ICD 08241

Amateur Radio

SERVING AMATEUR RADIO SINCE 1945
AUGUST 1992 $2.95
CANADA $3.95

CQ

This Issue:

CQ Reviews:

The ETO Alpha 87A HF Linear Amplifier . . . page 26
The Comet Dual-Band CA-2X4MAX Vertical Antenna . . . page 48
The 2:1 Unun Matching Transformer . . . page 13
How To Put On Type N Connectors . . . page 40
How To Wind Helix Antennas . . . page 52

: Robert Jones, KH6O

THE RADIO AMATEUR'S JOURNAL

KENWOOD

Kenwood continues its H.F. superiority with the new TS-450S!

- 100 Watts on all nine Amateur bands - SSB, CW, FM, FSK modes.
- General coverage receiver. 150kHz-30MHz.
- 108 dB Dynamic Range with Advanced Intercept Point (AIP).
- 100% Duty Cycle Transmitter allows continuous transmission (Key Down) at full power output for periods up to one hour with PS-53 heavy duty power supply.
- Direct Digital Synthesizer (DDS) allows fine-tuning in 1Hz steps.
- Digital Signal Processor (optional) DSP-100, another Kenwood exclusive!
- New CW REVERSE MODE and PITCH CONTROL.
- Primary Function Control.
- Selectable IF Filter with Memory.
- Transceiver-to-Transceiver Data Transfer.
- IF Shift.
- Special circuit design, including Triple Conversion.
- 100 Memory Channels.
- New Ten-Key "Telephone Pad" Layout.
- Digital Bar Meter and Multi-function Display.
- Internal Automatic Antenna Tuner (optional).
- Three Scan Modes.
- Switchable AGC (slow/fast) Circuit. Front Panel VOX Control All-Mode Squelch Circuit.

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominquez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA
6070 Kestrel Road
Mississauga, Ontario, Canada L5T 1S8

FREE
HS-5 Headphone with purchase! A $67.95 retail value. See your Kenwood dealer for details.

Kenwood meets or exceeds all specifications. Contact your dealer for a complete listing of specifications and accessories. Specifications are subject to change without notice. Complete service manuals are available for all Kenwood transceivers and most accessories. One year warranty in the U.S.A. only.

KENWOOD

. . . pacesetter in Amateur Radio

State of the art, pure and simple. Offering superb TX/RX performance plus exceptional signal purity, the TS-950SDX establishes a new benchmark for HF communications.

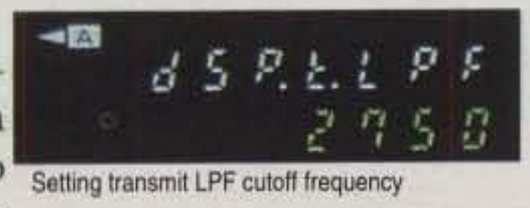
- **Built-in DSP (digital signal processor)**
- **Dedicated Power MOS FET final section**
- **User-friendly design and menu system**

TS-950SDX HF TRANSCEIVER

Enjoy Total Control with Kenwood's New TS-950SDX

A competition-class transceiver only attains its real potential when powerful performance is balanced by user-friendly controls. Operating ease is fundamental. And it's one of the reasons why Kenwood's TS-950SDX is setting the pace for HF communications.

The design of the TS-950SDX represents a two-track approach to controls and displays: while providing a comprehensive menu system, there are also numerous time-saving functions — such as Quick Memory, direct band access keys and a remote function keypad.



Setting transmit LPF cutoff frequency

Display current CW pitch frequency

The menu system provides rapid front-panel access to a wide variety of features and operational modes. But there's no better way to appreciate this phenomenal rig than by operating split frequencies. The front panel controls include M/S select and an RX↔SUB key for instantly swapping frequencies. With an external speaker or headphones, the main and sub receivers can be monitored simultaneously yet independently. Monaural and semi-mixed monitoring are also available.

Among the many other convenient features of the TS-950SDX are ΔF (enabling instant verification of frequency difference), a CW filter (500Hz) for sub-receiver use, and dual S meters.

When it comes to HF, the choice is simple. Savor the thrill of the chase with Kenwood's TS-950SDX.

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.
6070 Kestrel Road, Mississauga,
Ontario, Canada L5T 1S8

KENWOOD

...pacesetter in Amateur Radio

New Model DJ-580T

RATED # 1 IN JAPAN, NOW AVAILABLE IN THE U.S.

A super-compact handheld, the tiny DJ-580T is a powerful, feature-packed twin bander. This super-compact HT is the smallest you'll find, and literally fits in the palm of your hand.

Ergonomic design, combined with excellent sensitivity and unbelievable great sound, sets a new standard for miniature HT's.

New MCF function allows you to set the 40 memory channels regardless of which channels you want for VHF or UHF. Any combination is possible.

Alinco's DJ-580T has Full-Duplex Cross Band Operation and Cross Band Repeater Functions with real world power and excellent sensitivity. Airband receive with simple modification.

If the battery is depleted to less than 5 volts, Alinco's Patented Super Low Battery Consumption Function is automatically activated. You can continue to operate the radio all the way down to 3.5 volts. This feature is effective with dry cell batteries only.

This unit has built in DSQ for paging, CTCSS encode and decode standard, various scanning functions, 3 power level selections for each band, bell function, and an illuminated keypad.

Check out the affordable technology of the 90's.
Check out ALINCO.

ALINCO ELECTRONICS INC.

ALINCO ELECTRONICS INC.
438 Amapola Avenue, Unit 130, Torrance, CA 90501
Tel. (310) 618-8616 Fax (310) 618-8758

Two Year Limited Warranty.
Specifications and features are subject to change without notice or obligation.

CIRCLE 178 ON READER SERVICE CARD

MASTHEAD

EDITORIAL STAFF
Alan M. Dorhoffer, K2EEK, Editor
Gail M. Schieber, Managing Editor
Lew McCoy, W1ICP, Technical Representative
Peter O'Dell, WB2D, Special Projects Editor

CONTRIBUTING STAFF
John Dorr, K1AR, Contest Calendar
Chod Harris, VP2ML, DX
Dave Ingram, K4TWJ, OSCAR & Antiques
George Jacobs, W3ASK, Propagation
Dorothy H. Johnson, WB9RCY, Awards & USA-CA
Joe Lynch, N6CL, VHF
Frederick O. Maia, W5YI, FCC Correspondent
Irwin Math, WA2NDM, Math's Notes
Bill Orr, W6SAI, Radio Fundamentals
Buck Rogers, K4ABT, Packet Radio Editor
Karl T. Thurber, Jr., W8FX, Antennas & Software
Bill Welsh, W6DDB, Novice

AWARD MANAGEMENT
Jim Dionne, K1MEM, WAZ Award
Dorothy H. Johnson, WB9RCY, USA-CA Award
Norman Koch, K6ZDL, WPX Award
Billy Williams, N4UF, CQ DX Award

CONTEST MANAGEMENT
Steve Bolia, N8BJQ, WPX Contest Director
Larry Brockman, N6AR, WW DX Contest Director
Robert Cox, K3EST, WW DX Contest Director
John Dorr, K1AR, WW DX Trophies & Certificates
Roy Gould, KT1N, RTTY Contest Director
David L. Thompson, K4JRB, 160M Contest Director

BUSINESS STAFF
Richard A. Ross, K2MGA, Publisher
Dorothy Kehrwieder, General Manager
Arnie Sposato, N2IQO, Advertising Manager
Tracy Parbst, Sales Assistant
Frank V. Fuzia, Controller
Catherine Ross, Circulation Manager
Melissa Kehrwieder, Data Processing Manager
Carol Licata, Data Processing
Denise Pyne, Customer Service

PRODUCTION STAFF
Elizabeth Ryan, Art Director
Barbara Terzo, Assistant Art Director
Susan Reale, Artist
Edmond Pesonen, Electronic Composition Manager
Dorothy Kehrwieder, Production Manager
Tracy Parbst, Production
Pat Le Blanc, Phototypographer
Florence V. Martin, Phototypographer
Hal Keith, Illustrator
Larry Mulvehill, WB2ZPI/VK5AAY, Photographer

A publication of

CQ Communications, Inc.
76 North Broadway
Hicksville, NY 11801-USA

Offices: 76 North Broadway, Hicksville, NY 11801. Telephone: 516 681-2922. FAX (516) 681-2926. CQ (ISSN 0007-893X) is published monthly by CQ Communications Inc. Second Class postage paid at Hicksville, NY and additional offices. Subscription prices: Domestic—one year $22.95, two years $43.00, three years $63.00; Canada/Mexico—one year $25.00, two years $47.00, three years $69.00; Foreign—one year $27.00, two years $51.00, three years $75.00; Foreign Air Mail—one year $80.00, two years $157.00, three years $234.00.
U.S. Government Agencies: Subscriptions to CQ are available to agencies of the United States government, including military services, only on a cash with order basis. Requests for quotations, bids, contracts, etc. will be refused and will not be returned or processed. Entire contents copyrighted CQ Communications Inc. 1992. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address. Printed in the United States of America.
Postmaster: Please send change of address to CQ Magazine, 76 North Broadway, Hicksville, NY 11801.

The Radio Amateur's Journal

ON THE COVER: Robert Jones, KH6O, checks out his 16 helix array for OSCAR on 432 MHz at his Kanehoe, Hawaii QTH. (Photo by Larry Mulvehill, WB2ZPI)

AUGUST 1992 **VOL. 48, NO. 8**

FEATURES

THE 2:1 UNUN MATCHING TRANSFORMER.....Jerry Sevick, W2FMI 13

THE EASY PVC—A COLLAPSIBLE, 2-ELEMENT BEAM AND MAST
Bruce Auld, NZ5G 20

CQ REVIEWS: THE ETO ALPHA 87A HF AMPLIFIER
Lew McCoy, W1ICP 26

TWO TUNERS NOT TO END ALL TUNERS.....John J. Schultz, W4FA 32

HOW TO CORRECTLY ASSEMBLE TYPE N CONNECTORS
Larry Higgins, W5QMU & John Bruemmer, W5LVE 40

CQ REVIEWS: THE COMET DUAL-BAND BASE/REPEATER VERTICAL ANTENNA.....Lew McCoy, W1ICP 48

BUT WILL THEY COME?.....John Pollock, KA7MCX 50

HOW TO WIND A HASSLE-FREE HF HELIX.....Ed Stiles, WA7P 52

CQ SHOWCASE: NEW AMATEUR PRODUCTS..... 56

RADIO FUNDAMENTALS: THE "ZIG-ZAG" BROADBAND ANTENNA
Bill Orr, W6SAI 58

ANTENNAS & ACCESSORIES: READER MAIL, ANTENNA NOTES, AND, SOFTWARE TOPICS.....Karl T. Thurber, Jr., W8FX 74

BILL'S BASICS: A MESSAGE TO NON-AMATEURS
Bill Welsh, W6DDB 84

VHF PLUS: ALL ABOUT METEOR SHOWERS AND PROPAGATION
Joe Lynch, N6CL 90

PACKET USER'S NOTEBOOK: PACKET PROFUSION
Buck Rogers, K4ABT 98

MATH'S NOTES: DATA PROCESSING STANDARDS
Irwin Math, WA2NDM 106

1992 CQ WORLD-WIDE 160 METER CONTEST HIGH-CLAIMED SCORES. 119

1992 CQ WORLD-WIDE WPX SSB CONTEST HIGH-CLAIMED SCORES... 130

WASHINGTON READOUT: YOUR QUESTIONS ON AMATEUR EXAMINATIONS ANSWERED!.....Frederick O. Maia, W5YI 132

DEPARTMENTS

AWARDS: STORY OF THE MONTH—H. "HANK" PETERSEN, KJ4LG
Dorothy Johnson, WB9RCY 66

CONTEST CALENDAR: A FINAL TRIBUTE TO LU8DQ, CONTESTS FOR AUGUST AND EARLY SEPTEMBER.....John Dorr, K1AR 110

DX: DX ADVISORY COMMITTEE REPORT.....Chod Harris, VP2ML 120

PROPAGATION: SUNSPOT CYCLE PROGRESS, DX CHARTS FOR AUG. 15 THROUGH SEPT. 15.....George Jacobs, W3ASK 136

ZERO BIAS..... 4
ANNOUNCEMENTS..... 6
OUR READERS SAY..... 8
HAM SHOP..... 144

ZERO BIAS EDITORIAL

Do you remember where you put all that hardware, wire, and coax you accumulated? Maybe it's time to stand up and say "now" when asked, "When are you going to get that stuff out of here?" It's antenna time again. We're heading into the heavy DX and contest season, and unlike that never-ending tube of toothpaste, you may have squeezed that last watt out of your old antenna by now.

Is this the year for a new tower or pneumatic mast? How about a new beam? Maybe your neighbors won't mind some wire antennas running through their property down to the next block. Scratch the last idea; they probably will. Anyway, it's time for a change and a step up in efficiency. You've read the articles, seen the books, and checked out the ads on antennas enough times to know that your antenna is the final determinant in how well you'll do in amateur radio.

Obviously, as amateurs we automatically know that more is better. Really big is great, and stacked monobanders for ALL bands means that the whole world knows us by our first name. Most of us, however, will fall far short of great or first-name recognition. But we certainly can be active players. Perseverance, patience, and skill can equate to a lot of aluminum. The biggest part of an antenna system is you and how good you are. Remember that a bigger antenna won't necessarily make you a better operator, but it certainly will make more people in the world know what kind of fool you can be. We can all cite call letters from some of the DX pile-up fiascoes this past year.

The one great element to changing and experimenting with antennas is satisfaction. The results are immediate and evident. You can hear what you couldn't before and they can hear you. It means you can share this information with other amateurs and they can enjoy it, too. So whether your goal is to rack up a few more countries, states, or counties or do a bit better in the next contest, a new or different antenna is in the offing. It's also worth the effort to get your antenna up a little (or a lot) higher and add some metal up there to access a new repeater or two.

If you're at a loss as to what's available out there or how things have changed since you put up your current antenna, pick up a copy of *CQ's 1992 Antenna Buyer's Guide*. It gives you information on just about every antenna product going, including specs and prices. If the antenna you are using now hasn't been manufactured since the Eisenhower administration, then you are due for a change.

Change for some of you is a conspiratorial word meaning "spend money"—a very touchy subject. Change in this sense is indeed a conspiratorial word meaning a subtle way of teaching and learning, an educational process that produces reward. Changing your antenna or even putting up your first antenna involves putting into practice what you think you know and quickly finding out what you really need to know. It involves understanding and compromise, as nothing in life is ideal. It doesn't take much time or involvement with amateur radio to be able to describe an ideal antenna system for any band, but reality dictates what is appropriate for our own situation. Often, though, what we may happily discover is that we have not begun to maximize what we could do with a little brain power and effort. If you look at a challenge as only a plot to spend money, then it is a loss for you in several areas. If you can develop this opportunity to learn as well as achieve, then you have something that will last long after this new antenna bites the dust.

Safety First

I'd like to make a few observations with regard to antenna safety. First, there is really nothing I can think of that is "obviously" a prime consideration for a task never done before. What may be obvious to you is not as obvious to someone else. If you are putting together a commercial antenna, follow all of the instructions for proper assembly and installation. It may seem to take longer since it's "obvious" what they mean, but do take the time to read the entire manual.

Some things are "obvious" but not seen—i.e., power lines. Look up and around before you decide where to place that vertical antenna. How close is the nearest power line? If the antenna were to waver or fall, would it hit the power line? What are the odds on me holding the antenna at the base while it makes contact?

I'm writing this not so much as an abstraction or concern, but as something I didn't "see." I was going to put up a 2 meter vertical antenna on top of a mast in my side yard, shielded by some trees. I have lived in my house for a number of years and so have become used to seeing (and accepting) everything there as part of the scenery. What was no longer obvious or what did not stand out was the power line and telephone drop to my neighbor's house which crossed my property at this point. I had seen it for so many years that I no longer noticed it. No, I didn't come in contact with it or have an accident. I finally noticed it while I was getting everything together to put up the antenna. Several calls to the local power company and the telephone company resulted in having the drops moved to a non-lethal position. So, look up and around to see what's there and how far away from you it is. In case you "no longer" see it, have someone else look, too.

If you ever catch yourself answering or thinking the phrase "I can handle it," it probably means you can't. In this instance there is literal truth in the adage "Pride goeth before a fall." Wherever possible, wait for someone to help you, if only to see what you don't. Also, save the 807s until after everything is completed and you have reason to celebrate.

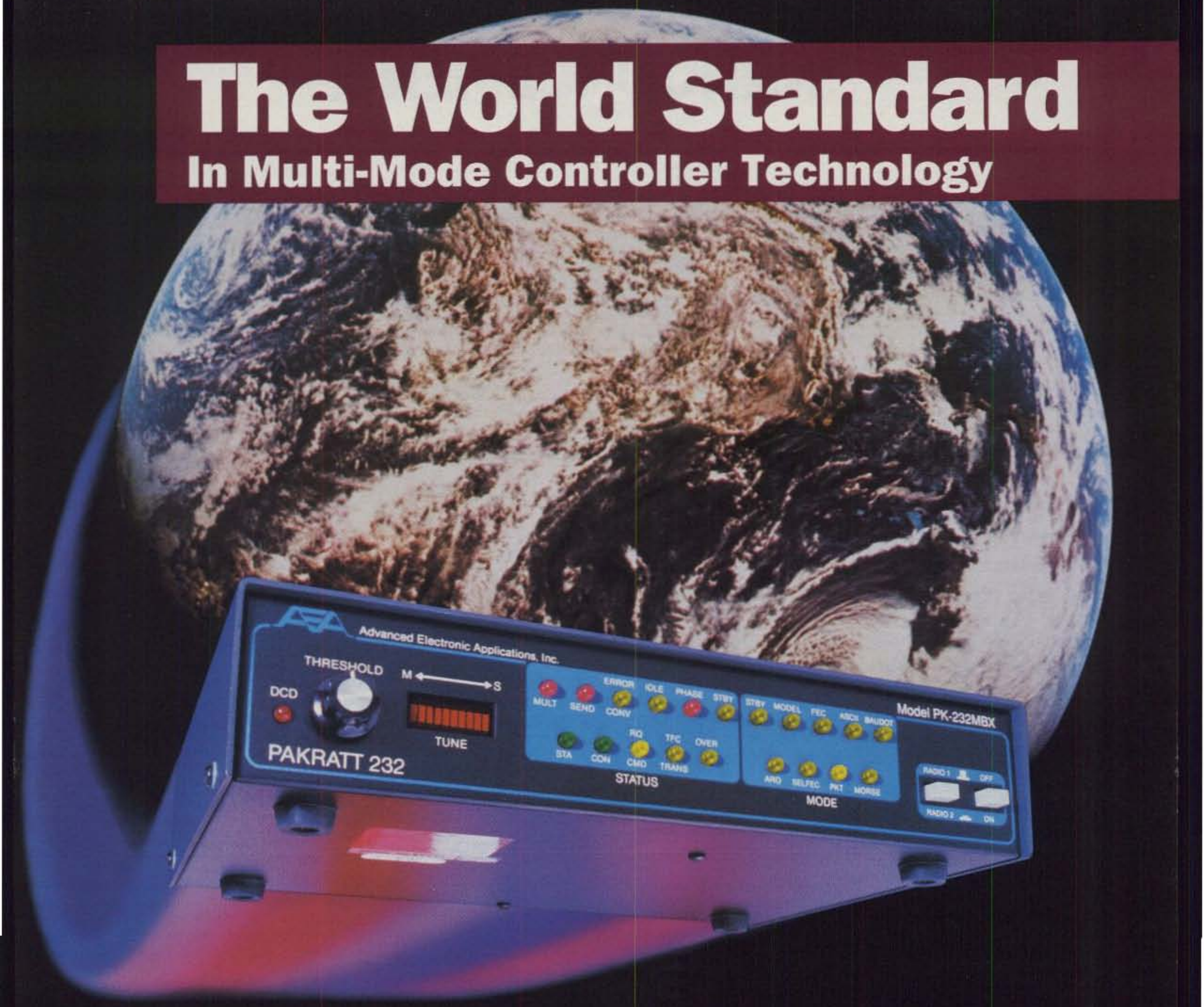
One other item I brought up last month is worth repeating when it comes to antenna safety—namely, a safety-belt. When I wrote that you should use it rather than display it, it prompted thoughts of the analogy between a safety-belt and a life-preserver (or life-jacket) used on the water.

For a number of years I was involved with marine law enforcement and made countless routine safety checks of vessels. The politically correct term for a life-jacket is a "Personal Flotation Device," or PFD. It sort of takes the onus out of what it is designed to do and makes it sound like you'd simply bob around casually in the water. New York state navigation law is quite simple: for all motor vessels over a certain size, there will be one PFD for each person on board and it will be readily available (for use). So much for theory. Reality proved that even though most people did buy PFDs, a significant number stowed them far forward in a locker, still wrapped in plastic. So much for common sense. Yes, they did have PFDs, but no, they'd never find them, unwrap them, put them on, and adjust them in time to prevent a really serious problem. There are two things you can count on: the first is that statistically you can't swim as far as you think you can, and the second is that the human body was not designed to levitate.

If you plan any antenna work, be it climbing your tower or a tall tree, wear a safety-belt. Buy a good one, learn how to put it on properly, and accustom yourself to putting it on automatically when you want to do even the smallest amount of work off the ground. There's a big difference between fear and respect for what you're doing. I'm trying to instill respect for the task at hand, not fear. Think of the slogan used for cars: "Buckle Up For Safety." You can't go wrong.

73, Alan, K2EEK

The World Standard
In Multi-Mode Controller Technology



The PK-232MBX is the undisputed leader in multi-mode controllers. Here are a few reasons why:

Filtering. With a high-quality front-end filter (seventeen-pole effective filtering), the PK-232MBX gives you the best HF performance of any multi-mode controller.

Software. Our Host Mode control programs offer unmatched power and versatility in an easy to use, intuitive format. Available for PC-compatible, Macintosh and Commodore computers.

Packet Lite™. On HF, two PK-232MBXs communicating with AEA's exclusive Packet Lite can achieve a 40% increase in throughput over standard packet.

Modes. The PK-232MBX can transmit and receive AMTOR, Morse, Baudot, ASCII, Packet, and WEFAX. In addition, it can receive NAVTEX (NAVigational TelEX) and TDM (Time Division Multiplex) for a total of eight different types of signals.

AMTOR and Packet Mailboxes. The only controller with a mailbox for both packet and AMTOR is of course the PK-232MBX.

See for yourself why more hams choose the PK-232MBX than any other controller.
In two words,
UNBEATABLE PERFORMANCE.

Advanced Electronic Applications, Inc.
P.O. Box C2160/2006 196th St. S.W. Lynnwood, WA 98036-0918
Customer Service (206) 775-7373 Upgrade Hot Line (206) 774-1722 Catalog Request Line (800) 432-8873
CompuServe user ID 76702,1013

ANNOUNCEMENTS

• The following special events will take place during August:

W2OB, from the Barnegat Lighthouse (Old Barney), Barnegat Light, New Jersey; Old Barney ARC; 1200–2300Z Aug. 8–9; CW 7.040, 14.040, 21.040, 28.040; phone 7.225, 14.290, 21.390, 28.390, 146.52, 146.835/R. For unfolded certificate send 9 × 12 SASE and QSL to Joe Fleishinger, NU2F, 75 Joshua Dr., Manahawkin, NJ 08050.

AA2AV, from 25th anniversary of Electronic Technology Society of New Jersey, Skeleton Hill Island (IOTA NA111), New Jersey; 2200Z Aug. 7 through 2200Z Aug. 9; CW 3.530, 7.035, 7.135, 10.15, 21.035, 21.135, 28.035, 28.135; phone 3.875, 7.275, 14.235, 21.335, 28.335; plus 146.94. For QSL send QSL and SASE to AA2AV, P.O. Box 1233, Piscataway, NJ 08854.

K3DNA, from 25th anniversary U.S. Canoe Assn. National Championships, Lewistown, Pennsylvania; Juniata Valley ARC; Aug. 1–16 (with most operation from Aug. 1–8); General portion of SSB bands, as well as CW. For certificate send QSL and SASE to K3DNA, P.O. Box 73, Yeagertown, PA 17099.

KM4YH, from Hiawassee, Georgia site of 42nd annual Georgia Mountain Fair; Triode ARC; 1300–2100Z Aug. 8–9; General portions of 80, 40, 20, and 10 meter Novice band, plus 147.045 K4AIH repeater. For QSL send SASE to KM4YH, Rt. 5 Box 1055, Hayesville, NC 28904.

W4NJA, from Paducah Police Dept. D.A.R.E. Daycamp, Paducah, Kentucky; Paducah ARA; 1400–2100Z Aug. 4–5; lower 25 kHz of 20 meter phone and lower 50 kHz in Novice 10 meter phone. For D.A.R.E. QSL send SASE to John Hudson, KC4HGX, 3214 Lorine Lane, Paducah, KY 42001.

KG5QO/5, from "Jot 'em Down Store, of Lum 'n Abner," Pine Ridge, Montgomery County, Arkansas; Ouachita ARA; 1300–2400Z Aug. 6–8; lower 25 kHz of General phone bands and 10 meters Novice. For QSL send QSL and SASE to Jack Brewer, KG5QO, Rt. 1 Box 137, Hatfield, AR 71945.

W1AW/6, from 1992 ARRL National Convention, Los Angeles, California; Aug. 22–23 *(no times given)*; General subband of 80, 40, 20, 15 meters, Novice 10 meters, and VHF/UHF bands. For certificate send QSL and 9 × 12 SASE to Dick Bruno, N6ISY, P.O. Box 570756, Tarzana, CA 91356.

KK6EK, from 15th anniversary of founding of Cordell Expeditions, Channel Islands, California; during the month of August; SSB, principally on 20 meters, usually 14.328. For special expedition QSL and information, contact KK6EK, Cordell Expeditions, 4295 Walnut Blvd., Walnut Creek, CA 94596.

K2BSA/6, from Rendezvous '92, Camp Hi-Sierra, Sonora, California; Santa Clara County Council, Boy Scouts of America; 1600–0300Z Aug. 9–14; on 28.350, 21.350, 14.280, 7.260 MHz, packet on 145.05 MHz or FM voice on 146.55 or 446.0 MHz. Send QSL and SASE to Ghery Pettit, N6TPT, 5998 Alvarado Court, San Jose, CA 95120.

7-land, from 50th anniversary of first flight of a B29, Museum of Flight, Seattle, Washington; Boeing Employees ARS; 1700–2400Z Aug. 14, 15, 16; on 28.400, 21.360, 14.280 MHz. QSL and information via KS7F.

W7AIA, from Antique Aircraft Fly-in, Evergreen Flying Field, east of Vancouver, Washington; Clark County ARC; Aug. 15–16 *(no specific times given)*; lower portions of 40, 20, 15 meters phone, with some 75 meter phone during the night. For certificate send SASE to CCARC, P.O. Box 1424, Vancouver, WA 98668.

WB8LLY, from Erie County Fair, Heritage Barn, Sandusky, Ohio; Firelands ARA; Aug. 11–16 *(no times given)*; lower 50 kHz of General phone subbands on 80, 40, 20, 17, 15, 12, and starting on 10 meters Novice phone subbands (28.400) daily; also WB8LLY @ WB8JUI packet. For certificate send 9 × 12 SASE with 2 first-class stamps and QSL with contact number to Tim, N8AHK, 1307 Fifth St., Sandusky, OH 44870-4201.

KB9BWS, from Findlay, Illinois Centennial; 0600–1800Z Aug. 15; lower 25 kHz of General subbands on 40, 20, 15, and 28.400–28.450 MHz. For certificate send QSL and SASE to Byron Abrams, KB9BWS, P.O. Box 242, Findlay, IL 62534.

W9AML, from McLean Co. 4H Fair, Bloomington, Illinois; 1700–2400Z Aug. 4–7; General portion of 80–15 meters and Novice 10 meters. For QSL send QSL and SASE to Central Illinois RC, P.O. Box 993, Bloomington, IL 61702.

Ø-land, from Trainfest, Milbank, South Dakota; amateurs from NE South Dakota; 1400–0200Z Aug. 8 and 9; General phone subbands and Novice 10 meters. For certificate send QSL and 9 × 12 SASE to NØJUO, P.O. Box 189, Wilmot, SD 57279-0189.

GBØAAF, from 50th anniversary of commissioning of station 597 (WW II), Langford Lodge Centre, near Crumlin, county Antrim, N. Ireland; Lagan Valley ARS; Aug. 15 *(no times given)*; 144.260, 28.260, 21.260, 14.260, 7.070, 3.760 MHz, and packet and AMTOR. Contact address is Colin Tait, 33 Riverside Drive, Lisburn, BT 27 4HE, County Antrim, Northern Ireland.

H44GC, from 50th anniversary of battle of Guadalcanal, Fighter Base 2, Solomon Islands; 0800Z Aug. 7 to 0800Z Aug. 9; SSB (+/–) 28.480, 21.380, 14.280, 7.080 MHz, and CW 28.040, 21.040, 14.040, 7.030 MHz. For QSL send QSL and SASE to KU9C, Steve Wheatley, P.O. Box 5953, Parsippany, NJ 07054.

US76BL, special event from the hill Lyson, near the

(continued on page 142)

10, 12, 15, 17, 20, 30 & 40 Meters

There's never been an antenna like this!

R7

Look all you want–you won't find another multiband vertical with the quality, features and performance of the Cushcraft R7. The R7 is a combination of exceptional half-wave performance and user friendly features such as compact size, no moving parts or ground radials and mount-anywhere convenience.

R7 puts the fun back into ham radio. It can be assembled and on the air in less than an hour. Its convenient size and lack of radials make it easy to locate for home, vacation or portable stations. Mount it anywhere from ground level to tower top.

JOIN THOUSANDS OF SATISFIED OWNERS.

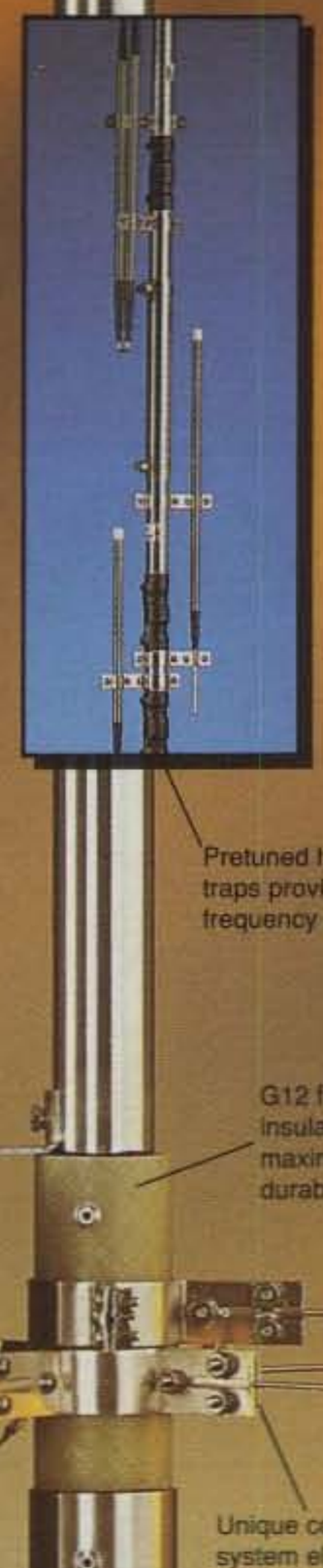
"Tropical storm Zelda struck Kwajalein on Thanksgiving Day . . . Harbor Control clocked gusts at 87 knots (100 mph) . . . As the beams blew down, my R7 vertical stayed up. I maintained communications for the entire storm." V73CT

"My first QSO was ZA1A in Albania with my R7." NE8Z / HC1MD

"Metalwork, machining and traps well made . . . Assembly was straight forward and easy." WX6W

SPECIFICATIONS

Frequency, MHz	28, 24, 21, 18, 14, 10, 7
Gain, dBi	3
Electrical Wavelength	Half-wave
SWR 2:1 Bandwidth	10m-2 MHz / 12m-100 KHz 15m-450 KHz / 17m-100 KHz 20m-250 KHz / 30m-25 KHz 40m-75 KHz
Power Rating, Watts PEP	1800
Radiation Angle, degrees	16
Frequency Selection	Automatic
Horizontal Radiation Pattern, degrees	360
Height, ft (m)	22.5 (6.9)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)
Wind Load, ft² (m²)	2.25 (.21)
Weight, lb (kg)	12.3 (5.6)
Counterpoise Radials Supplied	7
Wind Survival, mph (kph)	80 (128)



cushcraft CORPORATION

WHERE PERFORMANCE IS A TRADITION

48 PERIMETER ROAD, P.O. BOX 4680, MANCHESTER, NH 03108 USA
TELEPHONE: 603-627-7877 • TELEX: 4949472 • FAX: 603-627-1764

AVAILABLE THROUGH DEALERS WORLDWIDE

OUR READERS SAY

Radio Shack Mouse/HT Holder

Editor, *CQ*:

Seems like every time I got a call, my HT had slid to the other side of the dash out of reach (I drive a large van). Every time I grabbed the mike, my HT would come flying at me at light speed. While trying to change frequency, I spent too much time studying the (invisible) LCD and proceeded to rear-end the police car in front of me. Something had to be done!! I didn't want to permanently mount it. I wanted it portable so I could instantly take it with me.

While searching for an inexpensive way to keep my HT secure and visible while mobile, I discovered I had the answer right here in my shack. The mouse holder for my computer fit the base of my HT perfectly. NO HOLES TO DRILL! It has adhesive backing that mounts it securely to my dash, supporting the weight of the HT with ease. It puts the HT in plain view so I can read the display and keeps it from moving when I grab the mike or turn corners. Plus it keeps the rig vertical so the "rubber duck" is able to be used.

If you want a simple solution to securing your HT or scanner, hop on over to your local Radio Shack and pick up part #26-275 for $2.49. Peel off the backing, slap it on the dash, drop in your HT, and enjoy!

Tim Hagelganz, KC6WLS
Alta Loma, CA

Bravo, The Real McCoy

Editor, *CQ*:

With all the misconceptions and misunderstandings about multiband dipole antennas being said on our many bands today, a refreshing insight has once again surfaced in Lew McCoy's article in the June issue ("The McCoy Dipole and How It Came To Be," *CQ*, June 1992, p.11). It gives excellent straight talk and a no-nonsense approach to a very efficient and inexpensive multiband dipole that will work like "The Real McCoy" on all bands. I recommend that your magazine re-run this article every six months to inform all new hams that an efficient multiband dipole does not have to cost an arm and a leg.

Love it! Lew McCoy has a great gift for getting the information into the brain with some straight talk. He does a great job. Keep this line of information coming.

Roger F. Wise, KI0F
Wabasha, MN

This Mooney aircraft was spotted by Bill Barbee, AA5ZR, at the Grenada, Mississippi airport.

ICOM

IC-228H 2-Meter Mobiles

BACK BY POPULAR DEMAND!

THE BEST THINGS COME IN SMALL PACKAGES

Meet the master of 2-meter FM mobiles! ICOM's easy-to-operate IC-228H answers your requests for custom big rig performance and maximum frequency coverage in a compact unit designed to fit today's autos. Operate odd split and subaudible-tone accessed repeaters, monitor NOAA weather and enjoy incomparable ICOM quality with every call!

DUPLEX INDICATOR
Indicates plus or minus duplex.

PRIORITY WATCH
Monitor any channel for calls while continuing operation on another frequency.

TUNING STEP INDICATOR
Programmable tuning steps of 5kHz, 10kHz, 15kHz, 20kHz or 25kHz.

45 OR 25 WATTS
The IC-228H delivers 45 watts or 25 watts. Selectable from the front panel.

SRF INDICATOR
Shows signal strength when receiving, and relative output power selection when transmitting.

SUBAUDIBLE TONES/BEEPER
Includes all subaudible tones built-in. TONE appears when the tone encoder is turned on. SQL lights when the optional UT-40 pocket beep function is activated (silently monitors for calls with your pre-programmed tone).

WIDE BAND COVERAGE
Full reception of 138-174MHz including public service and NOAA weather bands. Transmit range of 140-150MHz includes MARS and CAP frequencies.

20 MEMORIES
Each memory stores any Tx offset and subaudible tone.

MEMORY LOCKOUT
Lights when a memory channel is programmed as a skip channel.

- Wideband Coverage 138-174MHz Rx
- 20 Memories with Memory Channel Lock-Out
- 45/25 Watts
- Color Keyed LCD
- Band and Memory Scanning from Supplied DTMF Mic
- Call Channel
- Optional Beeper
- Priority Watch

For a brochure on any ICOM product, call our Toll-Free Literature Request Hotline 1-800-999-9877.

ICOM

First in Communications

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004
Customer Service Hotline (206) 454-7619
18102 Skypark South, Ste. 52-B, Irvine, CA 92714 /
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

Larsen Dual Band Antennas Offer One Option Our Competitors Don't:

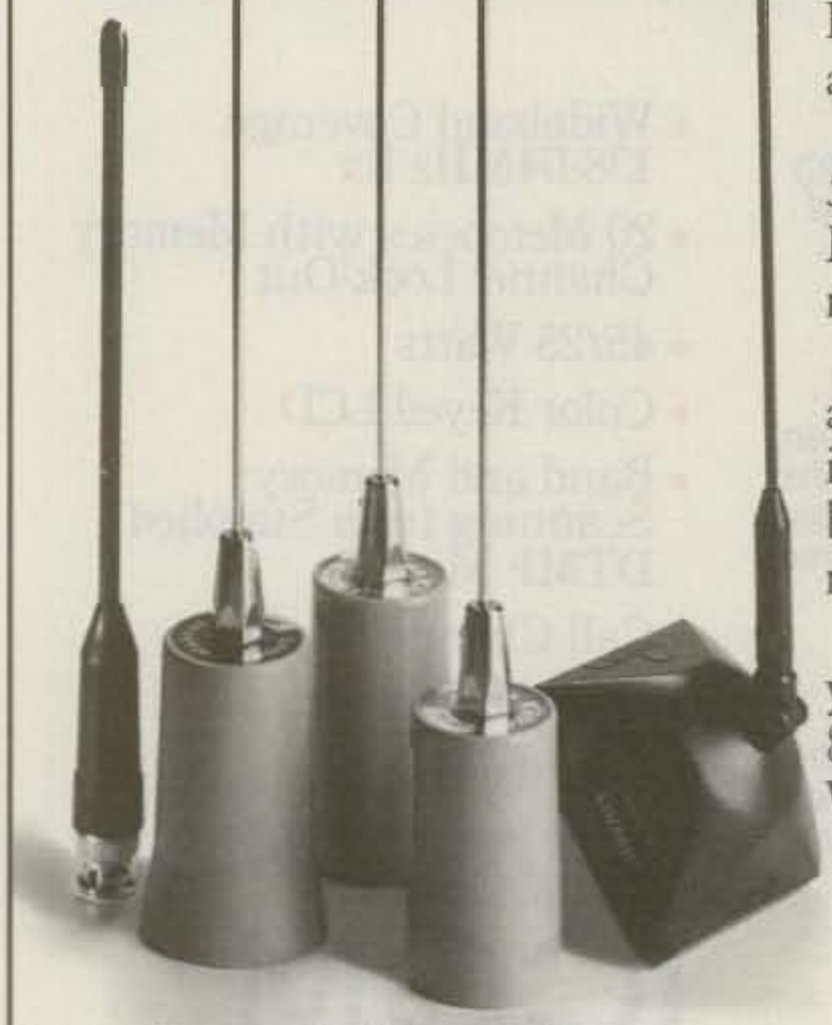
More Options.

Why do so many amateurs choose Larsen dual band antennas? Because nobody offers more choice than Larsen. Amateurs from around the world are tuned in to our professional quality.

Permanent mount models handle 100 watts of power; on-glass, 50 watts. Frequency range is 144-148 MHz on VHF and 442-448 MHz on UHF. Each is factory preset to guarantee optimal performance. No tuning required.

At the heart of our popular NMO model is a precision engineered air-wound coil, fully soldered for increased tuning accuracy. The shell is made from super-strength Makroblend plastic (available in stealth black or gray/chrome) which is tapered to ensure water runoff. The net result is superior electrical performance and lasting durability.

If you want the best choice of dual band antennas, Larsen is your only option. For a data sheet on our new on-glass KG 270: call 800-426-1656 (USA); 800-663-6734 (Canada). Or write: P.O. Box 1799, Vancouver, WA 98668.



Formats include: on-glass; portable; and NLA, NMO, and PO mobile mounts.

Larsen® Antennas

The Amateur's Professional™

CIRCLE 18 ON READER SERVICE CARD

ONLY ICOM COULD BUILD THIS MANY FEATURES INTO SUCH A TINY RADIO

ICOM'S AMAZING MINI HANDHELDS

ICOM's **"S Series"** mini handhelds deliver top performance on the 144, 220 and 440MHz bands with super easy operation and a kaleidoscope of features. Built to fit your needs today, tomorrow, anywhere and anytime.

Wide Frequency Coverage. Plenty of overlap for scanning, monitoring, CAP and MARS use. IC-2SAT: 138-174 MHz Rx. IC-3SAT 220-225MHz Rx. IC-4SAT; 440-450 MHz Rx. All units transmit all U.S. amateur bands.

Flexible Size And Power. The IC-2SAT, 3SAT and 4SAT's internal battery packs 2 watts of output on high power. All models deliver five watts when powered via optional BP-85 battery pack or via top-mounted 13.8 volt socket. A small rig with a big punch! **48 Memories.** Store your present frequencies and expand your future interests. Offset frequencies are independently programmed in memory channels 0-9. Memories 10-47 use offset frequency contents of the VFO. Also includes soft-sector memory masking. Use only the number of memories you need! **Band and Memory Scanning** with programmable limits, memory skip function, plus selectable pause times while scanning. Additional features include: **Automatic Power Shut-off.** Built-in programmable timer automatically switches off transceiver when you forget. **Optional DTMF Paging Function.** Silently monitors any selected frequency for your preprogrammed 3-digit DTMF-keyed calls, then beeps and displays calling station's code. All ICOM's **"S Series"** handhelds are supported by an extensive line of optional battery packs, chargers, cases, speaker/mics and other accessories. See the exciting ICOM mini-series handhelds at your authorized ICOM dealer today!

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004
Customer Service Hotline (206) 454-7619
18102 Skypark South, Ste. 52-B, Irvine, CA 92714
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc.,
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

Four Power Selections

10 Memory DTMF Autodialer

DC Socket For Charging and Mobiling

24 Hour Clock With Timer

48 Memories

Easy Knob or Keypad Frequency Selection

Optional Battery Packs Vary Size, Power Output

ACTUAL SIZE

For a brochure on any ICOM product, call our Toll Free Literature Request Hotline 1-800-999-9877.

ICOM
First in Communications

CIRCLE 161 ON READER SERVICE CARD

— 11 STORE BUYING POWER —

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

Phone Hours:
9:30 AM to 5:30 PM

Store Walk-In Hours:
10:00 AM - 5:30 PM
Closed Sundays

NOW TOLL FREE IN CALIFORNIA!

CALL TOLL FREE:

West 1-800-854-6046
Mountain 1-800-444-9476
Southeast 1-800-444-7927
Mid-Atlantic ... 1-800-444-4799
New England ..1-800-444-0047

Toll free, incl. Hawaii, Alaska, Canada; call routed to nearest store; ***all HRO 800-lines can assist you, if the first line you call is busy, you may call another.***

ANAHEIM, CA 92801
933 N. Euclid St.
(714) 533-7373
(800) 854-6046
Jim Rafferty, N6RJ, V.P.
Near Disneyland

OAKLAND, CA 94606
2210 Livingston St.
(510) 534-5757
(800) 854-6046
Rich, WA9WYB, Mgr.
I-880 at 23rd Ave. ramp

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 &
Claremont Mesa

SUNNYVALE, CA 94086
510 Lawrence Expwy. #102
(408) 736-9496
(800) 854-6046
Tom, KB6LUC, Mgr.
Lawrence Expwy.
So. from Hwy. 101

VAN NUYS, CA 91411
6265 Sepulveda Blvd.
(818) 988-2212
(800) 854-6046
Jon, KB6ZBI, Mgr.
San Diego Fwy.
at Victory Blvd.

Bob Ferrero W6RJ
President/Owner

Jim Rafferty N6RJ
Vice President

PORTLAND, OR 97223
11705 S.W. Pacific Hwy.
(503) 598-0555
(800) 854-6046
Earl, KE7OA, Mgr.
Tigard-99W exit
from Hwy. 5 & 217

DENVER, CO 80231
8400 E. Iliff Ave., #9
(303) 745-7373
(800) 444-9476
George, KDØRW, Mgr.

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
(800) 444-9476
Gary, WB7SLY, Mgr.
East of Highway 17

ATLANTA, GA 30340
6071 Buford Highway
(404) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi.
no. of I-285

WOODBRIDGE, VA 22191
14803 Build America Dr.
(703) 643-1063
(800) 444-4799
Curtis, WB4KZL, Mgr.
Exit 54, I-95, South to US 1

SALEM, NH 03079
224 N. Broadway
(603) 898-3750
(800) 444-0047
Jim, K3QIO, Mgr.
Exit 1, I-93;
28 mi. No. of Boston

AZ, CA, CO, GA, VA residents add sales tax.
Prices, specifications, descriptions, subject to change without notice.

ICOM

IC-765

100W HF Transceiver
General Coverage Receiver
Maximum Operation Flexibility
SALE! CALL FOR PRICE

ICOM

IC-735

100W 12 volt • 12 channel memory
General Coverage • IF Notch & QSK
CALL FOR LOW PRICE

ICOM

IC-725

100W General Coverage
Receiver, HF All Band
Compact Transceiver
GREAT PRICE

ICOM

IC-781

The Ultimate 150W,
All Band HF Receiver
SPECIAL PRICE!

ICOM

IC-229H

2 Meter Mobile

50 W • 20 Memories • Small Size
Extended RX Coverage, 118-174 MHz
GREAT PRICE

ICOM

IC-2410H/3220

Compact 2m/440 Duo-Bander

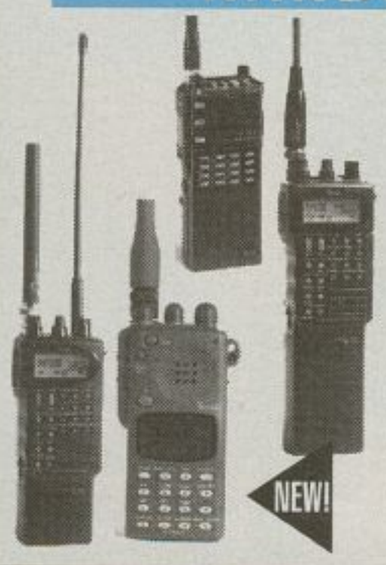
IC-2410H Shown

NEW!

45W 2M/35W 440 • Backlit LCD
Microphone controllable (w/optional UT-55)
36 mems • Crossband repeat
Simultaneous receive on ***same*** band
SPECIAL PRICE

ICOM

HANDHELDS



NEW!

IC-2GAT
2 Meter HT • 7 Watt
IC-4GAT
440 MHz • 5 Watt
IC-W2A
Deluxe Duo-Band
Wide RX Band HT
IC-P2AT, 2 Meter
IC-P3AT, 220 MHz
IC-P4AT, 440 MHz
IC-24AT, Duo Band
IC-2SRA, 2M + Wide Rx

ICOM

IC-901

Fiber Optic Multi-
Band Transceiver

2 Meter and 440 MHz
Extra Large Multi-Color LCD
HM 14 Touch Tone Microphone
CALL FOR PRICE

Multimatch transformers come in all shapes and sizes. W2FMI presents the first in a series of articles on these devices, how to understand them, and most important, how to roll your own.

The 2:1 Unun Matching Transformer

BY JERRY SEVICK*, W2FMI

Many of you are familiar with the name Jerry Sevick from his previous writing or perhaps from his book, Transmission Line Transformers. *I would like to welcome Jerry to the pages of CQ, and we look forward to reading more of his work.—K2EEK*

Little practical design information has been available on ununs (unbalanced-to-unbalanced transformers) with impedance transformation ratios less than 4:1 (which are called *fractional* ratios). However, many important applications can be found for efficient and broadband ununs with ratios such as 1.5:1, 2:1, and 3:1. Some examples include the matching of 50 ohm cable to (a) vertical antennas, inverted Ls, and ground-fed slopers (all over good ground systems); (b) 75 ohm cable; (c) a junction of two 50 ohm cables; (d) shunt-fed towers performing as vertical antennas; and (e) the output of a transceiver or class B linear amplifier when an unfavorable VSWR condition exists.

Recently, it has been shown that a continuum of ratios can now be obtained with ununs matching 50 ohm cable to impedances as low as 3.125 ohms and as high as 800 ohms.[1] Also, by using higher-order windings (trifilar, quadrifilar, etc.), ununs can be constructed with two broadband ratios such as 1.5:1 and 3:1 or 2:1 and 4:1. Furthermore, by tapping some of the windings of these higher-order ununs, multimatch transformers can be made with at least eight broadband ratios.

This first article treats the practical aspects of the 2:1 unun. This unun is not only one of the more useful transformers, but it also serves as a good introduction to the trifilar and quadrifilar designs. For a more in-depth discussion of these fractional-ratio ununs, refer to the author's second edition of *Transmission Line Transformers*.

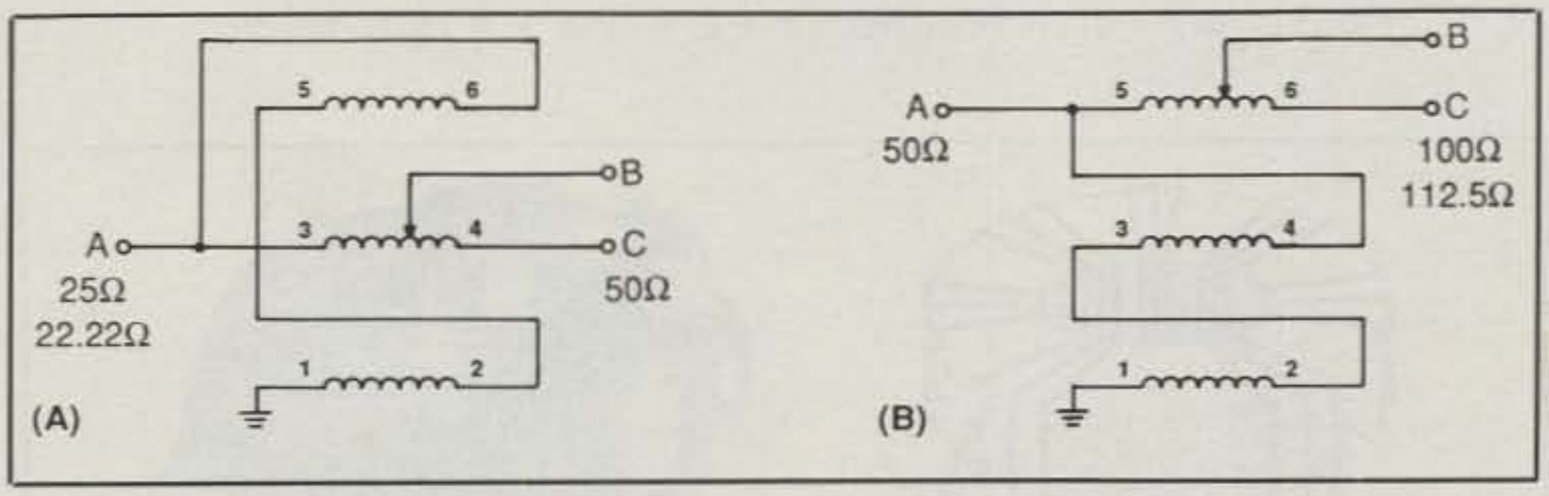


Fig. 1–Schematics: (A) matching 50 ohms to 25 ohms (B–A) and 50 ohms to 22.22 ohms (C–A); (B) matching 100 ohms to 50 ohms (B–A) and 112.5 ohms to 50 ohms (C–A).

The Trifilar 2:1 Unun

Fig. 1(A) shows the schematic diagram of an unun designed to match 50 ohm cable to an unbalanced load of 25 ohms (2:1 ratio with connections A–B) or 22.22 ohms (2.25:1 ratio with connections A–C). It has 6 trifilar turns of No. 14 H Thermaleze wire on a 1.5 inch OD ferrite toroid with a permeability of 250. Winding 3–4 is tapped at 5 turns from terminal 3.

Fig. 2 is a photograph and artwork showing the various connections. The connector is on the low-impedance side.

Fig. 3 shows the transformer mounted in a CU-3015A (4″L × 2″W × 2.75″H)

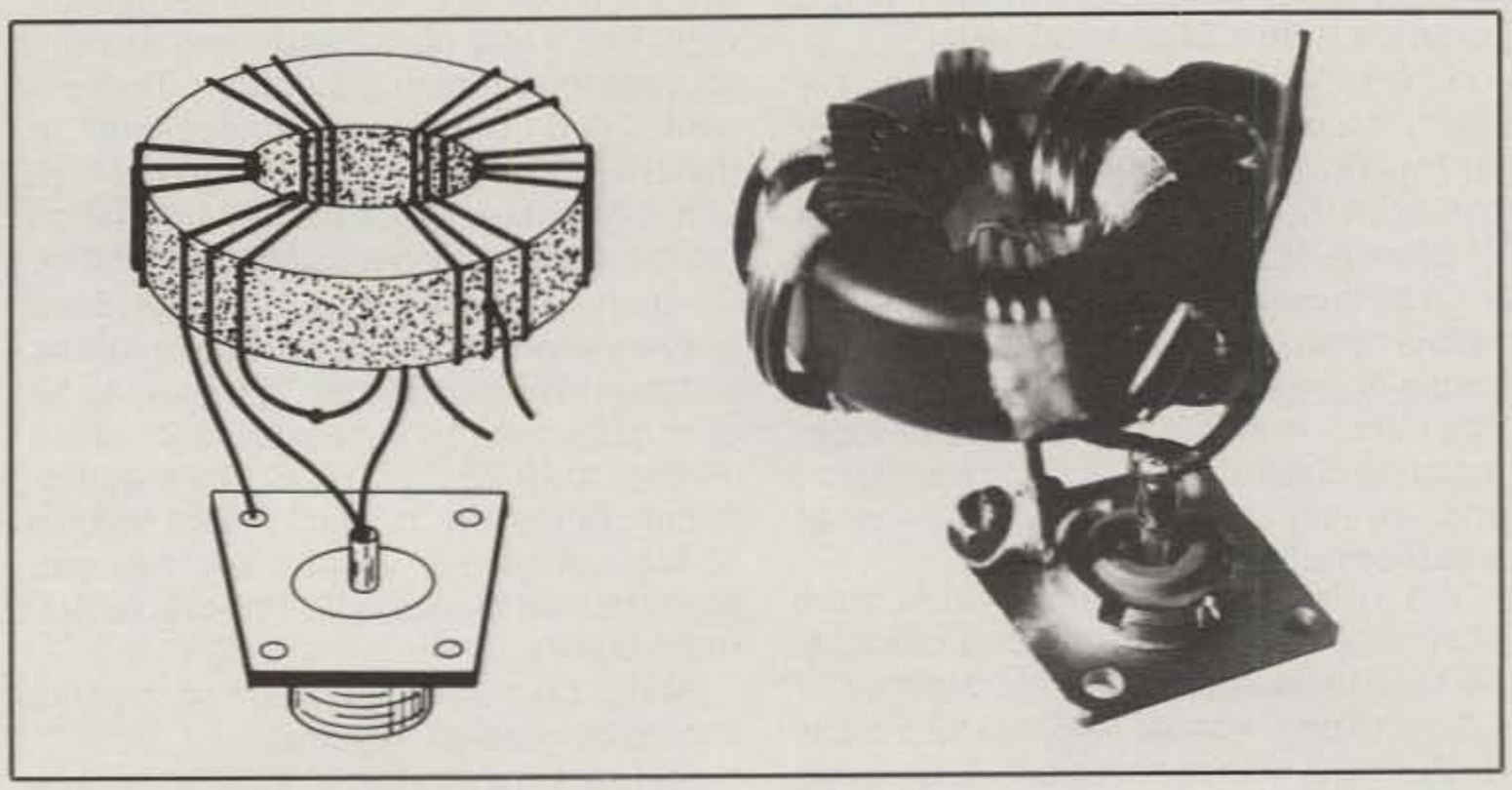


Fig. 2– Bottom view of the 2:1 unun designed to match 50 ohms to 25 ohms or 22.22 ohms (see fig. 1[A]). The connector is on the low-impedance side. (All photographs by Robert S. Le Blanc)

**32 Granville Way, Basking Ridge, NJ 07920*

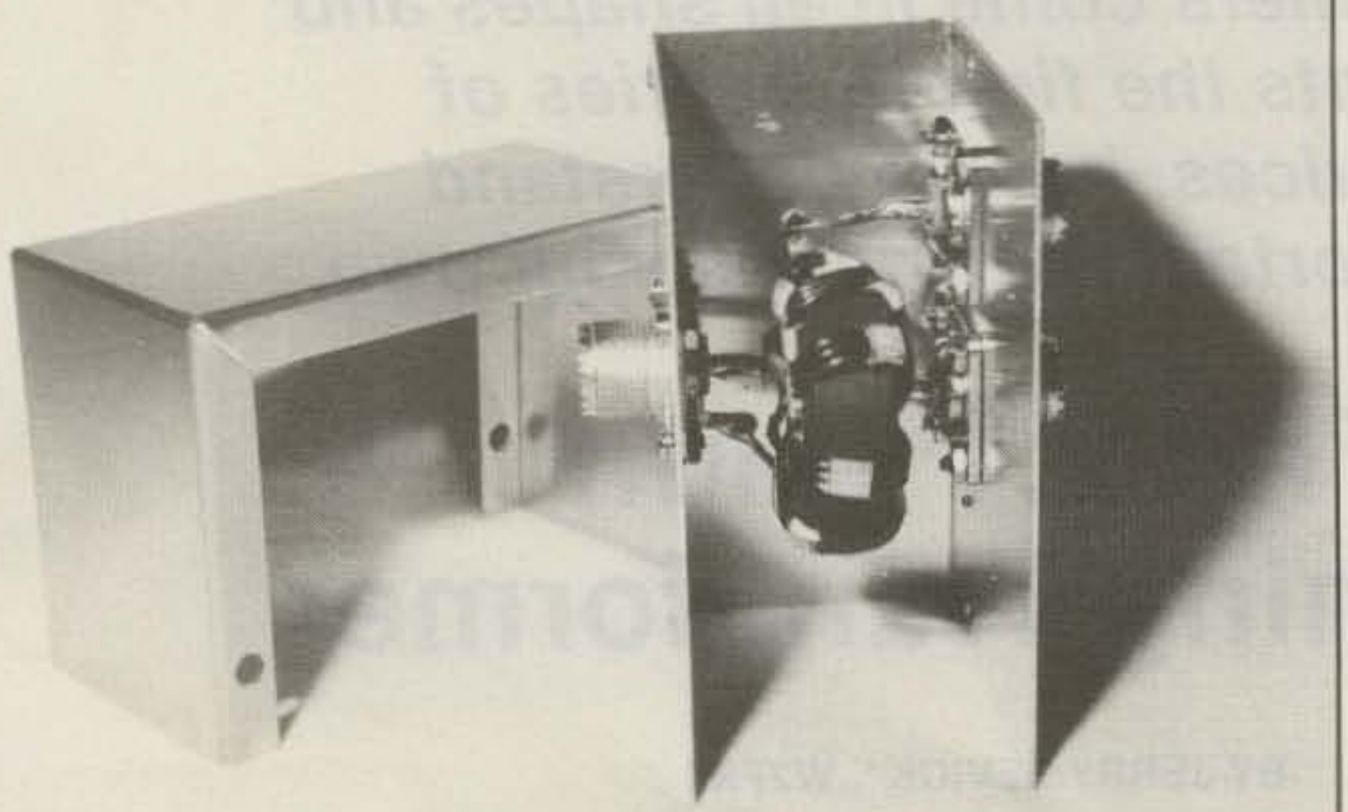


Fig. 3– The 2:1 unun mounted in a 4"L × 2"W × 2.75"H minibox.

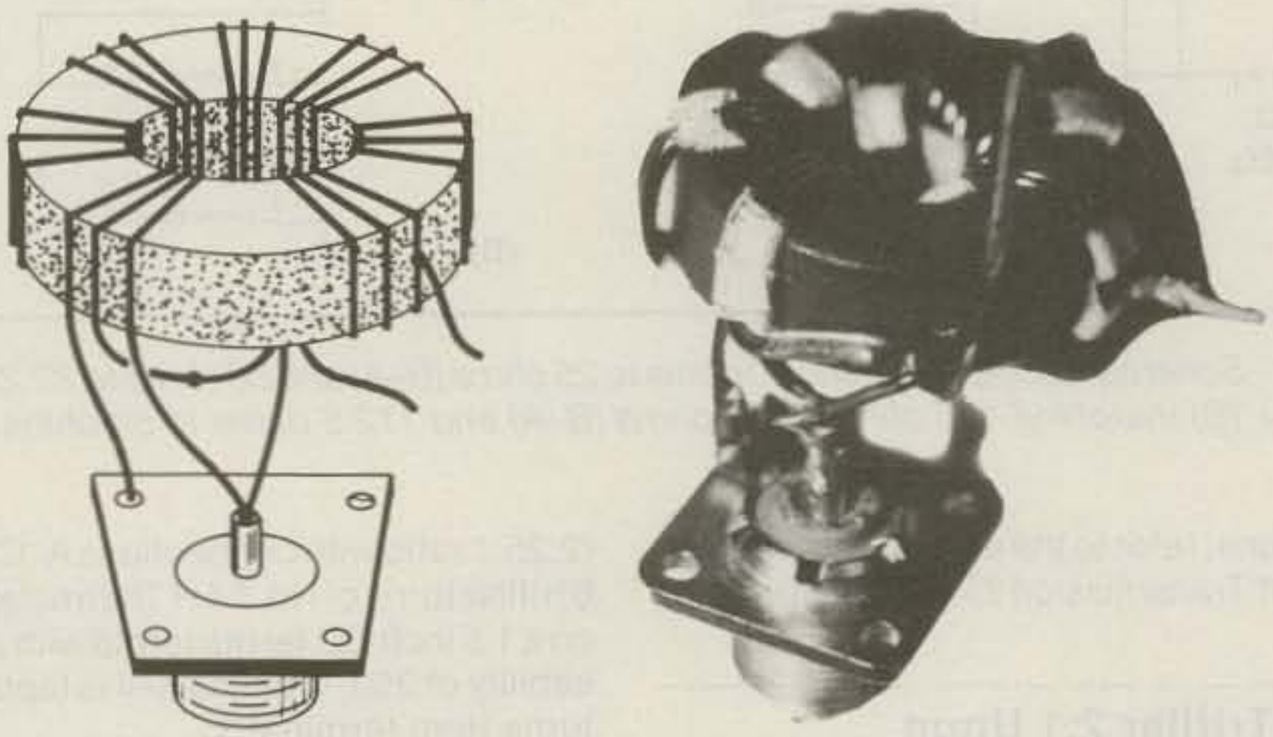


Fig. 4– Bottom view of the 2:1 unun designed to match 50 ohms to 100 ohms or 112.5 ohms (fig. 1[B]). The connector is on the low-impedance side.

minibox. In matching 50 ohms to either 25 or 22.22 ohms, the transformation ratio is constant from 1 MHz to 30 MHz.

Since the transmission lines are very short, this unun does quite well as a step-up transformer. That is, in matching 50 ohms (on the left side) to 100 ohms (connections A–B) or 112.5 ohms (connections A–C) on the right side, the transformation ratio is constant from 1 MHz to 15 MHz. Because of the extremely high efficiency of this transformer (98 to 99 percent under matched conditions), this small transformer can easily handle the full legal limit of amateur radio power.

Fig. 1(B) shows the schematic diagram of an unun designed to match 50 ohm cable to an unbalanced load of 100 ohms (2:1 ratio with connections A–B) or 112.5 ohms (2.25:1 ratio with connections A–C). It has 7 trifilar turns on a 1.5 inch OD ferrite toroid with a permeability of 250. The top winding 5–6 is No. 14 H Thermaleze wire and is tapped at 6 turns from terminal 5. The other two windings are No. 16 H Thermaleze wire. Fig. 4 is a photograph and artwork showing the various connections. The connector is on the low-impedance side. In matching 50 ohm cable to 100 ohms (A–B) or to 112.5 ohms (A–C), the transformation ratio is constant from 1 MHz to 30 MHz.

Again, because the transmission lines are very short, this unun does quite well as a step-down transformer. In matching 50 ohm cable (on the right side) to 25 ohms (A–B) or to 22.22 ohms (A–C), the transformation ratios are constant from 1 MHz to 15 MHz. As above, this transformer can easily handle the full legal limit of amateur radio power.

At this point, two important comments should be made. They are:

(a) Tapping a winding is not easy. It takes considerable effort (which is explained later). Also winding a tapped transformer is more difficult.

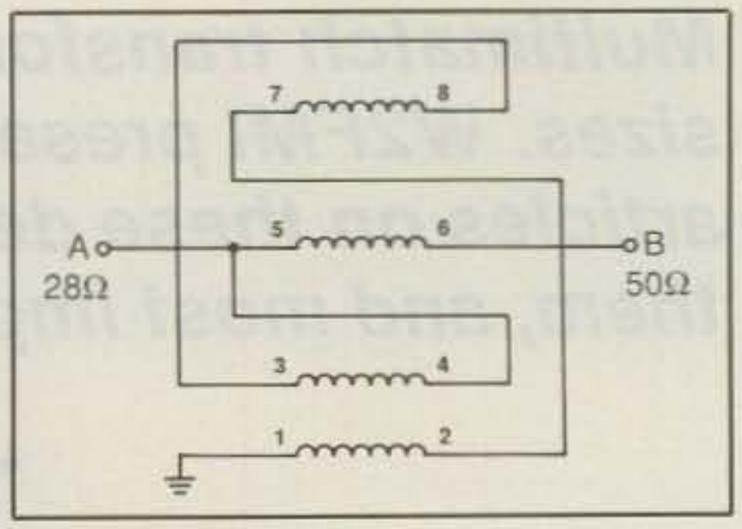


Fig. 5– Schematic diagram of the quadrifilar unun designed to match 50 ohms to 28 ohms (1.78:1 ratio).

(b) Most of the requirements for a 2:1 unun (especially for matching to antennas) can be met with a 2.25:1 ratio.

Furthermore, many will find that copper wire becomes work-hardened very quickly, thus requiring considerable effort in the winding process. Therefore, tapped windings should only be tried after you gain some experience on untapped transformers.

The Quadrifilar 2:1 Unun

Although the quadrifilar unun shown in the schematic diagram in fig. 5 and in the photograph and artwork in fig. 6 has an impedance transformation ratio of 1.78:1, it should also satisfy many of the 2:1 requirements. This unun, which is designed to match 50 ohm cable to an unbalanced load of 28 ohms, not only has a very broadband response (1 MHz to over 50 MHz), but also offers other possible wideband ratios which will be covered in succeeding articles.

Specifically, this unun has 5 quadrifilar turns on a 1.5 inch OD ferrite toroid with a permeability of 250. Winding 5–6 is No. 14 H Thermaleze wire, and the other three are No. 16 H Thermaleze wire. Like the other two 2:1 ununs described above, this one also easily handles the full legal limit of amateur radio power.

Construction Tips

Most of the ununs designed by the author use the *boot-strap* connection, which sums a direct voltage (on the high-impedance side) with delayed voltages which traverse transmission lines.[1] Therefore, in order to achieve the very wideband responses, small toroids (which allow the shortest transmission lines) are used. Since well-designed transformers have virtually no flux in the core, their power ratings are mainly determined by the ability of the transmission lines to handle the voltages and currents. Furthermore, it can be shown that the losses in these transformers are related to the voltage gradients along the transmission lines.[1] Thus, they are dielectric-type ferrite losses. This

JRC

JRL-2000F

Fully Automatic MOSFET
HF LINEAR AMPLIFIER

- 1 kW No-Tune Power Amplifier
- 48 MOSFETs Single Ended Push-Pull (SEPP) Design
- Built-In Automatic Antenna Tuner
- High-Efficiency Switching Power Supply

The JRL-2000F is the world's first MOSFET HF linear amplifier, designed using the same high technology found in JRC's professional high-power radio transmitters. Featuring a heavy-duty power amp that incorporates 48 RF power MOSFETs to ensure low distortion and clean output up to 1,000 watts (100% duty cycle, 24 hour) SSB/CW, plus a high-speed automatic antenna tuner with memory capacity of 1820 channels for instant QSY. Plus a high efficiency switching power supply (80V-264V) with power factor correction to supress AC line currents, an automatic antenna selector for up to four antennas and a wireless remote control unit.

JRC Japan Radio Co., Ltd.

430 Park Ave, 2nd Floor New York. NY 10022
Phone : (212)355-1180 Fax : (212)319-5227
Telex : 961114 JAPAN RADIO NYK

FAMILY MATTERS

When choosing a new dual-band antenna, consider pedigree.

The **Hustler** family of UHF and VHF antennas has earned a world - wide reputation for excellence.
Our newest family member is the G6-270.
Created from the same design philosophy as our well-known G7 and G6 series.
The G6-270 delivers what you expect from **Hustler**. Real specifications. Rugged design. Solid gain and wide bandwidth. Reliable performance.
Invite our newest family member to your home today.

Mechanical

Length:	7' 6"
Weight:	5.3 lbs.
Wind Survival	100 mph
Mounting	1-1/4" to 1-1/2" mast Supplied U-bolts Mounting plate will accept 2" U-bolts

New

2M/440
Dual-band
from

HUSTLER®

See your
favorite Amateur
radio dealer

Electrical

Max. Power	200 watts
Gain	6 dBd VHF 6 dBd UHF
Design	5/8 over 5/8VHF 4 x 5/8 UHF
Bandwidth	2 MHz under 1.5:1 VH 10 MHz under 1.5:1 U Shunt fed - D.C. Grou
Termination	Type N female

CIRCLE 176 ON READER SERVICE CARD

— 11 STORE BUYING POWER! —

HAM RADIO OUTLET

WORLDWIDE DISTRIBUTION

ALINCO
DR-1200T
(Packet Only)

2M Packet Only
Transceiver, 25W
REG. $319.
SPECIAL $249.95

ALINCO
DR-570T
Twin Band 2m/70 cm FM Transceiver

40W 2m • 35W 70cm
Full Duplex • Cross Band Operation
Twin Band Receiver
REG. $749.00 ***SALE $529.95***

ALINCO
DR-119T

2M 45W Mobile
Backlit LCD, Wide Range RX
CALL FOR SPECIAL PRICE!

ALINCO
DJ-F1T/DJ-F1T-HP

2w 2 meter compact HT
8 scan modes • 40 memories
Now 5W Version Available, Too!

CALL FOR SPECIAL PRICE

ALINCO
DR-599T
2M/440 FM Transceiver

45W/35W + Airband RX
Detachable/Remotable Head
EMS-3 Remote Control Mic Std.
CALL FOR SPECIAL PRICE

ALINCO
DJ-162T
2 Meter Deluxe HT

20 Mem Channels
5W Optional Battery
Encode Built-in
DTMF Auto-Dialer
Built-in DSQ
(DTMF) Paging

Purchase a great radio from a Ham Radio store
(Ham Radio is our only business!)
Not for $259. **But Only $249.95 !!**

ALINCO
DJ-580T
2M/440 Dual Band

40 Mem Channels
DSQ, Dual Display
CTCSS Enc/Dec Built-in
Cross Band Full Duplex

CALL FOR SPECIAL LOW PRICE

ALINCO
DJ-560 TA
2M/440

SPECIAL! $349.95

Dual RX
40 Mem. Channels
Built-in DSQ
PL Enc./Decode Built-in
Call Now!

COAST TO COAST

FREE SHIPMENT
UPS - Most items over $100

RAPID DELIVERIES FROM
THE STORE NEAREST TO YOU!

ANAHEIM, CA 92801
933 N. Euclid St.
(714) 533-7373
(800) 854-6046
Jim Rafferty, N6RJ, V.P.
Near Disneyland

OAKLAND, CA 94606
2210 Livingston St.
(510) 534-5757
(800) 854-6046
Rich, WA9WYB, Mgr.
I-880 at 23rd Ave. ramp

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 &
Clairemont Mesa

SUNNYVALE, CA 94086
510 Lawrence Expwy. #102
(408) 736-9496
(800) 854-6046
Tom, KB6LUC, Mgr.
Lawrence Expwy.
So. from Hwy. 101

VAN NUYS, CA 91411
6265 Sepulveda Blvd.
(818) 988-2212
(800) 854-6046
Jon, KB6ZBI, Mgr.
San Diego Fwy.
at Victory Blvd.

-NEW STORE-
PORTLAND, OR 97223
11705 S.W. Pacific Hwy.
(503) 598-0555
(800) 854-6046
Earl, KE7OA, Mgr.
Tigard-99W exit
from Hwy. 5 & 217

DENVER, CO 80231
8400 E. Iliff Ave., #9
(303) 745-7373
(800) 444-9476
George, KDØRW, Mgr.

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
(800) 444-9476
Gary, WB7SLY, Mgr.
East of Highway 17

ATLANTA, GA 30340
6071 Buford Highway
(404) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi.
no. of I-285

WOODBRIDGE, VA 22191
14803 Build America Dr.
(703) 643-1063
(800) 444-4799
Curtis, WB4KZL, Mgr.
Exit 54, I-95, South to US 1

SALEM, NH 03079
224 N. Broadway
(603) 898-3750
(800) 444-0047
Jim, K3QIO, Mgr.
Exit 1, I-93,
28 mi. No. of Boston

Bob Ferrero W6RJ
President/Owner

Jim Rafferty N6RJ
Vice President

AZ, CA, CO, GA, VA residents add sales tax.
Prices, specifications, descriptions, subject
to change without notice.

means that the efficiency can be severely degraded with very high VSWRs, since higher voltage gradients occur under these conditions.

Several suggestions can be made regarding the construction of ununs using these higher-order windings (trifilar, quadrifilar, etc.). They are:

(1) Make a ribbon out of the wires and thus wind them all at the same time. This keeps them as close as possible, resulting in the maintenance of the optimum characteristic impedance of the transmission lines. I found that strips made with 1" × 3/16" glass tape (Scotch No. 27), clamped about every ½ inch, hold the wires in place very well. The starting lengths of the wires should be about 5 inches longer than you would calculate knowing the number of turns and the length around each turn.

(2) Since work-hardening of the copper wire takes place in coiling it around a toroid, indispensable tools are a pair of pliers and a strong thumb (and arms). It takes considerable effort in winding these transformers. Also, since these designs have adequate margins at their low-frequency ends, some space between the windings and the toroids can be tolerated.

(3) It is helpful to recognize the various patterns that appear at the ends of the windings. Fig. 7 shows a drawing of the trifilar and quadrifilar patterns. Note that terminal 1 and terminal 6 or terminal 8 are the outside terminals of the patterns. Also, note that terminal 1 is always grounded in the schematic diagrams.

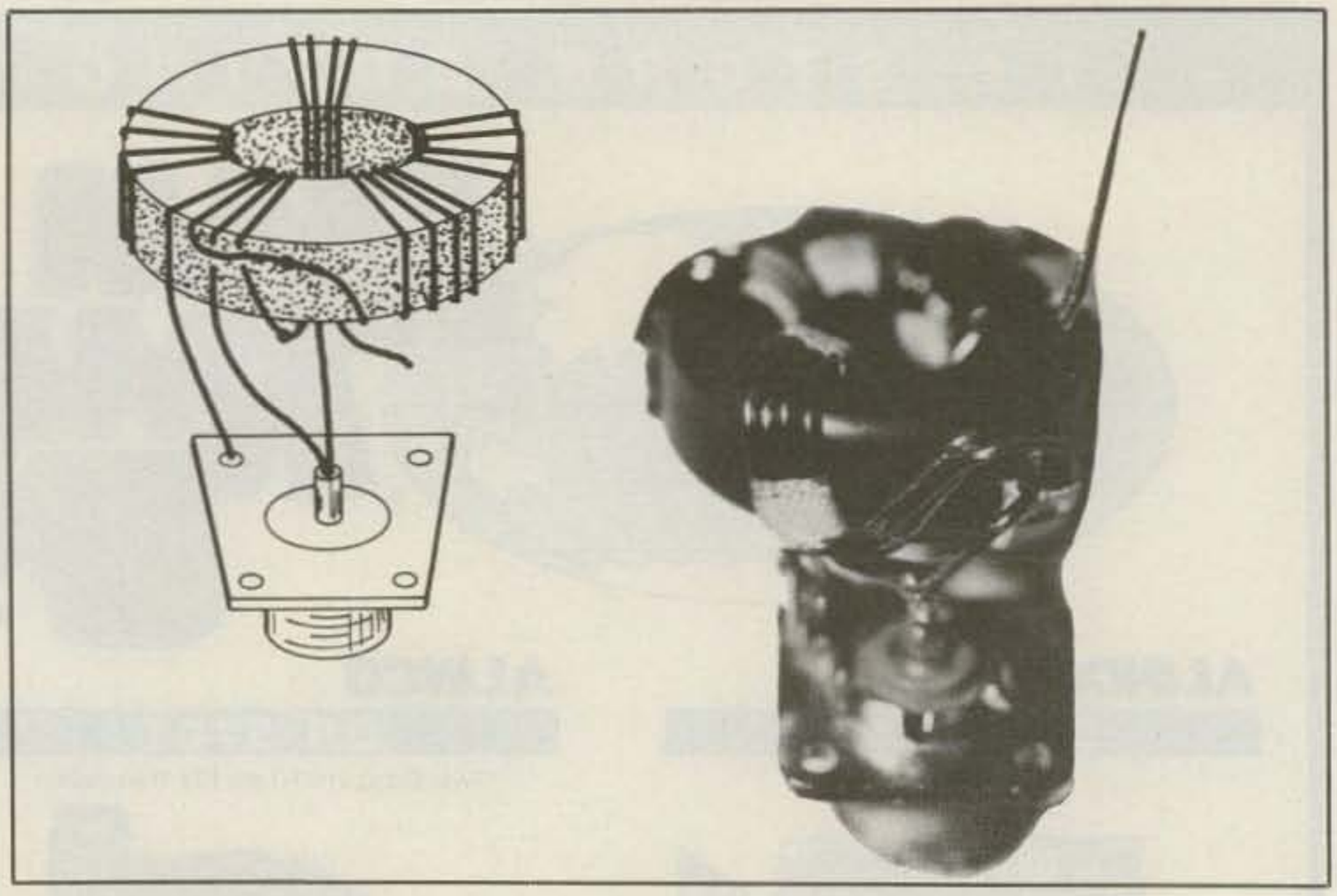


Fig. 6– Bottom view of the 1.78:1 unun designed to match 50 ohms to 28 ohms. The connector is on the low-impedance side.

(4) As was mentioned before, tapping windings can be one of the more difficult tasks in constructing these transformers. I found that the edge of a small, fine file does the best job in removing the insulation. About ⅛ to ¼ inch is removed around the wire. It also helps to remove some of the copper. Then a flat ⅛ inch copper strip or No. 14 wire flattened on one end is soldered to the bare wire. The soldered connection is then rendered smooth by the edge of the file. Finally, two pieces of Scotch No. 92 polyimide tape are placed on the joint to insulate it from the neighboring turns. I also found for a tap one turn from the end of the winding that it is best to make it at about 4 inches from the end of the wire (when it is straight).

Also, a word can be said about the procurement of the components for constructing these transformers. This, by the way, has been one of the major complaints seen in the feedback forms from my book. The question frequently asked was "Where do we get the parts?" Thanks to the cooperation of Amidon Associates,[2] these transformers are now available both as kits and finished units. In fact, most of the transformers in my book have been redesigned in order to optimize the performance/price ratio.

Finally, a comment should be made about low-power ununs. Practically all of the transformers in the second edition of my book are now available in low-power designs as well from Amidon. These designs can easily handle the output power of all present transceivers. Since smaller cores and thinner wires are used, these lower-power units are not only easier to construct, but they also have wider bandwidths because of the shorter lengths of the windings.

References

1. Sevick, J., *Transmission Line Transformers*, 2nd ed., Newington, CT: ARRL, 1990.

2. Amidon Associates, Inc., 2216 East Gladwick Street, Dominguez Hills, CA 90220.

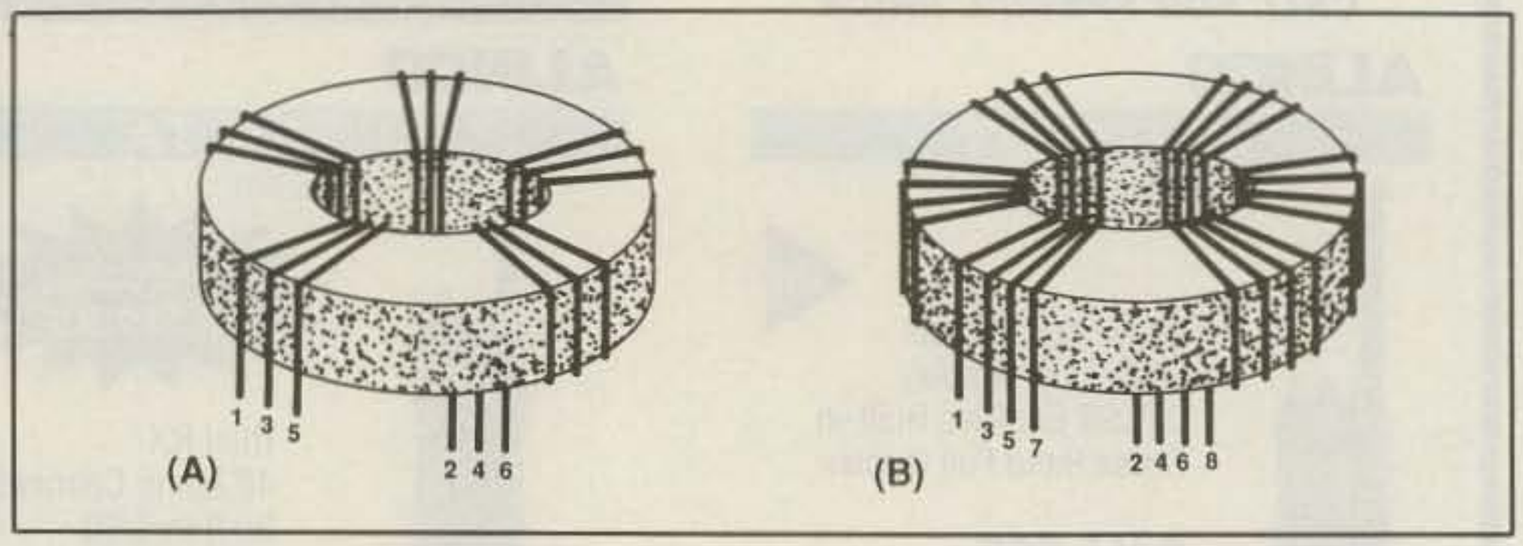


Fig. 7– Pictorials of higher-order windings: (A) trifilar and (B) quadrifilar.

600 WATTS OUT . . . $649

Ameritron's new . . .

AL-811 linear amplifier gives you plenty of power to bust thru QRM. You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM gets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed. You get three tough 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC and much more . . . for an incredible $649 . . .

The first 600 watts makes the most difference

The AL-811 gives you 600 watts PEP output — that's nearly 2 full S-units over your barefoot rig.

That could mean the difference between hearing, "You're Q-5 armchair copy" and, "Sorry can't copy you, too much QRM."

Now you won't have to stand aside while the "big guns" steal your DX. You'll be able to log some of those stations first.

