt that a beam was needed that would yield good gain and could be constructed by anyone with limited knowledge and/or ability. In all respects the results exceeded all of the above specifications.

Research was done, reading antenna books and magazines back to the early 1930s. I found very little written on the subject of phased-beam antennas. The most information found was in the RSGB *Radio Communication Handbook* and the NAB *Engineering Handbook*.

It was decided to first try the two-element type with a driven antenna element and another element that would act as a director. Since it also would be driven, it could be fed at 180°, which would make the beam bi-directional or fed in the same phase as the driven antenna element. The latter was chosen, and it was also decided to tilt the elements forward 40°.

A boom was selected and two elements of equal length (267″) were placed on it. Next, I put on a gamma-match consisting of ⅜″ tubing 36″ long, spaced 4″ from the element. Next a 36″ length of RG8U, with the outside covering and shield removed, was slid inside the ⅜″ tubing, and this could easily be adjusted for low s.w.r. No. 12 electrical wire was used between the antenna gamma-match and the director gamma-match. Another gamma-match, as described, was put on the director, and believe it or not it worked right off the bat (where was Murphy?). This antenna is shown in fig. 1 and the photo.

The s.w.r. was adjusted down to 1.1 to 1 with very little effort. The antenna was installed 12′ high, and it showed very good gain and directivity. The antenna was used on the 21 MHz band while plans were made for adding the out-of-phase element. It was decided to use a ¼ wavelength of RG8U to achieve 90° phasing between the antenna element and the reflector. The length of RG8U figured out to be 7′9″.



A two-element Zimbeam in phase with the elements forward 40°. The directivity and gain on this model were very good.

The reflector element, also 267″ long, was added, and another gamma rod and capacitor as described were put in place. As before, Murphy was not present, and the antenna worked right off with an s.w.r. less than 2 to 1. The front-to-back ratio left much to be desired, however, so further research was indicated.

The feedpoint was changed, and although the antenna worked better, I felt that the front-to-back ratio still needed improvement. I then tried 270° phasing, and here again improvement was noted; it did not completely satisfy me, however, so further research was indicated. After some time and study it was found that 225° phasing with 45° or ⅛-wavelength spacing might be what I was looking for. It was tried and the results were better, showing 18–20 dB front to back. The antenna shown in fig. 2 started to take shape. With only three elements on the boom at 12′ high, it was showing signal strengths near to the four-element antenna that was 50′ high.

It was at this point that I decided to consult the National Association of Broadcaster's *Engineering Handbook*. The a.m. broadcast stations use phased

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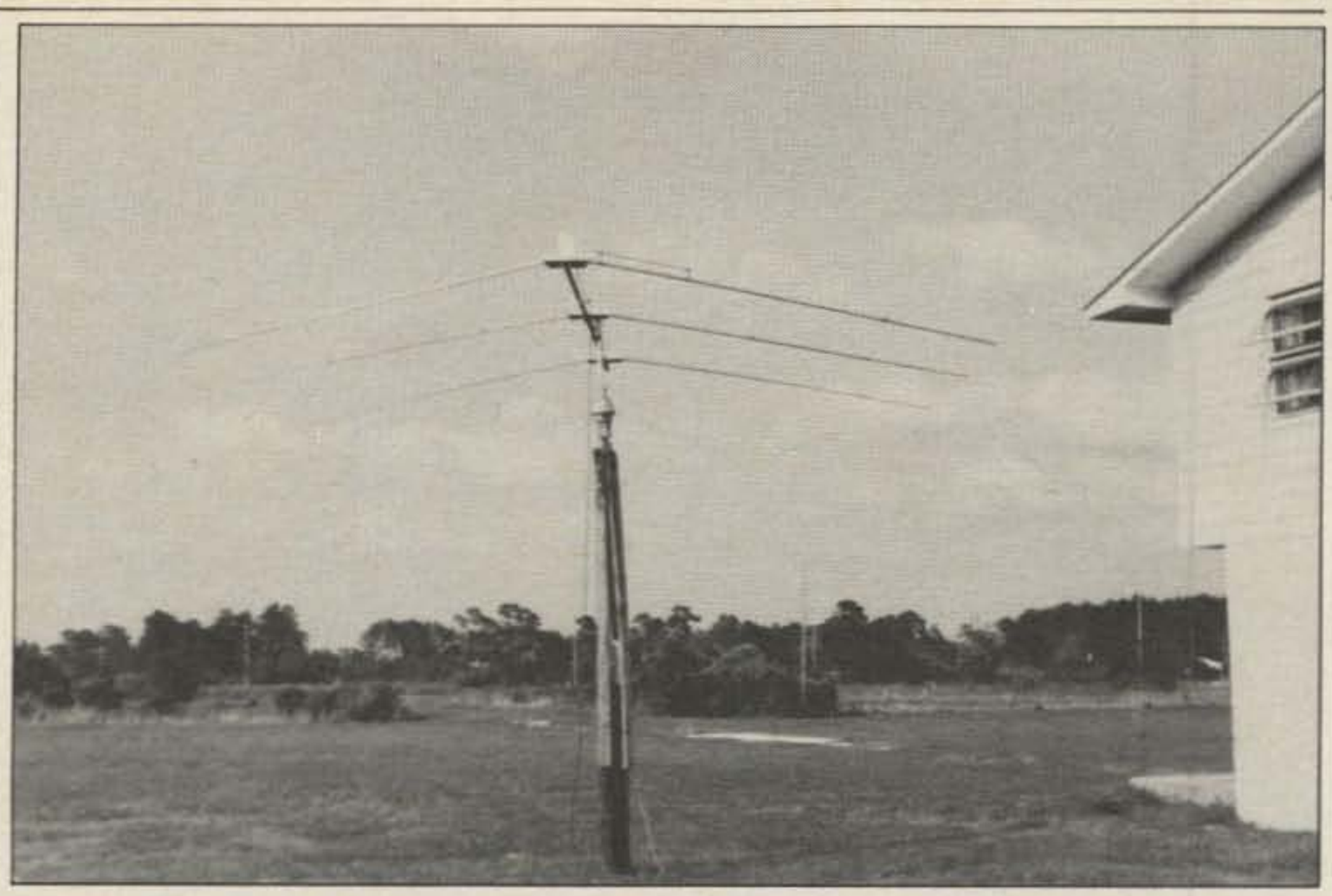


This version had the reflector at 180° and the director in phase. The elements are forward 40°. This one showed some promise, but more work was needed.

	DEGREES							
0	45	90	135	180	225	270	315	360
14MHz RG-8U	5¼'	10'7"	15'11"	21'1"	26'5"	31'8"	36'11"	
21MHz RG-8U	3'7"	7'7"	10'11"	14'6"	18'1"	21'10"	25'5"	
28MHz RG-8U	2.64'	5¼'	7.92'	10.56'	13.2'	15.84'	18.48'	

Table I– For poly RG8U with a velocity factor of 0.66. For more than 180° put the gamma-match on the other side of the element from the preceding element and add coax to make up the difference.

vertical antennas to protect other stations on the same frequency, but in other parts of the country. In their *Handbook* are pictured patterns for any degree of spacing and phasing. After much study what I was trying to do and how to do it became apparent. With 45° spacing (⅛ wavelength) the best phase angles were 90°, 105°, 120°, 135°, and 150°. With a phase angle of 180° the antenna was bidirectional. To get the maximum radiation in the opposite direction the phasing could be 210°, 225°, 240°, and 270°. From this one could deduce that the exact amount of phasing is not the least bit critical to getting excellent results.

The lengths of RG8U used to achieve the degrees of phasing are shown in Table I for 28, 21, and 14 MHz. To get phasing of 180° it is necessary to put the gamma rod on the opposite side of the adjoining antenna element. To get more than 180°, as say 225°, use coaxial cable for 45° (3'7") and put gamma on the opposite side of the preceding element.

I decided to try 225° and 90°, although the patterns indicated that the best would be 225° and 135°. The decision was made because of something I read in the RSGB *Handbook* which stated that better results would occur with the least phasing one could use while still doing the job of directivity.

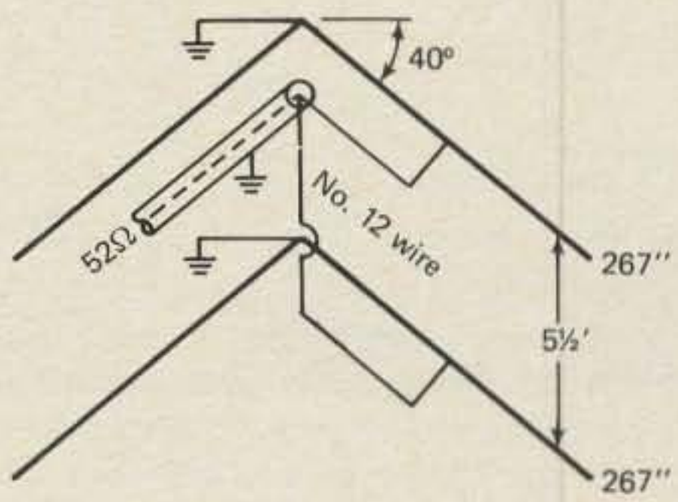


Fig. 1– An in-phase antenna and director resulted in good gain and good front-to-back ratio.

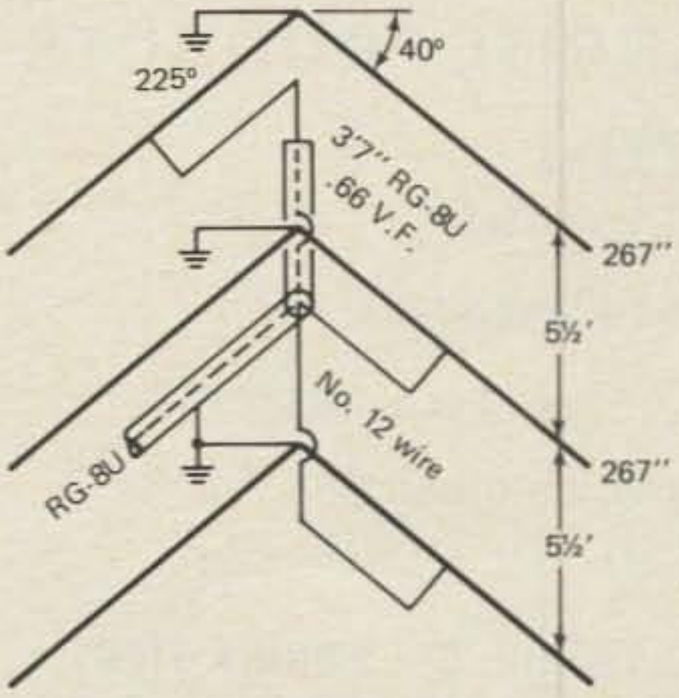
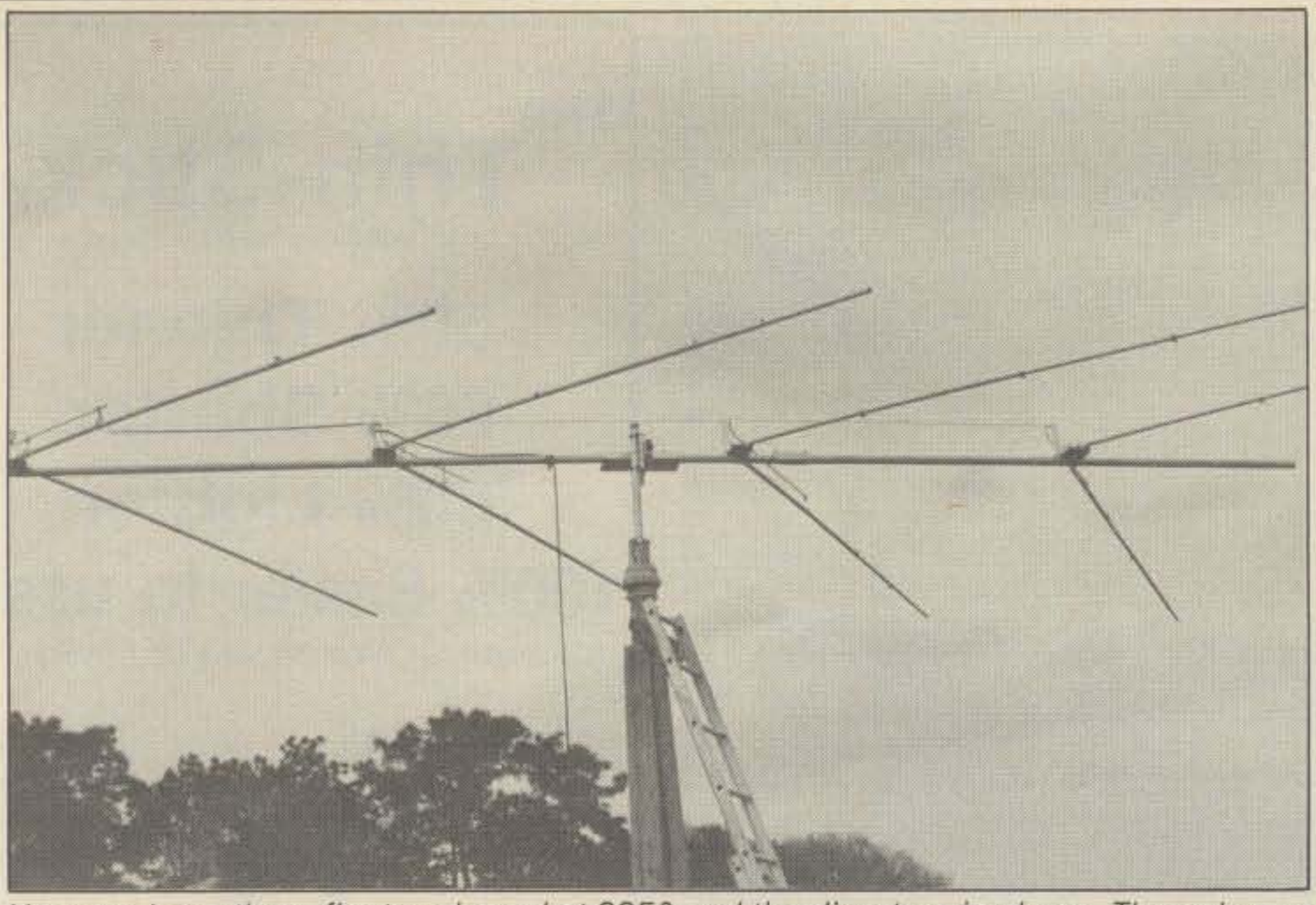
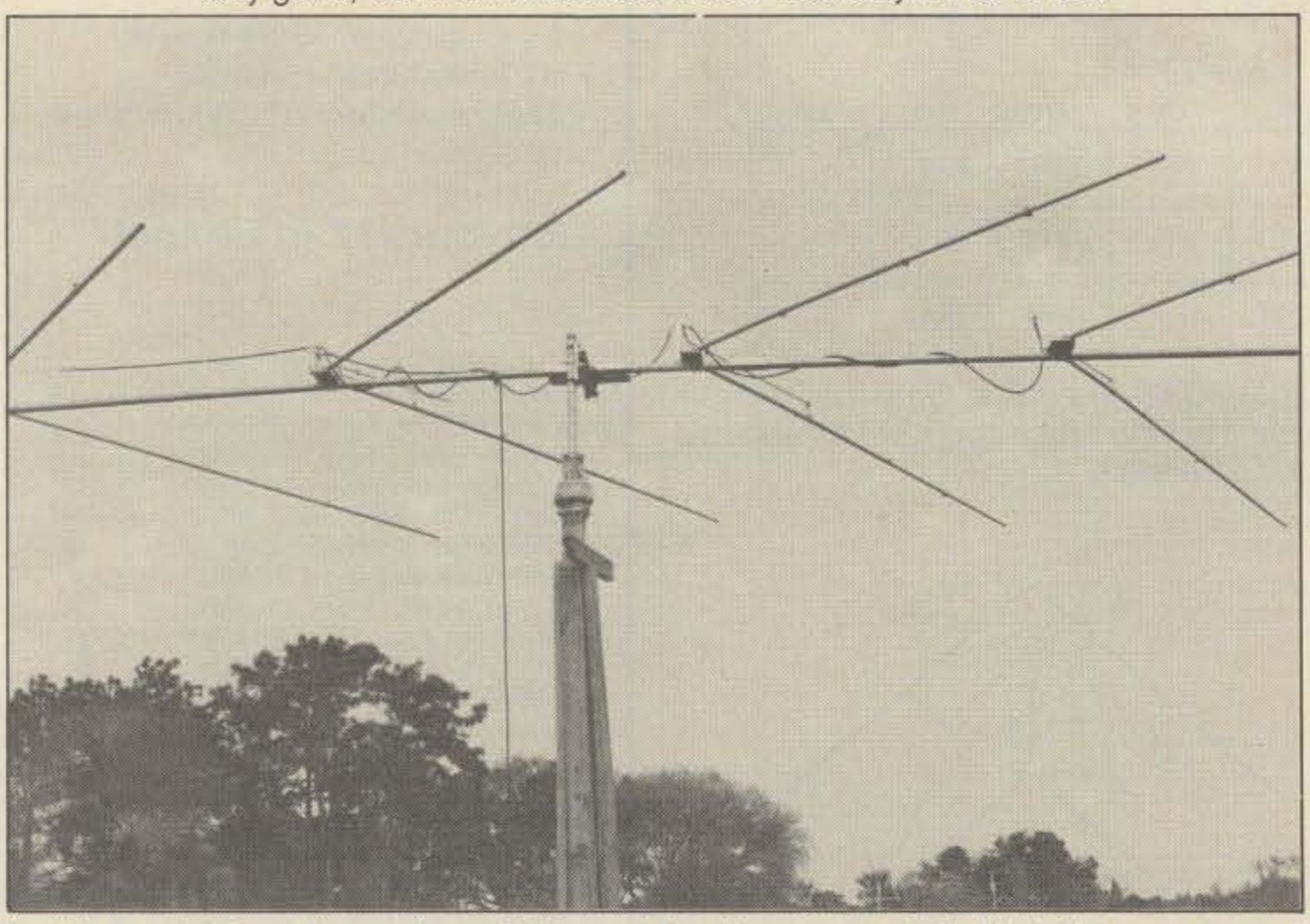


Fig. 2– An added reflector with phasing of 225° (180° plus 45° of poly RG8U).



Here we have the reflector phased at 225° and the directors in phase. The gain was very good, but the front-to-back ratio was only 12 to 15 dB.



In this model the reflector is at 225°, and the directors at 90°. Note the coax wound around the boom. The gain was very good, plus the front-to-back ratio was 30+ dB.

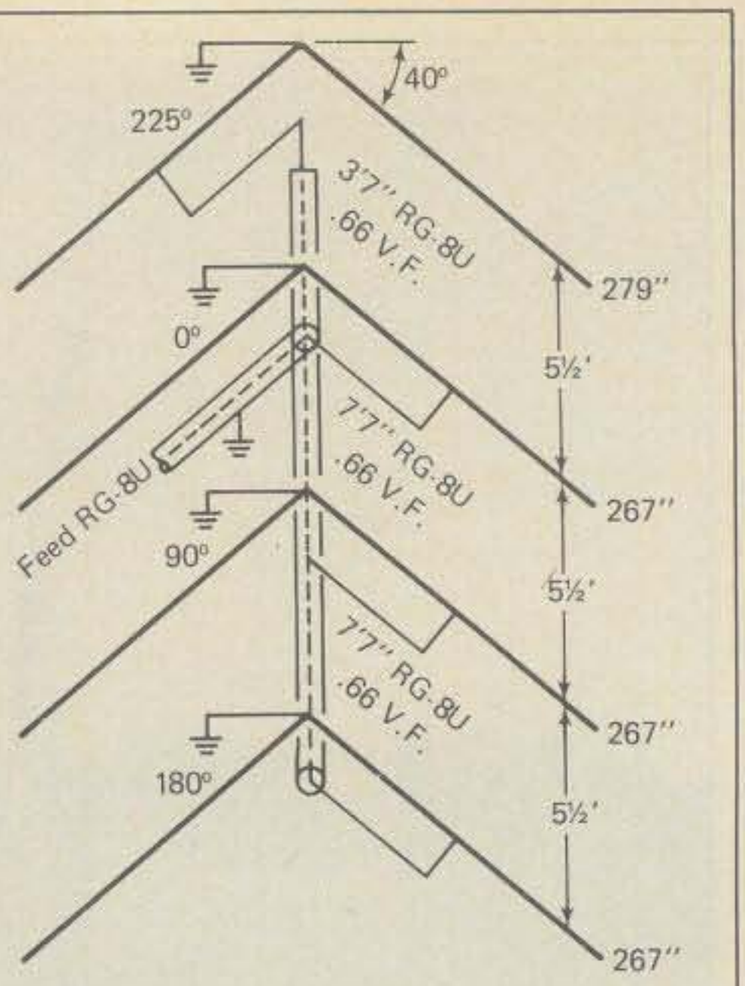


Fig. 3– The reflector at 225° and 279" long. Each director is at 90°.

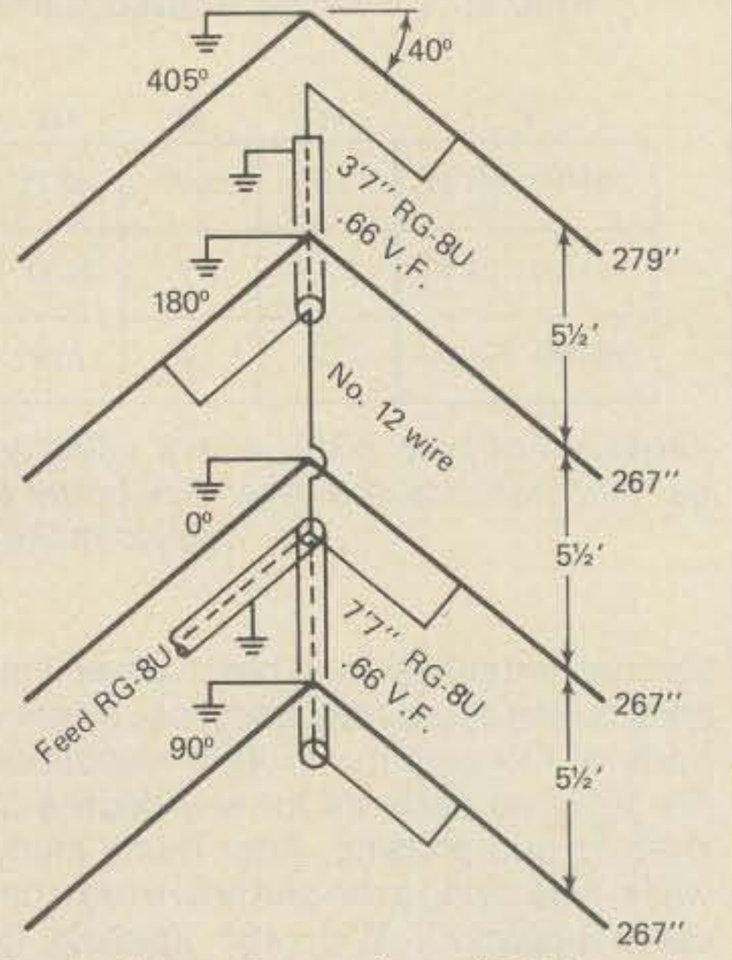


Fig. 4– The reflector is at 405° from the feedpoint, but only 225° from the preceding element.

A fourth element (as in fig. 3) was added with 225° phasing to reflector and 90° phasing to each director. The spacing between each element was 45°, or 5½'. The gain was very good and the front-to-back ratio was 18 to 20 dB, but it was increased to 30+ dB by changing the reflector element length from 267" to 279". This had the effect of increasing the phasing. All other element lengths were left at 267". The s.w.r. was less than 2 to 1 across the 21 MHz band.

On-the-air checks were made with HC8GI and OZ2PG, and they both reported 10 dB difference between the four-element monobander at 50' and this phased four-element antenna at 12' high. I believe the phased antenna would be far better than the monobander if it were at a 50' height. Both of these antennas can be classified as super gain antennas.

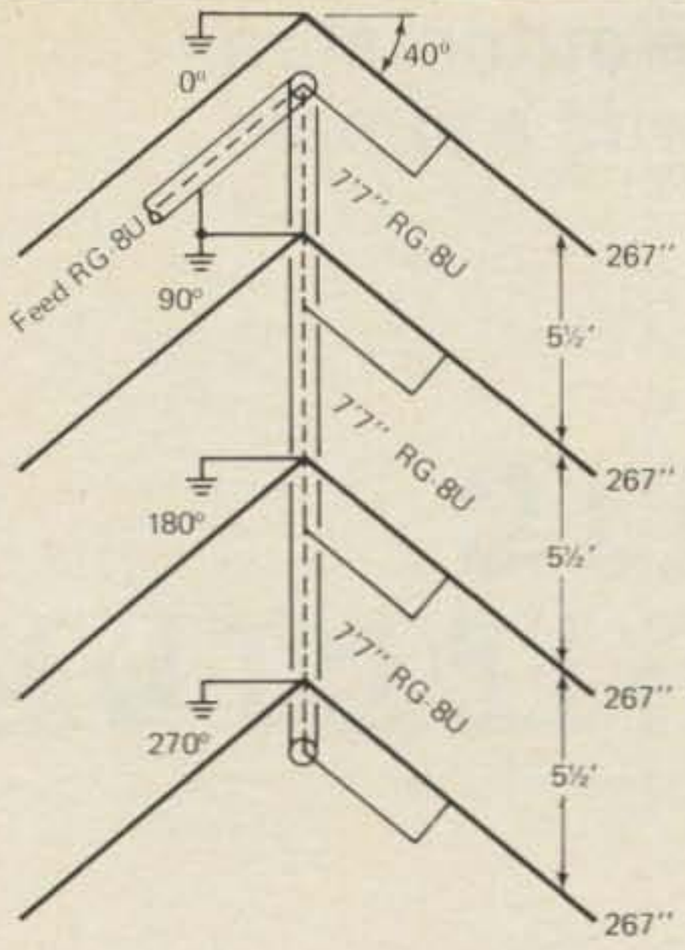


Fig. 5– Back-feeding with all elements at 90° from preceding element.

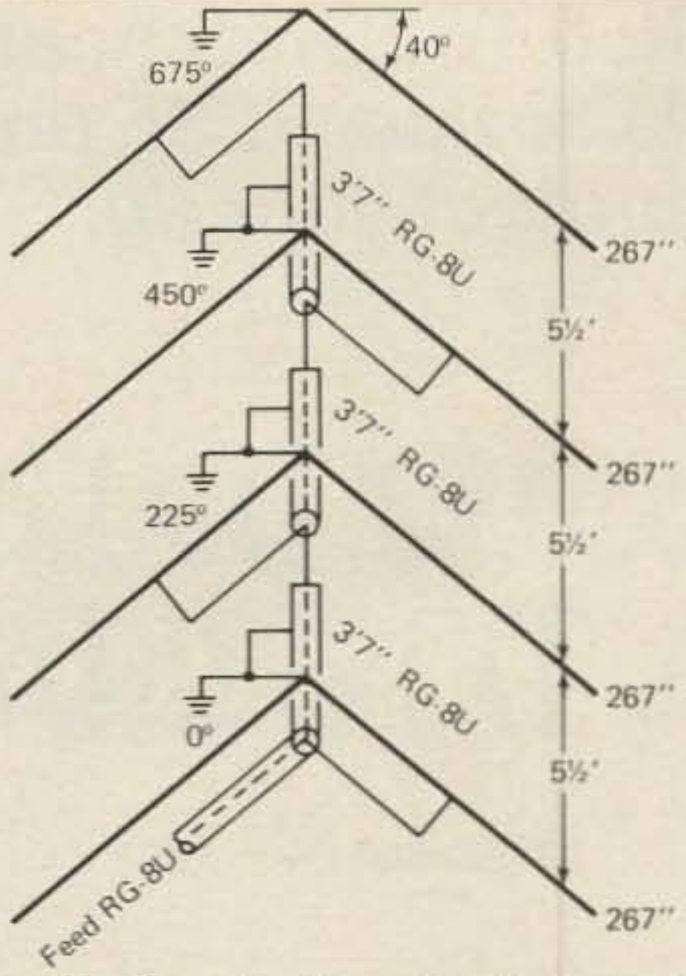


Fig. 6– Front-feeding with all elements progressing 225° all the way up to 675°.

A total of 11 different designs were tried. They all had merit, and in addition to the one already described, I shall cover two others that I found to be outstanding. In fig. 3, the reflector is 225°, the first director is at 90°, and the second director is also at 90°. In fig. 4 the reflector is 279" at 225°. The next two elements are 180° out of phase with each other. The four-element is phased 90°. All spacing is 45° or 4½' on 21 MHz. This puts four elements on a 17' boom.

In fig. 5 the antenna is fed at the back with all elements progressing by 90°. In fig. 6 the antenna is front-fed with each element at 225°.

These last two designs were tried only briefly, and although they showed merit, I did not test them as thoroughly as the others. I shall get back to them at an early opportune time. The construction details are as described in a previous article, so I will not go into detail here.

I have had many reports on the preceding antenna designs and comments from all over the world. OZ2PG built and reported on the first five-element beam which was described in the January 1983 issue of *CQ*. He measured the gain of, as he said, the best three-element tribander made in Germany at 5 dB better than a dipole. Also, he found my five-element antenna 7 dB better than the tribander. That makes his measured gain of the five-element beam at 12 dB better than a dipole or 14.14 DBI. As he reported, with 200 watts p.e.p., he now has no problem with pile-ups, and is reported to be the strongest signal out of Denmark. I can attest to his strong signal, as we have worked several times on 21 MHz.

On the original five-element design I have run more tests and found that to achieve the maximum gain figures the spacing between DE 1, DE 2, and DE 3 must be increased to 5½' rather than the 2' originally stated. Also, the antenna will not work with less than 2' spacing. I found this out the hard way. I built a seven-element job with 1½" spacing and the gain went down the drain; when it was increased to 3' it again was a real super-gain antenna. The antenna was described by an amateur overseas as a "Super-Gain Antenna," and in thinking it over, I guess the description fits.

The old adage of "Switch To Safety" can be automated reasonably by this little device. K2SE presents a simple project that will help protect your rig.

AN AUTOMATIC ANTENNA DISCONNECTOR

BY ED SOLOV*, K2SE

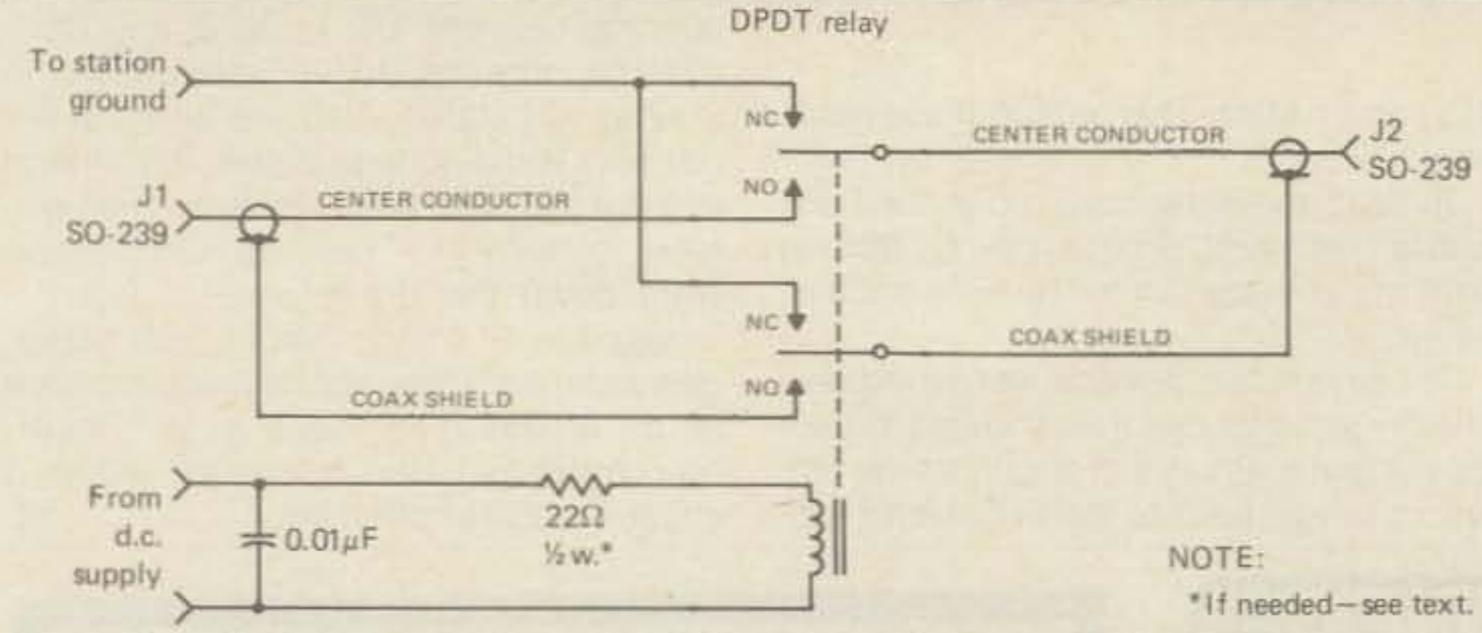


Fig. 1– Schematic diagram for the automatic antenna disconnector.

Recently I came across an article in one of the leading amateur radio publications describing in terrifying detail how a lightning bolt, even if not too close to home, could seek out my shiny, new solid-state h.f. rig and render it deaf. I had always made it a point to ground my antennas when I was not using them for a long time or during an electrical storm, but more often than not I forgot to do it. I decided that something more positive was required to protect my precious new toy.

What was needed was something that would not require me to remember anything, would disconnect the rig from the antenna system when not being used, and would, of course, be cheap. The solution I chose is shown in fig. 1.

The feature of my new rig that made it convenient to build a "no-think, no-remember" gadget is that, like many solid-state rigs, it operates from a separate 13.8 v.d.c. power supply that has an auxiliary output for powering other shack equipment. (If my rig did not have this feature, it would mean more work to bring this gadget off, but it would be just as workable. More about that later.) I never forget to turn the power supply on when I sit down to operate, and I never forget to turn it off when I'm done. So, by sensing the 13.8 v. output and controlling the relay with that, the antennas are automatically connected to the rig when the power goes on and automatically disconnected when the power goes off.

Construction

The antenna protector only has a few parts and can be built for about $10 if all parts are bought new. The central element is a d.p.d.t. relay with a 12 v. coil. I had one in my junk box, but if I hadn't, I could have used one such as Radio Shack's No. 275-218, which sells for $5.49. Two SO-239 connectors, a bit of coax, a small piece of perfboard, and a plastic box are the only other supplies needed. The perfboard proved a convenient way to mount the relay. A plastic box, rather than a metal one, was chosen because I wanted to bring both the center conductor and the shield of the feedline through the relay, so the shells of the SO-239 connectors had to be insulated from one another.

The relay was mounted to the perfboard, and the perfboard was attached to the inside of the plastic box. The coax was used to wire the relay to the r.f. connectors. As a precaution the coil leads were bypassed to one another with a disc-ceramic capacitor to discourage r.f. from leaving the area via the d.c. coil line.

No Convenient D.C.?

The relay coil is rated at 12 v.d.c., and I have been operating mine at 13.8 v.d.c. with no problem. An easy way to restore it to its ratings is to add a 22 ohm, ½ watt resistor in series with it as shown in fig. 1.

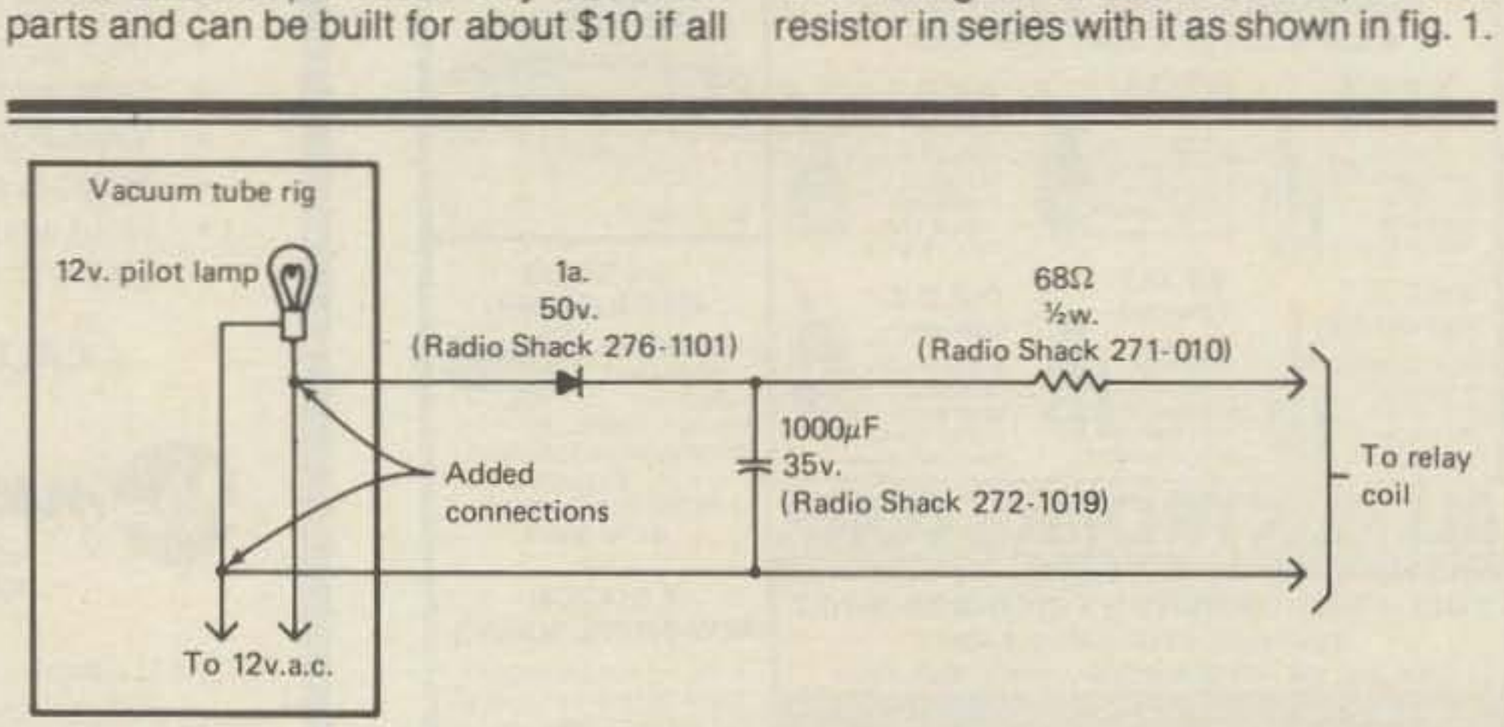


Fig. 2– How to generate coil voltage from a filament/pilot lamp supply.

*247 Andover Drive, Wayne, NJ 07470

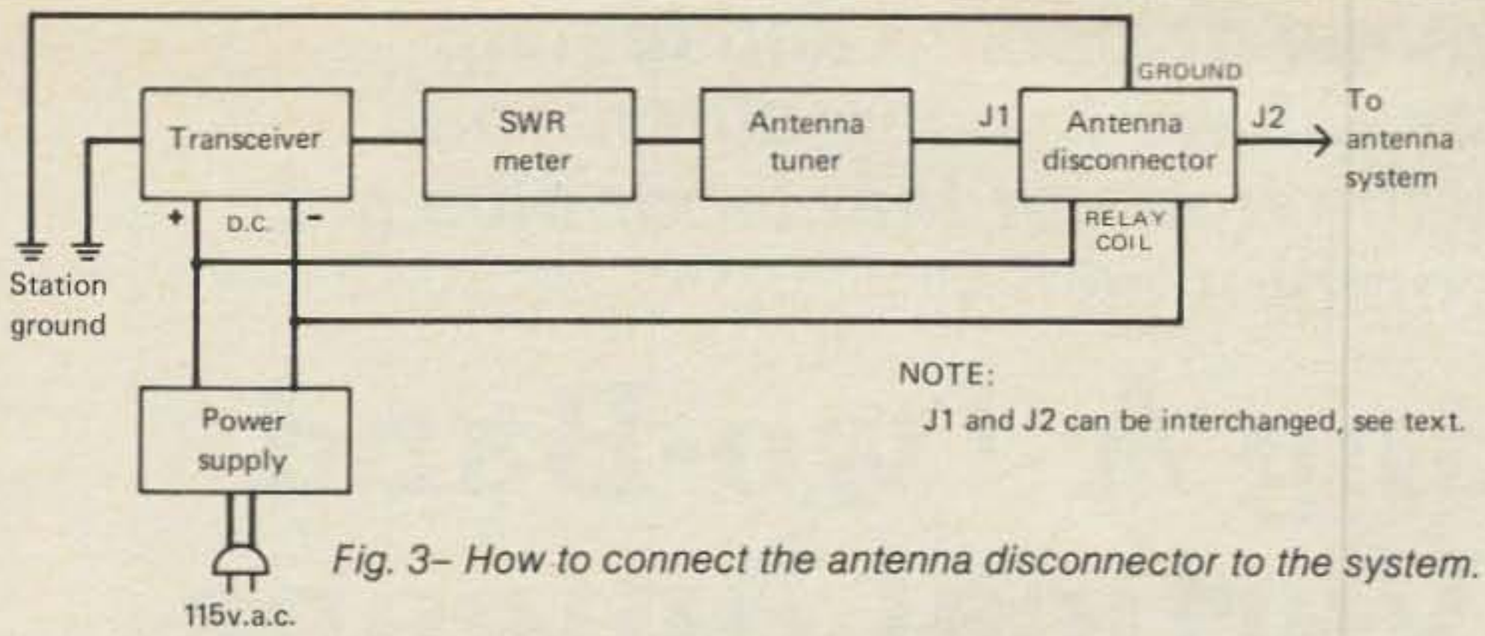


Fig. 3– How to connect the antenna disconnector to the system.

If I had not had a convenient external source of 12 to 13.8 v.d.c., I could have extracted it from the innards of the rig. If there is no such voltage even inside your rig itself (such as on my previous rig—an all vacuum tube model), it can be created from the filament or pilot lamp leads, as shown in fig. 2. (I used this method with my old rig to power a small relay I had added to provide another function.)

Interconnection

The antenna disconnector is connected to the rig, the rig's d.c. power supply, and the station ground as shown in fig. 3. I have the rig connected to J1, and the antenna to J2, which open-circuits the rig's antenna input terminals and grounds both sides of the antenna when power is off. It might make just as much sense to reverse these two connections, which would short together the antenna input terminals on the rig and ground them, while open-circuiting the antenna itself. Which arrangement is better remains to be determined.

Caution

This design is intended for use with h.f. rigs, not for v.h.f. or higher frequency rigs. Much more care is required in introducing switches or relays into the antenna circuits of that type of equipment. All precautions with respect to lightning protection which would be followed if this disconnector were not in use should be followed anyway for maximum protection. If possible, use lightning protectors and disconnect the antennas when they are not in use.

Naturally, this gadget offers no protection at all if you are operating your rig when the lightning hits. It at no time offers any protection against a.c. power-line transients.

Finally, if you should be so unfortunate as to experience a direct lightning hit, this disconnector will simply disappear in a puff of smoke like so much fluff. It will not help at all (but then, what will?).

Results

My main concern with this approach was that it would unduly elevate the s.w.r. in my already sub-standard antenna system, thereby frustrating the choosy solid-state finals in my jewel. However, this did not prove to be the case. As you would expect, the amount of disruption increases with frequency. It is not noticeable at all on 80 meters, but on 15 meters it raises the s.w.r. of my antenna from 1.6 to 1 to about 2 to 1. This is not negligible, but it is tolerable, especially considering the degree of protection afforded.

Conclusion

My antenna protector now offers me peace of mind. When I'm away from home and lightning and thunder begin their assault, I no longer need worry (as much) that my precious rig will be blasted to an untimely demise.

W1DBM spent his summer designing and testing two-band vertical antennas via his computer. This summer we can enjoy the fruits of that labor plus get some time in on our computers.

Designing A Two-Band Loaded Vertical Antenna

BY PHILIP S. RAND*, W1DBM

I have used a two-band vertical phased array quite successfully for the past few years. This antenna consists of four 20 meter verticals with a 40 meter mobile resonator mounted on the top of each element. The idea occurred to me that it should be possible to redesign this antenna for use on other frequencies and for other purposes such as mobile whips, travel-trailer antennas, or low-frequency DX verticals.

After considerable researching of engineering handbooks and back issues of amateur magazines, in the September 1974 issue of *QST* I found an article entitled "Off-Center-Loaded Dipole Antennas" by Jerry Hall, K1PLP. A ¼-wave vertical, of course, is one half of a dipole. Therefore, all that would be necessary is to cut the overall length in half and wind only one loading coil. It was worth a try. However, the gigantic mathematical equation in this article (fig. 1) almost frightened me away. Since I had a computer, though, I figured if I could get the formula into a workable program I would be home free.

Another article was found in *CQ* magazine, December 1981 by Dick Sander, K5QY, entitled "A Computer-Designed Loaded Dipole Antenna." This article lists a program for an Apple II computer that puts Jerry Hall's formula into a workable form, and some useful ideas were obtained from it.

Jerry's article describes the design of a dipole that is considerably shorter than normal (you select the length that you have available). It then calculates the necessary inductance for a pair of loading coils to make it resonate at the desired frequency. You must select the distance, "B," from the center insulator to each loading coil. Considering one half of the dipole, if you choose "B" as ¼ wave at a higher frequency, you will have a two-band, ¼-wave vertical antenna.

Fig. 2 shows a diagram of the loaded vertical. Note that the overall height, "H," resonates at a low frequency, while the length below the loading coil resonates at a higher frequency. This design requires that the overall height be less than ¼ wavelength at the lower frequency, and that the part below the loading coil be ¼ wavelength at the higher frequency. The overall length, of course, must be longer than a ¼ wave at the higher frequency. The loading coil must have enough inductance so that it will act like an RFC on the higher frequency and isolate the lower part of the antenna, while acting like a loading coil to resonate the entire antenna at the lower frequency. A good radial ground system will be necessary under the antenna for best results.

$$L_{\mu H} = \frac{10^6}{68\pi^2 f^2}\left\{\frac{\left[\ln\frac{24\left(\frac{234}{f}-B\right)}{D}-1\right]\left[\left(1-\frac{fB}{234}\right)^2-1\right]}{\frac{234}{f}-B} - \frac{\left[\ln\frac{24\left(\frac{A}{2}-B\right)}{D}-1\right]\left[\left(\frac{fA}{2}-fB\right)^2-1\right]}{\frac{A}{2}-B}\right\}$$

where

$L_{\mu H}$ = inductance required for resonance
$\ln$ = natural log
f = frequency, megahertz
A = overall antenna length, feet
B = distance from center to each loading coil, feet
D = diameter of radiator, inches

Fig. 1– The program formula from Jerry Hall's article "Off-Center-Loaded Dipole Antennas," which appeared in QST, *September 1974.*

The Equation

The equation in *QST* is rather cumbersome to handle in its present form (see fig. 1). It is much easier to enter into the computer if you first divide it algebraically into several logical sections, calculating each separately and then recombining them later. Also, two parts of the equation are each used twice, so they are also calculated separately. Their values have been assigned to the variables "DD" and "GG." "F" is the lower frequency. "F2" has been added as the higher frequency. "F2" is used to determine the length "B" in fig. 2 automatically (B = 246 * K1 / F2 where K1 = K + .04). "K" is calculated from the ratio of the length to the diameter of the total antenna, while the ".04" was derived experimentally to compensate for the inductance of the loading coil that replaces the capacity of an end insulator. "D" is the diameter of the radiating element in inches. The computer program has a wire table built in so that the uH of the loading coil will be correct for any diameter of radiating element. You may enter either the diameter of the antenna or the wire gauge. You can therefore use this program to design a two-band ground-plane antenna with a large-diameter radiator as well as a wire vertical hung from a tree or a wooden pole.

The *QST* article only calculated the inductance in uH of the loading coils. Of course, you must wind these coils (see fig. 3). It is necessary, therefore, to find out the number of turns, wire size, length, etc. To determine the physical size of a single-layer air-wound coil where "EQ" equals inductance, the following formula

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is entered into the computer program: "Inductance equals the number of turns, squared, times the coil radius, squared, divided by 9 times the radius plus 10 times the coil length," where **N** = number of turns, **A** = coil radius in inches, **B** = coil length in inches, and **EQ** = inductance in uH.

Rearranging the formula to solve for the number of turns and putting it into computer format, the formula becomes:

"N=SQR(EQ*(9*A+10*B))/A"

where **SQR** = square root, * = multiplication, and / = division. Since B is unknown, we enter B = 5 inches as a starter, and then "iterate" the equation 12 times, each time entering a new value for "B" by recalculating "B" = number of turns divided by turns-per-inch (for the size wire that you have selected). The number of turns-per-inch = "**WW**" and therefore, "B = N/WW." Usually, by the seventh or eighth iteration we have an accurate figure for both "N" and "B" and can proceed to wind the coils.

Practical Designs

To prove out this method of designing two-band shortened verticals, I have constructed several such verticals and have measured both the inductance of the computer designed coils and the s.w.r. of the finished antennas. In general, the

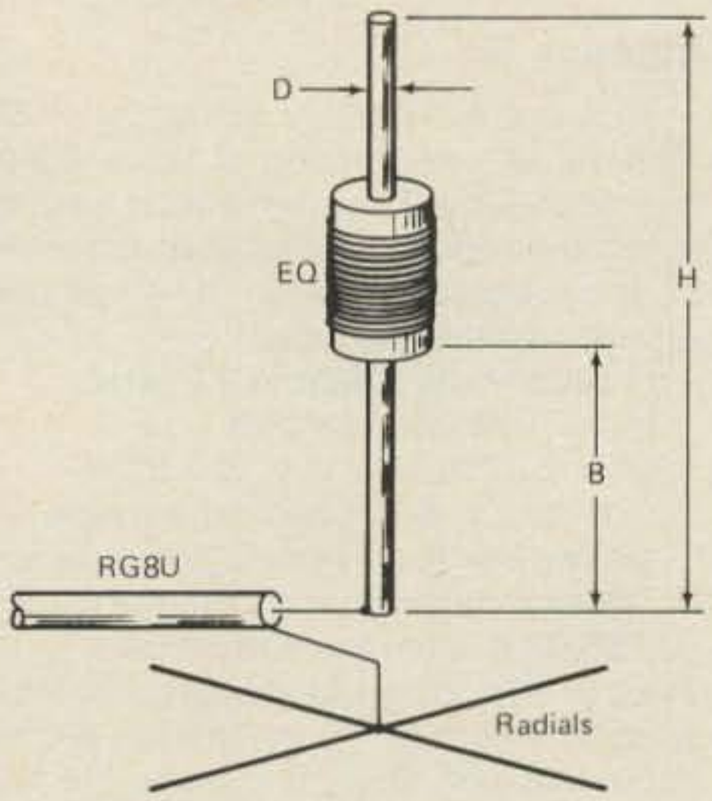
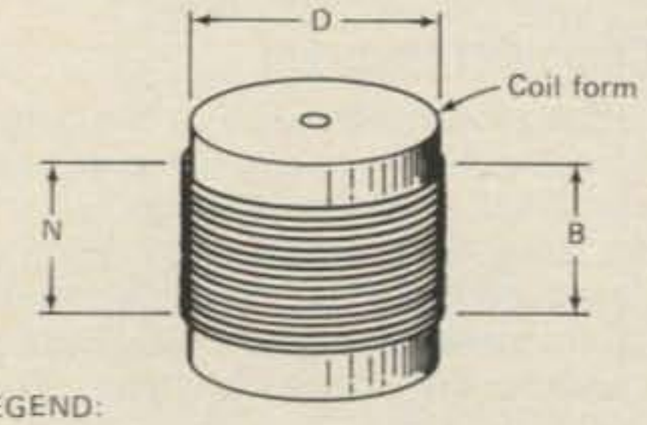


Fig. 2– Diagram of a two-band loaded vertical antenna.



LEGEND:
A = Coil radius (D/2)
B = Coil length
D = Coil diameter
N = Number of turns
EQ = Inductance (μH)

Fig. 3– Loading-coil winding criteria.

coils measured very close to the design inductance. Any difference was attributable to the unknown dielectric of the coil form (plastic water pipe). The lowest s.w.r. was not quite on the design frequency. This was attributable to ground conditions and to the proximity of nearby objects. With a small amount of pruning, it was possible to get all antennas down to an s.w.r. of less than 1.3/1 at the design frequency. The bandwidth for the higher frequency verticals was normal. As expected, the bandwidth of the lower frequency verticals decreased in proportion to the amount of shortening.

Antenna No. 1

This is a two-band travel-trailer antenna designed for use on the 20 and 40 meter Recreational Vehicle Service Nets on 7234 and 14308 kHz. A height of 20 feet was chosen for the vertical, which was mounted on my Airstream's rear bumper. The following data was entered into the computer:

F = 7.2; F2 = 14.3; H = 20; D = .625 (average dia. of mast, 10 ft. each of ½ in. and ¾ in. electrical conduit).

The computer said we needed a coil of 35.3 uH and that it should be placed 17.72 ft. above the bottom. Next we entered the coil diameter in inches and the size of the wire we planned to use.

D = 1.0 in.; WW = 14-gauge enameled magnet wire.

The computer calculated the following data for the loading coil:

Coil length = 6.69 in.

No. of turns = 100.4 using No. 14 enameled wire close-wound. (An 8 in. length of 1 in. dia. plastic water pipe was used for the form).

Antenna No. 1 performed well. The bandwidth on 40 meters was quite a bit narrower than a full-size vertical due to its shorter length. The 20 meter bottom section resonated close to the design frequency and worked like any other 20 meter ground-plane.

Antenna No. 2

This two-bander was for 3.9 and 21.3 MHz with an overall height of 15 ft. and a diam. of 1.25 in. (TV masting). The computer calculated the bottom-to-coil distance as 11.9 ft. and the coil inductance as 92.9 uH. It was decided to use a 12 in. length of 1.5 in. dia. plastic pipe for the coil form. The coil length is 9.05 in. wound with 126.8 turns of No. 20 insulated hookup wire.

Antenna No. 2 had a much narrower bandwidth than a normal-size dipole on 75 meters due to its much shorter overall length. It did, however, have a better bandwidth than a mobile whip with only a 5 ft. bottom section, and it also got out much better. On 15 meters it appeared to function normally. Slight pruning was required to get the s.w.r. down to a low value, especially on 75. For solid-state rigs a "match-box" solves the s.w.r. problem when QSYing too far from the design frequency.

