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Amateur Radio

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HAM RADIO

SPECIAL ANTENNA ISSUE

On the cover:
Ralph Bellas, K9ZO
of Bloomington, Ill.

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R'S JOURNAL

KENWOOD

Triple Play!

TM-941A

TRI-BAND FM Transceiver

Kenwood brings you yet another breakthrough – the TM-941A *TRI-BAND* FM TRANSCEIVER. Now you can operate on *three* bands – 144, 450, or 1200 MHz – with one radio! This rig even gives you full duplex, cross-band, triple-band repeat!

- **High power output.**
  50 W on 144 MHz, 35 W on 450 MHz, and 10 W on 1200 MHz. (Selectable low power: 5 and 10 W, 1 W on 1200 MHz.)
- **Wide band receiver coverage.**
  118-174, 438-450 (400-475 after modification), 1240-1300 (1210-1330 after modification) MHz. TX on Amateur bands only. Modifiable for MARS/CAP. Permits required.
- **CTCSS encode/decode built-in.**
  38 sub-tones selectable from the front panel.
- **Cross-band repeat function.**
  Selectable single or dual input! Offset function on output, allows simplex to repeater repeat!
- **Simultaneous tri-band receive.**
  Individual volume and squelch controls help you "sort out" the signals.
- **Detachable front panel.**
  Use the optional PG-4K or PG-4L to mount the front panel remotely.
- **Selective calling option (DTU-2).**
  Selectively call a single station,or call a group with DTMF tones.
- **303 memory channels.**
  Store everything you need for efficient operation. All channels allow you to store "odd split" repeaters.
- **Versatile scanning functions.**
  Band scan, memory scan and programmed scan with carrier or time operated stop.
- **NEW! Auto memory scan.**
  Automatically memorizes a busy frequency while scanning the band!
- **Automatic repeater offset on 2 m.**
  Plus or minus 600 kHz for 144 MHz, ±5 MHz on 450 MHz, and ±12 or 20 MHz for 1200 MHz. (Manual offset for 450 and 1200 MHz.)
- **Fixed detect output.**
  For packet operators!
- **Multi-function DTMF mic supplied.**
- **Auto power off and time-out timer.**
- **4-step dimmer control.**
  Selectable 4-step dimmer control.
- **Three separate antenna and speaker connectors.**
  For maximum performance.

Optional Accessories:

- **DTU-2** Digital paging (DTMF) unit
- **PG-4K, PG-4L** Front panel cable kits
- **MC-45** Multi function mic.
- **MB-11** Extra mounting bracket
- **SP-41, SP-50B** External mobile speakers
- **PG-3B** DC line noise filter
- **PS-430** Power supply
- **PG-2N** DC power cable.

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

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
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Stacked in your favor!

TM-231A/ 331A/431A/531A

FM Mobile Transceiver

Looking for a compact transceiver for your mobile VHF and UHF operations? KENWOOD has a compact rig for each of the most popular VHF/ UHF bands.

- **20 multi-function memory channels.**
- **High performance — high power! 50W (TM-231A), 35W (TM-431A) with a 3 position power switch.**
- **Optional full-function remote controller (RC-20).**
  A full-function remote controller can be mounted in any convenient location. Using the IF-20 interface the RC-20 may be connected to four mobile transceivers. (TM-231A/ 431A/531A or the TM-701A).
- **Multi-function microphone supplied.**
  Various controls are provided on the mic. for increased utility.
- **Auto repeater offset on 144 and 220 MHz.**
- **Built-in digital VFO allows selection of the frequency step.**
  (5, 10, 15, 20, 12.5, 25kHz; TM-531A: 10, 20, 12.5, 25kHz.)
- **Selectable CTCSS tone built-in.**
- **Tone alert system — for true "quiet monitoring"!**
  When enabled this function will activate a tone when squelch opens.
- **DRS (Digital recording system).**
  The optional DRU-1 can store received and transmitted messages for up to 32 seconds, allowing the operator to check or return any call using the tone alert system.
- **Automatic lock tuning function (TM-531A).**
- **Repeater reverse switch.**

TM-231A
136–174 MHz receive,
TX on Amateur bands only
Modifiable for MARS/CAP
Permit required.

Optional Accessories:

- **RC-20** Full-function remote controller • **RC-10** Handset • **IF-20** Interface unit handset • **DRU-1** Digital recording unit • **MC-44** Multi-function hand mic. • **MC-44DM** Multi-function hand mic. with auto-patch • **MC-48B** 16-key DTMF hand mic. • **MC-55** 8-pin mobile mic. • **MC-60A/80/85** Desktop mics. • **MA-700** Dual band (2m/ 70cm) mobile antenna (mount not supplied) • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **PS-430** Power supply • **MB-201** Mobile mount • **PG-2N** Power cable • **PG-3B** DC line noise filter
- **PG-4H** Interface connecting cable
- **PG-4J** Extension cable kit
- **TSU-6** CTCSS unit

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Prefer-ability!

TH-26AT/46AT

144 MHz/450 MHz

Compact Portable FM transceivers

Select the radio that lets you choose who can call *you*. The new DTMF encode/decode squelch system (DTSS) gives you selective calling—either "single page" or "group call". You also get a four 15 digit auto-dialer, DC direct-in capability (with optional PG-3F or PG-2W), versatile scanning functions, wide-range of DC power sources, 5 W capability, and an extensive list of exciting accessories!

- **Frequency coverage:**
  TH-26AT: 136–173.995 MHz;
  TH-46: 438–449.995 MHz.
  (TH-26AT modifiable for MARS/CAP. Permits required.) TX on Amateur band only.
- ***NEW!* Dual Tone Squelch System (DTSS)**
  Enables selective calling with 3-digit DTMF codes! The DTSS codes can be stored in channels 1–3.
- **Multi-function scanning.**
  Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **21 memory channels.**
  Store everything you need, including CTCSS and DTSS codes. Ten channels can store RX and TX frequencies independently for odd split operations.
- **Auto-dialer function.**
  Four 15-digit DTMF codes can be stored for auto-patch use.
- **Frequency step selectable for quick QSY.**
  Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- Five watts output when operated with PB-8 battery pack or 13.8 volts.
- Large top mounted LCD display, with night-light.
- Automatic repeater offset.
- **T-ALERT for quiet monitoring.**
  Tone Alert beeps when squelch is opened.
- Auto battery saver, and economy power mode to extend battery life.

- **Supplied Accessories:**
  Flex antenna, PB-10 battery pack (7.2 V, 600mAH), wall charger, belt hook, wrist strap, bottom cover.

Optional Accessories:

- **PB-5** 7.2 V, 200 mAh NiCd pack for 2.5 W output
- **PB-6** 7.2 V, 600 mAH NiCd pack
- **PB-7** 7.2 V, 1100 mAH NiCd pack
- **PB-8** 12 V, 600 mAh NiCd for 5 W output
- **PB-9** 7.2 V, 600 mAh NiCd with built-in charger
- **PB-10** 7.2 V, 600 mAh (works with BC-2 wall charger)
- **PB-11** 12 V, 600 mAh **OR** 6 V, 1200 mAh, for 5 W **OR** 2 W
- **BC-10** Compact charger
- **BC-11** Rapid charger
- **BT-6** AAA battery case
- **BT-7** AA battery case
- **DC-1/PG-2V** DC adapter
- **HMC-2** Headset with VOX and PTT
- **SC-24, 25, 26** Soft cases
- **SMC-31** Speaker mic.
- **SMC-33** Speaker mic. w/remote control
- **TSU-7** CTCSS encode/decode unit
- **PG-2W** DC cable w/fuse
- **PG-3F** DC cable with filter and cigarette lighter plug
- **WR-1** Water resistant bag

NOTE: The BC-11 and BC-10 stand chargers can charge all NiCd packs except the PB-10.

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

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The Radio Amateur's Journal

ON THE COVER: Contester Ralph Bellas, K9ZO, prepares to hoist a homebrew 6 element 10 meter beam to its final position on one of his two 70' towers. That's a 3" by 42' boom near the tower base . . . future project, says Ralph. (Photo by Larry Mulvehill, WB2ZPI)

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EDITORIAL

At the recent Dallas HAMCOM I noticed a very interesting phenomenon. There was a petition circulating demanding political redress from the ARRL on their recent proposal to "excommunicate" DXpeditions or certain DX operations which *seemed* to encourage bad behavior on the amateur bands. I use the word "seemed," because the proposal would make it appear that on the part of the DXpedition and the thousands of amateurs calling them there is some sort of collusion to create an internationally embarrassing, raucous situation, albeit "The Ugly Americans Take To The Air."

At the Dayton Hamvention there was celebration on the part of amateurs who had helped defeat another ARRL proposal on shifting frequencies for digital communications. The announcement of the League's formal withdrawal of their FCC proposal came at Dayton. I was told that part of the rationale for the proposal was based on "how we looked to the rest of the world at WARC."

So it would appear that while the League concentrates on the "Big Picture," the American amateur has become politicized and in some ways radicalized against what has been heretofore the unquestioned establishment. In the '60s everyone went along with the rationale for "Incentive Licensing" even though the consequences proved dire to the hobby. Today some amateurs question whether the "emperor has clothes" or not, and they are not shy about saying that sometimes the emperor is just standing there naked and looking foolish.

If you think I'm League Bashing, you're wrong. It's not a question of "us against them" or "them against us," for the ARRL *should* be our respected national organization. In the last few years more and more amateurs have begun to feel that the League has been marching to a different drummer and keeping an agenda that no longer represents their constituency (that's us).

Years ago we at *CQ* liked to think of ourselves as "the loyal opposition," providing an alternative voice. As other periodicals came on the scene, they too added their comments as well as their readers' thoughts. I think that everyone agreed in principle that there was, and still is, a need for a national representative organization. As years went by and times changed, the concept of "loyal opposition" was viewed as an adversarial position, and at times the wagons were drawn in a circle to defend the indefensible.

Emotionally the wagons are still drawn in a tight circle. The blind trust is no longer there, nor is the blanket acceptance of the all-knowing smile that says "trust us to know what's right for you" and "we're working behind the scenes, so we know things that you don't (and we can't tell you)." People these days won't take that attitude from the government, let alone from the League. This is not a slap in the face of the League. It's just that people are more willing to stand up for what they believe and to ask for accountability.

The concept of a league is that it should represent all amateurs, not just members, and reflect what is good for amateur radio, not just its membership. Maybe that's too ideal or naive to expect, but that is what is being inferred. Most of us don't belong to the League. More of us should. The League represents about 25% of us, the *us* being licensed amateurs. To be fair, neither the League nor anyone else can tell you what most of us are doing with our licenses.

There are at present about a half million of us out there doing different things (or nothing) with our licenses. We are no longer the small homogeneous group of the '40s that offered blind faith and loyalty to government and 38 LaSalle Street. We're all self-policing in the sense of being policemen on the bands and protecting or advancing what we construe our rights to be.

Again, to be perfectly fair, if you consider all of the amateurs involved with what is questionable, despicable, and blatantly illegal activity of the recent 3Y and 7O1 operations and add in all sides of the maritime net fiasco, they add up to a very, very small percentage of the half million of us. It should come as no surprise to anyone when the next bit of rare earth to get activated produces the same feeding frenzy. The problem is ignorance.

The role of the League is changing, and I'm not sure if the organization has figured that out yet. The recent display of petitions and organized resistance to ARRL-backed proposals has shown in perhaps a small way that its purpose is not necessarily to perpetuate itself by creating restrictive legislation or regulating behavior. Its purpose would seem to be evolving into *teaching* appropriate behavior rather than *regulating* it. In fact, the entire hobby would benefit from such a program.

Since 1983 we have spent more time discussing code or no code and how hard (or easy) to make license exams to protect everyone's feelings and egos, than we have spent sitting down and trying to develop material to teach the average amateur what is actually done on the air. I've written for years that one of the few elements of the exam that can be failed (and a license still issued) is the one on rules and regulations.

I know in some perverse way it makes sense to memorize the theory of some circuit that you can't afford the test equipment to check out, and to totally ignore how to work split operation or understand what the controls on your transceiver do. We have this irrational fixation on the way things should be and a total disregard of the way they really are.

Learning more and more theory or faster and faster code will not solve our problems nor add to our ranks. Bad operating is "learned" and is not eradicated by punishing a DXpedition. Bad operating is not confined to license class or the number of years a license is held. It also is not confined to Americans, as listening to any pile-up will attest.

If we are to expect an influx of new amateurs via a Communicator Class license, then we shouldn't be adding to the problem. The government through the FCC long ago decided to deregulate amateur radio, not create an alternative body to assume the task. What we should be doing now and not somewhere down the road is examining that reality and making it work.

Self-policing is also a concept with little grounding in reality. It infers something punitive rather than instructive, and I'm afraid that it too is standing naked in the wind. To punish the operating activity or to seek legislation to remedy a purported "image" problem is to say we cannot educate our licensees. I can't accept that, especially when for years we've gone out of our way not to include or value material on rules, regulations, and operating on our licensing exams.

If all we and our national organization have to worry about is punishment and restriction, then we have failed our basic obligation to teach what is important, expected, and needed to be a good amateur radio operator. It is still amazing to me that no one finds it curious that an individual can pass a license exam (of any class) and still have no idea how to build or buy, set up, or operate the station for which he or she is licensed. Try out that concept with the FAA.

Rather than creating more "image-changing" fiascoes ala Incentive Licensing, why don't we try to work at reality for a while? How crazy can it be to prepare someone for what he or she actually needs to know in order to be successful?

73, Alan, K2EEK

AEA's IsoLoop™ HF ANTENNA

REVOLUTIONARY COMPACT DESIGN

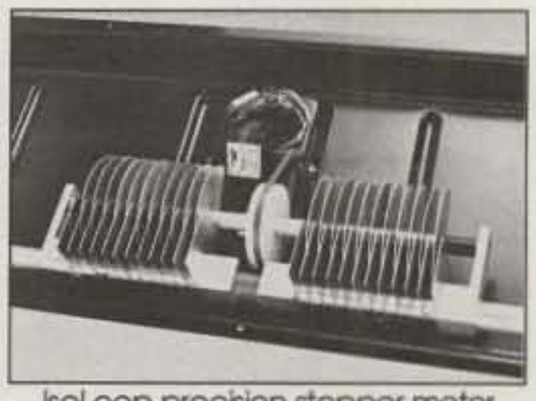
Once again AEA has achieved a significant engineering breakthrough with its high-performance, low profile HF IsoLoop antenna. Performance isn't compromised by its small size. Operate your favorite HF band (14 to 30 MHz frequency coverage) from areas with restrictive zoning ordinances or apartments and condos. Or take it with you on vacation. . . it's the ideal go-anywhere portable antenna. And it's the only antenna you need to cover 14 to 30 MHz. ONE antenna instead of numerous dipoles and without any traps!

150 Watts. Rated up to 150 watts, the IsoLoop transmits and receives on any frequency between 14 to 30 MHz. When mounted with the loop in the horizontal plane, the radiation pattern is omni-directional and horizontally polarized, with the gain of a dipole. Maximum radiation is at low angles which is ideal for DX operation. The IsoLoop may also be mounted with the loop in the vertical plane to provide a null in a desired direction. Tuning is provided by a precision stepper-motor and a small remote control box, the LC-1.

The IsoLoop does not need ground radials and its balanced, shielded feed-loop isolates the feedline from the antenna. The IsoLoop is well-isolated from the feedline. Like AEA's Isopole antennas, your signal is radiated by the antenna and not the feedline. With end-fed antennas, the outside of the coax becomes part of the antenna, resulting in noise and computer hash pickup and increased TVI problems.

High-Q Design. One of the unique features of the IsoLoop is its inherent High-Q. The IsoLoop can be considered a very sharp tunable filter that radiates. The narrow bandwidth suppresses harmonics from your transmitter reducing TVI problems. It also attenuates out-of-band signals from nearby transmitters that could overload your receiver.

Compact. The IsoLoop is square, with rounded corners, and measures 32 inches on a side and weighs only 12 pounds. Because of the IsoLoop's small size, it makes a perfect attic or balcony antenna. It's also excellent for portable operation, recreational vehicles or camp-site use. A rotator is not necessary when used in the omni-directional, horizontally polarized mode.



IsoLoop precision stepper motor provides accurate tuning.

IsoLoop LC-1 control box with variable speed tuning.

Revolutionary. The AEA IsoLoop antenna represents years of research and development. Others may try to imitate the IsoLoop, but none can match the patent-pending design.

AEA also provides technical support from the factory or through your personal computer and modem on CompuServe's HamNet. If you are already a CompuServe member, just type GO HAMNET at any CompuServe prompt. For a free introductory CompuServe membership, call 1-800-848-8199 and ask for representative #48.

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Stand optional.

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WOW!
SO MANY FEATURES!

DJ-160T
DJ-460T

Engineered with the most advanced electronic technology, the new DJ-160T and DJ-460T, VHF and UHF FM hand-held transceiver from Alinco are now available. Standard features include simple operation, easy to read LCD, 3 methods of frequency selection, 5W when operated on 12V DC, and a unique DTMF Decode/display features.

- **Ultra Compact Body:**
  5-1/2"(H) x 2- 1/2"(W) x 1-1/4"(D)
- **Power Output**
  DJ-160T 3 Watts
  DJ-460T 2.5 Watts
  with standard 700mAH Battery
- **Extended Frequency Coverage**
  DJ-160T
  144.0 Mhz - 147.995 Mhz (TX)
  137.0 Mhz - 173.995 Mhz (RX)
  DJ-460T
  440.0Mhz - 450.0Mhz (TX)
  410.0Mhz - 470.0Mhz (RX)
  Specification guaranteed on amateur band only (Modifiable for mars / Cap-permits required)
- **Easy to Enter Frequency Selection**
  Direct Frequency entry from keyboard, UP/DOWN Buttons or Dial
- **20 Memory Channels plus 1 Call Channel**
  Tone Frequency, Tone Encode, + or - Shift, DSQ Setting and Offset Frequency can be stored in memory
- **3 Scan Modes**
  Memory Scan, Band Scan or Program Scan
- **2 Selectable Scan Types**
  Busy Scan - Resume Scan after the signal drops
  Time Scan - Resume Scan after a 5 second pause on a busy frequency
- **DSQ (DTMF Squelch) Function**
  3 Types of paging Function, Group Paging, Private Paging in a group or Private Paging to a specific person (This Function is compatible with other manufacturers units) The DTMF decode Function and optional tone squelch (DJ-160) will give you additional flexibility in your communication needs
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- **Priority Function:** VFO Priority, Memory Priority or Call Priority
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  This function will turn the power off automatically after 30 minutes of non - use
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  The unit displays DTMF Codes, as received, on LCD
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The ALINCO Model DR-590T is a full featured/dual band tranceiver that is user friendly, and puts the fun back in Radio.

The DR-590T is packed with more features than most hams will ever use. But it is engineered so that you don't have to be an engineer to understand and use the various functions. The easy LCD display lets the operator know, at a glance, which functions are in operation.

ALINCO has listened to you, the Ham, and incorporated many of the features you told us you wanted in a Dual Band (VHF/UHF) radio. And we did it while keeping the operations truly user friendly.

DR-590T

- **Ultra-Compact Body**
  5-7/8" (W) x 2" (H) x 7" (D)
- **High Power (Selectable)**
  High: 45W at VHF — High: 35W at UHF
  Middle: 10W — Middle: 8W
  Low: 5W — Low: 4W
- **Extended Receiver Range**
  144.00 - 147.995 Mhz (TX), 130 - 173.995 Mhz (RX), 440.00 - 449.995 Mhz (TX), 410 -470 Mhz (RX)
  (Specification guaranteed on amateur bandsonly. Modifiable for MARS/CAP permits required)

FEATURES

- **Simultaneous**
  Receiving on both bands at the same time
  Scanning intermix scan model on both bands at the same time.
- **Independent VHF & UHF Controls**
- **Detachable**
  With the optional remoting kit, the front panel can be seperated from the main unit.
- **DSQ (DTMF Squelch) Function**
- **Code Squelch Function**
  You can program a 3 digit code that will open the squelch only when the same code signal is receive from another transceiver. This allows for selective receiving. Additionally, with the optional tone squelch unit, the code squelch and tone squelch work together as a powerful calling function.
- **Various Useful Paging Functions for Grouping Calling and Individual Calling**
- **Remote Control Microphone**
  With this microphone there are several functions that can be controlled remotely:
  1. Direct setting of frequencies in VFO mode
  2. Up/Down of memory channels in memory mode
  3. Shifting to call mode
  4. ARM (Automatic Repeater Mode)
  5. VHF/UHF Switching
  6. Up/Down by 1 Mhz steps
  7. Setting and Selecting DSQ codes
  8. Setting and Automatic Dialer
- **Scanning Features**
  Memory Scan, Program Scan, ARM Scan, Band Scan, and more Scan.
- **Memory Channels**
  The unit has 28 memory channels, one independent "Call" channel, and 10 ARM memory channels (40 channels in total). You can program set tones, shift frequences, shift directions, and channel steps in each of the 28 memory channels.
- **ARM (Automatic Repeater Memory) Function**
  10 repeater channels can be memorized automatically. While ARM mode is active, scanning stops at vacant channels and pauses, then starts again automatically. This function is useful to find vacant repeaters.
- **ABX (Automatic Band Exchange) Function**
- **Bell Function**
- **Dimmer Function**
  Selectable 2 different brightness of LCD light
- **Three Priority Functions**
  VFO Priority, Memory Priority and Call Priority.
- **Repeater Operation**
  The DR-590T can be used as a cross band repeater.
- **Full Duplex Cross band Operation**
- **Others**
  1. Auto Dialer Function
  2. 6 Channel Steps (5/10/12.5/15/20/25 Khz)
  3. DTMF Monitor Function
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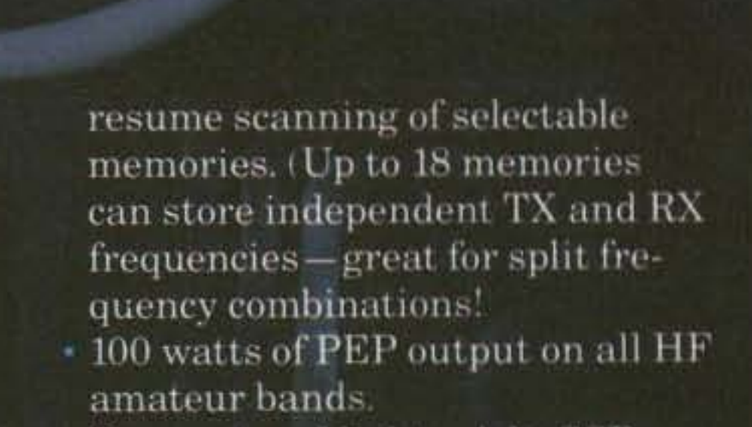
- Compact and lightweight SSB, CW, AM and FM (optional) transceiver.

Standard model shown.



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*Optional remote kit (RMK-747) shown.

ANNOUNCEMENTS

•The following Special Event stations will be on the air in August:

KA1BB, from Flat Hammock Island, Fishers Island Sound, NY; Tri-City ARC; 1300–2000Z Aug. 5; lower 20 kHz of General phone and CW bands, 10, 15, 20, 40 meters, center of 10 meter Novice band, 2 meter SSB band. QSL with letter-size SASE via Tri-City ARC, Box 686, Groton, CT 06340.

K2CGD, from 200th anniversary of founding of U.S. Coast Guard, Wildwood, NJ; U.S. Coast Guard Engineering Center and Cape May County ARC; from 2000–2359Z Aug. 1, 2, 3, and 1200–2359Z Aug. 4; phone 28.375, 21.375, 14.300, 7.235, 3.875; CW 21.175, 14.100, 7.110, 3.710. For QSL and certificate send 9 × 12 SASE and QSL to K2CGD, USCG EECEN, P.O. Box 60, Wildwood, NJ 08260.

W2USA, from Goodwill Games, Seattle, WA; Fort Lewis Amateur Radio Activity; July 20 through Aug. 5; top 15 kHz of General portion of 80, 40, 20, 15, 18 meters, Novice/Tech portion of 10 meters. For QSL send No. 10 SASE to Commander, I Corps and Fort Lewis, AFZH-PAM-H, Ft. Lewis, WA 98433-5000.

W2OB, from National Lighthouse Day, "Old Barney," Barnegat Inlet, Barnegat Light, NJ; Old Barney ARC; Aug. 4–5; CW 3.540, 7.040, 14.040, 21.040, 28.040; SSB 3.900, 7.275, 14.290, 21.390, 28.390; FM 146.835 repeater, 146.52. For special QSL send SASE to NU2F.

WC2ADK, from 4-H Fair, Bridgewater, NJ; Somerset County Office of Emergency Management; Aug. 15–17 from 1400–0100Z each day; lower 25 kHz of General 80–10 meters and 10 meter Novice, visitors on 145.32 simplex. Send QSL and SASE to Somerset County OEM/4H, P.O. Box 3000, Somerville, NJ 08876.

N3GBH, from Perry Street railroad station,, Titusville, PA; Oil Creek Valley Radio Society; 1300Z Sat. through 1900Z Sun., Aug. 4 and 5; CW—Novice portion of 80, 40, 15 meters, SSB—Novice portion of 10 and General portion of 15, 20, 40, and 80 meters. For special photo QSL cancelled from the only operating railway post office car in the country, send QSL and No. 10 SASE to Bill Lyons, Sr., N3GBH, 427 South Drake St., Titusville, PA 16354.

4-land, from Steam and Gas Show, Benton, KY; Marshall County ARA; Aug. 4–5; 20 kHz above the lower phone portion of General band edge and 28.367 plus or minus for QRM, on Novice portion. For certificate send SASE to MCARA, P.O. Box 534, Benton, KY 42025.

AB4MT, from 200th anniversary of U.S. Coast Guard, U.S. Coast Guard Communications Station, Miami, FL; active duty coast guard ops; 0000–2400Z Aug. 4; .060 kHz on 7, 14, 21, 28 MHz CW; 7260, 14260, 21350, 28450 kHz SSB. For special edition "collector's item" QSL, QSL direct via USCG Communication Station Miami, FL—NMA, 16001 SW 117th Ave., Miami, FL 33177-1699, or via AB4MT CBA.

WA4AVU, from Hoover Days, Shenandoah National Park, VA; Laurel Maryland ARC; 1600Z Aug. 25 to 1600Z Aug. 26; VHF/UHF 50.125 SSB, 144.2 SSB, 146.52 and .55 FM, 432.1 SSB; HF 3.940, 7.240, 28.340 SSB. For special photo certificate send QSL and No. 10 SASE to Laurel ARC, Box 3039, Laurel, MD 20709.

AA8AA, from All-American Soap Box Derby, Cuyahoga Falls, OH; Cuyahoga Falls ARC; 2200–0300Z Aug. 6–10, 1100–2000Z Aug. 11; 3.860, 14.240, 28.420. For certificate send large SASE by 9/20/90 to CFARC, Box 614, Cuyahoga Falls, OH 44222.

K8PBQ, from Jewish Community Center Maccabi Games, Detroit, MI; Jewish Community Center Radio Club; from 1400–0100Z Aug. 19–26; CW up 45 kHz from bottom of all bands; Novices 3725, 7125, 21.125 MHz; phone 3910, 7280, 14.335, 21.380, 28.580 MHz. Special QSLs and certificates; certificates for contacts on both CW and phone. Send No. 10 SASE for QSL, 9 × 12 for certificate to JCCRC—K8PBQ, 6600 West Maple Rd., West Bloomfield, MI 48322.

W8AL, from Pro-Football Hall of Fame Greatest Weekend, Canton, OH; Canton ARC; 2200–0200Z July 30 through Aug. 3, and 1700–2300Z Aug. 4–5; SSB 28.350, 21.350, 14.270, 7.270; CW 28.150, 21.060, 14.060, 7.060; RTTY, packet, AMTOR, 2 meter FM also, plus SWLs welcome. For unfolded certificate send QSL and 9 × 12 SASE with 45 cents postage. For QSL or folded certificate send QSL and No. 10 SASE. Send to Randy Phelps, KD8JN, 1226 Delverne Ave. SW, Canton, OH 44710-1306.

DA1WA, from DXpedition to Castle Frankenstein, near Darmstadt, West Germany; Wiesbaden ARC; 2000Z Aug. 3 through 1200Z Aug. 5; SSB and CW 10–80 meters using 100 watts and a dipole. QSL via the bureau or direct to DJ0PU for special QSL.

GB0JDC, from Jaguar Drivers Club, Old Warden Airfield, UK; The Bedford and District ARC; Aug. 26; 2 and 6 meters and as many of the HF bands as possible. QSL to Bedford and District ARC, 1 Perring Close, Sharnbrook, Bedford, UK (no certificates, etc., mentioned).

• The following hamfests, etc., are slated for August:

Aug. 3–5, **Central Oklahoma Radio Amateurs Ham Holiday/ARRL Oklahoma State Convention,** Lincoln Plaza Convention Center, Oklahoma City, OK. Contact CORA, P.O. Box 95942, Oklahoma City, OK 73143-5942. (License exams Saturday and Sunday.)

(continued on p. 72)

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This month we pick up the odyssey of Marek, YJ8MB, as he tours the Venuatu Archipelago putting a new IOTA Island on the air—OC-111.

A DXpedition To The Shepherd Island Group—YJ1SHD

BY DR. MAREK BLADOWSKI, D.D.S.*, YJ8MB

I had been planning a DXpedition to the Shepherd Group of the Vanuata Archipelago for quite a long time—actually since IOTA management gave the islands a new directory number, OC-111. During my contacts with IOTA, I had promised to go there after returning from my expedition to the Torres Group in December 1989. Unfortunately, some circumstances arose which made my trip impossible at that time. Finally I went there on January 19, 1990.

This time I decided to hire a plane so as to be independent of public transport. I also acquired a Kawasaki 1800 W generator to avoid the lack of power situation I had in Torres. Jack Scantlin, YJ8AB, my amateur friend, gave me a brand new A4S Cushcraft beam and a very accurate marine compass. I decided to make a brief but effective trip, and the weekend seemed to be the best time. Assisting me on this trip were my wife, Iwona, and our friend Dr. Ewa Rybowska from Fiji.

The French pilot, Claude Mitride, and his Cessna awaited us at Vila airport when we arrived with over 330 lbs. of luggage including rig, antenna, fuel, mast, supporting equipment, and personal effects. We started loading the plane and immediately had problems when we tried to load the six-section aluminum mast. It would not fit in the plane. We tried to put the sections through the open window on the pilot's side, but could only fit four of the sections. Unfortunately, I had to leave two of them behind.

The aircraft was fully loaded and seemed to be bursting at the seams. We could hardly close the doors. Claude started the engine and said the rear was overloaded, so we shifted heavy pieces forward, including rig, life raft, fuel, etc., which required us to contort our bodies into unnatural positions. Finally we took off much to my delight and Claude's amazement.

Here's Marek demonstrating amateur radio to some of the island's youngsters. Perhaps there is a budding amateur among them.

We landed on the grass airstrip of Tongoa Island in the Shepherd Group after one hour of flying over some of the most beautiful Vanuatu islands and reefs.

Before we left Vila, Claude arranged with the local priest so that I could stay and transmit from the Catholic mission. When we arrived, the priest was somewhere on the other end of the island and nobody there knew who we were or why we had come.

Woraviu village was to be our home for the next few days and was only a short distance from the airstrip. The locals helped us to carry all of our luggage. The priest's assistant showed us our accommodations. The mission was a simple double hut made of bamboo and covered with a pandanus thatch roof. There were two rooms; one was the sleeping quarters and the other had a few chairs, a table, and a little altar where every morning the priest would pray.

The only place to put my rig was at the altar, so with permission from him, I set up the rig. I then started to establish the antenna system. All the men of the village helped me while women and children were watching. I knew the villagers did not have a clue as to why I was putting up this antenna, but nobody questioned it.

When I put particular parts of the antenna elements together and started to make the necessary measurements, one of the brave ones asked, "Excuse me, sir. What are you going to do with these tubes?"

I replied, "I am going to talk to people worldwide."

"True, with Australia, too?"

"With Australia, too. It is the closest

*P.O. Box 217, Port Vila, Republic of Vanuatu

An antenna party looks pretty much the same all over the world. Team work and muscle help to put YJ1SHD on the air.

continent to this island, so I hope it will be the easiest to talk with."

We connected the elements to the boom and fixed up the first section of the mast. Later we attached the second, third, and fourth, which made a 25 foot high mast which we fixed up against the back bamboo wall of the mission and secured by rope. I took a compass to establish directions, drew compass points on the ground, and turned the beam to the north. A couple of natives, after my explanation, declared themselves to be the manual rotators.

I connected the IC-PS30 external power supply to my IC-751A. I then set up a cooling fan and lights through a switching board that I had brought with me. The station was fed via a 60 foot extension cord to the generator to keep the noise down.

I decided to have a last look outside before I began. The beam was glistening in the setting sun. The orange sky cast a warm glow over my station, cooled by a gentle sea breeze rustling through the swaying palms on the rolling hills surrounding me in the middle of the Pacific Ocean.

I switched on the generator. It worked perfectly. The whole village was watching me in silence. I entered the mission with pride, sat behind the altar, and started transmitting on 21.260 MHz, which is the international IOTA frequency. I just said once "This is YJ1SHD DX-pedition to Shepherd Group, CQ DX," and a huge pile-up appeared. They knew I was there and they were waiting for me.

At 0622 GMT I worked the first station, which was JA1HU, 59+10 both ways, marvelous copy. After 30 or more Japanese stations, the first South Korean came through. It was HL1AHS, 59+. It seemed as though propagation was the best I had had in all of Vanuatu. PY3OL was the first South American. He was 55 but very clear, so I did not even worry about turning my beam to the east. During the first hour I worked about 150 stations from Japan, Indonesia, Korea, and South America, all with excellent reports.

At 0731 GMT the first European came through. It was my friend Livio, I1ZL. He was strong but copied me 55. Later on John, I1HYW, Italy's IOTA Manager, appeared, also not too strong. The band was not open to Europe yet.

I ordered my manual rotator team to turn to the northwest, which is the short path to Europe. They did exactly the opposite, so I had to show them again how to do it. I still worked a majority of Japan-

The home of the YJ1SHD DXpedition. This is normally a Catholic Mission on the Island of Tongoa, and was graciously loaned to the group for the operation.

ese stations, but slowly Europeans started to appear. At 0805 GMT I had a longer QSO with Roger, G3KMA, IOTA Director, fantastic copy 59. Later on I worked many VKs and ZLs, as they were booming into my shack. The mission was stuffed with interested Melanesians. I could hear my wife explaining to them what I was doing.

At 1114 GMT I had the first QSO with Africa, 5T5CK from Mauritania. I finished the day at 1146 GMT after having 624 QSOs with 34 countries.

On Saturday, January 20th I started at 2253 and pointed the beam to the northeast. The first Canadians and Americans came in and they copied me very weakly—33 mostly. I worked a couple of hundred of them over the next few hours. Later on propagation increased and I could easily copy North America 55-57. At 0330 GMT I asked my rotator to turn the beam to the east, and again they did exactly the opposite, so I fired them. I turned it myself and started to work Central and South America. Around 0600 GMT I checked into the 222 net run by Jim Smith, from Norfolk Island. I worked with him for about an hour and made not more than 20 contacts, mainly with the US.

While I was operating, Iwona and Ewa worked on public relations. They took over from me, as I did not have the time to participate in the local customs as well as operate the radio. Thanks to them I could work in peace, as they attracted most of the villagers.

Hordes of kids were sitting at my back watching me, but they were quiet. Having had bad experience on previous expeditions, each time I left the hut I made sure all equipment was safe and could not be eaten by rats.

I spent all of Saturday on the radio and made over 1100 QSOs.

Sunday, January 21st was extremely windy and rainy, and I was very worried about the possibility of a cyclone. Several times I went out to check my A4S Cushcraft beam and saw it dancing in the dark, ominous sky. The antenna proved to be highly resistant to gusting winds, heavy rain, and very tough atmospheric conditions. All this did not affect its excellent performance. I was very proud to have it, and I blessed the Cushcraft Corporation for creating such a quality product.

I was still worried about the possibility of a cyclone, but the priest came out and calmed me down, assuring me that there would not be a cyclone. Propagation was not too good, so I decided to take a break. I had forgotten that it was Sunday, and being in a Catholic mission, it was a normal church day. The mass was long and in three languages—English, French, and Bislama (a local one)—but I enjoyed the Melanesian gospel singing very much. When the mass finally ended I ran back to my shack.

I found a big pile-up on 28 MHz at around 0000 GMT. The station was CEØDFL, from Easter Island. I called him several times, but I could not break the strong Japanese and US stations. I wanted him as a new one on 10 meters. Finally I called him in Spanish and he picked me up. We had about a 7 minute QSO, which made the waiting stations very angry.

Up until 0100 GMT I had about 60 QSOs with the States and Canada. Conditions were bad and I decided to switch off, because the quantity of fuel was limited. I had worked several hundred stations, mainly from Japan and Europe and some from Africa and Central America. I had to work a split due to the big pile-up I had. At 2330 local time the fuel ran out. The last station I worked was RA3VR, and that was the end of my operating from the Shepherds. During the whole expedition I made 2873 QSOs with 91 countries.

The next morning Claude arrived as promised, and we took off back to Port Vila.

The Shepherd Group is classified as a separate island for IOTA with OC-111 as its directory number. I activated these islands on January 19, 1990. The group consists of a chain of eight islands: Makura, Emae, Etaric, Mataso, Buninga, Ewose, Tongariki, and Tongoa. Most of the islands in the group were formed by volcanic action. YJ1SHD was the special callsign given to me by Telecom Vanuatu Ltd. for the first DXpedition to this part of the South Pacific. CQ

Our three-part series concludes this month with a discussion of feed lines, how they work, and how they're made.

Basic Antenna Information Part III

BY LEW McCOY*, W1ICP

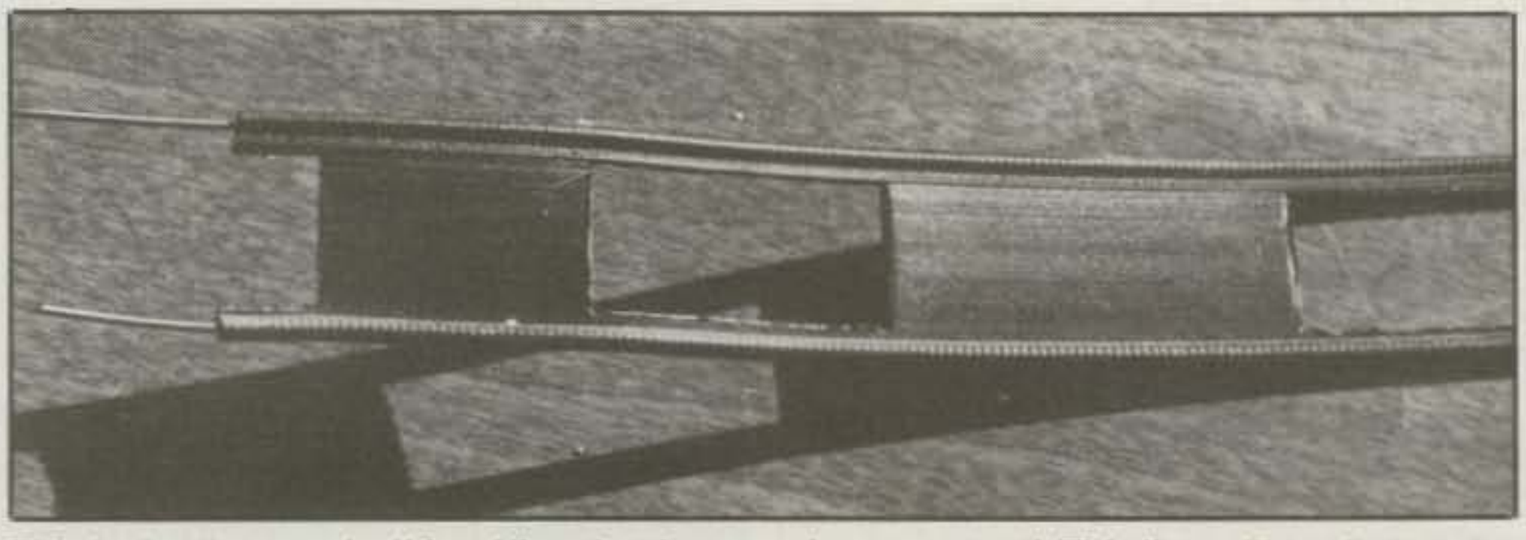
In Part II I touched on the subject of feed lines, but not nearly enough. The newly licensed amateur, or for that matter some of the more experienced amateurs, frequently question me about what type of transmission line to use. No antenna theory article would be complete without information on feed lines, and I hope this series will be helpful to both old and new amateurs.

Some things are pretty basic. For example, if you have an antenna, then in most cases you need a feed line (the exception would be where the antenna is mounted directly to the rig, such as with a handheld). However, in most instances you are going to need a feed line to get the power from your rig to the antenna. That is really basic!

Another basic: The function of a transmission line is to transfer the RF power from the transmitter to the antenna, to do it as efficiently as possible, and probably to do it without radiating. If a feed line radiates, it "ain't" a feed line; it is an antenna.

Normally, we think of a feed line as two conductors. Without getting too technical, there is a certain amount of inductance and capacitance between these two conductors, depending on the size of the conductors and their spacing from each other. These and a few other factors determine what we call the "characteristic impedance" of the line, the symbol being **Zo**. This Zo is important, as we will see.

In the good old days (whenever that was!) the most popular feed line was what is known as open wire line. This consisted of two wires, usually No. 12, that were separated by insulators, the insulators being spaced close enough to maintain a more or less constant spacing between the two conductors. Usually the distance between the conductors was 2, 4, or 6 inches apart, with the separators one or more feet apart. Another basic point here: All feed lines have a certain amount of loss, caused by the actual ohmic losses in the wire size and the insulators; however, the least lossy of lines are the open wire types.

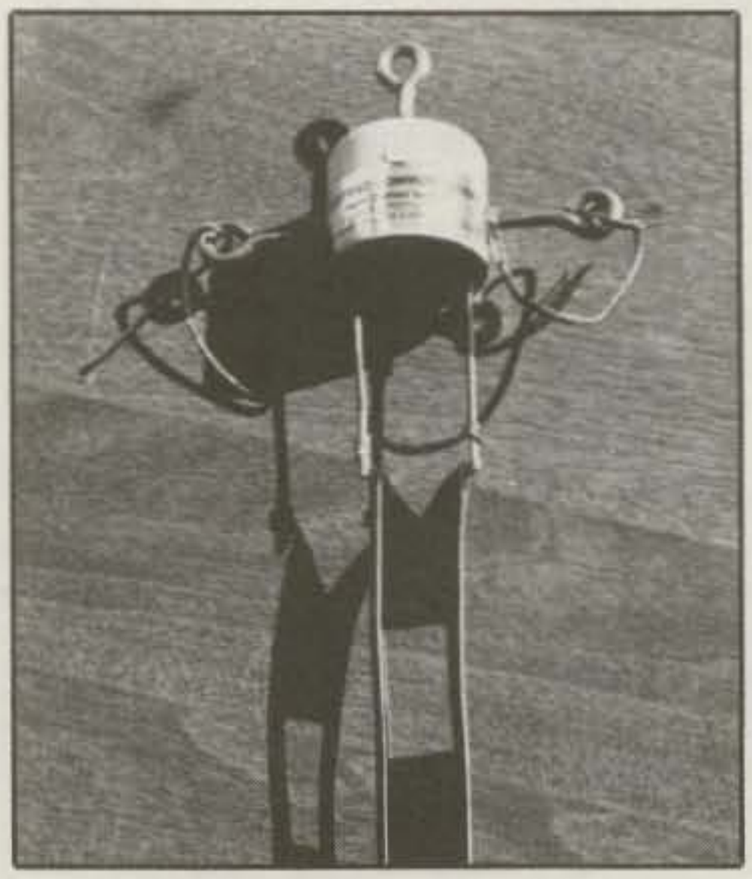


This is the "open wire" feed line that I use and recommend. This line will easily handle any mismatch or SWR you will encounter and is very low loss—plus power-handling capabilities of the legal limit.

The characteristic impedance is determined by the spacing and size of the wires, plus other factors. As a general rule, the impedance of open-wire lines is on the order of 450 to 600 ohms. A more modern approach to open wire line is that shown in the photograph.

At this point I think I should give credit to Press Jones, N8UG, owner of Certified Communications, who is known as "The Wireman." Press deals primarily in feed lines and cables. Press has lines manufactured to his specs for the amateur market. Nearly all of the lines shown in the photographs are his products, and he provided the samples for this article.

The "open wire" line shown in the photo is made up of two conductors covered with a polyvinyl or polyethylene low-loss material, and the line has a characteristic impedance of 450 ohms. The conductor spacing is ⅞ inch, and the line has a power-handling capability of well over the amateur limits. In my own case I use this wire to feed an 80 meter extended double Zepp on all bands. This type line and other open wire types are what are usually referred to as "tuned feeders." It is an expression you'll hear many times in your amateur career. Amateurs customarily



This is a dipole antenna center mounting fixture for open wire (or direct coax fed) antennas. (Photograph courtesy Certified Communications)

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

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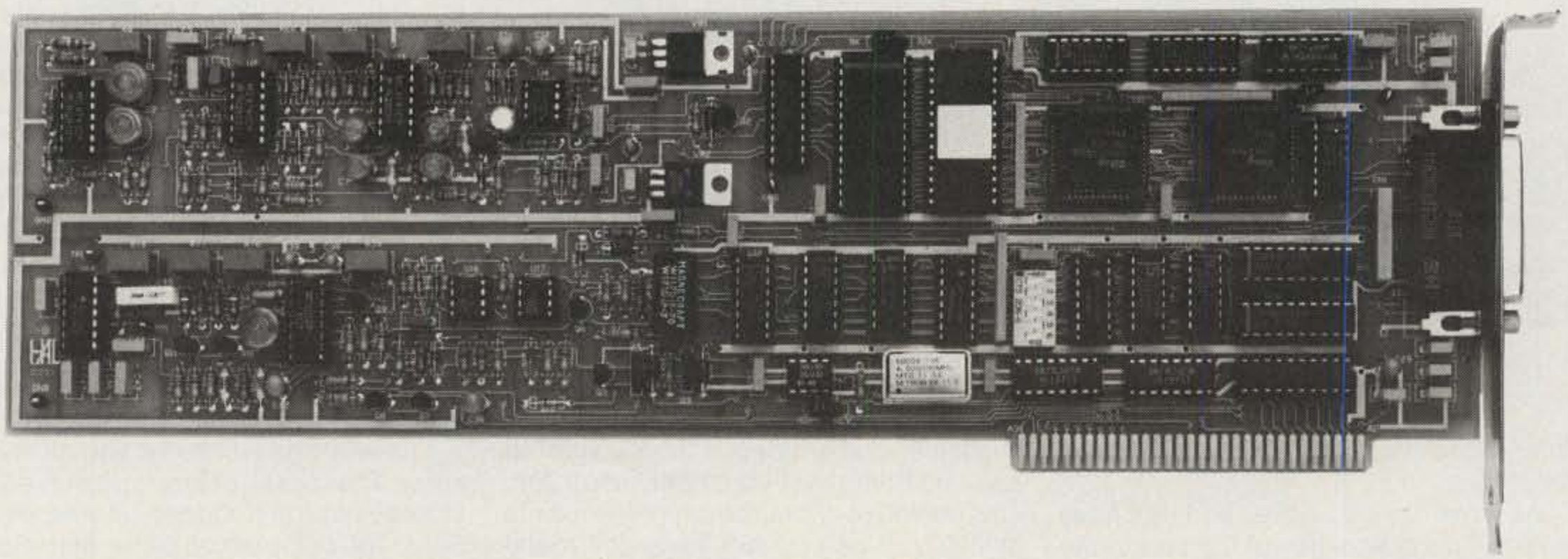
The PCI-3000 and SPT-2 from HAL!



The HAL PCI-3000/PC-AMTOR system is designed to put your PC on the HF bands with outstanding performance at an affordable price. Amtor allows you to get through when other methods fail. If you've ever been DX-ing with someone on Amtor when 20 meters dies out in the evening, you know what we mean. Things may slow down, but you can usually keep up the QSO!

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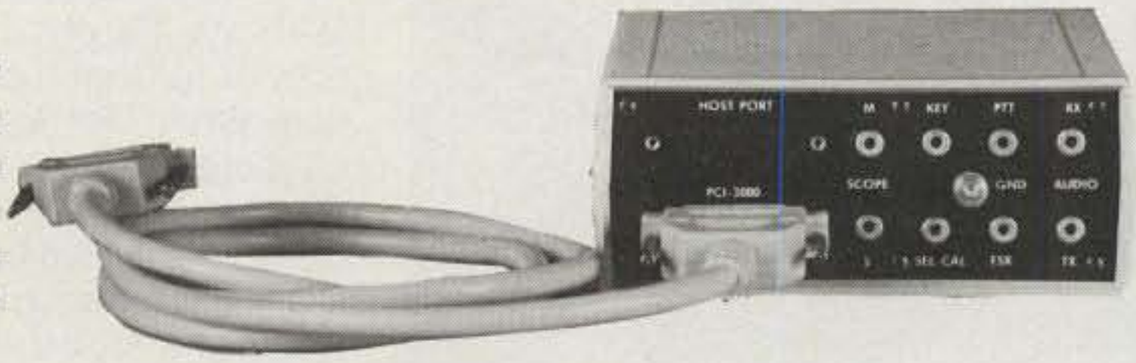

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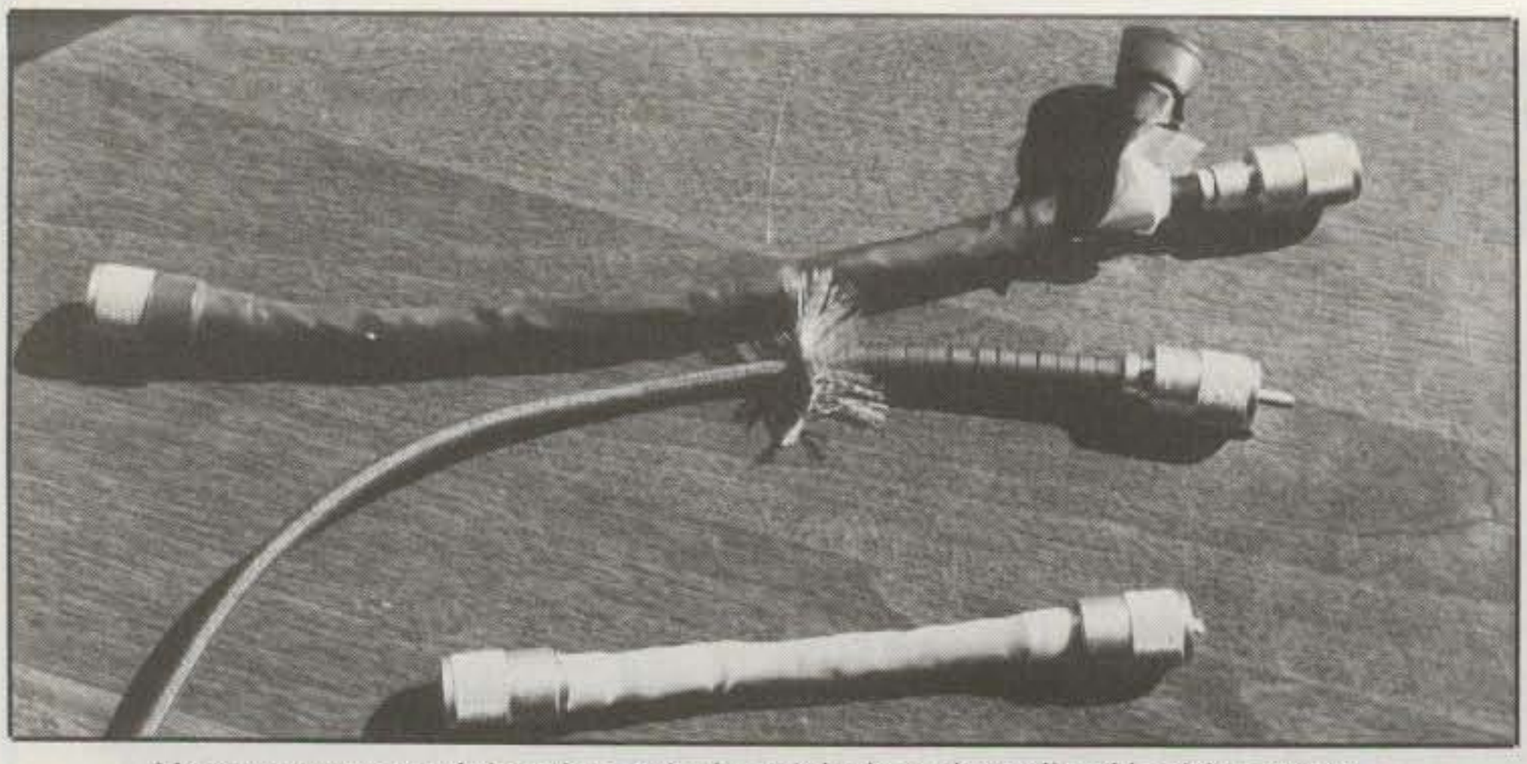
CIRCLE 58 ON READER SERVICE CARD

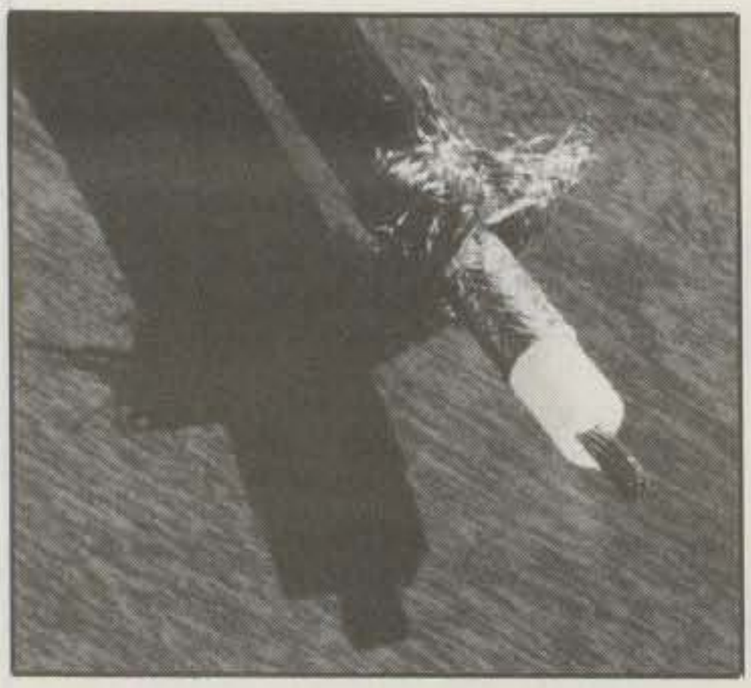


Here are some of the sleeve baluns/chokes described in this article.

refer to the line as "balanced line, tuned feeders."

As I mentioned above, all lines have losses. This is because of the size of the conductors (ohmic losses) and the dielectric material used to separate the lines. Normally, we think of open wire line and the 450 ohm type shown in the photo as almost lossless lines. There is another specification applied to all feed lines, and that is called the "velocity factor." A perfect line—one that has absolutely no losses (of course, this would be a theoretical line only)—would have a velocity factor of 100%. In very simple language (and at the risk of oversimplifying) it means the RF traveling down the line would have its maximum velocity (100%) simply because there is no resistance to slow down the RF. The 450 ohm line shown in the photo has a velocity factor of 94% to 96%, which is very, very good.

I need to digress here for a moment with a bit of history. Before WW II open wire line was the most common line used by amateurs. With the advent of the war, there were great strides in the communications field, and coaxial feed line came into common use. After the war there were huge amounts of surplus coax line available, and amateurs quickly went to coax as their most commonly used line. The reason is of course simple—coax is shielded, it can be run alongside metal such as towers, and it can be buried.



This is coaxial Flexi 4 described in the text. Note the shield and braid covering which offers double protection against leakage to the outside.

Coax line consists of an inner conductor, which is surrounded by insulating material, then an outer conductor (which is usually in the form of a braid), and then an outer covering of a poly material. The line conductors are completely insulated. In fact, some types of coax have what is known as a non-contaminating jacket or outer covering, and this type of line can be buried under the ground without ill effects. There is no doubt that coax lines have many advantages, but they also have disadvantages. Namely, under many conditions, coax should not be operated at high standing wave ratios. By "high" I mean not much over 4 or 5 to 1.

As I discussed and explained in Part I, every antenna has an impedance at its feed point. Also as I pointed out, this impedance will depend on many factors—the electrical length of the antenna, the height above earth, proximity to nearby objects, etc. As you can surmise from what I have said so far, the characteristic impedance of a transmission line is a definite, unchanging value. In other words, that 450 ohms open wire line impedance is always 450 ohms, as is 50 ohm coaxial line, or for that matter any transmission line. When, for example, we attach 50 ohm coax to an antenna with a resonant 50 ohm impedance, we have a perfect match. When we transmit RF power into the line to the antenna, we set up voltages and currents on the line. The ratio of these voltages and currents in each conductor in our matched system would be a ratio of 1 to 1.

However, let's assume we change frequency so that the antenna is no longer resonant, and its impedance will change. Let's say the impedance goes to 100 ohms. As I already said, the impedance of the feed line does not change, but instead it remains at 50 ohms. Therefore now we have a 50 ohm line feeding a 100 ohm antenna. Our SWR is to 2 to 1, the 50 ohm impedance line divided into 100 ohm antenna impedance. Because the current nodes become higher as the SWR rises, the losses in the line become higher.

The velocity factor on good coax will run from 82% down to 66%—and by good, I mean fresh, new coax. In my instance of using 450 ohm line to feed my Zepp antenna, I have standing wave ratios on the line of 10 or 15 to 1. But because the line is essentially lossless, the high SWR presents no problems. With coax, however, I just could not tolerate those high mismatches.

This leaves us with some pretty easy-to-understand facts. Coax should always be matched or operated with as near a match as possible. A general rule is not to exceed an SWR of 3 to 1 with coax.

There is one last basic you all should know. The losses in any type of feed line increase as the frequency increases. RG 58/U type coax, which is one of the lower priced coaxial lines, has a loss of 0.5 dB per 100 feet at 80 meters (almost insignificant). However, at 2 meters the losses rise to almost 6 dB, and by any standards that is a lot of loss—almost 4 times the power loss. The ARRL *Antenna Book* has charts for most types of line if you want additional information for a specific line. More on line losses in a moment.

In coax, radio energy from your transmitter flows on the *outside* of the inner conductor and on the *inside* of the outer shield. I illustrated this in Part II, figs. 2 and 3. There should be no RF flowing on the *outside* of the outer shield. In recent years some manufacturers have been skimping on the amount of copper they use in their outer braid, and in such cases RF escapes from the inside of the coax, causing outer shield radiation. Why is this bad? Think for a moment that you are feeding a beam or any antenna that has a desired pattern. If the feed line radiates (and by the same token, receives signals), such radiation can destroy the pattern of the beam or antenna, front to back, gain, etc. So when you buy coax, be sure that it is well made.

I have mentioned previously the problems of RF flowing on the outside of lines and that a balun may or may not help. However, if you have the problem, then I would recommend trying a balun. Another approach is that popularized by Walt Maxwell, W2DU, the well-known antenna authority. I mentioned this previously, but it is worth covering again.

This approach consists of using ferrite chokes, as shown in the accompanying photo, slipped over the jacket or outer covering of the coax. A number of these are used directly where the coax is attached to the antenna. The chokes present an extremely high impedance for the outer jacket to the antenna and act to "choke" off any current flowing back down the line from the antenna. As I have

pointed out in the photos, you may purchase ready-made sections of line ready for installation or make your own as shown. Always keep mind, however, that installing baluns or chokes at the feed point is only really necessary if you want to keep your antenna pattern intact. Also as I stated, feed-line radiation is *not* lost power; it is going to go somewhere and will work someone for you (usually). In other words, if you are using a beam, then feed-line radiation is not good. However, if it is a multiband wire antenna, the radiation may not be worth concerning yourself. I cannot emphasize this last point too strongly. The incidental radiation from feeders on a multiband wire antenna is not worth worrying about. *It is not lost power.*

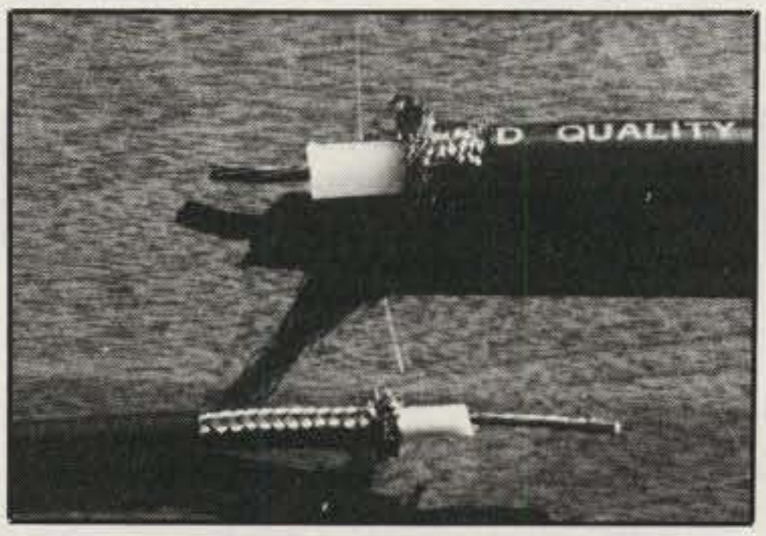
When you decide to purchase coax, a term with which you should be familiar is "non-contaminating jacket." This refers to the quality of the outer jacket, and there are two basic classifications. A Class I jacket has a normal life span of 5 to 10 years, while a Class II jacket will go 15 to 20 years. Several companies make the jacket material, but it is interesting to note that the only one our military will accept is made by Goodrich (at least that is what I have been told). The difference in cost between Class I and II varies with the type of line, but an example, via Certified Communications, for RG-8X is 19 cents per foot for Class I and 26 cents per foot for Class II.

This brings up another point: Many amateurs wish to bury their coaxial lines for one reason or another. Regardless of the type of jacket, it is wise to run the coax through pipe (poly) underground. This keeps other contaminents in the earth from working on the jacket and shortening its life.

What To Look For in Coax

In my talks with Press Jones, he emphasized that amateurs tend to use "overkill" in their transmission-line selection. Let me explain that. Each installation is unique. One amateur, for example, may have a vertical on the roof and only require 25 feet or so of line, while another may have to go 200 or 300 feet to a tower. Still another may be concerned about a long run to a VHF beam, and another may only be interested in a mobile or marine installation. All four can use a different type of line to suit their needs.

Let's look at some specific examples. Frequently, particularly when you are working 2 meters or higher, you'll hear amateurs discussing "hardline" for transmission lines. Hardline is a coaxial line with a solid metal (pipe) outer conductor, usually aluminum tubing. The 50 ohm hardline sells for about $2.00 per foot (maybe slightly more for the ½ inch diameter type). Normally, it is considered a low-loss line at VHF and UHF, the loss being on the order of slightly less than one decibel per 100 feet at 2 meters. Many repeater owners use this type of line. Two of the problems with hardline are its cost and the fact that special fittings are required. Because it is not flexible, anyone using the line with a rotary beam needs a section of some type of flexible line plus the necessary fittings up at the beam.



These are the two types of popular coax—RG 213/U and RG8-X. Both these types have a very dense outer braid (see text).

Two of the new RG-8/U type lines that Certified is having manufactured are CQ-4XL and Flexi 4 CQ-4XL (both have Class II non-contaminating jackets). Flexi 4 is shown in the photo. The Flexi 4 shown here is a ½ inch diameter coax, completely flexible but with an aluminum 100% cover and then a coaxial shield over the cover. In other words, there should be no leakage to the outside. The loss is very low—about 1.3 dB per 100 feet at 2 meters. It could easily be called a poor man's hard line because the cost is about 25% that of hardline. The 4XL line is designed for installations with non-rotatable antennas, such as repeater antennas.

However, according to Press Jones, even these lines could be overkill because they are primarily designed for VHF/UHF operators or HF amateurs who have long runs of line to their antennas. I asked Press what he would recommend for an amateur with a low band, triband beam in the typical installation. Without hesitation he recommended the lower priced CQ-213/U. This is also a ½ inch type coax, 50 ohms impedance, capable of the amateur legal limit plus (as is Flexi 4). CQ-213/U has a loss of about 1 dB per 100 feet at 10 meters, and this is almost insignificant (and, of course, costs less).

Conclusions: If you have a long run, 100 feet or more on VHF, then use the lower loss cable; for below 10 meters, and running up to maximum limit of 1500 watts, the cable to use is the 213 type. Note I said 1500 watts. Many amateurs stay with just transceiver power, and this is on the order of less than 200 watts.

I hope you have found this series on antenna information useful and informative. I have drawn from my own years of experience—and experiences. After all these years I still find that antennas and feed systems are a fascinating subject. CQ

Here's a neat little vertical antenna that you can build and get plenty of use out of all in the same weekend.

Build A Top-Hat Vertical Antenna For 80/75 Meters

BY ANDY BOURASSA*, WA1LJJ

It's hard to put up a good DX antenna for 80/75 meters if you have limited space and a limited budget. Without a tower or tall trees from which to hang antennas you are pretty limited in your choices. Urban or suburban dwellers may lack the flat-top space needed for a dipole or inverted Vee. The vertical provides a good solution to the space problem and provides good low-angle radiation for DX work.

I like to work across the entire 80/75 meter band, operating CW and phone as well as packet. Most verticals require you to choose a particular segment of the band when setting up the antenna. Outside of the usual 100 kHz or so selected, the SWR rises rapidly to unacceptably high levels. You can choose to ignore the SWR and use an antenna tuner, but then feed-line losses begin to take their toll. I was looking for a broad-band, yet compact vertical that I could construct from easily available materials. Here in the woods of New Hampshire extruded aluminum tubing is hard to come by in small quantities unless you have connections in the business.

With these parameters in mind, I came up with a design that has an SWR of less than 2:1 over the entire 80/75 meter band and is still fairly compact. I used easily available materials which kept the cost around $50 for the entire project. The antenna is compact and requires only a 60 × 60 foot area on which to install it. It uses a large capacitive hat to resonate the shortened vertical, instead of coils or traps, and thereby achieves a high radiating resistance.