Going from 600 watts to the full legal limit gives you less than one S-unit increase. But is that fraction of an S-unit worth the 3 to 4 times more money it'll cost you?

The AL-811 gives you a powerful punch at a price that's easy on your wallet.

All band, all mode coverage

The AL-811 covers all HF bands (10/12 meters with easy user mod). There's no compromise on WARC and most MARS bands — you get a 100% rated output.

You can operate the AL-811 on all modes. You get 600 watts output PEP SSB and 500 watts output CW. You even get 500 watts on demanding continuous carrier modes like RTTY, SSTV, FM and AM.

How the low cost 811A tube resists premature failure - even when your amplifier is mistuned

811A tubes resist premature failure in two ways.

First, they're constructed with widely spaced elements that minimize the chance of elements touching and causing a short - even if the plate gets hot enough to melt.

Second, they use a directly heated thoriated tungsten filament cathode that prevents the electron emitting layer from instantly stripping off — even if mistuning causes a sudden, severe current overload.

Indirectly heated oxide cathode tubes (like the $400 3CX800A7) can be rendered instantly useless if their electron emitting layer is stripped off because of a severe current overload due to mistuning.

The Ameritron AL-811 is excellent for the newcomer because it's tough enough to withstand momentary mistuning. And the tubes are so inexpensive that you can replace one for mere pocket change.

The Ameritron advantage: extra heavy duty power supply that gives you peak performance year after year

The heart of the AL-811 power supply is a heavy duty power transformer with a high silicon steel core weighing a hefty 17 pounds.

A full wave bridge using 52.5 ufd of total capacitance (four 210 ufd, 470 volt capacitors) produces 1500 volts under full load and 1700 volts no load. That's excellent high voltage regulation!

Full height computer grade filter capacitors with screw terminals are used — not short stubby, light duty soldered-in "high technology" capacitors that can't dissipate the heat generated by high current

The rectifier diodes are rated for a massive surge current of 200 amps. They won't blow even if you accidentally short the high voltage supply.

Wire wound, 7 watt, 50 K ohm equalizing resistors safely protect each filter capacitor — not 2 watt, 100 K ohm carbon composition resistors that can open and cause your filter capacitors to explode or fail.

The Ameritron AL-811 power supply is built tough so you get peak performance year after year.

Tuned input provides excellent load for any rig

A Pi-Network *tuned input* provides a 50 ohm load for your rig. Even fussy solid state rigs can deliver their full drive to AL-811.

Low loss slug tuned coils — tunable from the rear panel — let you optimize performance. High quality low drift silver mica capacitors maintain proper tuning.

800 WATTS OUT . . . $795

from *FOUR* fully neutralized 811A tubes

Only the Ameritron AL-811H gives you *four fully neutralized* 811A transmitting tubes. You get absolute stability and surperb performance on higher bands that *can't* be matched by un-neutralized tubes.

NEW

Ameritron mounts the 811A tubes *vertically* — not horizontally — to prevent hot tube elements from sagging and shorting out. Others, using *potentially damaging horizontal mounting*, require special 811A tubes to retard sagging and shorting.

A powerful 20 CFM computer grade blower — not an open frame phonograph motor — draws in cool air to pressurized the cabinet and efficiently cool your 811A tubes for extra long life.

You also get efficient full size heavy duty tank coils, full height computer grade capacitors, heavy duty high silicon core power transformer, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual meters, QSK compatibility with QSK-5 plus much more.

Output tank: optimum Q on each band

The low loss pi-network output tank of the AL-811 has been carefully designed for optimum Q on each band and built with quality RF components.

The result is peak performance over each band, wide impedance matching range and exceptionally smooth tuning with efficiencies close to 70%. Even a 3:1 SWR load won't damage the tubes or tank components.

A ball bearing vernier reduction drive makes plate tuning precise and easy.

Quiet pressurized ventilation keeps your tubes safely cooled

A quiet fan pressurizes the cabinet with over 20 cubic feet per minute of cool air.

This large volume of air flow keeps the 811A tube temperature safely below the tube manufacturer's rating — even with a key

Two illuminated meters

Two illuminated meters give you a clear picture of your AL-811 operating conditions so you can tell right away if something is wrong.

The Grid Current meter continuously checks for improper loading. The other meter switches between high voltage and plate current to warn of abnormal conditions.

Ameritron exclusive Adapt-A-Volt™ power transformer

Too high line voltage stresses components and causes them to wear out and fail. Too low line voltage causes a "soft-tube" effect — low output and signal distortion.

Ameritron's exclusive Adapt-A-Volt™ power transformer has a special buck-boost winding that lets you compensate for stressful high line voltage and performance robbing low line voltage.

This makes your components last longer and gives you peak performance — regardless of your line voltage.

Plus more . . .

An Operate/Standby switch lets you run barefoot, but you can instantly switch to full power if you need it.

A transmit LED tells you when your rig is keying your AL-811.

A 12 VDC keying relay makes it compatible with all solid state and tube rigs. A built-in back-pulse cancelling diode protects your rig's keying circuit.

Shielded RF compartment. One year limited warranty. Compact 16" D x 13¾" W X 8" H. 30 pounds. UPS shippable. Shipped with transformer installed and wired for 120 VAC. Draws 8 amps at 120 VAC. Export model Al-811X wired for 240 VAC and includes 10 and 12 meters.

Made in USA

Made in USA. You're keeping your money here at home and helping fellow Americans. If you buy a foreign made product, how do you get service? Are you willing to pay expensive freight and duties to a foreign country for service?

Call your dealer for your best price

Get 600 watts of real power and the most for your money. Call your favorite dealer for your best price and order your AL-811 today.

AMERITRON

. . . the high power specialist

921 Louisville Rd. • Starkville, MS 39759
(601) 323-8211 • **FAX:** (601) 323-6551
Free Catalog/Nearest Dealer: **800-647-1800**
8 a.m. - 4:30 p.m. CST, Monday - Friday
Prices and specifications subject to change. © *1992 Ameritron*

Get set for another trip to the local home repair center. NZ5G presents a 2-element, 15 meter version of his "Irrigator's Special." This is a great project to take along on your next vacation or weekend get-away.

The Easy PVC

A Collapsible, 2-Element Beam and Mast

BY BRUCE AULD*, NZ5G

Having finished construction of the "Irrigator's Special" PVC vertical antenna ("The Irrigator's Special," *CQ*, April 1992, page 38), I could not resist the challenge of creating a rotatable dipole or 2-element beam using PVC tubing. PVC is a very lightweight plastic water pipe which is only a few dollars per 10 foot length. What resulted will make backpackers, spelunkers, beach-goers, mountain-climbers, and fun-loving outdoor amateurs happy.

Described herein is a system for constructing a helically wound, rotatable, 2-element beam. It may be constructed for most bands and rests on its own 15 foot mast. It is completely collapsible and may be set up in 5 minutes. For an even simpler and more portable assembly, the antenna may be constructed as a rotatable dipole by eliminating the second element.

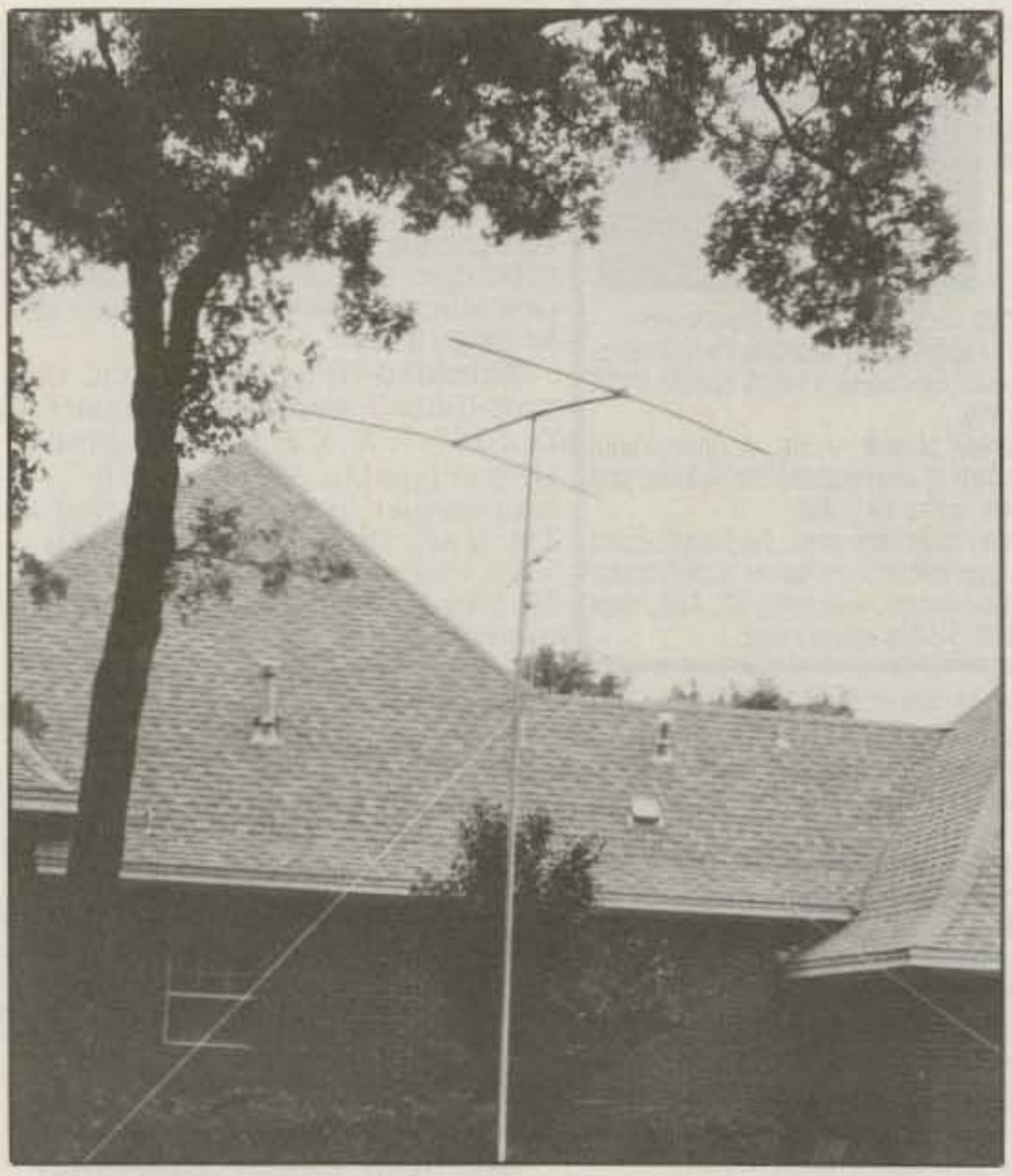
The design parameters were simple. The antenna had to be truly portable. I wanted an antenna that could be set up on a beach where there were no trees handy and where it would be inconvenient to others to have radials strewn in every direction. The idea of a helically wound dipole on its own collapsible mast seemed perfect. But if a dipole could be held up in the air, surely a second element would be possible! This would be a bonus, because as most homebrewers and QRPers know, portable operation often means less power and makeshift antennas. I was excited at the possibility of introducing a little gain to the antenna system of portable stations.

This antenna system requires no tuner and can be built for about $10. Other than the tedious business of pruning the antenna to resonance, there is little about the antenna that is critical. Any Novice class amateur can construct the antenna and learn the essentials of beam antennas and impedance matching in the bargain.

*1704 Windsor Forest Trail, Roanoke, TX 76262

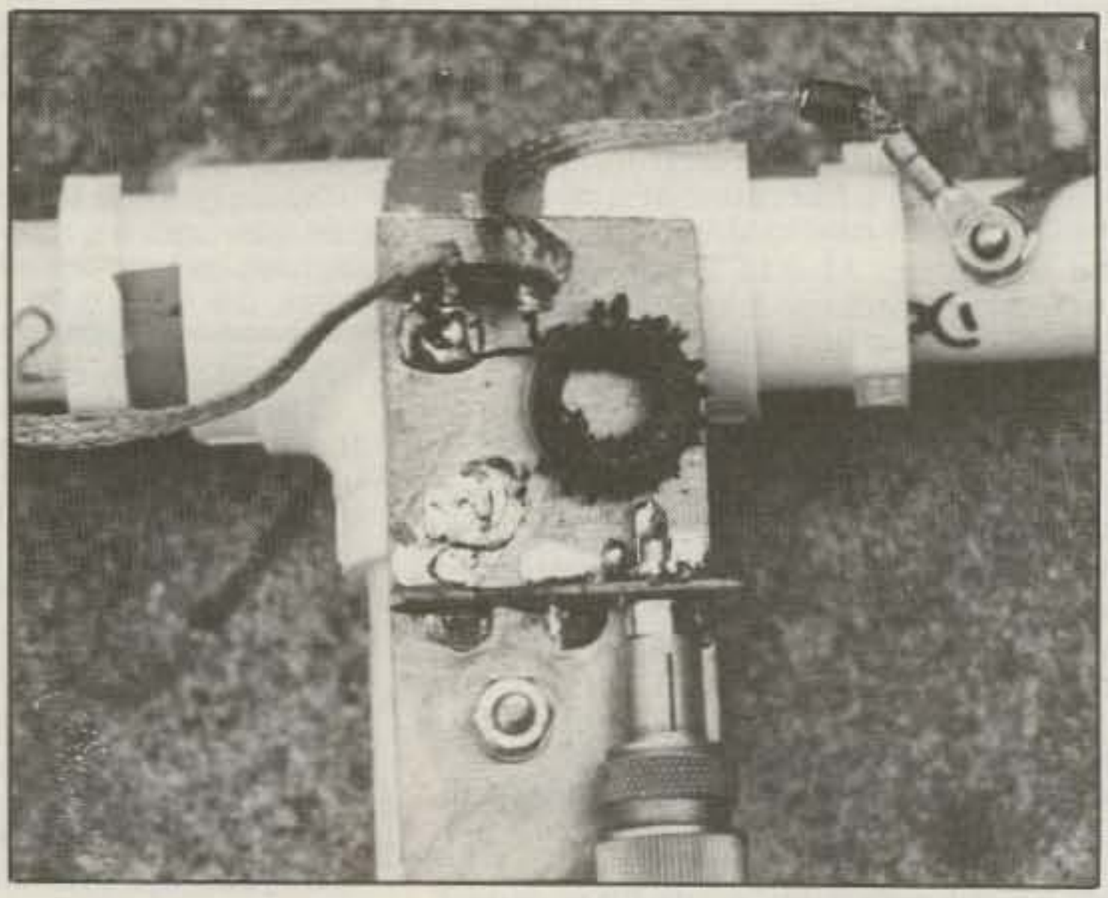
Theory of Operation

The antenna is a dipole, enhanced by a second parasitic element acting as a director. You will remember that a full-size dipole is a half wavelength in size. At 20 meters, for instance, a dipole is approx-



Though not designed for permanent installation, the antenna can be assembled quickly and used almost anywhere.

Close-up view of the balun and driven element assembly.



HF Equipment

	Regular	SALE
IC-781 Xcvr/ps/tuner/scope	$6523.00	**5298**

IC-765 Xcvr/ps/keyer/tuner	$2856.00	**2348**

IC-751A 9-band xcvr/SW rx	$1627.00	**1348**
PS-35 Internal power supply	232.00	**209.95**
FL-63A 250 Hz CW filter (Ist IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	**109.95**
FL-53A 250 Hz CW filter (2nd IF)	115.00	**109.95**
FL-70 2.8 kHz wide SSB filter	59.00	
IC-735 HF xcvr/SW rcvr/mic	1145.00	**949.95**
PS-55 External power supply	233.00	**209.95**
AT-150 Automatic antenna tuner	446.67	**389.95**
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.67	
UT-30 Tone encoder	18.67	

IC-725 HF xcvr/SW rcvr/mic	D $893.00	**719.95**
AH-3 Automatic antenna tuner	488.33	**429.95**
IC-726 10-band xcvr w/6m.	D 1283.00	**1058**
IC-728 HF xcvr/SW rcvr/mic.	1092.00	**899.95**
IC-729 HF xcvr/SW rcvr w/6m.	1412.00	**1168**

HF Accessories:

	Regular	SALE
IC-2KL HF solid state amp w/ps	$2119.00	**1768**
IC-4KL HF 1 kw amp w/ps	7457.00	**5998**
EX-627 Automatic antenna selector	314.67	**279.95**
PS-15 20A external power supply	213.00	**189.95**
PS-30 Systems p/s w/cord, 6 pin plug	371.00	**329.95**
SM-6 Desk microphone	47.93	
SM-8 Desk mic; two cables, scan	89.00	
AT-500 500w 9 band auto ant tuner	589.00	**529.95**
AH-2 8-band tuner w/mount & whip	780.00	**689.95**

Accessories for IC-781/765/765/726/725 • CALL

MasterCard VISA DISCOVER AMERICAN EXPRESS

ICOM

Double Bonuses are Discontinued because ICOM has had an unexpected Price Increase.

VHF/UHF Base Transceivers

	Regular	SALE
IC-275H 100w 2m FM/SSB/CW	$1584.00	**1298**
IC-475H 100w 440 FM/SSB/CW	1812.00	**1498**
IC-575A 25w 6/10m xcvr/ps	D 1455.00	**1158**
IC-575H 25w 100w 6/10m xcvr	1699.00	**1398**
IC-1275A 10w 1.2GHz FM/SSB/CW	1924.00	**1598**

VHF/UHF FM Transceivers

	Regular	SALE
IC-28H 45w 2m FM/TTP mic	$385.00	**329.95**
IC-229A 25w 2m FM/TTP mic	439.00	**369.95**
IC-229H 50w 2m FM/TTP mic	439.00	**369.95**
IC-38A 25w 220 MHz FM xcvr	439.00	**369.95**
IC-449A 35w 440FM xcvr/TTP	527.00	**439.95**
IC-1201 10w 1.2GHz FM/SSB/CW	847.00	**719.95**

Dual band FM Transceivers

	Regular	SALE
IC-2410A 25w 2m/440 FM/TTP mic	$889.00	**729.95**
IC-2410H 45w 2m/35w 440 FM/TTP	931.00	**769.95**
IC-3220A 25w 2m/440 FM/TTP mic	D 685.00	**569.95**
IC-3220H 45w 2m/ 35w 440 FM/TTP	D 727.00	**589.95**
IC-2500A 35w 440/10w 1.2GHz FM	D 1039.00	**829.95**

Multi-band FM Transceiver

	Regular	SALE
IC-901 50w 2m/35w 440 FM xcvr	$1060.00	**879.95**
UX-R91A Broad band receiver unit	533.00	**449.95**
UX-19A 10w 10m unit	317.00	**269.95**
UX-59A 10w 6m unit.	369.00	**319.95**
UX-S92A 2m SSB/CW module.	635.00	**549.95**
UX-39A 25w 220MHz unit	479.00	**399.95**
UX-129A 10w 1.2GHz unit	581.00	**489.95**
UX-49A 440MHz module for IC-900	369.00	**319.95**
IC-970A 25w 2m/430MHz xcvr/ps	2839.00	**2348**
IC-970H 45w 2m/430 MHz xcvr/ps	3071.00	**2548**
UX-R96 50-905 MHz receive unit	413.00	**349.95**
UX-97 1.2GHz band unit	1069.00	**899.95**

VHF/UHF Mobile Antenna

	Regular	SALE
AH-32 2m/440 Dual Band mobile ant	$39.33	
Larsen PO-MM Magnetic mount	28.75	

VHF/UHF Repeaters

	Regular	SALE
RP-1520 2m 25w repeater	$2367.00	**1968**
RP-2210 220MHz 25w repeater	2009.00	**1658**
RP-4020 440MHz 25w repeater.	2439.00	**1998**
RP-4020/50W 440MHz 50w repeater.	2648.00	**2198**
RP-1220 1.2GHz 10w repeater	2756.00	**2298**

Due to space limits some items are not listed. Prices subject to change without notice.

Handhelds

	Regular	SALE
IC-P2AT NEW! 2m HT	$412.00	**349.95**
IC-P3AT NEW! 220MHz HT	412.00	**359.95**
IC-P4AT NEW! 440 MHz HT	468.00	**389.95**
IC-2A 1.5w 2m HT • *Closeout*		**199.95**
IC-2AT 1.5w 2m HT/TTP	265.00	**219.95**
IC-02AT/HP 5w 2m HT/TTP.	345.00	**289.95**
IC-03AT 2.5w 220 HT/TTP	325.00	**279.95**
IC-2GAT 2m HT/TTP	399.00	**329.95**
IC-2SA 2m HT	D 345.00	**279.95**
IC-2SAT 2m/TTP	372.00	**319.95**
IC-2SRA 2m/25-905 rx	572.00	**479.95**
IC-24AT 2m/440MHz/TTP	456.00	**379.95**
IC-3SAT 220MHz HT/TTP	357.00	**299.95**
IC-4GAT 440MHz/TTP	392.00	**329.95**
IC-4SAT 440MHz HT/TTP	392.00	**329.95**
IC-4SRA 440/25-905 rx	579.00	**489.95**
IC-12GAT 1.2GHz/TTP	515.00	**429.95**
IC-W2A 2m/440 HT	588.00	**499.95**

Aircraft band handhelds

	Regular	SALE
A-2 5W PEP synth aircraft HT	525.00	**429.95**
A-20 aircraft HT w/VOR • *Closeout*	625.00	**469.95**
A-21 Navicom Plus Aircraft HT	660.00	**499.95**

For info/prices on HT accessories • CALL

Shortwave Receivers

	Regular	SALE
R-1 100kHz-1.3GHz AM/FM pocket	$539.00	**449.95**
R-71A 100kHz-30MHz rcvr	1204.00	**989.95**
RC-11 Infrared remote controller	71.00	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (Ist IF)	59.00	
FL-44A SSB filter (2nd IF)	178.00	**169.95**
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stablity oscillator xtal	79.00	
R-72 30kHz-30MHz SW receiver	1103.00	**929.95**

Accessories for R-1/R-72/R-100/R-9000 CALL

R-100 100kHz-1.856GHz AM/FM, 12v.	$721.00	**599.95**
R-7000 25MHz-2GHz receiver	1431.00	**1198**
RC-12 Infrared remote controller	71.00	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit	139.00	**129.95**
R-7100 25MHz - 2 GHz recveiver	1479.00	**1228**
R-9000 100kHz-2GHz all mode rec	5851.00	**4898**

Large ICOM receivers include a Coupon redeemable toward the purchase of a ICOM R-1 from AES® for only $349.00 (Limited Offer!)

Order Toll Free: 1-800-558-0411 *FAX: (414) 358-3337*

AMATEUR ELECTRONIC SUPPLY® Inc.

5710 W. Good Hope Road; Milwaukee, WI 53223 • Phone (414) 358-0333

AES® BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (407) 894-3238
1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No Toll Free Line

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
1-800-634-6227

Watch for Future AES® Branch Store Openings!

Band	Boom Length (0.1 wavelength	Wire Length (per side)*
20	6.5 ft.	33.3 ft.
17	5.2	25.9
15	4.4	22.2
12	3.37	18.75
10	3.3	16.5

**Using the formula 468/freq. in MHz for low end of the band.*

Table I– Antenna construction values calculated for the various bands.

imately 33 feet. At 40 meters it is proportionally larger, or about 66 feet. This can be quite a cumbersome antenna in many portable operating sites.

One method of shortening the overall length of an antenna is to wind it spirally around a form. This so-called "helically wound" antenna is competitive with its full-size sibling. The compromise in using the helically wound dipole is that it exhibits a narrower bandwidth and lower feedpoint impedance. It also requires a full wavelength of wire to make the equivalent of a half-wave full-size dipole. Fortunately, all of these are manageable.

The bandwidth of this antenna is about 100 kHz between 2:1 SWR points. This is entirely acceptable for portable operation, and any segment of the band can be used by adjusting the resonance of the antenna with the aid of telescoping whips at the ends of the elements.

The feedpoint impedance of a helically wound dipole is on the order of 10 to 15 ohms. Worse mismatches than this have been successfully operated into 50 ohm coax, but a 4:1 balun transformer at the feedpoint is included in the design in order to step up the impedance to achieve a better match. The balun is an ordinary T-68-6 powdered iron toroid wound with ten bifilar turns of enameled wire. While this size of toroid will probably overheat with much operating at the 100 watt level, I have run 50 watts without incident.

The addition of a second element makes the antenna a beam. This element acts as a director and is wound identically to the dipole, or driven element. It is spaced 0.1 wavelength from the driven element. It adds a few decibels of forward gain, displays a surprising amount of side rejection, and provides the antenna a good front-to-back ratio.

All of the materials required to construct the antenna are widely available. Any building supply store should have all of the tubing and connectors. The two elements are wound around ½ inch PVC and the boom is of ¾ inch material for rigidity. The elements are attached to the boom, and the boom is attached to the mast by using PVC "T" connectors.

The mast is simply 15 feet of 1 inch thick-walled PVC, which may be broken into

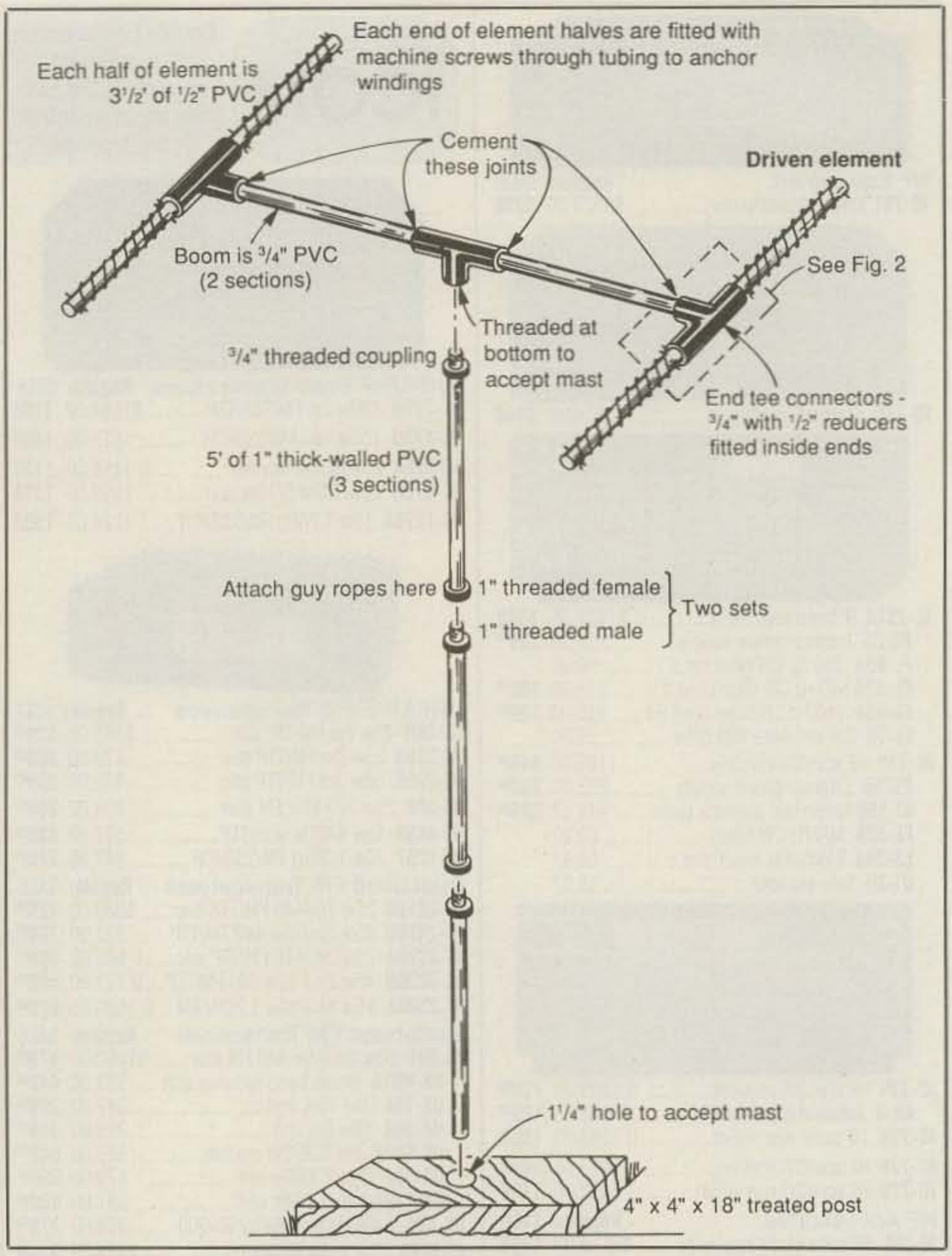


Fig. 1– Overall plan for the portable, 2-element, 15 meter beam. Basic material is ordinary PVC tubing found in most home repair centers.

three sections for ease of portability. This height was chosen as the minimum that would be acceptable in return for going to the effort of constructing a modest beam for HF. It is also about the maximum height sustainable using PVC as a support. After construction, though, I found that 20 feet is probably a manageable height, especially if larger diameter tubing is used for the mast.

Construction

Fig. 1 is a diagram of the antenna and the mast. The text of this article details the construction of the 15 meter version of the antenna, as pictured in the photographs. Table I gives the values calculated for the various bands.

Although helical dipoles and beams can be constructed for any band, it was felt that 20 meters was the lowest band for which ½ inch PVC is feasible. This is because the elements at lower frequencies are heavier and quite floppy. By eliminating the director and using all ¾ inch pipe, a rotatable dipole can be constructed for any band. Or alternatively, using larger gauges of PVC and anticipating a greater demand on the mast, operation on the lower bands might be accommodated. However, note that the correct boom length for a 30 meter antenna using this design would be 9 feet.

Begin by constructing the dipole or driven element. Use a ¾ inch Tee connector and cement two ¾ to ½ inch reducing couplings to it. These will accept two lengths of ½ inch tubing forming the halves of the dipole.

A decision must be made at this juncture concerning portability and per-

manence. While the Tee connection must eventually be cemented to the boom to prevent the elements from rotating around the boom, the elements themselves do not necessarily need to be cemented. As constructed, the 15 meter elements are about 7 feet long—much too long to stuff in a backpack. If the element halves are cemented to the Tee, the antenna is permanently in the beam configuration. I have found that ½ inch tubing fits snugly enough into the reducer inside the Tee connector so that it resists turning and twisting. Although this would not be satisfactory for a permanent installation atop your 50 foot tower, it works fine for temporary portable operation. This way the element can simply be plugged into the boom and the antenna hoisted atop the mast. An alternative is to fit the ends of the elements with threaded couplers that will fit into threaded couplings you cement to the Tee connector.

Note that the physical and electrical connections in the antenna are not weather-tight or made with the ruggedness to ride out a tornado. This is intentional and facilitates quick knock down and enhances portability.

Cut two 3½ foot lengths of ½ inch PVC and drill a hole through the tubing about an inch from each end. Next attach the nuts and bolts which anchor the winding. Measure a half wave of wire for the band of interest, and then a few inches extra for good measure. This will help in the pruning stage later. Any gauge of wire will do, but the heavier the better. Note, though, that the heavier the wire, the heavier and floppier the antenna. I used plain 22-gauge hookup wire.

The measurements given in the table for the amount of wire needed are approximate, because from antenna to antenna, element to element, the exact amount of wire necessary to resonate at the design frequency will vary. This is because a helically wound antenna is continuously loaded throughout its length, and no two hand-made elements are wound exactly alike. For example, in my version, one 15 meter element resonated with exactly a half wave of wire on each element half, and the other element required another foot!

With a solder lug on the end of the wire, fasten it to the end of the element which will be at the boom and wind the wire around the tubing. The number of turns per foot depends on the band, element length, and wire gauge. Take heart, because this part of the construction is not critical. It is not terribly important that the turns be spaced evenly, but in the case of the 15 meter antenna, the windings were about a half inch apart.

Trial and error is the best way to approach the job. It does not take very long to wind the elements, so start over if you reach the end with too much or too little wire. You will develop a feel for it quickly.

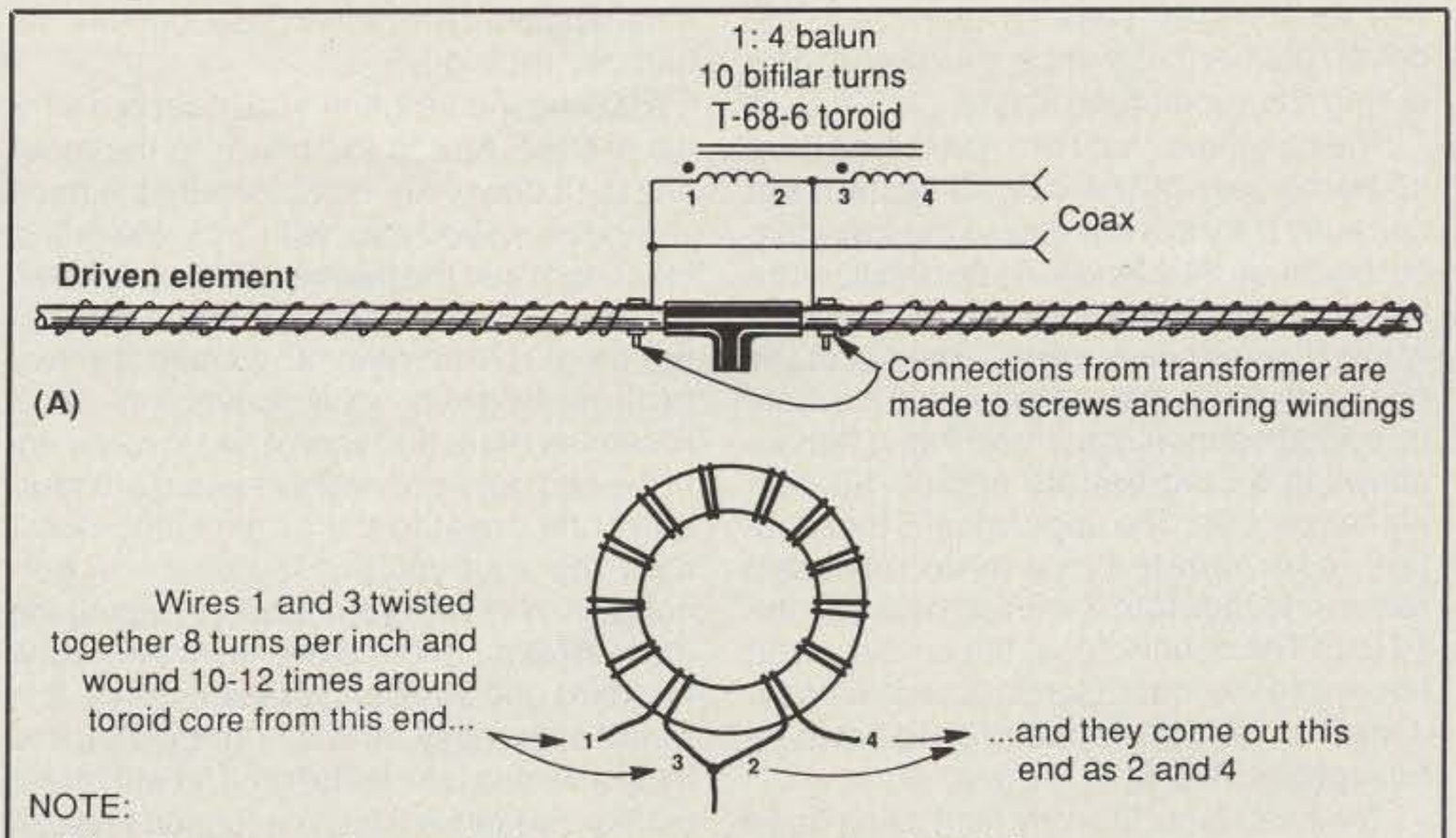


Fig. 2– Details of the driven element and balun.

If you end up with an inch or two too much wire at the end, just squeeze a few turns together and create a little more space. Performance is not affected by this maneuver.

Anchor the wire at the end bolt and wind the other half of the driven element the same way. It is important that you keep the wire tightly wound on the tubing, and you will find that wrapping tape around the tubing about 6 inches from the end as a temporary measure will save the windings from coming unsprung during the tuning process. Later you can tape the windings or use a spray varnish for the same effect.

Construct the boom as shown in fig. 1. Note that it is made of ¾ inch PVC for added rigidity. The boom is a unit, with all the Tee connectors cemented to the tubing. The center T connector is a little different from the other two. The foot of the T is not a simple female coupling to accept a length of tubing. It should be threaded so the dipole or beam will not rotate freely around the mast. A threaded coupling allows the beam to be screwed tightly to the mast. For casual use the elements fit snugly enough, but on a windy beach or mountaintop the antenna would probably swing freely.

You may use any good cement for this project, but rubber cement made especially for PVC pipe is very strong and quick drying. It is also relatively inexpensive and is found in the same department as the tubing and connectors.

The balun transformer is constructed by winding 10 bifilar turns on a T-68-6. A larger diameter toroid would allow higher power operation. You may consider a T-80-6 or larger toroid.

To wind the core, cut two lengths of #20 enameled wire about 18 inches long and twist them together to achieve about 8 turns per inch. Wire size is not critical as long as it is not too thin. Then wind ten turns of this twisted pair onto the toroid. The actual number is not critical. Wind a few more if you prefer.

Refer to fig. 2, which is a pictorial of the correct method of winding the connecting toroidal coil to the antenna. Note the dots on the schematic representation of the coil. These are phasing dots and indicate which wire ends come out of which end of the winding. Note that ends 1 and 4 are the free ends and 2 and 3 are soldered together. To identify which ends on one side of the winding are connected to which ends on the other side of the winding, use an ohmmeter to check electrical conductivity (scrape the insulation off first so a connection can be made!) or use wires of dissimilar color.

I mounted the toroid on a small rectangle of PVC on which was mounted the coax connector. I soldered a small terminal strip on the board, and the toroid fit neatly between them all. I then drilled a hole through the board and the boom and attached the board to the boom with a screw and wing nut. The output terminals of the transformer connect to the screw holding down the wire of each element half. Make sure the connection is electrically tight.

If you are constructing a dipole only, your antenna is complete (except for the optional telescoping whips for the ends of the elements, described below). If you will add a director to make a 2-element beam, wind two more element halves the same

way and using the same dimensions as the driven element. It will be shortened later during the tune-up process.

The base and mast are described here as being part of the overall system not because they are integral to the antenna, but because they lend to its portability. The mast is three 5 foot sections of 1 inch thick-walled "schedule 40" PVC. The top of the two lower sections is terminated in a male threaded coupler. It is fitted into a female coupling on the bottom end of the next higher section. The uppermost 5 foot section is terminated in a male threaded reducer to facilitate the union between the ¾ inch Tee connector at the center of the boom and the mast. Constructed this way, a mast of 15 feet may be broken down into sections that fit in a trunk.

The mast is sufficiently rigid using three guy ropes fastened to the antenna with a simple knot and affixed to the ground using commonly available tent stakes. There is little enough pressure on the line so that even a pencil might suffice for a stake. The construction of a base is left up to the individual needs of the builder. I chose to seat the mast in a ¼ inch hole in an 18 inch length of 4" × 4" treated post which I had on hand and which is quite heavy. The mast and antenna turn easily in the hole for ease of rotation. Any base that will act as some deterrent to the mast slipping will suffice. You may attach a stake to bottom of the mast and omit the heavy base, but this will hamper rotation.

Raising the antenna and mast is a simple matter. Attach the beam to the mast and lay it down. Anticipate where the base should be so you can, with luck, lower the mast right into the base at the proper time. Lay the guys in a tripod arrangement, fasten them to the mast, and stake the two farthest from you in a convenient spot. Raise the mast and walk it backwards until the two guys previously staked are taut. Lower the mast to the ground (hopefully, near the spot you put the base—if not, nudge it over with your foot!). Keeping the mast straight and the two guys taut, walk the third guy back and stake it down. It is really quite easy, and do not be alarmed if the antenna falls to the ground with great flourish, because it is quite rugged and can repeatedly withstand such abuse.

Tune-Up and Operation

Tuning the antenna can be time consuming, but like the design of the antenna itself, it is quite simple. The best way to approach it is to tune each element separately as a dipole, not together as a beam. If possible, construct the elements and raise the driven element up the mast (or anywhere away from the ground and large adjacent objects). If you have wound the two halves with a little extra wire, you can expect the antenna to resonate low in whatever band you have chosen. The fastest way to determine the resonance point is with a grid dip meter.

You can also use your station equipment to determine where the antenna is resonant. Apply a little power to the antenna (only enough to get a good SWR reading, please!) at a frequency at the top of the band and check the SWR. Perform the same check at small intervals down the band. If the SWR declines as you go down the band, you are reaching the resonance. If you do not reach the point of lowest SWR in the band, the antenna is too long. In such a case, trim a few inches off each side and check again. If, on the other hand, the SWR increases as you go up the band, the winding is a little short. Add a few inches and recheck. In any event, keep track of how much you have clipped or added so that you know how much wire comprises the driven element. This will be important in tuning the director.

If you persevere, you will conclude with an antenna resonant in the portion of the band you have chosen. I achieved a final SWR of 1.2:1.

The director is tuned the same way, except that it will be tuned to resonance at a higher frequency than the driven element. This and its spacing from the driven element are what make the director active and cause the antenna to have some directivity. Though this part of the tune-up is not difficult, some care must be taken to see that it is done correctly.

There are many ways to achieve the correct director length. Theoretically, it should be 5% shorter than the driven element. Note that the length of PVC is the same for both elements, but the wire length of the director is shorter. Remembering the amount of wire you ultimately ended with after pruning to make the driven element, calculate the length of wire which would be 5% shorter. For instance, on 15 meters, if one half of the driven element was 21.4 feet, 5% of that length would be 1.07 feet. The correct length of one half of the director would be 20.33 feet.

To achieve the correct final length for the director, unwind 1.07 feet of wire from each half of the director element (remember that each half is one-half wavelength of wire).

One addition may make the antenna somewhat more convenient for your particular application. Because the nature of a helically wound antenna is to exhibit a narrow bandwidth, the antenna will show a high SWR at the opposite end of the band than for which it was tuned. If you terminate the ends of the elements of the driven element (and theoretically the director) in telescoping whips, you can easily adjust the frequency at which the antenna is resonant by sliding the whip in and out. The added capacitance of the whip may broaden the bandwidth of the antenna as an added benefit. A hose clamp will hold the whip securely.

On-the-air operating is in the manner of any other antenna. If you are physically positioned next to the antenna and can rotate it by hand while listening to the signals, you can readily note the effect of swinging the beam's direction. The maximum gain of the antenna will be in the direction of the director. Stations from a direction more or less behind the driven element will be weaker.

Rotation is accomplished by the "armstrong" method—by hand. Just pick up the mast and turn it. There is enough play in the rope guys to allow for plenty of rotation.

In the tune-up phase of this project, I found myself on one level of roof at the back of my house outside my shack. I positioned the rig so the dial was accessible through the window and held the antenna on a short mast with one hand. I looked quite silly, but to my surprise, in every instance where I rotated the antenna while listening to a station and chose the likely direction of the station, I was correct. It really was quite gratifying. I next set up the antenna on its 15 foot mast and promptly worked YO9BLY in Romania, running about 50 watts.

The antenna really works and was fun to build. Better still, it was cheap. Now maybe portable QRP station operators can enjoy a little stronger signal than they enjoyed before.

Happy homebrewing! CQ

IC-W2A

IC-24AT

ICOM

IC-2410

IC-3220H

IC-765

IC-781

IC-229H

Oklahoma Comm Center

IC-735

IC-2SAT

IC-2GAT

HUSTLER rfconcepts PC Electronics SR STANDARD

YAESU Ramsey Kits ALINCO Larsen Antennas Ameco

Outbacker Antennas cushcraft CORPORATION W5YI MFJ DIAMOND ANTENNA

AEA Nye-Viking Kantronics M² ENTERPRISES

TELEX hy-gain Bug Catcher COMET ARRL

SPECIAL SPECIAL

CALL

For This Month's Special-Buy
Some Quantities Are Limited

Orders & Price Quotes **1-800-70K-HAMS**
1-800-765-4267

Local & Information (405) 478-2866

Oklahoma Comm Center

FREE SHIPPING UPS SURFACE (except Power Supplies and Antennas)

9500 Cedar Lake Ave., Suite 100
Oklahoma City, Oklahoma 73114
FAX (405) 478-4202

Showroom Open Tues. thru Sat.
Hours M-F 10-6 Sat 10-3

VISA DISCOVER COD MasterCard

Oklahoma owned and operated. Not affiliated with any other store.

CQ REVIEWS:

The Alpha 87A Amplifier

BY LEW McCOY*, W1ICP

Ehrhorn Technological Operations, Inc. has long been known for its extremely high quality amateur (and commercial) power amplifiers. The new Alpha 87A reviewed in this article is no exception. It is one of the most desired pieces of equipment in the amateur market.

The 87A provides frequency coverage of all amateur bands from 1.8–29.7 MHz. A pair of EIMAC 3CX800s are used to provide 1500 watts *continuous* output for SSB, CW, or any of the newer modes. The amplifier requires 50 to 55 watts of drive to run at the full legal limit of 1500 watts. There are several important features I will go over in this review, some of which will be new to many readers.

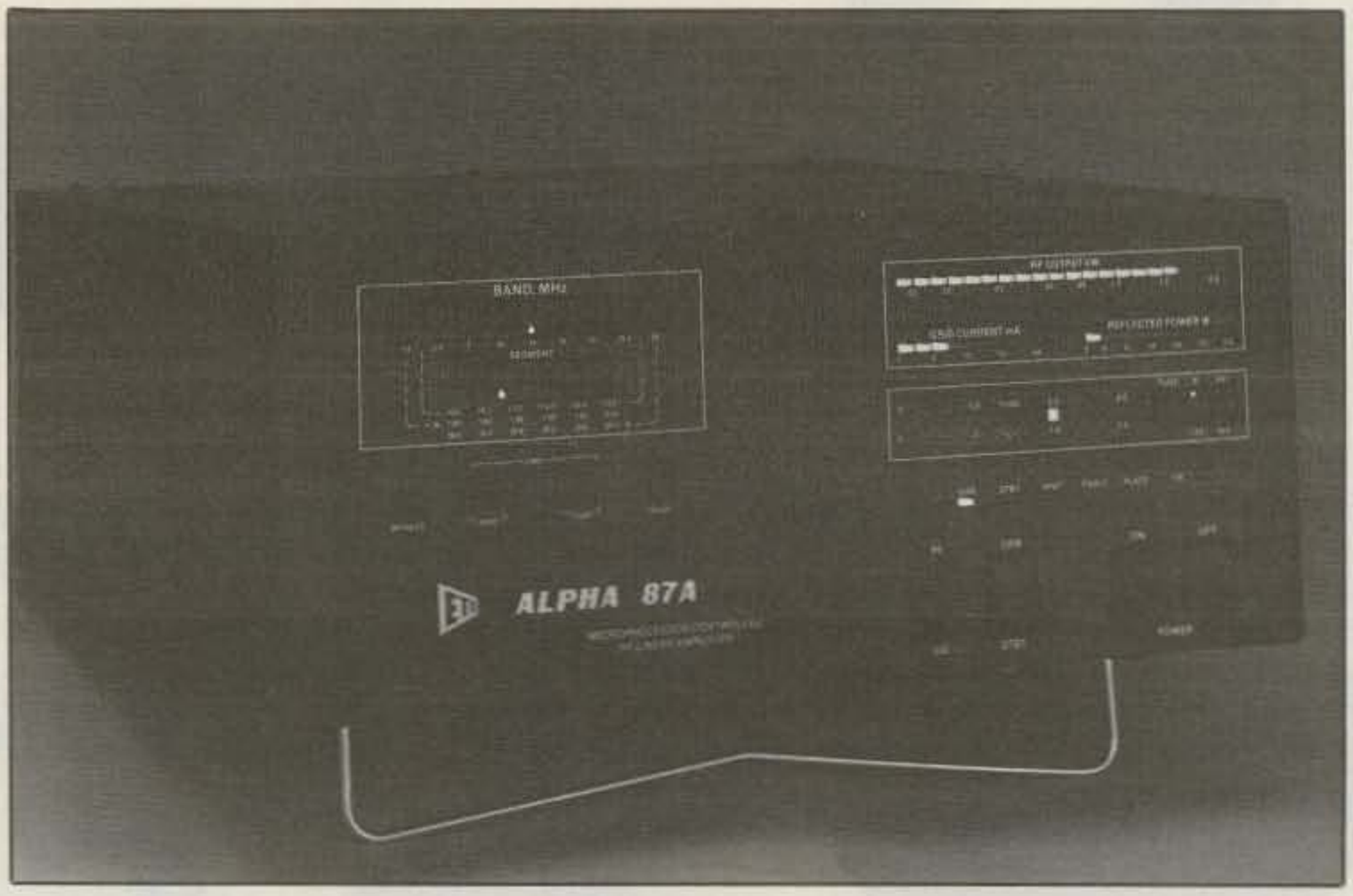
First of all, band changing is completely automatic, being computer controlled. The average band change time required for complete band change and tune-up is *less* than one second! The transmit/receive function, or QSK operation, requires approximately one millisecond via a heavy-duty pin diode switch which is capable of hot switching and feedthrough of 150 watts exciter power.

There are many features in this amplifier not found in other amplifiers. For example, there is fault protection built in to handle excess plate or grid current, or things such as load VSWR that gets out of range, T/R sequencing, gain (mistuning or RF arc), overdrive, open heaters, overtemperatures, etc. In other words, the amplifier, if you'll forgive the expression, is for all purposes idiot proof.

There are no "conventional" meters. All functions are monitored via LED bargraphs. These display peak power out, power reflected, grid current, plus a switched bargraph for plate current, plate voltage, and tune indicator.

The amplifier measures 17.3"W × 7"H × 16.5"D and weighs 75 pounds net. The cabinet has ducted air for cooling, and the fan is mounted in a "floating" mode, providing extremely quiet operation.

At this point I would like to refer you to the block diagram in fig. 1 and the amplifier circuit diagram in fig. 2. A signal from an exciter is fed to the input of the amplifier,



The front-panel view of the Alpha 87A. At the upper right are the bargraph displays. Frequency and band entries are at the upper left.

where an input wattmeter measures the input amount. From there the signal goes through the T/R switching setup, thence to a pi-network type circuit for the tuned grid input. The output from the 3CX800s is then fed through a pi-network tank circuit to the antenna. All this sounds very simple, but a study of the block and circuit diagrams will show there is a lot more to it.

The grid input circuit is pretuned and electronically switched (along with the tank circuit) via stepping motors, which in turn are controlled by the microprocessor. As I stated earlier, a band change requires less than one second—truly a contest operator's dream.

The instruction manual is excellent and very detailed. For example, here is the section on initial tune-up taken verbatim from the manual.

Procedure:

1) Press **Power On** button, set mode switches to **Hi** and **Opr**.

2) After the red **Wait** (tube warm-up) LED extinguishes, the **Opr** LED will light. Apply 10–25 watts of excitation on the desired operating frequency.

3) Automatic band-change and tune-up, when necessary, require only about one second, during which time the transceiver output is bypassed directly to the antenna. After the Alpha switches back in line, adjust drive power (in the desired mode) so that peak output as indicated on the **RF Output** bargraph is about 1.5 KW. (Once you have become familiar with the operation of the Alpha 87A, it is quite possible that you won't need to readjust transceiver output when changing bands.)

With RF output peaking near 1500 watts, *highest indicated grid current peaks should be 20–50 ma to ensure both efficiency and linearity*. If peak grid current is higher or lower, drive from the transceiver can be adjusted to correct it. Alternatively, the Alpha 87A's field (user) programming capability may be used to accurately match the actual antenna in use while achieving optimum efficiency and linearity at the power level decided.

The reader can quickly recognize the simplicity and details of the instruction manual. Being a writer, many times I get completely frustrated with poorly written manuals, and I make it a point to say so in my reviews. That is why it is always a pleasure when one does a review and the instruction manual is worth praising.

Speaking of this manual, the amplifier is shipped with the power transformer separate. There is a complete page, shown in simple drawing steps, on how to install the transformer. This merely means mounting

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

the transformer on the chassis, securing it with nuts and bolts, and then plugging in a couple of cables. When I say merely, I don't mean to give the impression that it's a 30 second job. The actual assembly couldn't be easier, but there are mechanical considerations pointed out in the manual.

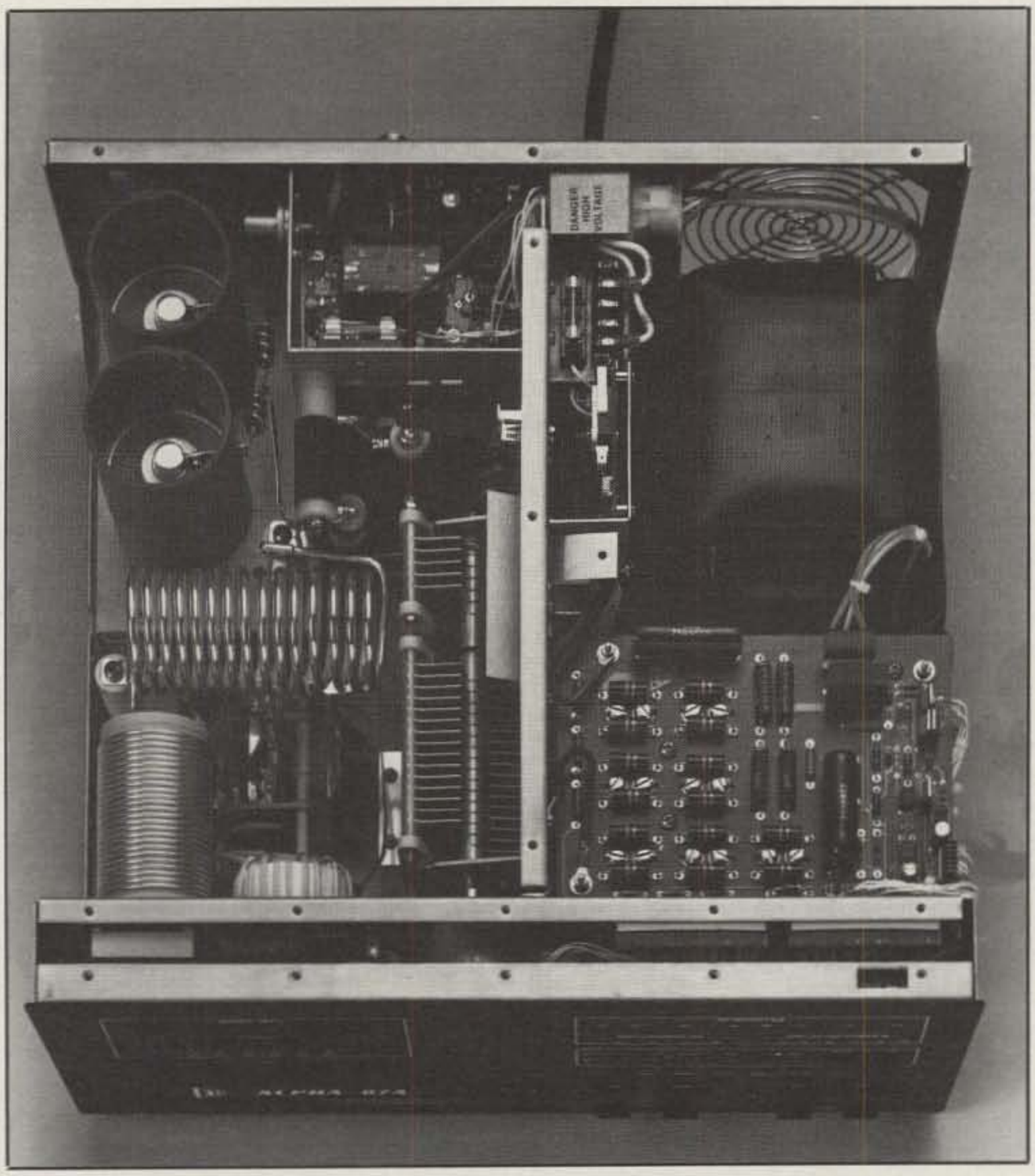
Obviously, the first step is to remove the wooden shipping plate mounted to the transformer. You might want to keep it in the box with its mounting hardware. The second consideration which faces you is the number of screws holding the cabinet together. You can use one of those plastic soup containers from a take-out restaurant to hold and keep track of the screws.

I would suggest that you assemble the amplifier on the floor in a clear area. Since the total weight is about 75 pounds, you really don't want to move the amplifier around too much without the cabinet, as you can twist and distort the chassis. The other prime consideration is to avoid twisting and distorting you and your back as you pick up the amplifier and move it to the operating position. Get a friend or a neighbor to give you a hand.

In the unpacking and installation instructions it also cautions about the correct primary tap. This amplifier requires a nominal 220 volts AC input, but there are taps for 200, 220, and the nominal United States voltage, 240 volts. The amplifier comes from the factory set up for 240 volts.

Although I mentioned the metering earlier, I would like to go over it again in more detail. The **RF Output, Grid Current,** and **Reflected Power** bargraphs are peak reading. As an example, 1.5 KW output (forward power into a 50 ohm load) is indicated when all green LED segments to the left of the 1.5 KW label are fully lighted and the first red LED segment is not lighted. The Alpha 87A, as tested, meets or exceeds the 1500 watt output power legal limit on any band from 160 through 10 meters into a flat 50 ohm load with under 60 watts of drive. (It is possible to run well over 1500 watts with this amplifier, so the red LED serves as a warning.)

The **Tune/IP/HV** "multimeter" has its functions selected by buttons directly at its right. It is a moving dot display. The **HV**



Looking down into the amplifier, on the right is the power-supply area; on the left are the RF components.

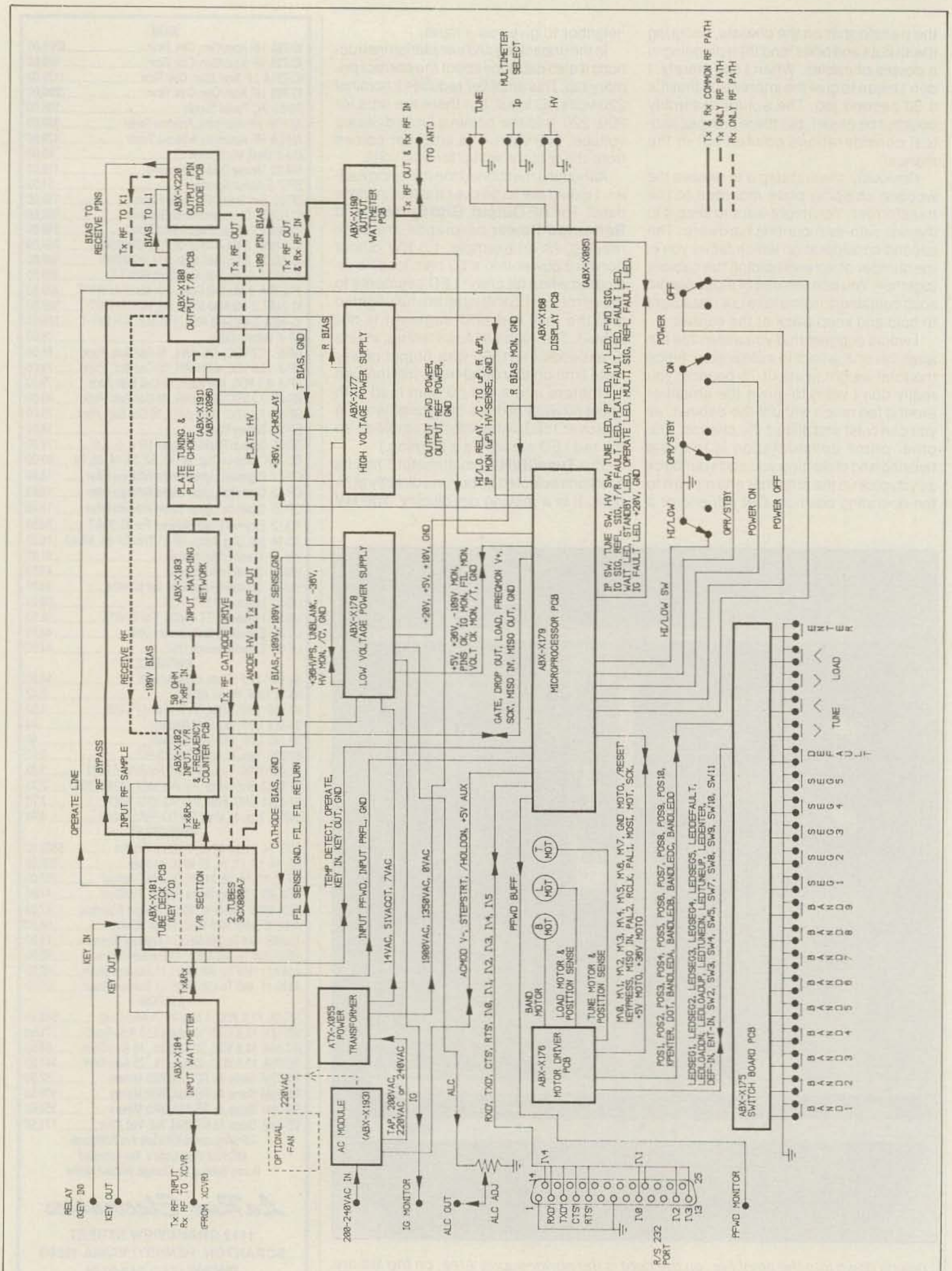


Fig. 1– Here is the block diagram of the Alpha 87A amplifier. The signal path designators are shown at the right.

R&L ELECTRONICS

1315 Maple Avenue
Hamilton, OH 45011

Orders & Price Quotes
800-221-7735
Local & Technical: (513) 868-6399
FAX: 513-868-6574
Hours: 10-6 M-F, 10-3 Sat.

NEW STORE

8524 E. Washington Street
Indianapolis, IN 46219

Orders & Price Quotes
800-524-4889
Local & Technical: (317) 897-7362
FAX: 317-898-3027
Hours: 10-6 M-F, 10-3 Sat.

Call Or Write For Our FREE Catalog

YAESU

HF

FT-747

FT-990

FT-757

FT-1000

FT-890AT

YAESU

HT's

FT-23

FT-33

FT-411

FT-415

FT-911E

FT-815

FT-811E

FT-470

YAESU

Mobile

FT-5200

FT-2400

FT-212RH

FT-290

Satellite

FT-736

COD'S WE TAKE TRADE-INS

CIRCLE 57 ON READER SERVICE CARD

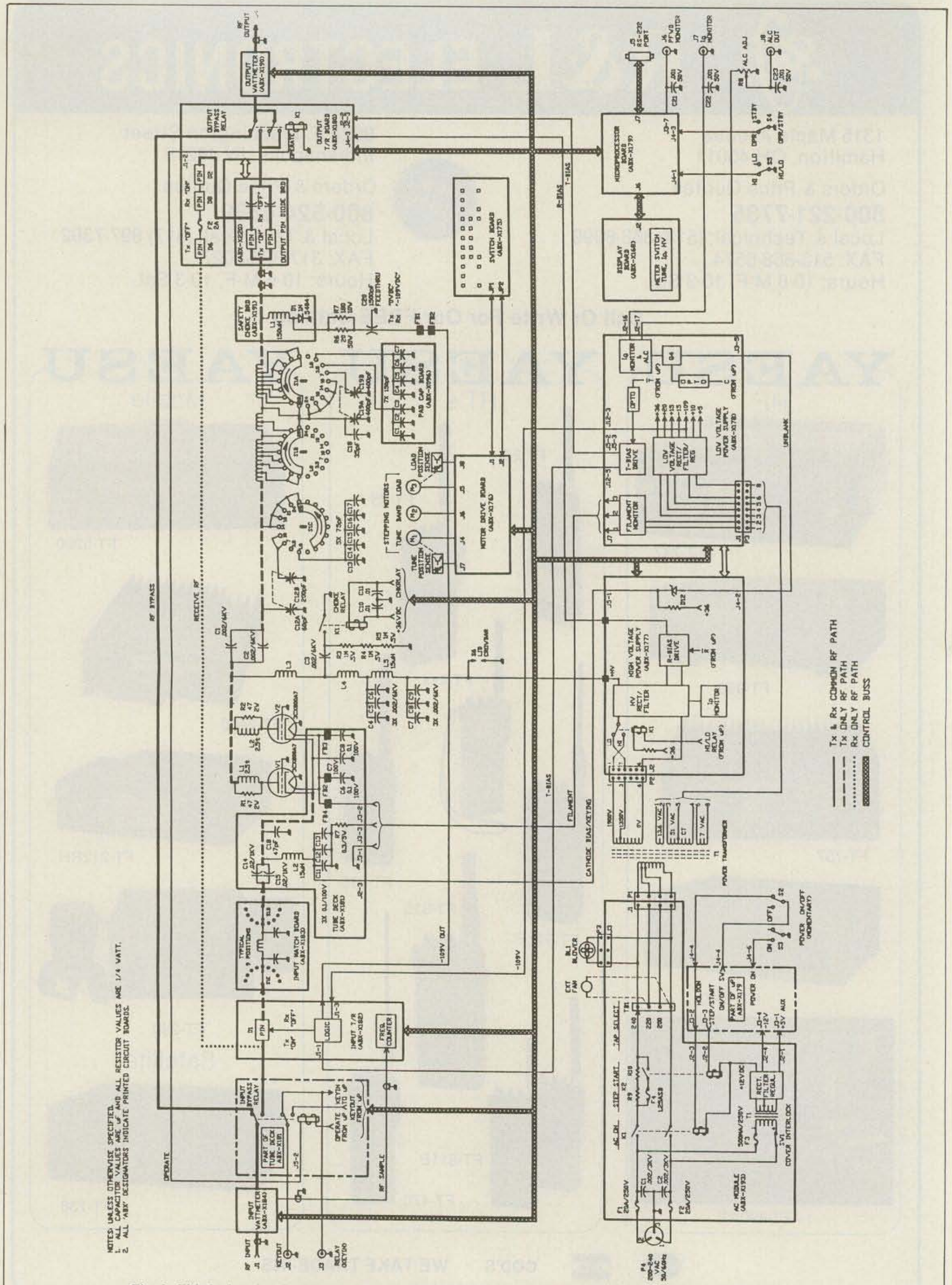


Fig. 2– This is the circuit diagram of the amplifier. Signal path codes are shown at the bottom.

(high voltage) is read on a 0 to 3 KV scale and the plate current on the bottom scale.

The **Band** and **Segment** buttons are used to select each band tuning range, displayed on the upper left panel via an LED. On each band there are five memory channels, or segments, that are factory preset, plus five more segments for the user to set. There are five LED segment buttons that correspond to your settings. These **Band** or **Segment** buttons are not used during routine operation because the amplifier automatically switches bands and tunes up if necessary when drive is applied.

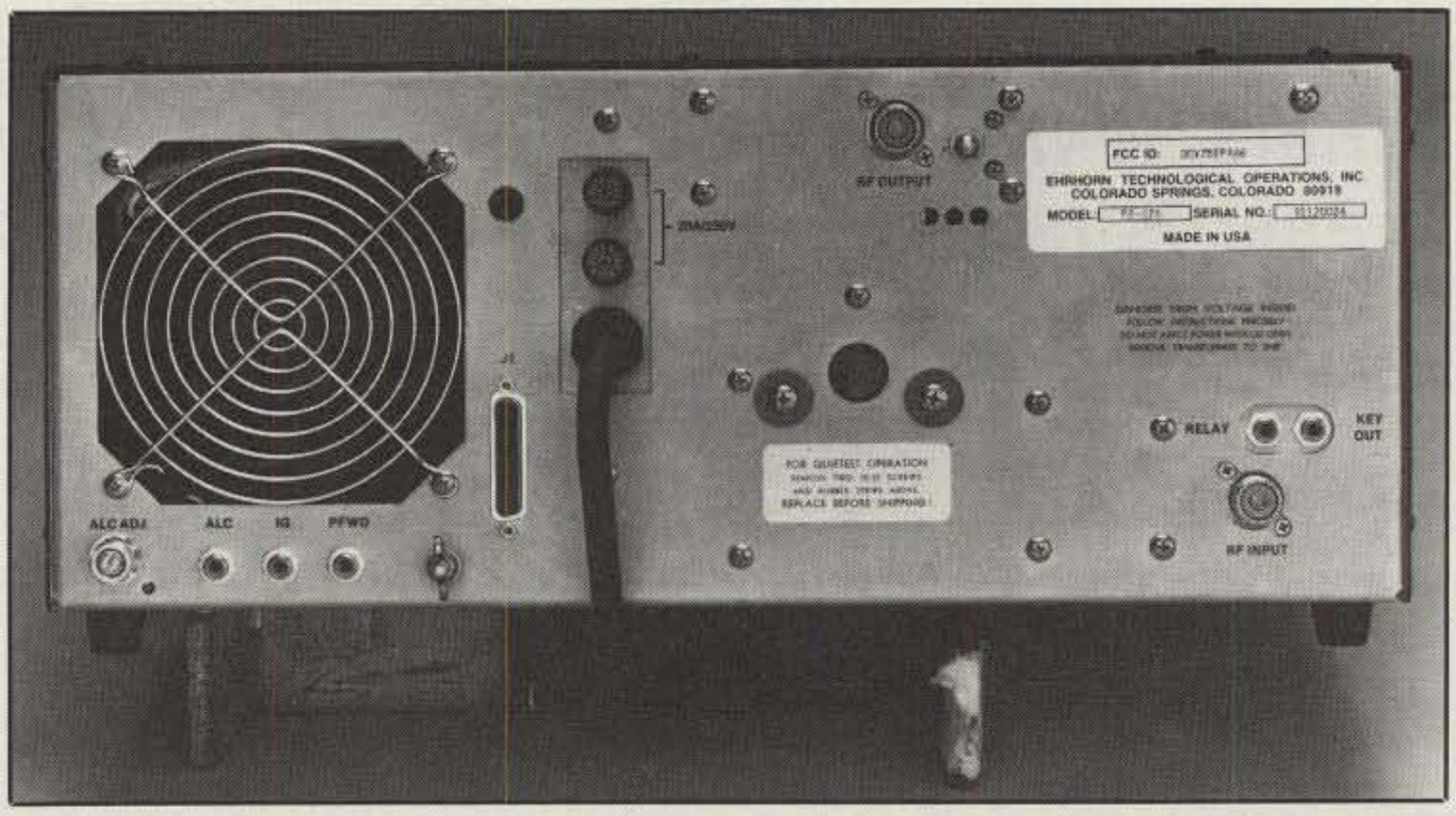
Keep in mind that the amplifier tune-up is computer controlled, and once drive is applied, the computer senses the frequency and tunes up on that predetermined setting. The actual program by the factory is set so that the amplifier will deliver 1.5 KW output into a 50 ohm load of no greater than an SWR of 1.5 to 1. For example, the default (factory tuning) with the 14 MHz button and number 3 **Segment** button illuminated means that the Alpha 87A tuning is centered at 14,250 kHz to provide optimum performance from approximately 14.2 to 14.3 MHz.

This is the first completely computer-controlled amplifier I have ever used, and to say I was impressed would be putting it mildly. If you make a mistake, the computer will light the front-panel **Segment** display with "Fault" codes. There are two pages provided in the manual which give all these errors. As some examples, the display of five LEDs showing either zeros or plus marks—0 0 0 + 0—would indicate that the 5 volt supply voltage is too low. On the other hand, 0 0 0 + + would mean the voltage is too high. One other display worth mentioning is 0 + + 0 +, which would indicate the drive power is *too* high—a very important consideration. (Too many amplifier users for some reason love to drive an amplifier too hard!)

Also, as one would expect with a computer-controlled amplifier, there is present an RS-232 serial communications link. Complete details are given for setting this and your own computer terminal command for RTTY, AMSAT, AMTOR, etc. The terminal setup will also support XON/XOFF and RTS/CTS off.

To provide 10 meter operation, when the amplifier is purchased, a copy of your license must be sent to Ehrhorn Technologies. They will then send you an entry code which you enter via the keypad front panel. This then activates 10 meter operation. It should be pointed out that this code will work *only* with your amplifier.

If I were going to rate this amplifier on a scale of one to ten, my rating would be something well over a ten. It is truly a beautiful piece of work. The Alpha 87A amplifier is available in the USA factory-direct-only for $5,490.00. The unit is manufactured by Ehrhorn Technologies Operations, Inc., 4975 N. 30th Street, Colorado Springs, CO 80919-4101.



The rear view shows the cooling-air input area and the simple input and output connections. CQ

A perennial topic for antenna tinkerers is antenna tuners. W4FA is no exception in this area, and he presents two ideas with which to experiment.

Two Tuners Not To End All Tuners

BY JOHN J. SCHULTZ*, W4FA

Every time I construct a new HF antenna tuner (antenna coupler, antenna tuning unit, transmission line interface unit, or whatever you wish to name them) I sort of feel this is it. I've constructed my final unit. By now, however, I've learned it's an illusion. I'll be constructing other tuners as time goes on.

The two tuners presented in this article are not the tuners to end all tuners. But until some newer designs come along, homebrewers might like to take a look at them. Both are relatively simple-to-construct homebrew projects. They don't perform any great tricks except to rather efficiently couple a transceiver into a *wide* variety of unbalanced or balanced HF antenna loads. I sort of emphasize the word *wide*, because although the automatic antenna tuners in various new transceivers are very good indeed, manual tuners still have an edge. In a sense, with a manual tuner you replace the "computer" in sensing which control adjustments are best. The automatic tuner's "computer" may too quickly reject control adjustments which are out of programmed bounds, because of tuning time restrictions, although a "match" to an antenna load might still be possible. Some of the late-model transceivers provide, in fact, a manual override feature for their built-in automatic tuners in recognition of that fact.

The first tuner presented is designed for the 100 watt output level and not only mimics but uses some surplus parts from an MFJ product. However, since I first started describing T-network tuners in *CQ* in 1968 and MFJ came along a bit later using T networks in their tuners, I guess we both can be satisfied. The tuner is basically very easy to construct, and with a bit of searching around you can find the necessary parts from a variety of sources.

The second tuner described here is designed for the 1 KW + output level. It also utilizes a T network, but one with two variable-inductor arms. Heavy-duty but relatively easy to accomplish construction is a feature of this tuner. The parts needed are readily available from mail-order houses, but are not inexpensive. I doubt if any reader would want to exactly duplicate the tuner, although that can be done easily. Rather, I suspect some readers might like to take the basic idea involved and develop it into their own form of a KW + level tuner.

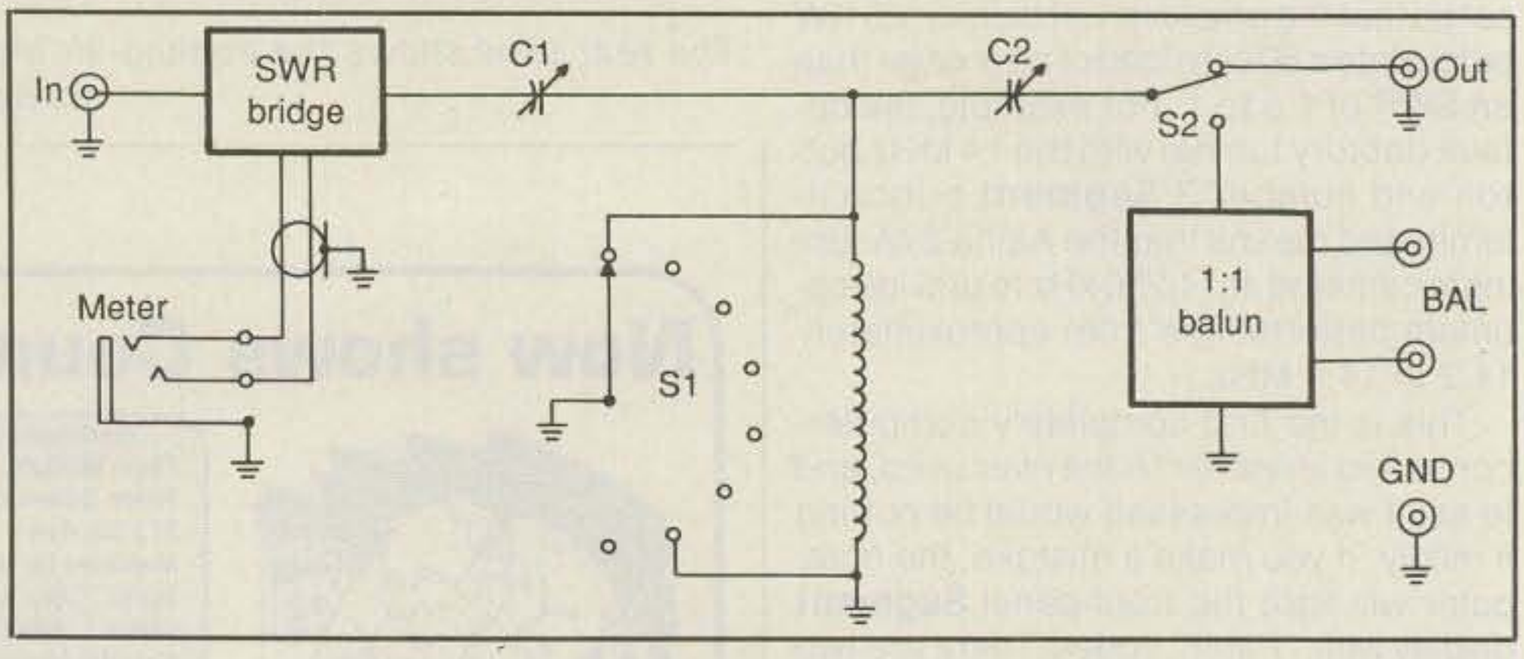
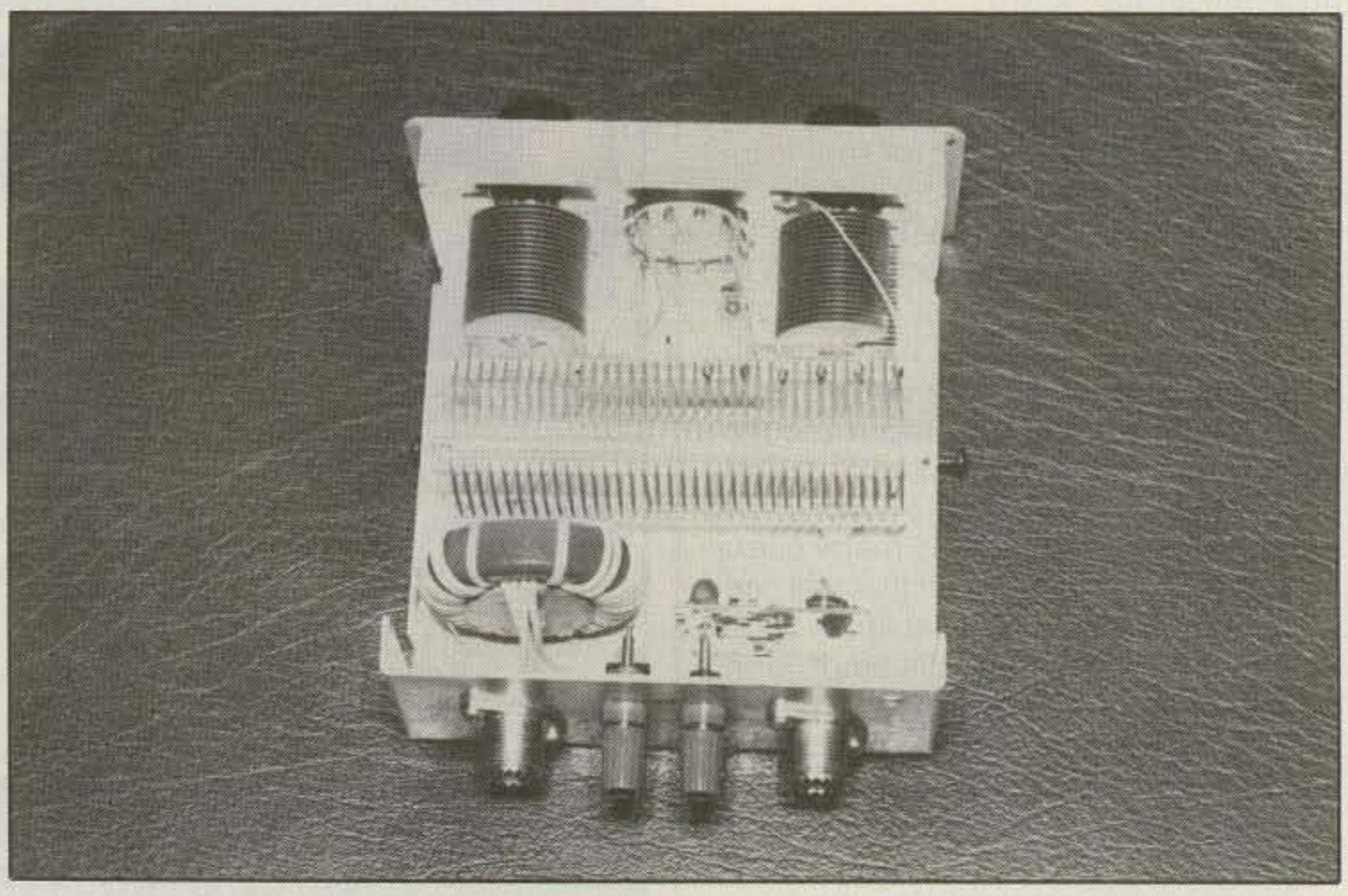


Fig. 1– Tuner #1—component values and the wiring of S1 are discussed in the text. S2 is a simple mini-toggle or slide switch.



Interior view of tuner #1. It's not too clear, but the PC board containing the SWR bridge is just behind the right-hand SO-239 connector.

*302 Glasgow Lane, Greenville, NC 27858

LET THE FUN BEGIN!

2 BIG DAYS

BOXBORO '92

The New England ARRL Convention at Boxboro, Massachusetts

Take the Mass. Pike to Rte I-495. The convention is at exit 28.