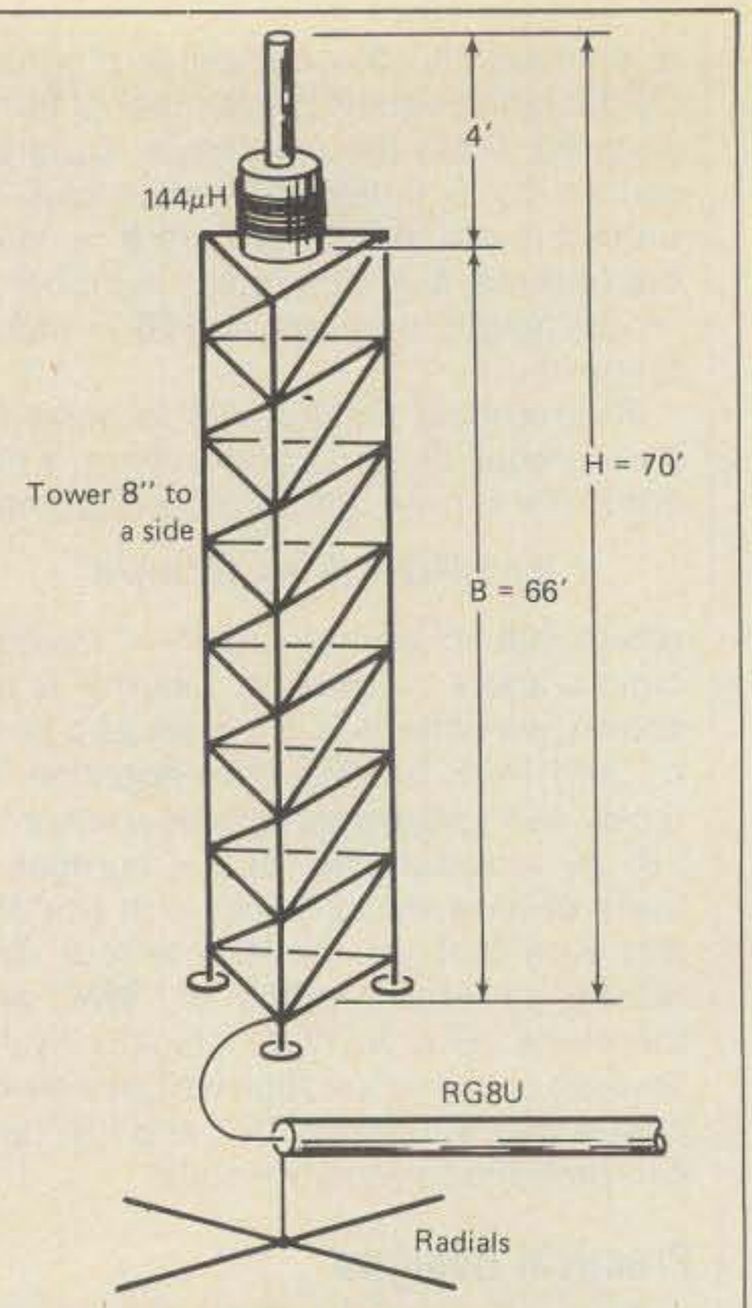


Fig. 4– A two-band, low-frequency DX antenna. See "Antenna No. 3" section for details.

Antenna No. 3

This is a two-band, low-frequency DX antenna. A wire version of this antenna has been tested in a horizontal position as a dipole and should work much better in the vertical position if a suitable ground-plane is provided.

Frequencies: 1.82 and 3.8 MHz
H = 70 ft. (total height)
D = 8 in. (tower, 8 in. to a side)
Coil dia. = 4 in. plastic drain pipe
Coil wire = No. 14 insulated house wire

The computer says: mount the loading coil 66.03 ft. from the bottom (see fig. 4). The coil should be 144 uH, 59 turns with a winding length of 7.9 in. The top section should be long enough to make the total height 70 ft. Adjust bottom length for lowest s.w.r. on 3.8 and then the top section for lowest s.w.r. on 1.82.

Computer Program

The program is made up of a bunch of numbered lines telling the computer in numerical sequence what you want it to do. Lines 10 through 200 ask you to input data such as frequencies, overall length, "want to use wire table?" etc. The actual computation starts at line 200. A "GOSUB 1280" statement sends the computer to line 1280, a sub-routine, to calculate the value of "K" from the length-to-diameter ratio. It then returns to line 210 to calculate the value of "B," the length of the higher frequency vertical.

51

No-49-50

Program Listing

```
10 CLS
20 PRINT" A PROGRAM FOR:"
30 PRINT" DESIGNING A 2-BAND SHORTENED"
40 PRINT" AND LOADED VERTICAL ANTENNA."
50 PRINT" WRITTEN BY PHIL RAND-W1DBM."
60 PRINT" JULY 15, 1983
70 PRINT" ENTER A FREQ. IN LOWER BAND:"
80 INPUT F
90 PRINT" ENTER A FREQ. IN HIGHER BAND:"
100 INPUT F2
110 PRINT" ENTER OVERALL VERT. ANT.HEIGHT"
120 INPUT H
130 A=2*H
140 PRINT" WANT TO USE ANT. WIRE TABLE? ANSWER 'Y' OR 'N':"
150 INPUT Y$
160 IF Y$="Y" THEN 1090
170 IF Y$="N" THEN 1240
180 IF Y$<>"Y" THEN 150
190 IF Y$<>"N"THEN 150
200 GOSUB 1280
210 B=246*K1/F2
220 SL=B
230 PI=3.1416
240 AA=10^6/(68*PI^2*F^2)
250 DD=234/F-B
260 GG=A/2-B
270 BB=LOG(24*DD/D)-1
280 CC=(1-F*B/234)^2-1
290 EE=LOG(24*GG/D)-1
300 FF=(F*GG/234)^2-1
310 EQ=AA*((BB*CC/DD)-(EE*FF/GG))
320 EQ=INT(EQ*100+.5)/100
330 PRINT
340 CLS
350 PRINT" INDUCTANCE OF THE LOADING COIL IS"EQ"UH."
360 PRINT"** CALCULATING SIZE OF COIL **"
370 PRINT" ENTER DIA. OF LOADING COIL:"
380 INPUT DL
390 A=DL/2
400 B=5
410 CLS
420 PRINT" ENTER THE WIRE GAUGE OF THE COIL, 12 TO 16."
430 REM-
440 PRINT"          - OR -"
450 PRINT" ENTER '1' FOR B&W 10 TURNS PER INCH COIL STOCK."
460 PRINT" ENTER '2' FOR N0.12 GA. INSULATED HOUSE WIRE."
470 PRINT" ENTER '4' FOR NO.14 GA. INSULATED HOUSE WIRE."
480 PRINT" ENTER '6' FOR NO.20 INSULATED HOOK-UP WIRE."
490 INPUT W
500 IF W=1 THEN WW=10
510 IF W=2 THEN WW=6.5
520 IF W=4 THEN WW=7.5
530 IF W=6 THEN WW=14
540 IF W=12 THEN WW=12
550 IF W=13 THEN WW=13.5
560 IF W=14 THEN WW=15
570 IF W=15 THEN WW=16.8
580 IF W=16 THEN WW=18.9
590 CLS
600 PRINT" < ITERATING FORMULA >"
610 PRINT TAB(7)"TURNS";TAB(15)"LENGTH"
620 X=1
630 FOR I=1 TO 12
640 N=SQR(EQ*(9*A+10*B))/A
650 N=INT(N*100+.5)/100
660 B=INT(B*100+.5)/100
670 PRINT"NO."X;TAB(8)N;TAB(15)B
680 B=N/WW
690 B=INT(B*100+.5)/100
700 X=X+1
710 NEXT I
720 PRINT" PRESS ENTER/RETURN"
730 INPUT C
740 CLS
750 PRINT" *** ANTENNA AND COIL DATA ***"
760 PRINT" DIA.OF ANT.ELEMENT IS"D"IN."
770 PRINT" FREQ.S ARE:"F"AND"F2"MHZ."
780 PRINT" HT.OF VERT.ANT.IS"H"FEET"
790 SL=INT(SL*100+.5)/100
800 PRINT" LENGTH FROM BOTTOM OF ANT."
810 PRINT" TO COIL IS"SL"FEET."
820 TL=H-SL
830 PRINT" LENGTH-TOP SECTION:"TL"FT."
840 PRINT" INDUCT. OF COIL IS"EQ"UH."
850 PRINT" DIA. OF COIL IS"DL"INCHES."
860 PRINT" LENGTH OF COIL IS"B"IN."
870 PRINT" NO. OF TURNS-PER-IN. IS";WW
880 PRINT" TOTAL NO. OF TURNS IS";N
890 IF W=1 THEN 960
900 IF W=2 THEN 990
910 IF W=4 THEN 1020
920 IF W=6 THEN 1050
930 PRINT " USE"W" GAUGE ENAMMELED MAGNET"
940 PRINT" WIRE FOR WINDIND COIL."
950 GOTO 1080
960 PRINT" USE B&W 10 TURNS-PER-INCH COIL"
970 PRINT" STOCK FOR THE COIL."
980 GOTO 1080
990 PRINT" USE NO.12 INSULATED HOUSE WIRE"
1000 PRINT" FOR THE COIL."
1010 GOTO 1080
1020 PRINT" USE NO.14 INSULATED HOUSE WIRE"
1030 PRINT" FOR THE COIL."
1040 GOTO1080
1050 PRINT" USE NO.20 INSULATED HOOK-UP"
1060 PRINT" WIRE FOR THE COIL."
1070 GOTO 1080
1080 END
1090 PRINT" ENTER ANT. WIRE GA., 10 TO 16,"
1100 PRINT" IN EVEN NUMBERS."
1110 INPUT GA
1120 IF GA=10 THEN D=.1019
1130 IF GA<>10 THEN 1150
1140 IF D=.1019 THEN 200
1150 IF GA=12 THEN D=.0808
1160 IF GA<>12 THEN 1180
1170 IF D=.0808 THEN 200
1180 IF GA=14 THEN D=.064
1190 IF GA<>14 THEN 1210
1200 IF D=.064 THEN 200
1210 IF GA=16 THEN D=.0508
1220 IF GA<>16 THEN 1240
1230 IF D=.0508 THEN 200
1240 PRINT" ENTER ANT. ELEMENT DIA. IN IN.:"
1250 INPUT D
1260 GOTO 200
1270 REM L=ANT. LENGTH IN FT.
1280 L=A
1290 DF=D/12
1300 R=L/DF
1310 IF R<5.0 THEN K=.90
1320 IF K=.90 THEN 1480
1330 IF R<8  THEN K=.91
1340 IF K=.91 THEN 1480
1350 IF R<13 THEN K=.92
1360 IF K=.92 THEN 1480
1370 IF R<17 THEN K=.93
1380 IF K=.93 THEN 1480
1390 IF R<25 THEN K=.94
1400 IF K=.94 THEN 1480
1410 IF R<50 THEN K=.95
1420 IF K=.95 THEN 1480
1430 IF R<250 THEN K=.96
1440 IF K=.96 THEN 1480
1450 IF R<5000 THEN K=.97
1460 IF K=.97 THEN 1480
1470 IF R=>5000 THEN K=.98
1480 K1=K+.04
1490 RETURN:REM (TO 390)
```

Next it starts the calculation of the loading-coil inductance by defining the values of the numeric variables: B = 246 * K1 / F2; SL = B; PI = 3.1416; DD = 234 / F − B; GG = A / 2 − B. The actual equation for the inductance starts at line 240 and has been broken down into:

EQ=AA*((BB*CC/DD)−(EE*FF/GG))

where EQ is in uH and AA, BB, CC, DD, EE, FF, and GG are parts of the original equation (fig. 1).

Designing The Coil. Lines 420 to 560 give you your choice of a number of different kinds of wire for winding the coil. Lines 580 to 710 give the computer instructions for "ITERATING" the no.-of-turns equation:

N=SQR(EQ*(9*A+10*B))/A

Computer Printout. Lines 730 through 1060 tell the computer to display the results on the TV screen. Lines 1100 to 1260 contain the antenna wire table.

Program Listing. In the accompanying program listing, whenever you see a line containing "CLS", (command to "CLEAR THE SCREEN"), you must change it to one of the following, depending upon your brand of computer. For example, if you own an:

Apple II—change "CLS" to "HOME"

Vic-20—change "CLS" to "PRINT "CLR/HOME" "

TI-99/4A—change "CLS" to "CALL CLEAR"

For the Timex-Sinclair, IBM, and TRS-80—"CLS" is okay.

This complete program requires only about 3.5K of usable RAM and the use of LOGs. (Extended BASIC required for the TRS-80 Color Computer and the TI99/4A.) It may be run on a Vic-20 with 3583 BYTES FREE. You will need extra memory for the Timex/Sinclair, which also requires the addition of the word "LET" when assigning values to numeric variables. (For example: 210 B = 246*K1/F2, becomes 210 LET B = 246*K1/F2, etc.)

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2004-A is identical to the 2002A except that it is set up for the 430 to 450 MHz band. This amplifier will use a ½ wave strip line and offer all of the same specifications as the 2002A. This will replace our limited production 2004.

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1004-A...a half-power version of the 2004A. Will cover the 430 to 450 MHz band using a ½ wave strip line design.

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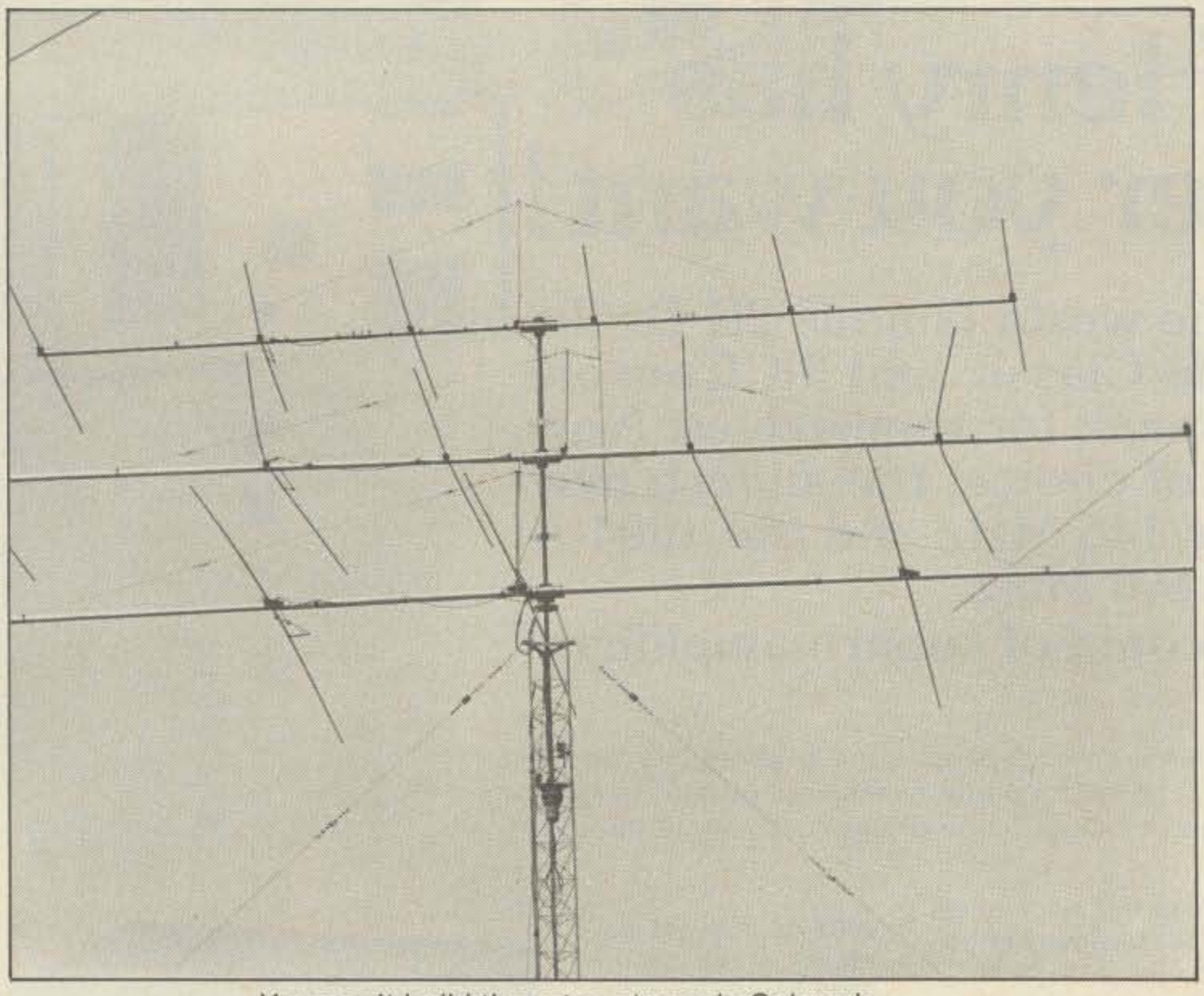
CIRCLE 127 ON READER SERVICE CARD

A tramline is not necessarily a streetcar in Britain, and a come-along may not be an invitation to follow. Besides learning about these two terms, you will learn how to repair that big array you hope to get.

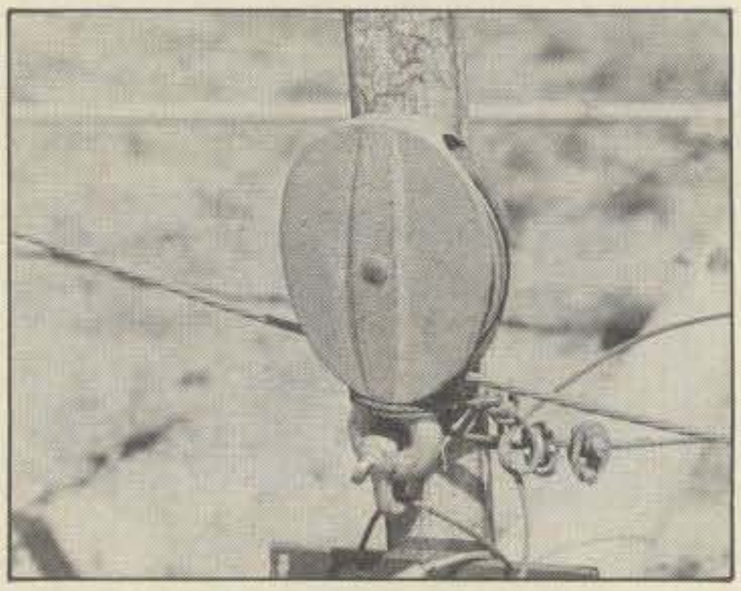
HOW TO GET 'EM DOWN THE EASY WAY

BY TED A. CULLIAN*, K6RF



You can't build them too strong in Colorado.

KØRF (left) and WØUA rigging up for the great antenna caper.



Pulley mounted on vertical boom support rides on the tramline.

Stacking long-boom Yagis at over 100 feet on the front range in Colorado is not advisable. If you *must* do it, be sure to have the tower well removed from the shack and the antennas designed to survive wind velocities ranging from violent to cyclonic.

I did it. The monobanders at K6RF are stacked on a husky mast. A ⅜ inch wall gives the mast an ultimate strength of 118,000 psi. A 20 meter 5-element Yagi, on a 54 foot boom, is mounted at the bottom of the mast. The 15 meter 6-element antenna is in the center; the boom length measures 45 feet. Ten meters is covered with 6 elements on a 36 foot boom. All booms are constructed of 3½ inch aluminum pipe with 3/16 inch wall. Elements taper from 1⅛ to ⅞ inches with wall thicknesses ranging from .058 to .045 inches. These are not run-of-the-mill Yagis. They're big and they're of heavy design to survive the worst . . . at least I thought they were.

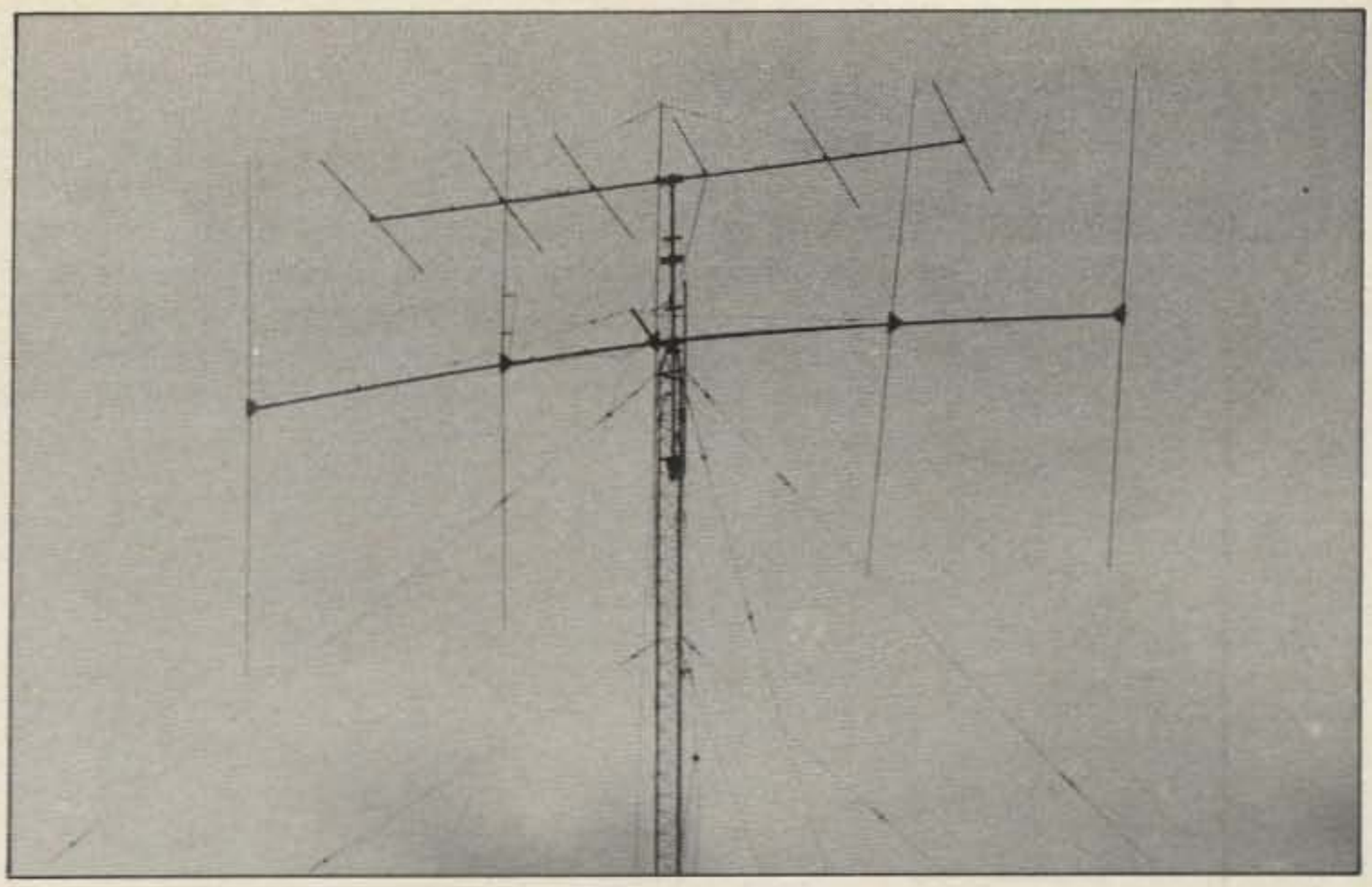
In mid-January, 147 m.p.h. winds broke off one element of the 15 meter antenna and swept the others up and back, giving the antenna a smart, racy look. Another zephyr—a week later—finished if off and blew an element off the 10 meter beam. This one could be replaced on the tower.

Problem: Given three long Yagis stacked at over 100 feet, how do you get the middle one down without removing the one below it?

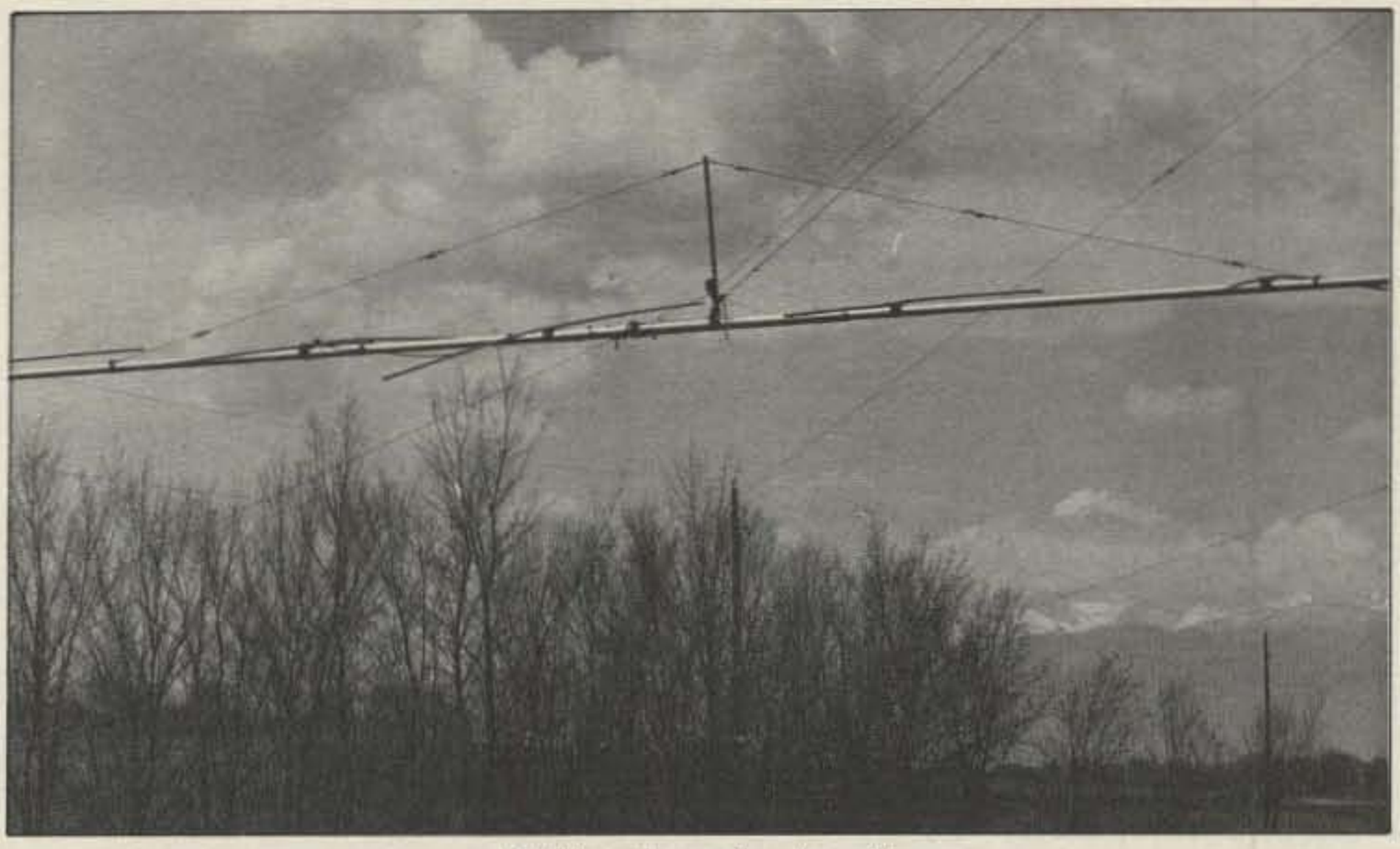
I talked it over with Chuck, KØRF, who's been putting 'em up and taking 'em down for more years than I like to think about. (I've learned a lot from him. He taught me all I know about climbing towers and raising antennas in the dark of night. It's the price I paid for getting my son into ham radio.) There weren't many options available. The first one considered was using a cherry picker to install new elements with the beam in place. At $79/hr—portal to portal—we didn't consider it for long.

Solution: A tramline! The idea is to attach a pulley to the antenna, suspend it from a steel cable, and let it roll down to the ground (hopefully at a controlled rate

*7399 N. 95th St., Longmont, CO 80501



Twenty meter beam rotated to clear the way.



Rolling down the tramline.

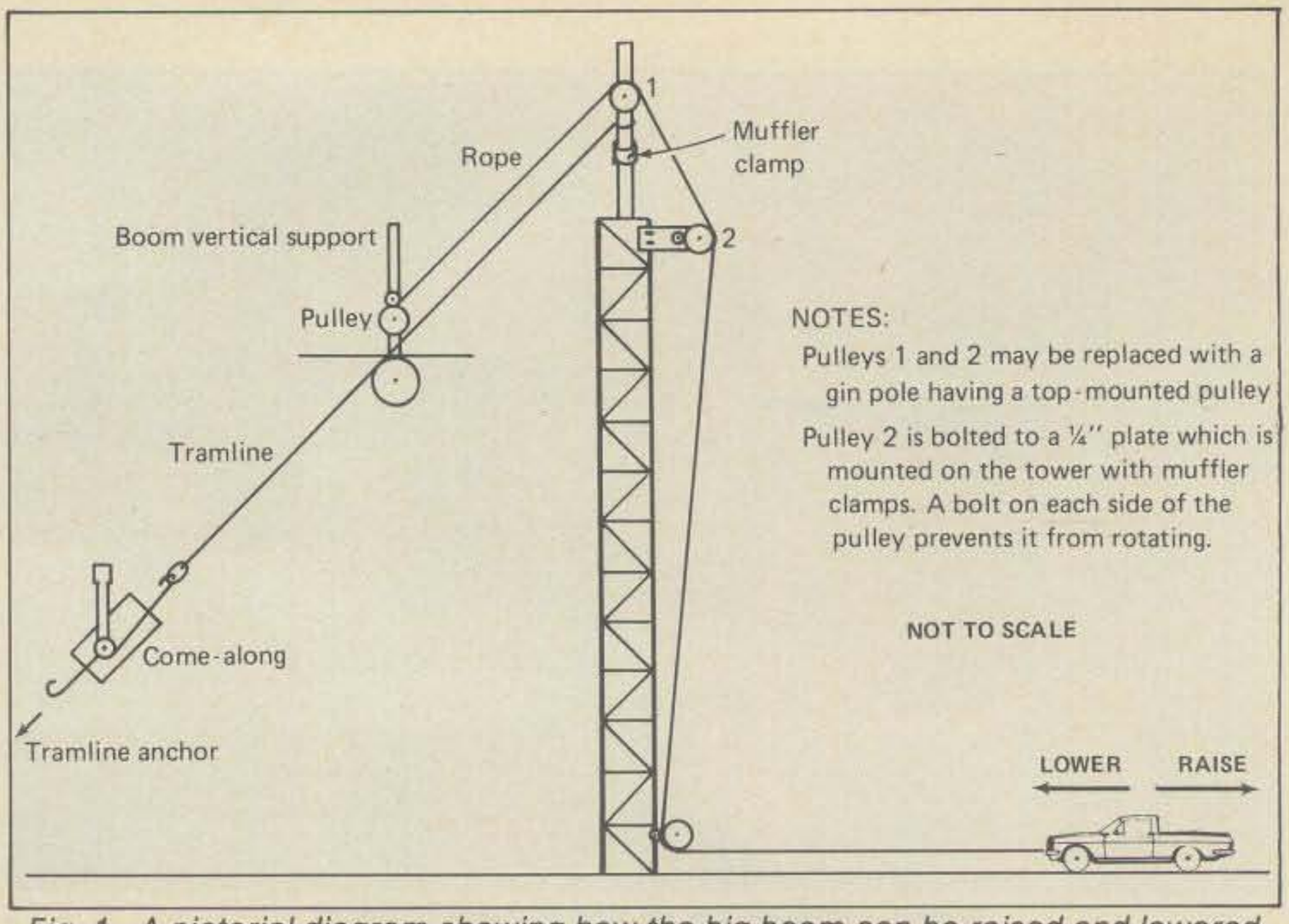
of speed). It had been used several times on much larger antennas at KØRF without mishap. The way Chuck described it, it would be a piece of cake. It was.

One Saturday morning, Chuck arrived with George, WØUA, perennial contest winner and c.w. op *par excellence*, ready to put the game plan into operation. George and I handled the ground work while Chuck rigged the tower.

Using the top of the mast for an anchor point, a *come-along*[1] was attached to the 15 meter beam to support the antenna when the boom clamps were loosened. Next, the clamps holding the lower antenna were loosened and the boom rotated to get the long 20 meter elements out of the path of the upper antenna when it started down the tramline. A heavy-duty pulley was attached to the mast above the 15 meter beam and one each to the top and bottom of the tower. A rope was strung through the pulleys with one end attached to a pickup truck and the other to the vertical boom support of the antenna. The tramline pulley was secured to the vertical support just below the point where the rope was tied off. We used another vehicle to anchor the tramline and took up the slack with a come-along. The pickup was backed away from the tower to put the full weight of the antenna on the rope so that the come-along could be removed. Next the antenna was suspended from the tramline pulley and held in place only by the rope attached to the pickup. After that it was all down hill (if I may be permitted a pun). All that remained was to drive the pickup toward the tower and allow the antenna to roll down the tramline to the ground. Total elapsed time was about two and a half hours. Running the antenna down the tramline took less than five minutes.

We were ready to run it back up on the following weekend. The only thing left

[1]*A gripping device (as for pulling in or stretching wire) consisting of two jaws so attached to a ring that they are closed by pulling on the ring.*



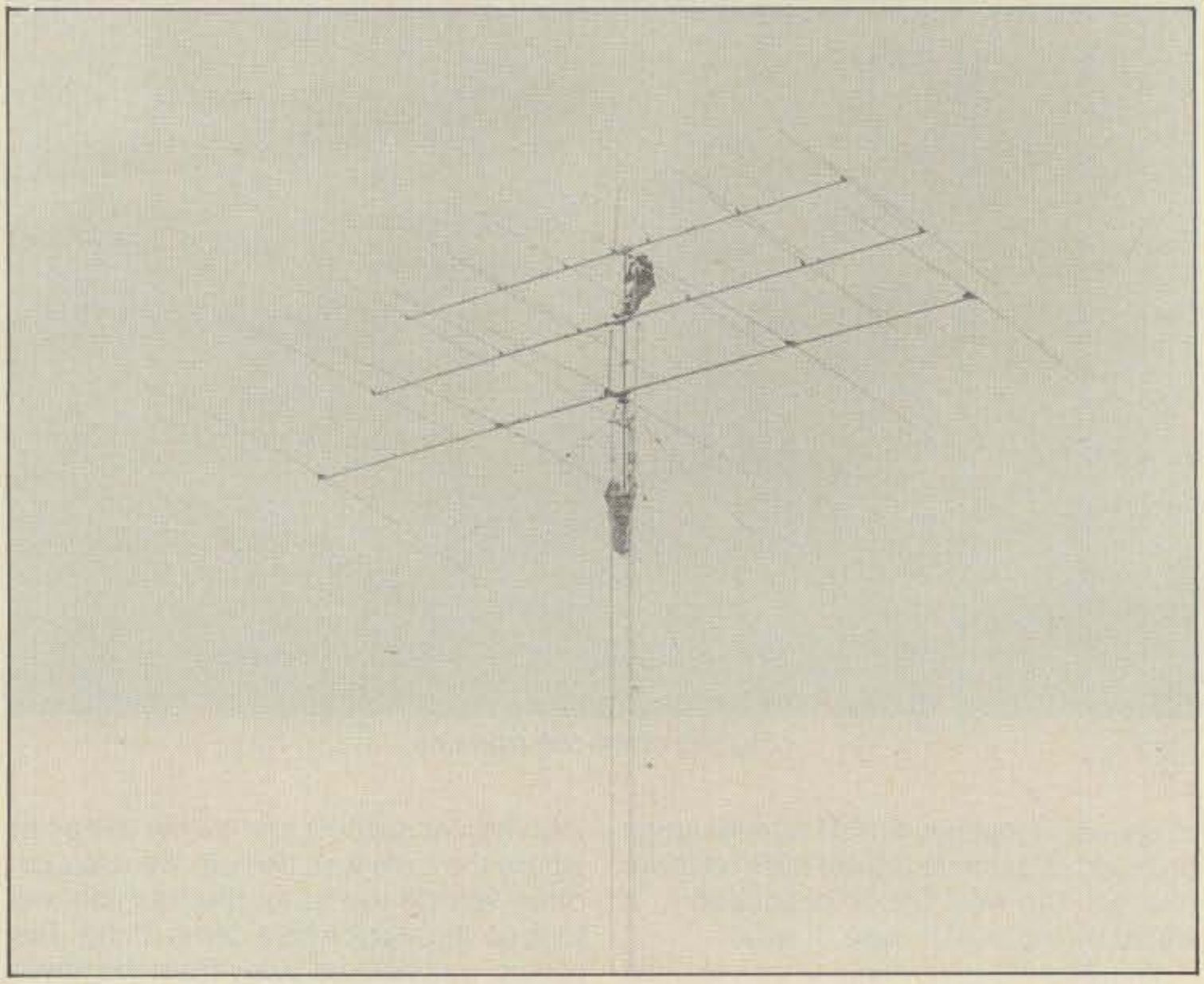
NOTES:

Pulleys 1 and 2 may be replaced with a gin pole having a top-mounted pulley

Pulley 2 is bolted to a ¼" plate which is mounted on the tower with muffler clamps. A bolt on each side of the pulley prevents it from rotating.

NOT TO SCALE

Fig. 1– A pictorial diagram showing how the big beam can be raised and lowered.



Back in place, KØRF (on top) replacing 10 meter element. That's K6RF below.

was to adjust the gamma match. Tuning antennas 5 or 10 feet off the ground can yield some disappointing results when a v.s.w.r. check is made with the antenna on the tower. That problem goes away when you use a tramline. All you have to do is adjust the match with the antenna a few feet off the ground, run it up the tramline about 60 feet, and check the v.s.w.r. If it's a good match at 60 feet, you'll have a good antenna. We found no significant change in v.s.w.r. above 50 feet. Two or three trips up the line will take care of the matching problem.

Finishing the job was only a matter of backing the truck away from the tower and pulling the antenna up the line to a point where the come-along could be attached. After rotating the 20 meter beam back into position, the come-along was used to pull the 15 meter beam into the bracket on the mast. All that remained was derigging the tower.

If you decide to use a tramline, there are some precautions to be taken. Be sure that there is nothing to interfere with the antenna on the way down. Inspect rope, cable, and pulleys for any flaw that could result in failure. Use heavy-duty hardware, even if you don't think it's required; like chicken soup, it can't hurt. If you use a gin pole with top-mounted pulley, a guy wire opposing the tramline will reduce the strain on the gin pole.

Thanks to John, WØUN, and Chuck, WDØDJP, for their support.

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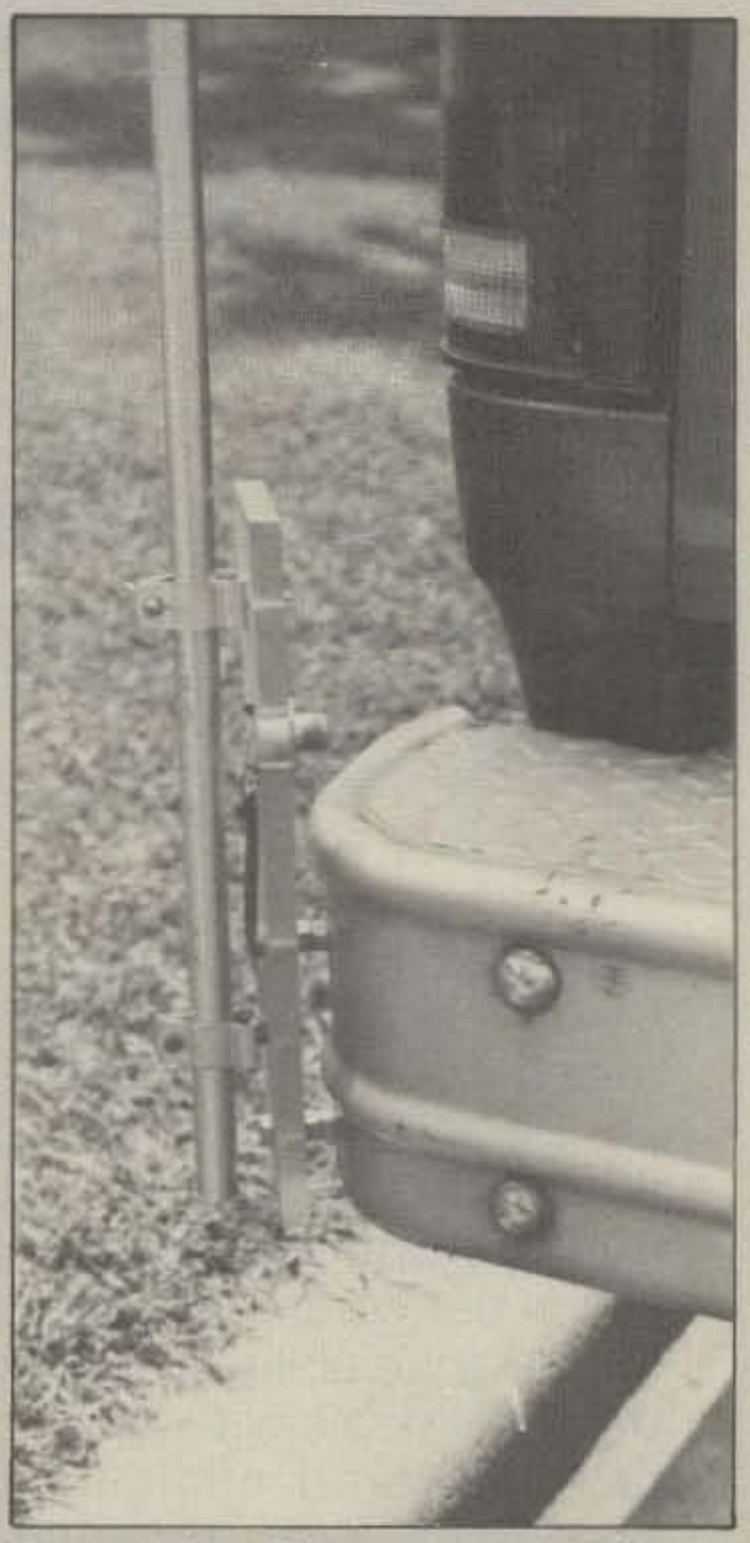
Here's an afternoon project that will make your drive time happier. You can also use it to compare traffic jams across the country with other 15 meter mobilers.

How To Build a Quick and Easy 15 Meter QRP Mobile Antenna

BY LOUIS J. JACOBS, JR.*, KN9V



The completed bumper mount on the author's pickup truck.

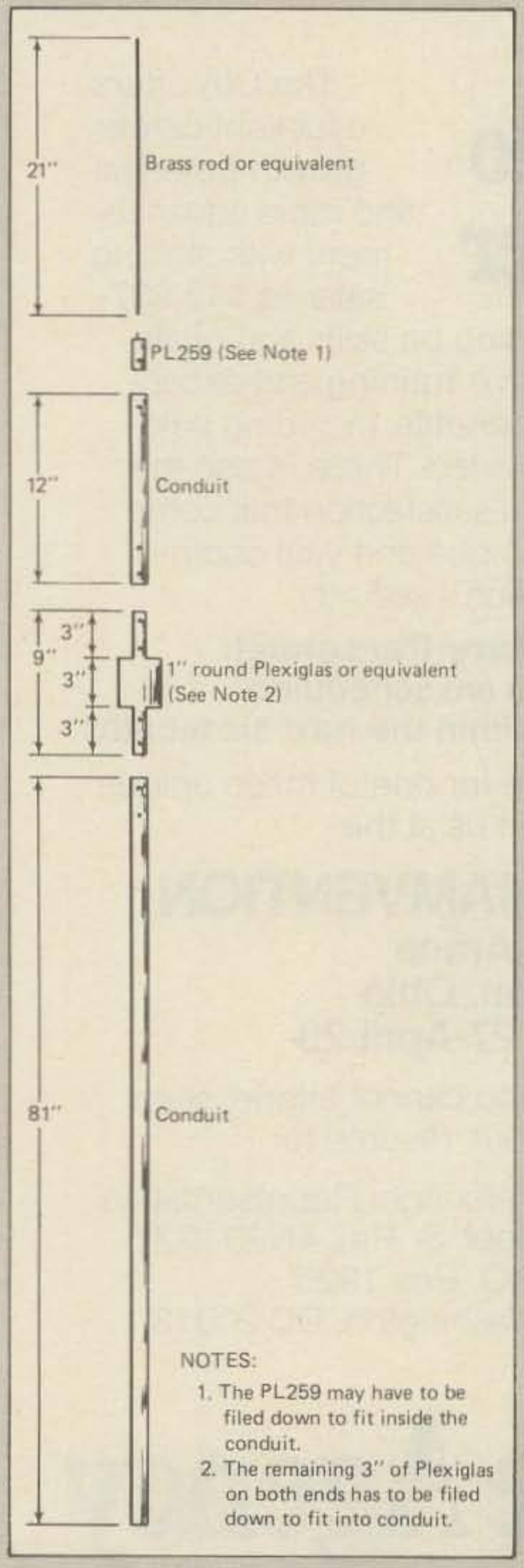


Fig. 1– Overall dimensions for the 15 meter mobile antenna.

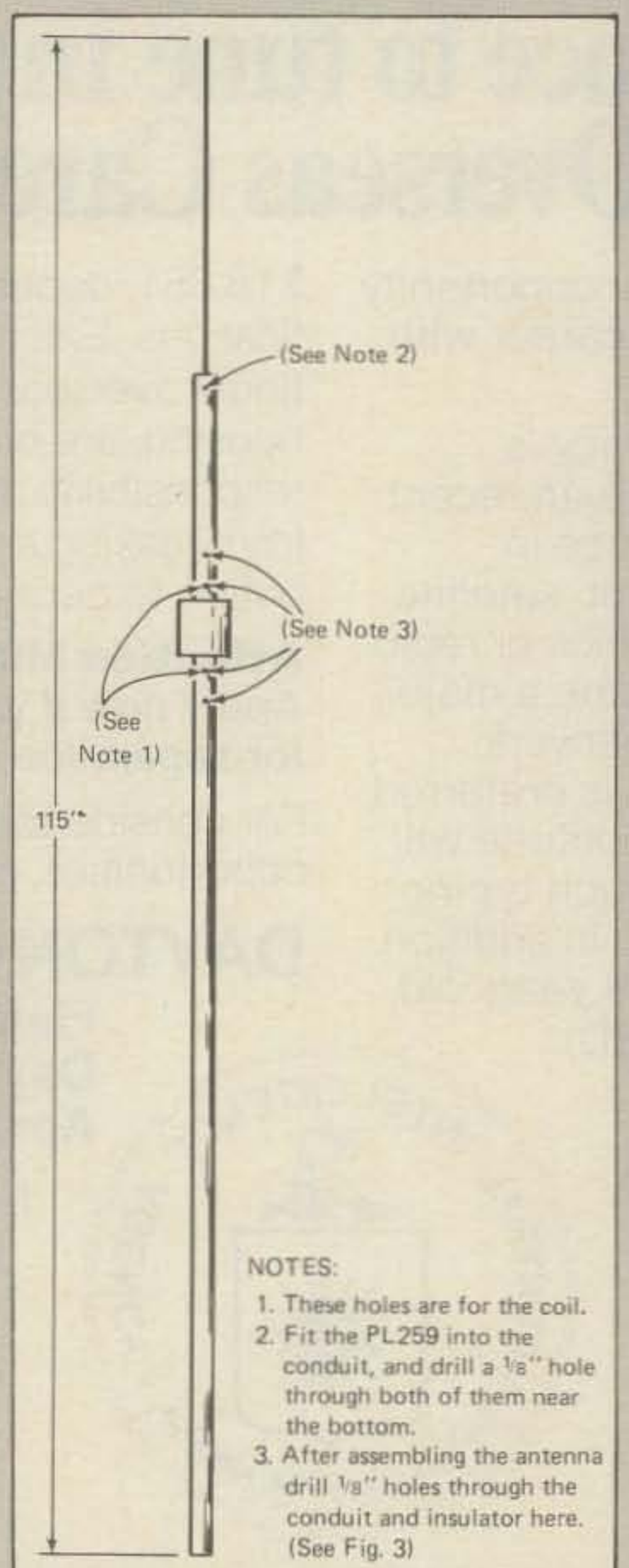


Fig. 2– The assembled vertical antenna for 15 meters.

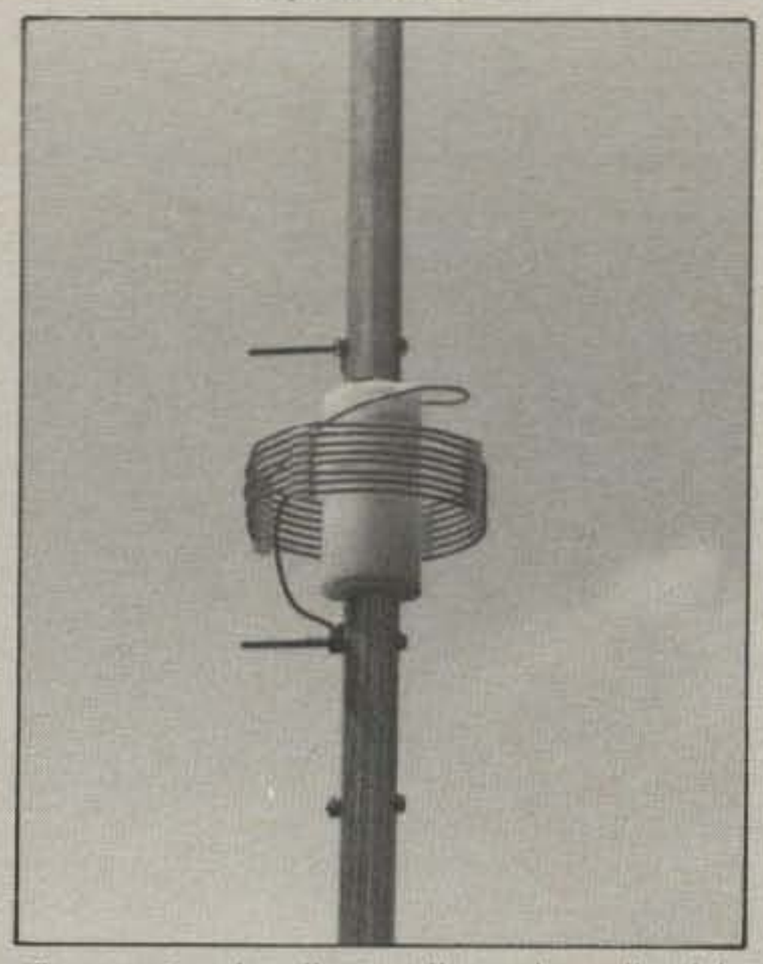
Time spent driving to and from work is time away from the shack, which led me to the thought of running mobile. Being an amateur, and admittedly a frugal one, the thought of buying a commercial antenna just didn't sit right with me.

My major interest lies in QRPing, and I was anxious to try my new NCG 15 meter QRP rig while on the road. The only obstacle was the antenna. Where does one get a cheap, efficient, easily built antenna? Well, a trip to the junkbox, the basement, and the local hardware store resulted in this 15 meter QRP mobile antenna.

Before getting into the construction, I would like to say that it works well with a

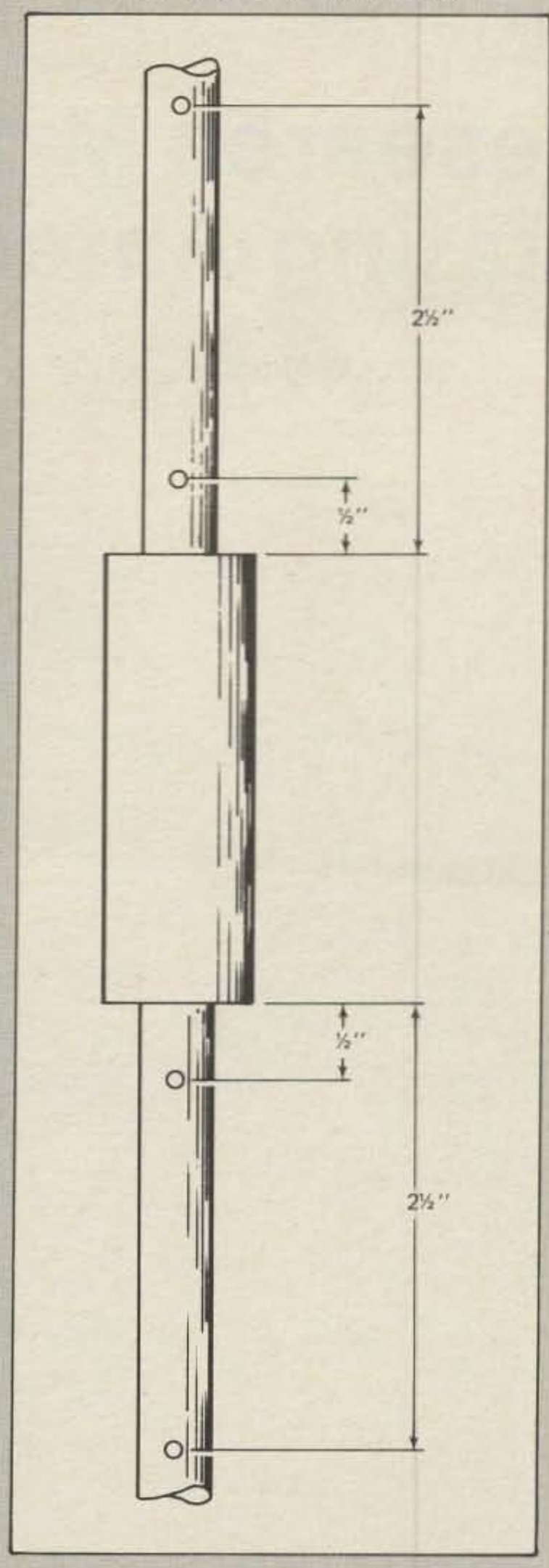
*5627 So. Homan, Chicago, IL 60629

The conduit is held in place by conduit clips as shown.



The center loading coil as described in the text.

Fig. 3– Drilling dimensions for mounting the insulator to the conduit.