*Box 646A Holmes Road, Barnstead, NH 03225

Construction and Materials

The antenna can easily be constructed in an afternoon with the help of another person. It consists simply of a vertical ele-

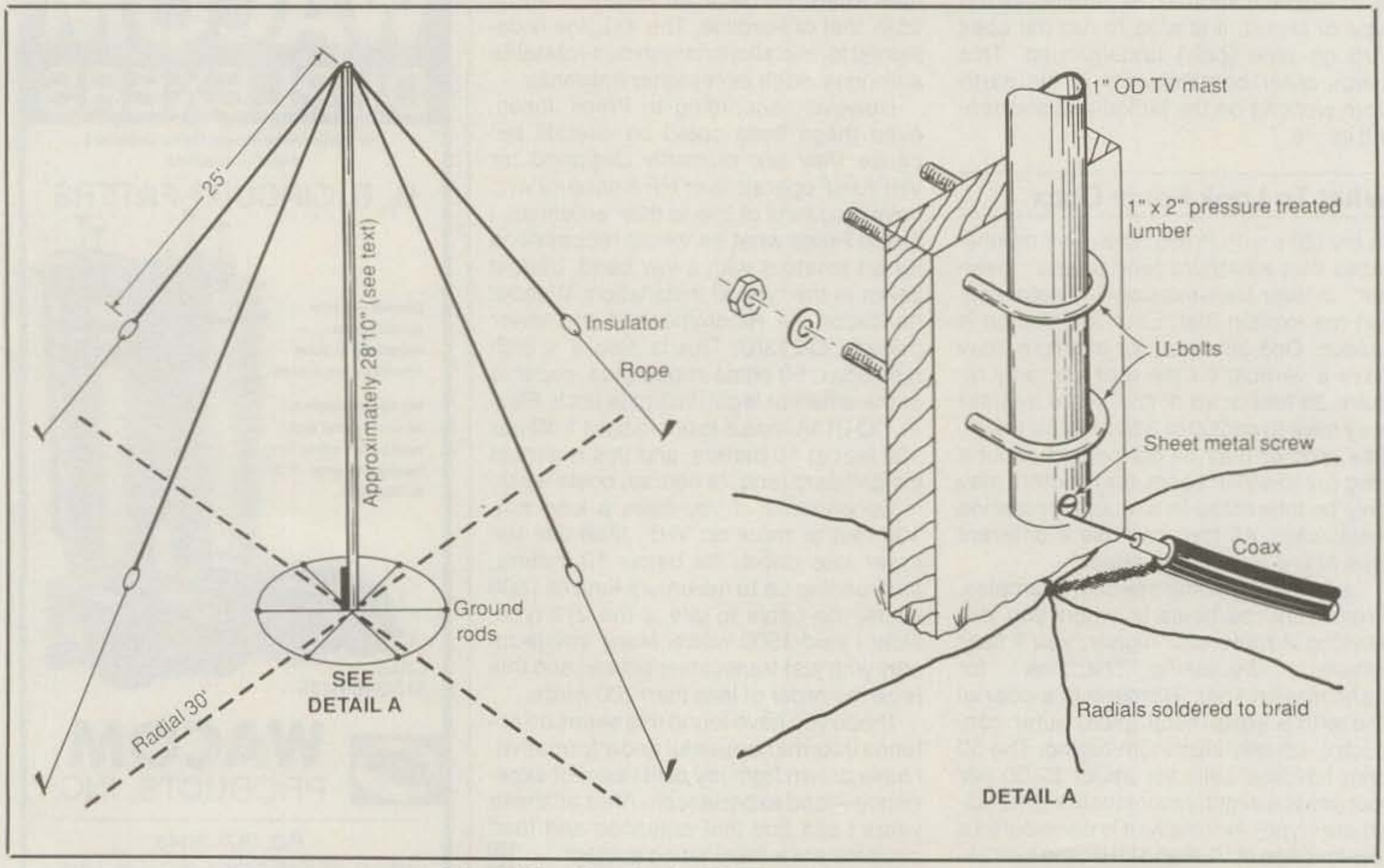


Fig. 1– The plans for the 80/75 top-hat vertical.

ment approximately 28 feet 10 inches high with four 25 foot wire elements spaced evenly around the top of the antenna to form the capacitive hat and guy the antenna as well. For the vertical element I used three 10 foot lengths of Radio Shack antenna mast fastened with sheet-metal screws to secure the sections together. You can use any brand of antenna mast as long as it is reasonably strong and has an outside diameter of 1 inch.

Cut the vertical element to an initial length of 28 feet 10 inches to begin with. It will have to be fine tuned by cutting an inch at a time once the antenna is erected. Now install the base insulator, which consists of an 18 inch section of 1 inch reinforced heater hose. You can buy it by the foot at most automotive supply stores. Work the heater hose onto the base of the antenna mast. A bit of soap and a twisting motion helps it along. Keep working the heater hose along until about 4 inches of the mast is visible. This will give you room to cut the mast during adjustment and fasten to it.

The next step is to make the capacitive hat. I used Radio Shack 16-gauge copper antenna wire and plastic insulators. Copper wire does have a tendency to want to twist up and tangle easily even if it's fairly light aloft. Cut each of the 4 wires 25 feet long, solder an eye to the upper end, and fasten them 90 degrees apart at the top of the vertical element with sheet-metal screws. Coat the sheet-metal screws with grease or Coax Seal® to prevent corrosion. Attach the insulators to the other end. I used inexpensive clothesline for the rest of the run to the ground. It's cheaper than wire and much easier to see so you aren't always tripping over it. Allow about 12 feet of clothesline for each element.

The antenna mounts onto a piece of 1 × 4 inch pressure-treated lumber 4 feet long. Begin by cutting a point on one end to make it easier to drive into the ground. Two 1¼ inch general-purpose pipe clamps fit over the rubber heater hose and through the 1 × 4 board to fasten the antenna to the base. Once the antenna is erected and the capacitive hat fastened to stakes in the ground, they will steady the antenna in place. It's easiest to lay out the holes for the clamps before driving the 1 × 4 into the ground. Simply center the clamps on the board about 12 inches apart and lightly tap the clamp with a hammer. The impression left in the wood marks where the holes need to be drilled. Once you've finished drilling the hole, you are ready to set up the antenna.

Siting and Adjustment

All ¼-wave vertical antennas need a good ground for maximum efficiency. Picking a good site can help. A wet, soggy area is preferable to a ledge or dry ground. You might also take into account sources of good grounds. An artesian well casing or a lawn sprinkler system with metal pipes can provide a good ground for the antenna with a minimum of effort.

If you don't have a ready ground, you'll need to make one. I used a series of ground rods spaced 6 feet apart in a circle around the base along with 4 radials 30 feet long. The radials need not be full length since the antenna is shortened and the RF field is also more compact. The radials only need to be as long as the antenna (see Doug DeMaw's *W1FB's Antenna Handbook*, p. 4). Because of the high radiating resistance, a good ground isn't as critical, but still, go for the best ground you can get.

Begin by driving the 1 × 4 about 18 inches into the ground. Lay out 4 stakes evenly around the mounting post and 30 feet away so you can fasten the guys/capacitive hat onto them. Next step the base of the antenna up against the mounting stake, and with the help of another person walk the mast up to a vertical position. While one person holds the antenna, the other person can loosely tie the guys to the four stakes you laid out previously. This should steady the antenna while you lift the mast up along the mounting stake to where the clamps will go. Work the U clamps over the heater hose and through the holes in the mounting stake and tighten. Now snug up the guys, and the antenna is ready for adjustment.

Because there is so much capacitance in the hat, the length of the vertical element becomes critical. I used an antenna bridge to tune up mine, but an SWR meter will also do the job provided it is used at the base of the antenna. Tune up your transceiver on the lower, middle, and upper part of the band and write down the resulting SWR. You should find the SWR lowest at the low end of the band and higher on the upper end of the band. If so, begin cutting the mast 1 inch at a time while recording the SWR. Don't be tempted to cut off several inches or you may come up short. Cutting even 1 inch off the mast changes the SWR. In my case I found a length of 28 feet 7 inches gave me an SWR of 2:1 or less over the entire band.

Once you find the proper length, solder an eye onto the center conductor of your coax (RG/8 or other low-loss 52 ohm coax) and fasten to the antenna with a sheet-metal screw. Coat the connection with a layer of grease or Coax Seal® for corrosion protection.

The bandwidth is almost unbelievable at first. However, once you get used to it you'll love being able to QSY all over the band without fiddling with tuners each time. It's a good contest antenna and the performance will surprise you. For a shortened antenna it has a surprising signal, and you can't beat the price.

Materials List

Three 10 foot lengths of TV antenna mast from Radio Shack, or any 1 inch outside diameter antenna mast.

100 feet of 16-gauge stranded antenna wire, Radio Shack or equivalent.

18 feet of 1 inch reinforced heater hose, from auto parts supplier.

Two 1¼ inch general-purpose U clamps, from any hardware store.

Four insulators, Radio Shack or any brand.

50 feet of clothesline rope.

Seven sheet-metal screws, any convenient size.

4 feet of 1 × 4 pressure-treated board, from any lumber yard.

Four stakes.

Tools: drills and bits, soldering iron, screwdriver, 7/16 inch wrench, hammer, hacksaw. CQ

A little ingenuity, a little reading, and a little work put KC3YB on the direct path.

Beam Your Mobile Signal With A Phased Pair

BY JOHN R. SOMERS*, KC3YB

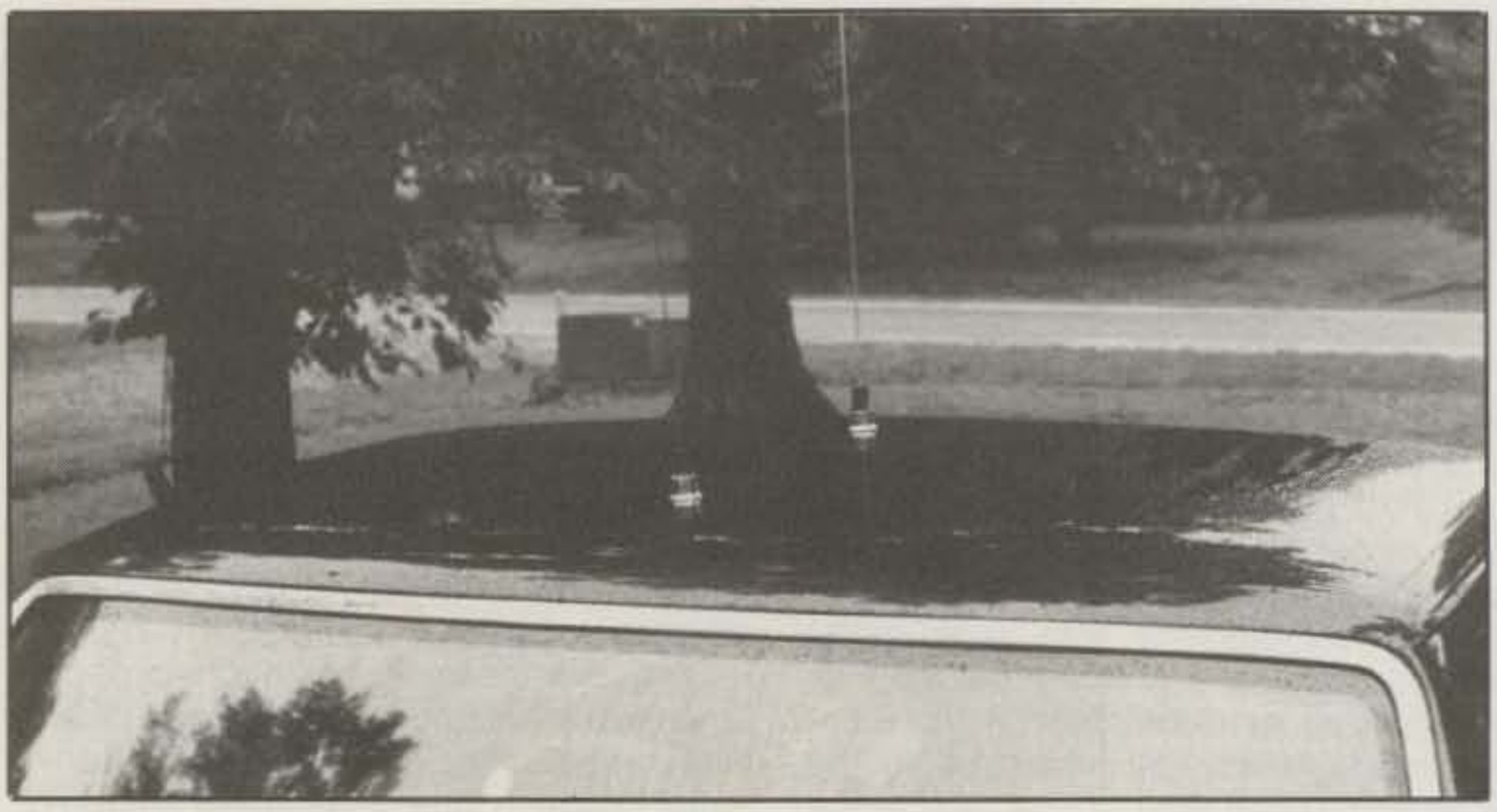
I have not yet reached the stage of mounting a VHF antenna and rotator on the family car, but the thought has entered my mind, particularly when I couldn't use the local repeater because of interference from one a couple of states away. I could turn the beam around and null out the other machine....

That is not likely to happen very soon, as the XYL is horrified at the thought of my drilling a tiny hole in the roof for a conventional antenna. I'm certain she would put her foot down, hard, at the mere suggestion of creating a mobile antenna farm. That goes double for the company car, where I am restricted to antennas that don't need holes, which limits my creativity severely. For a long time all I could do was turn off the radio if I didn't want to hear my neighbors to the north.

One fine day while leafing through Orr and Cowan's *Antenna Handbook,* I came across the section dealing with phasing vertical antennas in order to change their directional characteristics. Although they were discussing HF base antennas, it seemed to me that the same principle could apply to mobile antennas in the VHF spectrum. After all, half the trucks on the highway sport two antennas. Up until then I figured that they were more or less a gimmick, but what if they really worked?

A little more research showed me that the CBers were on to something. The combination of proper antenna spacing and feeding two vertical antennas signals that were either in phase with each other or out of phase by certain amounts could, in fact, direct radiated RF energy in certain directions. And what's more, the act of concentrating the signals has the side benefit of increasing gain.

I reasoned that what was possible on the HF bands might just work on VHF, and since a good ground system was called for on the lower frequencies, what could be better than the roof of a car? The idea of an appreciable amount of gain and a pronounced null excited me, and I set to work immediately.



Twin phased vertical on the author's truck provide both gain and a selectable null.

I first decided that what I was looking for was a cardioid pattern in one direction and a null in the other. This pattern is the result of feeding two vertical antennas spaced a quarter wavelength apart with a signal 90 degrees out of phase. While this may sound complicated, it is actually

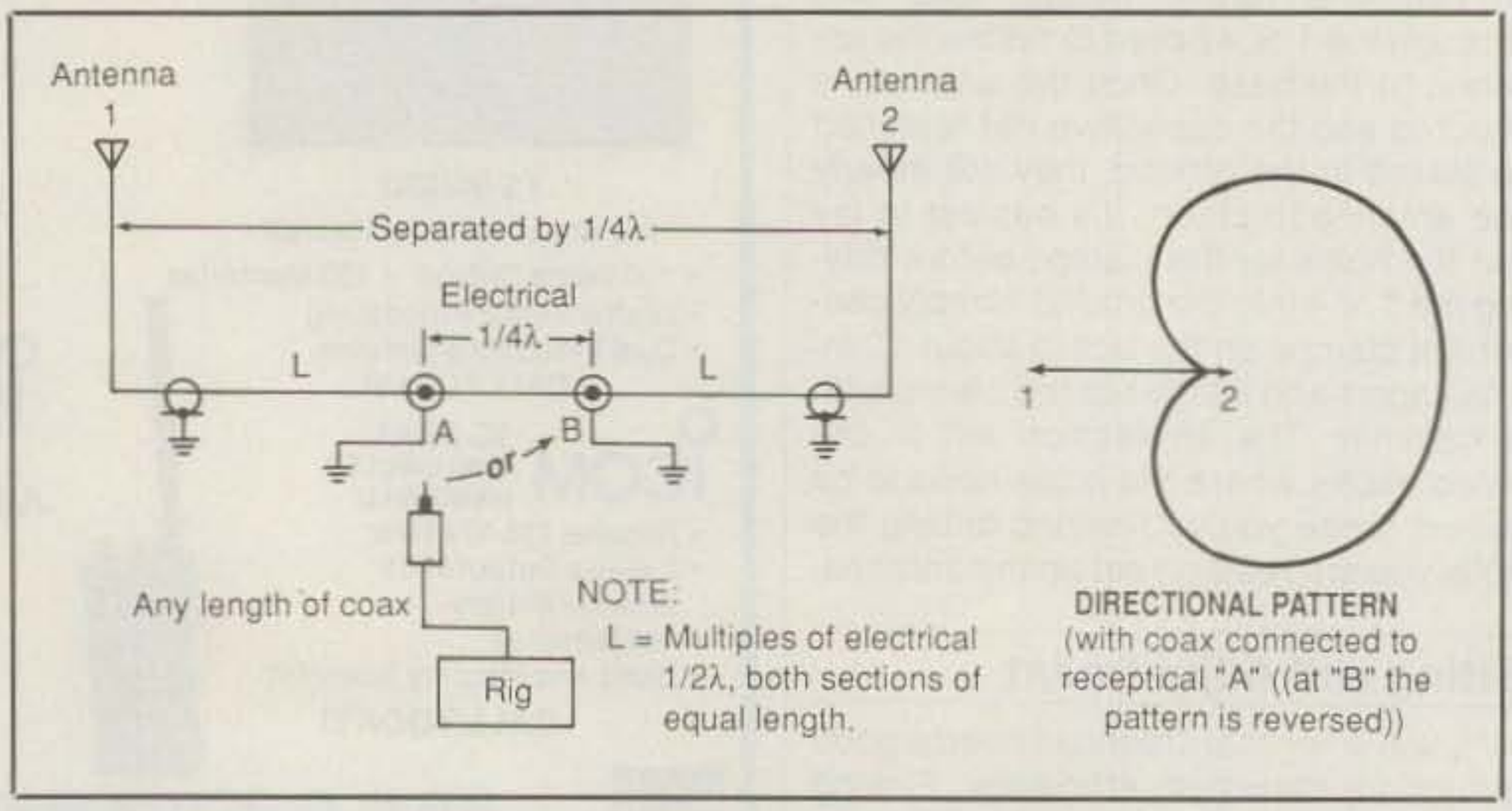


Fig. 1– The schematic diagram of the vertical antenna phasing system. Fifty ohm coax from each antenna terminates at coaxial connectors, which are joined by a section an electrical quarter wavelength long. The cable from the rig can be of any length.

*93-25 Beechwood Place, Crisfield, MD 21817

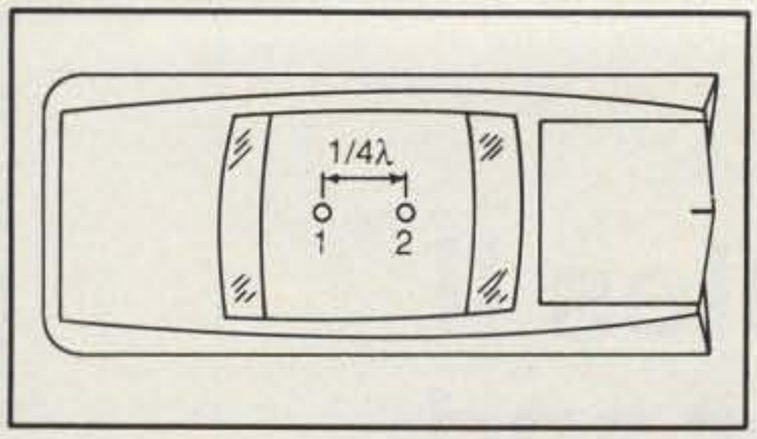


Fig. 2– Antenna installation on a typical vehicle. The antennas can be mag mounts or mechanically connected. Likewise, either gain antennas or simple quarterwaves can be used.

simple; all the work is done in the coax cable. It just takes longer for one signal to reach the antenna because that particular piece of cable is a quarter wavelength longer. (It is *electrically* a quarter wavelength longer. That is not the same distance as the two antennas are separated.)

The only real obstacle I had to overcome was how to switch the pattern from one direction to the other. Fig. 1 shows my solution, which was merely to connect the transceiver to one of two feed points, each at one end of a quarter-wave section of coax. This causes the 90 degree phase differential. The connecting cables themselves can be as long as necessary, as long as they are both of the same length and are multiples of a half wavelength. Remember that the electrical length of a piece of coax is equal to a certain percentage of its physical length. In other words, a piece of RG-8X having a velocity factor of .75 will be only three-quarters as long as you would expect from using the formula for finding the length of a wire antenna. For 146 MHz, a half wavelength of the same cable is 2.4 feet, so you may have cable runs of 9.6 feet, 12 feet, or so on. The center section will be 1.2 feet, of course. Bear in mind that different cables have different velocity factors.

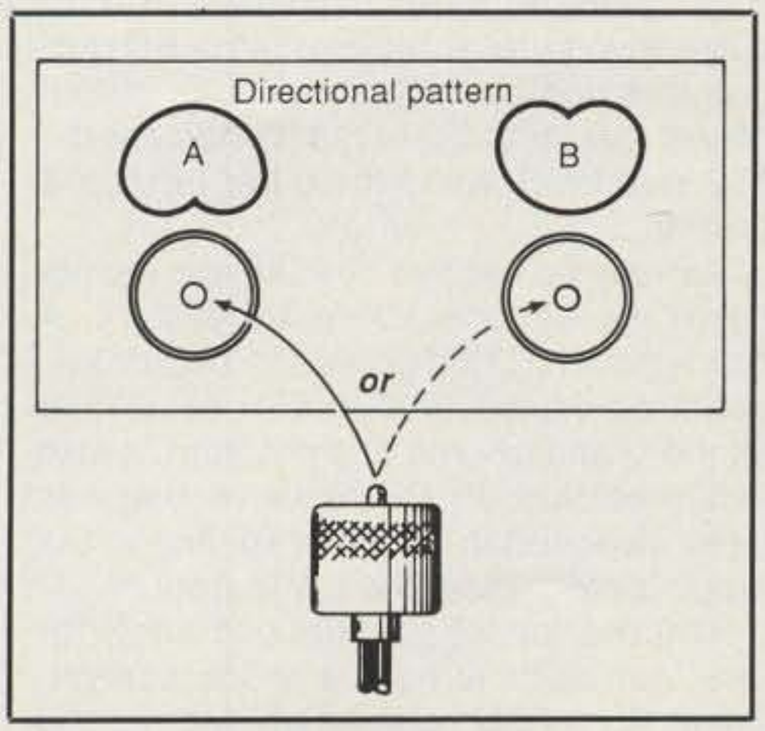


Fig. 3– The front panel of the antenna phasing unit. The directional pattern is selected by moving the coaxial connector from one recepticle to the other.

In order to facilitate switching from one pattern to the other, I mounted two coax receptacles on a metal panel and wired the cables directly to them, keeping leads short and neat, and ensuring that the assembly was properly grounded. An alternative method would be to use a couple of coaxial bulkhead connectors, which is like a barrel connector with a mounting flange. Connect a "T" to each and use PL-259s to connect the whole thing together. This is significantly more expensive, more trouble, and more lossy, although not enough to worry about in either case.

In use this antenna system proved to be quite worth the small amount of trouble it required. The area of maximum gain is quite broad. In my travels to and from work I am either headed away from or toward the repeater, and any turning movement, up to almost broadside to the machine, has no appreciable effect. On the other hand, the null is quite deep and totally eliminates the QRM from the other repeater which annoyed me so badly before.

I have not experimented with this scheme on other than the 2 meter band, but logic tells me that it should work on other bands, 10 meters and up, to at least 220 MHz. The only drawback to lower frequency use is the lack of room to space the antennas properly.

I have been quite pleased with the phased antenna system, and a good part of my satisfaction comes from having inexpensively built something useful that I couldn't readily buy. For me that is one of the most exciting parts of the hobby. CQ

CQ REVIEWS:

The Ten-Tec Hercules II HF Linear Amplifier and Model 9420 Power Supply

BY JOHN J. SCHULTZ*, W4FA

If you are lucky enough to own a Paragon or Omni V transceiver, the Hercules II makes a perfect match. It can, of course, be used with almost any transceiver.

Many of us today are thoroughly accustomed to turning on a solid-state transceiver and having that transceiver deliver 100 watts or so of output power on demand without any warm-up time and without any tuning adjustments. Of course, when more power output than 100 watts proves necessary, it would be wonderful to have a station setup that offers the same operating convenience at the KW level. That convenience was first offered some years ago as various manufacturers introduced solid-state KW-input-level linear amplifiers. Unfortunately, many of the early designs had "teething" problems.

Although going from the 100 watt output level to the KW input level in a solid-state amplifier design doesn't sound like a quantum step, it really is such a step when it comes down to bringing in a practical KW-level design that is reliable, realistic in cost, and truly suitable for both fixed station or portable/mobile applications, and for all modes!

After several years of development Ten-Tec seems to have solved the problems with their Hercules II design. Although the "Hercules" name remains the same, the Hercules II is an almost complete redesign of the original Ten-Tec Hercules amplifier.

General Features

The actual Hercules II amplifier is an amazing bit of engineering. The enclosure housing the amplifier measures only 5¼" × 12" × 14½" and weighs *only* 15 lbs. You put in 50 to 60 watts of driving power on *any* band from 160–15 meters and the amplifier delivers about 550 watts *output*. Bandswitching can be automatic or manual. There is, of course, absolutely no tuning necessary, although the amplifier must be operated into a low SWR antenna load.

*302 Glasgow Lane, Greenville, NC 27858

The amplifier requires a single 12.5 to 14 volt power supply at roughly 80 amps. The 80 amps may at first seem to be a daunting requirement, but in reality it can easily be met from a variety of sources such as a dedicated AC supply or heavy-duty automobile battery which is kept charged by a low amperage battery charger.

A distinct feature of the Hercules II design, as compared to other amplifier designs, is that it does not require up to 50 volts and use rather exotic, expensive transistors. That's fine for fixed-station operation, but it can pose some real problems when operating portable or mobile or when it comes to servicing an amplifier, especially in the field.

Detailed Specifications

Table I shows the specifications for the Hercules II. It is worthwhile to read through the table to see the capabilities of the amplifier. Note that when a 10 meter modification kit is installed (free to licensed amateurs), the frequency coverage is absolutely *continuous* from 1.8 to 30 MHz.

The duty cycle is 100% for SSB voice modulation and 50% continuously for CW/RTTY with a maximum 15 minute key-down period per cycle. The transmit/receive switching time of less than 5 milliseconds means that the amplifier is perfectly suitable for fast CW QSK, AMTOR, or packet modes without any accessory add-ons!

The third-order IMD products are a few dB more than those which can be obtained with amplifiers using higher voltage transistors. However, the −35 dB figure is fully acceptable for all practical purposes.

The metering is quite complete. The analog meter can be switched to measure forward power/SWR or collector current/voltage. A ten-element LED bargraph is dedicated to read peak output power (the last LED is red to indicate the 550 watt level, while the other LEDs are green).

Various protective circuits are included to protect the power transistors. A front-panel LED indicates an "overdrive" condition. However, the LED doesn't just sit there and tell you of a problem. It also indicates that an RF resistive pad has been switched in the input RF line to the amplifier to protect the transistors.

The rear-panel connections allow for interface with almost any transceiver. There is no ALC connection and none is necessary, as will be covered later. That little notation for "Remote Control" in the listing of the rear-panel connections in the specifications table is a real "sleep-

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R-7000 25MHz-2GHz receiver.....	1199.00	**1029**
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er." I think it should have been separately highlighted. It refers not only to the fact that the amplifier's bandswitching can track that of many transceivers, but it also means that the amplifier can be completely controlled (bandswitching, metering, etc.) from a remote-control head even if the amplifier's bandswitching does not track that of a transceiver. Besides being of apparent application for mobile installations, such remote control is also applicable to fixed-station operation if you want to keep the clutter on an operating desk at a minimum. Imagine the possibilities of having the amplifier/power supply placed in a remote corner!

Circuitry

Although transistors are now available such that you can build an HF amplifier using a single transistor pair that will provide a KW output (the transistor pair costs just under a mere $1000), Ten-Tec has chosen a more conservative and economical approach! The Hercules II transistors cost less than $20 each!

Fig. 1 shows a block diagram of the basic RF circuitry in the Hercules II. The input signal is routed first through a broadband input transformer which establishes the nominal 50 ohm input impedance and which couples into four splitters which divide the input power equally to four outputs. The splitters incorporate balancing resistors so if one or more of the amplifiers they feed should fail, operation will still be possible at a reduced power level. The four outputs from the splitters feed four amplifiers, each of which utilizes a pair of MRF458 power transistors.

There are two such amplifiers on each of two PC boards. The output of each pair of amplifiers is combined on each board and then the from each board fed to an overall combiner. The output of the final combiner feeds one of seven relay-selected output low-pass filters. Amplifier bypass/keying switching is handled by a vacuum relay on the output side and reed relays on the input side. Only a very simplified representation of the actual switching is shown fig. 1.

Fig. 2 shows the schematic of one of

OPERATING FREQUENCY:	1.8 to 30 MHz in seven bands. (22-30 MHz Band is disabled on domestic model).
MAXIMUM POWER:	550 watts output CW,RTTY and SSB. (1 KW dc input).
DRIVE POWER REQUIRED:	50 to 80 watts typical for 550 watts output.
DUTY CYCLE:	SSB- continuous voice modulation; CW/RTTY- 50% duty cycle continuously; 15 minutes maximum continuous key-down at 550 watts output.
DISTORTION:	Third order products -35dB from 550 watt output level.
INPUT AND OUTPUT IMPEDANCES:	50 ohms unbalanced, VSWR < 2:1.
METERING:	Switch selectable Forward Power, SWR (calibrated @ 500W Forward Power), Icc (collector current), Vcc (collector voltage). Ten element LED bargraph instantly displays Peak Output Power.
TX/RX SWITCHING TIME:	Less than 5 mS.
PROTECTIVE CIRCUITS:	Hot switching T/R protection. Over-voltage and over-current lockout. Automatically switched input pad in overdriven condition. Front panel "overdrive" LED indicates fault condition.
PRIMARY POWER:	RF Deck — 12.5-14 volts @ 80 amps. (100 amps maximum).
FINAL AMPLIFIER TRANSISTORS:	Eight MRF458, SD1405, or equivalent.
COOLING:	Internal forced air, rear exhaust.
FRONT PANEL CONTROLS:	Power (ON-OFF), Control (QSK/RELAY), Meter (FWD,REF,Ic, Vcc), Band (REMOTE,1.8-2.5,2.5-4.0,4.0-6.5,6.5-10.5,10.5-15.0,15.0-22.0,22.0-30.0).
REAR PANEL CONNECTIONS:	RF Input, RF Output, DC Power, Key In, Key Out, Vox Key, Speaker, Remote Control, Ground.
SIZE:	HWD 5.25" x 12" x 14.5", (13.3 x 30.5 x 36.8 cm).
WEIGHT:	15 lbs. (6.8 Kg).

Table I- Specifications for the Hercules II Amplifier.

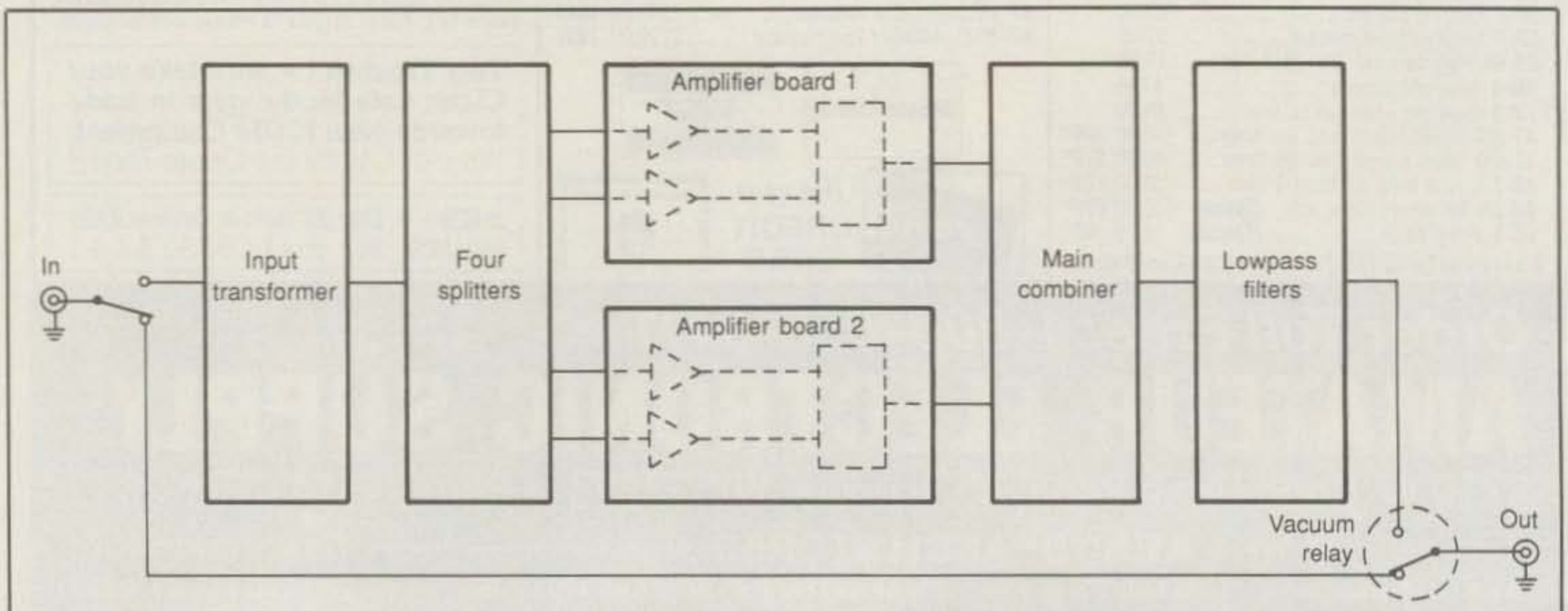


Fig. 1- A generalized block diagram for the Hercules. The Transmit/Receive switching is more involved than presented, incorporating a separate PC board with T/R RF sensing and timing circuitry.

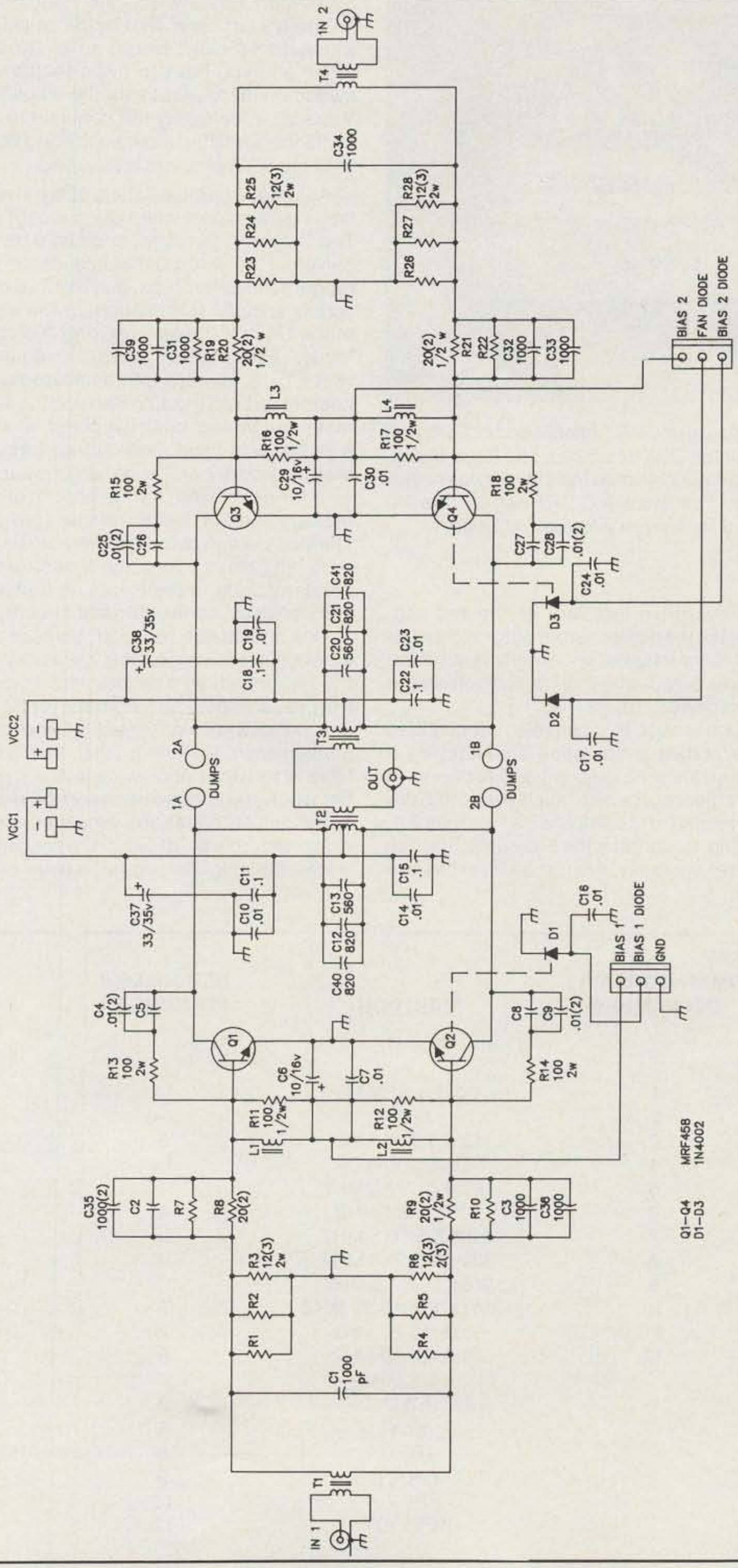


Fig. 2– One of two dual RF amplifiers used to construct the amplifier. Essentially, each amplifier (Q1 and Q2 or Q3 and Q4) is a separate 250 watt input broadband amplifier.

the two identical amplifier boards. I realize most readers are not interested in a lengthy discussion on the circuitry involved, but I think it is interesting to at least have a glance at the intricate circuitry. The two input transformers, one for each amplifier, are shown to left and right in fig. 2. The output transformers (T2 and T3 in the middle) combine the output of the two amplifiers. The terminals marked "DUMPS" go to resistive networks which absorb power in case some imbalance should occur when the amplifier outputs are combined rather than have the unbalanced power circulate and possibly damage components. Diodes D1–D3 sense temperature and activate a higher speed for the cooling fan or protective bias.

Many other boards are concerned with control functions, bias regulation, DC voltage distribution, display functions, etc.

Construction

Various of the photographs illustrate what you would see if you look around both the outside and inside of the Hercules II. It utilizes aluminum-frame construction, but in spite of its light weight, appears to be very rugged. Two massive heatsinks run almost the entire depth of the amplifier, as shown from the top view. All of the PC boards are neatly constructed and the various interconnecting cables compactly grouped and clearly identified.

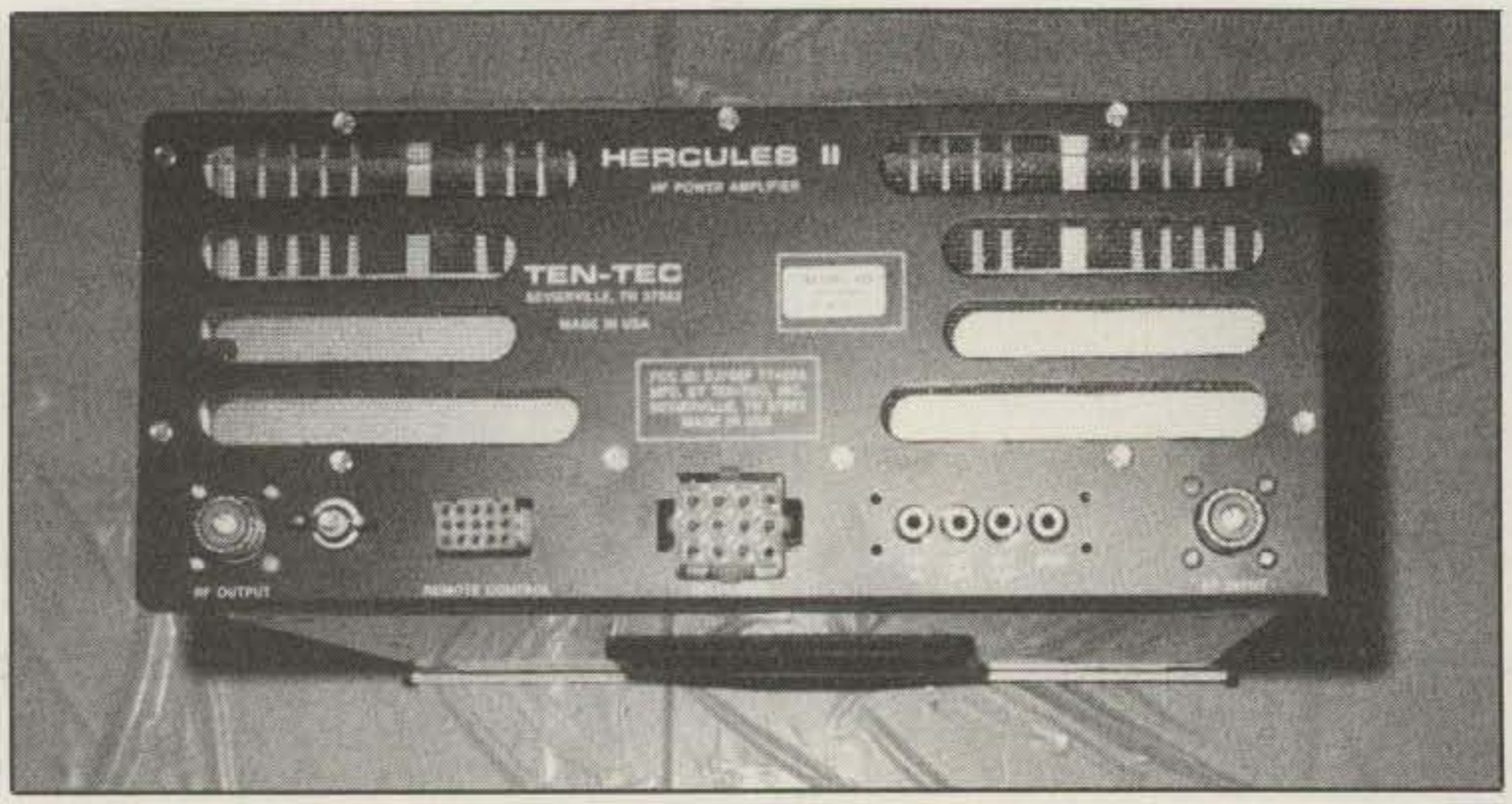
As is typical for Ten-Tec construction, a tremendous amount of circuitry has been put into a reasonably compact space. However, there still remains enough space between the components and between the boards that most field repairs are not intimidating, at least to the extent of identifying a defective PC board. In fact, the warranty is not voided if the covers are taken off of the amplifier in an attempt (perhaps with the help of Ten-Tec's service department) to simply locate a defective board. An experienced technician could, of course, proceed much further, but it would be senseless to do so while the amplifier was under warranty without the specific consent of Ten-Tec's service people.

Setting Up The Hercules

There are basically three interconnections that have to be made with the Hercules II, the same as for any linear amplifier—a power source connection, connections to the transceiver driving the amplifier, and a connection to a suitable antenna load. An optional connection in the case of the Hercules II is that for a remote-control unit.

The power-source connection is simple if you use the Model 9420 Power Sup-

No-25-26



The rear-panel connections are quite simple with the usual RF in/out connections and keying connections for simple PTT, semi-QSK, or full QSK operation. The large Molex-type connector (center) is for a power source connection, while the smaller connector to the left of it is for a remote-control connection. The two SO-239 RF connectors are each fastened with four sets of hardware, a touch rarely found any longer!

ply. You simply plug the cable furnished with the power supply into the amplifier. Otherwise, you have to think a bit as to how you are going to get 12.5 to 14 VDC at 80 amps to the amplifier. The main consideration is not to have a significant voltage drop in the interconnecting leads at 80 amps of load.

Ten-Tec suggests for battery-powered installations, mobile or portable, that four parallel #12-gauge wires be used for both the plus and minus DC leads. I haven't calculated it out, but I imagine 5 to 10 feet of power-cable length would be tolerable using #12-gauge wires. A reasonably good buy in #12-gauge stranded wire is Radio Shack 278-1289 (red) or 278-1280 (black) at $4.00 for 20 foot hanks. Large hardware stores will sell #12-gauge solid conductor wire at a bit lower price, but the solid wire is far more difficult to handle.

Transceiver interconnections are generally very simple with just an interconnecting RF cable and a cable from the transceiver to key the amplifier. Full QSK is possible with the Ten-Tec Paragon and Omni transceivers as well as with various other transceivers. However, there are some cases where only semi-break-in CW operations or normal PTT operation is possible. If you lay great value on full QSK operations, you should inquire of Ten-Tec as to how a given transceiver will interface with the Hercules II. In the case of any transceiver, no ALC interconnection is required. The Hercules II has an internal circuit which provides a few dB of ALC action. Also, if you use the Hercules II with any transceiver which has the usual internal ALC action, there is no problem. You operate the transceiver as usual, keeping the ALC reading on the transceiver's meter within its normal range. If the overdrive indicator or the red segment of the power output bargraph on the Hercules II lights, you simply reduce the power output level (drive control) on the transceiver.

Connection to a suitable antenna load simply means operating the Hercules II into an antenna load, either directly or via an antenna coupler, such that the SWR presented to the amplifier is less than 2:1. Trying to operate the Hercules II at full power into a load which has an excessive SWR will indirectly activate "latching" protective circuitry. That is, the amplifier will automatically switch to a bypass mode and you have to cycle the power switch on/off to reactivate the amplifier. You should definitely not continue to recycle the amplifier under such conditions until the SWR problem is resolved.

Automatic bandswitching of the amplifier is quite simple when using most Ten-Tec Corsair I, Paragon, and Omni transceivers. The interconnecting cable arrangements differ a bit, but Ten-Tec can supply specific information. In the case of the Omni V transceiver, only a simple Model 236 control cable is required which plugs directly into dedicated connectors on both the amplifier and the Omni V. Automatic bandswitching is also possible with most modern transceivers that provide a parallel band output (one wire for each band) for the control of accessory items. Transceivers that provide stepped voltage outputs for remote bandswitching cannot be used to control the bandswitching in the Hercules II unless you construct some interface circuitry.

One should not, however, confuse the automatic bandswitching capability of the Hercules II with its total remote-control possibilities. The automatic (or tracking) bandswitching capability is only a convenience feature in that you don't have to turn the bandswitch on the amplifier when you change bands on the transceiver which drives the amplifier. However, regardless of which transceiver drives the amplifier, you can have com-

OMNI / CORSAIR I PIN NUMBER	FUNCTION	HERCULES II PIN NUMBER	
1	GND & SHIELD	11	
2	T	—	
3	12M, 22-30 MHZ	5	
4	COMM,PWR ON	14	
5	160M, 1.7-2.5 MHZ	1	
6	80M, 2.5-4 MHZ	4	
7	40M, 6.5-10.5 MHZ	10	
8	30M, 6.5-10.5 MHZ	10	
9	20M, 10.5-15 MHZ	13	
10	18M (17M), 15-22 MHZ	2	
11	15M, 15-22 MHZ	2	
12	10M, 22-30 MHZ	5	
	4-6.5 MHZ	7	NO CONNECTION
	FWD	3	
	KEY	6	
	+REG	8	
	FAULT	9	
	REV	15	
	KEY OUT	12	

Table II– Pinout for the remote-control connector on the Hercules II.

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MFJ's *peak* (and average) reading Cross-Needle meter shows you SWR, forward and reflected power — all in a glance. Shows peak SSB power.

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An external dummy load can cost you ***another $30*** — plus it takes up valuable space at your operating position and requires another cable.

Full 1.8 to 30 MHz coverage

Make sure the tuner you're considering covers *all* the HF bands . . . the MFJ-949D does.

Plus more . . .

You get an antenna switch that lets you select 2 coax lines (direct or thru tuner), random wire or balanced lines and built-in dummy load. You get a 4:1 balun for balanced lines.

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Precise control for minimum SWR

The MFJ-949D gives you more precise control for minimum SWR than any tuner that uses two tapped inductors.

Why? Because the two continuously variable capacitors in the MFJ-949D give you infinitely more positions than the limited number on two switched coils.

This gives you precise control to get minimum SWR and maximum power into your antenna. **After** all, isn't that why you use a tuner?

High efficiency and a compact size

The MFJ-949D uses a single high-Q airwound coil that takes up a minimum of space without mutual coupling problems.

You get a highly efficient tuner that puts maximum power into your antenna *and* a compact 10x3x7inch size that fits right into your station.

Competing tuners using two tapped coils require a large cabinet — not just to house the coils but also to help reduce detrimental coupling between the inductors. The result? *A tuner that's **bigger** than your radio.*

Easy to tune

With the MFJ-949D once you select the correct inductance, you can turn on your transmitter and tune *both* capacitors for minimum SWR.

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You have to turn off your transmitter *each time* you adjust either of the two inductors. Then turn it back on to readjust the capacitor and to check for acceptable SWR.

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One year *unconditional* guarantee: That means we will repair or replace your MFJ tuner (at our option) *no matter what* happens to it for a year.

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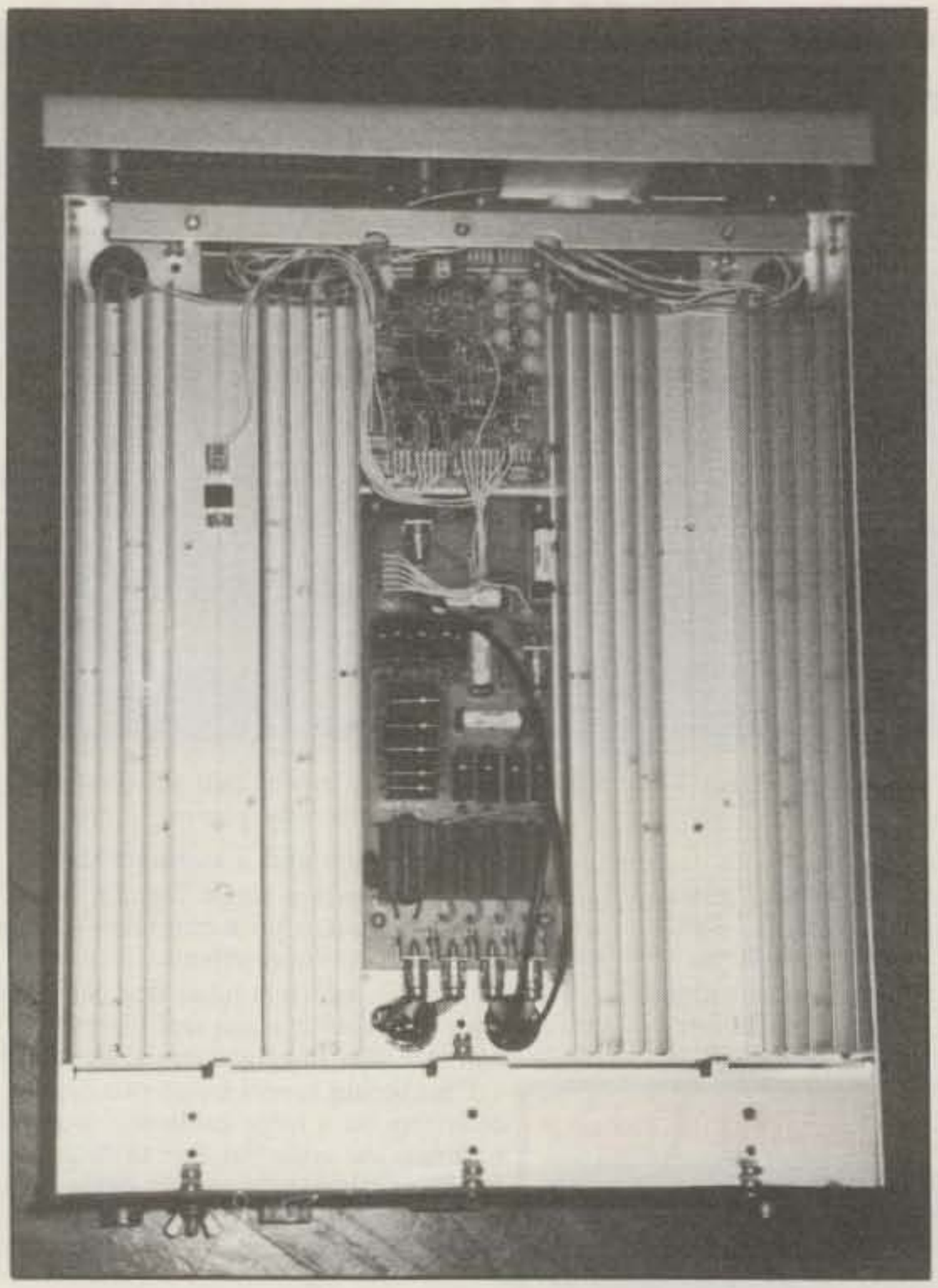
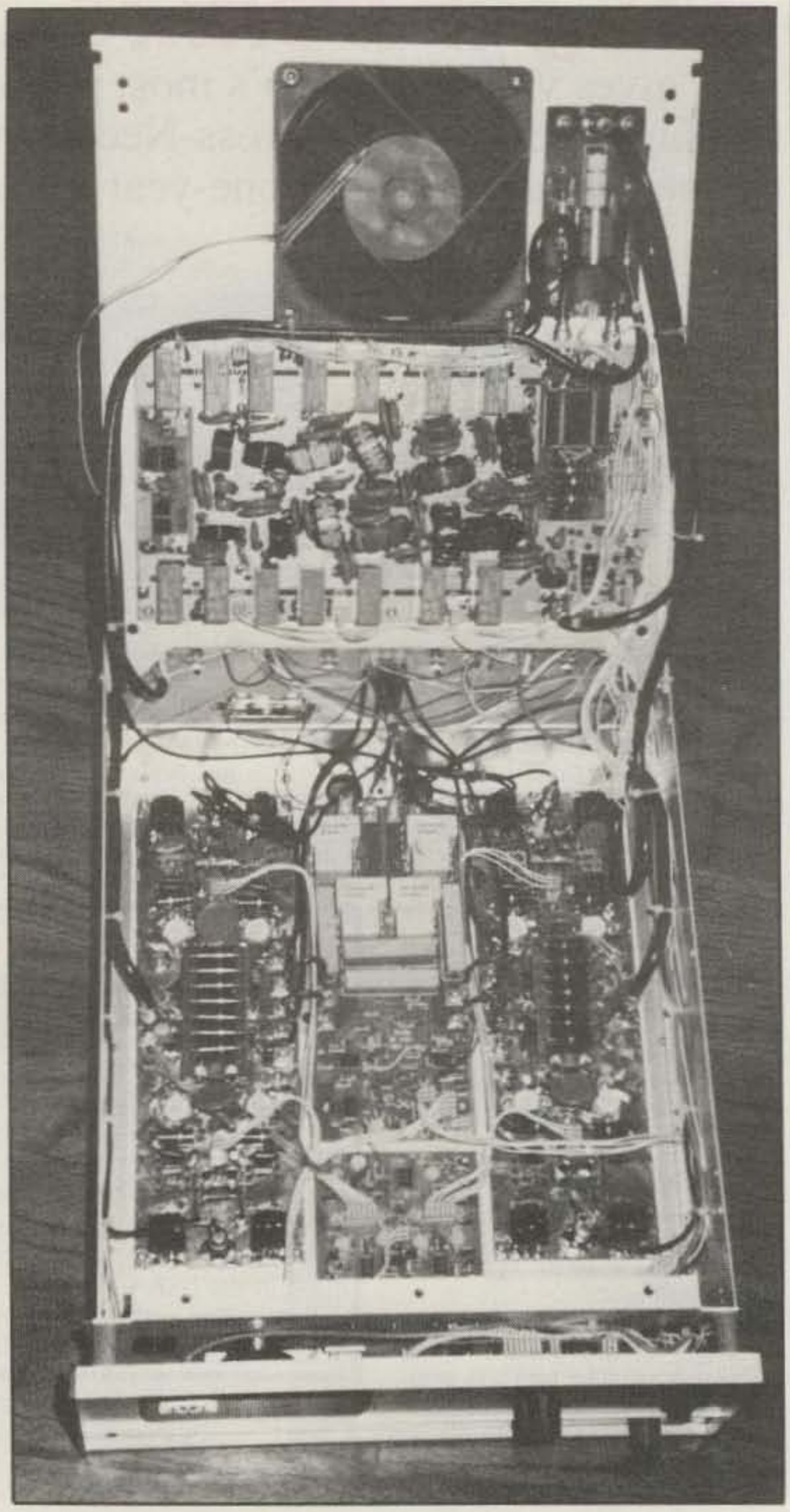


Taking off the top cover you can see two large heatsinks which run almost the entire depth of the amplifier. One heatsink is associated with each amplifier board.



You have to study this view a bit to understand it. It shows the bottom cover removed, but also with an internal, inside bottom cover hinged up. The hinged-up section contains the blower and a large PC board for the relay-switched low-pass filters. Deeper inside the enclosure are the large amplifier boards, one each on the left and right sides. By comparing this view with that of the internal top view, you can basically understand how the amplifier is constructed. Service access is quite easy.

plete manual remote-control facilities which include power on/off, QSK or PTT operation, band selection with band indicator LEDs, 10-element bargraph LED peak power display, and LED "FAULT" indicator display. Ten-Tec can supply an optional accessory remote-control head for the Hercules II or you can homebrew such a unit. Table II is a listing of the pinout connections on the remote-control connector on the amplifier so you can gather some idea as to the remote-control possibilities. Again, it should be emphasized that the remote-control capabilities are fully built into the amplifier. Only external switches and indicators have to be added to have remote control.

Of course, don't forget grounding connections both for safety purposes and to avoid possible RF feedback problems.

Test and Operating Results

Bench checks easily confirmed that the Hercules II conservatively meets its published specifications. On every band (CW and SSB) 550 watts of output was obtained with 55–70 watts of drive power. The amplifier was held key-down for 15 minutes without any change in output power being noted. Third-order IMD products were never worse than the rated −35 dB. The transmit/receive switching time of less than 5 milliseconds was not directly measured. However, full QSK CW at 20 WPM proved flawless, so there is no reason to doubt the specification.

Operating ease was superb. Normally when I describe the operation of a piece of equipment, I get into a discussion of how various controls function, etc. But what can you really say about the Hercules II? Once you have the amplifier set up properly (operating into a proper antenna load, etc), there is really nothing to do except to toggle the power switch "on" for an instant boost of output power to the 550 watt level. The bargraph instantly displays the peak output power as confirmation that the amplifier is doing its job. I usually left the analog meter in the SWR position just to confirm that the antenna load was proper. The overdrive LED did come on a few times, but that was strictly due to "cockpit error" when I forgot to reduce drive to the amplifier. A beautiful anti-splatter device!

As far as on-the-air results were concerned, they definitely have to be divided into two aspects. First of all, boosting the

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The best modem you can get

Tests in ***Packet Radio Magazine*** prove the modem used in the MFJ-1278 copies HF packet more accurately than all other modems tested.

MFJ-1278 is the *only* multi-mode with a ***true*** DCD circuit. This reduces sensitivity to noise and dramatically increases completed QSOs.

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Only the MFJ-1278 has a dedicated printer port that lets you plug in your Epson or IBM compatible printer.

You don't need to buy a silly $40 cable just to plug in your printer.

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MFJ's unequaled tuning indicator makes it really easy to work HF packet. Unlike others, you use it the same for all modes -- not different for each mode. Just tune your radio to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

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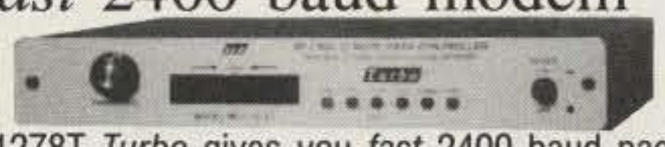
with *fast* 2400 baud modem

MFJ-1278T

$359.95



The new MFJ-1278T *Turbo* gives you *fast* 2400 baud packet -- *twice* the baud rate of any other multi-mode. By communicating faster you'll reduce chances for error, lessen congestion and more efficiently utilize our ham frequencies. You'll also get 1200/300 baud for compatibility with older TNCs.

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All you need is an MFJ-1278, your rig, computer and terminal program.

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You get MFJ's one year No Matter What™ Guarantee.

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MFJ-1270B super clone of TAPR's TNC-2 gives you more features than *any* other packet controller -- for $139.95

You can double your fun by operating VHF and HF because you get ***high performance*** switchable VHF/HF modems.

You get the Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

In MFJ's new WeFAX mode you can print full-fledged weather maps to screen or printer and save to disk using an IBM compatible, C-64/128 or Macintosh.

A new KISS interface lets you run TCP/IP. They also come ***NET ROM*** compatible.

You also get 32K RAM and a free 110 VAC power supply (or use 12 VDC).

For dependable HF packet tuning, the MFJ-1274 gives you a high resolution tuning indicator -- and it's only $20 more.

MFJ Video Digitizer

Here's Aimee. This unretouched picture was shot directly from a VGA monitor. We digitized Aimee with a camcorder, MFJ-1292 "Picture Perfect" Video Digitizer and IBM compatible computer.

Create fascinating digitized snapshots to transmit with your MFJ-1278 of *anything* you can point your camcorder at!

The new MFJ-1292 "Picture Perfect" Video Digitizer connects your video camera to your IBM compatible computer so you can capture digitized video snapshots on disks.

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You can use your digitized snapshots in any desk-top publishing program that uses the popular PCX format. MFJ-1292 lets you capture pictures in VGA, EGA, CGA, Hercules or Raw Data formats. Get yours today.

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CIRCLE 1 ON READER SERVICE CARD

power output of a station by five to six times definitely makes you more readable. But if absolutely all other factors are the same, such as modulation quality (which is rarely the case), it is true that a station producing 1500 watts output will have an edge of somewhat less than an "S" unit over a station producing 500/600 watts output. Using the Hercules II, I could definitely crack DX pile-ups that would have been impossible to crack in any reasonable time if I had been operating barefoot. On the other hand, I didn't always crack a pileup on the first or second try against stations running the full legal power output.

The second aspect, however, is pretty much the Tortoise and the Hare tale, at least as far as DXing is concerned. If you can be on frequency quickly with a bit of power, you can make DX contacts long before higher powered stations get their amplifiers tuned up and their big beams turned around. However, you do need a bit of instant power to turn the trick. A look down my log shows a few exotic calls that I'm sure I would not have been able to contact without the agility of a Omni V/Hercules II station setup.

One very refreshing aspect of the Hercules II is its super mechanical "quiet" (fan noise) which nicely matches the super electrical "quiet" of the Omni V. You can hear the fan, but it is very quiet. The boxer fan on the bottom takes in air, and the air is exhausted through openings on the rear panel. Strangely enough, I never found the exhaust air to be more than moderately warm even after a very long-winded QSO (on my side). Somehow the combination of the large internal heatsinks and the fan arrangement seems to have done the trick. It certainly is the coolest running amplifier in its power class that I have encountered.

The amplifier seemed to easily tolerate a very high SWR, up to 4:1, for at least 30 seconds without tripping off. It seemed as if it would tolerate the high SWR much longer, but I didn't feel comfortable in continuing the test. Thirty seconds should be more than long enough to get an antenna tuner "touched-up" if you are using a manual tuner. At an SWR of 2:1 the power output only dropped to the 400–450 watt range. The only time the cooling fan ever switched into a higher speed mode was during the 4:1 SWR test. The front-mounted loudspeaker is a bit "different." This amplifier is the only one I know of which has such a feature. However, I do admit the audio from the Omni V sounded better using the amplifier's speaker.

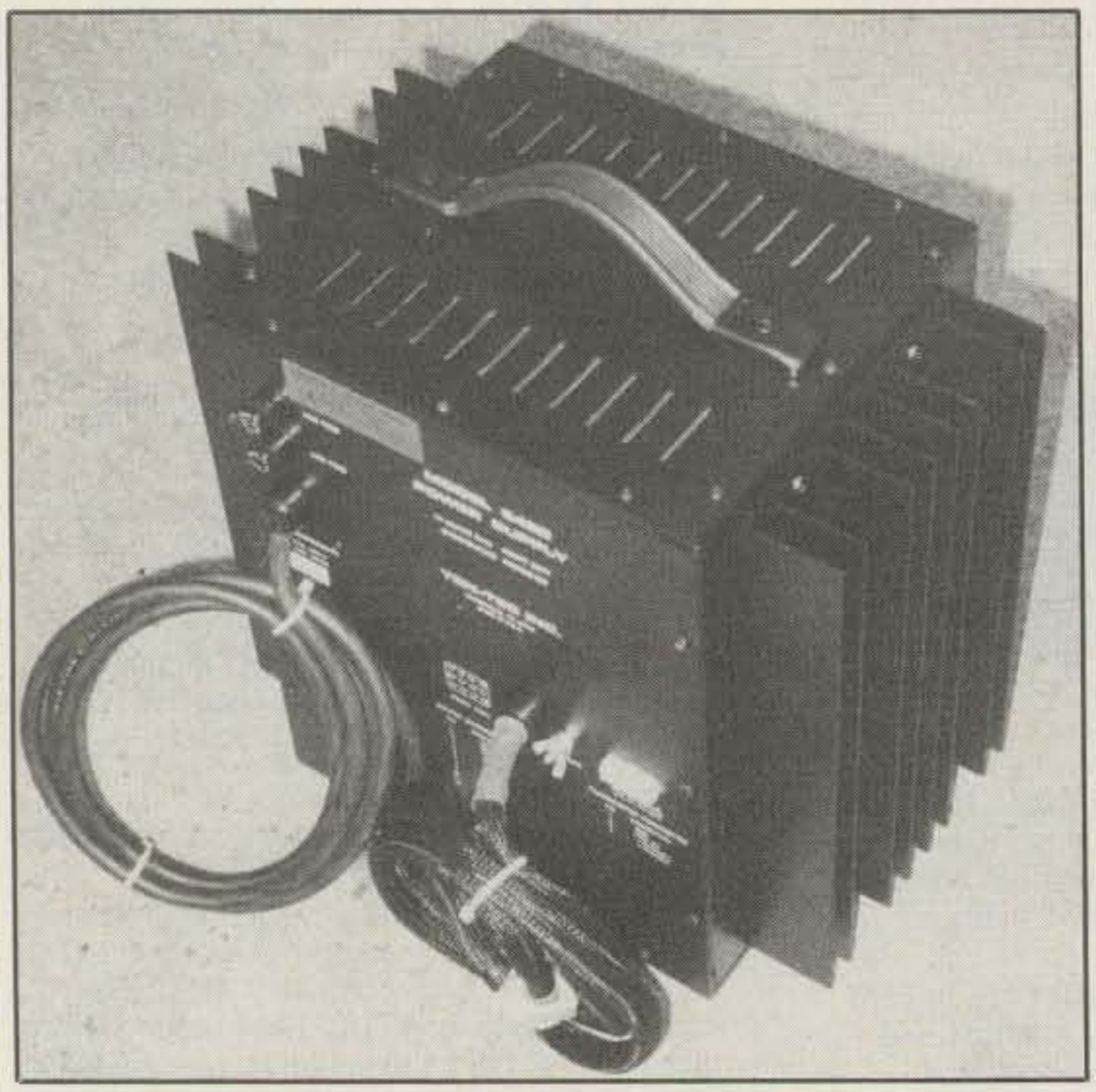
10 Meter Modification

Ten-Tec supplies all necessary parts free. Basically, the only part needed is a low-pass filter assembly. The assembly does have to be soldered in place and you do have to remove the top and bottom covers from the amplifier. Neither effort presents any problem. In fact, when the covers are off, it presents a good opportunity to see a bit of the inside makeup of the amplifier. Also, as long as the covers have been removed, I would suggest checking the "seating" of all of the obvious PC board connectors. I didn't find any loose ones, but why not take advantage of the opportunity.