OCTOBER 3 & 4




- Make DEALS with the Dealers! • Meet the Manufacturers! • WIN the Contests!
- FCC Exams - All Levels • Hidden Transmitter Hunts • Giant Flea Market
- Wouff Hong Ceremony • YL Programs • AMSAT Meetings • DX Meetings • ECARS
- DXCC QSL Card Upgrades & Checking • QCWA • Big Dance Saturday Night

Early Bird Registration $7

For Tickets write: Sonny Cascio, K1SVP , 240 Hamilton St., Saugus, MA 01906

CIRCLE 164 ON READER SERVICE CARD

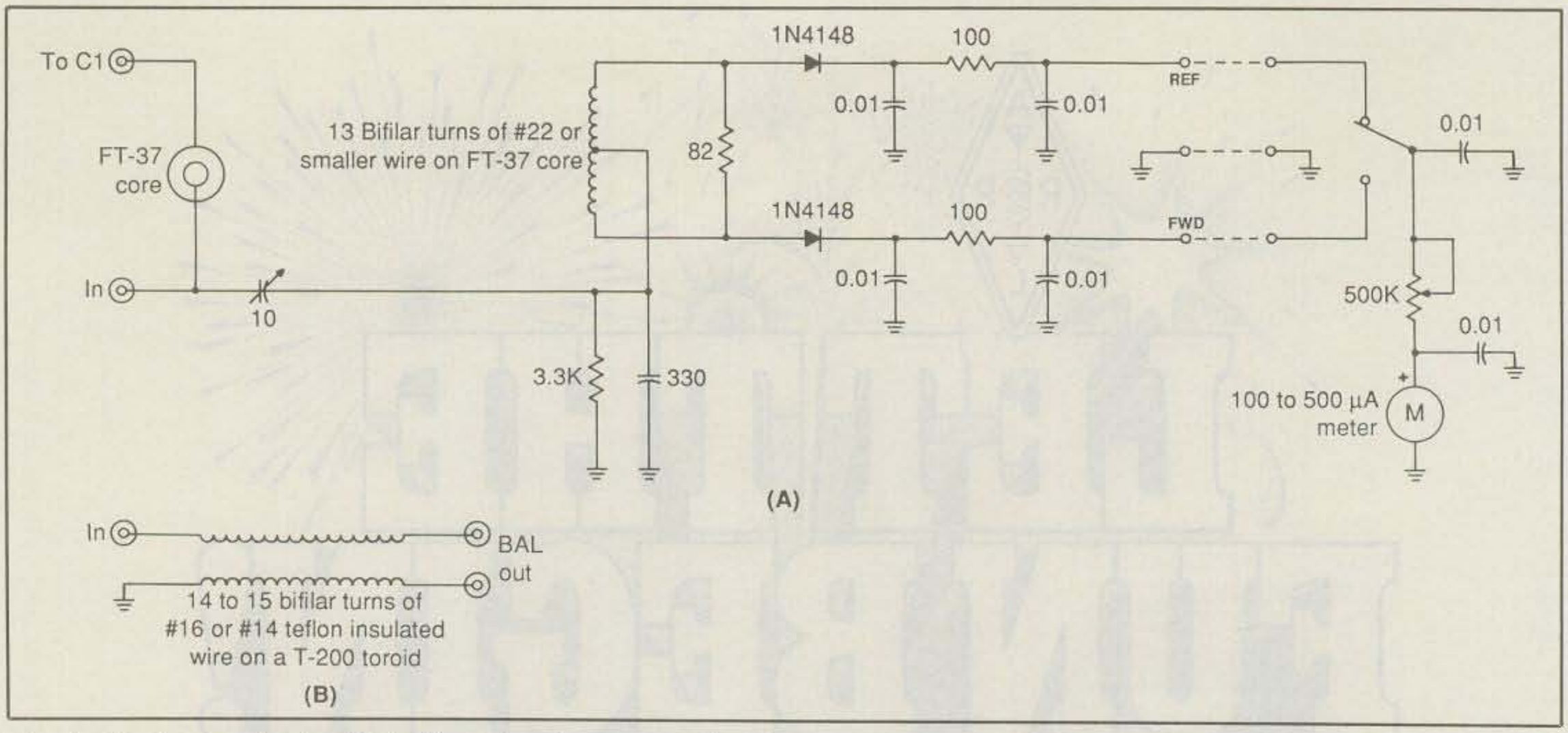


Fig. 2– (A) shows a simple SWR bridge. The trimmer capacitor is adjusted for a 1:1 SWR on 10 meters using a dummy load. (B) shows a 1:1 current balun.

Tuner #1

The schematic of the 100 watt level tuner is shown in fig. 1, and one of the photographs provides an interior view and some view of the rear panel. The tuner features a built-in SWR bridge, but no SWR meter! Rather, the outputs from the bridge go to a rear-panel connector (a ⅛ inch stereo phone jack) for connection to an external meter. The reason for this little "twist" was to keep the tuner as compact as possible. It also helps to eliminate some external RF interconnections compared to using an external self-contained SWR meter. The external meter can be as small or as large as desired and located where desired.

Skipping to the output end of the tuner for a moment, you can see the switch selection of either unbalanced or balanced antenna loads. The balun used is of the current type and is rather massive for a 100 watt level tuner. But for a homebrewer, it costs relatively little more to purchase a larger core and more wire for the balun in order to ensure the lowest possible losses. Fig. 2 presents schematics for the SWR bridge and the balun. If you don't need either of these items, the tuner can be placed in a smaller enclosure or space can be left in an enclosure to add them later.

The core part of the tuner is, of course, the T network. The two variable capacitors should have a maximum value of at least 250 pF each. The old "broadcast" style 365 pF variables (single section) will do quite well if you can locate them at a reasonable price. Ocean State Electronics (Box 1458, Westerly, RI 02891) had some at one time for $6.00. I used two single-section 340 pF variables "rescued" from some old MFJ tuners. Similar items might be available from surplus sources. Then again, if you don't mind switching in a fixed capacitor on the lower frequency bands across a variable capacitor, there are an enormous amount of small variables in the 100 to 140 pF range available from surplus sources at a cost of a few dollars. You should, however, stay with air-insulated variables. Ones with a voltage rating of 500 VDC or more are suitable.

The coil used is a very standard machine-wound one, B&W Miniductor #3053 (1½ inch diameter, 8 TPI, 4 inches long). It provides about 12.5 µH of inductance, which is fine for operation down to 80 meters. For operation down to 160 meters, a B&W type 3059, which provides 26 µH, might be used. The coil is tapped by means of a 1 P 12 position rotary switch. Although a simple Radio Shack switch will suffice, you might search around for a more rugged type. Ocean Electronics had some in their catalog. The coil is tapped progressively by turns starting with zero turns (to take advantage of stray inductance) and then in steps of 2, 3, 4 turns, etc. The best way to do this is to mark the coil with the intended tap points *before* you start soldering wires to the switch.

The tuner (including SWR bridge and balun) can be constructed in an enclosure measuring about 5½" × 2½" × 6". A Ten-Tec TP43 enclosure is suitable, although many other types can be found in catalogs. Construction is very straightforward and can be varied as a builder desires once the components are on hand. The only point that deserves a bit of mention is the mounting of the variable capacitors, since they "float" above ground. In the case of "broadcast" variables, the use of nylon-screw hardware provides an easy solution. In the case of shaft-mounted capacitors, fiber shoulder washers can be used on both sides of the front panel. Or, a fiber flat washer can be inserted in the front panel and larger outside diameter flat fiber washers can be placed in front and back of the panel. The center hole of both washers has to accommodate the capacitor's threaded shaft, and when the shaft nuts are tightened up, everything will be held securely in place.

A final note is not to use knobs which contain a lot of metal on the capacitor shafts. Ideally, knobs which have no metal shaft inserts and which use nylon set screws should be used. The idea is not to provide an extreme of electrical insulation, but to avoid hand capacitance effects while tuning.

This little tuner will give a very good account of itself at the 100 watt level and is fairly ideal for portable/mobile applications.

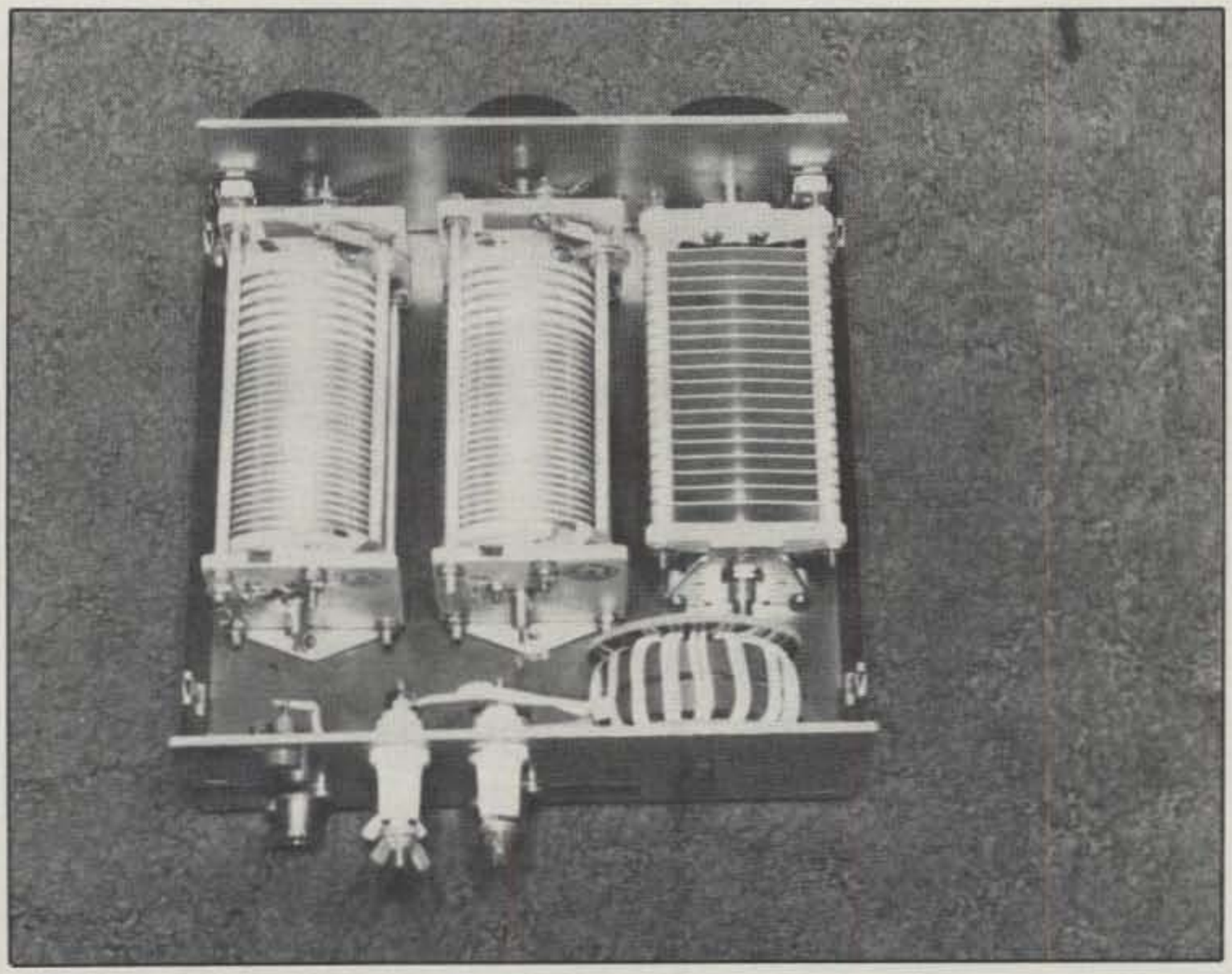
Tuner #2

This tuner has a rather plain-looking front panel, as can be seen from one of the photographs. It measures only about 9" × 3½" × 9½" and is hardly a large tuner. If you take a look at the interior-view photograph, though, it should become apparent that this tuner is "packed" with heavy-duty components, allowing it to handle well over a KW of RF output. However, it wasn't designed to be a "fancy" tuner and does not include meters, turns counters for the inductors, or a vernier

Front view of tuner #2. It's not as plain as it looks. The top cover is orange in color and the front panel is blue with decals above each control to designate the function of each. The details didn't come out in the photography.

drive for the variable capacitor. Yet it is a relatively easy tuner to adjust and hardly anything mechanically or electrically can go wrong with it, except for whatever faults are inherent in the variable inductor and capacitor components.

Fig. 3 presents a schematic of the unit. The inductors are Multronics 229-202 or equivalent units which are wound with #12 wire! The variable capacitor is a Cardwell 154-9, or equivalent having a 3 KV rating. If you don't need the balun, you could substitute a Cardwell 154-10 capacitor to gain a bit more capacitance (347 pF). The balun itself uses stacked 2 ½ inch cores. I realize an argument might be made for using an



A look inside tuner #2. Conventional advice would be to place the capacitor in the middle, but I didn't notice any interaction by having the roller inductors placed side by side. The balun is secured to the rear panel by two fiber discs and a central bolt.

external, transmission-line balun to save a fraction of a dB of power, especially on 10 meters. However, I generally found the idea of being able to run something like 450 ohm ladder line right up to the tuner very convenient.

The construction of the tuner is fairly clear by referring to fig. 3 and the interior-view photograph. I won't go into great detail about construction of the tuner, since I think anyone who constructs this type of tuner should already have a bit of home-brew construction experience, a small collection of surplus material catalogs, and perhaps a bit of a nose to hunt out bargains at fleamarkets! Let me mention a few points, however. A jumper arrangement is used to go from the coaxial output to the balun input. A good RF switch, if found, would of course be more convenient. All internal wiring was done using #14 silver-plated Teflon wire, the same wire as is used to wire the balun. You can go super-deluxe by using #12 Teflon wire at a cost of about 10 cents per foot more. I happened to have the #14 on hand, but I guess I would have used #12 otherwise.

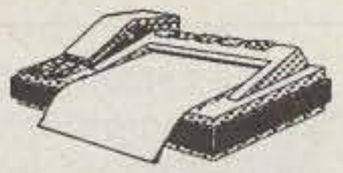
Watch the quality of the SO-239 connectors. Several times I have experienced the dielectric on inexpensive connectors melt at extended key-down KW levels. The Multronics inductors (and several similar types) have tapered windings at one end, which is very handy for precise tuning on the higher frequency bands. However, the inductor (like the Multronics units) must have a shaft long enough to attach into *at the tapered end* if the inductor is to be set up for simple, direct, clockwise rotation for increasing inductance. Some surplus inductors do not have this feature and can be wired up only for conter-clockwise rotation. It's not a tremendously important point, but clockwise rotation is more "natural" for most operators.

I didn't find it necessary for 80–10 meter operation into a wide variety of antenna loads, but you might allow construction space for additional capacitors to be placed across the 250 pF variable. I can't quite imagine any circumstance where more than an additional 250 to 300 pF would be required. Rather old-fashioned high-voltage (2.5 KV or more) mica capacitors can still be found and are far more economical for the purpose than so-called RF "doorknob" capacitors.

As was mentioned, I constructed the tuner with only the simplest of front-panel "readouts"—0 to 10 for the variable capacitor and a direction of rotation sign for increasing inductance for the variable inductors. The variable inductors, especially ones with a tapered winding at one end, have a built-in vernier tuning effect. A large knob on the direct-drive variable capacitor provides a bit of the same effect. I never found resettability a problem if I logged the setting of the variable capacitor and the approximate turns on the variable inductors

ACE COMMUNICATIONS
800 445 7717
317 842 7115
ACE Communications Monitor Division
10707 East 106th Street Fishers, IN 46038

Dial 317 849 8683 to get instant tech information FREE from your Fax!
You can obtain specs and info on these products and more by dialing our Fax Facts automated service. Call our number from your fax, then request the document as listed below. Start your fax and the document will start printing immediately on your fax!



Scanner & Shortwave

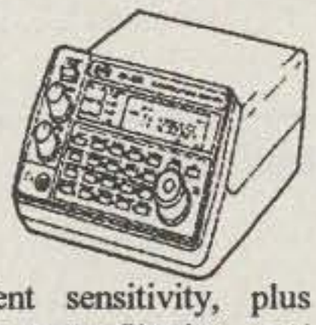
AOR AR1000XLT
$429.00
AM Broadcast to Microwave
1000 Channels

500KHz to 1300MHz coverage in a programmable hand held. Ten scan banks, ten search banks. Lockout on search and scan. AM plus narrow and broadcast FM. Priority, hold, delay and selectable search increment of 5 to 995 KHz. Permanent memory. 4 AA ni-cads and wall plus cig charger included along with belt clip, case, ant. & earphone. Size: 6 7/8 x 1 3/4 x 2 1/2. Wt 12 oz. Fax fact document # 205.

AR2500
$429.00
2016 Channels
1 to 1300MHz
Computer Control

62 Scan Banks, 16 Search Banks, 35 Channels per second. Computer control for logging and spectrum display. AM, NFM, WFM, & BFO for CW/SSB. Priority bank, delay/hold and selectable search increments. Permanent memory. DC or AC with adaptors. Mtng Brkt & Antenna included. Size: 2 1/4H x 5 5/8W x 6 1/2D. Wt. 1lb. Fax fact # 305

AR3000
$1095.00
400 Channels
100KHz to 2036MHz



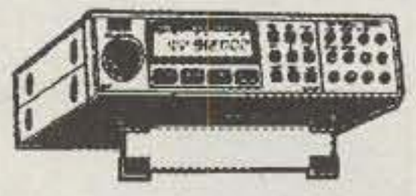
Extreme coverage, excellent sensitivity, plus processor controlled band pass filtering and attenuation to eliminate interference. Top rated receiver in its class, offers AM, NFM Wide FM, LSB, USB, CW modes. RS232 control. Lockout in search. 4 priority channels. Delay & hold & Freescan modes. AC/DC pwr cord and whip ant. included. Size: 3 1/7H x 5 2/5W x 7 7/8D. Wt 2lbs., 10oz. Fax fact document #105.

Free Stuff

Demo disk of SCS (scanner control system) software for AR 3000 & AR2500. Call toll free to order. Also, Free with AR2500: Control software, a $49.95 value. Allocation chart of all voice frequencies. Dial Fax Facts for doc. #999.

Mobile Scanners

Bearcat 760XLTM
$249.95
100 Channel
800 MHz



Five banks of 20 channels each. Covers 29-54, 118-174, 406-512 and 806-954MHz (with cell lock). Features scan, search, delay, priority, memory backup, lockout, service search, & keylock. Includes AC/DC cords, mtng brkt, antenna. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 7.5lbs. Fax fact document #550.

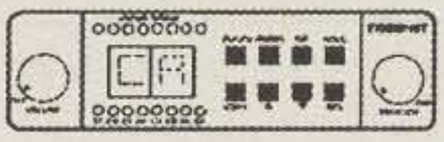
Bearcat 590XLTX
$199.95
100 Channel
11 Band

Five banks of 20 channels each. Covers 29-54, 118-174, and 406-512MHz. Features scan, search, delay, priority, memory backup, lockout, service search, & keylock. Includes AC/DC cords, mtng brkt, antenna. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 7.5lbs. Fax fact document #570.

Bearcat 560XLTZ
$99.95
16 Channel
10 Band

Compact, digital programmable unit covers 29-54, 136-174, and 406-512MHz. Features scan, WX search, delay, priority, memory backup, lockout, review,& auto delay. Includes AC/DC cords, mtng brkt, antenna. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 2.5lbs. Fax fact document #560.

Trident TR-2C
$89.95
Scan/CB with optional radar detector



Scans pre-programmed by state channels in low, high, UHF & T bands. Weather, 40 ch. CB receive plus mobile relay. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 2.5lbs. Fax fact document #580.

Mag Mount Antenna. Easy to install whip antenna with 20' of coax & heavy duty magnet BNC MA 100 **$19.95**
Base Antenna. 25 to 1000MHz coverage with 50' of coax. All mounting hardware included. BNC AS 300 **$59.95**
External Speaker. Base or mobile mount. MS190 **$19.50**
Wide Band Pre-Amp. Variable gain up to 20dB covers 100 KHz to 1500MHz. 9Vbatt included. BNC. GW-2 **$89.00**
Interference Filter. Filters and eliminates common causes of interference to scanners. BNC. Model MPIF-1. **$59.00**
Downconverter. Converts 800MHz freqs to 400MHz for 3 band scanners. Quartz locked, 9V batt. DC89. **$89.00**
Extended Warranties & Service. Extended warranties available for most models. Call for quote. Out of warranty service by ex- Bearcat/Regency factory techs. Call for quote.

Hand Held Scanners

AOR 900 $199.95
100 Channel 800 MHz

Five scan banks 5 search banks. Covers 29-54, 118-174, 406-512 and 830-950 MHz (no cell lock). Features scan, search, delay, priority, memory backup, lockout, service search, & keylock. Includes AC/DC cords, mtng brkt, antenna. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 7.5lbs. Fax fact document #650.

Bearcat 200XLTN
$239.95 200 Channels 800MHz
Keyboard Programmable.

Ten scan banks plus search. Covers 29-54, 118-174, 406-512 and 806 956MHz (with cell lock). Features scan, search, delay, 10 priorities, mem backup, lockout, WX search, & keylock. Includes NiCad & Chrgr. Size: 1 3/8 x 2 11/16 x 7 1/2. Wt. 32 oz. Fax Facts # 450

Bearcat 100XLTN Now $159.95
100 Channels, Keyboard Programmable.
Similar to 200XLTN above without 800MHz. Fax facts #460

Bearcat 70XLTP Only $139.95
20 Channels Keyboard Programmable.
10 Band Hand Held with Ni-Cads & Charger. **Fax facts #470**

Bearcat 55XLTR Now $99.95!
10 Channels Keyboard Programmable.
10 Band with LCD. Requires 5AA's. Fax facts #480

Table Top Scanners

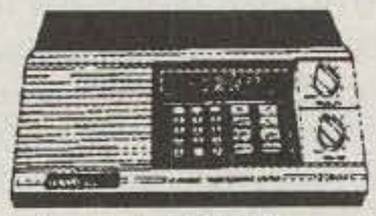
Bearcat 855XLTE Now $179.95!
50 Channels Keyboard Programmable with 800MHz. LCD display, lock, priority, Search, WX, Fax facts #655

Bearcat 142XLM Only $87.95
16 Channels with 10 bands. LED display, lockout, priority, WX scan , review key and memory backup. Fax facts #660.

Bearcat 147XLJ Now $93.95
16 Channels with 10 bands. Track tuned, LED display, priority, WX search, review, memory backup. Fax facts #670.

Bearcat 172XLM Only $124.95
16 Channels with 10 bands. Track tuned, LED display, priority, WX search, review, memory backup. Fax facts #680.

Bearcat 800XLX
$239.95



12 bands and 40 channels with 800MHz and nothing cut out. AC or DC. Fax facts #690.

2 Way Radios

VHF hi band programmable mobiles as low as $299.95. Call for quotes or Fax Fact #755

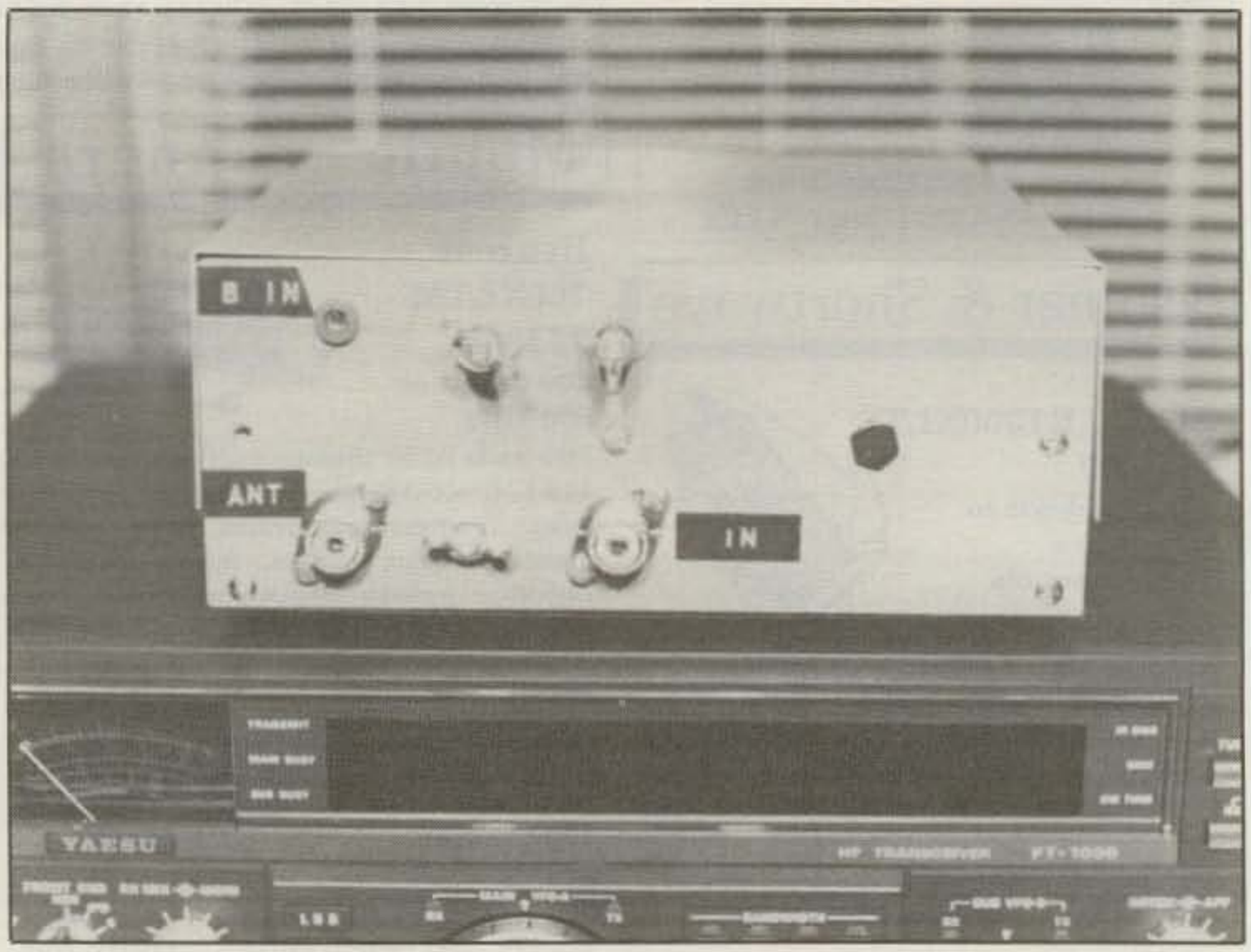
Call Toll Free, 24 Hours a Day! ***Dial 1-800-445-7717****. Fax Toll Free, 1-800-448-1084*
800 numbers operational in all 50 states, plus Canada. For international voice lines, dial 317-842-7115 or fax 317-849-8794
ACE Communications 10707 East 106th Street, Fishers, IN 46038
Service & Support hours: Mon. - Fri. 9 A.M. to 6 P.M., Sat. 10-4 EST. MasterCard, Visa, Checks, Approved P.O.'s & C.O.D. (add $5.00) & AMEX (add 5%.) Prices, specifications and availability subject to change. Flat rate shipping & handling charge, $4.95 per unit. Express shipping available , no express C.O.D. One week trial, no returns accepted two weeks after original receipt without substantial restocking charge. All units carry full factory warranty. Indiana residents add sales tax.

CIRCLE 166 ON READER SERVICE CARD

from a zero (fully CCW) position. Using an external cross-needle SWR meter, it was perfectly obvious when a matched tuning condition was being approached and how you should "touch-up" the tuning for an exact match. However, having said that, I would readily admit that if you found it necessary to QSY quite rapidly between bands, a turns counter on the variable inductors would be useful, although I doubt very much that a vernier drive for the variable capacitor would be necessary. Once the inductors have been set, the capacitor can be set to an approximate setting and final "touch-up" tuning accomplished using the variable inductors.

Adjustment

The general rule for both tuners is to start matching into an unknown antenna load with minimum inductance and the capacitor(s) set half way. Adjust the capacitor(s) and then increase the inductance, etc., until a match is found. Tuner #1 tunes rather sharply, especially on the higher frequency bands. Rotate the capacitors slowly and then log the settings. Tuner #2 adjusts almost effortlessly, but that's the reward of using roller inductors as compared to a switched inductor.



The rear panel of tuner #2. A plug-in jumper is used between "ANT" and "B IN" when the balanced line output is used.

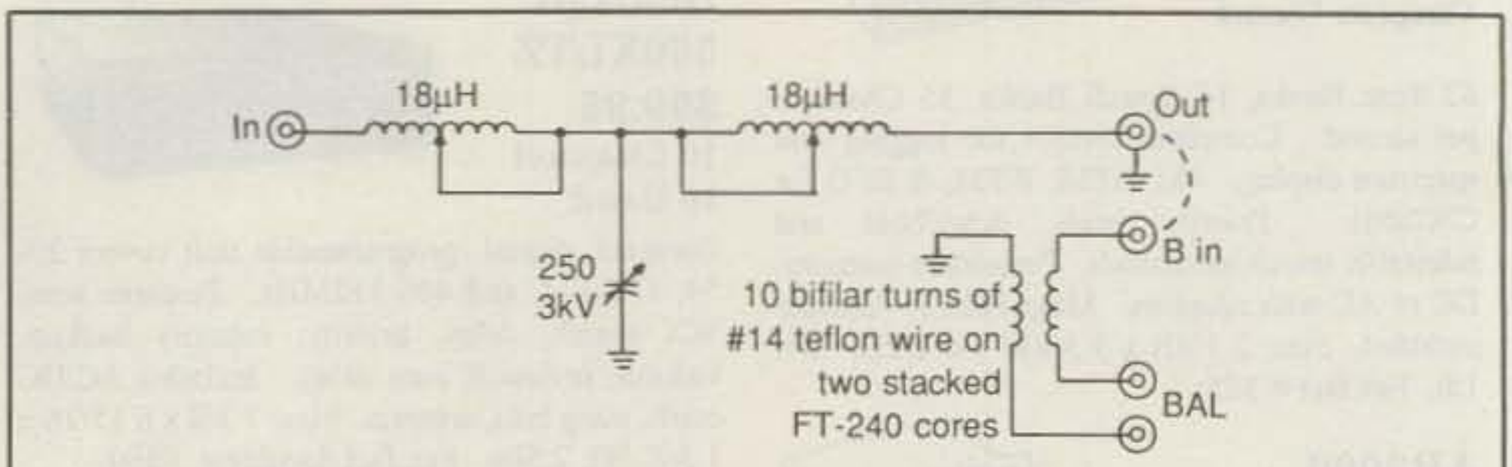


Fig. 3– Tuner #2—component values are discussed in the text.

Summary

One of the most perennial items of serious and humorous discussion in amateur radio circles revolves around antennas, SWR, and antenna tuners. There's nothing wrong with that, and there seems to be a new little twist or surprise around every corner. However, no "black magic" is involved in constructing a simple antenna tuner.

That's certainly the case with regard to the tuners described in this article. Both units will match a good variety of antenna loads and are relatively simple units to construct if you have a bit of time to collect the parts and assemble the units. Besides a monetary savings, there is still a bit of fun in "homebrewing" a piece of equipment, no matter how simple it is.

Both of the tuners described can be scaled up or down. Tuner #1, for instance, is limited to about the 100 watt level because of capacitor voltage rating and the coil switch used. By using variable capacitors with a 1500 volt rating and a ceramic switch of the 1 ¼ inch diameter variety, it should easily handle 300 watts. By using a coil having up to #14 wire, the tuner could accommodate even more power, but then its size starts to increase quite a bit.

Tuner #2 can be scaled down to roughly the 500 watt level by using a 1500/2000 volt capacitor and roller inductors with #14 wire. By the way, don't try to duplicate Tuner #2 using switched inductors. The matching range becomes much too restricted. What you can do for economy is replace one roller inductor with a switched inductor (as per tuner #1, but with heavier wire size). Then you must put in a switch to reverse the in/out connections to the tuner if the full matching range of the tuner is to be realized. CQ

GREAT ARROW LINE ANTENNA

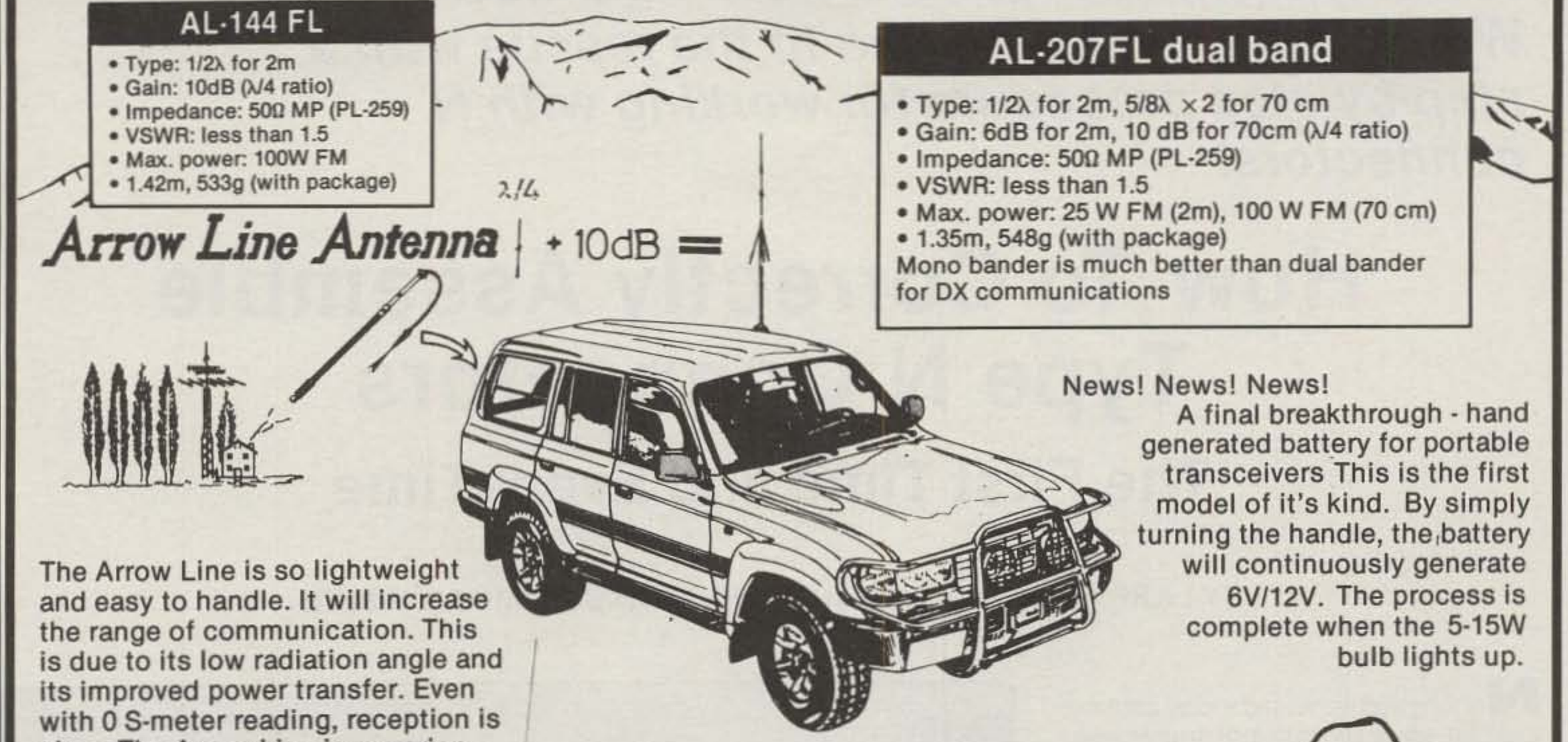
AL-144 FL

- Type: 1/2λ for 2m
- Gain: 10dB (λ/4 ratio)
- Impedance: 50Ω MP (PL-259)
- VSWR: less than 1.5
- Max. power: 100W FM
- 1.42m, 533g (with package)

AL-207FL dual band

- Type: 1/2λ for 2m, 5/8λ ×2 for 70 cm
- Gain: 6dB for 2m, 10 dB for 70cm (λ/4 ratio)
- Impedance: 50Ω MP (PL-259)
- VSWR: less than 1.5
- Max. power: 25 W FM (2m), 100 W FM (70 cm)
- 1.35m, 548g (with package)

Mono bander is much better than dual bander for DX communications



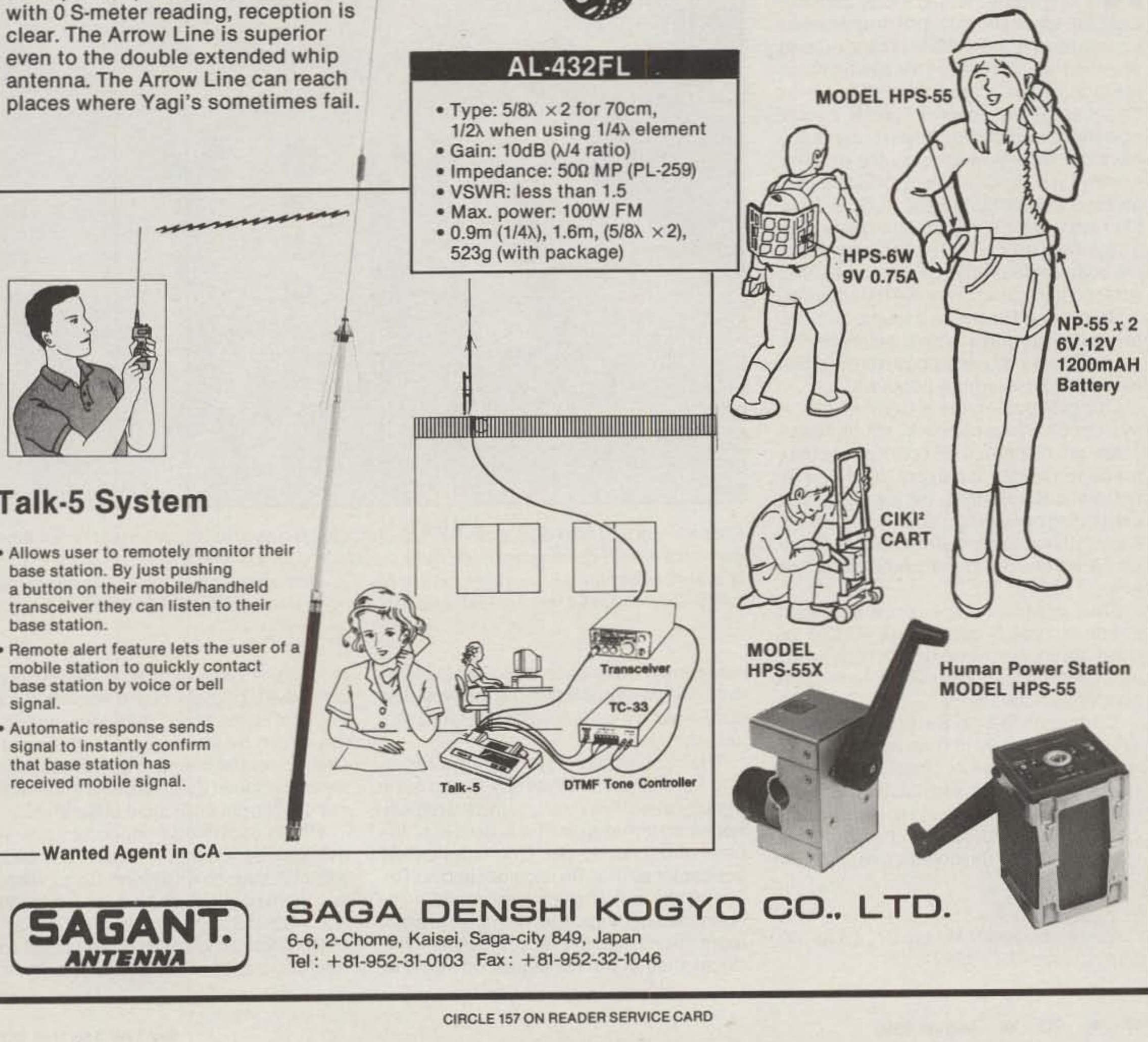
The Arrow Line is so lightweight and easy to handle. It will increase the range of communication. This is due to its low radiation angle and its improved power transfer. Even with 0 S-meter reading, reception is clear. The Arrow Line is superior even to the double extended whip antenna. The Arrow Line can reach places where Yagi's sometimes fail.

News! News! News!

A final breakthrough - hand generated battery for portable transceivers This is the first model of it's kind. By simply turning the handle, the battery will continuously generate 6V/12V. The process is complete when the 5-15W bulb lights up.

AL-432FL

- Type: 5/8λ ×2 for 70cm, 1/2λ when using 1/4λ element
- Gain: 10dB (λ/4 ratio)
- Impedance: 50Ω MP (PL-259)
- VSWR: less than 1.5
- Max. power: 100W FM
- 0.9m (1/4λ), 1.6m, (5/8λ ×2), 523g (with package)



Talk-5 System

- Allows user to remotely monitor their base station. By just pushing a button on their mobile/handheld transceiver they can listen to their base station.
- Remote alert feature lets the user of a mobile station to quickly contact base station by voice or bell signal.
- Automatic response sends signal to instantly confirm that base station has received mobile signal.

Wanted Agent in CA

SAGANT. ANTENNA

SAGA DENSHI KOGYO CO., LTD.
6-6, 2-Chome, Kaisei, Saga-city 849, Japan
Tel: +81-952-31-0103 Fax: +81-952-32-1046

CIRCLE 157 ON READER SERVICE CARD

Somehow the thought of trying to put on an N connector turns some of us off. Fear not! W5QMU and W5LVE come to the rescue with a step-by-step procedure for working with N connectors.

How To Correctly Assemble Type N Connectors

The First Time and Every Time

BY LARRY HIGGINS, W5QMU*, AND JOHN BRUEMMER, W5LVE

Not long ago we visited a local commercial UHF tower site to help with an amateur installation thereon. While nosing around, attention naturally fell on the existing commercial radios. The connectors on the backs of the radios were Type N, but the commercial installer apparently didn't have the know-how to apply the required mating Type N male connector, so he used an expensive adapter to a PL-259. Thus, his radio saw an impedance hump right away; the customer got a poorer signal and the owner less profit from his installation. After climbing the tower, we found similar adapters used between the antenna, factory supplied with a Type N male connector, and the jumper equipped with PL-259's to the hardline—more adapters!

Our group operates a fairly extensive system of linked radios in south Texas. There are numerous RF connections to be made to radios, duplexers, lightning arrestors, and antennas. Hence, we have a continuing need for good RF connections. As with the commercial installation above, our RF hardware came equipped with Type N's.

Thus began our experience with application of Type N connectors. At first we used the very plentiful UG-21/U style, but we soon found problems with intermittents and loose connectors.

Over coffee one Saturday morning W5LVE mentioned that we were using the wrong kind of type N connector, and introduced me to the newer type UG-1185/U, which uses what he called a "captivated" contact. Better yet, Johnny offered to show me how to apply the connectors, and with many years experience doing just that with the FAA, I was confident the job would be done right. What follows is Johnny's fail-safe method.

Photo 1– Tools and N connector (left to right): soldering iron, about 35 watts; soldering gun, small, with tip removed; lineman's scissors; 5/8 inch wrench; sharp pocket knife; N male connector with captive center pin; 1 1/16 inch open-end wrench; file comb (normally used to clean metal files); and (not shown) ruler graduated in 64ths of an inch.

The "captivated" Type N connector differs from its predecessor by the addition of two Teflon™ washers, which are positioned on either side of a shoulder at the base of the center pin. (The older UG-21 connector pin has no shoulder and no Teflon washers.)[1] These washers sit in the connector body so as to maintain pin alignment in the exact center of the inner cylindrical shelf of the connector. In addition, longitudinal movement is prevented by impingement of the forward washer rim on the connector body; rearward motion is prevented by the impaction of the outer shield over the clamp and the rear Teflon washer against the rear of the shoulder of the center pin and cable dielectric.

These improved connectors are still available at flea markets, but you need to wear bifocals to find them. If you wish to buy them new, you should ask for Amphenol® 82-313, or 82-3312, or 82-4352.

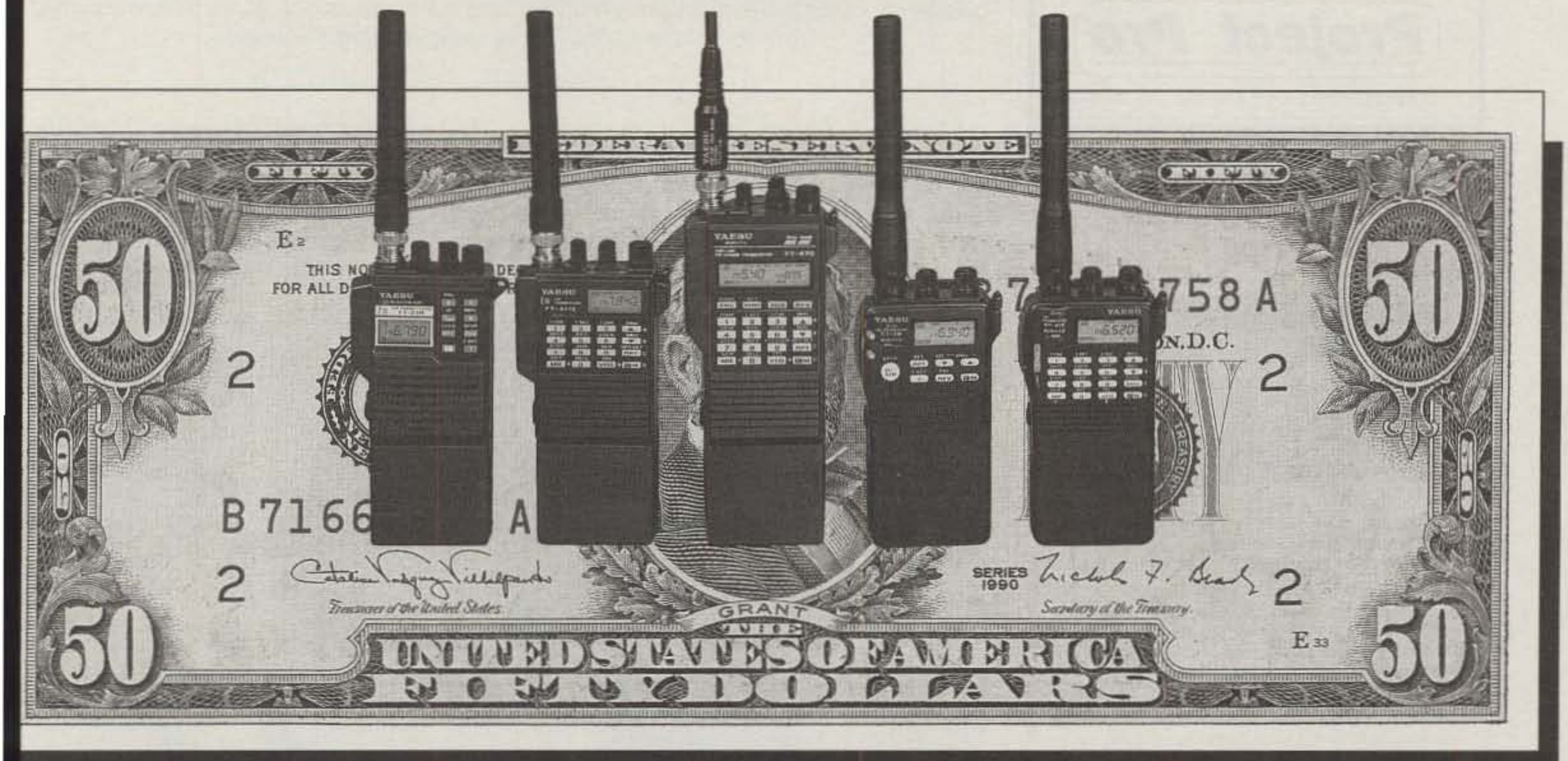
Once you've located some of these connectors, disassemble one to see how it is

*Intertie, Inc., 8601 Village Dr., Suite 100, San Antonio, TX 78217

YAESU HANDHELD TRADE-UP DAYS!

OFFER EXPIRES AUGUST 31, 1992

Out with the old in with the new! And, get $50 off from the folks at Yaesu!



Take your old amateur handheld* – any brand – working or not – to your authorized Yaesu amateur dealer and get $50 off the purchase price of any new Yaesu amateur handheld model. Right then and there! No coupons to send in – no rebates to wait for! $50 offer is limited to purchase of handhelds only and must be used at time of purchase. Sorry, no cash payments. Offer may not be used with any other Yaesu discount or promotion and is non-transferable. Limit (1) one trade-up per person. Valid at all Yaesu U.S.A. and Canadian dealers only.

So, hurry – act today! Just drop off the "old" and leave with the NEW – with $50 off from the folks at Yaesu!

This offer expires August 31, 1992.

*Mail order purchases: Call your Dealer for instructions.

YAESU

*Performance without compromise.*SM

Photo 2– Remove outer jacket: After square cutting the end, slide clamp jam nut and gasket on; make a clean circumferential single cut to the shield, 23/64 inch from squared off end of the cable. Try to avoid nicking the braid.

put together. You will find that the connector has eight parts. If you come upon short cables with UG-1185/U connectors already assembled, disassemble one, in order to see how it was put together. Beware: The person who did the original assembly may not know what you are going to know and may have made mistakes.

You will find that the connector has eight parts (in order, top to bottom; see photo 1):

Photo 3– Comb out the braid over the tip.

clamp nut, washer, braid clamp, rubber gasket, thick Teflon washer, center pin, thin Teflon washer, and outer shell.

How To Do It

Prepare your coaxial cable (photo 2). Using a sharp knife, square cut the cable end. Inspect the cable for breaks in the jacket. Amputate any cable that looks bad and trash it. Clean-wipe with a dry rag. Stay away from all silicone grease, etc.

Slide the jam nut and the rubber gasket with its groove facing the cut end of cable.

With a very sharp knife (I like a Case knife) make a clean circumferential single cut down to the shield $^{23}/_{64}$ inch from the end (just a hair less than $^{3}/_{8}$ inch). Remove the outer jacket. Try to avoid nicking the braid. Practice a little on a coax scrap if you feel the need.

With a file comb, comb out the braid over the tip (photo 3), fold back temporarily, and very carefully cut cable dielectric $^{1}/_{8}$ inch from the end of the outer jacket (photo 4). Do not nick the center conductor. Big lineman's pliers can be used to separate the dielectric by gently squeezing the cutter part in the cut grooves to pick the dielectric off the end. Then, once freed up all the way around, grasp the dielectric with the pliers and gently pull it off the center conductor. Don't pull so hard that you pull the dielectric out of the shield. (It won't, if you've really freed it up thoroughly with a knife in the first place.)

Now recomb the shield over the tip of the center conductor and slide the clamp on with its sharp side toward the rubber gasket and jam nut. The sharp edge is supposed to slide into and cut into the gasket groove.

Comb the shield back over the clamp and trim with lineman's scissors (photo 5) or a large toe-nail clipper. (Diagonal cutter pliers will make a messy job.) Form the wires neatly over the clamp.

Tin the center conductor with minimum heat and #18 or #20 good-quality rosin core solder.

Slide on the metal washer and thick Teflon insulator **with the counter sunk part facing the jam nut.** It should seat over the cable dielectric and butt against the washer. **This is critical.**

Using a Weller® gun without the tip as a heater, heat center contact, tin it, and slide it over the exposed tinned center conductor (photo 6). The center-pin shoulder must fit snugly down into the Teflon insulator. Be sparing with solder; try not to make a mess with excess around the base of the pins. Too much heat softens the dielectric and may decenter the center conductor. Use a cold, wet rag to cool the pin if it gets too hot.

Now slide the thin washer over the center pin. **The indented saucered part must face the tip of the center pin.** You must be able to see the metal shoulder of the

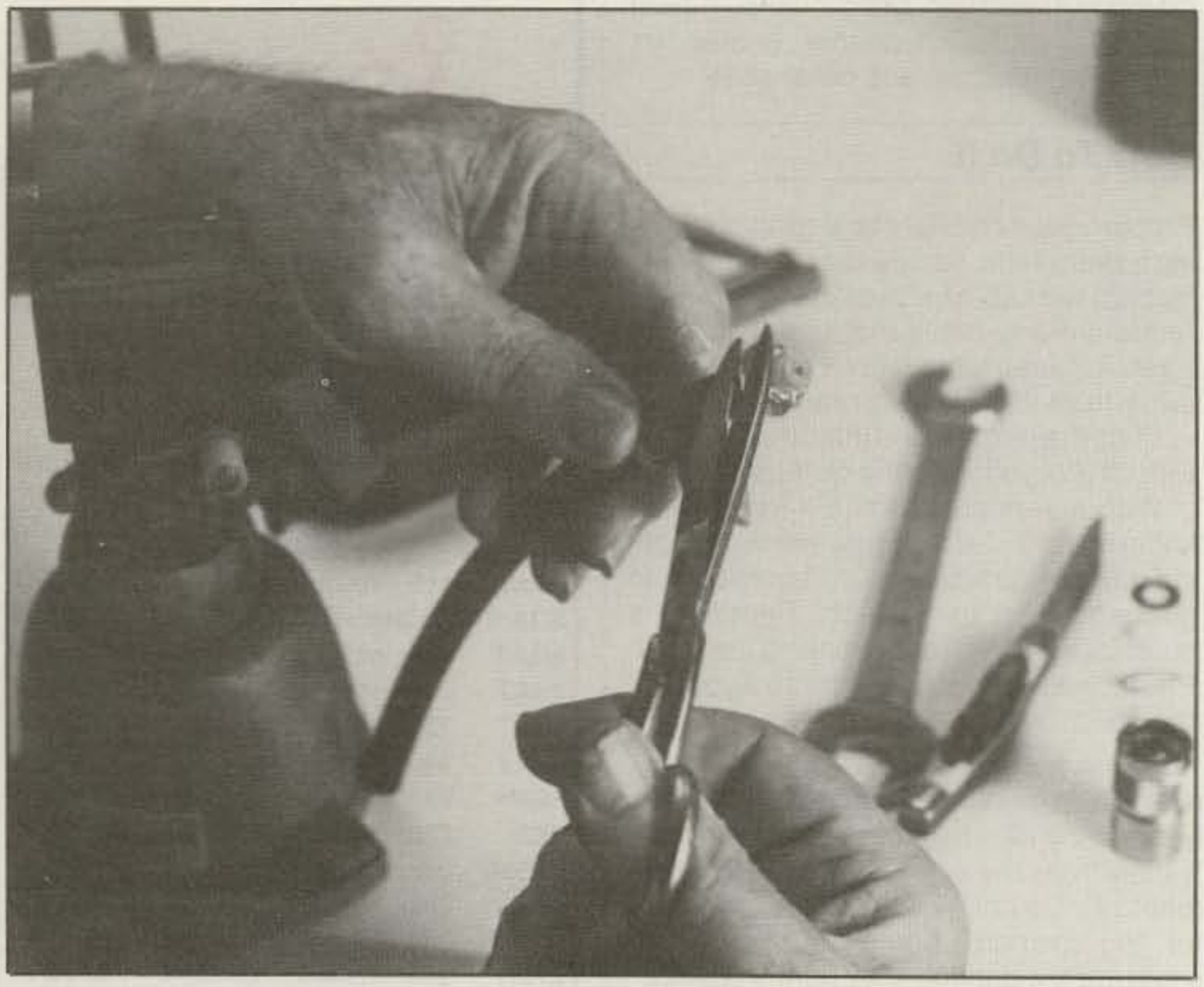


Photo 4– Trim excess braid. Do not use diagonal cutters!

center pin between the two Teflon washers. If you can't, re-check washer application (photo 7).

Re-check the shield for neat comb down and trim over the clamp.

Insert the prepared cable termination into the connector body. Before you tighten, check the tip to be certain that it is centered in the sleeve (photo 8). Watch it as you assemble to the shell, to make certain that it advances properly.

Tighten the nut using a $\frac{5}{8}$ inch wrench; hold the body while you snug up the nut with an $\frac{11}{16}$ inch wrench (photo 9). Don't use

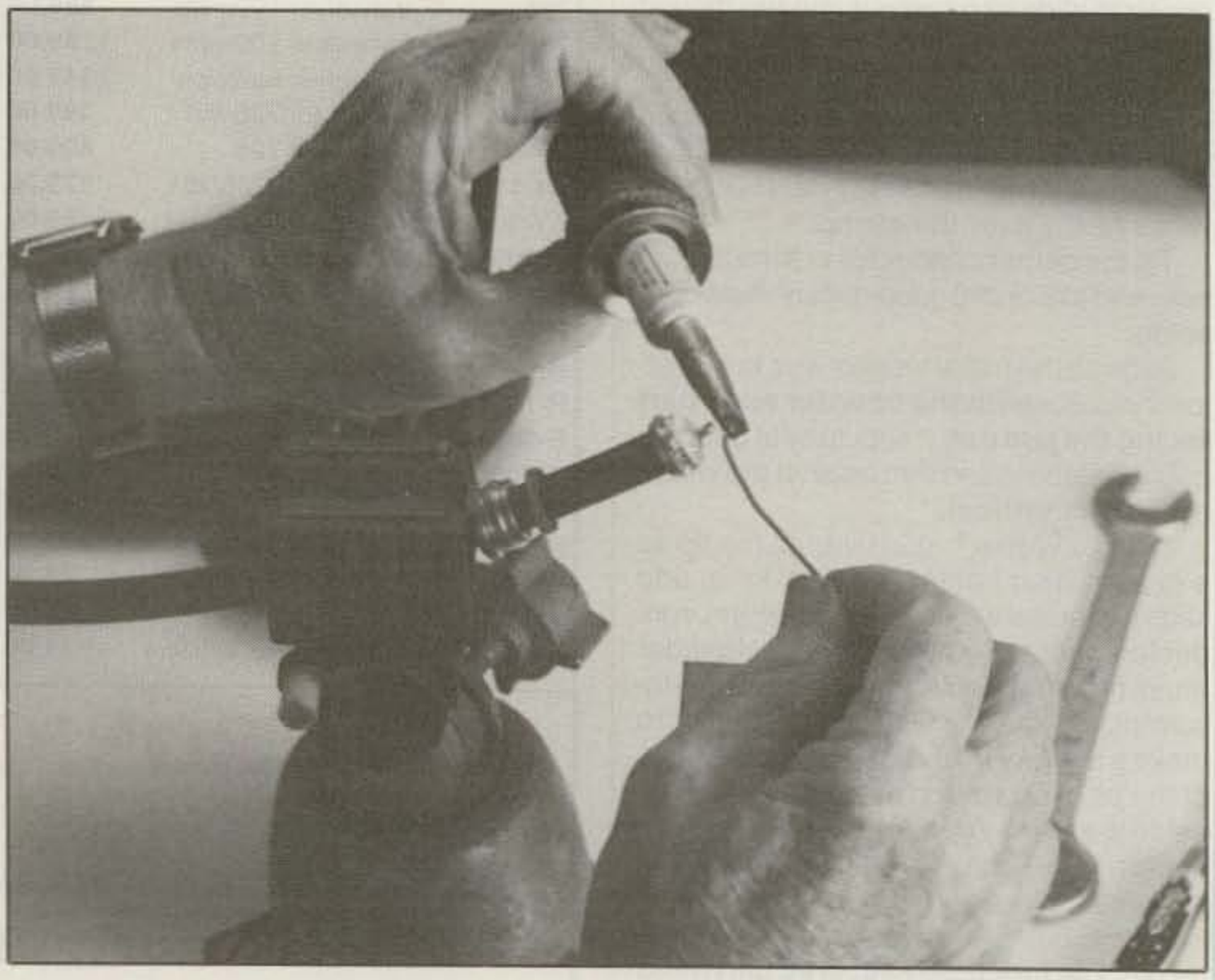


Photo 5– Cut cable dielectric $\frac{1}{8}$ inch from the end of the outer jacket. Don't nick the center conductor. Tin exposed center conductor. Do not overheat!

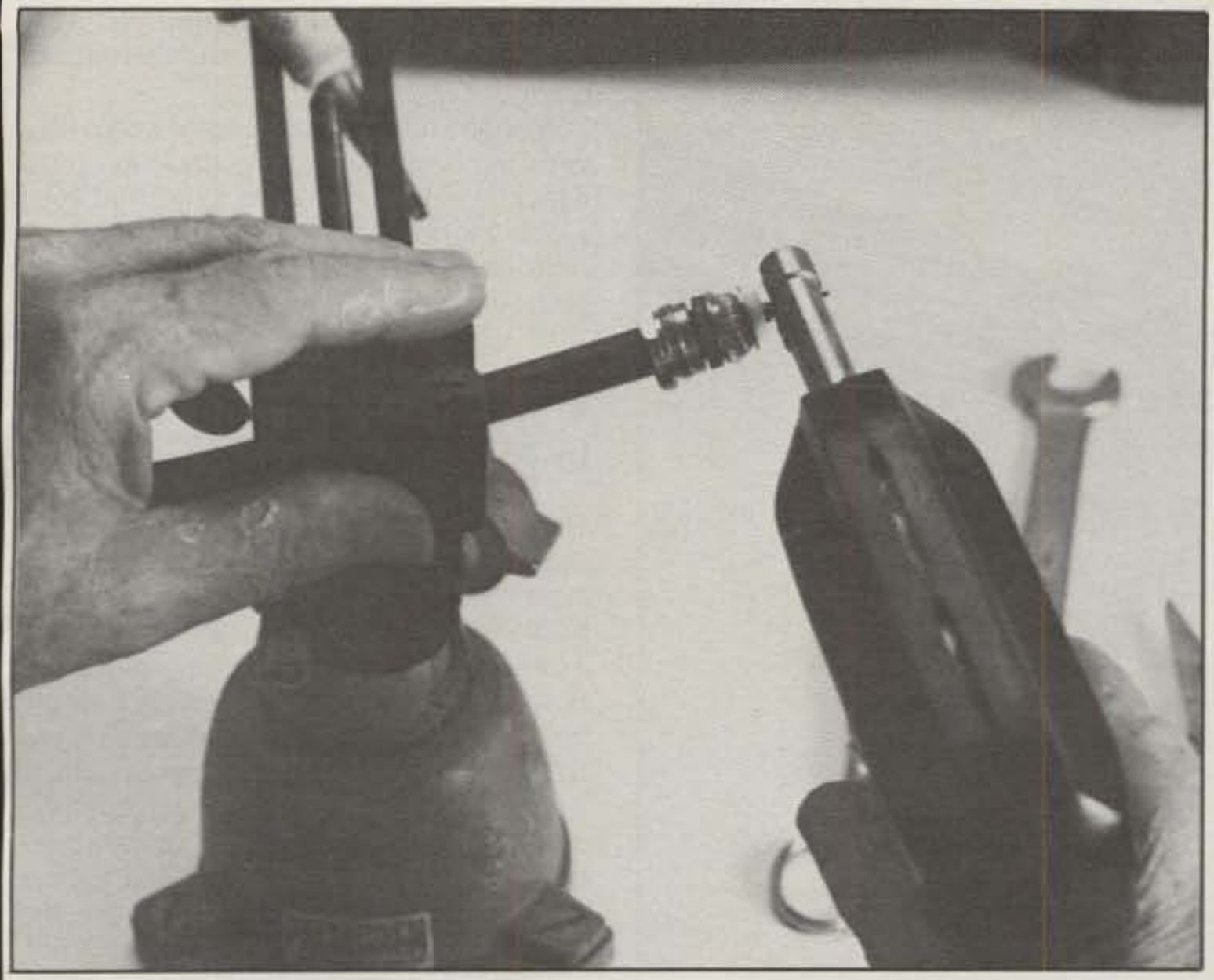


Photo 6– Apply center pin and solder. Use a soldering gun with the copper tip removed.

pliers, as it makes a mess of the expensive silver plate.

The Twist Test

Give the cable to a friend and let him gently (well, a little more than gently) hand-twist the body, while holding the cable right next to the nut. If it twists around the cable, chop it off and start over! If you don't, it won't be any good, will be noisy, arc over, get wet, and very rapidly corrode with a nasty coating of green, gooey, wet sandy material.

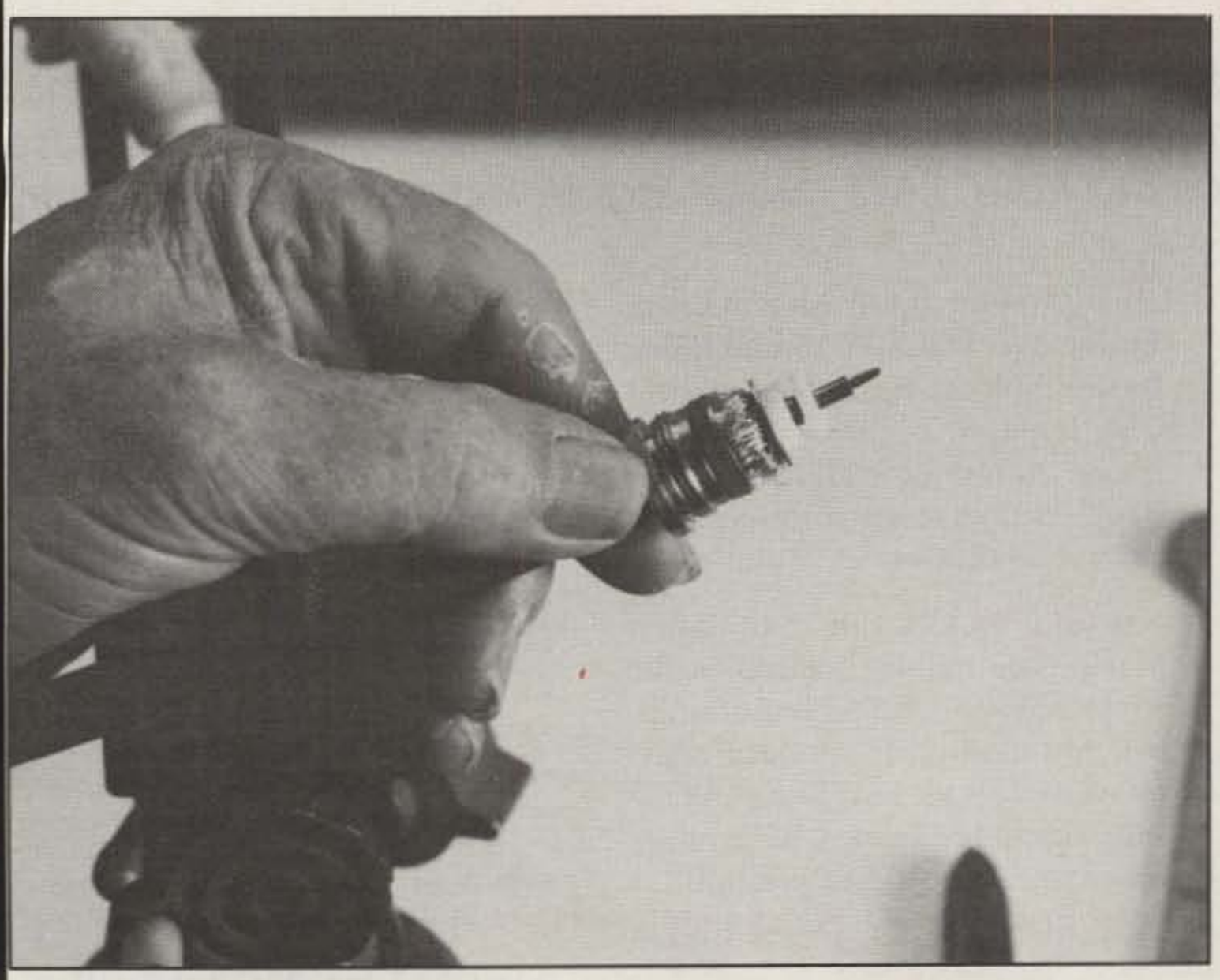


Photo 7– Finished prep ready for outer shell. You need to be able to see the metal shoulder of the center pin between the two Teflon™ washers.

Look at the tip. The center pin must be within a llama's hair of the end of the cylindrical piece that surrounds it. If it's not, chop off the connector and start over. If you do it the way we say, it will always be snug and stand the twist test and will always have the correct pin position.

A properly assembled connector should be noise free and exhibit no more than the rated ½ dB loss at 450 MHz.

Taping (Bonus info)

Tape your connector with Scotch 23™, a special uncured rubber that cures as it is stretched and wrapped. Paint the 23 with Scotch-Kote™.

Carry the tape ¾ inch below, then 1 inch above the connector. Cut the tape from the roll with a knife. Don't just pull it.

Keep all silicone *grease* away from these connectors. It will make taping much more difficult, because the tape won't stick. Touch only the edges of the tape roll. Tape down, then up. If you simply must use grease, as on a duplexer connector that is poorly machined, and the connector binds, place the minimum on the **threads only** and have a rag ready for a thorough hand wipe. Better yet, have a friend do the tape wrap with silicone-free fingers.

Prior to learning of Scotch 23, we tried Scotch-Kote™ in Texas and found that it

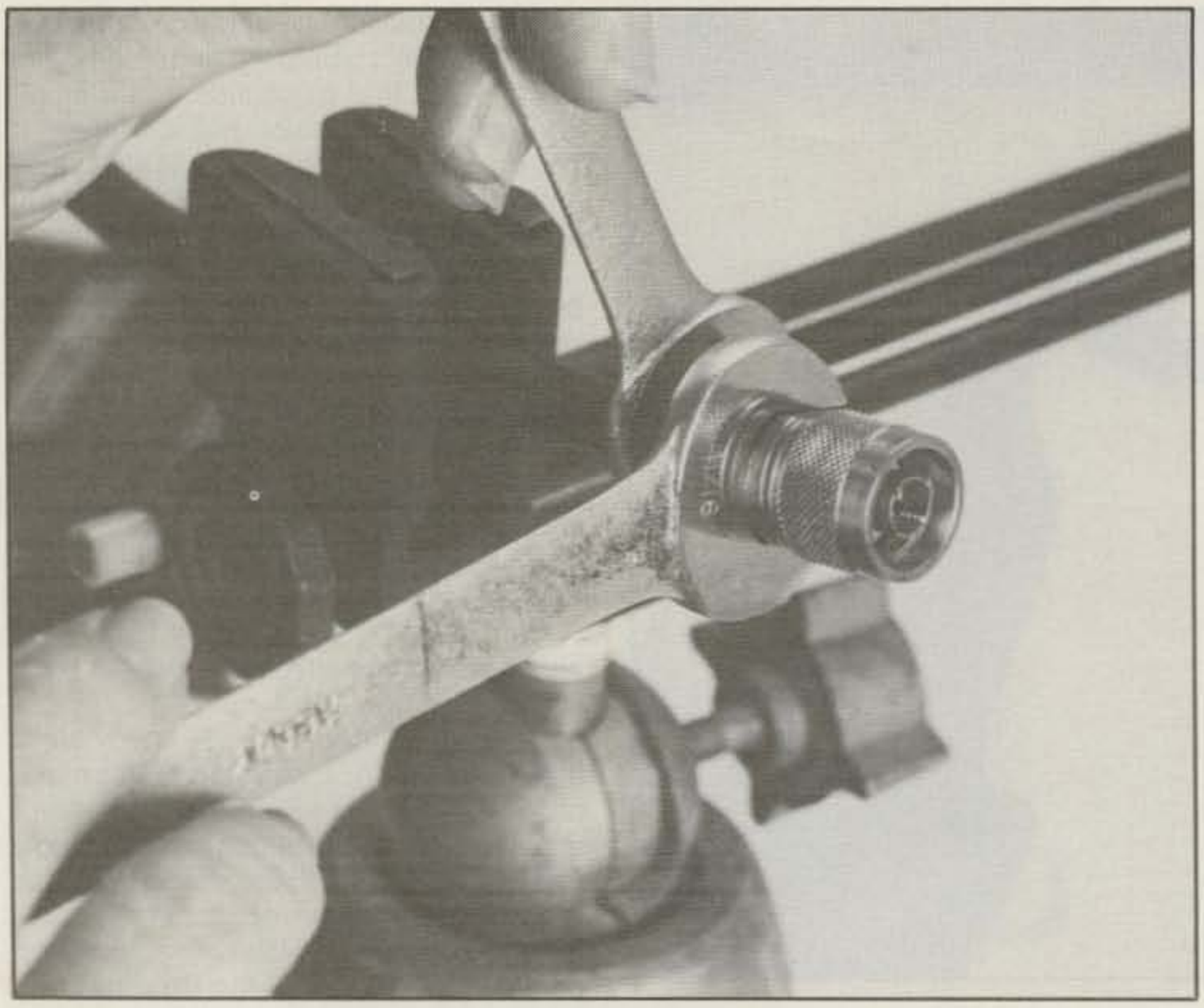


Photo 8– Hold the barrel still with a 5/8 inch wrench. Snug up the nut with an 1 1/16 inch wrench.

cracks when painted over Scotch 88 (or 33) and exposed to direct sunlight. It will stick without cracking to #23. This costs less per connection than our old method of Scotch 88 plus silicone bathtub seal. We thank W5LBD, Mr. Bob Gallaway of Uvalde, Texas, for this tip on #23, and WD5IYT, Houston, for the elimination of #88 tape as a second-layer wrapping.

Silicone rubber bathtub seal works very well, but is used by us mainly to keep UV light off the tape. We have found that used alone, it is not as permanent. Furthermore, near chimneys on buildings it has a very short (less than 2 years) life.

Why Use Type N Connectors In The First Place?

The Type N connector has considerable advantage over standard PL-259's. Many equipment manufacturers now supply "N" bulkhead connectors on their equipment as standard, and these connectors are now available as an option on UHF amplifiers and antennas. They provide a very low SWR connection up to the low gigaHertz region. They are not waterproof, but their design makes them easier to weatherproof. Unlike PL-259's, there is a female connector available, which makes in-line connections much easier to weatherproof.

Of course, it is useful over the entire UHF range, and is capable of transmitting full legal power from amateur transmitters. But if the center pin is improperly positioned on the cable center-conductor-tip it may:

1. Split the mating female center pin,

Photo 9– The pin should be centered and just scratch with your thumb as you move it over the tip of the connector.

causing at best an unreliable connection. If this mating pin is on hardline, you've ruined a very expensive connection.

2. Not pushed in quite far enough, RF will get through for a while; then (often with cold weather) the connection may open, causing receiver drop-out, or ruin a transmitter final amplifier.

These problems are totally eliminated by the captivated UG-1185/U style N connector. If assembled correctly, it will always mate properly and will not let you down with cold weather or cable movement at tower top. Even when assembled properly, the non-capitivated UG-21 connector may fail when tugged on, or windwhipped, or subjected to temperature changes. Hence, this connector should only be used indoors where it never moves and where cable length is not critical.

Use capitivated type N connectors for all outdoor connections with the RG-8 series coax and for all phasing lines where length of cable is important. Learn to put them on correctly and be liberated from the melted dielectric and impedance humps of PL-259's. Seal your connections with Scotch 23 tape protected Scotch Kote™, or Scotch 88, followed by Dow-Corning silicone rubber. CQ

Footnote

1. For assembly of UG-21 style connectors, see Newkirk, D., "Connectors for (Almost) All Occasions—Part 2," *QST*, Vol. 75, May 1991, pp. 34–40.

CQ REVIEWS:

The Comet Dual-Band Base/Repeater Vertical

BY LEW McCOY*, W1ICP

Comet Manufacturing in Japan makes a complete line of amateur antennas, both HF and VHF/UHF. Their products are distributed in the U.S.A. by NCG, which sent me one of their 2 meter/450 MHz combination verticals for review, the CA-2 × 4 MAX. This antenna is extremely well made and can be used either as a base or repeater vertical. Let's look at some of the specs first.

Basically, the antenna consists of three ⅝-wavelength stacked verticals on 146 MHz and eight ⅝-wavelength verticals on 446 MHz. The antennas are encased in heavy-duty fiberglass, and total antenna height is 17 feet 8 inches. The antenna is constructed in three sections using waterproof slip-joint assembly.

The claimed omnidirectional gain, as measured over a quarter-wavelength vertical, is 8.5 dB for 2 meters and 11.9 dB for 446 MHz. I have no way of making precise gain measurements, but I did make comparisons using a three-element vertical Yagi. My conclusions were that the published gain figures for the vertical are realistic. Both the beam and vertical were at essentially the same height, and I could trigger repeaters with the vertical that I could not trigger with the beam. Such results could of course be from different patterns from each antenna, but I prefer to believe the gain difference.

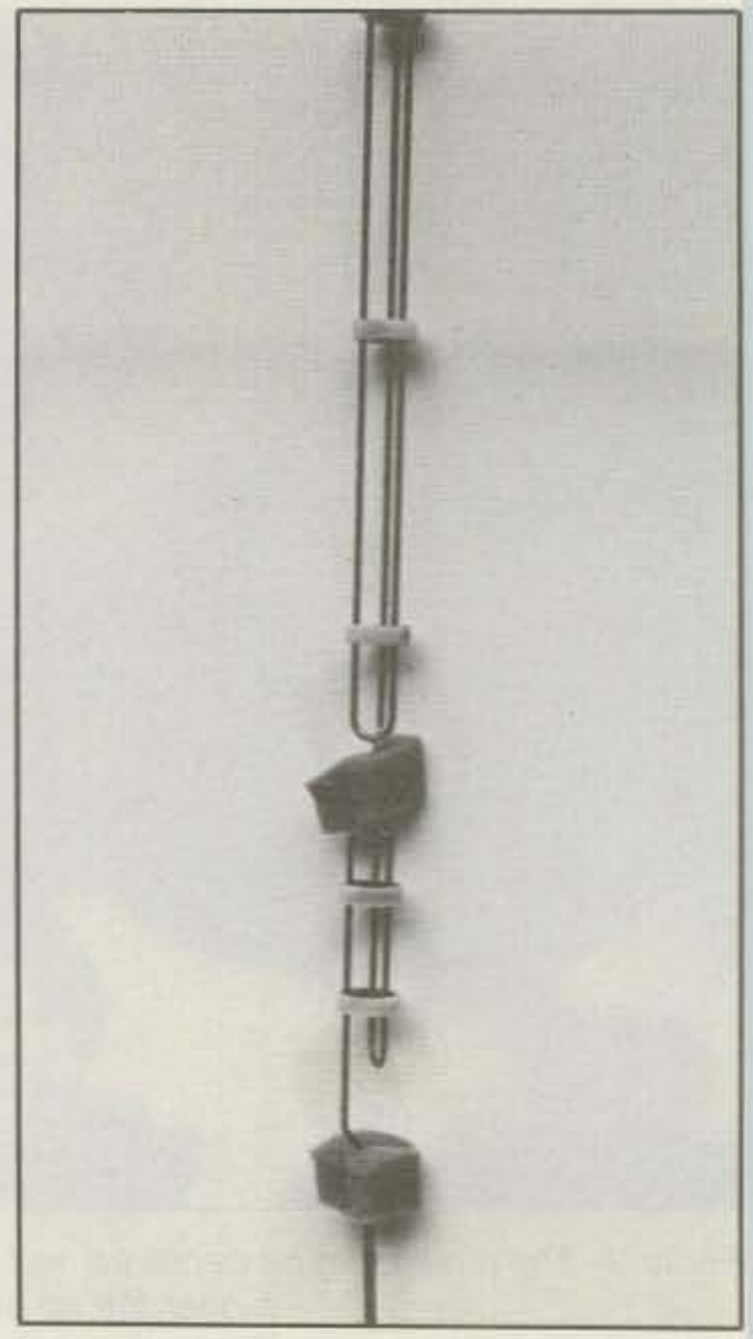
I measured the VSWR (at the base of the antenna) and found that my figures were 1.27 to 1 at 144.5 MHz, dropping to 1.1 to I at 146.0 MHz and 1.32 to 1 at 147.5 MHz. For 442 to 450 MHz the SWR stayed at approximately 1.2 to 1 across the band.

The actual vertical (electrical sections) are very unusual. The Japanese call the construction "Super Linear Converter" of each of the ⅝-wave segments. This consists of the actual conductors being folded back on each other to provide three conductors in each section (see photographs). The statement made is this construction technique provides better bandwidth and much less loss from conventional phasing coils or phasing loops with little or no impedance change under changing weather and temperature conditions.

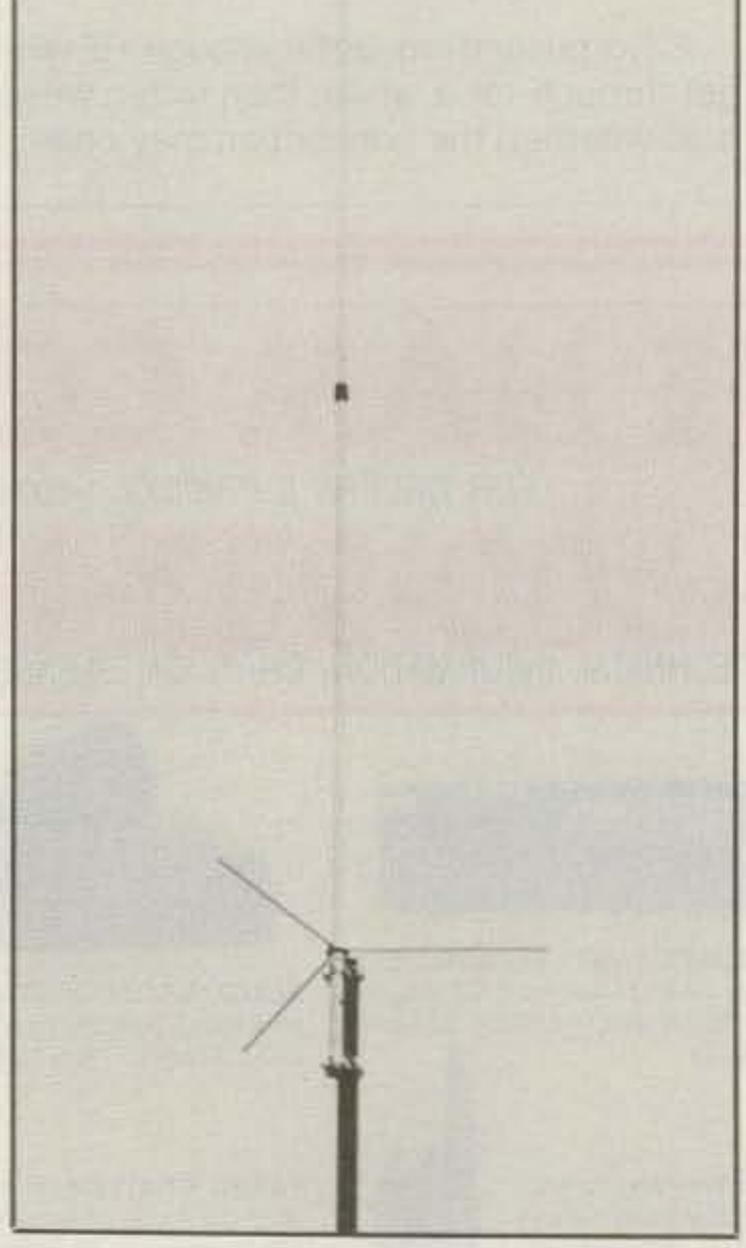
Another feature of the antenna is that it is directly grounded at the base, being matched and fed slightly up from the base. I suppose that a direct lightning hit would create havoc with any antenna, grounded or otherwise, but this antenna certainly offers an advantage, particularly in mountaintop locations.

This antenna has been installed in one of our repeater locations and has really done an outstanding job. Apparently, the "SLC" system works—and works well, judging from the antenna performance. As I said above, my direct tests against a beam show good performance.

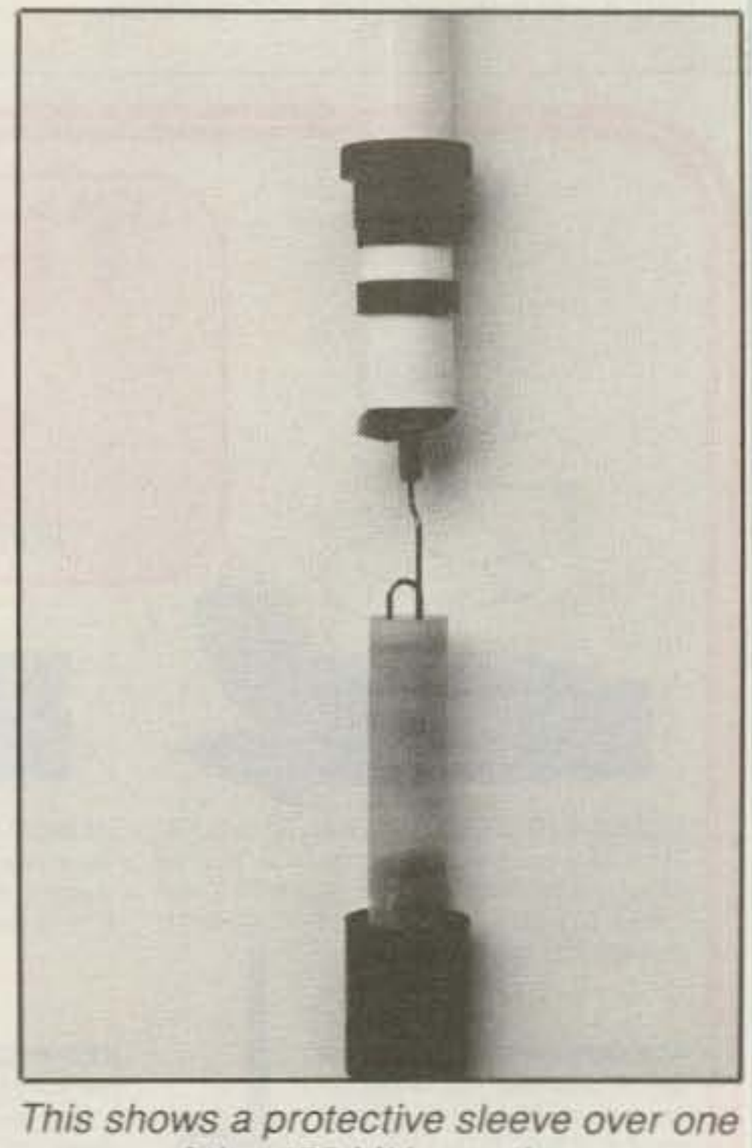
The Comet CA-2 × 4 MAX lists for $199.50 and is handled by NCG Co., 1275 North Grove St., Anaheim, CA 92806 (1-800-962-2611). CQ



At the lower part is one of 450 MHz antennas with 2 meters directly above. Note the three wires in the SLC configuration.