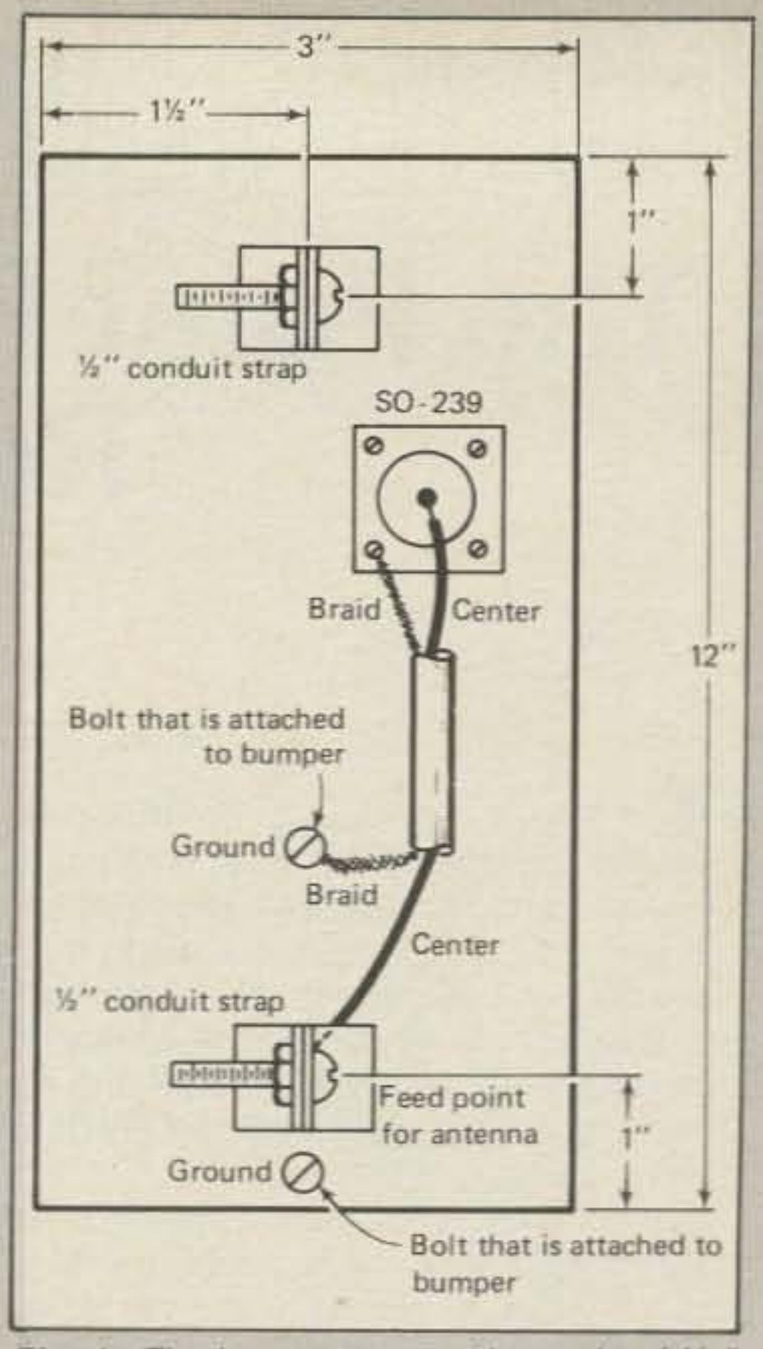


Fig. 4– The bumper mount is made of ½" plexiglass, 12" × 3", laid out as above.

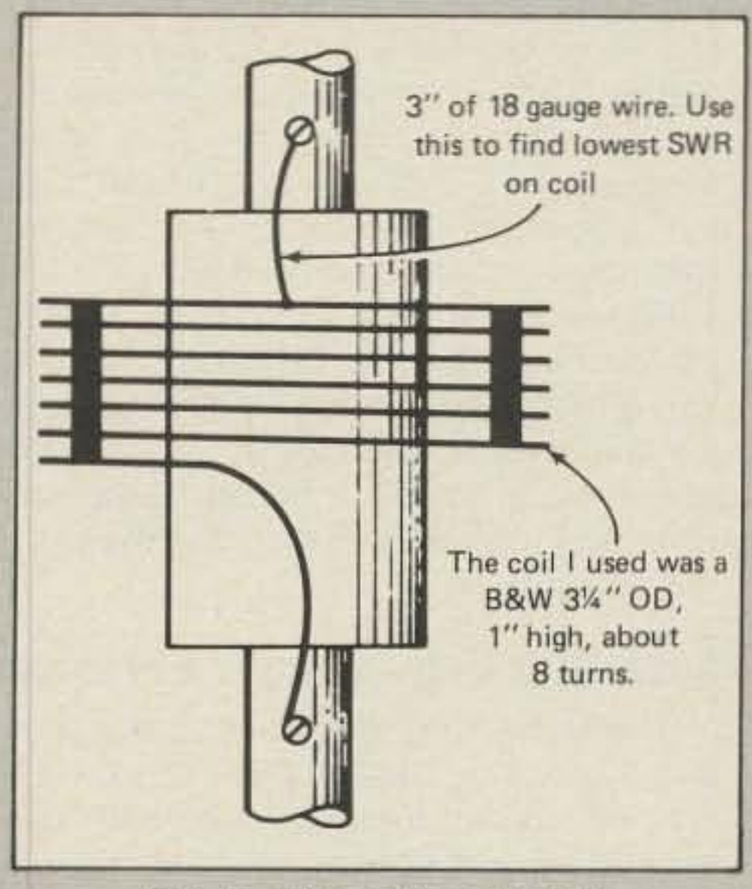


Fig. 5– The coil assembly.

low s.w.r. of 1.3:1 over the 15 meter band using 10 watts of input power. The antenna hasn't been tried with more power because as mentioned before it was designed with QRP in mind.

The antenna was constructed from ½ inch thin-wall conduit from the hardware store. The center loading coil is a piece of 3¼ inch diameter B&W stock from the junkbox. The inductor can be hand-wound using approximately 18-gauge wire. The top section is a piece of 19¼ inch whip from an old 11 meter antenna. The base mounting insulator was fabricated from an old piece of ½ inch thick plexiglass.

The accompanying diagrams and photos give all the necessary measurements and information pertinent to the construction of the antenna.

The antenna was field tested and the results are as follows. Using 10 watts with the antenna mounted to the rear bumper of my pickup truck the stations worked were Fort Worth, Texas; Picorivera, California; Richmond, Virginia; Hendersonville, North Carolina; and Milville, New Jersey. The signal reports on single sideband ranged from 5-1 to 5-7 and on c.w. from 519 to 579. I was well pleased with the antenna's performance and the signal reports considering the poor band conditions we've been having lately.

After consulting several handbooks and being thoroughly confused by conflicting statements, I decided to utilize a few facts and apply the old scientific principle of "trial and error." That is how I came up with this cookbook, 15 meter mobile QRP, homebrew, cheap, efficient, effective, easy, and fun-to-make antenna. CQ

Parts List

- 1 - 10' × ½" thin-wall conduit
- 5 - ⅛ × ¾" machine nuts and bolts
- 1 - 1" roundstock plexiglass 9" long or any other insulating material
- 1 - 3¼" B&W air inductor 1" high
- 1 - antenna whip
- 1 - SO-239 chassis connector
- 1 - coax cable, length as needed
- 1 - plexiglass ½" × 3" × 12" or any suitable size
- 2 - conduit pipe straps for ½" conduit
- 2 - Large nuts, bolts, and lock washers for mounting insulator to bumper

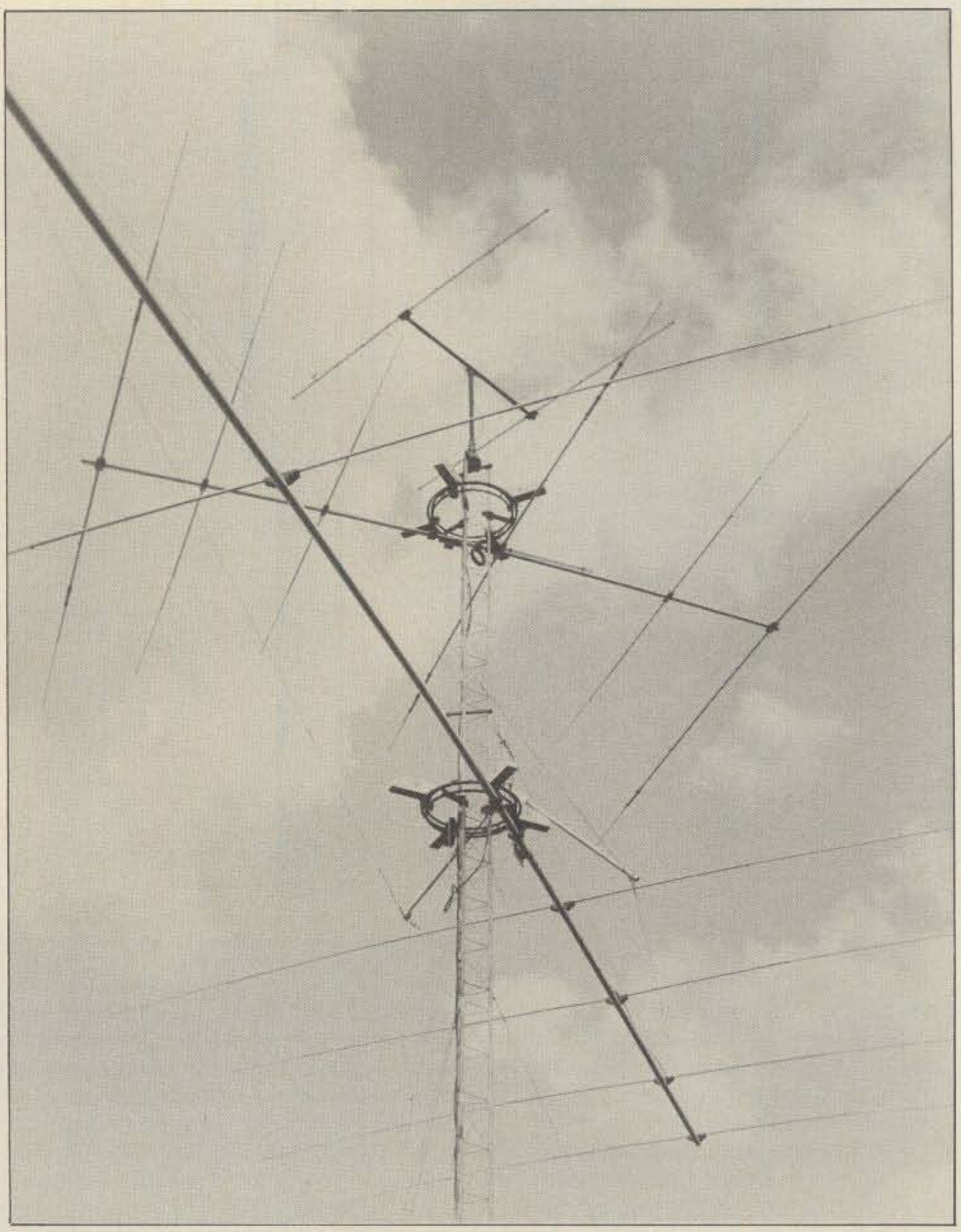
CQ REVIEWS:

The Polar Research M-1-A and ER-1 Rotating Antenna

BY LEW McCOY*, W1ICP

The M-1-A developed by Polar Research is probably the most unusual antenna rotating system ever developed for amateur radio use. It is unique in many ways which I will attempt to explain in this review. Let me say at the outset that the product is extremely well-made and rugged and will handle a wide variety of antenna loads.

What is unusual about the M-1-A is that the rotator does not fit inside the tower, but instead, it goes around the tower. That's right, it rotates around the tower. If you study the photographs and fig. 1, you'll get an idea of what I mean. The M-1-A consists of a double ring approximately 5 feet in diameter that is mounted around the tower. Another ring which supports the drive mechanism (and holds the antennas) rides on top of the other two rings. The system is used to rotate antennas in the horizontal plane. Still another rotator that can be used in conjuction with the M-1-A is the ER-1, which is an elevation rotor, providing a method of operating antennas in the vertical plane. Details of the ER-1 will also be covered in this review.



We asked Polar Research to provide a photo showing an extensive installation.

Beam Stacking—Always A Problem

The M-1-A can take care of the problem of stacking beams on a single mast. This eliminates top-mast mounting clutter and inaccessible arrays. Anyone who has used stacked antennas on a single mast knows the constant dread of a high wind storm taking down the stacked arrays. I don't have any idea how many amateurs have lost such a system, but I know I have twice. It should also be mentioned that by using this system, along with a conventionally mounted rotator, one has independent rotation control, particularly for v.h.f. arrays.

Getting It Up

In the unit I tested, the M-1-A was mounted just above the guy wires on the tower using a tribander as the test antenna. KE5CI did most of the work, and we found a couple of problems when making the installation. Working with shirts off in the hot New Mexico climate, we wound up with several scratches and cuts from the burrs on the metal parts of the rings, etc. I discussed this with the manufacturer, and they have since corrected the problem, providing deburred parts. Also, spring-loaded bolts were used in some parts of the rotor, and it isn't very pleasant to be up on a tower hanging on a safety belt, trying to hold down the spring-loaded bolt, and then drop the nut! However, another call to the manufacturer, and they now spot-weld the nuts in place, taking care of the problem. This brings up an important point about product reviews. I could have written the review,

*Technical Consultant, CQ, 200 Idaho St., Silver City, NM 88061

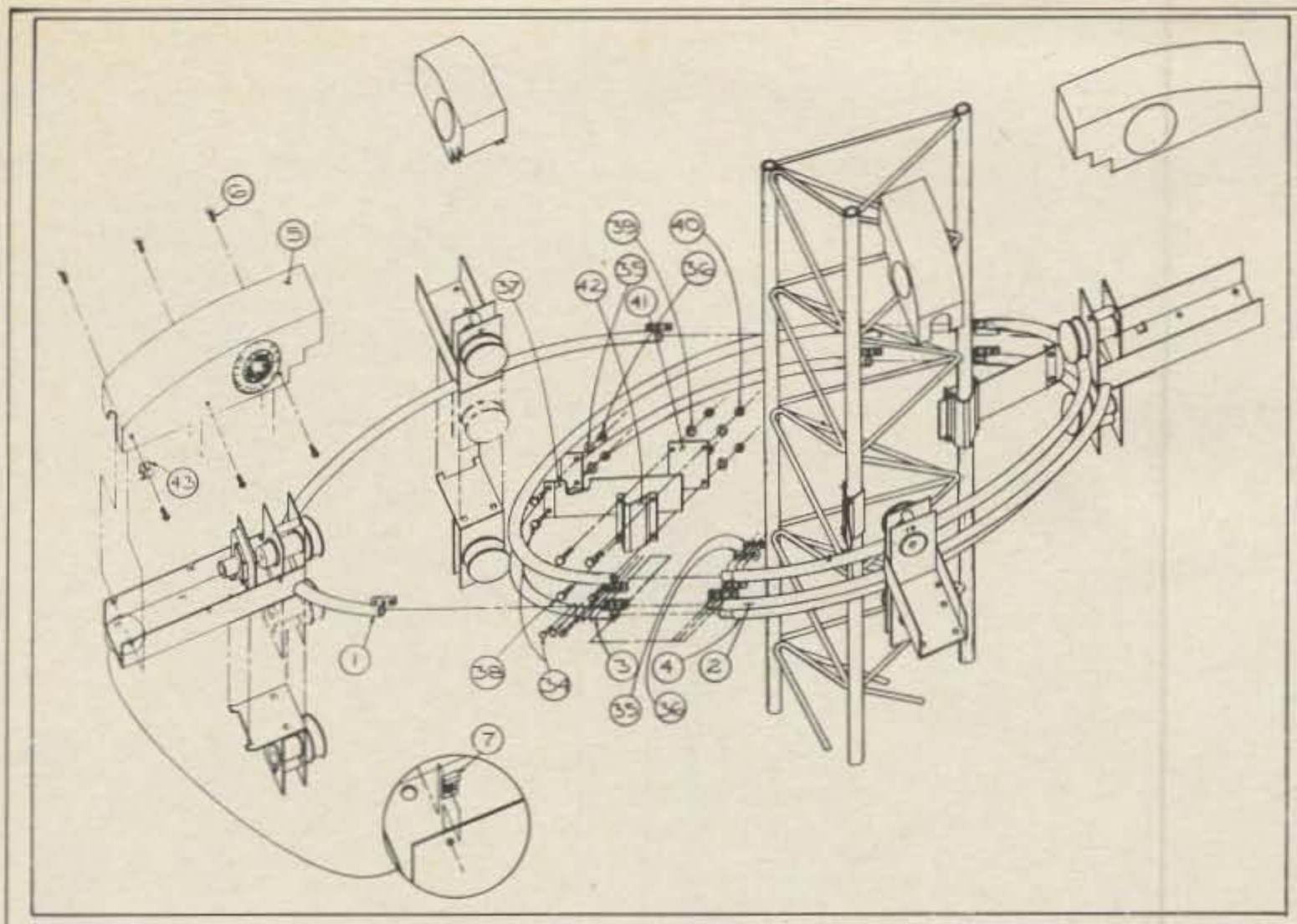


Fig. 1– This drawing is an exploded view of the M-1-A rotator.

never checked with the manufacturer, and the burrs and spring-loaded nuts would have been a real minus factor in the review. However, talking to the manufacturer about the problem and his correcting it gives a better product and does a real service for our readers. I didn't even have to mention these points in the review because the manufacturer corrected them. We thought you would like to know what happened plus the fact that the manufacturer, fellow amateurs in this case, is really willing to help.

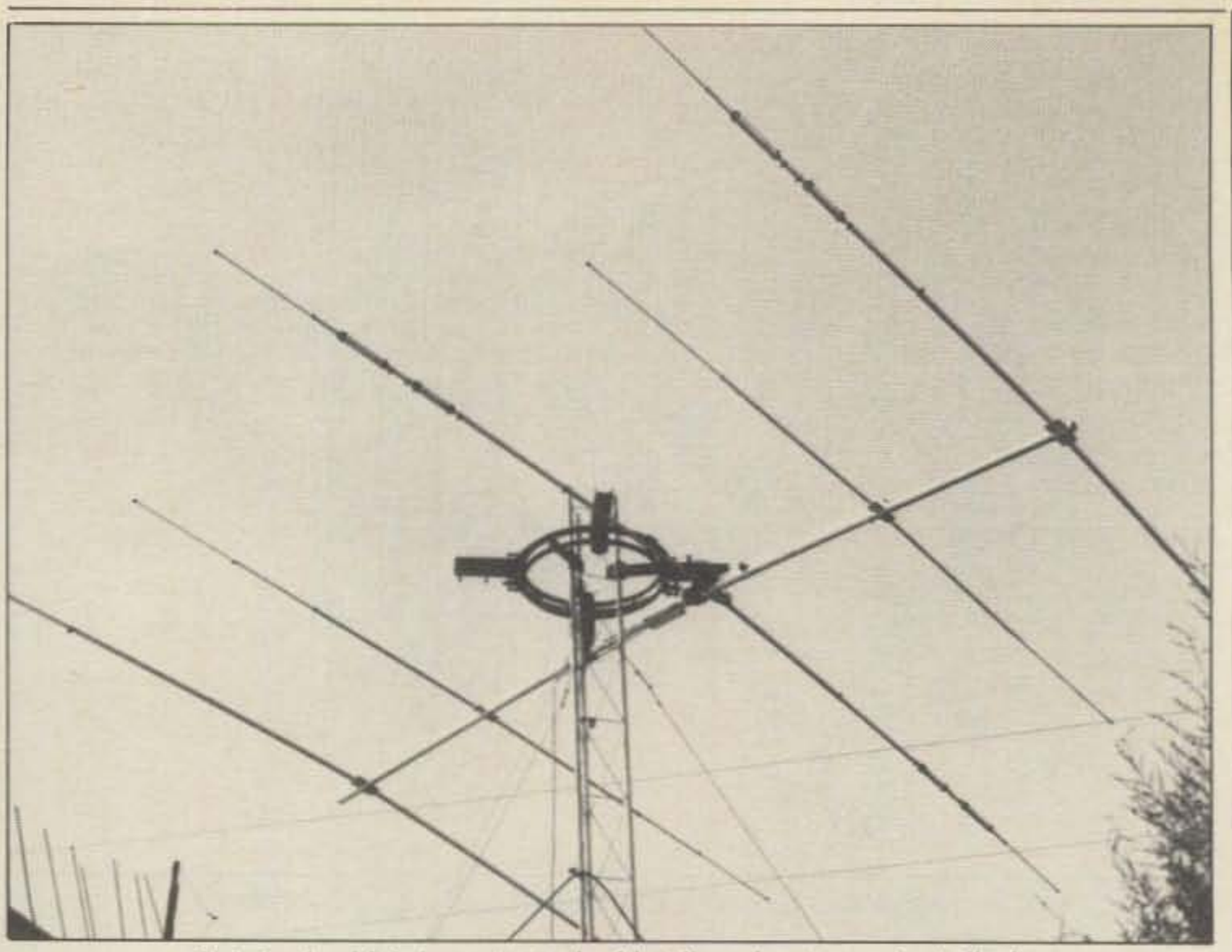
The rotator can be assembled on the ground and then hoisted into place. However, for us this presented a problem of getting around guy wires. In our case we elected to install the rotator in place. It took us the better part of one day to complete the installation.

Drive Details

As you can see from fig. 1, the two bottom rings and the rotator ring are split, so they can be mounted around any existing tower. The mounting rings and brackets will fit around any tower with a face side of up to 24 inches. One should be careful that the brackets and rings are mounted level to the earth. Four metal housings are mounted on the drive ring. Two of these housings contain the drive mechanisms. These consist of 12 v.d.c. geared motors which rotate drive wheels that ride on one of the lower rings. Motor control is provided by a remote sensing unit (in your station) which provides a large backlit display that indicates the array heading. These two drive motors will easily rotate 150 pounds of load with a wind area of 15 square feet.

With the brackets supplied, an operator can mount antennas with booms of up to 3 inches in diameter and 57 feet in length! Since the antennas do not need to be modified in any way, the antenna manufacturer's methods of boom tensioning may be employed for antennas with boom lengths greater than 24 feet.

Keep in mind that this system uses friction drive in that the upper ring (supporting the load) rides on four wheels on the lower ring. As stated earlier, two of the



This is the M-1-A we tested with triband antenna installed.

housings contain d.c. drive motors. These drives have a 500:1 gear ratio with an additional 16.33:1 roller wheel-to-ring ratio. This yields an over 8000:1 mechanical advantage to the d.c. motors. With the two drive units in the system, more than adequate driving and braking functions are accomplished. If more power is required, one or two additional drive units can be added. As you can see, the system is very versatile. Cable requirements are also simple. Five-conductor cable is adequate—three wires for the direction reading or sensing, and two for the d.c. motors which draw about 2 amperes maximum.

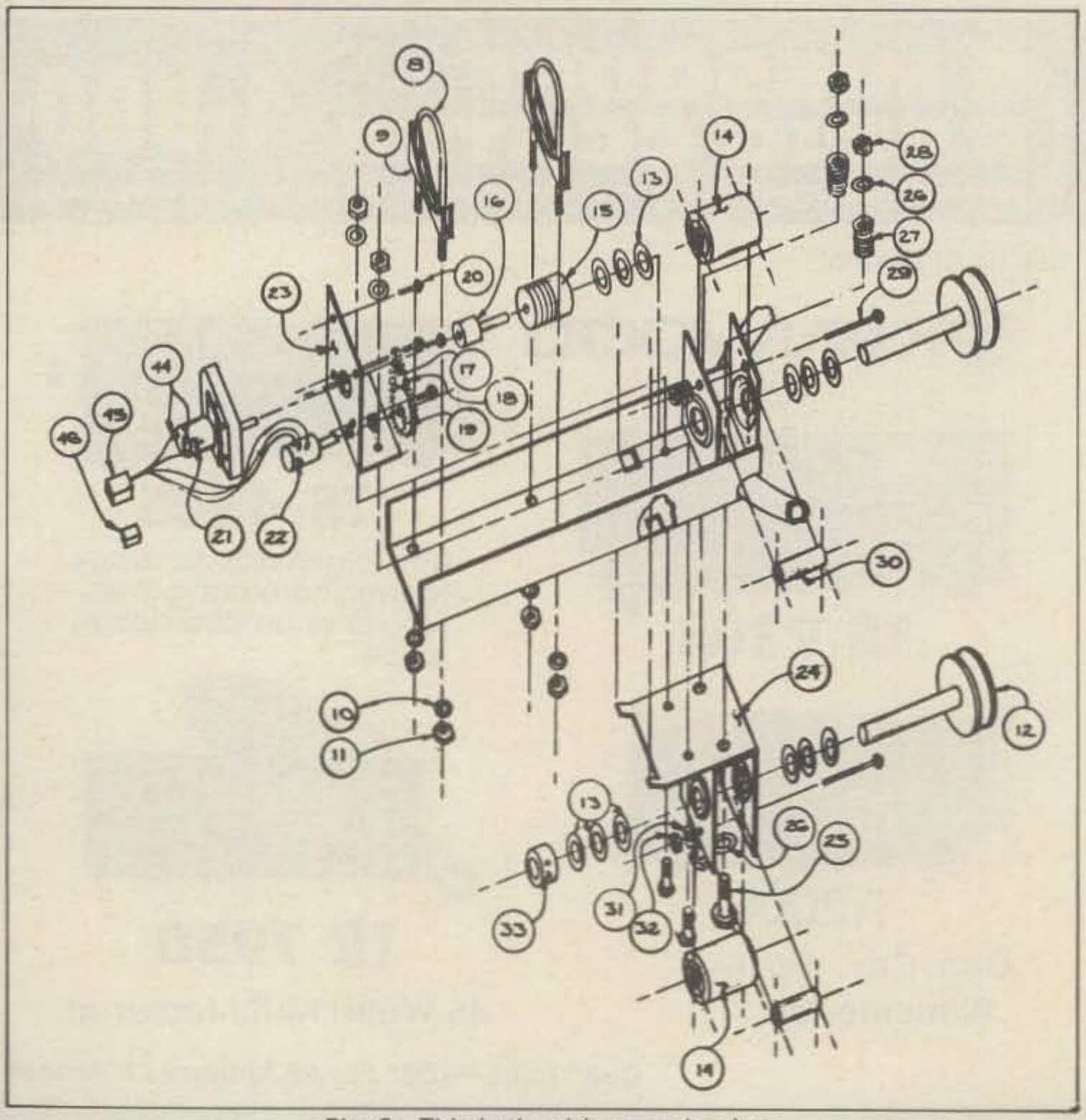
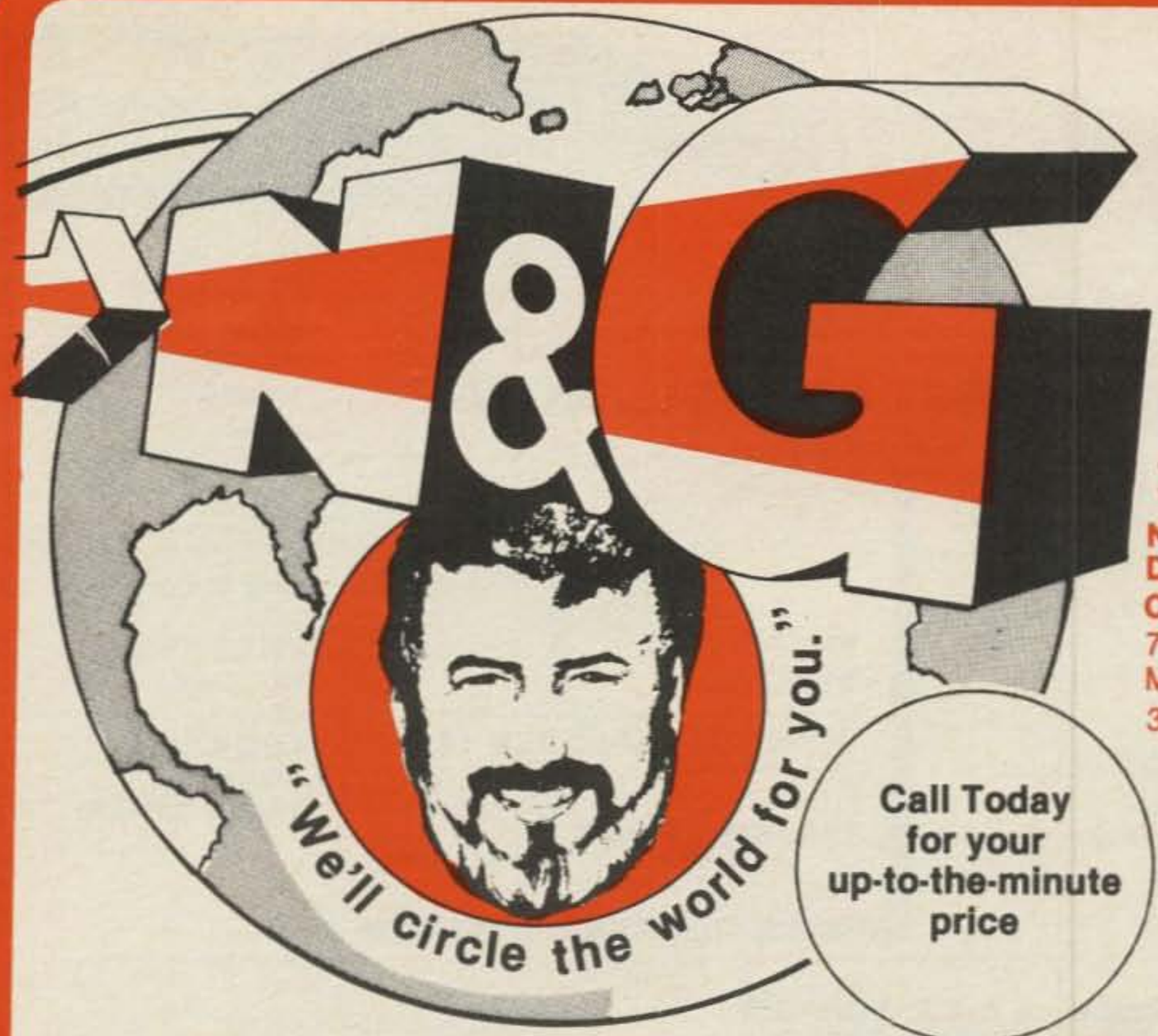


Fig. 2– This is the drive mechanism.



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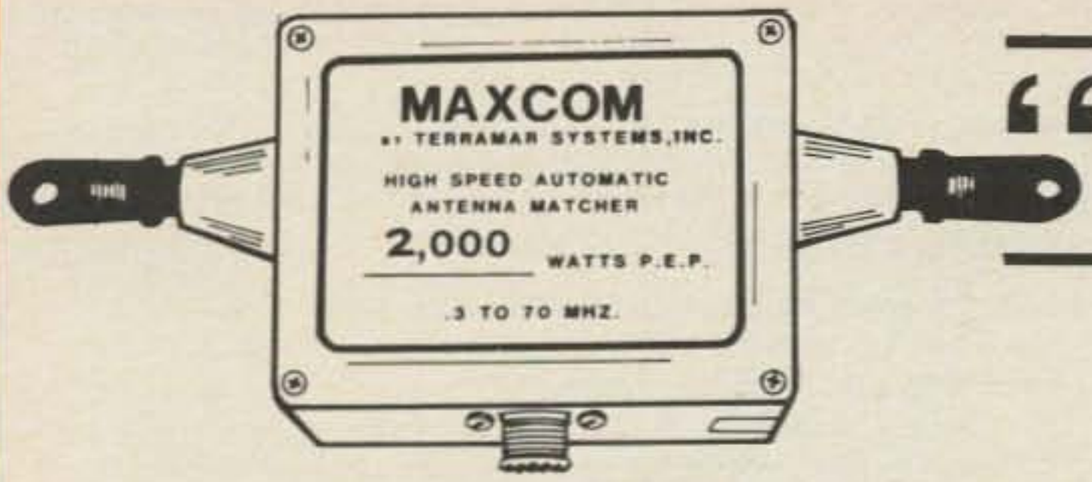

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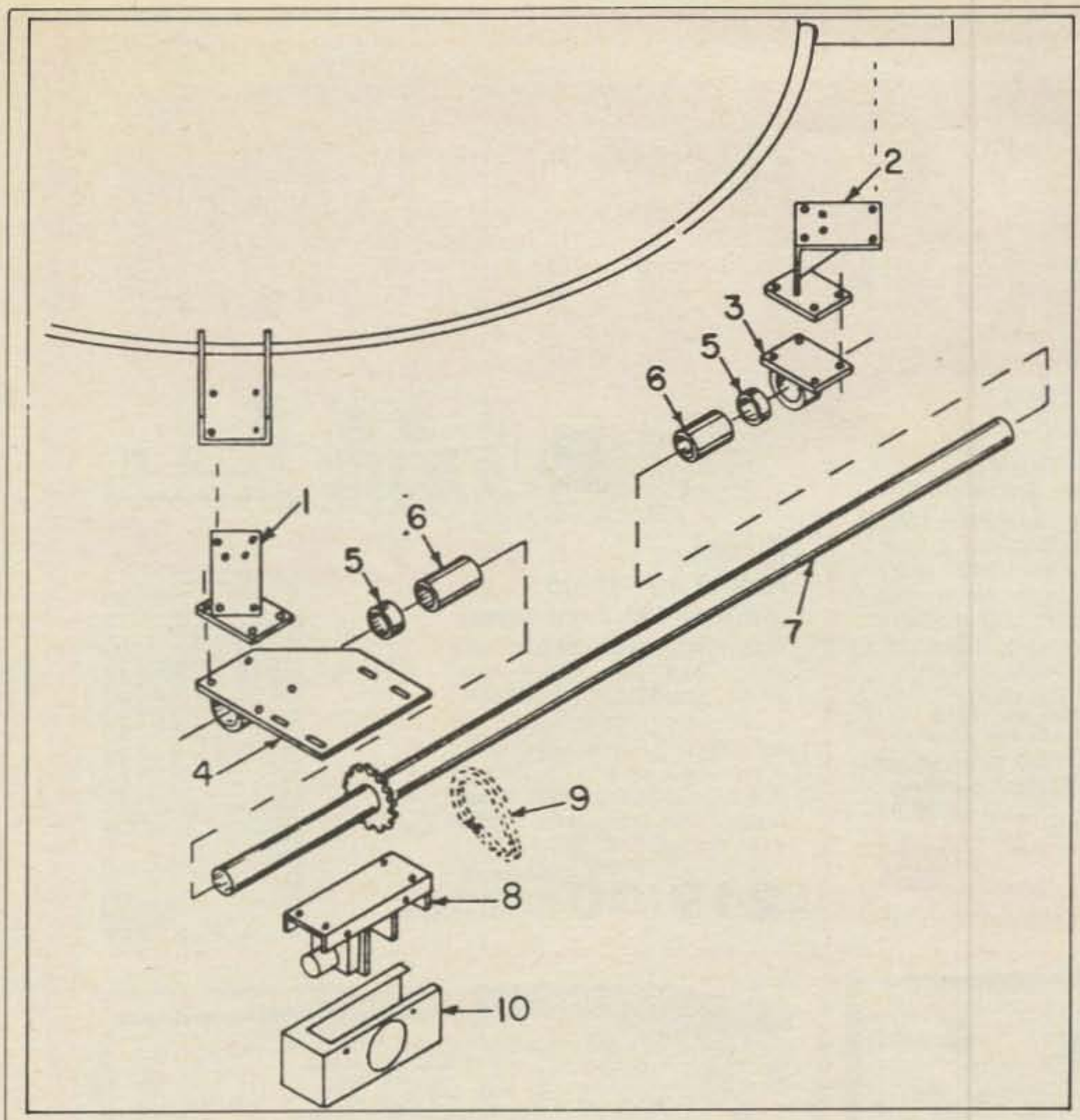
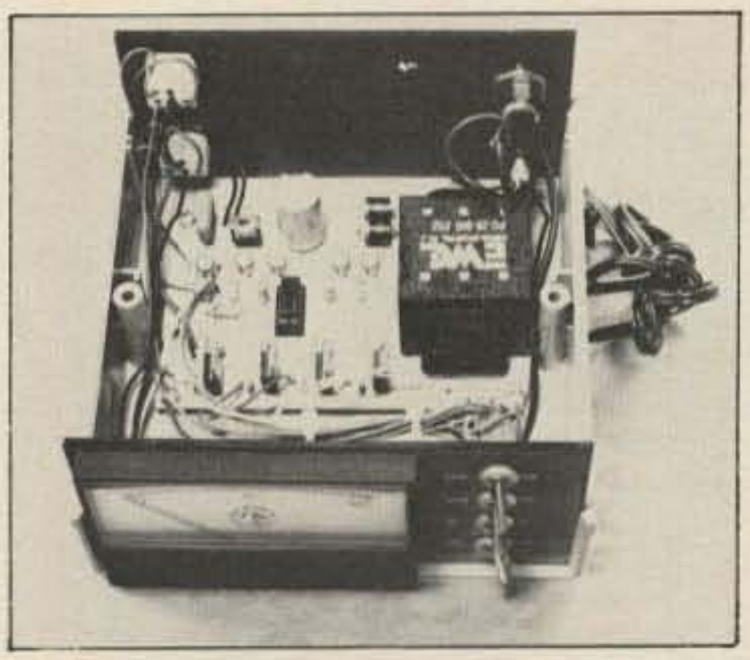


Fig. 3– Here is an exploded view of the ER-1, the vertical rotator.



Interior view of the control unit.

Rotator Control

The rotator control is housed in a gray plastic cabinet 6″ W x 6″ D x 3″ H. A large indicator (meter) is used to indicate the beam position. The system rotates at ½ r.p.m., which, while some amateurs may consider slow, we found to be adequate. As stated above, two wires are used for d.c. power to the motor in the rotator housing. Also in the housing is a potentiometer. Three leads are run from this control down to the indicator system. As the rotator turns, so does this control. Sensing voltages from the control are fed down to the indicator. These voltages are applied to an LM3302 quad comparator which in turn outputs to the meter, providing the direction to which the rotator is pointing. In addition, front-panel switching and meter indications are provided for the ER-1, the vertical rotator, if one is used.

The ER-1

The ER-1 elevation rotator is an ideal companion for the M-1-A. Many amateurs are interested in satellite work, and when used with an azimuthal mount, one has a completely directional antenna system. As the manufacturer points out, there are many other uses for the rotator, such as security cameras, high-intensity remote-controlled lighting systems, and so on.

Essentially, the ER-1 is a rotating section of your antenna boom. Your antenna boom can be passed through, or attached to, the ER-1. Fig. 3 is an exploded drawing of the ER-1. The drive system is almost identical to that of the M-1-A. A 12 v.d.c. motor, geared down and chain driven, is used to rotate the mast section. The static load the rotator will handle is 100 pounds, distributed. The rotator works through 180 degrees at approximately ½ r.p.m. Antenna mast acceptance (maximum size of your antenna mast) is 2 inches. As with the M-1-A, five-conductor rotator cable is used for driving the rotator and sensing directions. The ER-1 weighs 22½ pounds.

Conclusions

As I stated at the beginning, I strongly recommend this product. The design is excellent and it is very well made. If I have any criticism it would be a slight concern about the instruction manual. The manual is very detailed in most ways, and as one can see from figs. 1 and 3, there is plenty of information in the drawings. However, I feel a little more "hand-holding" telling the purchaser how best to actually install the M-1-A on a tower would be of help. We hauled the rings up and assembled them in place, but there may be better methods. However, a new manual currently supplied anticipated my concerns, and it answers all of the "hand-holding" requirements.

I think there are many problems an amateur can encounter when thinking in terms of multi-array systems in which only one support or tower is involved. The Polar M-1-A and ER-1 can be a real life-saver for the amateur who wants lots of directional antennas and has only one tower.

The M-1-A costs $489.95 and the ER-1 costs $219.00. Additional information can be obtained from Polar Research, Inc., P.O. Box 781, Thief River Falls, MN 56701, telephone 218-681-7413. CQ

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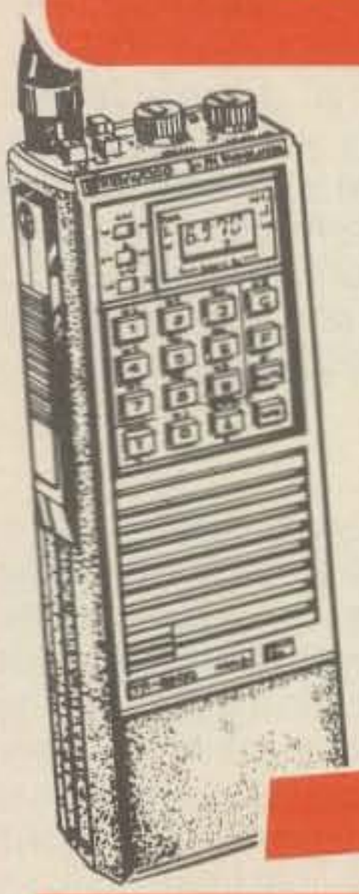

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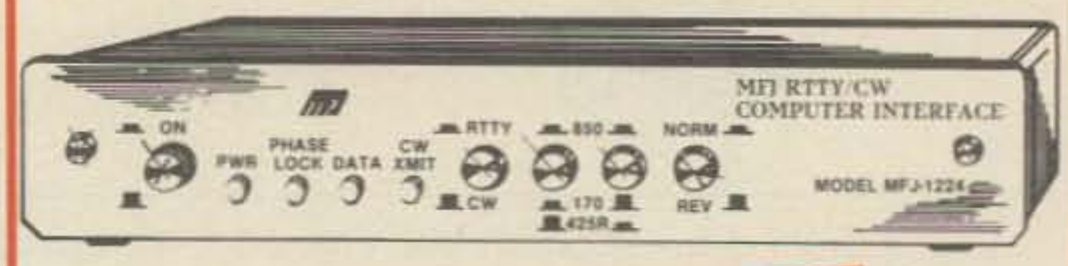

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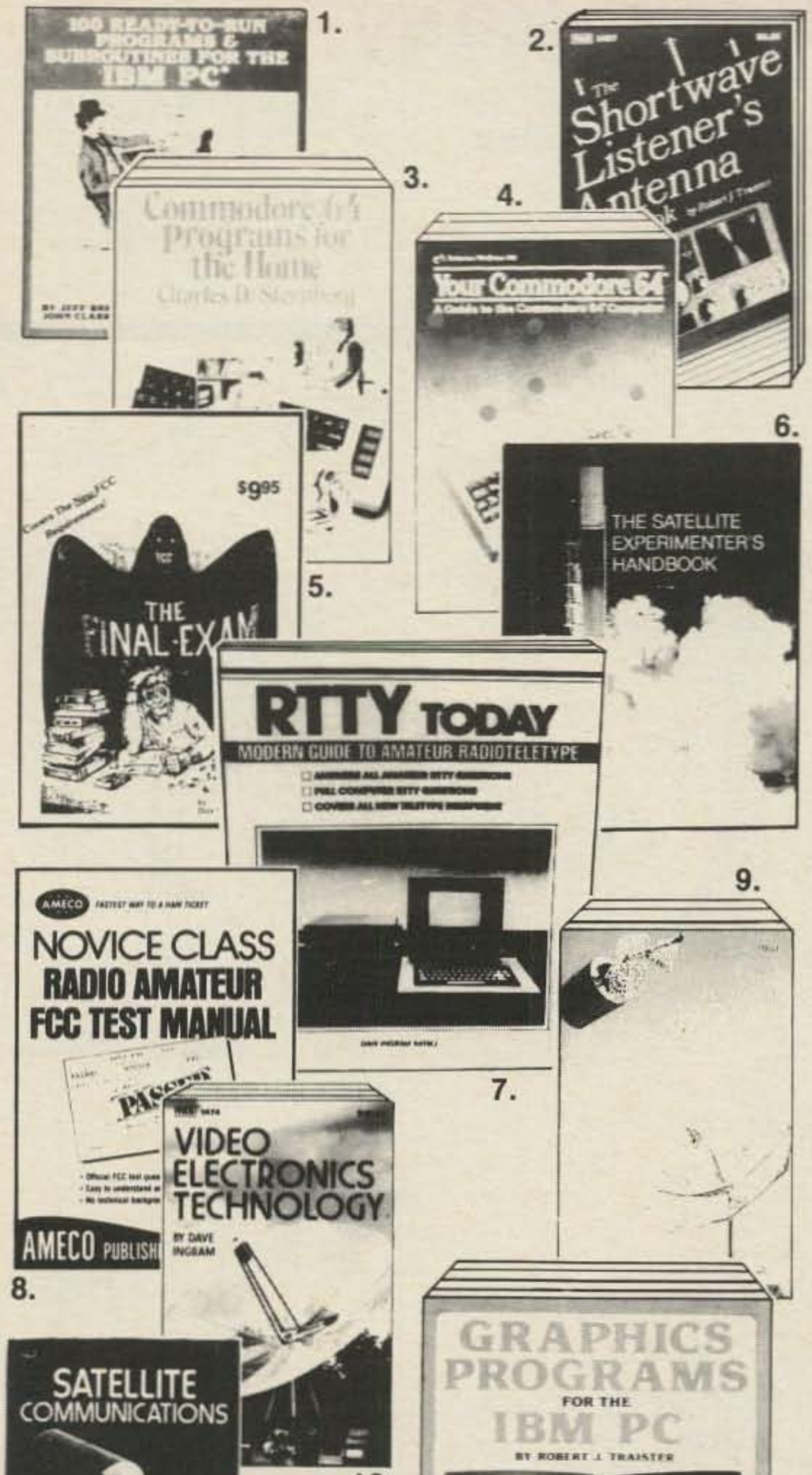

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How To Get A Wire Antenna Up 70 Feet, Easy

BY BRIAN LONGWELL*, WB2DSH

I like construction articles. I always read them, but like most people I usually don't build them. When I do follow through and try to reproduce an author's results, I generally run into a "surprise" or two along the way.

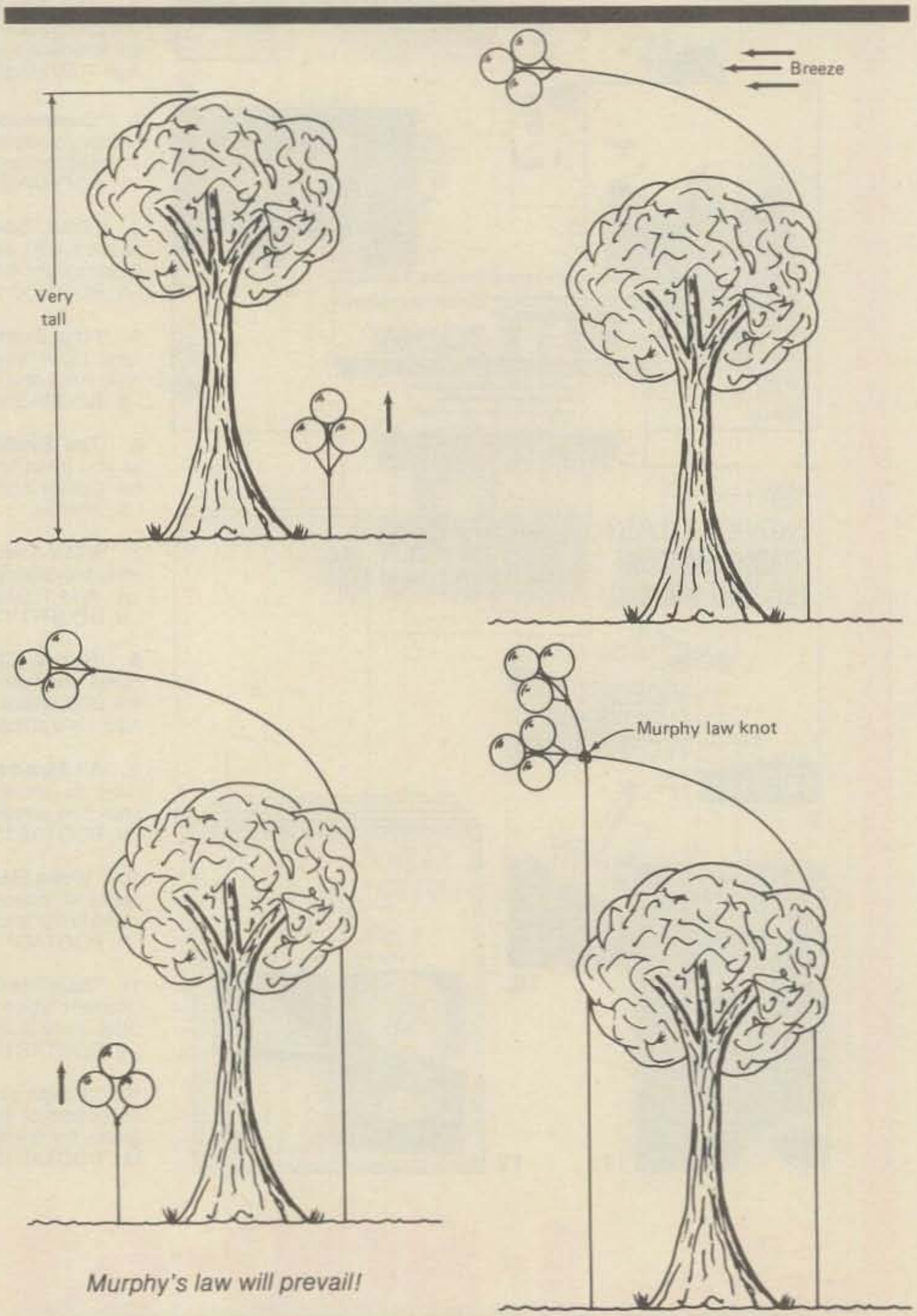
The most common surprises I come across always remind me of a routine that comedian Steve Martin does. He starts out by repeating several times that he has the secret to "how to make a million dollars and not even pay taxes." He then says, as if an insignificant detail, "First get a million dollars," followed by "and then don't pay taxes." This closely parallels the "how to get a 2 kw linear amplifier cheap" type article that tells you, "First find someone selling a 2 kw linear amplifier, and buy it from them cheap."

Well, this article is no exception. First off, the title "How To Get A Wire Antenna Up 70 Feet, Easy" is nice and deceptive. (You've read this far, haven't you?) Second, there is the "First get a million dollars" part, which is, first get a lot with two trees 70 feet tall and far apart enough to fit your antenna.

Okay, so I lied a little like everyone else. You still can use the idea described here to make antenna installations involving trees a lot easier. If you have a tree that you would like to use as an antenna support, but find it too difficult or dangerous to climb and too tall to throw a line over, then read on. If not, read on anyway. You might as well since you've wasted this much time already.

It all started after I bought a house in New Hampshire. My new lot has several pine trees over 70 feet in height, which I shortly realized was a mixed blessing. Having those trees there made me feel that I had to use them. I soon found that it was easier to just wish I had them.

I started out with conventional wea-



Murphy's law will prevail!

* 4 Hunt Road, Kingston, NH 03848

pons. The "string tied to a rock" trick proved to be feeble. Climbing was quickly ruled out, for pine trees tend to have many dead lower limbs, and 70 feet gets to be pretty high when you're clinging to a tree. I needed something different.

After some meditation I thought kites might do it, but control seemed as if it would be a problem. More thought. What about balloons? I decided to give it a try. With this in mind I waited for a calm day. When the first one came, I went to a department store and bought approximately 300 feet of strong, yet lightweight fishing line on two rolls. I then got six helium balloons from a place that sells them for parties and returned home.

I tied three of the balloons to the end of a roll of fishing line. Then standing on the side of the chosen tree from which any breeze would come, I began to let the balloons rise by releasing some fishing line. After the balloons reached the top, I waited for a breeze to pull them over. When it did come, I let off about another 40 feet and tied down the line.

At this point I took the other balloons and tied them to the second roll of fishing line. I released these balloons on the opposite side of the tree from the first set. My objective this time was to get the two groups of balloons to become sufficiently tangled so that I would effectively have a loop formed over the tree.

Now you might ask, "How dare he rely on such an unpredictable situation?" Contrare. Very predictable. Recall from childhood Murphy's law concerning kites: "Any two kites flying anywhere in sight of each other will become hopelessly entangled without exception." I figured a law so powerfull must spill over to include balloons.

Sure enough, with a little maneuvering all six balloons became adequately tangled. (I would, however, recommend tying knots in the line near the balloon to assist in the tangling.) I then began pulling the balloons down using the second fishing line until I retrieved them. The rest was quite simple. I tied a heavier rope to the fishing line and pulled that through to replace it. Now I had a way to take advantage of my tall trees.

I would suggest using a long-lasting cable or rope to finally loop through the trees. This may require the use of an intermediate rope after the fishing line, for the fishing line likely will break if it is used to pull a heavy cable. Also, placing a pully at the end of this rope/cable would be a good idea. That way the raising and lowering of the antenna would involve a pully and not the cable passing through the tree limbs. This becomes important when you realize that after about a year the tree has done some growing around the cable and it won't budge.

Results

I hate antenna articles that give signal reports at the end. They always give some baloney about getting signal reports of 10,000 dB over S-9 from an outer Mongolian mobile or from a submarine at the bottom of the Indian Ocean while on 75 meters with ½ milliwatt output during the daytime, during a contest, and during a thunderstorm. Well, you won't find that here. Anyway, I haven't finished putting up the other leg of the antenna.