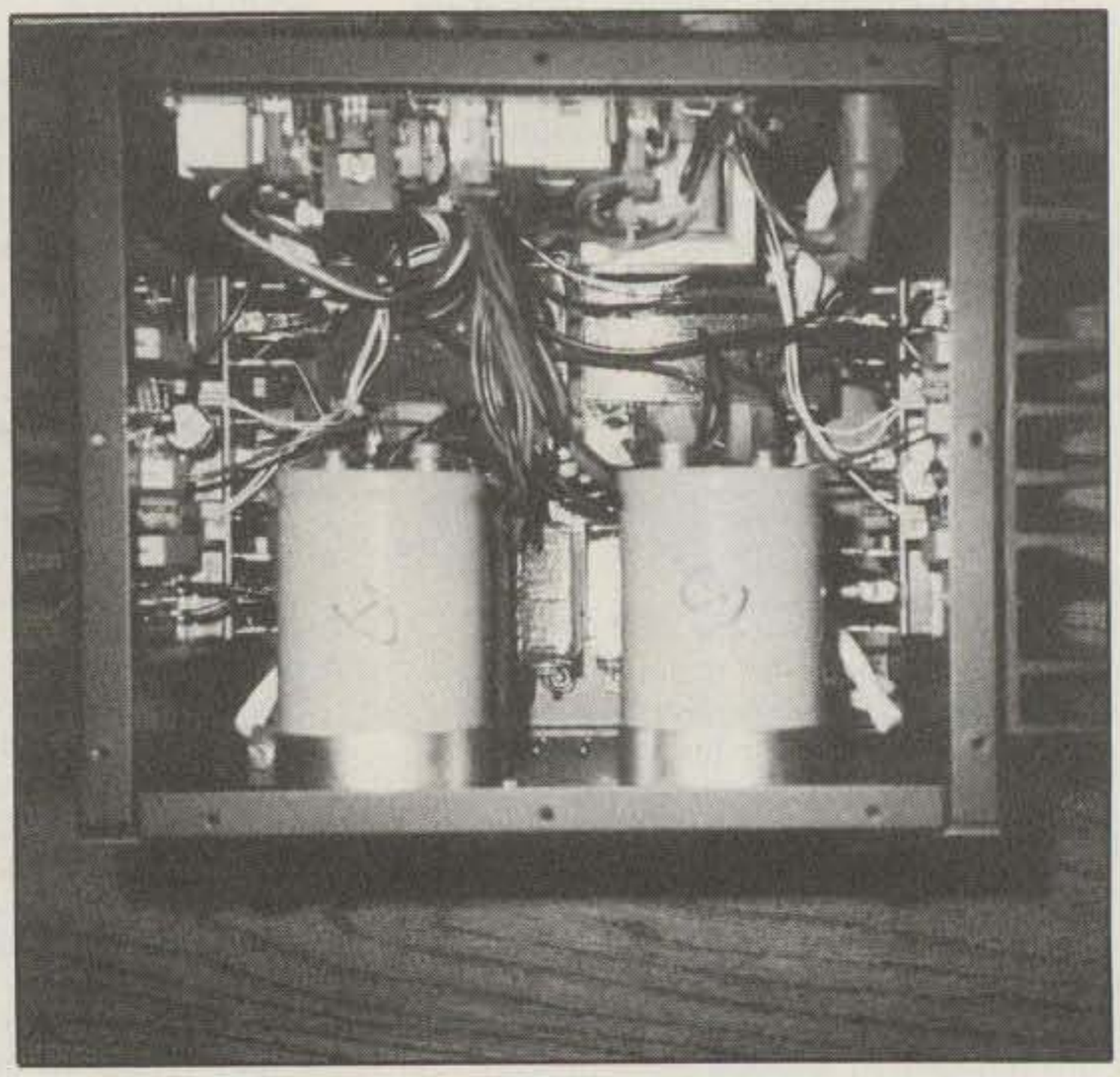
Accessories

The mundane (but highly convenient) accessory for the Hercules II is a Model 236 control cable. It allows the amplifier to be interfaced with a Ten-Tec Paragon or Omni V transceiver for automatic band-switching. It will only work with the Paragon if the transceiver has the RS-232 accessory board installed. It is about 4 feet long and also has provisions for connection of a PC or the Model 301 Remote Tuning Encoder (Omni V only).

The more interesting accessory is the optional Model 9423 Remote Control Head. It is a small enclosure (1.5" × 6¼" × 4") that allows for complete remote control of the Hercules II. The functions on the remote control include power on/off, QSK or PTT control, band select with band indicator LEDs, peak power output bargraph display, and LED fault indicator. It comes with a 12 foot cable that plugs directly into the Hercules II remote-control connector. There is even an extension remote-control cable available, Model 300, which adds another 12 feet. I'm not sure how many of the extension cables can be placed in series. If your yacht is such that several might be re-



The Model 9420 power supply is quite a unit. Imagine an output of 13.8 VDC regulated at 100 amps in less than a cubic foot of space and complete with carrying handle!



Looking down inside the power supply you can see a compact but not overcrowded grouping of components. The large filter capacitors are towards the top, and the four power transformers are at the very bottom of the enclosure.

quired, you had best contact customer service at Ten-Tec for advice. They'll gladly provide the information.

The Model 9420 Power Supply

Talk about a "brute force" but quite sophisticated power supply! Pick up the 9420 at 58 lbs and carry around an AC supply that will deliver 14 VDC regulated at 100 amps! The biggest surprise of all is that the unit is almost miniature in size considering its power capability. It measures 12½" × 14½" × 9¼" and has a convenient carrying handle on top.

Ten-Tec used a very interesting approach in designing this power supply. In essence, it consists of four parallel power supplies each having a separate power transformer and containing a great deal of sophisticated regulation and control circuitry. The output of each of the four power supplies is kept separate and powers one of the four amplifier stages in the Hercules II.

The power supply can be turned on by the power switch on the Hercules. The supply will also sense if only a transceiver it is powering has been turned on and the supply will be activated. The supply can be placed on a floor or in some other out-of-the-way location, but good air ventilation around all sides of the supply is a must. The supply contains no fan and is completely quiet.

The supply can be operated from 120 or 240 VAC lines, but since it draws up to 2 KW from the line, Ten-Tec recommends using it on a 240 V line. The supply comes wired for 240 V, but Ten-Tec includes the necessary materials, except for a heavy-duty 120 VAC plug, to modify it for 120 VAC operation. I could dedicate a 120 V line having a breaker rated at 20 amps to the supply, so I modified it for 120 V operation and it operated absolutely fine under such conditions. However, I would heartily agree with Ten-Tec that 240 V line operation is preferable if only to avoid the safety considerations of using a 120 V line at its maximum rating.

The 9420 power supply, with its size of less than a cubic foot, is an ideal complement to the Hercules II. However, if you only plan to use the amplifier for intermittent service, the idea advanced by Ten-Tec of powering it with a heavy-duty car battery which, in turn, is charged by a 10 amp charger has a lot of merit. You don't need a 240 VAC line under such circumstances, and the initial monetary investment can be considerably reduced. Besides, it would seem to be a dandy idea for emergency or field communications for a short period without having to get involved with a standby AC generator. I didn't try the idea myself, so I can't present any operating data. If you do go the car-battery route, note that safety considerations, mainly regarding ventilation, do have to be observed when lead-acid batteries are being charged.

The construction of the 9420 Power Supply is very rugged. A heavy-gauge aluminum enclosure is used with the four power transformers mounted in the base, various PC boards, and the filter capacitors mounted on the internal walls and then two large heatsinks along two exterior walls. Very heavy-gauge wire is used for high-amp leads, and push-on connectors, although used, are soldered together. Cable runs are neatly bunched. The supply gives the impression that it will last forever. The 120/240 V primary conversion does require some simple soldering. A switch could easily be installed if frequent primary voltage changes are required.

Manuals

The manuals for both the Hercules II and 9420 power supply follow the format Ten-Tec seems to have made standard. Basically, there are clear installation instructions, operating instructions, and then complete circuit schematics and PC board layouts. The manuals are clearly written and focus directly on practical setup information rather than trying to become partly operating manuals and partly advertising literature. Ten-Tec correctly identifies the manuals as "Operator's" manuals, although they do take on many aspects of service manuals also. The schematic diagrams and PC board layouts will allow you to do simple to complex troubleshooting depending upon your technical abilities. Perhaps more important, they do allow you to communicate intelligently with the service people at Ten-Tec should a problem develop which can be handled simply by exchanging PC boards, rather than having to ship entire pieces of equipment back and forth.

The warranty on the equipment extends for a period of one year to the original owner. Ten-Tec does support dealers of their equipment who offer warranty service, but it is also quite clear that Ten-Tec encourages factory-direct contact if you have any problems. I especially like the paragraph in their warranty statement which says: "We encourage self help. Taking the covers off does not void the warranty." It is refreshing to deal with a manufacturer who will respect your common sense in resolving a possible problem.

Summary

My objective in this review has been the same as in other product reviews I've written for *CQ*—to give you a real feel for the piece of equipment involved by taking off all of the covers and "poking" around various circuit details. This is a bit more, let's say, than just describing the functions of the knobs on the front panel.

I must confess that the more I operated the Hercules II and "poked" around its circuitry, the more I was impressed. The amplifier and power supply exhibit excellent quality throughout as far as construction and operation are concerned. If you treat the combination with a bit of reasonable care, I see no reason why you shouldn't get a decade or more of totally trouble-free performance from the units.

Those who like to go off on DXpeditions might like to seriously consider the use of a very lightweight Hercules II with a locally procured car-battery/charger combination. I can't imagine a simpler means of achieving a KW station setup weighing only 15 lbs. (unpacked) for the KW amplifier. The tradeoff, of course, would be limited operating time depending upon the time it takes to recharge the battery.

Pricing

The following are suggested retail prices for the Hercules II and its optional accessories: Hercules II HF Amplifier $1275; Model 9420 Power Supply $795; Model 236 Control Cable $57; Model 301 Remote Tuning Encoder (an accessory for the Ten-Tec Omni V) $75; Model 9423 Remote Control Head $147; Model 300 Extension Cable $37. CQ

Having a pair of 80 foot towers spaced enough apart presents some interesting possibilities and a great opportunity.

A Switchable Delta Loop Array For 40 Meters

BY TONY DEPRATO*, WA4JQS

I've always enjoyed tinkering and experimenting with different kinds of antennas. I also consider myself a devoted, avid amateur and spend considerable time on the bands from 20 meters up through 2 meters. For a number of years the thoughts of 40 meter DXing kept popping up, and I decided to explore antennas for that band.

The first antenna I tried was a two-element fixed quad which was adapted from an article in *QST* called "A 40 Meter Quad the E-Z Way." The article appeared sometime in the late 1970s. The antenna worked fairly well, but was fixed in the north-south direction. However well the antenna worked, this was not the orientation for a 40 meter antenna in south central Kentucky.

I then decided to try a delta loop array, but I wanted the option of being able to switch directions (from Africa to the Pacific) without having to rotate the entire system. The solution turned out to be a common reflector array with switchable driven elements and two director elements

*P.O. Box 131, 521 Jacksboro St., Ferguson, KY 42533

Design Frequency:	7.175 MHz
Number of Elements:	7 total, 4 elements per direction
Gain:	10 dB
Front-to-Back Ratio:	25 dB
Spacing:	0.125 wavelength, or 17 feet 1½ inches
Difference Factor:	+5% reflector, −5% directors
Wire Size:	#10 stranded copper insulated
Driven Element Feed:	¼ wavelength, 75 ohm stub

Table I– General specifications.

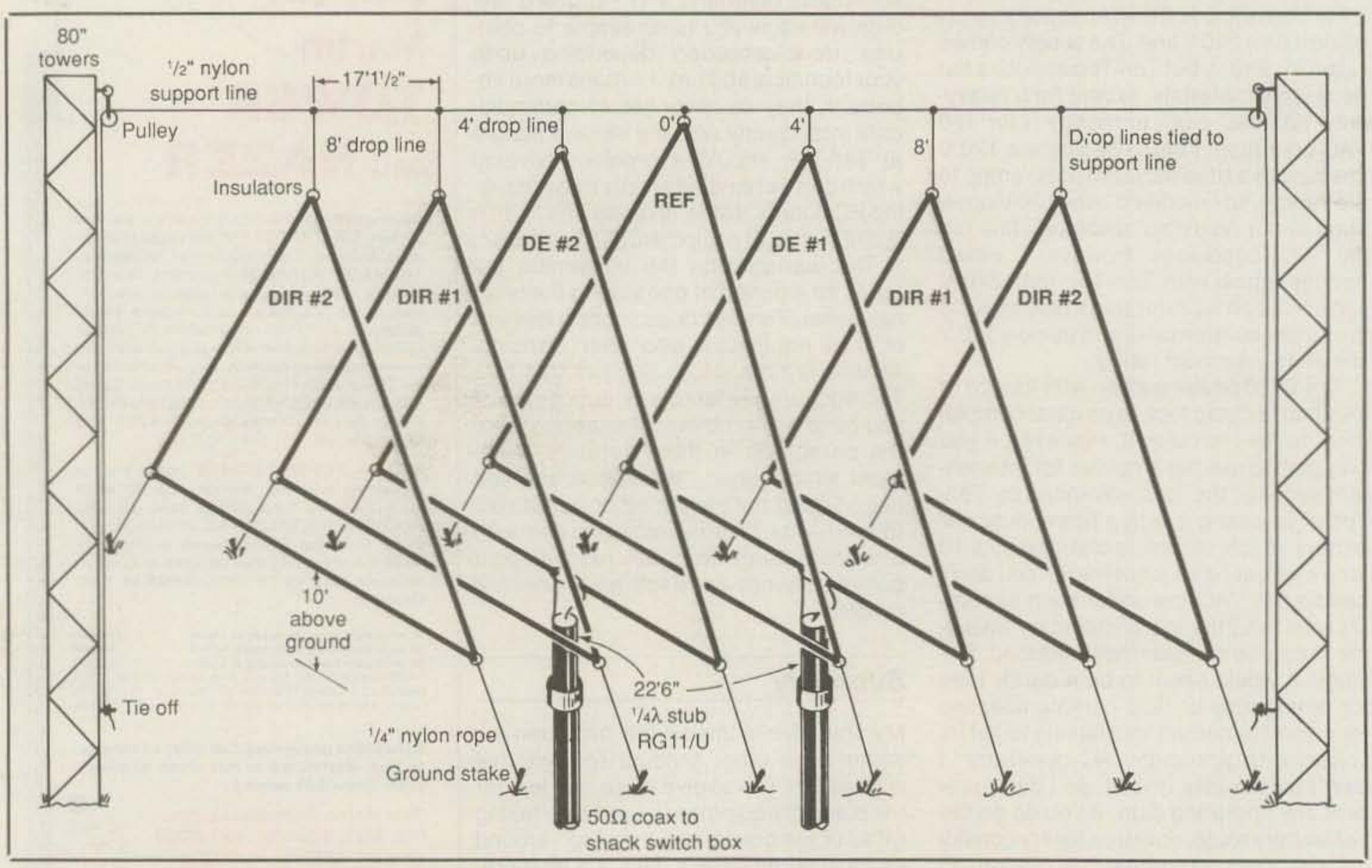


Fig. 1– The overall plan for the switchable array.

Driven Element: The driven element is cut to a frequency of 7.175 MHz using the formula

$$\frac{984}{\text{Freq. MHz}}$$

$$\frac{984}{\text{Freq. MHz}} = \frac{984}{7.175} = 137.142 \text{ overall length, or}$$

$$\frac{137.142}{3} = 45.71 \text{ feet per side}$$

Reflector:

$$\frac{1030}{\text{Freq. MHz}}$$

$$\frac{1030}{7.175} = 143.554 \text{ overall length, or}$$

$$\frac{143.554}{3} = 47.85 \text{ feet per side}$$

Directors 1 & 2:

$$\frac{935}{\text{Freq. MHz}}$$

$$\frac{935}{7.175} = 130.314 \text{ overall length, or}$$

$$\frac{130.314}{3} = 43.44 \text{ feet per side}$$

Phasing Line: RG11/U, 75 ohm coax (see note)

$$\frac{246VF}{\text{Freq. MHz}} = \frac{246 \times 0.66}{7.175} = 22 \text{ feet 6 inches}$$

Note: RG11/A (polyethylene) has 72 ohm impedance with a velocity factor of 0.66.

Table II– Construction of the antenna array.

fixed on each end of the twin array. The completed array consisted of a pair of four-element delta loops, one fixed on Africa and the other on the Pacific.

Construction

The delta loop has three equal sides, each side being one third of the overall length. Three insulators are slid onto the wire and fastened to the wire when it is bent into the triangular shape. The insulators are held in the corner angles by wrapping a couple of turns of #12 wire on each side of the insulator and then taping over the wrapped wire. Each element in the array is formed in the same manner.

Since I was fortunate in having two 80 foot towers already in place, the problem of supporting the array turned out not to be a problem. Trees or other structures might do as well. I installed a pulley system at the top of each tower to raise and lower the array and used ½ inch nylon line as the support "wire" from which the array is suspended.

The center reflector element is hung directly from the support "wire." The driven elements are suspended down from the support wire 4 feet, and the directors hang 8 feet down from the same "wire." The spacing between elements is 17 feet 1½ inches. The triangular shape of the loops is fixed by the use of wooden stakes driven in the ground as shown in fig. 1. Nylon rope is used to secure the corner insulators to the ground stakes.

After the elements are in place, the ¼-wave stubs are attached to the driven elements. The stubs are made of 22 foot 6 inch lengths of RG11/U with a coax connector at the end. The end then connects to another connector with 50 ohm coax feedline (use an odd number of ¼-wavelength feedline for 7.175 MHz) from the shack. I use a two-position coax switch in the shack to "change" direction, or if you want, you can install some sort of remote switch at the site and only use one run of coax. The important consideration is to maintain the element spacing of 17 feet 1½ inches by keeping the ground stakes spaced exactly the same.

Results

I have been using this array for over two years and have been very pleased with it. I did, however, install a two-element beam at 100 feet and did some rough comparisons between antennas. Even though the bottom of the reflector loop was only about 20 feet off the ground, both antennas behaved pretty much the same. The delta loop array was certainly worth all the work (and #10 wire) it took to get it up, and the results are well worth the effort. CQ

CQ REVIEWS:

The MFJ-1289 MULTICOM.EXE Terminal Software Package

(Including Its Use With The MFJ-1278T *Turbo* TNC)

BY BUCK ROGERS*, K4ABT

One can no longer question the direction the hobby of amateur radio is taking. This year Dayton gave us a rousing display of digital communications, and in a subtle way it told us that "digital" is now a way of life for all of us. With the introduction of higher speeds for digital communications (voice and data), there is more effort being expended to engage more applications for digital technology. We saw the introduction of Digital Signal Processing (DSP) relating to data and voice. DSP is a field that opens other avenues that enable greater exploration of ways to use "digital amateur radio."

The SouthNet Packet Conference at Albany, Georgia gave us a glimpse of the future for the digital amateur. We can now look for many strides to be made with regard to packet speeds. We were given a "heads-up" that routing and increased speed are the blessings that are also to provide relief from our throughput problems.

Many of the readers of *CQ* will benefit from the demonstrations at Dayton of equipment and devices that will be released later this year and into next year. There were those purveyors of digital peripheral "engines" (that is a new "buzz-word" that so far doesn't say anything) who told us of the pretty boxes that would be ready to deliver in the next six to eight months. The "engine" is analogous to the frame of an automobile that has four wheels but no motor and no steering mechanism.

What Happened To Support For The End User?

At Dayton there wasn't a lot of new software for us to see, but the software that we did see was something to behold. In the May and July installments of the "Packet User's Notebook" column I alluded to a radically new terminal program that was being developed for the packeteer. Many readers experienced a very small part of this program when they used the MFJXFER.EXE program. This terminal program gave us a tiny preview of the newly released MFJ MULTICOM.EXE.

I walked up behind the back of the crowd at the MFJ booth at the Dayton HamVention several times, but that was about as close as I got. The onlookers were deeply interested in the many features that were being demonstrated in the new super software called *MULTICOM.EXE*. I later learned that several hundred MULTICOMs were prepared for release at Dayton, and they were all sold out the second day. So unfortunately I had to wait to get my latest version of MULTICOM.EXE.

The Latest Version

This is the best $59.95 value I've gotten in packet radio in the last nine years. When the MULTICOM and the *new* MFJ-1278T *Turbo* (Photo 1) are combined, the user can transmit and receive Facsimile (modes 1 and 3), SSTV (modes 1-5), and packet pictures in all modes and levels. These include CGA, EGA, and VGA 256 color. There are several supporting utilities included with the three-disk set which enable the user to capture CGA, EGA, and VGA 256 color pictures. The pictures are converted to the packet picture mode within the utilities. This format of packet pictures (Photos 2A and 2B) enables the receiving station to see these pictures appear on the screen as they are received. To add another benefit to the system, while the pictures are painting on the screen, they are automatically saved to disk. The beauty of this packet picture format is that pictures are complete and error-free.

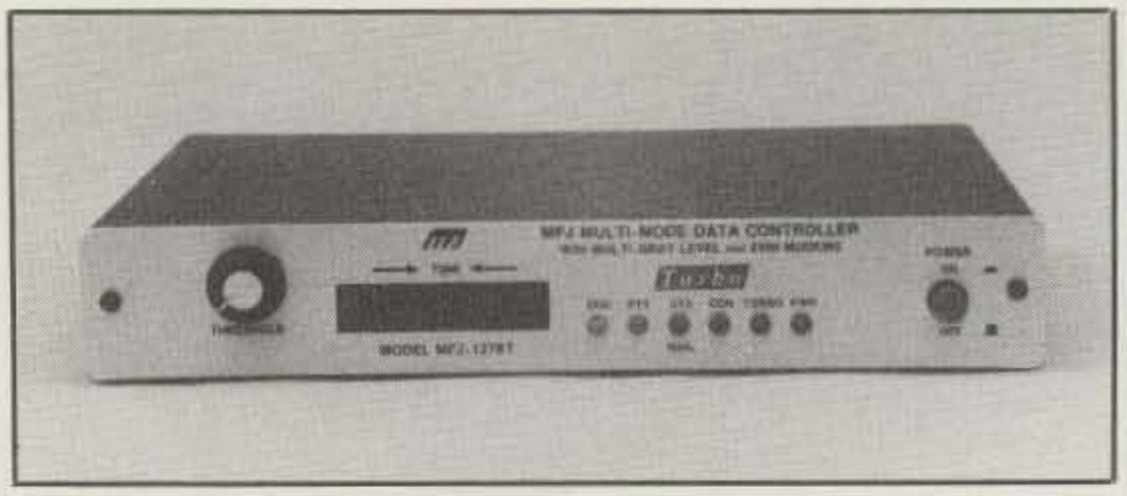


Photo 1- The MFJ-1278T Turbo. Notice the "Turbo" lable and the added "Turbo" LED.

The terminal program is the result of many years of packet experience and software writing. Many of the features in this program are ideas collected from those who use the digital modes day in and day out. I've watched the growth of this program from nearly the beginning to its present status. It has become the most powerful terminal program to date. The countless hours of preparation, code writing, compiling, and testing finally paid off.

In an effort to give credence to the growth of MULTICOM.EXE, I must also give credit to the MFJ-1278T *Turbo* around which it is built. The MFJ-1278T *Turbo* is not the only controller or TNC with which MULTICOM works. However, it does complement many of the special features of the MFJ-1278T *Turbo*.

Before I get to the digital modes that are universally supported by the MFJ MULTICOM.EXE, I need to talk about the non-digital modes of Facsimile (FAX) and Slow-Scan TV (SSTV).

MFJ MULTICOM.EXE is a "write-protected" program that enables the user to install it to the hard drive of his or her IBM PC or clone. Once the program is installed and the F3 function key is used to activate the parameters and colors that are desired by the user, then the user callsign is set into the software to enable the use of the program with the controller(s). The F3

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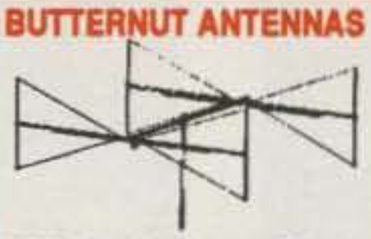

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AP8 - 80-10M Vertical Antenna.
D40 - 40M Rotatable Dipole.
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A50-5 - 5 Element, 6M Beam.
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HDBX48	48 Ft.	18 Sq.'	363	689

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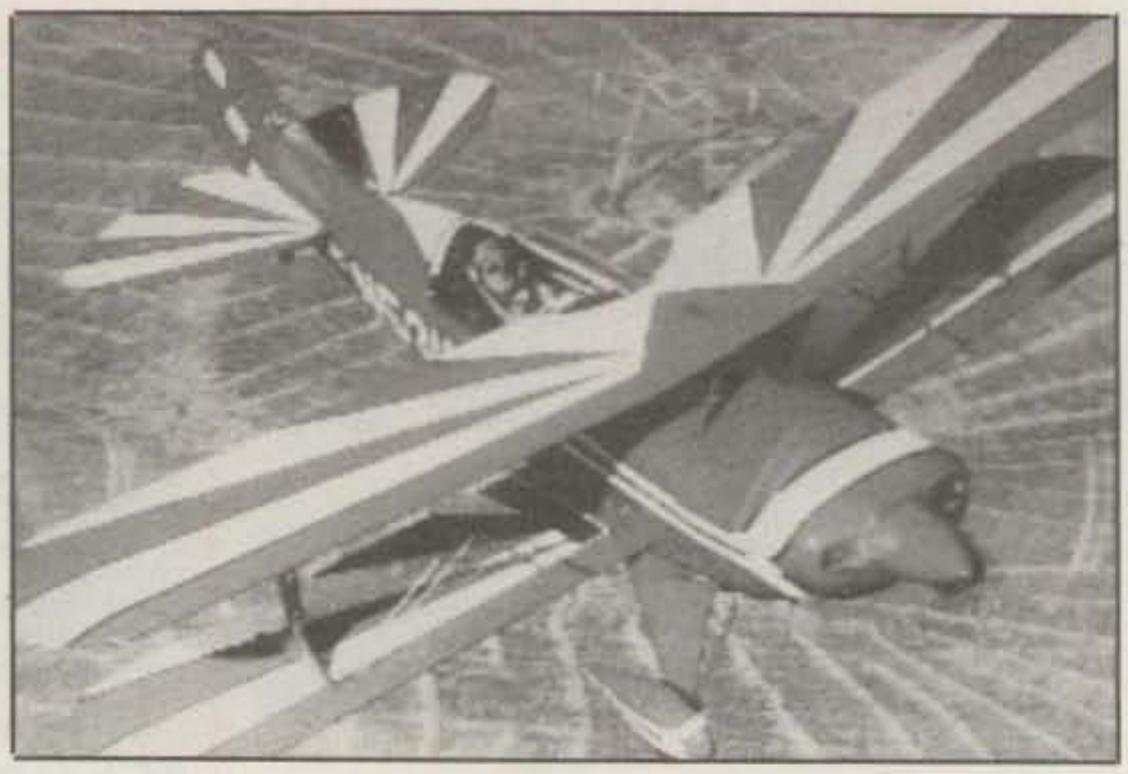


Photo 2– (A, left) "No clowning around," this packet picture displayed in 256 colors as it was received. (B) EGA packet pictures paint onto the screen in 16 colors, error-free, as they are received.

function even allows the user to set up paths to the various subdirectories for the FAX, SSTV, packet pictures, inbound, and outbound files. Setup of the MULTICOM.EXE is so easy that you might wonder why they included an installation section in the manual. The user need only remember the F3, or function key 3, to implement the setup of this software with his or her system. After the F3 key is pressed, just follow the on-screen instructions. For extra help, an easy access **HELP** screen is invoked with an **ALT H** keystroke.

As an added benefit and feature, the MULTICOM.EXE also doubles as a binary and picture BBS. The user/SYSOP has the option to set the parameters within MULTICOM.EXE so that other users may access only the file or picture subdirectories that he/she wishes. The same system can run directly from the floppy disks.

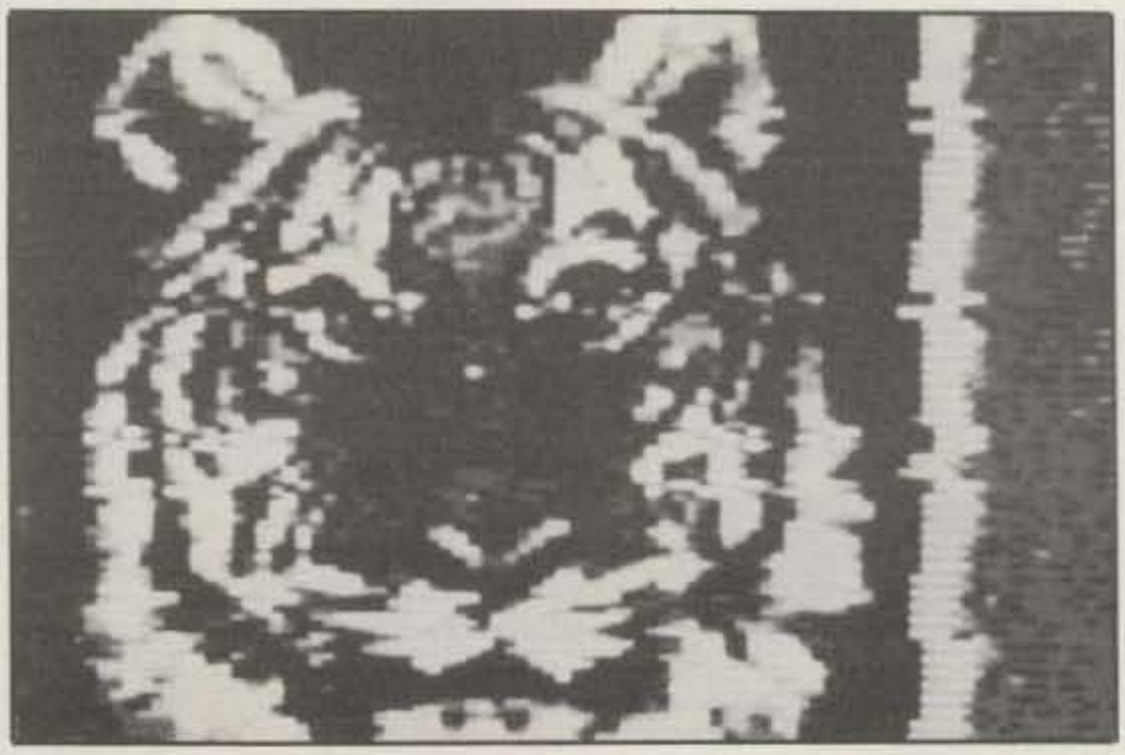


Photo 3– "Tabby" takes only 8 seconds to send or receive in SSTV mode. Not the best resolution, but very recognizable.

SSTV, FAX, and The MFJ-1278T *Turbo*

I like pictures, and the many readers of the "Packet User's Notebook" column in *CQ* are aware that I promote the use of packet video and digital image transfer via packet. As it turns out, I'm an addict of all the picture modes. I like to send and receive FAX and Slow-Scan, too. There are many of us who simply tune to 14.230 MHz or 14.233 MHz and monitor just to catch as many pictures as we can. On Saturday mornings, Franco, Hans, and heaven knows who all will get on one of these two frequencies on 20 meters and go at it sending SSTV back and forth until someone calls an end to the session or the SSTV net. It seems to end all too soon to suit most of us.

To really enjoy the SSTV mode set up the MFJ-1278T *Turbo* and the MULTICOM.EXE by pressing the F5 function key. The SSTV menu pops up and the rest is easy. I call the 1278 into the receive mode by pressing the **R** to position the MFJ-1278T *Turbo* into the automatic SSTV receive mode. The picture format in the MULTICOM and MFJ-1278 is automatically selected when the picture begins. As the picture finishes the display to my screen, an automatic option menu appears that asks me if I want to save the picture to disk. If I wish to save the picture from the receive buffer, I simply type in a name and an extension for the SSTV picture and press <enter>. The picture is saved. If I elect *not* to save the SSTV picture, I press either **ESCape** and return to the main menu, or press <enter> and I'm ready to receive the next SSTV picture that comes along.

To send an SSTV picture I need only to select the F5 key, and when the main SSTV menu appears I press the S key for SEND mode. A directory appears on the screen, and I use the arrow keys to move the cursor highlight to one of the SSTV picture tiles in the directory and press <enter>.

At this point the MFJ-1278T *Turbo* is configured for SSTV transmission, and the picture is loaded to the picture buffers and the 1278T begins the SSTV transmission.

At present there are five modes for SSTV in the MFJ-1278T *Turbo*, and by the time you read this, there will be more. I say this because I'm beta-testing the latest 72 second, high-resolution picture mode, and it looks great. At present the five modes are 8 second, 12 second, 17 second, 24 second, and 36 second. Photo 3 is an example of the 8 second SSTV picture, and Photo 4 is a 36 second SSTV picture.

Facsimile Modes 1 and 3

At one time there were several modes of FAX, but as time elapsed, the FAX picture transfer system came down to two primary systems for FAX transfer. It was not that modes 2, 4, and 5 were eliminated, but that the users seemed to decide for the industry which would best serve the application. The higher the mode number, the faster the transmission, or as it is referred to in FAX, more "lines per minute" (LPM). The one drawback is as speed increases, resolution decreases.

Using MULTICOM.EXE and the MFJ-1278T *Turbo* with the FAX modes is very similar to the SSTV mode(s). One difference is the F4 key instead of the F5 key is used to access the FAX mode menu. The reception and transmission can be set to

Photo 4– SSTV 36 second picture. This picture was digitized and saved to SSTV format by the MFJ-1292 digitizer. It was taken after being sent to and received from another station at VHF 70 miles distant using MFJ-MULTICOM.

either FAX mode 1 or FAX mode 3 (see Photo 5, FAX mode 1, and Photo 6, FAX mode 3). The FAX options menu at F4 enables the user to select the mode to send or receive.

Things Change With Time

The REV9 Turbo version of the MFJ-1278 is a multi-mode data controller superior to those of a couple of years ago. The MFJ-1278 with "turbo" has the capability to send and receive 8 levels of gray-scale and in both the facsimile 1 and the facsimile 3 modes. For those readers who are not yet into facsimile, the FAX 1 equates to 60 lines per minute, and FAX 3 is 120 lines per minute. The difference in these pictures is noted in the quality of the finished photos. No other hardware is required other than an MFJ-1278T *Turbo*, the MULTICOM.EXE, and the IBM PC or clone.

SSTV, FAX, and Packet Picture Creation

This is only the beginning of the graphics capabilities that are now included as part of the MFJ-1278T *Turbo* and the MULTICOM. Here is how the pictures for these modes are created.

The MFJ-1292 video digitizer (see Photo 7) and related "Picture-Perfect" software allow these pictures to be generated right inside your IBM PC or clone. The "Picture-Perfect" software that supports the MFJ-1292 Digitizer can be accessed while in the MULTICOM program. By pressing the F9 key you can access the "Picture-Perfect" software of the digitizer without leaving the MULTICOM terminal program. With this capability in the MULTICOM program you have the best of all worlds. The reason I press this point is because the "Picture-Perfect" software enables the user to save a screen of video into any one of several formats. The program also permits disk storage of the picture data to a "raw" video format for use at a later time. "Raw" video permits the user to reload the data to the "Picture-Perfect" system at a later time and save it again into another picture format such as SSTV, FAX, PCX, and packet picture formats.

The author has added another touch of genius by combining the power of his MFJ-1292 Picture-Perfect Video Digitizer software, enabling the user to capture and save a picture in the 8-level facsimile format. The user may then transmit it to another station who is also using the MFJ MULTICOM software.

The formats of this "Picture-Perfect" video digitizing system don't stop at the FAX mode(s). Included in this package is the user capability to save the pictures into several Slow-Scan Television modes, PCX format for use with the PC PAINTBrush drawing software (™/© ZSOFT), and into a special packet-picture format of either CGA, EGA, or VGA, and that's just for openers. The hardware and software of the MFJ-1292/"Picture-Perfect" can be a very useful and rewarding add-on to this system.

The "Digital Modes"

Digital modes are AMTOR, packet, RTTY, and CW. The multi-mode controller has become as much a part of amateur radio as the telephone is to our way of life. The multi-mode digital data controller now makes it possible to place all the digital modes onto one printed circuit board and control all the modes via one microprocessor. As most of the digital world knows, I eat, sleep, and live packet and portions of the other digital modes. This terminal software supports other TNCs and multi-mode controllers in the text modes such as AMTOR, CW, packet, RTTY, and NavTec.

I'm informed that an update of the REV7 and REV8 MFJ-1278s can be done for under $50. This enhancement is well worth the extra time it takes to return it to MFJ for upgrading with the REV9 multi-gray-level circuit board and new EPROM. To determine if you have the REV7 or REV8 PCB look on the printed circuit board (inside top) of your MFJ-1278 near the center and towards the front. The REVision and number will be etched onto the PCB.

Some Background on The Software Author

I referred to the author earlier, so it only makes sense that I relate some background about him. The MFJ MULTICOM.EXE is written by Bob Slomka, WD4MNT, who has more than a casual acquaintance with software writing. Bob is a pioneer of packet radio who was born near London, England, and spent most of his life in Georgia (USA).

Bob is one of the foremost composers of terminal software for our digital-based hobby. He makes packet into more than just a "type and send" medium.

In 1983 Bob wrote a program well ahead of its time. This terminal program was called "PACPRO".EXE. It was one of the first terminal programs written for packet that would pass binary and ASCII files. Included in this program was a conversion scheme that enabled the user to convert binary files to ASCII so the files could be uploaded to an "ASCII only" BBS. Later these

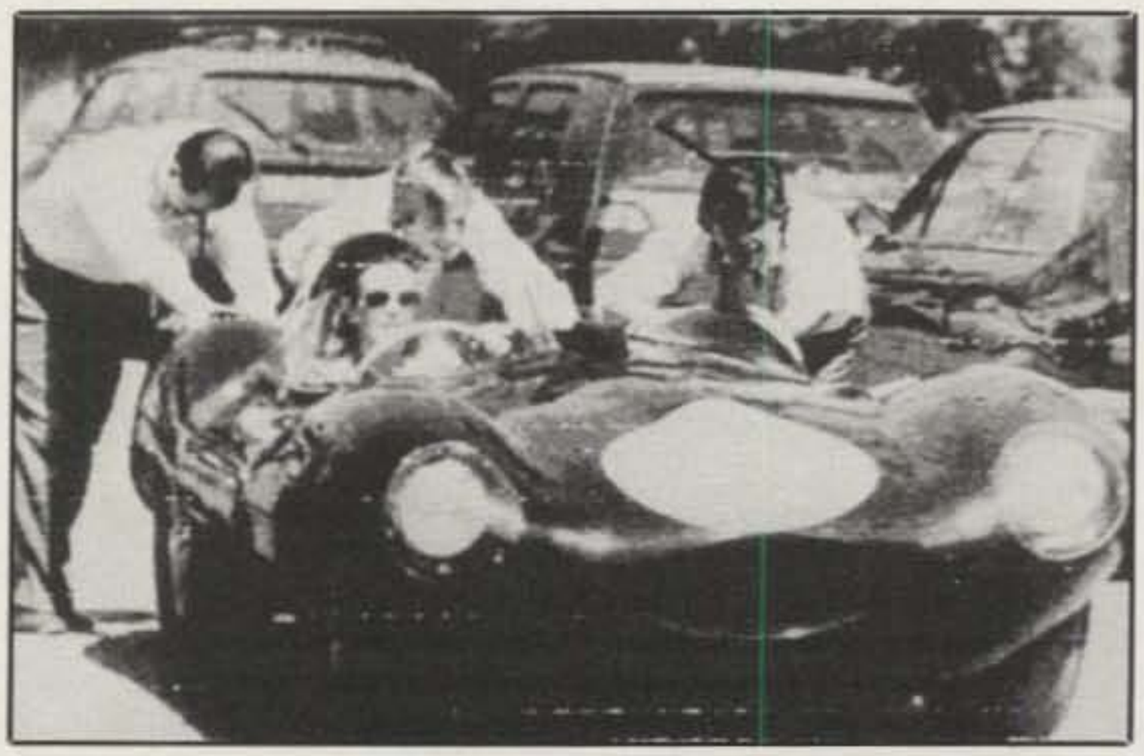


Photo 5– This "FAXmode 1" wire service photo was received by the author using the MFJ-1278 eight-level, FAX 1 mode and MULTICOM terminal software. Frequency was 20.735 MHz LSB.

files could be downloaded and the program could be used to convert the file back to the binary format.

In 1984 Bob developed the now famous "Packet Picture Passing" technique which enables the PC and clone packeteer to pass error-free pictures in high resolution, and 256 colors, via packet radio. The pictures appear on the screen as they are being received, and they are automatically saved to disk for future viewing, editing, and sending.

A Powerful "Digital Cannon"

With all this drive and devotion to building the best packet radio terminal programs, it is no great surprise that Bob developed the most powerful and advanced terminal program for packet to date. MULTICOM incorporates several years of digital communications software experience and takes advantage of Bob's genius as a master in the field of software writing. When combined with the MFJ-1278 multi-mode data controller, this program becomes one of the most powerful "digital cannons" ever released.

The program has an "always open" buffer that enables the user to edit, save, print, or transmit any portion of the buffer. In addition, there is a built-in text processor with all the just-mentioned features.

For the packet user who enjoys that extra touch of excitement, try the "auto-router." This is similar to the automatic routing found in the network nodes. All the user has to do is use the text processor (F10) portion of MULTICOM to quickly build a node route listing and save it to the disk with an extension of **.RTR.** The user no longer has to type all those long node connect lists again. Once the auto-router files are built, the only effort needed to make a connect to a friend who is 3, 4, or even 10 nodes away will be to press **ALT A** and highlight an **RTR** callsign route file and press <enter>.

You can have as many node routes as you like. It's so convenient that I use it to connect to nodes and BBSes that are only one node away. It is quick and easy, but that is the story of this software. From the first time you use this software, your problems with node connecting are over. When the **ALT A** is pressed, the directory will display only those auto-router files with the extension of **.RTR**.

An auto-router file will appear similar to the one listed here:

```
;AUTO-ROUTER
C MACON5      ;Connects me to ABT8 node at Macon, GA
C GFN5        ;Connects to the next node at Griffin, GA
C WGA5        ;Connects to West GA LAN node
C N4NAU       ;Connects to my brother in Anniston, AL
```

All text to the right of the semicolon (;) is not sent to the Auto-Router, and thus serves as comment and notation for each line command.

Photo 6– This multi-level weather-Facsimile (WeFAX) is an example of the MFJ-1278T Turbo "FAXmode" 3.

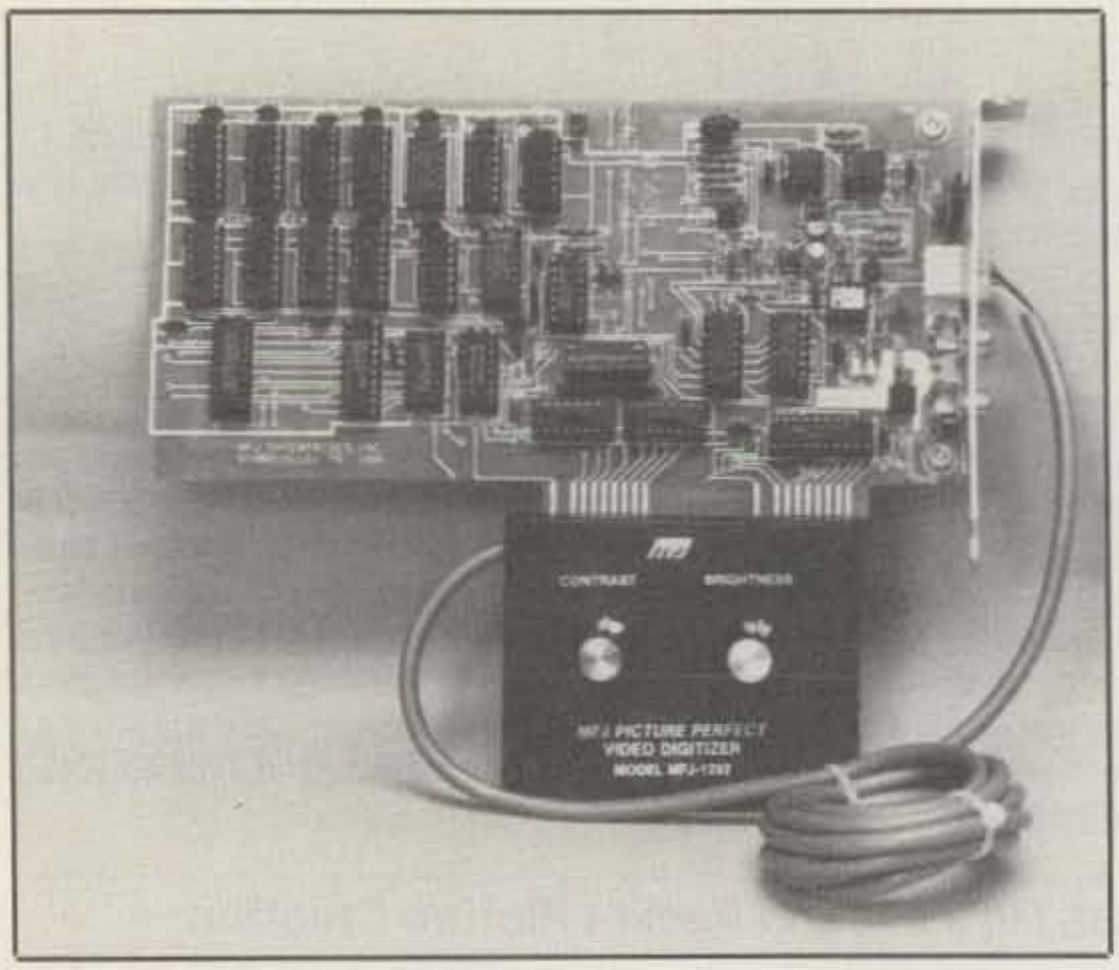
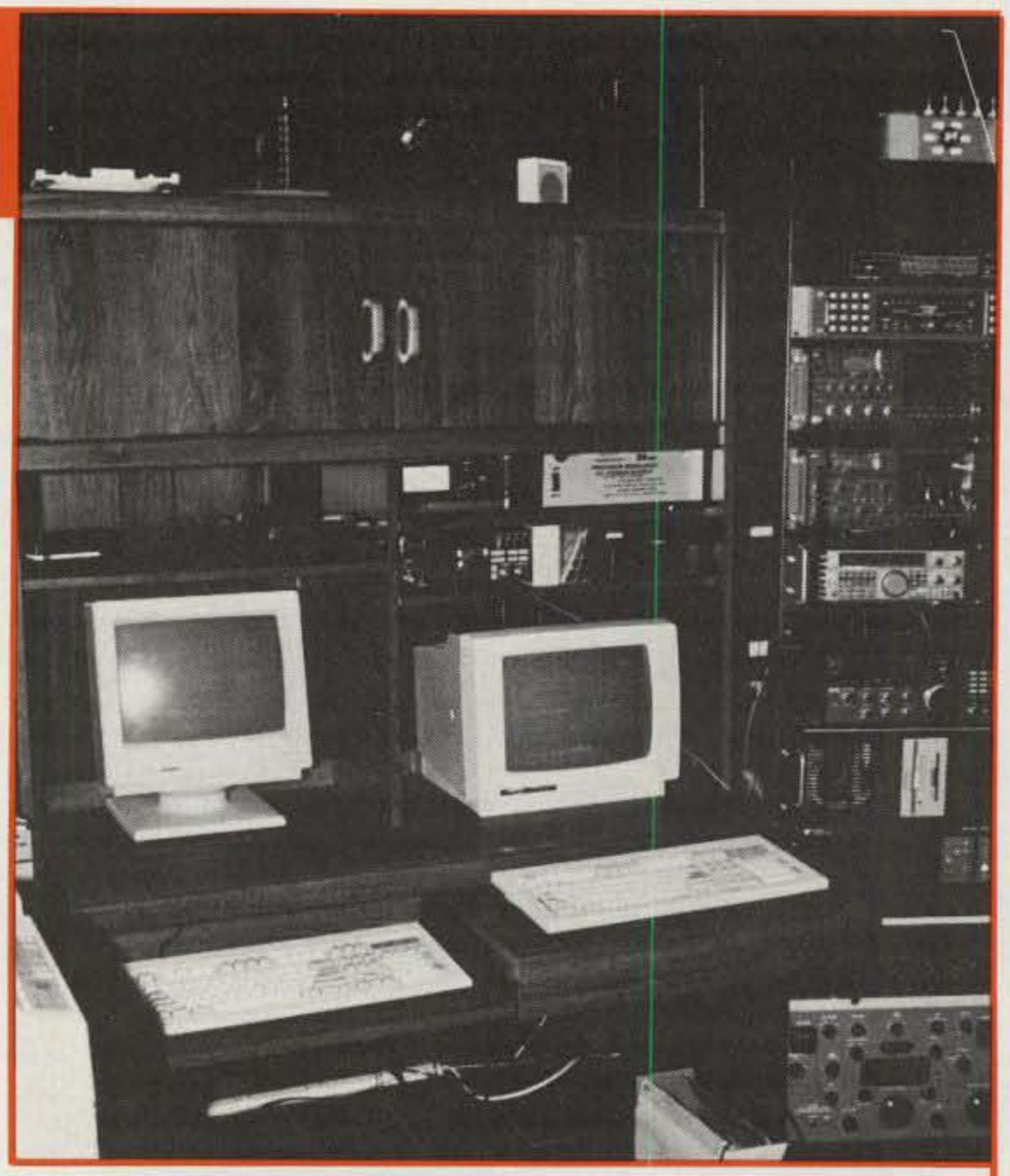


Photo 7– The MFJ-1292 shown here is a plug-in card for the PC or clones. The user has full control via the remote-control box and the "Picture Perfect" software. This digitizer is capable of several picture formats (see text).

COMPUTERIZE YOUR SHACK



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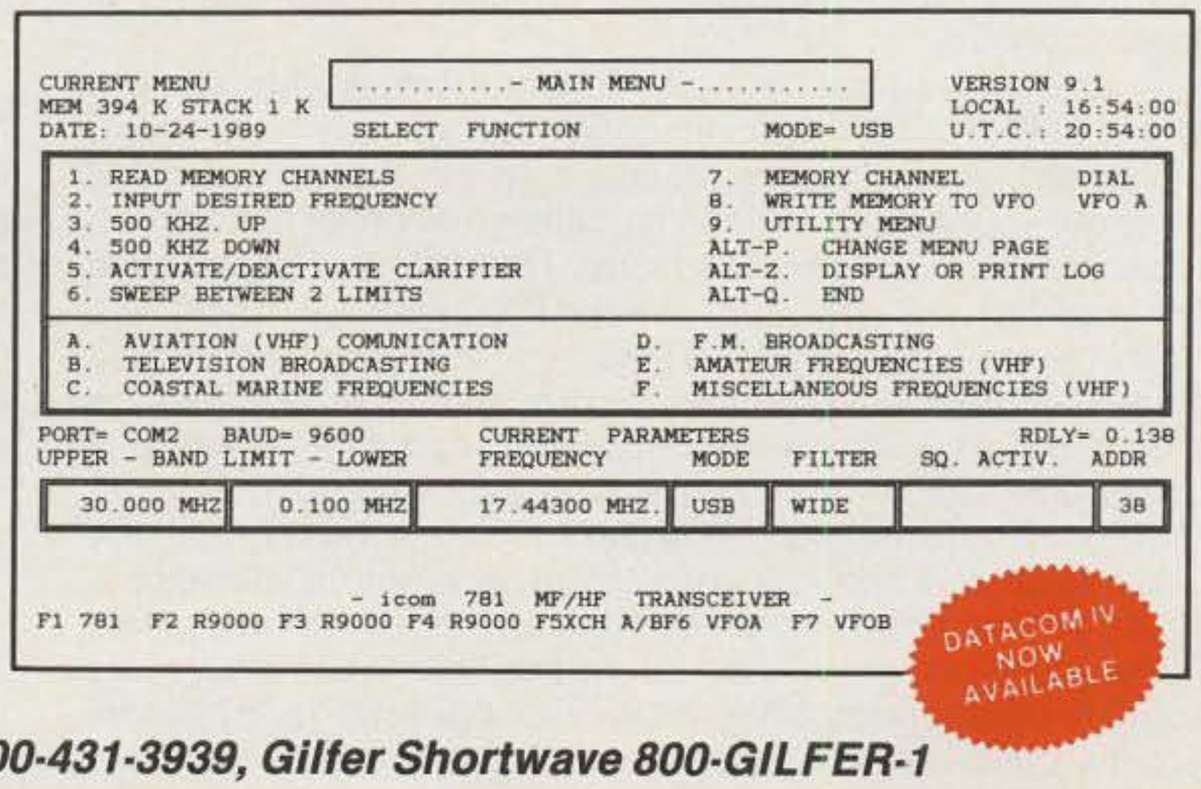

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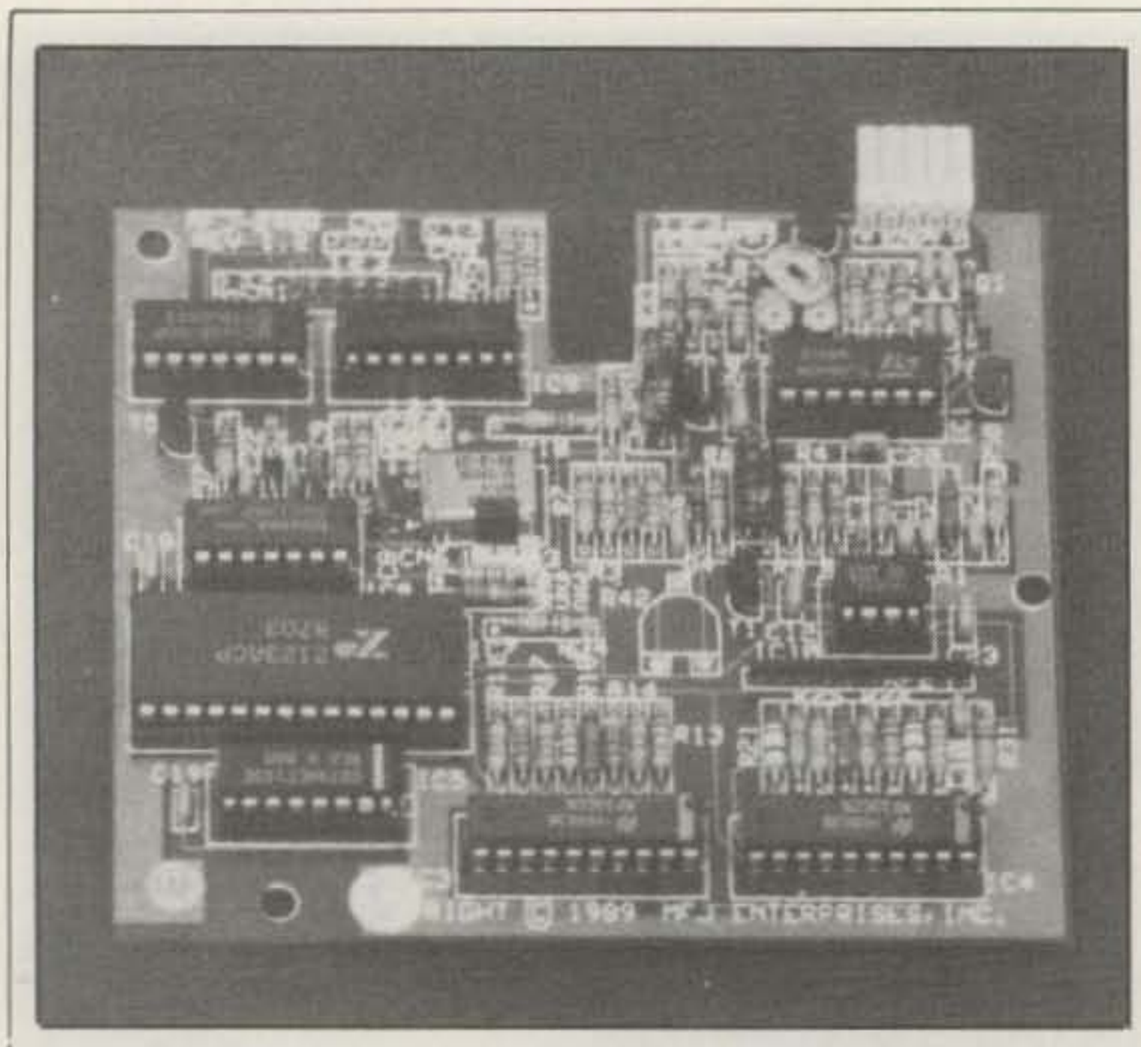
CIRCLE 22 ON READER SERVICE CARD



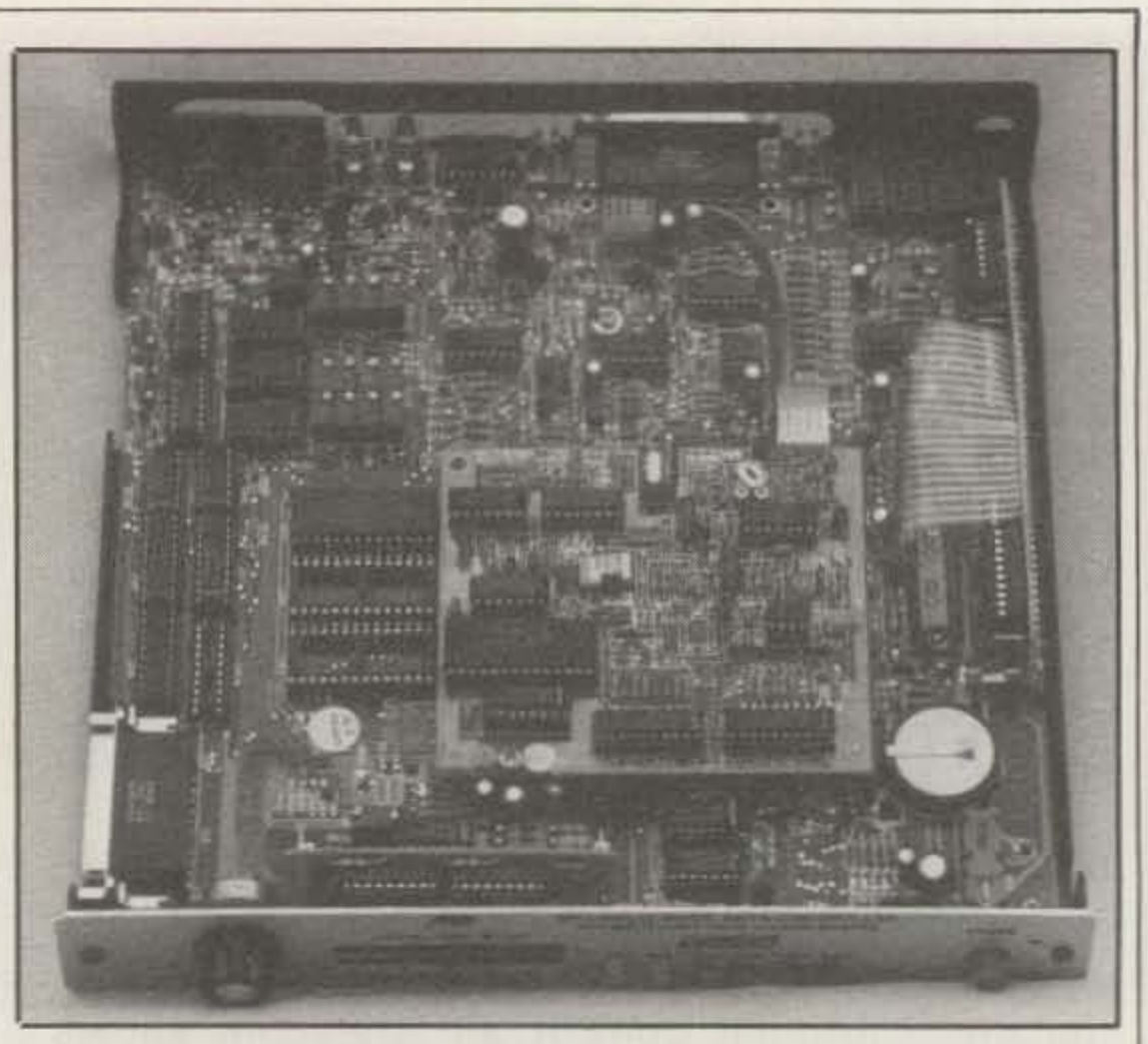


Photo 8– (A, left) The MFJ-2400 add-on 2400 b/s modem can be added to other MFJ TNCs. Most late-model MFJ-1278s can be retrofitted with this useful option. (B) This overview illustrates the placement of the MFJ-2400 b/s modem inside the MFJ-1278.

Feature After Feature

Another feature that appeals to us is the Auto-Monitor Alarm. This feature enables the user to set a string of letters or characters to "trap" an on-the-air string that is exactly the same.

This feature will work with packet, RTTY, AMTOR, CW, or any of the text modes. To set the "string" or "trap," the user presses the **ALT M** keys, and at the prompt types the string just as it will appear on the screen when heard by the controller. As an example, we press **ALT M** and set the string to **CQ** and press <enter>. The key to this feature is to type the string exactly as it will appear when received. This feature is "case" sensitive.

As most packet operators know, a "nested" CQ will appear on the screen when someone connects to a node and issues a CQ. With the MCOM on, the controller sees the callsign and the "greater-than" CQ (>**CQ**). This will trigger the Auto-Monitor Alarm, and all you have to do is issue a connect or give a call to the station.

Another way to use the Auto-Monitor Alarm is when you are on HF AMTOR, RTTY, packet, or CW and you are DX chasing. Set the string to any callsign or country prefix that you need and go about your affairs. When that callsign or prefix appears on the screen, it will trigger the alarm. The rest is up to you as to how you care to "land" that needed DX station.

This feature gives the avid DXer a powerful tool that truly is an advantage over other stations. You have the benefit of the alarm that lets you know the station you need is there. With this advantage you get first crack at it, because the alarm caught the prefix on the first pass. This feature has many ways in which it can be utilized, and your imagination becomes your limitation.

We've discussed only a few of the advanced features of this "user easy" program. Just about the time you think you've used all the features in the MULTICOM or MFJ-1278T *Turbo*, you discover a new one. For instance, function key F6 enables a feature that provides the user with total control over the MFJ-1278T *Turbo* and other multi-mode controllers. Press F6 and a menu appears that enables access to the many multi-mode controller modes.

The "Human Mode" Memory Test

No longer is it a memory test when trying to recollect each and every command within the controller. Let's say we want to move from packet to RTTY. Simply press F6, then press F3 (F3 equals RTTY on the menu) and you are there. For that matter, you can go to any mode you desire from the F6 menu. Just press the key associated with the function, and bingo you're there! Notice that F10 enables user editing of the F6 function key commands. As a matter of fact, the user can edit any command function to match the command structure of the controller being used.

Here is how the F6, Function Commands menu appears on your screen.

Function Commands

Selected: **MULTICOM.FUN**

F1-PACKET	F2-AMTOR	F3-RTTY	F4-ASCII	F5-CW MCW
F6-NAVTEX	F7-KEYER	F8-USER	F9-RAD PORT	F10-EDIT LINE

Not only are you able to move from one mode to the other with finger-touch ease, but you can move to either of the MFJ-1278 ports with the same menu (note F9). In fact, you are now able to move from not two, but three speeds with the same ease. The new MFJ-1278T *Turbo* offers the standard 300 (HF) and 1200 (VHF) bauds, and in addition it offers the new packet speed of 2400 bps Phase Shift Keying (see Photos 8A and 8B for the overview photo of the MFJ-2400 add-on modem and the placement inside the MFJ-1278T *Turbo*). The 2400 b/s modem can also be added as an option to the standard MFJ-1278.

There is much more to tell about MULTICOM.EXE, but space is limited. This gives you a preview of what can be expected from this new generation of terminal software for the digital modes of communications. After using MULTICOM.EXE, I've discovered the "type and send" QSO is only the beginning of the fun you can have with the digital modes.

The above described equipment is manufactured by MFJ Enterprises, Inc., Box 494, Mississippi State, MS 39762. The units have a suggested amateur net price of: MFJ-1278T *Turbo* $359.95, MFJ-1292 Digitizer $199.95, MFJ-2400 Modem (comes with the 1278T *Turbo*, but is available as an option for other TNCs) $79.95, and MFJ-1289 MULTICOM.EXE $59.95. CQ

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CIRCLE 135 ON READER SERVICE CARD

In case you weren't aware, there really was a person named Ohm. Almost everything we do as amateurs, including our antennas, involves the work of Mr. Ohm, and W9CNY explains just who Mr. Ohm was.

His Name Was Ohm

BY LEWIS COE*, W9CNY

Since the very beginning amateur radio operator license examinations have included elements on basic electricity, with questions on DC circuits that required a basic familiarity with Ohm's Law. Prospective licensees facing the terrors of the Morse code test, and the more complex questions of RF circuit theory, sometimes found these DC circuit questions a little tedious. Yet they would find out later that a solid knowledge of the relatively simple Ohm's Law was invaluable when they got out into the real world of radio. More than once even well-educated professional engineers have made grave errors simply because they forgot the simple precepts set forth by Mr. Ohm back in the dim past.

Georg Simon Ohm (1789–1854) was born in Erlangen, Bavaria. His father and grandfather were locksmiths. His father wanted to give his son a university education, but also stipulated that he learn the locksmith trade—just in case. It has not been recorded that Ohm ever had to fall back on his locksmithing trade after he got into electrical research!

Eventually receiving the degree of Doctor of Philosophy, he held a variety of posts as a university instructor, all the while working on new theories of electricity. Ohm worked at a time when exact measurements of electricity and principles of design for electrical instruments scarcely existed. Ill-defined expressions relating to quantity and intensity, combined with immature ideas of conductivity and derived circuits, made it almost impossible to widen the scope of electrical investigation. Using primitive laboratory equipment that would not even get a "boat anchor" rating at a hamfest, Ohm hammered out some of the basic principles of electrical circuits. His book *Die galvanische Kette, mathematisch bearbeitet*, published in Berlin in May 1827, did not immediately attract much attention, but in the years 1831–1837 the French scientist Pouillet confirmed the validity of Ohm's work by a series of brilliant experiments.

Widely used at one time, the dial-type Wheatstone bridge with galvanometer has been largely superseded by digital type instruments. (Photo by Lewis Coe)

In 1841 the Council of the Royal Society of London awarded Ohm the Copley Medal for his research into the laws of electric currents. The council declared that in his books Ohm had established, for the first time, the laws of the electric circuit, a subject then of vast importance which had previously been involved in the greatest uncertainty.

In addition to the electrical research for which he is best remembered, Ohm made an important contribution to acoustic science. His law of combination tones was the first to define the process by which the human ear hears musical tones, showing that the ear hears a musical tone only in response to sinusoidal air vibrations.

Ohm lived to see his work recognized by the highest scientific authorities. However, it was not until 1881 that the Electrical Congress at Paris officially designated the OHM as the practical unit of electrical resistance. How fortunate for the radio fraternity that the decision was made in 1881, sparing us from the confusion that resulted after the belated decision to honor Hertz by eliminating the term "cycles per second." Also fortunate was the name "Ohm"—short, easy to spell and pronounce. And when a unit was needed to express conductance, the reciprocal of resistance, how logical it was to use Ohm spelled backwards—the MHO.