The CA-2x4 MAX vertical.



This shows a protective sleeve over one of the 450 MHz sections.

**Technical Editor, CQ, 200 Idaho Street, Silver City, NM 88061*

NO PROBLEMO

You want a bargraph & a full range counter – Optoelectronics can deliver!

$199.

Don't Wait, This Offer Can't Last!
No discounts, No trade-ins.

Now for a limited time only, $160. off the list price. for our Full Range Model 2810 with bargraph – plus:

- Full range -10Hz to 3GHz.
- LCD display (daylight visibility).
- True state-of-the-art technology with the high speed ASIC.
- NiCads & Charger included.
- Ultra-high sensitivity.
- 4 fast gate times.
- Extruded metal case.
- Compatible with MFJ207.

Suggested options

TA100S:
Telescoping Whip Antenna.....$ 12.

CC30
Vinyl Carry Case.....$ 15.

BL28:
EL Backlight for use in roomlight and low light.....$ 45.

TCXO 30:
Precision ±0.2ppm 20 to 40°C temp. compensated time base .....$100.

Made in the USA

Universal Handi-Counter™ Model 3000, $375. and Bench Model 8030, $579. Both offer frequency, period, ratio and time interval.

OPTOELECTRONICS

Call for free catalog - Factory Direct Order Line:

1-800-327-5912

FL (305)771-2050 • FAX (305)771-2052

5821 NE 14th Ave. • Ft. Lauderdale, FL 33334
5% Ship/Handling (Max. $10) U.S. & Canada.
15% outside continental U.S.A.
Visa and Master Card accepted.

Are antenna convenants for the birds? In some cases being for the birds can bring all sorts of rewards.

But Will They Come?

BY JOHN POLLOCK*, KA7MCX

"Really a great new location you have here, Doc. Bet you can't wait to get up some antennas and get back on the bands."

"I'd rather not talk about that," Doc replied, frowning. "This neighborhood has the tightest convenants restricting antennas that you can imagine. I should have checked before signing the mortgage, but . . ."

The neighborhood was state-of-the-art—winding streets, lush landscaping, underground utilities, towering evergreens, and even some sweeping views of a rugged mountain range. The houses were all shiny fresh, as were the vehicles in and near the universal three-car garages.

"That's a real shame. You could bring up at least fifty repeaters from here just on two alone."

"I'm sure, but with just a rubber duck I even have trouble keeping in touch with most of the folks I've grown to know on the repeaters over the years."

As we strolled out onto the patio, Doc opened a large container and filled a plastic scoop-like device.

"Have to fill the bird feeders every other day. The more feeders I put out, the more customers I get, and the more often I have to fill 'em up. Gives me something to do and watch, except when it's raining. The little critters can make quite a racket at times. I suppose some of the neighbors will wish there was a covenant restricting bird feeders!"

"Mmmm. Interesting! Doc, do you still have that coil of RG-8 that was in your old garage?"

"Yep, it's in the new garage. Pity I'll never be able to use it."

"Is there enough to reach from that high spot in your yard to that crawl space vent?"

"Oh, sure. What are you thinking of?"

"Just an idea. Why don't you dig a hole on that high spot, right about there? Make it about 3 feet deep, just as if you were setting a fence post. And slit your lovely lawn from the hole right to that crawl space vent. I'm busy tonight, but I'll stop back tomorrow night about an hour after dark. Put fresh batteries in at least two small flashlights and dress warmly. And don't forget to put a fresh PL-259 on one end of that coax. See you then."

It's amazing how relaxing bird watching can be.

Enroute back to town, a stop at a nationwide discount store in a shopping mall turned up the critical ingredient. Ignoring the flashing blue lights, I found an 8″ × 8″ × 8″ "lantern style" all-plastic model #3405 made by the same outfit that produced most of the plastic containers found in the store's kitchen department.

The second stop was much more pleasant—the nearest amateur radio dealer. Ignoring the newest tempting goodies, I headed directly for the rear counter, where George sold me a long, skinny box with what appeared to be an AEA logo, and a 10 foot section of TV-type mast.

Opening the box in my shop that evening, I quickly determined the diameter of

*Box 27344, Seattle, WA 98125

the larger rod therein to be ⅜ inch. Finding a bit that size, I quickly enlarged the three holes which ran through the center of the soft plastic model #3405—one in the base, one in the center baffle, and the third in the removable roof. I enlarged the last one slightly, until the roof slid smoothly on the rod. Next I peeled the labels from the two cylindrical aluminum cones, then assembled the cones and the rods onto the mast, carefully measuring and following the manufacturer's directions.

Doc had some goodies on the kitchen table when I arrived the next night, but I suggested we wait until our work was done. As I unloaded the mast from the back of my car, Doc's face dropped. "That looks just like the old antenna you helped me take down and sell when we moved."

"It does now, but wait until we're finished. Now where's the end of your coax with the PL-259? And we'll need a screwdriver."

With the coax run up through the mast and the PL-259 snugly attached to the rod, we quietly walked to the hole, keeping our flashlights aimed directly down. Doc was still muttering as I placed the mast alongside the hole. "I'm sure this will reach all the repeaters, but it's a, an antenna . . . !"

"Yes, until we slip this over the top," I said, reaching into the large, plain paper bag. "It has just become the very latest high-tech, squirrel-proof bird feeder in your neighborhood."

Dock held the mast vertical as I quietly and firmly pushed the dirt back into the hole. Then I followed behind him, using my size 13's to press the sod together again as he fed the coax into the slit. In just minutes the wire screen covering the crawl-space vent had one of its holes enlarged to accept the RG-8, and the coax that was not buried was out of sight in the crawl space.

"I think I can figure out what to do from here on," said Doc, switching off his flashlight. "Let's go into the kitchen for the goodies and something warm to drink. Hmmm, I wonder if the birds will come?"

Freeway traffic was slow the next afternoon, allowing plenty of time to scan several repeaters as I drove home. "Did you hear about poor old Doc?" said Joe. "He's over on the DX repeater for the first time in months. Great to hear him again, except he's talking about all sorts of weird prefixes I can't find in any DXCC list."

Quickly I spun the dial. Doc's voice was full quieting: " . . . so this morning I got a SJ, a RBR, and a YGF. And this afternoon I got an OR and a BS!"

"Nice to hear you on the repeater again, Doc, but it sounds as though you need a current DXCC list."

"Oh, I've pretty much finished that list. Now I'm working on my ABCC! Give me a phone call when you get home and I'll tell you all about it."

The old chuckle was back in Doc's voice as he answered the phone. "Had you going with that ABCC, didn't I? Stands for Audubon Book CC. I'm up to nine already and enjoying every minute of it. Oh, and I'm already at 23 repeaters with lots more I'm sure, as soon as I can remember where I packed my repeater guide during the move."

"But what about all those strange calls?"

"Well, my log shows a Stellar Jay, a Red-Breasted Robin, a Yellow Gold Finch, an Oriole, and a Barn Swallow for starters. By the time I filled the feeder this morning and ran the coax up to my study and attached the BNC, I could hear the chatter out in the yard. I explained how those inverted cones were computer designed, sized and spaced specifically to thwart cats and squirrels, and how that rod sticking out of the top is a 'critically tuned vibrating resonator (CTVR),' which sends ultrasonic signals to birds each time the feeder is refilled. One neighbor wanted to know where she could buy one, but I explained that it was a prototype and thus still very expensive."

It was only a few nights later when Doc phoned. "Had a minor problem. Seems one of my neighbors is the program chairman of the local Audubon chapter, and he wanted me to bring my new feeder to the next meeting to explain how it works. I told him I didn't want to disturb it, now that the birds are using it every day, but I did take some snapshots for him to show at the meeting."

"Send me an extra print, Doc. It'll be fund to see just what your new antenna . . . er, feeder . . . looks like in daylight! And Isopoles . . . er, I suppose there are a few others who just could be interested!" CQ

(Author's note: Names, QTHs, makes, and models may have been changed and/or omitted to protect the tranquility of Doc's neighborhood.)

Articles about helically wound HF vertical antennas usually include the caveat that winding is done by trial and error. WA7P takes the guesswork out of it and shows us how to figure it out simply.

How To Wind A Hassle-Free HF Helix

BY ED STILES*, WA7P

Helically-wound verticals offer good performance for apartment dwellers and campers who have limited space. Winding them, however, has always been a tedious trial-and-error process, which probably explains why more haven't tried them. That's too bad, because with the exception of decreased bandwidth, they operate nearly as well as full-size verticals.

While making the Irrigator Special Antenna (*CQ*, April 1992) I encountered the frustrations of winding helical elements and kept coming out with either too much or too little wire. In between, my windings were a mess—some too close together and others too far apart. After quite a few false starts, I figured there had to be a better way. I dusted off the old college calculus book, found the section on parametric equations and the helix, and started crunching through the equations.

Now don't stop reading. You don't have to know anything about calculus or parametric equations to benefit from this technique. Anyone with a tape measure, ruler, and scientific calculator can handle the job. The payoff is that you'll almost always come out exactly right the first time. Or if measurement errors and number-rounding have put you off by a winding or two, you'll be so close that only one more try is needed. Your windings also will look like the next best thing to machine-wound.

Best of all, this method will tell you the number of turns needed, regardless of the diameter and length of the coil form. The equations also are good for any gauge of bare or insulated wire, which makes the method perfect for accommodating the odd combinations of wire and forms you have lying around in your junk box. I used a single side of some No. 16 zip cord, for instance, on my Irrigator Special.

When winding a helical antenna, you generally know the diameter and length of the PVC pipe or other form that will support the wire. You can easily determine how much wire is needed for a single turn close-wound around the form. Just wrap one turn around the pipe, unwind it, and measure.

What you don't know is the number of turns a length of wire will give you if the turns are not close-wound. If the wire is more than five times as long as the supporting form (and the diameter of the form is not unreasonably small or large), you can easily find the number of turns simply by dividing the total wire length by the length of a single turn. That's because the error introduced by the small space between the windings is not significant.

If the wire is less than five times as long as the form, however, the length of a single winding is significantly greater than that of a close-wound turn, and the simple method of dividing wire length by circumference won't work.

To handle the more complex case, you need to know the length of the coil form, the length of the wire, and the length of a single turn of wire close-wound around the PVC pipe or other form. Just plug those numbers (all measured in inches) into this equation and solve for T.

$$T = \sqrt{\frac{S^2 - L^2}{C^2}}$$

where:

S = length of wire

L = length of space windings will occupy on form

C = length of one turn of wire wound around the form

For instance, one of the 20 meter sections of the Irrigator Special calls for 8 feet (96 inches) of wire to be wound on a 57 inch long PVC pipe. A single winding of the zip cord wire I used had a length of 3.75 inches.

Plugging all this into the equation:

$$T = \sqrt{\frac{(96)^2 - (57)^2}{(3.75)^2}} = 20.6$$

You will have 20.6 turns spaced over 57 inches. Note that the simple method of just dividing the length of the wire by the length of a close-wound turn tells you that 25.6 turns will be needed. That's an error of about 25 percent.

Now you want to know the spacing between the turns—i.e., the pitch of the windings. Just divide 57 by 21 (rounding 20.6 turns to the next highest turn), and this will give you the spacing between each turn. You'll have 2.714 inches between turns.

Unless you have a ruler that measures in tenths of inches, this is a cumbersome number to work with. Most rulers have a centimeter scale, however, and the space between windings can be converted to centimeters by multiplying by 2.54 cm/inch. That's 6.89 cm in this example, which you can find easily on the centimeter scale.

Now it's a simple matter to use an etch-resistant pen or other permanent marker to make a series of dots along the form at 6.9 cm intervals. Just wind the wire so that it passes over a dot on each pass, and you will have a professional-looking antenna element.

I find that tying the end of the wire around a door knob and then walking toward it is the best way to keep the tension on the wire while winding the helical element.

You'll find that this simple-to-use formula will take a lot of the guesswork and frustration out of making helical verticals. For anyone who would like to see the math behind the formula, send an SASE, and I'll send you a photocopy of the calculations.

*3324 E. First St., Tucson, AZ 85716

BEST OF MFJ

MFJ, Bencher and Curtis team up to bring you America's most popular keyer in a compact package for smooth easy CW

MFJ-422B **$134.95**

The best of all CW world's -- a deluxe MFJ Keyer using a Curtis 8044ABM chip in a compact package that fits right on the Bencher iambic paddle!

This MFJ Keyer is small in size but big in features. **You** get iambic keying, adjustable weight and tone and front panel volume and speed controls (8-50 WPM), dot-dash memories, speaker, sidetone and push button selection of automatic or semi-automatic/ tune modes. It's also totally RF proof and has ultra-reliable solid state outputs that key both tube and solid state rigs. Use 9 volt battery or 110 VAC with MFJ-1305, $12.95.

The keyer mounts on a Bencher paddle to form a small (4-1/8 x 2-5/8 x 5½ inches) attractive combination that is a pleasure to look at and use.

The Bencher paddle has adjustable gold plated silver contacts, lucite paddles, chrome plated brass and a heavy steel base with non-skid feet.

You can buy just the keyer assembly, MFJ-422BX, for only $79.95 to mount on **your** Bencher paddle.

Deluxe 300 W Tuner

MFJ-949D **$149.95**

MFJ-949D is the world's most popular 300 watt PEP tuner. It covers 1.8-30 MHz, gives you a new peak and average reading Cross-Needle SWR/Wattmeter, built-in dummy load, 6 position antenna switch and 4:1 balun -- in a compact 10 x 3 x 7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Antenna Bridge

MFJ-204B **$79.95**

Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge.

No other equipment needed -- take it to your antenna site. Determine if your antenna is too long or too short, measure its resonate frequency and antenna resistance to 500 ohms. It's the easiest, most convenient way to determine antenna performance. Built-in resistance bridge, null meter, tunable oscillator-driver (1.8-30 MHz). Use 9 V battery or 110 VAC with AC adapter, $12.95.

Super Active Antenna

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to-operate active antenna ... quiet ... excellent dynamic range ... good gain ... very low noise ... broad frequency coverage ... excellent choice."

Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz to 30 MHz.

Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna.6x3x5 in. Remote unit has 54 inch whip, 50 ft. coax and connector. 3x2x4 in. Use 12 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ-1024 **$129.95**

VHF SWR/Wattmeter

MFJ-812B **$29.95**

Covers 2 Meters and 220 MHz. 30 or 300 Watt scales. Also reads relative field strength 1-170 MHz and SWR above 14 MHz. 4½x2¼x3 in.

MFJ Coax Antenna Switches

$34.95 MFJ-1701

$21.95 MFJ-1702B

$59.95 MFJ-1704

Select any of several antennas from your operating desk with these MFJ Coax Switches. They feature mounting holes and automatic grounding of unused terminals. They come with MFJ's one year **unconditional** guarantee.

MFJ-1701, $34.95. 6 pos. 2 KW PEP, 1 KW CW. 1.8-30 MHz. 10x3x1½ in.

MFJ-1702B, $21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 ohm. 3x2x2 in.

MFJ-1704, $59.95. 4 position cavity switch with lightening/surge protection device. Center ground. 2.5 KW PEP, 1 KW CW. Low SWR. Isolation better than 50 dB at 500 MHz. Negligible loss. 50 ohm. 6¼x4¼x1¼ in.

"Dry" Dummy Loads for HF/VHF/UHF

MFJ-260B **$28.95**

MFJ-264 **$59.95**

MFJ-264N **$69.95**

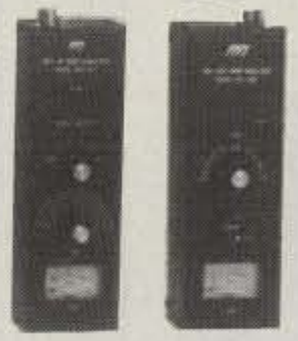
MFJ has a full line of dummy loads to suit your needs. Use a dummy load for tuning to reduce needless (and illegal) QRM and save your finals.

MFJ-260B, $28.95. VHF/HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. Handles 300 Watts. Run full load for 30 seconds, derating curve to 5 minutes. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 150 MHz. 2½x2½x7 in.

MFJ-264, $59.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz. Run 100 watts for 10 minutes, 1500 watts for 10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 inches. **MFJ-264N: "N" connector.**

HF or VHF SWR Analyzer™

MFJ-207 **$99.95** MFJ-208 **$89.95**



MFJ's revolutionary new SWR Analyzers give you a complete picture of your antenna SWR over an entire band -- without a transmitter, SWR meter or **any** other equipment. Just plug your antenna into the coax connector, set your SWR Analyzer™ to the frequency and read SWR off the meter. You can find your antennas true resonant frequency right at your feedline -- something a noise bridge can't do. Battery operated and handheld sized -- makes it **soooo easy** to work on antennas. MFJ-207,1.8-30 MHz; MFJ-208,142-156 MHz.9V battery or 110 'VAC with MFJ-1312, $12.95.

MFJ Speaker Mics

MFJ-283, 284, 285, 285L, 286, 287 or 287L **$24.95** *each*

MFJ's compact Speaker/Mics let you carry your HT on your belt and never have to remove it to monitor calls or talk. You get a wide range speaker and first-rate electret mic element for superb audio on transmit and receive. Earphone jack, lapel clip, PTT. MFJ-284 fits ICOM, Yaesu, Alinco. MFJ-286 fits Kenwood.

MINIATURE SPEAKER MICS: 2" x 1¼" x ¼". MFJ-285 and MFJ-285L (with "L" connector) fit Icom, Yaesu or Alinco; MFJ-287 or MFJ-287L fit Kenwood; MFJ-283: Split jack Alinco. All features of compact models. One year guarantee.

MFJ-1278 Multi-Mode Data Controller

MFJ-1278 **$279.95**

Use computer to transmit/ receive in **all 9** digital modes: Packet, AMTOR, ASCII, CW, RTTY, FAX, SSTV, Contest Memory Keyer and Navtex receive. Automatic Signal Analysis™ (ASA™), Easy-Mail™, printer port, 20 LED tuning indicator, AC supply, Host, Multi-gray level modem, CW key paddle jack and tons more. Options include 2400 baud modem (MFJ-2400, $69.95) and software with cables for IBM compatible, Commodore 64/128, Macintosh and VIC-20.

MFJ-1278T, $359.95. MFJ-1278 with 2400 modem built in.

12/24 Hour LCD Clocks

$19.95 MFJ-108B **$9.95** MFJ-107B

Huge 5/8 inch bold LCD digits let you see the time from anywhere in your shack. Choose from the dual clock that has separate UTC/local time display or the single 24 hour ham clock.

Mounted in a brushed aluminum frame. Easy to set. The world's most popular ham clocks for accurate logs. MFJ-108B 4½x1x2;MFJ-107B 2¼x1x2 in.

Cross-Needle SWR Meter

MFJ-815B **$69.95**

MFJ Cross-Needle SWR/ Wattmeter has a new **peak** reading function! It shows you SWR, forward and reflected power in 2000/500 and 200/50 watt ranges. Covers 1.8-30 MHz.

Mechanical zero adjusts for movement. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

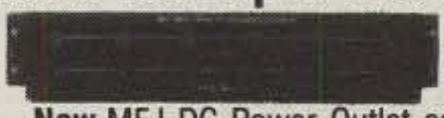
Deluxe Code Practice Oscillator

MFJ-557 **$24.95**

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable because it runs on a 9-volt battery (not included) or an AC adapter ($12.95) that plugs into a jack on the side.

Earphone jack for private practice, Tone and Volume controls for a wide range of sound. Speaker. Key has adjustable contacts and can be hooked to your transmitter. Sturdy. 8½x2¼x3¾ in.

MFJ Multiple DC Outlet



MFJ-1112 **$29.95**

New MFJ DC Power Outlet saves you space **and** money. Hook it to your 12 VDC power supply and get 6 DC outlets for connecting your accessories. RF bypassing keeps RF out of power supply from DC line outlet. 13½x2¾x2½ in.

Nearest Dealer/Orders: 800-647-1800

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; **FAX:** (601) 323-6551
TELEX: 53 4590 MFJ STKV

• One year **unconditional** guarantee • 30 day **money back** guarantee (less s/h) on orders from MFJ • Add $6.00 each s/h • **FREE** catalog

MFJ . . . making quality affordable

Prices and specifications subject to change without notice or obligation.

CIRCLE 16 ON READER SERVICE CARD

CQ SHOWCASE

Link Plus Multi-Use Link Enhancer

The MULE, or Multi-Use-Link-Enhancer, from Link Plus is a stand-alone unit that can be connected to any amateur radio with external cables. The MULE is designed to allow amateur radio operators to quickly upgrade the voice quality of their radio systems without changing existing radio equipment and without having to upgrade power and antenna systems. The MULE improves the "quality" of voice communications in the 2–30 MHz frequency range by eliminating all interference, channel noise, and signal fade, maker says. It produces a radio communications link equal to the best landline telephone system and at the same time boosts

the effective strength of the radio signal at the receiver. In recent field tests, the MULE's core technology measured a 22 dB average boost in signal strength over an 1800 mile HF-SSB link. An "Autosilence" feature maintains silence across the radio link when the transmitter is not keyed. The "Autocalibrate" feature aligns the carrier frequency between transmitter and receiver, eliminating the "duck-talk" that is the product of a mistuned or drifting single sideband link. The "Auto-bypass" feature automatically determines whether an incoming radio signal has a Link-Plus control tone, and directs conventional radio signals to bypass the MULE's processor.

For more information, contact Link Plus Corporation, 9052 Old Annapolis Road, Columbia, MD 21045 (301-982-1585), or circle number 103 on the reader service card.

ICOM IC-728 HF All-Band Transceiver

The ICOM IC-728 provides advanced operators, DXers, and Novices alike with features, such as triple conversion, tunable memories, receiver passband tuning, and a 100 watt transmitter with speech compressor for under $1100. The IC-728 has triple conversion for improved incoming signal quality and better interference suppression. Passband Tuning improves an operator's ability to capture signals they might have missed otherwise. The speech compressor feature increases the transmitter output signal strength. Direct Digital Synthesis is a microprocessor-boosted tuning circuit that provides the channel selected instantly. DDS also improves carrier-to-noise ratio by blocking interference and gives fast switching times needed for packet radio. Other features include noise blanker, band stacking register, 26 memory channels, 3 types of scanning, and plug-in CW filters. The optional AT-160 Antenna Tuner can be "built on" to the IC-728.

For more information, contact ICOM America, Inc., 2380 116th Ave. NE, Bellevue, WA 98009-9029 (1-800-999-9877), or circle number 106 on the reader service card.

Innova Electronics DC Power Pack

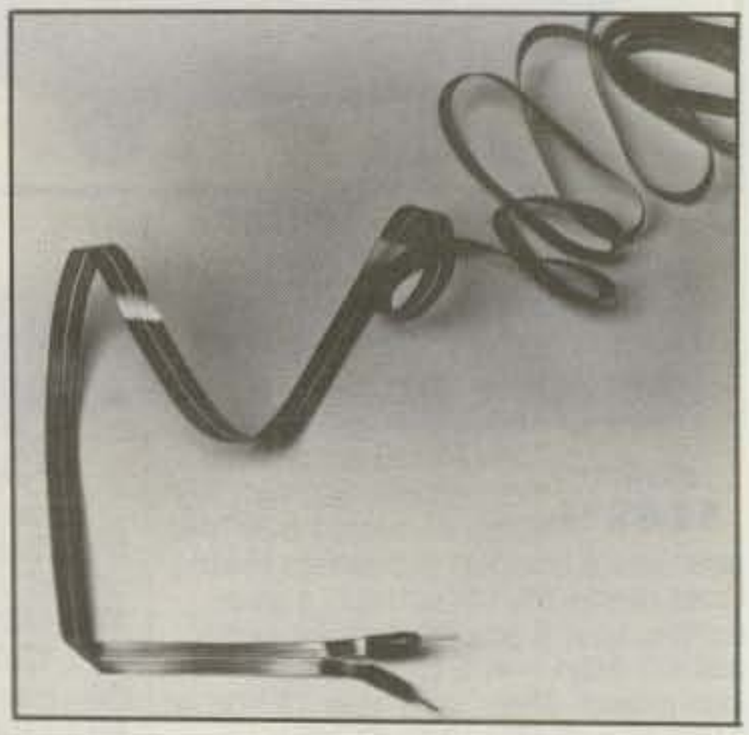
Innova Electronics has introduced the DC Power Pack, a 12 volt DC, cordless, rechargeable power pack designed for amateur radio applications. The Power Pack has a 6.5 amp-hour, rechargeable battery that can power a handheld walkie-talkie for up to 36 hours. A line of modular accessories will also be available this year, enabling the user to accessorize each DC Power Pack to his specific needs. All accessories are mounted by sliding the attachment onto the side mounting brackets. The entire DC Power Pack unit measures 7" × 10" × 3" and weighs 7 pounds. Each unit comes with a built-in male plug for recharging and a shoulder strap.

The product is for use with any 12-volt DC negative ground system or battery. The unit can be recharged through the cigarette lighter socket of any running automotive or marine vehicle (1 to 3 hours recharging time), or through an optional AC/DC adapter or solar panel (8 to 10 hours recharging time).

DC Power Pack is made in the U.S.A. and retails for $79.95. Accessories include the DC Power Iron, a 12 volt DC, 45 watt portable soldering iron which heats up to 600 degrees within 45 seconds, and more products which will be introduced this year. For more information contact Innova Electronics Corporation, 17287 Mount Herrmann St., Fountain Valley, CA 92708 (714-241-6800), or circle number 101 on the reader service card.

Nordost Flatline Speaker Cable

Flatline is an extruded Teflon ™ speaker cable developed from technology used in the aerospace and computer industries and is manufac-



tured in the USA. Flatline Cable is 2 one-hundredths of an inch thick and is thinner than a dime and can be run under floor coverings without leaving any bumps. It can also be run outside a wall to a speaker, because it is so thin it can be covered with dry-wall tape and painted. The cable uses an extruded fluorinated ethylene propylene insulation. Flatline Cable uses eight flat rectangular oxygen-free copper conductors encased in a uniformly thin extruded layer of FEP (Teflon). The cable is impervious to heat, oil, gasoline, and other corrosive substances and can be flexed indefinitely without breaking down. It will not burn and can withstand temperatures over 300° F. It is suitable for marine use and is non-hygroscopic. The FEP outer jacket is impervious to ultraviolet light and will not break down during prolonged outdoor exposure to sunlight.

Flatline Cable is available initially in 12 gauge and 16 gauge. Nordost plans to introduce special snap-on gold-plated connectors for the cable later in the year, as well as premade Flatline Cable lengths with connectors. For more information, contact Nordost Corporation, 420 Franklin Street, Framingham, MA 01701 (508-879-1242), or circle number 107 on the reader service card.

Four Band Metropolitan Antenna From Austin Antenna

The four band Metropolitan antenna covers 144, 220, 450, and 1200 MHz in a single antenna that is 19 inches tall. It operates as a quarter-wave radiator on each band and uses the metal car body as a ground plane. No tuning is required; simply screw onto a low-profile Motorola/NMO style mount. Price is $45.

For more information, contact Austin Antenna, 10 Main Street, Gonic, NH 03938 (603-335-6339), or circle number 102 on the reader service card.

MFJ TUNERS

MFJ's *world famous* 3 KW Versa Tuner V

If you won't settle for less . . . here is the finest 3 KW tuner money can buy!

The MFJ-989C is not for everyone.

However, if you make the investment, you'll get the finest 3 KW tuner money can buy. Here's why.

Massive Transmitting Capacitors

You get two *massive* 250 pf transmitting variable capacitors with detailed logging scales. They can handle *amps* of RF current and withstand 6000 RF volts because the plates are smoothed and polished and have extra wide spacing.

Precision Roller Inductor

A precision roller inductor lets you tune your SWR down to the absolute minimum. A 3-digit turns counter plus a spinner knob gives you exact inductance control.

Ball bearings on both the front and back shafts give you a velvet smooth vernier feel. Steel end plates and steel shafts give you lifetime durability.

You won't have arcing problems with this roller inductor. That's because firm springs put considerable pressure on a plated contact wheel for excellent electrical contact.

Wide, low inductance straps are used for high current connections and a new core gives you excellent RF properties for minimum loss.

MFJ-989C **$349.95**

Cross-Needle Meter

You get a lighted *peak* and average reading Cross-Needle SWR/Wattmeter with 200 and 2000 watt ranges. Its new directional coupler gives you accurate SWR and power readings over the entire 1.8 through 30 MHz range.

Super Heavy Duty Balun

You get a super heavy duty current balun for balanced lines. It's made with two giant 2 1/2 inch powder iron toroid cores and wound with *teflon* wire connected to high voltage ceramic feedthru insulators. It lets you operate high power into balanced feedlines out core saturation or voltage breakdown.

Ceramic Antenna Switch

You get a two wafer 6 position *ceramic* antenna switch with extra large contacts for trouble free switching.

Plus much, much more

You also get a *built-in 300 watt dummy load*, full one year *unconditional* guarantee, flip stand, all aluminum cabinet, tough baked on paint, locking compound on all nuts and bolts. 3 KW PEP. Meter lamp needs 12 volts. Compact 10 3/4x4 1/2x15 inches. Made in the USA. Add $10 s/h.

Don't settle for less--get yours today!

MFJ's *Deluxe* 300 Watt Tuner

MFJ-949D **$149.95**

More hams use the MFJ-949D than any other antenna tuner in the world! **Why?** Because the MFJ-949D gives you proven reliability, the ability to match just about anything and a one year *unconditional* guarantee.

You get a lighted *peak* and average reading Cross-Needle SWR/wattmeter, antenna switch, 4:1 balun for balanced lines, 1.8-30 MHz coverage and a *full size* dummy load that easily handles 300 watts of abusive tune-up power.

The inductor switch is *specially designed* to withstand the extreme voltages and currents that are developed in your tuner—it's not an underrated off-the-shelf switch that can put you off-the-air.

Each MFJ-949D aluminum cabinet is chemically etched to strongly bond MFJ's tough *baked-on* paint. You won't find a tougher, longer lasting finish anywhere.

MFJ's *New 300 Watt* Tuner

MFJ-948 **$129.95**

If you don't need a dummy load but want *all* the other features of the MFJ-949D, choose the MFJ-948 for $129.95.

The MFJ-948 features a **peak** reading **lighted** Cross-Needle meter with a built-in lamp switch, one year **unconditional** guarantee and is made here in the USA.

MFJ's *smallest* Versa Tuner

MFJ-901B **$59.95**

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP tuner -- when both your space **and** your budget is limited. Good for matching solid state rigs to linears.

MFJ'S *Super Value* Tuner

MFJ-941E **$109.95**

The new MFJ-941E gives you a 300 watt PEP tuner that covers everything from 1.8-30 MHz -- plus you get a cross-needle meter, antenna switch and balun . . . for an incredible $109.95. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors. Measures 10-5/8'' x 2-7/8'' x 7''.

2-Knob *Differential-T*™ Tuner

MFJ-986 **$289.95**

The new MFJ-986 Differential-T™ 2-knob tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only *one* best setting. Handles 3 KW PEP.

Roller inductor makes tuning smooth and easy. Turns counter lets you quickly re-tune to frequency.

MFJ's peak and average reading cross-needle meter reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95. Current balun reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced. It covers 1.8-30 MHz. Get yours today! Add $10 s/h.

MFJ's *Random Wire* Tuner

MFJ-16010 **$39.95**

Operate all bands anywhere with any transceiver with the MFJ-16010. It lets you turn a random wire into a transmitting antenna. 1.8-30 MHz. 200 watts PEP. Ultra small 2''x3''x4''.

MFJ's *Mobile* Tuner

MFJ-945D **$89.95**

Don't leave home without this *mobile* tuner! Have an uninterrupted trip as the MFJ-945D extends your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

Small 8 x 2 x 6 inches uses little room. *Lighted Cross-Needle* SWR/Wattmeter makes tuning easy while in motion. Has lamp switch. 1.8-30 MHz. 300 watts PEP. Mobile mount, MFJ-20, $4.95.

MFJ's *Versatile 1.5 KW* Tuner

MFJ-962C **$229.95**

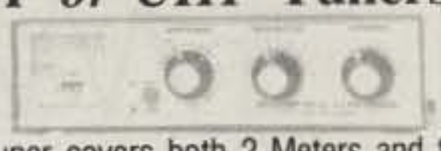
MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP amplifier later. It covers 1.8-30 MHz.

You get MFJ's **peak** and average reading Cross-needle SWR/Wattmeter. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Plus . . . 6-position antenna switch and teflon wound balun with ceramic feedthru insulators for balanced lines. 10¾ x 4½ x 14-7/87 in. $10 s/h.

MFJ's *VHF or UHF* Tuners

MFJ-921 or MFJ-924 **$69.95**



MFJ-921 VHF tuner covers both 2 Meters and the 220 MHz bands. **MFJ-924** covers **440** MHz. Built-in **SWR/Wattmeter.** 8'' x 2½'' x 3''. 2-knob tuning convenient for mobile or base.

Nearest Dealer/Orders: 800-647-1800
Technical Help: 800-647-TECH (8324)

• **1 year unconditional guarantee** • 30 day money back guarantee (less s/h) on orders from MFJ • Free catalog

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; **TELEX:** 53 4590
FAX: (601) 323-6551; Add $6 s/h.

MFJ . . . making quality affordable

CIRCLE 155 ON READER SERVICE CARD

Radio FUNdamentals

BY BILL ORR, W6SAI

THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

The "Zig-Zag" Broadband Antenna

In my June 1992 column I discussed a broadband (2 to 30 MHz) HF antenna designed at the U.S. Army Communication and Electronics Command, Ft. Monmouth, New Jersey. *(Note: The zig-zag antenna is copyrighted by Bernard Feigenbaum and is reproduced here for personal amateur use only and may not be used for commercial purposes. The antenna is also patented by U.S. Army [patent No. 4,733,243].)* In brief, it is a vertical zig-zag wire the sections of which are of a predetermined increasing height (fig. 1). The high end of the array is terminated to ground through a 400 ohm resistor. A simple four-wire radial system is used, and power is coupled to the wire by means of a 9:1 ferrite balun and 50 ohm line. The antenna is supported from a line running from a 35 foot high pole, and overall length is about 55 feet. For military use, it is made from a single 500 foot roll of #12 gauge wire. Radiation is vertically polarized, and the antenna is subject to ground losses, as would be any other vertical antenna mounted close to the ground.

48 Campbell Lane, Menlo Park, CA 94025

Antenna Suspension

The zig-zag wire is suspended from a ⅛ inch diameter Dacron line a little over 70 feet long. Hook-stops (fig. 2[A]) are attached to the support line at appropriate intervals to support the antenna wire, which has hooks attached to it to engage the hook-stops along the line.

The antenna is constructed in three parts: the support line, the zig-zag wire structure, and the radials. Let's look at the support line first. Dimensions for the line and placement of the loop for the pulley rope and antenna hooks are given in fig. 2(B) and Table I. Note that dimensions for the support line assume a five percent stretch in use; therefore, dimensions are 95 percent of the required values. Cut the line a little long for tie-off at the ends.

One loop is tied in the line for the pulley as indicated, and then small hook-stops made of #18 wire are twisted about the line. These are placed as indicated and may easily be moved about after the antenna is erected in order to adjust tension on the wires. The antenna wire hooks move easily along the support line and rest against the hook-stops when the antenna is erected. Once the support line is made up, it is put aside and the antenna wire is prepared.

Fig. 3 shows the lengths of the complete antenna. The radials and antenna are made of separate pieces of wire. The little wire hooks are made up and placed along the antenna wire at the appropriate points. The radial wires are cut to length and soldered to the antenna, as shown. Two radials terminate at the 400 ohm resistor. The whole assembly should be stretched out on the ground and measurements for hook placement carefully checked.

Table II gives antenna wire dimensions. Length A is terminated at the 400 ohm resistor. Length B consists of the amount of wire to go from hook 1 to hook 2. Length B goes from hook 2 to hook 3, and so on. Each wire length in Table II makes up two adjacent legs of the zig-zag structure.

Antenna Assembly

The first step is to align the antenna, as it is directional off the small end. The antenna support line is staked at the feedpoint (the small end), and the opposite end is attached to the support pulley atop the mast

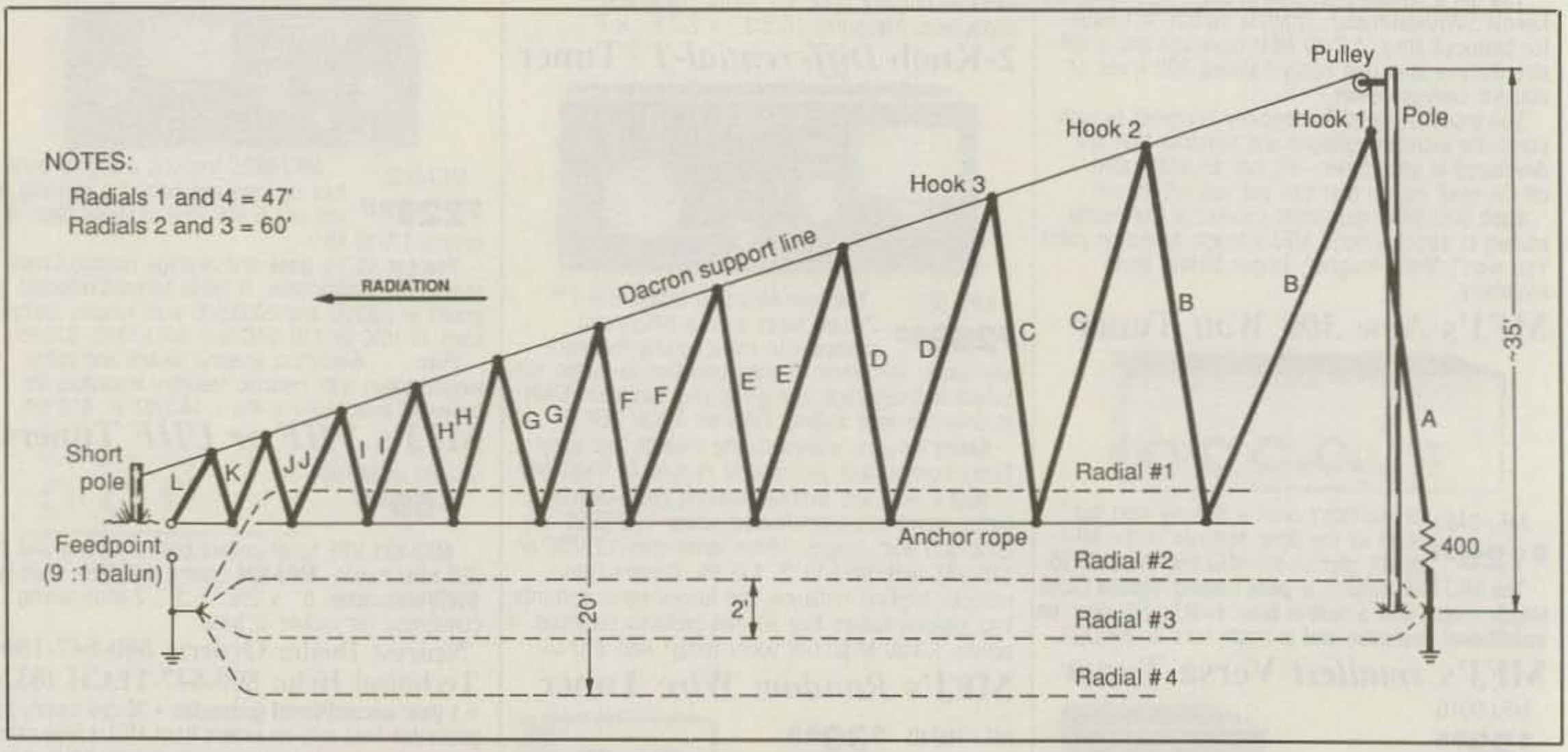


Fig. 1– The broadband "zig-zag" antenna (2–30 MHz) is about 60 feet long and requires a 35 to 40 foot high pole at one end for support. It is fed at the small end with a special balun. The antenna is slung from a support line and anchored at the bottom by a rope passing from one end to the other. Short stakes anchor the rope in place.

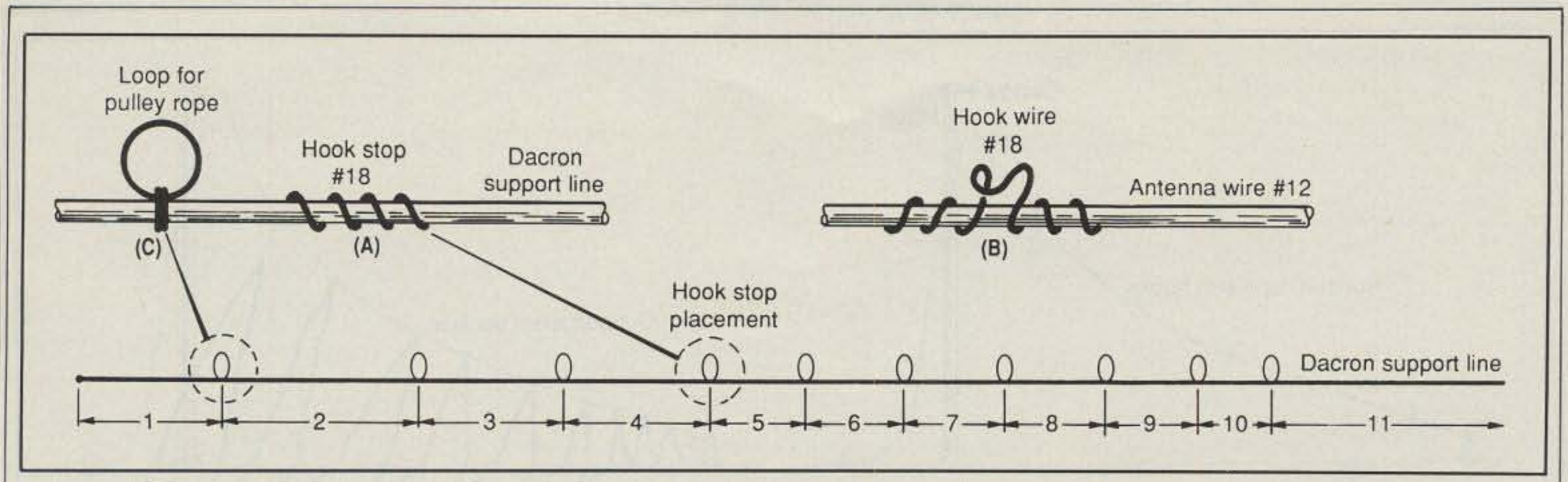


Fig. 2– (A) The antenna wire is held in position along the support line by means of small hooks which may be moved back and forth along the line to provide proper tension on the wires. (B) The hook wire fastens the antenna wire to the support line. (C) Hook stops are placed along the line in accord with Table I. Note that dimensions assume a 5 percent stretch in the line and are therefore 95 percent of the required value. Loop for pulley rope is shown.

Support Line Dimensions	
Segment	**Length**
1	2′ 0″
2	13′ 7½″
3	10′ 7¾″
4	8′ 3¾″
5	6′ 6″
6	5′ 1″
7	3′ 11¾″
8	3′ 1¼″
9	2′ 5″
10	1′ 10¾″
11	12′ 10″

Table I– Dimensions for the support loop (see fig. 2[C]) for the zig-zag antenna setup.

(fig. 4[A]). The support line is pulled up until it is about 4 feet above the ground in a convenient position to attach the antenna wire to it (fig. 4[B]). The antenna wire is carefully laid out along the ground and hooked on the support line at each wire stop. Once this is done, the antenna is raised by hauling in the rope passed over the pulley tower.

The whole thing looks pretty sloppy at this point, and a mid-support mast is put in position to reduce sag. The antenna wire hangs down in loops, and these must be anchored down at the right points. This is best done by means of an anchor rope woven along the bottom of the loops. The rope (fig. 5) is held in position with short ground stakes.

The last step is to lay out the ground radials and attach the balun transformer. The balun is taped to a 24 inch ground stake which supports the small end of the antenna.

Making the Balun

The 9:1 balun is shown in fig. 6(A). It is composed of a 7-turn trifilar winding of #14 wire on a 2.4 inch core (61 mix). An Amidon FT240-61 core is suggested. The three wires are wound on simultaneously and connected as shown in fig. 6(B). The balun can be weatherproofed by placing it in a cylindrical box made of PVC plastic water pipe. End pieces are epoxied on the pipe section and suitable connectors placed on one end. A suggested substitute balun is the UU-375 unbalanced-to-unbalanced transformer made by Palomar Engineers (Box 462222, Escondido, CA 92046).

The Ground Radials and Termination Resistor

Four short radials run parallel to the antenna wire on each side of it. The inner radials (numbers 2 and 3) are returned to the base of the mast and connect to one end of the terminating resistor. The other end of the resistor attaches to the antenna wire. The design calls for a 400 ohm resistor, noninductive, capable of dissipating about one half the output power of the transmitter. For the typical 100 watt transmitter I would suggest a 50 watt, wire-wound resistor. This resistor type has inductance and can't be considered noninductive. However, the inductance value is low, and my personal opinion is that it won't upset antenna operation to any great degree. The alternative is a noninductive resistor, and a 50 watt unit isn't cheap. Minimum power is dissipat-

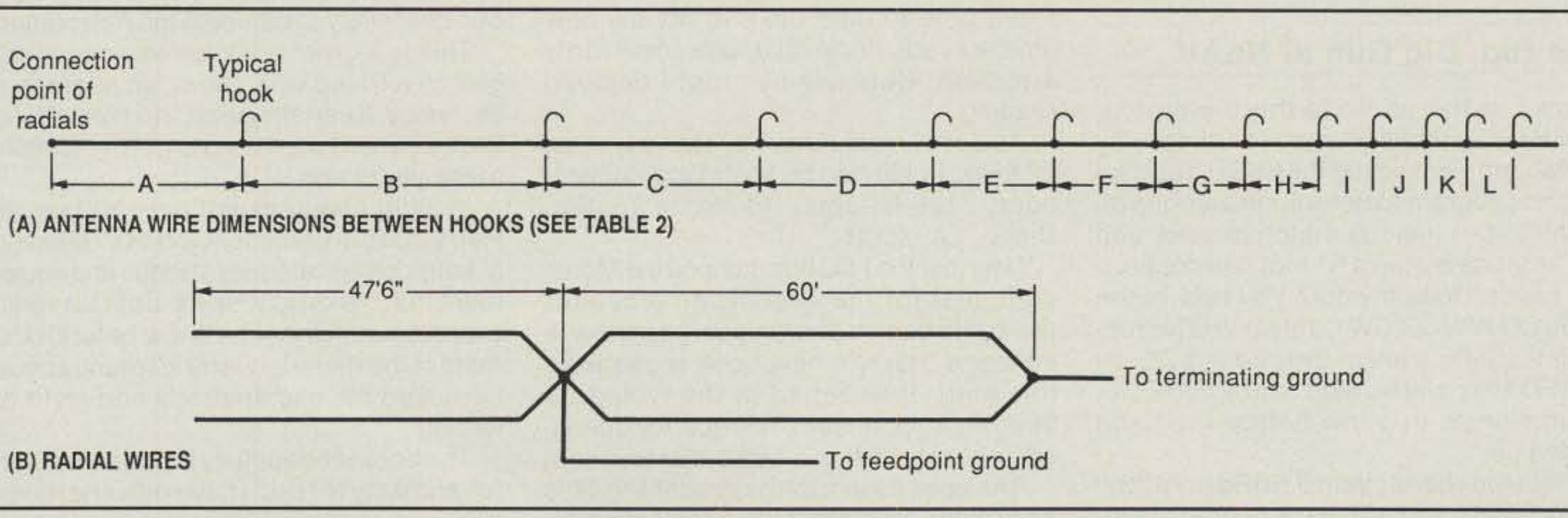


Fig. 3– Antenna wire dimensions between hooks are tabulated in Table II. Dimensions of radial wires are given in drawing (B). A more elaborate radial ground system should provide improved results and decrease ground loss.

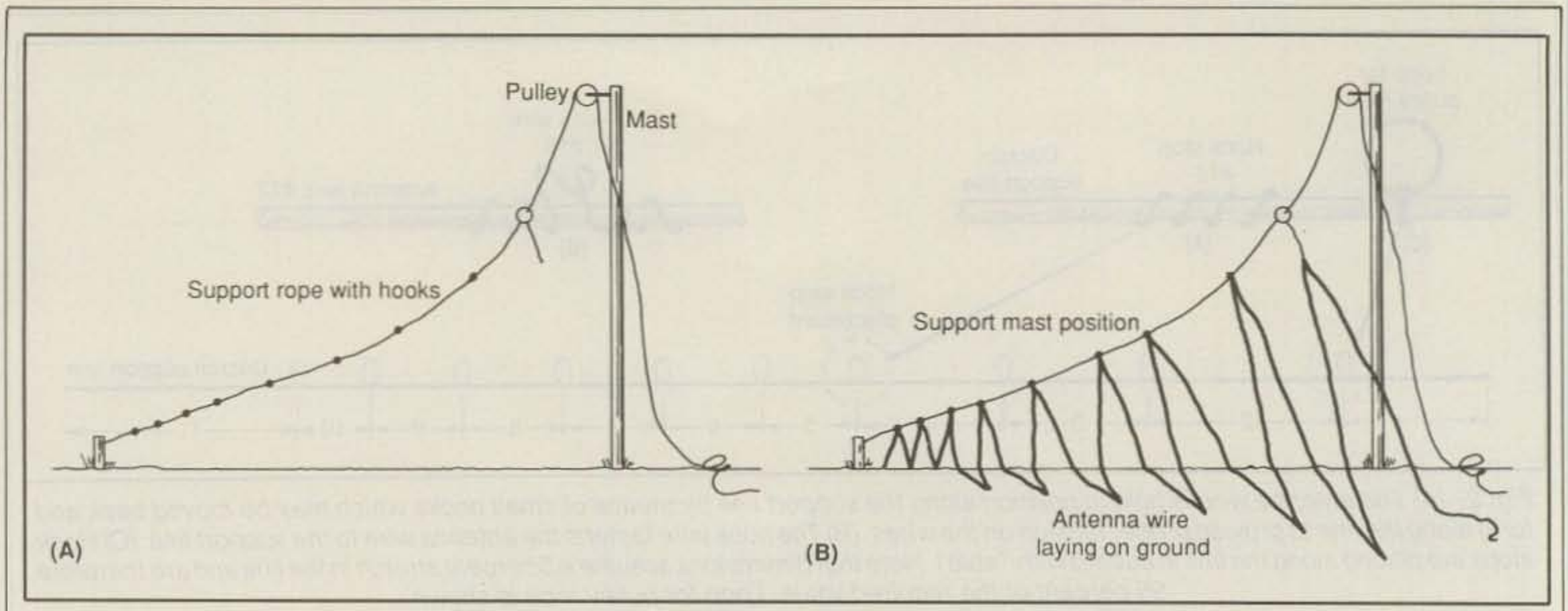


Fig. 4– (A) Support wire with hooks installed is partially pulled up mast, ready for antenna installation. (B) Antenna wire is laid out in approximate position on the ground, ready for attachment to support rope. A short support mast may be neded at the center of the antenna to reduce support rope sag.

Antenna Wire Hook Placement	
Segment	**Length**
A	35′ 6″
B	59′ 9″
C	46′ 8¼″
D	36′ 5¾″
E	28′ 6″
F	22′ 3¼″
G	17′ 5″
H	13′ 7¼″
I	10′ 7½″
J	8′ 3¾″
K	4′ 7¾″
L	1′ 0″

Table II– Antenna wire dimensions. Each wire length makes up two adjacent legs of the zig-zag structure.

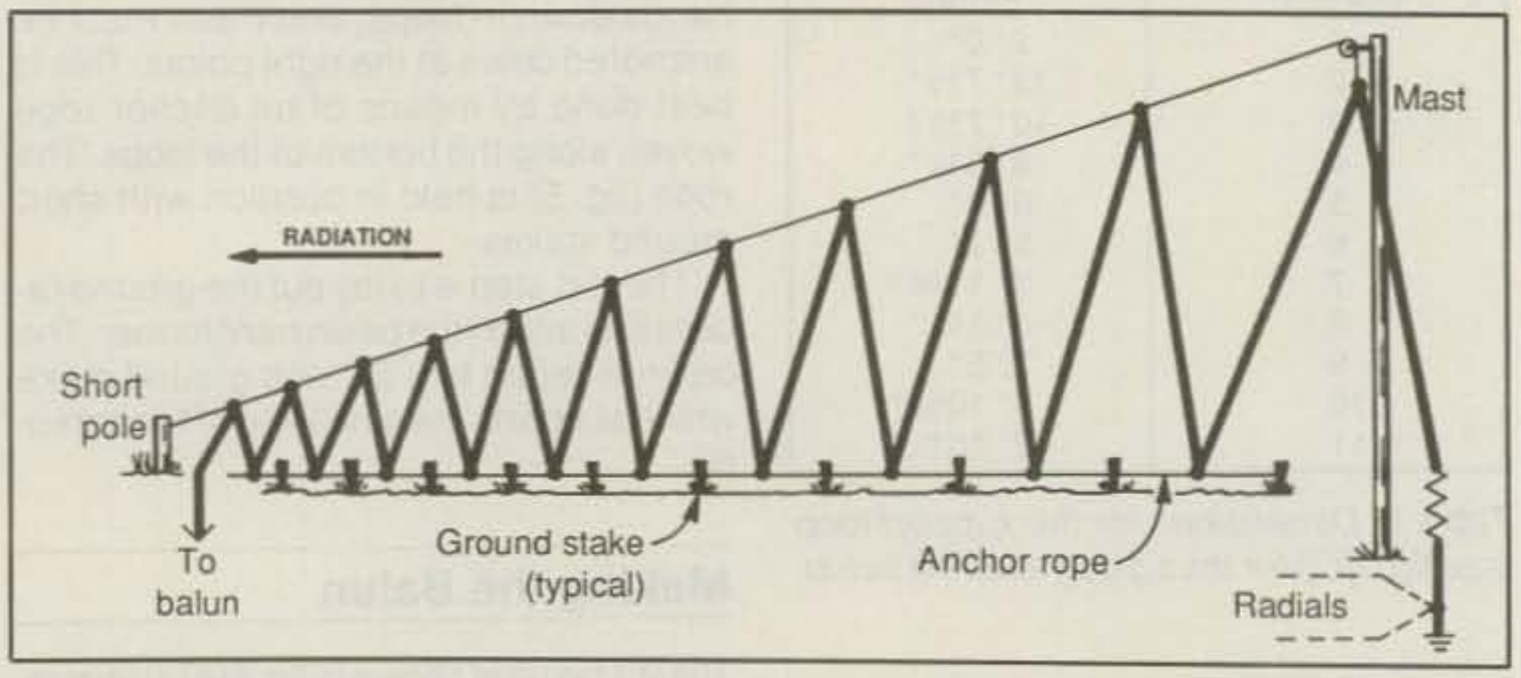


Fig. 5– Anchor rope passes along bottom of array to keep tension in the wire. Rope is staked down at appropriate intervals. Bottoms of the antenna "V"s should be about 1 to 2 feet above ground level.

ed in the load resistor at the higher operating frequencies. The dissipation level rises as the operating frequency is lowered.

The MN 4.0 program of K6STI can be used to analyze antenna patterns.

The Big, Big Gun at N6AV

Shown in the photo is the 6-element, 28MHz Yagi built on a 40 foot boom by N6AV. Jerry employed the K6STI Yagi Optimizer program to determine antenna dimensions. A gamma match is used, and the antenna is atop a 51 foot self-supporting tower. Does it work? You bet! In the 1990 CQ WW DX CW Contest W6BA, running a single transmitter, called CQ on 28.060 MHz and worked nearly 200 European signals in a row before the band folded up.

Gain runs better than 9.5 dBd from 28.0 to 28.7 MHz. Front-to-back averages better than 25 dB across this range.

Jerry's next project is a 5-element Yagi for 21 MHz on a 41 foot boom. (Stay clear of this guy!)

Book Reviews

From time to time I like to review new amateur radio books that have come to my attention. Here are two that I enjoyed reading.

All About Ham Radio, by Harry Helms, AA6FW. Published by High Text Publications, 7128 Miramar Rd., Suite 15, San Diego, CA 92121.

Now that the FCC has dropped the Morse code test for the Technician amateur, there has been a sharp upsurge in new licensees. Harry's new book recognizes this shift. It is aimed at the would-be Technician licensee and recently licensed Technician. It is a bull's-eye hit.

The book assumes the reader has little knowledge of amateur radio or electronics. Written in a humorous, conversational style, *All About Ham Radio* covers what amateurs actually do, what they talk about, and the mysteries of our lingo, which is usually incomprehensible to the newcomer. The book also discusses in detail equipment, antennas, repeaters, and other exotic gear likely to befuddle the newcomer.

This is a great book for an amateur to give to a friend who shows an interest in the hobby. (I certainly wish I had something like this when I was trying to get my license, many years ago.)

In eight chapters and over 300 pages Harry does an excellent job of explaining a really complicated set of ideas and equipment that make up today's amateur radio experience. Although I knew beforehand most of the material Harry is talking about, I enjoyed his explanations and style of writing.

The book is beautifully produced, colorful, and easy to read. I have only one minor observation about it. Harry refers to equipment he describes as "walkie-talkies." Good grief! That term went out with the

"Wow!! I had to record QSOs...to convince friends the DX was really there."

DX Engineering designs and manufactures high performance antenna systems for the most demanding applications.

- Full range of rugged, monoband Yagis for each band 80 through 10 meters (including the WARC bands), including the awesome DX Engineering 3 element full-size 80 meter Yagi (serial number 001 recently delivered to N7AVK).

- HF log periodic arrays, broad-banded and DX/contest-worthy.

- Full range of 6 meter Yagis (the world's largest 6 meter amateur array – at AA6TT – uses eight DX Engineering 10 element Yagis).

- Heavy-duty phasing boxes for low-band vertical arrays and stacked Yagi systems, including the new Universal Phase Box for stacking and phasing tribanders and log periodic arrays.

- High-power remote coax switches compatible with ETO's DASC (Digital Antenna Switch Control) and LTA's RBC (Remote Band Controller) devices.

- All DX Engineering products are optimized for DX and contest performance and built for the most demanding environments. Give us a call and we'll recommend a system to replace the Brand X antennas which came apart in your last blizzard.

- The DX Engineering staff are all active DXers and contesters. Day in, day out, we use the products we sell!

L. W. Sayre, M.D., P.C.
P.O. Box 3110
Salem, OR 97302

May 12, 1992

DX Engineering
618 Spaulding Ave.
Brownsville, Oregon 97327

Dear Bill,

I'm writing to thank you for the excellent help and hardware I've received from DX Engineering.

A few years ago I ran an average station with an average tribander and obtained average results in dxing and contesting. I enjoyed radio so much that I decided to upgrade my situation. After researching what was available, I cautiously purchased the 3 element full size 40M monobander.

Wow!! I had to record qsos with the dx to convince friends that the dx was really there.

This prompted me to put up 2 5 element 20's, 2 6 element 15's, and 2 6 element 10's on a rotating tower. The installation went up quickly, made easy from the help of DX Engineering with regard to the phase & switch boxes, spacing and actual antenna construction.

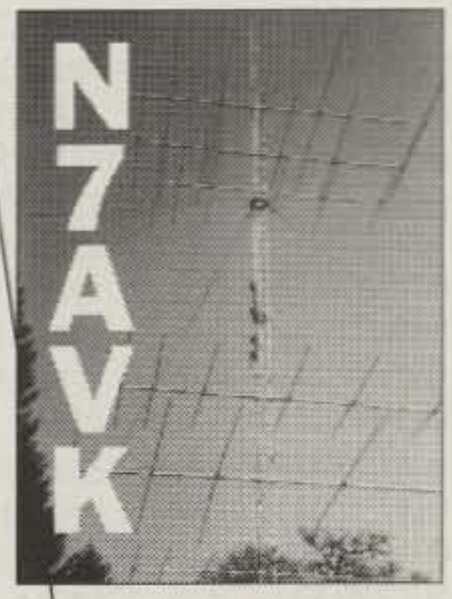
These antennae and systems work great! Dx pileups are cracked with 1 or 2 calls. My contest scores have soared. In short, your hardware has performed like my research indicated it would.

I've put the log periodic up now and am constructing the 3 element full size 80M monobander. By the start of this contest season I expect the 80 to be up performing like gangbusters like all of my DX Engineering hardware does.

I am developing a top single-op station, and DX Engineering has delivered spectacularly! All I can say is Thanks! You have surpassed my high expectations!

Further improvements here are left to cunning, guile, and operating ability as DX Engineering has maximized the hardware side of my station!

73, Jim



LOW, FACTORY DIRECT PRICES

MADE IN THE USA

CALL TOLL FREE (800) 373-0239

VISA & MASTERCARD ACCEPTED

FREE CATALOG

WE SHIP WORLDWIDE

DX ENGINEERING

618 Spaulding Avenue • Brownsville, Oregon 97327
telephone (800) 373 0239 or (503) 466 3138 • fax (503) 466-5453
FAX NOTE: our old fax number is out of order. If you sent us a fax and did not receive a reply, please resend the fax to our new number above. DXE apologizes for any inconvenience.

CIRCLE 169 ON READER SERVICE CARD

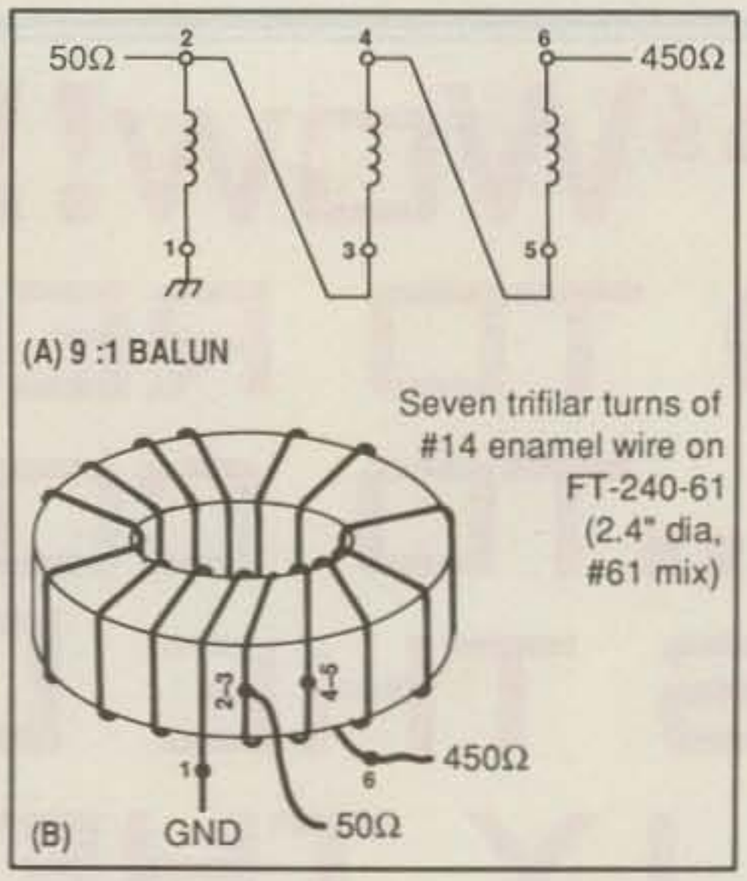
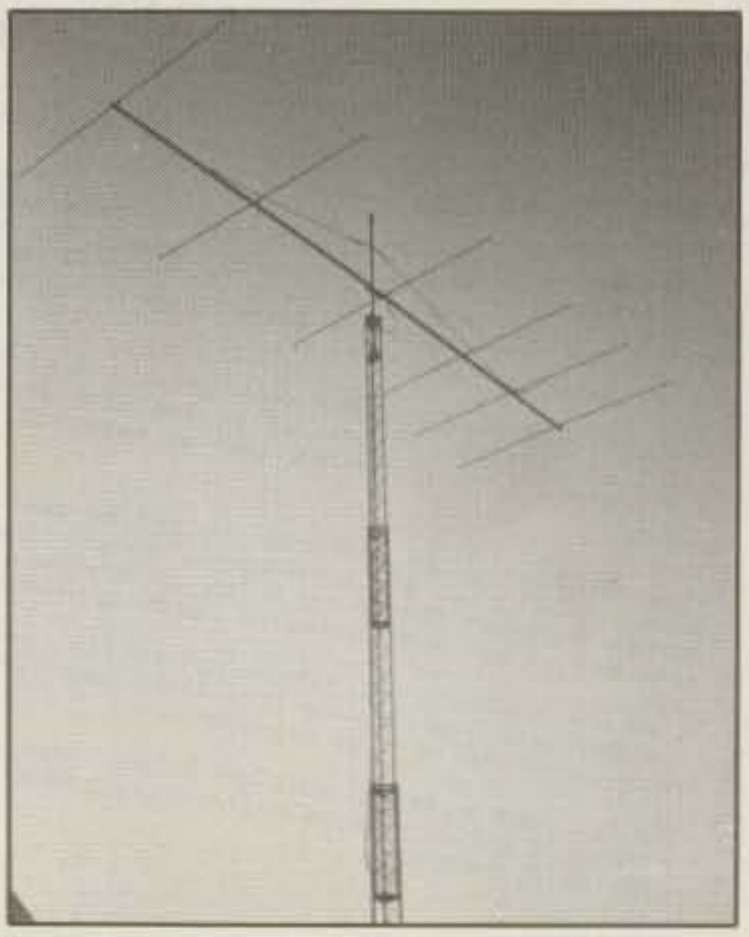


Fig. 6– (A) Schematic of special balun. Three trifilar windings are required, connected in series. (B) Balun is wound on 2.4 inch diameter ferrite core. Amidon FT240-61 is suggested. Core is 61 mix. Three windings are wound on simultaneously with marked ends to differentiate windings.

HRO and the BC-610. Harry is really talking about HTs, hand-helds, or handie-talkies. Right, Harry?

AA6FW's book is available at major radio distributors, or directly from the publisher for $19.95 plus $3 shipping/handling, and appropriate sales tax for California residents.

A second book of interest is *Aerials*, by "Kurt N. Sterba" and "Lil Paddle." Published by Worldradio, 2120 28th St., Sacramento, CA 95818.



The 6-element, 28 MHz Yagi of N6AV is built on a 40 foot boom and supported atop a 51 foot tower! Too bad the sunspot cycle is declining! In a few months all Jerry will be able to talk to is himself! Soon the beam will be replaced with a 21 MHz Yagi on a 41 foot boom.

This 92-page book is a compendium of 53 essays written for *Worldradio* magazine by a husband and wife team of enthusiastic amateur radio operators who have a firm grasp of the obvious. The book is a collection of some of the best essays.

Aerials, according to Walt Maxwell, W2DU, who wrote the introduction, "contains hard-hitting, sharply-aimed rebuttals targeting many ludicrous statements and claims appearing in amateur radio literature and equipment catalogs." I agree. The style of writing used by "Kurt" reminds me of the hard-bitten drill sargeant in the movie *An Officer and Gentleman*. But I have met "Kurt." He is soft and friendly as a kitten and obviously kind to his mother.

Walt says many of "Kurt" and "Lil"'s statements "are bound to rattle some cages and cause much gnashing of teeth among those of you who have been taken in by the myths." Right on! But the book introduces some myths of its own. In one essay the statement is made that "if you show an SWR of 2:1 and your transmitter has a 50 ohm output, and you are using 50 ohm cable, you will find either your antenna is 25 ohms or it is 100 ohms."

I suggest "Kurt" spend two-bits and buy himself a Smith Chart, normalized on 50 ohms, and draw a 2:1 SWR circle on it. He'll find that there are as many combinations of antenna impedance that will produce a 2:1 value of SWR as there are points on the circle. (This is all explained in the ARRL *Antenna Book* and in some of my antenna books.)

But I digress. The book is a lot of fun to read, and you'll find yourself in agreement with the proposed solutions to many of the perplexing mysteries facing the antenna enthusiast.

I was dismayed to read that "Kurt" spilled the beans on one of the most well-guarded secrets in amateur radio. He urges the reader to find a second-hand Johnson "Matchbox," kilowatt antenna tuner at a hamfest or fleamarket and snap it up. "Kurt," you shouldn't have said that! The rare "Matchbox" will quickly disappear and my chances of finding one will evaporate!

"Kurt" and "Lil Paddle" are not the authors' real names. Both writers work in companies whose policies require that all writing must be cleared through them. What hidebound company censor would understand these essays? Or understand amateur radio, for that matter? Hence the anonimity.

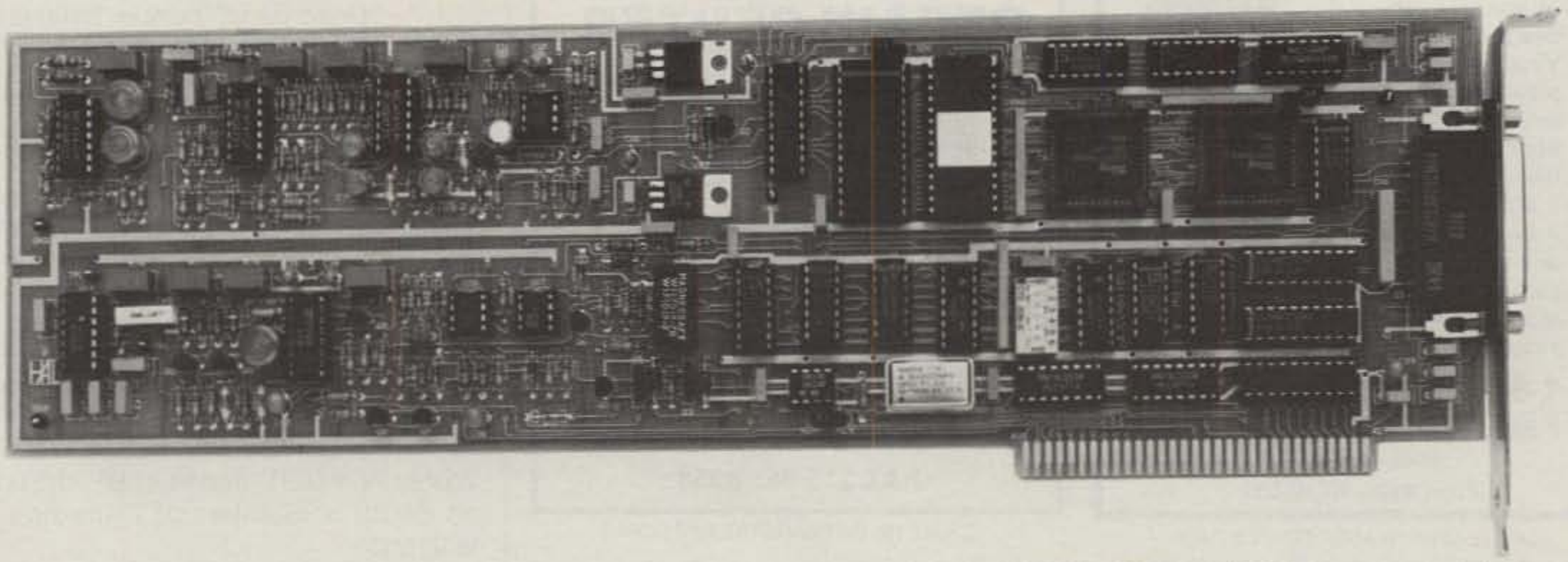
A tongue-in-cheek dissertion on the antenna game, *Aerials* is good reading. Get the book, grab an ice-cold 807, and settle down and enjoy.

Aerials is available at some radio distributors or on order from Worldradio, Box 189490, Sacramento, CA 95818. Price is $10, plus $2 shipping/handling. California residents add applicable sales tax. Overseas, add $4 postage/handling.

For Serious HF Work

Get the card that makes copying weak and fading signals possible!

The HAL PCI-3000 PC-AMTOR System



The PCI-3000 PC-AMTOR system gives you excellent HF performance on AMTOR, RTTY, and CW at a reasonable price. The PCI-3000 card plugs into a full size PC card slot. Filter circuits are optimized for 170 Hz shift - the RTTY and AMTOR standard. CW is optimized for an 800 Hz receive tone. Outstanding features of the PCI-3000 PC-AMTOR system are:

- Installs in your PC
- AMTOR, RTTY and CW modes
- High performance at a low price
- Split Screen operation
- Continuous receive storage
- Message transmission from disk
- APLink compatible
- HELP pages
- Search Mode
- Xmit & Rcv buffer storage
- Complete with software
- Optional SPT-2 & FIL-1

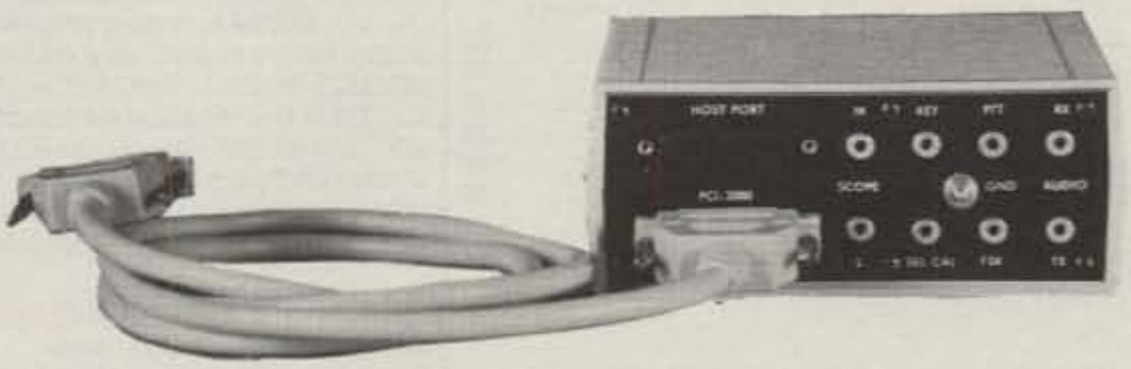
Don't wait any longer to experience what a true HF data interface can do for your station. Put your PC on the HF bands with high performance at a low price. Order the PCI-3000 PC-AMTOR system from HAL today!

SPT-2 Spectra-Tune

The SPT-2 makes tuning AMTOR, RTTY, and CW signals a breeze. It connects to the PCI-3000 via the supplied cable. The radio connections for the PCI-3000 are then made to the phono connectors on the SPT-2 rear panel. The tuning indicator is a 30-segment LED bar graph representing a 600 Hz range of the audio spectrum. The RTTY and AMTOR tuning range is centered at 2210 Hz. In CW mode the range is centered at 800 Hz. Simply tune the receiver until the signal is centered on the proper calibration marks.

FIL-1 AMTOR/RTTY Filter

If your transceiver doesn't have good RTTY filters, install the FIL-1 in your Spectra-Tune. The FIL-1 is a 500 Hz wide filter centered at 2210 Hz to optimize AMTOR and RTTY copy. The FIL-1 greatly reduces the noise input to the PCI-3000. This can mean the difference in barely detecting a signal and solid copy.



HAL Communications Corp.
P.O. Box 365
Urbana, IL 61801
Phone (217) 367-7373
FAX (217) 367-1701

PCI-3000 PC AMTOR with software **$395.**
SPT-2 Spectra Tune with cable **$169.**
FIL-1 Filter (installs in SPT-2) **$69.**
Complete System Price **$595.**

VISA and Mastercard Welcome

CIRCLE 17 ON READER SERVICE CARD

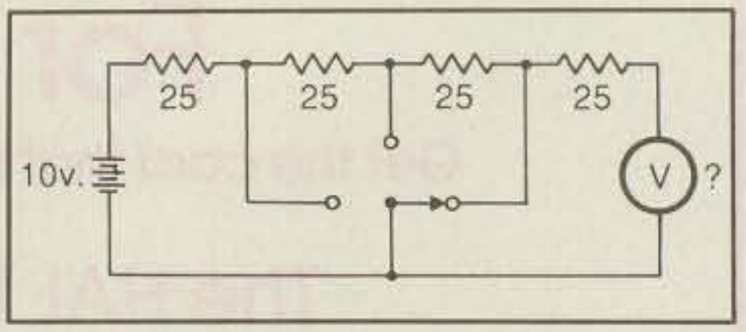


Fig. 7– "Dead Band" puzzle. What is the reading of the voltmeter when switch is placed as shown?

The Dead Band Quiz

I always thought a majority of my readers worked for the Circus, Moscow Center, or the CIA. Now I know I am right. The following sleuths have a staggering amount of information about "Moscow Rules," a little quiz I gave about John LeCarre's novel, *Tinker, Tailor, Soldier, Spy:* WA2CBU, NI3P, KM7U, WB9UHX, K2WR, W3HHG, WB5MTV, KG5IT, and VE1CBF, the latter no doubt a member of Canadian Intelligence.

Thanks to the above undercover agents who knew all about Vladimir, Max, and the rest of the shadowy bunch in that masterful novel/TV production.

Also thanks to P29MB and KB0HIB, who know a great movie when the see it: *High Road to China.*

This Month's Quiz

I've divided this quiz into two parts. The first part is for the technically minded Extra class amateurs; the second part is for us less fortunate individuals.

Question 1: Examine the circuit of fig. 7. With the switch in the position shown, what is the reading of the voltmeter (V)? (Quiz first appeared in *QST*, Feb. 1959.)

Question 2: Where does this little poem come from? What are the last two words of it? Who says it?

They seek him here,
They seek him there,
The Frenchies seek him everywhere.
Is he in Heaven, or in Hell?
That deuced ____ ____!

Okay, guys, have at it! Good luck, and may the Force be with you!

Recommended reading: Here's a thrilling story of the Spanish Armada that King Philip of Spain sent in 1588 to conquer and subdue England. I guarantee you won't put it down! *The Voyage of the Armada* by David Howarth, the Viking Press, NY (1981). Probably out of print, it may turn up in a second-hand bookstore.

If you think today's politics are confused and the results unreal, read about the catastrophy that King Philip unleashed on Spain. And think what might have happened if the ships of the Spanish Armada were equipped with today's hand-helds so as to be able to communicate with each other! The end of the story may have been different. 73, Bill, W6SAI

AWARDS

BY DOROTHY JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for August is:

H. "Hank" Petersen, KJ4LG USA-CA All Counties #720 Mixed, 7-1-91

"I was first introduced to radio when I was about 10 years old. We were at my grandfather's house one day and he was listening to a crystal set. It was something new and it was a mystery to me how the thing worked and where the sound came from. You moved the cat's whisker on the crystal and moved a slider on a bar over a large copper wound coil to tune in the various stations. The strongest and most popular station at the time was KYW in Schenectady, New York. He only had ear phones then and we all had to take turns listening.

"About five years later I started building radio sets. There was a store on State Street on the south end of the Chicago Loop called Allied Radio. They had long rows of tables with bins that had all kinds of parts to build radios with. Everything then was built breadboard style. You screwed the tube sockets down on the board and ran wires to the various parts. There were condensers, variable condensers, resistors, and potentiometers for volume controls.

"In 1928 I went to work for a printing company and that became my life-long trade. The company closed down a few years later due to the Depression. I then went to work for a man starting up a typesetting business. Later on I became a partner in the corporation and spent 42 years there until I retired in 1975.

"In the meantime I married in 1936 and the next year we moved to a village called Markham, just west of Harvey, Illinois. Still interested in radio, I bought a Howard shortwave receiver. I put up an 'A' frame mast with about 20 feet of wire for an antenna. There was a small airport nearby, and I became interested in flying and took lessons in a J3 Cub plane. We lived in Markham for seven years, and I rode the Rock Island R.R. daily to work in the Chicago Loop. It was a long trip, and during the war the train had to stop several times to get up enough steam to continue on. Getting tired of all this and having a growing family of two boys and a girl, we moved in to the southwest side of Chicago.

"I continued flying at another airport

333 South Lincoln Ave., Mundelein, IL 60060

Hank Petersen, KJ4LG, USA-CA All Counties #720, at home in Florida.

and then got an urge to have my own plane. I had been saving stamps since I was a kid, so I sold my collection of about 40,000 stamps and bought a plane. It was a Waco UPF-7 biplane, and it was used during the war to patrol the coastline looking for submarines.

"In 1951 I joined the B.P.O. Elks and became very involved with them, going through all the chairs. Being so involved with the Elks, I did not have much time for flying, so I sold the plane.

"When I retired, we moved to Butternut, Wisconsin, where my wife's brother had a hunting and fishing lodge on the Flambeau Flowage. We worked hard all summer, but the winters were long with nothing to do except for hunting and ice fishing and a lot of below zero weather.

"After two years up there, we decided to move to Florida. We put up a home in a subdivision called High Point on the Gulf Coast. This subdivision was built around a golf course, and we play golf a lot. I played piano and had a band of five pieces that played for some home talent shows we had here. One of the members of the band was a jazz guitarist and also an Advanced class ham. After talking to him on a number of occasions, my interest in radio was rekindled. After practicing code and studying the text books, he helped me to get my Novice license (a late bloomer, Hi). I bought a set of Drake 4-B twins and spent a lot of time on the air on CW.

"I finally got a General class license and a whole new world opened up. I bought a Kenwood TA-440S/AT and was mostly on SSB after that. I worked a lot of 10 meters then and belonged to about a dozen 10-10 chapters. In the interim I upgraded to Advanced class. One day I was scanning the 20 meter band and ran across the county hunters net. I sent for the packet of information and have been chasing counties since then.

USA-CA Special Honor Roll

Willie Ray Ross, WA5OPO
USA-CA All Counties #761
Mixed, 4-1-92

Randall W. Davis, Sr., N8ELQ
USA-CA All Counties #762
Mixed, 4-20-92

George W. Heflin, N4IXV
USA-CA All Counties #763
Mixed, 4-23-92

Bob Swanlund, W0WYX
USA-CA All Counties #764
Mixed, 4-29-92

"My earlier CW contacts helped me to reach the first plateau of 500 contacts in November 1987. Every time I had 500 contacts confirmed, I would send them in for an upgrade. The rest is history. It took about four years to make all the contacts in all 3076 counties.

"I owe much to the mobilers out there running the counties and to those who went out of their way to get some of my last

USA-CA Honor Roll

3000			
WA5OPO	787	N8ELQ	1032
K6PQA	788	N4IXV	1033
N8ELQ	789		
N4IXV	790	**1000**	
		G3SPU	1231
2500		WA5OPO	1232
WA5OPO	868	N8ELQ	1233
KB0FQC	869	N4IXV	1234
N8ELQ	870		
N4IXV	871	**500**	
		G3SPU	2597
2000		WA5OPO	2598
WA5OPO	944	IN3NJB	2599
N8ELQ	945	WA2ITJ	2600
N4IXV	946	WA4NIB	2601
		N8ELQ	2602
1500		N4IXV	2603
G3SPU	1030	KM6GF	2604
WA5OPO	1031	DL3ECK	2605

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 $2.00. 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 June 15, 1991. 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.