Seriously, try it. It's easier than it sounds, and more than that, I was able to do it. So what if the neighbors think you're crazy! CQ

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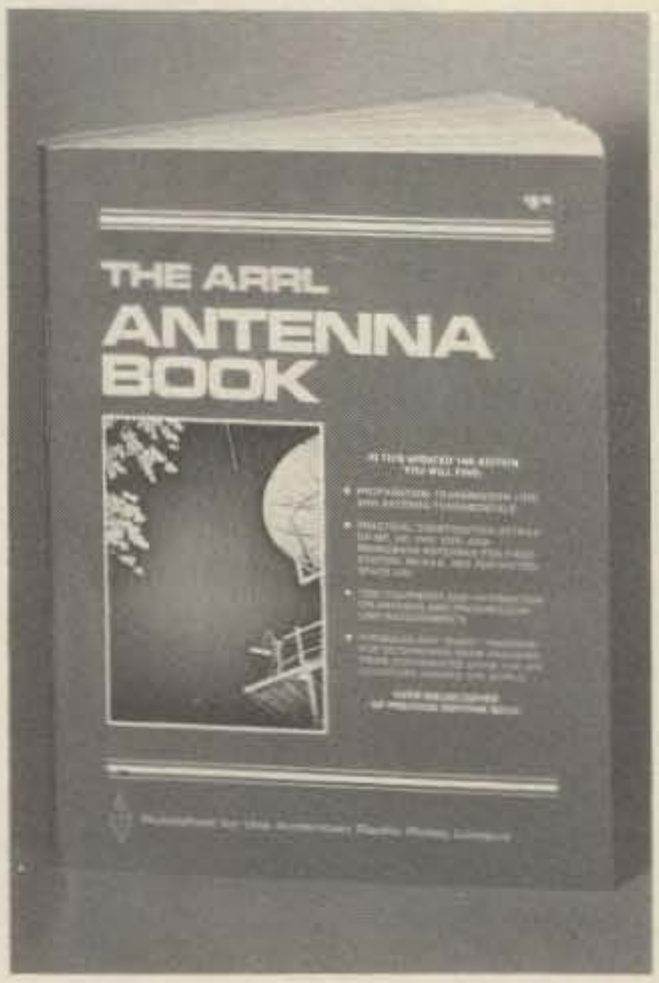

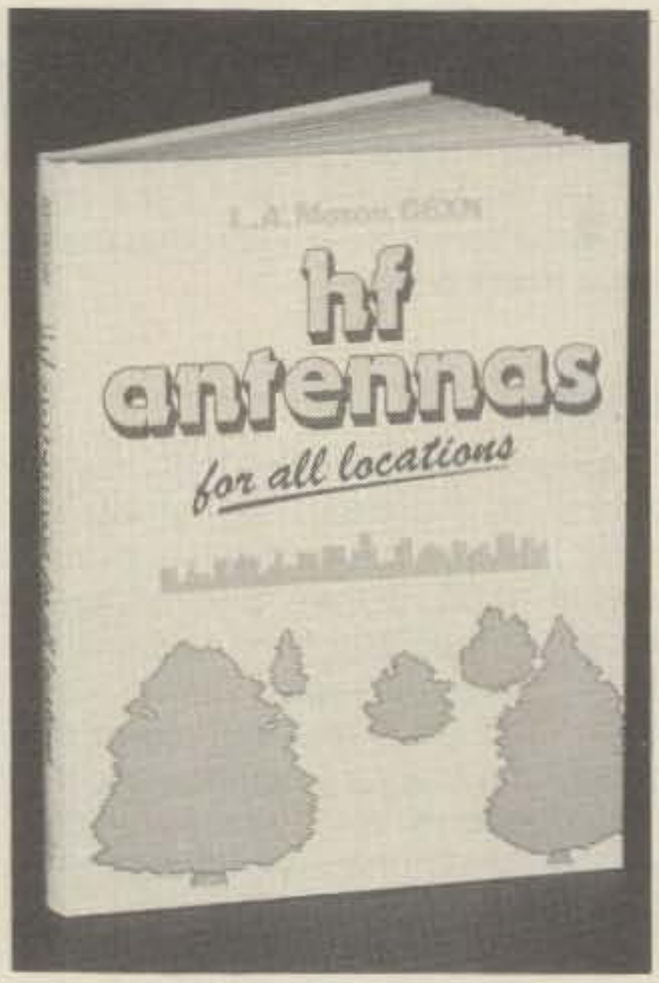

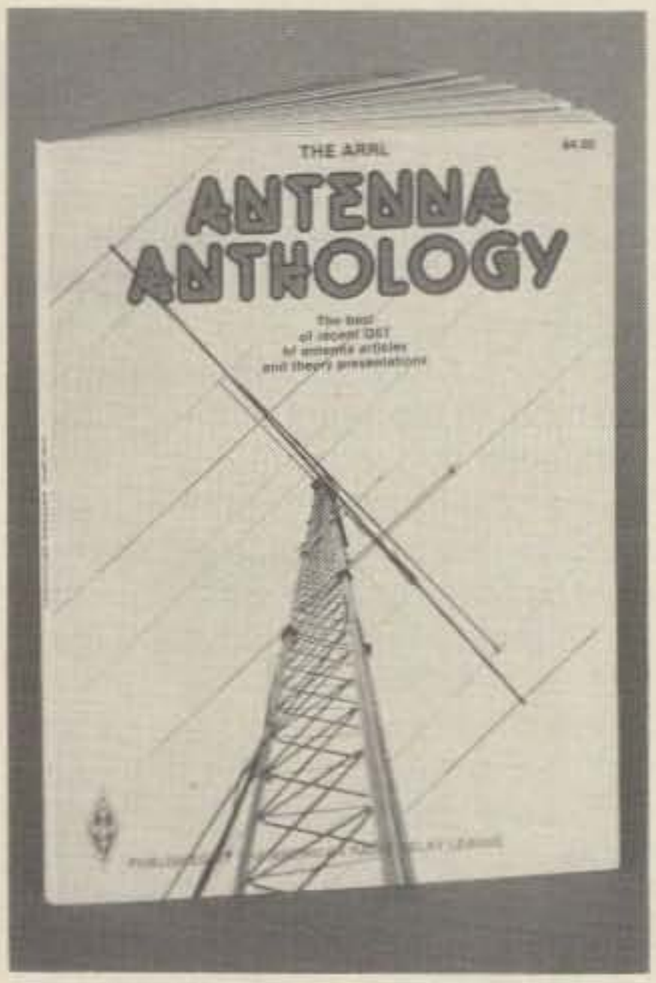

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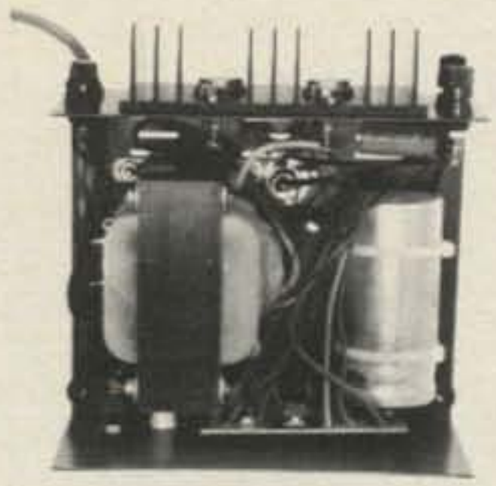

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RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
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*ICS—Intermittent Communication Service (50% Duty Cycle 5 min. on 5 min. off)

CIRCLE 8 ON READER SERVICE CARD

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Cable Television Interference—Conclusion

This is the concluding segment of a two-part article about cable television interference (CATVI). If you have not read last month's segment, you are urged to do so before you read this month's concluding part. The first part covers introduction, what it is, CATV channels, the ARRL booklet, and magazines.

Other Sources of CATV Information

The following list may be of interest:

Cable Television Information Center
1800 North Kent Street, Suite 1007
Arlington, VA 22209
703-528-6836

Community Antenna Television Association
3977 Chain Bridge Road
Fairfax, VA 22030
703-691-8875

Department of Agriculture
Rural Electrification Administration
14th and Independence Avenues, S.W.
Washington, D.C. 20250
202-447-5606

Department of Commerce
National Telecommunications and Information Administration
14th and Constitution Avenues, N.W.
Washington, D.C. 20230
202-377-1840

National Cable Television Association
1724 Massachusetts Avenue, N.W.
Washington, D.C. 20036
202-775-3550

National Federation of Local Cable Programmers
906 Pennsylvania Avenue, S.E.
Washington, D.C. 20003
202-544-7272

National League of Cities
1301 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
202-626-3115

Small Business Administration
1441 L Street, N.W.
Washington, D.C. 20416
202-653-6822

Telecommunications Research and Action Center (TRAC)
1530 P Street, N.W., Box 12038
Washington, D.C. 20006
202-462-2520

U.S. House of Representatives
Subcommittee of Telecommunications, Consumer Protection, and Finance
B-333 Rayburn House Office Building
Washington, D.C. 20515
202-225-9304

2814 Empire Ave., Burbank, CA 91504

Edward A. Manning, KA8QZT, of Beckley, West Virginia, is a 65-year-old retired home builder who obtained his Novice license in November 1982 and has upgraded to Technician. His station includes a Ten-Tec Omni-D transceiver, 40 meter dipole, 80 meter dipole, and a Butternut vertical antenna. He enjoys rag-chewing (chatting) on the 40 and 80 meter bands, and he maintains a regular schedule on the air with his son (Wayne, WØFI) in Missouri.

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CATV Op's Negative Comments

An official of Storer Broadcasting Company wrote comments which I believe are technically poor and reflect a lack of cooperation. A few items are summarized herein, and they are accompanied by ARRL (and my own) related comments.

The CATVI problem with amateurs was stated to be less serious and widespread than the ARRL alleges. However, the ARRL and FCC have documented CATVI cases in more than half of the states, and CATVI problems are occurring at an increasing rate. At the time a fairly recent CATVI article was written, there were 100 unresolved CATVI complaints throughout the country, with 15 of them current in California.

The Storer letter suggests that amateurs should change frequency to alleviate a CATVI problem. Doing this would amount to de facto frequency reallocation. It would reduce amateur communication capabilities and opportunities. Amateur radio's ability to conduct effective public service and emergency communications would also be impaired by such a reduction in frequencies.

Another Storer suggestion is that amateurs should position their directive antennas away from a CATV source. Most of the CATVI complaints involve v.h.f. operation. An overwhelming majority of amateurs use omnidirectional (non-directional) antennas on the two amateur bands (144–148 and 220–225 MHz) that are most commonly involved in CATVI. Consequently, very few amateurs could comply with this Storer suggestion, even if they decided to do so. The very few amateurs who use directional v.h.f. antennas (Yagi-Uda, quad, etc.) would be forfeiting opportunities to contact amateurs in certain directions if they followed this suggestion.

Fortunately, this Storer letter does not seem to be typical of the positions expressed by most CATV organizations. However, I fear that their apparent lack of understanding may exist in some parts of the fledgling CATV industry.

CATV Positive Position

Most of the material and letters I received from cognizant CATV organizations expressed a desire to cooperate with the amateur radio fraternity in the prevention and elimination of CATVI. Good CATV system operators want to know about interference problems that last more than a few hours. A few CATV industry people expressed the opinion that FCC rules and punitive actions are too lenient. One writer agreed with my position that a CATV system operator who fails to eliminate an interference condition within a reasonable period of time (three months?) should permanently lose the right to use the CATV channel on which the unresolved CATVI occurred.

FCC

Part 76 of the FCC Rules and Regulations governs the CATV service. Item 76.613(b) states that no amount of CATVI is acceptable, and it requires CATV system operators to take prompt appropriate measures to eliminate interference conditions. This stipulation of no allowable harmful interference is more stringent than the previously stated 20 microvolts per meter at 10 feet allowance. Reading CATV industry literature gave me the distinct impression that CATV organizations recognize the 20 microvolt figure, whereas they seem to ignore the fact that no harmful interference is allowable.

FCC docket 21006 proposes changing the present 20 microvolt allowance to 100 microvolts. On the other end of the scale, RM-4040 contains the ARRL's proposal to ban CATV system operation on any amateur radio frequencies.

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CIRCLE 113 ON READER SERVICE CARD

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The new SS-2 Heil sound system contains two five watt amplifiers, a 3.5" woofer with a half pound magnet, and a 1.5" tweeter with a 12 DB per octave passive crossover-network. The tweeter is crossed over at 1500 HZ., right where the response of the human ear starts to fall off and the huge woofer fills out the mid-range and low frequency response. No single, cheap speaker can begin to give you this type of response.

The second five watt amplifier can be used to drive a second speaker enclosure and will be used in a dual diversity system using the Heil parametric equalization system which will be introduced very soon.

When most receivers are running at a comfortable listening level, their little one half watt amplifiers are being pushed into extreme distortion levels. The extended response, the added efficiency and additional output power of the SS-2 will lower your noise floor, reduce noise and allow you to copy signals that were, heretofore, impossible to hear.

Mobile operation with the new Heil sound system is unbelievable. The 5 watts of output and the tweeter system really adds to the articulation factor making signals much easier to copy. The system makes handie talkie receivers come alive! An accessory mounting bracket will allow easy under the dash mounting for the SS-2.

The SS-2 measures 3¾" x 5 x 3¾". It weighs 2 lbs. and is housed in a high impact silver beige case. Power requirements are 12 - 13.8 volts D.C. at 400 MA. A red L.E.D. is mounted on the front panel for power up indication. All input/output connections to the amplifier is made through a 5 pin D.I.N. Accessories include a 110 volt power adapter, a mobile lighter plug adapter and a mobile mounting bracket.

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CIRCLE 69 ON READER SERVICE CARD

CIRCLE 21 ON READER SERVICE CARD

What To Do If CATVI Occurs

If you experience CATVI that continues for more than a few hours, or if you receive a report that your transmissions are causing interference to a CATV viewer, the first step you should take is to contact the Chief Engineer/Technician of the CATV system operator. If your initial contact is by telephone, follow it up with a letter that details the facts. Sample letters are shown in the ARRL's *CATVI Working Materials for the Radio Amateur.* A copy of this 91-page book can be requested from the American Radio Relay League, CATVI Desk, 225 Main Street, Newington, CT 06111. Send the original of your letter to your local CATV operator with a copy to the ARRL, and keep a copy yourself. All contacts with your local CATV operator (and others) should be friendly to promote cooperation. A visit to your local amateur radio club(s) could increase your knowledge of the local CATV situation.

If the problem is not resolved within one month, and if you are not confident that it will be corrected within a few more weeks, the next step should be to contact the joint NCTA/ARRL CATVI committee through Rick Palm, K1CE, of the ARRL. This committee's function is to track progress towards resolving CATVI problems that are reported on a special form that has been prepared by the ARRL. This form is a questionnaire that is intended to show whether or not all of the most effective steps have been taken to eliminate a CATVI problem.

Robert Dickinson, W2CCE, is a member of the NCTA engineering committee. He is chairman of a joint NCTA/ARRL committee that is asked to define CATV leakage standards.

Many of the smaller CATV operators are represented by the Community Antenna Television Association. CATA has the expertise and equipment needed to isolate and eliminate CATVI problems. CATA assistance is available to their member organizations.

If a letter to the NCTA/ARRL CATVI committee fails to resolve your CATVI difficulty within another month, the third step should be to send a follow-up letter to the local CATV outfit, advising them that you will send a formal complaint to the FCC if the CATVI problem continues to exist two weeks after your follow-up letter is sent. If the CATVI persists 15 days after you sent the follow-up letter to your local CATV operator, the fourth step is to notify the FCC, Enforcement Division, Complaints Branch, Mass Media Bureau, Washington, D.C. 20554. The telephone number at the Complaints and Information Branch of their Compliance Division is 202-632-9703. A letter, however, should be more productive than a telephone conversation. Your letter should be a brief but detailed summary of the CATVI problem, the steps already taken in attempts to have the interference eliminated, and any positive results to date. Include the name and address of the local CATV system operator, plus the community it serves. Send copies of your letter to your local CATV operator, the NCTA Liaison Office, and the ARRL. Keep a copy of each letter you write. Simply stated, keep the lines of communication open to everyone you contact regarding a CATVI problem. A note of thanks to everyone is a good way to conclude each successful elimination of a CATVI case.

Ralph Rippo, KA2QNH, of Kearny, New Jersey, is a 28-year-old security officer. He became interested in amateur radio during his shortwave listening activities. Ralph obtained his Novice license in the latter part of 1982, and he thanks Bill Wolf, KA2EEV, for helping him get started in amateur radio. Ralph's station includes a Swan 350-D transceiver and an 80–10 meter dipole.

When You Should Not Complain

Amateurs should be careful to avoid attributing an interference condition to a CATV system when it is caused by something else. I received two reports about defective fire alarm systems (in large condominiums) emitting signals that might be misidentified as being cable TV signals, and possibly be attributed to a local CATV outfit. High-gain amplifiers in these alarms can self-oscillate anywhere in the v.h.f. range, including oscillation in amateur bands. This self-oscillation does not appear to degrade intended fire alarm system operation, but it can cause interference to many radio services.

Those of us who have been active amateurs since television blossomed following WW II are familiar with television interference (TVI), plus interference to amateur communications by television and many other devices. We know the difference between CATVI and RFI (radio frequency interference). We accept responsibility for correcting RFI caused by amateur operation, and it is reasonable to expect local cable operators to accept responsibility for eliminating CATVI caused by CATV system leakage.

Temporary CATVI can be caused during system servicing or by accidents and storms. If a vehicle hits a utility pole and damages a CATV system cable, amateurs should allow a few hours for repairs to be made before complaining about CATVI.

The ARRL's position is that it is the cable operator's responsibility to eliminate the problem whenever the CATV system causes harmful interference. If cable leakage simply breaks squelch of a 2 meter receiver being operated in the scanning mode, no problem exists, unless an amateur proves that the signal leakage exceeds FCC specifications. However, if cable leakage interferes with amateur communications via a local repeater, harmful interference exists, and the cable operator should get rid of the interference regardless of the leakage level. Any CATVI disruption of amateur communications is intolerable.

Conclusion

CATVI problems are to be expected. They will occur more often as CATV service is expanded to cover more communities. Aging degrades CATV installations and increases the number of CATVI cases. It is preferable to resolve CATVI difficulties at the local level, rather than to involve regional or national organizations. It is good to keep the ARRL informed about CATVI cases, even when they are resolved at the local level.

CATVI must be eliminated at the source. Traps and filters are relatively ineffective in reducing CATVI. The CATV installation is at fault when CATVI exists, and the CATV system operator has the sole responsibility to eliminate such interference.

Amateurs cannot avoid CATVI caused by leaking CATV systems. CATV installation integrity must be established and maintained to avoid interference to amateur radio and other radio services.

I have read reports of CATV system operators being fined for excessive signal leakage and failure to correct interference problems. I doubt that occasional fines can significantly slow down the growing CATVI problem. NCTA has sponsored several sessions about signal leakage for the benefit of CATV system operators. Mr. William W. Riker (NCTA Director of Engineering) informed me that NCTA endorses FCC imposition of fines on operators who do not comply with the existing requirements. A CATV system operator who fails to eliminate a reported interference condition within three months should permanently lose the use of the channel on which the problem existed.

If the CATV industry wants to prove that it is being honest in regard to CATV/amateur interference matters, an excellent first step would be for the CATV industry to issue and widely distribute a letter that clearly states CATVI is always due to CATV installation faults, and that such interference is not the fault of amateur radio stations operated properly within FCC regulations. It should also advise CATV customers that CATV system operators are solely responsible for eliminating interference problems associated with CATV systems. Such a letter would be a great beginning to a real era of cooperation between the CATV industry and amateur radio.

CIRCLE 42 ON READER SERVICE CARD

dateline... Washington, D.C.

a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

RCA Begins Move To Limit Amateur Operations In 902–928 MHz Band

According to *The ARRL Letter*, RCA has informed the FCC that a potential interference problem has arisen "resulting from the new 902–928 MHz secondary status allocation to the Amateur Radio Service." Specifically, RCA claims that operations in the 902–928 MHz band would interfere with certain consumer products it produces, particularly its SelectaVision VideoDisc® Player System.

Said RCA: "It is RCA's goal, in advising the Commission of this potential interference problem, not to disserve in any way, the recognized valuable Amateur Radio Service contributions toward advancing the radio art; but, to seek recognition of the need for balancing a possible continuing experimental use of the 902–928 MHz band, against the beneficial influence of the video disc player in the lives of millions of U.S. consumers now, and for years to come."

Sources within the ARRL reject RCA's apparent move to limit amateur operations in the new band. A League spokesman noted that RCA was aware of potential interference problems with its video disc player early in the development cycle of the device and could have addressed the radio frequency problem at that time. Further, it should be recognized that allocation of the 902–928 MHz band to the Amateur service was repeatedly discussed in the mid-1970s, when preparations were underway for the 1979 World Administrative Radio Conference. For RCA to only now express concern—citing "the beneficial influence of the video disc player in the lives of millions of U.S. consumers"—is ludicrous.

The issue of potential interference to RCA's consumer products only points up the continuing need for the FCC to set susceptibility standards for electronic home entertainment equipment. Despite claims to the contrary, the electronics industry is clearly unable to address the problem in both a timely and effective manner.

The ARRL will register a strong complaint with the FCC regarding the above RCA letter.

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NCTA Asks FCC To Dismiss ARRL's Cable TV Petition

The National Cable TV Association, a Washington, DC based association of cable television (CATV) operators, has requested that the FCC dismiss RM-4040. This petition, if approved by the Commission, would require CATV operators to vacate channels E (144–150 MHz) and K (222–228 MHz), two portions of the spectrum where operators in the Amateur service have experienced interference from leaky CATV distribution systems. In requesting the dismissal, NCTA claimed that its members had successfully corrected most of the complaints cited by the ARRL in late 1982 and that no additional complaints have been referred to them for almost a year.

Reports reaching your Washington editor, however, suggest that the CATVI problem is far from being solved! In the past month alone, 17 cases of alleged CATVI have been reported by amateurs across the country; all have been forwarded to the Commission for action. Given the large number of such complaints, it seems likely that the League will continue to press for early action on its Motion for Expedited Action in the matter of RM-4040.

Amateurs experiencing interference with CATV systems are urged to file reports with the following groups: American Radio Relay League, Attn: CATVI Desk, 225 Main Street, Newington, CT 06111; and Federal Communications Commission, Attn: Field Operations Bureau, 1919 M St., NW, Washington, DC 20554.

Commisssion Expected to Issue Fee Reimbursement NPRM

As we go to press, a Notice of Proposed Rule Making (NPRM) is being prepared by the Private Radio Bureau (PRB) in the matter of the reimbursement of fees for the administration of amateur exams. The question to be addressed is, to whom should the fee (currently $4 per exam) be paid: (1) to the examination team, or (2) to the regional Volunteer Examination Coordinator (VEC)? The present rules require that an application form for an exam be filed with the team; this, in turn, suggests that the accompanying payment would also go to the team. However, in late 1983 the League filed a Request for Agency Action with the Commission that would require the fee to be paid directly to the VEC (presumably, a portion of the fee collected would be passed down to the examination team). Further, the League requested that such action be taken without a comment period for the public. To some in Washington, this would be a violation of the Administrative Procedures Act. As such, it is highly likely that by the time this is read, the NPRM will have been released by the Commission for public comment.

Amateur Loses Tech License for CB Infractions

On 10 January 1984, Paul O. Overlock, N6BHC, had his Technician Class license suspended, his station license revoked, and his application for upgrade to General Class rejected by Administrative Law Judge Joseph Stirmer. What makes this case unusual, according to Ray Kowalski, Chief, Special Services Division, PRB, is that the actions were taken as a result of violations Overlock commited as a CBer.

The case began in late 1979, when Overlock was served with an Order to Show Cause as to why his CB license should not be revoked. The action stemmed from his use of unauthorized frequencies, the use of non-type-accepted equipment, the use of "skip," and his failure to identify. As a result of this Order, Overlock's CB license was revoked in May 1980.

In August 1980, however, when Overlock applied for upgrade to General Class, the Commission sought the suspension and revocation of his amateur operator and station licenses, and requested a hearing on his application to upgrade. The PRB's claim was that Overlock's actions in the CB service reflected on his qualifications for licensing in the Amateur service.

Imposition of the sanctions proposed was delayed pending reviews of an FCC Review Board and the Commission itself. But in 1983, the PRB was finally able to convince the Commission that sanctions should be imposed with respect to privileges in one service based on violations committed in another service.

In imposing the sanctions, Judge Stir-

mer recommended that because of the delays to date, Overlock should be permitted to reapply for amateur privileges in 90 days. Normally, at least one year must pass before an applicant may reapply for amateur privileges.

Mass Media Bureau to Address Issue of Radio Rebroadcasts

According to James McKinney, Chief, Mass Media Bureau, FCC, the rebroadcast of amateur and CB communications has been selected for action in the fourth quarter of FY-84 (July-September 1984). The move to examine this issue resulted from the rebroadcast of amateur communications during the Grenadan operation and the recent STS-9 Shuttle flight, and the Commission's belief that guidelines should be established for such radio broadcast activities. The guidelines are required now that amateur and CB communications have been freed from the "privacy provisions" (Section 605) of the Communications Act of 1934.

In commenting on the issue of radio rebroadcast, McKinney noted that the prohibition on the business use of amateur radio would *not* be affected by Commission action in this matter. Therefore, amateur radio still could not be used by the press, for example, to conduct interviews.

McKinney Comments on No-Code Decision

Readers will recall that the "no-code" docket (PR Docket 83-28) was introduced for action at the time when James McKinney was chief of the Private Radio Bureau. As a matter of interest, then, *CQ* asked McKinney what he thought of the Commission's decision to reject the proposal.

"If I had been chief of the PRB," said McKinney, "the decision might have been different. I favored the creation of a no-code license, especially one that carried privileges at the higher frequencies. I am pleased, however, that the Commission addressed the issue and made a final decision in the matter."

In concluding his comments, McKinney noted that he was convinced the subject would not be revisited at an early date.

Toyota Issues Bulletin on R.F.I.

Following complaints on the "runability" of its 1982 automobiles (Dateline . . . Washington, D.C., November 1983), Toyota has issued the following bulletin (FI-5) regarding inspection precautions for the EFI System:

"When car is equipped with a mobile radio system (Ham, CB, etc.)

"The ECU has been designed so that it will not be affected by outside interference. However, if your vehicle is equipped with an amateur radio transceiver, etc., you must observe the following precautions.

"(a) Install the antenna as far as possible from the ECU. The ECU is located behind the glove box so the antenna should be installed at the rear, left side of the vehicle.

"If installing (the antenna) on the bumper, do so on the left side, if possible.

"(b) Keep the antenna feeder as far away as possible from the ECU wires—at least 20 cm (7.9 in.)—and, especially, do not wind them together.

"(c) Insure that the feeder and antenna are properly adjusted.

"(d) Do not equip your vehicle with a powerful mobile radio system."

Questions regarding the ECU and mobile communication systems should be addressed to Toyota's regional and distributor offices.

High-School Students To Have Amateur Radio Experiment on Future Shuttle Flight

As noted in *Amateur Satellite Report* (AMSAT's newsletter for the Amateur Space Program), a group of high-school students in Alabama will have a "Get Away Special" aboard a future Shuttle flight. One of the experiments will include an amateur radio transmitter, marking the first time that a so-called "GAS" will be permitted to radiate r.f. energy. The experiment, according to AMSAT, will also break "other new ground that will make easier AMSAT's future prospects for PACSAT and other future missions on the Shuttle." Amateurs who work at NASA's Marshall Space Flight Center in Huntsville, AL, are helping the students with their experiments.

Antique Radio Club of America To Sponsor Radiofest

Radiofest '84, sponsored by The Antique Radio Club of America, will be held June 21–23 at the Holiday Inn in Elgin, IL. Included in the activities will be the annual conference, trade sessions, and an auction of old and new radio equipment. Tours of Ralph Muchow's Radio Museum will also be conducted on the first two days of the meeting. The museum contains about 2500 receivers, which, according to *IEEE Spectrum*, includes the complete setup of Admiral Byrd's antartic radio station.

The banquet address will be given by Chuck Schaden, host of the television show "Those Were The Days." Schaden owns over 2500 recordings of old radio shows. For more information, contact Mr. Joe Willis, P.O. Box 14732, Chicago, IL 60614, phone (312) 871-3928.

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

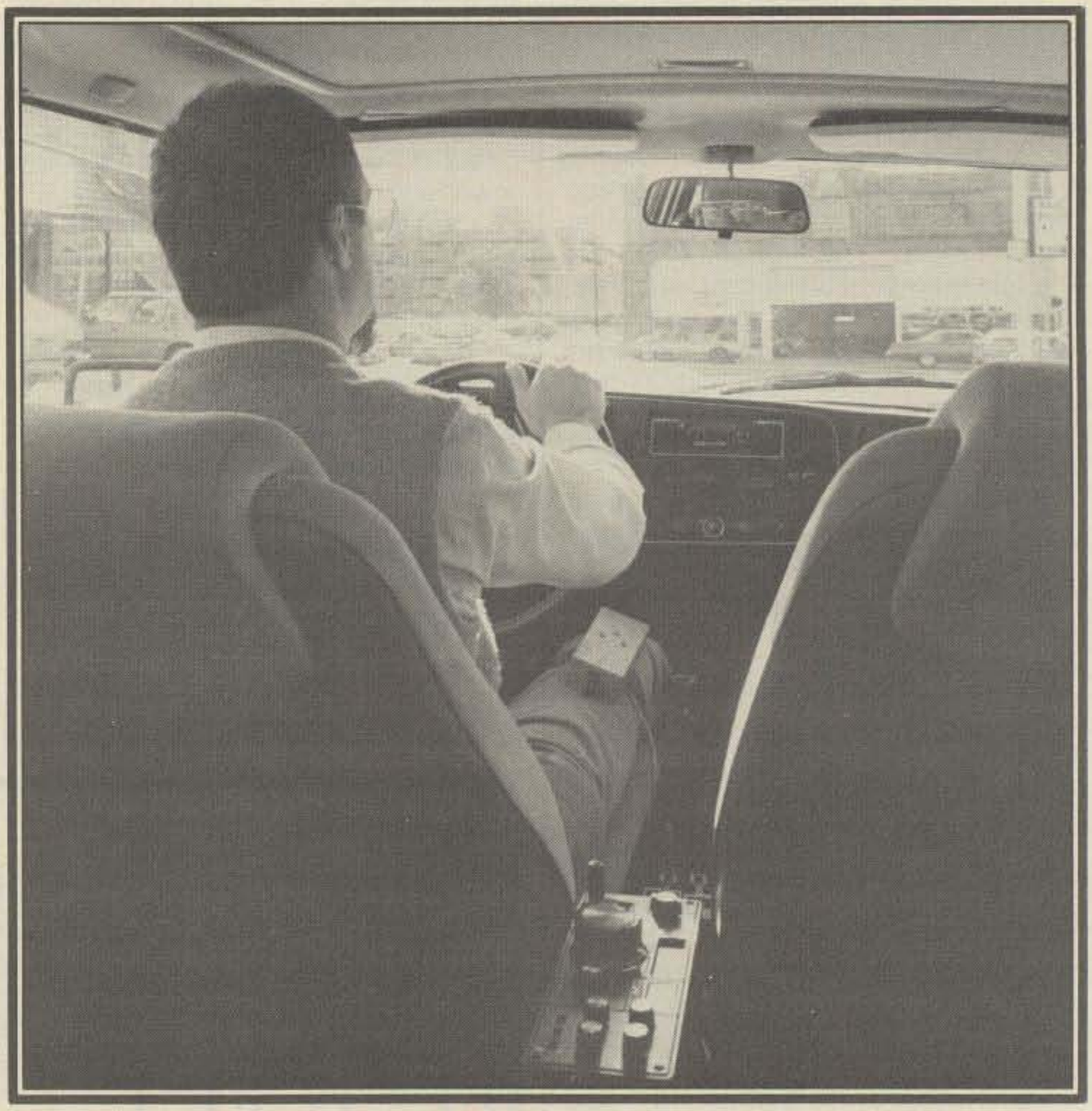
A LOOK AT THE WORLD AROUND US

Mobile C.W.: A Refreshing Alternative

Although being challenged by the widespread popularity of v.h.f. f.m. activities for several years, there are now definite signs of renewed amateur interest in h.f. mobiling. This welcomed situation is unquestionably due to the availability of smaller-size solid state h.f. transceivers with their instant-on, no-tuneup capabilities and their direct compatibility with 13 volt d.c. auto power systems. Great! Considering the vast amount of time many of us spend on the road—traveling in business, commuting between home and office five out of seven days a week, or minivacationing during weekends—getting the most use from those prime times is a very logical consideration.

If you enjoy h.f. operating and/or DXing, you know there are two optimum times within each day: dawn and dusk. As life's consequences have it, we're often traveling during those times, and occasionally wondering what's happening on 40, 30, or 20 meters. Are some exciting and enjoyable activities being missed? Probably. The bands are peaking, while people like yourself are scurrying about and leaving choice frequencies open for contacting distant amateurs. These are the times when being on the air has more merit than using high power. If you find yourself in the vehicle during other hours, the bands may also be surprisingly open or you might enjoy listening to shortwave stations such as The Rock of New Orleans with a "deluxe" rig's general-coverage receiver. Properly and safely instigated, however, you can have a ball during your travels by operating c.w. mobile.

Why Morse mobile? C.w. frequencies are consistently less crowded than s.s.b. allocations, and there are usually fewer "super stations" operating c.w. There's a creditable amount of choice DX which can be worked with low power, and you can avert those incredulous glares resulting from holding a mike while driving. C.w. mobile can actually be more enjoyable and safer than s.s.b. mobiling, and an f.m. talkie can still be laid on the seat for emergency use.

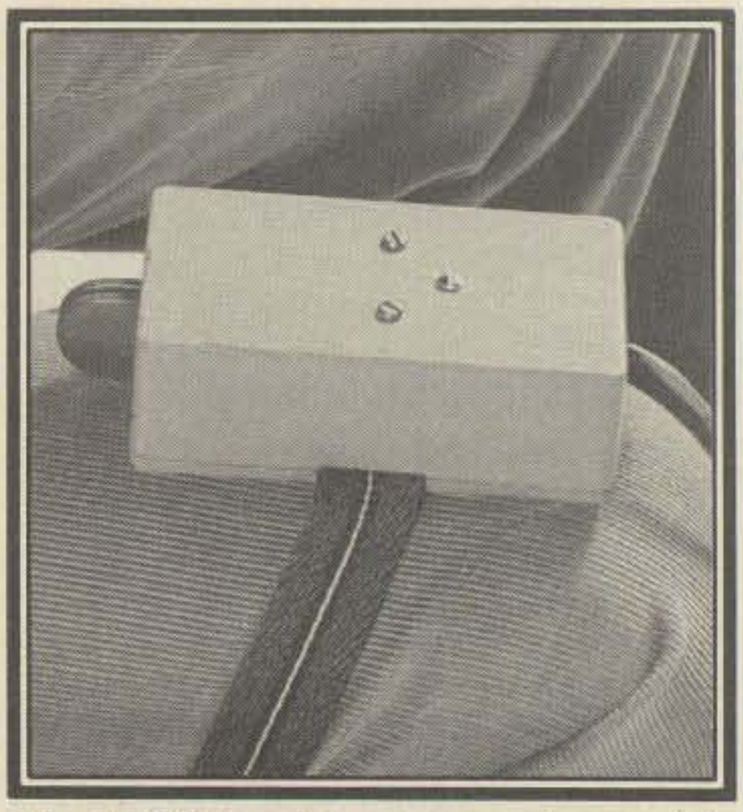


Traveling thousands of miles on assignments each year, photographer Joe Veras, N4QB, operates 99 percent mobile c.w. using an Argosy transceiver, electronic keyer, and whip antenna. This picture of N4QB operating in traffic was also shot by Joe!

The Mobile Setup

If you're considering trying c.w. mobile with your prized key sitting on the seat beside you and a logbook on the dash, forget it. The key will go spiraling towards the rider's door during a sharp turn, and your attention will be diverted from the road. Try using a smooth operating electronic keyer with the paddle strapped right above your knee, and make it common practice to copy "in your head." The logical speed here seems to be between 10 and 15 words per minute. Slower rates are difficult to remember in sentence form, and faster rates require extra concentration.

Assuming you're not the driver, a customized van or recreational vehicle is an ideal arrangement for operating c.w. or RTTY mobile. Adapting some of those ideas to a regular auto, however, can also prove quite fruitful. Consider, for example, the layout sketched in fig. 1. A small TV rack's shelf is fitted with braces to match one's auto and placed at a comfortable arm height above one side of the rear seat. An h.f. transceiver, keyer, com-



The N4QB leg-strapped paddle consists of a Ham-Key unit bolted in a Bud cabinet. Side areas were cut to pass a cut-down belt fitted with Velcro quick-fasteners.

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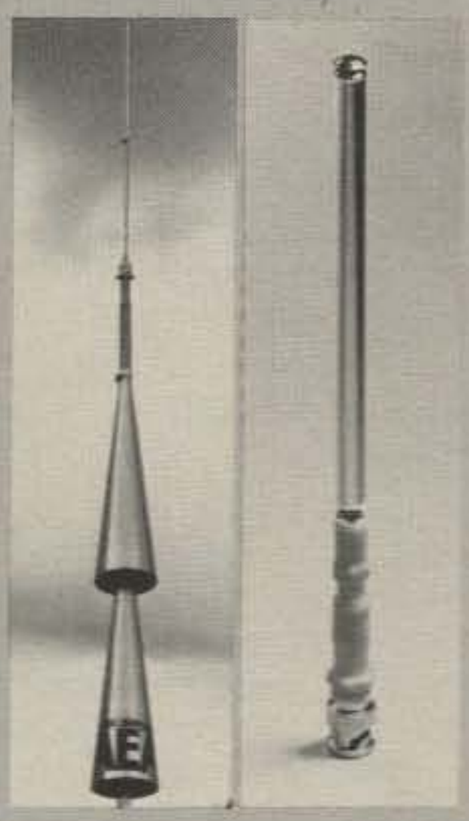
ANTENNAS



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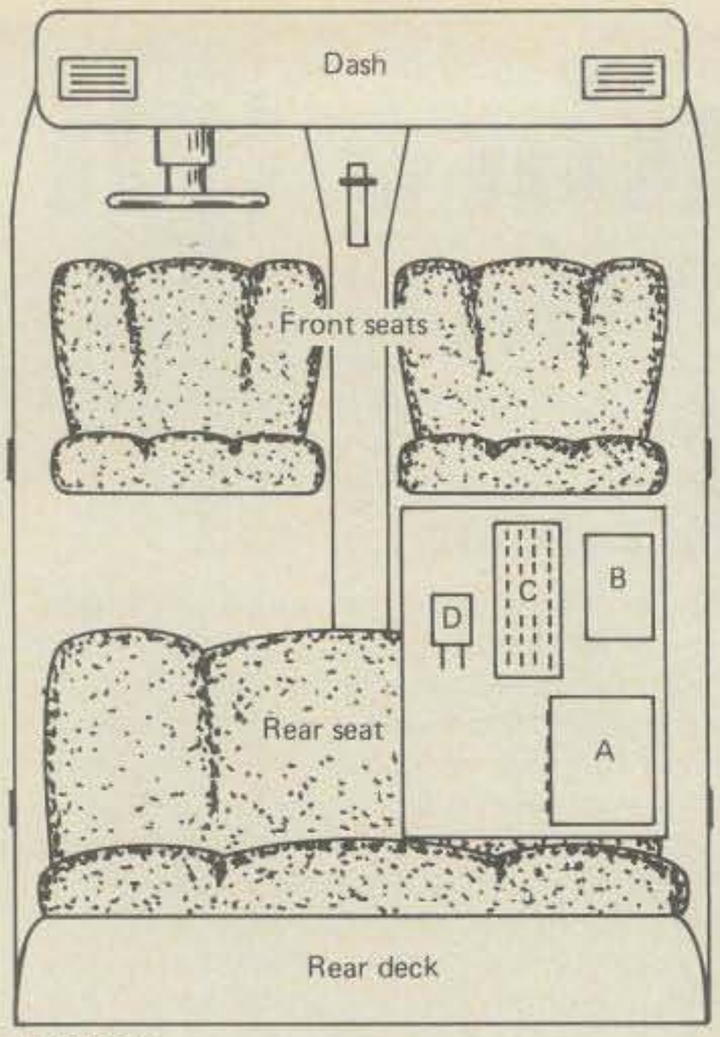


LEGEND:

A = HF transceiver
B = Video monitor
C = Home computer
D = Keyer

Fig. 1– Layout for a deluxe c.w. mobile setup using a small shelf or rack fitted with cut-to-length legs and braces. Shelf is mounted a few inches above the rear seat, allowing a comfortable operating angle plus underdesk storage area.

puter (?), etc., can then be mounted on the "desk," resulting in a comfortable and functional layout, complete with window and underdesk storage area.

One of the most attractive mobile c.w. setups we've seen is that of photographer Joe Veras, N4QB (Joe, incidentally, has shot a number of *CQ* covers, and he recently shot the picture for our new book *RTTY Today*). The paddle is an older Ham Key unit in which slots were cut near the bottom area for passing through a strap. A cut-down belt with Velcro quick-fasteners glued to belt ends then comfortably secures the paddle in place, with instant on/off capabilities. The transceiver and electronic keyer used with this setup are mounted vertically between and slightly behind the auto's front seats. Although the rig's dial is within easy view, tuning is primarily by feeling and hearing.

Rigs and Keyers

While most of the popular solid state transceivers are good candidates for c.w. operation, units with full break-in capabilities are in an "ultimate" class of their own. When used mobile, that flexibility is more beneficial than VOX on s.s.b. Being able to hear on-frequency activity during one's transmissions also provides a higher QSO success ratio, especially when using power levels below 100 watts. If your auto has a straightstick floorshift, try to position the keyer so you can change gears easily with a single wrist movement, and then check your movements before driving. Chances are good that things will come together quite smoothly, and your ability to remember calls will become a natural reflex.

Don't become overly concerned about the need for digital dials or programmable memories for c.w. mobile operation. Develop a feel for your rig's main tuning from a certain operating frequency you might call "home." Tuning roughly a half-turn in either direction from that spot (and returning to the center spot when leaving the rig) can provide almost no-view enjoyment.

Concerning the selection of electronic keyers, we heartily suggest iambic units with dot/dash memories. If you would like to homebrew that unit, consider the Curtis 8044 series of keyer chips advertised in most of the amateur magazines. Alternately, you might consider "butchering" an MFJ-422X for its circuitry and mating it with a rugged and enclosed paddle (the MFJ-422X is a superb keyer which slides onto the back of a Bencher paddle).

Antennas

Most of the popular mobile antennas can easily be tuned for operation on c.w. allocations of h.f. bands. The Hustler RM series of resonators are especially attractive in this respect, as their tip rod can accurately be readjusted within one or two minutes time. Once set, a small notch can be filed in the rod for marking its c.w. spot, while the supplied split-pea clamp can mark s.s.b. tuning. Likewise, the recently popular three and five band adapters (those mast mounting plates that hold several resonators in place) can be used to assemble an instant band-switching mobile antenna. You would surely want to include one of the new Hustler 30 meter resonators in that setup, as that band is a blast of fun for QRP and/or mobile operations. A short length of nylon fishing line can be run from the multiband array to the trunk's front lip for steadying everything at highway speeds.

If you really feel ambitious and would like a super setup, check with Hustler Company, 3275 No. B Avenue, Kissimmee, Florida 32741, about their dual rear antenna's phasing harness which was popular a few years ago. In addition to radiating an impressive signal, the dual resonators can also be removed and used in a rotary dipole arrangement during portable or overnight operations. Details on that rotary dipole were included in our October 1983 "World of Ideas" column.

If you occasionally operate from a travel or camping trailer, we remind you to look up when seeking a good antenna location. The metal roofs on most of these trailers are super ground planes for full-size verticals. While a quick swivel base for using a vertical during overnight stops is attractive, a center-mounted location is more effective. We'll leave the mechanical designing to your ingenuity. Needless to say, the trailer located atop a mountain or near the beach has a 3 to 6 dB advantage over setups in lowlands or woods.

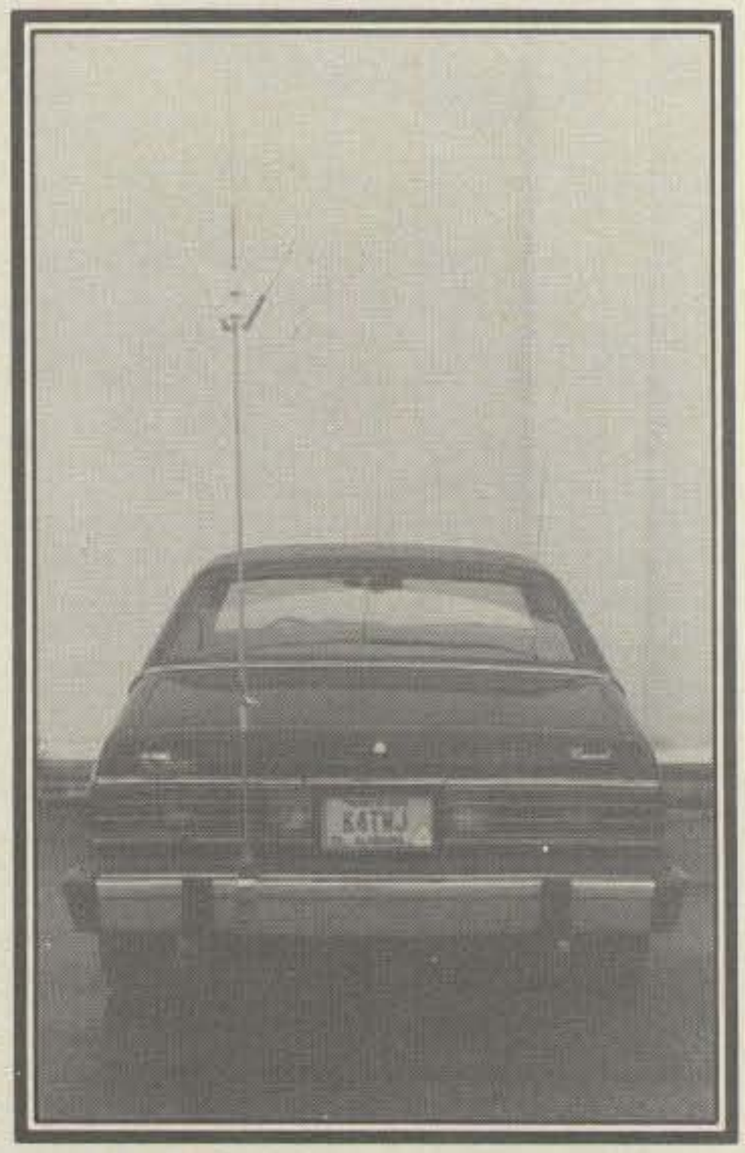
Closing Thoughts

Although the classic voyage of STS-9 and W5LFL is now history, it surely must be categorized as one of 1983's most outstanding events. We would have included details of the mission, orbital predictions, frequencies to monitor on h.f. and v.h.f., etc., but unfortunately there wasn't enough lead time before publication. As most of you now know, the activities were quite successful and a tremendous promotion for all amateur radio. Our hearty congratulations to W5LFL and others for a fantastic operation.

On the discouraging side, we are all deeply saddened by the untimely death of ARRL President Vic Clark, W4KFC. Vic was deeply concerned for all aspects of amateur radio, especially the many specialized areas (which, incidentally, he knew quite well). He was the League's most outstanding and capable leader to date. Locating a comparable replacement is going to be extremely difficult.

As this column is being written, propagation on the h.f. bands is unusually poor. Have patience, however, and remember the lull is more seasonal than sunspot cycle. Although we're on the downhill side of the present cycle, there will still be reasonably good times during the spring and summer of '84 (reassuring, eh?). Meanwhile, I'm personally enjoying talking with many of you around 14.180 kHz at 2300 GMT Sundays. Maybe the 11 year changes add unique flavor to amateur radio activities.

73, Dave, K4TWJ



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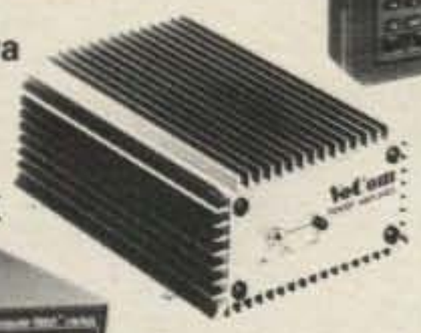

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Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The story of the month as told by Dave, VE3BHZ, is:

Dave Lott, VE3BHZ
All Counties #400, 9-23-82

"I have read the awards pages of *CQ* magazine for quite a few years now, never dreaming that I would ever be in the position I now find myself—i.e., the proud owner of USA-CA All Counties #400, thereby qualifying for "Story of the Month." I was a little hesitant about submitting my story, but after some thought and also some persuasion from the new Awards Director, I decided to give it a try.

"My entry into the ranks of amateur radio took a very long time from when I first became interested in the mysteries of Morse code back in 1938, at which time I joined the Boy Scouts and learned the code on a flashing light. I later joined the Sea Cadets and was introduced to radio for the first time. I found this more interesting, mainly because it was possible to communicate in code much more quickly by sound than by sight, and my code speed increased to somewhere around 20 w.p.m., which, at the time, I thought was fantastic.

"In 1945, at the age of 15, I joined the Royal Navy as a Boy Telegraphist and I stayed with the navy until 1955.

"I met and married my wife, Mary, in 1951, and this convinced me that the sea was no place to be when you have a pretty wife who is also a good cook. Therefore, as soon as my hitch was up, in September 1955, I said goodbye to active service. I then went to work as a test technician with a cable manufacturing company until I emigrated to Canada in 1956.

"I came to Toronto, where I promptly joined the Canadian Naval Reserve to renew my ties with the service and more importantly to continue my love affair with Morse code. I instructed courses in radio theory and Morse code until 1980, when I had to retire because I had reached the magic age of 50. However, in 1969/70 the Canadian Navy decided to phase out Morse code, and it was no longer taught to reservists. It was at this time that I became interested in the amateur side of radio after having been a professional operator for so long. It soon became very obvious to me that I had been missing out on a good thing, and I kicked myself for not getting my license much sooner.

"I suppose I started off like many others. I bought myself a used NCX5 transceiver, built a matchbox, and strung up a random-length wire to get on the air. My first QSO was on August 11, 1970 at 1610 GMT on 20 meters with WA3JES/8, who was in Dayton, Ohio. I never did get a QSL card from him, which was rather disappointing.

"After feeling my way around for a couple of days, I worked my first DX on August 14th, also on 20 meters, with F8BC, and I was hooked on c.w. DXing. I chased all the usual awards: DXCC, WAS, WAC, and WAZ. When I had those, I decided to try my hand at 5 Band DXCC. By this time I had slightly upgraded my station by building the SB401, SB303, and SB200, adding a TA33 on a 10 foot section of tower on the roof of the apartment and a trap dipole for 40 and 80 meters. I cleaned up four bands without too much difficulty, but had problems on 80 mainly because of a poor antenna and a poor location.

"It was while I was struggling with this that I got hooked on County Hunting. A good friend of mine, Chris Turner, VE3EQF, showed me his USA-CA certificate and I was immediately impressed. It was easily the most attractive piece of 'wallpaper' I had ever seen, much more impressive than anything I already had. I decided to try for it. My first intention was just to make the 500 counties, but county hunting for me was like smoking: once you start it's hard to stop. On February 6, 1979 at 1957 GMT I made my first contact on the 20 meter Independent County Hunters Net with W0BK, who was mobile in Morehouse Parish, Louisiana. I found the net great fun and very productive because I needed every county there was. I thought I would have them all in no time at all! How mistaken I was. I finally got my last one—Grand Isle County, Vermont—on August 20, 1982 at 0042 GMT, thanks to Bob Ford, VE1RQ, who made a special trip to get it for me. The hunt was finally over, and I experienced a mixture of relief, achievement, and sorrow. I had lots of fun chasing those mobiles, and more importantly I had met many wonderful people in the process.

"I considered going around a second time, but decided against it for the present so that I can concentrate on increasing my DXCC total, which presently stands at 304. I am also trying to work 5 Band WAS by working only one station in the five bands in each state. I only have 15 states completed, so there is still a long way to go.

"In the meantime I have moved out of the apartment in Toronto where I lived for 25 years and have improved my operating conditions a little. I now have a 5-element tribander up 45 feet, a TS-820S, a 30L1 linear, and an atmosphere free of all the electrical noise I had in the city. However, I find my operating time reduced somewhat because of the extra time spent traveling to and from Toronto to work at my job as a detective sergeant on the Toronto Police Force and also gardening, which I didn't have in the apartment.

"However, I still have time to listen in on the net now and then to hear the familiar voices. No doubt one of these days I shall make up my mind to go around again and then I will be on 14.336 to renew old acquaintances and to meet some new ones. Until then I would once more like to thank all you wonderful people who helped me get my All Counties #400 and made the hunt such an enjoyable experience. 73, and God bless you all."

Dave, VE3BHZ, All Counties #400. This picture was taken at the First Class Operators Club in London, England.

333 South Lincoln Ave., Mundelein, IL 60060

Special Honor Roll
All Counties

#448 Lad F. Hlavaty, W1CRL, 12-2-83
#449 Richard S. Larsen, K8MW, 12-3-83
#450 Al Miller, W0EWH, 12-5-83
#451 William R. Rufe, K2YIY, 12-21-83
#452 Frank Russo, WA2JTY, 12-22-83
#453 Donald R. Priebe, W2IN, 12-22-83
#454 Steven L. Hand, VE7AIO, 12-29-83

Awards Issued

Lad Hlavaty, W1CRL, completed them all and was awarded All Counties #448, 12/2/83, All S.S.B.

Dick Larsen, KM8W, had me send him

USA-CA Honor Roll

3000

K8MW	480
WØEWH	481
K2YIY	482
WA2JTY	483

2500

K8MW	538
WØEWH	539
WD4RAF	540
ZL2ACP	541
K2YIY	542
WA2JTY	543

2000

K8MW	593
WØEWH	594
K2YIY	595
WA2JTY	596

1500

K8MW	661
WØEWH	662
K2YIY	663
WA2JTY	664
VE3KZE	665

1000

KB8QP	811
KC4AD	812
K8MW	813
WØEWH	814
K2YIY	815
WA2JTY	816
YU4EBL	817

500

KB9QP	1898
IØAOF	1899
K8MW	1900
WØEWH	1901
KE6KT	1902
K2YIY	1903
WA2JTY	1904
YU4EBL	1905

Roberto Ibieta B., first in Chile to receive the USA-CA Award.

USA-CA 500 through All Counties #449, Mixed, 12/3/83.

Al Miller, WØEWH, qualified for All Counties #450, All S.S.B., 12/5/83. We all remember Al's father, "Bing" Miller, WØGV, who held All Counties #140.

Bill Rufe, K2YIY, did all his paperwork and came up with All Counties #451, All 20m Mobile, 12/21/83.

Frank Russo, WA2JTY, won All Counties, #452, All 20m S.S.B., 12/22/83.

Don Priebe, W2IN, finished up the last few counties and had me send him All Counties #453, Mixed.

Steven Hand, VE7AIO, also finished his last few counties and was awarded All Counties, #454, All S.S.B., 12/29/83.

Bill Hatcher, N5BDY, added a 20m Mobile endorsement to his All Counties #437.

Fred L. Van Aalst, WD4RAF, continues to add to his fine collection, and has added the seal for USA-CA 2500 Mixed to his certificate.

Vic Brosnan, ZL2ACP, had me send him another seal for his certificate when he qualified for USA-CA 2500 Mixed.

Tom Rosebush, VE3KZE, added All C.W. endorsements to his USA-CA 500 and USA-CA 1000 and increased his count to USA-CA 1500, All C.W.

Bob Hartenstein, KB9QP, collected USA-CA 500 and 1000, Mixed.

Don Copperidge, KC4AD, received USA-CA 1000.

Akademski Radio Club of Banjaluke, Yugoslavia, YU4EBL, qualified for USA-CA 500 and 1000, Mixed.

Guiseppi Loreti, IØAOF, of Rome is the first station ever to qualify for a USA-CA

Award on RTTY. Joe now has the certificate for USA-CA 500, All RTTY.

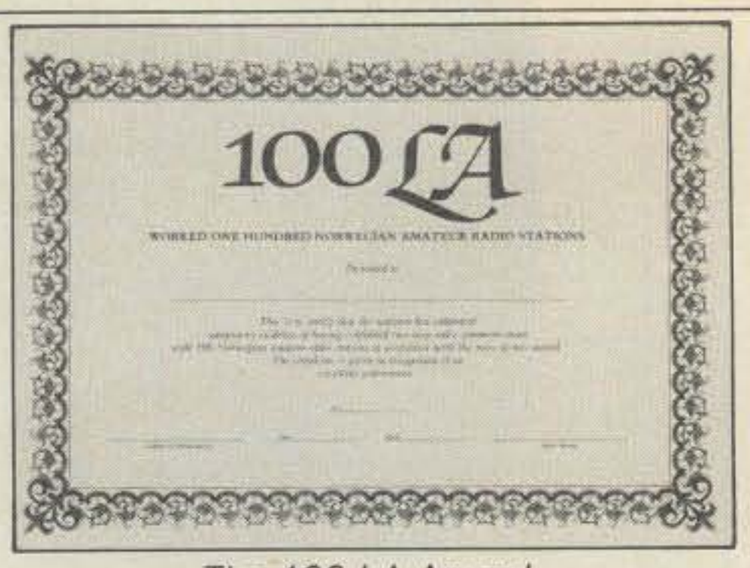
KE6KT qualified for USA-CA 500, Mixed.

New Awards

White Rose Award. Issued by the York Amateur Radio Club, York, PA, the requirements are as follows: 3rd U.S. call area, 10 QSO's; rest of the U.S., 5 QSO's; rest of the world, 2 QSO's. QSO's must be with stations in York, PA, or with any York Amateur Radio Club member on any band or any mode.

Send the required QSL cards (if cards are not available will check logs back one year) to White Rose Award Manager, Millard J. Martin, N3CYC, 2070 Thelon Drive, York, PA 17404. (Please note the new Awards Manager for the York Amateur Radio Club.) There is no charge for the award—no stamps, no IRC's, no monies. The local club supplies all postage.