As the application of electricity proliferated in the last half of the 19th century, one of the most often used devices for measuring resistance was the bridge brought into prominence by Sir Charles Wheatstone (1802–1875). Wheatstone

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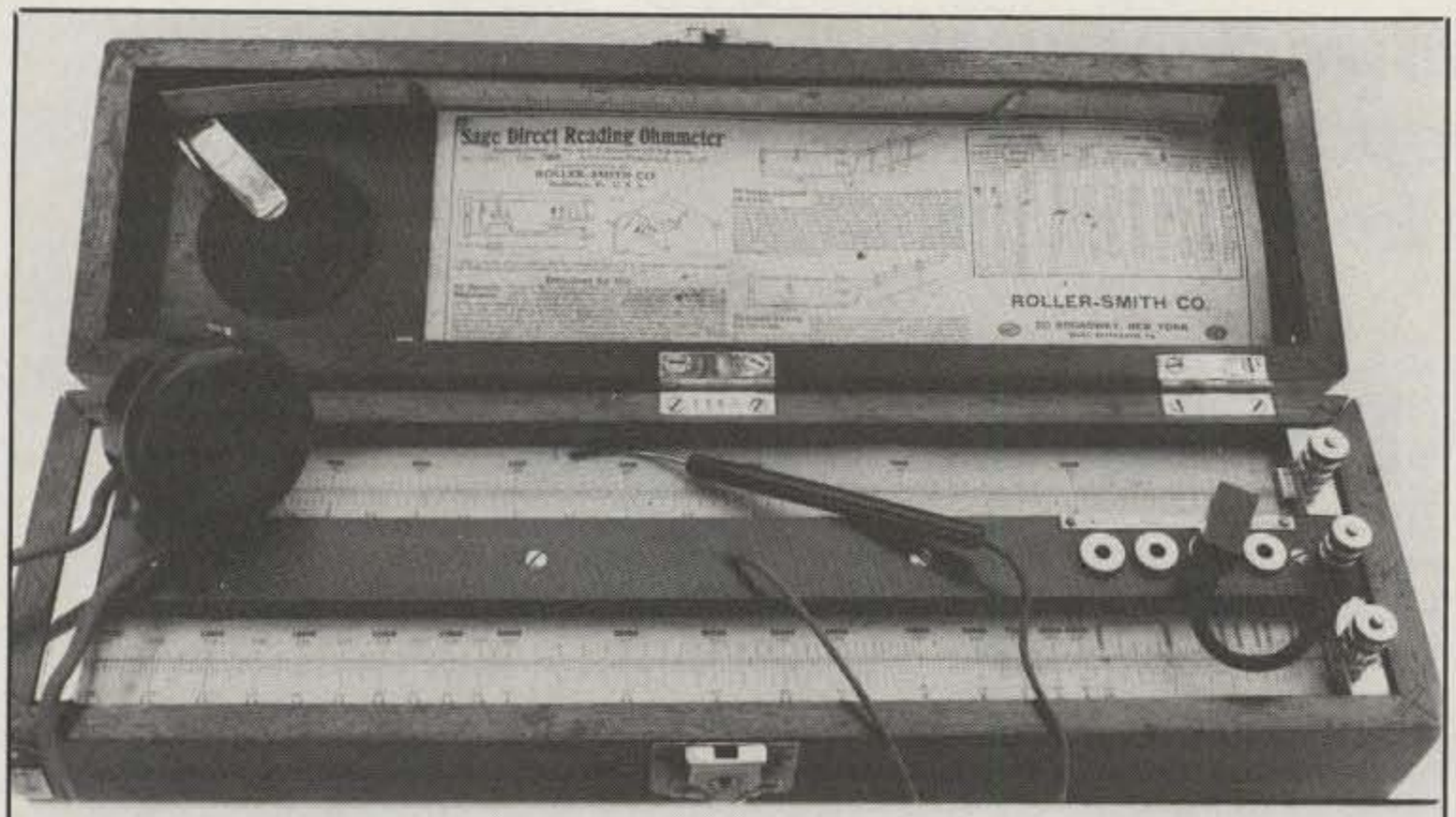
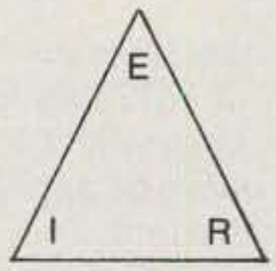


The slide wire ohmmeter was very accurate when used with care. The operator moved the probe along the resistance wire and listened on the ear phone for a null in the noise. Linear scale was calibrated directly in ohms. (Photo by Lewis Coe)

himself did not invent the bridge. It was actually the work of Samuel Hunter Christie (1784–1865). Wheatstone, however, was the first to call attention to this useful instrument, and in short order it became known as the "Wheatstone bridge." This was a source of great embarrassment to Sir Charles, who repeatedly tried to give the credit to Christie. Wheatstone by then was already a distinguished scientist who didn't need additional laurels based on another man's work.

Ohm's Law was originally developed to define the relationships in direct current circuits. By the last part of the 19th century alternating current was becoming an important part of electrical work. The basic theory of Ohm was so sound that it was found that the same relationships, with suitable modifications, would hold true in alternating-current circuits.

Not all of us are good at remembering the laws of electricity, but some elements of Ohm's Law can easily be remembered in simple statements such as "A current of one ampere produces a voltage drop of one volt across a resistance of one ohm." Simple as it is, Ohm's Law for DC sometimes completely escapes the memory when we are trying to figure out what size is needed to feed that new transceiver that draws 25 amperes at 12 volts! At such times it is hard to beat the familiar resistance triangle. Fix it in your memory and you can get on the right track by putting the finger over the unknown part of the equation.



$$E = IR,\ I = \frac{E}{R} \text{ and } R = \frac{E}{I}$$

Very simple! Remember it and it will help to unlock the mind for more complex problems. CQ

Tired of having your tower just sit there using up valuable real estate just to support a beam? Put it to work on a few more bands and keep it real busy.

Low-Band Verticals And How To Feed Them

BY GARY NICHOLS*, KD9SV, AND LYNN GERIG**, WA9GFR

This article describes the low-band antenna system at KD9SV's location. The 160 meter success with a tower only 70 feet tall could easily be applied to a shorter tower for 80 meters.

When I returned to the amateur radio ranks after some 15 years off the air, I bought a used, freestanding, 70 foot tower. After I installed a TH6-DXX antenna at 71 feet, I found I was in pretty good shape on 10, 15, and 20 meters, but I still needed something for the three low-frequency bands.

I wanted to give the new tower a clean, uncluttered look and avoid a lot of wire antennas which would detract from the appearance of my lot. To get on the low bands I fed the tower on 160 meters, used a half sloper (¼ wave) on 80 meters, and fed a 33 foot long rotary dipole loaded off center on 40 meters. This gave me all six bands with just one piece of wire in the air.

Design Approach

When we were given the new WARC bands, I started looking for a means to get on 12 and 17 meters. I decided to convert my 40 meter rotary dipole into a trap dipole for 12 and 17 meters using the tower as a vertical radiator for the three low-frequency bands. My friend Lynn, WA9GFR, and I found it possible to make a very effective vertical antenna out of a 50, 60, or 70 foot tower with a beam antenna for top loading. This equipment is something many amateurs already have in their arsenal.

I took this approach mainly because a short tower of about 50 feet with a small triband beam on top is nearly ⅝ wavelength long on 40 meters and close to ⅜ wavelength on 80 meters. The low angle

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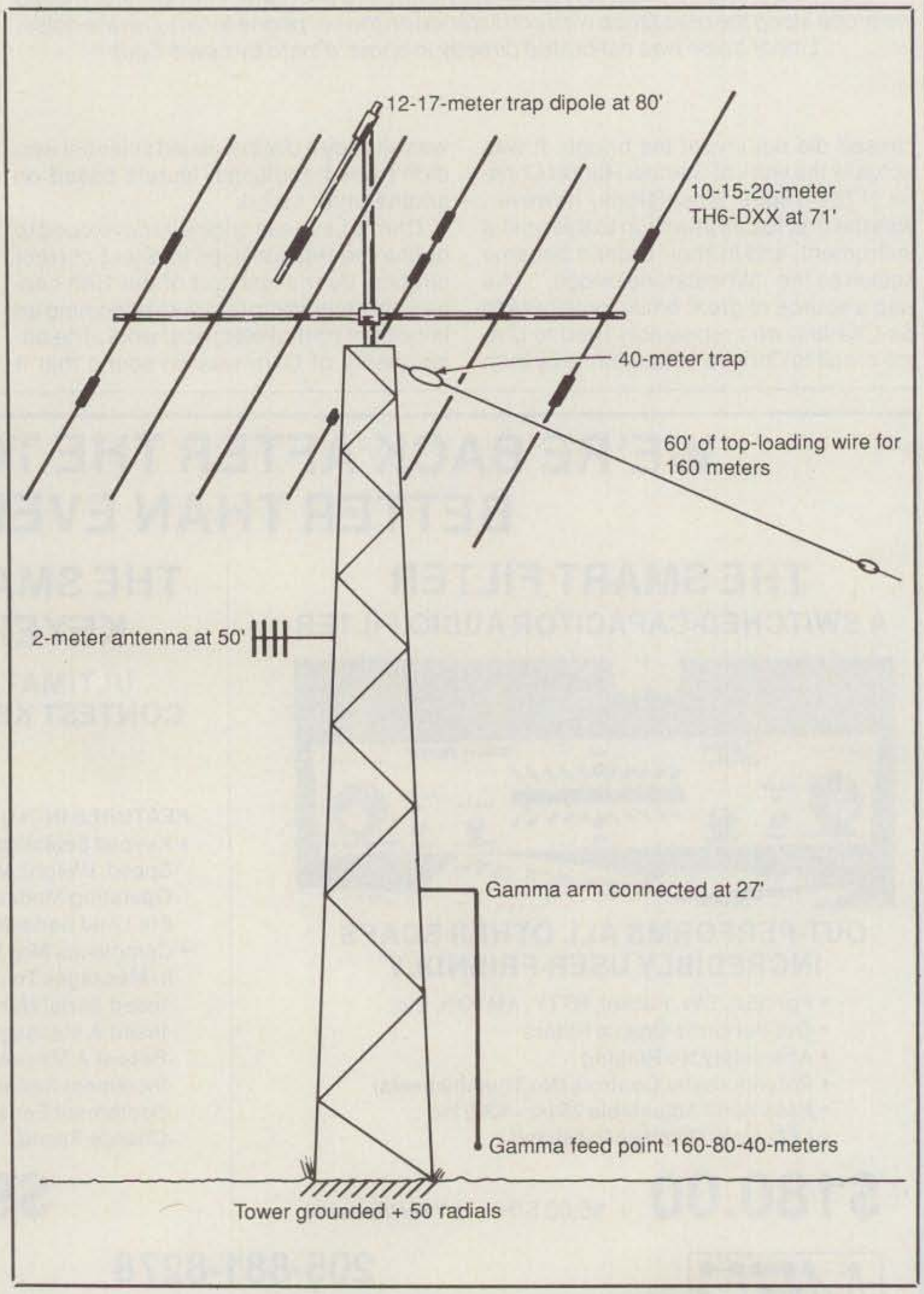

Fig. 1– KD9SV antenna system.

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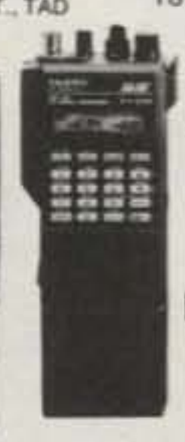

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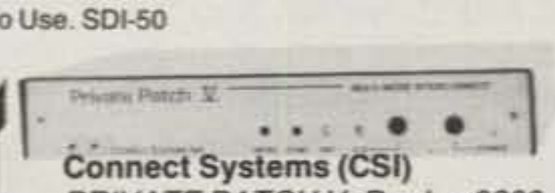

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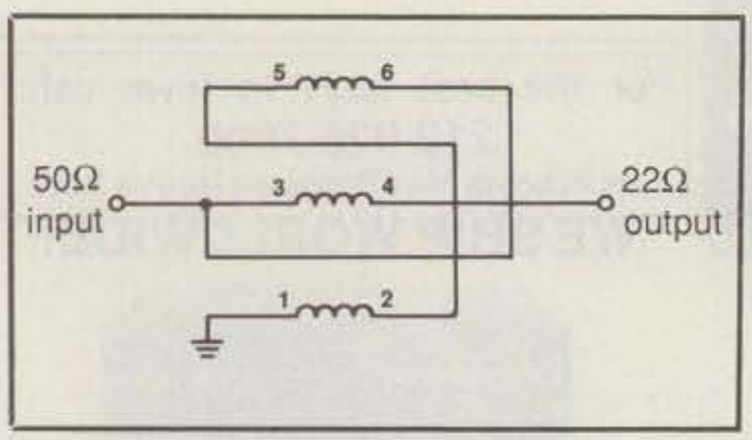

Fig. 2– The 2.25:1 broadband transformer.

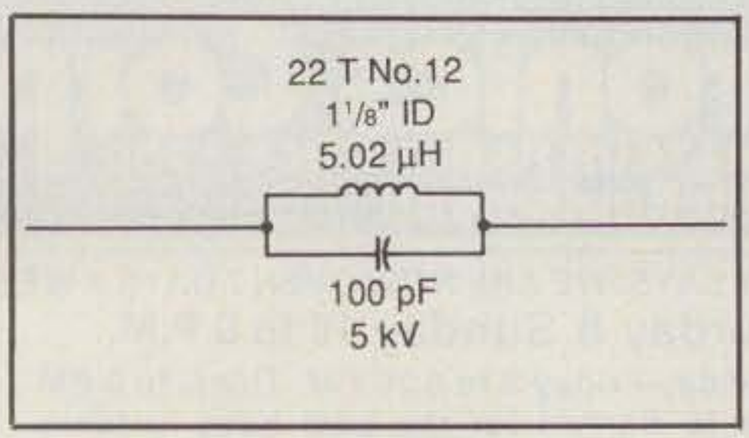

Fig. 3– The 40 meter trap.

of radiation from this system will do a much better job of working long-haul DX on those bands than an inverted Vee or dipole mounted at this height.

The KD9SV Vertical Radiator

As with any vertical system, performance depends upon the thoroughness of your ground radial system and the efficiency of your antenna match. I recommend a minimum of 20 quarter-wavelength radials for the lowest frequency band, but use a number that's practical for your location.

The 70 foot tower at KD9SV is grounded through several ground rods. It also has a ground radial system of approximately 20 radials 120 feet long, with 30 additional radials about 60 feet long. Fig. 1 shows details of my antenna system.

As a result of past experience and new insights gained while working on this project, I came up with the following guidelines which I believe provide a logical approach to multiband matching of a single vertical tower:

- The gamma arm must be less than ¼ wavelength long at the highest frequency (in this case, 7.3 MHz).
- Work on the lowest band first, then proceed to the next higher band. Any "tricks" you use to help the lowest frequency will force changes in the higher frequency bands.
- To prevent high-angle radiation lobes, make sure the antenna isn't electrically longer than ⅝ wavelength at the highest frequency. (I had to put a 40 meter trap in a top-loading wire that had been added to electrically lengthen the tower on 160.)

I used a Vector impedance meter, which took the guesswork out of determining the tower's feedpoint impedance. I made the gamma arm out of ⅝ inch copper pipe. The arm is attached to the tower at a height of 27 feet and spaced 30 inches from the tower. I began matching at 160 meters by tuning out the gamma-arm inductive reactance with a series capacitor. The feedpoint impedance resistive component was only about 15 ohms. Although my TH6-DXX triband Yagi provided some top loading, I added an additional top-loading wire (see fig. 1) to make the tower electrically longer and raise the feedpoint impedance.

I tuned out the reactance of the final configuration with a 600 pF capacitor. The resulting impedance was closer to 25 ohms than to 50 ohms. This was within a 2:1 VSWR of 50 ohms, and it looked as if either additional top loading or a 2:1 transformer would give me what I wanted on 160 meters.

Because I wanted to be able to feed the tower on the three low-frequency bands from a single feedpoint, I decided to investigate matching on 80 and 40 meters before finalizing the 160 meter match. Experience told me that approximately one quarter of the capacitance, or about 150 pF, would be the starting point for matching at 80 meters. A 120 pF series capacitor presented an impedance of 25 ohms at 3.8 MHz.

As both 160 and 80 meters seemed to match easily to about 25 ohms, Lynn and I decided to keep what we had and finish the match on both bands with a 2:1 broadband transformer. We found the perfect solution in W2FMI's book *Transmission Line Transformers.*[1] I constructed a 2.25:1 transformer consisting of 6 turns of #14 wire trifilar wound on an FT240-61 core (see fig. 2). A shunt coil of about 100 microHenries at the feedpoint (67 turns of #20 insulated wire on a T200A-2 core) fine-tuned the input impedance on 160 meters.

If you attempt something similar on your tower, you must match the resulting resistance when the gamma-arm reactance is tuned out. For example, if your impedance is nearer 12 ohms than 25 ohms, a 4:1 transformer would be appropriate. An unbalanced-to-unbalanced transformer is essential for this application. Do *not* use a balun transformer.

Adding a 40 meter match through the same gamma arm and transformer presented quite a challenge. Initial impedance measurements indicated that the Q was extremely high, and that a simple match wouldn't be possible. I also suspected that the 160 meter top loading would make the tower electrically longer than ⅝ wavelength. We made a few on-the-air tests using a crude preliminary match. Signal-strength comparisons from several contacts indicated high-angle radiation.

Our final 40 meter solution involved placing a 40 meter trap in series with the top-loading wire which had been added for 160 meters (see fig. 3). The original top-loading scheme is still in place on 160 and 80 meters, but now the effective radiator on 40 meters is comprised of just the tower with the top loading of the TH6-DXX beam. The impedance I needed to match boggled my mind. WA9GFR came to the rescue once again with a clever, but simple, matching network.

Matching Feedpoint Impedances

WA9GFR did all the impedance matching

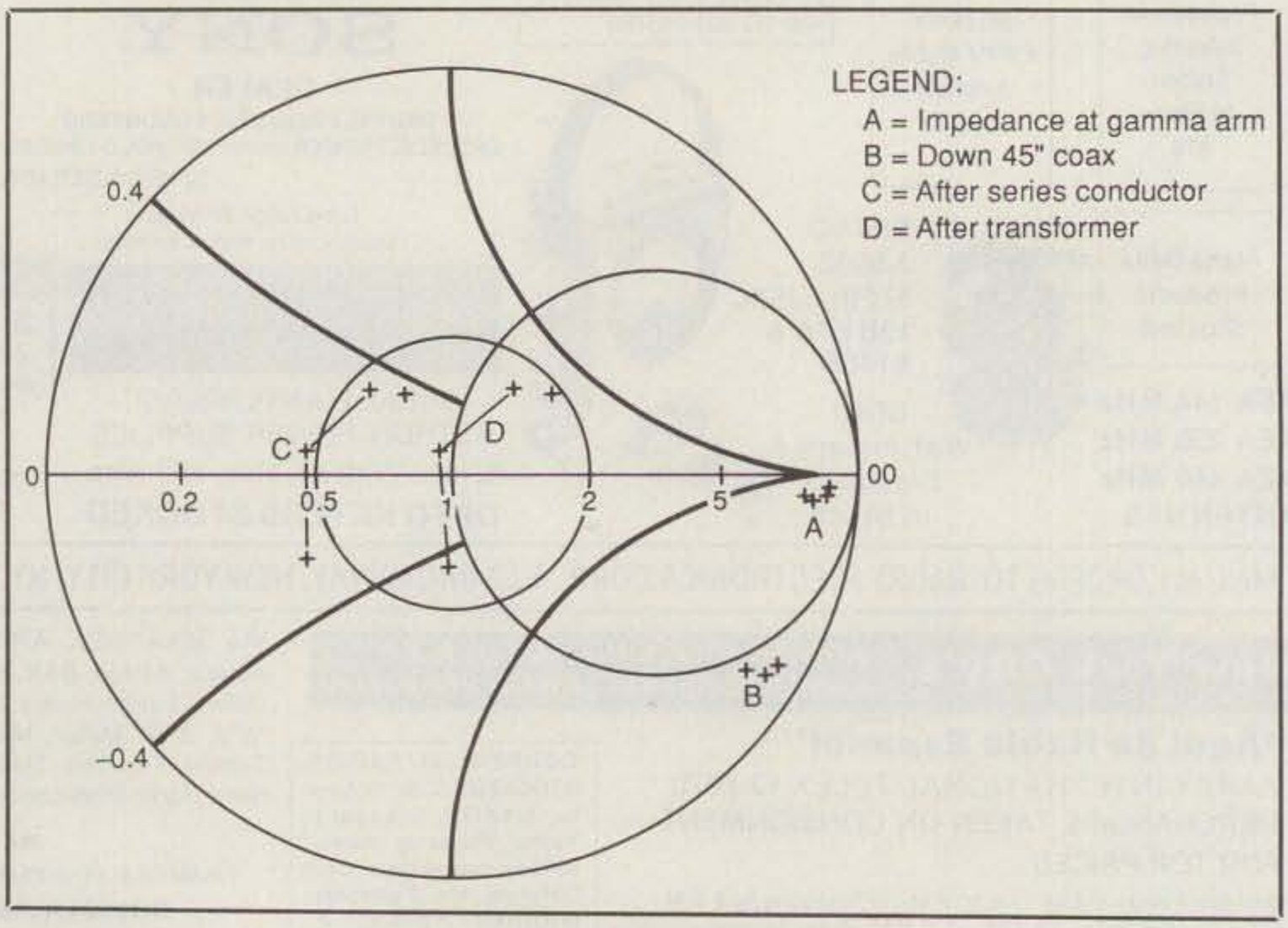

Fig. 4– Plot of SCHART results for 40 meter match.

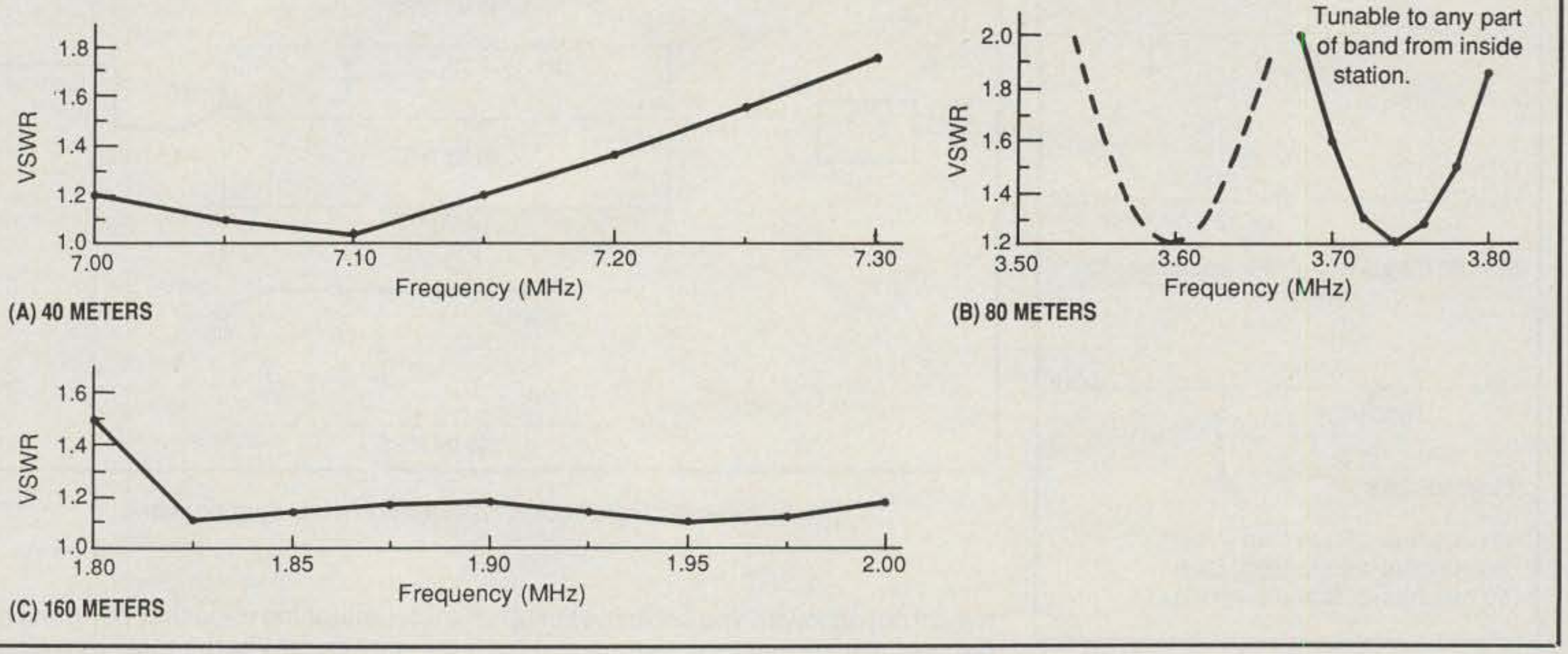

Fig. 5– VSWR plot for the three bands.

These were your load impedance inputs:

Freq (MHz)	RS (ohms)	XS (ohms)
7.000	1169.000	–675.000
7.100	766.000	–643.000
7.200	614.000	–430.000
7.300	634.000	–296.000

Added 45 inches of series transmission line of 50 ohm impedance and velocity factor of 0.66.

Freq (MHz)	RS (ohms)	XS (ohms)
7.000	22.273	–178.240
7.100	23.474	–166.363
7.200	30.914	–157.990
7.300	37.222	–158.127

Added series inductor of 3.79 micro-Henries.

Freq (MHz)	RS (ohms)	XS (ohms)
7.000	22.273	–11.108
7.100	23.474	3.158
7.200	30.914	13.918
7.300	37.222	16.168

Added step-up transformer of impedance ratio 2:1.

Freq (MHz)	RS (ohms)	XS (ohms)
7.000	44.546	–22.215
7.100	46.948	6.316
7.200	61.828	27.837
7.300	74.445	32.337

Table I– SCHART results for 40 meter match showing impedance listings.

using a Smith Chart impedance-matching computer program he had written called SCHART.[2] After you enter the impedances you wish to match, the program lets you experiment with all possible types of matching elements. It also permits cascading sections. The resulting impedances are listed in tabular form and can be plotted on a Smith Chart. (You can use your computer for plotting if you have a graphics card.)

We discarded several intermediate approaches, but the final system was easy to match on 160 and 80 meters. A simple series capacitance brought the impedance to approximately 25 ohms; the broadband transformer did the rest. After optimizing the system for the lower frequencies, we faced a real challenge with 40 meters. The Smith Chart matching program proved invaluable in finding an easy solution to a mind-boggling set of impedances.

The computer-generated results of the 40 meter matching network are shown in Table I and fig. 4. Highly active impedances with magnitudes of over 1000 ohms seemed to indicate that a broadband match would be impossible. Experimentation with physical networks would have been prohibitively time consuming. However, playing "what if" with the computer yielded an answer in just a few minutes.

Choosing a 30 inch length of coax, we "rotated" the impedances on the Smith Chart to the point that a simple series inductor could tune out capacitive reactance for a good 50 ohm match. However, we ultimately chose a 45 inch line

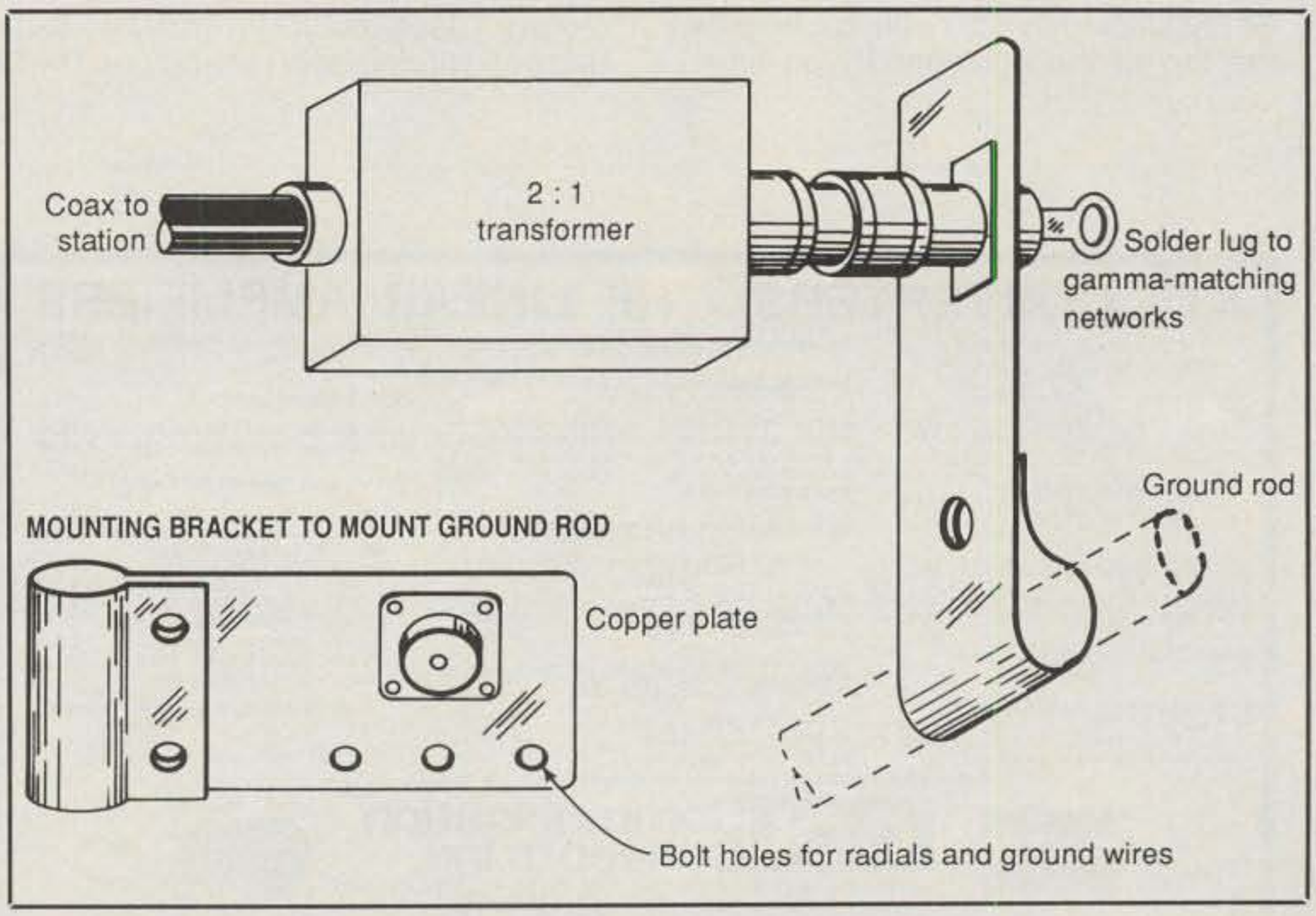

Fig. 6– Ground-clamp mounting details.

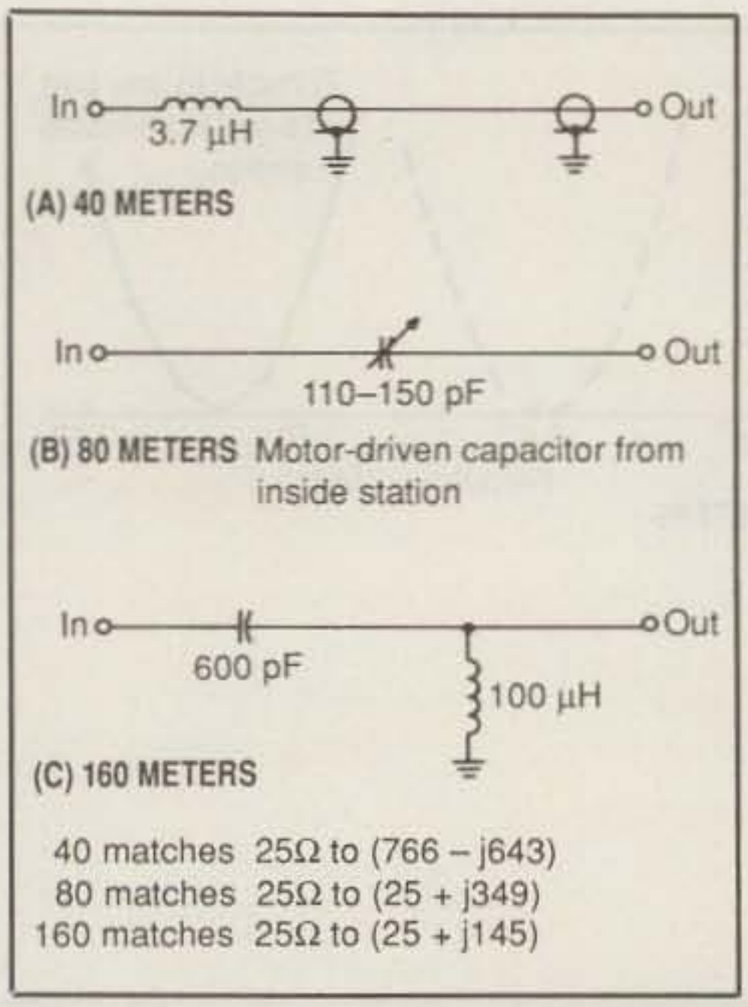

Fig. 7– Matching networks for each band.

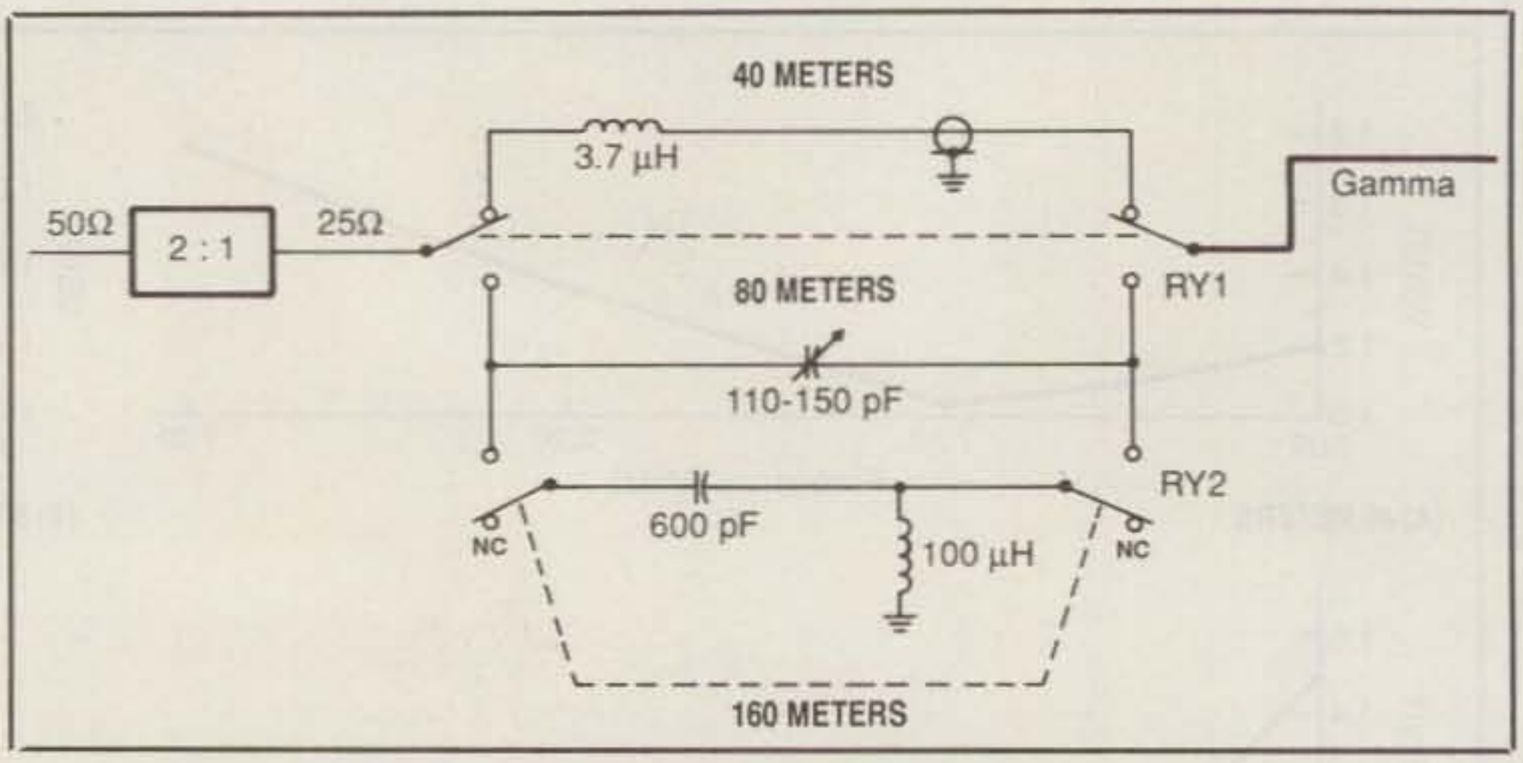

Fig. 8– Final configuration of three-band matching network.

because I wanted to use the transformer on all three bands. Now a series inductor of about 3.7 microHenries presented an impedance of about 25 ohms, which was transformed to 50 ohms through the transformer.

Fig. 5 shows a VSWR plot across each band. We achieved a good broadband match on 160 meters and most of 40. Although the bandwidth is narrow on 80 meters, a remotely controlled motor-driven capacitor provides easy matching from the station on that band.

Mechanical Description

Because my tower is freestanding, I added top loading by connecting a wire near the top of the antenna. If you have a typical guyed tower, you can use your uppermost set of guys for top loading by placing insulators in the appropriate spots. Insulate your bottom or middle guy wires from the tower.

Remember that good ground connections are essential for successful vertical radiators. Details of my ground clamp are shown in fig. 6.

Be sure to bring all coax cables and control cables down to ground level before running them into the station. I run a TL922 amplifier and don't have any RF in the shack.

Summary and Results

A single gamma arm is used to feed a 70 foot tower on 160, 80, and 40 meters. All three matching networks described for the three bands are mounted at the base of the tower in a waterproof box and are switched with Jennings RB3 vacuum relays. Due to the narrow bandwidth on 80 meters, I use a motor-driven capacitor on that band (tuned from the station). The 80 meter matching capacitor performs double duty as part of the total capacitance on 160 meters. Individual matching networks for each band are shown in fig. 7; the combined networks with relays and transformers are shown in fig. 8.

The VSWR is deceptively low across the 40 and 160 meter bands. After all, a dummy load has a good VSWR. One factor that influences the bandwidth of any antenna is its length-to-diameter ratio. My antenna tower is 42 inches wide at the base, which helps increase its bandwidth.

The proof of any antenna system is how efficiently it radiates. My 40 meter performance stateside is exceptional, with good DX results as well. My tower is electrically too long for optimum performance on this band. A 50 or 60 foot tower with a typical tribander on top should give better DX performance. My 80 meter performance is very good; I've made many solid contacts into Europe and Africa. This system was also used to work Bouvet Island (3Y5X) on 160, 80, 75, and 40 meters.

My goal was to have an efficient antenna on 160 meters, without my lot looking like an antenna farm. This system really radiates on 160. Although I'm not an experienced contester, I finished in the top 10 worldwide in the 1989 *CQ* WW 160 Meter Contest. If you're looking for an improved low-angle radiator on 160, try my approach. By using a shorter tower you should get similar results on 80 and 40 meters.

References

1. Jerry Sevick, W2FMI, *Transmission Line Transformers*, Chapter 6, ARRL, 1987.

2. This is one of several programs on the disk "WA9GFR Communications Engineering Software," which is available from the bookstore with a manual for $19.95. (Available in either MS-DOS or Commodore-64 formats.) CQ

Take advantage of the summer months to string some wire after you read N4PC's article on loop antennas.

The Full-Wave 80 Meter Loop Antenna—Revisited

BY PAUL D. CARR*, N4PC

Very few antennas in recent years have created as much controversy as the full-wave 80 meter loop. I built my first full-wave loop based on Dave Fischer's article in *QST* ("The Loop Skywire," November 1985, pp. 20–22). It was inexpensive, went up easily, and performed just as Dave said it would. My antenna was a 272 foot loop placed in almost a square configuration (the southwest-northeast diagonal was about 5% longer), and I fed the antenna in the southwest corner with 450 ohm balanced feedline. The antenna was supported by branches of pine trees at about 50 feet.

Preliminary Tests

During evaluation I noticed I could work just about everything that I could hear and seemed to copy everything other stations in my geographic area did. All my operation is either QRP (output of 5 watts or less) or at a maximum output of 100 watts. When I used the antenna at 20 meters and higher, I did not find the antenna to be the "cloud burner" high-angle radiator the skeptics had claimed. I found it to be a low-angle radiator with gain.

I had decided the 80 meter loop when used at 20 meters and higher was an efficient, low-angle radiator with gain. But how much gain? I set out to answer this question.

I chose the 12 meter band for my tests because it is fun to operate, and my comparison antenna would be relatively small and easy to build. I chose a four-element extended double Zepp collinear as my comparison antenna. The extended double Zepp has been around for many years and its gain characteristics are well known. Most published gain figures are listed at about 6–7 dB. As I said earlier, the major axis of my antenna was southwest-northeast and the results were

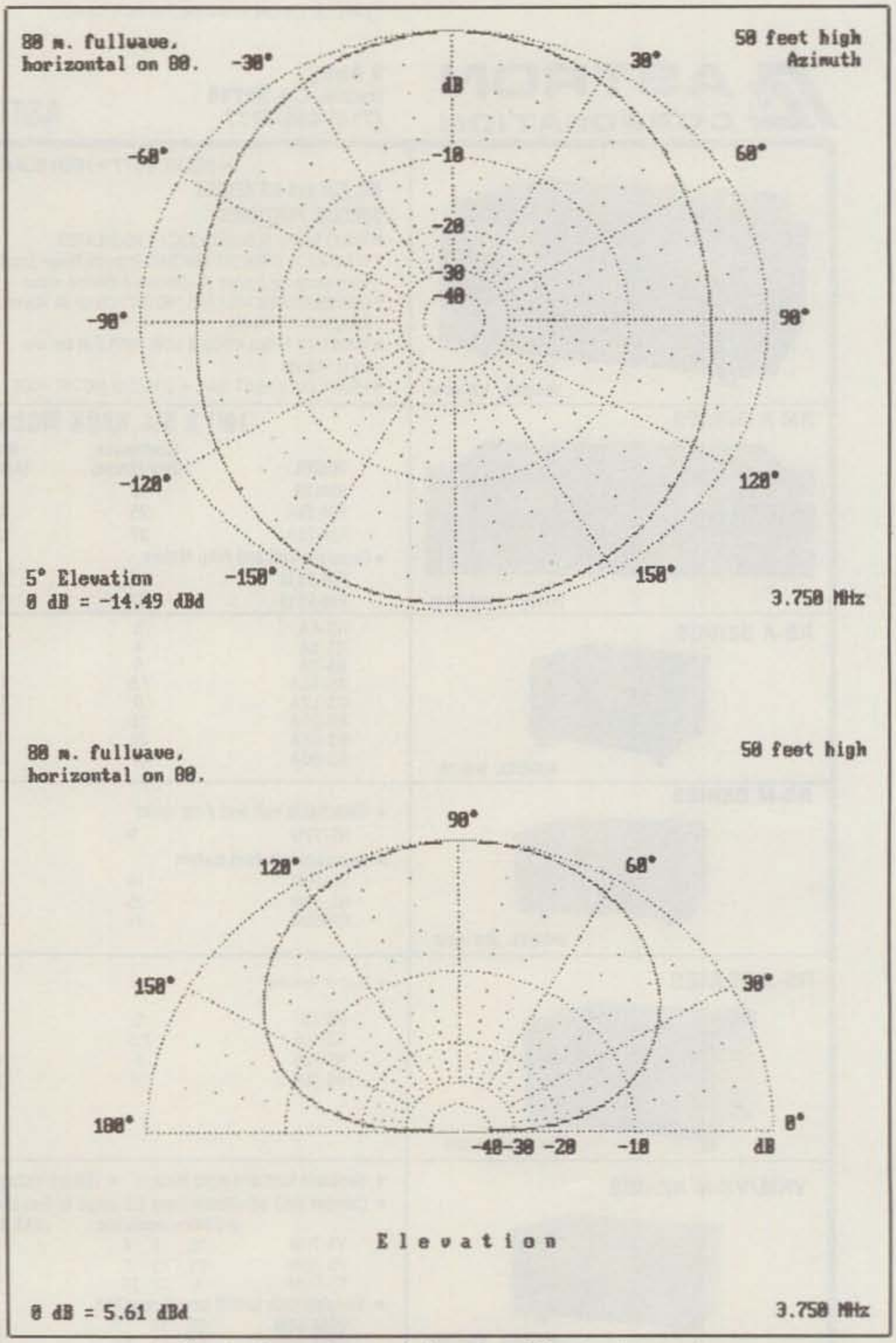

Fig. 1– Computer modeling of an 80 meter loop antenna.

*97 West Point Road, Jacksonville, AL 36265

slightly better in those directions, so I positioned the Zepp to favor them. Both antennas were at 50 feet and fed with balanced feedline.

Now for the test. I began to work stations in Europe and New Zealand with regularity. Two friends, Tony, ZL2ANT, and Jock, ZL1ACW, provided most of the comparisons. Since both gentlemen are antenna enthusiasts, I valued their reports very highly. In better than 90% of the test cases the loop was stronger than the Zepp. I also noted the same results on the receive path. Jock suggested that perhaps the antenna was acting as a small rhombic at this frequency. That suggestion paved the way for one more experiment.

If the antenna was acting like a small rhombic, then I would make it into a small rhombic and again compare it to the Zepp. Down came the loop, and I modified it by opening the loop at the corner opposite the feed point. I now had a small bi-directional rhombic. The same tests were conducted with Tony and Jock, and the results were the same. In more than 90% of the cases the rhombic (loop) provided superior results. I now had empirical data on the gain for the 12 meter band.

After the loop was converted to a rhombic, I rechecked the performance

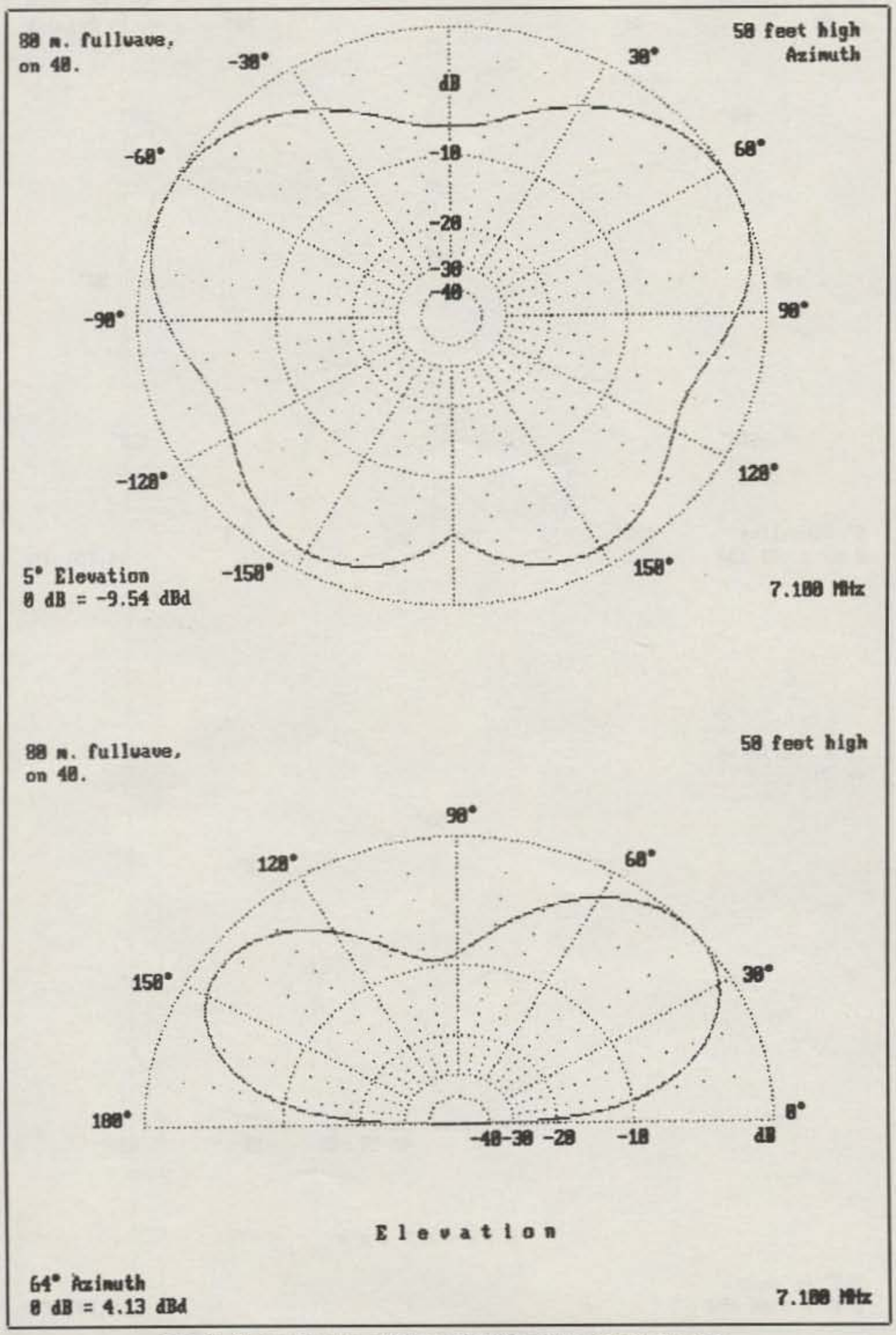

Fig. 2– Computer modeling of a 40 meter loop antenna.

an all bands 80 through 10 meters, and I could detect no difference in performance. One bonus did come from the "open loop" configuration: it now seemed to be a fairly efficient radiator on 160 meters. After all, the length is approximately a half-wave dipole for 160 meters. True, the pattern will be distorted because the antenna is folded back on itself, but most antennas for 160 meters that will fit on a city lot will have a compromise of some kind.

Further Evaluations

I was excited about my preliminary test results and discussed the results with my friend Lew McCoy, W1ICP. We agreed that computer modeling could provide further useful information about the loop's behavior at various frequencies.

As can be seen in fig. 1, the loop on 80 meters is basically an omni-directional "cloud burner." This is great for local nets, but its DX performance is highly lacking. The antenna is really a quad with the ground providing the function of the reflector and radiating the signal straight up.

Once you leave 80 meters and go to 40 meters and higher with this same antenna, the system produces multiple lobes that have gain. It is a completely "different" antenna from the one on 80 meters (see fig. 2). The predicted angle of radiation also lowers to about 40 to 45 degrees, and perhaps we get a bit of gain.

At 20 meters (see fig. 3) the lobes and nulls of the antenna become more pronounced. The angle of elevation now appears to be about 20 degrees and the gain figure is also greater.

At 15 meters (fig. 4) still more pronounced lobes appear. The angle of elevation now seems to be about 12 to 15 degrees, and the gain I observed during my field test appears to be confirmed by the computer model.

The gain figures should not be taken as gospel, because they depend on perfect ground and other factors. However, while the *true* gain figures are less, the maximum lobes do have gain when compared to a dipole.

Construction

As I indicated earlier, the antenna is easily built and erected. Cut the wire to length—272 feet for a closed loop or two pieces 136 feet if you are building an open loop. Place insulators on the wire so the side insulators can "float" or move a few feet to facilitate removing slack when the antenna is raised into the air. The in-

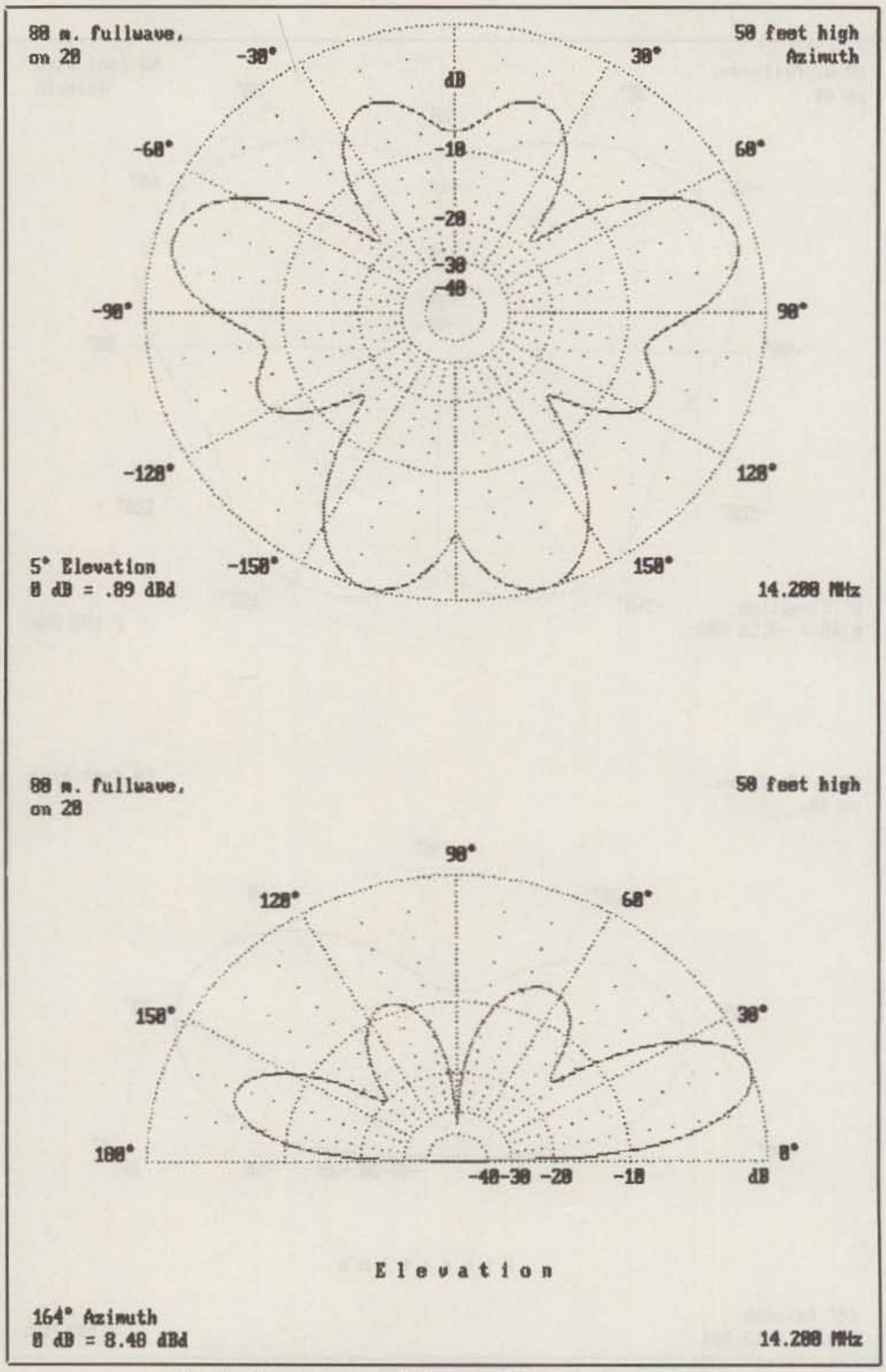

Fig. 3– Computer modeling of a 20 meter loop antenna.

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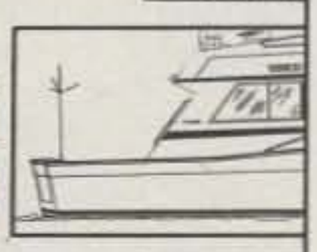

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sulators at the feed point and the opposite corner are stationary. Next attach the feedline. I fed the antenna with a balanced tuned line (also know as open-wire feeders). This type of feedline is essentially lossless at HF and can take a very high SWR with no adverse effects. A good line to use is the popular 450 ohm type twin-lead which is available from Certified Communications or Nemal Electronics (see *CQ*'s advertisers index). The antenna is now ready to go into the air.

Try to get your antenna 40 or more feet into the air. I am blessed with nice southern pines, and they make excellent supports. Specifically, this is the way I get my halyards into the trees. I use a closed-faced spinning reel taped to a wrist rocket with a half-ounce lead sinker attached to the 8 pound test monofilament line. The lead sinker can now be fired across a convenient branch on the tree. *One word of caution:* Be sure to trip the line release before firing the lead sinker. After you fire the lead weight across the tree branch, reel up the weight until it is near the branch and trip the line release. This will allow the sinker to fall to the ground close to the tree. Use the monofilament line to hoist a halyard. Notice how close the halyard is to the tree! This technique really works, but practice makes perfect.

Raise the antenna into the air and route the feed line into the shack using normal techniques for balanced feed lines. The antenna can be loaded through a transmatch. You should find the antenna loads well on all bands 80 through 10 meters for the closed loop or 160 through 10 meters for an open loop.

If space is at a premium at your QTH, you can use a length of 142 feet for a closed loop or two 71 foot lengths for an open loop. The closed loop will work 40 through 10 meters, and the open loop will work 80 through 10 meters. The gain will be reduced and the radiation will be higher, but it is still a good antenna.

Acknowledgements

I would like to thank Lew McCoy for the computer analysis and for his encouragement. To Tony and Jock, my friends from New Zealand, thanks for your help and keep building antennas.

Afterthoughts

I have heard there are only three antennas for any amateur—the one you had, the one you have presently, and the one you plan to build. This antenna has helped to postpone the one I plan to build. CQ

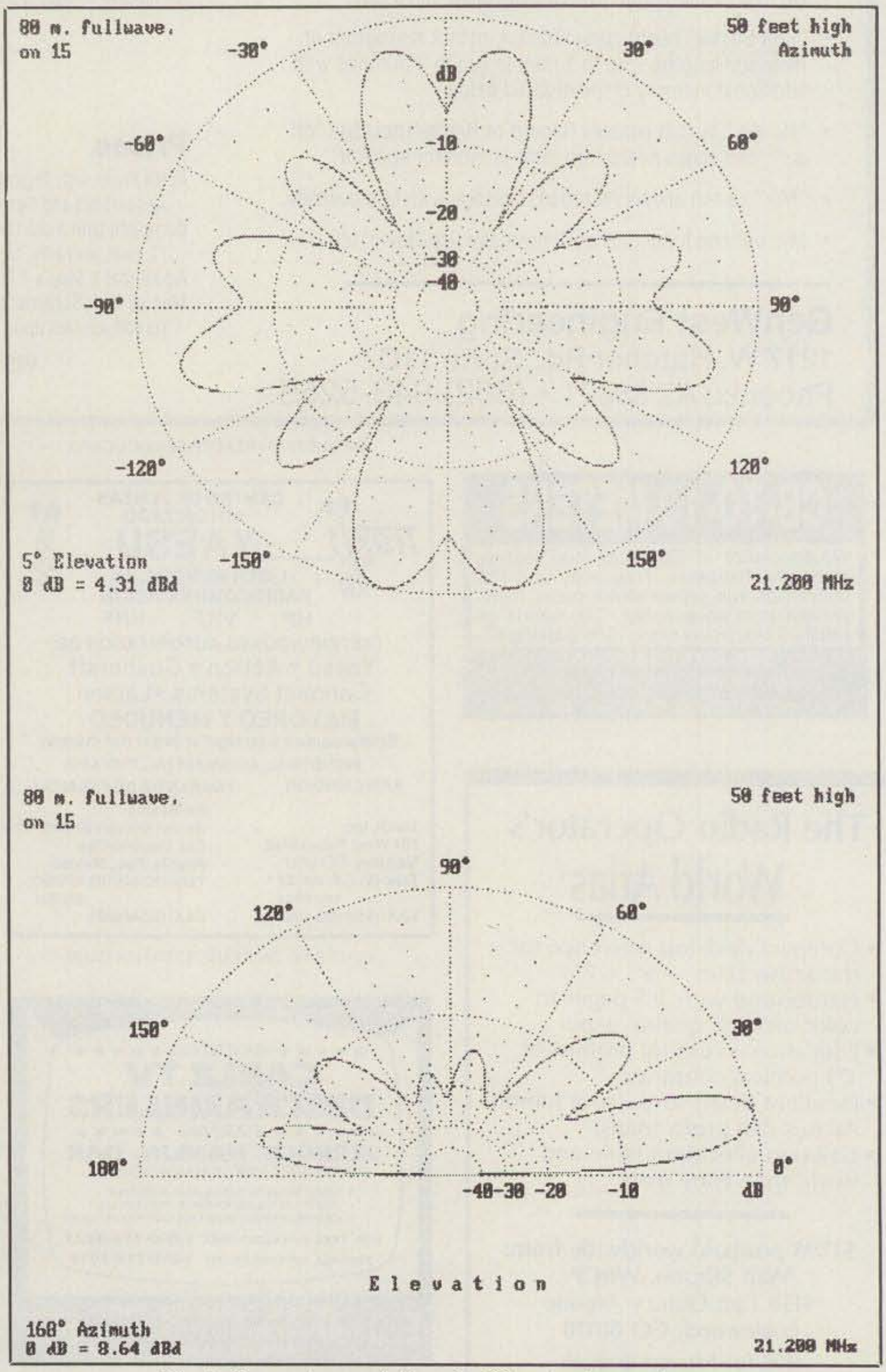

Fig. 4– Computer modeling of a 20 meter loop antenna.

N6HL presents some interesting information that none of us were born knowing, is not covered in the license manuals, and yet we're all expected to know and use with great facility.

The DXer's Tool Kit

BY HARVEY S. LAIDMAN*, N6HL

There's no additional exam required to be a DXer. I've been licensed since 1954, but when I started to chase DX in 1977, I didn't know what a "green stamp" was. I actually believed that a QSL card was a gesture of selfless goodwill and brotherhood. Now with the Honor Roll, 5BDXCC, and 5BWAZ (almost) behind me, I've come to realize that we are doing the neophyte DXer a disservice, and indirectly, doing it to ourselves. We need to educate our inexperienced friends before we turn them loose to QRM us to death.

I learned by emulating a few operators I came to admire, and I asked more than one embarrassing question. I wish that someone would have just handed me a list. Here's mine, by no means complete. Each DXer needs to have a kit of tools and techniques at her/his fingertips.

1. They used to be free, but now the ARRL charges for them, and it's a shame since it's been changing every couple of months—a Countries List. That's Tool #1.

2. You need a list of ITU Callsign Assignments. Usually these are included with an ARRL logbook or are in the *Callbook*. You won't need to ask where "DX1A" is!

3. A computer program, the "DX Edge," or the "Second Op" will give beam headings to each country. You should be able to calculate long-path headings and know that long path occurs around sunset or sunrise. You need a list of beam headings and . . .

4. You need to know when sunrise and sunset occur at your DX target. The "DX Edge" and several computer programs will provide that information.

5. Your equipment manual. Read it thoroughly. How hard is it to store a frequency in memory and return to it? Does the "T-F Set" button bypass the filters?

6. A dummy load so you can . . .

7. Go to 28.9 MHz late at night and practice tuning up and operating split into a dummy load. How can you quickly move your hands to check the transmit frequency and look for the last QSO? Is the "XIT" or "SPLIT" light lit before you transmit? While I'm waiting for long path to open up on 40 CW, I'll practice "DE N6HL 599 TU" a couple of thousand times with my keyer. There's a smaller possibility of "stage fright" when that ZA finally appears! It is possible to rehearse working DX! The DXpeditions that seem to go 50 wpm send the same thing all the time. All you have to dc is recognize your call. Decoding callsigns sent by a strong and skillful operator is very good practice. Sometimes I only get part of the DXpedition's call. Rather than ask the call, I'll hang around, listen to the QSO pattern, and wait for the next time he signs.

8. With QSK I can hear between my dots. If the DX station comes back while I'm transmitting, I stop immediately! Don't you wish everyone would? If you don't have QSK, perhaps you can master higher speed and give shorter calls.

9. Subscribe to a DX bulletin or newsletter. The "QSN" reports give you a feeling for a DX station's habits. Here's a little help in knowing where to look and when.

10. IRCs should get you a return from anyone, *prima donna* QSL managers excepted. I don't suppose many DXers take their IRCs to the post office. Instead, IRCs are traded or sold. The U.S. Post Office charges $.95 for an IRC, and I've found that they often don't know to stamp them, rendering them useless! Check the DX newsletters and bulletins for IRCs for sale. The going price is about $.50 each, and it's important to have a supply on hand.

That's my basic ten. I'm sure we can think of more. If you know of a DXer, tell him/her about it.

The Countries List is available from the American Radio Relay League, 225 Main Street, Newington, CT 06111. The *Callbook* is published by Radio Amateur Callbook Inc., 925 Sherwood Drive, Lake Bluff, IL 60044. The *Callbook* also publishes N6RJ's "Second Op." The "DX Edge" comes from Xantek, Inc., P.O. Box 834, Madison Square Station, New York, NY 10159. "The DX Bulletin" is at P.O. Box 50, Fulton, CA 95439, and "QRZ DX" can be reached at Box 832205, Richardson, TX 75983. CQ

*4923 Encino Terrace, Encino, CA 91316

How does it know where it is? How does it turn back and forth? W5PFG gives us a quick and thorough tour of our antenna rotators.

As The Antenna Turns

BY W. MAX ADAMS*, W5PFG

Amateur radio antenna rotators do not normally require periodic maintenance or receive any Tech-Talk attention—until they stop working properly. The degree of misery caused by a stubborn or sick antenna rotator is a direct function of its owner's ability to come within arm's reach of the troublemaker! Before you climb the tower, it is helpful to know what goes on in the electro-mechanical realm of your rotator.

There are a variety of antenna rotators designed for amateur applications. The unit described here was chosen as a descriptive example only. Other systems include solid-state directional control, digital readout, electro-mechanical brakes, etc. Consult your owner's manual for features of your rotator. Included in these manuals are specifications, installation and operation instructions, basic troubleshooting procedures, and replacement parts lists.

Recently I telephoned Telex Communications, Inc., and talked with Linda Dawson, Customer Service Representative. Linda was very helpful, locating an out-of-date non-polarized capacitor (for a CDR HAM Series 4 rotator). Although an almost forgotten part, Linda nonetheless provided the current part number, current price, etc., plus copies of six different Telex rotator owner's manuals for my writing reference library!

Most antenna rotators consist of three major assemblies—a control, a motor-driven rotator, and a multiconductor power/indicator cable.

The control assembly serves as an electric power distribution center, motion control, and direction indicator. Some systems include an electro-mechanical brake assembly which holds the rotator assembly from rotation due to Mother Nature's wind.

Power for the rotator system is supplied from 120 or 240 VAC, 50–60 Hz commercial power via voltage step-down transformers (see fig. 1). In addition to ordinary protective fuses, the primary power circuit includes a thermal switch (TS1) imbedded in the transformer windings which removes source power when excessive rotation or system failure causes the transformer to overheat. When TS1 operates due to excessive heat, allow the unit to "rest" and cool down for about 10 minutes; TS1 will automatically reset when T1's temperature returns to normal. A low-voltage incandescent lamp (B) lights when the directional control is operated and serves two purposes: (1) it indicates that power is applied to the system, and (2) it illuminates the direction scale. Transformer (T2) low voltage is rectified (D1), filtered (C1), and zener-diode regulated (VR1) to provide 13.0 VDC for operation of the indicator meter circuit.