KENWOOD

TS-950SD
Digital, 150W, Dual RX, Also Available w/out Digital. A Top Performer ..... **Call!**

TS-850SAT
General Coverage HF XCVR, 110W. Available Without The Autotuner. Available All Mode DSP ..... **Call!**

TS-450SAT
General Coverage HF XCVR, 100W, Available w/out Autotuner. A Great Mobile Performer ..... **Call!**

R-5000	HF Receiver	**Call**	TM-241	2m 45W Mobile	**Call**	TS-690S	HF & 6m Rig **Call**
TH-27	2m Tiny HT	**Call**	TM-741	2m/440 Mobile	**Call**	TS-790	Dual Band Base **Call**
TH-77	2m/440 Tiny HT	**Call**	TR-751	2m All Mode	**Call**	**New! Ham Windows Software for Windows 3.0**	**Call!**
TH-225	2m 5W HT	**Call**	TS-140S	HF Rig	**Call**		

YAESU

FT-1000D
200W HF XCVR, Dual RX, Deluxe and Standard Models Available. A Top Performer ..... **Call**

FT-990
General Coverage HF XCVR, 110W, Built-in Power Supply and Auto tuner. A Great Performer .... **Call**

FT-890
General Coverage HF XCVR, 110W, Runs From 13.8V, Available With And Without Autotuner ..... **Call**

FT-5200
45W 144/440 MHz Dual Band Mobile, Optional Kit Allows Remote Mounting ..... **Call**

FT-2400
45W 144 MHz Mobile, Tuned Front End Eliminates Intermod, Built To Military Specifications ..... **Call**

FT-470 / FT-411

FT-470	Dual Band HT	**Call**
FT-411	2m HT	**Call**
FT-415	2m HT	**Call**

LARGE YAESU INVENTORY - CALL FOR PRICES

ICOM

IC-765
General Coverage HF XCVR, Automatic Antenna Tuner, CW Keyer, and more ..... **Call**

IC-751A
General Coverage HF XCVR, 100W, Base Performance, Great For Mobile HF Work ..... **Call**

IC-735
General Coverage HF XCVR, 100W, Compact Size, Great For Mobile HF Work ..... **Call**

IC-751A	HF XCVR	**Call**	IC-3220H	2m/440 Mobile	**Call**	IC-24AT	2m/440 HT **Call**
IC-726	HF XCVR w/ 6m	**Call**	IC-229H	2m Mobile 45W	**Call**	IC-2GAT	2m HT 7W **Call**
IC-725	HF XCVR	**Call**	IC-W2A	2m/440 HT	**Call**	IC-2SAT	2m Tiny HT **Call**

ALINCO

DR-590T	2m/440 Mobile	**Call**
DR-570T	2m/440 Mobile	**Call**
DR-112T	2m 45W Mobile	**Call**
DJ-F1T	2m Micro HT	**Call**
DJ-120T	2m Tiny HT	**Call**
DJ-160T	2m Small HT	**Call**
DJ-560T	2m/440 HT	**Call**

Alinco Accessories In Stock!

ASTRON

MODEL	AMPS	ICS	PRICE
RS12A	9	12	79.00
RS20A	16	20	99.00
RS20M	16	20	119.00
RS35A	27	35	159.00
RS35M	27	35	179.00
VS-35M	27	35	179.00

FREE SHIPPING

M = Dual Meters / V = Variable.

TELEX / HYGAIN

218S	Oscar Pack	**Call**
TH7DX-S	7 El. Triband	**Call**
TH5MK2-S	5 El. Triband	**Call**
EX-14	4 El. Triband	**Call**
TH3JR-S	3 El. Triband	**Call**
V2R	2m Vertical	**Call**

Please Call For Prices On All Hygain Antennas And Crank-up Towers.

CUSHCRAFT

A3S	3 Element Triband Beam
A3WS	WARC Triband Beam
A4S	4 Element Triband Beam
R5	20-10m No Radial Vertical
R7	40-10m No Radial Vertical
13B2	13 Element 2m Beam
17B2	17 Element 2m Beam
26B2	26 Element 2m Beam
ARX2B	2m Vertical
AR270	2m/440 Vertical

Call For More Cushcraft Items!

MFJ

1278/1270	TNC'S	249/129
1284/1289	TNC Software	25/59
989/986	Tuners	299/25
949/948	Tuners	139/119
941/945	Tuners	99/89
901/910	Tuners	59/19
207/208	Analyzers	99/89
486/422	CW Keyers	169/119
407/401	CW Keyers	69/49
815/817	Wattmeters	79/89

We Stock Most MFJ Products!

ROTATORS

Orion OR2300	**Call**
Telex CD45II (8.5 SQ.')	**Call**
Telex HAMIV (15 SQ.')	**Call**
Telex Tailtwister (20 SQ.')	**Call**
Telex HDR300 (25 SQ.')	**Call**
Yaesu G400RC	**Call**
Yaesu G500A	**Call**
Yaesu G800SDX	**Call**
Yaesu G1000SDX	**Call**
Yaesu G5400 AZ./El.	**Call**

Please Call For Rotor Pricing!

AEA

Isoloop	HF Loop Antenna	**Call**
PK-232	All Mode TNC	**Call**
PK-88	2m Packet TNC	**Call**

BUTTERNUT

HF-2V	80/40 Vertical	149.95
HF-5B	5 Band Beam	259.95
HF-6V	80-10 Vertical	159.95

KANTRONICS

Hostmaster	Software	64.95
KAM	All Mode TNC	289.00
KPCII	Packet TNC	159.95

AMERITRON

AL1500	1500W Linear	**Call**
AL1200	1500W Linear	**Call**
AL82	1500W Linear	**Call**
AL80	1000W Linear	**Call**
AL811	600W Linear	**Call**

LARSEN

KG-144	2m On Glass	49.95
KG-270	2m/70cm On Glass	69.95
KG-440	70cm On Glass	44.95
LM-150	2m 5/8 Mag-mount	51.85

Call For Larsen Items Not Listed!

DIAMOND

X-500 / X-200 / X-50	**Call**
SG-7900 / SG7500	**Call**
NR-770 / NR-790	**Call**
SX-100 / SX-1000 / SX-200	**Call**

Call For More Diamond Products!

U.S. TOWERS

- All Steel Construction
- Hot Dip Galvanized
- Towers All Self-Support
- Many Available Options
- Highest Quality, Best Selling Crankups Available
- Larger Models Too
- Drop Shipped Directly From The Factory To You To Save $$$$
- California Residents Add 6% Tax

Call now and let our experts design a package just for you!

MODEL	MIN.	MAX.	WINDLOAD	PRICE
MA-40	22'6"	40 FT	10 SQ. FT	629
MA-550	22'1"	55 FT	10 SQ. FT	999
MA-770	23'10"	71 FT	10 SQ. FT	2249
MA-850	24'6"	85 FT	10 SQ. FT	3489
TX-438	22'6"	38 FT	18 SQ. FT	919
TX-455	21'0"	55 FT	18 SQ. FT	1385
TX-472	23'8"	72 FT	18 SQ. FT	2279
TX-489	24'4"	89 FT	18 SQ. FT	3959
HDX-538	22'6"	38 FT	30 SQ. FT	1179
HDX-555	22'0"	55 FT	30 SQ. FT	2079
HDX-572	23'8"	72 FT	30 SQ. FT	3559
HDX-589M	24'8"	89 FT	30 SQ. FT	7119

ROHN TOWER

GUYED TOWER PACKAGES

HEIGHT	25G	45G	55G
50	849	1229	1549
60	939	1389	1939
70	999	1719	2159
80	1199	1869	2369
90	1289	2039	2579
100	1369	2199	2989
110	1449	2459	3209
120	1669	2619	3429

These towers are shipped freight collect from Plano. Includes all required hardware & rotor plate.

SELF SUPPORTING TOWERS

MODEL	HGT	LOAD	COST
HBX40	40	10 SQ.'	449
HBX48	48	10 SQ.'	589
HBX56	56	10 SQ.'	699
HDBX40	40	18 SQ.'	569
HDBX48	48	18 SQ.'	689

10% West of Rockies Charge.

All BX series towers include top and rotor plates, and base stubs.

Free Shipping On BX Towers!

FOLDOVER TOWERS

FREE SHIPPING ON FOLDOVERS

MODEL	HEIGHT	LOAD
FK2548	48 FT.	15 SQ.'
FK2558	58 FT.	13 SQ.'
FK2568	68 FT.	11 SQ.'
FK4544	44 FT.	34 SQ.'
FK4554	54 FT.	29 SQ.'
FK4564	64 FT.	28 SQ.'
25G Double Guy Kit		$ 299.00
45G Double Guy Kit		319.00

Rohn Foldover Towers Are Shipped Freight Prepaid From The Factory; State Sales Tax Due In Most States.

STACKED SECTIONS

20G	Light Duty 12"	54.50
25G	Medium Duty 12"	65.50
45G	Heavy Duty 18"	153.50
55G	Extra Heavy 18"	197.50
EF245	Ginpole 25/45/55	375.00
EFBX	Ginpole HBX	399.00
M200H	2" O.D. Steel Mast	39.00
TB-3	2" Thrust Bearing	75.00
AS-25G	Rotor Shelf (25G)	29.85
AS-455G	Rotor Shelf (45/55)	74.25
GA25G	Guy Assembly	56.25

Other Rohn Items In Stock Too! Please Call For A Shipping Quote On Rohn Towers And Accessories.

COAX & CABLE

ANDREW HELIAX®
LDF4-50 1/2" Copper ..... 2.29/Ft.
LDF5-50 7/8" Copper ..... 5.69/Ft.
Connectors: 1/2"....29.00 7/8"....74.00

COAX
9086-9913 Equivalent, 100% shield, air diel., solid center ..... $ .49/Ft.

RG-213/U - Mil. Spec. RG-8, 95% shield, non-contaminating, polyethylene Dielectric ..... $ .39/Ft.

RG-8X - 95% Shield, Mini RG-8, Foam Dielectric ..... $ .25/Ft.

COAX LOSS CHART (DB/100Ft.)

Cable	10m	2m	70cm
7/8" Heliax®	.2	.5	.9
1/2" Heliax®	.4	.9	1.6
9086	.6	1.7	3.1
RG-213/U	.9	2.3	5.2
RG-8X	1.2	3.5	5.8

ROTOR CABLE
8 Conductor (2-#18, 6-#22) .... .25/Ft.
Heavy Duty (2-#16, 6-#18) .... .45/Ft.

GUY HARDWARE

3/16 EHS Guywire (3990#)	.15
1/4 EHS Guywire (6650#)	.18
3/16CCM Cable Clamp	.45
1/4CCM Cable Clamp	.55
1/4TH Thimble	.45
3/8EE Turnbuckle	7.95
3/8EJ Turnbuckle	9.95
1/2X9EE Turnbuckle	11.95
1/2X9EJ Turnbuckle	12.95
1/2X12EE Turnbuckle	13.95
1/2X12EJ Turnbuckle	14.95
3/16 Preformed Guy Grips	2.49
1/4 Preformed Guy Grips	2.99
GAS604 Screw Anchor	19.95
500D Guy Insulator	2.79
502 Guy Insulator	5.49
5/8X8' Copper Gnd. Rod	12.95

PHILLYSTRAN

NON-CONDUCTING GUY CABLE

HPTG2100I (2100#)	$ .39/Ft.
HPTG4000I (4000#)	.64/Ft.
HPTG6700 (6700#)	.84/Ft.
End Kits 2100/4000/6700	4/5/6

SAFETY BELTS

Nylon safety belts are available in four sizes. S, M, L, X-L **79.95**

CARBON STEEL MASTS

WALL	6'	8'	10'	12'	20'
.12	39	52	65	79	119
.18	59	79	99	119	189
.25	---	---	129	---	249

These 2" O.D. Masts Are Galvanized To Resist Rust, Up To 8' Ship By U P S

ORDER TOLL FREE: 1 - (800) 272 - 3467

LOCAL AND TECHNICAL HELP : 1 - (214) 422 - 7306 FAX: 1 (214) 881-0776

C.O.D.
MC / VISA

TEXAS TOWERS

M-F: 9AM-5PM
SAT.: 9AM-1PM

A Division of Texas RF Distributors, Inc., 1108 Summit Ave. Suite #4, Plano, TX 75074

counties. Some of them called me at home, long distance, to set up a schedule to meet them for a last county. Also, I am indebted to Wayne Burr, AA4HD, for getting my last three counties, which were all in Georgia. I also say thanks to Dorothy, WB9RCY, for her help.

"Last, but not least, a thank you to my wife of 55 years, Cecilia, who was very tolerant of the time I spent in the shack chasing counties. So, you see, it can be done. It takes time, patience, and a lot of help from the mobilers out there who are giving of their time to put out the counties. I hope to meet many of you again, as I will continue working counties.

"So 73 to one and all; and see you down the log—Hank, KJ4LG."

Awards Issued

Willie Ray Ross, WA5OPO, submitted his completely filled Record Book and qualified for USA-CA All Counties #761, USA-CA 3000 #787, USA-CA 2500 #868, USA-CA 2000 #944, USA-CA 1500 #1031, USA-CA 1000 #1232, and USA-CA 500 #2598, Mixed, dated 4-1-92.

Randall W. Davis, Sr., N8ELQ, filed his complete set of county confirmations and received USA-CA All Counties #762, USA-CA 3000 #789, USA-CA 2500 #870, USA-CA 2000 #945, USA-CA 1500 #1032, USA-CA 1000 #1233, and USA-CA 500 #2602, Mixed, dated 4-20-92.

George W. Heflin, N4IXV, did it all in one giant leap, qualifying for USA-CA All Counties #763, USA-CA 3000 #790, USA-CA 2500 #871, USA-CA 2000 #946, USA-CA 1500 #1033, USA-CA 1000 #1234, and USA-CA 500 #2603, Mixed, dated 4-23-92.

Bob Swanlund, W0WYX, put the finishing touches on his good record and received USA-CA All Counties #764, Mixed, dated 4-29-92.

Robert P. Banner, K6PQA, added another gold seal to his certificate by qualifying for USA-CA 3000 #788, Mixed, dated 4-18-92.

Jack W. Crutchfield, KB0FQC, took another good step in his quest and received USA-CA 2500 #869, Mixed, dated 4-6-92.

Robert C. Moore, G3SPU, got off to a good start with his application for USA-CA 1500 #1030, USA-CA 1000 #1231, and USA-CA 500 #2597, All SSB, dated 3-30-92.

USA-CA 500 certificates went to:

Robert C. Moore, G3SPU, USA-CA 500 #2597, All SSB, 3-30-92.

Willie Ray Ross, WA5OPO, USA-CA 500 #2598, Mixed, 4-1-92.

Roberto Gadler, IN3NJB, USA-CA 500 #2599, Mixed, 4-3-92.

Robert C. Bruno, WA2ITJ, USA-CA 500 #2600, Mixed, 4-9-92.

Vernon T. Underwood, WA4NIB, USA-CA 500 #2601, All 20M SSB, 4-20-92.

Randall W. Davis, Sr., N8ELQ, USA-CA 500 #2602, Mixed, 4-20-92.

George W. Heflin, N4IXV, USA-CA 500 #2603, Mixed, 4-23-92.

Robert W. Roehm, KM6GF, USA-CA 500 #2604, Mixed, 4-24-92.

Dr. Frank Schubert, DL3ECK, USA-CA 500 #2605, Mixed, 4-27-92.

The Ham's Book of Knowledge

The Ham's Book of Knowledge, published by In-Phase Publications, Ed Schneider, AA7AN, contains an extensive collection of information for the radio amateur. Published in 8½" × 11" format, the 240-page book can be ordered in one or two sections. In the two-part edition, the first holds the bulk of the text and technical data and the second section contains the beam headings, dealers and manufacturers' list, and operating information. The two-part volume is easier to use while on the air.

Virtually all books become outdated, some in a short time. To prevent this, updates (a reprint of section two of the book) are always available. The material is revised on an ongoing basis, keeping the data in the operating section current.

Political and geographic changes that affect amateur radio operators can render a book like this one obsolete. The breakup of the USSR and the ensuing creation of countries that previously did not exist is a prime example. Events such as this are recorded as they occur. The new Russian prefixes and countries, along with associated data, appeared in the book within a week of the occurrence.

The book is printed when ordered, guaranteeing that your copy will be up-to-date. No book is shipped "off the shelf." Prefixes are constantly added and deleted, countries are periodically activated and deactivated, and DXpeditions take place from time to time. It is events such as these that make regular updates mandatory. With them you may keep your book and all the DXing information accurate and current.

The book includes a great deal of information specific to each country that will "give you something to talk about" with the amateurs you contact throughout the world. Painstaking efforts were made to include unusual data and a wide range of statistics. All numerical data, such as distances and land area, are provided in both U.S. and metric equivalents.

QSL, third-party information, worldwide zones, and much more is included. All the statistics related to a country appear on the same page, grouped together. It is not necessary to turn pages or thumb through chapters. The data you need is simple to locate, in an easy-to-use format designed for access while on the air.

There are chapters on lightning protection, antennas, and grounding methods. Also covered in depth are metric and U.S. measurements. Virtually every conversion factor you will ever need appears in an easy-to-use table, and ranges from amp-hours to terawatts. Fractions, Roman numerals, and Centigrade to Fahrenheit conversions are all there.

The table of contents and index make it simple to locate information. All books are spiral-bound and can be laid flat on a desk or operating table for easy reference.

The goal of In-Phase Publications is to publish a book that includes every active prefix and country. This is a massive undertaking, as new prefixes appear almost daily. Help them help you. Let them know if you discover any new prefixes, and they'll immediately add them to the database. If you furnish them with ten prefixes that are not contained in the latest release, in appreciation, they will mail to you a current prefix/country list free of charge.

Worldwide Countries Sorted by Prefix. Two separate lists containing worldwide prefixes and the countries they represent appear in this section of the book. One list is sorted in prefix order, and the other is sorted by country name. Prefixes and countries are included not only for those appearing on the ARRL's official DXCC list, but for every country listed in the *Callbook*—even those that are normally activated only by DXpeditions. Every standard prefix and hundreds of lesser-used prefixes are cross-referenced.

These lists enable you to quickly identify an unrecognized country or prefix. Then you can examine the beam headings and country information list for detailed data. The information is revised on an ongoing basis. Accordingly, the updates contain not only the "standard," but also the most recent additions and revisions.

The Beam Headings section contains CQ and ITU zones, UTC time zones, geographic info, population data, DX distances, QSL info, zone info, prefixes.

While of general interest, the beam headings and associated information will appeal primarily to those who operate low-band DX. Each country's short-path heading is computed using the latitude and longitude of your station.

Also found in the Beam Headings section are long-path headings and distances to DX stations. Should you change QTH, you can immediately secure an update which will provide you with new headings. The update will include changes made to prefixes, country information, and manufacturers' data that took place since your original purchase.

Comprehensive demographic and geographic information is supplied for virtually every country in the world. Data pertaining to population and population density, land area, commercial products, languages spoken, and much more is available at your fingertips. Use it for general reference or while in QSO.

The Manufacturers & Dealers section lists more than 400 manufacturers, dealers, and suppliers of amateur radio gear, as well as merchants offering surplus and

miscellaneous equipment. More are added continuously and are included in the updates.

The Ham's Book of Knowledge, in one section, is priced at $21.95; in two sections, it is $23.95. The book update (Beam Headings, Prefix and Country Information, Manufacturers & Dealers List) is priced at $9.95. In-Phase Publications is located at 4665 E. Palo Brea Lane, Cave Creek, AZ 85331.

Awards Available

NCWA Awards Program. The Nassau County Wireless Association sponsors a series of awards and certificates, all of which are featured in *The Ham's Book of Knowledge*, and are available from custodian Ed Schneider, AA7AN, In-Phase Publications, 4665 E. Palo Brea Lane, Cave Creek, AZ 85331.

Application Forms and Log Sheets. Official application forms and logs *must* be submitted when applying for awards. An application package containing complete award and certificate information, log sheets, and verification and order forms is available.

Book owners: This package is a duplicate of the pages in the awards section of the book. If you do not wish to copy or remove pages from your book, please send for the application package or copy the required pages from the book.

Due to the size of the application package (16 double-sided pages), U.S. amateurs must enclose $1.00 (stamps are okay, but no IRCs) with your request. DX stations must remit $2.50 U.S. funds to cover mailing costs.

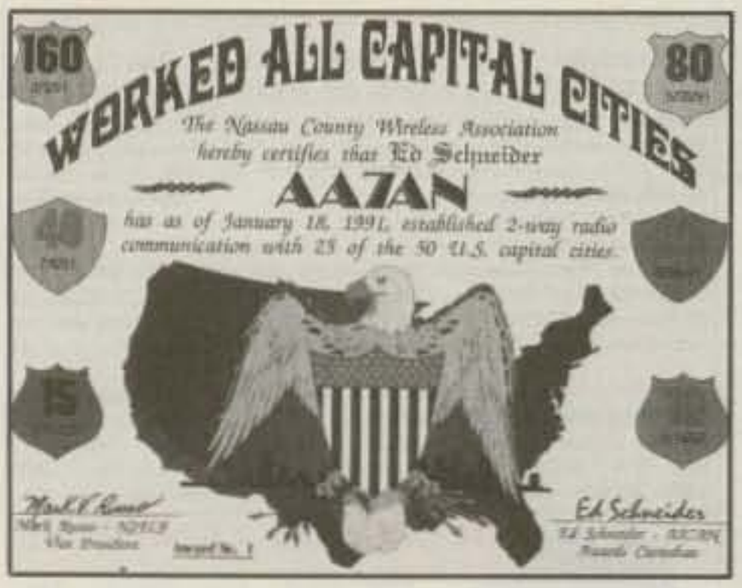
All amateurs: Your remittance for this package will be refunded with your order for any item. Direct all inquiries, orders, and requests to In-Phase Publications, Ed Schneider, at the address given above.

Information on each of three of the NCWA awards follows. However, the next three paragraphs pertain to all three awards.

QSL cards need not be sent, but should be in the possession of the applicant. You must send one of the following for verification along with your application: copies of the QSL cards showing your call and the other station's location or the verification form signed by a licensed amateur holding at least a Technician class license. The award sponsor reserves the right to randomly request QSL cards for authentication. All applications and logs must be on an official form (copies are okay).

The award is available in two sizes: 8½" × 11" and 11" × 14". Each multi-color award is individually custom-printed for the applicant and is personalized with the amateur's call letters.

Amateurs located outside the United States must remit in U.S. funds. Shipment to foreign countries is made by airmail



Worked All Capital Cities Award sponsored by The Nassau County Wireless Assn.

Worldwide Capital Cities Award by Nassau County Wireless Association.

only. See the order form for applicable postage rates.

Worked All Capital Cities. Two-way contact with at least 25 United States capital cities on any amateur band, any mode, qualifies for the award. A new award is issued for working all 50 cities, and band endorsements are issued for working all 50 cities on each band—160, 80, 40, 20, 15, and 10 meters. A 6-band endorsement will be presented to those contacting all 50 capital cities on each of the 6 bands. This endorsement is complimentary.

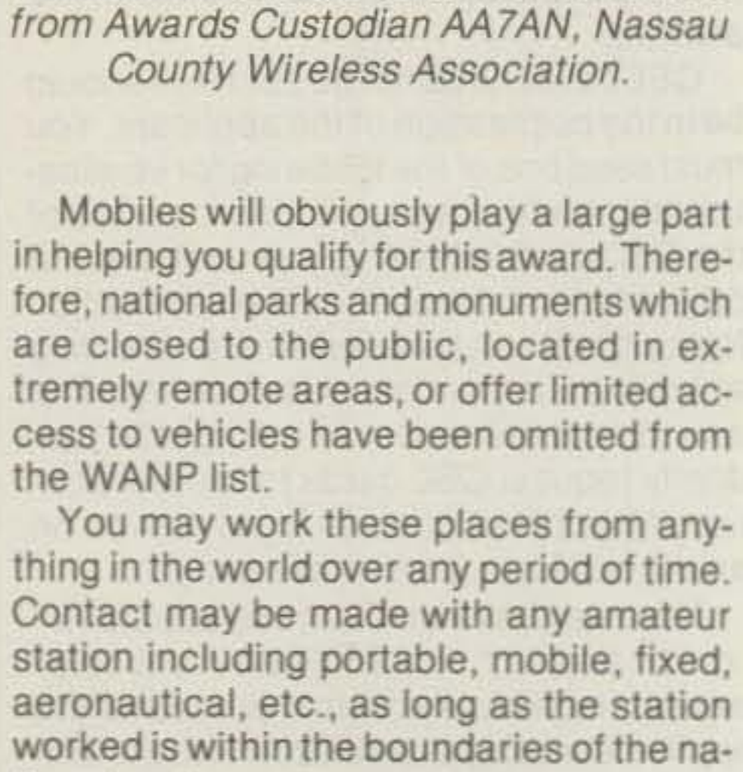
All contacts must be made with amateurs located in the cities appearing on the official WACC list.

Worldwide Capital Cities. Two-way contact with 25 worldwide capital cities on any amateur band, any mode, is required for the initial award. Endorsements are issued for 75, 150, and 200 capital cities worked. A final endorsement will be presented to those contacting each of the 218 capital cities. This endorsement is complimentary.

All contacts must be made with amateurs located in the cities appearing on the official WCC list.

You may work these cities form anywhere in the world over any period of time. Contact may be made with any amateur station including portable, mobile, fixed, aeronautical, etc., as long as they are operating within the specific city's borders.

Worked All National Parks. Two-way contact with a minimum of 20 locations on any amateur band, any mode is required for the initial award. Endorsements are issued for 30 to 90 locations in multiples of 10 (there are 7 available endorsements), and a final endorsement will be presented to those confirming all 98 locations. This endorsement is complimentary.



Worked All National Parks Award available from Awards Custodian AA7AN, Nassau County Wireless Association.

Mobiles will obviously play a large part in helping you qualify for this award. Therefore, national parks and monuments which are closed to the public, located in extremely remote areas, or offer limited access to vehicles have been omitted from the WANP list.

You may work these places from anything in the world over any period of time. Contact may be made with any amateur station including portable, mobile, fixed, aeronautical, etc., as long as the station worked is within the boundaries of the national park or monument.

That's it for this month. See you next month!

73, Dorothy, WB9RCY

Fastback styling and detachable convenience.

AVAILABLE NOW!
FANTASTIC 2-METER H.T.'s
HIGH PERFORMANCE AT A GREAT PRICE

- **DJ-F1TH World's smallest 5 watt H.T.**
- **DJ-162TR Full featured 2-meter comes standard with EDC-34 rapid charger**

New Model DR-599T

Here's the radio that goes where no radio has gone before. This is truly the most advanced twin-bander available today.

Hi-tech features and ergonomic design put the DR-599T in a league of its own. From the Remote control microphone to the contoured fingertip buttons, the DR-599T looks and feels like a smooth operator.

Space limitations are not a problem for the DR-599T. The detachable control head allows the transceiver body to be hidden from view while the sleek control head can be neatly mounted on a dash or visor. (Optional separation kit required).

This DR-599T has full duplex cross band operation and cross band repeater functions with real-world power and excellent sensitivity. Airband receive is also possible with a simple modification.

The standard features include 3 power output selections, ARM, ABX, Bell, Reverse, Mute, and Auto Dialer functions. Also, with the optional EJ-8U DTMF Decoder board installed, the DR-599T can be remotely operated from another transceiver.

Check out the affordable technology of the 90's. Check out ALINCO.

ALINCO ELECTRONICS INC.

ALINCO ELECTRONICS INC.
438 Amapola Avenue, Unit 130, Torrance, CA 90501
Tel. (310) 618-8616 Fax (310) 618-8758

Two Year Limited Warranty.
Specifications and features are subject to change without notice or obligation.

CIRCLE 179 ON READER SERVICE CARD

MODERN, MULTI-BAND ANTENNA SYSTEMS

COMET

For COMET Customer Service: Call NCG Company

714/630-4541

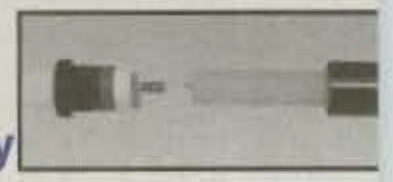


PHOTO A

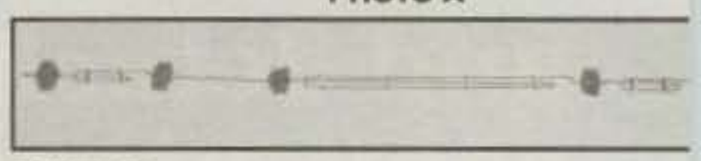


PHOTO B

COMET developed the Super Linear Converter (SLC) System to increase the actual gain of Dual/Triband antennas.

- A completely pre-formed phasing coil and phosphorus copper element eliminates additional components and gain loss. (Photo B)
- The SLC is electrically very efficient, providing a low angle of radiation directly to the horizon, for maximum performance. (Photo B)
- COMET sectional antennas use ABS (Transparent to RF) connecting joints for the finest pattern and easiest assembly. (Photo A)

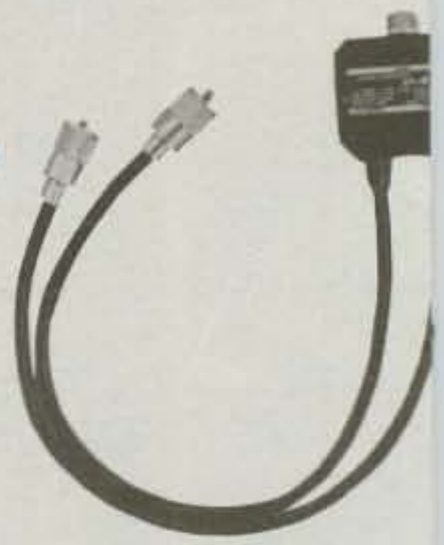
CFX-4310

CFX-431

COMET DUALBAND ANTENNAS

MODEL #	BANDS	GAIN	MAX PWR Watts	CONN	WEIGHT Lbs' oz"	LENGTH Ft' In"	MAX WIND SPEED MPH
DualBand Base Station/Repeater Antennas							
GPX-2010 SLC	2M/70cm	9.5/13.2	200	SO-239	7'14"	23'4"	65 w/o guys 90 w/guys
	Nylon Guys Included. Highest Gain Dualbander in the World!						
CA-2x4MAX SLC	2M/70cm	8.5/11.9	200	SO-239	5'11"	17'8"	90
CA-2x4WX SLC	2M/70cm	6.5/9.0	200	SO-239	3'8"	10'5"	90
CA-2x4FX SLC	2M/70cm	4.5/7.2	200	SO-239	2'12"	5'11"	112
NCG-1422B	2M/220MHz	2.15/3.4	200	SO-239	2'8"	3'8"	112
CA-350DB	10M/6M	2.15/6.5	100 FM	SO-239	7'8"	22'7"	65
CA-1243Z	70cm/23cm	9.4/12.8	150/50	N-Female	3'8"	7'5"	90
CA-1243E	70cm/23cm	6.0/8.4	150/50	N-Female	1'13"	3'4"	112
DualBand Mobile Antennas NEW B-Series BLACK ANODIZED Cellular Appearance							
B-10	2M/70cm	–/2.15	50	PL-259	–	12"	–
B10NMO	2M/70cm	–/2.15	50	NMO	–	12"	–
B-20	2M/70cm	2.15/5.0	50	PL-259	–	30"	–
B20NMO	2M/70cm	2.15/5.0	50	NMO	–	30"	–
NEW F Series: The Highest Quality DualBand Antenna You Can Buy!							
FL-62S	2M/70cm	3.6/6.0	150	PL-259	–	3'5"	–
FL-67S	2M/70cm	4.5/7.2	150	PL-259	–	4'11"	–
CA-2x4MB	2M/70cm	4.5/7.0	150	PL-259	–	4'11"	–
CA-2x4SR	2M/70cm	3.8/6.2	150	PL-259	–	3'4"	–
CHL-23J	2M/70cm	2.15/3.8	100	PL-259	–	20"	–
CHL-21J	2M/70cm	–/2.15	100	PL-259	–	12"	–
NCG-1422M	2M/220MHz	2.15/3.4	100	PL-259	–	3'0"	–
CHL-350	10M/6M	–/2.15	200	PL-259	–	7'0"	–

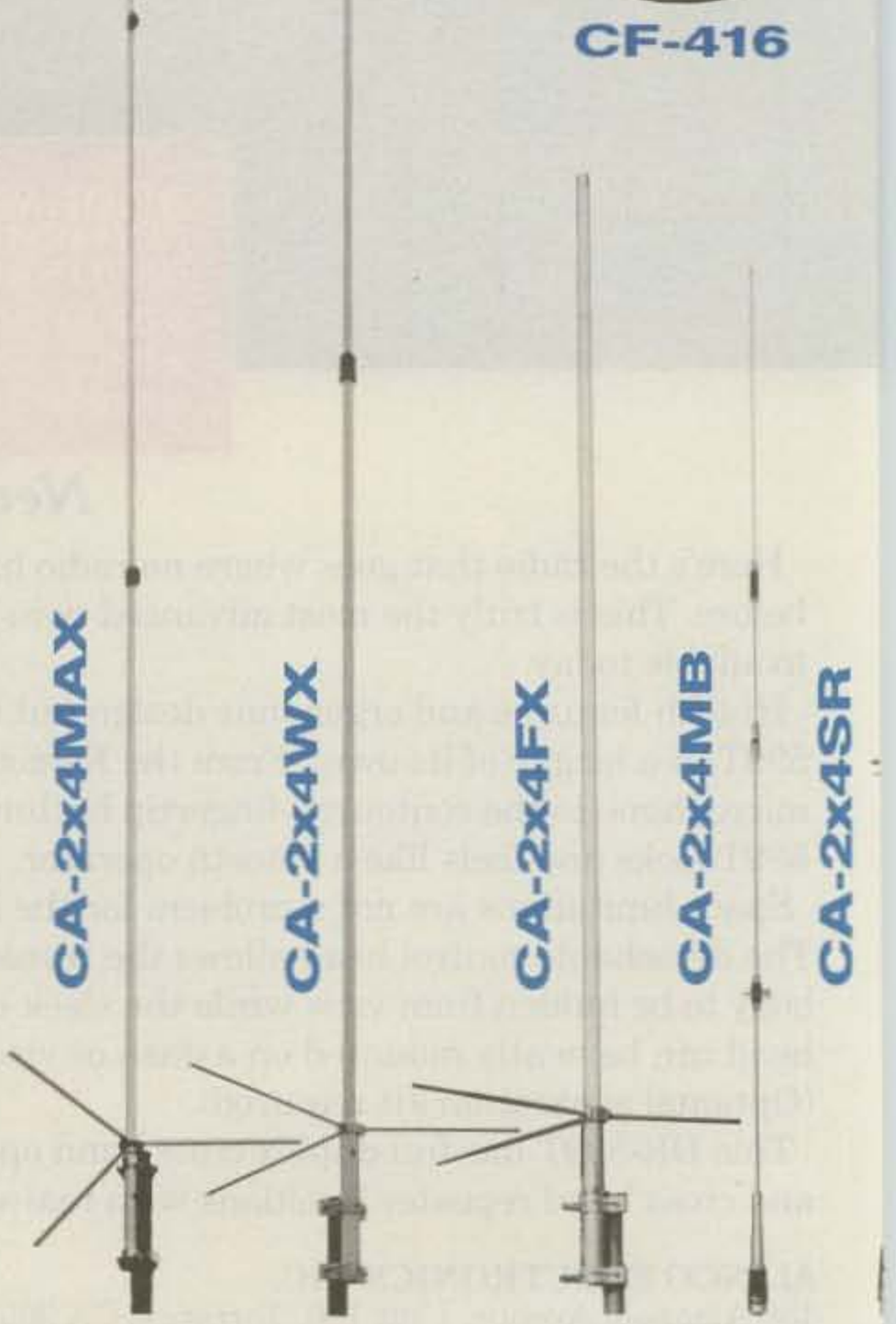
CF-4160



CF-416

COMET TRIBAND ANTENNAS

MODEL #	BANDS	GAIN	MAX PWR Watts	CONN	WEIGHT Lbs' oz"	LENGTH Ft' In"	MAX WIND SPEED MPH
TriBand Base Station/Repeater Antennas							
CX-725	6M/2M/70cm	2.15/6.2/8.4	200	SO-239	2'15"	7'11"	90
CX-902 SLC	2M/70cm/23cm	6.5/9.0/9.0	200	N-Female	3'3"	10'0"	90
CX-903	2M/70cm/23cm	6.5/9.0/13.5	100	N-Female	3'6"	9'8"	90+
TriBand Mobile Antennas							
CX-702	6M/2M/70cm	2.15/6.0/8.4	120	PL-259	–	6'10"	–
CX-801	2M/70cm/23cm	3.0/6.8/9.6	100	N-Male	–	3'3"	–
FL-95SN	2M/70cm/23cm	2.8/6.0/8.4	80	N-Male	–	2'7"	–
NEW! The Highest Gain 2M/220/440MHz Mobile In The World! Available from COMET, Of Course!							
CX-224	2M/220/70cm	2.15/3.6/6.0	150	PL-259	–	3'1"	–
CX-224NMO	2M/220/70cm	2.15/3.6/6.0	150	NMO	–	3'1"	–
NEW! QUAD-BAND Mobile Antenna. Simultaneous TX On 4 Bands. 6M And 2M Bands Are Constant. By Adding HF Coils, The CA-HV Can Be Used For 3 Or 4 Bands Easily!							
CA-HV	40/(20)/15/ 10/6/2Meters	HF –/2.15/3.4	120SSB	PL-259	MAX 1'3"	MAX 6'3"	– –
L-14	Optional 20M loading coil for the CA-HV.						



CA-2x4MAX

CA-2x4WX

CA-2x4FX

CA-2x4MB

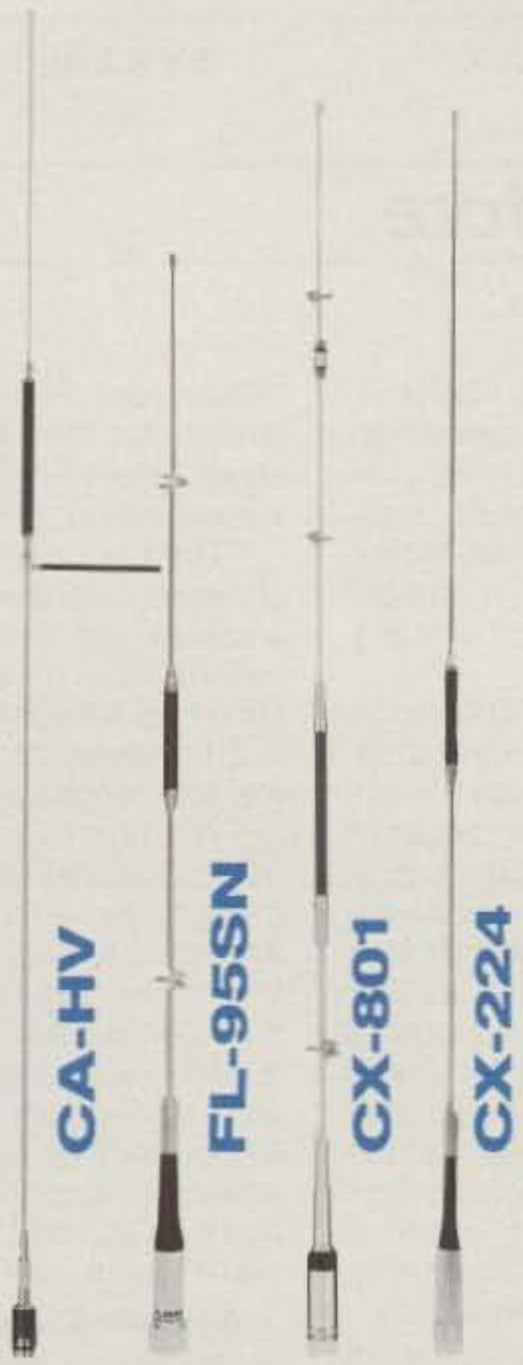
CA-2x4SR

S-80

RS-81

S-21

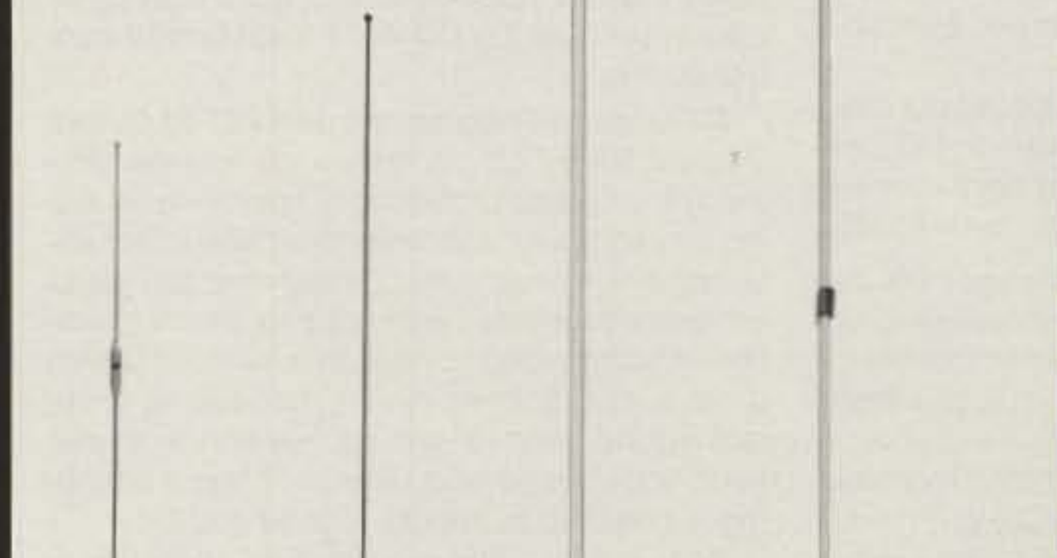
RS-9



CA-HV FL-95SN CX-801 CX-224

M Standard e assembly.

CK-5M Deluxe cable assembly.



FL-67S FL-62S B-10 B-20 CX-725 CX-902

COMET HIGH-POWER DUPLEXERS AND TRIPLEXERS

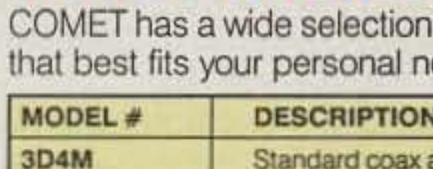
Zinc-Alloy, Die-Cast, Twin-Cavity. Low Input-Loss, High-Isolation, and HIGH-POWER. Modernize Your Station with COMET Antenna Products.

MODEL #	PORT	Freq MHz	CW Watts	PEP Watts	Loss dB	Isol dB	Mix Conn	Port Conn
CF-416A (2M/70cm)	LPF HPF	1.3-150MHz 400-540MHz	450 300	800 500	0.15 0.25	60dB 60dB	SO-239	PL-259 w/leads PL-259 w/leads
CF-416C (2M/70cm)	LPF HPF	1.3-150MHz 400-540MHz	450 300	800 500	0.15 0.25	60dB 60dB	N-Female	PL-259 w/leads N-Male w/leads
CF-4160I (2M/70cm)	LPF HPF	1.3-150MHz 400-540MHz	450 300	800 500	0.1 0.2	60dB 60dB	SO-239	PL-259 w/o leads N-Male w/o leads
CF-4160K (2M/70cm)	LPF HPF	1.3-150MHz 400-540MHz	450 300	800 500	0.1 0.2	60dB 60dB	SO-239	PL-259 w/o leads PL-259 w/o leads
CF-413A (70cm/1.2GHz)	LPF HPF	1.3-150MHz 350-500MHz 840-1.4GHz	450 300 100	800 500 200	0.25 0.25 0.4	55dB 55dB 55dB	N-Female	N-Male w/leads N-Male w/leads
CF-413B (70cm/1.2GHz)	LPF HPF	1.3-150MHz 350-500MHz 840-1.4GHz	450 300 100	800 500 200	0.25 0.25 0.4	55dB 55dB 55dB	N-Female	PL-259 w/leads N-Male w/leads
CF-413O (70cm/1.2GHz)	LPF HPF	1.3-150MHz 350-500MHz 840-1.4GHz	450 300 100	800 500 200	0.2 0.2 0.3	55dB 55dB 55dB	N-Female	N-Male w/o leads N-Male w/o leads
CF-350 (10m/6m)	LPF HPF	1.3-30MHz 50-240MHz	350 350	600 600	0.2 0.2	40dB 40dB	SO-239	PL-259 w/leads PL-259 w/leads
NCG-1422D (2m/220MHz)	LPF HPF	144-148MHz 220-225MHz	50 50	100 100	0.5 0.5	40dB 40dB	SO-239	PL-259 w/leads PL-259 w/leads
CFX-431A (2m/70cm/1.2)	LPF BPF HPF	1.6-60MHz 100-150MHz 350-500MHz 840-1.4GHz	600 450 300 100	1KW 800 500 200	0.2 0.2 0.3 0.4	50dB 50dB 50dB 50dB	N-Female	PL-259 w/leads N-Male w/leads N-Male w/leads
CFX-4310B (2m/70cm/1.2)	LPF BPF HPF	1.6-60MHz 100-150MHz 350-500MHz 840-1.4GHz	600 450 300 100	1KW 800 500 200	0.15 0.25 0.25 0.3	50dB 50dB 50dB 50dB	N-Female	PL-259 w/o leads N-Male w/o leads N-Male w/o leads
CFX-4310C (2m/70cm/1.2)	LPF BPF HPF	1.6-60MHz 100-150MHz 350-500MHz 840-1.4GHz	600 450 300 100	1KW 800 500 200	0.15 0.25 0.25 0.3	50dB 50dB 50dB 50dB	N-Female	PL-259 w/o leads PL-259 w/o leads N-Male w/o leads
CFX-514 (6m/2m/70cm)	LPF BPF HPF	1.3-90MHz 130-200MHz 380-500MHz	450 450 300	800 800 500	0.2 0.25 0.3	55dB 55dB 55dB	SO-239	PL-259 w/leads PL-259 w/leads PL-259 w/leads
CFX-514J (6m/2m/70cm)	LPF BPF HPF	1.3-90MHz 130-200MHz 380-500MHz	450 450 300	800 800 500	0.15 0.2 0.25	55dB 55dB 55dB	SO-239	SO-239 w/o leads SO-239 w/o leads SO-239 w/o leads
CFX-324A (2m/220/70cm)	LPF BPF HPF	1.3-150MHz 200-320MHz 390-500MHz	350 350 350	600 600 600	0.2 0.25 0.3	40dB 40dB 40dB	SO-239	PL-259 w/leads PL-259 w/leads PL-259 w/leads
CFX-324B (2m/220/70cm)	LPF BPF HPF	1.3-150MHz 200-320MHz 390-500MHz	350 350 350	600 600 600	0.2 0.25 0.3	40dB 40dB 40dB	SO-239	PL-259 w/o leads PL-259 w/o leads PL-259 w/o leads

COMET MOBILE MOUNTING SYSTEMS

COMET has a wide selection of mobile mounts, choose the mount and Coax Cable Assembly that best fits your personal needs. All COMET cables have detachable connectors.

MODEL #	DESCRIPTION
3D4M 3D4N	Standard coax assy. 13ft low loss coax w/UHF Connectors. Standard coax assembly with N-Conns. 13ft low loss coax.
CK-5M CK-5N	13ft VERY low loss cable + RG-188. Avoids cable damage upon vehicle entry. UHF Conns. 13ft VERY low loss cable + RG-188. Avoids cable damage upon vehicle entry. N-Conns.
5D4N	13ft VERY low loss cable assy. For 1.2GHz N-Connectors
The Following Mounts are w/o Coax. Choose from the Cable Assemblies Above.	
RS-80 RS-81 RS-21 RS-9	Heavy-Duty Gutter Mount, Black w/Dial lock. Heavy-Duty Trunk Lip Mount, Black w/Dial lock. Multi-Purpose Mount, Trunk-Lip/Hatch-Back, Black, Adj. to any position. Trunk Lip Mount, Black. For small antennas. (B-10, B-20, CHL-23J, etc.)
MS-3FVMM	Mag Mount, 13ft low-loss cable. 12 pole magnet. UHF Connectors
MS-5LXMM MS-5LXNN	Mag Mount, 13ft low loss cable + 10" RG-188 to avoid water leak/cable damage. Mag Mount, 13ft low loss cable + 10" RG-188, N-Connectors
TS-103MM TS-106NN	16.5ft low loss cable and trunk Lip mount, UHF Conns 16.5 VERY low loss coax + 10" RG-188, N-Connectors.



Detachable Connector
All Comet assemblies use this connector for easy installation.

COMET SWR/POWER METERS

MODEL #	DESCRIPTION
CD-270	Bench Meter, illuminated. 140-525MHz Pwr Range: 15/60/200W Low Inser. loss UHF Connectors, 50 Ohm impedance. Measure and Monitor, SWR Fwd AND Ref Power.

COMET Minimeters: Measure SWR 1.0-5:1 Imped: 50 Ohm Weight: 5 oz.

CM-200	140-150MHz	PWR Range: 15/50 Watts
CM-300	220-240MHz	PWR Range: 15/50 Watts
CM-400	430-450MHz	PWR Range: 15/50 Watts
CM-420	140-440MHz	PWR Range: 15/60 Watts
CM-1200	1240-1300MHz	PWR Range: 10/60 Watts

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

Letters and More

Last time we got together we focused on some books of interest to the well-read amateur. This time we shift focus to our ever-full mailbag. Let's dig in.

Mail Call

40 Meter Dipole Experiments de K6WS. We start to peek into the mailbag with a letter from Earle Grandison, K6WS. Earle wrote to let us know of some matching experiments he ran using a 40 meter dipole fed with 600 ohm openwire line and using the Johnson Viking Match Box and Dentron MT-2000A antenna tuners. Earle is particularly enthusiastic over the improvement in tuning ability gained from using an external variable inductor and variable capacitor across the output of the Match Box:

"Many authors recommend against using 4:1 baluns with balanced feeder impedances higher than 300 ohms or with high reactance conditions. Walt Maxwell, W2DU, in his book *Reflections* shows that a quarter-wavelength dipole centerfed with a low-loss openwire feeder is almost as efficient as a half-wavelength centerfed dipole. Because of my typical urban lot size I decided to use a 66 foot dipole, fed with 60 feet of 600 ohm openwire feeder as an antenna system for 75/80, 40, and 30 meters.

"Results have been excellent on these bands. I receive better reports on 75/80 meters when using the system with a Johnson Match Box balanced antenna tuner instead of a 'T' network with 4:1 balun. There doesn't seem to be any noticeable difference on 40 meters between either type of tuner.

"Tests were made to confirm the efficiency of a balanced tuner and a 'T' network tuner with various 4:1 baluns. The Johnson Match Box required capacitive reactance across the feedline to tune for a 1-to-1 match on 75/80. The ability of the Johnson Match Box to tune reactive feeders can be improved by installing a variable inductor and a variable capacitor with an SPDT porcelain knife switch across the balanced feeder output. If inductive or capacitive reactance is required to obtain a match, it can be switched in when needed."

For his tests—conducted at 3510, 3836, and 7010 kHz—Earle used five different antenna tuning unit configurations: (1) Johnson Match Box with external XC or XL as required; (2) Dentron MT-2000A with internal 4:1 balun; (3) Dentron MT-2000A with a Van Gorden 4:1 balun; (4) MT-2000A with a Radio Works "Remote Balun"; and (5) MT-2000A with a ferrite bead 4:1 balun.

Earle sent us his results showing RF current in each feeder of the 600 ohm transmission line. The test results, as expected, showed little difference in RF current between the tuning unit configurations on 40 meters, where feeder input impedance was about 200 ohms. However, on 75/80 meters, where the feeders showed high reactance, the results varied considerably between configurations. On these bands, measured feeder current was considerably higher using the Match Box with the external variable inductor and variable capacitor than with any of the other three configurations.

317 Poplar Drive, Millbrook, AL 36054

More on the GAP Challenger DX. In the January column we discussed the GAP Challenger DX "center launch technology" multiband vertical antennas, a discussion begun in the December 1989 and April 1991 columns. In January we mentioned some practical problems of antenna installation that one reader (Robert A. Wanderer, AA0CY) had in installing his GAP vertical, problems that were solved promptly after technical consultation with the factory. In the same column we also mentioned our meeting with GAP's George Henf, KK4CW, at the 1991 Atlanta HamFestival. GAP's Richard Henf saw our remarks in print and wrote to further stress the need to obtain technical consultation when a product doesn't seem to work right:

"What I particularly liked about your editorial was the reference to Robert [AA0CY] calling the factory, because something did not appear correct. I am amazed at how many people buy something, put it together, check their results, find they are higher or worse than specified, and accept this as the norm or the best they can achieve. The reason I am surprised is because it tells me people are getting used to accepting less than that which has been advertised .... Probably the one item we stress most is if you have any questions or something does not appear correct, call us."

Good point. And what he says applies not only to antennas, ham gear, or software, but to just about *anything* you buy with your hard-earned cash: Don't meekly accept substandard results.

Still More on the GAP Challenger DX de WN6J. The January column prompted a lengthy letter from Bill Drummond, WN6J. Wrote Bill in describing his clever minimum-space installation:

"I have had a DX-VI on the air for 5 months, since moving to this QTH.... The DX-VI is never going to replace a Yagi, but I have found it to be an excellent 'compromise' when space limitations don't permit a ground-mounted tower. (I have no side yards, no front yard, and no backyard.)

"I do have a second-story porch, so I mounted the DX-VI on it by sticking the ground mount into a prefab concrete base for a patio umbrella which can be obtained at most patio furniture stores. I guyed the antenna with four ⅛inch braided Dacron lines spaced 90 degrees apart and attached to the upper walls of my house. The guys are attached to the antenna just above the center insulator, as recommended by the manufacturer.

"I have three 'radials' extending horizontally at the level of the base of the antenna, spaced 120 degrees. Two of the 25 foot 'radials' extend straight for their full length and one extends about 10 feet and is then bent at 90 degrees for the remaining 15 feet.

"The base of the antenna is about 15 feet above ground level, but the antenna works like a charm—*far* better than any other vertical I ever used.... It loads well on all bands, though I don't work the low bands very much.... SWR is 2:1 or *lower* on all bands at the mid-point of the SSB range.

"We have had two pretty good storms with 50 mph plus winds—no problems except one metal screw, which fastens three wires together and holds through the plastic center insulator into one leg of the antenna, worked loose. I took the antenna down, fixed that, and put Loctite® *[a thread locking compound available in most hardware and auto stores; a similar product, Lock-It®, is made by Duro™—ed.]* on all the metal screws to stop that problem from happening again.... In short, it is a great vertical antenna and it works just fine when roof mounted."

Antenna Suggestions de WA0KKC. Richard Mollentine, WA0KKC, continues to keep the *CQ* FAX machine busy with yet another tower hint. He found that his Telex Hy-Gain Tail Twister® rotor control box had shadows on the face plate and was rather hard to see. To remedy this, he repositioned the clip holding the bulb to remove most shadows on the face plate and also replaced the No. 1819 bulb (0.34 candlepower) with a No. 313 bulb (3.5 candlepower). The result is a brighter and easier-to-see display. Richard notes that his tip should also work with other rotors, such as the CD 4511 and Ham-IV control boxes.

RF Ground Tribulations de KA8FFL/7. Ken Gilcrest, KA8FFL/7, recently wrote to lament the many frustrating problems of operating HF using limited-space antennas in an apartment environment. Ken says that he has read countless articles about small antennas for these conditions and has used several small antennas with great success. The problem, he feels, is to obtain a good, solid RF ground. He wonders what to do about it and asks whether copper plumbing is required to secure a good ground.

Well, copper plumbing isn't an absolute requirement for a good RF ground, something many of us "single family residence dwellers" seem to take for granted. Some factors I have found to be helpful in minimizing "RF in the hamshack" problems include running several different ground leads in parallel, experimenting with insulated counterpoises on troublesome bands (where the hamshack is "hot with RF"), using an antenna tuner, keeping power levels low, and avoiding the use of voltage-fed antennas (such as random wires) with the feedpoint in or near the hamshack.

In his letter Ken asked about such possible "solutions" to RF grounding problems as the MFJ-931 Artificial Ground unit and RF counterpoises. As it turns out, I reviewed the MFJ-931

FREE STARSHIP Rides!

Often we are asked "How can I get a ride in the Starship"? At our home base, Amateur Electronic Supply normally charges $40 (cost sharing) for a 16-minute ride. You, however, may qualify for a FREE ride if you are or have been a regular customer.

If, in the last 10 years, you have purchased at least $500 and have your invoice copies from **Amateur Electronic Supply**, **Audio Plus** and/or **Sterman Printing**, you would qualify for a FREE ride in the **AES Starship**. Persons purchasing $300 in the last 10 years can purchase a ride for $20. Persons qualifying for a free flight may purchase additional rides for $20 for immediate Family Members. Customers who have purchased at least $1000 can qualify for 2 free rides, etc.

What you must do is send us non-returnable photo copies of purchase invoices made within the last 10 years. Send them to the **AES Flight Department, 5710 W. Good Hope Road, MIlwaukee, WI 53223** along with your Work and Home telephone numbers and let us know what times you are normally at each number.

At various times we'll be giving rides at different locations. For example: For Wisconsin area customers we'll be giving rides at the uncongested Fond du Lac County Airport in Fond du Lac, Wisconsin, usually on Saturdays and Sundays. Some weekends we'll be giving rides at the Cuyahoga County Airport located east of Cleveland, just a few minutes from our Wickliffe store. Other weekends or days we'll be at the Executive Airport located next to the AES Orlando store. This will also be done at selected hamfests. Rides subject to good VFR weather.

Once you send us your qualifying invoice copies, we'll contact you sooner or later. In some of our future Catalogs we'll probably list some locations where you can redeem your FREE Flight Coupon.

Due to the short duration of the demonstration flights, only a few (or none) of the 7 ham radio stations aboard the Starship may be operational.

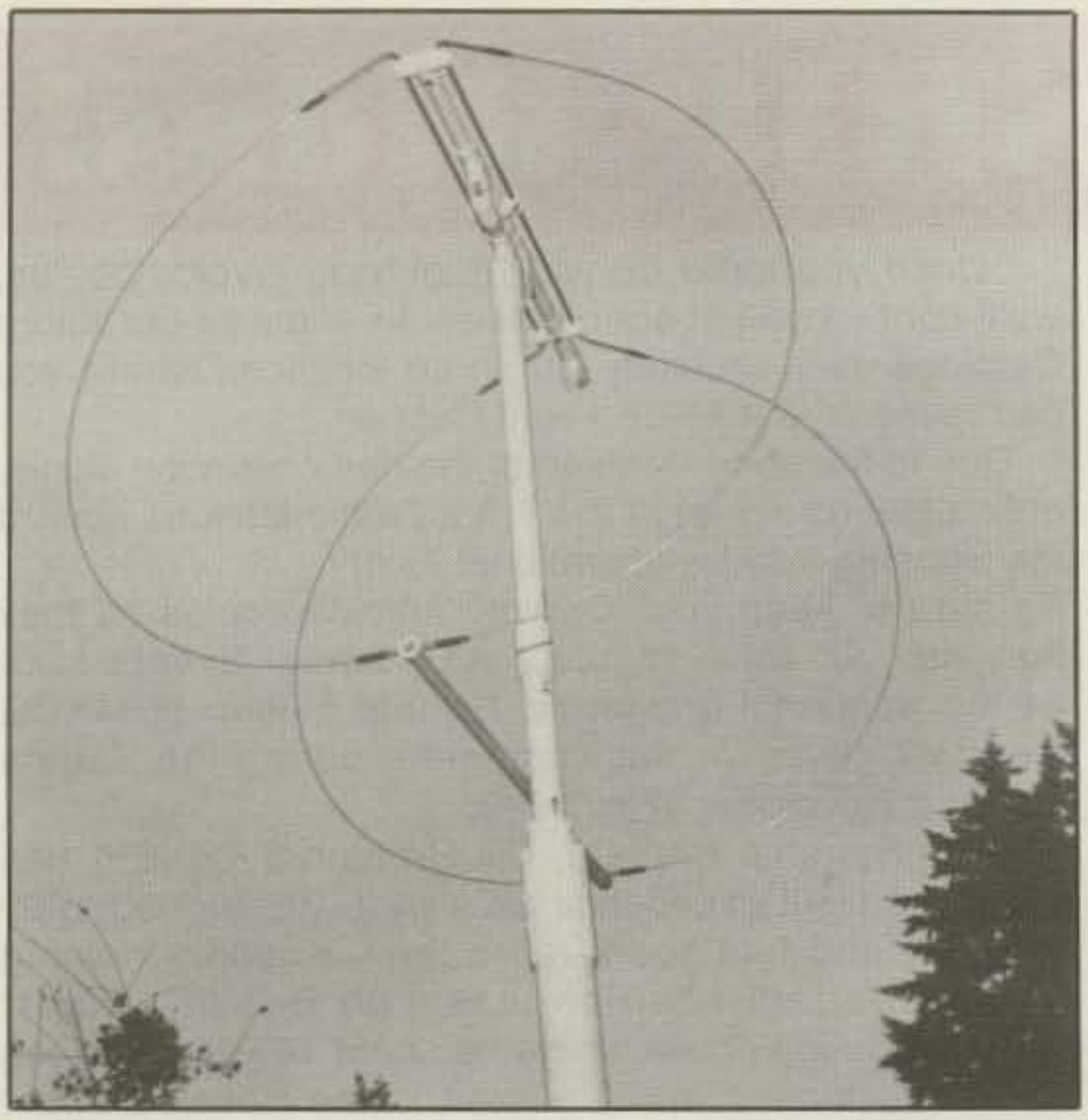
Be sure to keep your Original Invoice copies as they may be your ticket to future **AES Social Events** such as the wonderful and terrific **Ronnie Milsap WB4KCG Concert** given for our customers during the Tampa Hamfest November 18th, 1990.

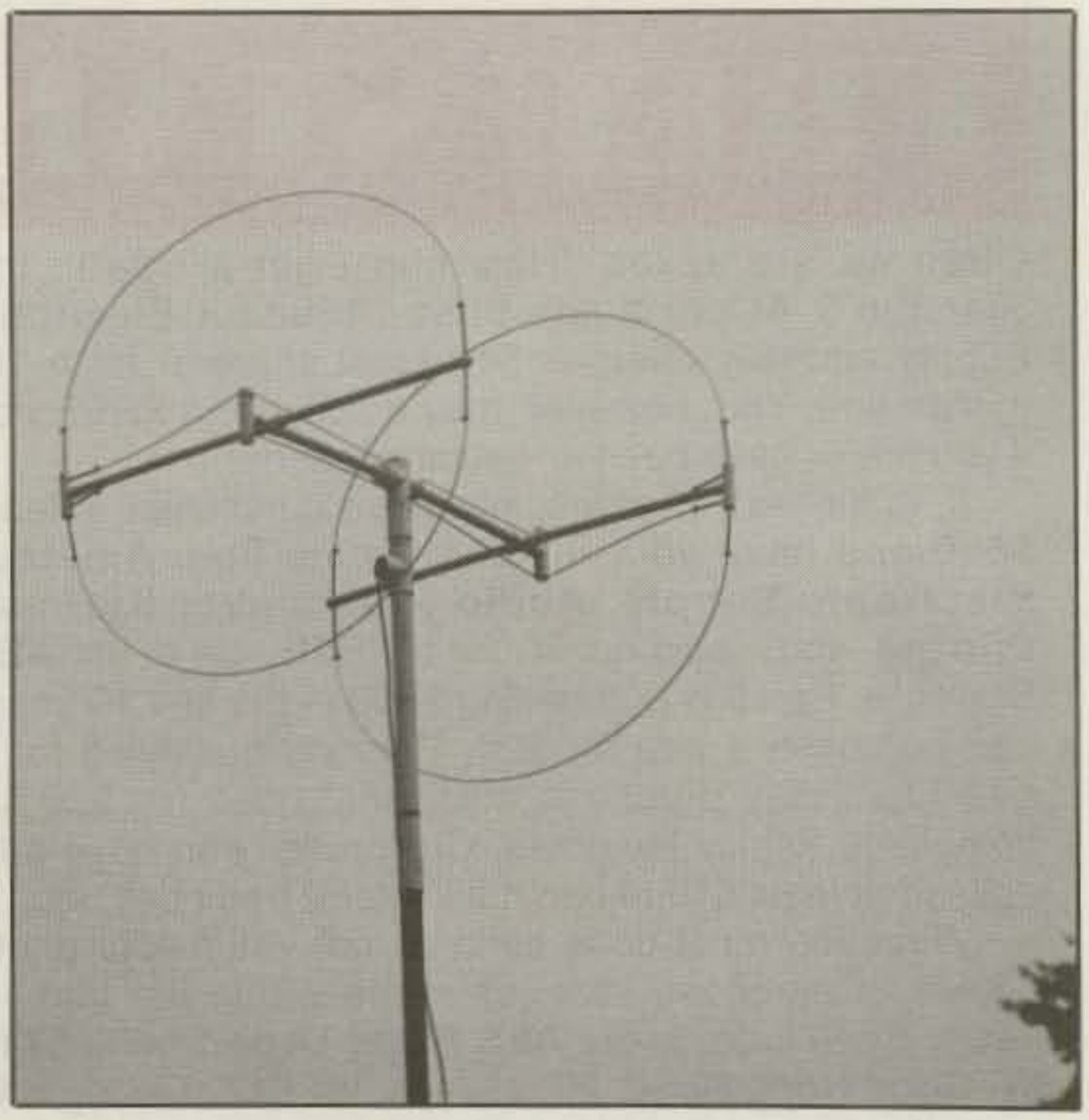
Our Starship Captain, Bill Brunton KAØSEP, has extensive flight experience as a pilot. Bill learned to fly in 1970, and has spent more than 20 years training pilots. His last position was with Beech Aircraft Corporation in Wichita where he spent 14 years training Beech customers on all aircraft in the Beech product line. Bill also was given authority by the FAA to give flight tests and issue Pilot Licenses. Bill possesses an Airline Transport Pilot Certificate, along with a Certified Flight Instructor Certificate. He has a total of 10,000 hours of flight experience. Bill earned an Amateur License with the call sign KAØSEP in 1984, and now holds an Advanced Class Amateur License. He enjoys 20 meter net operations, packet, and mobile HF operations. He has also operated in Mexico as XE2KWB, and Brazil as PY4ZBI. Bill lives in Fond du Lac, WI. with his wife Kay (KAØSEN) and his three children, Lisa, Elizabeth, and Billy.

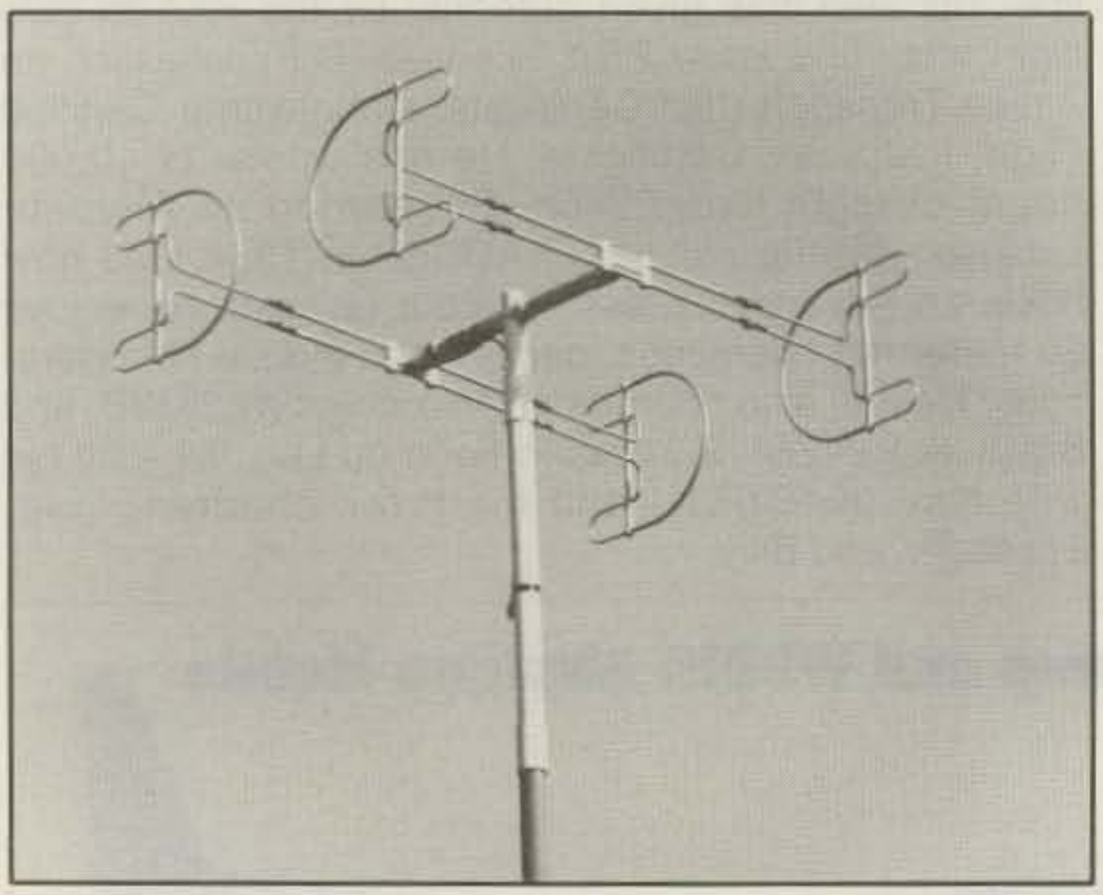
BILL KAØSEP
Starship Captain

The AES Starship and W9DIA Airplane Mobile

Photo courtesy of:
Jim Gilmore
Fond du Lac County Sheriff







(Above left) The H. Stewart DX Hidden Asset Loop Antenna is a two-loop design especially for use where conditions preclude outside antennas. Frequencies covered by the individual kits include the 2, 6, 10, and 12 meter bands; plans alone are available for 80 and 160 meters.

(Left) The II-DX Directional Antenna is a two-element directional beam for space-limited applications that's available for 2–12 meters. The II-DX uses a variation on the Hidden Asset design to make each element a full-wave loop at the frequency of choice. Feed is direct with 50 ohm coax, and you can install the antenna either vertically or horizontally.

(Above) Also offered by H. Stewart Designs is the ZHA Loop Antenna. This is a custom-designed Hidden Asset design variant that has a longer radiator and a bipolar omnidirectional pattern. (Photos courtesy H. Stewart Designs)

in the February 1988 column. To recall, the MFJ unit is designed to help create a usable RF ground, especially when using random-length antennas. The unit effectively places your rig near actual earth ground potential even if located on the second or higher floor, with no direct earth ground possible. The unit reduces the electrical length of the ground connection wire to almost zero by tuning out its reactance.

Thus, the device effectively places a far-away ground directly at your rig for RF purposes. It also can tune a counterpoise, used as an artificial ground when a "real" RF ground isn't available. It does this by tuning out the reactance of the counterpoise, accomplished by adjusting the variable inductor and capacitor in the unit. Doing so effectively resonates the random-length "ground" wire you may have strung along your apartment or condo floor.

So, then, what *is* a counterpoise? It's a type of capacitive ground that can be effective when an extensive buried ground system, or even a good "cold water pipe" ground, isn't available. To work best, the counterpoise should be large enough to have a considerable capacitance to ground, meaning that it should cover as much ground area as you can manage. The counterpoise's shape can be anything that's convenient; oblong or square designs are fairly easy to construct. Often large-area counterpoises are up to a half-wavelength in radius, although the actual radius or the length of individual wires which make it up aren't critical.

These large counterpoises, however, aren't always realistic. For the simple, insulated-wire counterpoise you might install in a small apartment or condo, MFJ simply suggests an insulated wire no more than one-quarter wavelength at the operating frequency. The counterpoise's height isn't important, although it should be routed so as not to be tripped over easily. If outdoors, that means installing it 7 to 10 feet above ground. It's best not to let the counterpoise touch the earth; if it does so, losses are likely to be increased in that the counterpoise tends to act as a poorly conducting ground.

Program Update de K4HXW. Harold J. Tucker, K4HXW, says he found an error in the REACTANCE routine in the widely circulated HAMCALC.BAS IBM PC BASIC program. Harold says he discovered the error after he had manually worked a problem in reactance and tried to duplicate it using the HAMCALC.BAS program. He noticed that one answer was just twice the value of the other, and this led to his finding two erroneous lines.

Although he's not a programmer, Harold will send instructions on fixing the program for an SASE. Address it to Harold J. Tucker, 4200 S. A 1 A Hwy., Melbourne Beach, FL 32951.

On "Finding Things" de W9SS. Dennis G. Eksten, W9SS, wrote asking about the problem of trying to find something (such as a computer program review) in a previous Antennas and Accessories column, noting that it takes a great deal of time to go through many years of columns (we took over the byline in 1980).

Yes, in the "information age" finding things is a very real problem. For my own use, I use a personal information manager (PIM) called SQUARENOTE™, to keep track of when I published something. The PIM lets me tell you when I previously covered a topic, or direct a reader to a previous column when he or she is in search of something "that I wrote up a couple of years

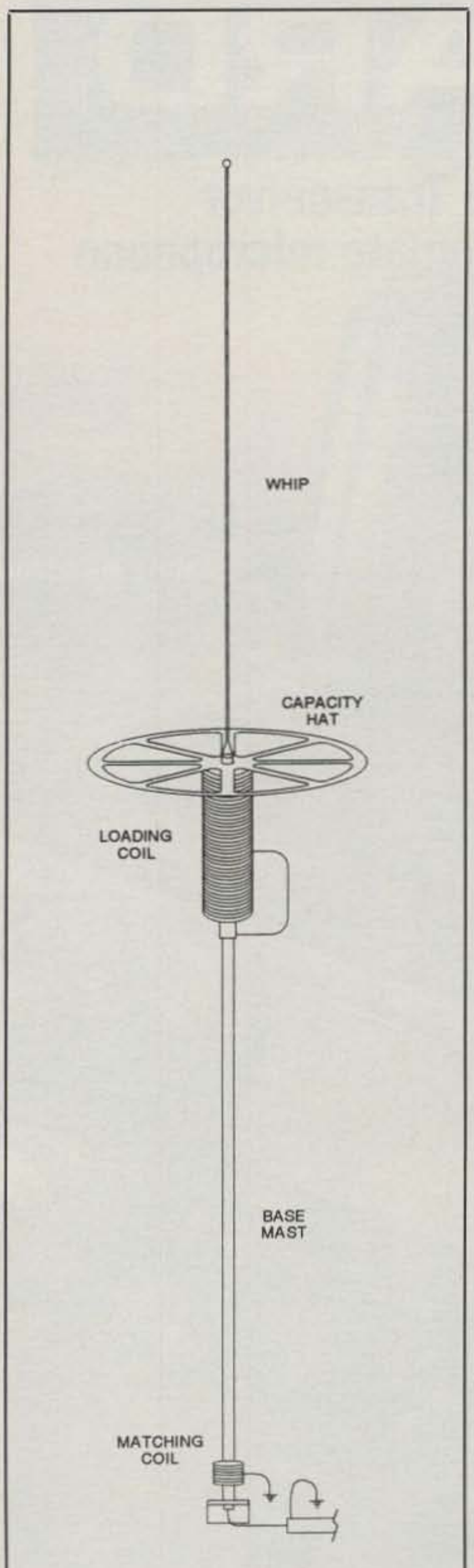


Fig. 1– The WB5TYD Texas Bugcatcher bills itself as "the serious HF mobile antenna," and for good reason: It's a physically large antenna that characteristically puts out a splendid mobile signal. Here's a sketch of the big-signal antenna, which consists of five major components: whip, capacity hat, center loading coil, base mast, and matching coil.

ago." Also, I keep text files of previous articles on my hard disk (and plan to, until the hard disk fills up) and use commercial text-retrieval search software using various key words and phrases.

I haven't found the time or inclination to publish a bibliography or compendium of amateur radio software, as Dennis suggested. Anyway, the problem of retrieving information in the various amateur magazines is much bigger than just this column. The most practical solution probably is to make use of the various hardcopy and computerized amateur radio publication index databases that Rich Rosen, K2RR, issues. I suggest his "From Beverages to OSCAR—A Bibliography" computer database, which covers not only *CQ*, but also *QST*, *Ham Radio*, *73*, and *RadCom* (British). I reviewed Rich's bibliographic offerings in the March column and provided an overview of what he offers and what indexes can do for you. Or write to Rich at Didah Publishing, P.O. Box 7368, Nashua, NH 03060-7368 for further information.

Antenna Notes

H. Stewart Designs. A recent letter from Henry Stewart updated his firm's antenna products, which we first covered in the July 1988 issue. He sent several photos, reproduced here, which graphically illustrate three of the most popular designs.

The DX Hidden Asset Loop Antenna (reviewed in February 1984 *73* magazine) is an unusual two-loop design originally intended for use where rules or conditions preclude outside antennas. Frequencies covered by the individual kits include the 2, 6, 10, and 12 meter bands. The radiation pattern is omnidirectional, and bandwidth at the 1.5:1 SWR points is claimed to be 5 to 8 percent of the resonant frequency. You can purchase a complete kit, or just the plans alone to cover those bands or 80 and 160 meters.

The II-DX Directional Antenna is a space-limited, inconspicuous two-element directional beam that's available in about the same (2–12 meter) band scheme as the Hidden Asset series. The II-DX uses a variation on the Hidden Asset design to make each element a full-wave loop at the frequency of choice. Feed is direct with 50 ohm coax, and the antenna can be installed either vertically or horizontally. A 1:1 balun and matching coax section are furnished. The SWR at the 2:1 bandwidth is about 6 to 7 percent of the resonant frequency. Gain is said to be about equal to that of a two-element quad. The antenna can be tuned for a bidirectional pattern or for maximum front-to-back (F/B) ratio.

Also offered is the ZHA Loop Antenna. This is a custom-designed Hidden Asset variant that has a longer radiator and a bipolar omnidirectional pattern. It's for use in small spaces.

The firm also makes two popular accessories. One of these is the DX Quick-Shift Antenna Mount. This is a handy mobile accessory that mounts on the vehicle roof or sidewall. It simplifies getting on the air when you back out of your garage and retracting the antenna when you drive back in. You can raise and lower the antenna from inside your vehicle and lock the antenna vertically or horizontally.

Another H. Stewart accessory is the MagCup Mobile Antenna Mount. This is a combination magnet mount and support arm to better resist wind and other impacts and to make antenna removal fast and easy. It's said to safely hold up to a quarter-wave 6 meter antenna or lightweight base- or linear-loaded 10 meter antenna. A coiled-steel mounting spring is available for the MagCup; a double-magnet model is offered, too. For a catalog contact H. Stewart Designs, P.O. Box 643, Oregon City, OR 97045.

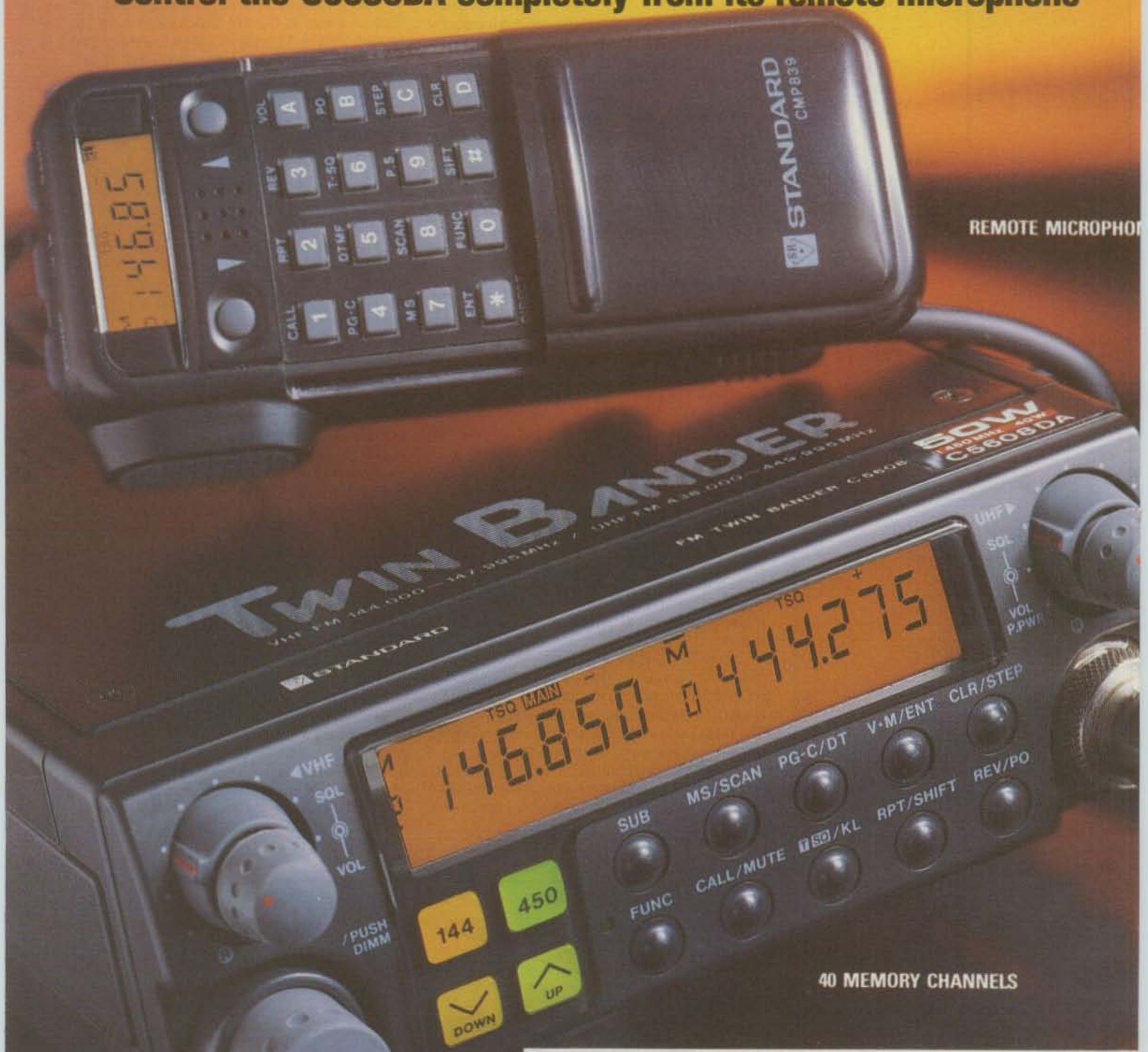
The Texas Bugcatchers. The Texas Bugcatchers are serious HF multiband mobile antennas that are manufactured by two small and unrelated Texas businesses.

Henry Allen, WB5TYD, offers his big, husky Bugcatchers. They are flexible mobile antennas that you can configure mechanically and electrically for your own needs and desires over the range 3 to 30 MHz. The antennas are center loaded, since in HF mobile work the center-loaded antenna usually has the highest radiation efficiency. A base mast of 3 to 5 feet and an upper whip of 4 to 7 feet is used. Several different loading coils covering 10 through 40 or 80 meters are available, depending on your operating preferences. A special coil for 160 meters also is available.

A major feature of the Texas Bugcatchers is the capacity hat. Since most of the loss in loaded mobile antennas is in the loading coil, it's important to reduce the inductance required. By adding a capacity hat, the resonant frequency of the antenna is lowered considerably; thus, a sizable amount of the loading coil can be re-

STANDARD®

New C5608DA True Twin Band Mobile Transceiver
Control the C5608DA completely from its remote microphone



40 MEMORY CHANNELS

OTHER KEY FEATURES:

- Unbeatable 0.158uV sensitivity.
- 50 Watts out on 2M, 40 on 70cm, 10W Mid and 3W Lo.
- Eight kinds of scan, including scan for correct CTCSS.
- Industry standard DTMF paging and code squelch.
- Repeater mode plus Full Duplex Cross Band Op.
- Impressive display and logical operation.
- Separate Volume and Squelch controls for each band.
- Automatic mute gives priority to one band.
- Built in CTCSS Encode/Decode.
- Much more...