White Rose Award.



The 100 LA Award.

"100 LA" Award. "We hereby have the great pleasure to present a new and exciting official award called "100 LA." The requirements of this new award from Norway are, as the title tells, to work (or hear) 100 different LA/LB stations. The award is issued by the Stavanger Group of NRRL, who offers a cup in all three modes as a prize to the first applicants, both Norwegian and foreign, who have obtained the requirements for the award. "Our intention is to increase operating activities and provide further enjoyment to amateur radio." Rules are as follows:

1. The award is issued by the Stavanger group of the Norwegian Radio Relay League and is available to all licensed amateurs and s.w.l.'s (on a "heard" basis).

2. 100 two-way radio contacts with different LA/LB stations after 1 January 1984 are valid. (LF, LJ, and LH stations do not count for this award.) All valid amateur bands can be used (10, 18, and 24 MHz are not available before 1/1/1989).

3. The award is issued for c.w., phone, or mixed modes.

4. A list showing full details of the contacts should be certified by the award manager of the national society. (The award manager of the Stavanger group will certify for Norwegian applicants.)

5. The fee for the award is 20 NOK, or 10 IRC's.

6. The application must contain call sign, date, band, RST, and modes, and must be addressed to: Award Manager, Stavangergruppen av NRRL, Postboks 354, 4001 Stavanger, Norway.

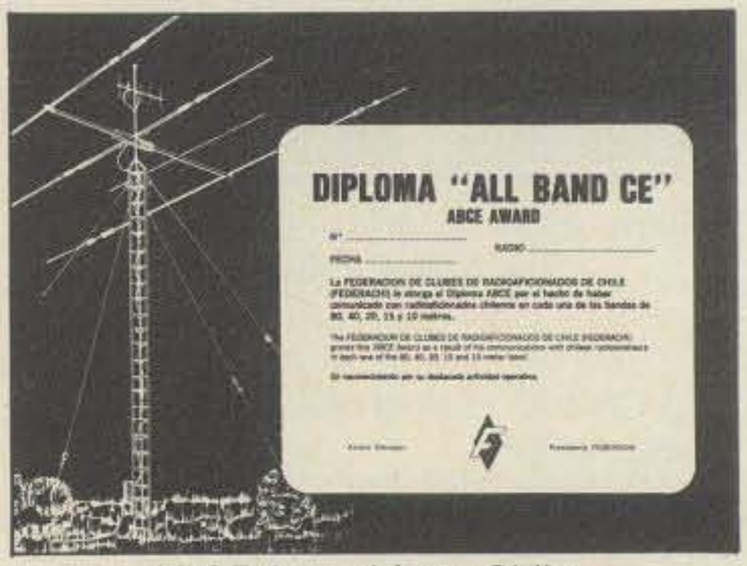
Crag Award. The Club de Radioaficionados de Guatemala offers a beautiful award for amateurs who can prove two-way radio contact with the seven Guatemalan Zones: TG0, TG9, TG8, TG7, TG6, TG5, and TG4. TG3, TG2, and TG1 are not operating from Guatemala at this time.

Send the cards with an application to: Club de Radioaficionados de Guatemala, 12 Calle 1-41, Zona 1, 2do. Nivel, Oficiana 03, Apartado Postal 115, Guatemale, Guatemala, C.A.

Federacion de Clubes de Radioaficionados de Chile (FEDERACHI). This group has three awards. General rules are as follows:

1. Send GCR list (showing station, date, time, band, and mode) certified by any official radio club in the applicant country. Similar for s.w.l.

Crag Award from Guatemala.



ABCE Award from Chile.

50 MHz CE Award.

2. For postage fees, send 10 IRC's.

3. Mail to: Awards Manager—Federachi, P.O. Box 2545, Concepcion, Chile.

ABCE Award (All band CE Award). Prove communications with 100 CE stations in each one of the 80, 40, 20, 15, and 10 meter bands. Chilean bordering countries must confirm 3 QSO's per band. Endorsements are available.

100 CE Award. Prove communications with 100 CE stations in the same mode.

50 MHz CE Award. Prove communications with 3 CE districts in the 6 meter band.

Notes

Finally our winter of record-breaking cold temperatures has ended, and we look forward to the summer holidays. I hope things are going well with you.

73, Dorothy, WB6RCY

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DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

The DXer hath a jolly life
Who by his rig sits down,
And leaves his business and his wife,
And all the din of town.

One who listens to the DX bands should easily realize that what Albert once said years back is still as true as ever: "All things are equal, and some more so!" Last week one of the local QRP types was up the hill in the warm April sunshine to stir again the knowledge that while all things are equal, the Eternal Truths of DXing are not always equally understood.

"It was the last club meeting," he told us. "Something was before the group, and some of the older members were not especially for it, though a large number of those present were. It did seem that everyone, the old timers more so, was in favor of majority rule and the democratic process as long as things were decided the way they wished them to be."

The QRPer was telling this with a furrowed brow, obvious that he did not completely understand. "I wonder if you might ever have noticed," he continued, "that while many of the older DX types at the club wish to tell how things should be run, they don't want to do the work. Is that something new?" Of course it wasn't. Almost everyone knows that when a DXer considers a problem, his main concern is what is best for DX. When it is good for him as a DXer, it is good for DX in general. We mentioned this to the QRPer.

"Of course that's right," the QRPer quickly continued without any hesitation. "I think that I'm always interested in what might be best for DXing even though my country total is not too far over the hundred mark. It frequently seems, however, that those other fellows are off the track somewhere. Know what one of them told me?" We could hardly wait to find out, though we had little doubt that we would quickly. "There was a bunch of us shorttimers in the club standing around talking about DX, and one of the older members told us something that most of us—maybe all of us—had a hard time accepting. He told us that all DXing is ordered by a system of logic, and DXers themselves are attuned to that logic, and that the more countries you have, the more attuned you become. Consequently, anything that a DXer with over 300 countries says or thinks, and this is definitely so with anyone on the Honor Roll, proceeds directly from that DX logic. Thus there can be no doubt about whatever they might think or say—no doubt at all!"

77 Coleman Dr., San Rafael, CA 94901

Rafael C. Azada, DU1FRA, holds a Class "A" license and is the current Secretary of the Philippine Amateur Radio League. A retired commercial pilot, DU1FRA flew for many years and was involved in several search and rescue missions. Rafael does not believe in calling CQ, this moving him up to the forefront of the true-blue DXers. Even in pile-ups he will wait and listen until things are right to make a contact. "Patience is the key to good DXing," DU1FRA says. Mostly on 20 meters, look for Rafael around 14240 kHz from 2200Z and 0700Z.

Perhaps it was the warm sunshine, or perhaps it was something else, but something was getting to us. We found that although the words flowed on, we were just sitting there blinking in the sun. Possibly we were expecting him to continue with his story, but finally we realized that what he had said was it. "Well, what do you think?" the QRPer finally prodded, and we had to stir ourselves.

Years back when we were entangled with a weekly DX bulletin we came to the realization that the weekly demand was more than we could handle. One of the local types, definitely a mature DXer, gave us some stern and sharp advice. "Forget any new subscriptions," he enjoined us, "limit the list to maybe 400 or 500 subscribers, and just let the old timers subscribe. That way you will keep things going, taking care of the real cream of the DXers." We then admitted that this was not in line with our thinking, and we thought to argue the point. "But all the old timers have worked just about everything and sometimes a couple of times. Isn't it the younger DXer who comes with his enthusiasm and possibly just over a hundred countries who really needs DX information?"

Actually, at the time we thought it polite not to add the comment that many of the old timers were retired and were able to watch for DX at just about any hour of the day or night, while many of the younger and less mature types had a job and a family to raise, their operating time being limited. Caution kept us from mentioning this point, as we felt that some maybe considered that we were walking close to the edge of DX heresy.

"No way!" was the firm prohibition to our proposal. "Let the newer DXers earn things just like we had to do. After all, there is so much DX around these days that they really shouldn't have any trouble at all!" At that point we were not disputing the advice, although we hardly were convinced that the position of the mature DXer was a valid one. However we still had the problem of being tied to more work than we could handle.

We took another slant and suggested in the bulletin that subscriptions be limited to a definite period, and after that a subscriber would be dropped from the mailing list to make room for a newer and needier DXer. It was hardly one of the more popular suggestions we ever offered. In fact, there were some suggestions that we were not faithful to our own kind, the over-the-hill DX type sitting on his 300 country and fondly recalling how good the old days were. However, we still had the QRPer on our hands, and it was obvious that he was still looking for some answers.

"One of the Eternal Truths of DXing," we started out saying, "is that only a DXer understands another DXer, and only a DXer understands DXing. But the way one DXer understands a matter may not necessarily be the way another DXer understands it."

We stopped to scan the face of the QRPer. "You do understand all of this, don't you?" we asked, and the QRPer slowly nodded his head. We continued to hold his gaze, and we continued to wonder just how much he understood. "Thus, while to a newly minted DXer just over the 100 mark the future may seem to be an endless, bleak DX journey, it is a familiar scene to the DXer on the Honor Roll and actually considered little to worry about; he has been there and survived.

We thought that we had been rolling right along and hoped that the QRPer had rolled along with us. Again we asked, "You do understand?" Again he was positive in saying he did. "I think I understand most of it," he said, "but how about that fellow at the meeting. How about being attuned to the DX logic? Do you understand it, and why don't I understand it? What he said keeps bothering me."

We had hoped that he had forgotten all about that session, but he had not. We still had to come up with something and there was no dodging it. "Remember

The WPX Program

Mixed

1085	KKØU	1086	WD4PVI

S.S.B.

1637	CP6IM	1639	KB9QP
1638	OX3AE		

C.W.

2235	JA2GCW	2239	KW9N
2236	AC5K	2240	KT2C
2237	VE6BND	2241	OH2BSA
2238	DL7GK		

Endorsements

Mixed: 450 I1EEW, DL7GK. 500 DL7GK. 600 DL7GK. 650 DL7GK. 700 VE2PD, DL7GK, AF2Y. 800 WD4RAF. 850 K5PR, G3ZRH. 900 G3ZRH, K2SHZ. 950 G3ZRH, K2SHZ. 1000 G3ZRH, K2SHZ. 1050 K2SHZ, I2MQP. 1100 K2SHZ, I2MQP. 1150 K2SHZ, I2MQP. 1200 I2DMK, K2SHZ. 1250 K2SHZ. 1300 K2SHZ. 1300 K2SHZ. 1350 K2SHZ. 1400 K2SHZ. 1450 K2SHZ. 1500 K2SHZ. 1550 K2SHZ. 1950 YU7DX. 2000 YU7DX. 2050 YU7DX. 2100 YU7DX. 2150 YU7DX. 2200 YU7DX. 2300 W2NC.

S.S.B.: 350 N4DRC, WØCON, CP6IM, OX3AE. 400 N4DRC, NB5C, CP6IM, OX3AE. 450 I2EOW, CP6IM. 500 CP6IM. 550 I2TZK. 600 I2TZK. 700 CT1BY, NP4CC, VE2PD. 750 VK3SM, CT1BY, I2DMK, NP4CC, F2VX. 800 VK3SM, NP4CC, F2VX. 850 F2VX. 900 F2VX. 950 F2VX. 1000 F2VX. 1050 F2VX, I2MQP. 1100 F2VX, I2MQP. 1150 WB2NYM, F2VX, I2MQP. 1200 WB2NYM, F2VX. 1250 F2VX. 1550 VE7WJ. 1600 VE7WJ. 1650 VE7WJ. 1950 K2POA.

C.W.: 350 JA2GCW, G4MVA, OH2BSA. 400 JA2GCW, OH2BSA. 450 JA2GCW, OH2BSA. 500 JA2GCW, OH2BSA. 550 OH2BSA. 600 OH2BSA, SM5DAC. 650 JA5SIX. 750 IT9VDQ, KA7T. 1000 I2DMK, JA2IU. 1400 VE7CNE.

10 meters:	DL7GK, WD4PVI.
15 meters:	DL7GK.
20 meters:	DL7GK, I2TZK, SM5DAC, G3ZRH, VE2PD.
80 meters:	DL7GK, KB9QP.
Asia:	KC8YM, WB4UBD, DL7GK.
No. America:	KW9N, WD4PVI, KB9QP, G3ZRH, DK3EG, DL7GK.
So. America:	KL7AF.
Europe:	WD4RAF, G4MVA, KAØIQR.

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.

when you first started in amateur radio and things were so confusing?" we asked. The QRPer nodded his head so we rushed on. "Then when you got your license there was a lot of talk on the air that meant little to you at first. And then there was DXing. Remember when you worked all the continents and got the WAC Award and were wild with delight?" The QRPer was starting to jig around with the delight of the memory.

"DXing did look like an unending mystery that I'd never really understand, but now I do a bit. But what about that logic and being tuned? That's something I'm not alone in not really understanding. A couple of the other fellows there were also skeptical." There was an intent look on the QRPer's face, and we were wondering if we were getting through at all. We just had to make him understand.

"Did you ever give any Novice examinations?" we asked, and the QRPer smiled. "Sure did. Those fellows were something to watch. All those simple questions, and they were sweating over them. And code at five words a minute! All I did was shake my head. But what about it?"

"Remember how irate you were about the local who kept working the VU7 on every band every day when they were on last January? You were jumping up and down in rage. How about that Novice to whom you last gave an examination? Wouldn't he be just as irate?" The QRPer paused and then admitted that it was a hard thing to visualize.

"Are you trying to tell me that there is logic in what most DXers think, but that there might be different logic depending on your country status?" We only looked wisely at him, at least we thought it was our wise look, but said nothing. "And perhaps amateur radio is that golden endeavor in which everyone is logically right and hardly ever wrong? Is that what I'm supposed to believe?"

We had carried things about as far as we wanted to go this day. "Have you ever thought that in these matters you may be picking up different ends of the same stick?" we asked. Reverse the ends and you may see things from a different perspective." He started to talk again but we had had enough. We said, "Why not wait until the same time next year when you have 50 or more new countries? Come back then and we'll discuss it again."

He wanted to talk more, but we did not. There is always deep logic in what the DXer does, and one must learn that that logic may not always be the same. There is none like the logic of those with 300 or more countries. Theirs is the pure DX logic. You hardly ever have to ask about it, and often you'll find one ready to tell you how it is. The 300 country is a different land beyond the DX watershed. Most DXers want to go there. A large number do and want to tell about it—eternally. If you are new to DXing, listen to the words often heard!

Kure/Midway

The current big gun at Kure Island, James Westerhold, N2EDQ/KH7, passes along a bit more information on his operation and the possibility of some Midway Island activity.

Jim is the only amateur on Kure, which is 56 miles northwest of Midway and on Green Island, the site of a Coast Guard Loran Station built back in 1961. On Green Island, which is about a half mile wide and a mile and a half long, there are usually about 23 service personnel, and Jim's main duty is to maintain the Loran equipment and back up the Material Officer in work and maintenance problems with the Loran facility. Jim is a Chief Electronics Electrician.

The present tour of duty is expected to keep N2EDQ/KH7 on Kure at least until June, with much of his operating time being spent handling phone patches for the crew on the island and a bit of DXing at times. He does not mind working the DXer looking for a needed counter and also advises that KH6LW in Honolulu maintains a regular contact with Kure and is a route for information on possible times and frequencies. Loren visits Kure

The downtown area of Green Island in the Kure group. Jim Westerhold, N2EDQ/KH7, controls all the local DX activity on Kure, he being the only operator at this time. He has been thinking of Midway, about 50 miles away, for some activity.

on occasion and sometimes serves as a downtown Honolulu shopping service for the crew about 1400 miles further west on Kure.

The Brown Sugar Net at 14310 kHz at 0300Z most days will frequently find N2EDQ/KH7 as a check-in. Also, on Saturdays at 0000Z there is a schedule with KH6JEB at 21400 kHz for the forwarding of log information for QSLing and things like that. Rick, KH6JEB, is the QSL manager for N2EDQ/KH7. On that Brown Sugar Net K6EDY is often the net control.

Back in January Jim was trying to line up some possible Midway action for three or four days. In this effort there will be K6EDY helping plan and line things up, and the Brown Sugar Net might be a place to listen for information.

Back some years Midway was the common one and Kure a tough one to catch. Then there were times when neither was available. Kure can be caught now and maybe even Midway. After Jim leaves the far end of the Hawaiian chain, it may be some time before another shows. Entry to either Kure or Midway is restricted, Coast Guard permission is needed to land on Kure, Midway is not part of the state of Hawaii but is within a Naval Defensive area established in February 1941, and entry is only with the permission of the Fleet Commander at Pearl Harbor. All this travel information can be found in NAAA's U.S. Coast Pilot #7.

The 1984 Great DX Convention

The annual International DX Convention will be sponsored this year by the Southern California DX Club and will again be at the Holiday Inn at Visalia. Neil Kaltman, K6SMF, is the chairman of this year's gathering, and the dates are April 13–15. Registration is being handled by Nick Winter, WB6DXU. Early in the planning the speaker list included 1AØKM, XU1SS, TT8BC, 3B8CF, and the Henson's, WA4ZNH and WN4FVU.

There is still time to make this outstanding DX gathering, and every year

The WAZ Program

10 Meter Phone

269	KS9R	270	DK5AD

15 Meter Phone

190	JR3RRY

20 Meter Phone

483	I7IEH	485	DJ8NK/A
484	SM4BOI	486	W7KOI

10 Meter C.W.

49	WB4RUA

15 Meter C.W.

102	KJ4F

20 Meter C.W.

209	DK5AD

All Band WAZ

S.S.B.

2791	I1EEW	2796	ON4QP
2792	I4KYO	2797	JA1SDV
2793	JE6WVT	2798	F6ANA
2794	ZP5MJO	2799	IK2AGN
2795	WA5IPS	2800	OZ9JV

C.W. and Phone

5686	W4VN	5691	SV1LV
5687	HB9BZA	5692	OE7RMI
5688	ZL2RY	5693	K3NS
5689	KU6Z	5694	JR1AHH
5690	DL8MBS		

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.

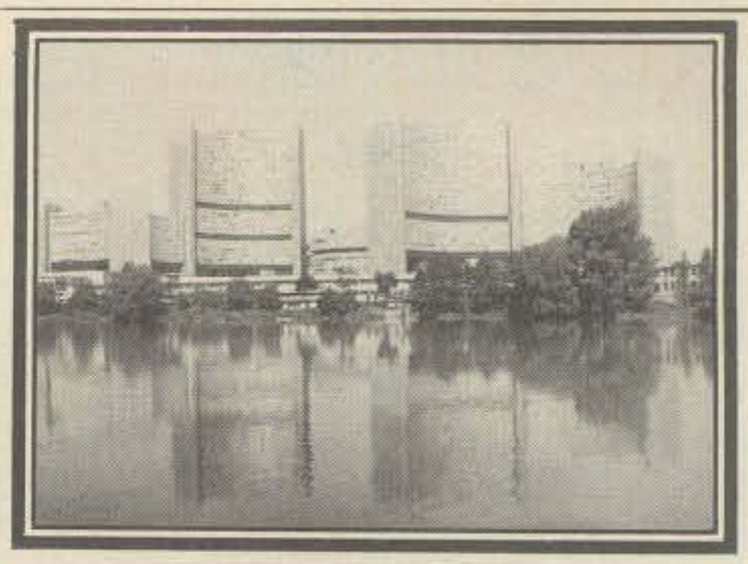
brings not only the current crop of DXers, but many of those who have made DX history in the past. Fried and Sandi Heyn, WA6WZP/WA6WZN, are the team handling the publicity.

New Countries

Those weak in spirit and faint in heart may think that there are no new countries under the sun, but those with long memories and longer longevity will be quick to step forth and declare that one should never lose hope. There are still DXCC countries to be discovered, and the DXCC chart certainly must have some blank areas therein—just don't ask where.

At the turn of the year, for example, there was study, consideration, and argument about some of the islands out in the Kiribati area in the Pacific. Are they or aren't they? Will they or won't they?

Back several decades there were intensive studies made by some individuals to compare the DXCC criteria against various locales to bring some new DXCC counters. They did—Spratly, for example. And years back there was one mixed in with these efforts who said that there were still a good number of spots that would count if only . . . . The years have been long waiting for "if only," but the doubt never waned. In the interim came Market Reef, Mt. Athos, Abu Ail, Kingman, 1A0KM, and the United Nations in New York.



The Vienna International Center is the location of several U.N. Agencies or U.N. affiliated agencies. The same extraterritorial rights granted the United Nations have also been given to the Vienna International Center. The radio club located in the center has put 4U1VIC on the air and is petitioning for country status.

Recently Tom Gabbert, K3TG, formerly OE1ZGA in Vienna, noted that the Vienna International Center is the headquarters for a number of United Nations organizations or organizations affiliated with the United Nations. These are housed in seven major buildings on a large tract of land that was afforded extraterritorial status in 1979. Each of the organizations in the VIC is subject to the jurisdiction of its own governing bodies, in most cases these being the U.N. General Assembly or Security Council.

United Nations premises are generally considered to be inviolable with all the rights of extraterritoriality, although in some instances there are limiting provisions in the agreements signed with the host nations. The legal basis involved in these matters is in these agreements and accounts for the 4U1UN callsign at the United Nations headquarters in New York City. The Vienna International Center also has these rights and the same legal provisions apply.

So where does that bring us? The Vienna International Amateur Radio Club (VIARC) has obtained permission from the administration to operate an amateur radio station on the premises of the Vienna Center using the callsign 4U1IVC. The only concern of the Austrians was that there be no interference with nearby mobile repeaters in another communications service.

It might be noted that the ITU regulations provide that an amateur radio station must be subject to the authority of an administration that has unrestricted access to the station. The extraterritorial status of the Vienna International Center would lead one to believe that the Center is not under the Austrian jurisdiction and an Austrian callsign cannot be issued for the Center.

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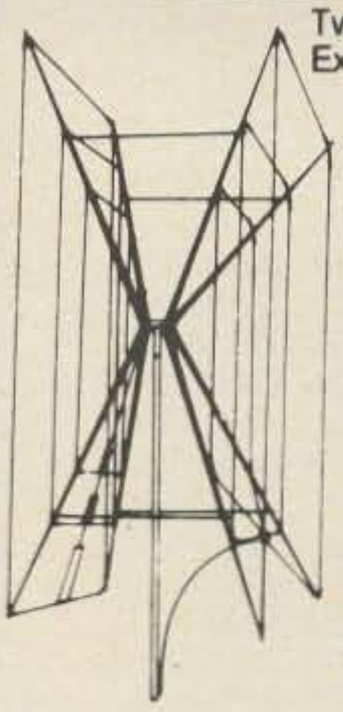

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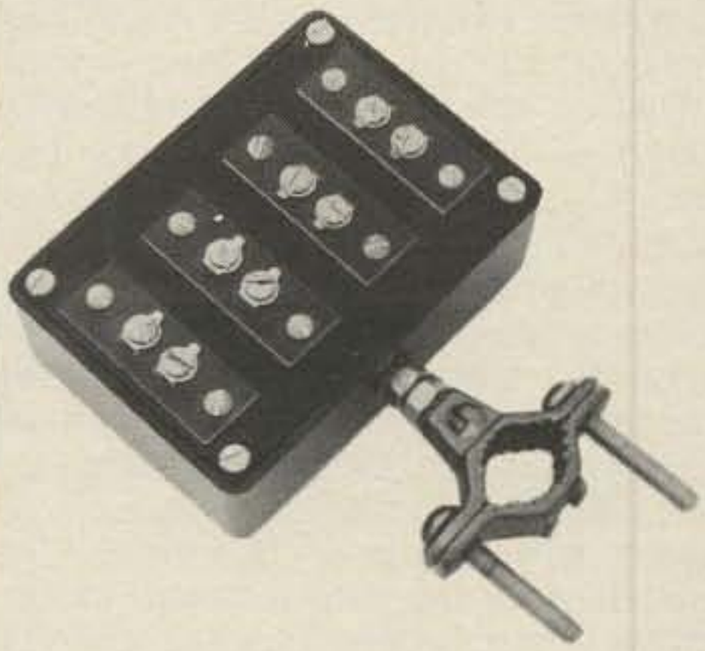

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CIRCLE 88 ON READER SERVICE CARD

This is 3X4EX, Arid Fotland, operating from Conakry in Guinea. His home call is LA2EX, and his QSL manager is N4CID, Tom Wood, P.O. Box 116, Dunn, NC 28334. Arid's call was issued June 6, 1983. He is available for s.s.b., c.w., and RTTY contacts on most bands, including 30 meters. (Photo via W2LZX)

There are three major United Nations Centers in the world: New York, Geneva, and Vienna. Each has U.N. Postal Administration offices and sells stamps which can only be used at a U.N. facility. The Austrian government provides full diplomatic privileges and immunities. There is a lot more, but by now the idea should be growing: a new country?

There is a good chance that one new country may show soon, with 4U1VIC the callsign. The question has been raised with the DXAC. There will be studies and more furrowed brows, but this one seems hardly likely to miss. Actually, 4U1VIC has been on the air since September 1982. If you have worked it, it may be more valuable than you think. If you have yet to work it, listen! It does count as a country multiplier in the *CQ* WW Contests and is considered a separate country by the DARC for the WAE Award. Perhaps by the time this is in print it will be a counter.

Club News

Years back there were few DX clubs. But times change, people change (grow older), and DX clubs are now with us in good number. Looking at the long list of clubs there is found the following:

Radio Club de Chile. This club has come back into action after reorganizing, and the officers for this year are President Rogelio Gomez Fernandez, CE3GF; Secretary Tito Moya Hernandez, CE3DBE; and Treasurer Daniel Zavala Gajardo, CE3DZ. The Radio Club de Chile has been in existence for 61 years. Their offices are at Nataniel N.° 1054, Casilla 13630, Correo 21, Santiago, Chile.

Kansas City DX Club. John Chass, W0JLC, is the president for the active Kansas City DX Club; Bill Henderson, K0VBU, vice-president; Tom Bishop, K0TLM, treasurer; and Steve Gecewicz, K0CS, secretary. Mike Crabtree, AB0X, publishes the club bulletin. The club's mailing address is 14134 Merrywood Circle, Grandview, MO 64030.

Radio Club Talca. This is a newly organized Chilean club with a DX slant. They are out to work the world on all h.f. bands. Their address is Radio Club Talca, Casilla 666, Talca, Chile. Raimundo Leon Echevarria, CE4UR, is the club president, while Ivan Bahamonde Moreno, CE4EBJ, is the chief of the club's DX section. The club station is CE4TA, and they were aiming for activity on March 1st to mark the first anniversary of the club.

Radio Aficionados de Venezuela. Just in time should come the word that this club is making an expedition to Angel Falls on the Caroni River to put 4M5ARV/6 on the air from March 30th through April 1st. The falls are considered to be the highest in the world at 3212 feet high with an uninterrupted drop of 2648 feet. There is a special QSL card for the effort. They planned to work 80–2 meters and the c.w./s.s.b. frequencies are 3710 kHz and 3796 kHz, 7010 and 7095 kHz, 14010 and 14195 kHz, 21110 and 21295 kHz, and 28110 and 28595 kHz. Two meter f.m. will be 144–148 MHz. QSL to Churu-Meru Expedition, Asociacion de Radioaficionados de Venezuela, P.O. Box 3636, Caracas 1010-A Venezuela. Angel Falls is in a remote and unique location. This will be the first amateur effort from this spot.

DXPO Atlanta. Carol Shrader, WI4K, advises that DXPO Atlanta will be held May 3–5, 1985. We know that the year is right because Carol underlined it. This event is sponsored by the Southeastern DX Club in Atlanta, and if you want to make an early-bird reservation, write to DXPO Atlanta, 720 Starlight Lane NE, Atlanta, GA 30342. This is possibly an unequalled chance to, as the Hero of Mafeking would often tell us, "Be Prepared!"

Western Pennsylvania DX Assn. John Getz, AD8J/3 is president for this year; Phil Koch, K3UA, vice-president; Wayne Albert, KB3KV, secretary; and Don McDaniel, KJ3Q, treasurer. Mike Cheponis, K3MC, publishes the club's newsletter, while Denny Brantner, KF3C, answers all requests for information.

Central Arizona DX Assn. Central Arizona generally means the Phoenix area, and the officers of the Central Arizona DX Assn. are from there. Even the club's repeater is in downtown Scottsdale. The president for the year is Mike Fulcher, KC7V; vice-president Gary Elliott, K7OX; secretary Jim McDonald, N7US: and treasurer Hal Beebe, W9YR. The repeater is ND7O and operates 147.93/147.33 MHz.

Radio Club Paraguay. This club has been around since 1941 and operates ZP5AA as the official club station. For the current year Carlos F. Schreiber, ZP5WH, is the president; Miguel Angel Stete, ZP8BE/5, vice-president; Juan Jose Benitez Richman, ZP5JCR, is secretary; and Norberto Morinigo, ZP5MJN, is treasurer. Carlos Crichigno, ZP5HF, wears a number of badges and fills a number of chairs, Carlos being the IARU representative, the club awards chairman, and the club's assistant treasurer. Mailing address for the club is Radio Club Paraguayo, Humaita 1057, Casilia Postal 512, Asuncion, Paraguay. The club's motto is "For service for the country and for humanity."

Kansas DX Assn. This is the group across the Missouri from the Kansas City DX Club. New officers for the year are president Eric Hardman, K0UR, vice-president Charles Hardman, W0IYR; and secretary-treasurer Dean Lewis, WA0TKJ. The Kansas DX Net meets on Wednesdays at 3810 kHz at 7:00 p.m. local time (that should figure out at around 0100Z Thursdays). Mailing address of the KDXA is Box 454, Salina, KS 67402.

Southern California DX Club. Don Moses, W6UY, is the president nominated by the club's board of directors; Fried Heyn, WA6WZO, is the vice-president; Esther Wolf, KB6HW, is the treasurer; and Dan Davitt, N6CGB, the secretary. Mike Hudgens, W6YQ, is the club bulletin's editor.

5 Band WAZ

Standings as of January 1, 1984

All 200 zones worked:

1.	ON4UN	36.	OH6JW
2.	K4MQG	37.	OK1AWZ
3.	SM4CAN	38.	IV3PRK
4.	AA6AA	39.	DJ6RX
5.	W8AH	40.	OH3YI
6.	W6KUT	41.	I4RYC
7.	EA8AK	42.	ZL1BIL
8.	LA7JO	43.	I4EAT
9.	EA3SF	44.	ZL1BQD
10.	OH1XX	45.	TG9NX
11.	EA8OZ	46.	XE1J
12.	W0SD	47.	F5VU
13.	K0ZZ	48.	W3AP
14.	ON6OS	49.	YO3AC
15.	OK3TCA	50.	K3TW
16.	K6SSS	51.	XE1OX
17.	ZL3GQ	52.	VE7IG
18.	OK3CGP	53.	OK1ADM
19.	SM0AJU	54.	CT1FL
20.	OZ3PZ	55.	WA1AER
21.	I3MAU	56.	N4RR
22.	I2ZGC	57.	UW0MF
23.	4Z4DX	58.	W4DR
24.	N4KE	59.	OK1MP
25.	K5UR	60.	W1NW
26.	K9AJ	61.	OE1ZJ
27.	SM3EVR	62.	HB9AHL
28.	LA5YJ	63.	HB9AMO
29.	DL3RK	64.	LA6OT
30.	N4WJ	65.	UR2QD
31.	G3MCS	66.	UK2RDX
32.	SM5AQD	67.	ZS5LB
33.	W0MLY	68.	F6DZU
34.	I0RIZ	69.	DL4YAH
35.	ON5NT	70.	LA7ZO

The top 10 contenders for 5 Band WAZ:

1.	VK9NS, 199	6.	W1NG, 199
2.	N4KG, 199	7.	W8VUZ, 198
3.	ZL1BOQ, 199	8.	LA9GV, 198
4.	JA3EMU, 199	9.	K4CEB, 198
5.	N4WW, 199	10.	OK1MG, 198

242 Stations have attained the 150 zone level

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

2558	YU4HA	1776	N6JV	1415	K6ZDL	1154	KL7AF	856	W6YMH
2528	YU2DX	1772	N6CW	1409	KF2O	1149	I2MQP	852	W0JIE
2522	F9RM	1755	N4UU	1401	YU1DZ	1057	WB8ZRL	843	AI6Z
2446	YU7DX	1726	N4NO	1400	W0SFU	1027	N3ED	817	N8BJQ
2273	W2NC	1725	K5UR	1379	N6FX	1023	K2QF	789	K7CU
2201	K6JG	1704	N9AF	1346	SM3EVR	1022	G4FAM	770	WD4RAF
2200	K2VV	1659	N2AC	1312	IN3ANE	1014	NN4Q	738	VE2PD
2168	VE3GCO	1657	W8CNL	1263	N6AW	1013	W8ILC	732	N2AIF
2150	K6XP	1657	YU2RTW	1253	K8LJG	1005	G3ZRH	700	KJ7N
2021	N4MM	1538	YU7AW	1204	JH1VRQ	1002	KA3A	690	K8HF
2002	W9DWQ	1520	I6SF	1196	N6JM	958	KO8T	659	JH8NYK
1920	W4BQY	1451	I2PHN	1192	CT1LN	958	YU2CBK	656	K2POF
1919	4Z4DX	1448	K9BG	1198	W8RSW	888	DK2BL	651	OE1KJW
1866	YU7BCD	1422	K6DT	1180	W7CB	859	WD9IIE	603	ND6U

S.S.B.

2438	F9RM	1476	W9DWQ	1099	I6NOA	946	XE1OX	746	W3GXK
2148	I0ZV	1476	K5UR	1089	W2CC	933	KC8CC	724	VE2PD
1915	K2POA	1400	WD8MGQ	1072	W2NC	924	WB6GFJ	702	I0SGF
1911	K6XP	1301	WA4QMQ	1072	CT1FL	898	W2LZX	700	EA8AZJ
1901	K6JG	1294	YU7AW	1063	WA4OIB	877	WA2FKF	694	ON6IT
1856	K2VV	1289	N2SS	1056	G4CHP	872	K8LJG	692	W0ULU
1818	N4MM	1286	N4UU	1033	KC4OV	865	CT4NH	670	JH5FQO
1810	ZL3NS	1247	N4NO	1032	N6FX	850	NN4Q	637	KB0C
1719	I4ZSQ	1243	W4BQY	1029	W6YMV	846	AC2J	616	WN5MBS
1611	I8YRK	1238	I2PHN	1027	WF4V	818	I1POR	612	YB0ACL
1600	I0MBX	1231	WB2NYM	1008	WB8ZRL	797	W3ARK	608	KA3A
1597	I8KDB	1223	VE1YX	1001	TG9GI	793	Z21GJ	604	W8RSW
1570	OZ5EV	1158	PY3BXW	985	I1HAG	768	W6LQC	601	W6YMH
1552	W0YDB	1147	I2MQP	955	N2AC	765	CT1BY	600	WD9HAW
1501	CT1UA	1107	KF2O	947	KL7AF	764	N3ED		

C.W.

2048	W2NC	1556	W3ARK	1334	YU7SF	1093	N4YB	756	NN4Q
2019	W8RSW	1509	N4NO	1304	VO1AW	1045	JE1JKL	749	KA3A
1790	W8KPL	1513	G2GM	1304	4X4FU	1024	JA1KRU	747	KA7T
1755	DL1QT	1496	W4BQY	1295	W9FD	925	KF2O	735	AG5C
1738	N6JV	1485	VK4SS	1281	I6SF	908	K8LJG	694	AI6Z
1723	WA2HZR	1482	N2AC	1225	LZ1XL	858	W1IHN	689	G4FAM
1706	K2VV	1459	N4UU	1206	YU3NP	848	KL7AF	655	VE2FOU
1656	ON4QX	1406	N4MM	1197	K6ZDL	801	N3ED	605	N2AIF
1630	K6JG	1351	K5UR	1182	YU7AW	796	AK9Z	600	WA2CNF
1602	W9DWQ	1350	VE7CNE	1105	N6FX	787	DJ1YH	600	OE1KJW
1580	K6XP	1344	WA1JMP						

Kwajalein

Dave Sublette, KX6DS, has been in the Marshall Islands since December and has been showing up with c.w. action on several bands. Actually, he has been on 75–15 and notes that 160 is not allowed there. His home call is K4TO, and he is a member of the North Alabama DX Club in Huntsville. This is also the route for his QSLs, the address being Box 4563, Huntsville, AL 35815-4563. Those with s.a.s.e. or s.a.e./IRC go direct, naturally. Those without take the bureau route.

Dave is open to scheduling by the needy DX types. Normally his work hours are from 1800Z to 0600Z the following day. Weekends are a bit better except for the 2100–0300Z period. Drop Dave a note at P.O. Box 1179, APO San Francisco, CA 96555. He works both c.w. and s.s.b. You can watch for him in the 3505, 7005, 14025, and 21025 kHz slots.

Kermedec

A couple of weeks or more back a note from Jim Smith, VK9NS, reported that he had finally wended his way through all the obstacles and had a permit for a three-week stay on Raoul Island in the Kermedec group. The permit was issued to the Heard Island DX Assn. and named Jim as the DXpedition leader. With the permit in hand, Jim was looking for some intrepid DX operators to put a station on the air. ZL8KI may be the callsign, although there may be separate calls for the c.w. and s.s.b. operations. Perhaps by the time you read this Jim will be on the air; perhaps he'll still be in the planning stages. Anyone who might be interested in a DXpedition to that island can drop a line to Jim Smith, VK9NS, Heard Island DX Assn., Box 90, Norfolk Island 2899 via New Zealand.

Pribilof Petition

The Alaska DX Assn. in downtown Anchorage has been petitioning the DXAC and the ARRL DX Desk for country status for the Pribilofs in the Bering Sea. Last August members of this association operated from St. Paul Island in the group, which is 250 miles out from the mainland. The islands have previously been rejected by the ARRL DX Desk, the last rejection coming in 1976 when there were many efforts to qualify a certain area as a DXCC country because of the "separate administration" clause in the DXCC criteria. Kingman Reef is an example, and there were efforts to qualify national parks, national monuments, indian reservations, and similar spots.

Last year there was a change with

CQ DX Awards Program

S.S.B.

1302	I1EEW	1304	N4KG
1303	SV1EX		

C.W.

604	DL7GK	605	N4KG

S.S.B. Endorsements

310	F9RM/315	300	LA7JO/304
310	VE3MJ/315	300	IØMBX/303
310	W4EEE/315	300	AI8S/301
310	ZL1AGO/314	275	WD9IIX/296
310	I8KDB/314	275	I5BDE/292
310	K6YRA/314	275	W6NLG/288
310	W9SS/310	275	K1VHS/287
300	N4PN/309	250	G4GED/250
300	N4KG/307	QRPp	N4KG
300	VE1YX/306		

C.W. Endorsements

310	N4PN/314	275	K1VHS/277
310	K6LEB/308	250	KP4EQF/259
300	K4KG/304	250	DL7GK/213
275	WD9IIX/284		

Total number of active countries is 315. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

federal control of the islands being relinquished. The Alaska DX Assn. is arguing that under points 2(a) and 2(b) of the criteria the islands are eligible for entry onto the DXCC country list. Note is taken of the 225 mile separation mentioned in the DXCC criteria, the DX Assn. maintaining that point 2(a) is met by the Pribilofs, and that point 2(b) need not apply in this instance and has not in a number of other similar cases.

All this and more was carefully, logically, and in great detail put forth in a multi-page petition by the Alaska DX Assn. Prepare! There is hope for the future, and the future may include the Pribilofs as a DXCC counter.

Some Turn-of-the-Year DX Notes

The Southern California DX Club will be operating three special Olympic stations during July 15 to August 15. Keep in mind that the sixes will be using the special Olympic prefix this year.

This is not exactly a fresh item, but it is an important one for most DXers. A couple of months back, the FCC voted to retain the Morse code requirements for amateur licenses, the vote by the Commission being unanimous. There is a permanent third-party agreement with J3-Grenada.

Keith, WB9TIY, was in the British Virgin Islands a couple of weeks back; his travel plans were up to March 12th. Keith was going with a crew of W9s, a K4, K9GL, K9PW, WB9TIY, and K4UEE, and they were signing a VP2V call. They signed VP2KMX last year.

LU9EIE and LU6ETB were on Laurie Island in the South Orkneys early this year, this being an effort of the Radio Club Argentino. They were at the Destacamento Naval base signing AZ5ZA. QSLs are going to LU2A, P.O. Box 100, 1428 Buenos Aires, Argentina. S.a.s.e. or s.a.e/IRC.

Early in March, Kenneth Palmer, K2FJ, was operating from the Samoas, both American and Western, and from Fiji. He signed K2FJ/KH8, and 5W1ER. If you worked him from the Fijis you probably know what the call was. All QSLs go to his home QTH, 12750 Williston Road, East Aurora, NY 14052 (s.a.s.e., etc.).

ZS2MI on Marion Island was expected to be active at about this time. There also have been reports that Bouvet may be visited by some scientific types out of Norway, but the visit was not expected to be long. TI2J was looking for a TI9-Cocos at about this time, this being one of a number of efforts aimed this spring at the island in the Pacific off Costa Rica. XU1SS has been reported rather regularly around 14006 kHz after 0100Z. VU7WCY was on from the Laccadives in January with a number of operators. If you caught this operation, it was a good one, and if you missed it, it may be a long wait. QSLs go to VU2GDG, G.D. Gopal, Box 3755, Coimbatore 641 018 India. VU2GDG was the leader of the outing which included VU2GO, VU2APE, VU2DVP, VU2CVP, VU2DQP, VU2WY.

The FCC is now issuing amateur licenses for a 10-year term. Your current license is *not* automatically extended, but the next time you renew or up-grade the 10-year tour will be automatic. Luigi Zavattero, IØLLZ, a long-time DXer, became a Silent Key this spring. K1MM went to China with prospects of operating, and he did, two hours from BY1PK last November. Bill Windle, G8VG, a founding member of FOC, became a Silent Key during the winter.

Chod Harris, once one of the ARRL headquarters staff, has proposed "wild card" DXCC counters where an operation is definitely within a country's border but does not meet full DXCC accreditation requirements. The ARRL would keep a roster of wild cards, and each year a needy DXer could claim credit for one. It might include an addition on the Honor Roll listings to show current/deleted/wild-card totals.

If you are looking for DX information, you might add the French DX information net on daily at 1730Z and 14170 kHz. CT1BWY is planning a trip to Sao Tome/Principe-S9 this year. Years back he was CR3AB.

DX Ten Years Back

In April 1974 Ken Palmer, K2FJ, was in Anguilla for the WPX Test, and there was the recurrent high hopes that Clipperton would soon be heard. A number of stations were on from the Andamans, including VU2ANI and VU7GV, a number of additional licenses were the rumor, and a local radio club had been organized. VP8MS was on from South Georgia and the FCC was wondering how amateur radio could mark the bicentennial a couple of years ahead. VR1AR was on from Tarawa. W1AM, the QSL Manager for XT2AG, sent his 17-year-old daughter to Upper Volta to pick up the logs. Of course, along the way she visited her brother in Ouagadougou. W1YRC was sending out the QSLs for XV5AC, XU1AA, and XU1DX; that was back when those countries were not too difficult to work, they say. Fred Laun, then LU5HFI and now HK3NBB, was kidnapped by terrorists from his post in Cordoba. Later he was found wounded, and after a long spell in an intensive-care ward of a hospital, he made a good recovery. There were rumors of a possible China operation, but the FCC was reported in the newspapers as saying it would be illegal for the W/Ks to work the operation. The ARRL deleted AC4.

73, Cass, WA6AUD

QSL Information

QSL information is always needed. There is a joy in finding the route to a needed one at long last, and there is despair when repeated efforts fail. Shrewd DXers, and there are many, collect DX QSL information which can be found in packages. Two good sources are the *QSL Manager List*, Box 700, Rio Linda, CA 95673, and *The QSL Report*, Hiromichi Katsurashima, JH1HWN, 5-2236-33 Iriya, Zama-City, Kanagawa, Japan. All the DX bulletins have QSL information, and you can also place a marker in any magazine you receive to mark the page of QSL information. Here is a portion of information with help from W9LNQ.

AA4V/6Y5 to K4CNW
CT1BY to WA3HUP
CQ/CR/CS/CU1TY to WA3HUP
CS8TBY to WA3HUP
CT7BY to WA3HUP
CT6BY to WA3HUP
C31LBL to EB3BG
A22ME to AK1E
A82LC to SM4CWY
N2EDQ/KH7 to KH6JEB
K2FJ/KH8 to K2FJ
HB8P to F6FQK
HH5CB to K9WJU
T32AQ to AD8J
V3C to N5DDV
V3CAI to KØRWL
V3CAG to WØJLC
V3EN to N6ADI
V3EE to N6ADI
VP2EAG to KJØD
VP2EEW to KU8E
VP2VDH to N6CW
VP2VDQ to AI5P
VP2VEG to WØDVZ
VP8AOH to KØJW
VP8AQH to GM4GRC
W5AT/PJ7 to W5AT
XE2MX to K6VNX
XE2SI to K6VNX
YV8AA to HK3DDD
Y83ANT to Y44ZK
ZF2AG to N8AG
ZL4OY/C to VK3DWJ
ZM8AJN to N7RK
ZS6WCY to ZS6TJ
3X4EX to N4CID
4K1GDW to UQ2GDW
4O1WCY to YU1FJK
4U38UN to W2WZV
5W1ER to K2FJ
6V3HL to WA4VDE
6V8DY to VE4SK
9H1CE to W2KF
9X5MB to ON5CM
AZ5ZA to LU2A, P.O. Box 100, 1428 Buenos Aires, Argentina
CE4TA to Radio Club Talca, Avda 2 Sur 359 3er Piso, Casilla, Talca, Chile
CT1BWY to Dennis Cornell, Box 26192, Tucson, AZ 85726
CT2FE to Dennis Cornell, Box 26192, Tucson, AZ 85726
CX8DT to (No call on envelope) M.A. F. Dallida, Box 18947, Montevideo, Uruguay
HK1AMW to Glenn Tracey, KC3EK, 6 Osborne Ave., Baltimore, MD 21228
H5ABP to B.P. 3848, Mabatho
KX6DS to North Alabama DX Club, Box 4563, Huntsville, AL 35815-4563
P29JM to J. Mowappi, P.O. Box 1205, Arawa, Bougainville, New Guinea
T30DB to D. Blythe, Box 457, Betio, Tarawa, Central Pacific
VU7WCY to G.D. Gopal, Box 3755, Coimbatore 641-018, India
WH0AA to Box 1398, Saipan 96950
W6QL/HC1 to YASME, Box 2025, Castro Valley, CA 94546
W6KG/HC8 to YASME, Box 2025, Castro Valley, CA 94546
W6KG/HK0 to YASME, Box 2025, Castro Valley, CA 94546
3D6AQ to P.O.B. 64, Manzini, Swaziland
4M5ARV/6 to Churu-Meru Expedition, Box 3636, Caracas 1010-A, Venezuela
5N8AMA to B/P 461, Kano, Nigeria

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CIRCLE 110 ON READER SERVICE CARD

In some circles it's called Bambusa Arundinaria Dendrocalamus, but to an amateur it can be the making of a quad. Whether you cut it yourself or buy it, W4DQU shows you how to treat bamboo to last a long time.

The Preparation and Use of Bamboo Poles For Quads

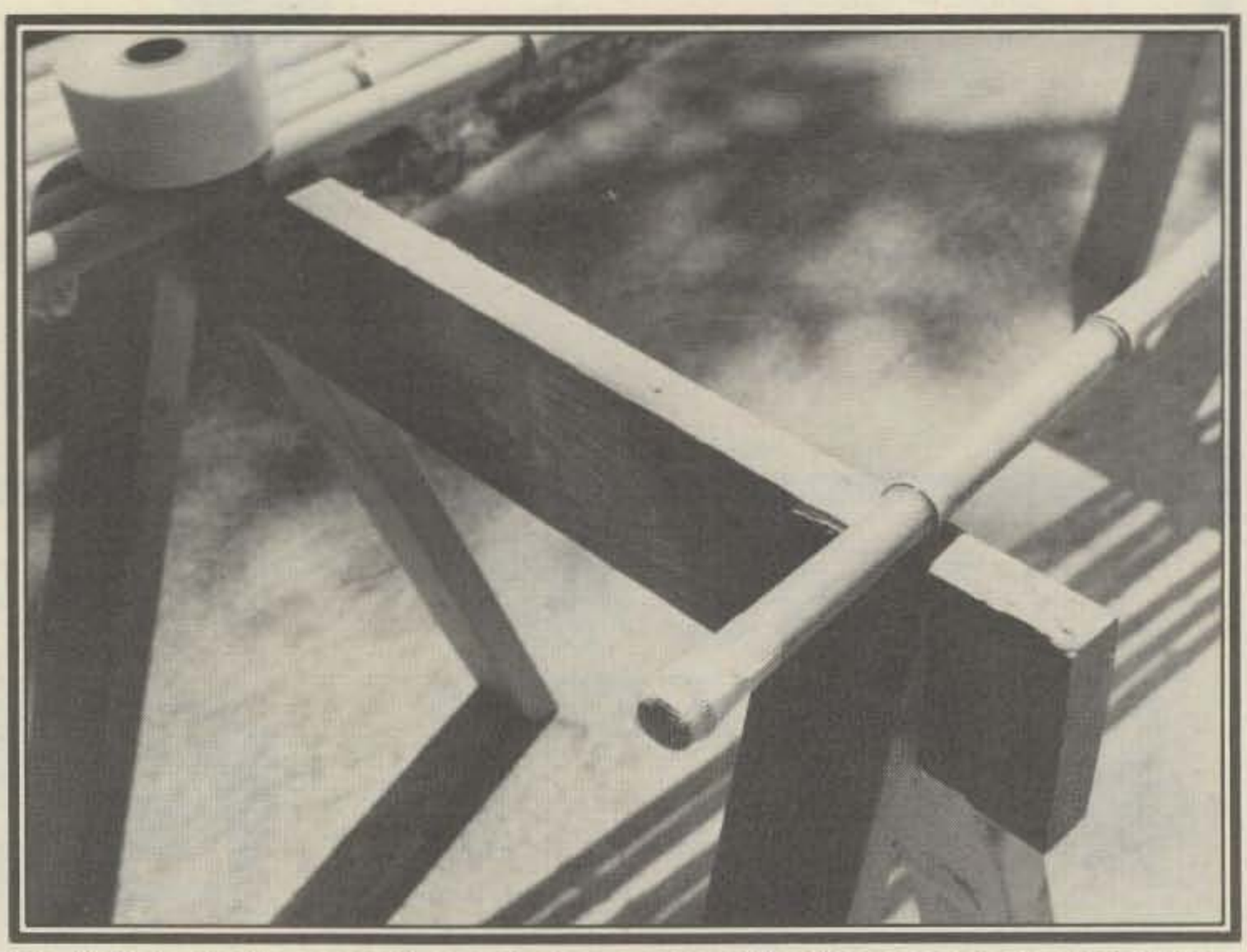
BY RICHARD E. JAMES, JR.,* W4DQU

The greatest problem with the cubical quad has always been what type of poles to use. Fiberglass is expensive, P.V.C. pipe can be too flexible, wood is too heavy, and bamboo ages and splits in two or three years.

On a trip to ZL and VK lands I saw some bamboo poles that had been covered with fiberglass and epoxy. One set of poles was 10 years old and looked as good as new! On my return to W land I had to try fiberglassing some poles myself. What a disaster! I wanted to spiral-wrap the cloth around the poles using about 3 inch wide strips of fiberglass cloth cut from yard-wide pieces of cloth. The only way I could get the cloth to stay on the poles was to soak a roll of the 3 inch wide strip in epoxy before trying to spiral-wrap the pole. Well, fiberglass cloth is a coarsely woven affair, and the outer threads shed off or unravel so badly that one ends up with a mess. Going to fiberglass matte was as bad if not worse!

At this point I gave up for a few months until one day I read an article about the use of fiberglass gauze tape for drywall work. It comes in 300 foot rolls, is 2½ inches wide, is sticky on one side, costs about $8.00 per roll, and will spiral-wrap about 12 poles. It has the consistency of window-screen material and is a light bluish-white. This material couldn't have been better if it had been designed by an amateur who was dying for a quad.

Before going directly into fiberglassing the poles, let's look at bamboo. There are many varieties, and I have been amazed at how much bamboo is grown for ornamental purposes in the U.S.A. I have found some 40 feet high in the Birmingham area! My favorite patch is one covering about ½ acre near my home. It is all about 20–25 feet in height and is about 1¼ to 1½ inches in diameter at the bottom. The lady who owns it offered to *give* me all I wanted, but I insisted on paying her something for them because she can use the help. (No extra charge for this public-relations tip!)



The first step in the procedure is to wrap some of the fiberglass gauze drywall tape around the butt end of the pole.

Select poles that grew the previous year. Do not cut down this year's growth (there is not much strength in the new poles). Last year's growth will be a slightly lighter green and even may be partly yellow. Select poles in the size mentioned in the previous paragraph. Using a hacksaw, saw off parallel and near to the ground. An angle cut will only ensure the next person a punctured foot!

After cutting the desired eight canes, select the best part of the cane for each pole. Sometimes you might want to cut off some of the bottom of the cane because it is crooked or too big in diameter. Usually you will do all or most of your trimming from the top of the pole. The poles should be fairly straight and taper down from about 1¼ inch or 1½ inch to about ½ inch to ¾ inch at the top end. Always cut your poles a little longer than needed by cutting just past the next joint (at both ends there should be a joint). If you are building the quad I wrote about in the April 1982 issue of *CQ*, make the poles at least 13 feet 1 inch or longer as necessary to reach the next joint in the cane. (The most distant drill hole for my quad's 20 meter reflector in the c.w. portion of the band was 13 feet 5/16 inches, so 13 feet 1 inch would take care of anything in my article.) If you are buying poles, try to buy poles at least 18 to 20 feet long and cut to length.