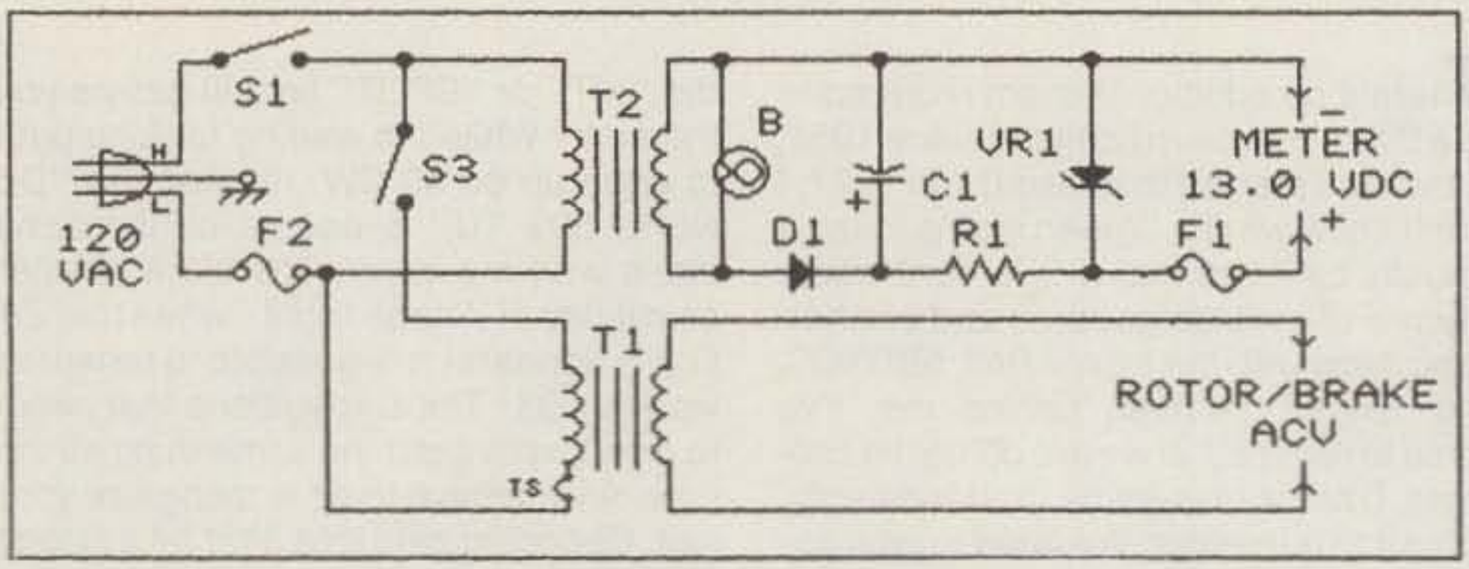

Fig. 1– Rotator control unit.

The need for multi-conductor control cable is obvious: "You gotta get it from here to there." Consult your owner's manual for proper wire size, according to the cable length required for your installation.

The rotator itself is the end user of your purchased commercial power and your logical decisions, such as start, stop, and stay put! The rotator assembly contains a bidirectional motor, speed-reduction gearing, and a rotator-position sensing circuit, all of which are contained in a streamline, weatherproof, die-cast aluminum enclosure (see fig. 2).

Motor speed is reduced by an arrangement of spur gears which result in 360 degrees of antenna rotation in 40 to 60 seconds. Speed-reduction gearing increases motor torque, thereby allowing the use of small, low-power, split-phase electric motors.

Notice in fig. 3 the typical schematic of a split-phase motor. There are three windings in this assembly—two stator windings and a rotor winding. The rotor

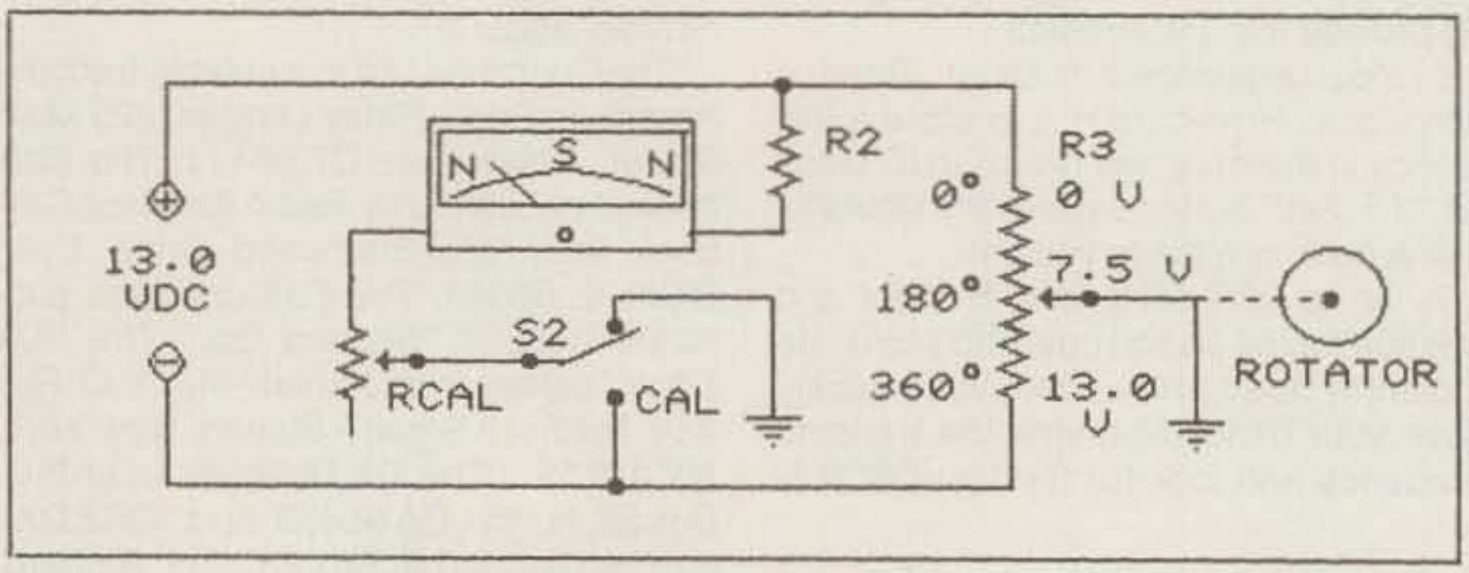

Fig. 2– Position indicator meter circuit.

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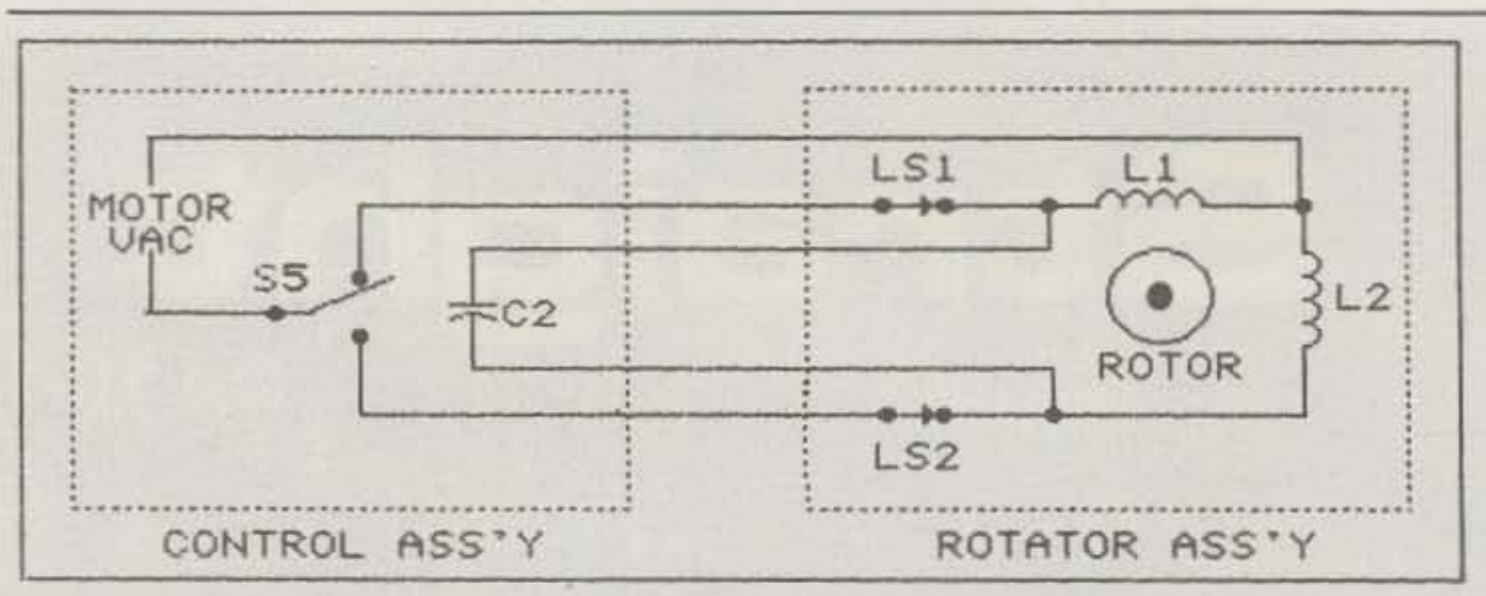

Fig. 3– Split AC phase motor circuit.

winding is not shown in the schematic. Stator windings (L1 and L2) are separate, insulated wire coils wound about a laminated steel "core." A round, laminated, steel rotor assembly has individual copper conductors imbedded along its cylindrical-like length, the ends of which are wired together, except for a small gap between two rotor conductors. This arrangement appears to be a "short circuit." However, it is electrically a low-resistance high-current winding.

A non-polarized capacitor (C2) is connected in series with one of the stator windings, which causes its associated winding current to lead the current of the other winding. Each stator winding produces a separate, stationary magnetic field which alternates with the applied electromotive force (AC voltage) polarity, 180 degrees out of phase with each other. Since these two windings produce no starting torque, motion must be started by some auxiliary means.

Each stator magnetic field induces a current in the rotor, which in turn develops its own magnetic field. The rotor magnetic field interacts with the stator fields, resulting in a revolving magnetic field which develops motor torque. Once started, the motor continues to run in the direction in which it was started.

The "start" value of the phase-shifting capacitor is selected to cause sufficient torque to overcome the rotor's mechanical load and other electrical/mechanical loss. Once the rotor is in motion, the value of the capacitor can be reduced to a "run" value. (Remember, an object at rest tends to remain at rest, and an object in motion tends to remain in motion.) Split-phase rotator motors are designed to use a "single value capacitor." The capacitor used in this type of motor is a compromise value between the "best start" and "best run" conditions.

Refer back to fig. 3 and notice that the phase-shifting capacitor is connected directly between one end of each stator coil, and the other end of each coil is connected directly to one of the AC source voltage leads. When power switch S1 and S3 are closed and S5 is positioned as shown in fig. 3, the switched lead of the AC source voltage is connected directly (through limit switch LS1) to stator winding L1, and the capacitor is placed in series with L2. This causes the rotor to move clockwise in this example. When S5 is placed in its "L" position, L2 is directly connected (through limit switch LS2) to the AC line, and the capacitor is placed in series with L1, thereby causing the motor to run counterclockwise. Because of low-frequency (60 Hz) AC voltage, the capacitor can be conveniently located in the control unit rather than at the top of the tower in the rotator assembly. Should the capacitor need replacement, it is much easier to climb the operating table in the ham shack than to climb a tower in the backyard!

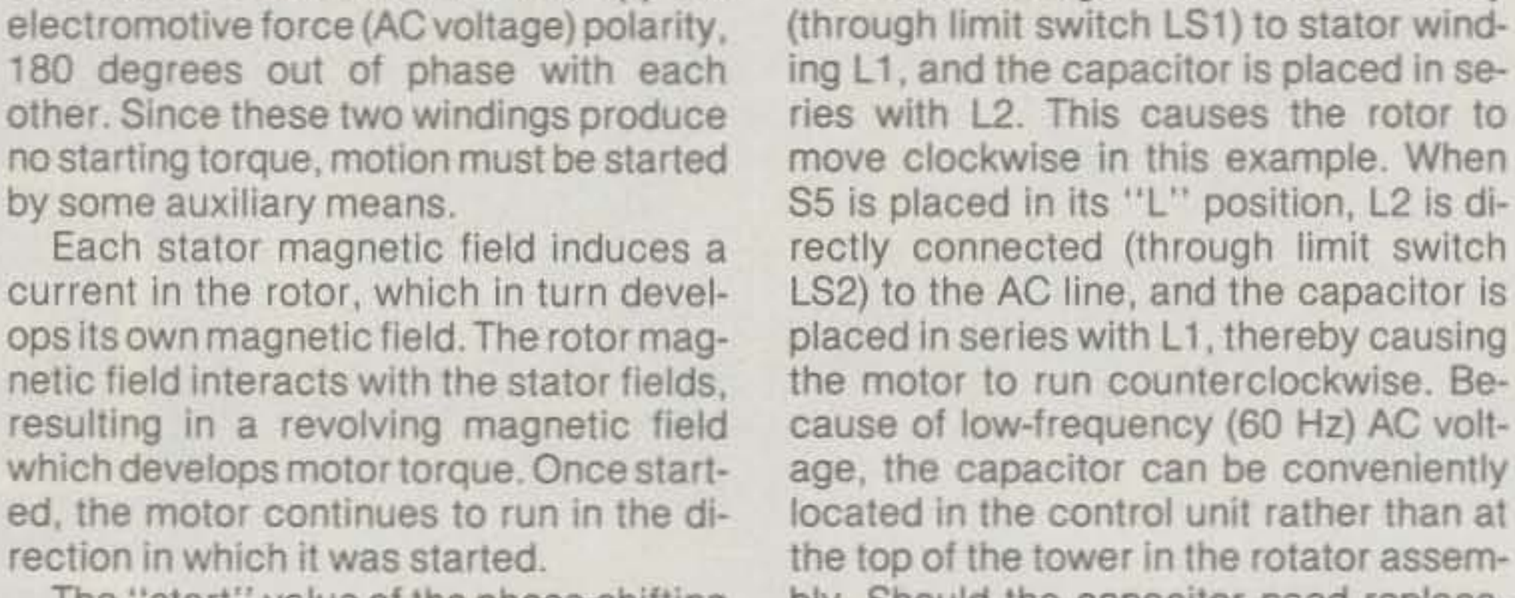

Fig. 4– True north location diagram. (Diagram is not drawn to any latitude, longitude, or time scale.)

Notice in fig. 2 that regulated 13.0 VDC is applied directly across linear-voltage dividing potentiometer (R3) located in the rotator assembly. The electrically ground—ed wiper arm of R3 is mechanically positioned through 360 degrees by the rotator. A voltmeter circuit consisting of resistor R2, milliampmeter I, and variable resistor Rcal is connected in series to measure the voltage determined by R3's position. Notice that R3 is labeled 0 degrees, 180 degrees, and 360 degrees. Interchangeable north-centered and south-centered scales are provided with some control indicators. One scale is installed according to individual operating preference.

Once the desired scale is installed, the rotator is electrically turned to its 360 degree position. Place S5 in the CAL position and adjust Rcal for full-scale meter indication. When correctly calibrated, the rotator is electrically turned to a "north" meter indication. Since maps and charts are referenced to *true* north, point your directional antenna toward *true* (not magnetic) north and securely bolt (clamp) it to the rotator mast.

As shown in fig. 4, true north can be determined by location of the North Star, easily visible to the naked eye on a clear night. An ordinary compass can be used for antenna azimuth alignment, provided the correct amount of magnetic deviation from true north is allowed for your location.

Mother Nature's lightning is probably the greatest hazard to the health of your rotator. The second greatest hazard is an uninformed screwdriver, soldering iron, wrench, or hammer. When troubleshooting becomes necessary, do not panic after hearing the six answers of a three-way QSO question on the local repeater (the three extra answers may come from well-meaning "reading the mail," "sitting out there in the weeds," or "just happened to be scanning by" kibitzers). Next . . .

1. Place the power switch OFF and disconnect the control assembly from its power source.

2. Check for blown or loose-fitting fuses. Replace blown fuses with (new) same-size fuses *only* after locating the reason for the fuse becoming an open circuit!

3. Look for mechanical faults first, such as broken, frayed, or loosely connected cable wiring. Look for "ill-logical" faults *not* shown in schematics (see WB5UEN's story below). Isolate the discrepancy (motor, brake, indicator, etc). Disconnect the control assembly and apply Ohm's Law. When troubleshooting, *mentally* disconnect a wire or ground, short or open *one place at a time*, and *mentally* analyze the results. Maybe, just maybe, you will "fix" your problem "on paper"!

4. By referring to a full schematic of your system, notice several continuous ohmic (resistive) paths through rotator-

cable wiring and rotator-assembly components, such as motor windings, etc. Refer to a standard wire table and determine the "nominal" resistance of your control-cable wire. Remember the "up-to-there and back-down-to-here" total wire length resistance, plus rotator component resistance, dirty switch and screw terminal contact resistance. A nearly correct value may save climbing the tower as a very last resort!

Caution: Inductive circuits can develop high-voltage spikes when resistance measurements are made using *low-voltage* test instruments. Use good personal insulating practice at all times and highest practical ohmmeter range.

A good (?), "ill-logical" (sick logic) fault occurred from a probable lightning strike to Lee Nolan, WB5UEN's rotator. The symptoms were:

1. Power lamp lighted normally.
2. Antenna rotated normally.
3. Indicator meter would change with different antenna positions.
4. Indicator meter would not calibrate properly, because of insufficient calibration control range.
5. A 220 ohm resistor, installed at control unit terminal 7, connected in series with the control cable wire, which caused:

a. a lower meter scale indication,

b. better, but not complete calibration,

c. rotor would not track actual antenna position, but according to Lee, "it was good enough to live with!"

After a late-night QSO about antenna rotators, Lee decided he had "lived with it long enough."

"I just happen to have an old one over there in the junk box!"

The junk-box spare worked normally. Therefore the fault was in the previously installed control assembly.

Lee removed the cover and gave the damaged control unit a good visual inspection and noted that the fuses were okay. Power was applied to the "ill" control unit; the 13.0 DC voltage measured about 35 volts. Apparently the one-eighth amp fuse withstood the lightning jolt, but the zener diode quit its regulating task! A new 13.0 volt zener was installed, and Lee's spare control unit again became a spare control unit!

Here's some food for thought. How many times have you heard the remark "Storm clouds a-commin! I'm gonna disconnect everything!"

How often do you suppose rotator cables are disconnected during stormy, lightning-filled severe weather?

"Oh, that's okay. I got it all grounded!"

Grounded yes, but skyborne lightning also travels through earth, even up extra heavy-duty ground cables! Therefore, should you feel secure about having "everything disconnected" (except your rotator cable and ground wires), check and ensure that your insurance premium is up to date. You just may need it! CQ

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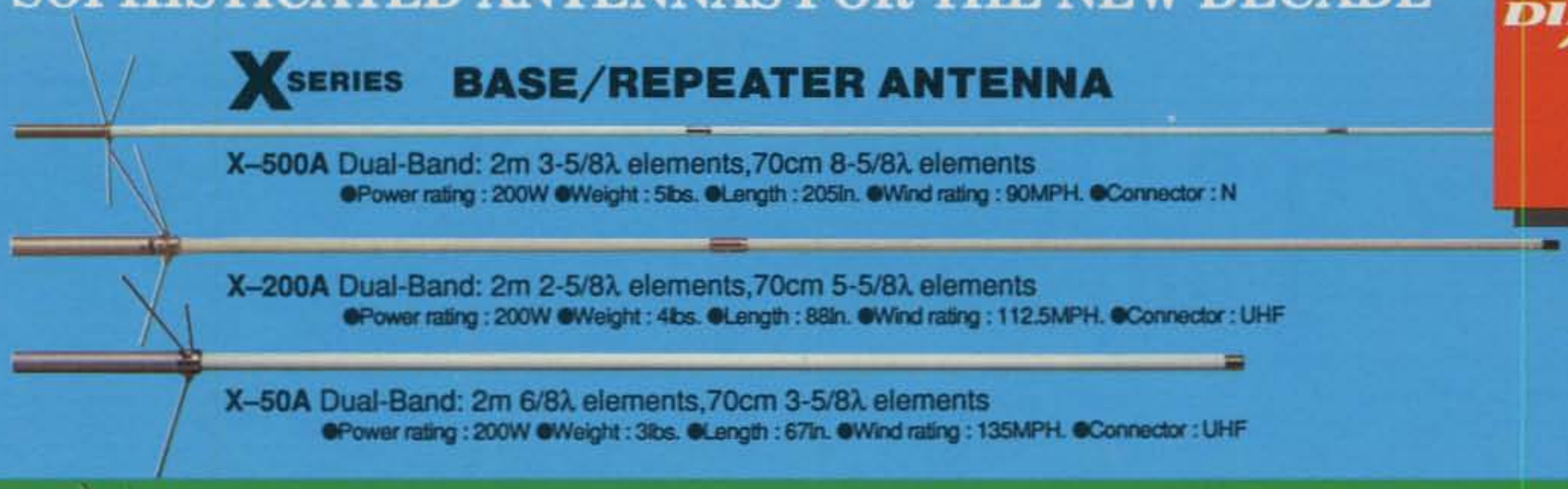
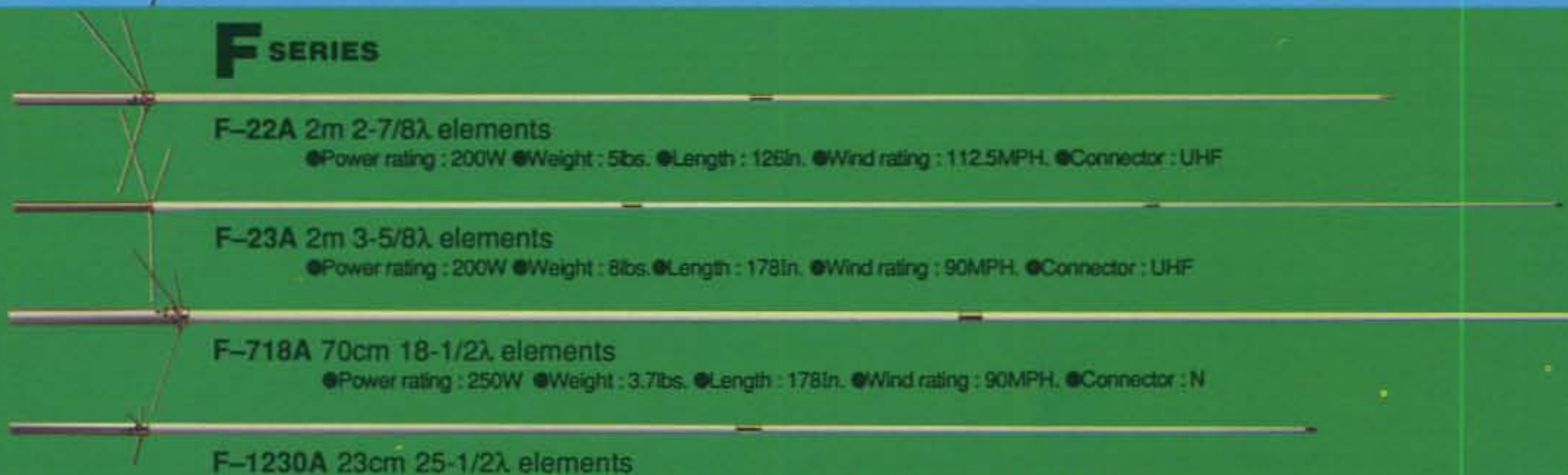


X–500A Dual-Band: 2m 3-5/8λ elements,70cm 8-5/8λ elements
●Power rating : 200W ●Weight : 5lbs. ●Length : 205In. ●Wind rating : 90MPH. ●Connector : N

X–200A Dual-Band: 2m 2-5/8λ elements,70cm 5-5/8λ elements
●Power rating : 200W ●Weight : 4lbs. ●Length : 88In. ●Wind rating : 112.5MPH. ●Connector : UHF

X–50A Dual-Band: 2m 6/8λ elements,70cm 3-5/8λ elements
●Power rating : 200W ●Weight : 3lbs. ●Length : 67In. ●Wind rating : 135MPH. ●Connector : UHF

F SERIES



F–22A 2m 2-7/8λ elements
●Power rating : 200W ●Weight : 5lbs. ●Length : 126In. ●Wind rating : 112.5MPH. ●Connector : UHF

F–23A 2m 3-5/8λ elements
●Power rating : 200W ●Weight : 8lbs. ●Length : 178In. ●Wind rating : 90MPH. ●Connector : UHF

F–718A 70cm 18-1/2λ elements
●Power rating : 250W ●Weight : 3.7lbs. ●Length : 178In. ●Wind rating : 90MPH. ●Connector : N

F–1230A 23cm 25-1/2λ elements
●Power rating : 100W ●Weight : 2.5lbs. ●Length : 120In. ●Wind rating : 90MPH. ●Connector : N

U SERIES

U–300A Dual-Band : 70cm 4-5/8λ elements, 23cm 10-5/8λ elements
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U–5000A Tri-Band : 2m 6/8λ, 70cm 3-5/8λ elements, 23cm 7-5/8λ elements
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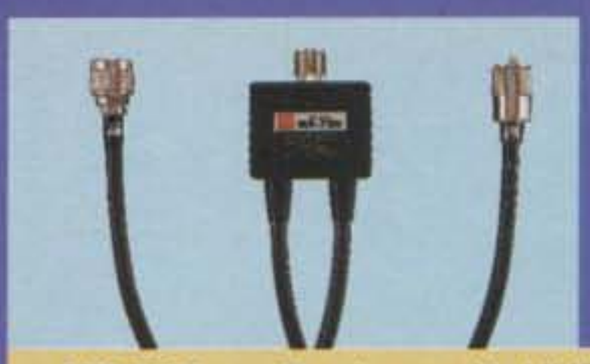

MX-72N Duplexer with UHF connectors and N connector for HF, 2m and 70cm bands
●Coaxial cable : 5D2VS 35cm

MX-72D Direct connection type Duplexer with UHF connectors for HF, 2m and 70cm bands
●Coaxial cable : None

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●Coaxial cable : 5D2VS 35cm

MX-72DN Direct connection type Duplexer with UHF connectors and N connector for HF, 2m and 70cm bands
●Coaxial cable : None

MX-3000N Triplexer with N connectors and UHF connector for HF, 2m, 70cm and 23cm bands
●Coaxial cable : 5D2VS 35cm

MX-3000DN Direct connection type Triplexer with N connectors and UHF connector for HF, 2m, 70cm and 23cm bands
●Coaxial cable : None

MX-3000 Triplexer with N connectors and UHF connectors for HF, 2m, 70cm and 23cm bands
●Coaxial cable : 5D2VS 35cm

MX-3000D Direct connection type Triplexer with N connectors and UHF connectors for HF, 2m, 70cm and 23cm bands
●Coaxial cable : None

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CQ REVIEWS:

The Lightning Bolt Multiband Quad

BY LEW McCOY*, W1ICP

Let me give you a little background about quad antennas as they relate to yours truly. I was first licensed as W9FHZ (Fannie's Handy Zipper) near Chicago. Shortly after World War II I got on the air on 10 meters, and along with several other South Chicago amateurs I became a 10 meter DXer, hanging out on 28.500 MHz (kilocycles in those days). Most of the amateurs used wide-spaced Yagis on 10 meters at that time.

An amateur named Clarence Moore, whose home base was in Indiana, not too far from me, had invented an antenna called a quad beam. He had been doing missionary work near Quito, Ecuador, working amateur radio as HC9JB. He had found that at the altitude where his station was located, something over 10,000 feet, corona discharge from his Yagi could not be tolerated. In his experiments he determined that full-wave elements in a square configuration were not inclined to be bothered by corona problems. Also, in his gain measurements against Yagis, the quad showed nearly identical gains with one less element. In other words, a two-element quad competed very favorably with a three-element Yagi, at least within ½ decibel. Additionally, the quad had other things going for it, including slightly lower radiation angles for the same antenna heights—hence a slightly better DX antenna. I might add here that some antenna experts disagree, but computer modeling shows that the quad is a few degrees lower than a Yagi for the same boom height. A few degrees may not mean much, but those few degrees will open a band sooner and close it later.

In addition, the quad was less susceptible to snow or rain static. Also, the quad element because of its low Q was not as critical as to element spacing as was the Yagi.

I could go on discussing the various merits of the two types of antennas, and needless to say, the argument of quads

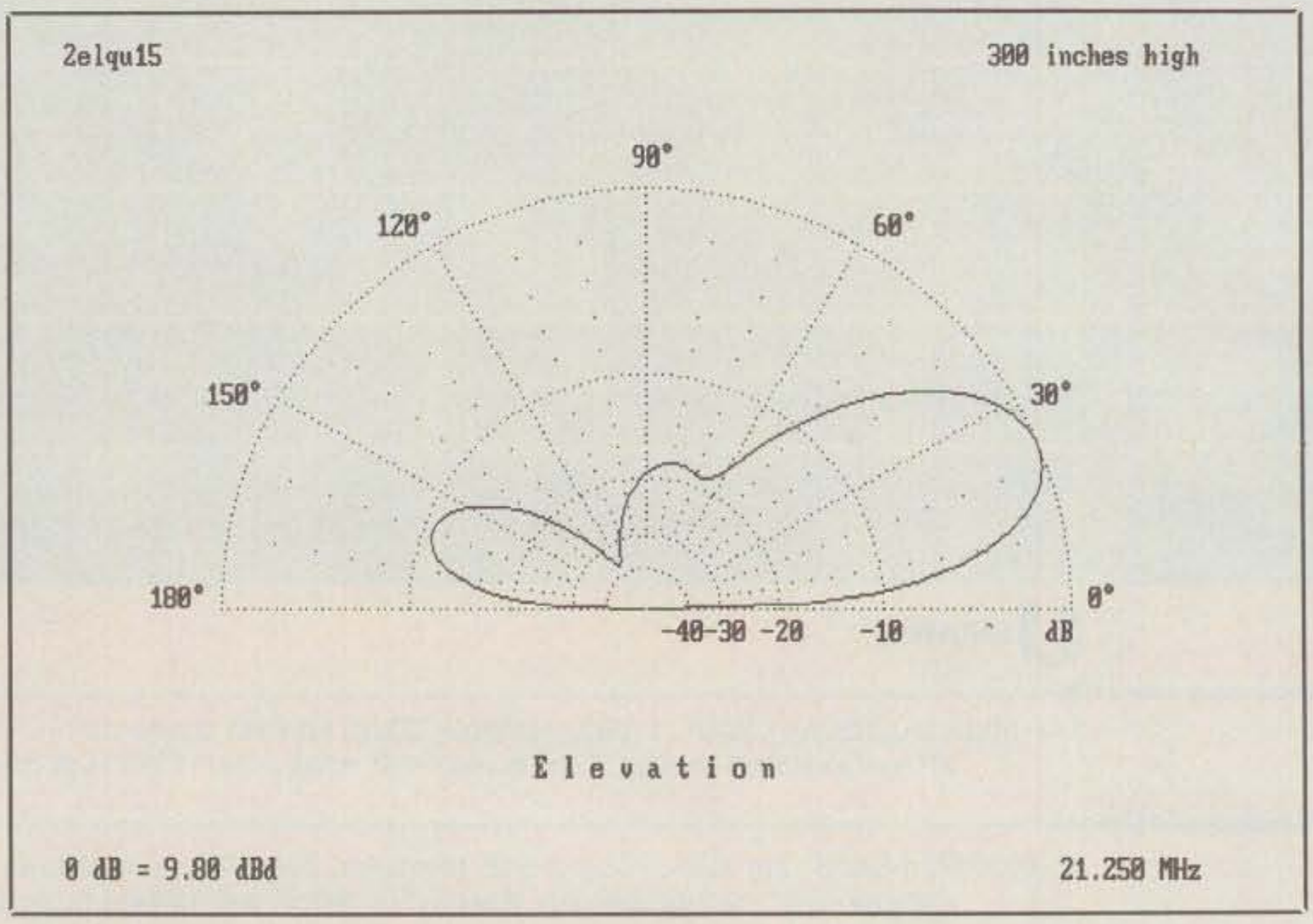
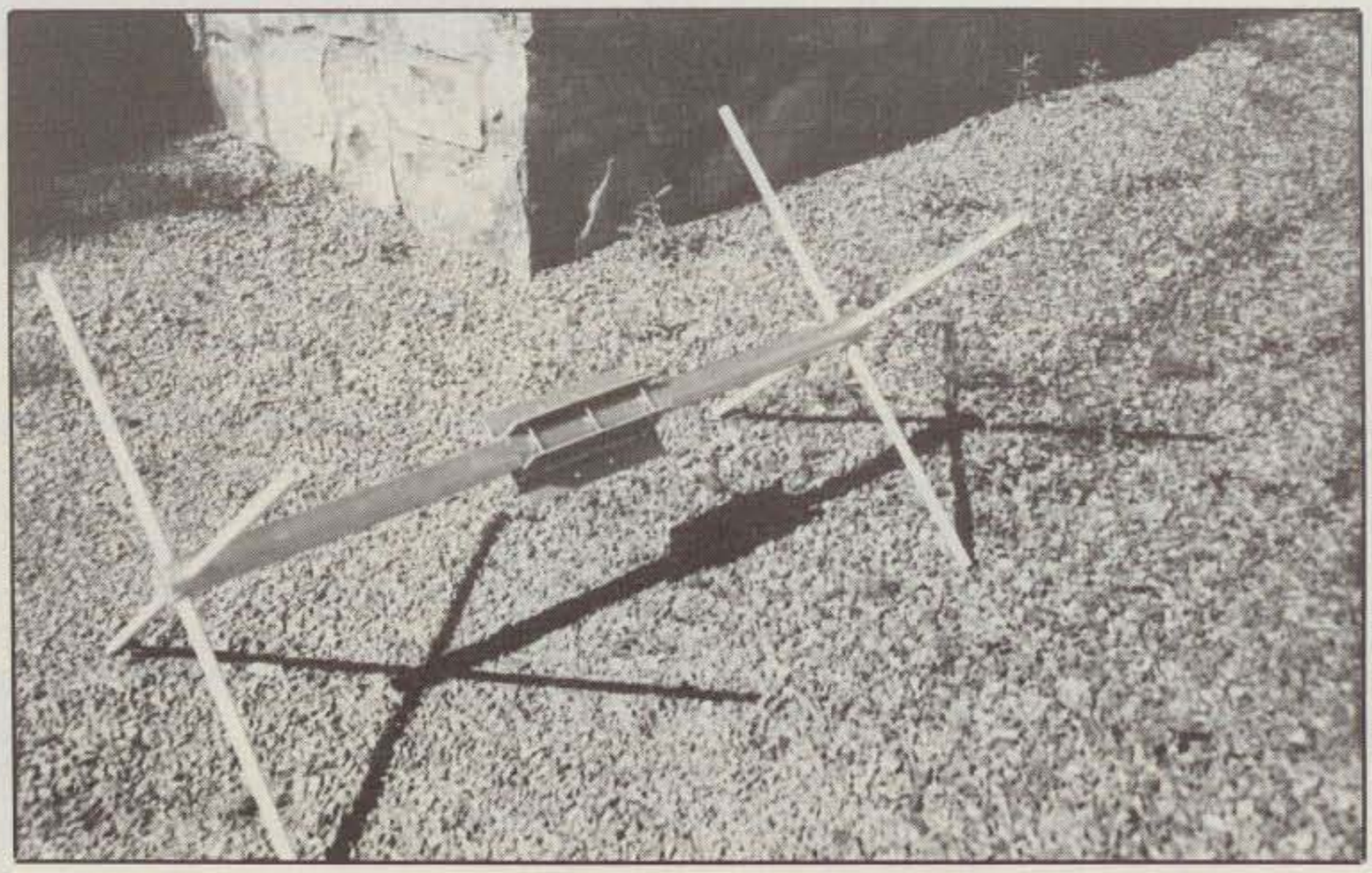
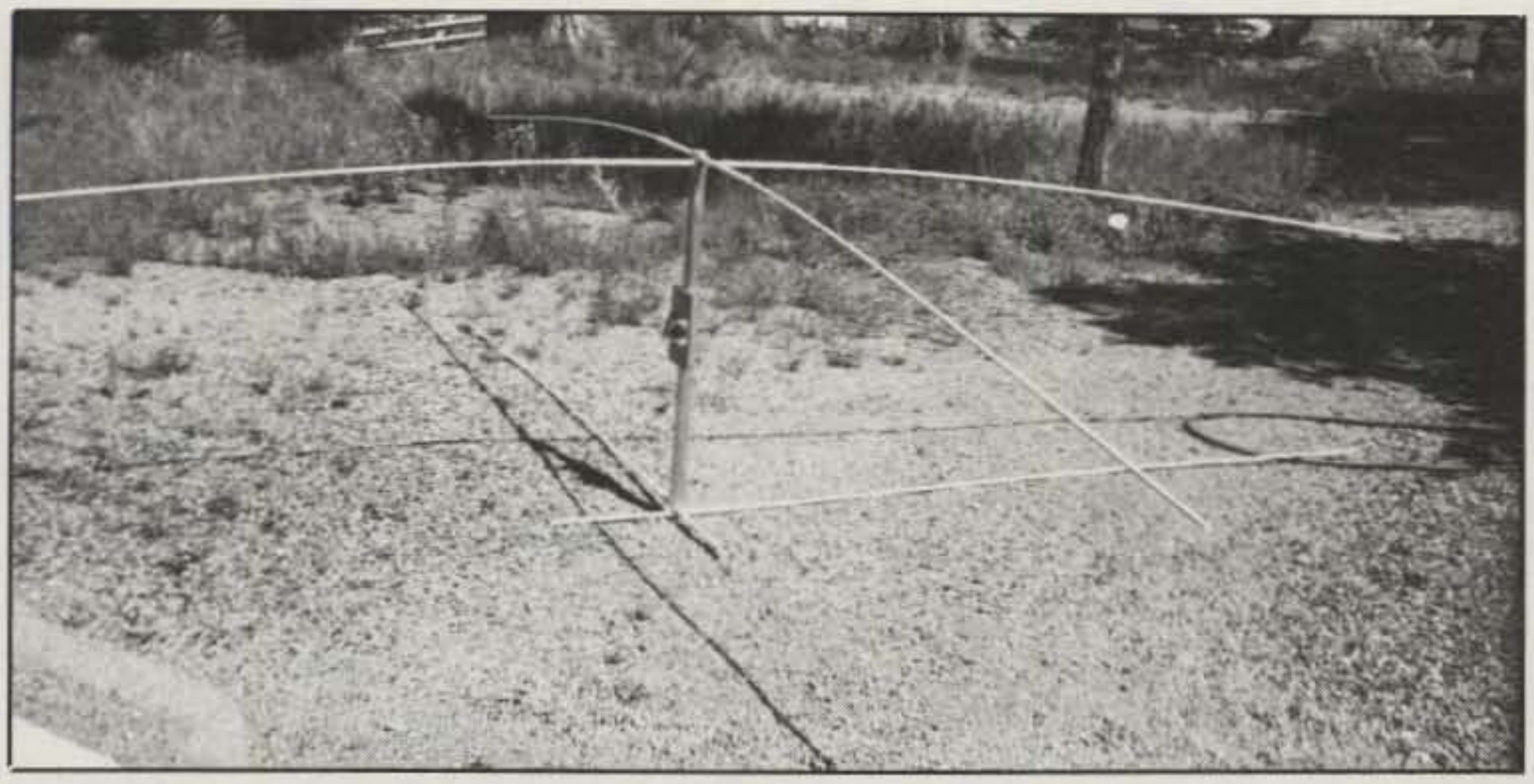


Fig. 1– MININEC computer printout of the Lightning Bolt quad on 15 meters. Gain is compared to a free-space pattern. This antenna was modeled at 25 feet (300 inches) above real ground.



Here are the boom and element supports. The fiberglass supports are "locked" into the boom with nuts and bolts.

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



Almost assembled. It took about an hour to put it together.

versus Yagis has raged over the years (and won't end here). Now don't misunderstand me. I like quads, but I also like Yagis. In fact, I have both types up in my location.

Getting back to Clarence Moore, when I sat on "MY" frequency of 28,500 kilocycles in those days (which was the band edge) and had my pants literally torn off by Moore when he was home in Indiana operating W9LZX, I developed a healthy respect for quads. Because of that I have built and used many over the years.

So much for some quad history. I could write reams more about the antennas, but this is a product review, not an antenna thesis.

The Lightning Bolt quad I got for review is a 10 and 15 meter antenna. It consists of two elements on each band—a reflector and driven element. (Lightning Bolt Antennas manufactures several multiband quads, including one that covers five bands, taking in the WARC bands.)

In the 10/15 meter version the 4 foot boom is drilled to take the support arms, while in the 10/15/20 meter model a 3 foot boom with support fixtures is used. In all versions the support rods are bowed to provide correct spacing of elements for each band. The support arms are unique in that they are reinforced fiberglass rods. These provide exceptional support for the quad wires. The wire used in the quads is aluminum alloy, ER 5356, which is a high-strength wire with very little corrosion potential. Stainless-steel hardware is used throughout the antenna. The entire 10/15 meter antenna is light weight, coming in at 16 pounds.

The actual element spacing is 6 feet on 10 meters and 8 feet on 15 meters. (Spacing is 11 feet, 6 inches for 20 on the 3-band model.) The Lightning Bolt quad is in what I call the classic configuration—the one used originally by Clarence Moore—a square rather than a diamond.

The nominal impedance of a 2-element quad is on the order of 100 ohms, so the antennas can be fed directly with 50 ohm coax, which will provide a match of 2 to 1 or less. An optional 2 to 1 balun/transformer is available, which I used in my tests. I found that on 10 meters the SWR was less than 2 to 1 across 1500 kHz, nearly the entire band, rising slightly above that figure at 29.5 to 29.7. For 15 meters the match was better than 1.3 to 1 across the entire band. Of course, quads are noted for their broad bandwidths.

Since I acquired the MININEC antenna-analysis computer program for my IBM I have made it a habit to run any an-

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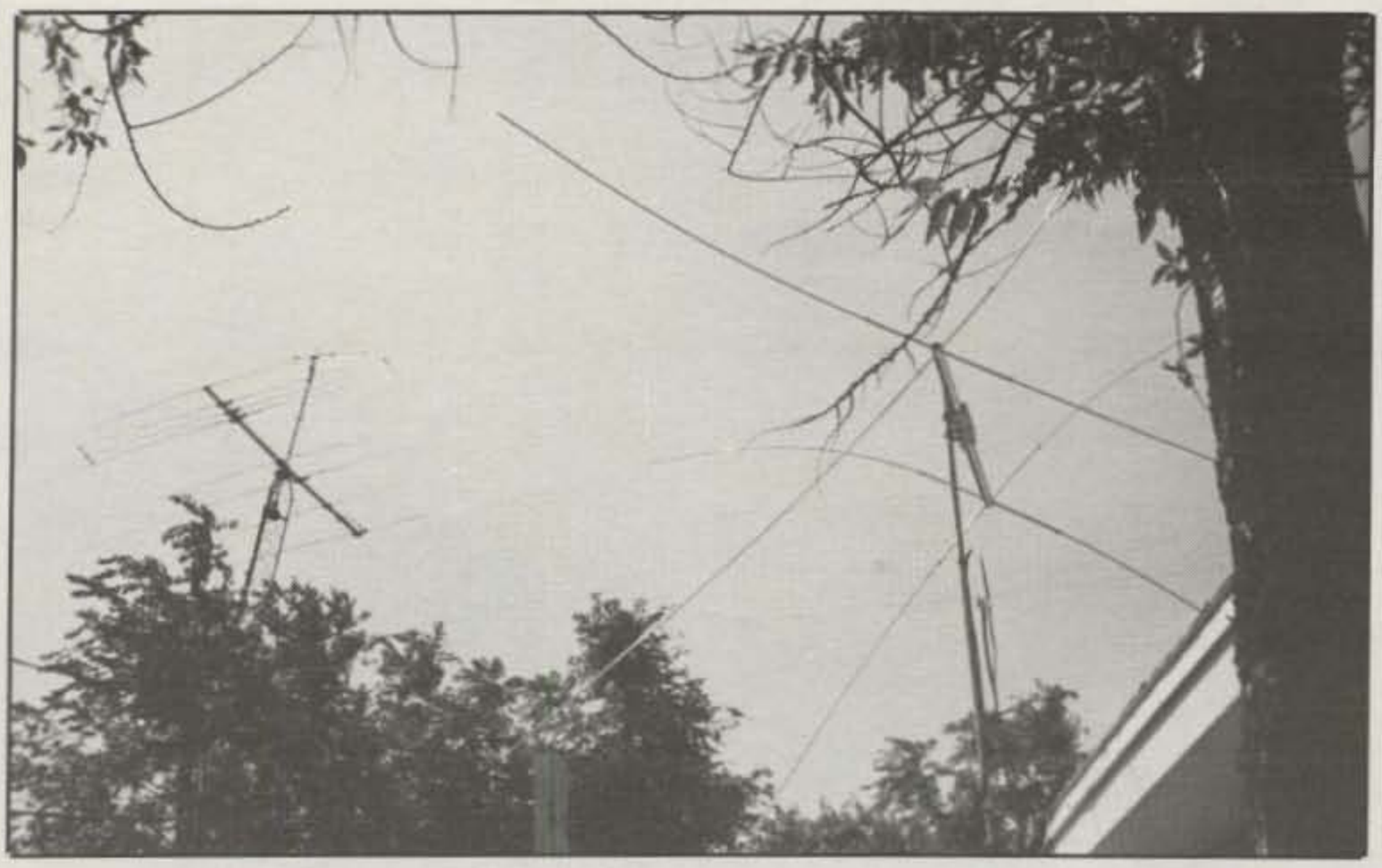

Well above the quad is the DJ2UT beam visible above and to the left.

wavelength apart. (Most of the radiation from an antenna is at the current points.) If you study *Yagi Antenna Design* by the late Jim Lawson, you will find charts showing the lower angle obtained from stacking elements. It is easy to confirm the lower angle with MININEC. I'll grant you it is only a few degrees, but the lower angle is there.

What does this mean to the uninitiated? Simply, if you are going to work DX, the lower the angle the less the number of hops your signal takes through the ionosphere and consequently the less absorption or loss of your signal. It has long been stated by many amateurs that a quad will "open" a band sooner and "close" it later than a Yagi. I never before had a chance to compare two antennas for band openings as I have with this setup. I did a lot of switching and listening at band opening times. There were actual differences in hearing or not hearing signals. Admittedly, this was not very scientific because the quad was considerably lower than the DJ2UT beam, but even so, the angle from the quad was obviously lower.

I would guess by now that readers would assume I am "high" on quad antennas. Well, there can be drawbacks to using a quad. A quad can be an unwieldy antenna. Also, unless a quad is well designed mechanically, it can have problems with high winds and icing. However, the manufacturer has given a lot of thought in designing his quads. The reinforced fiberglass support arms are extremely rugged. In addition, the quads have insulated stress lines to provide added strength between the driven and reflector elements.

As to some vital statistics, the 10/15 meter quad weighs 16 pounds. Turning radius is 7 feet, and the distance from outer loop to boom is 6 feet 7 inches. The wind load is 2.8 feet.

While I didn't test the 20 meter or other multiband models, I can give some details for 20. The turning radius on 20 is 10 feet 6 inches. The weight of the 20/15/10 unit is 25 pounds, and wind load is 6.8 feet. One other statistic: The distance from outer loop to boom is 9 feet 6 inches on the 20 meter model.

As to feed, you can use a single feed line with the optional transformer for the two- or three-band model. Or separate feedlines could be used. To be honest, 15 meters doesn't interact with 20 or 10, but you should be aware that with quads, when operating on 10 meters with a single feed line, the 20 meter *two* fullwave loop will take some of the power. However, this isn't really bad. It just means you are using a bigger antenna on 10. The result is that while the gain is still there on 10, the beam width is inclined to increase. One other important point: The reflector on these quads can be tuned if desired. As it comes, the dimensions are for a balanced beam—gain plus front to back—but the reflector stub can be adjusted.

Needless to say, this has been a little more than just a product review, but I felt there are some things that should be covered because there hasn't been much written about quads of late—and it is an excellent low-cost antenna. For Novices the company also makes a 10 meter model ($99.95). The antenna I reviewed lists for $139.95; the three-band 20/15/10 is $265.00; and the five-band WARC model, 10/12/15/17/20 meters is $290.00. The antennas are available from Lightning Bolt Antennas, RD #2, Rt. 19, Volant, PA 16156 (telephone 412-530-7396). CQ

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The DataEngine was designed to be fully compatible with existing communication networks as well as advanced enough for those yet to be designed. In line with this, each unit is shipped with end-user firmware including terminal mode, BBS mode and KISS mode. ROSE X.25, TCP/IP and G8BPQ code for the DataEngine are currently under development.

For a detailed technical specification sheet, call your Kantronics dealer or contact Kantronics direct.

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Kantronics**DataEngine**

Announcing *(from p. 9)*

Aug. 3–5, **WIMU '90 Hamfest,** Virginian Lodge, Jackson Hole, WY. Contact Doug Smith, WA7PYO, 208-529-5121 (days), 208-529-1504 (evenings).

Aug. 4–5, **Greater Jacksonville Amateur Radio & Computer Show,** Prime Osborn Convention Center, Jacksonville, FL. Contact Greater Jacksonville Hamfest Assn., Box 10623, Jacksonville, FL 32207. (Exams Sunday 9 AM.)

Aug. 5, **40th Annual Winchester Hamfest,** Clark County Ruritan Fairgrounds, west of Berryville, VA. Contact Walter Johnson, WA4HVU, 703-667-1474. (Exams 9 AM, walk-ins register by 8:30 AM.)

Aug. 5, **Portage ARC Hamfair,** Portage County Fairgrounds, Randolph, OH. Contact Joanne Solak, KJ3O/8, Portage ARC, 9971 Diagonal Road, Mantua, OH 44255 (216-274-8240).

Aug. 5, **Land of Lakes Angola Hamfest,** Steuben County 4-H Park, Crooked Lake, IN. Contact Land of Lakes Angola Hamfest, P.O. Box 465, Fremont, IN 46737. (Walk-in exams.)

Aug. 11, **Mid-Ohio Valley ARC Hamfest,** Parkersburg, WV. Contact Ron Ferrell, WD8RGZ, 614-423-5482; or write to MOVARC, 1810 Staunton Ave., Parkersburg, WV 26101.

Aug. 11, **Straits Area ARC Swap 'n Shop,** 4-H Building on Fairgrounds, Petoskey, MI. Contact Irene, N8HBT, 616-539-8986.

Aug. 11, **Burlington ARC Hamfest,** Champlain Valley Fairgrounds, Essex Junction, VT. Contact Tom Taylor, N1EXY, 802-893-4834.

Aug. 11, **Rhinelander/Tomahawk Swapfest,** Rhinelander Ice Arena, Rhinelander, WI. Contact Leonard Bauman, K9RMN, 804 Lincoln St., Rhinelander, WI (715-369-3296, or 369-5564). (Exams AM only.)

Aug. 11–12, **Golden Spread Hamfest,** Amarillo Civic Center exhibit Hall, Amarillo, TX. Contact Golden Spread Hamfest, P.O. Box 1524, Amarillo, TX 79105-1524.

Aug. 12, **St. Cloud ARC Hamfest,** Whitney Senior Center, St. Cloud, MN. Contact SCARC, Box 141, St. Cloud, MN 56302.

Aug. 12, **Mid-Atlantic ARC Hamfest '90,** Bucks County Drive-In Theatre, Warrington, PA. Contact Al Maslin, W3DZI, 215-446-4936.

Aug. 12, **ARRL Central Kentucky Hamfest,** Scott County High School, Georgetown, KY. Contact Bill DeVore, N4DIT, 112 Brigadoon Parkway, Lexington, KY 40517, or call evenings 606-273-8345.

Aug. 18–19, **South Dakota ARRL Convention,** Mueller Convention Center, Hot Springs, SD. Contact Barbara Dunmeyer, KB7ADK, Executive Secretary, Hot Springs Area Chamber of Commerce, 1-800-325-6991. (Exams Friday evening and Sunday morning, preregistration required.)

Aug. 19, **Lafayette, Indiana Hamfest,** Tippecanoe County Fairgrounds, Lafayette, IN. Contact David C. Roberts, KE9IT, 5124 Jackson Highway, West Lafayette, IN 47906 (317-583-2803). (Exams.)

Aug. 19, **Tri-States Swapfest,** Eagle's Alps Lodge, Quincy, IL. Contact Michael Nowack, NA9Q, c/o Western Illinois ARC, P.O. Box 3132, Quincy, IL 62305-3132 (217-224-8526).

Aug. 19, **MIT Tailgate Electronics, Computer, and Amateur Radio Fleamarket,** Albany & Main St., Cambridge, MA. Call 617-253-3776.

Aug. 19, **Delmarva Hamfest,** Delaware Technical Community College, Georgetown, DE. Contact Delmarva Hamfest, Route 2, Box 244G, Georgetown, DE 19947.

Aug. 19, **Warren ARA Hamfest,** Trumbull Branch Campus, Kent State University, Warren, OH. Contact Frank Fitzhugh, KD8KJ, Warren ARA Hamfest, P.O. Box 809, Warren, OH 44482 (216-652-0452). (Exams.)

Aug. 24–26, **1990 ARRL SW Div. Convention,** Town & Country Convention Center, San Diego, CA. Contact Bob Boehme, W6RHV, 619-448-4728. (Exams.)

Aug. 25, **Finger Lakes Hamfest,** New York State Armory, Ithaca, NY. Contact TCARC, P.O. Box 4144, Ithaca, NY 14852-4144, or call Larry King, N2GFW, 607-347-4313. (Handicapped accessible.)

Aug. 25, **Washburn Radio Club 'Fest 1990,** Whiting Fieldhouse, Washburn University, Topeka, KS. Contact Washburn Radio Club, c/o Rob Nall, WV0S, 2612 SW Arrowhead Rd., Topeka, KS 66614 (SASE). (Exams.)

Aug. 26, **St. Charles ARC Hamfest '90,** Blanchette Park, St. Charles, MO. Contact Mike Nolan, KA0UXQ, 16 Gateswood Drive, St. Peters, MO 63376. (Handicapped accessible; exams 10 AM.)

Aug. 26, **Gloucester County ARC Hamfest,** Gloucester County 4-H Fairgrounds, Mullica Hill, NJ. Contact KE2NY at 609-933-0213, or club phone 609-478-4738 and leave message. (Handicapped parking, wheelchair accessible if not raining; exams 9 AM.)

Aug. 26, **Lebanon Hamfest,** Cedars of Lebanon State Park, south of Lebanon, TN. Contact Mary Alice Fanning, KA4GSB, 4936 Danby Drive, Nashville, TN 37211 (615-832-3215).

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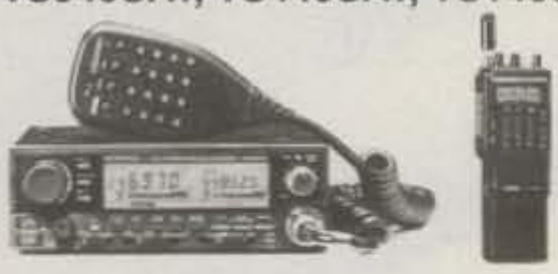

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KANTRONICS KAM

CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Contesting—A Traveler's Perspective

When we consider the reasons for our interest in contest operating, the majority of us recall our best score, the loudest station we've ever used, and a myriad of other operating experiences. I know these events are vivid in my mind. Leading the pack, however, is the camaraderie and exposure to the hobby I've gained in meeting my competitors in person. Over the years I've had the pleasure of meeting fellow contesters from dozens of countries and all continents (even KC4!). Many of these occasions were at large hamfests and conventions, while others were in the quiet setting of a family dinner.

With all the contact I've had with contesters over the years, the 1990 Dayton Hamvention was unquestionably the most memorable. I've always equated my experiences at Dayton to a 72 hour Single-Operator, All Band DX Contest effort.

The Dayton contest begins from the moment you check into your hotel room (which in my case has been an experience in itself) until you say good-bye to friends on 2 meters while parking your car in the garage.

This year I had the opportunity to work in the *CQ* magazine booth. Working in a booth at Dayton provides one of the best vantage points from which to see old friends and meet new acquaintances. Always looking for some form of competition, I began logging the eyeball QSOs I made with my friends. After 4 hours of "operating" here are some statistics: 102 two-way QSOs, 36 Countries, 11 Zones, Score 11,872 (as computed by K1EA CT Software).

My Dayton QSO rate really picked up as the contest forum began. Fortunately, *CQ* management are good operators and cleverly staked out an excellent booth location right near the contest forum's band edge. There was one point when I had three to four people calling and it almost became necessary ask for their last two letters (only kidding, of course)! Unfortunately, I missed the opportunity to break 200 multipliers as Lloyd Colvin walked by before I could shout and get his attention—another elusive multiplier lost in the pile-up.

2 Baldwin Street, Windham, NH 03087

Calendar of Events

July	20-21	World Radiosport Team Cham.
July	28-29	6M Activity Day Contest
July	28-29	Venezuela CW Contest
Aug.	4-5	ARRL UHF Contest
Aug.	4-5	YO DX Contest
Aug.	11-12	Worked All Europe CW
Aug.	12	ARCI QRP SSB Sprint
Aug.	18-19	New Jersey QSO Party
Aug.	18-19	Empire State QSO Party
Aug.	18-19	Keymen's Club CW Contest
Aug.	18-19	SARTG RTTY Contest
Aug.	18-19	Maryland/DC QSO Party
Aug.	25-26	All Asian CW Contest
Aug.	25-26	New Mexico QSO Party
Sep.	8-9	Worked All Europe SSB
Sep.	15-16	Scandinavia CW Contest
Sep.	22-23	Scandinavia SSB Contest
Sep.	29-30	Idaho QSO Party
Oct.	**27-28**	**CQ WW SSB DX Contest**
Nov.	3-5	ARRL CW Sweepstakes
Nov.	10	A.L.A.R.A. Contest
Nov.	10-11	OK-DX Contest
Nov.	17-19	ARRL SSB Sweepstakes
Nov.	**24-25**	**CQ WW CW DX Contest**

All kidding aside, there was one obvious difference in Dayton this year. Unlike previous conventions, there were numerous attendees from the USSR, including RB5JZ, UV3GM, UT4UO, UB5WE, and my good friend from Lithuania, Victor, LY2BIG.

Visiting the United States was overwhelming enough for most of our Soviet friends. I remember UB5WE standing alone in a hallway wondering why American homes have so many rooms. Unlike the others, Victor had the chance to spend two months visiting nearly every part of the United States before the events of Dayton. Everywhere Victor traveled, excitement and fascinating discussion were the order of the day. Dayton was no exception, as he managed a constant pile-up of contesters getting the chance to meet him in person for the first time.

There were a few lucky contesters who were able to share with Victor a piece of the United States outside of the madhouse called Dayton. At the conclusion of the Dayton Hamvention I was fortunate to escort Victor back to my home QTH with Doug, K1DG. My three days of visiting with Victor following the Hamvention include some of the most unforgettable memories I will ever experience in amateur radio.

Running a string of Europeans in a contest can be exhilarating. Producing a winning score in a DX contest provides satisfaction that is hard to describe. Sharing our enthusiasm with another contester in person, however, is one of the hobby's finest pleasures.

Closing Remarks

As you read this, the World Radiosport Team Championship will be history and the winning teams identified. This event in cooperation with the 1990 Goodwill Games is truly one of the crowning moments of the world of contesting. The theme of next month's column will include a synopsis of our experiences in Seattle and hopefully a few surprises as well.

I have been receiving good response to the survey we ran last month ("Are Contesters Real Hams?"). Remember the deadline for responses is September 15, 1990. In addition to the survey, don't miss out on your opportunity to be included in the Contesters' Roster (see July *CQ* "Contest Calendar" column).

As always, submit your contest announcements and news by September 1st for the November column.

73, John, K1AR

Maryland-DC QSO Party

1600Z Sat. to 2359Z Sun., Aug. 18–19

The Maryland/DC QSO Party is a new operating event sponsored by the Antietam Radio Association. Non-Maryland stations work Maryland/DC operators. Maryland/DC stations may work anyone. Stations may be worked once per band/mode and mobiles/portables that change counties may be worked again for QSO credit.

Exchange: RS(T) and QTH (county for MD stations, state/province/DXCC country for others).

Frequencies: SSB: 1.86, 3.92, 7.28, 14.28, 21.37, 28.37, 50.15, 144.55 MHz. CW: 3.643, 7.130, 14.04, 21.115, 28.115, 50.05, 144.15 MHz.

Scoring: Each Maryland county, Baltimore city, and D.C. are multipliers. Score 5 points for club station QSOs, 3 points

for mobiles, 2 points for a CW MD QSO, and 1 point for any other valid contact. Note that points are cumulative (e.g., mobile MD stations count 5 points). Final score is total QSO points times multiplier (25 maximum).

Awards: Certificates will be awarded to the high scorer from each state and Canadian province. In addition there will be awards to the high score from a MD club station, MD mobile, top three MD logs, Novice, Technician, and DX station.

Logs are to be postmarked by September 10, 1990 and sent to: Antietam Radio Association, P.O. Box 52, Hagerstown, MD 21741. Be sure to indicate your operating class on the summary sheet. If you want the final results, include an SASE with your entry.

ARRL UHF Contest

1800Z Sat. to 1800Z Sun., Aug. 4–5

Activity on this one starts at 220 MHz and goes all the way up to 2.3 GHz and higher.

Exchange: Grid square locator.

Points: Three for 220 or 432 MHz contacts. Six for 902 or 1296 MHz. And 12 for 2.3 GHz or higher.

Multiplier: Total number of different grid squares worked on each band.

Final Score: Total QSO points from all bands times the sum of the grid-square multiplier from each band.

Detailed rules were published in the July issue of *QST*. It is suggested you send a large SASE to the ARRL for official log and summary sheets.

Send to ARRL UHF Contest, 225 Main Street, Newington, CT 06111.

YO DX Contest

2000Z Sat. to 1600Z Sun., Aug. 4–5

This is the annual running of the YO DX Contest sponsored by the Romanian Amateur Radio Federation. This is a worldwide contest with everyone working each other on SSB and CW.

Classes: Single Operator—All Bands/Single Band, Multi Operator/Single Transmitter.

Frequencies: CW: 3510–60, 7010–40, 14010–60, 21010–60, 28010–60. SSB: 3700–75, 7040–90, 14150–250, 21200–300, 28400–600.

Exchange: RS(T) plus ITU Zone. YO stations will substitute their two-letter county abbreviation for their zone.

Scoring: 8 points for YO QSOs, 4 points for QSOs outside your continent, and 2 points for QSOs within your continent. Final score is computed by multiplying your total QSO points time the sum of YO counties and ITU Zones worked on each band.

Deadline for logs is September 3, 1990 and they should be mailed to: RARF, P.O. Box 05-50, R-76100 Bucharest, Romania.

European DX Contest

CW: Aug. 11–12 SSB: Sept. 8–9
1200Z Saturday to 2400Z Sunday

This is the 35th annual contest sponsored by the DARC. The activity will be between European countries and the rest of the world on all five bands, 3.5–28 MHz. (IARU Region I regulation of frequencies for contest operation.) This year's event features important rule changes.

Only 30 hours of operating time out of the 36-hour contest period are permitted for single operator stations. The 6-hour off times may be taken in one, but not more than three, periods any time during the contest and must be indicated in the log. The minimum operating time on a band is 15 minutes. This rule does not apply to new multipliers.

Classes: (a) Single operator, all band. (b) Multi-operator, single transmitter. Only one signal on any band at the same

Contesting From The Philippines
A View from Clark Air Base

By Ken Claerbout, KE9A/DU3

Ask any avid contester if he would like to operate from a DX location, and I'm sure his bags would be packed in a heartbeat. Such was the case when my job as a technician with the Diplomatic Telecommunications Service took me to the Philippines. The timing of my arrival, immediately after the 1988 *CQ* WW CW Contest, left something to be desired, but at least I knew that I was going to be there for several years.

One of Oceania's best operators, Ken Claerbout, KE9A/DU3.

The 1989 *CQ* WW DX Contests provided me with my first opportunity to operate in "the grandaddy of them all" from the Philippines. Several advantages exist in operating a contest from this part of the world. For starters, the contest doesn't start until 8 AM Saturday morning, allowing for a full night's sleep before the contest. The only drawback is that I am forced to operate about 18 straight hours after the start until our strategic morning break period (quite a big difference from the East Coast USA!). Moving through the day, the late afternoon provides a fantastic opportunity to pick up needed multipliers—especially on 20 meters. Although 20 meters is not a big QSO band, I find it to be the best place to produce the highest multiplier-to-QSO ratio of any of the six bands. Much like operating in the States, 20 meters offers numerous rare multipliers from stations that only enter the contest for a few short hours.

One of our key operating advantages in operating from Oceania is our proximity to those three-point JAs. This significantly enhances our scores when you consider that we only have three to four solid hours per day, when propagation is good, to work the States on 10 and 15 meters. In contrast, DU entries are forced to compete with stations in places such as KH6, KH3, and YJ8, who have a clear propagation advantage to the States.

While it is a lot of fun to operate from the Philippines, contesting can be tough. To be competitive, you need good openings to the States and Europe. If these conditions don't materialize, it can make for a long and boring weekend!

An important aspect of contesting from this part of the world is becoming good friends with the semi-serious contesters in V85, BV, 9M2, 9M6/8, VK6, 9V1, H44, P29, etc., and being able to move them from band to band during the contest. It also helps to be a DX station yourself as other contest expeditions want you to move as much as you do for your mutual benefit.

Contesting in the Philippines has truly been a unique experience, and I've enjoyed meeting old friends and establishing new ones. Like most of us, my enthusiasm for contesting has been mediated by family, school, work, and travel. Therefore, I have focused my contesting activities on the "big ones," ensuring the availability of the DU multiplier. I hope this strategy has paid off by providing just a little bit more excitement for the contest community. 73's and see you in the next contest.

time. (c) Multi-operator, multi-transmitter. All transmitters must be located within a 500 meter diameter and within the property limits of the station licensee's address. (d) SWL.

Exchange: RS(T) plus a progressive QSO number starting with 001.

Points: One point per QSO and 1 point for each QTC reported.

Multiplier: The multiplier for non-Europeans is determined by the number of European countries worked on each band (see WAE country list).

Europeans will use the ARRL DXCC list of non-European countries.

Bonus Multiplier: Multiply your multiplier on 80 meters by 4, on 40 by 3, and on 10/15/20 by 2.

Final Score: Total QSO points plus QTC points times the sum total multiplier from all bands.

SWL: Only (a) single operator, all-band class may be used. The same call sign, European or non-European, may only be logged once per band. The log must contain both call signs and at least one of the control numbers. Each QSO logged counts 1 point, each complete QTC 1 point (maximum of 10 per station). Multiplier is determined by the DXCC and WAE country lists.

QTC Traffic: Additional point credit may be earned by making use of the QTC traffic feature. A QTC is a report of a confirmed QSO that took place earlier in the contest and was later sent back to a European station. It can only be sent by a non-European station back to a European. The general idea is that after a number of Europeans have been worked, a list of these stations can be reported back during a QSO with another station. An additional, one point credit can be claimed for each station reported.

A QTC contains the time, call, and QSO number of the station being reported (i.e., 1300/DL2DN/134, which means that at 1300Z you worked DL2DN and received #134).

A QSO can be reported only once and not back to the originating station.

A maximum of 10 QTCs to a station is allowed. The same station may be worked several times to complete this quota. Only the original contact, however, has QSO value.

Keep a uniform list of QTCs sent; 3/7 indicates that this is the third series of QTCs sent and that 7 are being reported.

If more than 100 QTCs are claimed, a check list must show that the maximum quota of 10 per station is not exceeded.

Club Competition: This new rule requires the club to be a local group and not a national organization. Eligible club members must operate within a 500 km diameter. To be listed, a minimum of three logs must be received from a club. Entries must clearly indicate their club name on the summary sheet. A special

CIRCLE 157 ON READER SERVICE CARD

trophy will be awarded by the DARC to the winning clubs from Europe and non-Europe.

Awards: Certificates to the top scorers in each class in each country. Each participant with at least half the score of the continental leader will also receive a certificate. Plaques will go to continental winners in the single- and multi-operator classes and the winning EU and non-EU clubs.

Disqualification: Violation of the rules of the contest, or taking credit for excessive duplicate contacts, will be deemed cause for disqualification. Each duplicate QSO or QTC will result in a penalty of 3 QSO/QTC points.