BROAD RX FREQUENCY COVERAGE: VHF RX 115 MHz to 180 MHz (with less than 0.158uV sensitivity for 12DB SINAD between 130 and 165 MHz typical, spec guaranteed in ham bands only). Plus incredible UHF RX capability of 328 MHz to 500 MHz! Supplied TX is Amateur Bands only, but can be modified for MARS & CAP, proof of participation is required.

For more information on this and other STANDARD products, contact yoer nearest STANDARD dealer.
Specifications, price and features are subject to change without obligation or notice.

Standard Amateur Radio Products, Inc.
P.O. Box 48480
Niles, Illinois 60648
(312) 763-0081

CIRCLE 152 ON READER SERVICE CARD

STANDARD

STANDARD®

C558A TWIN BAND 2 METER / 70 CM HANDHELD

THE WORLD'S "STANDARD" OF EXCELLENCE

INTERCHANGEABLE 40-200 CHANNEL MEMORY CHIP

23 MENU AIDS FOR EASY PROGRAMMING

- MAKE NO MISTAKE THIS IS THE MOST ADVANCED HAND-HELD IN THE HAM MARKET
- REPEATER CROSSBAND MODE
- BUILT IN CTCSS ENCODE/DECODE
- WIDE BAND RECEIVE
- INTERCHANGEABLE BATTERIES AND ACCESSORIES WITH THE C228A, C528A AND C628A
- FULL DUPLEX OPERATION
- VERSATILE SCANNING MODES ALLOWS YOU TO LOCATE THE ACTION QUICKLY
- TRUE TWIN BAND HANDHELD WITH SEPARATE VOLUME AND SQUELCH CONTROLS
- RECEIVE SENSITIVITY IS UNBEATABLE, 0.158 uV FOR 12 dB SINAD
- LOWEST POWER REQUIREMENT FOR MAXIMUM BATTERY LIFE
- DIRECT FREQUENCY INPUT FROM THE KEY-BOARD

For more information on this and other STANDARD products, contact your nearest dealer or call STANDARD Amateur Radio products at (312) 763-0081.

Specifications, price and features are subject to change without obligation or notice. All products carry a ONE YEAR limited warranty.

STANDARD

STANDARD Amateur Radio Products, Inc.
P.O. Box 48480
Niles, Illinois 60648

CIRCLE 168 ON READER SERVICE CARD

moved. Another use for the capacity hat is to reduce the mechanical length of the antenna, a consideration on 75/80 meters. Four different-size capacity hats from 8 to 20 inches in diameter are available.

The Texas Bugcatchers are offered menu style, with five different loading coils, nine masts, and assorted whips, matching coils, mounts, quick disconnects, coil clips, and spade lugs available for customization. A special van mount is sold for mounting the antenna on full-size vans and other large utility vehicles; a shorter suburban mount is for suburbans and other utility-type vehicles. Details are available from Henry Allen, WB5TYD, at GLA Systems, P.O. Box 425, Caddo Mills, TX 75135. Fig. 1 is a sketch of the typical WB5TYD Texas Bugcatcher configuration.

Don't go away: There's another high-performance Bugcatcher out of Texas. This version is by Jim Alexander, W5UVF. It's somewhat similar to the GLA designs but is slightly smaller. The antenna is about 9 feet tall overall. The assembly, which should be guyed, consists of four main parts: a stainless-steel base section, a bandswitching resonator, a stainless-steel spring, and a tapered steel whip. Various versions are available for 10 to 80 meter bandswitching coverage, eliminating the need to carry extra resonators and antenna sections. The antenna uses an efficient, hi-Q inductor which can be set up with pretuned taps for any desired band or specific operating frequency.

For a catalog, contact Jim Alexander, W5UVF, Texas Radio Products, 5 East Upshaw, Temple, TX 76501.

W9INN Antennas Update. Bill Fanckboner, W9INN, has been selling antennas for about 10 years and making them for more than 50. That's about the number of years I've walked this earth!

Anyway, Bill's bag of antenna tricks focuses on multiband slopers (10 versions) and multiband dipoles (21 types at last count) that boast various coverage options from 160 through 10 meters, including the newly popular 30, 17, and 12 meter WARC bands. Bill also offers the popular 43 foot, 9-band "Eavesdropper" shortwave receiving antenna.

The newest W9INN antenna is the 5-band "Hideaway" MDX-5C Space-Saver Dipole, a 52 foot skywire designed for 80/75, 40, 20, 15, and 10 meter operation. The coax-fed antenna is intended for small lot, mobile home, portable, attic, and other use requiring a short, low-profile antenna.

Bill's antennas are furnished custom assembled complete with center connector, Dacron line, spreaders, and other needed accessories except for coax, which you provide. Incidentally, the term "custom assembled" means that Bill individually tailors each antenna for your operating environment. Thus, when ordering you're asked to state the center frequency for each band, and how high you'll hang the center and each end of a dipole. For slopers, he asks whether you'll tower-feed or ground-feed the antenna, and if it's to be tower fed, how high up on the tower you'll feed it.

For a flyer, which includes several sketches and useful configuration suggestions, send a long SASE with 52 cents postage affixed to W9INN Antennas, P.O. Box 393, Mt. Prospect, IL 60056.

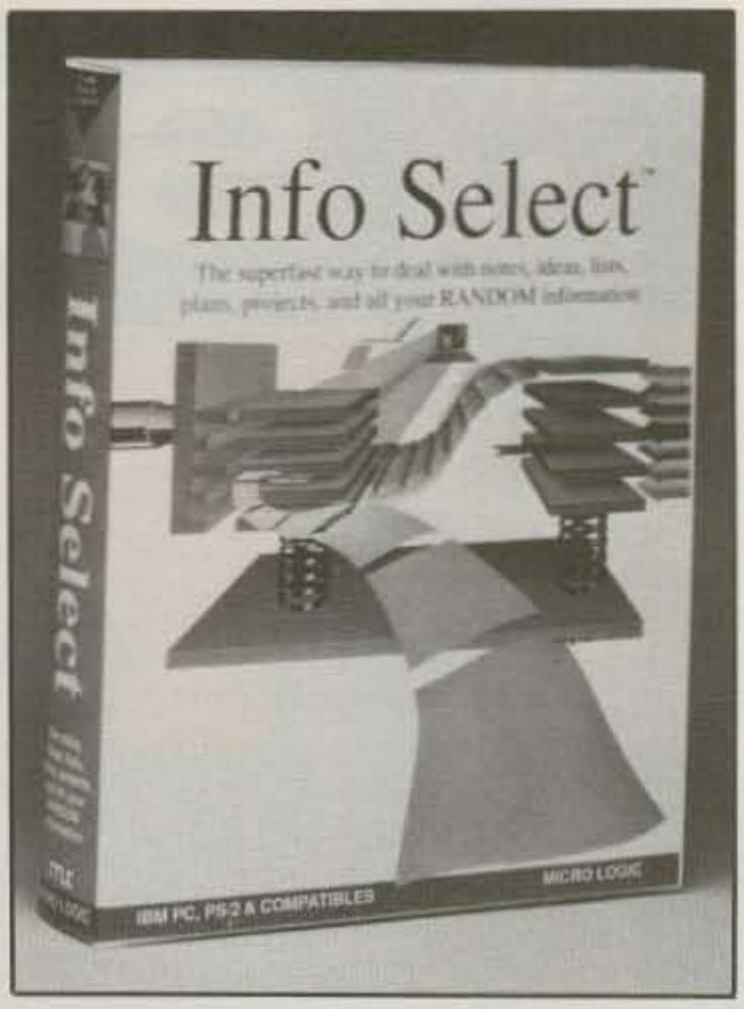
Software Topix

BOOTCON. One of the most frustrating things about the IBM PC is the way the special CONFIG.SYS file works. If you want to make a change, you have to reboot the machine to have the change take effect. Keeping tabs on the AUTOEXEC.BAT file is almost as annoying if you make many changes to it. Keeping "alternative configurations" for your PC via these two files (such as for DOS vs. Windows) is frankly a pain. What is needed is a simple and convenient method of selecting the desired system setup at boot time, without having to use multiple configuration files.

Several products address the problem of configuration control. One slick commercial product that takes care of the problem is BOOTCON. It's a device driver that replaces the continual editing or swapping out of your CONFIG.SYS and AUTOEXEC.BAT files with a single step. Using BOOTCON, the familiar CTRL-ALT-DELETE keypress sequence is effectively transformed into a hotkey that lets you configure your system from a simple menu. Unlike some other competing utilities, BOOTCON runs during each "boot," rather than after, and doesn't clutter your disk with multiple configuration files.

Once you've set up the program, on each boot BOOTCON presents you with a menu of up to 26 user-designed configurations which you can set up based on hardware, software, and memory options, as well as personal work preferences. If you do nothing during the boot, the program completes the boot using your default configuration. If you intervene, you can select any of up to 26 configuration choices.

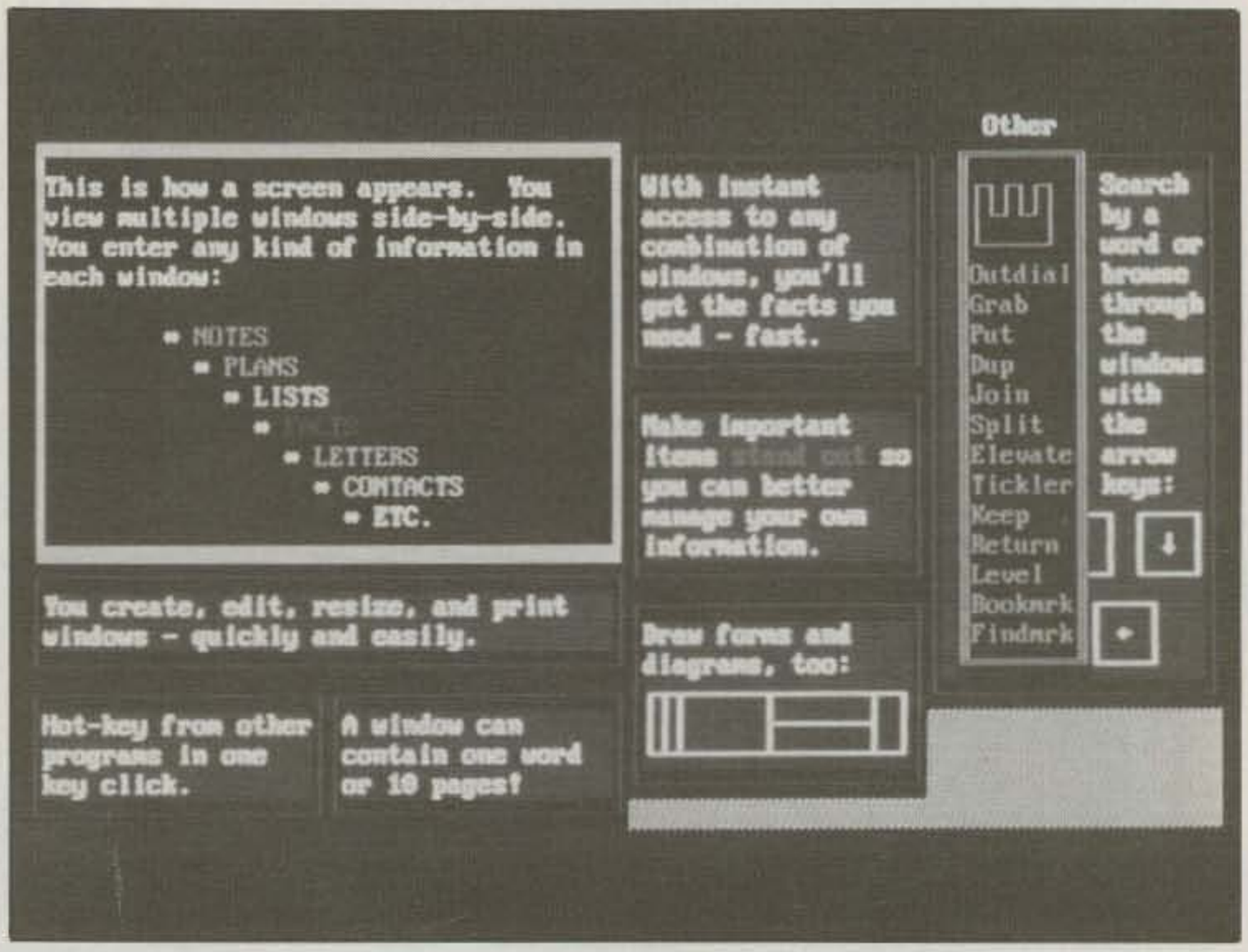
I found BOOTCON to be an excellent choice, and it performed flawlessly. My only objection is that while you now have just one CONFIG.SYS and AUTOEXEC.BAT file on your PC—no more confusing multiple configuration files—those two files grow mighty large. This is because all your alternate configurations now are stored in the single set of configuration files, and BOOTCON intelligently "reads" the previously set up embedded formatting codes or "configuration blocks" in the two large files during each boot.



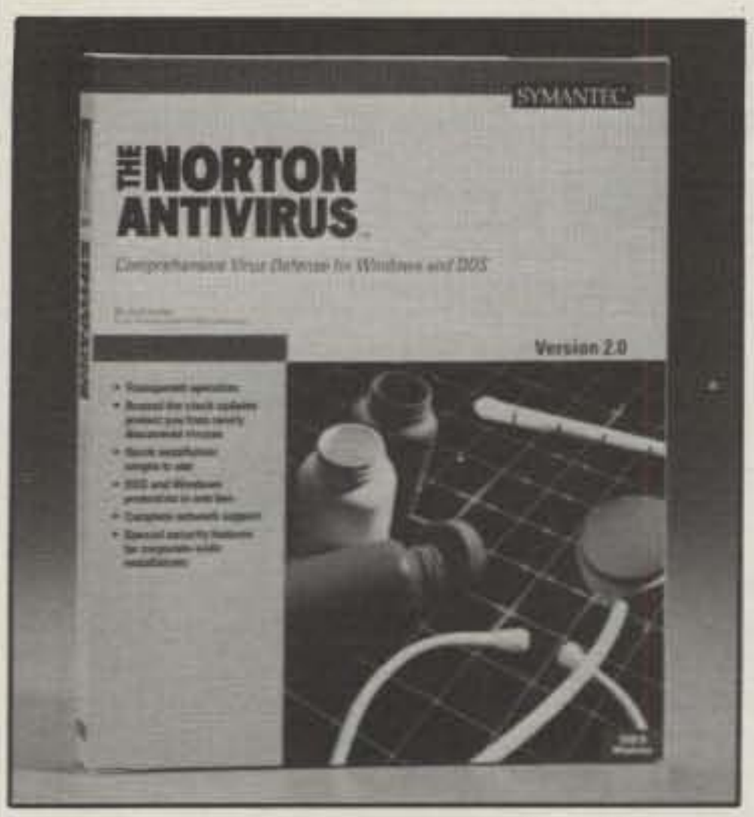
INFO SELECT 2.0 (shown here is the product packaging) is a very capable personal information manager (PIM). A PIM is a special database that allows you to readily enter, retrieve, analyze, and cross-reference data, not only numbers but also words. The kind of information the PIM is designed to handle is, as its name suggests, personal information—those hard-to-track random bits of information you encounter every day. (Photo courtesy Micro Logic Corp.)

Also, you need to be at least somewhat familiar with batch file programming to best use the program's powerful capabilities.

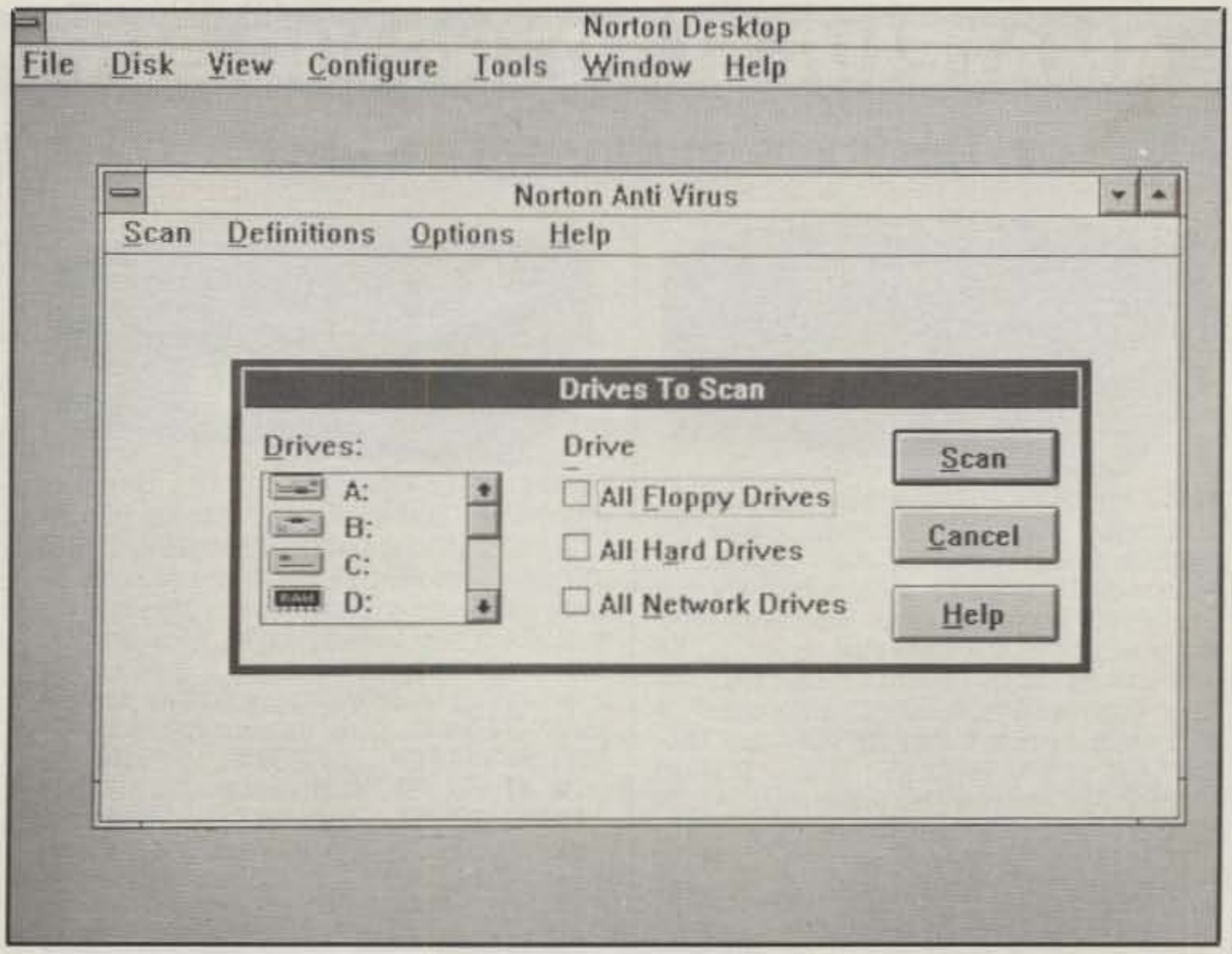
The $59.95 program is offered by Modular Software Systems, 25825 104th Ave. SE, Suite 208, Kent, WA 98031.



INFO SELECT 2.0 keeps your "infobase" information in intelligent, automatically positioned windows. Its advanced features not only help you instantly find the information you need, but also can help improve how you work, think, and make decisions. (Photo courtesy Micro Logic Corp.)



The Norton AntiVirus is designed to prevent viruses from infecting your PC operating under Windows and DOS. The program provides protection transparently in the background without interfering with your work. (Photo courtesy Symantec Corp.)



If you operate under Windows, you're in luck! The newest versions of the Norton AntiVirus have been improved in regard to Windows support. The program features a "Windows Scan Clinic" that offers capabilities that are at least comparable to the DOS version. (Photo courtesy Symantec

Note: If you want to go the shareware route to PC configuration control, consider AutoCon, which takes a much different approach. It's essentially a database manager for your AUTOEXEC.BAT and CONFIG.SYS files. The program enables you to keep up to 50 different configurations and to change easily between those configurations. It keeps all the configuration file sets in a single datafile and "writes out" the current set of files as the "real" ones the computer should use. The program is widely available on computer bulletin boards (BBSs), and full program registration is $15. For more information, contact Larry Weaver, P.O. Box 2639, Weaverville, CA 96093-2639.

INFO SELECT 2.0. In the December 1990 column we examined INFO SELECT, a very capable personal information manager (PIM). It's a direct descendant of Tornado, an early note-oriented PIM, marketed by Micro Logic.

A PIM is a special database ("infobase") that allows you to enter, retrieve, analyze, and cross-reference data, both words and numbers. The kinds of data the PIM handles are random bits of information you encounter every day, such as notes, names and addresses, parts lists, project plans, magazine articles, or even QSO log information. This type of information often doesn't fit easily into well-defined formats as does data that you can place in a conventional, structured database. A PIM can help you deal effectively with this hodgepodge. And, as we pointed out last December, INFO SELECT is easy to learn since it uses a data structure analogous to the familiar "stacks of paper" in which we tend to accumulate information.

INFO SELECT boasts some nice features. These include phone dialing, wordprocessing, and database functions; a computational capability; and overviews of your information. Other useful features include various sorting options, a hypertext capability, a date tickler, line drawing, mail merge, auto date stamping, "fuzzy" searching, expanded memory support, and many others.

Version 2.0 includes several new capabilities. Foremost is neural search, so named because of the similarity to the ways in which the human brain searches for and remembers things. Now the infobases can be searched for "best fit" matches in addition to existing "exact matches." Other new features include expanded sorting, highlighting of search result keywords, easier envelope and shipping label generation, better merging of infobase windows, sequential forms numbering, and more.

The program is optionally RAM resident and is compatible with various EMS drivers, Microsoft Windows, DESQView, and other complex environments. As with the previous version, the included swap utility allows the program to have an effective conventional memory size as small as 7K—very nice if you have other RAM-resident background programs operating on your PC.

The program is priced at $149.95, but previous users of INFO SELECT and TORNADO can upgrade for $49.95 plus $4.50 shipping. Also, a separate Windows version should be available soon. For more details, contact Micro Logic Corp., P.O. Box 70, Hackensack, NJ 07602.

The Norton AntiVirus 2.0. I already had a virus-free PC, thanks to The Norton AntiVirus 1.5, reviewed in the February column. Apparently, Symantec didn't think my PC was yet 100 percent clean, since they kindly sent me Version 2 to examine shortly after the original review appeared.

The Norton AntiVirus 2.0 is designed to work automatically, transparently, and continuously in the background, looking for any of over 1000 computer viruses and strains without interfering with your routine work. The program protects against virus infection and repairs files that are already damaged. It scans for viruses whenever a program is run or launched, and every time a file is copied or removed. If a virus is detected, the program can stop its further spread.

The updated version supports both Windows and "plain vanilla DOS," and it includes more virus detection and repair capabilities than previous versions. There are new user-configurable disk and file repair options; an easier process for adding virus definitions; recursive scan and repair (in which you only need to scan files once, while viruses are eliminated until the suspect file is "clean"); the ability to create a "rescue disk" that protects and recovers critical hard drive system information; storage of program "inoculation information" in a single file, thus requiring less hard disk space than in previous versions; and increased network compatibility.

Support for Microsoft Windows has been improved in the new version. There now are pop-up virus alert dialog boxes that provide comprehensive protection under Windows, and a "Windows Scan Clinic" that lets you scan for viruses, repair or remove infected files, add new virus definitions, and easily set configuration options, just as with the DOS version.

A nice convenience is that you can update the program yourself to protect against new viruses by adding "virus definitions" obtained from Symantec via FAX, telephone, BBS, or the Symantec Forum on CompuServe. You also can obtain virus updates by optionally subscribing to Symantec's quarterly virus definition disk service.

The retail price of The Norton AntiVirus is $129; special upgrade pricing is available for previous users. For more information, contact Symantec Corporation, 10201 Torre Avenue, Cupertino, CA 95014-2132.

Wrapping It Up

That's all for this time. Next time more Antennas & Accessories topics of current interest. See you then.

Overheard: Absolutely nothing is as unavoidable as a mistake whose time finally has come.

73, Karl, W8FX

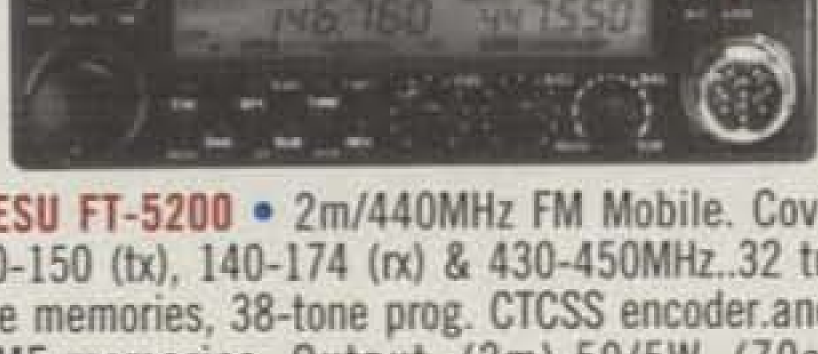
Low Discount Prices & Top Trades on YAESU Equipment at AES®

YAESU FT-736R • All-mode, 2M/430 multi-band VHF/UHF transceiver. Optional modules for 50MHz, 220MHz, and 1.2GHz. 10W out on 50MHz and 1.2GHz, 25W on the others. 14 VFO modes, 100 multi-function memories, 10 full-duplex memories. Satellite function, independent or syncronous operation of VFOs and more! Built-in AC ps, or 12V DC w/opt. power cord. 5⅛"h x 14½"w x 11½"d, 19.8 lbs............**$1922.00**

- **AD-3** 50w 2m/440 duplexer.......................... **48.00**
- **FEX-736-50** 6m module............................ **294.00**
- **FEX-736-220** 220MHz module.................... **322.00**
- **FEX-736-1.2** 1.2GHz module...................... **589.00**
- **FIF-232C** Interface; RS-232 .... **95.00**
- **FTS-8** Encoder/decoder................................ **55.00**
- **FVS-1A** Voice synthesizer............................. **37.00**
- **Keyer-B** Electronic keyer unit **19.00**
- **MD-1CB** Desk microphone **115.00**
- **MH-1B8** Extra hand microphone.................... **29.00**
- **SP-767** Speaker w/audio filters **99.00**
- **TV-736** 1.2 GHz ATV converter..................... **163.00**
- **E-736** DC cable.. **10.00**

Mark II • Shoulder-carried, FM/SSB/CW. Three models, same appearance and function. 2½W out when operating from 12V DC @ 1.1A, or with optional snap-on battery case containing 9 (C) cells or nicads. DTMF microphone with up-down control, dual VFOs, 10 multi-function memories with scanning, programmable band scan. Offset tuning for satellites, LCD display. 2⅛"h 6⅛"w x 7½"d, 2.6 lbs.

- **FT-290R MK II** • 2 meters, 25W.................... **$610.00**
- **FT-690R Mk II** • 6-meters, 50-54MHz, 10W .. **752.00**
- **FT-790R Mk II** • 430-450MHz, 25W **681.00**
  - **FBA-8** Holder for C-cell Nicads **32.00**
    - **NC-26B** Wall Charger for FBA-8.............. **10.00**
  - **CSC-19** Soft case.. **16.00**
  - **MH-10E8** Hand microphone......................... **24.00**



YAESU FT-5200 • 2m/440MHz FM Mobile. Covers 140-150 (tx), 140-174 (rx) & 430-450MHz..32 tunable memories, 38-tone prog. CTCSS encoder.and 7 DTMF memories. Output: (2m) 50/5W, (70cm) 35/5W. Cross band full duplex. Dual VFOs with DDS, superior SCF filter. Backlit DTMF mic, detachable front panel. 5½"w x 1⅝"h x 6"d, 2 lbs. **$769.00**

FT-6200 • 35/10w, 440MHz/1.2GHz.............. **899.00**

- **DVS-3** Digital voice memory....................... **129.00**
- **FRC-4** DTMF pager unit **34.00**
- **FTS-22** CTCSS decode unit **54.00**
- **MW-1** Wireless remote control micr...........**109.00**
- **SP-7** External speaker **34.00**

YSK-1L Separation kit w/18' cable **59.00**

YAESU FT-212RH/C8 • 2m FM mobile. 140-150MHz transmit, 138-174MHz receive. 45/5W. Large multi-function LCD display. User-selectable tuning steps with main tuning knob and up/down frequency entry with supplied DTMF mic. Digital VFO, 20 full-function memories with scan/lockout, encoder/decoder std. Programmable band scan and offset, priority and call channels. CAT System bus for PC control. 12V DC @ 10A. 1⅝"h 5½"w x 6"d, 2.8 lbs **$405.00**

FT-712RHT/C8 • same as 212 but covers 430-450MHz, 35/3W, 12V DC @ 10A.................. **$497.00**

FT-912RH • 1.2GHz, 10W, 12V DC @ 4A **$581.00**

- **DVS-1** Digital voice memory module **105.00**
- **FTS-12** Decoder; 121/212RH/912RH........... **55.00**
- **MH-15D8** Autodial TTP microphone.............. **80.00**

YAESU FT-2400H • 2m FM mobile. Rugged, built to take the abuse of off-road use. Three power levels: 50W/25W/5W. Wide band receive 140-174MHz (140-150MHz tx). 31 full function memories,CTCSS encoder.5 scan functions: Band; Memory; Memory channel lockout with selectable stops; Priority. Programmable call channel, auto. rptr offset. back-lit DTMF mic. 6"w x 1⅛"h x 7"d, 1½ lbs **$439.00**

- **2400 Mic Cable** 2 ft. packet cable................ **8.00**
- **FRC-6** DTMF pager unit **34.00**
- **FTS-17A** CTCSS decode unit **53.00**

SP-3 Small mobile speaker............................ **17.00**

SP-4 Mobile speaker....................................... **22.00**

YAESU FRG-8800 • Shortwave Receiver. Covers 150KHz-29.99MHz and 118-173.99MHz with optional VHF converter. Manual tuning and 21-button keyboard for direct entry and programming of 12 memories. LCD with 100 Hz resolution, bargraph S/SINPO indicator. Three scanning modes, dual 24-hour clock/timer, computer compatible with optional interface. 110/220V AC or 12V DC with optional. cord. 14"w x 6"h x 9"d, 13 lbs...................... **$784.00**

- **DC-8800** DC kit for FRG-8800........................ **4.00**
- **FIF-232C** Interface for RS-232 .... **95.00**
- **FM-W/8800** FM-wide kit for FRG-8800 .... **21.00**
- **FRA-7700** Indoor active receive antenna **58.00**
- **FRT-7700** Antenna tuner **77.00**
- **FRV-8800** 118-174 MHz VHF converter..... **107.00**

OTHER YAESU ACCESSORIES

- **YS-60** 1.8-60 MHz 2KW PEP wattmeter......... **127.00**
- **YS-500** 140-520 MHz 200w PEP wattmeter **99.00**
- **YH-55** Lo-Z headphones **28.00**
- **YH-77** Lightweight headphones...................... **26.00**

ANTENNA ROTORS

- **G-500A** Heavy duty elevation rotor.............. **$249.00**
- **G-5400B** Azimuth/elevation rotor combo **497.00**
  - **GC-038** Mast clamp for G-5400B **21.00**

Use Your Credit Card!

MasterCard VISA DISCOVER AMERICAN EXPRESS

YAESU FT-411E (right) • 2m, 140-150MHz (tx), 140-174MHz (rx). 2½w FM HT. LCD, keypad and rotary-dial frequency entry. Dual VFOs, 49 memories. Busy channel band, sub-band and selective memory scanning, priority. DTMF autodialer with 10 telephone number memories. Encoder/decoder, battery saver and automatic power off. *Optional* batteries for 5W or extended operation. Flexible ant., Ni-Cd battery, wall charger. 5½"h 2⅝"w x 1½"d, .85 lb. **$355.00**

YAESU FT-811 (left) • 2w, 430-450MHz...........**394.00**

YAESU FT-911 (left) • 1w, 1.2GHz **489.00**

YAESU FT-470 (center) • 2m/440MHz, 2.3w, FM handheld. Similar to FT-411/811 above. Simultaneous receive on both bands, 21 memories for each band. 6½"h x 2⅝"w x 1½"d, .88 lbs.............................. **$499.00**

See the latest AES Catalog for Discount Prices and a complete listing of accessories for handhelds, etc.

IMPORTANT!

In order to qualify for co-op advertising allowance **YAESU** will not allow us to show our **Discount Prices.**

or Call Toll Free

for AES® Discount Prices

YAESU FT-415 (left) • Compact 2m FM HT. 2w, 130-174MHz/rx (140-150MHz tx). Dual VFOs, 41 tunable memories (odd splits on any channel), DTMF paging and coded squelch, 15 digit DTMF autodialer, CTCSS encode/decode, VOX. Direct DC (5.5-16V) jack to power the transceiver and charge the battery. Programmable 4 power levels, battery saver & auto power off. 2⅛"w x 5¾ "h x 1⅛"d, 12½ oz .... **$409.00.**

FT-815 • Similar to FT-415 but 70cm, 2W, 430-450MHz receive and transmit **$439.00**

Similar to FT-415/815 but without TTP:

FT-26/25 • 2-meters, 2W, 130-174MHz receive and 140-150MHz transmit.................................. **$299.00**

FT-26/27 • 2-meters, 5W, 130-174MHz receive and 140-150MHz transmit.................................. **$329.00**

FT-76/25 • 70cm, 2W, 430/450 MHz/tx-rx.. **$329.00**

YAESU FT-23R-17 (right) • 2m FM HT 2.5w ouput, rotary dial frequency entry, LCD display, 10 full function memories, busy channel and memory scanning, priority channel monitoring. Rugged and weatherproofed. Flexible rubber antenna, nicad battery, wall charger. 4⅛"h 2⅛" x 1⅜"d, 1 lb **$290.00**

FT-23R-12 • as above but 2m, 5w **309.00**

FT-33R • 220 MHz FM, 5w..................................**328.00**

BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

A Message To Non-Amateurs

People who listen to radio transmissions on shortwave radio bands are called shortwave listeners, of course. These SWLers enjoy a very interesting aspect of radio. Most SWL activity occurs in the 3 to 30 megaHertz high-frequency range, which is also referred to as the 3,000 to 30,000 kiloHertz range. Some listeners are active on frequencies above and below the 3 to 30 MHz range.

The air around us is filled with thousands of radio signals all the time. All you need is a receiver, an antenna, and basic facts about where, when, and how to listen. Anyone can bring worldwide transmissions into his or her home. It is fascinating to listen to conversations, broadcasts, and the terse communications that saturate our airwaves.

The May through October 1982 issues of *CQ* magazine include my detailed article about shortwave listening. Copies of those issues may be available at $2.50 each from CQ Communications, 76 N. Broadway, Hicksville, NY 11801.

Beginning listeners usually listen to international shortwave stations broadcasting an interesting variety of programs. There are several publications which contain SWL data. My favorite book is the *World Radio TV Handbook;* it has long been the top-selling book in its field. The 600-page *WRTH* covers every major radio station in the world that operates on longwave, mediumwave, and shortwave frequencies. Musical interval signals, slogans, and languages are detailed to help listeners identify DX (foreign) stations. The selection and use of accessories and equipment are covered in the *WRTH*. This book is available from many stores throughout our country.

Amateur (and other) radio publications frequently include coverage of SWL accessories, equipment, and listening tips. *CQ*'s own sister publication, *Popular Communications,* is an excellent source of SWL information and equipment. Also available is the *1992 Popular Communications Summer Communications Guide* (the *Pop Comm Guides* are published twice a year), which is a comprehensive source of SWL and related activities and festivals for June through September for each state, plus articles of interest to scanner and SWL enthusiasts and an equipment directory. *Popular Communications* magazine is a monthly publication available for $19.95 for a one-year subscription. The *Summer Guide* sells for $4.95. Both are available from CQ Communications, 76 North Broadway, Hicksville, NY 11801.

As radio enthusiasts gain experience, their listening practices become more selective. Listeners may specialize in receiving radioteletype, radiotelegraph, facsimile, television, or other specialized transmissions. They may specialize in military, aircraft, marine, pirate broadcasts, or other types of communications. There are publications which provide information that is extremely useful to listeners with special interests.

A good SWL setup does not have to be either large or expensive. Satisfactory reception is possible without having to erect an outside antenna. However, most listeners will soon opt for a suitable outside antenna to improve shortwave reception capability. The better receivers sell in the $500 to $5000 price range, with many good receivers available in the $200 to $500 price range. A typical good, medium-priced AM/FM world-band portable radio is Radio Shack's Realistic DX-390. The following paragraphs provide detailed information about the DX-390 to give newcomers basic knowledge about this receiver. This coverage generally applies to all similar receivers in the same ($200 to $300) price range.

There are several controls/functions which are common to more than one band/mode. A pushbutton can be used to light the frequency display; this light automatically extinguishes 15 to 20 seconds after it is turned on. The red power pushbutton switch is conveniently located in the upper right front panel of the DX-390. Each time this switch is activited, input power is turned on or off. A row of pushbutton switches enables the user to quickly select the FM (87.5–108.0 MHz), MW (520–1710 kHz), LW (150–519 kHz), or SW (1711–29,999 kHz) band. A pair of pushbuttons can be used to shift frequency up or down manually or automatically. If one of these pushbuttons is activated and released quickly, the frequency moves one appropriate step, as is explained later in this column. If a pushbutton is activated long enough to cause the frequency to shift at least two steps, the frequency will continue to shift (in the same direction) until the receiver senses a suitably strong signal, which stops the search function.

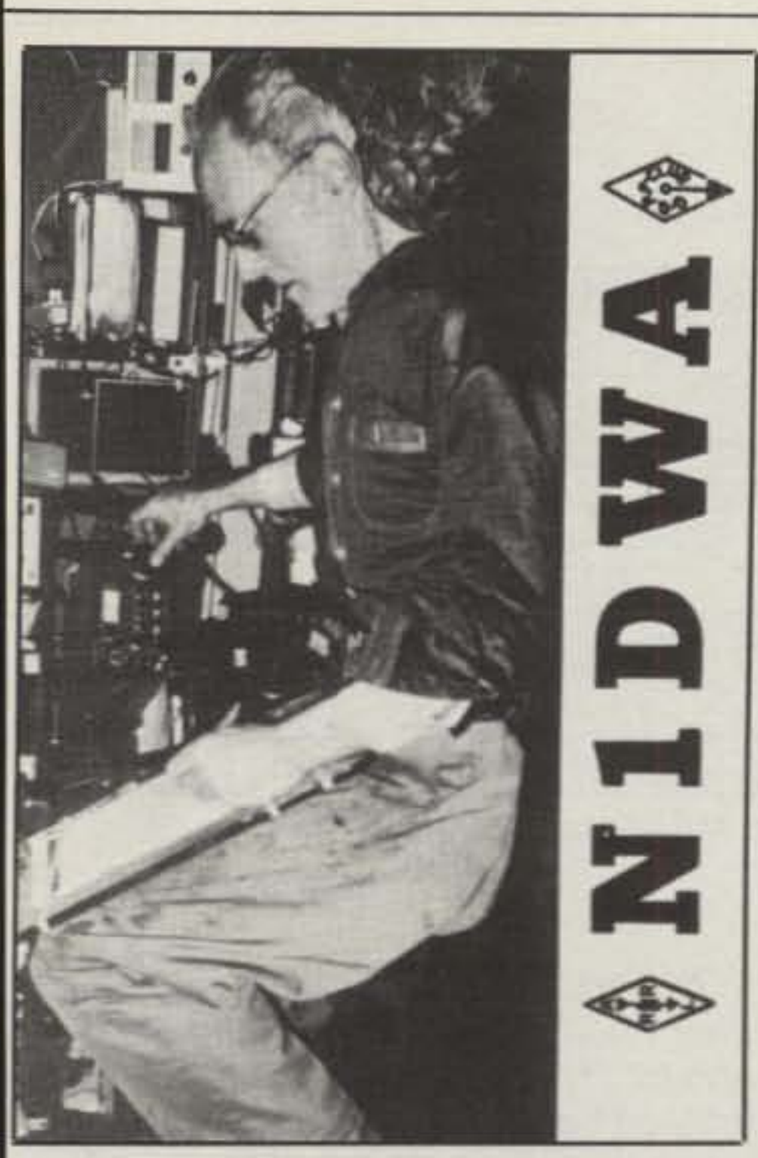
The Realistic DX-390 from Radio Shack is a typical, good, medium-priced AM/FM world-band portable radio.

Any desired frequency (within the reception ranges of the DX-390) can be directly inserted. Simply depress the **Freq** (frequency) pushbutton, use the numbered pushbuttons to insert the desired frequency (including any required decimal point), and then push the **Enter** pushbutton to cause the receiver to function on the selected frequency.

Any of the 12 popular shortwave broadcast bands, and the 11 meter citizens band, can be accessed directly by depressing the front-panel **Meter** pushbutton and then pushing the correct (indicated) pushbutton to activate the receiver on the desired band. In succession (one through zero, etc.) these bands are 2300–2495 kHz (1–120 meters), 3200–3400 kHz (2–90 meters), 3900-4000 kHz (3–75 meters), 4750–5060 kHz (4–60 meters), 5950-6200 kHz (5–49 meters), 7100–7300 kHz (6–41 meters), 9500–9900 kHz (7–31 meters), 11.65–12.05 MHz (8–25 meters), 13.60–13.80 MHz (9–21 meters), 15.10–15.60 MHz (0–19 meters), 17.55–17.90 MHz (16 meters), 21.45–21.85 MHz (13 meters), and 25.67–26.10 MHz (11 meters). Up to 18 shortwave stations, plus up to 9 other stations, can be stored in memory to provide quick and easy access to those stations listened to most frequently.

The received signal can also be changed using the main tuning knob on the side of the DX-390. This control functions

45527 Third Street East, Lancaster, CA 93535-1802



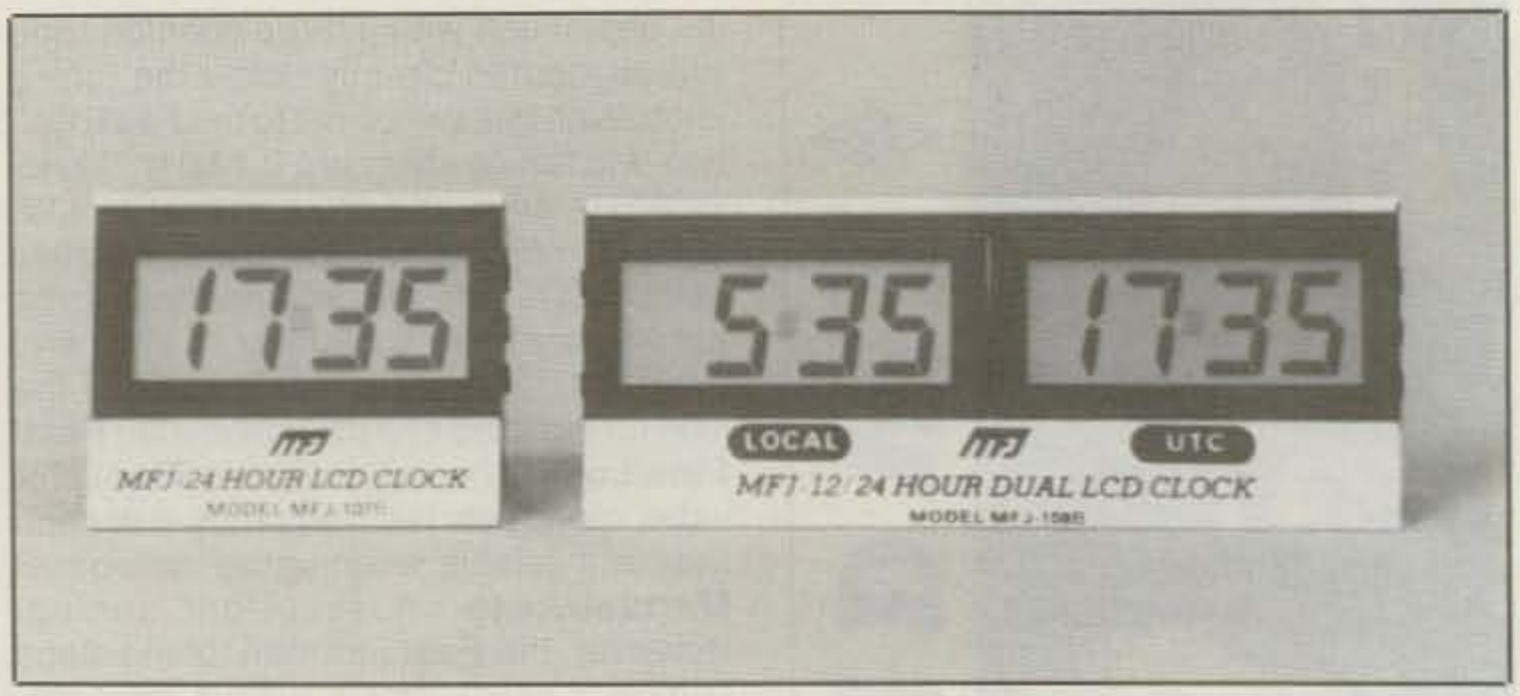
This is Clifford Wheeler, N1DWA, of Rockport, Massachusetts. He is a 67-year-old semi-retired piano tuner and repair man. He has been an amateur for five years and enjoys operating low-power (QRP). I know he is active on the air, because I enjoyed a contact with him.

in conjunction with a three-position slide switch located directly below the tuning knob. With this switch set to the **Fast** position, the tuning steps are 0.1 MHz, 9 kHz, 9/10 kHz, and 0.005 MHz on the FM, LW, MW and SW bands, respectively. With this switch set to the **Fine** position, these same tuning steps are 0.05 MHz, 1 kHz, and 0.001 MHz, respectively. The use of the side tuning knob and the associated **Fast/Fine/Lock** slide switch (set to **Fine**) provides more precise frequency selection than is available when using front-panel **Manual/Auto** pushbutton tuning. However, the **Fast** (normal) tuning steps suffice to satisfactorily tune in most stations.

The same slide switch has a **Lock** position which prevents the frequency from being changed if the tuning knob (only) is moved, such as by accident. This **Lock** feature does not stop the frequency from being changed by activating the front-panel pushbuttons. An all-controls-lock slide switch is located below the **Fine/Fast/Lock** switch on the side of the receiver. When this lower switch is positioned up (on), none of the controls (front or side panel) can be used until this switch is positioned down (off).

A **Tone** control enables the user to adjust a received signal to the desired tone.

Students of the Orangeburg County District's Middle Schools were thrilled to participate in SAREX. They talked with an astronaut during one of the shuttle's orbits around Earth. The adults (left to right) in the back row of this photograph are Bobby Mixson, N4WPJ; Jim Brown, WM3O; Mike Cone, KB4REI; and George Cone, WB4TGK. The students in the middle row (left to right) are Imari Wright, Jamie Danford, James Williams, Jason Stone, and Yasha Kdadkodayan. The students in the front row (left to right) are Samantha Horner, Jennifer James, Beth Crawford, Tasha Wheeler, and Tina Middleton. Their contact was covered by local newspapers, radio stations, and TV stations. The station was set up in the Stanback Planetarium at the South Carolina State University in Orangeburg. The Edisto Amateur Radio Society and the Southern Bell Telephone Pioneer Amateur Radio Society helped make this project successful.



These single and dual versions of digital clocks provide either 12 or 24 hour time display and are available from MFJ Enterprises.

The mid-scale tone setting is satisfactory for use in the reception of AM (MW), FM, and most SW signals. The maximum clockwise tone setting provides the highest tone, and that is usually preferred when you are receiving radiotelegraph (A1A/code) or single-sideband (SSB/voice) signals.

The RF (radio frequency) gain control is used to adjust the gain in the front (input) end of the receiver. This control is usually set close to the full clockwise (maximum gain) position.

The **Volume** control is located on the side of the receiver below the controls lock slide switch. This is the audio frequency gain control in the output stage of the receiver. It is advisable to set this control close to the minimum (counterclockwise) position when shifting bands to avoid the possibility of being blasted by strong signals.

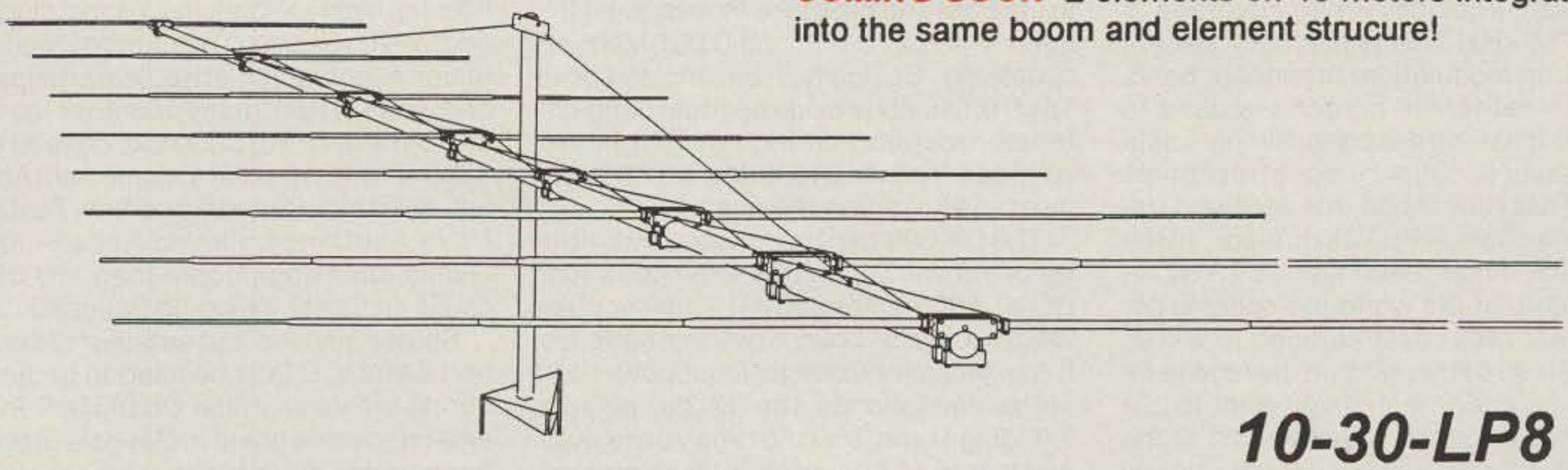
A beat frequency oscillator (BFO) slide switch allows the user to turn the BFO on and off. The BFO adjustment control is located below the **BFO On/Off** switch. When the BFO is switched **On,** the BFO control can be used to clarify (tune in) SSB/voice and A1A/code signals. In effect, the BFO control enables you to shift received signals up and down a small amount between the normal frequency steps.

The DX-390 has other features which are nice, but which have little to do with its reception capabilities; consequently, they are not discussed in this article. Such features include dual time clocks, alarm clock, sleep timer, time set, standby buzzer/radio, and a battery power indicator in the display area.

The FM (frequency modulation) coverage is 87.5–108 MHz. A front-panel slide switch allows the user to select **FM Mono**

This nice certificate to which you can affix you station license is available from KA9LWE and WB9CWE (see text for details).

M² asks is this the ultimate HF multiband antenna?



COMING SOON 2 elements on 40 meters integrated into the same boom and element strucure!

10-30-LP8

THINK ABOUT IT.....What if an **antenna** had.....

Excellent **gain** and **front to back** **Good match** (SWR) on **6 amateur bands**

Power handling capability for even the most '*rugged*' amateur amplifier

Rugged clean design **Single feedline** **No** traps **High efficiency**

And it was designed by a company where **Performance** is the name of the game

COMMERCIAL and MILITARY users figured it out long ago....
A ***LOG PERIODIC*** antenna does all these things like ***NO*** other antenna ***BUT*** has been long overlooked by Amateurs. **IT'S TIME TO RE-THINK YOUR ANTENNA SYSTEM!**

Just maybe our **10-30-LP8** will surprise you!!!

Consider the economics. You **don't** need a **brutal tower, monster rotator, multiple feedlines, remote coax switches or a heavy duty mast.** Put the money you save into a good feedline and reasonable 70 foot tower you'll have a very competitive antenna system! Tailoring your antenna system to your terrain is extremely important. Call and let us help you get the most performance out of your location.

SPECIFICATIONS

MODEL NUMBER	10-30-LP8
FREQUENCY RANGE	10 TO 30 MHz
TYPICAL GAIN OVER DIPOLE	6 dB (up to 12 dB over ground)
TYPICAL FRONT TO BACK	15 dB
BEAM WIDTH	65 - E, 75 - H PLANE
FEED IMPEDANCE	50 OHMS UNBALANCED
MAXIMUM VSWR	2:1
INPUT CONNECTOR	SO-239 or TYPE 'N' FEMALE
POWER HANDLING	1500 WATTS 5KW OPT
BOOM LENGTH AND DIAMETER	30 FT AND 3.0 X .125 WALL
MAXIMUM ELEMENT LENGTH	46 FT
TURNING RADIUS	28 FT.
WEIGHT	74 LBS
WIND AREA	15 SQ. FT.
WIND SURVIVAL	100 MPH
SHIPPING WEIGHT	95 LBS. TRUCK or EMORY AIR

This 10-30-LP8 is a rugged versatile antenna designed for years of trouble free service. Twenty years of log periodic design experience has gone into this HYBRID log. Machined aluminum element to boom clamps and solid fiberglass rod insulators create a system that will deny Mother Nature her due for years to come.

Maritime, Government, Commercial, MARS, Amateur Radio, and Shortwave listening are among its many uses. For just receiving, the log antenna works extremely well from 1 to 100 MHz.

Q & A

How does the 10-30-LP8 compare with a 3 element Yagi?
The log has the same gain as a typical 3 element Yagi. For many years amateurs have believed that a 3 element Yagi has 8.2 dB gain with 25 dB front to back. This is simply **not** the case. A short boom 3 element Yagi with 25 dB f/b usually produces less than 6 dB gain.

Why is the front to back on a log so poor?
In fact it is quite good on most of its range, mostly exceeding 20 dB. However to spec it properly over the entire frequency range would require a space consuming chart so is simplified for near worst case. Actually most Yagis only produce good f/b over a small part of their band. To get good broad band f/b from a 3 el. Yagi significant gain must be sacrificed.

What about more elements or a longer boom?
We feel that the negligible performance increase does not justify the added weight, wind area and cost.

Can you stack logs for added gain and narrow beam?
Absolutely, If this is your aim, call us so we can discuss the options.

If you have other questions when deciding about your HF antenna system, feel free to call us for honest straightforward answers.

M² Enterprises 7560 N. Del Mar, Fresno, CA 93711
(209) 432-8873 FAX (209) 432-3059

or **FM Stereo.** In the **Fast** tune mode, the received frequency is changed in steps of 0.1 MHz. In the **Fine** tune mode, frequency is changed in 0.05 MHz steps. The attached telescopic antenna should be extended and rotated to optimize signal reception.

The MW (medium wave) coverage is 520–1710 kHz. This is basically the AM (amplitude modulation) broadcast band. The internal ferrite antenna is used to receive signals on this band. Simply rotate the receiver to optimize signal reception. In the **Fast** tune mode, the received frequency is changed in 10 kHz steps. In the **Fine** tune mode, each step is 1 kHz. In some parts of the world the spacing between AM broadcast stations is 9 kHz. There is a 9/10 kHz switch in the receiver's battery compartment. If you want to use this receiver on AM in some part of the world that uses 9 kHz spacing, simply move this switch from the 10K to the 9K position. If an adjacent AM station causes interference to your reception of a desired station, a front-panel switch can be repositioned from the **AM Wide** position to the **AM Narrow** setting.

The LW (longwave) band frequency range is 150–540 kHz. The built-in ferrite antenna is used on this band. Rotate the receiver to optimize signal reception. In the **Fast** tune mode, each frequency step is 9 kHz, whereas it is 1 kHz in the **Fine** tune mode. Marine beacons and ships are usually heard well on this band between sundown and midnight.

The SW (shortwave) frequency range is 1711–29,999 kHz (1.711–29.999 MHz). The attached telescopic antenna should be fully extended and positioned straight up for optimum reception of most signals. In the **Fast** and **Fine** tune modes, each frequency step is 0.005 and 0.001 MHz, respectively. Basically, frequencies above 15 MHz usually provide optimum long-distance reception during daylight hours, whereas frequencies below 10 MHz are most useful during the night.

The DX-390 can be powered by batteries or a power supply that furnishes 6 volts DC at 400 milliamperes. This receiver weighs just 3.64 pounds, without batteries. It has jacks for external input power and stereo headphones. The DX-390 includes a folding stand, a world time zones map, and a useful 36-page instruction manual.

Gaelic Festival

Shirley McLennan, GM0ERV, is active in the American Novice code segments. She makes it easier for new amateurs to have contacts with Scotland. It have enjoyed contacts with Shirley on the 10 and 15 meter Novice code bands.

Shirley advises that a Gaelic dance, music, and song festival will be held in Oban, Scotland from 9 to 16 October 1992. This annual event is called a Mod. The first one was held in Oban and this year's centenary Mod is also being conducted in Oban. Small provincial day-long Mods are run throughout the country to select the winners who compete in the annual October national Mod. The Mod features unique fiddling, highland dancing, piping, singing, and verse reading. The national Mod is a major event which attracts participants and viewers from many countries, as well as from all parts of Scotland. Several participants are expected to come from America, Australia, Canada, and New Zealand. Nova Scotia is believed to have more Gaelic-speaking people than any other place on Earth, including Scotland.

Shirley advised that amateur radio station GM0MOD is scheduled to be active during the week of the Oban Mod. Every amateur who is fluent in Gaelic is urged to contact this station. Other amateurs are also urged to work this Oban station. Specific operation frequencies have not been established, but it should not be difficult to locate this voice station. It will be operating on the bands which are most useful throughout the days and nights, including the WARC bands. It is anticipated that the 20 meter band will be the most productive one, so it is advisable to listen there as a first choice. However, GM0MOD will be active on 10 and 15 meters whenever those bands are open.

Shirley's address is 6 Mull Terrace,

)ban, Argyll PA34 4YB, Scotland (tele-hone 0631-66518).

Amateur Radio License Plates

am preparing an article about the callsign icense plates which are available to mateur radio operators for use on their ehicles. I believe that such plates are ssued in every state except New Hamp-hire. I wrote to each state's Department f Motor Vehicles requesting all facts elated to their issuance of such plates. I till need information from Kansas, New Hampshire, New York, Oklahoma, Ten-essee, and Rhode Island. If you live in one f the preceding states, please have the equired data mailed to myself (W6DDB) ithout delay. Please use my California ad-ress, which is shown on the first page of his column. Please be sure that the infor-nation you supply is complete and correct. rinted DMV instructions would be ex-remely useful. The following paragraphs ighlight the kind of information I need om each state. I believe it should be of nterest to many amateurs to make com-arisons between the sets of data. This in-ormation will also be useful to amateurs who are going to move to different states nd intend to obtain callsign plates in those tates.

Address. What is the name, address, nd telephone number of the agency hich issues callsign license plates in your tate?

Fees. Are your state's callsign license late fees in addition to the regular plate harge? Is there a one-time charge and/or yearly fee? Do service and postage fees pply? How does the callsign plate fee ompare to the fees charged for standard lates and vanity plates? Are senior citi-ens eligible to get callsign plates at a dis-ount rate?

Vehicles. States differ in regard to the ypes of vehicles on which it is okay to ount callsign license plates. Does your tate allow them to be used on campers, otorcycles, passenger cars, and/or ucks?

Time. How long does it take to get such lates in your state? Four to nine weeks eems to be the common delay. How long re these plates valid in your state? When o they expire?

Perks. Are there special privileges elated to using callsign plates in your tate? As examples, drivers may be al-wed to wear headsets; they may also be ermitted to monitor police transmissions. MATEUR RADIO and HAM RADIO ap-ears on such plates in some states. Some tates allow variations on the same allsign to be used on more than one vehi-e such as W6JEP-1 and W6JEP-2.

Requirements. Most states require ach applicant to provide a copy of their cense, plus proof that the tax has been aid on the associated vehicle. Do these requirements apply in your state? Is the amateur required to own the vehicle to which the callsign plates are to be attached? Must the amateur station equipment be left in the vehicle? Some states do not issue callsign plates to Novices and/or Technicians. Does such a restriction apply in your state? Are there other requirements related to getting amateur radio callsign license plates in your state?

Shack Wallpaper

You can decorate your radio shack wall with your amateur radio license affixed to a very nice certificate. Linda, KA9LWE, and Michael, WB9CWE, Simmons offer a certificate which has been professionally printed on 60 pound (stock/bond) paper. Double-sided removable stickers are provided to attach your license to the certificate.

Each certificate sells for $2.00 and volume discounts are available. The mailing address is 1801 Seven Pines Road (5), Springfield, IL 62704 (telephone 217-698-9135).

12/24 Hour Digital Clocks

MFJ markets single and dual versions of digital clocks which can be set to provide either 12 or 24 hour time display. I use the dual model with local time displayed on one clock and UTC (Universal Time Coordinated) displayed by the other clock. These clocks are mounted in brushed aluminum frames with 0.625 inch LED numerals displayed on a sloped face. These clocks are battery powered, and I have only had to change batteries twice in about four years. The single clock dimensions are 2.25″ × 1″ × 2″. The dual clock version measures 4.5″ × 1″ × 2″. The sigle and dual clocks sell at about $10 and $20 dollars each, respectively. Additional information can be requested from MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762.

VHF PLUS

BY JOE LYNCH, N6CL

ALL ABOUT THE WORLD ABOVE HF

It Was A Not So Dark But A Very Starry Night

It was a not so dark but a very starry night—too starry, for it was the night of October 9, 1946, and the sky was falling. It was the night the Giacobinid-Zinner Comet and its associated meteoroids were making their predicted rendezvous with earth. What was not predicted, however, was the associated effect the meteor vaporization would have on the VHF amateur bands.

Amateurs had experienced the sounds of bursts of reception from distant stations during meteor showers. It was then called the "shooting star" effect. Until 1946 no definitive work had been written concerning using meteor-vaporization-caused ionization for propagation.

Then in January, Oswald Villard, Jr., W6QYT, wrote an article for *QST* (pages 59–60, 120, 122) entitled "Listening in on the Stars." In it he described how meteor-vaporization-caused ionization of the E-layer worked and what to expect when listening to distant shortwave stations. He described how the ionized trail would be at a slant within the atmosphere and how this slant would cause a Doppler shift in frequency of any signal being refracted from it. He further declared that such a Doppler-shifted signal would heterodyne with the signal being refracted by normal ionization of the atmosphere, which could cause a whistling sound in the receiver.

The 6 meter amateur band had only been assigned since May, and amateurs were eager to establish records and generally see what the amateur band could do in the way of propagation. Because of this curiosity, the familiarity with the "shooting star" effect, the article written by Villard, and the publicity surrounding the then forthcoming meteor shower, there was a lot of anticipation of what might occur during that October night. Both amateur observers and hams were eagerly awaiting the effects of the shower.

What happened on 6 meters was beyond description. Jo Conklin, W9SLG, the original editor of this column in *CQ* (then called "U.H.F."), reported in the December 1946 column (page 34) a summary from a letter written by John Taylor, W3OMY, indicating that " . . . he enjoyed a lot of what look(ed) like short sporadic-E distance or long ground-wave or low-atmosphere-bending DX . . . " John went on to say that there were numerous stations being heard in heavy QRM.

Ed Tilton, W1HDQ, then editor of *QST*'s "The World Above 50 Mc.," reported in his December 1946 column (page 43), that the event " . . . produced such bursts, occurring over a wider area and for a longer period of time than ever before in the history of v.h.f. work." Reports sent to Tilton from numerous amateurs indicated that the band opened around 8:30 PM. He described the sound they heard as a "peculiar rumble" noticeable on all signals coming from beyond the horizon. He told that his reports indicated that signals from as close as 200 miles and as far as 1200 miles were coming in all at once, causing QRM that " . . . had never before been experienced on the normally wide open space (of the 6 meter ham band)."

Because of the unusually low ionization of the E-layer, very short skip contacts were being made. Because of the intensity of the ionization, contacts of long duration (for meteor-scatter work) were being completed. Ed Ladd, W2IDZ, one of the participants that night, described the QSOs as "finished," saying that not only were signal reports and other necessities exchanged, but unnecessary items such as equipment and weather reports were being swapped, as well. Additionally, Ladd reported that after QSOs were completed, operators could hear the other stations for two to three minutes following the contact. He described the sound of the contacts as fluttery with intermittent drop-outs of signal strength as the ionization would disappear and reappear with each meteor vaporization.

In all, the party lasted for around three hours. Most of Tilton's reports came from the east and the midwest portions of the U.S. This, for the first time in the history of amateur radio, was the genuine use of meteor scatter for signal propagation. And what an event to try out this form of propagation.

Because of this shower, interest in this form of propagation was piqued. John Stewart and others reported in an article entitled "Radar Observations of the Draconids" in *Sky and Telescope* (issue 65, pages 3–4) the results of a U.S. Army radar experiment conducted during the shower that showed echoes on the 106 MHz "early warning" radar. (The shower became known as the "Draconids" because the radiant the point of origin in the sky of the meteo shower, appeared to radiate from the head o the Draco star constellation.) The article alsc reported that no evidence of echoes was detect ed on radars operating on 600, 1200, 3000, o 10,000 MHz.

In November 1946 Gurdon Abell, Jr., W2IXK wrote a letter that appeared in the "Correspon dence From Members—" column in *QST* (page 48). In it he discussed the results of an experi ment he conducted during the previous August's Perseids shower. Using the information from the Villard article, he set his HF radio (an SX-25) tc hear the whistles of the meteors. Simultaneous ly, he set his 2 meter super-regenerative receiv er alongside the SX-25. Curiously, at the same time he heard the whistles on the SX-25, he re ported hearing bursts of signals from distant sta tions on the 2 meter radio. He tried several varia tions on the experiment to make sure that he wa: not trying to trick his own mind. He finally con cluded that the bursts of signals must be relate to the meteor showers.

Following the October shower and this letter Mr. Villard wrote a letter to the editor which ap peared in the "Correspondence From Member —" column of the January 1947 issue of *QS* (page 61) that commented on Abell's exper ments and experiments of his own conducte during the October shower. Then in July he wrot another article, entitled "Meteor Detection b Amateur Radio" which appeared in the Jul 1947 issue of *QST* (pages 13–18). While not d rectly acknowledging the veracity of the expe iments conducted by Abell, Villard did indicat some credibility by citing it as a reference in hi article.

P.O. Box 73, Oklahoma City, OK 73101

VHF Plus Calendar

August 2	Very good EME conditions
August 5	First quarter moon
August 9	Noisy moon, very poor EME conditions—Sagittarius A
August 12	Perseids meteor shower peak: 0617 UTC
August 13	Full moon
August 14	Apogee
August 14–16	East Coast EME Conference (see text for details)
August 15–16	ARRL 10 GHz Cumulative Contest (see text for details)
August 16	Moderate EME conditions
August 21	VK5MC NA: 1600 UTC, 144.012 (call .010-); last quarter moon
August 22	VK5MC NA: 1700 UTC.
August 23	VK5MC NA: 1800 UTC; very poor EME conditions
August 27	Perigee; new moon; noisy EME conditions
August 29	VK5MC Europe: 0906 UTC.
August 30	Good EME conditions but still in latter phase of new moon.

(Courtesy W4ZD and others)

From this bang of a beginning, the meteor-shower-caused propagation became a part of the VHF operator's repertoire of communicating. However, it wasn't until 1953 that a 2 meter contact via this form of propagation would take place.

In June 1953 Paul Wilson, W4HHK, and Ross, W4AO, were in contact with each other via a tropo path. After the tropo path fell apart, Paul continued to hear bursts of signals. Ross advised Paul that what he was hearing were meteor bursts. Within a few days of this contact Paul got a letter from Ralph "Tommy" Thomas, W2UK, asking to set up schedules for a possible 2 meter contact via any mode of propagation. In Paul's answer he indicated a desire to try to work him via meteor scatter.

Over the next several months schedules were set but with no success until October of that year. Then on the morning of the 22nd it all fell together when Tommy copied more than 2 minutes of transmission from Paul and he, in turn, was able to copy Tommy's confirmation and signal report. With that exchange, they had the first complete 2 meter QSO via meteor scatter.

Over the years interest grew. In April 1957 Walt Bain, W4LTU, wrote what has become the classic commentary on meteor-scatter work. Among the topics covered were what to expect in attempting a contact and suggested sequencing lengths. Because CW was used as the mode of communication, there was support for five-minute lengths of sequencing. However, today's almost exclusive use of SSB makes anything but fifteen-second sequencing archaic.

Interest continued to grow as an increasing number of operators tried out the mode. Keep in mind that in those days the operators did not have the sophisticated equipment with the fancy filtering and digital readout. With analog readout, calibration as close as 5 kHz was considered excellent. Imagine trying to find that burst when you were not at all sure where to look. Also, the primary mode of communication was high-speed CW (often around 40 WPM). It was not the method of propagation for the faint of heart. Nevertheless, encouraged by intensified publicity more operators tried out the mode.

In November 1965 a number of operators experienced excellent results from the Leonids shower. Continued good press prompted more interest. Encouraged by pronouncements in the November 1966 issues of both *Sky and Telescope* (page 251) and *Natural History* (pages 43–44), amateurs stood by for what they thought might possibly be a better than average night.

Indeed, it was! The headline for Sam Harris, W1FZJ's "World Above 50 Mc." column in the January 1967 *QST* was "November Leonids—Shower of a Lifetime." Sam recounted, "Hundreds of contacts were made by calling CQ, or by breaking stations when their skeds were completed, as most were in the first minute or two of prearranged calls."

Reports of visual observance sent to *Sky and Telescope* came from all over the country. Among the reports was one from Shelby Ennis, W4WNH (now W8WN). From his letter he was quoted: "For us in Kentucky, the 1966 Leonids will be rated much better as a 'radio' shower than as a 'visual' shower due at least in part to the very sharp peak coming after dawn." However, where dawn had not come, particularly in the west, the display was awesome. Reports of 1000 meteors per minute were not uncommon. It was a night (or early morning) to remember for amateur radio operators and amateur astronomers alike.

The Meteor Shower Nobody Saw

While the Giacobinid-Zinner Comet meteor shower was spectacular in its effect on the 6 meter amateur band and the Leonids storm displayed its wonder on the 2 meter amateur band, they also were very visible showers. There was, however, a shower that apparently far surpassed these two, but that no one is known to have seen.

Evidence of this shower came by way of the moon. The Apollo astronauts left seismometers on the moon during their missions in the late 1960s. During June 1975 these seismometers detected a very intense meteoroid onslaught that lasted for around ten days. A group of Brazilian astronomers, headed by Pierre Kaufmann, became aware of these reports and decided to examine VLF data for the same period. They published the results of their studies in an article entitled "Effects of the Large June 1975 Meteoroid Storm on Earth's Ionosphere," which appeared in the November 10, 1989 issue of *Science* magazine (pages 787–790).

They decided to use the VLF data because of the known effects of meteor ionization to the D- and E-layers of the atmosphere. The D-layer forms a waveguide effect on signals within the VLF frequency range, transporting them for long distances across the earth's surface. Meteoroid vaporization would cause phase shifts in the D- and E-layers of the atmosphere and thus phase shifts in the reception of the VLF signals. Therefore, examination of VLF reception records could reveal any meteor-caused detectable effects on these layers of the atmosphere.

First, by examining data from several different VLF transmitters, they concluded that the radiant was low in the sky, in the same general location of the sun. Because of the sunlight, the shower was not visible. However, their examination of the data indicated that the shower was as much as three to nine times as intense as the Giacobinid-Zinner Comet caused shower.

Was this shower otherwise detected? While it occurred during normal sporadic-E season, could there be any unusual events on VHF during that time frame, or did what was perceived to be normal sporadic-E events mask the effects of the shower?

Kaufmann's research indicated that the days of activity were between June 20 and June 30, with the prime days being June 22–23 and June 26–27. An examination of Bill Tynan's "World Above 50 MHz" column in the September 1975 issue of *QST* (pages 78, 136, 138, and 140) showed that sporadic-E type propagation occurred during these days, with especially intense reports of events occurring on June 22 and June 30.

One of the most interesting reports (to this editor), was of a three-way QSO on June 22 that Bill (then located in Maryland) had with K3AAY and K8CAY, the latter being only 280 miles away in West Virginia. He convincingly concludes that the mode of propagation had to be sporadic-E. He goes on to refer to other reports of very short-skip contacts during the same day. Oddly, this short-distance propagation was also cited as typical during the Giacobinid-Zinner Comet caused shower.

Bill also reports on receptions made by Pat, WA5IYX (near San Antonio, Texas), of numerous signals during the days indicated. Most notable were the receptions, on June 30, of many sporadic-E type signals throughout the FM broadcas band and the low-band VHF television band These signals were being copied as early as 7:1(AM, Pat's local time. Pat also reported recep tion of several high-band VHF television station east of him in Florida. These receptions laste for as long as 3 minutes at a time. Additionally on the same day Glenn Hauser, of Enid, Okla homa, also reported reception of a high-ban VHF television station from Florida. Glenn als reported reception of YVVK, a Caracas, Vene zuela channel 3 television station. Althoug there was an increase in activity on June 3(there were not correlating data in the Kaufman studies. It is possible that the data they exam ined were not complete on this day (a point the alude to in their article).

Bill also quotes a report from W7NFC, in Ath ens, Oregon, that indicated contacts with a states in the W1, W4, and W5 call areas durin the day of June 22. He goes on to include othe reports that specified that day and others du ing latter June and early July. Bill conclude these reports by observing that "...the day-o days was June 22, with QSOs all over the cour try (being reported)."

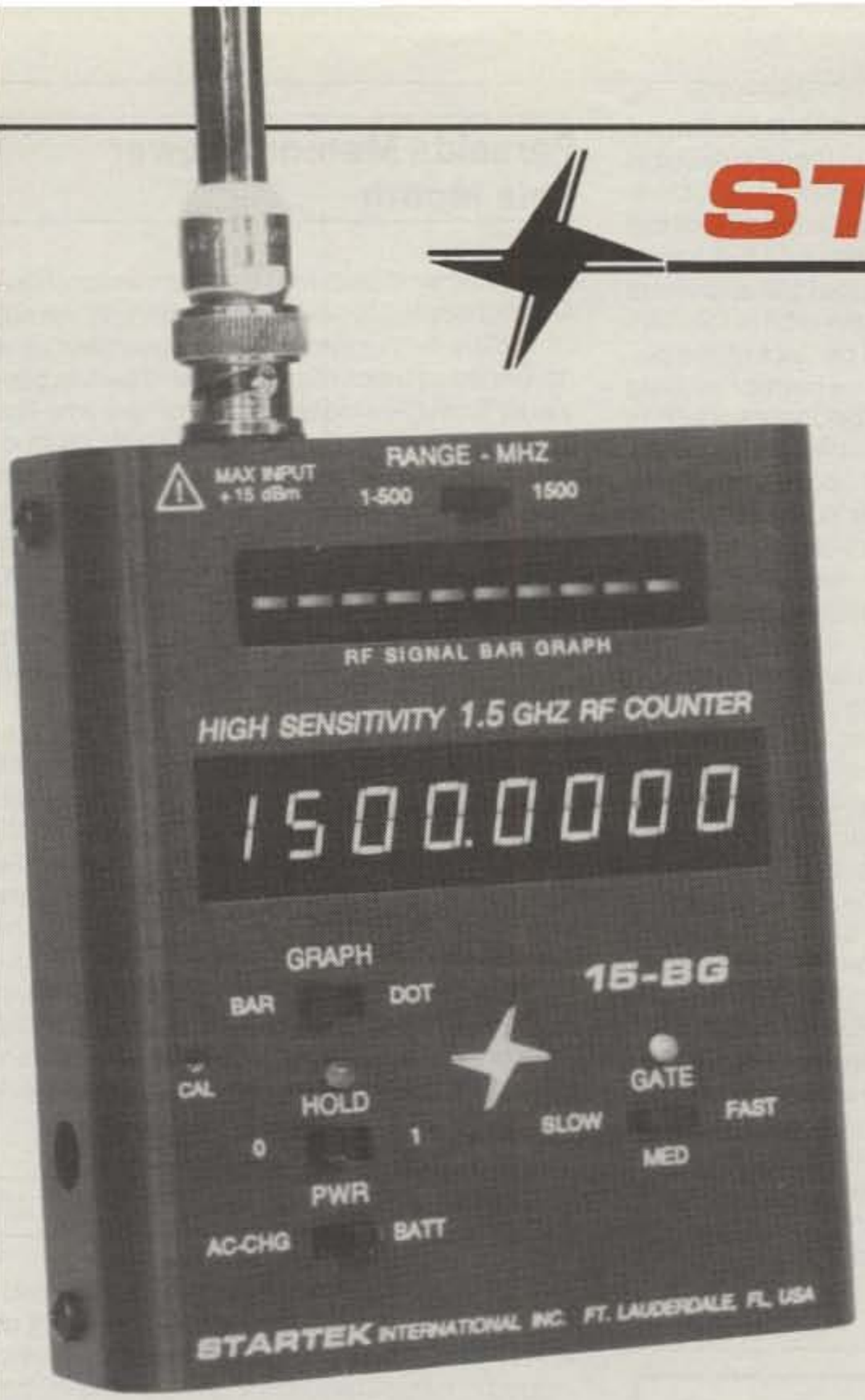
However, these days are during the sporadic E time frame and any activity could have bee (and was) easily interpreted as sporadic- caused propagation. As stated, June 22 seeme to be a key day for both data. However, Bill doe not report any correlating data on June 26. Coul it be that many amateurs were on the air on Sur day, June 22, and that few amateurs were o the air on Thursday, June 26? Could it also b that most of the activity was overnight on Jun 26–27, whereby many amateurs were in bed, nc expecting or suspecting anything out of th ordinary?

For as much meteor shower activity, ther seems to be little other correlating amateur radi VHF data (absence of 2 meter reports, for ex ample). Again the question is asked, "Could th amateur radio observations be incomplete be cause 'nobody was on the air?'" In conductin unrelated research, I looked back into my meter log for the last three years and found tha each Memorial Day weekend the band had bee open. No matter that the dates of the weeken have floated. Without exception, the band wa open during some time of the weekend. Was th band open because people were home and o the air, or was the band being open and peopl being home coincidental?

Perhaps more study of pertinent log entrie should be performed in order to see what effe this unknown June 1975 sporadic-E mete storm had on VHF communications during th key days in late June.

Interest in Meteor-Scatter Propagation Continues To Grov

After the VUCC award program was assume by the ARRL from the Central States VHF Soci ty (in January 1983), 2 meter meteor-scatte work once again became popular as a way f operators to make contact with others in the 1(grid squares necessary for that band's awa requirements. Interest in meteor-scatter-forme propagation continues today, as once again th month we look to the Perseids to complete co tacts on VHF. August 12 is again predicted be the peak day. With this year's anticipate return of the Swift-Tuttle Comet, the parent the Perseids meteor shower, excellent conc tions are quite possible.



STARTEK

FREQUENCY COUNTERS

MODEL *15-BG*

ULTRA HIGH SENSITIVITY
RF DETECTOR - COUNTER
2 INCH LED BAR GRAPH

Regular $220. value !!

$169.

SPECIAL LIMITED TIME OFFER

PLEASE MENTION THIS AD FOR SPECIAL PRICE

STARTEK Bar Graph counters are *simply the best* for finding frequencies, testing, adjusting, repairing or locating RF devices. Superior sensitivity, longer battery operation, high quality USA construction and sub-compact size are just a few of the reasons to select a ***STARTEK*** counter.

ACCESSORIES:

#CC-90	BLACK VINYL CARRYING CASE	$12.00
#TA-90	TELESCOPING BNC ANTENNA	12.00
#P-110	PROBE, 200 MHZ, 1X-10X	39.00
#M207IC	CABLE FOR MFJ-207/208	10.00

STANDARD FEATURES FOR ALL 6 MODELS

- *3 to 5 HOUR* BATTERY PORTABLE OPERATION
- NI-CAD BATTERIES & 110VAC ADP/CHARGER INC.
- 1 PPM TCXO TIME BASE WITH EXTERNAL ADJ.
- 3 GATE TIMES, AUTO DECIMAL PLACEMENT
- HOLD SWITCH (WORKS PROPERLY- NO GATE CHG)
- 9-12VDC AUTO-POLARITY POWER INPUT
- StarCab™ QUALITY ALUMINUM CABINET
- COMPUTER AIDED CIRCUIT DESIGN
- TOP QUALITY COMPONENTS - SOCKETED IC's
- COMPATABLE WITH MFJ-207/208 ANT. ANALYZERS
- FULL YEAR PARTS & LABOR LIMITED WARRANTY
- DESIGNED & ASSEMBLED IN THE USA

SAME DAY SHIPMENT

FACTORY DIRECT ORDER LINES

Orders & Information
305-561-2211
Orders only
800-638-8050
FAX 305-561-9133

MasterCard VISA DISCOVER

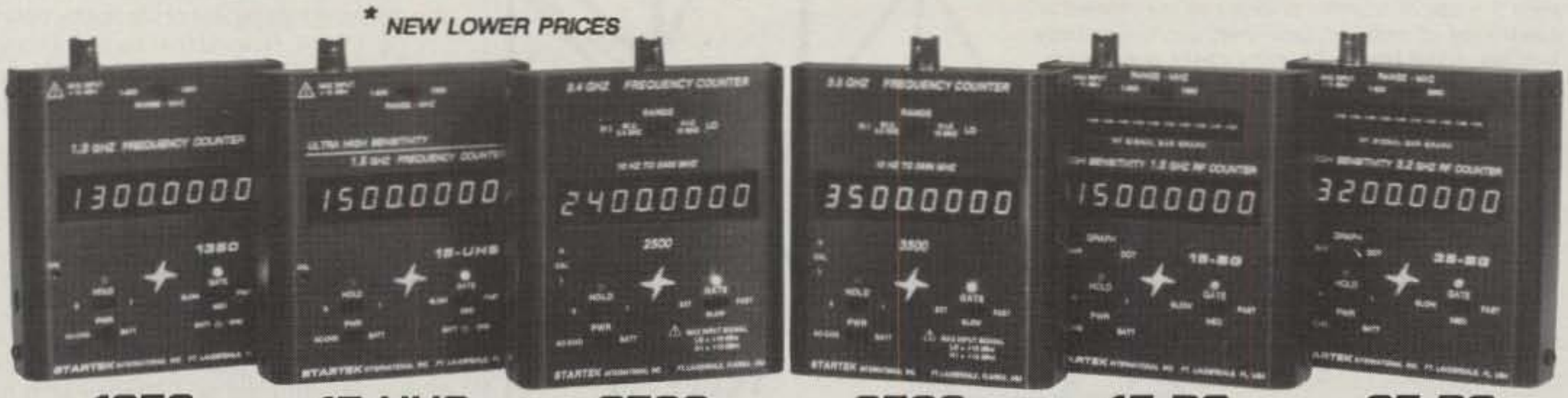
TERMS: Shipping-handling charges for Florida add $4 + tax, US & Canada add 5% ($4 min - $10 max), others add 15% of total. COD fee $4. VISA, MC or DISCOVER accepted. Prices & specifications subject to change without notice or obligation.

STARTEK *INTERNATIONAL INC*

398 NE 38th St., Ft. Lauderdale, FL 33334

SELECT YOUR ***STARTEK*** *POCKET COUNTER™* TODAY !