*3653 Crestside Road, Birmingham, AL 35223

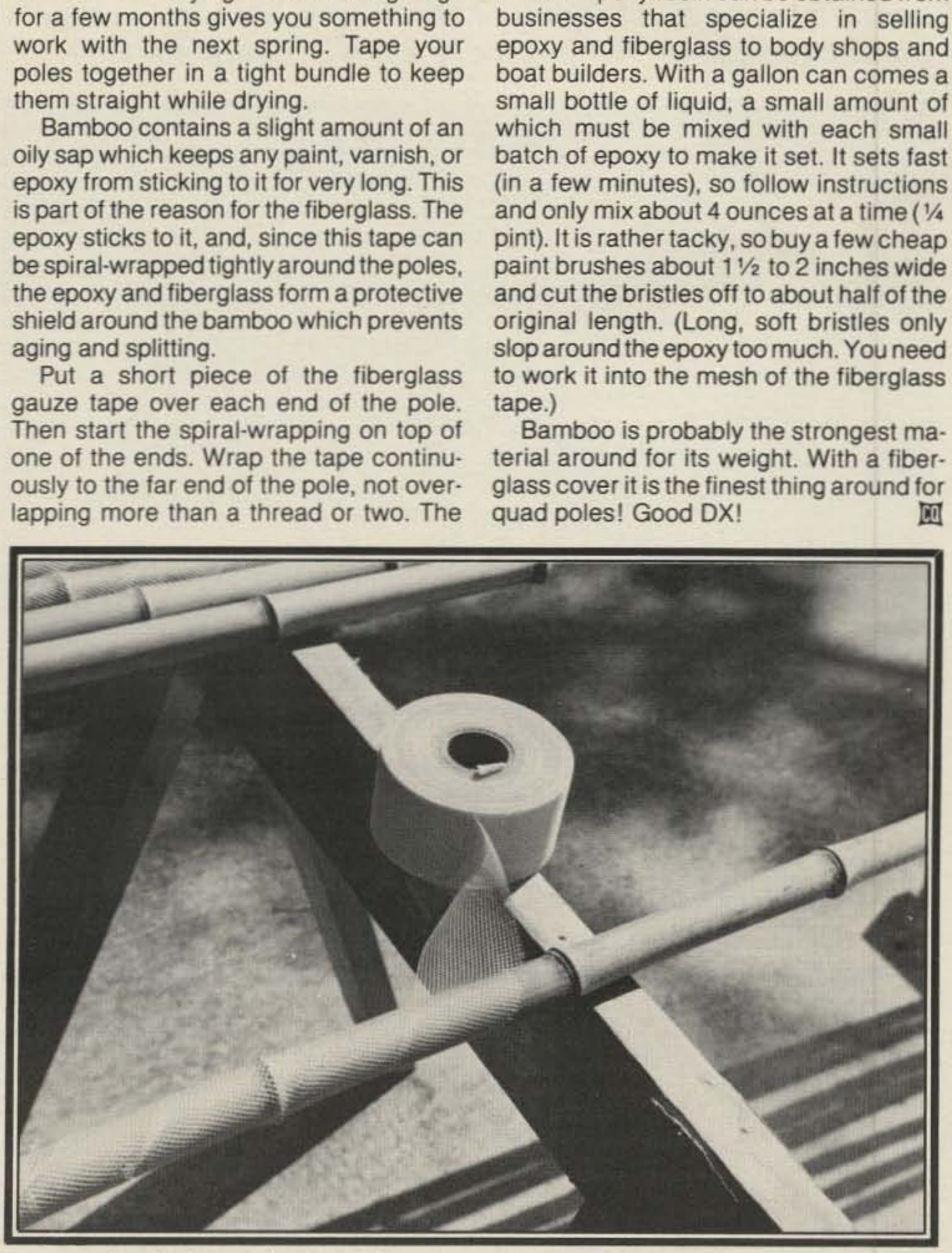
If you cut your own poles, they will need to be dried out. Cutting them one summer and drying them in the garage for a few months gives you something to work with the next spring. Tape your poles together in a tight bundle to keep them straight while drying.

Bamboo contains a slight amount of an oily sap which keeps any paint, varnish, or epoxy from sticking to it for very long. This is part of the reason for the fiberglass. The epoxy sticks to it, and, since this tape can be spiral-wrapped tightly around the poles, the epoxy and fiberglass form a protective shield around the bamboo which prevents aging and splitting.

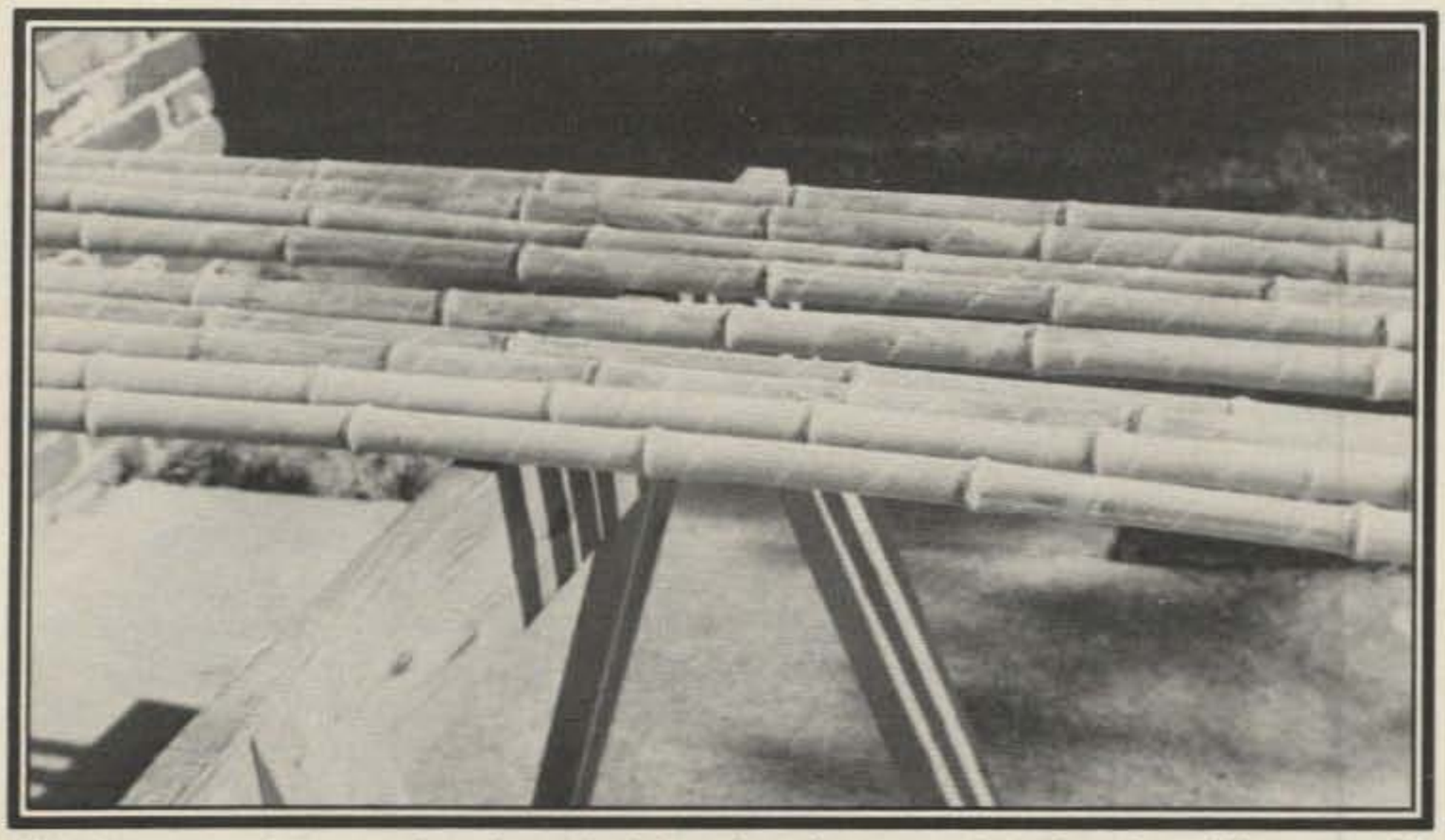
Put a short piece of the fiberglass gauze tape over each end of the pole. Then start the spiral-wrapping on top of one of the ends. Wrap the tape continuously to the far end of the pole, not overlapping more than a thread or two. The tape will stay in place until you are ready to paint with epoxy.

Your epoxy resin can be obtained from businesses that specialize in selling epoxy and fiberglass to body shops and boat builders. With a gallon can comes a small bottle of liquid, a small amount of which must be mixed with each small batch of epoxy to make it set. It sets fast (in a few minutes), so follow instructions and only mix about 4 ounces at a time (¼ pint). It is rather tacky, so buy a few cheap paint brushes about 1½ to 2 inches wide and cut the bristles off to about half of the original length. (Long, soft bristles only slop around the epoxy too much. You need to work it into the mesh of the fiberglass tape.)

Bamboo is probably the strongest material around for its weight. With a fiberglass cover it is the finest thing around for quad poles! Good DX! CQ

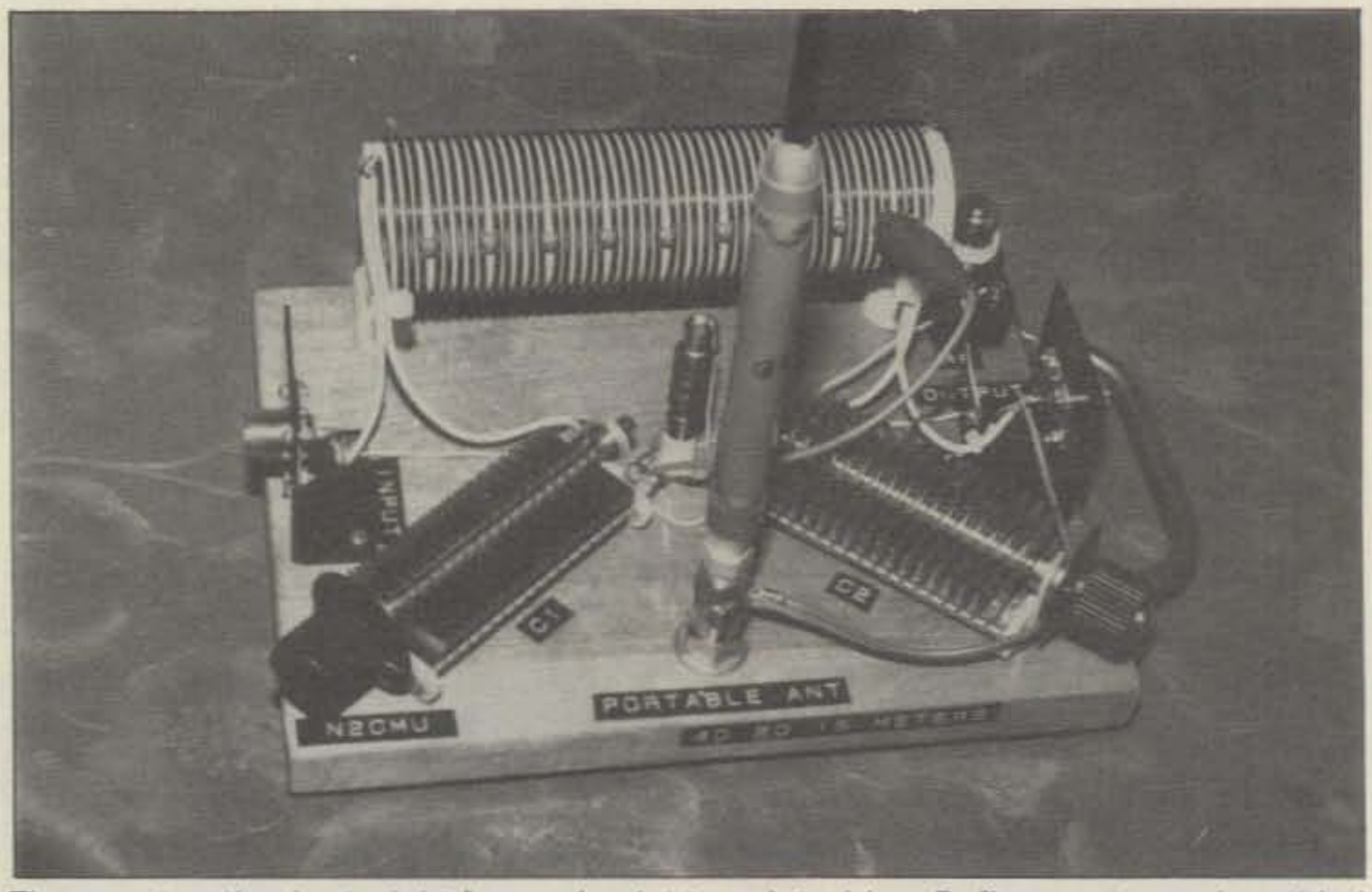


The tape is spiral-wound around the pole starting from the butt end and working up.



With the wrapping completed on all eight poles, the epoxy is painted on. All you need is a couple of sawhorses in the backyard and a nice day.

While not really as clandestine as a James Bond operation, amateurs have always figured a way to operate in the most trying of situations. Here's another great example of "where there's a will, there's a way."



The construction is straight-forward point-to-point wiring. Refinements can be added in relation to the size of your junkbox.

The "Hidden" Apartment Antenna

BY GLENN W. RUSSELL*, N2CMU

It's a portable antenna and a sometimes antenna, the sometimes being those times you want to get on the air. The antenna is designed to work indoors, is very easy to construct, and best of all is inexpensive. If you are faced with landlord or other antenna restrictions, perhaps you might find this to be a reasonable solution to your problem. It is, as I like to call it, my "four-band table-topper."

The basic configuration is a combination of an indoor antenna and an antenna tuner. I used a basic pi-network impedance matching network along with a mobile Hustler resonator. The choice of resonator depends on the band on which I want to operate. I have resonators for 40, 20, 15, and 10 meters. Without a resonator, the unit is an antenna tuner.

Construction is literally breadboarded with everything mounted on a 7" × 9" × ¾" piece of hardwood board. The tuning capacitors are 150 pF each. The coil is 2" in diameter, 7" long, wound at 7 turns per inch. I've used 8 tap points on the coil. The tap points are found experimentally while adjusting the antenna for lowest s.w.r. The photo shows construction details and the simplicity of the device.

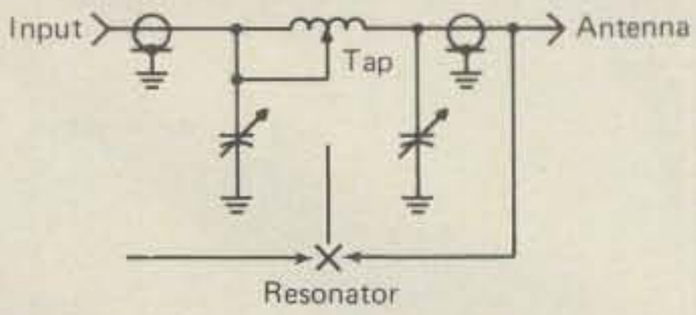


Fig. 1– The simple circuit for the four-band tabletop hidden antenna.

Although it is a compromise antenna, it does work. I have gotten the s.w.r. down to 1.3:1 on 40, 20, and 15 meters. I still have a few problems with a 2.5:1 s.w.r. on 10 meters, but I don't operate on 10 very much. On the other hand, with the 20 meter resonator installed, the total height of the antenna is 28".

With this antenna sitting on my workbench within my aluminum-sided home I've managed to work some DX. After completing the antenna and adjusting the s.w.r., I installed the 20 meter resonator and started hearing UAØs and many other DX stations. I soon worked a UK2 station and received a 569 report. The next day I worked eight other European countries and Israel with similar signal reports.

No doubt improvements can be made to the system, but as a simple project, it's hard to beat. CQ

*915 Academy St., Apt. 3, Watertown, NY 13601

Please send all reader inquiries directly.

CIRCLE 90 ON READER SERVICE CARD

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CQ SHOWCASE

Heil Sound System SS-2

The Heil Sound System SS-2 is a complete sound system which contains two 5 watt amplifiers, a 3½ ″ woofer with a half-pound magnet, and a 1½ ″ tweeter with a 12 dB per octave crossover network at 1500 Hz, right where the response of the human ear begins to fall off and that extra punch for maximum articulation is needed. The second 5 watt amp can be used to drive a second speaker system that is used in a new dual diversity system that will be introduced late in 1984.

Mobile operation is enhanced with the HSL SS-2. An accessory mounting bracket allows mounting under the dash. The HSL SS-2 measures 3.75 ″ x 5 ″ x 3.75 ″. It weighs 2.2 lbs and is housed in a high-impact silver-beige case. Power requirements are 13.8 volts d.c. at 400 MHz. A red LED is mounted on the front panel for power-up indication. All input/output connections are made through a 5 pin DIN plug on the rear panel. A 110 volt power adapter and a mobile lighter power plug are also available. For more information, contact Heil Sound, Ltd., Marissa, IL 62257, or circle number 102 on the reader service card.

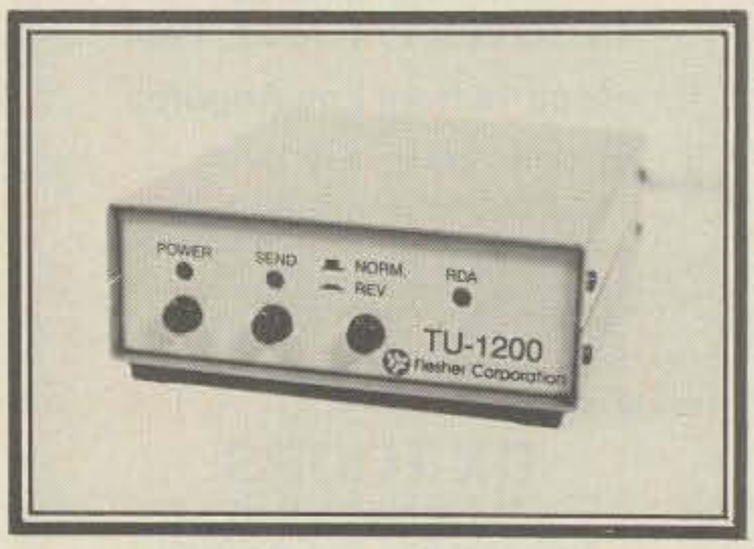
Micro Control Specialties MR4 Receiver

The new Micro Control Specialties MR4 receiver uses 7 helical resonators in the front-end and 12 poles of i.f. filtering to achieve a dynamic range greater than 100 dB. By using a first i.f. of 21.4 MHz and extensive shielding it also rejects images by 120 dB.

The MR4 is intended for fixed frequency applications in the v.h.f. and u.h.f. bands especially at multi-transmitter sites where r.f. interference is severe. The receiver is available in both modular and rack-mounted versions. The rack-mounted version includes full metering plus a local audio speaker. For more information, contact Micro Control Specialties, 23 Elm Park, Groveland, MA 01834, or circle number 104 on the reader service card.

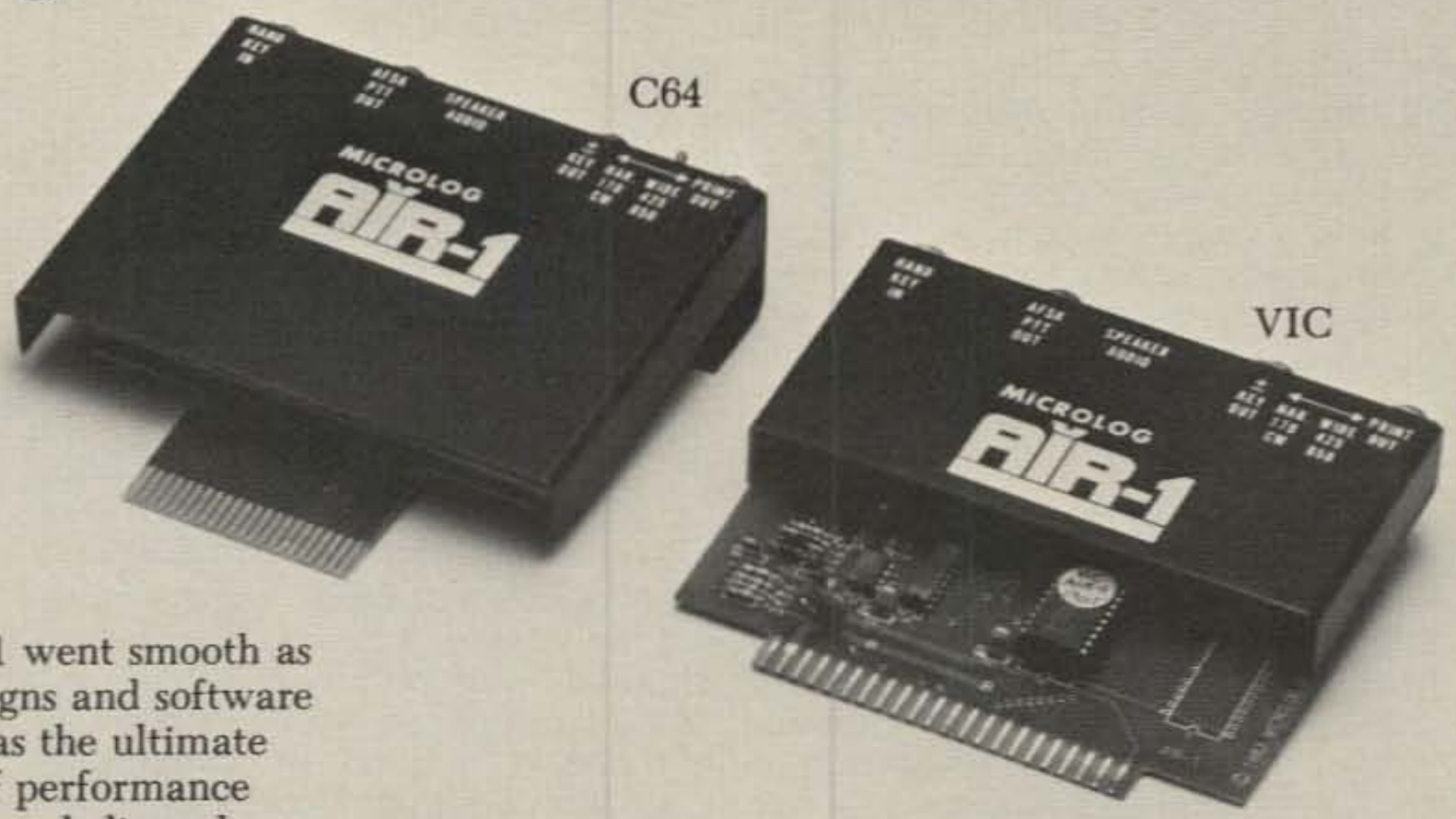
Flesher Corp. TU-1200 U.H.F./V.H.F. RTTY Terminal

The TU-1200 u.h.f./v.h.f. RTTY terminal from Flesher Corp. receives all Baudot and ASCII rates to 1200 buad and uses Bell 202 standard tones (1200 Hz and 2200 Hz). The TU-1200 has many applications for modern communications, including RTTY repeater systems. The unit provides TTL and RS-232C compatible I/O and includes transmitter PTT output for complete remote control. It also provides AFSK output and RDA (received data available.)



Front-panel controls include only three push-button switches to operate Power, Send, and Normal/Reverse Shift. Three LED indicators show Power, Send, and RDA status. The TU-1200 is 5⅛ ″W x 1¾ ″ H x 6 ″ L and is available either wired ($129.95) or in kit form ($99.95) complete with a mating DB-25 I/O plug, power supply, and manual. The TU-1200 will be available by April 30th. For more information, contact Flesher Corp., P.O. Box 976, Topeka, KS 66601, or circle number 101 on the reader service card.

The Evolution of a Superior Terminal for RTTY and CW



AIR-1 Past

As an R & D project, the AIR-1 went smooth as silk. By using our proven TU designs and software that's been refined on units such as the ultimate ATR-6800, we obtained a level of performance only found in much more expensive dedicated systems. Compare it for yourself or ask an AIR-1 owner. They work great!

AIR-1 Present

Along with great performance, the AIR-1 boasts an impressive list of features, some of which are exclusive to Microlog.

- Computer enhanced detection means extensive use of software digital filtering techniques for noise and bandwidth that track the operating speed and code.
- Full speed RTTY 60 to 132 WPM, CW to 150 WPM, & 110/300 Baud ASCII.
- Choice of full or split-screen display with large type ahead text buffer and programmable memories.
- On screen tuning indicators mean you never have to take your eyes off the video for perfect copy tuning. RTTY "scope" cross hatch and "red-dot" signal acquisition monitor right on the screen.
- Keyword or manual control of VIC or Parallel printer and receive buffer storage.
- Convenient plug-in jacks for all connections.
- Single board design contains TU & ROM software that does not require external power.
- Full one year warranty.
- WRU, UNshift On Space, Word wrap-around, Test "Quick Brown Fox" & "RYRY" in ROM. Break buffer, Random Code generator, Hand-key input, Real-time clock, sturdy metal cover and more.

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The optional on-board 4 mode AMTOR includes these exciting extras:

- ARQ mode A (chirp), Time Diversity mode B (Selective & Collective Broadcast), and Listen (eavesdrop) for mode A.
- Word processor mode for full editing of transmit and receive text.
- The unprecedented ability to transmit BASIC programs over the air directly from memory!!! Just load your program normally by hand, disc or tape, jump to AIR-1 to establish communications, and type a special control command. The AIR-1 does the rest. All standard Commodore Basic and screen control commands are transmitted/received intact, just as you typed them, for immediate RUN/SAVE. Share BASIC programs with your friends around the world without tedious "two-step" re-typing or mailing fragile discs and tapes.

AIR-1 Future

There's room for expansion and adaptability with some really "neat stuff" planned for the AIR-1. But then, why tip off the competition? Now you understand how we live up to the title "Innovators in Digital Communications." The complete AIR-1 for VIC-20 or C-64 is $199 (with AMTOR, $279). See it at your local dealer or call Microlog Corporation, 18713 Mooney Drive, Gaithersburg, Maryland 20879. TELEPHONE (301) 258-8400, TELEX 908153.

CIRCLE 53 ON READER SERVICE CARD

Antennas

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

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

MUF and Stuff

Last month columnist W8FX discussed the "quadricube" beam, as well as a number of software topics. This month, he emphasizes more software, blending antennas and propagation in a combination you're sure to find interesting.

In last month's Antennas column we highlighted the so-called "quadricube" antenna of Antonio Lascurain, XE1LFA. We also covered a modification of the W6ZGN v.h.f./u.h.f. ray path computer program. In addition, we examined a set of logging programs and an interesting Maximum Usable Frequency (MUF) program from the Ham Data Company. We also made mention of the amateur-oriented *vic-COMM Journal*.

This time we will recognize the fact that once you've installed a beam antenna, the twin questions of "when" and "where" to aim it are usually raised. To help answer these two important questions, the focus will be on more software of an antenna and propagation nature. We'll first provide some background on the nature of h.f. propagation and offer some important definitions, discuss the **DXPREDICTOR** from Flynn's Business Services, the **MUFPLOT** from Base 2 Systems, and the **PROCAST/VICCAST** programs by Procast. We'll also mention several programs offered by Sunderland Software; Walt Grosch, KA9GLB; and Jim Grubbs, K9EI. Let's begin by looking briefly at the nature of the propagation "beast."

A Mini-Primer on H.F. Propagation

Three waveforms are generally associated with the propagation of radio signals: groundwave, tropospheric, and ionospheric. For the purposes of h.f. DXing, it's the ionospheric waveform with which we are most concerned, and which we will cover here.

To review, the ionosphere is that portion of the earth's atmosphere which lies between altitudes of 60 and 200 miles. The ionosphere is usually subdivided into three layers (*D*, *E*, and *F*) which bend and absorb radio waves at different rates. Both the *D* and *E* layers may have a significant impact on h.f. propagation, but the *F* layer is the one most responsible for DX communications. This layer is further subdivided into the *F1* and *F2* regions.

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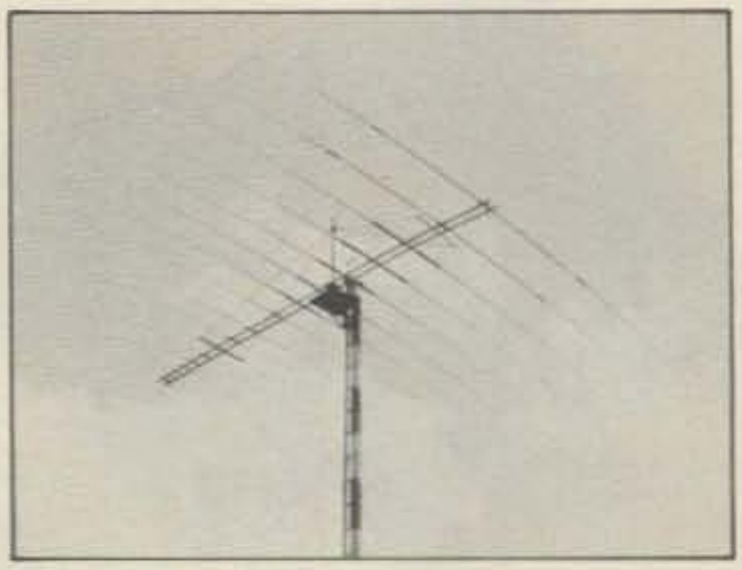

The log-periodic beam represents a "dream antenna" for many amateurs, especially with the advent of the new WARC bands, where frequency agility is of special importance. Two problems remain, regardless of antenna: when to point the antenna, and where to point it. The MUF and beam-heading calculation programs discussed in the column this month provide welcome assistance and lead to more efficient station operation. (Photo courtesy Hy-Gain Electronics)

Most propagation programs analyze the *F* layer characteristics for Maximum Usable Frequency (MUF) predictions, and the *D* and *E* layer characteristics for Lowest Usable Frequency (LUF) forecasts.

To be sure, ionospheric propagation is dependent upon many things besides the layer structure which we mentioned. Among these other factors are ultraviolet light and particle emissions from the sun; the travel time of these emissions; the critical frequency at which wave bending becomes ineffective; the time of day; absorption rates; and season. Other important factors include the latitude and direction of the wave path; the point on the 11-year sunspot and the 27.5-day solar cycles; the earth's geomagnetic activity and level; and solar disturbances of various kinds.

Before proceeding further, it's a good idea to define some key terms used in discussing propagation. These include:

1. **HPF**, or **H**ighest **P**ossible **F**requency. This is the highest frequency on which a signal will propagate over a given path; signals higher in frequency will not propagate due to insufficient bending. Note that the HPF is a physical barrier that can't be overcome by a higher power transmitter or a high-gain antenna.

2. **MUF**, or **M**aximum **U**sable **F**requency. This is, as used here, the maximum frequency at which h.f. signals will propagate over a given path at least 50% of the time. This is not, however, the highest possible frequency for communications, nor is MUF synonymous with "critical frequency."

3. **FOT**, or **F**requency of **O**ptimum **T**ransmission (or **T**raffic). This is the frequency at which a signal will propagate 90% of the time. Thus, on average, for 90% of the time the maximum usable frequency for communications will be above this value. This frequency may be considered to be the best choice for h.f. DX communications when extreme reliability is required, as for military and commercial purposes.

4. **LUF**, or **L**owest **U**sable **F**requency. This is the lowest frequency which will generally support h.f. propagation over a given path. For 50% of the time the actual lowest frequency that will allow communications over a path will be below the LUF. For the remaining 50% of the time the lowest frequency will be above the LUF.

5. **Critical Frequency**. This is the highest frequency at which a signal will be returned to the earth. Contrary to popular belief, the MUF may be considerably higher than the critical frequency. For example, under excellent conditions it's possible for 10 meter refraction to occur when the critical frequency is but 7 MHz.

6. **A- and K-indices.** The *A*-index is a measure of geomagnetic activity which ranges from 0 (extremely quiet) to 400 (very disturbed). The *K*-index is a quasi-logarithmic index of geomagnetic activity ranging from zero to nine units. The two indices are closely related, but use different scales of measurement for geomagnetic states. The *A*-index describes conditions for the previous 24 hours and is based on the *K*-index, which describes conditions for the past 3 hours.

7. **Solar Flux and Sunspot Number**. The solar flux is a measure of the sun's energy output in terms of solar electromagnetic radiation, and it may range from about 60 to 400 units. There is a positive correlation with the sunspot number, which physically refers to the total number of "spots" and cluster groupings visible on the face of the sun using a high-power telescope.

From all this it's not too hard to see that the chances of communications over a path are greatest for frequencies which lie somewhere between the MUF and the LUF, thus defining the so-called "DX window." By and large, DX signals will be strongest at frequencies bracketing the MUF.

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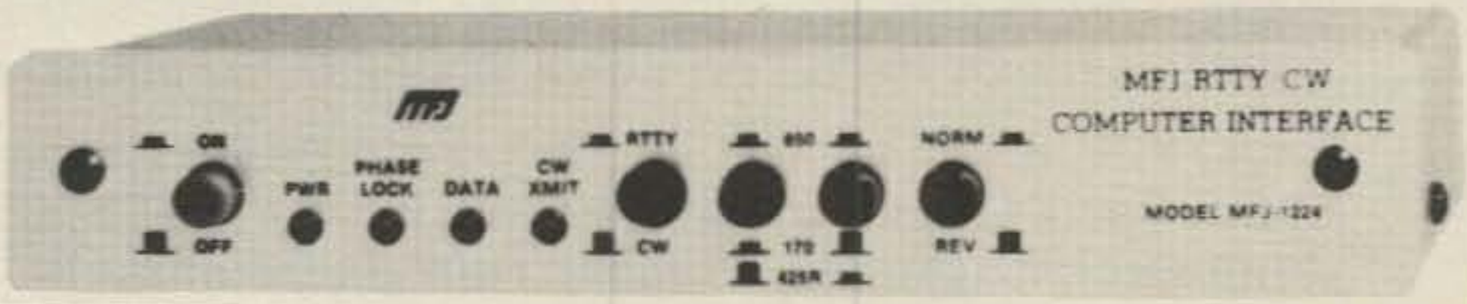

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Naturally, most h.f. DXers are primarily interested in the MUF. As we indicated in last month's column, most of the commercial MUF prediction programs make use of public domain algorithms which owe their existence to extensive work done at the Naval Ocean Systems Center (NOSC) at San Diego. The original MUF program developed by the Navy was extensively tested and verified. Test data covered a complete sunspot cycle and incorporated MUF measurements from more than 4700 test sites on 23 h.f. signal paths. As part of the verification process, the program's predictions were compared to actual MUF measurements and predictions of mainframe computer systems. A home-computer-size version of the Navy MUF program was introduced in amateur radio circles by Bob Rose, K6GKU, in his landmark *QST* article "MINIMUF: A Simplified MUF Prediction Program for Microcomputers," which appeared in the December 1982 issue.

The MINIMUF program calculates single skip MUF, where the MUF equals the critical frequency of the *F2* layer times a certain "M" factor. The critical frequency is dependent upon the cosine of the angle of the sun at the midpoint of the propagation path (the "solar zenith angle"), the sunspot number or solar flux, time of day, and several constants. The "M" factor takes into account layer size, and it adjusts for factors such as midnight sun conditions over the path, high latitudes (those greater than 45 degrees), and transequatorial paths. Where more than a single hop occurs along a path, two MUFs are calculated, and the lowest of the two is chosen by the program.

General propagation condition forecasts can readily be obtained from the monthly propagation column which appears in *CQ* as well as from various DX newsletters. "Same day" raw information is not difficult to obtain for use with various MUF/LUF computer programs. The National Bureau of Standards provides current basic propagation data over station WWV, which broadcasts on 2.5, 5, 10, 15, and 20 MHz. A propagation bulletin prepared by the NOAA is aired by WWV every hour at 18 minutes past the hour. THis bulletin provides much useful propagation information, including yesterday's solar flux and *A*-index; the current *K*-index; past solar and geomagnetic activity; and expected solar and geomagnetic activity for the following 24 hours. The solar flux data is updated each day at 1818 UTC.

Geomagnetic Activity Range	Geomagnetic K Level	A	Solar Flux Range & Expected Propagation 90-130	130+
Quiet	0–2	0–7	Above/High Normal	Above Normal
Unsettled	2–3	7–15	High/Low Normal	High Normal
Active	3–4	15–30	Low/Below Normal	Low Normal
Minor Storm	4–5	30–50	Below Normal/ Disturbed	Below Normal
Major Storm	5+	50+	Disturbed	Disturbed

Fig. 1– The table shows the relationship between geomagnetic conditions and solar flux. Generally, best DX conditions will be experienced when the A-index is roughly 7 or less and the K-index is 0 to 2, coupled with a solar flux of above 130. NOAA propagation bulletins are broadcast by WWV every hour at 18 minutes past the hour. (Table from CQ Propagation column, by George Jacobs, W3ASK, October 1983, p. 92.

Researchers have found that when geomagnetic conditions are quiet, and there are no more than two hops in a given signal path, a sound estimate of MUF can be produced within about plus/minus 3.8 MHz using versions of the NOSC algorithms. However, there can be great and unpredictable changes in band conditions when various anomalies such as solar flares occur, producing **SID**s (**S**udden **I**onospheric **D**isturbances) and **SWF**s (**S**hort **W**ave **F**adeouts). A key to anticipating such disturbances can be found in monitoring the *A*- and *K*-indices broadcast by WWV.

Note that minimum absorption and best propagation occur when the *A*-index is roughly 7 or less and the *K*-index is 0 to 2. The relationship between geomagnetic conditions and solar flux is shown in fig. 1. For example, with a solar flux of 90, an *A*-index of 10, and a *K*-index of 3, the unsettled geomagnetic activity leads to "low normal" conditions.

We've indicated that there is also a lower limit for communications, a fairly fuzzy boundary known as the LUF. As the frequency of operation decreases, atmospheric absorption increases, to the point where practically none of the signal remains to be passed through the *D* and *E* layers on to the *F* layers and back to earth. This is most notable during the daytime, when ionization levels, and therefore absorption, are highest.

Note that the highest frequency that can be propagated over a signal path (HPF) is dependent almost entirely on refraction: increases in power levels or antenna gain have little effect. However, the absorptive function associated with the LUF at least can be overcome partially by attempts to increase the signal-to-noise ratio, such as by increasing effective radiated power.

Nevertheless, LUF can be determined, however roughly, in a more straightforward manner than MUF. Since the density of the *D* and *E* layers is directly related to the position of the sun in the sky, the time of day can provide a useful approximation of *E*-layer density. This approximation, especially when coupled with information about power level and antenna gain, can be used to estimate the LUF "barrier," below which communication isn't likely to be supported.

In practice, rather than being a mathematically precise number, the LUF, in effect, tells you at which times of the day the absorption is at its worst, as a guide for choosing the time for the most reliable communications; at other times, absorption may simply be too strong to support communications. Bear in mind, too, that at the lower h.f. frequencies most antennas installed at moderate heights have takeoff angles that are different from (usually higher than) the angle at which the antenna supposedly has its maximum

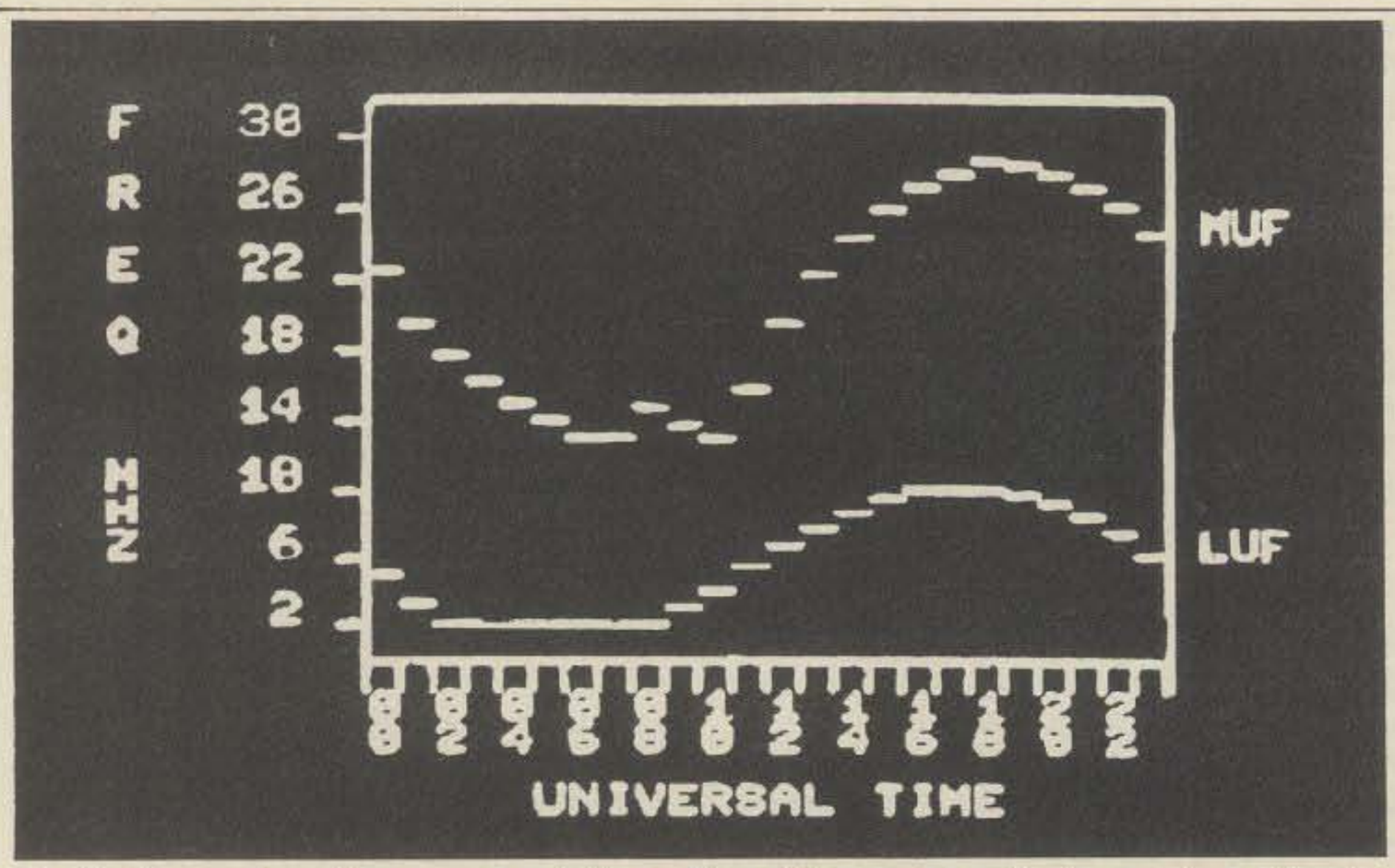


Fig. 2– Shown here is a representation of the video screen display produced by the "DXPREDICTOR" program for the PET/CBM and Commodore 64 computers. In addition to MUF and LUF, the program also calculates FOT, which is not shown on the graph but which can be displayed in a separate tabular presentation. The Vic-20 display is similar, but plots every other hour. (Distance and bearing are also calculated, but are not shown on this representative display.)

gain. Thus, "plugging in" the gain at the "peak" of the antenna or beam lobe may cause you to believe the LUF is lower than it actually is for your setup.

Being a little more specific, whereas short-path distances of, say, 600 to 2000 km have optimum take-off angles of between 30 and 40 degrees, long-skip DX paths of more than 8000 km have take-off angles of 5 to 10 degrees. Unfortunately, horizontal antennas (such as dipoles) usually have very low gain at angles less than 10 degrees, unless placed at heights one wavelength or more above ground. Verticals do better, however, with maximum gain normally under 10 degrees.

With this background on propagation in mind, let's examine three rather sophisticated propagation programs: the "DXPREDICTOR," "MUFPLOT," and "PROCAST/VICCAST." Our thanks to Mr. K.J. Flynn, of Flynn's Business Services, as well as to Mr. Jim Dolson, WB8ZBD, and Mr. Joe Turner, K8CQF, of Base 2 Systems, for providing much of the "meat" of the preceding technical discussion.

The "DXPREDICTOR"

This program was written to provide amateurs with a ready-to-run routine that can be used both as an operating aid and an educational tool. The program is based on the NOSC MUF algorithms, and it displays three useful propagation path parameters—MUF, FOT, and LUF—as well as beam heading to target and great circle path distance. It is available for the Apple II+/IIe, IBM-PC, Commodore Vic-20 and 64, and PET/CBM computers (we examined the C-64 version). Prices range from $30 to $50, depending on the computer.

Once booted up, the program asks a series of questions for input data. These include transmitter and receiver latitude and longitude, month and day, sunspot number or 10 cm x-ray flux, transmitter power, and antenna system gain. Once the data has been entered, the calculations begin. A graph is produced on the video screen which displays the LUF and MUF "curves" for the entire day, from 0000 to 2300 UTC, as well as the distance in km and great circle bearing to the target. The program also calculates FOT. FOT is not shown on the graph in order to keep it uncluttered, but it can be displayed on keystroke command in a nicely formatted tabular presentation available once the screen graph has been drawn. All program display is on the screen.

A few interesting points about the program: (a) Both transmitter and receiver lat/lon coordinates must be inputted; (b) long-term predictions can be made using the middle date of the month (instead of using the current date) and by using a smoothed mean sunspot number; (c) you have the choice of using either sunspot number or 10.7 cm x-ray flux (you can simply use the WWV solar flux, but 5-day running averages are best for plots of immediate conditions, and 15-day to 90-day averages are best for future predictions; (d) the transmitter power input and antenna gain input prompts are used to "fine tune" the LUF calculation. The latter prompt asks for the combined gain of the transmitter and receiver antennas. This is something which will probably have to be "eyeballed" unless one knows what antenna is being used on the other end of the QSO!

I found the "DXPREDICTOR" to be accompanied by adequate documentation, and to work as advertised on the Commodore 64. Though written primarily in BASIC, I found it to be reasonably fast-acting. According to the manufacturer, there are some minor differences in program operation which arise due to the idiosyncracies of each computer, but the general program format and instructions are applicable to all program versions.

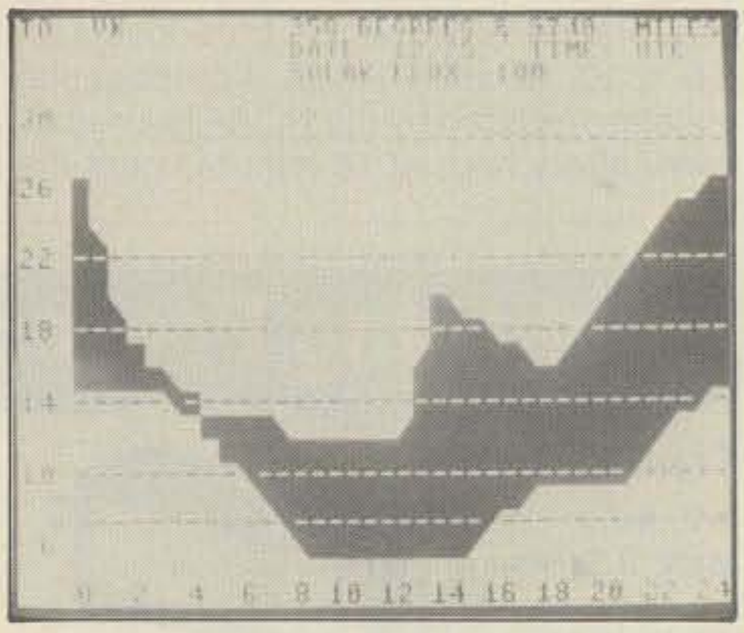
A representation of the "DXPREDICTOR" screen display is shown in fig. 2.

"MUFPLOT"

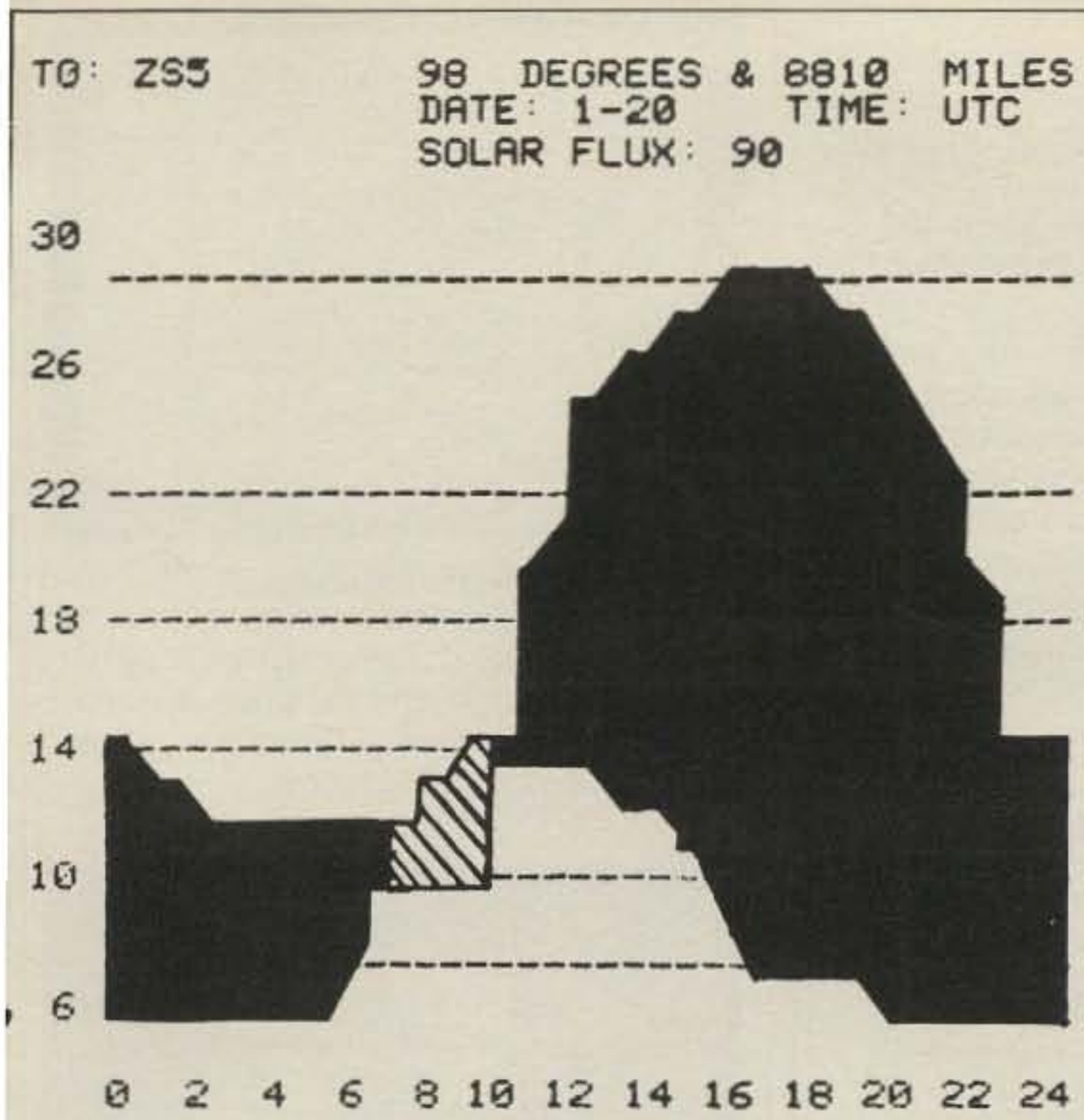
"MUFPLOT" is a comprehensive propagation program for the Commodore 64 or Vic-20. The former version is written in a fast machine language, the latter in BASIC, although both use a special search routine that provides fast response time. Both programs are available on disk or tape and cost between $7.95 and $29.95, depending on computer and storage medium. We'll primarily reference the C-64 version here.

The "MUFPLOT" has four operating aid functions: (a) calculating a great circle beam heading to a user-selected target; (b) determining the statute-mile distance between user and target; (c) estimating the MUF to the target over a 24-hour period; and (d) estimating the LUF for the same target and over the same period.

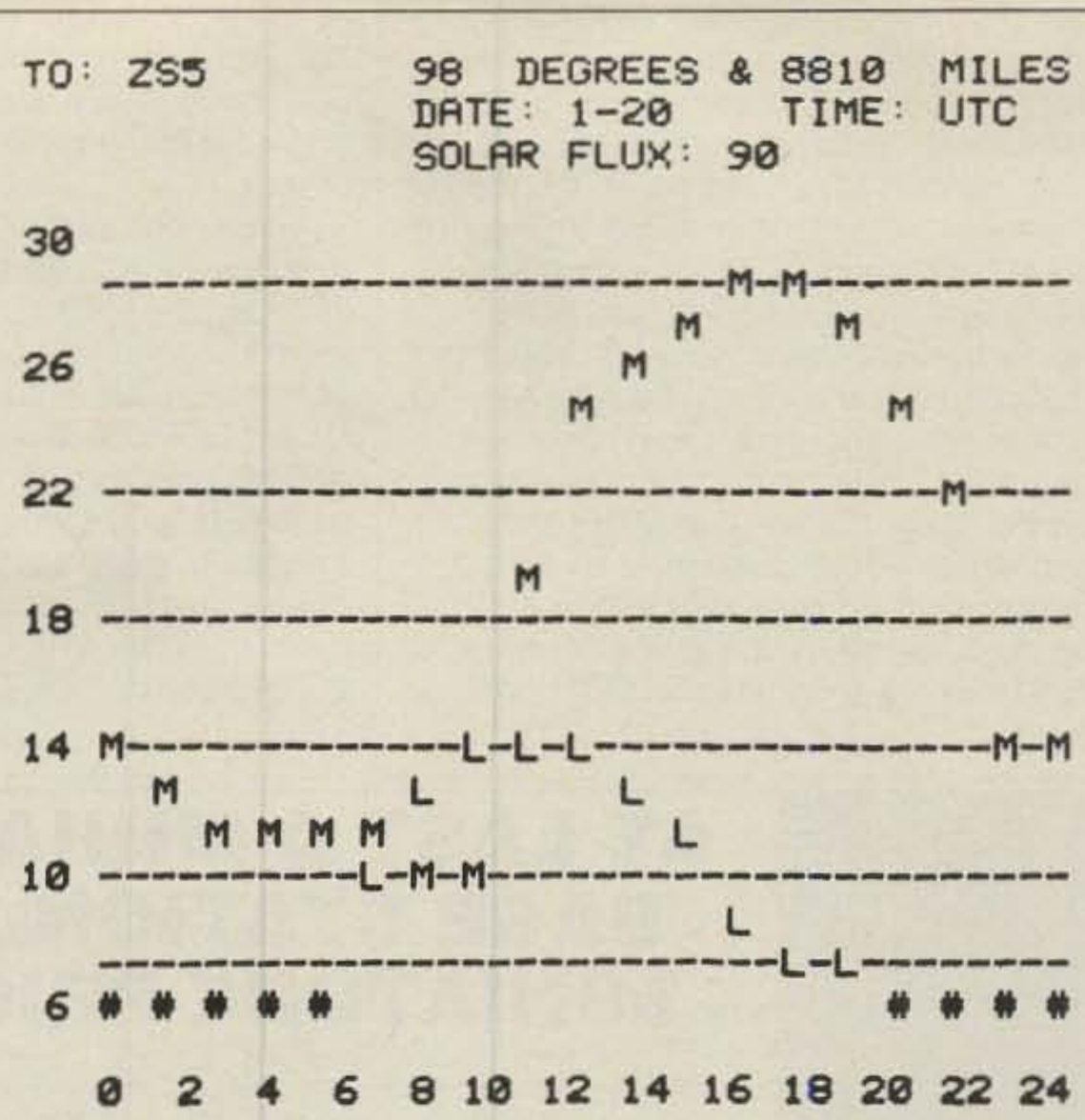
The first input prompt asks for you to select the target area to which you would like a propagation forecast. The program is "smart," in that it can recognize a prefix from the ARRL DX countries list, a two-letter U.S. state abbreviation, or an actual latitude and longitude, greatly simplifying data input. You can even input a DX station's callsign, and the program will recognize the correct prefix. You can also enter the two letters "DX"; this causes the program to generate an extensive summary of world propagation conditions by plotting to eight preselected regions. Other input prompts requested are the time zone in which the forecast



A typical video-screen output produced by the "MUFPLOT" program package as sold by Base 2 Systems. The main features of this program include incorporation of DX lat/lon coordinates in the program's database, as well as a highly graphic display. A printer routine is provided. (W8FX photo)



(A) Shown here is a simulation of the video display for the Commodore 64 "MUFPLOT." The dark (black) area shows the "DX window" to the target. The crosshatched area shows that there is no band opening to the target; this will appear in red on a color monitor and in gray on a black-and-white monitor. The Vic-20 version does not have this feature and only the MUF portion of the curve is plotted.