Logs: It is suggested that you use the official DARC or equivalent log form. Figure 40 contacts to the page and use a separate sheet for each band. Submit a dupe sheet for each band with 200 or more contacts. A summary sheet showing the scoring and a signed declaration are also required. (Sample log forms are available—SASE or IRCs.)

WAE Country List: C31, CT1, CU, EA, EA6, EI, F, G, GD, GI, GJ, GM, GM Shetland, GU, GW, HA, HB, HB0, HV, I, IS, IT, JW Bear, JW Spitsbergen, JX, LA, LX, LZ, OE, OH, OH0, OJ0, OK, ON, OY, OZ, PA, SM, SP, SV, SV5 Rhodes, SV9 Crete, SY Athos, T7, TA1, TF, TK, UA1346, UA2/UZ2F, UA1 Franz-Josef-Land, UB, UC, UN/UA1N/UZ1N, UO, UP, UQ, UR, Y2, YO, YU, ZA, ZB2, 1A0, 3A, 4J1M–V, 4U1 Geneva, 4U1 Vienna, 9H1.

Mailing deadline is September 15th for CW entries and October 15th for SSB to: WAEDC Contest Committee, P.O. Box 1328, D-8950 Kaufbeuren, Fed. Rep. of Germany.

ARCI QRP SSB Sprint

2000Z to 2400Z Sunday, August 12

Here is another shorty by the ARCI QRP, the "Summer Daze Sprint."

Exchange: RS and state, province, or country. Members will include their membership number, non-members their power output.

Points: Contacts with a member 5 points, non-members same continent 2 points, but 4 points if on a different continent.

Multiplier: Total states, provinces, and countries worked on each band. (Same station may be worked on each band for QSO and multiplier credit.)

Power Multiplier:
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 out—×10
Over 5 watts out—check log.

Power Supply Multiplier: 1.5 if using battery; 2 if using solar/natural supply, or

Final Score: Total QSO points × QTH × power × power supply if any.

Frequencies: 1810, 3985, 7285, 14285, 21285, 28385, 28885, and 50385.

Awards: Certificates to the top three scorers overall and to the top score in each state, province, and country in which two or more entries are received.

Use a separate log sheet for each and a summary sheet showing the scoring and other essential information. Sample log forms are available from K5VOL. Include a large SASE with your request, also if you desire results of the contest.

This year logs go to: Red Reynolds, K5VOL, 835 Surryse Road, Lake Zurich, IL 60047 USA.

Empire State QSO Party

0000Z Sat. to 0000Z Sun., Aug. 18–19

This is the seventh annual QSO Party sponsored by the Albany ARA.

The same station may be worked on each band and each mode. Mobiles count each time their county changes.

Exchange: RS(T) and QTH. County for NY stations; state, VE province, or country for DX.

Scoring: Two points for SSB contacts, 4 points for CW.

New York stations multiply total QSO points by (NY counties + states + VE provinces + DX countries) worked for their final score.

Others multiply total NY QSO points by the number of NY counties worked (maximum of 61).

Frequencies: 35 kHz up from bottom of all other bands on CW. And 1.850, 3.925, 7.275, 14.280, 21.380, 28.40, 50.40, 144.20, 146.55, and 223.50 MHz on SSB. (No WARC bands.)

Awards: Certificates to the top scoring stations in each NY county and multiplier area.

Mailing deadline is October 1st to: AARA, c/o John Yodis, K2VV, P.O. Box 460, Hagaman, NY 12086.

SARTG RTTY Contest

Three Periods GMT
0000–0800 & 1600–2400 Sat., Aug. 18
0800–1600 Sun., Aug. 19

This is the 20th annual contest sponsored by the Scandinavian Amateur Radio Teleprinter Group. Use all bands 3.5 through 28 MHz. The same station may be worked on each band for QSO and multiplier credit.

Classes: Single operator all band, single operator single band, multi-operator single transmitter, and SWL.

Exchange: RST and QSO no.

Points: QSOs with own country, 5 points. With other countries on same con-

tinent, 10 points. With other continents, 15 points.

Multiplier: Each DXCC country and each W/K, VE/VO, and VK call area.

Final Score: Sum of QSO points from all bands times the sum of the multiplier from each band.

SWLs use same scoring but based on sum of stations and messages copied.

Awards: Certificates to the top-scoring stations in each class in each country and each call area of the U.S., Canada, and Australia.

Use a separate sheet for each band, and include a summary sheet showing the scoring, comments, and other essential information, and your name and address in block letters.

Logs must be received by October 10th and go to: SARTG Contest Manager, Bo Ohlsson, SM4CMG, Skulsta 1258, S-710 41 Fellingsbro, Sweden.

Keymen's Club of Japan CW Contest

1200Z Sat. to 1200Z Sun., Aug. 18–19

The Keymen's Club is a Japanese organization the members of which are exclusively interested in CW communications. The object of the KCJ contest is to work as many amateurs in Japanese prefectures/districts as possible using JA CW-band allocations. Eligibility is limited to single operators only, with non-JAs participating in an all-band category (JAs can submit single-band/SWL logs).

Frequencies: 1908–1912, 3510–3525, 7010–7030, 14050–14090, 21050–21090, 28050–28090, 50050–50090, 144050–144090, 430050–430090, and 1294050–1294090 kHz.

Exchange: RST plus continent for non-JAs. JA stations send RST plus Prefecture/District Code.

Scoring: One point for each completed QSO per band. Count the first 60 Japanese districts you work for multipliers. Final score is total QSO points times multiplier.

There are various certificates available to the top three world-wide scorers and the winners from each country and U.S. call area. All entries must be postmarked by September 19, 1990 and be mailed to: Yasuo Taneda, JA1DD, 3-9-2-102 Gyoda-cho, Funabashi, Chiba 273, Japan.

New Jersey QSO Party

2000Z Sat. to 0700Z Sun. Aug. 18–19
1300Z Sun. to 0200Z Mon. Aug. 19–20

This is the 31st annual party sponsored by the Englewood ARA. Phone and CW are part of the same contest, the same station may be worked on each band and mode, and NJ stations may contact in-state stations for QSO and multiplier credit.

Exchange: QSO no., RS(T), and QTH. County for NJ, ARRL section or country for others.

Scoring: NJ stations score 1 point for W/K and VE/VO contacts, and 3 points for DX. Multiply total by ARRL sections worked. KP4, KL7, KH6, etc., are 3-point contacts and section multipliers.

Out-of-state stations multiply total NJ QSOs by number of NJ counties worked (maximum of 21).

Frequencies: 1810, 3535, 3950, 7035, 7135, 7235, 14035, 14285, 21100, 21355, 28100, 28400, 50–50.5, and 144–146. Suggest phone on even hours, 15/10 meters on odd hours, and 160 at 0500Z.

Awards: Certificates to the top scorers in each NJ county, ARRL section, and DX country. Second-place awards if four or more logs are received from that section. Also Novice/Tech. and mobile awards. There are four plaques donated by the section managers for NNJ and SNJ to the winning stations in those sections.

Use UTC time, indicate the multiplier only the first time it is worked, include a QSO check sheet, and include a summary sheet showing the scoring, etc. Send a large SASE if you wish a copy of the results.

Stations planning activity in NJ are requested to advise the EARA by August 1st so that coverage of all counties may be planned.

Logs must be received no later than Sept. 16th and go to: Englewood ARA, P.O. Box 528, Englewood, NJ 07631-0528.

All Asian CW Contest

0000Z Sat. to 2400Z Sun., Aug. 25–26

The same rules as for the Phone Contest on June 16–17 apply here. See June Contest Calendar for complete rules. Logs for this one must be in the hands of the committee no later than September 30th. They go to: JARL, P.O. Box 377, Tokyo Central, Japan.

New Mexico QSO Party

1800Z Sat. to 1800Z Sun., Aug. 25–26

This annual event is sponsored again by the Albuquerque DX Association. The object is for New Mexico and non-New Mexico stations (including DX) to QSO each other on as many bands as possible. Note that New Mexico mobile stations can be worked from more than one county.

Classes: New Mexico portable/mobile stations, New Mexico fixed stations, and non-New Mexico stations. All bands are encouraged (excluding WARC bands). SSB—1880, 3945, 7280, 14280, 21380, 28480; and CW—1810, 3555, 7055, 14055, 21055, 28055.

Exchange: New Mexico stations send RS(T) and county. Stations outside New Mexico send RS(T) and state/province/country.

Scoring: Count 2 points for SSB and 3 points for CW QSOs. Multipliers are U.S. states, Canadian provinces, and DXCC countries (KH6 and KL7 are states) worked per band. Final score is computed by QSO points times multiplier or QSO points times multiplier times number of counties operated from for New Mexico mobile/portable stations. Stations may only be worked once per band/mode.

Awards: Certificates will be issued to the highest scoring portable/mobile and fixed stations in each New Mexico county and each state/province/country. Plaques will be awarded to the highest scoring portable/mobile and fixed New Mexico entry and the highest scoring entry outside of New Mexico.

Stations making 200 or more contacts must include dupe sheets. Logs must be postmarked by September 30th and sent to: Richard Stump, KD5VV, P.O. Box 11021, Albuquerque, NM 87192. Include an SASE for a copy of the final results.

HR BOOK

ANTENNAS

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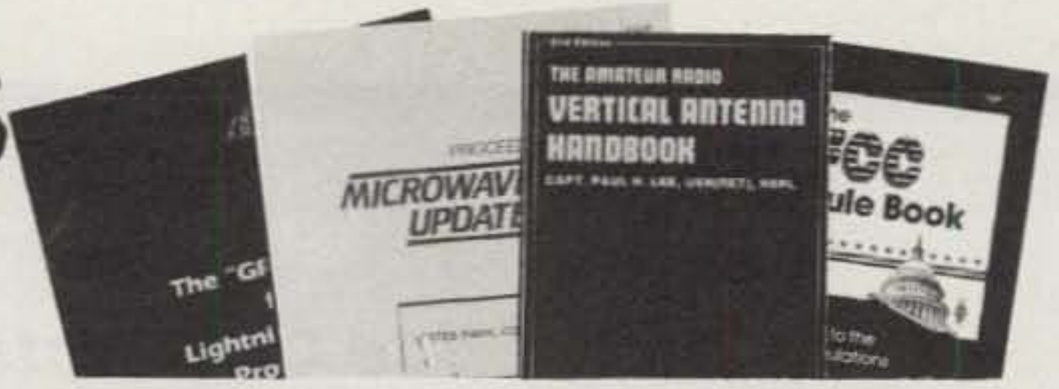

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proceedings July 1989

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DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Insurance Contacts

The 3Y5X Bouvet operators made just over 47,000 contacts during the 16 days they were on the Antarctic island. However, they worked only 20,400 different DXers. Almost 27,000 contacts, or 57% of the total, were with stations who had already made at least one contact with 3Y5X.

Most of these contacts were on an additional mode or band, of course. The 3Y5X operation spanned the traditional amateur bands from 160 to 10 meters, and even included a handful of RTTY contacts, as well as CW and SSB. An active DXer who was chasing the new, single-band DXCC awards, as well as CW, Phone, and RTTY DXCC, would try for several QSOs with 3Y5X, as it will likely be many years before the next serious Bouvet operation.

However, 5558 of the 47,000 3Y5X contacts were simply duplicates—that is, contacts with the same station, on the same band and mode. Nearly 12% of the 3Y5X QSOs were wasted in this fashion, depriving many DXers of what may be their only chance to work and confirm this remote DXCC country. Most of these duplicates were "insurance contacts." Insurance contacts are those made because the DXer was not absolutely certain that he or she was "in the log," and thus the DXer made an additional contact on the same band and mode. By the end of the DXpedition, the dupe rate was 20%. One in five contacts was the repeat of a previous QSO. How many hundreds or thousands of DXers were denied a shot at Bouvet because of these thousands of duplicate contacts?

The problem of duplicate contacts is not unique to the 3Y5X DXpedition. Every major DXpedition encounters the same phenomenon: about 10% of their contacts are wasted duplicates. A small fraction of these duplicate contacts is due to "DX hogs" who work the DXpedition day after day on the same band and mode just to prove they can break through the pileups. There is probably no way to convince a dedicated "DX hog" that such duplicate contacts prevent other less-well-equipped stations from many *any* contacts with the DXpedition. However, both the DXpedition operators and the DXers chasing the DXpedition can help reduce the waste of insurance contacts.

Jim Fenstermaker, K9JF, managed to earn 5-Band Worked All Zones with his Kenwood TS-830 and Drake L4B amp, feeding monbanders on 20 and 40 meters, and phased verticals on 80.

There are two causes of insurance contacts. First, the DXpedition operator may neglect to give the complete callsign of the station worked. A typical pileup exchange might go like this. 1SØXV: "Hotel Oscar, you're five nine." WB2CHO/6: "Roger. This is Whiskey Bravo Two Charlie Hotel Oscar Portable Six. You're five nine." 1SØXV: "QSL. QRZ." Because the Spratly operator did not give the complete callsign of the Hotel Oscar station he acknowledged, WB2CHO/6 doesn't know, for certain, that he is the Hotel Oscar station in the Spratly log. Another Hotel Oscar station might have been transmitting at the same time. (Or maybe even another station without Hotel Oscar in the call, but that is the subject of a future column.) WB2CHO/6 will probably try for an insurance contact soon thereafter, and hope that the Spratly operator gives his complete callsign next time. This leads to duplicate contacts, and wasted operating time on both ends of the contact.

The operator on Spratly could have eliminated the "need" for the insurance contact by saying, "WB2CHO/6, QSL, QRZ." The slight additional time required to give the full callsign of the station worked will be paid back many-fold, in fewer insurance contacts. Giving complete callsigns of stations worked does not necessarily reduce the QSO rate. Listen to a world-class DXpeditioner such as Eric Sjolund, SMØAGD, or Martti Laine, OH2BH. They not only give the complete callsign they worked, unambiguously, but they even personally thank each station for the contact. And they do this at a rate that few DXpeditioners can match.

Another thing that DXpeditioners can do to reduce (or even eliminate) duplicate contacts is to log on computer. Instant-logging programs that flag duplicate con-

The operators of the 3Y5X Bouvet DXpedition found that 12% of their contacts were duplicates. From left: LA2GV, JF1IST, LA1EE, HB9AHL, and F2CW. (CX7BY photo)

P.O. Box 50, Fulton, CA 95439

The WPX Program

Mixed

1454	4X4RE	1458	JH8BOE
1455	WA3EOP	1459	WB2ABD
1456	OH3MIG	1460	HB9AFI
1457	KV1M	1461	JA6WOV

SSB

2152	KB9AIT	2155	IK2DUW
2153	IK5DNE	2156	IK2LEY
2154	KD5ZD		

CW

2631	W6YLL	2632	I2KKL

VPX

263 JA1-24770

WPNX

256 N2ENM

Endorsements

Mixed: 450 WA4SFN, JH8BOE, WB2ABD, HB9AFI. 500 JH8BOE, WB2ABD, HB9AFI, W9GCH. 550 JH8BOE, WB2ABD, HB9AFI. 600 JH8BOE, WB2ABD, HB9AFI. 650 JH8BOE, WB2ABD, HB9AFI. 700 KA6SWI, JH8BOE, WB2ABD, HB9AFI, OZ1ACB. 750 JH8BOE, WB2ABD, HB9AFI, OZ1ACB. 800 JH8BOE, WB2ABD, HB9AFI, OZ1ACB, ONL-2169. 850 IK2ILH, JH8BOE, WB2ABD, HB9AFI, ONL-2169. 900 W4WKQ, JH8BOE, WB2ABD, HB9AFI. 950 WA3HUP, JH8BOE, HB9AFI, AB5C. 1000 WA3HUP, KA3DBN, JH8BOE, H5GOE, HB9AFI, AB5C. 1050 WA3HUP, KA3DBN, JH8BOE, K5GOE, HB9AFI. 1100 KA3DBN, JH8BOE, K5GOE, HB9AFI, DF4ZL. 1150 JH8BOE, HB9AFI, DF4ZL. 1200 JH8BOE, HB9AFI. 1250 JA1-20784, JH8BOE, HB9AFI. 1300 JA1-20784, JH8BOE, HB9AFI. 1350 HB9AFI. 1400 HB9AFI, KS3F. 1450 HB9AFI. 1500 HB9AFI. 1550 HB9AFI. 1600 HB9AFI. 1650 HB9AFI. 1700 HB9AFI. 1750 W8UMR. 1800 HB9AFI. 1850 KL7AF, HB9AFI. 1900 W2FXA, HB9AFI. 1950 HB9AFI. 2000 HB9AFI.

SSB: 350 N4HID, N9ICH, HB9AIT, IK5DNE, IK2DUW, IK2LEY. 400 N4HID, VE3KQS, KB9AIT, IK5DNE, IK2DUW, IK2LEY, N9ICH, WD8EOL. 450 N4HID, VE3KQS, KS4S, IK5DNE, IK2DUW, W9GCH. 500 KS4S, IK2DUW, I7VEZ. 550 KS4S, KF7RU, KB8DAE, I7VEZ. 600 KS4S, KF7RU, I7VEZ. 650 KS4S, I7VEZ. 700 KS4S, I7VEZ. 750 KS4S. 800 KS4S, W4WKQ. 850 EA5FCO, KS4S, WB6SRK. 900 EA5FCO, K3ZPG, WB6SRK, K5GOE. 950 K5GOE. 1000 K5GOE. 1050 EA5BD. 1100 EA5BD, WA2FKF. 1150 EA5BD. 1200 EA5BD. 1350 PP2ZDD. 1550 W8UMR. 1600 W8UMR. 1650 W8UMR. 2000 NJ0C.

CW: 350 KS4S, I2KKL. 400 KS4S, I2KKL. 450 AH6JF, KS4S, I2KKL. 500 AH6JF, KS4S, I2KKL. 550 KS4S, LA3GI. 650 NS2H. 750 KT2C. 850 PA3BEJ. 900 PA3BEJ, IK3GER. 1200 G4SSH, LA9XG. 1900 I6SF. 1950 I6SF. 2150 N2AC.

10 Meters:	OZ1ACB, JA0SU, AB5C
15 Meters:	W9IAL
20 Meters:	IK2ILH
40 Meters:	KV1M, K5GOE
160 Meters:	UA3FT
Asia:	SP1MHV, JA6WOV
Africa:	K3ZPG, K5GOE, JA0SU
So. America:	UA3FT, K5GOE
Europe:	WA4SFN, JA6WOV
Oceania:	UA3FT, K3ZPG

Award of Excellence Plaque Holders: N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DE0DXM, DK4SY, UR2**, AB9O, FM5WD, I2DMK, W4BQY, I0JX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, K0JN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KB0G, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, YB0TK, VE7WJ, VE7IG, K9QFR, YU2NA, N2AC, W4UW, NX0I, W9NUF.

Award of Excellence Plaque Holders with 160 Meter Endorsement: LU3YL/W4, I4EAT, VE7WJ, W9NUF, N4NX, VK9NS, DE0DXM, VE7IG, K9BG, AB9O, FM5UD, SM0DJZ, DK5AD, SM6CST, I1JQJ, W3ARK, HI8LC, KA5W, UR2**, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SM0AJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KB0G, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YB0TK, W8ILC, W1BWS, VE7WJ, YB0TK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, NX0I, G4BUE.

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.

tacts, such as WB2DND's Amateur Radio Log Database, completely abolish the need for an insurance contact. If a station calls a second time, the DXpeditioner can say, "You're in the log." The DXer is now absolutely confident that he made a valid contact and can stop calling. Tom Gregory, N4NW, made extensive use of this technique from the Congo, and was thus able to offer a new country to many DXers.

Fully equipped lap-top computers currently sell for about $1200 and can be used on many different trips. This is a small cost compared to the overall cost of a serious DXpedition, and the computer will probably pay for itself quickly in improved QSLing. If more DXpeditions logged on computer, more DXers would be able to work and confirm more new countries. And isn't that the goal of every DXpedition?

The DXer can also help reduce the waste of insurance contacts. First, the DXer should not call the DXpedition if the DXer can't hear the DXpedition well enough to know if he or she made a valid contact. Too often you hear over the local DX repeater (or read on the local Packet-Cluster network): "Did I get through? Did he come back to me?" If you can't hear the DXpedition that well, you have no business in the pileup.

5 Band WAZ

As of May 1, 1990, 275 stations have attained the 200 zone level.

New recipients of 5 Band WAZ Award with all 200 zones confirmed:

CT1TM
DL1YD
YO3CD
ON6HE
IV3YKK

The top 21 contenders for 5 Band WAZ are:

1. N4WW, 199
2. UQ1GXX, 199
3. W7OM, 199
4. K1MEM, 199
5. SP9PT, 199
6. K6YRA, 199
7. K5UC, 199
8. LA4HW, 199
9. PY7ZZ, 199
10. DL9WW, 199
11. K0CS, 199
12. I1JQJ, 199
13. HA8XX, 198
14. K7UR, 198
15. I8IGS, 198
16. VE7DX, 198
17. W0PGI, 198
18. SM6AHS, 198
19. HA0MM, 198
20. K1ST, 198
21. KB8DB, 198

657 Stations have attained the 150 zone level as of May 1, 1990.

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (65 cents) size 4½ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 De Marco Rd., Sudbury, MA 01776. Applicants should include sufficient postage for safe return of their QSL cards. The processing fee for all CQ awards is $4.00 for subscribers and $10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

The WAZ Program

Single Band WAZ

10 Meter SSB

356 ..... K4UEE

15 Meter SSB

337 ..... JI1HNJ 338 ..... NM5Y

20 Meter SSB

795 ..... XE1XM 797 ..... N3FBN
796 ..... CP6PX

10 Meter CW

82 ..... KA2DIV 83 ..... K4UEE

15 Meter CW

180 ..... OH4OJ 182 ..... WL7E
181 ..... WD5DBV

20 Meter CW

367 ..... SM6BWQ 368 ..... K4UEE

40 Meter CW

119 ..... W1MK 121 ..... K4UEE
120 ..... AA4KT

80 Meter CW

26 ..... OH2BVM

All Band WAZ SSB

3548 ..... I0HU 3556 ..... WA0X
3549 ..... CT1AVR 3557 ..... WB4NXG
3550 ..... G4ZYB 3558 ..... KA9VRA
3551 ..... W4MBD 3559 ..... KA8WAS
3552 ..... I2GGJ 3560 ..... G4YEK
3553 ..... 4X6UV 3561 ..... KW6N
3554 ..... DL9HCW 3562 ..... VE3UR
3555 ..... DJ8DE

CW/Phone

6787 ..... I2IEY 6795 ..... WA3SLN (CW)
6788 ..... F6BKI 6796 ..... DL2OBF (CW)
6789 ..... WA2USA 6797 ..... JH9AUB
6790 ..... KD8EE 6798 ..... K2LFG
6791 ..... W5OLN 6799 ..... SM4DDS (CW)
6792 ..... JA8RJE 6800 ..... ON4ACG
6793 ..... IK1LBL 6801 ..... WB6OKK (CW)
6794 ..... EA5FFQ 6802 ..... G3XON

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Also, if the DXpedition operator persists in not giving complete callsigns, the DXer can immediately ask if he or she is really in the log. In the above example WB2CHO/6 can come back immediately with "WB2CHO/6. Did you come back to me?" This serves two purposes. WB2CHO/6 can be assured that he is in the log, and the DXpedition operator might realize that he or she is not operating in the most efficient manner and start giving complete callsigns.

Finally, the DXer can make the insurance contact on a different band. For example, if WB2CHO/6 makes a possible contact with 1S0XV on 20 meters, he can make an additional contact on 15 meters. There are no DXCC single-band awards for 20 or 15 meters, so there is little reason to ensure contacts on *both* bands. One or the other will be sufficient.

Many DXers boasted that they worked the 3Y5X DXpedition on every band, both CW and SSB. While these contacts don't show up as actual duplicates, several of these contacts were unnecessary and cheat other DXers out of their chance to make even a single Bouvet QSO. Why does the DXer work Bouvet on both CW and SSB, on both 15 and 20 meters? One CW and one SSB contact cover the major DXCC awards. For that matter, a single 10 meter CW contact covers both CW DXCC and 10 meter DXCC. Why make additional CW contacts on 20 or 15 meters? Is this operator any different from the DX

hog who makes duplicate contacts on the same band and mode? Surely such a well-equipped and talented operator doesn't need Bouvet on 20 meters for 5 Band DXCC!

The proliferation of single-band DXCC awards has encouraged more DXpeditioners to make contacts on 160, 80, 40, and 10 meters. But again, why make a contact on both 75 meter SSB and 80 meter CW? Even the most avid DXCC award chaser can be completely covered with only four contacts: 160 meter CW, 75 meter SSB, 40 meter CW, and 10 meter RTTY. That covers all the DXCC award programs.

The problem of insurance contacts has been with us for a long time. It is not going to vanish overnight. But if both DXpedition operators and DXers take steps to reduce duplicate and insurance contacts, hundreds and thousands more DXers will be able to work and confirm many new countries.

Dr. Wolff Parmentier, DJ5JH, was the 159th DXer to earn 5-Band Worked All Zones. His wife Monika is DJ8UY, and his daughter Miriam is DJ3IF. The family shares this ICOM 740 and Heath SB-220.

More Deleted Countries

On May 22 the governments of the People's Democratic Republic of Yemen (also known as South Yemen 7O) and the Yemen Arab Republic (known to amateurs as North Yemen 4W) merged to form a new republic: the Republic of Yemen. The two countries had very different political views, with the conservative North Yemen often at odds with the Marxist South Yemen. If fact, the two countries fought a brief war against each other in 1972. They apparently settled their differences, as of May 22.

As far as amateur radio is concerned, this merger means that both 7O and 4W will be deleted from the DXCC country list, and a new entity will be added. When the DXCC rules were rewritten in 1988, Section III: Deletion Criteria was added. Previously, the deletion of a DXCC country was a very ad-hoc process. The addition of the deletion criteria was meant to make the process of removing DXCC countries more easily understood by the DX community.

Paragraph (b) of the deletion criteria is unambiguous: "When two or more entries that have been separate DXCC countries under Point 1 [Government] unite or combine into a single entity under a common administration, one new DXCC country is created and two or more DXCC countries become deleted."

Since both Yemens were clearly "legitimate" Point 1 DXCC countries, they will both be deleted from the DXCC list, effective May 22, 1990. The new Yemeni Republic will have a start date of May 22, 1990, and instantly becomes the Most Wanted Country in amateur radio, as nobody has worked it! Such a DX plum will attract DXpeditioners from all over the world. How long will it be before the Republic of Yemen is on the amateur bands for the first time?

Meanwhile, East and West Germany are moving closer to a unified country. At some point, probably when telecommunications and callsign allocated are unified, both the German Democratic Republic Y2 and the Federal Republic of Germany DK will be deleted from the DXCC countries list. The former country of Germany, which was deleted in 1973, may be restored. It's too early to call this one.

Two or Three Canadas?

The Canadian province of Quebec once again hums with murmurs of succession from Canada. If this happens, will we gain some new DXCC countries in VE-land? Will the separation of the Maritime provinces (New Brunswick, Prince Edward Island, etc.) from the rest of Canada by Quebec mean yet another new DXCC country?

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 updated 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 (U.S.) for each mode, with no fees required for up-dates.

MIXED

3879	YU2AA	2192	YU7BPQ	1695	N6JM	1285	I0AOF	1020	YU1PJ
3658	F9RM	2176	SM7TV	1682	W8UMR	1276	YU7DR	966	YU3PG
3415	K2VV	2147	PY4OD	1680	K2POF	1257	DF6EX	960	K1BAZ/DV1
2978	YU2TW	2135	IN3ANE	1676	YU2TY	1242	JA6GWU	943	K9BQL
2871	VE3XN	2116	IT9TQH	1665	K9LJN	1241	YU1GR	939	W9IAL
2864	K6JG	2107	K9BG	1623	K8LJG	1239	K7CU	917	YB0EMJ
2794	EA2IA	2102	N6CW	1609	WE2L	1228	AI6Z	909	NX9H
2750	W4BQY	2085	KA5W	1564	K9QFR	1224	NE6I	905	I5ZTC
2724	K6XP	2064	I2UIY	1560	I1POR	1202	JA1WJ	858	OE1KJW
2670	N6JV	2059	W9NUF	1559	K20LG	1202	JA1WJ	858	IK2BHX
2656	PY1APS	2039	K5UR	1557	YT7WW	1201	NV9S	816	N6IBP
2650	N4NO	2027	YU2NA	1553	W6OUL	1199	K5DB	806	RB5MP
2570	N4MM	2025	HA0DU	1545	YU2CQ	1190	PY2DBU	798	JA7XBG
2558	W9DWQ	2012	I2MQP	1542	DK5AD	1187	VE7EIK	797	F6CDJ
2547	WA8YTM	2003	I1EEW	1501	WB8ZRL	1184	F1HWB	781	NJ1T
2473	K0BLT	1977	4X4FU	1462	KB0G	1172	DF4ZL	776	W4WKQ
2472	I2PJA	1955	IT9QDS	1458	SM6CST	1166	LZ2JE	748	W4USW
2436	YU1AB	1945	DJ4XA	1450	4N7ZZ	1158	WD8IIC	734	YU7FT
2377	N9AF	1935	W0SFU	1445	LA7JO	1157	K3UA	710	W6LC
2344	YU7BCD	1880	KF2O	1402	AC2J	1130	KS0Z	661	IK2BLA
2243	PA0SNG	1851	SM0AJU	1374	I2EOW	1115	I2EAY	650	WM0G
2237	YT7DX	1834	HA8XX	1370	HA0IT	1107	WB3DNA	638	DL6UQ
2225	I8YRK	1749	KL7AF	1345	W9IL	1098	5H3RB	638	5H4BH
2221	SM3EVR	1740	I2DMK	1338	GM4OBK	1037	CT1QF	607	WK0B
2217	I6SF	1737	N6AW	1300	VE1ACK	1036	G4SDJ	600	VE3OMM
2214	N2AC	1732	W4UW	1293	YU3NU	1036	VE3NUP	600	K9QFR
2206	YU7SF	1718	SM6DHU	1290	YB0TK	1029	YU7RU		

SSB

3589	F9RM	1871	I2MQP	1419	EA4KK	1097	AG2K	876	I3ZSX
3256	I02V	1801	WF4V	1403	KD9OT	1084	DK5WQ	875	NE6I
2955	K2VV	1795	EA8AKN	1402	AC2J	1072	I8LEL	850	IT9ONV
2861	ZL3NS	1782	I1EEW	1400	KL7AF	1063	WA2FKF	836	KB0G
2669	K2POA	1757	I2UIY	1397	LU8ESU	1059	I2WZX	834	K9BQL
2593	K6JG	1741	K5UR	1378	I2EOW	1044	K2POF	806	K3UA
2572	VE1YX	1712	W3ARK	1364	CT1BY	1041	K8LJG	805	KB2DE
2478	I2PJA	1709	WA4QMQ	1356	KK0L	1029	YB3CEV	797	LU8DWN
2420	K6XP	1702	KA5W	1338	IK5ACO	1029	G4SDJ	792	AI6Z
2349	I0AMU	1690	HA8XX	1302	I1POR	1028	W0ULU	776	5Z4BP
2348	WD8MGQ	1646	G4CHP	1246	N6FX	1022	KB0C	776	KB4HU
2338	N4MM	1626	W9NUF	1243	CT1AHU	1017	EA1AK	758	HR1FC
2227	W0YDB	1623	W4UW	1242	KE6KT	1009	CX6BZ	750	K8MDU
2201	CT4NH	1608	KF20	1234	K9LJN	1001	W3GXK	749	EA3FHT
2169	14ZSQ	1596	EA3AQC	1225	EA2AOM	997	IT9JKY	748	KA0ZFX
2097	W4BQY	1590	CT1FL	1221	N2AC	995	IK7DBB	744	IK0EIM
2073	ZP5JCY	1587	YU2NA	1214	YU7SF	989	WN5MBS	702	IK2AEQ
2061	I6ZJC	1554	I5ZJK	1205	YV1CP	989	KS0Z	698	A41JV
2025	WA8YTM	1537	WE2L	1199	F6BVB	959	WB6GFJ	697	A4XJV
2006	N4NO	1535	K8KCI	1197	I2TZK	941	W6OUL	696	IK7BDN
2004	OZ5EV	1524	K5RPC	1195	AB9O	940	K3IXD	662	KA5YCM
1976	PA0SNG	1521	KC8YM	1186	IK8GCS	915	WB6SRK	661	NM5Y
1968	EA2IA	1507	CT4UW	1184	F1HWB	910	IK2DUU	643	EA3EQT
1965	I8YZP	1482	G4CPJ	1176	WB8ZRL	909	W5ILR	631	KA5RNH
1937	NJ0C	1464	SM0AJU	1174	HK6BER	908	CT1DIZ	630	SM6CST
1933	I8YRK	1453	K9QFR	1169	SM6DHU	895	N2AIF	612	K1BAZ/DV1
1932	I4CSP	1440	XE1OX	1153	PY4VX	894	NK2H	612	KA9MOM
1917	IT9TQH	1424	PY4OD	1136	KC8CC	883	GM4OBK	607	I6KYL
1878	W9DWQ	1420	PY4OY	1106	I8WYD	878	HA0IT	602	K5HT
1876	YU7BCD								

CW

2803	K2VV	1711	N4MM	1285	W1WAI	1123	K8LJG	838	JJ1FSK
2717	WA2HZR	1630	VO1AW	1274	SM0AJU	1088	HA8XX	830	YU2GIJ
2650	N6JV	1611	K5UR	1266	I7PXV	1078	AK9Z	826	G4MVA
2579	ON4QX	1609	W9NUF	1252	YU3NU	1052	ZS6BCR	813	JA2GCW
2324	N4NO	1586	I1ZEU	1240	F6HKD	1039	SM5DAC	803	W0JIE
2301	VE7CNE	1517	DJ4XA	1234	KF20	1024	NN4Q	803	VS6UW
2206	W3ARK	1515	N4YB	1203	I8YRK	1012	NF5Z	802	I1EEW
2146	W4BQY	1504	JH3CXL	1194	DK1CZ	1008	HA5LZ	801	KA1CLV
2142	K6JG	1497	IT9VDQ	1188	G4SSH	1004	0Z5UR	762	OE1KJW
2135	EA2IA	1476	KA7T	1181	YU2CQ	994	DL2HBX	754	K1BAZ/DV1
2116	W9DWQ	1444	I2DMK	1177	G4UOL	993	VE4CE	753	NJ1T
2088	YU7SF	1437	KA5W	1177	LA9XG	985	AI6Z	744	IS0FIC
2042	I1YRL	1374	I2UIY	1166	SM6DHU	972	GM4OBK	728	YU1PJ
2034	K6XP	1371	K9LJN	1152	KB0G	965	I2EAY	707	W9IAL
2030	N2AC	1349	KL7AF	1150	DJ1YH	938	K3UA	704	K6UXO
1965	I6SF	1346	N6FX	1145	W8IQ	917	EA1AK	700	WE2P
1899	WA8YTM	1341	SM6CST	1139	G3VQO	907	N4RNR	687	RB5MP
1868	YU7BCD	1334	K2POF	1134	N2AIF	878	WB8ZRL	623	WB5MTV
1857	LZ1XL	1326	YU2NA	1128	W6OUL	878	N4IR	618	PY4WS
1855	IT9TQH	1322	VE1ACK	1128	HA0IT	857	YU3PG	601	W4UW
1848	PY4OD	1307	TI4SU	1127	EA7OH	845	NE6I	600	4X6DK
1741	4X4FU	1292	W9PWM						

This seems unlikely. The administrative separation of Quebec from the rest of Canada probably won't be complete enough for the "country" to count separately for DXCC. Quebec and the rest of Canada will most likely continue to share a common currency, foreign affairs, embassies, national defense, postal system, callsign allocations, etc. The DX Advisory Committee will probably not consider such an entity as sufficiently "separate" to count as a new DXCC country.

In the unlikely event that Quebec *does* become a separate DXCC country, will the maritime provinces become another new DXCC country because of the separation of foreign land? After all, there is no way to draw a line between any of the maritime provinces and the province of Ontario without passing through the foreign land of the US or Quebec. However, the Northwest Territories is part of Canada, and they lie less than 100 miles from the northern tip of Labrador, at the Hudson strait. Thus, even if Quebec is a new

CQ DX Awards Program

SSB

1766	GM4NGJ	1771	I7VEZ
1767	CT1CQK	1772	TI2YO
1768	KD4YT	1773	WA1UDU
1769	N4THE	1774	N5HSF
1770	YV2EJU		

CW

791	WA8MEM	793	VE3PYA
792	IK2ILH		

SSB Endorsements

320	4Z4DX/324	300	XE1XM/303
320	YU1HA/324	300	KB1JU/302
320	I0ZV/324	275	YV2EJU/289
320	N4JF/324	275	WB8TLI/280
320	VE3GMT/323	275	I8IYW/277
320	K5OVC/321	275	NO4J/276
320	K1UO/320	275	WA5SUE/275
320	IT9ZGY/320	250	I7VEZ/261
310	WA4DAN/318	200	CT1CQK/211
310	KR9O/317	150	TI2YO/190
310	XE1OX/311	28 MHz	CT1CQK
300	XE1MDX/307	28 MHz	N4THE
300	WA2FKF/304	28 MHz	WA1UDU
3.5/7 MHz	CT1CQK	28 MHz	N5HSF

CW Endorsements

320	N4JF/324	300	W0HZ/308
310	K3UA/314	275	WA4DAN/297
310	IT9ZGY/311	150	IK2ILH/150

Total number of active countries is 323. 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 SASE. 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.

QSL Managers

3C1EA to EA4CJA
3D2QB to SM5BQB
3X1SG to ON7GV
4J0QWJ to UA0QBO
4K2BDU to UA9MA
4K2OIL to UA9MA
4K3ODX to RA1OA
4K4QQ to RA1QX
5N6ZHM to 5N6YBC
5W1HM to JH4IFF
5W1IZ to KD0DI
5W1KY to WA3HUP
5Z4BI to W4FRU
6W1FJ to F6CBL
6W1QB to DK3NP
7P8EN to ZS4TX
7X5ST to YU8CF
8J90XPO to JA3RL
9J2FR to I2ZZU
9K2KS to ON7LX
9L1US to WA8JOC
9N1FOC to K5VT
9Q5DX to KQ3S
9Q5UN to OH3GZ
9Y4/JA2EZD to JA2MNB
A22BW to DK3KD
A41KC to KA1XN
AH3C/KH5J to OH2BN
CU3LD to KB2FJG
CY9SAB to VE1CBK
EK9DR to RW3DR
EK9KBZ to UA0KBZ
EL2CX to N2AU
EN9ELT to G4OHX
ER4L to UA4LCQ
ER4LYL to UA4LU
F2JD/HR5 to F6AJA
FO9IGS to F6EEM
FO9SST to AA6LF
FO5BI/P to F6HSI
FR4FO to F6FYA
FR6FO to WA2NHA
FS/K2BS to W2GHK
FT2XE to F6ESH
FT4XG to FD1AAS
FT5XA to FD6ITD/F6ITD
FT5XH to F6GYV
FU8GJ to F6CXJ
FY5FO to F6BYZ
G4WYG/ST2 to G4OHX
GB2CCE to GM0EFH
GB6DX to G3VBL
HC8/HC4MZ to HC4MZ
HF9POL to KB6GWX
HR1LW to JA1LW
HR2JEP to WB6QPG
HV3SJ to I0DUD
HZ1AB to K8PYD
IB9/IK5JAN to IK5JAN
IG9W to IT9JKY
IJ5ONU to I5KKW
J28SI to DJ6SI
J3/JA2EZD to JA2MNB
J6/IK2EKL to IK2CFH
J88BS to WA4WIP
JG6CVO/JD1 to JG6CVO
JX7DFA to LA2KD
JY9SR to W3FYT
KA5UWW/KH2 to WW5F
KA6ZYF/KP4 to KA6ZYF
KG4CL to KC3CL
KH9/JF1MDK to JI1NJC
KH9AC to K7ZA
KH7/KH6JEB to KH6JEB
KH8/SM7PKK to SM7PKK
KH8/VK2EKY to WA3HUP
KL7AF/P to KL7AF
OL1A/JP to OK1TN
P29SC to WB1GWB
PA9GAM/ST2 to PA0GIN
PA3CXC/ST0 to PA3CXC
PJ2/OH6RI to OH6RI
PQ2DX to PY5TT
PY9FF to W9VA
R3MIR/7 to UW3AA
RF6FO to WA2NHA
RU3Y to RA3YF
RV9YF to RB7GG
RW9AT/RH6Y to UA9AQN
S20VT to K5VT
S21U to JH1AJT
S79D to WB4YZU
SV5/DK6AS to DJ8MT
T30BC to ZL2QW
T32AB to N7YL
T32AW to K1RH
T32B to JG2BRI
T5RM to HB9RTR
TA3B to K7SN
TG9/JA2PLT to JARL
TG9/KP2Z to JA5DQH
TI4SU/7 to TI4SU
TI4WAM/7 to TI4WAM
TK/PA3DQW to PA0KHS
TK5UC to F6AOI
TR8CJ to G3ORC
U1IB/UI8IAX to UI8IAJ
UA9/G8GWA to G4PKT
UA9KG/A to UA0KCL
UA9QT/U8K to UB5VFT
UC5A/UA6EO to UC2AHZ
UD6DWW to W3HNK
UD7ODJ to UD6DJ
UG/UV3ZZ to UA9AB
UG7GWG to UG6GAT
UI1D/UI8IAY to UI8IAJ
UM4N/UW4CF to UW4CF
UW8V/UA9UBG to UA9AB
UZ9MWV to UA9MV
V31DX to KA6V
V47KTG to AI6M
V47NZD to W1JZD
V63AH to KB3R
V73AT to K2CL
VK9TR to VK5FG
VP2EOH to K8BL
VP2EXX to KC8JH
VP2V/KG6WI to KU9A
VP5VKS to WM2C
VP8BFM to GM4ILS
VP8BXK to W9ARV
VQ9IF to KG5IF
VR200PI/XX to KB6ISL
VR6ID to KB6ISL
VR6JR to G3OKO
XU8CW to F2YS/W2
XU8DX to F2YS/W2
XX9JN to KU9C
Y90AHC to Y24AO
YM7SGP to TA1KA
YS1GMV to W3HNK
ZC4CZ to G4SSH
ZC4EE to G4SSH
ZC4HMS to G4SSH
ZC4JA to G4SSH
ZC4MK to G4WOQ
ZC4RSJ to G4SSH
ZD9BV to W4FRU
ZF2DR to K5RQ
ZF2PB to N7ARO
ZF2PP/ZF8 to WB6RSY
ZK1AK to VE7BXG
ZK1TB to W7TB
ZK1XN to KR0B
ZK1XQ to SM5BOQ
ZK2KK to SM7PKK
ZK2OQ to SM5BOQ
ZK2RW to ZL1AMO
ZM9AEM to NW4Y
ZY9FX to W9VA
ZZ9TA to PP1CZ
1SXV to BRA Venikong, P.O. Box 308, Moscow 103009
3DA9BK to Franz, Box 122, Evewi, Swaziland
4S7WP to Box 80, Colombo
5T5SR to P.O. Box 51, Atar, Mauritania
7X2DS to Box 105, Rouiba 35300 Algeria
A41JV to Box 2447, CPO Seeb, Oman
A45JV to P.O. Box 50202, Muscat, Oman
A45ZN to Box 981, Muscat
A45ZP to Gary, American Embassy, Muscat, Department Of State, Washington DC 20521-6220
BV2TA to Box 112/16, Taipei
BV2WA to Box 61-77 Taipei, Taiwan
BZ1OK to Wang, Box 6111, Beijing
BZ1SYL to Lee, Box 2916, Beijing PRC
BZ4RCC to Box 1827, Nanking
EK9AAC/4K4 to Box 73, Moscow 103051
HK9NZI to P.O. Box 1019, San Andres
JU1DX to Box 676, Ulan Bator, Mongolia
OH9MXY to Box 1, SF 21711 Korpo, Finland
PP5WB to Box 18, Sao Francisco do Sul 89230 Santa Catarina, Brazil
PZ1DY to Box 9131, Parbo
RA3MI to Alex, P.O. Box 101, Pere Slavl 151400
RA9ABK/RH5Y to Box 49, Dostlu 103051
TL8FT to Fritz, Box 7, Alindao Lar
TY1DX to IK6FHG, Ville Federice, 61020 Trasonni, Italy
UJ8AQ to Box 1171, Dushanbe 734064
V51P to P.O. Box 9080, Windhoek, Namibia
VP8CDR to Box 260, Port Stanley, Falklands
XW8KPL to P.O. Box, 3770 Vietien
YC3JVW to P.O. Box 18WO, Surabaya 60244A
ZK1BY to Kioko, P.O. Box 3, Tokaimura, Japan 31911
ZK2KY to P.O. Box 3, Tokaimura, Japan 31911

DXCC country, the maritime provinces will continue to count for Canada.

WPX Award Note

Norm Koch, K6ZDL, WPX Award Manager, has sent us the following: "When claiming a prefix which has been sent as K6ZDL/XV5, and you are claiming the XV5 for credit, it is requested that the CLAIMED PREFIX be listed in the proper alphabetical position, such as XV5/K6ZDL, if for XV5; or K6ZDL/XV5 if for K6. It makes research easier when the applicant makes his or her wishes known."

QSL Notes

The QSL route for Franz Josef Land station **4K2PGO** (ex-RZ1OWA, UK1PGO, EO1AOK, and UA1KED) is via Sergej Levchenko, RA9LA, P.O. Box 44, Ishim-6 627400 USSR.

Carl Ikaheimo, OH6XY, is the QSL manager for the 1989 CQ WW SSB multi-multi station **PJ9W.** His address is Box 1, SF 21711 Korppoo, Finland.

QSL other Finnish operations in the Netherland Antilles as follows: **PJ9M** via Touko Kapanen, SF 77980 Istunmaki; **PJ9V** via OH3VV; **PJ2/OH6NU** via Timo Korhonnen, Pillilammenk 5, 40270 Palokka; and **PJ2/OH6RI, 6FT, 6MW, 5BM, 4RH, 4QN, 4RW, 4TH,** and **1TD** via their home calls.

Krishna Khatry, **9N1MC**, has retired from the Nepal Ministry of Communications and will no longer receive any mail, including QSL cards, sent to the Ministry. QSL direct to Krishna Cottage, Ka 5/61 Lagankhel, Lalitpur, Kathmandu, Nepal, with IRCs (US $1.00 seldom makes it through the Nepal mail system).

The correct address for **LY2WW** (ex-UP1BWW), the Vingis Radio Club at the electronic manufacturing plant in Vilnius, is P.O. Box 2189, Vilnius 232049, Lithuania. (This up-dates information in the July issue.)

Jack Ciaccia, WM0G, handles the *stateside* cards for **UM8HM** and **Y48HL.**

ZC4CZ has had a new manager since 1989: G4SSH.

JH3DPB now has all the **XV2A** logs and will QSL all operations of that station.

Dick, N7RO, has to drop managing for **CW8B** and **CX8BBH** due to lack of log information.

N5FTR handles QSLs for **A41KJ, P29BT, Z21BA,** and **ZS4PB.**

QSL the 1990 WPX SSB operation of **4M9X** via YV5ARV, P.O. Box 3636, Caracas 1010-A, Venezuela.

QSL the **4B2A** (Mexico) operation via N7BSA.

Steve Hurst, KA7NOC, is helping Zoran, **YU1PJ** (YU1PJQ) with his awards. Send your cards to Steve at Box 213, Wendell, ID 83355.

QSL **TM5A** via F6IFR or the REF bureau.

Jay and Beth Weaver, **FY/N4QDX** and **FY/KD3FK** request their cards direct to 35 bis Cite Cesaire, 97300 Cayenne, French Guiana.

QSL **LY2ZA** via LY2BIM, Saulius Zalnerauskas, P.O. Box 787, Kaunas 233041, Lithuania.

William Hein, AA6TT, says the announced QSL address for his **AA6TT/V2** March operation (KC6EDP) is not correct in the 1990 Callbook. QSL to Box 3628, Culver City, CA 90231; SASE appreciated.

Cuba has set up separate QSL bureaus for each call district as follows: 1 and 2—Box 1, Ciudad, Habana 10100; 3—Box 16, Sta. Cruz Notre, 32900 Provincia Habana; 4—Calle 28 #2806 Apto 5, Edif-14, La Fe, Isla de la Juventud; 5—Ayuntamiento #8504, e/85 y 87, Matanzas; 6—Lorda #2, Sta. Clara, Villaclara; 7—Palses #774, Camaguey; and 8—Calvario esq. Jose A. Saco, Santiago de Cuba.

And following up on a May item, Jim, **V31BB**, stopped by our booth at Dayton to say that he *does* QSL, but only reluctantly, and after a variable delay of a year or more. He does not receive cards via the bureau. *(While a patient DXer may eventually receive a V31BB card from Jim, I recommend that DXers work and confirm a more-reliable Belize station.)*

QSL Manager Volunteers. The following stations have volunteered their services as QSL managers for DX stations: **LY2BIM** (address above); **HG7JBN**, Becsei Miklos, H-2100 Godollo, Furst S.U.14, Hungary; and Allen Swicinski, WB2PQG, 44 Point Pleasant Road, Hopalong, NJ 07843.

AWARDS

BY DOROTHY JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for August is:

Joyce B. Lagasse, WA1YZV
USA-CA All Counties #617
All SSB Mobiles, 5-5-89

"Tune in to The Wonderful World of Ham Radio." That really says a lot. I still find it amazing that I can sit in my car and talk to hams in New Zealand and Australia. Are you guys really that far away? You wouldn't be joshing me, would you? It hasn't become old hat to me yet, and I hope it never does.

"I became interested in ham radio when I was in high school and read the book *Calling CQ*. At that time I visually learned Morse code, but that's as far as I went.

"My sister married a ham (W1SGH/W0OQW). They did give me a license manual and other books, but they lived out of state. It wasn't until the second of my three children found those books, read them, and became interested, that I got the boost that I needed. 'Hey, Mom, they're giving code classes at the local ham club. Let's go.' And so we did (Pensacola, Florida).

"We got a receiver for Christmas that year and sent for a DX60B. While going to classes we built the transmitter. We'd double-check each others work, and it was a plus that my dad taught me to solder years ago. True, it was soldering pipes, but the theory is the same.

"The transmitter was finished, and we passed our Novice tests at about the same time. Our instructor, W4UBN, took the transmitter home to test it. It worked the first time it was plugged in—amazing! I didn't know the difference between a resistor, diode, or capacitor. Now I work with them at least 40 hours a week at National Semiconductor.

"Then it was time for our licenses to arrive. For several weeks the routine was turn on the rig, wait for the mailman, turn off the rig. Bob was WN4EOV and my call was WN4EFR (1973). We kept the rig hot. We took turns 16 to 20 hours a day.

"After we moved back to Maine, my time on the air got limited, but Bob went on to get his General class license, WA1UZD; and then ND1H, also DA1KM. For me life kept interfering with my hobby. I was off the air more than I was on. Just one time I thought of selling my gear,

Joyce, WA1YZV, on the county line.

Mobile as WA1YZV, Joyce at the controls running those Maine counties.

but I couldn't. I just refused to give up my dream.

"Finally, life evened out so I could set up my station *again*. I bought another license manual (I do have a stack of them!). I was going for my Technician class, then General. I'd do the hard part first with no thought of passing, just to find out what the test was like and what my weak points were. I was completely relaxed. This was a test run, not the real thing. 'You've passed the code test.' Darn, I'm doing things backward again, I thought to myself. Then came those words I wondered if I'd ever hear: 'Congratulations, you are now a General.' What beautiful words. I can't find the words to express the joy and excitement. It was worth the long wait, and I'm grateful I didn't lose hope and give up my dream.

"My car floated home. I stopped 20 minutes from home, called Larry (OM) and asked him to turn on my rig—a Heathkit 101. I had to get the tubes warmed up. When I got home I still had to find the mic, as it was packed away. What did I need a mic for? It was only used when Bob came home. Next, of course, was the phone call to Bob: 'How would you like to talk to your Mom on the radio?' (Thirteen years from Novice to General—is that some kind of record?)

"It took Bob about six months to really get me into county hunting. When he gave me the county hunter's kit for Christmas I figured out he was serious. That was a pretty big hint, or kick, so it's all his fault.

"Larry hasn't missed any meals, but he sure has cooked a lot of them and eaten alone. He deserves a lot of credit for the patience he's shown while I've worked all counties.

"Sondra, my daughter, mother of two and telephone representative for L. L. Bean, can't figure out why when Bob comes home (he's in the Air Force), we're always running around in the car talking on the radio.

"Ray, my other son, is busy chasing fires. He's a full-time fireman for the Portland Fire Department and a lieutenant for the Freeport Volunteer Fire Department.

"Some of the highlights were my first mobile trip with Bob from Wyoming to Maine, and when N0EYK and N7AKC took me to my first convention, Manchester, Tennessee, where I got to meet many wonderful people. I was so excited. I was sitting right on top of the world. Then I got my mobile rig and took that first mini-mobile trip. It was so exciting I could hardly talk.

"I do have a lot of wonderful friends, and I thank each and every one of you for being there. My cup surely runneth over! —73, Joyce, WA1YZV"

333 South Lincoln Ave., Mundelein, IL 60060

Awards Issued

Larry Hickman, KA9ZRW, collected all of his remaining confirmations and claimed USA-CA All Counties #657, USA-CA 3000 #686, USA-CA 2500 #765, USA-CA 2000 #833, USA-CA 1500 #916, and USA-CA 1000 #1112, Mixed, dated 4-5-90.

Dr. Hugh S. Unger, WB4UHN, completed the search and received USA-CA

USA-CA Special Honor Roll

Larry Hickman, KA9ZRW
USA-CA All Counties #657
Mixed, 4-5-90

Dr. Hugh S. Unger, WB4UHN
USA-CA All Counties #658
All 20M SSB, 4-23-90

Angelo Ferrari, I2PHN
USA-CA All Counties #659
All 20M SSB Mobiles, 4-24-90

Wayne Bollschweiler, WB7QID
USA-CA All Counties #660
All SSB, 4-30-90

Tom Campbell, W2EZ
USA-CA All Counties #588, 10-22-88
Endorsed All CW, 4-11-90

All Counties #658, USA-CA 3000 #687, and USA-CA 2500 #767, All 20M SSB, dated 4-23-90.

Angelo Ferrari, I2PHN, logged that elusive "last one" and filed his good application for USA-CA All Counties #659, and USA-CA 3000 #688, All 20M SSB Mobiles, dated 4-24-90. This is USA-CA All Counties #1 to Italy.

Wayne Bollschweiler, WB7QID, made a clean sweep of it and claimed USA-CA All Counties #660, USA-CA 3000 #689, USA-CA 2500 #768, USA-CA 2000 #834, USA-CA 1500 #917, USA-CA 1000 #1114, and USA-CA 500 #2416, All SSB, dated 4-30-90.

Tom Campbell, W2EZ, completed his brass-pounding requirements and had his USA-CA All Counties #588, dated 10-22-88, endorsed All CW on 4-11-90.

USA-CA 500 certificates went to:

Kirk Carl Wheeler, KB7GOW, USA-CA 500 #2409, All 10M SSB, 4-7-90.

Milos A. Oblak, YU3EO, USA-CA 500 #2410, Mixed, 4-7-90.

Arkadiy Nigamov, UA9JH, USA-CA 500 #2411, All CW, 4-9-90.

Shinobu Kataoka, JH8BOE, USA-CA 500 #2412, Mixed, 4-11-90.

Leon Fletcher, N6HYK, USA-CA 500 #2413, Mixed, 4-13-90.

Bernard Quinn, KD3QP, USA-CA 500 #2414, Mixed, 4-23-90.

William R. Welch, K1CLN, USA-CA 500 #2415, All SSB, 4-26-90.

Wayne Bollschweiler, WB7QID, USA-CA 500 #2416, All SSB, 4-30-90.

USA-CA Honor Roll

3000		1500	
K4MF	685	K4MF	915
KA9ZRW	686	KA9ZRW	916
WB4UHN	687	WB7QID	917
I2PHN	688		
WB7QID	689	**1000**	
		N7LWX	1111
2500		KA9ZRW	1112
K4MF	764	YU3EO	1113
KA9ZRW	765	WB7QID	1114
KA1CLV	766		
WB4UHN	767	**500**	
WB7QID	768	KB7GOW	2409
		YU3EO	2410
2000		UA9JH	2411
K4MF	832	JH8BOE	2412
KA9ZRW	833	N6HYK	2413
WB7QID	834	KD3QP	2414
		K1CLN	2415
		WB7QID	2416

The total number of counties for credit for the United States of America County Award is 3076. The basic award fee for subscribers to *CQ* is $4.00. For nonsubscribers it is $10.00. Initial application must be submitted in the USA-CA Record Book, which may be obtained from CQ Communications, 76 North Broadway, Hicksville, NY 11801, USA for $1.25. To qualify for the special subscriber rate please send a recent *CQ* mailing label with your application. To be eligible for the USA-CA, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated April 2, 1985. A complete copy of the rules may be obtained by sending an SASE to Dorothy Johnson, WB9RCY, USA-CA Custodian, 333 South Lincoln Avenue, Mundelein, IL 60060 USA. DX stations must include extra postage for airmail reply.

Awards Available

Key Award. The Key Award is sponsored by the Willenhall and District Amateur Radio Society. Following its success in the U.K., the Key Award is now being offered to all licensed amateurs outside the United Kingdom.

To obtain the award simply establish contact with U.K. amateur stations and ascertain the National Telephone Codes (area codes) for their locations—e.g., London, 071 and 081; Birmingham, 021; Edinburgh, 031; Belfast, 0232; etc. There are over 4000 area codes available, but a certified copy of your log to include 100 different area codes is needed to qualify for the award.

Valid transmission modes are AM, FM, SSB, and CW; all bands (where applicable).

SWLs are invited to apply for the award by submitting certified logs indicating that they have heard 100 U.K. stations participating in the Key Award program.

The fee for the Key Award is $5.00 in the form of an international money order, or equivalent in IRCs, to be sent to The Awards Manager, Willenhall & District ARS, P.O. Box 252, Willenhall, West Midlands, WV13 3DW, England.

This award commences on 15 July 1990. Willenhall is situated in the Industrial Midlands of the United Kingdom, the center of the lock and key industry.

KARL Award Program. The Korean Amateur Radio League (KARL) sponsors the following four awards, which are available to HLs and all amateurs/SWLs outside Korea.

HLA (HL Award). This award will be issued to all amateurs/SWLs who received QSL cards from any HL stations (except HL9s), depending on the number of contacts made (heard) with (from) HL stations (except HL9s). Depending on the number of contacts made (heard) with (from) HL stations, one or more of the following classes may be claimed.

Class K: 5 QSLs required
Class O: 10 QSLs required
Class R: 20 QSLs required
Class E: 30 QSLs required
Class A: 50 QSLs required

Stickers to affix to certificates endorsing additional credits are available in multiples of 50 upon submission of QSL cards.

HL Award offered by the Korean Amateur Radio League.

All Korea Award for working Korean call areas.

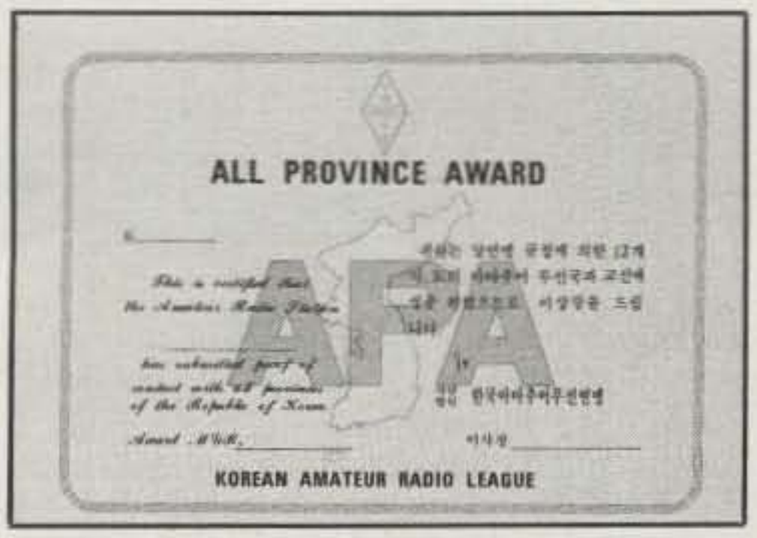
AKA (All Korea Award). This award will be issued to amateurs/SWLs who received QSL cards from HL stations—at least one from each of the seven (7) different call areas (1, 2, 3, 4, 5, 8, and 0).

KDN (Korean District Number Award). This will be issued to amateurs/SWLs who received at least one QSL card from HL stations located in each of the 50 different cities, Guns or Gus in Korea. The award will be issued in multiples of 50 (KDN 50, 100, 150) upon submission of cards with list prepared in order of KDN reference numbers.

APA (All Province Award). This award will be issued to amateurs/SWLs who received QSL cards from HL stations located in each of the different special cities and provinces in Korea. Area codes for cities and/or provinces are as follows:

Area Code 1—City of Seoul

Korean District Number Award available from the KARL.



All Province Award for working radio amateurs in Korean cities and provinces.

Area Code 2—Inchon City, Kyonggi-do, Kangwon-do

Area Code 3—Chungchongnam-do, Chungchongbuk-do

Area Code 4—Chollanam-do, Chollabuk-do, Cheju-do

Area Code 5—Pusan city, Taegu city, Kyongsangnam-do, Kyongsangbuk-do

General Rules and Requirements. Eight IRCs will be charged per award and 4 IRCs for each HLA sticker. If QSL cards are submitted, IRCs enough for return postage must also be sent. Endorsements for operating distinctions such as bands, modes, and QRP may be applied for. Proofs of contacts/receptions made with any HL stations (except HL9s) on/or after February 3, 1959 will be accepted. Proofs of contacts/receptions made with U.S. Army stations in Korea (HL9 call area) will not be accepted. All contacts must be made within the same call area.

Mail your application to Korean Amateur Radio League, C.P.O. Box 162, Seoul 100, Korea.

Amsterdam DX Certificate (ADXC). The Amsterdam DX Club issues the Amsterdam DX Certificate to all radio amateurs who submit proof of two-way communication with ten members of the club, and who did receive QSLs of the members concerned.

Contacts may be made over any period starting January 1, 1957, in any mode, and a log extract signed by yourself and two fellow amateurs will be accepted.

The cost of the award is 6 IRCs, $3.00 U.S., 1 pound (U.K.), or DF1. 5,—. Applications may be sent to ADXC Club, P.O. Box 9, 1000 AA Amsterdam, The Netherlands. Requests for current club membership lists may also be sent to this address.

The Amsterdam DX Certificate was first issued in 1957, and it is the oldest city award in Holland. Due to this fact, amateurs whose QSLs were valid some years ago may have moved to other parts of Holland or may no longer be active. However, QSLs from stations backdated to January 1, 1957 who were members of the Amsterdam DX Club at the time of the QSO are still valid. They usually have some type of ADXC marks on them such as "valid for ADXC" or "member ADXC." Furthermore, over the years numerous types of adhesive labels and stickers were used to publicize the award, and older labels also have membership lists printed on them. Some amateurs have the ADX information printed on their QSL cards, and special QSL cards were printed for ADXC members on a few occasions.

Contacts made with ADXC members operating mobile, portable, etc., from any location in Holland are valid. Contacts with members operating abroad or maritime mobile are not valid.

Contacts made under a previous callsign or a special prefix are of course valid for the award. However, all contacts must be made with your own private callsign and from the same country. The award will be issued to the callsign mentioned in the application letter.

Of Interest To County Hunters

The North Central District County Hunters Convention will be held at the Karakahl Inn, Mt. Horeb, Wisconsin on September 28 and 29, 1990. Rooms are $39 single, $42 double; registration is $8 single, $10 couple. Friday fish fry, Saturday banquet, golf course, indoor pool. Questions? Contact Arnie, K9DCJ, or Lorraine, Route 1, Box 85, Blue Mounds, WI 53517, telephone 608-795-2672.

Until next month . . .

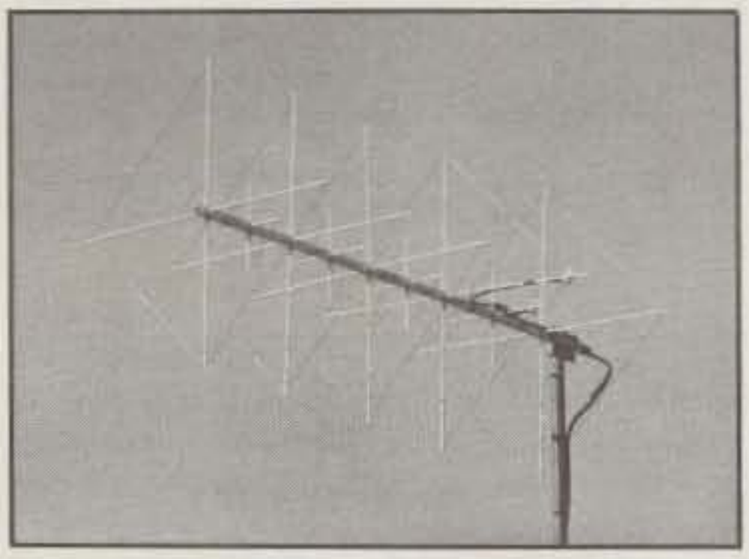
73, Dorothy, WB9RCY

CQ SHOWCASE

ITT Pomona Electronics Universal Adapter Kit

The Model 5698 Universal Adapter Kit allows the user to adapt almost any coaxial end termination style to another, creating combinations such as SMA to BNC, or BNC to double banana plugs for connecting coax to instruments. All adapters in the kit are constructed with gold-plated center pins and silver-plated bodies.

The kit includes two each: BNC male, BNC female, TNC male, TNC female, SMA male, SMA female, "N" male, "N" female; four intermediate coupling nuts; one double banana plug; and one double banana jack/binding post. Each of the double banana jack/plug adapters is fitted with an integral coupler to accept any threaded coax connector. Individual connectors may be joined with a coupling nut to any other to make the coaxial assembly needed. The Model 5698 kit, which comes in a plastic case, is priced at $99. For more information, contact ITT Pomona, 1500 E. Ninth St., P.O. Box 2767, Pomona, CA 91769, or circle number 101 on the reader service card.



Custom Antenna Systems DB2/70 Quad Antenna

Custom Antenna Systems' dual band 2M/70cm quad antenna has five elements for 2 meters and 9 elements for 70 cm. This UHF/VHF antenna is broad-banded and offers 12.5 dB forward gain on 2 meters and 10.5 dB on 70 cm. Front-to-back ratio is 20 dB. The antenna is 5 feet long, takes a mast size of 1 to 1⅜ inches, is end mounted, and needs only one feed line (you may feed both bands separately with a second feed line). The boom is constructed of heavy-wall ¾ inch rigid square tub-

ing and the element spreaders are ¼ inch solid fiberglass rods. The antenna weighs approximately 3½ pounds and will handle a wind load of 90+ mph.

The DB2/70 is priced at $109.95 (plus s&h). For more information, contact Custom Antenna Systems, P.O. Box 17012, Munds Park, AZ 86017, or circle 108 on reader service card.

Datacom III Software

The Datacom III software package allows centralized control of several radios from a single operating position. The radios may be controlled remotely via telephone lines, microwave link, or via a packet repeater. If the specific radios permit it, the program operates in a closed loop with the controlled radio and indicates to the operator if the link is not active. The package includes standard features such as entry of frequency and mode from keyboard input and progresses to more sophisticated functions such as sweeping frequencies between two limits, the ability to skew the radio's frequency from the keyboard, step scanning with variable scan interval adjustable by the user, logging the received frequency, mode, time, date, log reference number (supplied automatically by the radio and computer), and comments (supplied manually by the user).