* *NEW LOWER PRICES*



1350
1 MHZ - 1300 MHZ
QUALITY & ECONOMY
(REPLACES #1500A)
$129

15-UHS
1 MHZ - 1500 MHZ
ULTRA HIGH SENSITIVITY
(REPLACES #1500HS)
*$159

2500
10 HZ - 2400 MHZ
HI-Z INPUT - LO RANGE
HIGH SENSITIVITY
*$189

3500
10 HZ - 3500 MHZ
HI-Z INPUT - LO RANGE
HIGH SENSITIVITY
$250

15-BG
1 MHZ - 1500 MHZ
ULTRA HIGH SENSITIVITY
2 INCH BAR GRAPH
$SPECIAL$

35-BG
1 MHZ - 3200 MHZ
ULTRA HIGH SENSITIVITY
2 INCH BAR GRAPH
$265

CIRCLE 151 ON READER SERVICE CARD

Are Future Meteor Storms Possible?

It has been nearly 46 years since the Giacobinid-Zinner Comet made its appearance. Twenty years would pass before another storm would affect the earth's atmosphere. The night of November 16–17, 1966 witnessed the giant Leonid shower that produced thousands of meteors per hour, but for only a couple of hours during the early morning hours just before sunrise. Then, nearly nine years later, another storm, the sporadic meteor shower of June 1975, unleashed its fury on earth. However, as stated above, no one was aware of the shower until several years after it had occurred.

What are the prospects for future meteor storms and how can we, the VHF and above operators, benefit from such events?

In an article entitled "Will the Lion Roar Again?" which appeared in the November 1991 issue of *Astronomy* magazine (pages 44–49) author Ken Croswell, citing the work of Donald Yeomans of JPL in 1981, predicts that the Leonids could very well once again make a grand show in either 1998 or 1999. Croswell states that the parent comet, the Tempell-Tuttle Comet, is in a period orbit of approximately 33.2 years. Because the comet made its last best appearance in 1965, it is possible that another appearance is due 33 or so years later, or around 1997. Croswell reports that Yeomans determined from previous showers caused by this comet that the best possible location for debris from the comet is behind it. According to Yeomans' calculations, the probable years that we will be behind the comet (and thereby possibly run into such debris) are 1998 and 1999. However, we must be lucky. Because the orbit of this comet is influenced by Jupiter and Saturn, its orbit might be shifted such that the alignment of the Earth in relationship to the orbit of the comet may be such that we will be "out of the picture" for any collision with the meteor causing dust clouds. Even if we are fortunate enough to run into a storm, it will probably be short lived, lasting for just a couple of hours. Ultimately, Croswell concludes, there is no way to predict when, where, or if the storm will occur.

There is one other thing to keep in mind concerning this shower. There was a significant increase in activity related to this shower in 1961, five years before the gigantic storm. If there continues to be a reason for such an increase in activity (i.e., dust clouds leading the comet), then maybe there will be an increase in activity five years before the forecasted substantial increase of 1998 or 1999. That five-year time frame would put the possible increase in 1993 or 1994. We just do not know at this time.

Such is the case of the unpredictability of forecasting any meteor shower. Our friends in the astronomy field see no other storms on the horizon. Given the infrequency of these meteor storms, experiencing the effects of one is a once in a lifetime event. We therefore must be prepared. Maintaining contact with members of the astronomy community will help keep us informed of any possible previously unknown showers. Occupying the bands will also help us be in a position to experience the effects of any unpredicted storms.

Perseids Meteor Shower This Month

As previously stated, the Perseids meteor shower is scheduled for early this month. While not as prolific as the Geminids in December, it is nevertheless much more popular. It gets its popularity from the amateur astronomers who like to observe its long running and prolific production and from the time of year that it occurs (warm summer nights are made for star gazing). For many of the same reasons amateurs have enjoyed using its vaporization-caused ionization as a mode of communication. Because of the Perseids long-running nature, some amateurs have completed contacts via the shower as early as mid-July.

A final note about the Perseids: Based on previous years' experiences, August 12 between 1200 UTC and 1500 UTC seems to be a magic time. For example, Ted, WA4VCC, worked 25 states the morning of the 12th last year. While there are no guarantees, it is better to be there and not get anything than to not be there and miss out.

Incidentally, I have an article in the August issue of *Sky and Telescope* concerning using the Perseids meteor shower to listen for distant FM broadcast stations and low-band VHF television stations. Just thought I'd mention it.

On The Air

Terry, N6CW, reports that the F2 season ended on the west coast during the last week of April. Stations in FK8, VK, 3D2, and YJ8 were logged in those final days. However, the beginning of May heralded the beginning of the sporadic-E season. Openings occurred on May 5, 6, 12, 13, 14, 15, and 25. On the 15th KL7NO was into San Diego until 2 AM local time.

Hal Perry, KC4YO, reports that on May 2 he had a very nice 2 meter tropo opening to the southwest. During that opening he worked N5FEQ in EM15, K5ACR in EM14, K5SW and WB5YWI in EM25, WD5AGO in EM26, WAØKBZ in EM28, WD5DJT and WB5VPC in EM12, and N5JBZ in EM31. The following day he worked K5KJ and W5USM, both in EM12.

Ed Maikranz, KG5UN, reports that he had his first 6 meter opening on May 5. He reported contacts with Dave, N8NQS, in Michigan, Fred N2LXD, in New York, and Dwaine, N8MLE, in Ohio. He reported that all the guys he worked were very nice and willing to chat for a few minutes even at the risk of missing out on other contacts during the opening. Ed is very new to VHF and enjoying this aspect of the hobby very much.

Eric, TI2NA, reports that he had a 40 second 6 meter QSO with Pat, HH2PV. During that contact he found out that Pat has a new QSL manager. If you have been wondering about where to send your card, wonder no more, because Jim, AA5DW, has picked up the responsibilities of management for Pat. As always, please include an SASE. Eric also reports that he has purchased the EME equipment that Jim, W6JKV used on HKØ. Eric hopes to be working some moon-rise EME on 2 meters by December.

Jack, WB4NFS, reports making 80 contacts in over 50 different grids from FM18 on May 25–26. Included among his QSOs were some double-hop contacts to California and Arizona.

Andy, W2HWG, also got in on the fun over the Memorial Day weekend. He closed out a long

time spent in FN21. By the time you read this, Andy will hopefully be well on his way developing his new glider pilot training business in Florida. He should be on from EL89 very soon. Good luck, Andy.

Also experiencing the newness of operating on VHF is Walt, N8PVT. He wrote me a nice letter about the fun he is having on 6 meters. And that is what this hobby is all about—having fun.

Dave, N5JHV, reports that he too worked Alaska on May 14. KL7NO and KL7GNG both made it into his log during a double-hop sporadic-E opening. Additionally, Dave reports that he worked 69 stations in VE1, and W1–4 call areas during the double-hop opening on May 25–26.

I experienced sporadic-E openings on May 8, 9, 12, 14, and 25, with most of the activity on the 25th. On that day I worked 75 stations in W1, W2, W3, W4, W6, W8, W9, VE3, and 4U. A total of three new states and one new country were added to the log. As you can see, it was an excellent opening shared by many across the country.

West Coast VHF/UHF Conference: A Final Report

The West Coast VHF/UHF Conference last May was an outstanding success, with a new attendance record of 245 participants registered. Among the hottest sessions was "How to Get Started on EME" conducted by Chuck Smallhouse, WA6MGZ. There were 92 people interested in what Chuck had to say. More than half of the participants attended the banquet, and more than one third of them attended the breakfast. Additionally, two dozen pre-amps and two dozen antennas were measured at the measuring sessions. Also, all vendors reported brisk sales of their wares.

If you missed this year's conference, you missed a great one. So as to not miss next year's conference, mark your calendar now. The dates for you to set aside are May 21–23, 1993. The conference will be held at the same place. If you are interested in obtaining a copy of this year's proceedings, send $15 ($12 plus $3 shipping) to the ARRL and ask for the "1992 West Coast VHF/UHF Conference Proceedings." It is 150 pages long and full of excellent papers related to weak-signal work.

Western States VHF-Microwave Society Formed. Also at the Conference Chip Angle, N6CA, and Wayne Overbeck, N6NB, announced the formation of the Western States VHF-Microwave Society. The society was established to represent the interests of the weak-signal community in national and local band-planning matters. Approximately 95 people signed up as members while at the conference. Most of the new members also completed a survey developed by Chip. The outgrowth of the survey and the society formation was the appointment of Chip and Jim Steffen, KC6A, as its representatives in band-planning matters and the development of a clear position for the society to take at any future band-planning meetings.

Incidentally, the society has an open membership policy; that is, its membership is open to anyone who is interested in the promotion of the principles of the Society. If you are interested in membership, send an SASE to The Western States VHF-Microwave Society, P.O. Box 35, Lomita, CA 90717. As of this writing ongoing negotiations are being conducted between the society and SMA concerning the ARRL-sponsored 222 MHz weak-signal window petition.

Current Contests

CQ WW VHF WPX Contest. Did you enjoy the revised contest? As this is being written a month and a half before the contest is to take place, I cannot say how it went. However, many of you with whom I have spoken expressed an interest it. I am especially appreciative of the plugs that "The West Coast VHFer," the "SWOT Bulletin," and "FEEDPOINT" gave the contest by reprinting the rules. I also want to thank *NCJ* for the front-cover plug on their July/August edition and Terry Baxter, N6CW, and John Dorr, K1AR, for writing some very kind words about the contest organizer (me) in the respective columns for which they write.

If you participated, please get your logs in the mail to me postmarked by August 31, 1992. Even if you did not participate and have some input concerning the new rules, please send me a note.

ARRL 10 GHz Cumulative Contest. This year's 10 GHz Contest is scheduled for the weekends of August 15–16 and September 19–20 from 8 AM to 8 PM local time. The rules were published in the June issue of *QST*. However, here are a few of the highlights.

The exchange is the *six*-character Maidenhead Locator (example: FM18hp). Duplicate contacts may be made, provided one end of the two stations has moved at least 16 km (10 miles). Contacts must be made over a minimum distance of 1 km. Scheduling of contacts can be accomplished during the evenings of Tuesday through Thursday prior to the contest on 3.818 MHz. Alternatively, scheduling can be made on 144.230 MHz and 146.55 MHz. Scoring is done by way of adding distance points (in km) of each contact and unique callsigns (worth 100 points each) to each other for a total score. Send your logs to the ARRL by October 20, 1992. Incidentally, for those of you in the North Texas area, Kent Britain, WA5VJB, will supply a 10 GHz RF Head to help you get in on the fun.

Current Conferences

East Coast EME Meeting. The East Coast EME Conference for those who are not going to Europe is scheduled to take place between August 14 and 16 at the Oxon Hill, Maryland Ramada Hotel. Contact Willy Mank, W1ZX, Hwy 228, Box 144D, Waldorf, MD 20603, for more information. Contact the hotel at 301-630-4050 for special rates for the meeting. See last month's column for a list of tentative speakers.

VHF-Plus DXpeditions

KM1E/C6A. During Bill's second stay at C6A, between March 6 and March 31, he managed 53 QSOs with 13 countries. He was responsible for giving Peter, PY5CC, his 129th country; for completing Doug, ZP6CW's DXCC on 6 meters; and for the first ZL-C6A QSO. He noted the change in propagation from the beginning of the month to the end of the month. In the beginning of the month he had two QSOs with Europe. At the end of the month most of his QSOs were south, southeast, and southwest, with a number of backscatter contacts to W4 and W5 land. Bill is due to return to C6A around Thanksgiving weekend. QSLs go to his home call.

Aves Island. I forgot to mention last month that I met the guys who operated from YX0AI

while we were at Dayton. They told me that they made in excess of 250 contacts on 6 meters. They very much appreciated Ed Muller, YV5ZZ's loaning them his 6 meter station for the DXpedition. Also, they wanted me to be sure to mention that the QSL route has changed. Cards should now be sent to: Mr. Pablo Alonso, P.O. Box 68535, Caracas, 1062-A, Venezuela. Indicate 6 meters by marking "6M" on the lower left side of the envelope. Do *not* show any callsigns on the outside of the envelope.

V31IV. A pleasant surprise for those of us on 6 meters over the Memorial Day weekend was the appearance of Jim Treybig, W6JKV, as V31IV. While conditions were not good for north-south sporadic-E propagation, around 80 operators from the W1, W2, W3, W4, W5, and VE1 parts of North America were able to add a new country to their totals. Among the lucky ones was Joe Reisert, W1JR, for his one hundredth country on 6 meters. With this contact Joe is now a winner of the mythical ten band DXCC. As always, QSLs go to Jim's home call.

4U0UN. Also showing up on the Memorial Day weekend (specifically Monday, May 25) was 4U0UN, a special prefix for the United Nations building amateur radio station (normally 4U1UN). Contacts as far away as California (K6ODV, among others) were made. Many contacts throughout the U.S. were logged by Dave, K2GN, the operator of the station. Numerous 6 meter operators were very appreciative of Dave's efforts to put that "country" on the air on such short notice over the holiday weekend. QSLs go to W8RZN.

Kerry, ZL2TPY. While operating as 5W1KY he had contacts with the following countries: 3D2, KH6, JA, V73, JD1 (Ogasawara), T20, VK, P29, HK4, ZS6, TI2, V31, ZP6, ZL1, 3D2 (Rotuma), PY5, CX2, CE3, V63, and two North Americans (K6QXY and WA6BYA). He heard the VS6 and ZD8VHF beacons. Additionally he heard, but did not work, YS1AG, FO5DR, and a BT4(?) during his stay that lasted from April 18 to April 28. From ZK3TPY he has worked the following: VK, VS6, P29, V63, FO5, PY5, 3D2 (Rotuma), FK8, KH6, T20, V73, KG6, 3D2, HL9, H44, and all JA districts. He has heard the PY2AMI, ZD8VHF, and DX1XB beacons. Kerry had some political problems initially when the island chief refused permission for him to operate because the chief was never notified of his arrival. However, he overcame that probem and, in turn, made himself welcome by everyone on the island by fixing every appliance that has been broken for the last three years. To date, he has made over 1000 QSOs from each island. Thanks to Bob, WA6BYA, for the report on Kerry.

VHF-Plus Products

Audio Keyers and Voice Processors. Are you planning on working the Perseids? Do you want to save your voice? Then you might want to take a hint from the contest boys and get yourself an audio keyer. Four of them currently on the market are the W2IHY Audio Keyer, the Ventriloquist, the Advanced Voice Products' VB-8A, and the K1EA Digital Voice Processor.

The W2IHY Audio Keyer. This is a kit that is based on the audio keyer that was published in the ARRL *Handbook* in the 1989 and 1990 editions. It allows up to four messages of 13 seconds in length to be recorded and played back over the air. Kit prices range from $45 (PC board and manual) to $250 (PC board, manual, eight 256K DRAMS, all necessary parts, and case). A fully assembled model may be purchased for $300. Mail orders to: W2IHY Keyer, *c/o* Julius Jones, 15 Vanessa Lane, Staatsburg, NY 12580. Phone orders to 914-889-4933.

The Ventriloquist. Susan, WA6OCV, who is one of the principals in the company, has worked eight states via meteor scatter. So if you call her up to order one of these for meteor-scatter work, you will be speaking to someone who is familiar with this application. This unit is a fully assembled and tested PC board that also contains provisions for four messages. For keying purposes, it is compatible with K1EA software. The assembled PC board sells for $124.95, and if you want one in an ABS enclosure (it is recommended) you should add $25. Send for yours at: j•Com, P.O. Box 194, Ben Lomond, CA 95005. Phone orders to 408-335-9120 and FAX orders to 408-335-9121.

Advanced Voice Products' VB-8A. This is the most sophisticated self-contained unit of the ones mentioned here. It can store up to 100 seconds of audio in 16 separate segments. One neat thing about this unit is that you can chain messages together. You can also set the length of the pause for those of you who pause (or break) during your sequence. Because the pause length can be set for up to 20 seconds, you can set up your whole sequence. Your imagination is the limit to how you can use it for meteor-scatter work. It can be controlled by a built-in keypad or via a serial port on your computer. It can also be used as a voice beacon. Fully assembled and tested units are available for $375. Orders to: Advanced Voice Products, P.O. Box 1064, Mauldin, SC 29662. You may also place your order toll-free by dialing 800-736-1409.

The K1EA Digital Voice Processor. This item made its debut appearance at Dayton. It promises to revolutionize voice contests. It is a short XT card you stick in your IBM-type or compatible personal computer. What you get is a dream! You can use your computer's hard drive to record hundreds of stored messages (the only limit is the size of your remaining memory on your hard drive). It also has an "on the fly" running "record" memory that you can use with your receiver in order to play back the last 30 seconds of received audio. This feature alone has numerous applications.

Obviously, this product is fully compatible with K1EA software. The purchase price is $299. K1EA's CT version 8 is also available for $50. If you buy both, the combined price is $325. An interface cable can be purchased for your radio (specify which one) for $45. When they were at Dayton they were awaiting their FCC registration number. However, by now they should be shipping these cards. For yours, you can write to K1EA Software, 33 Truell Road, Hollis, NH 03049. Phone orders to 603-465-2392.

And Finally . . .

This is the beginning of my second year as your columnist. I really appreciate your acceptance of me. Your contributions and words of encouragement are what keeps me snooping out the news of interest to you. Therefore, this column is a success because of you. Keep those contributions coming. I hope to make your efforts a little easier in a couple of months by adding a FAX machine. As soon as I get it going, I'll let you know the number.

Until next month . . .

73, Joe, N6CL

PACKET USER'S NOTEBOOK

BY BUCK ROGERS, K4ABT

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

Packet Profusion

I have several topics to cover in this month's "Packet User's Notebook." However, I'm finding it difficult to decide which to address first. Tossing a coin won't work either, as there are only two sides to the coin, and there are a dozen topics that need attention.

From the mail I'm getting these days it appears there is a lot of networking taking place. Many sysops are interested in the latest techniques used to build and install backbones and trunks. The requests for information pertaining to the 9600 baud issue are overwhelming. I'm happy to add that I'm continuing the research along these lines, and I hope to have more information to add to the 9600 baud modifications of the May 92 column.

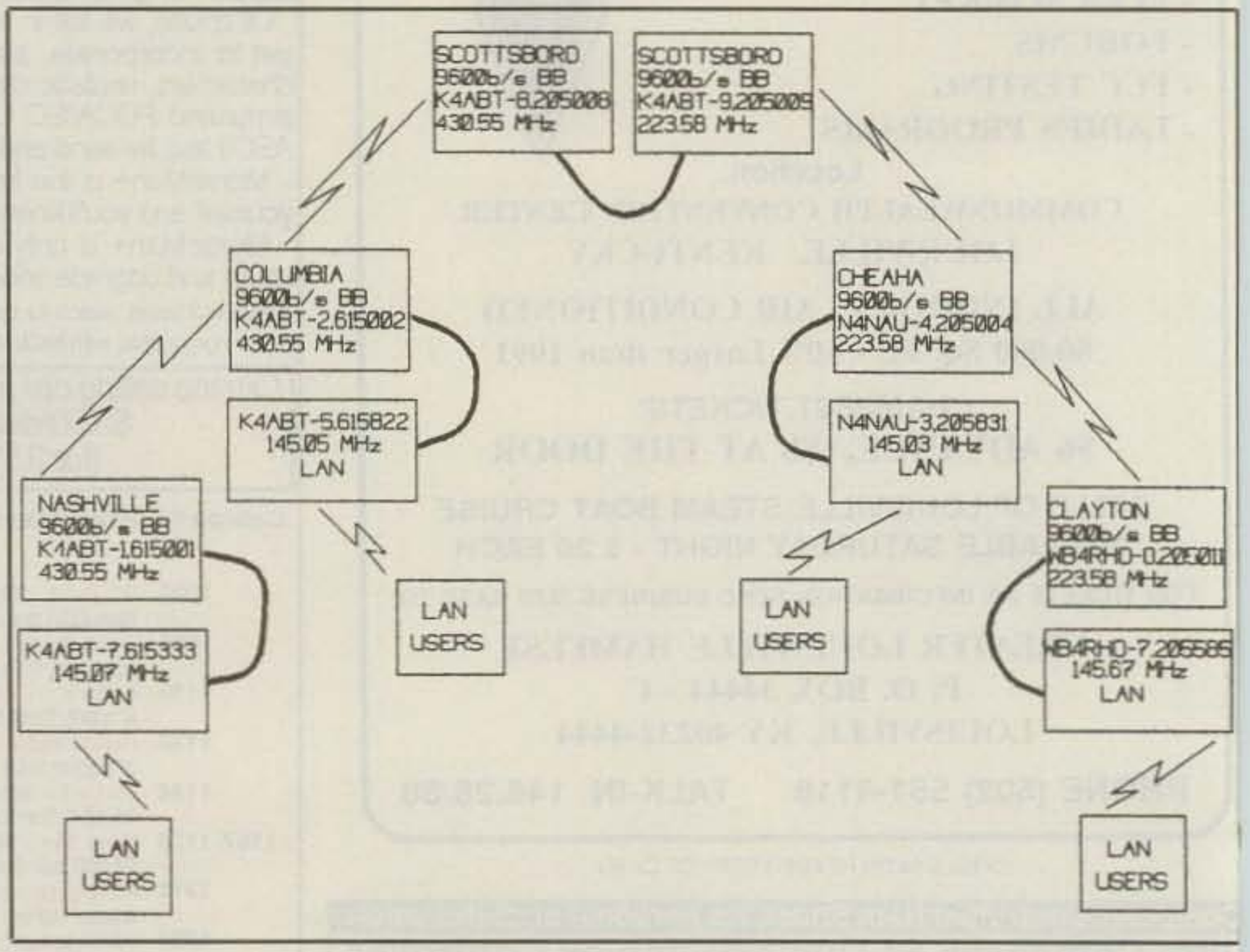


Fig. 1– Solid, curved lines indicate RS-232 interface between the LAN switch and the backbone. Electric "bolt" symbols indicate RF path between users and the Local Area Network, and the backbone (BB) limited access switches. (Note: At the SCOTTBORO switch the transition from 430.55 MHz to 223.580 MHz is similar to the way a LAN switch is interfaced into the backbone trunk.)

Caveat

Adding 9600 baud to the network trunks and backbones enables us to move data faster. There is one caveat, and that is the use as well as the need of spectrum for use with these higher speed trunks and backbones. We packeteers would do well to look at the 223 MHz region for the needed spectrum. We might even consider supporting those publications which promote the use of the 220 MHz band.

There is one such publication that has stood strong and fought hard to defend the 220 MHz band during the recent FCC actions that were directed at fragmenting this precious spectrum. It is also one of the most read 220 newsletters because of its watch-dog concern with HR-73.

"220 NOTES" is the name of the newsletter to which I'm referring. The "220 NOTES" newsletter is well worth the $6.50 a year. It is published 6 times a year and covers 220 MHz items of interest to both the 220 voice operator and the 223 MHz packeteer.

You can obtain more information about "220 NOTES" by writing to Walt Altus, AA9AW, W6539 Birch Street, Onalaska, WI 54650. You may also phone the editor, A. B. "Art" Reis, K9XI, at 815-485-7377.

For now we are continuing to use both the low end of the 430 MHz band and 223.58 or 223.40 for 9600 baud trunks. If possible, we could make use of these frequencies for nationwide trunk applications.

1584 Oxford Court, Gallatin, TN 37066

"Gimme A Break"

Seldom do we find a user who attempts a connect directly onto the backbone of a network. However, there is always an exception. Now and then someone will try to circumvent the system, bypassing the LAN gateways and doors, by moving directly to the backbone frequency and attempting a connect at this level. For this reason we've found it necessary to place nondigipeater, limited-access switches on the high-speed trunks. Another approach is to use switches that have password protection at the backbone level so that only sysop maintenance connects are allowed.

In a recent "Packet User's Notebook" article I alluded to the need for a band-plan, while presenting the reader with an example outline. As I stated, I presented the outline only as a basic format, and to give the "planners" a place to begin building. Even though I explained the purpose of the example format, there were a few readers who read their own words into the article and leaped to their own conclusions. A few of these readers concluded that this was a packet band-plan that was etched in stone.

The reason I've mentioned the earlier article is because fig. 1 in this month's column illustrates the use of frequencies that may not be available in all areas. **The frequencies shown in fig. 1 are for illustration only.**

Defining A Backbone

In the following paragraphs I'll attempt to define the building, installation, and use of a backbone system. In some areas the sysops are using several frequencies because the backbone will traverse across more than one state. In this case there are gateways added along the backbone path to accommodate the transition from one frequency to another (see fig. 1).

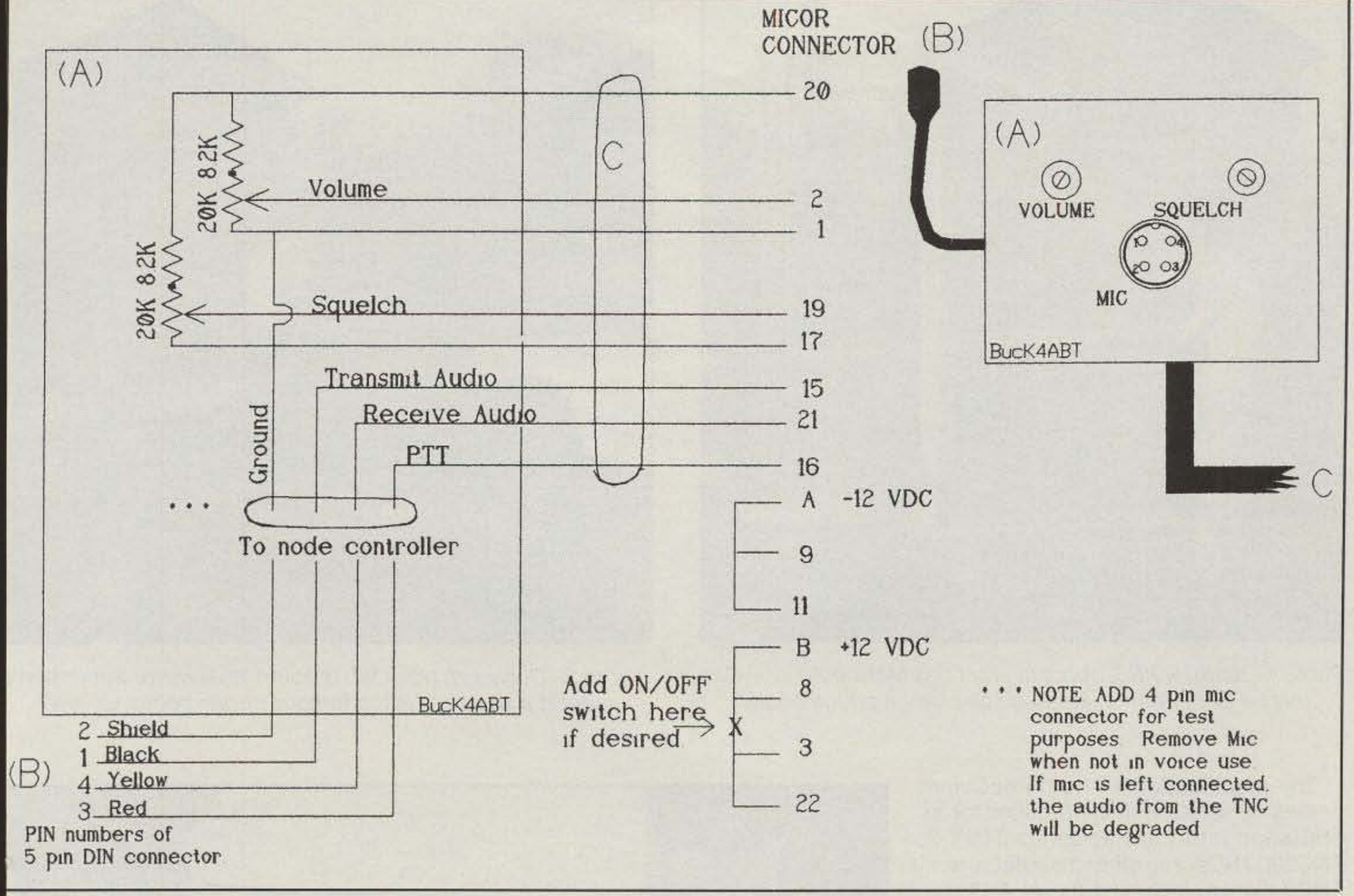


Fig. 2– Interfacing the Motorola MICOR to the TNC2. The pin numbers at cable "C" represent the pins in the connector at the front of the MICOR and directly behind the handle. (Note: To increase the TNC2's transmit audio see the section "Mod the MICORs For Packet" in this column.)

To further define the backbone, let's assume there are areas that use baud rates that are faster or slower than your backbone speeds. This application calls for another type of gateway, which is also shown in fig. 1. In a few cases the protocol used on one switch or node at one baud rate may interface with a different protocol and a different baud rate of another backbone. This is a rare case, and will deserve some careful consideration when deciding on the protocol to be implemented in your network.

"Speed Shifting" To Twice The CPU Speed

In the May 1992 column I made reference to the use of "fast" EPROM and RAM when implementing 9600 baud in the TNC2 and clones. Since then I've learned that a 10 MHz (9.830 MHz) CPU clock-speed modification can be added to these switches and nodes to give them an even greater level of performance than TNCs which use the 4.9152 MHz clock speeds. Not only is this modification useful with switch/node applications, but it also improves TNC performance at the user level when implementing 9600 baud.

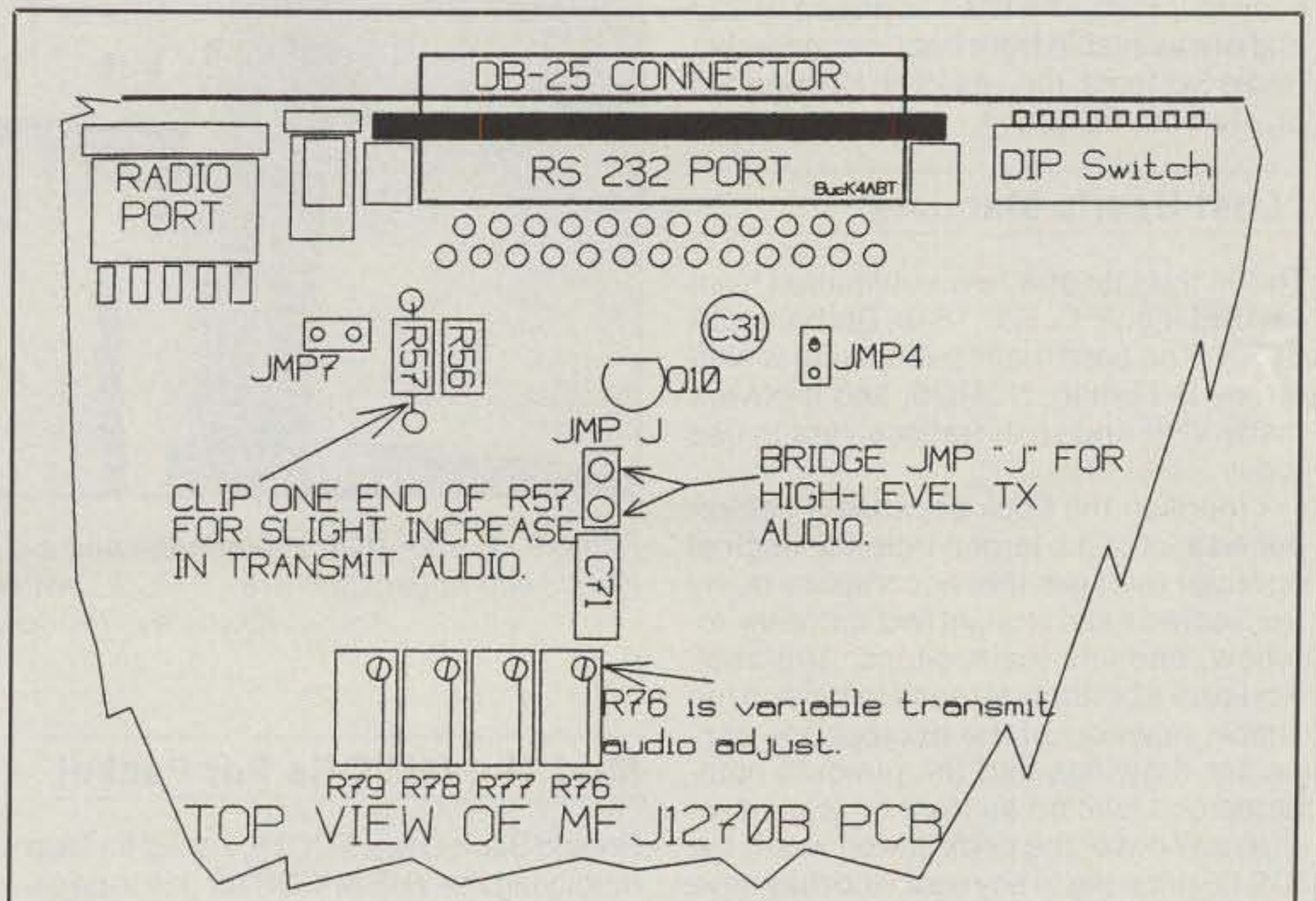


Fig. 3– Top view of a portion of the MFJ-1270B TNC. Arrows indicate points within the TNC that may be useful when more (or less) transmit audio is needed. (See text.)

Photo 1– Keith, N9IBS, about to enter this Metropolis site. Can this be Superman's famed quick-change phone booth?

Photo 2– Durwood, N9HQM, is about to discover Superman's secret if this truly is the famous phone booth. Or is it?

The modification kit from PacComm comes complete with instructions for installation into the PacComm TINY-2, TNC200 TNCs, and other manufacturers' TNC2 clones, including the AEA PK-80, GLB-TNC2A, MFJ-1270B, and MFJ-1274.

The kit includes the 9.8304 MHz crystal, the CPU, and SIO ICs. The new CPU and SIO ICs are designed for the faster speed. The modification is straightforward and easy to install. The kits are priced at $25 and are available from PacComm Packet Radio Systems, Inc., 4413 N. Hesperides St., Tampa, FL 33614.

"Lost User's Manuals"

This is the title of a new publication from ARTSEI Inc., P.O. Box 1848, Burbank, CA 91507. The paperback publication is written by Bill Smith, N6MQS, and it covers many VHF and UHF transceivers in use today.

I mention the book because it has reduced a lot of the jargon from the original operator manuals that accompany many transceivers into straight text with easy-to-follow, one-line instructions. The book would be a better reference to have in the shack, however, if the microphone connector drawings had the pin-outs numbered and labeled as front or rear view.

In any case, the book is well worth the $19.95 price tag to any user who may have lost or misplaced the manual for his or her transceiver. The book covers operation of many Alinco, Kenwood, ICOM, Yaesu, and Uniden VHF and UHF transceivers. Specific transceiver information is available from ARTSIC at 818-843-4080.

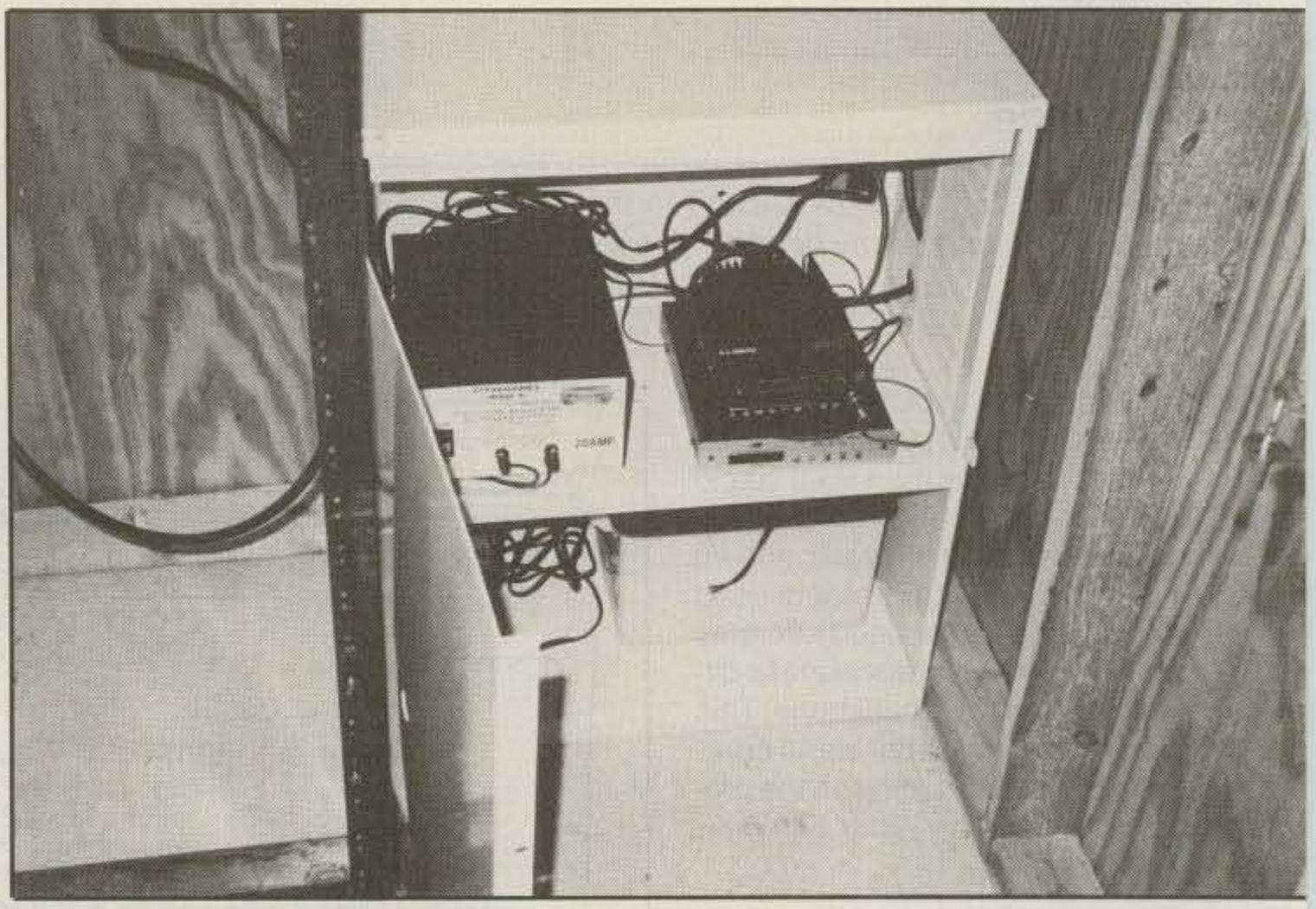


Photo 3– Rather than a telephone and a discarded gray suit and hat, this Metropolis, Illinois site houses the area's ROSE switch. The area is the junction of three states: Kentucky, Tennessee, and Missouri.

Mod The MICORs For Packet

Ronald Scott Gray, N7CTF, asked for help modifying the VHF MICOR for use in packet radio service. In fig. 2 I've illustrated the manner used by Paul and other Griffin, Georgia packeteers to interface the MICOR to a TNC2 ROSE switch.

In addition, in fig. 3 I've drawn a portion of the "late model" MFJ-1270B TNC PC board to indicate how the ROSE op can increase the transmit audio level enough to drive the Motorola MICOR, MOCOM, and GE MASTER II's to the 3.5 to 4 kHz deviation level.

This audio modification is easy to make and requires only the bridging of two solder pads at JMP "J" on the MFJ-1270B PCB. If carefully performed, this modification can be made without removing the PC

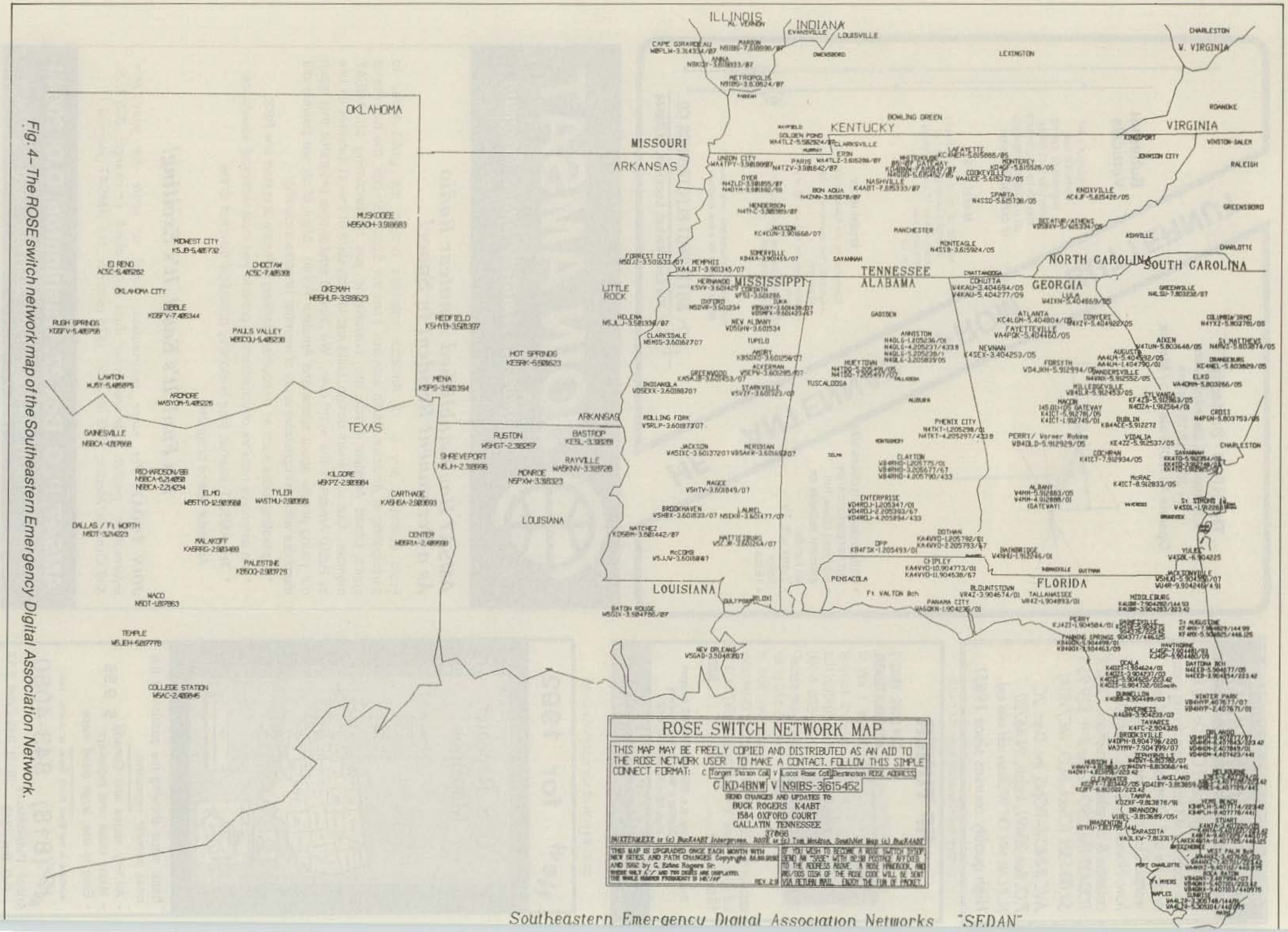


Fig. 4– The ROSE switch network map of the Southeastern Emergency Digital Association Network.

board from the bottom metal cover. Use only enough heat to make a solder bridge between the pads at JMP "J." JMP "J" is located just to the rear of C71 and to the front of Q10. JMP "J" is marked on the PC board. I've implemented this modification with several transceivers that require high-level mic input audio. Even some older amateur transceivers which used pre-amplified mics were easily driven once this mod was in place.

Use an FM Deviation Monitor Whenever Possible!

Often enough transmit audio can be achieved by adjusting R76 to the desired output. If slightly more level is needed, then clip one end of R57, just to the right of JMP "7," and then adjust R76 to the desired level. *Only* when a high audio output level is needed should JMP "J" be bridged. To do so without need for the resulting level could cause extremely wide deviation if the transceiver does not have protective circuitry to prevent this occurrence.

The use of an FM deviation monitor is the best insurance when making the kind of adjustments we are addressing here. There are some very expensive "Service Monitors" available for this purpose, and there are some more affordable deviation monitors that we can use.

The "Quarter Moon" Is Missing From The Door

Something is missing in photos one and two. In photo one Keith, N9IBS, is about to enter, and in photo two Durwood, N9HQM, is just leaving. What and where is this place?

At first, when we learned the location was near Metropolis, we thought this might be the phone booth that Superman uses for his "quick-changes." Actually, however, this is the site of the Metropolis, Illinois ROSE switch. We found the answer in photo three. A TNC2 clone is the boarding place for the ROSE EPROM, and the Data-Radio is the Alinco DR-1200. The power-plant is a 20 amp 13 volt Pyramid supply, with a 70 amp 14 volt marine battery attached as a standby power source.

The building houses the N9IBS-3, 18524 ROSE network switch for Metropolis, Illinois. This is the point where three states meet. They are Golden Pond, Kentucky (WA4TLZ-5,502924), Union City, Tennessee (WA4TPY-3,615885), and Cape Girardeau, Missouri (W0PLW-3,314334). From here the path goes to Anna, Illinois (N9KQY-3,618833) and north.

Fig. 4 tells more about the growth of the ROSE network. However, if I draw the map to include more area, the text becomes too small to read. Maybe I'm about to undertake a second map.

We're Having Fun Packeting!

73 de BucK4ABT@W4HHY.TN.USA.NA

MATH'S NOTES

BY IRWIN MATH, WA2NDM

WHAT'S NEW AND HOW TO USE IT

In a move to simplify the problem of interconnecting the data-processing equipment built by many different manufacturers, the Electronic Industries Association (EIA) has specified certain transmission methods that over the years have become the accepted "official" input/output standards. This month we will look at three of the more common ones, how they are handled, and how we can interface with them.

The oldest and most well-known standard is, of course, RS-232. It provides a data communications link with speeds of up to 19.2 Kb/sec. and transmits data in one direction per line. Fig. 1 shows the basic scheme and data waveshape. RS-232 employs voltage levels from ±3.75 to ±15 volts and load impedances of 3K ohms or higher. Quite often ±5 volts is employed, as it is closest to the voltages found in other parts of the data-processing equipment. Due to the relatively high impedance of the system, direct cable lengths of 50 feet are the longest recommended by the standard. However, it is not uncommon to extend this distance to 100 feet in actual practice. RS-232 is usually accessed by means of specific pins on a 25 pin "DB" type connector. Although only two of these pins are actually used for the data (transmit and receive), the other pins are used to connect various support signals. All pins use the ± voltage levels, however. A full explanation of these other pins is available in most computer handbooks, so we will not take up the space to explain them here.

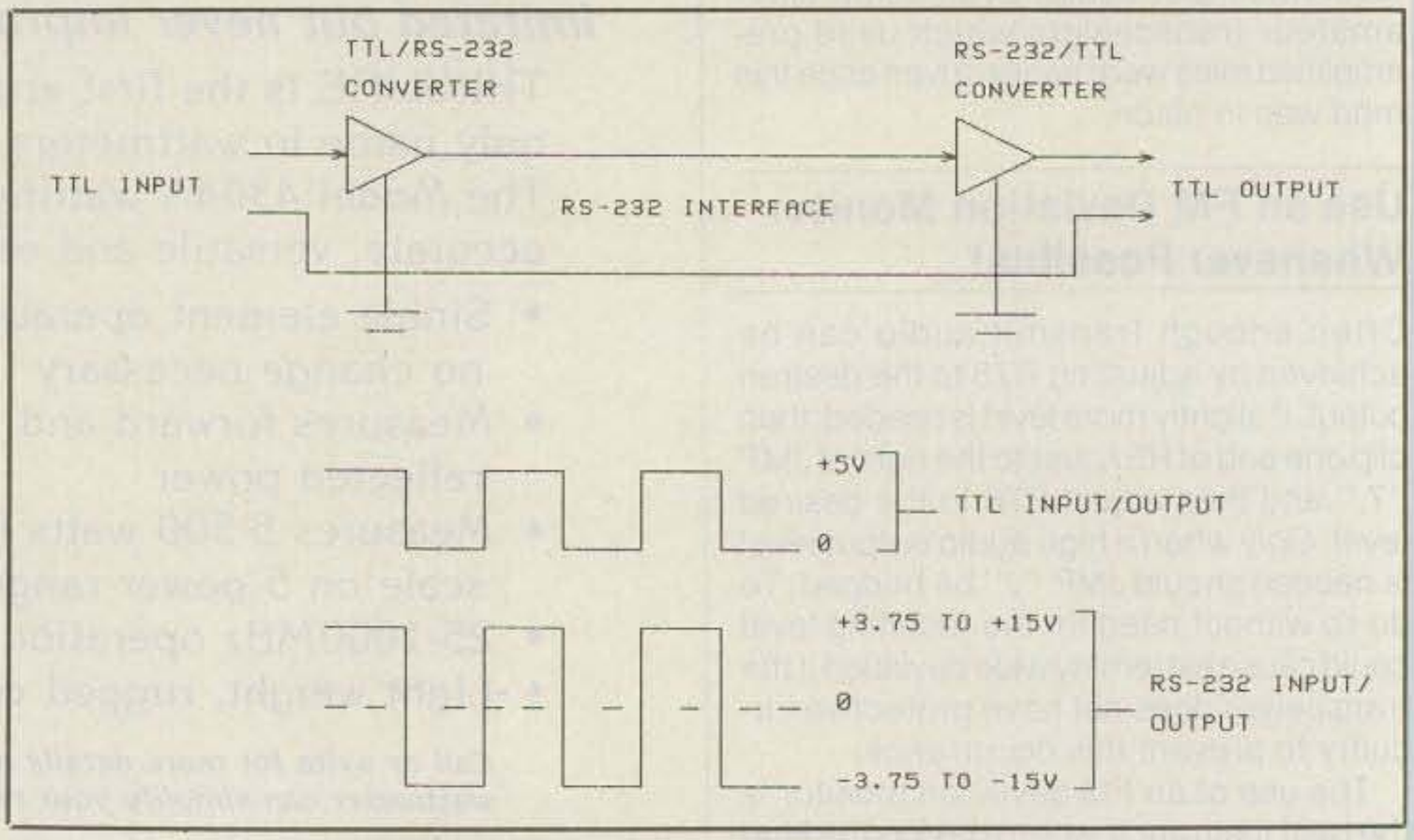


Fig. 1– Details of the EIA RS-232 standard.

Several chips are available to convert digital TTL to RS-232 or vice versa. The most common are the 1488 and 1489 (with many different prefixes, depending on the manufacturer). Fig. 2 shows the hookup for these. You will notice that the 1488 requires a negative voltage to satisfy the RS-232 standard. The negative-voltage converters discussed in the February edition of this column would be ideal for this application. The 1489 does not require the negative voltage, as it ignores negative transitions of the input signal and considers anything below 3.75 volts as a logic 0. For those who do not have access to these chips, fig. 3 shows a way to transmit and receive RS-232 signals with common "junk box" components. Incidentally, international standard V.24 is identical to RS-232.

In an attempt to upgrade RS-232 with a more modern approach, the EIA introduced RS-422 in 1975. RS-422 extends the upper data rate limit to 10 Mb/sec. and does away with the need for negative voltage. The method of transmission is shown in fig. 4 and consists of a two-wire line transmitting both the data and its complement, which is, in turn, received by a balanced differential receiver. Furthermore, the impedance of the line has been dropped to 100 ohms, which allows the 10 Mb/sec. rate to be transmitted over twisted pairs at distances of up to 40 feet in length. At slower rates, hundreds and even thousands of feet can be covered.

Some of the commercial ICs that convert TTL to RS-422 and vice versa are the 26LS31, 26LS32, 88C20, 88C120, and 8921. If these are not available, you can use a three TTL inverter to transmit RS-422 and two op-amps to receive it as shown in fig. 5. The TTL inverters, to fully comply with the specification, must be capable of driving a 100 ohm load. If the distance is

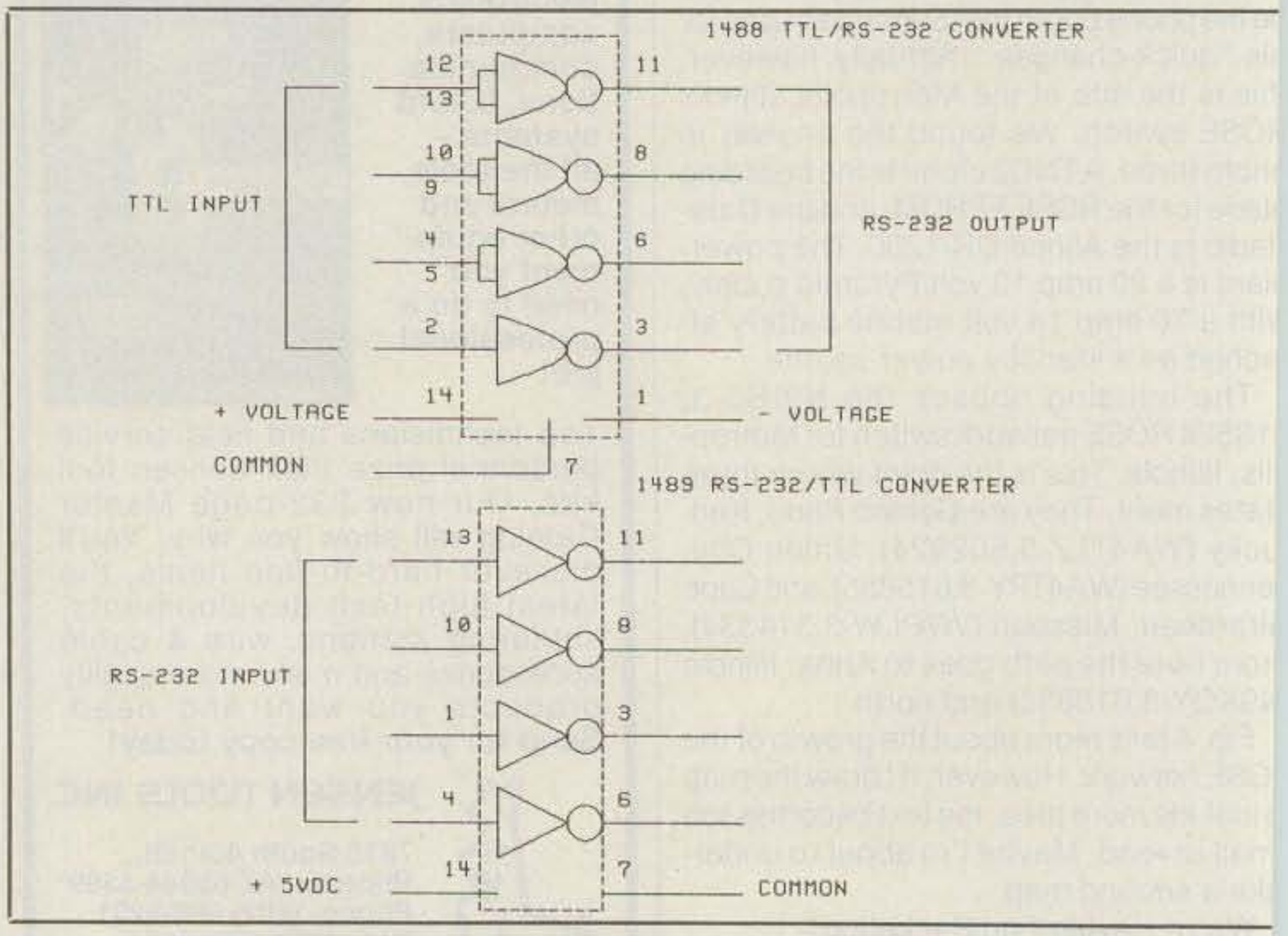


Fig. 2– Common RS-232/TTL chips, the 1488 and the 1489.

c/o CQ magazine

WE SHIP WORLDWIDE

Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en Nueva York
WE SHIP WORLDWIDE!

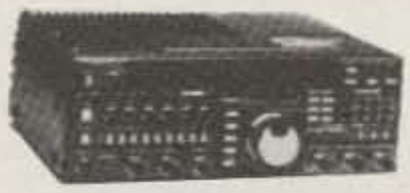
L. Juli

Lewis W2BIE, Kitty WA2BAP,Jan KB2RV
Specialist in RADIOS;
Business marine aviation, ham radios and scanners.

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday 10-5pm/Sunday 11-2pm
Monday-Friday 9 to 6:00 PM
Come to Barry's for the best buys in town

DRSI
ONV Safety belts- in stock

ICOM
IC-R71A, 751A, 781, 229H, R-7000, IC-765, IC-726, 3230H, 729 &728, IC-901, R-7100, IC-2410A/2500A, R-1, R-72, R-100, P2/P4AT



CONTACT US FOR THE LATEST IN COMMERCIAL HAM SHORTWAVE RADIOS AND SCANNER

YAESU

FT-767GX, FT-890, FT-747GX, FT-990, FRG-8800, FT-736R, FT-1000D, FT-415/815 FT-5200, FT-2400, FT-470, FT-411E

CES
Simplex Autopatch SDI-50 Will Patch FM Transceiver To Your Telephone. Great For Telephone Calls From mobile To Base. Simple To use. SDI-50

KENWOOD

ANTENNAS
A-S, AES, Cushcraft, Hy-Gain, Hustler, KLM, METZ, Urban, MODUBLOX, TONNA, Butternut, Multi-Band

TS450S/AT, R-5000, TS-850S, TM 241/A/ 441A, TR-751A, Kenwood Service Repair, TS140S, TS690S, RZ-1, TS-790A, TS950SD, TH-78A, TH28/48A, TM-941A, TM-741A, TM-732A, TM-641A

YAESU	ICOM
FT-23R/26/76	IC2/3/4SAT
FT411E-811-911	IC02AT/2SRA
FTH-2008/7008	IC2/4GAT/24AT
	IC-A21/U16

Landmobile HT's
ICOM: U16, H16, V100, U400
MAXON, MOTOROLA,
YAESU: FTH 2008/7008
UNIDEN, REGENCY, KING,
MARINE ICOM: M7, M56, M700
AVIATION ICOM: A21 H.T., TAD

IC-W2A

IC-H16/U16

MOTOROLA RADIUS COMMERCIAL RADIOS

TH-78A

FT-470

MARINE RADIOS
ICOM M7, M11, M56, M700TY, M800
AVIATION PORTABLE ICOM A-21
KING KX-99

Budwig ANT. Products
FLUKE 77, 83, 85, 87 Multimeters

AOR-AR900, 1000, 2500, 2800, 3000—wide range scanners

CES
Connect Systems (CSI)
PRIVATE PATCH V, Duplex 8200, CS800

TUNERS STOCKED:
NYE MBV-A 3 Kilowatt Tuner

MFJ-989C

Covercraft/Coaxseal Stocked

SHORTWAVE RECEIVERS STOCKED

GEOCHRON
World Time Indicators

VoCom/Mirage/Alinco
VoCom/Mirage/TE SYSTEMS
Amplifiers & 5/8λ HT Gain Antennas IN STOCK

G&G ELECTRONICS ART1, Air Disk, SWL, Morse Coach

Computer Interfaces Stocked: MFJ-1270B, MFJ-1274, MFJ-1224, AEA PK-88, MFJ-1278T, PK-232 MBX W/FAX, DRSI PRODUCTS

DAIWA

COMMERCIAL & HAM REPEATERS STOCKED. WRITE FOR QUOTES

Kantronics
KAM, KPC II, KPC IV, Data Engine, DVR 2.2 ,KPC-3

MOTOROLA

MOTOROLA AUTHORIZED DEALER
KACHINA COMMUNICATIONS DEALER

Radios for Business, Gov't, 2-way, etc. Stocked & Serviced,
Call for Great Prices!

Panasonic

Shortwave Radios/Marine

Wide selection of SW & Amateur Publications

AUTHORIZED
SONY®
DEALER

AMPLIFIERS STOCKED:
RF Concepts
Mirage
TE Systems

DIGITAL FREQUENCY COUNTERS
OPTOELECTRONICS model 1300 H/A, 0-1300MHz
2300, 2210 H, 0-2200 MHz, 2600H, UTC-3000, 2810

Long-range Wireless Telephone for export in stock

COMET ANTENNAS STOCKED

HEIL EQUIPMENT IN STOCK

DRAKE

Telephone scramblers for cellular and regular phones. $299.00 each

Phillips DC-777
FM, MW, LW, SW
Cassette Car Stereo

Alpha Delta Products Stocked

AEA Isopoles (144, 220, 440 MHz), Isoloop.

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
6146B

BIRD
Wattmeters & Elements In Stock

BENCHER PADDLES. BALUNS. LOW PASS FILTERS IN STOCK

MIRAGE AMPLIFIERS
ASTRON POWER SUPPLIES
Belden Wire & Cable, Int'l Wire
OPTO KEYERS STOCKED

STANDARD.

JRC
NRD-525,
JST135,
NRD-535D

Hy-Gain Towers will be shipped direct to you FREE of shipping cost.

IIX Towers, Antennas, Mobile Radio mounts stocked. Call.

AMERITRON AUTHORIZED DEALER

MAIL ALL ORDERS TO: BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST., BETWEEN SPRING AND BROOME ST.)

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"
BARRY INTERNATIONAL TELEX 12-7670

Monday-Friday 9 A.M to 6:00 P.M.
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)

IRT/LEX-"Spring St. Station". **Subways:** BMT-"Prince St. Station". IND-"F" Train-Bwy Station"
Bus: Broadway #6 to Spring St. Path-9th St./6th Ave. Station.

COMMERCIAL RADIOS STOCKED: ICOM, Motorola, MAXON, Standard, Yaesu. We serve municipalities, businesses, Civil Defense, etc. Portables, mobiles, bases, repeaters...

ALL SALES FINAL

We stock: AEA, ARRL, Ameco, Ameritron, Antenna Specialists, Astatic, Astron, B&K, Belden, Bencher, Bird, Butternut, CES, Cushcraft, Daiwa, Elmac, Henry, Heil, Hustler, Hy-Gain, Icom, KLM, Kantronics, Larsen, MFJ, Mirage, Nye, Palomar, RF Products, Shure, Tempo, TUBES, Yaesu, Vibroflex, Duplexers, Repeaters, Scanners, Radio Publications,

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED
COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
Export Orders Shipped Immediately. TELEX 12-7670

Technical help offered upon purchase

FAX: 212-925-7001

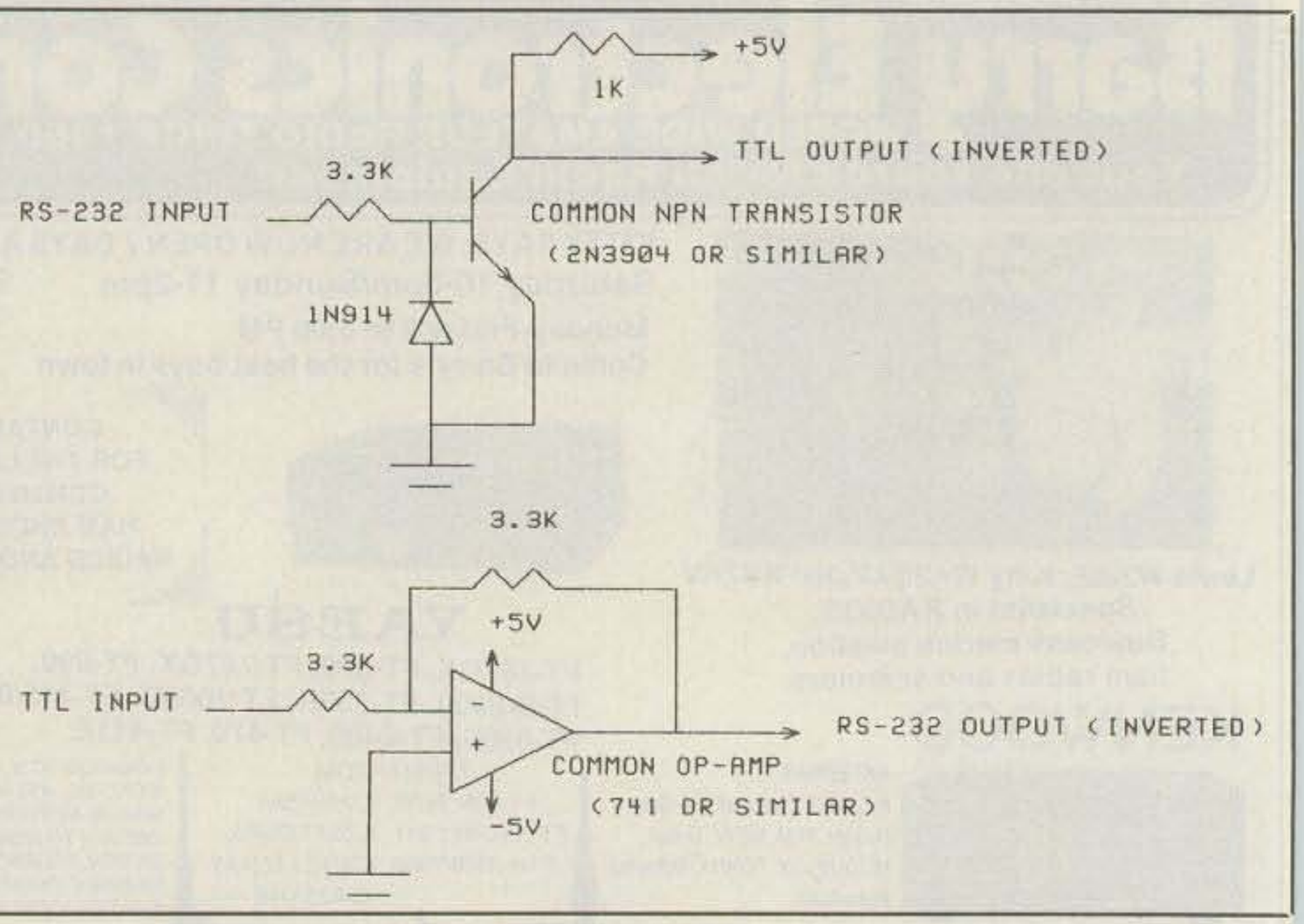


Fig. 3– A method of interfacing RS-232 with common components.

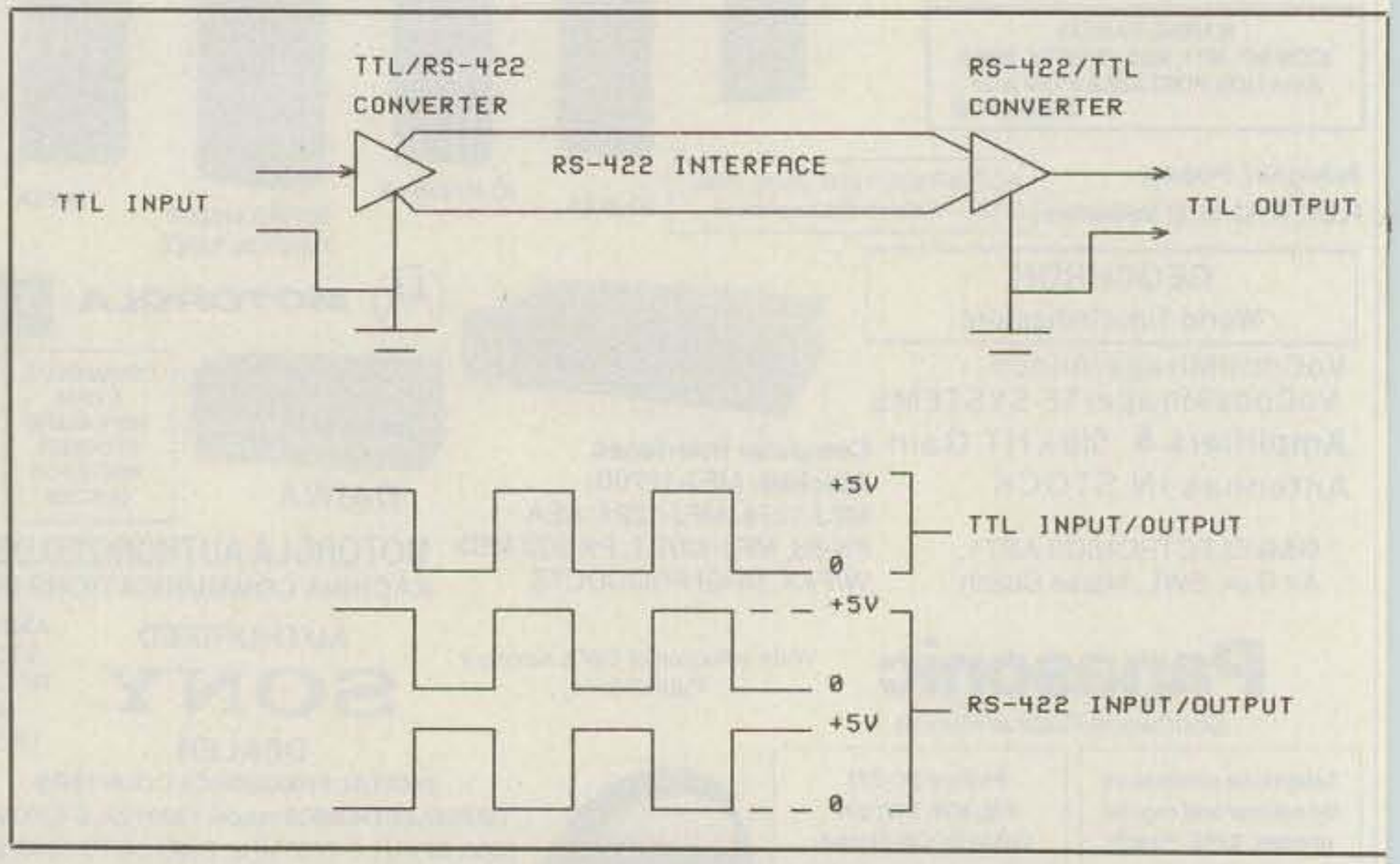


Fig. 4– Details of the RS-422 standard.

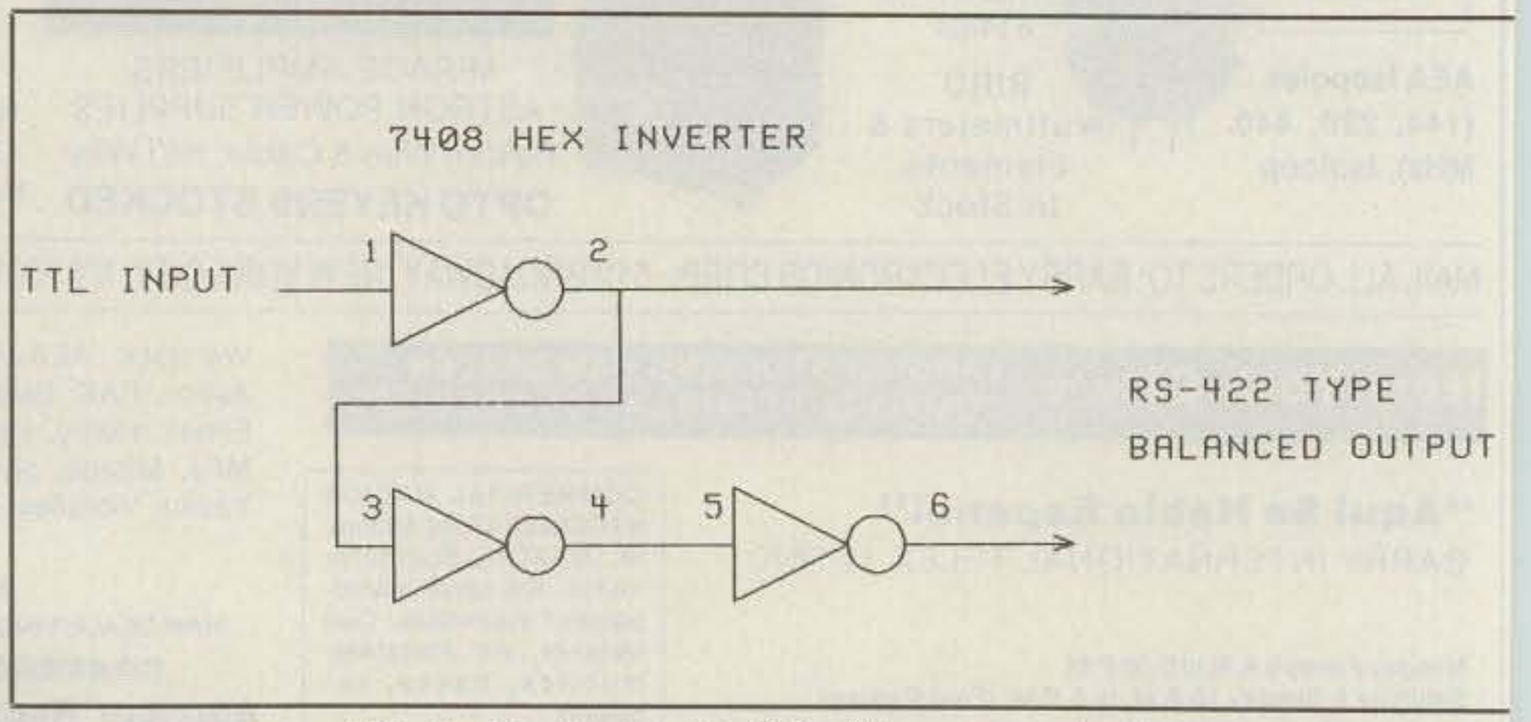


Fig. 5– Producing RS-422 with common logic.

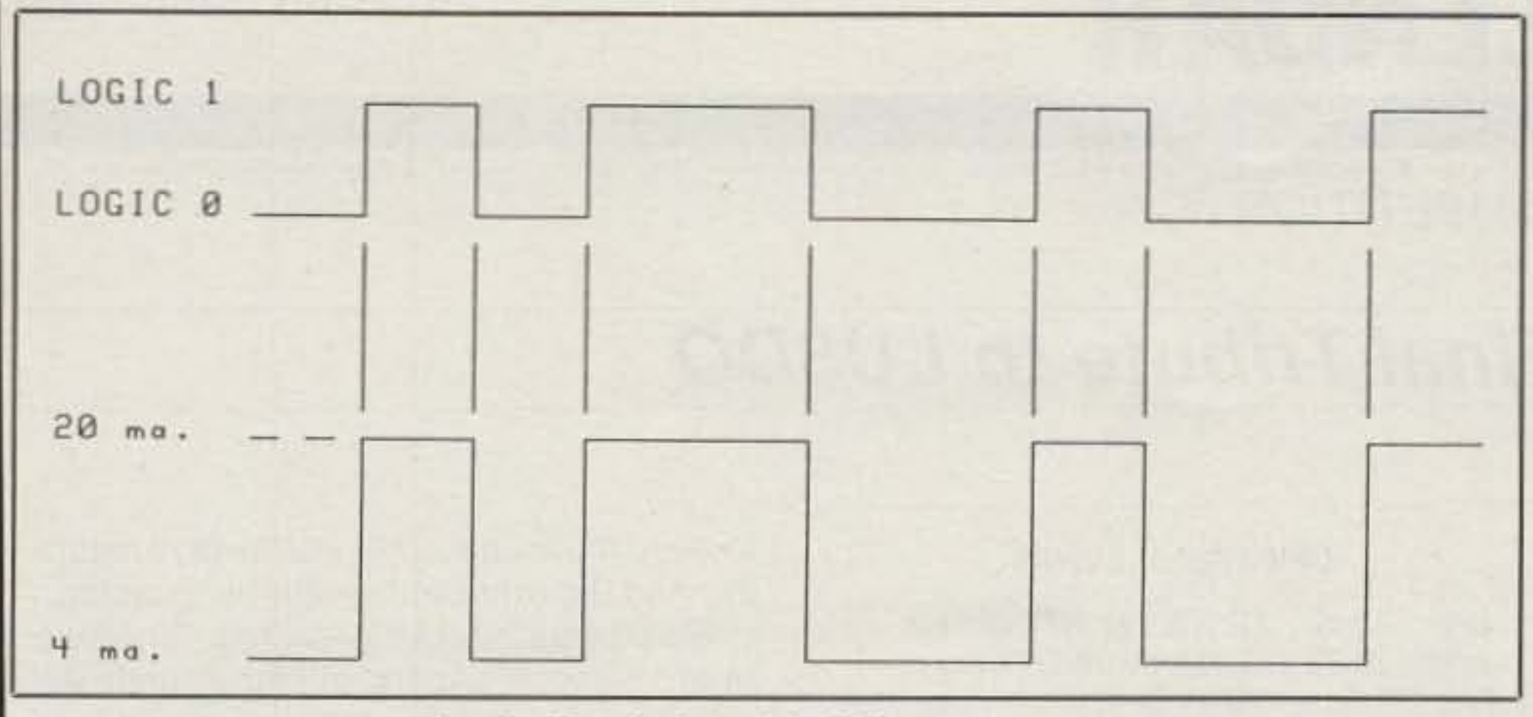


Fig. 6– The industrial 4/20 ma standard.

short, however, and the data rate slow, you can get away with common 7400 units by raising the terminating load impedance as high as 3K. International standard X.26 is almost identical to RS-422 and will operate with most RS-422 equipment.

Another very common data transmission standard is the industrial control 4/20 ma current loop standard. As you can tell from the name itself, data is transmitted by current instead of voltage with logic 0 being 4 miliamperes and logic 1 being 20 milliamperes. Fig. 6 shows the details of this standard. The 4/20 ma current loop standard was developed to reduce the effects of noise induced on a data transmission line in electrically noisy areas such as heavy manufacturing plants. It does this quite well, since there is no voltage on the line, only current. This results in a very low impedance line (a few ohms) which is relatively immune to inductively coupled interfering voltages. Fig. 7 shows a workable TTL to 4/20 ma and 4/20 ma to TTL transmission loop. You will notice that the values of R1 and R2 are a function of the current loop voltage source. In the 4/20 ma/TTL converter, 20 ma through the 5 ohm resistor develops 2.5 volts and turns the transistor on. A 4 ma current, however, does not develop enough voltage and the transistor remains off. In the TTL/4/20 ma converter, a TTL logic 1 turns the transistor on, shorting R2. Logic 0 does not turn it on, and the current is developed by R1 and R2 in series. Notice that the logic is inverted in both cases.

The three digital standards shown here are among the most common in use today. Hopefully the information in this column will give you enough insight to be able to easily interface with any of them. If there are any other standards that you feel should be covered, please do not hesitate to write to me c/o *CQ* magazine and I will be glad to comply.

Until next month, then . . .

73, Irwin, WA2NDM

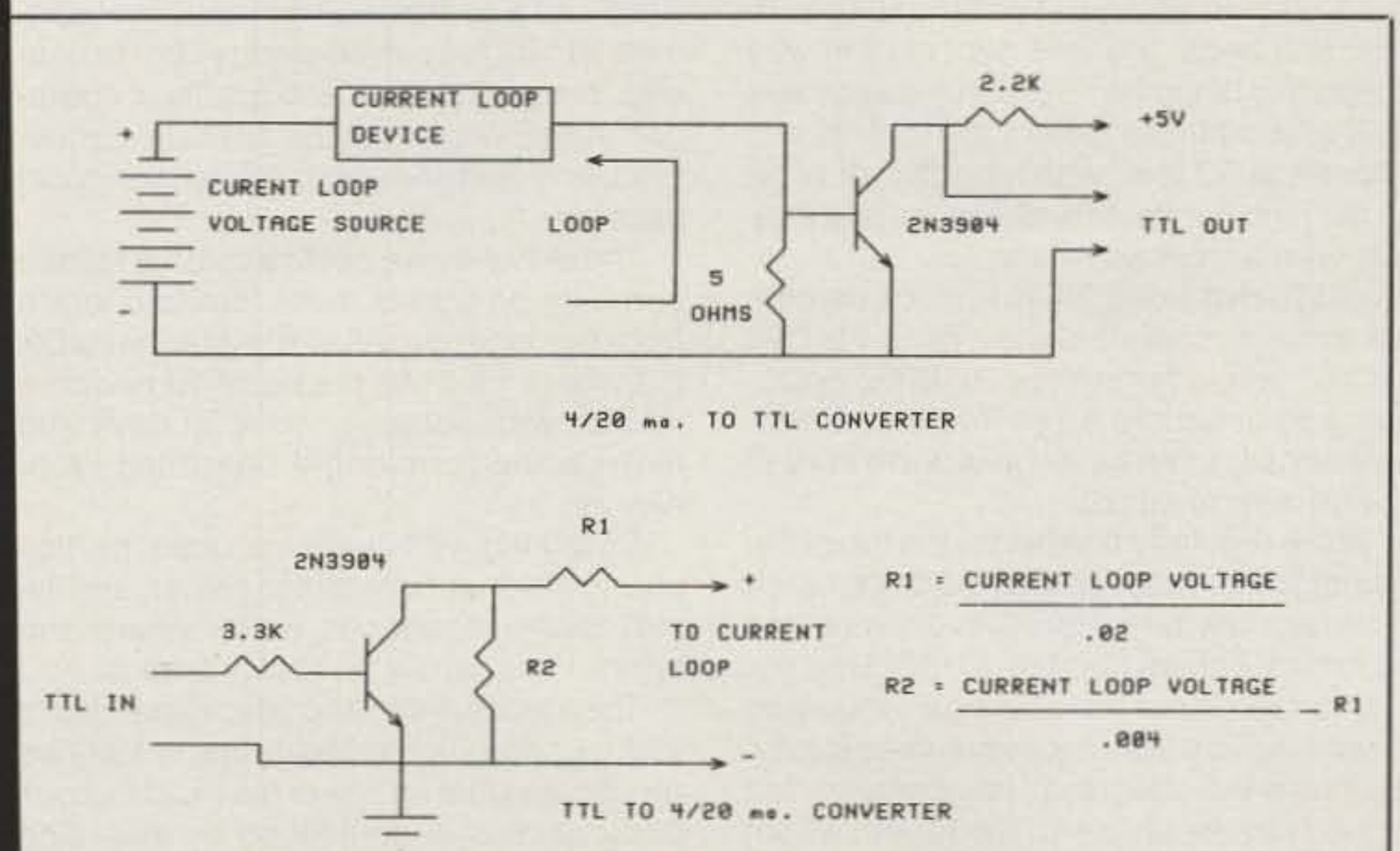


Fig. 7– TTL/current loop/TTL converter circuits.

CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

A Final Tribute to LU8DQ

This week I was fortunate to receive some more information from Jim Hoffman, N5FA, about the life and contributions of Jorge Humberto Bozzo, LU8DQ, who tragically passed away several months ago. For those of you who don't know, Jorge was perhaps one of the finest CW contest operators we had the pleasure to witness in our contest experience. Few of us can give Jorge the justice he deserves, so let's permit the following contributions to speak for themselves.

The LU8DQ Life Story

by Arturo J. Gargarella, LU6ETB

Sometimes we have to report news that is unpleasant and this is one of those moments. On January 22, 1992 at the age of 55 years, in Bernal (province of Buenos Aires) where he was born, Jorge Humberto Bozzo, LU8DQ, became a silent key.

Jorge's father had an active interest in electronics. As such, beginning with his childhood, Jorge was familiar with resistors, capacitors, etc. Jorge was 14 years old when he started radio operating using his father's callsign, and at the same time began his passion for telegraphy. He built his first key with little pieces of metal which he manipulated by using his index finger. Starting work with his father in a local radio station, he received his first license around 1954 at the age of 18 years old. Shortly thereafter he began operating in contests, although achieving limited results in those early years. Nevertheless, Jorge kept on participating in all contests, developing improved skill by observing the work of more proficient operators. It was in 1965 that he received his father's callsign, LU8DQ.

Jorge's first experience in international contests was in 1965 in the ARRL DX Contest while operating multi-single with LU1DZ and LU8DLK. That year the team accomplished a second-place worldwide finish! Jorge was always one to try new techniques as he made several changes to the antenna system in an effort to move into the winner's circle. One modification was a 700 foot long wire suspended from an air balloon for 160 meters!