(B) Shown is a typical "MUFPLOT" printout. The Vic-20 version is similar, but it does not have the LUF calculation feature. Note that the "#" (pound) sign indicates that the LUF is below 6 MHz, and thus "off the chart."

Fig. 3– "MUFPLOT" typical output.

is to be plotted, date, and solar flux (the user does not have the option of using sunspot number).

The program produces a graphical display on the screen, which shows estimated MUF and LUF over a 24-hour period, as well as beam heading and distance to the target. When the two-color graph is completed, the shaded area in black represents the range of frequencies which will propagate signals over the path selected. The shaded area in red indicates the times during which no frequency will propagate signals over the path. The program has a "screen dump" feature so that hardcopy can be obtained.

The Commodore 64 version is a very long, compiled program (about 31K), primarily because of the considerable prefix data which it contains. It is furnished customized for the user's specific location. The Vic-20 version is considerably shorter, and it works in a similar manner, but is written in BASIC and is customized by the user. MUF, beam heading, and distance are calculated, but not LUF in the Vic-20 version.

I found "MUFPLOT" to be a very worthwhile program. It's particularly suitable for harried real-time operation in view of the prefix recognition features and the printer routines which were available. Documentation was good and included some excellent tutorial material. Some propagation experiment suggestions were also included in the user's guide that ran over 20 pages. Fig. 3 shows a typical "MUFPLOT" output.

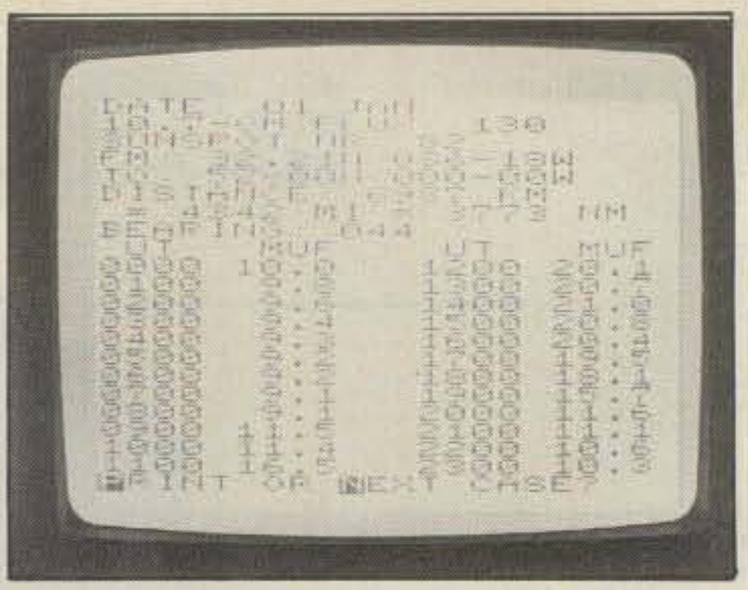
"PROCAST/VICCAST"

"The "PROCAST/VICCAST" MUF programs were originally based on the MINIMUF model, although they contain some modifications. The BASIC language "PROCAST" program is designed to run on any PET/CBM, Commodore 64, or expanded Vic-20 computer. The program features a 40-column output display, including optional station and location names, although there are some program limitations with the Vic-20. Some of the features include lat/lon coordinate entry in degrees and minutes (decimal fractions are not required), use of either solar flux or sunspot number, and distance display in kilometers, statute miles,

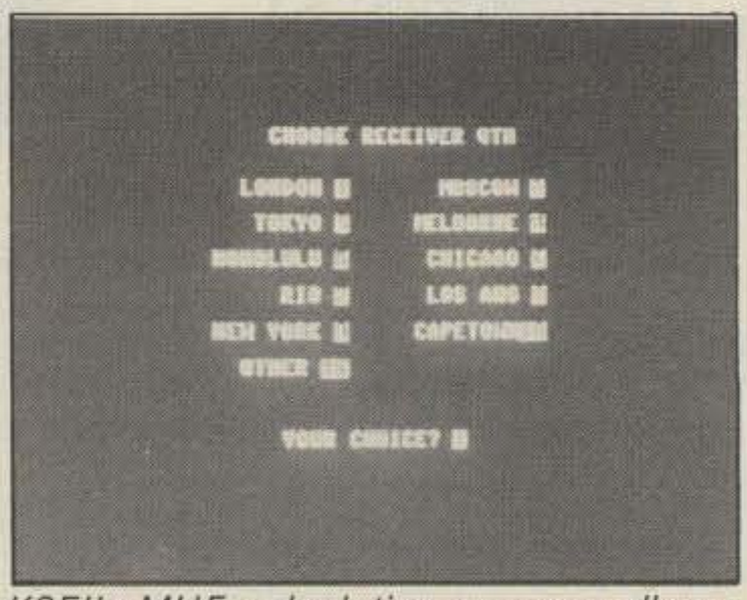
and nautical miles. The "VICCAST" program is similar, but is designed to work on the unexpanded, 3.5K Vic-20. Purchasers receive both program versions.

According to Mr. James R. Duncan of Procast, the algorithm used in the program represents not only a simple translation into Commodore basic, but also a fundamentally restructured algorithm that produces program results in a more highly efficient and rapid manner: in about 20 seconds a formatted video or printer output of 24-hour MUF, distance, and great circle bearing is available to the user. In addition, the programs may be customized by the owner in order to build into the program one's QTH instead of having to enter coordinates each time the program is run. Printers other than Commodore are supported in this program set that sells for $11.95 on cassette or disk.

These programs—the three we covered this month, as well as the Ham Data "Propagation Chart" program in last month's column—can be very useful in scheduling QSO's, certificate hunting, DXing, QRP operating, conducting propagation studies, or simply figuring out where to point one's antenna. But be mindful of program limitations. These include the LUF considerations already discussed, an MUF calculation error of about plus/minus 3.8 MHz over 250–6000



Screen display as produced by the "VICCAST" MUF prediction program as described in the text. The program is particularly fast-acting and includes a printer routine for producing hardcopy output. (W8FX photo)



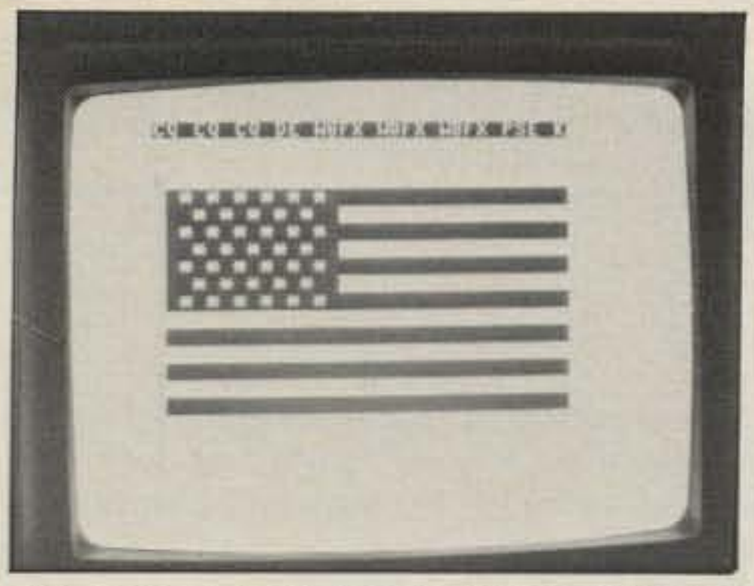
K9EI's MUF calculation program allows menu selection of ten DX targets, thus minimizing the need to manually enter the latitude and longitude of the DX objective. (W8FX photo)

mile "optimum" paths, operation from polar or equatorial locations, and the fact that freak and unsettled propagation conditions aren't accounted for. With these limitations in mind, have fun!

Software Notes

We would also like to share notes on some commercial software that has come to our attention lately. I'd like to highlight some of the offerings of three amateurs in this month's column.

Thomas R. O'Neil, WB8CUW, offers several specialized multiple-purpose amateur operating programs through his firm, Sunderland Software, that he says are "designed to ease some of the more mundane chores." His major offering is the "HAM-PAK" for the TRS-80 Model III 48K, two-disk system. This menu-driven program enables you to obtain fast great circle beam headings from your QTH to any one of 290 DX areas. The program is supplied in a format that allows quick customization to a particular QTH; this need only be done once, upon initial setup. The program also allows for quick QSL status determination by country. Not a "full service" logger or contest secretary, it nevertheless allows you to enter the first QSL card from each country until you have verified each country in the program's file. The country file may also be re-



A sample "title slide" produced using the K9EI "VIDEOTITLIST/64" program for the Commodore 64. SSTV, FSTV, and video enthusiasts should find this program interesting and useful. (W8FX photo)

searched to see if a QSL has been received from a given prefix. As a bonus, six electronic math calculation formulas commonly encountered in amateur radio use have been included as a third major feature of the program.

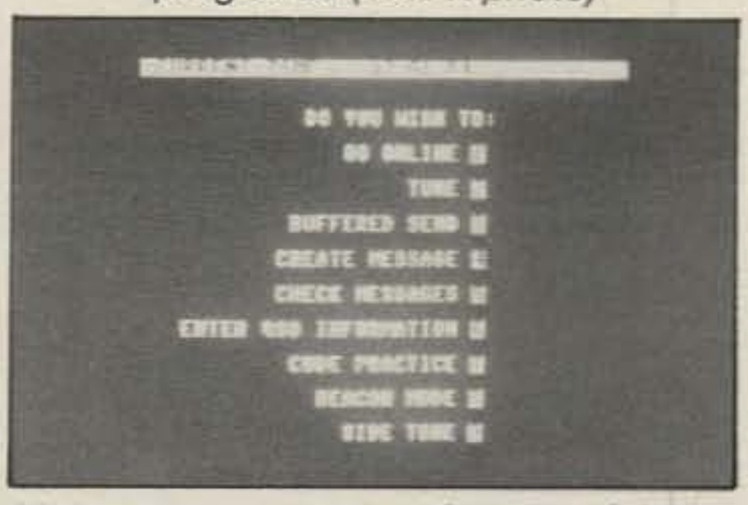
A similar cassette-based program for the Commodore 64 has been released. This program, the "HAMPACK-64," is similar, but it does not have the QSL management feature. An expanded disk-based version incorporating QSL logging for the Commodore 64 is expected to be available by the time this column appears. Price of the TRS-80 disk program is $29.95, and the Commodore 64 cassette version is $19.95.

Jim Grubbs, K9EI, offers several Vic-20 and Commodore 64 programs. These include an MUF calculator in separate Vic-20 and Commodore 64 versions and the "PROKEY" c.w. transmit package for both Commodore computers. Jim also offers an interesting set of programs for slow-scan and fast-scan TV enthusiasts. These programs allow one to store and reproduce electronic "video slides" or "pictures" generated by the computer. A test-pattern generator is included for alignment and test purposes. The Vic-20 program is called "SAVEPIX/VIDEO TITLIST," and the Commodore 64 version is known as "VIDEO TITLIST/64." Either program is available at $20 for a two-cassette package.

Incidentally, Jim is also the amateur radio editor of *Commander*, a specialized journal supporting various Commodore computers. He writes a monthly amateur computer column for the magazine *Command Post*. We hope to trade notes with Jim from time to time, and we wish him luck in his new writing endeavor.

Operating out of Milwaukee, Walt Grosch, KA9GLB, offers an extensive line of small, inexpensive amateur programs for the Vic-20. A look at a recent flyer shows more than a dozen programs, mostly priced between $4 and $10. Walt has programs for MUF calculation, beam headings, antenna design, electronic formulas, logging, and so on. Recently, Walt has advised that he's expanded his prod-

Main menu selection options are shown in this screen photo of KA9GLB's "Ham Antennas" program, which offers six calculation choices. Although designed for the Vic-20 computer, the author found that the program ran well on the Commodore 64—not uncommon for many Vic-20 programs. (W8FX photo)



Main menu selection for Jim Grubbs, K9EI's "PROKEY" c.w. transmit program for use on Commodore computers. Screen display is as shown on the Commodore 64. (W8FX photo)

uct line to include programs for the Commodore 64, offering much the same range of programs as for the Vic-20.

For those interested in "rolling their own" beam-heading programs on a personal computer, take a look at Thomas R. Sundstrom, W2XQ's article "Latitude and Longitude Calculations," which appeared in August 1983 *CQ*. His program is designed for the Apple, but it should be fairly easy to convert for other computers. And, if you have a PET or a Commodore 64, look into David C. Swaim, WA4NAG's article "The Amazing Beam Header," which appeared in October 1982 *73*. It's a menu-driven program that's easy to use and includes a dandy printer routine.

Bibliography

Gibilisco, S., W1GV, "Propagation of Radio Waves," *Ham Radio Magazine*, August 1982.

Jacobs, George, W3ASK, monthly Propagation column in *CQ*.

Jacobs, George, W3ASK, and Theodore J. Cohen, N4XX, *The Shortwave Propagation Handbook*, 2nd Edition, *CQ* Publishing, Hicksville, NY, 1982.

Leinwoll, Stanley, *Shortwave Propagation*, John F. Rider, Publisher, NY, 1959.

Product literature, "MUFPLOT," Base 2 Systems, 2534 Nebraska St., Saginaw, MI 48601.

Product literature, "DXPREDICTOR," Flynn's Business Services, Box 903, Mountain View, CA 94043.

Product literature, "PROCAST/VIC-CAST," Procast, P.O. Box 682, Millersville, MD 21108.

Product literature, "HAM-PAK" and HAMPACK-64," Sunderland Software, 39256 Sunderland Drive, Mt. Clemens, MI 48044.

Rose, R.B., K6GKU, "MINIMUF: A Simplified MUF Prediction Program for Microcomputers, *QST*, December 1982.

Stonehocker, Garth, K0RYW, monthly DX Forecaster column in *Ham Radio*.

Sundstrom, Thomas R., W2XQ, "How Come I Can't Hear Anything?" *CQ*, September 1983.

Sundstrom, Thomas R., W2XQ, "Latitude and Longitude Calculations," *CQ*, August 1983.

Swaim, David C., WA4NAG, "The Amazing Beam Header,"*73*, Oct 1982.

Wrapping It

This month we've discussed some of the fundamentals of h.f. propagation, with an emphasis on computer assisted MUF, LUF, and beam-heading calculations. We have examined three comprehensive MUF/LUF propagation programs, and we've highlighted the offerings of several amateur-oriented software sources. Next month we hope to reflect on the first four years of our stewardship of the column. Join us then.

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The sunspot cycle continues to decline rapidly. The Royal Observatory of Belgium reports a monthly mean sunspot number of 33.4 centered on December 1983. This results in a 12-month running smoothed sunspot number of 70.5 centered on June 1983. This is a drop of 6.5 in the sunspot cycle over a one-month period. A smoothed sunspot number of approximately 50 is forecast for April 1984.

April DX Conditions

Fewer DX openings are forecast for the *10* and *15* meter bands during April, but conditions are expected to *improve* on *20* meters during the day and *40* meters at night. Seasonably favorable conditions for long DX openings between the northern and southern hemispheres, associated with the equinoctial period, should continue through the month. An increased number of short-skip openings due to sporadic-*E* propagation is expected during April, and a major meteor shower is also expected to take place.

Twenty meters should be the optimum band for DX propagation during April. The band should open to most parts of the world shortly after sunrise, and remain open for DX throughout the daylight hours and well into the evening. Exceptionally strong signals should often be noticeable during the late afternoon and early evening hours.

Expect fewer openings on *15* meters this month, but some fairly good DX still should be possible to many areas of the world during the daylight hours. Peak conditions are expected during the afternoon and early evening hours on this band.

Not many DX openings are expected on *10* meters this month, but some should be possible towards Central and South America, the Caribbean area, and to the South Pacific during the afternoon hours, particularly during periods of High or Above Normal conditions.

Improved DX propagation conditions are expected on *40* meters during April. The band should open towards Europe and the east an hour or so before sundown, towards the south an hour or so after sundown, and towards the west and South Pacific after midnight. Expect good DX openings throughout the hours of darkness, but signals should peak around midnight from an easterly direction and an hour or so before sunrise from all other directions.

Fairly good DX openings to many areas of the world should also be possible on *80* meters during the hours of darkness and at sunrise. There is also a chance for a few *160* meter DX openings during this same time period.

Ionospheric absorption should continue to increase in the northern hemisphere during April as the sun rises higher in the northern sky. This should result in somewhat *weaker* DX signal levels during daytime openings compared to the winter months. Static levels are also expected to increase noticeably during April as thunderstorms become more numerous. This should result in higher noise levels, particularly on *40, 80,* and *160* meters.

Seasonably favorable equinoctial propagation conditions should continue during April for openings between the northern and southern hemispheres. Be sure to check during the sunrise and sunset twilight periods for some exceptionally good openings on *20* meters from the USA to areas in the southern hemisphere such as Australasia, South America, southern Africa, etc. These inter-hemispheric openings can take place at other times and on other bands as well, as shown in the DX Propagation Charts.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for April 1984

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 4, 15, 22	A	A	B	C
High Normal: 3, 7-8, 14, 16, 23, 30	A	B	C	C-D
Low Normal: 2, 5-6, 9, 12-13, 20-21, 24, 26-27, 29	A-B	B-C	C-D	D-E
Below Normal: 1, 10-11, 17, 19, 25, 28	B-C	C-D	D-E	E
Disturbed: 18	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 the 1st, good-to-fair (B-C) on the 2nd, good (B) on the 3rd, excellent (A) on the 4th, etc.**

Short-Skip Propagation

For openings between 50 and 250 miles, the best band should be *80* meters during the day and *160* meters at night. Between 250 and 750 miles, *40* meters should be best during the day, *80* meters for an hour or two after sunrise and again from sunset to midnight, and *160* meters from midnight to sunrise. For openings between 750 miles and the one-hop, short-skip limit of 2300 miles, use *20* meters during the day, *40* meters for an hour or so at sunrise and again from sunset to midnight, and *80* meters from midnight to sunrise. Look for *15* meter short-skip openings from about 10 a.m. to sundown, ranging between approximately 1300 and 2300 miles, although at times openings may be as short as 500 miles. There is also the possibility for some *10* meter short-skip openings during the daylight hours over similar distances.

The DX Propagation Charts in this month's column contain DX propagation predictions for each amateur band between *10* and *160* meters for the period *April 15 through June 15, 1984.* Beginning this month and continuing through the summer and fall, the times shown in the Charts will be local *daylight* time (EDT, CDT, MDT, and PDT).

For more detailed predictions of short-skip openings between distances of 50 and 2300 miles, refer to the Short-Skip Charts, which appeared in last month's column.

V.H.F. Ionospheric Openings

April looks like it should be a good month for v.h.f. ionospheric openings. *Lyrids,* a major meteor shower, should take place between April 22–23, with a peak expected during the late afternoon of April 22. During the shower's peak, at least 15 good-size meteors should enter the earth's atmosphere hourly, permitting fairly good meteor-scatter-type openings on the v.h.f. bands.

A seasonal increase in sporadic-*E* ionization usually begins during April and continues through the spring and summer months. This should result in an increased number of short-skip openings on both *15* and *10* meters during April, as well as occasional openings on *6* meters. Openings on *10* and *15* meters will range between approximately 400 and 1300 miles, while those on *6* meters will usually

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart approprate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region as shown in the left-hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw. p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level for each 10 dB loss, it will lower by one level.

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, 1984
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40-80 Meters*
Western & Central Europe & North Africa	*Nil*	09-14 (1) 14-18 (2) 18-19 (1)	05-06 (1) 06-10 (2) 10-12 (1) 12-14 (2) 14-17 (3) 17-20 (4) 20-21 (3) 21-22 (2) 22-01 (1)	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	*Nil*	10-13 (1) 13-15 (2) 15-17 (1)	06-09 (2) 09-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-23 (1) 23-01 (2) 01-06 (1)	19-20 (1) 20-23 (2) 23-01 (1) 20-00 (1)*
Eastern Mediterranean & Middle East	*Nil*	11-15 (1) 15-17 (2) 17-19 (1)	06-08 (1) 13-16 (1) 16-19 (2) 19-23 (3) 23-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Western Africa	14-18 (1)	08-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	08-14 (1) 14-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-01 (2) 01-06 (1)	20-22 (1) 22-02 (2) 02-03 (1) 00-02 (1)*
Eastern & Central Africa	16-18 (1)	09-11 (1) 11-14 (2) 14-17 (3) 17-18 (2) 18-19 (1)	05-06 (1) 06-08 (2) 08-09 (1) 14-16 (1) 16-18 (2) 18-21 (3) 21-23 (2) 23-01 (1)	21-01 (1) 22-00 (1)*
Southern Africa	*Nil*	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	14-16 (1) 16-17 (2) 17-18 (3) 18-19 (1) 23-01 (1)	21-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Central & South Asia	*Nil*	10-12 (1) 18-20 (1)	07-10 (1) 14-16 (1) 19-22 (1)	05-07 (1) 19-21 (1)
South-east Asia	*Nil*	10-12 (1) 18-20 (1)	07-08 (1) 08-09 (2) 09-11 (1) 19-22 (1)	*Nil*
Far East	*Nil*	18-21 (1)	07-08 (1) 08-10 (2) 10-12 (1) 22-00 (1) 00-02 (2) 02-04 (1)	04-06 (1)
South Pacific & New Zealand	17-20 (1)	08-09 (1) 09-11 (2) 11-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-22 (1)	04-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-20 (1) 20-22 (2) 22-00 (3) 00-04 (2)	02-03 (1) 03-04 (2) 04-06 (3) 06-07 (1) 02-03 (1)* 03-05 (2)* 05-06 (1)*
Australasia	18-20 (1)	17-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-11 (1) 15-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-04 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)*
Caribbean, Central America & Northern Countries of South America	10-14 (1) 14-17 (2) 17-19 (1)	08-10 (1) 10-11 (2) 11-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	04-06 (1) 06-07 (2) 07-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-22 (4) 22-00 (3) 00-04 (2)	19-20 (1) 20-21 (2) 21-04 (3) 04-06 (2) 06-07 (1) 21-02 (1)* 02-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	10-14 (1) 14-16 (2) 16-17 (3) 17-19 (1)	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (2) 19-21 (1)	04-06 (1) 06-09 (2) 09-15 (1) 15-17 (2) 17-19 (3) 19-22 (4) 22-01 (3) 01-04 (2)	20-21 (1) 21-04 (2) 04-06 (1) 23-03 (1)* 03-04 (2)* 04-06 (1)*
McMurdo Sound, Antarctica	*Nil*	14-15 (1) 15-17 (2) 17-19 (1)	07-08 (1) 08-09 (2) 09-10 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-23 (2) 23-01 (1)	01-05 (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	*Nil*	14-18 (1)	06-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-21 (2) 21-22 (1) 22-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-01 (1) 21-00 (1)
Northern & Central Europe & European USSR	*Nil*	13-15 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-17 (2) 17-19 (1) 22-00 (2)	20-00 (1)
Eastern Mediterranean & Middle East	*Nil*	15-17 (1)	07-09 (1) 13-16 (1) 16-22 (2) 22-00 (1)	20-00 (1)
Western Africa	13-17 (1)	12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	05-06 (1) 06-08 (2) 08-09 (1) 12-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-23 (2) 23-00 (1)	20-01 (1)
Eastern & Central Africa	14-17 (1)	10-14 (1) 14-16 (2) 16-18 (1)	06-08 (1) 13-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	21-00 (1)
Southern Africa	*Nil*	08-10 (1) 10-12 (2) 12-13 (3) 13-14 (2) 14-15 (1)	14-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 22-23 (1) 23-01 (2) 01-02 (1)	20-22 (1) 22-00 (2) 00-01 (1) 23-01 (1)*
Central & South Asia	*Nil*	09-11 (1) 18-21 (1)	07-10 (1) 18-20 (1) 20-22 (2) 22-23 (1)	05-07 (1) 19-21 (1)
South-east Asia	*Nil*	08-10 (1) 19-22 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-22 (1)	05-07 (1)
Far East	*Nil*	18-21 (1)	20-00 (1) 00-04 (2) 04-06 (1) 06-07 (2) 07-08 (3) 08-09 (2) 09-11 (1) 15-18 (1)	03-05 (1) 05-06 (2) 06-07 (1) 05-06 (1)*
South Pacific & New Zealand	14-16 (1) 16-18 (2) 18-20 (1)	07-09 (1) 11-14 (1) 14-17 (2) 17-19 (3) 19-21 (2) 21-22 (1)	16-19 (1) 19-21 (2) 21-23 (3) 23-01 (4) 01-03 (3) 03-07 (2) 07-10 (3) 10-11 (2) 11-12 (1)	00-02 (1) 02-04 (2) 04-05 (3) 05-06 (2) 06-07 (1) 02-04 (1)* 04-05 (2)* 05-06 (1)*
Australasia	17-20 (1)	09-11 (1) 16-18 (1) 18-21 (2) 21-22 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-15 (1) 15-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-06 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*
Caribbean, Central America & Northern Countries of South America	10-14 (1) 14-17 (2) 17-19 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	00-04 (2) 04-06 (1) 06-08 (2) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-22 (4) 22-00 (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	10-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	07-08 (1) 08-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	05-06 (1) 06-10 (2) 10-16 (1) 16-18 (2) 18-19 (3) 19-23 (4) 23-01 (3) 01-02 (3) 02-04 (2) 04-05 (1)	21-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-06 (1) 00-04 (1)*
McMurdo Sound, Antarctica	*Nil*	13-15 (1) 15-18 (2) 18-19 (1)	06-09 (1) 17-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-01 (1)	00-06 (1)

Time Zone: PDT (24-Hour Time) WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40-80 Meters*
Western & Southern Europe & North Africa	*Nil*	12-16 (1)	06-08 (1) 08-11 (2) 11-13 (1) 13-17 (2) 17-19 (1) 20-22 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	*Nil*	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 12-15 (2) 15-17 (1) 20-22 (1)	20-23 (1) 21-22 (1)*
Eastern Mediterranean & Middle East	*Nil*	13-15 (1)	07-10 (1) 10-12 (2) 12-13 (1) 13-15 (2) 15-17 (1) 20-22 (1)	20-23 (1)
Western Africa	13-15 (1)	09-12 (1) 12-15 (2) 15-17 (1)	05-06 (1) 06-08 (2) 08-15 (1) 15-18 (3) 18-20 (2) 20-22 (1)	20-23 (1)
Eastern & Central Africa	*Nil*	10-14 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-18 (1)	20-22 (1)
Southern Africa	*Nil*	10-12 (1) 12-14 (2) 14-15 (1)	07-09 (1) 13-14 (1) 14-17 (2) 17-18 (1) 21-22 (1) 22-00 (2) 00-02 (1)	19-21 (1) 21-22 (2) 22-23 (1) 20-22 (1)*
Central & South Asia	*Nil*	09-11 (1) 19-21 (1)	07-08 (1) 08-10 (2) 10-11 (1) 17-19 (1) 19-21 (2) 21-23 (1)	04-07 (1)
Southeast Asia	*Nil*	09-11 (1) 16-19 (1) 19-21 (2) 21-22 (1)	04-07 (1) 07-08 (2) 08-10 (3) 10-11 (2) 11-12 (1) 22-00 (1) 00-04 (2)	04-07 (1) 05-06 (1)*
Far East	*Nil*	14-17 (1) 17-20 (2) 20-22 (1)	04-07 (1) 07-08 (2) 08-09 (3) 09-10 (2) 10-12 (1) 12-14 (2) 14-21 (1) 21-23 (2) 23-00 (3) 00-02 (4) 02-03 (3) 03-04 (2)	02-03 (1) 03-06 (2) 06-08 (1) 03-06 (1)*
South Pacific & New Zealand	13-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	10-12 (1) 12-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-23 (1)	05-08 (1) 08-12 (2) 12-17 (1) 17-19 (2) 19-21 (3) 21-23 (4) 23-01 (3) 01-05 (2)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-02 (1)* 02-05 (2)* 05-06 (1)
Australasia	15-17 (1) 17-19 (2) 19-20 (1)	13-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-23 (1)	05-08 (1) 08-10 (3) 10-12 (1) 18-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-03 (3) 03-05 (2)	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	10-14 (1) 14-17 (2) 17-18 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	00-03 (2) 03-05 (1) 05-06 (2) 06-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-20 (4) 20-00 (3)	19-20 (1) 20-21 (2) 21-02 (3) 02-04 (2) 04-06 (1) 21-00 (1)* 00-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	13-15 (1) 15-17 (2) 17-18 (1)	07-08 (1) 08-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	00-02 (2) 02-06 (1) 06-10 (2) 10-15 (1) 15-17 (2) 17-18 (3) 18-23 (4) 23-00 (3)	20-22 (1) 22-02 (2) 02-04 (1) 21-03 (1)*
McMurdo Sound, Antarctica	15-17 (1)	15-16 (1) 16-18 (2) 18-19 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-01 (1) 04-06 (1) 07-09 (1)	23-03 (1) 03-06 (2) 06-07 (1)

*Predicted times 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.

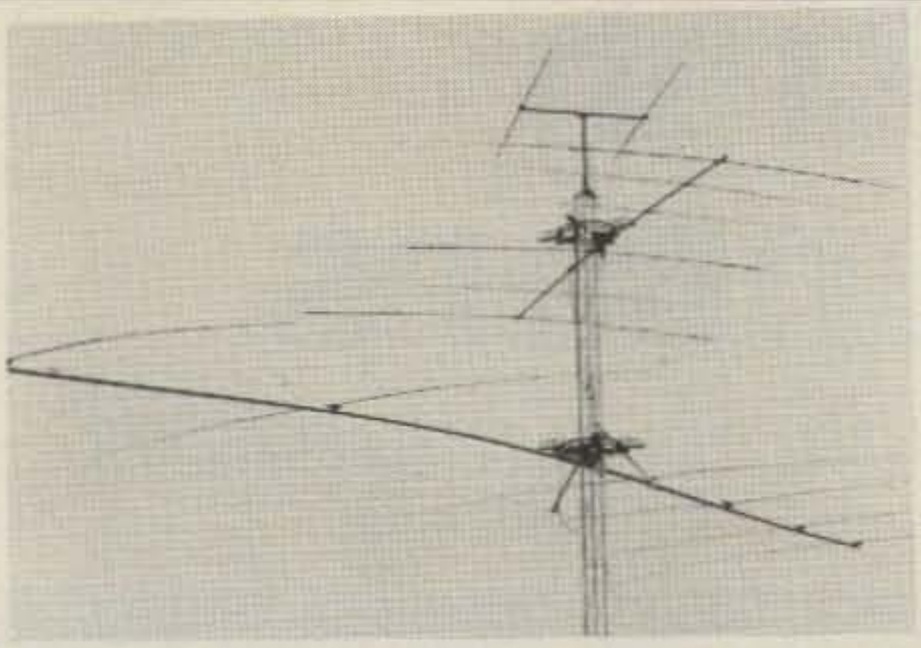
be between 750 and 1300 miles. While sporadic-*E* ionization can occur at just about any time, there is a tendency for it to peak between 8 a.m. and noon and again between 5 and 9 p.m. local time.

Unusual ionospheric openings on the v.h.f. bands can also occur during April from widespread auroral activity. The best times to check for such openings are during periods of radio storminess on the h.f. bands. Check the Last Minute Forecast at the beginning of this column for those days during April that are expected to be Below Normal or Disturbed.

For the very patient, some trans-equatorial (TE) propagation may be possible during April. This type of propagation tends to peak during the equinoctial seasons. Openings are most likely to occur between 8 and 11 p.m. local daylight time on long north-south paths which cross the *geomagnetic* equator at an approximate right angle. TE openings towards South America from the United States favor locations in the southern tier states and Caribbean area, but some openings may also be possible to more northerly locations. TE openings are more likely to occur on 6 meters, but they can occur on 2 meters as well. Openings can be expected to be very weak with considerable flutter fading.

73, George, W3ASK

CQ World-Wide WPX C.W. Contest
May 26-27, 1984



— Yes, that's a six element 20m monobander with a 57' boom.

THE M-1-A ROTATING ANTENNA MOUNT . . .

— Eliminates inaccessable and top heavy arrays while allowing a maximum utilization of the entire tower structure for antenna mounting locations.
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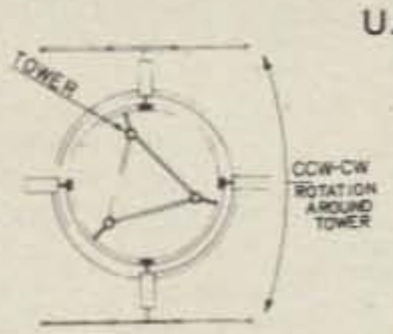

THE M-1-A FEATURES . . .

— Segmented rings allow installation around existing towers, masts or poles - even trees - up to 24 inch face width or 27 inch diameters. (other sizes available on special order)
— Booms up to 3½ inch O.D. may be mounted to the M1A system. Perfect for adding "Just one more" mono bander or VHF/UHF array to your existing system without additional top loading.
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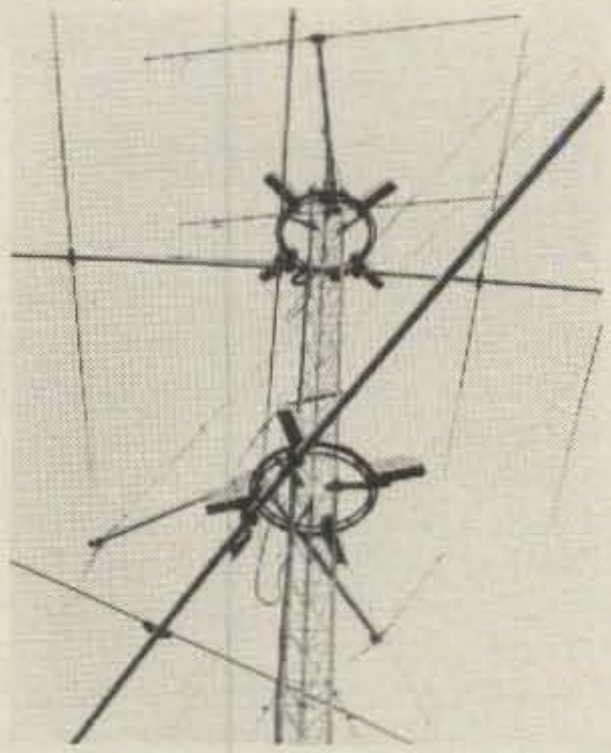

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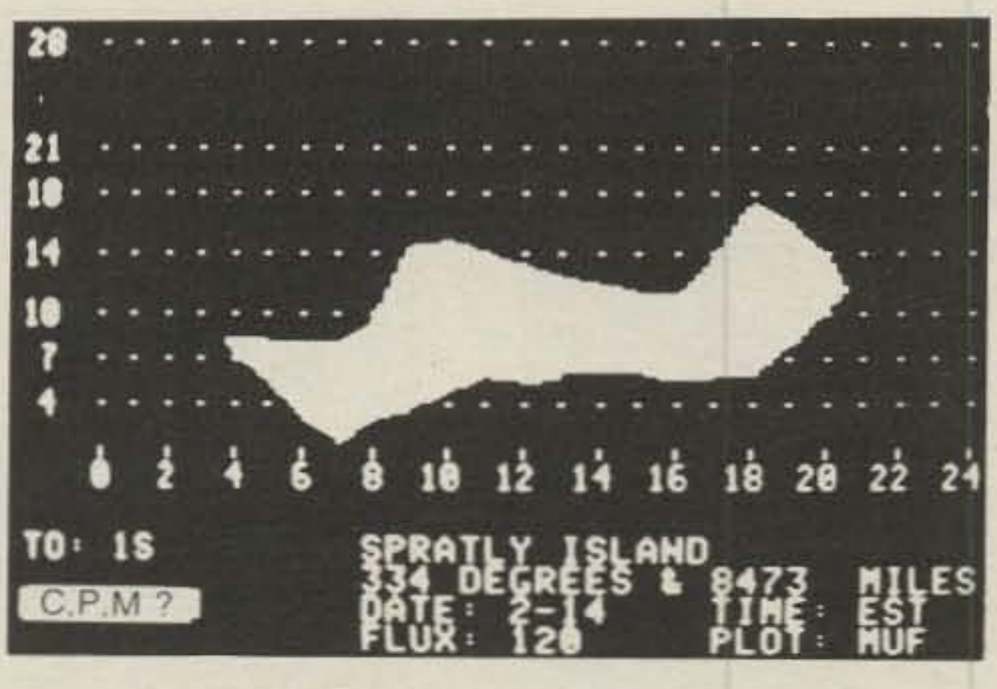

Shaded areas show the times and frequencies of band openings.

Unshaded areas indicate band closings.

Forecasts may be plotted in any US time zone—or UTC.

Upper frequency limit is selectable between HPF, MUF and FOT. Lower limit is always LUF.

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CIRCLE 41 ON READER SERVICE CARD

Attention Moonbouncers

and Satellite Communications Enthusiasts

Introducing New Ultra High Performance Antennas from KLM Electronics, Inc.

KLM Electronics is fueling the Moonbounce and Oscar 10 revolution with Antenna Equipment that delivers truely Out-of-This-World performance.

For the Moonbouncer, our New 2M-16LBX is designed to be the highest gain 2 meter antenna available on the market today by more than a full db, making the 2M-16LBX an outstanding performer as a single antenna or in Moonbounce (EME) arrays.

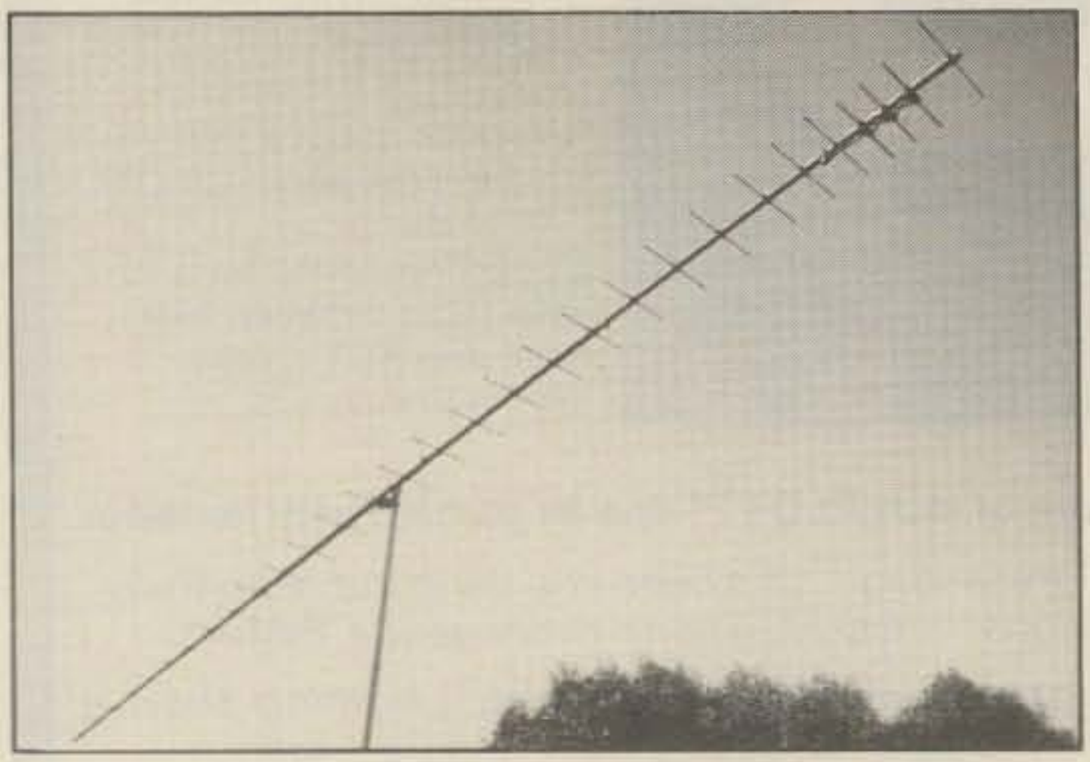
The New 432-30LBX follows the same pattern as the 2M-16LBX, and soon will become the industry's standard of comparison.

Featuring straight forward construction, and an innovative tapered boom that greatly reduces windload and adds strength and durability. Virtually unbreakable, insulated, 3/16" rod parasitic elements are anchored through the boom to insure years of trouble-free performance.

For the satellite enthusiasts, the 2M-22C high gain 2 meter, circular polarized antenna, features the same rugged construction and total flexibility as our very popular 2M-14C with a 2db increase in gain.

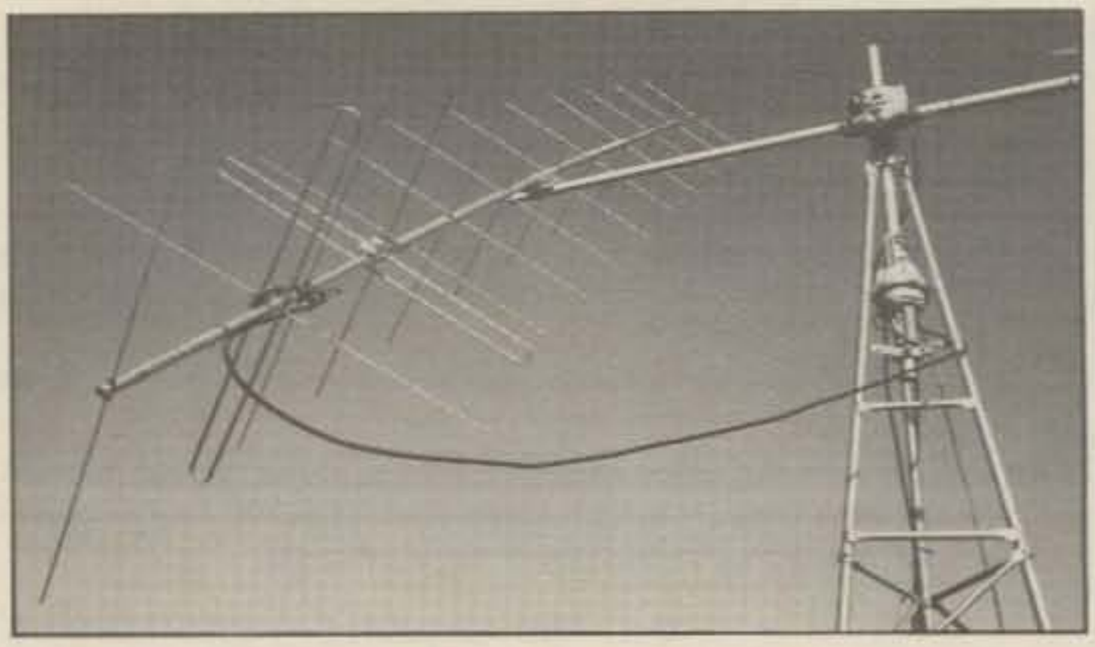
Four or more 2M-22Cs make an excellent array for Moonbounce (EME) by elminating Faraday fading.

Fiberglass/aluminum stacking frames are available as well as 2 and 4 port power dividers and phasing harnesses to optimize the performance of these type arrays. Watch for our new elevation drive system coming soon.



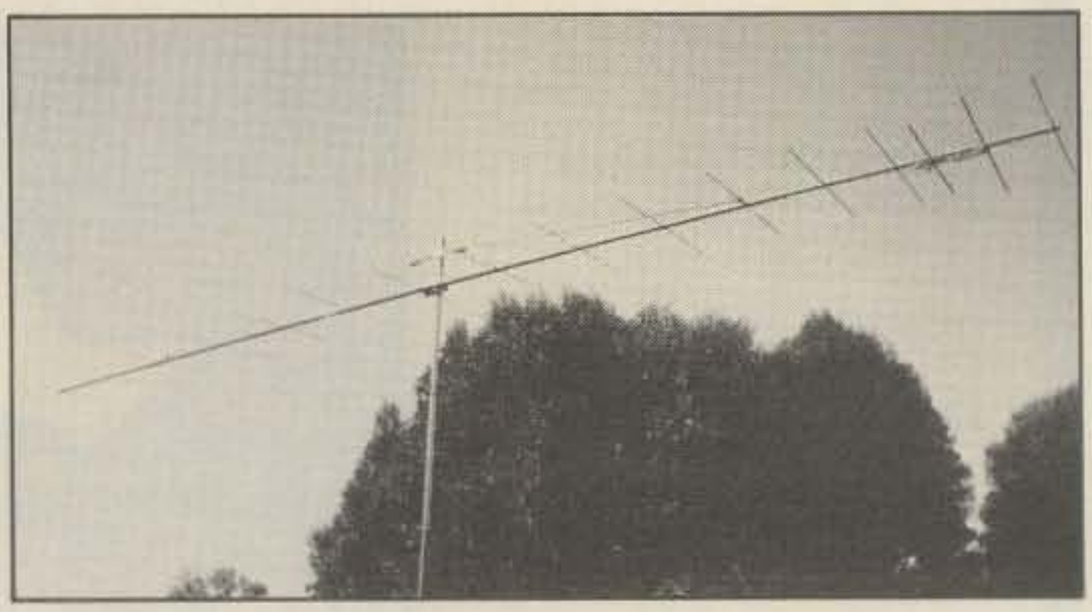
432-30LBX

BANDWIDTH	430–440 MHz
GAIN	17.3 dBd
BEAMWIDTH	20°
FEED IMP	50 ohms unbal.
BALUN	included
BOOM LENGTH	21 ft. 9 in.
F/B 20 dB F/S	35 dB
VSWR	1.5:1
WINDLOAD	1.43 sq. ft. (typical)
TURNING RADIUS	12 ft. 5 in.
WT. (lbs.)	9 lbs.



2M-22C

BANDWIDTH	143–146 MHZ
GAIN	(144 MHz) 14.8 dBdc
BEAMWIDTH	(V) 28°, (H) 33°
FEED IMP	50 ohms unbal.
BALUN	4:1 RG303, Teflon
BOOM LENGTH	28 ft. 1 in. (tapered)
VSWR	1.4:1
WINDLOAD	(H) 1.75 sq. ft. (V) 2.44 sq. ft.
WT. (lbs.)	10 lbs.
TURNING RADIUS	15 ft. 6 in.



2M-16LBX

BANDWIDTH	144–148 MHz
GAIN	13 dBd
BEAMWIDTH	34°
FEED IMP	50 ohms unbal.
BALUN	(2) 4:1 coax
BOOM LENGTH	19 ft. 1 in. (tapered)
VSWR	1.5:1
WINDLOAD	1.85 sq. ft.
ELLIPTICITY	3 dB max.
CIRCULARITY SWITCHER	CS-3 included
WT. (lbs.)	11 lbs.

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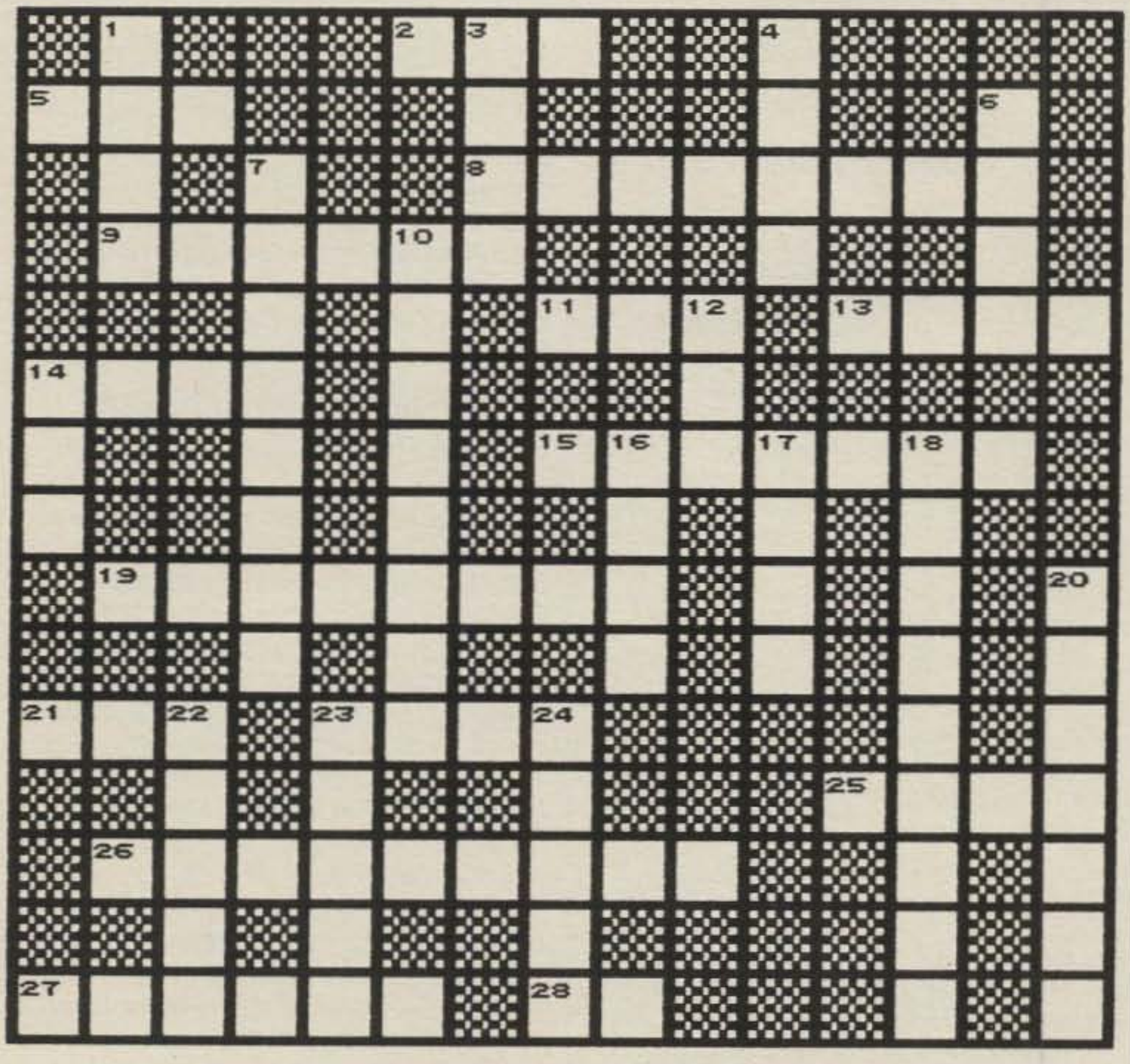
Antenna Mania



Submitted by Phil Anderson, W0KI

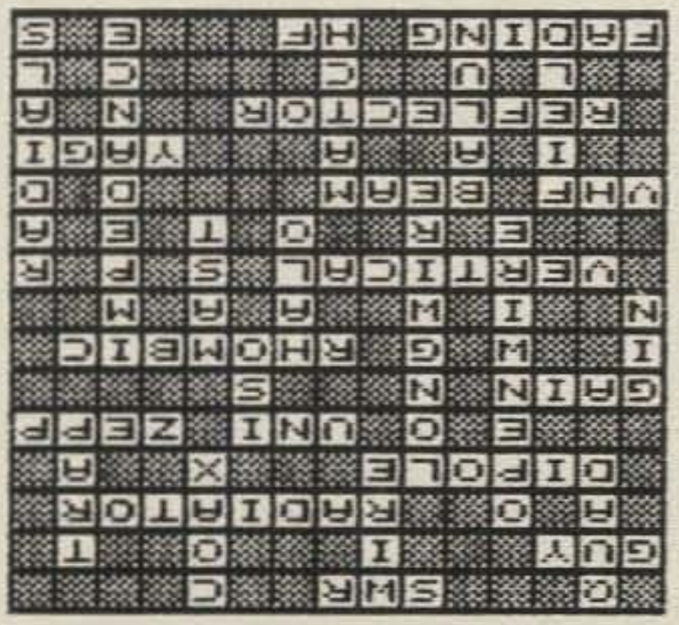
Across Clues

2. Standing-wave ratio
5. Type of holding wire
8. Main element
9. Half-wave antenna
11. One direction antenna
13. Type of antenna (Z ---)
14. Output versus input
15. Big gain wire antenna
19. Popular DX antenna
21. Two meter spectrum
23. Multi-element horz. antenna
25. Type of beam
26. Back element of beam
27. Weakening signal
28. High frequency

Down Clues

1. A four-sided antenna
3. A simple antenna
4. Feedline
6. A small antenna element
7. A simple feedline
10. A long antenna
12. All direction radiator
14. Type of pole
16. Round antenna
17. Vertical holder
18. Property of antenna
20. Ground wires
22. Electric or magnetic
23. A matching device
24. Equal impedances

Answers to Antenna Mania



Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

We had hoped that we would be able to tell you that there would be an SP contest this year now that they are back on the air. However, letters to the PZK have produced no results, so it's anybody's guess if there will be any contest activity out of Poland the first and third weekends of April, the dates used previously.

Add some more trophies to the *CQ* World-Wide Contest awards list: Europe, multi-operator, multi-transmitter, both phone and c.w., sponsored by OH2AM of the OH-DX-Ring of Finland, in celebration of their 20th anniversary. Bob Cox, K3EST, will relinquish his multi-multi c.w. European sponsorship and will now make it a multi-operator, single transmitter award. Jay Carr, W6FAY, has offered to sponsor a trophy for Australia, single operator, 14 MHz c.w. All of these are for the coming World-Wide Contest this fall in October and November.

At the time of this writing (middle of January) we are looking forward with anticipation to the coming *CQ* 160 C.W. Contest. Conditions on the top band have been rather good the past couple of weeks, and it was encouraging to hear "see you in the contest" as the closing remarks in many of the 160 contacts. However, I'm just a bit apprehensive. The band is now loaded with s.s.b. signals, many of which are newcomers to the top band, and I wonder if they are aware of the "DX Window" and the gentleman's agreement to keep it free of W/K and VE activity during the contest weekend. Also, where possible it would be appreciated if phone operation is confined to frequencies above 1855 kHz during the c.w. weekend. (USSR stations are usually found on c.w. between 1850 and 1855.) Hope I will be able to say "thanks a lot, fellows" in the next month's column.

In the results of the 1983 *CQ* WW 160 Meter Contest published in the December 1983 issue there was an error in the Aggregate C.W. and Phone Club scores on page 54. The Phone winner should have been K1IK instead of WA2SPL.

I still continue to receive announcements after the deadline date for current issues, but with the cooperation of all those at the office we have been able to have most of them included in the month of the event. However, some were out of luck. If they had used my home address, they would have made it.

Deadline for the July issue is April 15th, and May 15th for the August issue.