Hardware required is an IBM PC compatible with 512K of RAM, one floppy drive, and a monochrome monitor. (The program works better with a color, EGA, or VGA display monitor and a hard disk, maker says.) At least one serial port is required. For more information on Datacom III and its add-ons and new additions, contact Data Communications International, Inc., Box 5205, Hollywood, FL 33083, or circle number 102 on the reader service card.

PACKET USER'S NOTEBOOK

BY BUCK ROGERS, K4ABT

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

Don't Kill The Goose That Laid The Golden Egg!

There is plenty to talk about this month and in months to come. After co-chairing the Dayton Digital Digest Forum with its founder, Dale Sinner of *The RTTY Journal*, I feel there will be plenty of news to last us a long time. We heard from Bob McGuire, Phil Karn, Harold Price, Pete Eaton, Bill Henry, Bob Slomka, Tom Clark, and many others who gave some interesting highlights to the session. Much of the input from these pioneers of packet and digital communications will prove to be useful contributions for the future of the packet hobby.

The most refreshing news is the fact that RM-7248 no longer looms over our heads as a threat to "legislate" assigned frequencies for HF packet, RTTY, and AMTOR BBS forwarding.

For the moment, automatic forwarding STAs for packet remain in the 14.107 to 14.113 MHz region, while AMTOR continues in the 14.060 to 14.080 MHz region. RTTY systems will continue in the 14.080 to 14.100 MHz slots.

After the many letters from the packet, RTTY, and AMTOR community to the FCC, the message was conveyed to the ARRL that more time and thought should be allowed in planning a proposal of this magnitude. The reason that most of us were unhappy with the proposal was the fact that packet, RTTY, and AMTOR BBSes would have been thrown into the same 10 kHz on some of the HF bands, and that would have meant chaos.

The request by the ARRL to remove their motion for these changes from possible rule-making at the FCC has given us another year to prepare a more rational approach to the proposal. If you have suggestions to add to the list that we have gathered, then by all means send them to me or address them to the ARRL Digital Committee. A year may seem like a long time, but it can suddenly pass, and the need for rulemaking may again become imminent. We don't need to be stampeded into major decisions at the last minute.

I sincerely wish to thank Bill Henry, Dale Sinner, Phil Lennen, and the many supporters who took time to write to the FCC objecting to the unwarranted changes that had been proposed. RM-7248 is behind us, so let's prepare for the future of the digital modes.

506 Pheasant Ridge Drive, Warner Robins, GA 31088

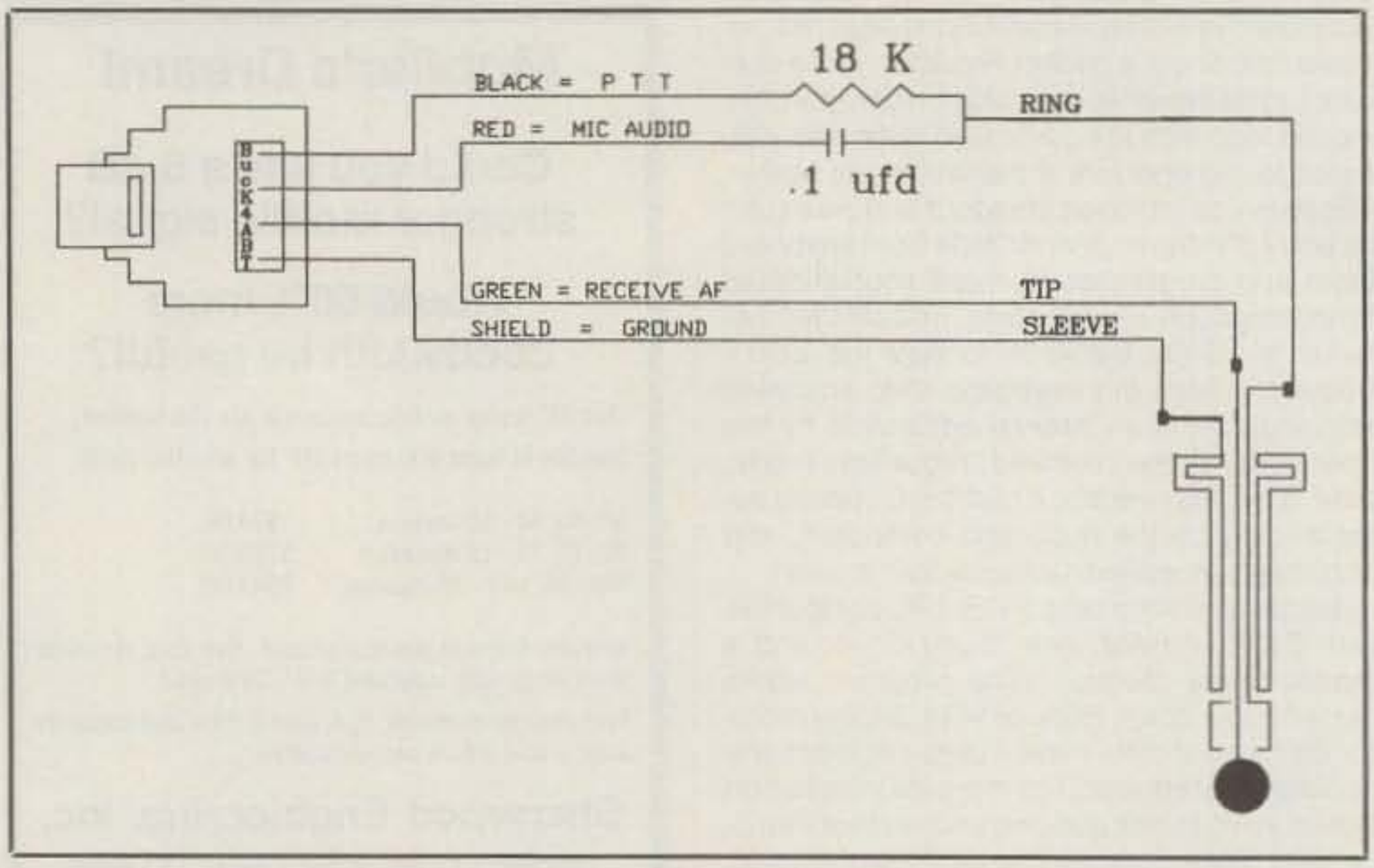


Fig. 1– For the notebook, Heath HK-21 to Alinco DJ-100P handie-talkie.

Are We Losing Control?

While I'm on the topic of BBSes and digital message forwarding, there is no better time to discuss a topic that I and other writers have side-stepped long enough. No matter how unpopular the subject matter may be, there comes a time when it must be addressed. In any way I approach it, this month's topic will not suit every reader of this column.

The readers who are daily users of the packet frequencies will agree that a growing number of packet BBSes are running out of control, and in a few instances are running totally "amuck." There will be a cry from others (mostly the SYSOPs) who don't agree. In both cases I expect to get plenty of mail defending both sides.

The truth of the matter is this: Before the BBS user points the finger at the SYSOP, he or she should first take inventory at the user level. Likewise, before the SYSOP accuses the user of wrong-doing, he/she should also take personal inventory.

In recent months I've watched carefully how the local BBSes become flooded with all manner of mail, messages, and files. The SYSOP would have to maintain a staff of proof readers, auditors, and censors just to keep some kind of order within one system.

Thanks to some innovative BBS software writers, built into the latest versions of BBS software are vehicles that enable some degree of automatic purging. Most of the file purging is done on a timeout, or length of time that a message or file has been kept on the BBS.

A Lethal "Apple-Box"

Not long ago the packet, RTTY, AMTOR, and APPLINK BBS systems presented us with the perfect modus-operandi for dispensing NTS (National Traffic System) and other message formats to the digital users throughout the world. Today this same medium has become the tool of the unscrupulous user and egocentric SYSOP.

My intent here is not to include all users in the unethical category, nor do I mean to imply that all SYSOPs are gifted with over-inflated egos. As we all have observed, there are a few of each kind. That is to say, there are immoral characters in the digital community who would use the BBS as a way to vent anger and frustration at another faction, person, or manu-

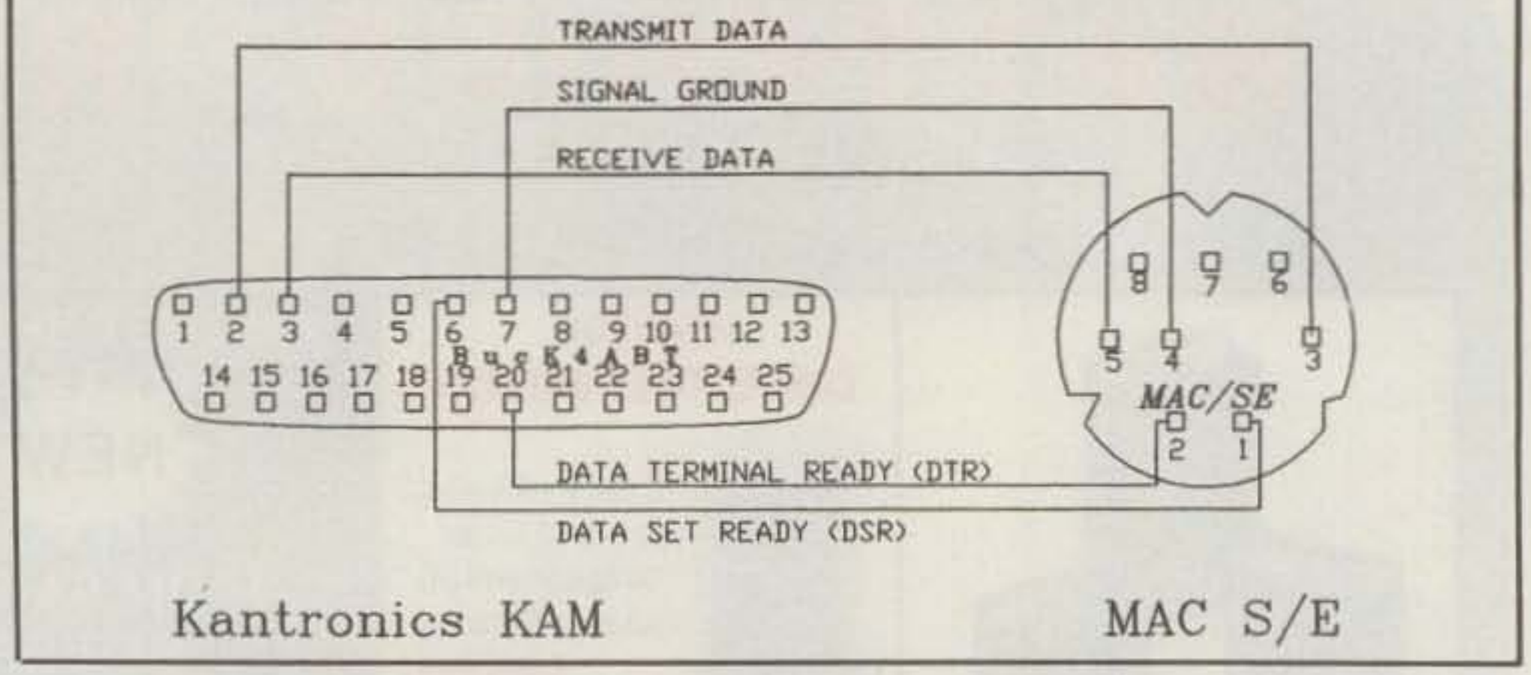


Fig. 2– Also for the notebook, Kantronics KAM dual port to Macintosh /SE.

facturer just to enhance his or her self-esteem.

In a similar fashion, there are SYSOPs who have elected themselves some form of god who wields power by sending notes to the user(s) instructing them in the evils of sending too many messages, or listing the same message with a different "bid" number, whatever that means. Remember this, users: A very limited number of BBS SYSOPs expect you to know as much about their BBS as they do. I know of one SYSOP who even went so far as to send a user a message telling him that if he wished to continue receiving mail at that (SYSOP's) BBS, he had better "kill" all his mail after it was read.

The "threat" of losing one's BBS privileges seems to be one of the most used ploys within this kind of SYSOP's horror chamber. Again, there are only a limited number of these "holier-than-thou" SYSOPs who fit into this category. It is only fair to advise them that they could be "playing with fire" in a "censorship" manner of speaking. To restrict an innocent user of his privilege to use a BBS that is made available to all packeteers could be an infringement of his rights as granted under the first amendment. This SYSOP falls into a class that uses the BBS as an extension of his ego.

The Flip Side

Now to the users who abuse the privilege, and the intent of the BBS. I cannot condone nor can I understand why a packeteer who has a small problem with a transceiver, handie-talkie, TNC, or broken-down refrigerator thinks he or she can get the problem resolved by placing a nasty, and many times untrue, message on a BBS addressed to "ALLUS."

Another legal point comes to light with this abuse of the packet BBS system when some user decides to "go public" instead of one-on-one with his discontent.

If you and I are in a QSO, and we talk about how bad my "XYZ" transceiver is behaving, then we are having a discussion between just the two of us. Now if I decide to put the same message on a BBS to broadcast it to many thousands of users, then I have just entered into the "broadcasting" mode. In short, I have begun to tread on very hallowed ground, and the results of my wrath could become the basis of some unfriendly legal proceedings.

Case in Point

I recently connected to my "home" (local) GARDS BBS, WB4EZL. There were several messages to me, so I went through the customary RM (read mine). After reading all my mail, I began looking through the message base at the messages addressed to "ALLUS." An "ALLUS" message is a message that is placed on a BBS and intended for "All the USA."

There were several messages that were about AMSAT and propagation, and one or two for-sale messages. There was one that caught my eye, mostly because the subject header was about a large amateur radio equipment manufacturer. The message header looked something like this: " 'JOHNDOE' TNCs Fail User-Group Tests." There was no way I could let this one get by without reading it, especially since it concerned one of the TNCs that I use daily. I read the message, which had originated two days before in California. The message contained several statements about the TNC that even I knew were untrue. Furthermore, it gave the reader the impression that all the products manufactured by this firm were of poor quality and workmanship.

Being familiar with all the TNC manufacturers and their service policies, I first tried to reach the originator of the message. This became an exercise in futility. My next call was to the manufacturer to determine if they had heard about the equipment assassination attempt via the BBSes. It came as no surprise to hear that not one but many calls had come to them about the underhanded and seemingly devious message. While I was discussing the message with the CEO of the

company, he told me that they too had tried to reach the originator, or to find anyone who had even heard of the users group mentioned in the message.

The users group had never been heard of by anyone in the area where the message originated. It would seem the users group mentioned might consist of the originator and his unsuspecting flea-collar carrier.

You Can Make More Bees Happy With Sugar Than With Salt

This kind of "grand-standing" or perverse "apple-boxing" serves no purpose. In fact, it tends to give the OEM (original equipment manufacturer) the idea that we are not appreciative of the work they are already doing. The OEM is fully aware that the packeteer has one of the most lethal weapons at his/her fingertips in the form of the packet station keyboard. Let's try to resolve the problems at the place where they get the most attention, and that is at the source, not via the airwaves.

The CEO of the company who was the target of this devious message assured me that had any problem like those listed in the message been brought to their attention, they would have acted immediately to resolve them. He told me that his policy was simple and easy—make the customer happy, and resolve any problem attributed to OEM defect.

This is the same old adage "You can catch more flies with sugar than you can with salt." He remarked, "It has always worked, and continues to do so. When the customer is happy, so are we."

Out of Control!

This incident is not an isolated case, nor is it the only one that I've encountered on the packet, RTTY, AMTOR, BBS/NTS system. Take it from many who use the BBSes, "There are many messages like this and there will likely be more to come." This is why I ask if the BBS system is beginning to run "out of control."

There are more than 3000 packet BBSes on the air today, and there are more being added to this number each week. If we don't begin to build a means of self-policing within our ranks at both the user and SYSOP levels, then we shouldn't complain if some rule-making or law-making body steps in and does it for us. I for one would rather see us do the mending of our fences than have another entity provide what could be interpreted as unreasonable demands upon our traffic-handling system and methods.

The Originator Is Responsible

The content of a message or file should and does lie with the originator. There is no established rule that says the SYSOP is held responsible for the BBS message content. To hold the SYSOP responsible for the BBS data base would mean that a BBS SYSOP would have to have two full-time secretaries, and an "on-duty" SYSOP around the clock devoting full attention to every message or file sent to and from the BBS.

Far be it from me to say the above statement should be changed. I'm only stating that the message originator should be aware that any message that he or she places into the BBS message forwarding system can easily carry with it a serious caveat that can cause the originator more grief than it would cause the unsuspecting target of the message.

With the benefits that we acquire from our packet BBS network we must make every effort to protect it in as many ways as we can. At the same time let's keep the SYSOP informed of any "not-so-useful" messages that may have gotten by them. As for the SYSOP, it is in your best interest to appoint a remote SYSOP to help identify possible problems before they arise. You will find too that a remote SYSOP can help purge the old, outdated, or useless messages from the system. Remember, this is a hobby. Let's keep it a *fun* hobby. 73 de BucK4ABT

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

Books and More

This month we will explore the world of books for the well-appointed hamshack. Software news and views are also on this month's agenda.

From the Bookshelf

Antenna Compendium Vol. 2. Several months ago the ARRL released Vol. 2 of the *Antenna Compendium*, the first edition of which was released in 1985. Shortly after the release of the first volume, the ARRL editors started a new collection of articles, many of which originated as technical and construction papers that "overflowed" the capability of the ARRL's journal, *QST*, to absorb.

Six of the papers in the new 208-page volume contain listings of computer programs that are suitable for use with an IBM PC or compatible computer. These programs are offered separately from the book on a 5.25 inch, 360K computer disk that contains 11 BASIC programs and one compiled Pascal program.

The full range of topics included in Vol. 2 is too extensive to list here. However, suffice it to say that some of the more interesting and unusual topics covered include new design and construction data for steerable vertical arrays, inverted bobtail curtains, attic tribanders, coil-shortened quads, computer-based traps, end-coupled resonator (ECR) loops, balloon and kite-supported antennas, apartment window slot antennas, and much more. Various technical topics are addressed as well, including antenna tuner design, baluns, computer antenna modeling, matching network design, and HF signal propagation.

The book is available for $12 and the companion diskette is $10; both are available together for $18, plus shipping. For more details contact the ARRL at 225 Main Street, Newington, CT 06111.

The Auto Radio: A Romantic Genealogy. Donald W. Matteson's 296-page treatise on auto radios is clearly a labor of love, produced after many years of pursuing the fascinating story of the car radio's evolution from about 1925 onward.

Matteson's book briefly summarizes the history of telecommunications and transportation, chronicles the early development of radio broadcasting, and moves through the evolution of the automobile radio from an embryonic idea in the "Roaring Twenties" to present sophisticated audio systems.

The book focuses especially on the years 1925–1929, which the author views as the formative years in auto radio development; it then moves on to the "golden years" from 1930 to 1942—years of great expansion in the auto radio industry. A wealth of historical details, technical information, and nostalgia on popular sets is included. Almost any company involved in any way with the auto radio industry is mentioned, including not only popular and well-known names such as Motorola and Philco, but also lesser names such as Case Radio, Pee-Wee, and Kinetphone. An addenda incorporates a list of manufacturers, a glossary, and an index.

The book is priced at $34.95 and is available from Thornridge Publishing, Box 11, Jackson, MI 49204.

Amateur Television Quarterly (ATVQ). ATVQ is well into its third year of publication, and it's growing in popularity and acceptance in the ATV community. The magazine was founded to be a high-quality, specialized journal to promote technical development, public service, and goodwill in the ATV community. Special focus is on color transmission, construction projects, operating and repeater news, and questions submitted by readers.

A one-year subscription to ATVQ is priced at $15. For more information, contact Amateur Television Quarterly, 1545 Lee St., Suite 73, Des Plaines, IL 60018.

The 16-page 1990 MFJ catalog is a gadgeteer's delight. The free catalog includes antenna tuners, a portable transmitting antenna, SWR bridge/wattmeters, coax switches and dummy loads, antenna and RF noise bridges, RFI choke kits, an artificial ground system, SWL accessories, amateur software (IBM, Mac, and Commodore), and more. For a catalog, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762.

Talk to the World. Joining the recent spate of books designed to tell one how to obtain an amateur license is this new TAB book by Jim Dux, K3JD, and Mort Keyser, N3MK. Their 140-page entry isn't intended to be a technically oriented license study guide. Rather, it's designed to reduce or eliminate the fears and misconceptions that surround the rank beginner's conception of the amateur radio hobby. The book includes discussion of the currently available licenses, with special emphasis on the requirements for the Novice license and the volunteer testing involved. Also included is information on setting up a beginner's amateur station.

The K3JD/N3MK book is priced at $11.95 and is available from TAB Books, Inc., Blue Ridge Summit, PA 17294-1024.

1990 World Satellite Annual. According to the publisher, this book is intended as a stand-alone reference to the future of satellite communications, but it also supplements the second edition of the *World Satellite Almanac* issued in mid-1987. The annual is intended to keep the satellite community abreast of technical developments that will affect the industry during the next decade.

Not limited to coverage of amateur satellites, the book addresses areas such as mobile satellite communications systems, plan array antennas, satellite launch vehicles, high-definition television (HDTV), the Intelstat and Intersputnik systems, and various next-generation satellite systems such as the Eutelstat II, Intelstat VI and VII, Anik E, Superbird, and the new U.S. "domsats" recently approved by the FCC. The 432-page book contains more than 150 new graphs, charts, and satellite-coverage "footprints."

The annual is available for $39.95 plus shipping charges from MLE, Inc., P.O. Box 159, Winter Beach, FL 32971.

Two from CRB Research. CRB's Judy Gibson recently sent me two new CRB books for review. The first is the *Air Scan Guide to Aeronautical Communications*. This book, first issued in 1979 and now into the 5th edition, is perhaps the most comprehensive guide to monitoring aeronautical communications yet compiled. It is authored by Tom Kneitel, K2AES, who also serves as editor of *Popular Communications*.

The 192-page guidebook is designed to be a standard reference guide to have at hand when tuning the aeronautical frequency bands, from HF to UHF. Listings are arranged according to state and city, with a VHF frequency log that shows the most important national aeronautical channels assigned to civil, military, commercial, and federal users. Expanded Canadian listings show all civil and military landing area and seaplane base two-way communications facilities.

317 Poplar Drive, Millbrook, AL 36054

Just a few of the many frequencies listed include approach and departure channels, control towers, air-route traffic control centers (ARTCCs), Civil Air Patrol, Air Force One, traffic helicopters, police aviation, ground control, weather, and others. The guidebook covers the United States, Canada, Caribbean, Pacific Territories, and the North Atlantic.

There's even some nostalgia in the book, with information on what author Tom Kneitel calls the "first stirrings of aviation radio." According to Tom, the first American aircraft radio license was issued in August 1922. Seven commercial radio licenses were issued in the 1922–23 period, all for operation on 571 kHz. By 1928 two airlines had embryonic networks of ground stations used to exchange messages with one another and also to send one-way messages to their aircraft. By 1930 aviation radio had "arrived," with the still-active Aeronautical Radio, Inc. (ARINC) establishing a network of 31 HF ground stations operating on various frequencies ranging from 278 kHz to 12.180 MHz.

The guidebook is priced at $14.95 plus shipping and is available from CRB Research Books, Inc., P.O. Box 56, Commack, NY 11725.

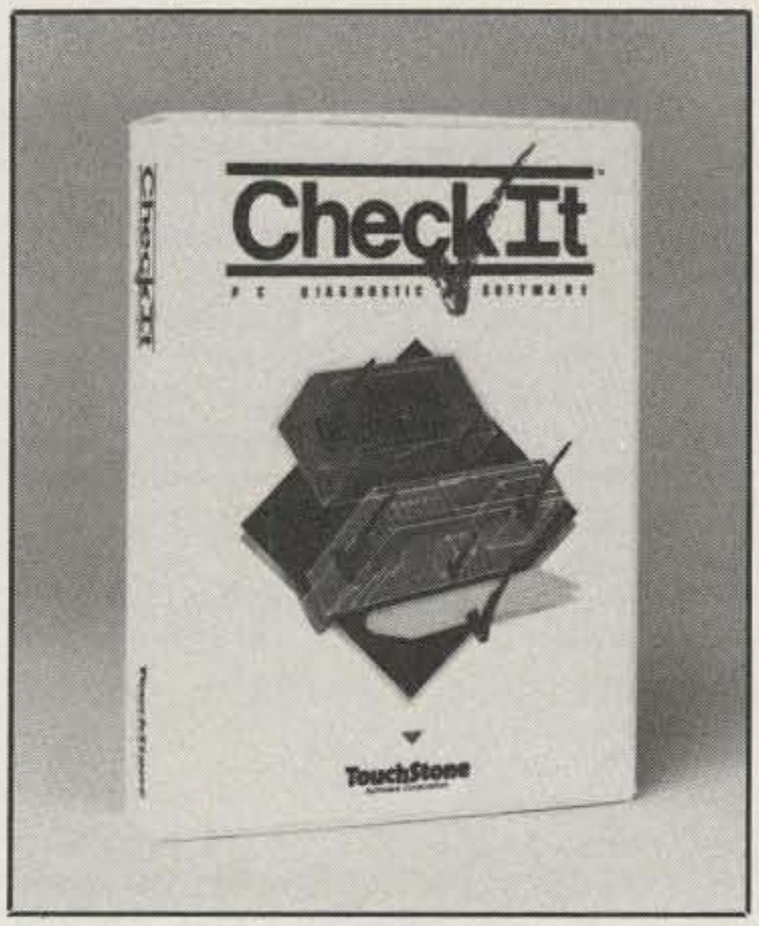
The second book we received from CRB Research is Bill Cheek's 160-page *Scanner Modification Handbook*. Bill's book covers more than 20 worthwhile performance-improvement modifications to popular scanners such as the Realistic PRO-34, PRO-2004, PRO-2005, and PRO-2021, as well as several Bearcat scanners, including the BC-200/205XLT, BC-760XLT, and BC-950XLT.

Some of the types of modifications covered include adding channels (including those blocked by the manufacturer), hooking up S-meters, improving squelch action, speeding up search/scan rates, improving audio quality, and protecting from voltage surges. Also included are modifications to interface a scanner with a communications receiver in order to add features such as fine tuning, noise limiting, and SSB reception.

The mods range from those requiring but a single snip of a wirecutter to more extensive mods requiring the addition of chips, boards, and switches. In addition to the modifications, the book also presents a number of scanner tips and hints, including many worthwhile suggestions on antenna and feedline selection, preamplifiers and converters, and emergency power sources. There also is a section explaining cellular mobile telephones and the legal ramifications of the Electronics Communications Privacy Act (ECPA) of 1986, which expressly forbids monitoring cellular mobile radiotelephone conversations and a wide assortment of other types of radio communications.

I found the book to be a good, easy-to-understand resource for the scanner hobbyist, being amply illustrated with photos, tables, and figures. It's priced at $17.95 plus shipping and is also available from CRB Research (address above).

Dvorak's Guide to PC Telecommunications. Although a licensed radio amateur since 1954, I recall the frustration in trying to reliably communicate via landline modem using my Commodore Vic-20 and 64 in the early 1980s. What confusion! Only when a few good, clearly written texts (such as those by telecommunications writer Alfred Glossbrenner) became available did the confusion begin to evaporate. Still needed has been a one-stop, authoritative book and software package that provides computer users with most everything they need to communicate successfully via landline.



CheckIt® is billed as an all-in-one PC diagnostic software package. It can produce reports of your hardware configuration and the system resources being used, test your system's hardware components, and display benchmarks measuring key aspects of your PC's performance. (Photo courtesy TouchStone Software Corporation)

In my view, the search is over with the introduction of *Dvorak's Guide to PC Telecommunication,* authored by respected computer columnist John C. Dvorak and programmer Nick Anis. While the book is priced at a steep $49.95, it's a heavyweight in more ways than its nearly 4-pound physical weight suggests. The book and software package's 1136 pages, 2 computer disks, more than 300 photos and illustrations, and coupons for discounts for up to $1500 worth of merchandise and services, make the price seem quite reasonable indeed.

The Dvorak and Anis book presents users with very easy to understand information on modems, how they work, and how to best use them. The authors include detailed information on each of the major electronic mail systems and bulletin board services, what they are, and how to employ them to best advantage. Also included are tips and tricks on linking two remote computers and even establishing a home-based office. The authors cover the major commercial and shareware telecommunications packages and the various online services, including even obscure databases. While the focus is on the IBM PC, the Apple Macintosh isn't forgotten, with the Mac being covered in some detail.

The book is divided into four parts. Part One is "A Layman's View" of the many elements of telecommunications. Part Two is the counterpart "A Technical View," and Part Three, "User Guides," is a set of condensed user manuals for the many programs included in the package. Part Four, "Appendixes," offers a broad array of reference materials.

Two disks are included with the combo. The first contains the "Modem Tutor" program which is designed to take the fear and confusion out of going online by providing the user with a realistic, slideshow-like experience of using online services and bulletin boards. The second disk contains the popular Telix SE™, a comprehensive and intuitive modem terminal program. Also included is an extensive set of freeware and shareware computer utility programs, several of which I have not seen elsewhere.

The Dvorak and Anis book and software package is available in most of the larger chain booksellers, or contact Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710.

Three from Brady Books. A number of excellent computer books crossed my desk recently. Three of these are from the Brady library.

First on the list is *Peter Norton's DOS Guide: Third Edition,* authored by the same gent who gave the computer world the famed Norton Utilities. Norton's book serves as an easy and practical guide to using all DOS versions up to 4.x, and it has been updated to include hardware references to 80386 and 80486 computer systems. The 408-page book is especially suited to computer beginners and is priced at $24.95.

The second Brady book I'll share with you is the 674-page *Understanding and Using dBase III Plus,* by Rob Krumm. For those amateurs who wrestle with setting up their own database applications using dBASE®, this all-in-one reference book is a godsend to navigating and mastering the sometimes arcane database programming commands used in DBASE III Plus. It's priced at $29.95. A similar, 816-page version is available for dBASE IV, and is also priced at $29.95.

The third book is an excellent companion for Krumm's book. It is *Fast Access dBASE III Plus,* an A-to-Z quick reference to the dBASE III Plus program's commands and functions. Organized by command, the book includes numerous detailed interactive programming examples as well as a number of hints and tips for increased productivity. The 289-page reference by Rhyder McClure and Tony Rizzo is priced at $16.95.

The Brady books, which are published by the Prentice Hall Press, should be available at most well-stocked bookstores. More information is available from the Prentice Hall Press division of Simon & Schuster, Inc., One Gulf & Western Plaza, New York, NY 10023.

Three from Wiley. If you've recently upgraded to DOS 4.x on your IBM PC as I have, you'll appreciate two recent issues from John Wiley and Sons. The two books made me aware of several features of the new DOS that I didn't quite grasp from reading the Microsoft DOS user's guide.

The first of these is *The New DOS 4.0,* by Ken W. Christopher, Jr., Barry Feigenbaum, and Shon O. Sliga. These three gentlemen should be in the know, since they are prominent among the IBM "architects" of the latest DOS versions. The authors cover practically everything, including considerable detail on the new DOS Shell with its pull-down menus, windows, and help screens. Topics also include basic DOS concepts, installing DOS 4.0, the DOS commands and utilities, "performance tuning" DOS 4.0, and more. The book is priced at $22.95.

Second is a complement to *The New DOS 4.0* by the same three authors. It's the *DOS 4.0 Reference,* a 216-page user guide that lists every DOS command and shell feature, showing you how and when to use them. The reference guide is arranged by task so that unlike dictionary-style guides you can quickly find the command and directions you need for any feature. It's $10.95.

In addition to these two DOS "how to"

books, a third new Wiley book is for WordStar users (like myself). It is *WordStar Professional Release 5: An Advanced Book,* by Ruth Ashley and Judi N. Fernandez. The new book is designed to help the WordStar® user take advantage of the program's many new and enhanced features, including windowing, footnoting, merging, indexing, and the like. I've found the book to be quite helpful, with its numerous exercises and examples distributed throughout its 347 pages. It is priced at $19.95.

The Wiley books are also widely distributed. Or, you can contact John Wiley & Sons, Inc., 1 Wiley Dr., Somerset, NJ 08875.

Three from Sams. Rounding out this month's selection of books are three DOS books from Howard W. Sams & Co., a division of the Macmillan publishing house.

The first one we'll pick up on is The Waite Group's *Understanding MS-DOS*, Second Edition, priced at $19.95. This is a beginner's quick start guide to DOS through Version 4. One of the "understanding" series, the book takes an easy-to-follow approach to DOS fundamentals to help the computer novice get up-and-running with DOS. Margin notes summarize concepts, and questions and answers are used to facilitate learning. The book runs 361 pages.

A more comprehensive and detailed book for both the novice and more advanced users is Alan Simpson's *The Best Book of: DOS*. The 643-page book includes tutorial-style chapters that are designed to make learning easy. The Simpson book covers all DOS versions, including Version 4 and the new DOS Shell. The book also contains information on optimizing computer performance with extended and expanded memory, RAM disks, and disk caching. There are also tips for using the latest computer options such as FAX boards, high-speed modems, and mice. I'm impressed by the fact that need-to-know information is presented without deadening technical jargon. The book is priced at $24.95.

Rounding out Sams' entries is The Wait Group's *Using PC DOS,* an authoritative 764-page reference source to all versions of DOS from 2.0 through 4, as well as OS/2. Containing a wealth of DOS information, the book has an introductory "Quick Primer" that explains important fundamentals. Tutorial sections provide hundreds of examples, tricks, and warnings, and the command reference section provides alphabetic reference pages for all DOS commands and for the standard device drivers. A "find it fast" lookup table inside the front and back covers shows where in the book you'll find answers to your DOS questions. One feature I particularly like in the command reference is a "compatibility box" that shows at a glance its associated DOS version. The book is priced at $26.95.

Sams' books are widely distributed through the national bookseller chains. Or contact Howard W. Sams & Company, 1711 North College, Carmel, IN 46032.

Software News and Views

Aristotle, Anyone? Dr. Albert P. Malvino has developed Aristotle™—The Artificial Teacher, as he calls it. A type of computer-assisted instructional (CAI) program, the system consists of a textbook and computer software. As you read the textbook, you watch "computer movies" about the basic concepts—roughly the equivalent of sitting in a classroom and watching an instructor draw on the blackboard.

In addition to giving you a lecture about the material you're trying to master, the Aristotle system includes a screen-based "artificial laboratory" called QUIK LAB™ because you can run experiments about 50 times faster than in real life. Basic circuits are shown on the screen, and with the keyboard you can run experiments, swap out parts, and troubleshoot.

Presently Dr. Malvino's company offers four complete courses for beginners: DC Circuits, AC Circuits, Basic Electronics, and Advanced Electronics. Future plans include courses in computers, digital electronic, computers, mathematics, and communications. There also are several mini-courses that cover special topics.

For more information and a demo disk, contact Malvino, Inc., 229 Polaris Ave., Suites 14-17, Mountain View, CA 94043.

CheckIt®. Most PC users conveniently just don't think about the day when something might go wrong with their PC; I know that I don't overly dwell on that possibility. However, the cold fact is that all computers *will* fail at least once, the question being when. Sometimes the problem is obvious, like a hard disk drive that won't boot. Other times the problem isn't so obvious and is much more difficult to track down, such as when the problem lies in a bad memory chip. Diagnostic software can help locate most problems you have with your system.

CheckIt is billed as an all-in-one diagnostic program that helps provide "quality assurance" for your PC. The program can produce on-screen and printed reports of your hardware configuration and the system resources it's using. It can also test the system's hardware components and display "benchmarks" measuring key aspects of your system's performance and power. The menu-driven program, which sports context sensitive help throughout, is generally easy to use, even by users who are not technically intimate with their PCs.

CheckIt is divided into three major components. The first of these is the System Information (SysInfo) Menu, which lets you display a list of the hardware and software installed in your PC, display the hardware interrupts (IRQs) of your PC, view the various configuration settings displayed in your computer's battery backed-up CMOS memory, and scan the list of block and character device drivers that are installed and available to DOS.

The second is the Tests Menu, which lets you access a wide selection of methods to probe the components of your PC. You can run diagnostic tests individually or by group, or you can test everything. You can test memory, hard and floppy disks, the system board, the real-time clock, serial and parallel ports, printers, video, and input devices (keyboard, mouse, and joystick).

Third, but certainly not least, is the Benchmarks Menu, which lets you measure the performance of three important aspects of your PC's computing power. Here you can check your computer's CPU (central processing unit) speed, its video speed, and its math speed. You can also check out hard-disk performance. As the program runs the benchmark tests, it draws bar graphs in each of three different boxes to graphically display the speed of your PC in performing different tasks; for the CPU benchmark, results from several popular computers are displayed for comparison.

In addition, CheckIt includes some "system tools" to help you fix simple problems. For ex-

CIRCLE 99 ON READER SERVICE CARD

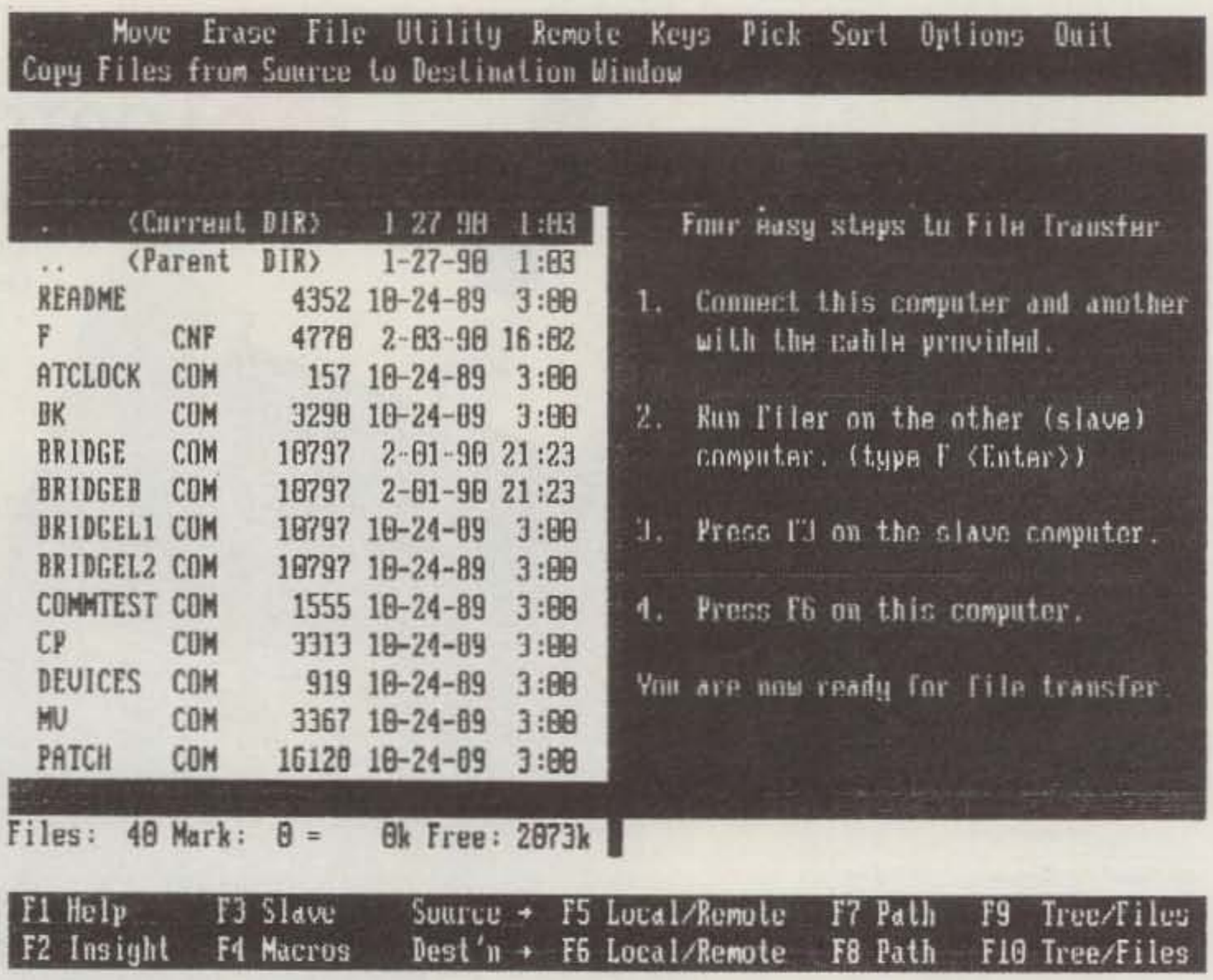


Fig. 1– The Brooklyn Bridge's Filer utility, shown here, provides a powerful but simplified means of controlling the Bridge's myriad computer-to-computer file transfer capabilities. The Filer is also a full-featured DOS shell which can be used as a standalone program.

ample, for a memory error the program's RAM locator shows you which chip to replace (assuming you've previously configured the program with your PC's memory setup). There's also a hard-disk formatter and CMOS date/time setup utility.

What did I think of CheckIt? It's a nifty program, arguably sporting the most complete armada of system diagnostics found in any comparable program for the IBM PC and its variants. It was, indeed, easy to use, with the exception of the RAM memory setup, which takes some understanding of how memory on a PC is configured, both electrically and physically. Also, in some cases the program simply reports that a test failed, without providing insight into exactly what was wrong or why.

In addition, the "tools" are rather limited in scope, especially with respect to hard disks, so you'll not want to dispose of your copies of PC Tools, Norton Utilities, Mace Utilities, and the like. CheckIt complements, but does not replace, utilities such as these. Finally, recognize that no software-based utility can save the day if your PC won't boot or if the display is blank: you'll need a plug-in POST (power-on self-test) circuit card and some knowledge of your computer's diagnostic messages for *that* kind of major catastrophe.

Overall, while CheckIt is rather expensive ($149) for hobbyist use, updates are very reasonably priced, and the serious computer user will recognize the program's real value when his system crashes. For more information, contact TouchStone Software Corporation, 909 Electric Ave., Seal Beach, CA 90740.

Post Script: Ted Needleman, "PC Capers" columnist in *CQ*'s sister publication *Modern Electronics*, did an in-depth review of CheckIt in the February issue of *ME*. If you're considering the purchase of PC diagnostic software, you'll surely want to examine Ted's CheckIt review.

The Brooklyn Bridge™. We've all heard the story of the out-of-town rube who was sold New York's Brooklyn Bridge. But the software kind of Brooklyn Bridge is a much better deal than the concrete-and-steel version the rube was pitched.

The Brooklyn Bridge, now in version 3.00, is a unique kind of software. It's a comprehensive file transfer and file management program that includes over 175 utilities that let you quickly and easily copy, erase, sort, select, rename, organize, and move files on any IBM PC-compatible computer, or *between* any two computers, including laptops and PS/2s. The program works its magic through a cable connected to either the parallel or serial port on each PC—both cables are included, and no circuit boards are required.

While the latest version of Brooklyn Bridge can legitimately be called a DOS shell, which it is, the package is at heart a program for expeditiously transferring files from one PC to another, such as from a laptop to a PC, or from a PC-XT to a PC-AT. Actually, there are two variations of the program included in the same package that provide quite different approaches to file transfer. In initially setting up the program's interface, you decide whether you want to use the command-line method or the menu method—though you can, if you like, set up for both methods and use either.

The command line method, which appeals to more experienced users, is very powerful, but requires that you have an understanding of how the DOS CONFIG.SYS file and the Bridge's own files work. This method uses regular DOS commands, allows access to remote printers and tape backup systems, and lets you work with remote drives (on the second

computer) from within your application programs. This approach, for example, lets you sit at the computer which you designate as the master and treat all disk drives on the slave machine as if they were additional drives on the master PC. You can transfer programs using the DOS COPY command, and can even run programs residing on the slave's disk drives.

The menu method is for the rest of us, as they say. Equipped with Lotus-style menus and point-and-shoot operation, the "Filer" program functions as a file manager to harness most of the capabilities of the Bridge. Filer lets you copy, move, erase, and otherwise manipulate files, change logged disk drives, create and remove directories, print directory trees and lists, search for specific files, and more—paralleling the capabilities of conventional DOS shells like XTree and WonderPlus, but customized for file transfer applications.

One of the few limitations of the menu method, using Filer, is that you can't run a program on the slave. But you *can* use the Filer as a standalone DOS shell even if you never plan to transfer any files between computers. Fig. 1 shows a typical Filer screen.

From experience, I can state that hooking up computers and transferring files through so-called "null modem" cables sounds easy, but typically turns out to be rather flaky and difficult in practice. But The Brooklyn Bridge includes a special, 7 foot RS-232 serial cable equipped with both 9- and 25-pin DB-type connectors to minimize connection problems; the serial cables allow you to transfer data serially up to 115,200 bits per second (bps). Also included is a special 7 foot parallel cable that lets you transfer data via the parallel port at claimed rates of 100,000 to 500,000 bps. Of course, you must have either an available serial or parallel port in order to transfer files.

Overall, this latest incarnation of The Brooklyn Bridge is a solid value that stacks up well against its competitors. While its $139.95 price may seem steep at first glance, it's really two software packages in one, and the manufacturer, Fifth Generation Systems, regularly runs attractively priced special offers for users of its other programs and for Bridge upgrades.

For more details, contact Fifth Generation Systems, Inc., 10049 N. Reiger Road, Baton Rouge, LA 70809.

The StarMouse™. In the January and February 1990 columns we reviewed our favorite wordprocessor, WordStar 5.5™, along with some add-on programs we found useful. At that time we had intended to review The StarMouse™, a menuing and mouse driver utility that enhances WordStar, but the version to be used with the latest version of WordStar was delayed in release.

The StarMouse is now available, adding complete mouse support to WordStar 5.0 and 5.5. The add-on utility lets you set the cursor and mark text within the editing window using the StarMouse's own "cursor control system," which lets you set the cursor anywhere within WordStar's "edit" or "directory of" windows. The StarMouse also allows you to select any of the menu options through the program's point-and-shoot features.

Although I'm a dyed-in-the-wool WordStar user, and use the latest version, 5.5, almost every day, I never really understood why WordStar Corp. didn't include complete internal mouse support, especially since many of its wordprocessing challengers do. The StarMouse and several competitors remedy that deficiency by letting you "mouse around" to your heart's content within WordStar. This lets you take better advantage of the program's array of pull-down menus than you could from the keyboard alone. The StarMouse also provides a compact auxiliary menu (accessed by pressing and holding the right mouse button) that covers all of the important but difficult to remember control keys supported by WordStar.

At $40 the program represents an inexpensive but very useful program add-on that in my opinion significantly improves WordStar's ease of use. It is available from Mostly Mice Software, Inc., 125 Gates Ave., Montclair, NJ 07042.

Wrapping It Up

That's all the space we can squeeze out this time, gang. Next month more Antennas & Accessories topics of current interest. See you then.

Overheard: The nicest thing about people with inflated egos is that they don't talk about other people.

73, Karl, W8FX

WASHINGTON READOUT

BY FREDERICK O. MAIA, W5YI

REGULATORY HAPPENINGS FROM THE WORLD OF AMATEUR RADIO

Code-Free Hamming Around The World

Ordinarily it wouldn't be news that Great Britain is in the process of adopting a Novice amateur radio operator license. What is significant, however, is the fact that the United Kingdom has had a code-free amateur license for some 25 years, and Great Britain still feels the need to further simplify entry into its amateur radio service. This month lets talk about what is going on in other countries that have a code-free amateur license and their experiences.

Amateur Radio In The United Kingdom

There are two general types of licenses in the UK. The Class A yields all privileges once an applicant passes the Radio Amateurs Examination (RAE) and a 12 word-per-minute Morse sending and receiving test. The Class B requires the same RAE, but no Morse code test. No-code Class B licensees have access to all bands except those below 30 MHz. They may upgrade simply by taking the 12 wpm code test—a simple and effective licensing system indeed.

The UK's Department of Trade and Industry (DTI, similar to our FCC) introduced the Class B code-free license in 1964. At that time it permitted only 420 MHz operation and above. Fewer than 1,000 British Class B licenses were issued during the first four years. It wasn't until 1968 when the DTI added the 2 meter band that the license became relatively popular. By 1970 the annual increase in Class B licenses was greater than that of Class A. This trend has continued to the present day. Many code-free licensees go on to take the Morse test and transfer to the full privilege Class A.

The CB boom hit the United Kingdom in the early 1980s. Many British CBers, experiencing radio communication for the first time, were attracted by the wider opportunities offered by amateur radio and came into the hobby mainly as Class B licensees. As a result, by 1984 the number of Class B licensees in the UK exceeded the number of Class A amateurs. The latest figures show a slight reversal of this trend. There are approximately 59,000 radio amateurs in the United Kingdom. About 32,000 hold the Class A ticket; 27,000 are Class B.

We thank Tony Smith, G4FAI, a London-based journalist, for the above statistics. Tony writes several continuing columns for amateur magazines in Great Britain. We asked him to tell us about amateur radio in the United Kingdom, since their situation is exactly opposite that of the United States. We have had a Novice "beginners" amateur license for about the same length of time England has had a code-free VHF/UHF amateur class.

Tony reports that in 1964 there was much apprehension about issuing VHF amateur licenses without Morse qualifications. "Today, Class B operation has become a major part of the UK amateur radio scene with activities taking place all over the spectrum." Packet radio and 2 meter operation are the most popular.

"Most newcomers come into the hobby via the Class B license, nearly always declaring their intention to go on to take the Morse," Tony wrote us. "Despite the current trend, many abandon this intention and remain on the higher frequencies. For some, this is because Morse presents an insurmountable barrier, but others clearly find the specialization of VHF and higher to their liking and have no wish to operate on the HF bands."

"As in the United States, opinion is frequently expressed in the UK amateur press that the Morse code test is outmoded and serves no useful purpose." Like the FCC, the DTI recognizes and abides by the stipulation in the International Radio Regulations requiring licensed amateurs operating below 30 MHz to prove a certain proficiency in sending and receiving Morse.

Undoubtedly, without the Class B license, the UK amateur population would be much smaller than it is today. Despite the availability of a no-code entry in Britain, the RSGB (Radio Society of Great Britain, the voice of the UK amateur) shares the concern of the ARRL and others about the failure of amateur radio to attract bright young newcomers. Tony contends there are less than 200 amateurs in Britain under the age of 18.

Novice Class To Be Adopted in UK

The RSGB and the British government attach great importance to recruiting many more amateurs, not only to ensure the future of amateur radio, but more importantly to encourage young people to pur-

Operating Privileges for United Kingdom Novice Licensees

Frequency Bands in MHz	Available to Novice	Permitted Modes of Transmission
1.950–2.000	A	Morse, Telephony, RTTY, Data
3.565–3.585	A	Morse
10.130–10.140	A	Morse
21.100–21.149	A	Morse
28.100–28.190	A	Morse, RTTY, Data
28.225–28.300	A	Morse, RTTY, Data
28.300–28.500	A	Morse, Telephony
50.620–50.760	A, B	Data
50.250–51.750	A, B	Morse, Telephony, Data
433.0–435.0	A, B	Morse, Telephony, Data
1240–1325	A, B	Morse, Telephony, RTTY, Data, Facsimile, Slow Scan TV, Fast Scan TV
10,000–10,500	A, B	Morse, Telephony, RTTY, Data, Facsimile, Slow Scan TV, Fast Scan TV

Table I– Frequency bands and privileges to be available in Great Britain to the new Novice A and VHF/UHF-Novice B licensees. The Novice A licensee must pass both a simplified theory and 5 wpm Morse exam. To obtain the Novice B requires only the written exam. Implementation is anticipated during early 1991. There will be no privileges on 40, 20, or 2 meters for British Novices.

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101

sue the mushrooming field of sophisticated telecommunications. The RSGB's answer is to promote the idea of a Novice license with an easier entrance examination and a 5 wpm code test.

On April 19, 1990 the DTI announced a new licensing procedure aimed to encourage more young people to take an interest in amateur radio. "The value of amateur radio as a training ground for careers in electronics and radio engineering has long been recognized by both government and the radio industry," their press notice reads.

The system, planned for introduction by Spring 1991, will allow Novice amateurs to operate at low power on limited segments of the wavebands allocated to amateur radio.

In order to qualify for one of the new Novice licenses, applicants will be required to complete a practical RSGB training course and pass a Novice license examination. There will be no minimum age for Novice licensees, and it appears the license fee will be waived for applicants under age 21.

Interestingly, there will be not one, but two Novice licenses—a Novice A and a Novice B. The Novice A requires passing a 5 wpm Morse code test in addition to a simplified written examination. The code-free Novice B only allows privileges above 30 MHz. Existing Class B licensees (VHF only) of at least one year's standing will be granted the HF privileges of the Novice A license if they pass a 5 wpm Morse test (see Table I).

This is all very interesting and there well may be some lessons to be learned! Great Britain is a country with people and customs very similar to our own. Their code-free Class B, which yields all emission/mode privileges above 30 MHz, has been very advantageous to them.

Even though they have had considerable experience with a code-free admission into amateur radio, the U.K. believes there is a need to further simplify entry into amateur radio—especially for the youth of their nation. The United States has a Novice class with prerequisites not too much different from those to be implemented in Great Britain. The U.S. also feels it beneficial to interest young people to seek a high-tech career. The U.K.'s "carrot" will be a Novice ticket; the United States, the code-free Communicator.

There is also an interesting parallel between the actions of the United Kingdom and Canada. Neither has had an amateur licensing line-up that allowed beginners with minimum criteria to enter amateur radio. Both shortly will be implementing such a system, and at about the same time—the U.K. with a Novice (both code and no code) and Canada with a code-free modular licensing scheme. Both nations will only have two written examinations (a beginning and advanced theory test) and two telegraphy examinations (5 and 12 wpm).

Code-Free Operation In Other Countries

Australia is also in the process of restructuring their amateur radio program. They have been very successful with their no-code licence, and 25% of their amateurs hold a code-free ticket. They are now aiming for a four-class system. They will implement a no-code (VHF only) Novice, code Novice, no-code (VHF/UHF) full license, and a full license. The only difference between the Australian no-code and code "full" license is the Morse requirement—again, not much different from Canada and the U.K.

West Germany has had a code-free Class C license since 1967. About 40% of all licensees hold that class. The technical questions are the same for the code and code-free licenses, although a lower pass mark is allowed to obtain the Class C ticket.

About 70% of Austria's amateurs hold a code-free amateur license. Most eventually upgrade. The only difference between the code and code-free license is the Morse requirement. The same written test applies. Code-free licensees are allowed to operate CW on 2 meters and 70 cm for training purposes.

Almost all of Belgium's amateur population starts by getting a VHF/UHF code-free ticket. Again, the written examination is the same. It is the same in South Africa. We know of no country that is not pleased with their code-free amateur radio class.

From reviewing the amateur radio licensing schemes of several countries, it appears to us that the consensus international licensing arrangement provides for four classes or levels. An easy-to-qualify-for entry class, with and without a 5 wpm code requirement, and an advanced class, again with and without 12 wpm Morse knowledge. The code proficient licensees get to operate on all amateur bands; the code-free are restricted to operation above 30 MHz. We found no nation that had five, much less six (Novice, Technician, Communicator, General, Advanced, and Extra), amateur radio classes.

It also appears to us that international licensing schemes are increasingly recognizing that no longer does an amateur radio operator need to be able to repair or build his equipment. While knowledge in the basics is certainly important, ham gear has gotten so complex that not many amateurs have the expertise to follow a schematic of today's microprocessor-based equipment, much less build it from scratch.

Amateur radio now goes in dozens of different directions! No longer is it just CW, analog phone, and praying for radio-wave propagation. Amateur radio now contains many different side hobbies, and new sophisticated modes are being developed all the time! The rules of yesterday are constantly being shattered by the technology of tomorrow.

No Explosive Growth From Code-Free Operation

Some amateurs have the opinion that a code-free amateur class will immediately result in explosive—and possibly uncontrollable—growth for the U.S. amateur service. They point to the chaos that erupted on the 11 meter band. Well, it didn't happen in any of the countries that have adopted a reasonable "no-code" amateur radio entry, and there is certainly no reason to believe it will happen here. Most countries do have a code-free entry class, and all seem satisfied with how they have developed.

The CB debacle was caused by the absence of any licensing requirements, radio-wave enforcement, and appropriate role models for licensees to follow. "What you see is what you get," held true. The gas-hungry trucker on the lookout for "smokey" became the leadership of the 11 meter band.

In my view, code-free entry into American amateur radio should be considered more of a recruiting "tool" by which to promote amateur radio to the public than a harbinger of impending disaster. I honestly believe a code-free amateur ticket without accompanying publicity and promotion will result in very little growth indeed!

A code-free amateur license class certainly helps to make amateur radio more attractive to the masses, but the nations that have a long-term no-code license still seem to be taking steps to make amateur radio more attractive to their citizens—especially to youngsters. Applicants simply weren't standing in long lines waiting to take the code-free amateur radio entrance examinations. And they certainly won't be in the United States either.

Typing Test To Enter Amateur Radio?

The International Amateur Radio Union (IARU) is made up of the various national amateur societies around the world. The American Radio Relay League, of course, represents the United States in our ITU Region 2 (North and South America).

The Israel Amateur Radio Club is the recognized amateur voice of Israel. The IARU Region 1 conference was held this past April at Castillo Santa Clara, Spain, where Israel put forth a rather interesting formal proposal. They suggested that a test in keyboard data entry be substituted

for Morse code sending and receiving. We quote:

"It is still recognized that the privilege of access to the HF bands should be worked for, but the demonstration of ability should be made more in keeping with amateur radio as it is today.... With great respect to the historical and traditional mode of amateur operation and the CW operators (amongst whom I am proud to count myself) I submit that we must not permit ourselves to indulge in nostalgia to the possible future detriment of the Amateur Radio Service."

"... VHF, UHF, microwave, and satellite operators are, and will increasingly be, using data modes of transmission ... the requirements for keyboard proficiency, knowledge of codes, and operating procedures should equally apply to all seeking an amateur license."

The Israeli proposal suggested the CW test for amateurs be replaced by some form of operating proficiency more suitable to the present-day data operating modes of amateur radio such as manual keyboard operation, knowledge of the various data codes in use, and digital operating procedures.

The Israeli proposal closed with "It is felt that introduction of the measures proposed will not only prove attractive to the 'computer generation,' but will also fully satisfy the concept of self training."

The proposal was indeed put forth at the IARU Region 1 Conference in Spain. It was defeated by a vote of 30 countries against and 9 countries in favor of the proposal. France, surprisingly, was one of the nations voting for the measure. The Board of Directors of REF (the French national amateur radio society) agreed that no Morse examination should be necessary for access to any frequency. The French government is supposedly prepared to give their amateurs access to all frequencies, including those below 30 MHz, without the need for a CW test.

The Radio Amateur's Licensing Manual

All volunteer examiners and applicants for all classes of licenses should be aware that all amateur radio operator question pools have recently been revised, or are in the process of being changed. New Novice and Technician question banks were put into effect on July 1, 1990. In addition, the General, Advanced, and Extra Class question pools have been revised by the Question Pool Committee and will be implemented this Fall. There are now 1,931 total questions in all pools (Novice 372, Technician 326, General 286, Advanced 507, and Extra Class 440 questions).

To assist you in getting the correct license preparation material, we have developed and published the *Radio Amateur's Licensing Manual*. This 300-plus page book is actually made up of seven individual booklets bound together in a single publication. The book consists of all five question pools—complete with the multiple choices and correct answer identified—plus the Novice testing program and Technician through Extra Class level VE instruction manuals.

The book constantly changes, depending upon revisions to the individual question-pool booklets. When one pool changes, we simply substitute a new updated booklet version. The publication is ideal for everyone, from applicants desiring to enter amateur radio or wishing to upgrade their present ticket to those who conduct Novice or VEC coordinated (Technician through Extra Class) examinations.

The Radio Amateur's Licensing Manual reflects all of the 1990 question changes. Cost is $9.95 plus $2.00 shipping, and the book is available from W5YI, P.O. Box 565101, Dallas, TX 75356.

No-107-108

BILL'S BASICS

BY BILL WELSH, W6DDB

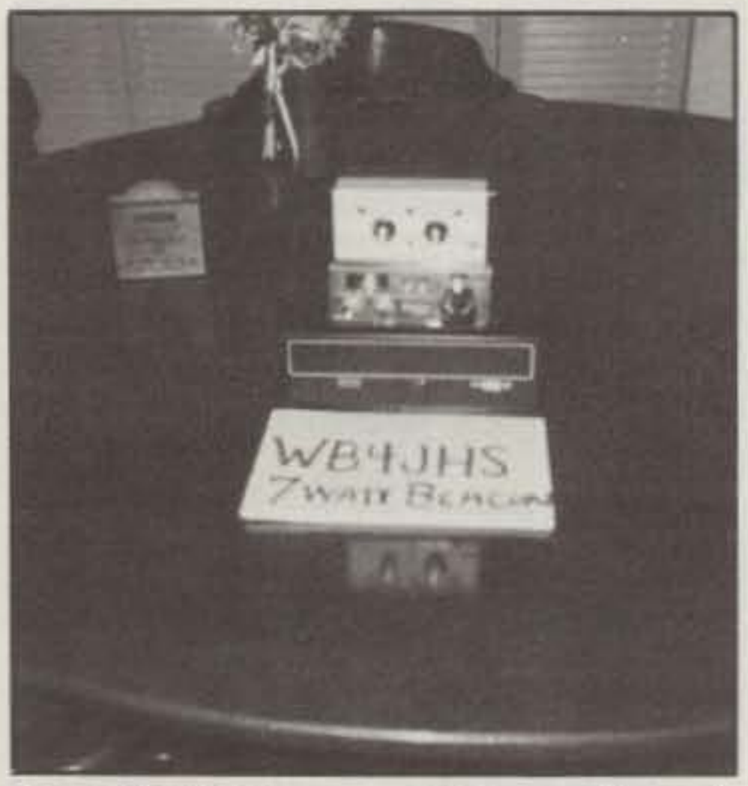
"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Ten Meter Beacons and Band Operating Conditions

An easy way to quickly determine existing operating conditions on the 10 meter band is to listen for amateur radio beacon station transmissions. Most of these stations add /B or /BCN to their callsigns to clarify that they are beacons. Almost all 10 meter beacon stations transmit between 28.2 and 28.3 MHz. Low-power and omnidirectional (nondirectional) antennas are common to the majority of these worldwide beacons. If you can hear a beacon station's transmission, you should be able to work other amateurs in the area where that beacon is located. The Morse code identification of a beacon station is usually transmitted slowly. FCC regulation 97.119 states that automatic code identification may not exceed 20 words per minute. Most beacon identifications are considerably slower than the 20 wpm maximum.

Beacon operation is authorized to facilitate measurement of radio equipment characteristics, adjustment of radio equipment, observation of radio signal propagation phenomena, and other such experimental activities. A1A, F1B, J2A, and NØN emissions may be used by beacon stations. The radio or audio frequency shift (as appropriate) of F1B or J2A emissions must not exceed 1000 Hz. Beacon station emissions are one-way transmissions; they are "broadcasts" which are primarily of interest to amateur radio operators. Beacons are run by clubs and individuals. They come and go quickly. Technician through Extra class licensees (only) may operate beacons. The maximum allowable beacon power is 100 watts. The existing 28.2–28.3 MHz beacon segment is scheduled to be shifted to 28.1–28.2 MHz. The International Amateur Radio Union (IARU) may scrap the existing beacon band and establish an A1A/code beacon network on 20 meters.

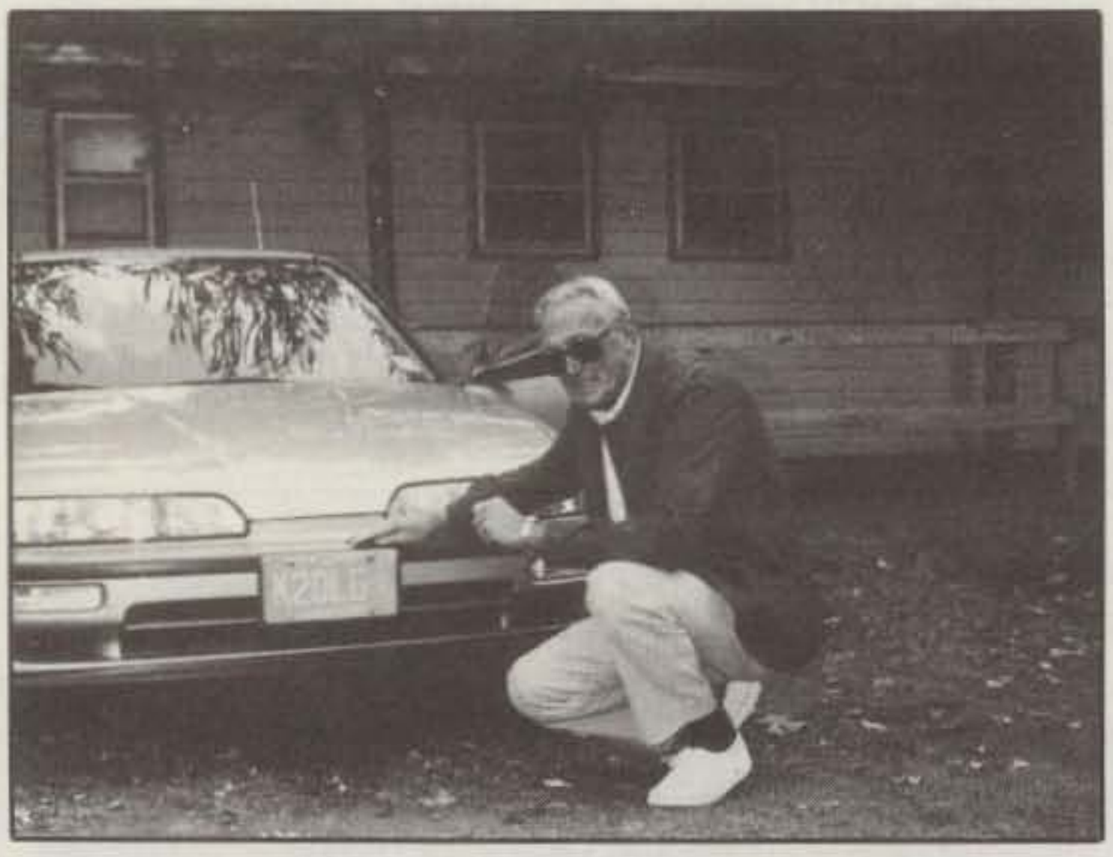
Beacon signals are particularly useful during the low point of an 11-year sunspot cycle, when the 10 meter band could be assumed to be dead, but is open. Openings do occur throughout each cycle, and beacons enable us to realize when they exist. Beacons provide a useful service throughout the sunspot cycles. During low points of a cycle, long-range (DX) communications may be made possible by meteorite bursts, scatter, or sporadic-E. Sporadic-E usually occurs during the spring, summer, and fall. It is unrelated to F-layer propagation predictions. Ten meter contacts can be possible at times when F-layer propagation conditions show they are impossible to achieve. Listen on 10 to determine when these opportunities exist. No other band provides as good DX possibilities as 10 meters does when it is open.