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	Mar.	23-25	OOTC Phone QSO Party
*	**Mar.**	**24-25**	**CQ WW WPX S.S.B. Contest**
*	Mar.	24-26	BARTG RTTY Contest
*	Mr.31	Apr.1	Connecticut QSO Party
	Apr.	7	Holiday-in-Dixie QSO Party
	Apr.	7-8	DX-YL to NA-YL CW Contest
	Apr.	14-15	DX-YL to NA-YL SSB Contest
	Apr.	21-22	ARCI QRP C.W. Contest
	Apr.	28-29	Massachusetts QSO Party
	Apr.	28-29	King of Spain Contest
	Apr.	28-29	Swiss Helvetia "26" Contest
	Apr.	28-29	County Hunters SSB Contest
	May	5-6	Florida QSO Party
	May	19-21	Michigan QSO Party
	May	**26-27**	**CQ WW WPX C.W. Contest**
	June	9-10	WW So. Amer. CW Contest
	July	7-8	Venezuelan SSB Contest
	July	28-29	Venezuelan CW Contest
	July	28-30	County Hunters CW Contest
	Aug.	18-19	SARTG RTTY Contest

** Covered last month.*

DX-YL to N.A.-YL Contest

C.W.: April 7–8 S.S.B.: April 14–15
1800Z Saturday to 1800Z Sunday

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 three 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. This year they go to: Marty Silver, NY4H, 3118 Eton Road, Raleigh, NC 27608.

Holiday-in-Dixie QSO Party

1800Z to 2300Z Saturday April 7

This is the seventh annual Holiday-in-Dixie QSO Party sponsored by Shreveport, Louisiana, operators. It is a 10-day celebration held in Shreveport commemorating the Louisiana Purchase. To help promote the event, radio amateurs will be operating on the 10, 15, 20, and 40 meter bands from the Fais-do-do location of the event. On c.w. look for activity 60 kHz up from the bottom of each band. On s.s.b. try 7240, 14280, 21370, and 28570. Novice on 7125 and 21125.

An attractive commemorative certificate will be sent to anyone establishing two-way contact with any of the "H-I-D" stations. All that is required is to send your QSL card verifying the contact to: Holiday-in-Dixie QSO Party, P.O. Box 4842, Shreveport, LA 71104. Include a large s.a.s.e. and be sure to include signal report and the name of the operator of the station you contacted.

ARCI QRP Spring C.W. Contest

1200Z Sat. to 2400Z Sun., Apr. 21–22

This is the spring edition of this QRP C.W. contest sponsored by the QRP Amateur Radio Club International. It is open to 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 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, but 4 points if with a DX station. There is a power multiplier as follows:

4 to 5 watts output	×2.
3 to 4 watts output	×4.
2 to 3 watts output	×6.
1 to 2 watts output	×8.
Less than 1 watt output	×10.
Over 5 watts output	check log.

There is a bonus multiplier of ×2 for stations using solar or wind power (no storage), and ×1.5 if using battery power (100% in both cases).

Final Score: Total QSO points ×

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Please send all reader inquiries directly.

On a sunny day last summer Ralph, W2CVF, Bernie, W8IMZ, and W1WY made a visit to Radio Hill North, summer home of Clarence, W2KW, and the QCWA Antique Radio Museum near Middletown, N.Y. The object of the trip was to visit Clarence and also to make a donation to the QCWA Museum. In the photo Bernie is holding a ¼ kw W.E. 211D tube and Clarence is displayng an RCA 851 bottle. As usual I hand out the goodies but end up with empty hands. What we cannot show you is W2KW's antenna farm: three 130 foot heavy-duty towers in a triangular configuration 365 feet on a side with Sterba arrays between each tower. (Wow! What a contest station that would make.) (W2CVF photo)

(states + provinces + countries worked on each band) × power multiplier × bonus multiplier if any.

Frequencies: 1810, 3560, 7040, 14060, 21060, 28060, 50360. Novice 3710, 7110, 21110, 28110.

Awards: Certificates to the highest scorers in each state, province, and country with two or more entries. Scores will be credited for the annual Triple Crown QRP award. There is also a special Milliwatt certificate from Adrian Weiss, W0RSP, for stations using less than 1 watt.

Use a separate log sheet for each band and a summary sheet showing the scoring and other essential information. Scoring sheets are available from KA5NLY. Include a large s.a.s.e. for scoring sheets and/or a copy of the results.

Logs must be received by May 21st and go to: QRP ARCI Contest Chairman, Eugene C. Smith, Jr., KA5NLY, 16 Fairmont Drive, Little Rock, AR 72204.

Swiss Helvetia Contest

1300Z Sat. to 1300Z Sun., Apr. 28–29

This activity again offers an excellent opportunity to work some of the rare Swiss Cantons and 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 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: Kurt Bindschedler, HB9MX, Strahleggweg 28, CH-8400 Winterthur, Switzerland.

County Hunters SSB Contest

Three Periods GMT
0001–0800 Sat., Apr. 28
1200 Sat., Apr. 28 to 0800 Sun., Apr. 29
1200 to 2400 Sun., Apr. 29

This is the 13th 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 contacted from each county or band change. Mobiles contacted on a county line count as one QSO but two multipliers. Avoid net frequencies.

Exchange: Signal report, county, state, and 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 it's a DX station (KH6 and KL7 are DX). Mobile contacts 15 points; mobile teams 30 points.

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

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

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

3930, 7230, and 14285. Fixed stations are requested to QSY after working a mobile in the window.

Awards: Certificates to the top 10 fixed and top 10 mobile stations in the U.S. and 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 to the mobile team winners.

It is suggested that you write W0QWS for detailed rules and log forms. Include a large s.a.s.e. with your request. All entries must be received by June 1st and go to: John W. Ferguson, W0QWS, 3820 Stonewall Ct., Independence, MO 64055.

Florida QSO Party

Sat., May 5 1400Z to 1900Z
Sun., May 6 0001–0500 & 1500–2300Z

This is the 18th annual QSO Party sponsored by *Florida Skip*. The same station may be worked on each band and on each mode. Phone and c.w. are separate contests and require separate logs. Fla. stations may work other Fla. stations, but for QSO points only.

Fla. stations are divided into two classes. Class A—Portables and mobiles operating outside own county, using emergency power of 100 watts output or less. Class B—All other single operator and multi-operator stations.

Exchange: RS(T) and QTH. County for Fla.; state, VE province, or country for others.

Scoring: *For Florida*—One point per QSO. Multiply total by sum of states (49), VE provinces (12), and DX countries (maximum of 27) worked (maximum multiplier of 88). Class A stations multiply total score by 1.5 factor.

Out-of-state—Two points for each Fla. contact. Multiply total by Fla. counties worked (maximum of 67).

Frequencies: C.W.—3555, 7055, 14055, 21055, 28055. S.S.B.—3945, 7279, 14279, 21379, 25579. Also 160 and 2 meters.

Awards: Certificates, both phone and c.w., to the top single operator score in each state, province, and DX country, and each Fla. county. There are five plaques as follows: to the top single operator in Fla. and out-of-state, both on s.s.b. and c.w., and to the Fla. club with the highest aggregate score. (Certificate winners must show a minimum of 25 contacts.)

There is a disqualification clause for taking credit for excessive dupes, multipliers, and other obvious reasons.

Include a summary sheet showing the scoring and other essential details, a dupe sheet for entries with 200 or more contacts, and the usual signed declaration.

Include a large s.a.s.e. if you desire a copy of the results. Mailing deadline is June 3rd to: Florida Skip Contest Committee, c/o North Florida A.R.S., P.O. Box 9673, Jacksonville, FL 32208.

Massachusetts QSO Party

1600Z Sat. to 2400Z Sun., Apr. 28–29

This year's party is being sponsored by the Pilgrim Amateur Wireless Association. The same station may be worked on each band and each mode, and mobiles in each county change.

Exchange: RS(T) and QTH. County and PAWA member I.D. for Mass. stations, state or VE province for others.

Scoring: Two points for s.s.b. contacts, 4 points if on c.w. Final score for Mass. stations is QSO points × (Mass. counties + states + provinces + PAWA members) worked. Out-of-state stations, QSO points × (Mass. counties + PAWA members) worked. Multiplier credit for club members worked is counted once only.

Frequencies: For s.s.b., c.w., and Novice—20 kHz from bottom of the General portion of each sub-band and Novice bands.

Awards: Certificates to first-, second-, and third-place winners in each Mass. county, each state and province, and Novice in each state. A plaque to the Mass. station who surpasses the record of 1483 QSOs made by K1GSK in the 1979 party.

A summary sheet showing the scoring, etc., is requested with each entry. A dupe QSO sheet is also requested with logs having more than 100 QSOs.

Mailing deadline for all entries is May 31st to: Ed Peters, K1KJT, 29 Greenbrier Drive, New Bedford, MA 02745. (Include 40¢ postage for awards and results, no envelope.)

"King of Spain" Contest

2000Z Sat. to 2000Z Sun., Apr. 28–29

There are a few modifications in the format used in previous years. This is a phone-only single-operator contest now, and no mention was made of the expense-paid trip to Calella for the worldwide winner to receive his trophy.

The same EA station may be contacted on each of the six bands, 10 through 160 meters, for QSO credit. A minimum of 15 consecutive minutes must be spent on any one band, and there is a compulsory rest period of 4 consecutive hours in the 24-hour contest period.

Exchange: Signal report and a contact number starting with 001. EA stations will also include two letters to identify their province.

Scoring: One point per QSO. Multiply total EA QSOs by the number of EA provinces worked (maximum of 55). A contact with EA3RCC is worth an extra multiplier. EA stations will use the DXCC country list for their multiplier.

Awards: The list of awards includes the winners in each country, the continental winners, the top 10 world wide, and stations making at least 75 contacts. The list also includes a large selection of trophies.

There is an s.w.l. category with awards to the top 10 and to those reporting 150 or more stations.

Mailing deadline for all entries is July 30th to: Agrupacio Radioficionats Calella, P.O. Box 181, Calella (Barcelona) Spain. (Include 4 IRCs or $2.00 to cover expenses for awards.)

1983 Contest Results
North America
Helvetia "26"

W3GM	**20,703**	**W5EIJ**	**720**
W4OEL	**16,464**	**W1WY**	**612**
W8DA	**6,552**	**W8BQ**	**330**
K2SX	**4,536**	KM2X	270
K4RZ	4,320	WA3JXW	75
W3ARK	3,900	**VE3TQ**	**7,056**
K8ZR	3,567	**VE6CHW**	**1,425**
W6UA	**2,916**	**VE4MF**	**243**
W4YN	1,764	VO1AW	60
W2OB	1,425	**HH2VP**	**1,404**

Certificate winners are in boldface.

All Asian Phone

N6AW		**22,568**
N7AM		**2,739**
K1XM		**88**
W6OK	14	**4,182**
N4MM	"	**2,201**
KA7JVW	"	**1,474**
KA0IQR	"	**612**
W4IT	"	375
KB2MK	"	**335**
WA5IHS	"	**176**
KV9S	"	**165**
K3TW	"	**143**
N2AIR	"	16
N2ATT	"	**4**
WA6VNR	21	966
WA7CGR	"	**816**
K6HNZ	AB	**274,555**
KE6RH	"	**69,454**
KB5FU	"	**24,080**
KI1M	"	**16,827**
W6OKK	"	13,244
N5JB	"	5,070
W3GM	"	**3,315**
N4UH	"	**1,947**
KC7V	"	**1,575**
KA2BBZ	"	**1,218**
N2ATF	"	589

Multi Opr.

K9MWM/0		**113,925**
WB7PSO		**105**
VE7EPN/7		**893**
4U1UN		**476**
HI8GB	14	**3,430**
HI8LC	"	234
NP4P	AB	**888**
6Y5DA	14	**504**

SARTG RTTY

KA3GIK	**116,250**	**W0BWJ**	**17,050**
W4CQI	**105,600**	W3KV	14,420
KB2VO	**105,525**	**VE3KQS**	**14,420**
K6WZ	**44,490**	K4AGC	8,875
WB4UBD	44,200	W0IHS	5,830
VE7YB	**31,600**	**TI2DO**	**4,880**
XE1VV	**29,785**	VE3IR	1,800
AA4CK	27,080	KE6T	1,485
W7MI	**26,445**	W8TCO	120
W2KHQ	20,650		

KA3GIK was #10, W4CQI #12, KB2VO #13 worldwide out of 67 entries.

YL Anniv. Party Award Winners

C.W.		S.S.B.	
DJ0EK	1,500	DJ0EK	13,688
K4AOH	1,332	WD4NKP	13,360
WD4NKP	1,250	KC9V	13,110

C.W./S.S.B.

DJ0EK	15,188
WD4NKP	14,610

There were 47 c.w. and 66 s.s.b. entries.

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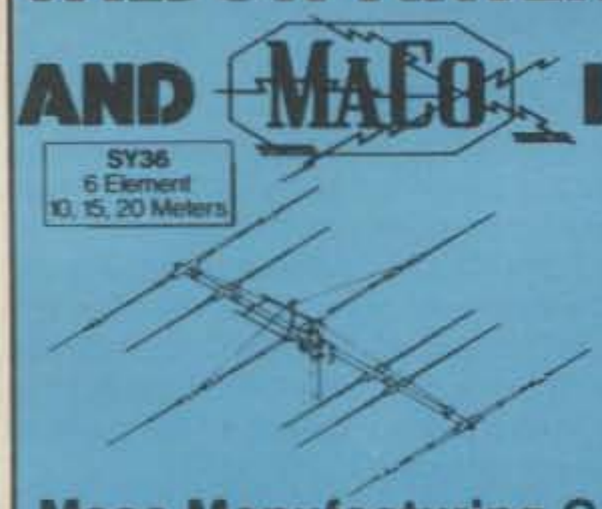

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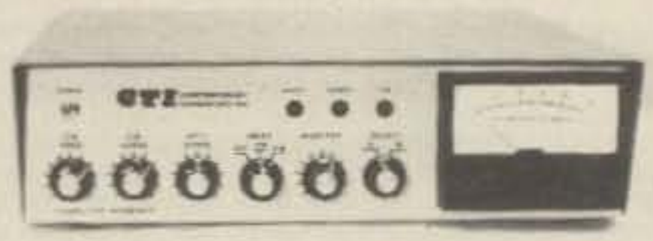

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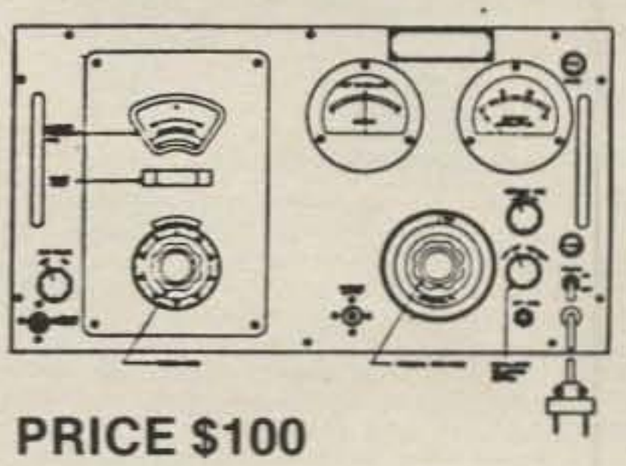
ULTRAHEADINGS: Beam headings, distances from your QTH to DXCC countries. $18.50/cass. for C-64 and TRS-80 (I&III). No computer? Custom listing for your QTH, $4.95. ULTRAMORSE for C-64: Learn code ultrafast with Ultramorse First Course; $14.50/cass. Upgrade with Ultramorse Code Practice; $12.50/cass. SASE for info. $1.00 shipping, all orders. ULTRA Ham Software, Box 119, Macedonia, OH 44056.

WANTED: Bencher paddle and AEA CK-1 keyer. W7OM, Box 16253, Seattle, WA 98116.

SIGNAL GENERATOR TS-497B/URR



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Band A: 2 mc to 5 mc.
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ANNUAL EVANSVILLE TARS HAMFEST May 20, 1984, Vanderburgh County 4-H Fairgrounds. Open at 6 AM CDT. All indoor, inside and outside flea market. Admission $3.00. Indoor tables $7.50. Outdoor flea market $3.00. Talk-in on 147.75/.15 and 146.19/.79. For table reservations and information, contact Mike Anderson, KA9LQM, Post Office Box 3284, Evansville, IN 47732.

C-64 and VIC-20 HAM SOFTWARE: New Contest-II program, call-name-QTH log program, ham formulas program, L.S.A.S.E. appreciated. Specify computer. Walt, KA9GLB, 4880 N. 49th St., Milwaukee, WI 53218.

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- Measures Peak or Average power
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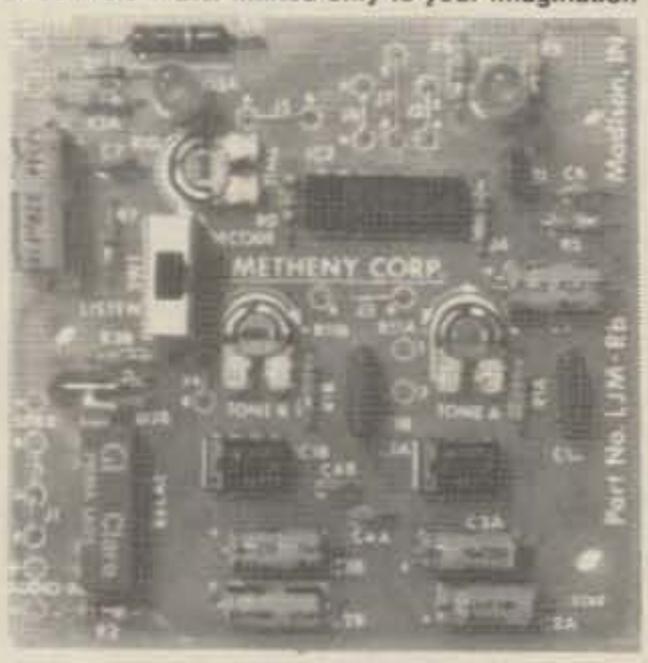
INPUT: Audio from transceiver, scanner, etc.
OUTPUT: SPST (N.O.) relay.

FEATURES: Single or dual tones adjustable over the 16 digit Touch Tone range • Adjustable response time • Relay output • Manual or auto reset • Single tone ON latching with different single tone reset OFF • Operates on 12VDC • Interfacing of multiple boards for multi-digit sequential activation and reset.

APPLICATIONS: Call-up system • Repeater or commercial controls • Etc. limited only to your imagination •



Actual Size 3"x3" - Shown Assembled

LJM2RK decoder kit includes all component, relay, and P.C. Board. . . . $15 plus $1.50 shipping.

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"THE SWAP LIST" has bargains galore. Subscribe now! Six months for $4.00; one year only $6.50. "THE SWAP LIST," Box 988-C, Evergreen, CO 80439.

COMPUTER PROGRAMS for TI99/4A, VIC-20, Commodore 64, Apple II; Ham, educational, and financial software from $6.95. LICENSE PLATE FRAMES read "Amateur Radio—Licensed Operator," $5.00/pair or $3.50 each. Write ELECTRONIC PUT-ONS, 7805 N.E. 147th Ave., Vancouver, WA 98662.

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COMMODORE 64 and VIC-20 SOFTWARE: Amateur Radio, Utility, and Game software available from RAK Electronics, Box 1585, Orange Park, Florida 32067-1585. FREE CATALOG!

REPLACE RUSTED ANTENNA BOLTS WITH STAINLESS STEEL BOLTS. Small quantities, free catalog. Elwick, Dept. 507, 230 Woods Lane, Somerdale, NJ 08083.

MISSOURI STATE ARRL CONVENTION, Kansas City, Missouri, April 7–8, 1984. Information PHD Amateur Radio Assn., P.O. Box 11, Liberty, MO 64068-0011, or call 816-781-7313.

WANTED: Book or schematic on Johnson Challenger. Fred, Box 706, Orange City, Florida 32763.

MARCONI WIRELESS TELEGRAPH CO. OF AMERICA. We have a small quantity of ORIGINAL STOCK CERTIFICATES signed by the Vice-President and Treasurer of the Company, sealed, issued, and cancelled. MARCONI first proved that messages actually could be sent by wireless, and sparked the imagination of those who became the first HAM RADIO OPERATORS. These certificates, dated in the 1910's, are colorful with an exceptionally nice VIGNETTE of Miss Liberty sitting between globes of the East and West hemispheres, with transmission towers on each side. Each comes beautifully framed and matted, including glass protection, ready to add to the decor of any room or shack. ORIGINAL MARCONI CERTIFICATES cost much less than limited edition artworks, represent the beginning of our great hobby, may increase in value (Scripophly, the collection of old stock and bond certificates, is in its infancy and becoming more popular), represent the beginning of a giant corporation (RCA was formed with the express purpose of buying out the Marconi Wireless Telegraph Co. of America), make a unique addition to any home, and make a great gift. 10-day unconditional money-back guarantee. Price complete and delivered (we pay shipping charges). $49.95 (PA residents must add $3 for sales tax). Send check (personal check okay; place your call on your check and we will ship immediately without waiting for the check to clear your bank), Money Order, or Master Card/VISA information to: AUTHENTIC CERTIFICATES, RD 2073, Fleetwood, PA 19522. Phone: 215-944-0627. Checks received after the MARCONI Certificates are sold out will be returned uncashed.

WANTED: Old RCA, Cunningham, Western Electric, etc., tubes. Also old Thorens, Western Electric speakers, amplifiers, McIntosh, Marantz, Dynaco, tube amps. Phone 713-728-4343. Corb, 11122 Atwell, Houston, TX 77096.

A + B + C now means ARSON-BURGLARY-CRIME. SECURITY ALARM INDUSTRY BOOMING. Tremendous demand. EMPLOYMENT-BUSINESS OPPORTUNITIES terrific. INFORMATION PACKAGE $2.00 (redeemable). SECURITY ELECTRONICS INTERNATIONAL, P.O.B. 1456-GQ, Grand Rapids, Michigan 49501.

OPERATORS STILL NEEDED!! There are still many openings for operators on DXpeditions and at contest stations. Get your name on the list. Send SASE to OPERATOR REFERRAL SERVICE, Box 125, Holton, Kansas 66436 for details. No charge for this free service.

COMPUTER CALCULATED BEAM HEADINGS from your QTH. $6.00 ppd. Ham radio programs for Commodore 64, send for information. HUFF, Box 1112, Springfield, IL 62705.

SELL: Superb KWM-2A/312B-5/516F-2, all RE w/manuals, $1000. HAL ST-5000 (newest version w/TTL), excellent, w/manual, $175. Prices firm and include shipping. N4EDX (205) 836-0187.

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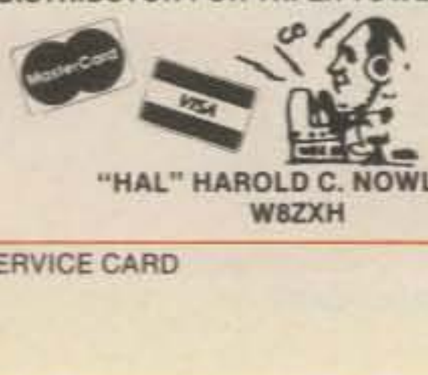

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6360	4.25	8877	450.00
6883B	6.75	8908	12.50

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MRF 454	14.95	2N3055	.75
MRF 455	10.95	2N6084	12.50

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TIMEX and TI99/4A HAM/SWL programs. CW/RTTY. Also Timex 2068. SASE for information. Kentronics, P.O. Box 586, Vernon, AL 35592.

HAMS FOR WORLD GOODWILL. Outstanding opportunity for training in international youth community. Practicum in intercultural relations, communications, youth work, preparation for international careers. Seeking flexible, enthusiastic operators (licensed) capable of preparing youths (ages 9–18) for novice, technician, general, and above class licenses. Help youths create an international amateur radio and satellite computer communications network. Full station setup: 2 meters, low band, RTTY, computer. Cost: $875 includes training, room, board. June 20–August 18. College credit available at extra cost. Ask about financial assistance. LEGACY, 1141 N. Glebe Rd., Arlington, VA 22201.

ROSS $$$$ NEW APRIL SPECIALS: If this month's special is not what you are looking for, send call letters, name, & phone number for personal price quote. Over 5,000 ham-related items in stock. ICOM # IC-02AT $309.90, IC-745 $859.90, IC-R70 $569.90. KENWOOD # TS-530SP $644.90, TS-530S $589.90, TR-9000 $379.90, TS-780 $839.00, TR-7950 $339.90. YAESU # FT-708 $259.90, FT-757GX $729.90, FRG-7700 $379.90, FRG-7 $239.90. All major lines stocked. USED KENWOOD TS-520 $429.90, TS-520S $489.90, TS-120S $449.90. L.T.O. MENTION AD. PRICES CASH, FOB PRESTON. CLOSED MONDAY AT 2:00. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263, phone (208) 852-0830.

The 15th annual B*A*S*H will be held on the Friday night of the Dayton Hamvention, April 27, 1984, at the Convention Center, Main and Fifth Streets. Parking in adjacent City Garage. Admission is free to all. Sandwiches, snacks, and C.O.D. bar available. Live entertainment for a super social evening. Don't miss it. Two exciting top awards, and many, many others. For further information, contact the Miami Valley F.M. Association, P.O. Box 263, Dayton, Ohio 45401.

WANTED: COLLINS 32V-3 with S.S.B. Write to: J. Benedict, 6300 Lapeer Rd., Goodells, MI 48027.

ATTENTION DXERS! Get Russian cards faster. All local Soviet QSL buro addresses, $4. Ed. Kritsky, KA2MXO, P.O. Box 715, Brooklyn, NY 11230.

ATTENTION C-64 USERS: Don't buy a logging program until you've read our fact sheet. For free information, write to CRUMTRONICS, P.O. Box 6187, Ft. Wayne, IN 46896.

SELL MXD Resistors: 1500 carbon $17.50; 200 W.W. $25.00; 300 pots mxd. $70.00; transformers. All F.O.B. T. Wosciechowski, 101-45 94th St., Ozone Park, NY 11416, phone 212-845-4756.

WANTED: B&W or equivalent coils. HDVL 160, 80, 40. TVL 160, 40. JVL, JEL 160, 40. In good condition, unmodified. Mike Beachy, N8ECR, 143 N. Caseville Rd., Pigeon, MI 48755.

HAMFEST: The Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 6 from 8 am to 4 pm. FCC booth, large fleamarket, and many exhibitors. Take 308 exit off I-57 to 45 South, one mile. Admission $3.00 at the gate, $2.50 in advance (s.a.s.e.). For further information: Don Kerouac, 1377 Circle Drive NW, Kankakee, IL 60901.

COMPLETE nine (9) piece all Hallicrafter amateur 10 to 80 meter station consisting of HT-37 transmitter, SX-111 Receiver, Speaker, HA-1 Keyer. HA-2 two meter transverter, HA-6 six meter transverter, power supply, TR switch, and desk microphone. This station is an estate sale in mint condition with all manuals, cords, and four extra tubes for transverter. Ready to go on air. $575.00. Navy communications Royal typewriter, $25.00. Collins Transmitter 32V-2 and Receiver 75A-1, transmitter needs low voltage transformer, $400.00 both. Clegg Apollo six linear amplifier, $150.00. Heath HP-13B 12 VDC power supply with manual, $40.00. Hallicrafter SW-500 five-band worldwide shortwave receiver, $100.00. Paul Duncanson, 6846 Calumet Ave., Hammond, IN 46324 (tel. 219-932-2196).

FOX-TANGO NEWSLETTERS: Since 1972, the prime source of modifications, improvements, and repair of Yaesu gear, free to Club members. Calendar-year dues still only $8 US, $9 Canada, $12 elsewhere. Includes five-year cumulative index by model numbers, or send $1 for index and sample Newsletter. Fox Tango Club, Box 15944, W. Palm Beach, FL 33416.

CASA MARCONI, INC.: First Pre-owned Radio Communication Equipment in Miami. Used and new gear, Bought, Sold, and in Consignments, anything in HF, SSB, VHF, CB Commercial, Marine, Amateur, Mobile, and Base Stations. Casa Marconi, Inc., 2290 NW 28 St., Miami, FL 33142, phone (305) 634-9059.

WANTED, MILITARY SURPLUS RADIOS: We neeed COLLINS 618T, ARC-72, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-823/ARC-131, or FM-622, RT-857/ARC-134 or WILCOX 807A, ARC-159, RT-1167 or RT-1168/ARC-164, RT-1299/ARC-186, RT-859/APX-72, APX-76, ARN-82, ARN-84, ARN-89, APN-155, RT-804/APN-171, MRC-95, 718F-1/2, HF-105. COLLINS ANTENNA COUPLERS 490T-1, 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, 490B-1, 690D-1, CU-1239/ARC-105. Top dollar paid or trade for new amateur gear. Write or phone Bill Slep 704-524-7519, Slep Electronics Co., Hwy. 441, Otto, NC 28763.

THE ATLANTA HAMFESTIVAL 1984, sponsored by the Atlanta Radio Club, June 16th and 17th, will be held at the Atlanta Civic Center. 70,000 square feet of air-conditioned exhibitor space and over 800 outdoor fleamarket spaces will be available. Fleamarket $12.50/space in advance. $15.00 at the gate for both days. Hamfest registration $5.00 in advance, $6.00 at the door. To be preregistered for the fleamarket or hamfest, we must receive your application and check by June 8th. Preregistration applications received after June 8th will be returned. Hours 8:00 AM to 5:00 PM on Saturday, 8:00 AM to 2:30 PM on Sunday. Talk-in on 3.975 MHz, 146.22/82 and 146.94 simplex. For preregistration or other information, write Atlanta Radio Club, P.O. Box 77171, Atlanta, GA 30357.

COMMODORE 64 CW INSTRUCTOR PROGRAM. Generates C.W. on TV speaker. Random code, keyboard input, or prerecorded "CW Tests." Character speed and spacing set independently. Designed for classes and increasing code speed. $15.00—diskette or cassette (specify). N7BCU, Dennis Olver, 20909 S. Ferguson Rd., Oregon City, OR 97045.

TUNABLE CW FILTER. High selectivity with low ringing. See page 14, October 1983 *QST* for details. Complete PC kit: $20 postpaid. Information: Analog Technology, Box 8964, Fort Collins, CO 80525.

CARIBBEAN DXPEDITION! Well-equipped ham shack, contest-quality antennas, AND secluded private villa in tropical gardens. Be a VP2M and give your family a once-in-a-lifetime Montserrat vacation. N5DXD, Box 7681, Houston, Texas 77270.

SELL: Kenwood TR-2400 2M HT with case, $125; Kenwood TR-7200A 2M FM transceiver, $100; both like new. HT-220, $100. Dick Yerian, KE4YC, 1525 LaRochelle, Charlotte, NC 28226, phone (704) 366-3127.

TI994/A LEARN CODE via Learning Tree and Key entry. Cassette $4, Listing $1. WA3UQR, 6004 Goodfellow Drive, Suitland, MD 20746.

MAGAZINES FOR SALE: CQ/Ham Radio/QST/73. Send SASE for list. E. Guimares, RFD 1, Bedford St., Lakeville, MA 02346.

TI-99/4A SOFTWARE: HAM ANTENNAS $5.95, TI FORMULAS $5.95, TI FILEWRITER $7.95, FINANCE $5.95, TI MAIL $10.95*, TI FILE JUNIOR $9.95, TI FILE $14.95* + $2.00 shipping, $3.00 additional for diskette. *Requires 32K and extended Basic. FREE CATALOG. RAK Electronics, Box 1585, Orange Park, Florida 32067-1585.

OPERATORS WANTED for DXpeditions and contests. Free referral service needs your qualifications for referrals. Send SASE to OPERATOR REFERRAL SERVICE, Box 125, Holton, KS 66436.

RECEIVERS: SCA FM Multiplex for background music reception, commercial grade. SASE for specs. W4JGO, Box 26, Salem, VA 24153.

ATARI PUBLIC DOMAIN SOFTWARE: 10 diskettes available. Categories: Utilities, Home & Business, Graphics & Demos, Music & Sound, Communications, Educational, Games—$12.95 each + $2.00 shipping. FREE CATALOG. RAK ELECTRONICS, Box 1585, Orange Park, Florida 32067-1585.

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- Automatic Band Switching (80/10 meters).
- Automatic Band Switching (160/10 meters) with optional model TBR-160 HD.
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Model RMK-11 (roof mount kit with multiband radial kit $39.00.
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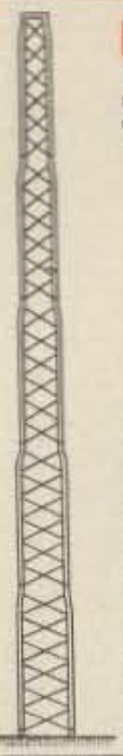

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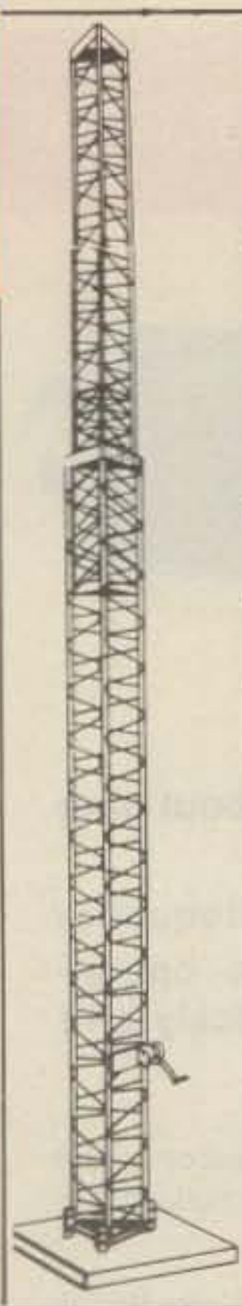
These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

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	289	24	313
HBX48	48 ft	10 sq ft	303	BXB7	369	26	395
HBX56	56 ft	10 sq ft	385	BXB8	449	30	479
HDBX40	40 ft	18 sq ft	281	BXB7	339	26	365
HDBX48	48 ft	18 sq ft	363	BXB8	429	30	459



hy-gain CRANKUP SALE!

All Models Shipped Factory Direct— Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting— no guys needed

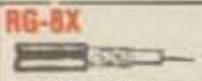
Model	Height	Load	Sale Price
HG37SS	37 ft.	9 sq. ft.,	$ 679
HG52SS	52 ft.	9 sq. ft.,	$ 959
HG54HD	54 ft.	16 sq. ft.,	$1499
HG70HD	70 ft.	16 sq. ft.,	$2399

Masts—Thrust Bearings—Other Accessories Available —Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

RG-213U
$.29/ft $279/1000 ft
Up to 600 ft via UPS

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

RG-8X
$.19/ft $179/1000 ft



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

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 ™	$1.69/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

6BTV 80-10 mtr Vert $129
4BTV 40-10 mtr Vert $89 5BTV 80-10 mtr Vert $109
G6-144B 2-mtr Base $89 G7-144 2-mtr Base $119

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$12	$12	$15	$18	$22
2KW Super	$18	$20	$22	$26	$36

Bumper Mounts - Springs - Folding Masts in Stock!

CUSHCRAFT

MULTI-BAND HF ANTENNAS

A3 3-el Tribander	$219	A4 4-el Tribander	$289
R3 20/15/10mtr Vert	$279	A743/A744 40mtr Kit	$75

HF MONO-BAND ANTENNAS

10-3CD	$ 95	10-4CD	$109
15-3CD	$119	15-4CD	$129
20-3CD	$199	20-4CD	$279
40-2CD	$289	D40	$149

VHF/UHF BEAMS

A50-5	$ 79	617B	$199
214B	$ 79	3219	$ 95
220B	$ 95	424B	$ 79

OSCAR/TWIST ANTENNAS

A144-10T	$ 52	A144-20T	$ 75
A147-20T	$ 63	416TB	$ 59
A14TMB	$ 29	PS4	$ 69

VHF/UHF FM ANTENNAS

A147-4	$ 29	A147-11	$ 49
214FB	$ 79	228FB	$219
A449-6	$ 29	ARX2B	$ 39

HY-GAIN

Broadband 3-el Triband Beam Explorer-14, In Stock—$289

QK710 30/40 mtr. Add-On-Kit	$79.00
V2S 2-mtr Base Vertical	$39
TH5MK2S Broad Band 5-el Triband Beam	$389
TH7DXS 7-el Triband Beam	$439
TH3JRS 3-el Triband Beam	$179
TH2MK3S 2-el Triband Beam	$159
HY-QUAD 2-el Triband Quad	$299
402BAS 2-el 40-mtr Beam	$219
205BAS 5-el 20-mtr Beam	$329
155BAS 5-el 15-mtr Beam	$189
105BAS 5-el 10-mtr Beam	$129
204BAS 4-el 20-mtr Beam	$249
203BAS 3-el 20-mtr Beam	$149
153BAS 3-el 15-mtr Beam	$89
103BAS 3-el 10-mtr Beam	$69
DB1015BAS 3-el 10/15 mtr Beam	$179
64BS 4-el 6-mtr Beam	$59
66BS 6-el 6-mtr Beam	$119
18HTS 80-10 mtr Hy-Tower Vertical	$429
LC-160 160-mtr Coil Kit for 18HTS	$39
214 14-el 2-mtr Beam	$39
28DQ 80/40 mtr Trap Dipole	$59
58DQ 80-10 mtr Trap Dipole	$119
BN86 80-10 mtr KW Balun W/Coax Seal	$19

MOSLEY

CL-33 3-el Triband Beam	$279
TA-33 3-el Triband Beam	$249
TA-33JR 3-el Triband Beam	$189
TA40KR 40mtr Kit for TA33	$119

Tri-Ex TOWERS SPECIAL PRICES! SAVES$!

Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$999
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$2999
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$6200	Call

ALPHA DELTA COMMUNICATIONS

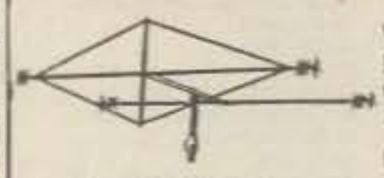
Transi-Trap ™ Surge Protectors—In Stock Now!

Model LT 200W UHF Type	$19
Model HT 2KW UHF Type	$29
Model LT/N 200W N Type	$39
Model HT/N 2KW N Type	$44
Model R-T 200W Deluxe	$29
Model HV 2KW Deluxe	$32

KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
80m-1 80-mtr Rotatable Dipole	$469
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$339
40m-4 4-el 40-mtr Beam	$649
20m-6 6-el 20-mtr Beam	$689
15m-6 6-el 15-mtr Beam	$439
10m-6 6-el 10-mtr Beam	$259
10-30-7LPA Log Periodic Beam	$639
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14-el 2-mtr Satellite Antenna	$89
435-18C 435 MHz Satellite Antenna	$65
432-16LB 16-el 432 MHz Beam	$69

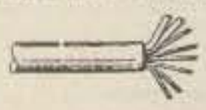
MINI-PRODUCTS HQ-1 only $159!



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)	$109
Alliance U110 (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)	$479
Kenpro KR-500 Heavy duty elevation rotor	$189.00



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)

UNR-ROHN GUYED TOWERS

10 ft Sections 20G $37.50 25G $46.50 45G $107.50

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	829
FK2558	58 ft	13.3 sq ft	$ 899
FK2568	68 ft	11.7 sq ft	$ 959
FK4544	44 ft	34.8 sq ft	$1159
FK4554	54 ft	29.1 sq ft	$1259
FK4564	64 ft	28.4 sq ft	$1359
25G Foldover Double Guy Kit			$249
45G Foldover Double Guy Kit			$269

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid!
Foldover prices 10% higher west of Rockies.
All Rohn 25G & 45G Accessories in stock - Call!

TOWER/GUY HARDWARE

3/16 "EHS Guywire (3990 lb rating)	$.13/ft
1/4 "EHS Guywire (6000 lb rating)	$.16/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	$1.99
1/4 " Preformed Guy Grip	$2.49
6 " Diam - 4 ft Long Earth Screw Anchor	$12.95
500D Guy Insulator (5/32 " or 3/16 " Cable)	$1.39
502 Guy Insulator (1/4 " Cable)	$2.49
5/8 " Diam - 8 ft Copper Clad Ground Rod	$12.95

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)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$6.9
9902LD Cable End (for 6700 cable)	$7.9
Socketfast Potting Compound (does 6-8 ends)	$12.9

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	$49	$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

TEXAS TOWERS

DIV. OF TEXAS RF DISTRIBUTORS INC.

1108 Summit Ave., Suite 4 / Plano, Texas 75074

ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Mon.-Fri.: 8:30 a.m. - 5:30 p.m. Sat. 9 a.m. - 1 p.m.

TELEPHONE: (214) 422-7306

MasterCard VISA

CIRCLE 43 ON READER SERVICE CARD

COMMUNICATIONS EQUIPMENT SALE!

ICOM

ICOM IC-751A LIST PRICE $1399
CALL FOR SPECIAL SALE PRICE!

ICOM IC-745 LIST PRICE $999
CALL FOR SPECIAL SALE PRICE!

IC-02AT
NEW 2 METER
TOP OF THE LINE HT

- Digital LCD Readout
- Scanning
- Programmable PL Tones
- Optional 5W Battery
- S-meter Function
- 10 Memories
- Offset Storage
- Lithium Memory Backup
- 13.8VDC Operation!
- Sealed Case

SUGGESTED LIST PRICE $349
CALL FOR SALE PRICES!

KENWOOD

TS-930S LIST PRICE $1799
CALL FOR SPECIAL SALE PRICE!

TS-430S LIST PRICE $899.95
CALL FOR SPECIAL SALE PRICE!

TR-2500 2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver
Small Size— Small Price— Big Performance!

- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built In Sub-tone Encoder
- Built-In 16 Key Autopatch Encoder
- Slide Lock Battery Pack

TR-2500 List Price $329.95
CALL FOR SPECIAL SALE PRICES

FT-757GX LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

FT-726R LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

FT-208R 2M HT
List $319
FT-708R 440 MHz HT
List $319

- **LCD Display**
- **10 Memories**

CALL FOR SPECIAL PRICES!

SANTEC

NEW ST142μP 2M HT

- 3.5W/1W/0.1W
- 142-149.995 MHz
- LCD Display
- Programmable PL Option

List 339.95
SALE $299.95!

ST144μP	$259.95
ST222μP	CALL!
ST442μP	CALL!

SANTEC Accessories

SM3 Speaker Mic	$34.95
ST-LC Leather Case	$34.95
ST-500 NiCad Battery	$29.95
ST-4QC Base Charger	$69.95

FACTORY AUTHORIZED DEALER FOR ALL MAJOR AMATEUR LINES

ALPHA SALE!

76PA $1899!

Model	List	Sale*
76A	$1985	CALL
76PA	$2395	CALL
76CA	$2695	CALL
374A	$2595	CALL
78	$3495	CALL

***Sale Prices Too Low To Print— CALL & SAVE $$!**

TEN-TEC SALE!

CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!
All Ten-Tec Accessories in Stock for Fast Shipment!

TEN-TEC
New 2M HT
Full Featured!
List $319
Sale $279.95!

4229 2KW Tuner Kit $189.95!

HAL SALE!

NEW RTTY/CW COMPUTER INTERFACES

CRI-100 List $249 SALE $229.95!
CRI-200 List $299 SALE $269.95!

CWR6850 RTTY/CW TERMINAL

List $999 SALE $749.95!

Other HAL Products On Sale

CWR6700	$439.95	DS3100ASR	$1699.95
CWR6750	$629.95	MPT3100	$2199.95
CT2100/KB2100	$749.95	RS2100	$289.95
CT2200/KB2100	$949.95	ST5000	$219.95
DSK3100	$1049.95	ST6000	$649.95
ARQ1000	$649.95	KG-12	$169.95

TOKYO HY-POWER LABS

HL-30V Reg. $69.95 SALE $59.95

HL-82V . $139.95	HL-90U . $329.95
HL-160V $289.95	HC-200 . . $89.95
HL-20U . . $99.95	HC-2000 $289.95

KDK FM2033

List $339.95 Sale $299.95

JANEL QSA5 PREAMP $39.95!

QSA-6	$41	432PL	$59
PB-30	$25	PB144	$25
PB-50	$25	PB220	$25

MIRAGE AMPLIFIER SALE!

B1016 $249

Model	Band	Pre-amp	Input	Output	DC Pwr	Sale Price
A1015	6M	Yes	10W	150W	20A	$249
B23	2M	No	2W	30W	5A	$ 79
B215	2M	Yes	2W	150W	22A	$259
B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
D24	440	No	2W	40W	8A	$179
D1010N	440	No	10W	100W	20A	$289

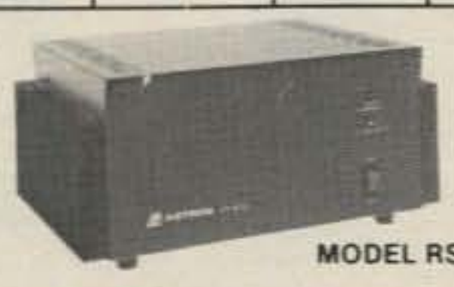
RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak-Reading Wattmeter $99

ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable

- Input Voltage: 105–125 VAC Output: 13.8 VDC ± 05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	'Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

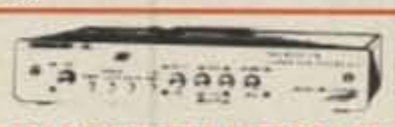


MODEL RS-50A

CP-1 COMPUTER PATCH
List $239.95 SALE $189.95!

CP1-20	$219	CP1-64	$219
MP-20	$219	MP-64	$219
VIC-20 MBAText	$79	C-64 MBAText	$79

All AEA Keyers, Antennas & Accessories In Stock!



MFJ 1224 COMPUTER INTERFACE $89.95

202B Noise Bridge	$59.95
250 2KW Oil Load	$35.95
422 Keyer/Paddle	$89.95
901 300W Tuner	$59.95
941C 300 W Tuner	$89.95
989 Deluxe 2KW	$299.95

KANTRONICS

The Interface Reg. $169.95 Sale $129.95
The Interface II Reg. $269.95 Sale $239.95

Apple Amtor Soft/Hamtext	$139	VIC-20 Hamsoft	49
Vic-20 Amtor Soft	89	Hamtext VIC-20	99
Model 64 Amtor Soft	89	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
		TRS-80C Hamsoft	59

METRON MA1000B AMPLIFIER

Solid State 1KW Amplifier

- No Tuning
- 13.8 VDC Operation
- Remote Bandswitching
- Compact
- Heavy-Duty Construction

List Price $995 SALE PRICE $895.95

TEXAS TOWERS

Telephone (214) 422-7306

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Monday-Friday 9 AM - 5 PM Saturday 9 AM - 1 PM

CIRCLE 47 ON READER SERVICE CARD

YAESU SALE!

FT-ONE

GENERAL COVERAGE—ALL MODE DELUXE SOLID STATE TRANSCEIVER

Buy Now and Receive These Accessories Free:

300Hz CW Filter..$FREE	600Hz CW Filter..$FREE
800Hz CW Filter..$FREE	6Khz AM Filter...$FREE
Memory Backup..$FREE	Installation.....$FREE

List Price $3074. CALL FOR YOUR SPECIAL PRICE!
Quantities Limited — Hurry!

FT-980

CAT SYSTEM—Computer Aided Transceiver

- Wide Dynamic Range
- Low Noise Front End
- General Coverage
- 10Hz Digital Readout
- All Mode Transceive—CW/SSB/AM/FM/FSK!
- Full Break-in CW
- RF Speech Processor
- Variable Bandwidth
- IF Shift
- APF/Notch
- AC Power Supply
- Adjustable Noise Blanker
- 12 Internal Digital VFO's with Memories
- Much, much more—call or write for info

Computer Interface now in development—
Own Tomorrow's HF Transceiver—Today!!
Manufacturer's Suggested List Price $1499
Call For Your Special Price Today!!

FT-757 GX

Compact General-Coverage Transceiver

- General-Coverage Receiver
- USB/LSB/CW/AM/FM
- Dual VFOs
- 8 Memories with Lithium Backup
- IF Shift/IF Width Controls
- Memory/Band Scan
- Speech Processor
- CW Filter and CW Keyer included
- 100 Watt Output/100% Duty Cycle
- Many, Many Other Features

List Price $829. Call for Special Low Texas Towers Discount Price and Save $$$

FT-77

New 80-10mtr Compact HF Transceiver

- Digital Readout
- Adj Noise Blanker
- CW/SSB/FM Modes
- CW Wide/Narrow
- Optional AC Supply, CW Filter, FM Unit External VFO, Antenna Tuner Available

List Price $599—Call for Special Low Texas Towers Discount Price and Save $$

FT-230R 2mtr FM.....$359
FT-730R 440Mhz FM.....$399

- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory or Up/Down Scan

Call today for Special Discount Price & Save $$

FT-726R VHF/UHF
All Mode Tri-Band Transceiver

- 50-54 Mhz
- 144-148 Mhz
- 10 watts output on all bands
- 430-450 Mhz
- 21, 24.5 & 28 Mhz option available soon

Please Call For Price & Delivery Information

VHF/UHF Multimode Portables

FT-690R 50Mhz.....$379
FT-290R 144Mhz.....$399
FT-790R 430Mhz.....$399

Call today for Special Discount Price & Save $$

FRG-7700

All Mode Digital Communications Receiver .15 to 29.99Mhz—Receives SSB/AM/FM/CW, Built-in S Meter, Speaker, Noise Blanker, Timer, FM Squelch, AC Supply and More!

Manufacturer's List $499—Call today for Your Special Discount Price!!

FT-208R 2mtr HT.....$319
RF Out: 300mw/2.5W

FT-708R 440Mhz HT....$319
RF Out: 200mw/1.0W

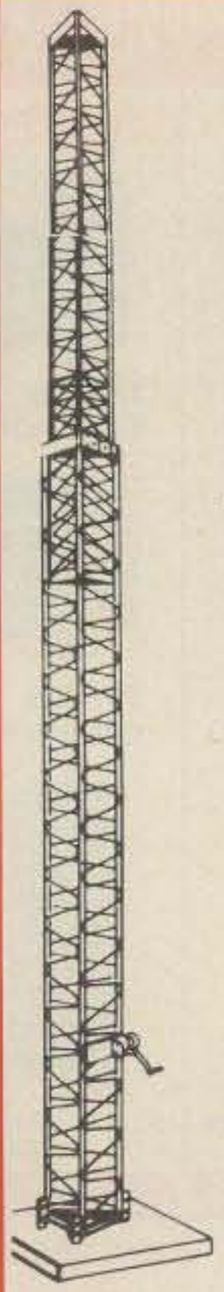
- LCD Display
- 10 Memories
- Up/Down and Memory Scanning
- Complete w/Nicad Battery, Charger and Rubber Duck Ant

Accessories Available:

LCC-8 Leather Case	$35
YM24A Spkr/Mic	$39
FNB-2 Nicad	$29
NC-8 Base Chgr	$99

Call for Special Yaesu Discount Prices!!

IMPORTANT — Prices shown are suggested by the Manufacturer.
You can Save Money with a Big Texas Towers Discount!
Call today for our Special Yaesu Sale Prices and Save $$$!!



hy-gain

CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft.	9 sq. ft.,	$ 679
HG52SS	52 ft.	9 sq. ft.,	$ 959
HG54HD	54 ft.	16 sq. ft.,	$1499
HG70HD	70 ft.	16 sq. ft.,	$2399

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

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	$579
WT-51	51 ft.	9 sq. ft., 50 mph	$999
LM-354	54 ft.	16 sq. ft., 60 mph	$1599
LM-470D (Motorized)	70 ft.	16 sq. ft., 60 mph	$2999

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

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CIRCLE 136 ON READER SERVICE CARD

YAESU FT-726R TRIBANDER

NEW GALAXIES OF PERFORMANCE ON VHF AND UHF

FULL DUPLEX!!

ATELLITES!! **SCATTER!!**

M!! **EME!!**

The New Yaesu FT-726R Tribander is the world's first multiband, multimode Amateur transceiver capable of full duplex operation. Whether you're interested in OSCAR, moonbounce, or terrestrial repeaters, you owe yourself a look at this one-of-a-kind technological wonder!

Multiband Capability

Factory equipped for 2 meter operation, the FT-726R is a three-band unit capable of operation on 10 meters, 6 meters, and/or two segments of the 70 cm band (430-440 or 440-450 MHz), using optional modules. The appropriate repeater shift is automatically programmed for each module. Other bands pending.

Advanced Microprocessor Control

Powered by an 8-bit Central Processing Unit, the ten-channel memory of the FT-726R stores both frequency and mode, with pushbutton transfer capability to either of two VFO registers. The synthesized VFO tunes in 20 Hz steps on SSB/CW, with selectable steps on FM. Scanning of the band or memories is provided.

Full Duplex Option

The optional SU-726 module provides a second, parallel IF strip, thereby allowing full duplex crossband satellite work. Either the transmit or receive frequency may be varied during transmission, for quick zero-beat on another station or for tracking Doppler shift.

High Performance Features

Borrowing heavily from Yaesu's HF transceiver experience, the FT-726R comes equipped with a speech processor, variable receiver bandwidth, IF shift, all-mode squelch, receiver audio tone control, and an IF noise blanker. When the optional XF-455MC CW filter is installed, CW Wide/Narrow selection is provided. Convenient rear panel connections allow quick interface to your station audio, linear amplifier, and control lines.

Leading the way into the space age of Ham communications, Yaesu's FT-726R is the first VHF/UHF base station built around modern-day requirements. If you're tired of piecing together converters, transmitter strips, and relays, ask your Authorized Yaesu Dealer for a demonstration of the exciting new FT-726R, the rig that will expand your DX horizons!

Price And Specifications Subject To Change Without Notice Or Obligation

CIRCLE 4 ON READER SERVICE CARD

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The radio.

483

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YAESU CINCINNATI SERVICE CENTER 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100

ICOM IC-27A

The Most Compact 2 Meter Mobile!

Now ICOM presents an important breakthrough in two-meter mobile communications, the IC-27A. The smallest two-meter mobile available, the IC-27A measures only 38 millimeters high by 140 millimeters wide. As an added bonus, the IC-27A, through ICOM engineering, is able to contain an internal speaker to provide ease of mounting and make the unit one small compact complete package.

25 Watts. In such an incredibly small package, the IC-27A is able to provide 25 watts of output power. And even though the IC-27A is the smallest available two-meter mobile unit, it has sacrificed none of the features found in fully featured VHF mobiles.

32 PL Frequencies. The IC-27A comes complete with 32 PL frequencies ready to go and controlled from the front panel knob. Each PL frequency may be selected by the main tuning knob and stored into memory for easy access along with frequency.

10 Memories. The IC-27A has 10 tunable memories available to store receive frequency, transmit offset, offset direction, and PL tone. Memories are backed up by a lithium backup battery, which will store memories for up to seven years.

Speech Synthesizer. As an added plus, the IC-27A features an optional speech synthesizer to verbally announce the receiver frequency of the transceiver through the simple push of a button. This allows the operator to hear what frequency he is operating on without looking at the transceiver.

Scanning. Included with the IC-27A is a scanning system which allows scanning of memories or scanning of the band. Each memory may be scanned between programmable limits.

Priority Scan. Priority may be selected to be either a memory channel or a VFO channel. By using sampling techniques, the operator can determine if a frequency he is interested in using is free or busy.

Microphone. Each IC-27A comes complete with a microphone which includes a 16-button touchtone pad for access to your favorite repeater or for dialing through an autopatch.

THE ICOM 27A is a superior piece of ham equipment engineered and built by ICOM to provide superb performance in the mobile radio environment. See the IC-27A at your local ICOM dealer.

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The World System

CIRCLE 49 ON READER SERVICE CARD

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 27A108