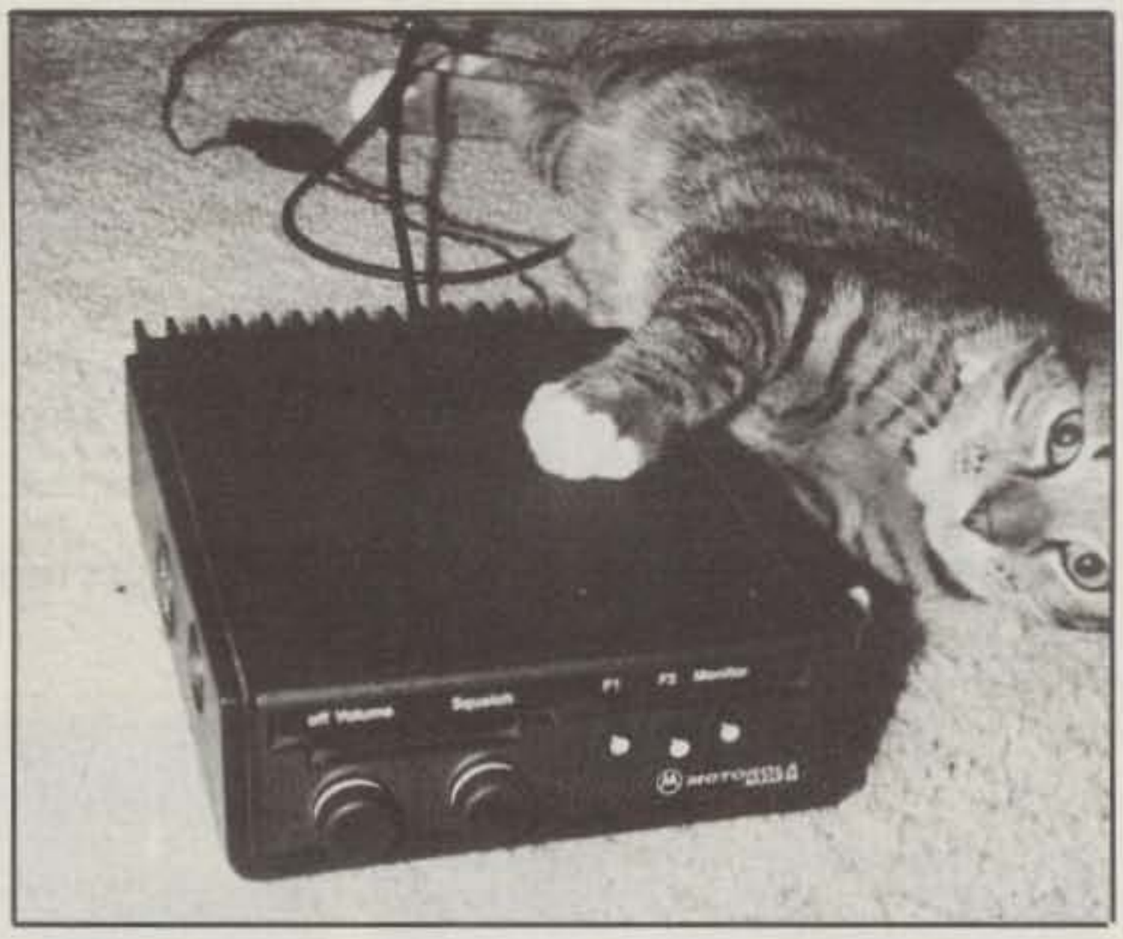
The WB4JHS beacon station equipment.

Propagation conditions and DX communication possibilities can vary between terrible and terrific. Get used to day and night reception conditions of known stations at your location during each season of the year. It is a good practice to maintain a written record of reception data for subsequent comparison use. Each area has its own peculiarities. When checking reception conditions, remember to consider the types of antennas being used at the beacon station and

*45527 Third Street East, Lancaster, CA 93535-1802



This is Joe Gumino, K2OLG. He became intrigued with beacons when he heard such transmissions from foreign countries at a time when the 10 meter band was supposed to be "dead."



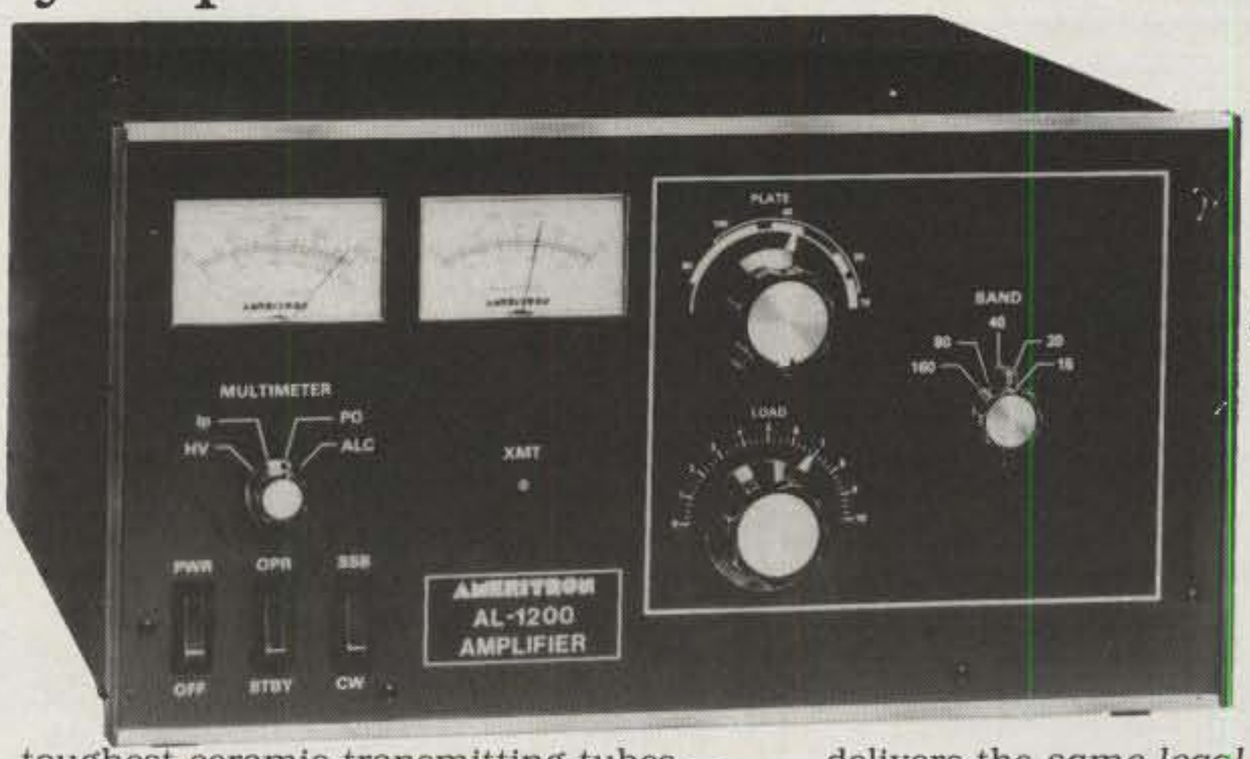
Here is the W9UXO beacon gear. I assume that it is purr-fect.

Ameritron Linear loafs at full legal limit . . .

massive power supply capable of 2500 watts for half hour!

What makes the Ameritron AL-1200 stand out from other legal limit amplifiers?

The answer: a super heavy duty power supply that loafs at full legal power - it can deliver power for more than 2500 watts PEP two tone output for a half hour!



AL-1200
$2045
Suggested Retail

The heart of the AL-1200 power supply is a highly efficent Peter Dahl tape wound hypersil® transformer weighing 32 pounds. — it's equivalent to a 45 pound transformer using standard E-I laminations.

High current computer grade capacitors

You get genuine high current, full height *computer grade* capacitors with screw-on terminals — not short stubby, light duty soldered in "capacitors" that can't dissipate the heat generated by high current.

Why some filter capacitors explode

The failure of *carbon* equalizing resistors — used in most linear amplifiers — is the primary cause of filter capacitor failures.

When a *carbon* resistor gets hot its resistance drops, causing more current to flow, causing the resistor to get hotter.

This destructive cycle repeats until the *carbon* resistor opens and causes excessive voltage on the capacitor — the capacitor can explode.

Carbon equalizing resistors *can't* fail in the AL-1200. Why? Because no-compromise *wire wound* SEVEN WATT 50 K ohm equalizing resistors — not the 2 watt 100K resistors others use — safely protect each filter capacitor. Plus, the lower value gives better regulation.

A direct short won't blow these rectifiers

The AL-1200 rectifier board uses diodes rated for a massive surge current of *200 amps* — you can accidentally short the high voltage supply and the diodes won't blow!

Will the amplifier you're considering withstand a direct power supply short?

Eimac® 3CX1200A7: the durability of glass and the power of ceramic

The AL-1200 uses one of Eimac® 's toughest ceramic transmitting tubes — the high gain 3CX1200A7. It has the durability of glass tubes and the power dissipation of ceramic tubes.

3CX1200A7: 12 times tougher than the 3CX800A7

A 3CX1200A7 has a 50 watt control grid dissipation — that's more than 12 times tougher than the delicate 4 watts grid dissipation of a 3CX800A7.

If you accidentally drive a 3CX1200A7 with your 100 watt exciter when your amplifier is off, you won't fry your control grid. But don't make that mistake if you have a pair of 3CX800A7s — unless you're ready to buy another pair.

Full legal power at half the price

A *single* 3CX1200A7 in the AL-1200 delivers the *same legal limit* as a *pair* of 3CX800A7s that cost nearly twice as much. What do you get for paying twice as much? Twice as many parts to fail.

Plus more . . .

The UPS shippable AL-1200 also gives you . . . all mode, all band coverage including WARC and MARS, Pi-network tuned input, Step-Start Inrush Protection™, multi-voltage primary, Pi-L output tank with silver-plated components, separate filament transformer eliminates poor regulation and surges, adjustable ALC, SSB/CW switch for best linearity and efficiency, operate/standby switch, transmit indicator LED, 12 VDC auxiliary output, 35% safety factor for tuning capacitors and bandswitch virtually eliminates failures, shielded RF compartment, quiet die cast blower has 4 speeds, two illuminated meters show continuous grid current, peak RF watts out, drive power/ALC, plate voltage and plate current, ball bearing vernier reduction drives on plate and load controls, optional QSK board, one year limited warranty and more.

Call your dealer for your best price

Even at $2045 list it's a bargain. For your best price, call your favorite dealer and order today!

Pair of 3-500Z tubes give you full legal output for . . . $1995

Want a pair of tough 3-500Z workhorses?

The AL-82 is the **same** amplifier as the AL-1200 except it uses a pair of 3-500Z tubes. It has the same super heavy duty power supply to give you full legal output. Some amplifiers With a pair of 3-500Zs can't deliver full legal output because they use a lighter duty power supply.

AL-82
$1995
Suggested Retail

That's why the AL-82 costs a little more -- and why it's well worth it. Call for your best price today!

Legal limit antenna tuner

ATR-15
$399
Suggested Retail

Ameritron — the high power specialist — brings you the ATR-15 antenna tuner that's designed for legal limit amplifiers. It handles full legal power with ease.

Heavy duty silver plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. 6 position antenna switch. Selectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ inches. Meter lamps uses 12 VDC.

Ameritron's most powerful amplifier

AL-1500
$2625
Suggested Retail

Ameritron super power amplifier uses the herculean 8877 ceramic tube.

It's so powerful that a mere 65 watts drive gives you full legal output — 1500 watts — and it's just loafing because the power supply is capable of 2500 watts PEP.

Compact 600 Watt Linear

AL-84
$549
Suggested Retail

600 watts for only $549! 5x10x11 inch powerhouse gives 600 watts PEP, 400 watts CW output. Four 6MJ6/6LQ6 tubes. Low SWR input for solid state exciters.

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CIRCLE 14 ON READER SERVICE CARD

Callsign	kHz	Location	Duty[1]	Watts	Antenna[2]
AL7GQ	28275	Colorado	C	1	Loop
A92C	28245	Bahrain			NW/SE Dipole
DF0AAB	28277.5	West Germany	C	10	GP
DF0ANN	28992	West Germany		0.02	Delta Log
DF0THD	28325	West Germany		4	GP
DK0TEN	28257.5	West Germany	C	40	GP
DL1PI	28205	West Germany			
DL0IGI	28204	West Germany	C	100	V. Dipole
EA1EVE	28225.5	Spain		1	
EA2HB	28247.5	Spain	I	6	GP
EA3JA	28247	Spain			
EA6AU	28227.5	Balearic Islands	C	10	5/8 GP
EA6RCM	28212	Mallorca		4	5-el NNE Yagi
EA7RCC	28283.5	Spain		10	
FX5TEN	28227	France		8	
GB3RAL	28215	England	C	20	GP
GB3SXE	28200	England	25-30, 55-00	25	5/8 Vertical
HG2BHA	28222.5	Hungary	C	10	GP
H44SI	28287	Solomon Islands	C	15	GP
IY4M	28195	Italy	R	20	5/8 GP
KA1YE	28286	New York	C	2	V. Dipole
KA3OEM	28205	Pennsylvania		27	Yagi West
KB2BBW	28280	New Jersey			
KB4UPI	28266	Alabama	C	20	1/4-wave Vertical
KB7ADL	28234	Montana			
KC4DPC	28210	North Carolina	C	4	Dipole
KD4EC	28232.5	Florida	C	5	Vertical
KE2DI	28286	New York		2	V. Dipole
KE4NL	28207	Florida		5	Vertical
KE5GY	28202	Texas		5	Vertical
KF4MS	28200	Florida	C	5	GP
KI4PJ	28225	Florida			
KI6ZU	28273	California			
KJ4X	28206	South Carolina		2	Vertical
KK4M	28286	Nevada	C	5	Vertical
KW7Y	28223	Washington		4	
K1BZ	28248	Maine	C	5	V. Dipole
K4KMZ	28210	Kentucky	I	20	Vertical
K0HTF	28249.5	Iowa	C	2	GP
LA5TEN	28237.5	Norway	C	10	5/8 GP
LU1DZ	28215	Argentina			
LU1UG	28254.5	Argentina		5	GP
LU2FFV	28292.5	Argentina		5	GP
LU4XI	28215	Argentina			
LU4XS	28219.5	Argentina		2	5/8 GP
LU8EB	28280	Argentina		5	
LU8ED	28201	Argentina		5	
NX2O	28209	New York	C	10	GP
N2ECB	28240	New Jersey		10	Yagi
N3GPP	28278	Pennsylvania			
N4LMZ	28231	Alabama	C	2	5/8 GP
N6RDX	28275.5	California	I	20	3-el Yagi
N8KHE	28246	Michigan	C	0.05	Loop
OH1ZAA	28270	Finland	I		
OH2TEN	28252.5	Finland		10	GP
OK0EG	28282.5	Czechoslovakia	C	10	Dipole
PI7ETE	28300	Netherlands			
PT2UIT	28225	Brazil		5	GP

Table I–Ten meter beacon stations.

at your station. You can compare reception results using every antenna you have available. Radio-wave polarization is changed with distance from the transmitting antenna. You may note that an antenna of opposite polarization provides better reception.

You can listen for other types of stations to determine propagation conditions on adjacent amateur bands. International shortwave broadcast stations and time/frequency standard stations are particularly useful. Make use of dependable stations to determine communications possibilities quickly and easily. It is important to know each station's antenna type, output power (effective radiated power, preferably), callsign, operating times, and frequency.

FCC regulation 97.203 covers beacon station rules. Automatically controlled beacon operation is limited to the following frequency segments, expressed in megaHertz: 28.20–28.30, 50.06–50.08,

Callsign	kHz	Location	Duty[1]	Watts	Antenna[2]
PT7AAC	28302.5	Brazil	C	5	GP
PT8AA	28306	Brazil	C	5	Dipole
PY2AMI	28225	Brazil	C	10	GP
PY2GOB	28221	Brazil		15	Vertical
SK5TEN	28290	Sweden			
VE1MUF	28282	Canada	C	0.5	Dipole
VE2HOT	28282	Canada	C	5	V. Dipole
VE2MO	28300	Canada			
VE3TEN	28174.5	Canada	C	10	GP
VE6YF	28190.5	Canada	C	10	
VK2RSY	28261.5	Australia	C	25	GP
VK4RTL	28270	Australia	C		
VK5WI	28259	Australia	C	10	GP
VK6RTW	28266	Australia	C		
VK6RWA	28264	Australia	C		
VP8ADE	28284	Adelaide Island	C	8	V-beam to G-land
VK8VF	28268	Australia	C		
VP9BA	28235	Bermuda	C	10	GP
VS6TEN	28290	Hong Kong	C	10	GP
WA1IOB	28208	Massachusetts	C	75	Vertical
WA4DJS	28297	Florida	I	30	GP
WB4JHS	28252	Missouri	I	7	Vertical
WB8UPN	28295	Ohio	I	10	Ringo
WB9FVR	28259	Florida	C	10	Dipole
WB9VMY	28217.5	Oklahoma	C	4	GP
WC8E	28293.5	Ohio	I	10	Ringo
WJ7X	28252	Washington	C	5	Ringo
WT8D	28244	South Carolina		10	
W2NZH	28288	New Jersey	I	5	GP
W3SV	28250	Pennsylvania	C	10	Vertical
W3VD	28295	Maryland	C	1.5	V. Dipole
W6IRT	28888	California	I	5	GP (code)
W7JPI	28232	Arizona	C	5	NE 3-el Yagi
W8FKL	28207.5	Florida	C	10	Vertical
W8OMV	28287	North Carolina		5	GP
W8UR	28217.5	Michigan	C	0.5	GP
W9KFO	28268.5	Indiana	I	0.75	Vertical
W9UXO	28221.5	Illinois	C	10	GP
YO2KHP	28237	Romania		20	
YV5AYV	28280	Venezuela		10	Beam on Europe
ZD8HF	28292	Ascension Island		1	5/8 Vertical
ZD9GI	28212.5	Gough Island			GP
ZL2MHF	28230	New Zealand	C	1	V. Dipole
ZS1CTB	28245.5	South Africa	C	20	1/4wave Vertical
ZS1LA	28274.5	South Africa	C	20	3-el NW Yagi
ZS5VHF	28202.5	South Africa	C	10	GP
ZS6DN	28315	South Africa	C	100	Vertical
ZS6PW	28270	South Africa	C	10	3-el Yagi to G-land
Z21ANB	28250	Zimbabwe	C	2	Quad
3B8MS	28210	Mauritius	C		GP
4N3ZHK	28250.5	Yugoslavia	C	1	Vertical
5B4CY	28220	Cyprus	C	26	GP
5Z4ERR	28240.5	Kenya	C		
9L1FTN	28272.5	Sierra Leone	I	10	V. Dipole

[1]Note: C = continuous; I = intermittent; R = robot.
[2]Note: GP = ground plane; V. Dipole = vertical dipole; Yagi = Yagi-Uda beam.

144.275–144.300, 220.05–220.06, 222.05–222.06, 432.300–432.400, plus all amateur bands above 450 MHz. Manually-controlled beacon operations is not restricted to the above frequency segments.

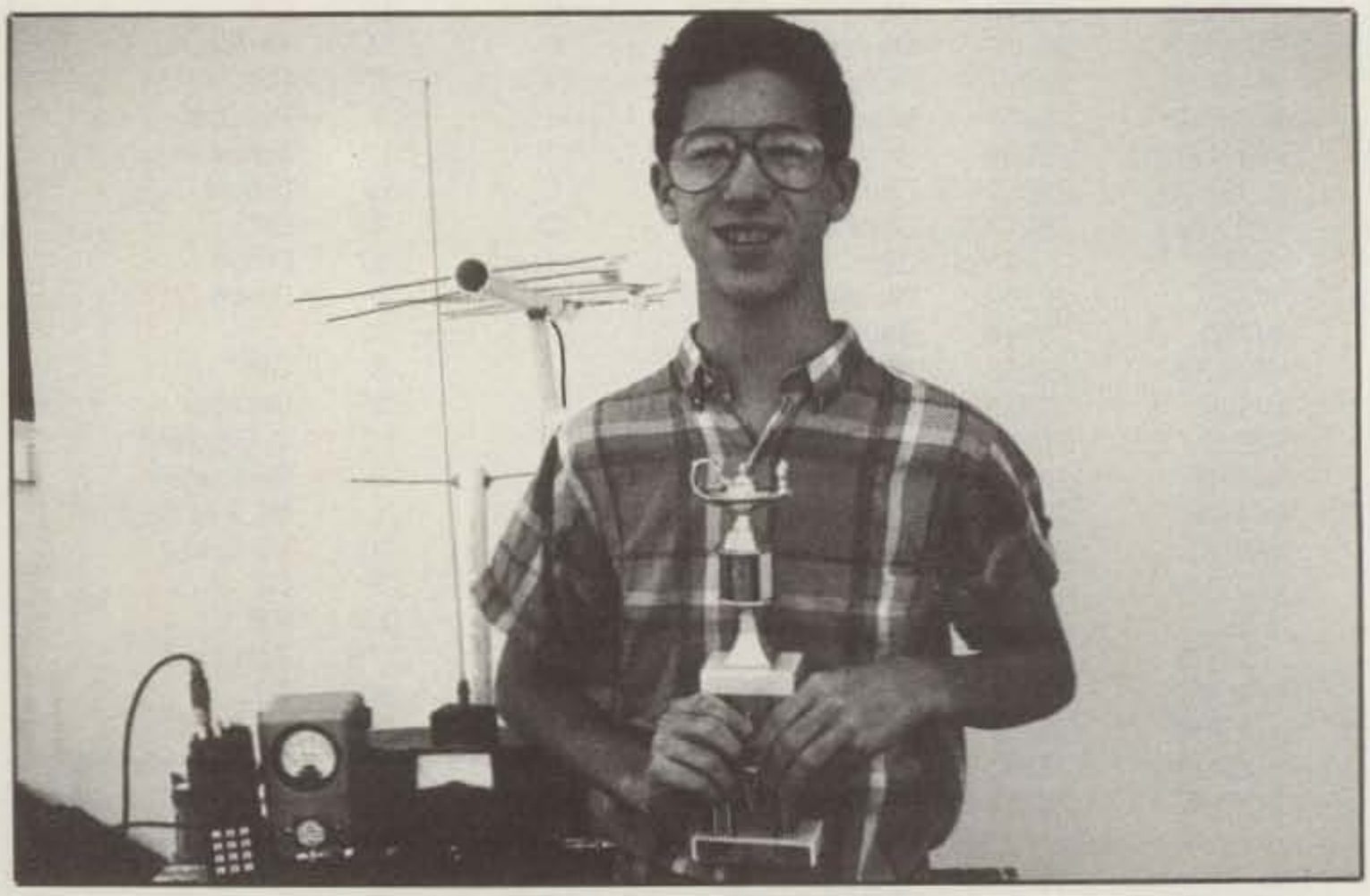
Ten meter beacon lists have been generated by several amateurs. The ones I know about were prepared by G3DME, K2OLG, W8OMV, and W8UR. The *Callbook* includes lists of 6 and 10 meter beacons. The ARRL includes beacon information in its *Repeater Directory*. The ARRL's address is 225 Main Street, Newington, CT 06111.

The information in this article was received from several sources. The major contributors were Alan Taylor, G3DME, Joe Gumino, K2OLG, Tom Harrington, W8OMV, and Dennis Havlena, W8UR. Please send corrections and additions to the California address of W6DDB as shown on the first page of this article.

Beacon station operators greatly appreciate receiving reception reports of

kHz	Callsign	Location	Watts	Antenna
10144	DKØWCY	West Germany	30	Dipole
14100	4U1UN	New York	100	GP
14100	W6WX	California	100	Turnstile
14100	KH6O	Hawaii	100	GP
14100	JA2IGY	Japan	100	Vertical
14100	4X4TU	Israel	100	GP
14100	OH2B	Finland	100	GP
14100	CT3B	Portugal	100	Vertical
14100	ZS6DN	Union of South Africa	100	GP
14100	LU4AA	Argentina	100	
18080	PY2AMI	Brazil		
24901	PY2AMI	Brazil		

Table II– The international high-frequency beacon segments are 14100 (±1) kHz, 21150 (±1) kHz, and 28190–28225 kHz. In addition to the 10 meter beacons listed in Table I, the above stations exist.



This is fourteen-year-old Todd Kramer, N4WOR, of Longwood, Florida holding one of the awards he won for his experimentation with high-temperature superconductive antennas, as compared to copper antennas. Imperial Chemical Industries (ICI) provided the superconductive antenna Todd used with a Repco SYN2100 handheld transceiver. On New Year's Eve (31 December 1989) Todd contacted Mike Hudzik, KN4BG, on the 70 centimeter band. This was probably the first amateur radio contact made using this special type of antenna. Todd is active in Boy Scouts and local amateur radio organizations. He is a Star Scout and a Technician licensee. Todd is a member of the National Junior Beta Club, a middle-school honorary society. He has a part-time job at a tropical fish store.

their transmissions. Their efforts merit our time and postage.

You should not listen on the exact transmit frequency of a beacon station. If you did this, no satisfactory audio tone would exist to allow easy copy of a received signal. Most of us listen 500 to 800 Hz away from the received frequency to hear a tone (beat frequency difference) we like to hear when we copy code. Therefore, beacon stations may seem to be about 500 to 800 Hz away from stated frequencies. The exact frequency is the point where the received signal's audio tone can no longer be heard, after you tune from a high pitch down through the lowest frequency tone you can hear. Beacon lists commonly contain frequency differences which appear to be due to this transmit-receive frequency difference (offset). The November 1984 issue of *CQ* contains my zero beat article. My class handout on this subject is available at no charge to anyone who requests one and provides a self-addressed envelope with double postage (45 cents) attached.

I often operate in the 10 meter Novice code band. I have noticed that the 28.2 to 28.3 MHz segment is seldom used for code contacts, which is a mistake. Beacon stations are not intended to have sole use of this segment. New amateurs are urged to use 28.1 to 28.3 MHz for code contacts, not just 28.1 to 28.2 MHz. Please move up and share the upper segment with beacon stations.

SGC SG-230 SMARTUNER

HF ANTENNA COUPLER
SSB, AM, CW & DATA
FAST-INTELLIGENT-ACCURATE
OPERATES WITH ANY HF TRANSCEIVER

The *Smartuner* high technology coupler intelligently tunes any length antenna (8 to 80 ft) in the HF band. The unit will operate with any HF transceiver within its' specifications. The *Smartuner* switches 64 input and 32 output capacitance combinations plus 256 inductance combinations in a "pi" network resulting in over a half-million different ways to ensure a perfect match for the transceiver. And, *it remembers the frequency and the tuning values* and will re-select these values in less than 10 ms next time you transmit on that frequency.

SPECIAL HAM PRICE: $555.00

- **MICROPROCESSOR CONTROLLED**
- **NON-VOLATILE MEMORY**
- **WATERPROOF**
- **B.I.T.E. INDICATOR**
- **1.8 TO 30 MHZ RANGE**
- **10 TO 150 WATTS INPUT POWER**
- **10 mS RETUNING TIME**
- **8 TO 80 FT. ANTENNA (All Types)**
- **FOR MARINE, AVIATION, HAM AND PARA-MILITARY APPLICATIONS**

The SG-230 Smartuner is available from:

Eli's Amateur Radio, FL - 305-525-0103
Gordon West Radio, CA - 714-549-5000
Henry Radio, CA - 213-820-1234
Surplus Sales, NE - 402-346-4750

SGC Inc. SGC Building, 13737 S.E. 26th St. Bellevue, WA 98005 USA
P.O. Box 3526, 98009. Telex: 328834. Fax: 206-746-6384 Tel: (206) 746-6310

CIRCLE 142 ON READER SERVICE CARD

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Cycle 22 Still Stalled

Sunspot Cycle 22 continues to stand dead in its tracks for the sixth consecutive month at the 157/158 level.

The world's official keeper of sunspot records, the Royal Observatory of Belgium, reports monthly mean sunspot number of 140 for April 1990. Daily values fluctuated wildly during the month with a low count of 77 reported on April 10 and 12, and a high of 214 reported on April 22. This results in a 12-month running smoothed sunspot number (SSN) of 157 centered on October 1989. The solar cycle is measured by the value of smoothed sunspot number. Between May and October 1989 the smoothed sunspot number remained almost constant at the 157/158 level.

According to Prof. M. A. Koeckelenbergh, director of the Royal Observatory of Belgium, the peak of Cycle 22 occurred during July 1989, and solar activity is now on the decline. He is forecasting a smoothed sunspot number of 137 for August 1990.

On the other hand, the National Geophysical Data Center at Boulder, Colorado forecasts a smoothed sunspot number of 153 for August 1990. This is based on their belief that peak activity occurred during February 1990 with a count of 168.

According to daily observations made at the Algonquin Radio Observatory in Ottawa, Canada, the mean level of 10.7 cm solar flux during April 1990 was 188. This results in a 12-month running mean of 208 centered on October 1990. A mean level of 198 is forecast for August 1990. Cycle 22's peak in solar activity, as measured by the 12-month running mean values of 10.7 cm solar flux, took place during June 1989 with a value of 214.

There continues to be considerable differences of opinion among the experts as to when the peak of Cycle 22 actually occurred and at what level. Table I compares the following four different solar/ionospheric parameters that measure solar activity for the period May through October 1989.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for August 1990

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 4-5, 14, 22-23, 31	A	A	B	C
High Normal: 2-3, 6, 8, 13, 17-18, 20-21, 24, 29-30	A	B	C	C-D
Low Normal: 1, 7, 9-10, 12, 15-16, 19, 25, 28	A-B	B-C	C-D	D-E
Below Normal: 11, 26	B-C	C-D	D-E	E
Disturbed: 27	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 S0 and S3, and with considerable fading and noise.

E—No opening expected.
3dB per S-Unit.

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 good-to-fair (B-C) on August 1, good (B) on the 2nd and 3rd, excellent (A) on the 4th and 5th, good (B) on the 6th, etc.**

August Propagation

August and early September are usually a transition period between summer and fall propagation conditions on the HF bands. On many days propagation conditions should seem much as they did during June and July. On other days, particularly during late August and early September, they will sound more typically fall-like, with somewhat higher daytime and lower nighttime usable frequencies. Since this is a period of transition, this month's DX Propagation Charts cover only the *one*-month period from August 15th through September 15th, rather than the usual two-month period. Short-Skip Charts for use during this period appeared in last month's column.

During the daylight hours good DX conditions should be possible on five bands: *10, 12, 15, 17, and 20* meters. Of the five, conditions should be best on *15* meters, with peak conditions expected to most areas of the world during the afternoon hours. While the *17* and *20* meter band should be open for DX throughout the daylight hours, peak signals are expected during an approximate two-hour window immediately following sunrise and again during the late afternoon. Some fairly good DX openings should also be possible on *10* and *12* meters during the hours of daylight, particularly along an arc extending across central Africa, Latin America, and into the far Pacific area. Peak conditions should occur during the afternoon hours, but an increasing number of earlier openings should be possible by early September.

Between sundown and sunrise *20* meters is expected to be the best DX band. Openings should be possible to almost all areas of the world, often with exceptionally strong signal levels. Until midnight good DX conditions should also be found on *15* and *17* meters for openings toward Latin America, the far Pacific, and into Asia. Fairly good nighttime DX conditions are also expected on *30, 40,* and *80* meters despite high static levels at times. Openings should be possible before midnight along an arc extending from northern Europe, through Africa, and into Latin America, the far Pacific, and Asia after midnight.

By late August it should be possible to work some DX on *160* meters during the hours of darkness. Conditions on this band, as well as on *40* and *80* meters, will tend to peak just as the sun begins to *rise* on the *light*, or easternmost, terminal of a path.

1989	R12	F12	IG12	IF12
May	157	212	149	154
June	158	214*	151	156
July	158*	211	152*	157*
August	158	208	152	156
September	157	206	150	154
October	157	206	150	153

**Apparent peak value.*
R12 = 12-month running smoothed sunspot number.
F12 = 12-month running smoothed 10.7 cm solar flux level.
IG12 = 12-month running smoothed ionospherically derived solar activity index.
IF12 = 12-month running smoothed ionospheric index.

Table I– Measured indices for sunspot Cycle 22, May–October 1989.

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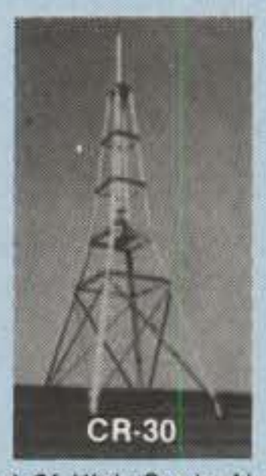

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Model	Height	Maximum Antenna Wind Load In FT 2	Base Width	Max. Vert. Load Lbs.	Tower Weight Lbs.	SALE
CR-18	5'10"	21@ 90 MPH	31⅛"	440	28	$139.95*
CR-30	9'10"	27 @ 90 MPH	39"	1,322	39	239.95*
CR-45	14'9"	23 @ 90 MPH	39"	881	55	319.95*
CK-46	Thrust Bearing For CR-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2½"					39.95*

*U.P.S. Not Included — For Safety's Sake All Towers Should Be Guyed.

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- 19 Elements Longest 4'6"
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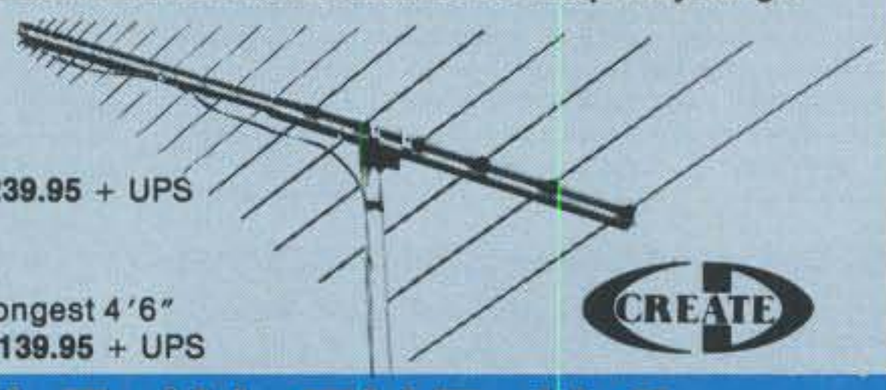

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Brk.Tq.	108	215	502	717	1290	1792	2150
Notes	12VDC		HiSp		HiSp		
PreSet	No	No	No	Opt	Yes	Yes	Yes
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CIRCLE 88 ON READER SERVICE CARD

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location, The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. wetc. Appropriate *daylight* time is used, *not* GMT. T convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

6. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado, 80302.

August 15 to September 15, 1990
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Central Europe & North Africa	09-15 (1)	08-10 (1) 10-15 (2) 15-18 (3) 18-19 (2) 19-20 (1)	09-15 (1) 15-16 (2) 16-18 (3) 18-23 (4) 23-03 (3) 03-05 (2) 05-07 (3) 07-09 (2)	19-20 (1) 20-21 (2) 21-22 (3) 22-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 20-21 (1)* 21-22 (2)* 22-00 (3)* 00-01 (2)* 01-03 (1)*
Northern Europe & European USSR	12-15 (1)	08-10 (1) 10-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	09-14 (1) 14-16 (2) 16-19 (3) 19-20 (2) 20-22 (1) 22-01 (2) 01-06 (1) 06-09 (2)	20-21 (1) 21-22 (2) 22-00 (3) 00-01 (2) 01-03 (1) 21-02 (1)*
Eastern Mediter-ranean & Middle East	12-16 (1)	08-10 (1) 10-13 (2) 13-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	07-09 (2) 09-16 (1) 16-17 (2) 17-20 (3) 20-23 (4) 23-00 (3) 00-02 (2) 02-07 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	12-17 (1) 17-19 (2) 19-20 (1) 11-16 (1)**	08-10 (1) 10-15 (2) 15-17 (3) 17-21 (4) 21-23 (3) 23-01 (2) 01-03 (1)	13-16 (1) 16-17 (2) 17-19 (3) 19-02 (4) 02-04 (3) 04-06 (2) 06-09 (1)	19-21 (1) 21-02 (2) 02-03 (1) 22-01 (1)*
Eastern & Central Africa	16-17 (1) 17-19 (2) 19-20 (1)	09-12 (1) 12-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	13-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-00 (3) 00-02 (2) 02-05 (1)	21-01 (1)
Southern Africa	09-11 (1) 11-15 (2) 15-17 (1) 10-15 (1)**	08-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-08 (2) 08-15 (1) 15-18 (2) 18-21 (3) 21-22 (2) 22-00 (1) 00-03 (3) 03-04 (2) 04-06 (1)	21-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	10-12 (1) 20-22 (1)	09-10 (1) 10-12 (2) 12-13 (1) 18-20 (1) 20-22 (2) 22-23 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1) 20-22 (2) 22-02 (1)	06-08 (1) 20-22 (1)
Southeast Asia	18-21 (1)	09-12 (1) 12-16 (2) 16-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-21 (1) 21-23 (2) 23-02 (1)	06-08 (1)
Far East	18-20 (1)	09-11 (2) 16-18 (1) 18-20 (2) 20-22 (1)	17-20 (1) 20-22 (3) 22-00 (2) 00-05 (1) 05-06 (2) 06-08 (3) 08-10 (2) 10-12 (1)	05-08 (1)
South Pacific & New Zealand	09-14 (1) 14-18 (2) 18-20 (3) 20-21 (2) 21-22 (1) 15-18 (1)**	09-10 (1) 10-12 (2) 12-16 (1) 16-18 (2) 18-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-01 (1)	14-20 (1) 20-22 (2) 22-01 (3) 01-04 (4) 04-05 (3) 05-06 (2) 06-09 (3) 09-10 (2) 10-12 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	09-10 (1) 10-11 (2) 11-12 (1) 16-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	05-08 (2) 08-10 (3) 10-12 (2) 12-17 (1) 17-19 (2) 19-22 (1) 22-01 (2) 01-05 (4)	03-04 (1) 04-07 (2) 07-08 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (3) 15-18 (4) 18-19 (2) 19-21 (1) 11-14 (1)** 15-17 (1)**	07-08 (1) 08-09 (2) 09-12 (4) 12-14 (3) 14-21 (4) 21-22 (3) 22-23 (2) 23-01 (1)	06-07 (3) 07-10 (4) 10-11 (3) 11-15 (2) 15-17 (3) 17-03 (4) 03-05 (3) 05-06 (2)	19-20 (1) 20-21 (2) 21-23 (3) 23-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 22-23 (1)* 23-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile Argentina & Uruguay	08-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-11 (2) 11-15 (1) 15-16 (2) 16-18 (3) 18-22 (4) 22-00 (3) 00-01 (2) 01-02 (1)	10-16 (1) 16-18 (2) 18-19 (3) 19-02 (4) 02-04 (3) 04-07 (2) 07-09 (3) 09-10 (2)	20-21 (1) 21-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 22-00 (1)* 00-04 (2)* 04-06 (1)*
McMurdo Sound, Antarctica	11-14 (1)** 16-18 (1)** 17-18 (2) 18-19 (1)	12-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	16-19 (1) 19-22 (2) 22-02 (3) 02-05 (2) 05-08 (1) 07-09 (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	10-13 (1)	09-10 (1) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	08-13 (1) 13-16 (2) 16-17 (3) 17-21 (4) 21-23 (2) 23-01 (1) 04-06 (1) 06-08 (2)	19-21 (1) 21-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 20-22 (1)* 22-00 (2)* 00-02 (1)*
Northern & Central Euorpe & European USSR	11-13 (1)	09-10 (1) 10-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	01-06 (1) 06-09 (2) 09-12 (1) 12-15 (2) 15-18 (3) 18-19 (2) 19-22 (1) 22-01 (2)	19-20 (1) 20-00 (2) 00-02 (1) 21-00 (1)*
Eastern Mediter-ranean & Middle East	11-13 (1) 15-17 (1)	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-16 (1) 16-18 (2) 18-22 (3) 22-00 (2) 00-02 (1)	20-23 (1) 21-22 (1)*
Western Africa	10-14 (1) 14-17 (2) 17-18 (1) 10-15 (1)**	07-10 (1) 10-13 (2) 13-15 (3) 15-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-00 (4) 00-02 (3) 02-04 (2) 04-06 (1)	19-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Eastern & Central Africa	14-16 (1) 16-18 (2) 18-19 (1)	10-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-15 (1) 15-18 (2) 18-19 (3) 19-21 (4) 21-23 (3) 23-00 (2) 00-02 (1)	20-00 (1)
Southeast Africa	09-11 (1) 11-13 (2)	08-09 (1) 09-11 (2)	06-08 (2) 08-15 (1)	20-21 (1) 21-23 (2)
Central & South Asia	13-15 (1) 11-13 (1)**	11-12 (3) 12-14 (4) 14-15 (3) 15-17 (2) 17-18 (1)	15-16 (2) 16-19 (3) 19-21 (2) 21-23 (1) 23-03 (2) 03-06 (1)	23-00 (1) 21-00 (1)*
Southeast Asia	09-11 (1) 19-21 (1)	08-09 (1) 09-10 (2) 10-11 (1) 18-19 (1) 19-21 (2) 21-23 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-11 (1) 17-19 (1) 19-22 (2) 22-02 (1)	05-08 (1) 19-21 (1)
Far East	12-14 (1) 17-19 (1)	08-09 (1) 09-12 (2) 12-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-13 (1) 18-20 (1) 20-23 (2) 23-00 (3) 00-01 (2) 01-02 (1)	05-08 (1)
South Pacific & New Zealand	16-20 (1)	08-10 (1) 13-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	19-22 (1) 22-23 (2) 23-01 (3) 01-03 (2) 03-06 (1) 06-07 (2) 06-09 (3) 09-11 (2) 11-13 (1)	03-06 (1) 06-07 (2) 07-08 (1) 06-07 (1)*
Australasia	10-12 (1) 12-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-21 (2) 21-22 (1) 14-18 (1)**	07-11 (1) 11-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-02 (1)	07-09 (4) 09-10 (3) 10-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-02 (4) 02-04 (3) 04-07 (2)	23-00 (1) 00-01 (2) 01-04 (3) 04-06 (4) 06-07 (2) 07-08 (1) 23-01 (1)* 01-05 (2)* 05-06 (3)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (3) 15-17 (4) 17-18 (2) 18-19 (1) 11-16 (1)**	07-08 (1) 08-09 (2) 09-12 (4) 12-14 (3) 14-20 (4) 20-22 (3) 22-23 (2) 23-01 (1)	07-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-01 (4) 01-03 (3) 03-05 (2) 05-07 (3)	19-20 (1) 20-21 (2) 21-23 (3) 23-02 (4) 02-05 (3) 05-06 (2) 06-07 (1) 20-22 (1)* 22-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile Argentina & Uruguay	07-08 (1) 08-13 (2) 13-15 (3) 15-18 (4) 18-19)2) 19-20 (1) 11-16 (1)**	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-21)4) 21-23 (3) 23-00 (2) 00-01 (1)	10-15 (1) 15-17 (2) 17-18 (3) 18-01 (4) 01-03 (3) 03-06 (2) 06-08 (3) 08-10 (2)	19-20 (1) 20-21 (2) 21-02 (3) 02-03 (2) 03-05 (1) 20-22 (1)* 22-02 (2)* 02-03 (1)*
McMurdo Sound, Antarctica	11-15 (1) 15-18 (2) 18-19 (1)	10-15 (1) 15-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	16-18 (1) 18-20 (2) 20-02 (3) 02-04 (2) 04-07 (1) 07-09 (2) 09-10 (1)	00-04 (1) 04-06 (2) 06-07 (1)

Time Zone: PDT
(24-Hour Time)
WESTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Southern Europe & North Africa	11-13 (1)	08-09 (1) 09-12 (2) 12-14 (1) 14-15 (2) 15-16 (1) 22-00 (1)	00-07 (1) 07-09 (2) 09-13)1) 13-15 (2) 15-19 (3) 19-22 (2) 22-00 (3)	19-21 (1) 21-23 (2) 23-00 (1) 22-23 (1)*
Central & Northern Europe & European USSR	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-16 (1) 22-00 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-23 (2) 23-01 (1) 06-08 (2) 08-09 (1)	19-23 (1)
Eastern Mediter-ranean & Middle East	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (1) 22-00 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-23 (2) 23-01 (1) 06-08 (1)	20-22 (1)
Western & Central Africa	10-13 (1) 13-16 (2) 16-17 (1)	08-11 (1) 11-13 (2) 13-17 (3) 17-19 (2) 19-20 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-03 (2) 03-06 (1)	21-23 (1)

Eastern Africa	13-16 (1)	09-13 (1) 13-15 (2) 16-17 (3) 17-18 (2) 18-19 (1) 00-02 (1)	13-16 (1) 16-18 (2) 18-21 (3) 21-23 (2) 23-00 (1)	*Nil*
Southern Africa	09-11 (1) 11-13 (2) 13-15 (1)	08-10)1) 10-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-18 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (2) 22-00 (3) 00-02 (2) 02-06 (1) 06-08 (2) 08-10 (1)	19-21 (1) 21-22 (2) 22-23 (1) 21-22 (1)*
Central & South Asia	17-19 (1)	08-09 (1) 09-11 (2) 11-13 (1) 16-18 (1) 18-21 (2) 21-23 (1)	06-07 (1) 07-09 (3) 09-11 (1) 19-21 (1) 21-23 (2) 23-01 (1)	05-07 (1) 17-19 (1)
Southeast Asia	16-19 (1)	09-10 (1) 10-12 (3) 12-13 (2) 13-16 (1) 16-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	23-01 (1) 01-02 (2) 02-04 (3) 04-07 (2) 07-09 (3) 09-11 (2) 11-14 (1)	03-07 (1)
Far East	12-14 (1) 14-16 (2) 16-18 (1) 14-16 (1)**	09-10 (1) 10-12 (2) 12-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-22 (2) 22-23 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-04 (4) 04-05 (2) 05-06 (1) 06-08 (2) 08-10 (3) 10-12 (2) 12-14 (1)	01-02 (1) 02-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 03-06 (1)*
South Pacific & New Zealand	10-13 (1) 13-15 (2) 15-18 (3) 18-20 (4) 20-21 (2) 21-22 (1) 12-18 (1)**	08-10 (1) 10-12 (3) 12-15 (2) 15-18 (3) 18-22 (4) 22-00 (3) 00-02 (2) 02-03 (1)	07-09 (4) 09-11 (3) 11-13 (2) 13-17 (1) 17-19 (2) 19-21 (3) 21-03 (4) 03-05 (3) 05-07 (2)	22-23 (1) 23-00 (2) 00-03 (3) 03-06 (4) 06-07 (3) 07-08 (1) 23-01 (1)* 01-06 (2)* 06-07 (1)*
Australasia	13-15 (1) 15-18 (2) 18-20 (3) 20-21 (2) 21-22 (1) 14-18 (1)**	07-08 (1) 08-10 (2) 10-17 (1) 17-19 (2) 19-21 (3) 21-23 (4) 23-00 (3) 00-03 (1)	12-20 (1) 20-22 (2) 22-23 (3) 23-04 (4) 04-06 (3) 06-08 (2) 08-10 (3) 10-12 (2)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-03 (1)* 03-05 (2)* 05-06 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1) 11-14 (1)**	07-08 (1) 08-09 (2) 09-14 (3) 14-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	06-08 (4) 08-11 (3) 11-15 (2) 15-18 (3) 18-04 (4) 04-06 (3)	19-21 (1) 21-01 (3) 01-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 20-22 (1)* 22-04 (2)* 04-05 (1)*
Peru, Bolivia, Paraguay,, Brazil, Chile, Argentina & Uruguay	09-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 11-15 (1)**	06-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-22 (4) 22-23 (3) 23-00 (2) 00-01 (1)	09-15 (1) 15-17 (2) 17-18 (3) 18-01 (4) 01-02 (3) 02-06 (2) 06-08 (3) 08-09 (2)	20-21 (1) 21-00 (2) 00-02 (1) 02-04 (3) 04-05 (2) 05-06 (1) 22-01 (1)* 01-03 (2)* 03-05 (1)*
McMurdo Sound, Antarctica	13-15 (1) 15-17 (2) 17-19 (1)	12-16 (1) 16-18)2) 18-20 (3) 20-22 (2) 22-00 (1)	09-11 (1) 17-19 (1) 19-20 (2) 20-01 (3) 01-03 (2) 03-04 (1) 06-08 (2)	22-23 (1) 23-01 (2) 01-04 (1) 04-06 (2) 06-07 (1)

* Indicates best times to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a propagation index of (2), or higher.

** Indicates best times to listen for F-2 layer openings on 6 Meters.

For *short-skip* openings during August and early September, try *80* meters during the day for distances less than *250* miles, with *40* meters also usable. During the hours of darkness both *80* and *160* meters should provide excellent communications over this distance. For openings between *250* and *750* miles use *30* and *40* meters during the day for distances up to *500* miles, and *20* and *17* meters between *500* and *750* miles. At night *40* and *30* meters should be the best bands for this distance until midnight, with *80* meters optimum from midnight to sunrise. *Twenty* and *17* meters should provide optimum propagation during the hours of daylight for openings between *750* and *1300* miles. Optimum conditions should continue on these bands for this distance range after sundown and until midnight. Between midnight and sunrise the best band should be *40* meters. For openings between *1300* miles and the one-hop short-skip limit of approximately *2300* miles try *20* and *17* meters during the day, with *15* meters also usable. After sundown try *30* and *40* meters, with *80* meters also providing good propagation conditions for this distance range.

Frequent short-skip openings between approximately *400* and *1300* miles should also be possible on *10* and *12* meters, particularly during the daylight hours. Longer skip, up to *2300* miles, should often be possible during the late afternoon and early evening hours.

VHF Ionospheric Openings

Five peak periods in meteor activity are expected during August, and these could produce considerable meteor-scatter openings on the VHF bands.

At least one of these, the *Perseids*, should be a major shower with a great deal of activity. Maximum intensity should occur during the early evening of August 11th. Other peak periods, but with considerably less meteor activity, are expected on August 5, 12, 18, and 20.

Increasing daytime usable frequencies, particularly during late August and early September, along with continuing high levels of solar activity should make possible F-2 layer DX openings on *6* meters.

The best times for such openings are shown in this month's DX Propagation Charts. Don't expect them to happen every day, but chances are good for some openings during the daylight hours when conditions are expected to be High Normal or better.

Although a seasonal decrease in the number of sporadic-E-produced short-skip openings on *6* meters is expected during August, occasional openings between approximately 1000 and 1300 miles still should be possible. When sporadic-E ionization is intense and widespread, similar openings on *2* meters may also be possible. While sporadic-E ionization can occur at any time, there is a tendency for it to peak between 8 AM and noon, and again between 6 and 9 PM local daylight time.

Seasonal conditions should begin to improve by late August for some *6* meter trans-equatorial (TE) openings. These openings won't occur every day, and at best they will be weak, noisy, and often affected with severe flutter fading. Openings favor paths between the southern tier states and deep South America. The best time to check for TE openings is during the early evening hours, shortly before and just after sundown, although they may occur at later times as well.

VHF signals can be propagated for distances up to approximately 1000 miles by reflection from ionized patches produced by auroral activity. Auroral displays are most likely to occur during August when conditions are Below Normal or Disturbed on the HF bands. Check the Last Minute Forecast appearing at the beginning of this column for those days that are expected to be in these categories during the month.

73, George, W3ASK

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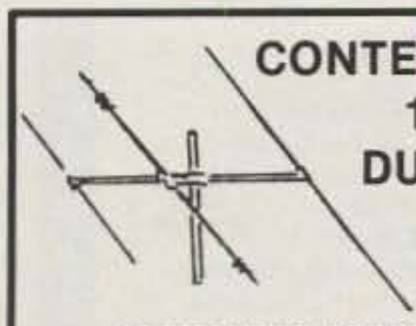

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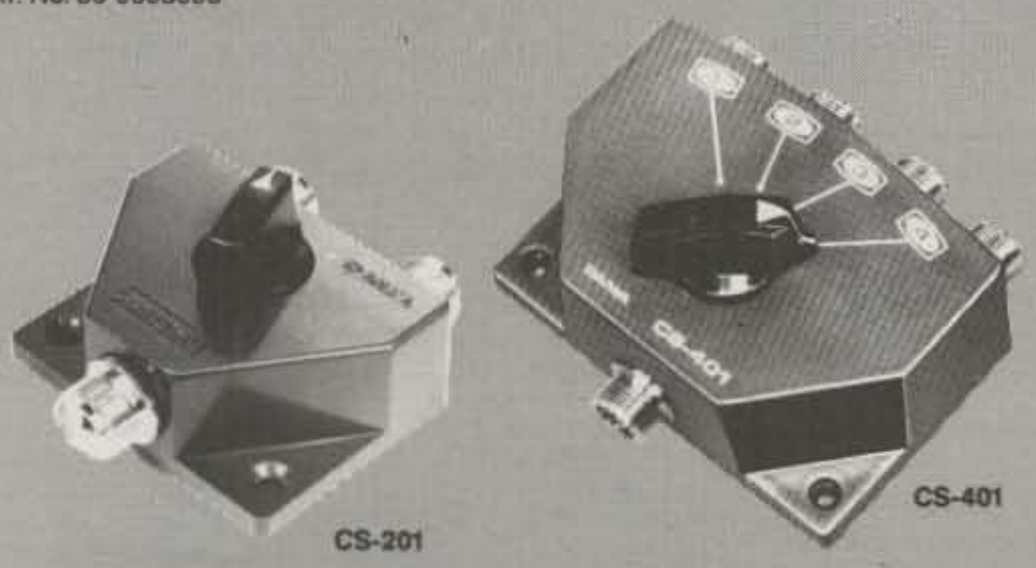

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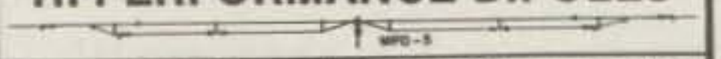

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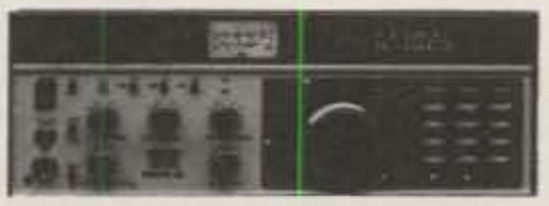

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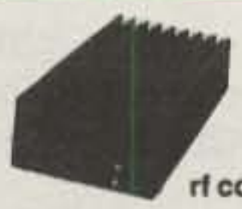

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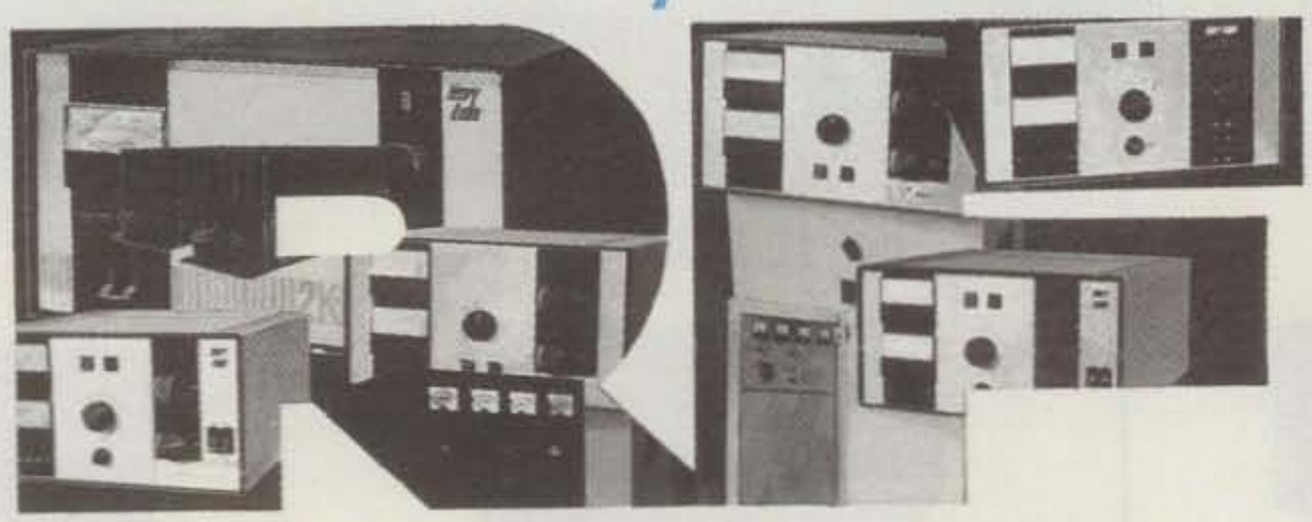

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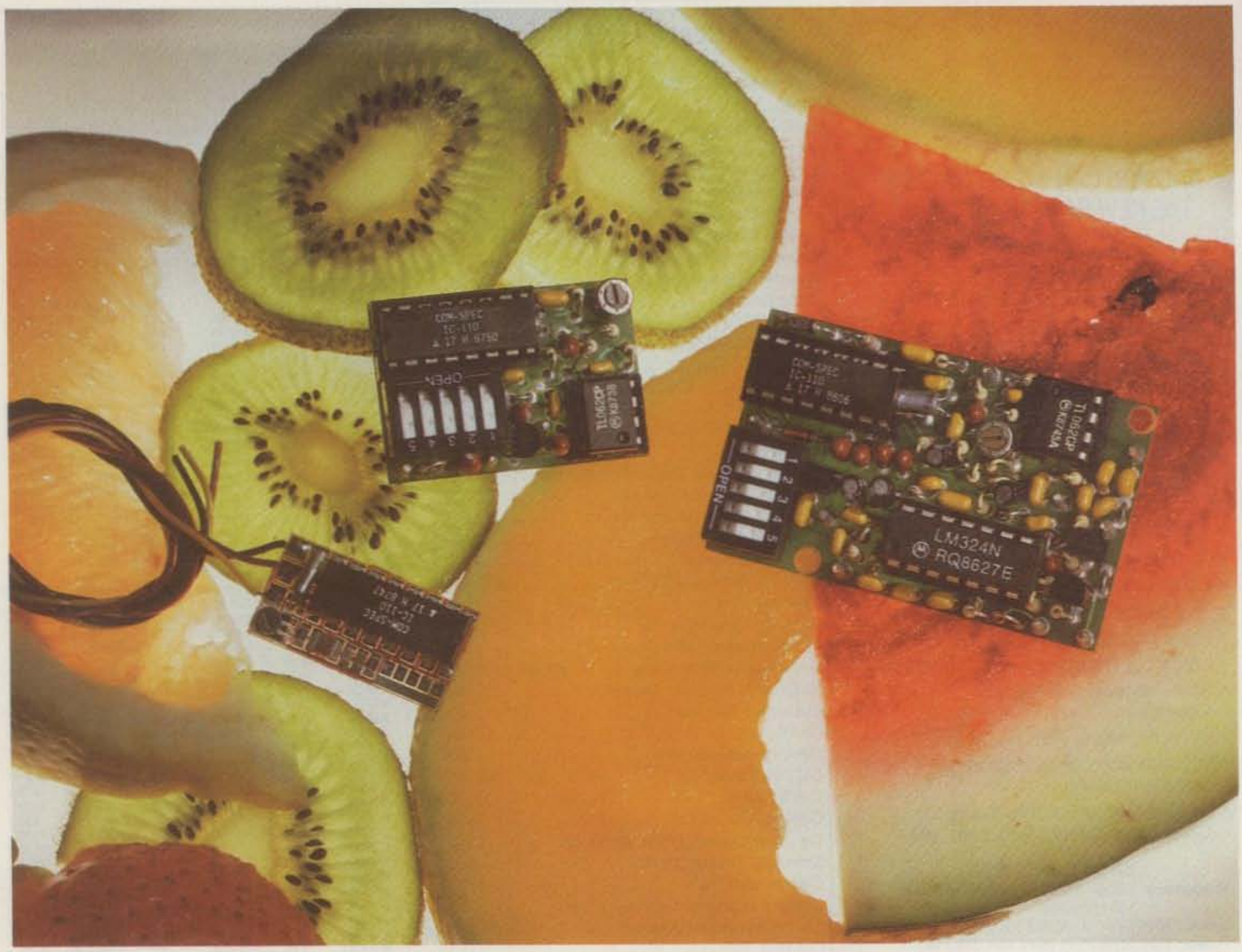

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TRANSMIT THE ULTIMATE SIGNAL

- Digital Signal Processing
- Dual Frequency Receive
- Digital AF Filter • 100 Memories

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THE BEST OF THE BEST

- 200 Watts Output
- All Amateur Bands
- Dual Receive
- DDS-Direct Digital Synthesis

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IC-765

ADVANCED PERFORMANCE HF TRANSCEIVER

- DDS (Direct Digital Synthesizer)
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2 METER/440 MOBILE

NEW!

- 45 W/2 Meter 35 W/UHF
- Cross Band Repeater Function
- Receiving and Scanning on Both Bands
- Detachable Front Control Panel

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PROVEN HF WINNER

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21 Memories for Each Band
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Up to 5 Watts Power
Built-in CTCSS
Built-in 10-Memory DTMF Autodialer

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- Up to 5 Watts Output
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- 3 Watts Standard
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Fiberglass Construction
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SPECIAL SALE

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AMPLIFIERS

- High Gain, Low Noise GaAsFET Pre-Amps
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- Made In USA

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• VS20M	$124	• RM50M	$259
• RS35A	$139	• VS50M	$232

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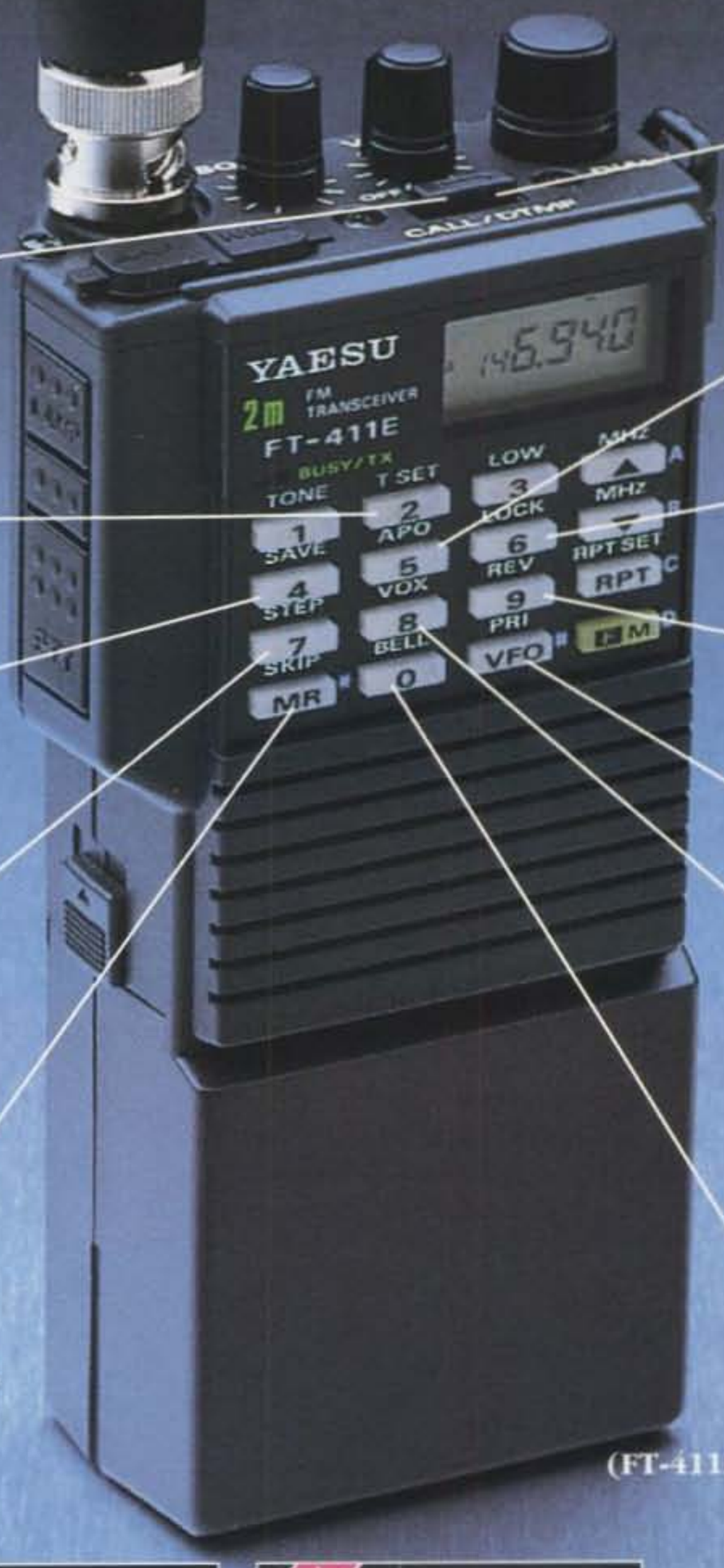
INDUSTRY FIRST!

FT-411 (ENHANCED)



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One-touch instant recall of favorite channel

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10 battery saving sampling rates

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Programmable channel steps (5, 10, 12.5, 20, 25)

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User friendly for those with impaired vision. Keys have their own distinctive tone.

INDUSTRY FIRST!
10-memory auto dialer

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APO (Automatic Power Off)

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Backlit keypad & display

INDUSTRY FIRST!
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INDUSTRY FIRST!
Built-in VOX at no charge

INDUSTRY FIRST!
Built-in CTCSS paging

(FT-411E shown actual size.)

FT-811
Small Size and Most Features

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Most Popular Dual Band

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THINK OF IT AS A BASE STATION FOR YOUR CAR

ICOM's new IC-229 and IC-449 ultra-compact mobiles make you feel like you're sitting in your ham shack while driving your car! These transceivers fit almost anywhere!

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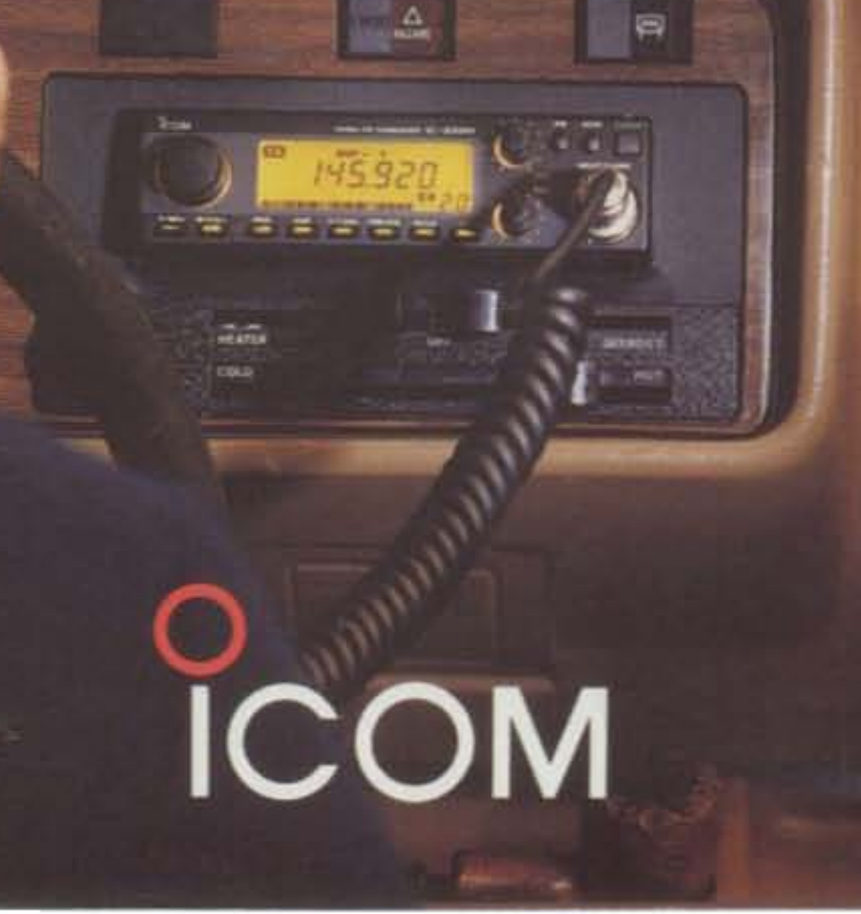
CIRCLE 165 ON READER SERVICE CARD



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