In 1968 Jorge's team won their category for the first time. Jorge remembered those times joyfully as did his team and host, LU1DAY.

2 Baldwin Street, Windham, NH 03087

Calendar of Events

July	**11-12**	**CQ WW VHF WPX Contest**
July	25-26	Venezuela CW DX Contest
Aug.	1-2	YO DX Contest
Aug.	1-2	North American CW QSO Party
Aug.	1-2	ARRL UHF Contest
Aug.	8-9	Maryland-D.C. QSO Party
Aug.	8-9	Worked All Europe CW Contest
Aug.	15-16	SARTG RTTY Contest
Aug.	15-16	North American SSB QSO Party
Aug.	15-17	New Jersey QSO Party
Aug.	15-17	SEANET SSB Contest
Aug.	29-30	Empire State QSO Party
Sept.	5-6	Bulgarian DX Contest
Sept.	5-6	All Asian SSB Contest
Sept.	6	North American CW Sprint
Sept.	6-20	FOC Late Summer CW QSO Party
Sept.	12-13	Worked All Europe SSB Contest
Sept.	13	North American SSB Sprint
Sept.	19-20	Scandinavian CW Contest
Sept.	26-27	Scandinavian SSB Contest
Sept.	**26-27**	**CQ WW RTTY Contest**
Oct.	**24-25**	**CQ WW SSB DX Contest**
Nov.	7-9	ARRL Sweepstakes CW Contest
Nov.	14-15	Worked All Europe RTTY Contest
Nov.	21-23	ARRL Sweepstakes SSB Contest
Nov.	**28-29**	**CQ WW CW DX Contest**

As time went on, Jorge's career changed from working in the broadcasting station to managing a factory developing communication equipment. During this period he fulfilled his own personal goal of installing a station in his own QTH and started to operate mainly as a single operator.

Jorge was always experimenting with new antennas; thus his own station was constantly being improved. His station was built around three towers at 105 feet and a fourth at 50 feet, with monobanders on all the high bands. In addition, he had various wire antennas on the low bands, including a delta loop for 40 meters. Jorge's equipment consisted of a Yaesu FL-101/FR-101 line, a homebrew 3-1000Z amplifier, and of course a Ten-Tec key. Unfortunately, his main tower blew down in 1988 during a wind storm.

Jorge regularly finished at the top of the standings in major contests from an area of the world where victory is very rare (see summary Tables I and II). LU8DQ did not like to talk about his achievements, and when he did, it was always with modesty. Everyone will attest that Jorge always had a good relationship with those with whom he associated, spending many hours explaining the details of any topic we wanted to learn more about. He was always teaching and experimenting with his passion.

Radio was in fact his longing. When we heard his words so full of enthusiasm, we could never envision that we would lose him so prematurely. His accomplishments will be forever remembered among those difficult to achieve and be an example to all of us. With his outstanding CW skills he was able to achieve success in a sport known by few people, but which granted him the distinguished honor of being one of the best radio operators in the world.

Jorge's last operating activity was in the 1991 ARRL 10 Meter Contest. The radio amateur community has lost one of its best operators, and we have lost a very good friend. The "dots and dashes" of Jorge, LU8DQ's "CQ TEST" will always be in the airwaves.

LU8DQ Approaches The Araucaria DX Group

by Atilano de Oms Sobrinho, PY5EG

My first QSO with Jorge was on January 1, 1963, and since then I had maintained a very close relationship as a friend, amateur radio operator, and contest participant. I quickly became accustomed to hearing Jorge's loud signal on CW and SSB. It was at all times that Jorge showed his special kindness and goodwill.

As a friend, our relationship grew by "on-the-air" QSOs and several personal meetings in Argentina and at my shack in Brazil. As a contester, I learned how to admire him for his extraordinary sportsmanship, common sense, and quality of operation. As a CW competitor, as many discovered, only God and good propagation could beat him.

The only way we could avoid his terrific competition was to invite him to operate from our location. All of the Araucaria DX members had the pleasure to become friends with Jorge for several days and learn some formidable operating techniques.

By talking with Jorge via radio, participating in some contests together, and living together as friends, we became members of one family as real brothers.

This wonderful relationship expanded to all Araucaria DX members, and in 1989 we recognized him as one of the most famous personalities in contesting by awarding him the Araucaria DX Group Contest Certificate "#3" granted to the ten best world-

Contest	Year	Category	Result
CQ WW CW	1978	Single Op/28 MHz	1st Place/World Record
CQ WW CW	1979	Single Op/28 MHz	1st Place/World Record
CQ WW CW	1980	Single Op/All Band	2nd Place World
CQ WW CW	1981	Single Op/21 MHz	1st Place/World Record
CQ WW CW	1982	Multi-Single L8D/X	6th Place World
CQ WW CW	1983	Single Op/7 MHz	5th Place World
CQ WW CW	1984	Single Op/14 MHz	1st Place World
CQ WW CW	1985	Single Op/All Band	8th Place World
CQ WW CW	1987	Single Op/21 MHz LO8WW	1st Place/World Record
CQ WW CW	1989	Single Op/28 MHz ZP0Y	1st Place World
CQ WW CW	1990	Single Op/28 MHz	2nd Place World
CQ WW CW	1991	Single Op/21 MHz ZW5B	1st Place/World Record*
CQ WPX CW	1980	Single Op/28 MHz	1st Place/World Record
CQ WPX CW	1981	Single Op/21 MHz	1st Place
CQ WPX CW	1983	Single Op/All Band L8DQ	1st Place/World Record
CQ WPX CW	1985	Multi-Single	3rd Place World
CQ WPX CW	1986	Multi-Single	2nd Place World
CQ WPX CW	1987	Single Op/All Band ZZ5EG	2nd Place/World Record
CQ WPX CW	1990	Single Op/All Band LR4F	3rd Place World
CQ WPX CW	1991	Single Op/All Band ZP50Y	2nd Place World
ARRL DX CW	1977	Multi-Single	1st Place World
ARRL DX CW	1980	Single Op/28 MHz	1st Place World
ARRL DX CW	1982	Single Op/21 MHz	1st Place World
ARRL DX CW	1986	Single Op/21 MHz	2nd Place World
ARRL DX CW	1987	Single Op/14 MHz	1st Place World

**Claimed score awaiting final results.*

Table I– The amazing contest achievements of Jorge Bozzo, LU8DQ.

- Continental winner 9 times in WAE CW (always in Top 10).
- Continental winner 8 times in All Asian CW Contest.
- World Single Operator winner, 11 straight years (1977–87) IARU Radiosport.

Table II– Some other statistics about LU8DQ at which you can marvel.

Rich, N6KT, at his home QTH.

From my perspective, looking for a station in the Caribbean or Central America that was due south of the United States/Canada was the required strategy. It was suggested that I contact Carlos, TI2CF, about the possibility of operating his station. Luckily, he agreed and preparations began immediately to visit his newly built installation.

I arrived in San Jose, ready to operate, meeting Carlos (as well as Jim, TI2IDX) at the airport and beginning the one-hour drive to Carlos's farm. Carlos's station is *tremendous*, with five separate 170 foot towers with 6-element KLMs on 10, 15, and 20 and a 4-element KLM on 40 meters. Eighty meters has a pair of fixed 4-element diamond-shaped quads. There was also a 3-element 80 meter beam on the ground by the fifth tower, but we had no way of getting it ready for the contest.

wide performances during the calendar year. That year other recipients included *CQ* magazine and Martti Laine, OH2BH (numbers one and two).

All of amateur radio has lost a dear friend, and I have lost my beloved brother.

Making 10,000 QSOs N6KT Style

Working 10,000 QSOs is a significant achievement for most of us when you measure it in terms of our entire operating career, contest year, or the combined efforts of a CQ WW DX and ARRL DX Contest Year. Can you imagine completing this feat in one weekend? While speaking with Rich Smith, N6KT, on the telephone recently, he told me of his recent accomplishment in the 1992 ARRL DX SSB Contest. What follows is his personal account (at my request), which I hope you find as fascinating as I did.

Breaking the 10,000 QSO Barrier

by Rich Smith, N6KT

I have believed for several years that 10,000 QSOs were possible in a 48-hour DX contest by a Single Operator, with the ARRL DX SSB Contest seeming to be the most likely place for this to happen.

The growing antenna farm at Carlos, TI4CF's QTH.

Getting used to this super-station was very enjoyable. Smashing through pile-ups with Carlos's signal was incredible. We talked about a gain antenna for 160 meters, and after weighing the possibilities, Carlos decided that a 4-element 160 meter delta loop would be a good experiment. Carlos has a lot of experience with loop antennas. This version, in fact, could be perhaps one of the biggest amateur antennas ever constructed for 160 meters.

My operating strategy was relatively simple: stay on the band that offered the fastest rate. While establishing mid-contest goals, I had to assume that the second day would be slower than the first. I believed that I needed 6000 QSOs in the first day to reach my goal of 10,000 by the end of the contest. I actually found it harder to comprehend the thought of 6000 QSOs in 24 hours than the ultimate "10K" goal.

The contest began at 6 PM local time with 300-plus hourly rates for the first 4 hours (See Table III). During the third hour of the contest we had an earthquake which measured over 5 on the Richter scale! I made 2 or 3 QSOs during the quake and kept going after it ended *(good thing Rich is from California—ed.)*. A couple of short power outages after the quake caused problems in one of the amplifiers, forcing me to re-cable the station somewhat during the contest. I felt *strong* the whole contest, only losing my frequency one time when propagation fell off.

My first full hour on the low bands was 271 QSOs, split between 40 and 80 meters. The 80 meter quads worked *great* with lots

Hour	# of QSOs	Rate/minute	Total QSOs	Bands of Operation
1	350	5.83	350	10
2	333	5.55	683	10/15
3	324	5.40	1007	15
4	343	5.72	1350	15/20
5	282	4.70	1632	20
6	207	3.45	1839	20
7	154	2.57	1993	20/40
8	271	4.52	2264	40/80
9	165	2.75	2429	20/40/80/160
10	151	2.52	2580	20/40/80/160
11	89	1.48	2669	20/40/80/160
12	129	2.15	2798	20/40/80
13	132	2.20	2930	15/20
14	175	2.92	3105	15/20
15	147	2.45	3252	10/15
16	230	3.83	3482	10
17	244	4.07	3726	10
18	222	3.70	3948	10
19	265	4.42	4213	10
20	258	4.27	4469	10
21	288	4.80	4757	10
22	293	4.88	5050	10
23	298	4.97	5348	10
24	**258**	**4.30**	**5606**	**10/15**
25	342	5.70	5948	15
26	283	4.72	6231	15
27	245	4.08	6476	15
28	222	3.70	6698	15/20
29	270	4.50	6968	20
30	183	3.05	7151	20/80
31	181	3.02	7332	80/160
32	136	2.27	7468	40/80/160
33	90	1.50	7558	80/160
34	16	0.27	7574	20/80
35	0	0.00	7574	N/A
36	114	1.90	7688	40/80
37	168	2.80	7856	20
38	116	1.93	7972	10/15
39	174	2.90	8146	10
40	186	3.10	8332	10
41	216	3.60	8548	10
42	174	2.90	8722	10/15
43	213	3.55	8935	10
44	238	3.97	9173	10
45	224	3.73	9397	10
46	253	4.22	9650	10
47	218	3.63	9868	10/15
48	301	5.02	10169	15

able III– Rate/band analysis for TI1C 1992 ARRL DX SSB Contest operation (N6KT operator).

of gain and a 30 dB front-to-side ratio.

Carlos fixed the broken amplifier halfway through the contest, but Murphy wasn't finished. Later in the contest my headphones and then foot-switch went on the blink. I had to scramble each time to either find a replacement or change some wiring.

At the end, the total was 10,170 QSOs! Besides the QSO total itself, I was pleased with two other things: a 342 rate at hour 25 and a 301 rate at hour 48! I missed my mid contest goal of 6000 QSOs (actual number was 5608), but made it up the second day with 4562 QSOs. The number of excellent signal reports on all bands was proof of the excellent job done by Carlos in putting together a world-class contest station.

I have very fond memories of not just the contest, but the 10 days I spent with a great DXer, contester, and friend, Carlos, TI2CF and a very enjoyable younger ham, Jim TI2IDX (N9IUO). It was a great trip and contest.

Many thanks to Carlos and his family friends, and to my wife Rebecca, who encourages my contest travels while she stays home and cares for our three heterodynes—ages 3, 2, and 1.

Final Comments

It's getting near that time of year for our annual Contest Survey. Get your pens ready and opinions honed for next month! Hopefully, we can have even more fun with this one.

As always, please remember that the deadline for the November issue is September 1st.

73, John, K1AK

ARRL UHF Contest

1800Z Sat. to 1800Z Sun., Aug. 1–2

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 June 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. 1–2

This is the annual running of the YO DX Contest sponsored by the Romanian Ar

ateur Radio Federation. This is a world-wide 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 times the sum of YO counties and ITU Zones worked on each band.

Deadline for logs is September 3, 1992 and they should be mailed to: RARF, P.O. Box 05-50, R-76100 Bucharest, Romania.

North American QSO Party

CW: 1800Z Sat., Aug. 1 to 0600Z Sun., Aug. 2
SSB: 1800Z Sat., Aug. 15 to 0600Z Sun., Aug. 16

This is a short but fun QSO party that can have some fast rates at times. Any licensed radio amateur may enter with the object being to work as many North American stations (and/or other stations if you are in North America) as possible during the contest period.

Classes: Single operator and multi-operator, two transmitter. Multi-operator stations shall keep a separate log for each transmitter. Multi-operator stations must have at least 10 minutes between band changes. Single operator entrants may only have one transmitted signal at a time. Output power must be limited to 150 watts for eligible entries. Multi-operator stations may operate for the entire 12 hour period. Single operator stations may operate 10 out of 12 hours. Off times must be at least 30 minutes in length and must be clearly marked in the log.

Mode: CW only in CW parties. Phone only in Phone parties.

Bands: 160, 80, 40, 20, 15, and 10 meters only. You may work a station once per band. Suggested frequencies are 1815, 3535, 7035, 14035, 21035, and 28.035 (20 kHz up from band edge for Novice) on CW, and 1865, 3850, 7225, 14250, 21300, and 28.600 (28.450 Novice) on phone. Try 10 meters at 1900Z and 2000Z, 15 meters at 1930Z and 2030Z, and 160 meters at 0430Z and 0530Z.

Exchange: Operator name and station location (state, province, or country).

Scoring: Multiply total valid contacts by the sum of the number of multipliers worked on each band. Multipliers are states (including KH6 and KL7), Canadian call areas (VE1-VE8, VO1, VO2, VY1, and VY2) and other North American countries. (Do not count USA, Canada, KH6, or KL7 as countries). Non-North American countries do not count as multipliers, but may be worked for QSO credit.

Team Competition: Team competition is limited to a maximum of 5 single operator stations as a single entry unit. Groups having more than five members may submit more than one team entry. To qualify as a team entry, the name, callsign of each operator, and callsign of the station operated should the operator be a guest at a station other than his own (e.g., N4RJ op by KM9P) must be registered with K8CC. The team registration information must be in written or telegraphic form and must be received before the start of the NAQP. There are neither distance nor meeting requirements for a team entry.

Awards: A total of five trophies will be awarded for the high score for the Single Operator CW, Single Operator Phone, Multi-Operator CW, Multi-Operator Phone, and Single Operator Combined score categories. Certificates of merit will be awarded to the highest scoring entrant with at least 200 QSOs from each State, Province, and North American Country. T-shirts will be awarded to each member of winning teams.

Contest logs must be sent to Dave

Pruett, K8CC, 2727 Haris Rd., Ypsilanti, MI 48198. Entries must be postmarked not later than 30 days after the party to be eligible for trophies and awards. Logs may be submitted on disk in the form of files generated by K8CC's NA program or MS-DOS ASCII files if generated from another logging program.

Maryland-DC QSO Party

1600Z Sat. to 0300Z Sun., Aug. 8–9
1600Z to 2359Z Sun., Aug. 9

The Maryland/DC QSO Party is 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), and operating category (Club, QRP, Mobile, Novice, Technician, and Standard).

Frequencies: SSB: 1.86, 3.92, 7.23, 14.26, 21.37, 28.37, 50.15, 146.55 MHz. CW: 3.643, 7.06, 14.04, 21.115, 28.06 MHz.

Scoring: Each Maryland county, Baltimore city, and D.C. are multipliers. Score 10 points for club station QSOs, 5 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). Mobiles add 100 bonus points to their final score for each county outside their own from which 20 QSOs were made. 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 10 MD logs, Novice, Technician, DX station, and MD YL. Certificate to each station with at least 100 QSO points in entry, and the top 3 SWL and QRP logs.

Logs are to be postmarked by September 10, 1992 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.

European DX Contest

CW: Aug. 8–9 SSB: Sept. 12–13
1200Z Saturday to 2400Z Sunday

This is the 38th 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 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. *Note:* DX packet cluster spotting is allowed for *all* classes.

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 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 trophy will be awarded b

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. Logs may also be sent on MS-DOS disks in ASCII files. 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, HBØ, HV, I, IS, IT, JW Bear, JW Spitsbergen, JX, LA, LX, LZ, OE, OH, OHØ, OJØ, 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, YO, YU1567, YU2, YU3, YU4, ZA, ZB2, 1AØ, 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.

SARTG RTTY Contest

Three Periods GMT
0000–0800 & 1600–2400 Sat., Aug. 15
0800–1600 Sun., Aug. 16

This is the 22nd 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 continent, 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.

New Jersey QSO Party

2000Z Sat. to 0700Z Sun. Aug. 15–16
1300Z Sun. to 0200Z Mon. Aug. 16–17

This is the 33rd 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. 14th and go to: Englewood ARA, P.O. Box 528, Englewood, NJ 07631-0528

All Asian SSB Contest

0000Z Sat. to 2400Z Sun., Sept. 5–6

The same rules as for the CW Contest on June 20–21 apply here. See June Contest Calendar for complete rules. Logs for this one must be in the hands of the committee no later than October 15th. They go to JARL, P.O. Box 377, Tokyo Central, Japan

1992 CQ 160 Meter Contest
High-Claimed Scores

The following scores are high-claimed scores only and are subject to verification.

CW

CALL	M/S*	SCORE	QSOs
P40PI	S	488,621	592
KP2A	S	487,935	822
VE3EJ	S	448,649	992
K1ZM	S	371,520	1113
ON4UN	S	350,660	660
K5NA	M	319,566	1066
W2GD	M	313,120	1066
K8PO	S	311,584	905
TA4/DK7PE	S	294,294	464
KN8Z	M	294,048	1113
VO1NA	S	284,504	537
6D2X	M	282,168	741
K1KI	S	280,269	903
AB4RU	M	273,831	1031
NX1G	M	271,488	911
W3LPL	S	255,360	878
KH6CC	S	249,856	388
HG5A	M	245,280	610
WB9Z	M	241,920	1056
4X4NJ	S	233,856	379
HA6PX	S	216,692	576
K3LR	M	211,932	1055
K7EG	M	204,776	858
VE3DO	S	201,450	545
DK8ZB	S	200,800	484
W0ZV	S	199,430	927
KU4J	M	192,950	944
VE3PN	S	192,430	554
DH0AM	M	191,912	653
AA1K	S	191,350	863
W0UN	M	188,705	882
AA5BL	M	184,480	905
VE3KP	S	182,133	596
WA2SRQ	S	181,890	767
YU3EA	M	179,275	459
K2KIR	S	179,246	693
DK1KSO	M	176,775	440
UZ2FWA	M	176,526	526
KZ3H	M	175,860	728
KD9SV	M	175,355	810
G0NAA	S	172,620	430
GM3YOR	S	171,453	426
K3ZO	S	170,829	889
VC7SV	M	167,648	557
0J1BZ/A	M	166,670	455
K5ZD	S	166,175	770
0K3KAP	M	165,053	440
V3UM	S	163,880	710
VE5RA	S	162,806	582
AA1KA/2	M	160,515	361
V0CD	M	160,368	868
G3XTT	S	159,390	355
VD8LLD	S	158,945	739
0Z7YY	S	158,272	492
1IK	S	157,932	651
Y0A	M	157,904	830
4VX/0	S	156,658	899
2BA	M	156,341	801
N7A	M	156,300	496
N5RZ	S	154,851	858
OK7MM	M	150,282	464
VE3MSN	S	150,192	420
N0TT	S	148,993	871
I3VHO	S	145,424	447
VC2OJ	M	143,000	540
W3BGN	S	141,963	540
N6DX	M	141,048	656
K8CC	S	140,346	899
W0AIH	S	140,083	873
WX4G	S	138,915	709
PI4COM	M	138,474	411
IT9ZGY	S	137,293	430
K4LTA	S	137,103	890
G0MFO	M	136,959	322
NC0P	M	135,397	827

SSB

CALL	M/S*	SCORE	QSOs
VP9AD	M	408,483	946
VC3EJ	S	338,504	1030
AB4RU	M	208,012	1210
WB9Z	S	194,425	1132
N2NU	M	166,513	964
K1ZM	S	164,428	950
N5OLS	M	133,210	866
K5NA	M	121,940	827
K7EG	M	121,875	845
WY2X	S	115,896	755
K3ANS	M	114,840	862
IR4T	M	110,637	388
NQ4I	S	106,140	792
K4JRB	S	104,788	704
VE3PN	S	101,379	447
KD9SV	S	101,304	734
W3BGN	S	100,165	606
K0LW	M	98,027	758
AA4MM	S	93,240	548
N8ATR	S	93,186	698
NX3A	S	92,400	761
OK3KAP	M	87,722	377
K4YT	S	84,606	658
VE3DC	M	82,940	395
N8UM	S	82,012	661
IV3PRK	S	79,092	308
AA4S	S	78,831	651
W3TS	S	75,720	575
W9AZ	M	74,646	601
NE3F	S	74,298	575
K5QBG	S	73,022	589
VE3MSN	S	72,991	319
WD4KXB	S	70,470	552
K4PI	M	69,266	544
N7BXX	M	67,164	529
NX1G	M	67,146	516
KN2T	S	67,100	553
AB4WY	M	66,480	510
OK1DXS	S	65,325	348
K0LIR	M	62,699	554
K4IUV	S	61,710	509
KC8P	S	60,268	554
CT3M	S	60,032	110
W9HLY	S	60,000	566
RY7D	S	58,608	532
KA1BQ	S	58,141	458

CLUB SCORES

CLUB NAME	TOTAL CLAIMED SCORE
Frankford Radio Club	3,274,955
Southeastern DX Club	3,144,210
Yankee Clipper Contest Club	3,078,643
Mad River Radio Club	1,514,364
North Coast Contesters	1,452,806
Potomac Valley Radio Club	1,026,559

HB9CXZ	S	57,904	237
W1OO	M	57,120	441
W4DOC	M	55,998	482
WZ4F	S	55,440	463
K2DOX	S	55,350	505
OZ7YY	S	55,255	317
N3FTI/5	S	54,586	536
NX9T	M	52,947	469
NK7U	M	52,002	425
IK5EPU	S	51,660	245
K8OQL	S	51,499	484
WF2W	S	51,459	454
K4ODL	S	51,450	481
WX4G	S	49,448	407
KJ0B	S	49,000	403
WA1UJU	S	47,628	459
W2CWW	M	46,563	404
KE2JO	S	44,639	423
I3QJZ	S	44,572	202
N6LL	S	43,316	378
AD0O	S	42,500	400
WD5COV/0	S	42,421	323
KO4HS	M	41,817	361
K5WXZ	S	41,688	349
EA3ALD	S	41,668	196
KU3X	S	41,202	449
AA1K	M	41,028	360
KE0RO	M	40,278	390
VC1FRT	M	38,760	219

**M/S indicates M for multi-operator or S for single operator.*

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

DX Advisory Committee Report

The DX Advisory Committee (DXAC) of the ARRL has a full agenda, as usual. The members of the DXAC have a wide variety of DXCC issues under consideration, from possible New Countries to some possible Deleted countries, as well as several miscellaneous items. The DXAC does not work in a vacuum, and most members actively encourage comments, suggestions, and opinions from the DX community. Here's a quick summary of DXAC actions and possible actions as of June 1, 1992. Thanks to DXAC Chairman Ted Pauck, K8NA, for his invaluable assistance.

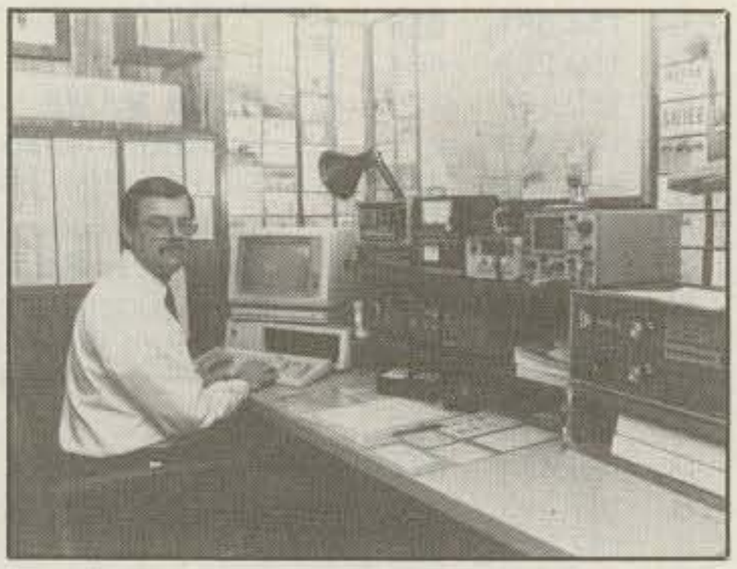
DXCC Country Petitions

Nothing stirs the blood of active DXers as much as a possible New One for DXCC. Thousands of man-hours (and often thousands of dollars) go into efforts to add new countries to the DXCC countries list. As for mid-1992, here is the status of potential New Ones: Earlier this year, the DXAC voted unanimously to reject a petition for separate DXCC country status for the Vatican enclave of the Holy House, HV0HH.

A vote on separating the Spanish African enclaves of Melilla and Ceuta was set for early June. In their petition for creating two new DXCC countries out of the EA9s, the Lynx DX Group says that DXCC Country Criterion Point 3 applies: separation by another DXCC country. The two enclaves are about 150 miles apart, but almost all of that distance is the Mediterranean Sea; actual Moroccan land makes up less than 25 miles. While there is no question that the two enclaves are farther apart than the 75 miles specified in Point 3, other considerations suggest that this petition will not be approved. The rule states that the 75 miles may include "inland lakes and seas" that are part of the intervening DXCC country, but the Mediterranean hardly qualifies as an "inland sea." Prognosis: not likely.

On another matter, Morocco would very much like to take possession of the two enclaves. Spain would probably be willing to give up control over the areas, if it could regain Gibraltar ZB. If that happens (and it won't happen right away), both ZB and EA9 will be deleted from the DXCC countries list, under deletion criterion a: annexation.

P.O. Box 50, Fulton, CA 95439



Bob Meyer, WA9AKT, was the first W9 to Work All Zones on RTTY, and earned only the 31st RTTY WAZ overall.

Another very possible new DXCC country is Pratus Island, a Taiwan-occupied island off the coast of China. An informal review of the Pratus situation strongly suggests a potential New One. However, as of June 1 no official petition for New Country status had been submitted.

The best bet for New Countries in the immediate future lies in what was once Yugoslavia. Three of the ex-Yugoslavian states have been officially recognized as independent by the European Community and by the US. They have even been admitted to the United Nations. This is overwhelming evidence that these republics will be recognized as separate DXCC countries soon. The New Ones will include Croatia YU2, Slovenia YU3, and Bonia-Hercegovina YU4. The start date for these new countries will probably be the subject of much discussion, but January 1, 1992 is a good guess. A prudent DXer will make sure to work YU2s, YU3s, and YU4s in 1992, in anticipation of a DXAC decision.

Macedonia YU5 will probably also become a New One, if it continues its efforts to split off from Serbia YU1. This leaves YU1, YU6, YU7, and YU8 as the remains of the old Yugoslavia. If the former Yugoslavian government continues to hold sway over these provinces, DXCC status will remain the same as the old YU. Again, no formal petition for New Country status is under DXAC consideration, but this one should be a straight-forward decision.

Possible Deletions

When the new DXCC rules were adopted in 1988, they included, for the first time, deletion criteria. Prior to the new rules, deletion of DXCC countries was very much an ad hoc process. The new rules specify four reasons for deletion from the DXCC list: annexation, unification, partition, and independence. Several current DXCC countries may be deleted under these rules.

A vote on whether to delete the Spratly Islands was set for early June, based on a petition from new DXAC representative Bill Shipp, KC1AG. Shipp argues that the Spratlies were added to the DXCC list because they were claimed, but unoccupied, by several neighboring countries, including Vietnam, Philippines, Malaysia, and China. Once the islands are occupied (as many now are), their reason for separate DXCC status disappears.

Shipp has submitted another proposal to delete South Sudan ST0, as not meeting current DXCC criteria. This is a more difficult case than that of the Spratlies, as little has changed since the "country" was added to the DXCC list. Shipp says the agreement under which the country was added to the DXCC list is no longer in force and therefore South Sudan should be deleted under annexation. Note that the argument that *any* country doesn't meet current DXCC country criteria is *not*, by itself, sufficient to delete a country. Some 60 current DXCC countries *don't* meet existing DXCC criteria for separate status; deleting even a few of these would create an uproar among DXers. Again, a vote was set for early June.

Yet more possible deletions are under investigation in the remains of the USSR. It is still too early to sort out alliances, mergers, agreements, etc., in the former USSR, but if some of the republics come together to form a union of some sort, one could make an argument that some ex-Soviet republics should be deleted, under the unification rule. Don't expect a decision on this anytime soon, however. It may take years to sort this one out.

Another deletion waiting for confirmation is Abu Ail, the once-separate country at the mouth of the Red Sea. These islands were a separate DXCC country because they were administered by a consortium of countries headed by the UK. However, control of the islands has reverted to neighboring Yemen. Once appropriate paperwork confirming this transfer is located, this rare country will most likely be removed from the current DXCC list.

The WPX Program

Mixed

1542	WB2RAJ	1564	IK6GZM
1562	DL9GCF	1565	IK6BSN
1563	KE0A	1566	WD4REX

SSB

2289	JE6JVH	2318	DH0GAS
2317	KA3UNQ	2319	WB2RAJ

CW

2738	EA6ZS	2741	CT4UW
2739	KA3UNQ	2742	OH7MSW
2740	KD7VI		

WPNX

270	N8MYC	271	KB2NEK

Endorsements

Mixed: 450 DL9GCF, WB2RAJ, IK6GZM, IK6BSN. 500 DL9GCF, WB2RAJ, IK6GZM, IK6BSN. 550 DL9GCF, WB2RAJ, IK6GZM, IK6BSN. 600 DL9GCF, WB2RAJ, IK6GZM. 650 DL9GCF, IK6GZM. 700 DL9GCF, IK3DRO, JE1RRK, IK6GZM. 750 IK6GZM. 800 SM5DUT, KC7EM, IK6GZM. 850 SM5DUT, KC7EM, IK6GZM. 900 SM5DUT, KC7EM, IK6GZM. 950 SM5DUT, KC7EM, IK6GZM. 1000 IK6GZM, W4WKQ. 1050 W0IZV. 1100 DK7NP. 1150 DK7NP. 1250 KA5TQF. 1300 KA5TQF. 1350 W3KH, KA5TQF. 1400 W3KH. 1450 W3KH. 1500 LA7JO. 1550 LA7JO. 1600 LA7JO. 1650 IK2ILH. 1800 WB2YQH. 1850 WE2L. 1900 W8UMR. 1950 W8UMR. 2000 W4UW. 2600 W2FXA. 2650 N2AC. 3100 W4BQY. 3150 W4BQY. 3250 WA2HZR.

SSB: 350 KA3UNQ, WB2RAJ, WT3B. 400 KA3UNQ, WB2RAJ, N4SLU, WT3B. 450 CT1ZW, KA3UNQ, WB2RAJ. 500 CT1ZW, KA3UNQ, WB2RAJ. 550 CT1ZW, WB2RAJ. 600 CT1ZW, TI4SAH. 650 CT1ZW, TI4SAH, HP2CWB, KC7EM. 700 CT1ZW, TI4SAH, KC7EM. 750 CT1ZW, TI4SAH. 800 TI4SAH. 850 IT9SVJ. 900 IT9SVJ, W4WKQ. 950 IK2AEQ, IT9SVJ. 1000 KA5TQF, W3FDU, IT9SVJ. 1050 KA5TQF. 1100 HP6AYV, KA5TQF, W5ILR. 1150 HP6AYV, K2EEK, W5ILR. 1200 HP6AYV. 1250 LA7JO, KC9DS. 1300 LA7JO, KF7RU. 1350 KE6KT, LA7JO. 1400 LA7JO, N2AC. 1550 IK5ACO. 1750 KD9OT, WE2L. 2300 W4BQY. 2450 NJ0C.

CW: 350 PY2PN, KD7VI, JA5CAV, CT4UM. 400 PY2YN, KD7VI, JA5CAV, KC7EM, WE2L. 450 PY2YN, KD7VI, JA5CAV, KC7EM. 500 PY2YN, JA5CAV, KC7EM. 550 PY2YN, JA5CAV, KC7EM. 600 PY2YN, JA5CAV. 650 PY2YN. 700 PY2YN, LA7JO, KA5TQF. 750 PY2YN, SM5DUT, LA7JO, KA5TQF, VE5BOB. 800 PY2YN, SM5DUT. 850 SM5DUT. 950 KT2C. 1000 KC7EM. 1050 WA4QMQ. 1800 OK2PO, W8UMR. 1850 W8UMR. 2400 W4BQY, N2AC. 2450 W4BQY.

10 Meters: SM5DUT, I3UBL, K0IFL, KC7EM
15 Meters: I3UBL, K0IFL, KC7EM, VE3OMM
20 Meters: I3UBL, K0IFL
40 Meters: I3UBL, CT4UW
80 Meters: K0IFL
160 Meters: K0IFL

Asia: KA3UNQ, I3UBL, K0IFL
Africa: K0IFL, OK2PO
No. Amer.: W2FXA, SM5DUT, KA3UNQ, DK7NP, JE1RRK, I3UBL, K0IFL, KC7EM
So. Amer.: W2FXA, KC7EM
Europe: KA3UNQ, DK7NP, I3UBL, K0IFL, NK0S
Oceania: JE3CYH, DK7NP, K0IFL, OK2PO

Award of Excellence 160M Bar: KA5TQF

Award of Excellence Plaque Holders: 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, K9QRF, YU2NA, N2AC, W4UW, NX0I, W9NUF, N4NX, SM0DJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, VE3FXR, N4MM, KC7EM, ZS6BCR, CT1YH, IV3PVD, KA5RNH, ZP5JCY, F1HWB, KC8PG, NE4F, VE3MS, K9LJN.

Award of Excellence Plaque Holders with 160 Meter Endorsement: FM5WD, SM0DJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, 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, K9QFR, NN4Q, W4UW, K9QFR, NN4Q, W4UW, NX0I, G4BUE, LU3YL/W4, I4EAT, WB4RUA, VE7WJ, N4NX, DE0DXM, VE7IG, K9BG, I1EEW, AB9O, CT1YH, IV3PVD, KA5RNH, ZP5JCV.

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," 880, CR13, Clovis, NM 88101-9511 USA.

Non-Country Issues

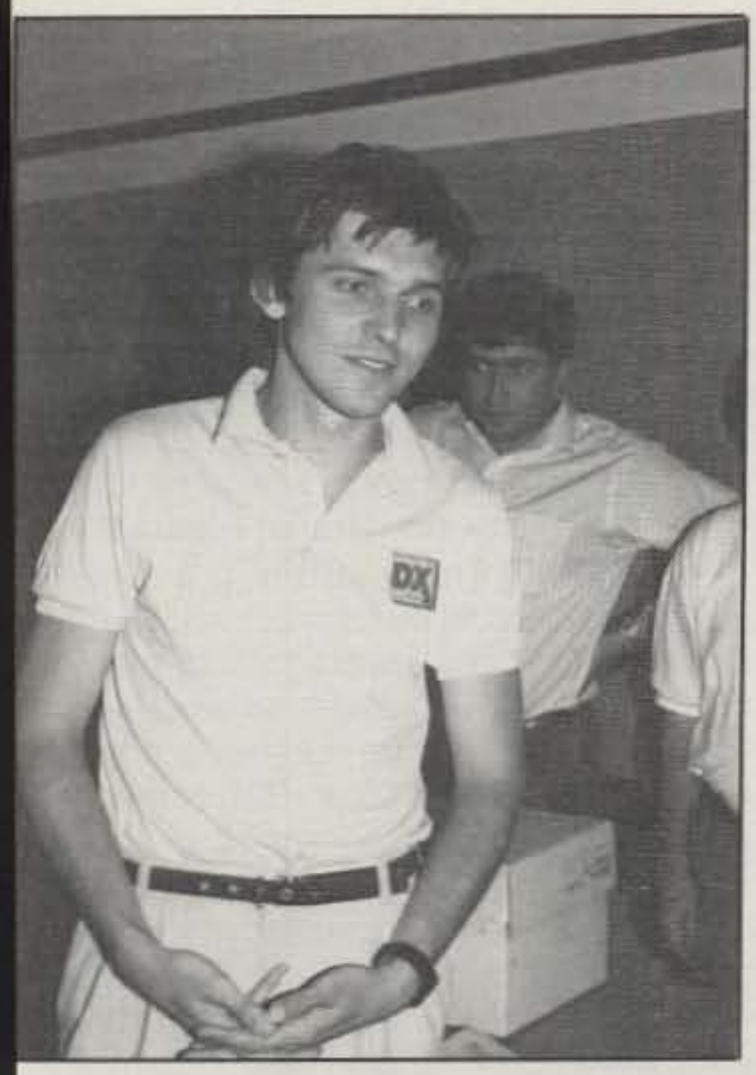
The DXAC considers other aspects of DXCC in addition to possible changes in the DXCC countries list. For example, the DXAC considered adding foreign advisors/observers to the DXAC. This idea is based on the fact that DXCC is an international award program, and input from DXers outside the US should be considered in decisions. However, the DXAC did not approve this proposal. Instead, they may send news releases about "external" DXAC agenda items (such as DXCC country petitions) to overseas organizations and publications, and invite comments from individuals and groups. Look for this plan to be implemented in the near future.

The DXAC also voted against the use of electronic and facsimile confirmations for DXCC credit. While this issue will probably rise again, for the time being the DXAC wants to continue the use of "hard copy" confirmations—i.e., QSL cards.

Under Consideration

Many other topics are under discussion within the DXAC. For example, the question of "disqualification criteria" that surfaced following the interference-plagued Bouvet DXpedition has not been resolved after two years of work. The DXAC is currently more inclined to suggest operating guidelines for DXpeditions than to advocate rigid disqualification criteria, but this issue remains open for now. Among the topics being discussed is whether DXpeditions should work "portable" stations, such as WB2CHO/6, and if so, under which call area—2 or 6?

Some DXers have asked that one of the "Don Miller" inspired rules about opera



Romeo Stepanenko, 3W3RR's operations from Burma and Afghanistan helped put many DXers on the Honor Roll. Is it time for a more difficult DX challenge?

tion from shipboard be relaxed. The current rule says that contacts with ships and boats, anchored or underway, cannot count for DXCC credit. Some DXers argue that a "docked" ship, tied up to a pier, should count for DXCC credit, while retaining the prohibition against ships underway and airborne aircraft. Question: If contact with an aircraft *on the ground* counts for DXCC credit, why doesn't a similar contact with a ship *tied up to a dock* count?

Another item being considered is a "Master DXCC Award" as a way of recognizing active and versatile DXers. Several DXers argue that the DXCC Honor Roll is not enough of a challenge today, thanks to many extensive (and expensive) DXpeditions. In the past year Albania, Burma, South Sandwich, Bangladesh, Afghanistan, Glorioso, South Georgia, and Spratly all have been quite workable. The first five of these were the Top Five in the 1991 Most Wanted survey. Thanks to these operations, and many others, thousands of DXers are now on the Honor Roll. Perhaps it is time to introduce a more difficult challenge to reward the world's best DXers.

In yet another forward-looking action, the DXAC has been asked by the ARRL Board of Directors to look at DX in the next 5 or 20 years. What will DX and DXing be like in the early 21st Century? *(This item is so intriguing that we will return to it next month in some detail, barring late-breaking news.)*

As the DXer can easily see, the DXAC has its hands full of interesting and important decisions. The members of the DXAC welcome individual and club comments on any proposal before the body. Send your

You don't need all this hardware to work long path, but high antennas and plenty of gain increase DX success.

written comments to ARRL Headquarters in Newington, and ask that they be distributed to the DXAC.

DX News

The ARRL DXCC desk has approved the documentation for OK1IAI/YA, YA5MM, and HA5BUS/S2. This means that QSL cards for these operations may be submitted for DXCC credit. The BUS now has two successes from very difficult countries: Iran EP and Bangladesh S2. OK1IAI/YA continues to be very active on CW, despite the continuing armed conflict in the country.

Also, the ARRL has announced that reciprocal licenses are available from Albania. Albania is working to consolidate amateur operating permission to reduce the confusion described in a previous column. The National Radiocommunication Commission will issue amateur licenses, with applications funneled through the Albanian Radioamateur Association (AARA). Foreign licensees may apply for a three-month reciprocal license through the AARA at Box 66, Tirana, Albania.

"Long Path Propagation" is the title of a 60-page booklet by Bob Brown, NM7M. Bob has thoroughly investigated one of the more elusive DX propagation modes, and his monograph on the subject is a must-read for the serious DXer. Bob extensively covers the subject, showing the relationship between successful long-path DXing and the state of the ionosphere. The approach is scholarly and frankly will be difficult going for the neophyte, but DXers who want to increase their knowledge about this important propagation mode should contact Bob for a copy: $10 from Bob Brown, 504 Channel View Drive, Anacortes, WA 98221.

W9DXCC DX Convention. The 40th annual W9DXCC convention is Saturday, September 12 at the Glen Ellyn Holiday Inn, in Glen Ellyn, Illinois, near Chicago. The program includes the **VP8SSI** South Sandwich and **FO0CI** Clipperton DXpeditions; DX contesting and propagation by W3LPL; Digital Signal Processing by

The WAZ Program

Single Band WAZ

10 Meter SSB

427	F3XY	428	JJ1JTG

15 Meter SSB

417	TI5RLI	420	JA3LDH
418	DL2FAI	421	JJ1LWA
419	KY7M	422	JF2PZH

20 Meter SSB

885	K3ND	887	LX2KQ
886	ZL1BJN		

10 Meter CW

130	KC7V		

15 Meter CW

229	JI3BFC	230	AA5BT

17 Meter CW

3	W8UVZ	4	KL7CYL

20 Meter CW

418	DK2UR	420	BV2TA
419	JA3VOV		

40 Meter CW

155	JG1XLV		

RTTY

70—Mixed	KE5PO		
39—20M	PJ2MI		

All CW

11	W8URM	12	N4MM

WNZ

49—10M SSB	KA8ZHO

All Band WAZ

SSB

3939	NY3Y	3947	JR5SWZ
3940	PZ5JR	3948	W0IKD
3941	DF9ND	3949	VE1RJ
3942	K5OVC (All YL)	3950	LU1CQ
3943	KC2Q	3951	DL3FBY
3944	K4MLD	3952	DJ6HU
3945	JA2FGL	3953	LU2FYU
3946	N2JSB	3954	N4REE

CW/Phone

7208	WD4REX	7218	K8JE
7209	OH3NXW (CW)	7219	N3SL (CW)
7210	K2OQA (CW)	7220	N8IAG
7211	DL9OE	7221	WA5NOM
7212	DJ5JY (CW)	7222	I8QJU
7213	DJ6TZ (CW)	7223	KR2J
7214	JA5CAV (CW)	7224	N0IWL
7215	KA8OUT	7225	JE3CHA
7216	N3RC	7226	DL3SCG (CW)
7217	NG6X	7227	DL3MDK (CW)

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4½ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all *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).

5 Band WAZ

As of April 30, 1992, 337 stations have attained the 200 zone level.

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

None

The top contenders for 5 Band WAZ are:

N4WW, 199	W9WAQ, 199
SP9PT, 199	K6EID, 199
K6YRA, 199	IK8CNT, 199
PY7ZZ, 199	W1JR, 199
DL9WW, 199	W8SEY, 199
K0CS, 199	N7RT, 199
KB0G, 199	JA7HMZ, 199
AA4KT, 199	I8IGS, 198
K7UR, 199	VE7AHA, 198
K9EL, 199	SM6AHS, 198
NA0Y, 199	K1ST, 198
VE7DX, 199	4X4DK, 198
W0PGI, 199	JA2DSY, 198
W2YY, 199	

780 Stations have attained the 150 zone level as of April 30, 1992.

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 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).

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

MODEL VS-50M

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

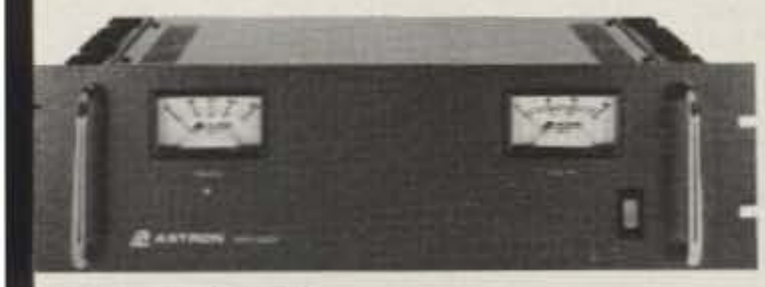
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



RM SERIES

MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or confirmation of, present total. If no up-date, file will be made inactive. Lifetime Honor Roll fee is $4.00 (U.S.) for each mode, with no fee for additions.

MIXED

4271	YU2AA	2649	I2PHN	2276	IT9QDS	1956	K8LJG	1604	WB4RUA	1332	YU3PG	1037	W0IZV
4016	F9RM	2624	I1EEW	2205	SM0AJU	1914	YU1GR	1599	KB0G	1329	F1HWB	1008	IK2BLA
3904	K2VV	2577	ZP5JCY	2202	I2MQP	1856	N6JM	1589	YU2CQ	1323	YU1PJ	994	WM0G
3289	EA2IA	2573	YU7SF	2202	SM6DHU	1855	W8UMR	1572	NV9S	1306	WB3DNA	975	F6CDJ
3231	VE3XN	2564	PA0SNG	2158	KF2O	1835	WE2L	1553	VE1RJ	1294	JA6GWU	963	CT3CU
3206	K6JG	2558	IN3ANE	2141	YU4EXA	1829	K9AGB	1548	LA7JO	1287	I2EAY	920	WB2PCF
3175	K6XP	2557	4N2NA	2133	3A2LF	1812	K2OLG	1522	YU3NU	1249	N3ED	915	W4USW
3005	N6JV	2546	YU7BCD	2106	K5UR	1811	I2DMK	1497	W7CB	1241	TF1MM	908	NH6T
2965	PY1APS	2534	IT9TQH	2077	HA0HW	1793	YT7WW	1485	YB0TK	1236	KI3L	906	YU7FT
2961	W4BQY	2508	N2AC	2068	K9QFR	1789	YU7RU	1472	PY2DBU	1222	WD9IIC	904	WK0B
2933	N4NO	2504	W2FXA	2062	4N7ZZ	1783	DK5AD	1468	K5DB	1197	LU8DY	875	RB5MP
2904	I2PJA	2499	YT7DX	2053	K2POF	1778	YU1GR	1455	YU7DR	1192	KS0Z	815	W6LC
2845	WA8YTM	2479	I2UIY	2040	W0SFU	1776	W6OUL	1430	W3KH	1164	W9IAL	778	VE3OMM
2840	SM3EVR	2471	I6SF	2040	YT3AA	1760	WB2YQH	1384	KS4S	1120	W0JIE	733	N3KR
2829	N4MM	2418	HA0DU	2020	N4UU	1709	G4OBK	1381	IK2ILH	1101	G4SDJ	714	VE6BMX
2821	N9AF	2409	K9BG	2013	UA3FT	1667	VE3FXR	1379	I0AOF	1094	K0IFL	684	K6DYP
2817	YU1AB	2382	SM7TV	2010	YU3EO	1646	N2AIF	1352	WB2ABD	1081	K9BOL	669	WK3Z
2801	K0BLT	2376	I8YRK	2001	I2EOW	1629	DF6EX	1342	KA5TQF	1075	NJ1T	642	VE3GOV
2779	PY4OD	2340	4X4FU	2000	KL7AF	1628	WB8ZRL	1341	DF4ZL	1065	YV7QP		
2748	W9DWQ	2295	HA8XX	1976	W4UW	1626	SM6CST	1335	AI6Z	1041	I5ZTC		
2667	KA5W	2288	W1BWS	1970	HA0IT	1604	W9IL						

SSB

3937	F9RM	2268	W4BQY	1850	K5RPC	1508	I2TZK	1216	WN5MBS	1050	KB2DE	869	DK7NP
3780	I0ZV	2264	N4NO	1841	LU8ESU	1465	CX6BZ	1207	K2EEK	1044	WB6SRK	854	VE3FXR
3303	K2VV	2256	PA0SNG	1828	W4UW	1448	YU7SF	1200	ZS6AOO	1035	IT9SVJ	829	KB4HU
3229	ZL3NS	2250	WA8YTM	1812	I8KCI	1414	IN3QCI	1195	KB0C	1029	W5LLU	822	WD5KBB
3114	VE1YX	2244	I4ZSQ	1797	K5UR	1406	N4UU	1152	W5AWT	1028	OE2EGL	806	I6KYL
2917	K6JG	2213	KA5W	1762	I2EOW	1394	K9LJN	1151	G4OBK	1019	CT1CQK	791	KA9MOM
2889	I2PJA	2111	I2UIY	1747	SM0AJU	1392	KE6KT	1148	DK5WQ	1017	CT1BWW	787	CT1YH
2810	K6XP	2089	HA8XX	1739	KD9OT	1391	HA0IT	1142	IK2DUU	1010	CT1DIZ	750	NM5Y
2714	WD8MGQ	2085	I2MQP	1718	PY4OY	1367	LA7JO	1138	N2AIF	1010	LU1VK	736	EA1IF
2622	I2PHN	2067	I8YRK	1703	WE2L	1367	N2AC	1137	W5ILR	990	NG9L	728	YU1PJ
2608	CT4NH	2041	WA4QMQ	1690	CT1AHU	1360	K8LJG	1136	I7VEZ	981	K8MDU	728	CT1ZW
2554	N4MM	2024	W9DWQ	1673	EA4KK	1334	EA1AK	1112	WA2FKF	972	K9BQL	720	HP2CWB
2484	ZP5JCY	2010	PY4OD	1655	CT1BY	1330	F1HWB	1104	HP6AYV	958	IK2DUW	708	EA3EQT
2481	I6ZJC	1994	YU7BCD	1645	IK8GCS	1315	CT1UE	1101	FE6FNA	956	WB6GFJ	707	KE7UH
2466	I0AMU	1986	YU2NA	1642	SM6DHU	1305	KF7RU	1097	W6OUL	948	IK2AEQ	697	YV7QP
2409	W0YDB	1971	WF4V	1633	KC8YM	1288	WB8ZRL	1092	KA5TQF	942	KC2FC	690	I8IYW
2403	I8YZP	1969	I5ZJK	1592	4X6DK	1286	IK7DBB	1091	TF1MM	941	5Z4BP	664	SM6CST
2381	EA2IA	1944	EA3AQC	1590	XE1OX	1285	EA3FHT	1090	I3ZSX	910	KB0G	646	KB8DAE
2379	IT9TQH	1913	K9QFR	1574	IK5ACO	1277	LU7HJM	1081	K3IXD	899	AI6Z	632	IK5DNE
2354	OZ5EV	1897	W3ARK	1550	KL7AF	1267	G4MVA	1073	KS4S	894	N3ED	625	G4XTA
2322	NJ0C	1885	CT4UW	1543	K2POF	1265	LU8DY	1062	IK0EIM	885	EA3BOX	624	YB1RED
2303	EA9AKN	1883	HR1KAS	1534	EA2AOM	1244	KA0ZFX	1056	G4SDJ	884	KK5P	608	CE5FSB
2292	I1EEW	1856	KF2O	1514	N6FX	1229	IT9JKY	1055	OE6CLD	881	WM0G	608	VE3GQV
2280	I4CSP												

CW

3266	K2VV	2252	W9DWQ	1673	K5UR	1468	IK0ADY	1295	I8YRK	1010	YU1PJ	808	YV7QP
3173	WA2HZR	2211	I6SF	1656	G4UOL	1442	K8LJG	1294	ZS6BCR	993	N3ED	794	LA7JO
2984	N6JV	2147	WA8YTM	1642	I2UIY	1439	YU3NU	1269	I1EEW	961	KA1CLV	786	W4UW
2717	VE7CNE	2128	LZ1XL	1619	TI4SU	1433	F6HKD	1244	DL2HBX	951	N4IR	754	WB5MTV
2555	N4NO	2085	4X4FU	1584	W8IO	1430	W1WAI	1243	KB0G	949	IS0FIC	754	KA5TQF
2486	PY4OD	2042	YU7BCD	1574	G4SSH	1428	I7PXV	1230	DJ1YH	933	K3UA	752	EA6AAK
2406	K6JG	1948	KA5W	1560	KL7AF	1427	G3VQO	1222	YU2CQ	923	YU4BR	749	W8LRY
2405	EA2IA	1926	YU7LS	1557	K2POF	1417	KF2O	1187	YU3PG	909	AH6JF	744	RB5MP
2386	W3ARK	1899	N4MM	1556	SM0AJU	1362	I2IWM	1173	IK3GER	907	IK2ECP	700	VE3OMM
2373	K6XP	1884	VE7DP	1553	N6FX	1359	HA8XX	1110	I2EAY	905	W9IAL	700	EA1MV
2345	IT9TQH	1710	N4YB	1526	HA0IT	1323	VS6UW	1093	EA1AK	900	3A2LF	698	4X6DK
2344	I1YRL	1708	N4UU	1525	VE1RJ	1319	W6OUL	1091	NF5Z	858	KS4S	659	TF1MM
2344	YU7SF	1700	YU2NA	1517	SM6CST	1310	G4OBK	1059	AI6Z	855	W0JIE	617	DK7NP
2328	K6XP	1699	KA7T	1513	K9LJN	1306	LA9XG	1033	NJ1T	851	K9QFR	606	I5OQV
2321	W4BQY	1692	IT9VDQ	1509	W9PWM	1305	W5AWT	1022	EA5AR	846	AC5K	601	N5GFX
2275	N2AC	1686	EA7AZA	1486	SM6DHU	1303	N2AIF	1013	WB8ZRL	813	ZP5JCY		

N9RF; Len Traubman, W6HJK; and banquet speaker Gordon West, WB6NOA. For details and registration information contact Chairperson Paula Uscian, WF9K, 4965 Castaway Lane, Barrington, IL 60010.

Regatta Colon 92 Certificate. The Puerto Rico Amateur Radio League (PRARL) is offering the Regatta Colon 92 certificate in connection with the celebration of the 500th anniversary of the discovery of America. Amateurs need to contact seven stations during the May 20 to November 20 time frame as follows: the two **KP4/500** stations in San Juan and Aguadilla; the **KP4/500** station aboard the USCG ship Eagle; and four KP4/NP4/WP4 stations in Puerto Rico. Try the official frequencies of 3897, 14250, and 21325 kHz, as well as secondary frequencies of 7297, 28497, 10106, 21063, and 28063 kHz. QRP CW stations may try 7040 kHz at 8:30 PM, Puerto Rico time. Send QSL cards and 9" × 12" SASE to PRARL, Box 1917, Sa Juan, PR 00919-1917.

500th Anniversary of Christophe Columbus's Trip to the New Worl Some 140 boats from 30 countries will b re-tracing Christopher Columbus's 149 voyage of discovery. Among the ships wi be the *Tievoli*, a 33 foot Nauticat, with fou amateurs from Indiana on board: Jac Parker, NT9J, Steve Smith, WA4VWV, Eri

im Muco (left) at the Tokyo hamfest with Martti Laine, OH2BH (right). Foreigners may pply for reciprocal operating permission from Albania thanks to them and others.

der, KB9BGS, and Ralph Talbott, who aits his license. The itinerary includes ain, Madeira, Canary Islands, and back he Bahamas in December. The opera- s will be on all HF bands, including the ital modes.

This is a non-profit voyage, under IRS es for amateur sports competition tax emption. This means most donations by taxpayers will be deductible. There will special recognition of donations of $25 $50. Donations may be sent to Hoosier's umbus Voyage Ltd., Box 36299, Indian- olis, IN 46236. Indiana's governor Evan yh has proclaimed the Tievoli as the te's official representation at cere- nies along the route.

Voice of America Club Callsign. In an precedented move, the Federal Com- nications Commission has issued a nse modification to the Voice of Amer- Amateur Radio Club to change its ama- r radio callsign from K3EKA to the more ognizable call sign, **K3VOA.**

For more than ten years the club has de several informal inquiries in an ef- to secure a VOA-suffix callsign. In ry case the FCC cited that the request s directly prohibited by the Rules and gulations Part 97.17.

During VOA's 50th anniversary in Feb- ry, the new USIA Director of the Bureau Broadcasting (which includes VOA), ase Untermeyer, expressed a desire to t the VOA ARC amateur radio shack. o president Al Brown, WA3FYZ, felt this uld be a perfect opportunity to ask Mr. ermeyer to intervene on the club's alf and ask the FCC Chairman to grant exemption. Mr. Untermeyer agreed and ed Al Brown to draft a letter for him to sign, which was sent to Alfred Sikes, Chairman of the FCC, in March.

In his reply Mr. Sikes stated that considering the importance of the 50th anniversary of the Voice of America and that other governments around the world have issued VOA-suffix callsigns, "I have asked . . . that Rule 97.17 be waived and that the VOA headquarters amateur radio station be issued a 'VOA-suffix' callsign."

To our knowledge, this is the first time since the adoption of FCC Rule 97.17(f) that a waiver has been granted.

The license for the new callsign K3VOA was mailed from the FCC office in Gettysburg, Pennsylvania on May 7th.

QSL Notes

QSL the March 1992 operation of **P40Z** only via Mike Zane, K6URI, P.O. Box 455, Lodi, CA 95241. US hams please include an SASE, or reply will be via the bureau. (Novices and club stations excepted; Mike will foot the return postage for these Deserving.)

QSL the CW-only March 21–22 operation of **4U1ITU** in Geneva via operator Glarey Luc, I1YRL, Via San Martino 11, 10091 Alpignano (To) Italy.

QSL the special Brazilian call **PR0R** via Sergio Lima de Almeida, PP5JR, Rubens A. Ramos 438/501, Florianopolis SC Brazil 88015.

When sending cards to **Taiwan BV**, remember that Taiwan is not a member of the International Postal Union (or of any other international body, for that matter), and IRCs cannot be directly converted into postage in Taiwan. Note also that

CQ DX Awards Program

SSB

1951	XE1X	1956	EA5RJ
1952	TI5RLI	1957	EA5AH
1953	K5HYB	1958	EA5GKE
1954	VE4AMU	1959	TI2TEB
1955	VE1RJ		

CW

853	XE1X

SSB Endorsements

320	W4UNP/323	300	TI2TEB/307
320	W@SFU/323	300	VE2GHZ/306
320	YV5AIP/323	300	W8URM/305
320	YV5CWO/323	300	AC@A/303
320	XE1AE/323	300	RA2YA/302
320	K9IW/322	300	WA5HWB/302
320	YS1GMV/322	275	EA5RJ/296
320	ZS6LW/322	275	I4CSP/295
320	AA6AA/321	275	TI5RLI/287
320	K8CSG/321	275	N5HSF/282
320	PY4OY/320	250	K5HYB/259
310	WE2L/316	250	KB7IVU/255
310	W@ULU/315	250	XE1X/252
310	KB2MY/311	150	VE1RJ/176
310	KD5ZM/311	OSCAR	VE4AMU

CW Endorsements

320	K1MEM/323	310	AA6AA/315
320	OK1MP/321	275	W8URM/298
320	K3UA/321	275	KA7T/294
310	K2OWE/318	275	VE1RJ/277
310	K9IW/318	275	IK2ILH/276
310	W@HZ/317	200	XE1X/202

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, Bill 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.

BV2FA's QSL card is oversized; use European-sized return envelope.

The March **VR6FM** QSOs, mostly on meter CW, were by a pirate, according QSL manager KI6YN. VR6FM left Pitcai on February 14.

QSL **9J2CF** to operator Charles Fro K5LBU, 2911 Camelot Lane, Missouri Ci TX 77459.

JH3DPB reports that he has not ceived any logs from **5U7M**. He sugges QSLing via the bureau; cards will be a swered via the bureau system.

QSL cards for **9K2JH** should be sent KE4JG, 1325 North Harrison Street, Arli ton, VA 22205.

Mitsuru Haraoka, JJ1VKL, is back in pan after his prolonged ***I4S7*** operati QSL via the JARL bureau, or direct 2-15-4 Kinuta, Setagaya, Tokyo 15 Japan.

Mike Zuber, N5PSI, is now QSL man er for **5N3ZIP**.

Peter Zoch Sprengel, PY5CC, repo that he prefers cards to be sent via Brazilian bureau. Also, US$1 does not c rently cover return postage costs. Pe handles cards for **ZX5C, ZZ5A, ZX ZZ9A, PS5C, PQ5C, PX5A, PX9A, PU PT9ZZ, ZV9ZZ, PP5XX, PW9A, PR** and others.

QSL **SO5CFA** via operator Jerzy K

It's not too early to make plans for CQ WW DX Contest DXpeditions this fall. Frank Schwab, W8OK, has arranged five Southwest Ohio DX Association operations from St. Lucia.

mider, VE7CFA, P.O. Marpole Box 30001, Vancouver BC V6P 5A0, Canada. (The 1992 *Callbook* address is incorrect.)

Bob Mantell, K3BYV, is now QSL manager for Norman, **P29NB**. SASE/SAEs with two IRCs or US$1. Non-US may QSL via the bureau. Bob requests no 19¢ postcards nor bureau cards from US hams. Bob also handles cards for **PZ5JR, PZ5DX, TG9CXM,** and **TG6/KB0HML**.

QSL the March Finnish operations in the Caribbean as follows: **8P9CW** via OH3UU; **8P9CX** via OH3VV; **PJ9Y** and **PJ2/OH6XY** via OH6XY; and **PJ2/OH6RI** via Toivo Flyktman, Saniastie 10 as 9, SF 40530 Jyaskyla, Finland.

QSL the November/December 1989 operation of **XF4T** via XE2CQ, Box 434859, San Diego, CA 92143. QSL cards have been mailed; re-QSL if necessary. More recent use of the callsign has been by a pirate.

Some help with French special-event calls: Calls beginning with **TM** are located in France; calls beginning with **TX** are located in overseas departments (FG, FY, FM, FS, etc.), and the prefix **TO** is used in overseas territories: FO, FK, FW, etc. DXers cannot tell from the prefix in which DXCC country the station is located.

With the closure of the Clark Air Force Base in the Philippines, and the new APO/FPO addresses, the current address for **DU1AK (ex-DU1KK)** is M. A. Vargas, USMAG RP JPGF, APO San Francisco AP 96440.

The new address for the **Taiwan BV** bureau is P.O. Box 93, Taipei, Taiwan.

QSL Information

1A0KM/IT to IT9ZGY
3A/DF2UU to DF2UU
3D2PO to VK3OT
3D2QB to SM3CER
3X0HNU to F6FNU
4K1YAR to UA3YAR
4K3OLL to RA3YG
4K4/EK0AAC to W7TSQ
4K4/UA6WCG to I8YRK
4K4BVI to UY5XE
4L1HMC to OH7AB
4L4UPA to UA4LEW
4L6HMC to OH7AB
4N2AJ to YU2AJ
4N3NMP to XE1MX
4X5W to 4X1EL
4Z4DX to F6FNU
4Z70UR to 4Z4UR
5B4ADA to K2VHW
5H3RA to JA3PAU
5N0CEP to KI5NF
6T2YD/SA to F6AJA
6W1Q8 to DK3NP
7P0FE to OH3GZ
7Q7XX to JH3RRA
7S0RQ to IS0LYN
7Z1AB to WB2QMP
8Q7PJ to PA0CRA
9H3JR to DJ0QJ
9K2MC to 9K2KM
9K2MU to 9K2AR
9K2WR to N6UXB
9K2ZR to K8EFS
9L3BM to VE3VON
9M2NA to VE3HZ
9M8AJ to AA5AZ
9V1YQ to K2QBV
9X5JA to W0ZUZ
A71AZ to SP9UO
AM25DMV to EA5DMV
AM25GFM8 to EA3BCU
AP/WA2WYR to KK6TX
BV2DA to DL7FT
BZ4RCW to BY4WNG
C3/F6AUS to F6AUS
CT4DX to WN5A
CU3/KF2EJ to KD4XN
CY0SAB to VE1CBK
DU7AF to AA6ZP
EA9/DK7ZB to DK7ZB
EH4MC to EA4CP
EL2PP to I5CZE
EM3ALS to UA3LJO
EU10 to K4RKI
EX2FP to UF6DZ
FG/N2HNQ to JH4IFF
FO5BI/P to F6HSI
FR/DJ6SI to DJ6SI
FR/DJ8CR to DJ8CR
G4SMC/8RI to G4SMC
HB0/DL2SCJ/P to DL2SCJ
HF0POL to SP9DWT
HI6UD to HI3UD
HI7/VP2EXX to KC8JE
HI8DDC to VE3LKU
HK0/W6JKV to W6JKV
HP1XQN to WT3K
HU1FT to DL7FT
HV3SJ to I0DUD
HZ1HZ to N7RO
IA0KM/IT to IT9ZGY
IL3SP to IK3QAR
J28FO to F6FNU
J37AJ to W2KF
JA8BS to WA4WIP
JW0E to UC1AHZ
JW5NM to LA5NM
JY9ZK to KA5ZMK
K4IWW/EV60 to K4RKI
KC4USV to KG5GH
KH0AC to K7ZA
KH8/LA4LN to LA4LN
LU3CQ/D to LU3AJW
OD5/LA4GHA to LA4GHA
OK1IAI/YA to OK1IAI
OX3KM to F6FNU
P29KH to WD9DZV
P4/KA1MJR to KA1MJR
PJ5/N4XO to N4XO
RA0AL to W3HCW
RA4HW to N7OTR
RE5Q to RB5QF
RE5Q/UB5J to RB5QF
RN3KDX to UA1NEJ
RO40A to SP9HWN
RU4F/UM9MWB to UA4FLA
RW73WA to RW9WA
RY0I to NA3O
RY1I to RB4II
S0RASD to EA2JG
S79HP to JA1OEM
S92AA to F6AXX
S9AGD to SM0AGD
SO2FCJ/MM to SP2UUU
SU1HV to IS0LYN
SV0HS/SX5 to DJ8MT
SV9/SV0HW to KA5EJX
SX5/SV0HS to DJ8MT
TL8GR to F5XX
TM5IDP to F1JPA
TM5MM to F5LP
TU4SR to OH8SR
TY1DX to IK2NNI
TZ6NU to F6FNU
U1RC to KA1DWX
UA8TAA to K7RO
UB5J/K4EWG to K4EWG
UB5WUS to KK4WW
UB9X/UB2KA to UB5KDD
UC2AAA to F6AML
UC860 to K4RKI
UD6DKW to Y42DA
UF6FAL to YU1XA
UF6FDR to UF6FFF
UH8EA to W5BWA
UI8ZAA to K9FD
UI9ACP to F6FNU
UJ8KAC/RU9U to UJ8JMG
UM9MWB/P to UA4FLA
US6CH to G0NKZ
UU6U/P to OH7AB
UZ0FWA to UA0FH
V31LM to W0IIM
V630M to VE2PPP
V85KX to G3JHX
VG2E0H to VE2DCK
VP2E0H to K8BL
VP2E0H to K8BL
VP2MLD to KC4DWI
VP2MR to N5DXD
VP5/WB9PHRO to WB9HRO
VP8BZL to KA6V
VP8C8A to W6MKB
VP8C8C to WA3YVN
VP8CFM to GM4KLO
VP9MN to WB2YQH
VQ9RS to ND0F
VS6CT to KA6V
XV7TH to SK7AX
XX9AW to KU9C
YB0ARM to N4AA
YI1RM to JY5HH
YJ8RN to N9NRU
Z21HJ to DL1GJP
ZA1TAA to I2MQP
ZA1TAJ to I2MQP
ZD8JIM to GM4FIW
ZD8OK to GW0FJT
ZF1JE to VE7FJE
ZF2SD to KB0EBH
ZK1TB to W7TB
ZP6CW to ZP6XDW
ZP8AA to ZP5AA
ZS7BSA to ZS4XJ
9L1MR to P.O. Box 966 Freetown, Sierra Leone
A22JP to P.O. Box 1022 Gaborone, Botswana
BZ4RA to P.O. Box 538 Nanjing, PRC
CL8NM to Box 40, Bayamo, Cuba
FR5FY to P.O. Box 1222, St. Denis, Reunion Island, via France
OD5WS to P.O. Box 3250 Halba Akkar, Tripoli, Lebanon
OD5ZZ to P.O. Box 782, Tripoli, Lebanon
R1ASP to P.O. Box Kronstad, 189610, Russia
R65BCH to P.O. Box 145, St. Petersburg, 180630, Russia
UD6DFA to P.O. Box 825, Baku 370129, Azerbaijan
XQ8YAF to P.O. Box 4 Easter Island, Chile
XX9GD to P.O. Box 14705, Macau
YI1BGD to Box 7477, Bagdad
YI1MH to P.O. Box 5864 Baghdad
ZD7SM to P.O. Box 86 St. Helena, S. Atlantic Ocean

ot Managers, But QSL Helpers

ario, I2MQP, reports that he is acting as mail drop for several Albanian stations: **A1TAB, ZA1TAE,** and **ZA1TAJ**. He does *ot* have the logs, but instead forwards the ards via a secure route once a month. our reply will come directly from Albania. ario also transfers the funds from your cards via the bank, so it is not lost in the mail.

Likewise, Leon Katz, K2EWB, reports that he is *not* the manager for **AP2JZB**. However, he *can* help obtain the AP2JZB QSL card. Send an SAE and two IRCs or US$1 to Leon at 4136 Lakespur Circle N., Palm Beach Gardens, FL 33410. As above, Leon deposits funds into AP2JZB's account, and forwards the cards to Pakistan to be answered.

Note: These "QSL Helpers" do *not* have logs and *don't* answer the cards; they serve only to reduce postage rip-off in overseas mailing. Allow for extra time for QSLing, and don't pester these volunteers with follow-up QSL requests.

73, Chod, VP2ML

1992 CQ WPX SSB Contest High-Claimed Scores

The following are early-bird high-claimed scores as of June 1, 1992. These are raw scores subject to verification.

UNITED STATES SINGLE OPERATOR HIGH POWER ALL BAND

KM1H	7,971,096
AA9AK/Ø	5,991,726
N7AVK	4,941,016
NU6S	4,667,208
AD1C	4,136,654
AA2GQ	3,892,770
K3ZO	3,591,040
N7TT	3,452,070
K6HNZ	3,123,750
NG8D	3,077,368
WZ4F	3,073,726
W5KFT	2,831,070
N6AR	2,576,373
K9ZO	2,552,004
N6EK	2,365,362
K4VUD	2,359,136
WØCG	2,316,624
KI6CG	2,281,944
K2PS	2,075,520
KA4RRU	1,964,996
WA4CHI	1,905,225
KY2J	1,646,620
WC7S	1,645,360
AJ9C	1,602,042
KØIJL	1,592,574
KAØZFX	1,408,728
AI2C	1,326,438
AB4RU	1,316,486
KBØC	1,284,734
K5NW	1,267,362
KKØL	1,246,320
AE6Y	1,053,522

28 MHz

WU3V	2,717,000
K5TSQ	1,081,694
AG6D	631,350
KC4TIR/T	529,452
WF5E	431,034

21 MHz

WN4KKN/6	4,551,648
K5MR	4,456,270
KA2AEV	4,322,292
N4MO	1,291,290
W7FP	1,116,744

14 MHz

KK9A	3,389,568
AA1AA	1,492,344
AA5WQ	1,029,600
K1KJT	1,000,395

7 MHz

KC7EM	1,413,926
N5RZ	1,043,316

3.7 MHz

K1ZM	1,272,848
WE3C	548,298
KØCS	56,024
W6CN	16,560
K2ONP	14,774

1.8 MHz

WT3Q	17,280

LOW POWER ALL BAND

N1HOQ	1,195,110
K2POF	1,079,884
KF2O	967,978
KA8WEO	890,625
ACØW	795,586
N8FEH	758,536
WS1A	736,644
KJ4TI	615,750
KA8D	580,260
NG9L	521,400

28 MHz

KS3F	871,145
KA2KRA/7/N	647,629
KF7LK	617,520
WB6CJE	401,103
KJ6HO	297,440
WB5RUS/T	227,154

21 MHz

WZ8T	402,052
WA9BOW	175,440

14 MHz

K7DBV	77,760
W9HNI	25,056
WS1O	22,440
KA1UJ/4	18,281

7 MHz

WA6WPG	20,502

QRP/p

KR2Q	A	1,269,960
KY5N	A	845,598
WB6JMS	A	438,426
N6YKL	A	420,948
N1AFC	A	362,729
WK6V	A	320,422
WA6FGV	28	53,064
KJ6MW	28	46,410
KS9U	21	262,350
K9JS	21	121,746
K5IID	14	214,118
K9OSH	14	38,503
K7UR	7	36,740

DX SINGLE OPERATOR HIGH POWER ALL BAND

PJ9Y	13,733,172
7Z2AB	9,218,636
VG3EJ	9,010,820
5U7M	8,738,068
WR6R/KH6	8,556,644
KG6DX	7,784,400
PRØR	7,764,900
OH5NQ	6,821,280
ZF2NE/ZF8	6,538,824
XJ1XX	6,525,030
OM5R	6,498,556
9K2WR	6,435,123
WL7E	5,771,320
ZS5ØØA	5,318,378
JA8RUZ	4,775,760
4D9RG	4,381,240
ON4UN	4,305,780
OA4ZV	4,084,511
EZ9MA	3,814,688
OG6YF	3,814,486

28 MHz

ZW5B	13,143,300
ZY5Z	11,501,757
HDØT	9,014,216
CE6EZ	8,840,768
P2ØA	5,265,743
ZS5WPX	5,006,250
VG7NTT	4,105,570
8A2DX	3,613,030
ZL2ACP	3,247,688
L2Q	2,250,848

21 MHz

ZZ9A	10,446,940
ZPØY	10,319,451
VG7SV	5,110,521
YL1WW	4,513,474
OG6NIO	3,567,148
VG5RA	3,440,556
VG7EIK	2,765,084
RY7D	2,628,900
UW9AG	2,549,180
LY2WW	2,426,872

14 MHz

ZV5A	7,333,470
LZ5W	5,671,509
GB8FX	4,984,488
IR8A	4,811,625
4N2HDE	4,084,860
DL8PC	3,089,130
LU2F	2,963,250
LU1DF	2,944,548
YW5N	2,415,360
4N3DL	1,769,520

7 MHz

EA9LZ	4,721,924
IZ3A	2,093,624
IU9S	1,256,280
HA9BVK	870,480
SP5SSN	499,200

3.5 MHz

CT7N	1,456,704
OK3CBU	523,488
F1NBX	205,422

1.8 MHz

EI7M	48,168

LOW POWER ALL BAND

5Z4BI	8,251,698
KG4DD	5,414,256
CY2C	4,872,924
NH6T	3,128,494
NP2I	2,910,338
DX1L	2,369,180
YB2ARQ	2,155,766
ED6UC	1,960,178
PW2A	1,805,248
HI3ADJ	1,252,944

28 MHz

JG1EGG	3,276,396
8P9CW	2,836,064
JE4VVM	2,427,858
EA6VQ	1,168,903
JE7JZC	1,122,317

21 MHz

XJ1SF	810,719
ZF2QP	610,740
JG4KCW	349,692
EC1CTH	323,730
OH2BUU	199,430

14 MHz

CT1BWW	620,310
OK1ARI	470,592
4M5KWS	276,060
7M1GAG	189,318
FE6FNA	105,792

3.5 MHz

VG3LRL	401,478
YU3KH	124,640
YO8RTR	85,760
EA3EGB	24,354

1.8 MHz

G4PKP	36,080

QRP/p

HI5ØØA	A	2,651,944
DL1YAW	A	697,544
5Y4FO	A	407,056
LZ2BE	A	350,436
HA7YS	A	335,016
JF3EIU	28	173,817
VE7EKS	28	29,224
OH2MPO	21	24,840
UB4JHE	14	116,560
SMØDZH	14	36,494

MULTI-OPERATOR SINGLE TRANSMITTER USA

NE8T	6,401,49
AA8U	5,665,86
WA6IET	4,149,76
KJ4VH	3,680,25
KD9ST	3,562,15
WT2F	3,540,34
WC5C	2,757,26
WS9V	2,707,77
N5NMX	2,532,42
KI5ER	2,205,40
NCØP	2,139,52
KC1F	1,742,40
W8BI	1,629,01
KB4GID	1,595,56
NNØM	1,356,88
W6YRA	1,073,75

DX

VP2EC	24,479,05
TX4B	13,302,34
TM5C	12,837,19
GB6BT	12,001,38
IR4T	11,405,77
TM2V	10,616,37
FFØXX	10,494,53
VG7SZ	10,313,22
XB9Z	10,055,18
GB8LC	9,520,46
CU2ØT	8,500,42
FO8AA	8,259,16
XA5T	7,394,50
XE2FU	7,226,95
PA6WPX	7,210,44
TM2P	6,451,99
HZ1AB	6,072,74
GXØOBS	6,050,15
OG1EH	5,835,83
4D1P	5,721,60

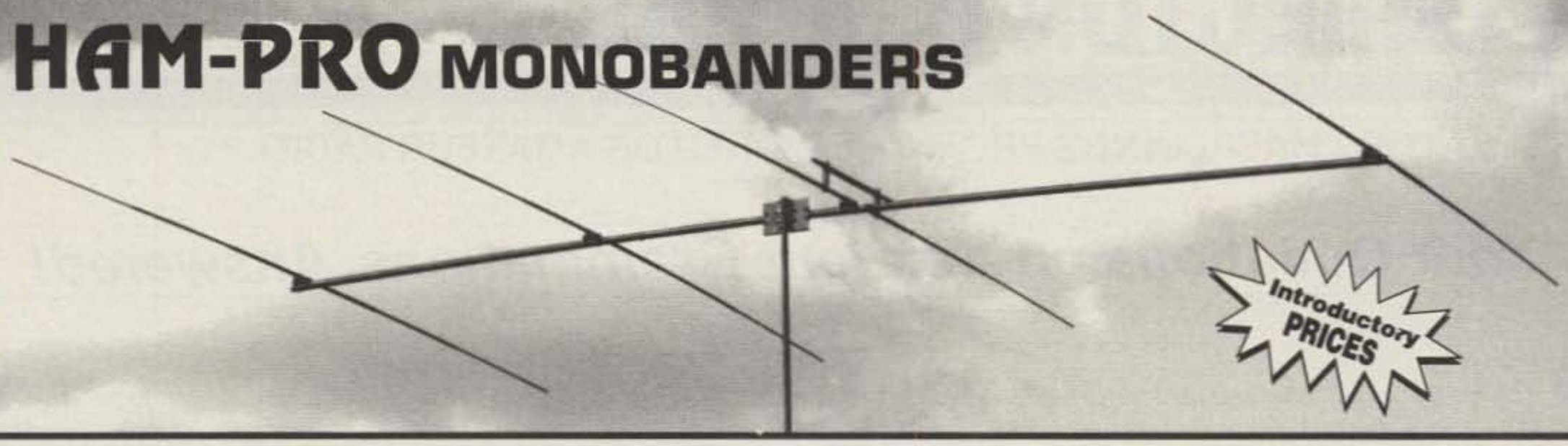
MULTI-OPERATOR MULTI-TRANSMITTER USA

WZ6Z	15,616,2
NX1H	13,173,5
WK4Y	11,226,9
WZ1R	5,368,4
W6EEN	2,121,8

DX

HG73DX	24,692,1
OT2A	21,432,8
SN6O	8,457,0
DEØDBT	4,939,7
JK1ZHH	1,016,1

HAM-PRO MONOBANDERS



- ❑ *Patented* feed makes all others obsolete*
- ❑ *More gain than any tribander*
- ❑ *New feed method reduces TVI & noise*
- ❑ *Factory pretuned driven elements*
- ❑ *High Gain—Low VSWR over full band*
- ❑ *Buy direct and get factory prices*
- ❑ *Exclusive money back guarantee*

Ham-Pro's monobanders are acclaimed in product reviews by CQ and DX Magazine. Enjoy more QSOs with our weather-proof patented new feed technology.

Electrically and mechanically superior to any other beam on the market. Third party range testing insures honest gain figures. Only Ham-Pro meets EIA RS-409 antenna specs!

Enjoy higher gains, lower VSWR, reduced TVI and a very quiet antenna. Get the best beams available. Call us toll free, for more information, or to place your order.

*** U.S. Patent 5,068,672**

MEASURED

Model-Elements	Band	Gain dB/d	VSWR Min	VSWR Max	Price
H20-4	20m	9.23	1.02	1.61	$530
H15-4	15m	8.80	1.02	1.62	$340
H10-3	10m	6.46	1.04	1.79	$190
H6-6	6m	9.41	1.02	1.91	$200
H144-5	2m	9.10	1.05	1.39	$ 69
H144-15	2m	13.73	1.02	1.68	$145
H220-5	1.25m	9.20	1.02	1.30	$ 65
H220-17	1.25m	13.53	1.02	1.29	$150
H432-5	70cm	9.35	1.08	1.28	$ 65
H432-24	70cm	16.14	1.04	1.83	$145

HAM-PRO ANTENNAS

VISA MasterCard

TOLL FREE 1-800-879-7569

RECEIVING TUBES

OVER 3000 TYPES IN STOCK!

Also hard-to-find transformers, capacitors and parts for tube equipment.

Send $2.00 for our 32 page catalog.

ANTIQUE ELECTRONIC SUPPLY

6221 S. Maple Ave.•Tempe, AZ 85283•602-820-5411

HIGH-ACCURACY ANTENNA SOFTWARE

MN 4.0 is the fastest, most powerful, and most accurate MININEC antenna-analysis program available. MN corrects fundamental problems in the MININEC algorithm for improved accuracy. MN features 3-D views of antenna geometry and wire currents, presentation-quality polar and rectangular plots, automatic wire segmentation, automatic frequency sweep, symbolic dimensions, skin-effect modeling, near-field calculation for TVI and RF-hazard analysis, up to 254 pulses for complex models, simple definition of sources and loads, and pop-up menus. MN 4.0, $85. MNC 4.0 (1.6-2.4 times faster, coprocessor required), $110. MNH 4.0 (huge-model option), $25.

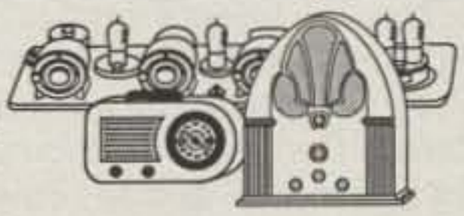
YO 4.0 automatically optimizes Yagi antennas for maximum forward gain, best pattern, and minimum SWR. YO handles designs from HF to microwave. YO models stacked Yagis, Yagis over ground, skin-effect, dual driven-elements, element tapering, mounting plates, and matching networks. YO runs hundreds of times faster than MININEC. YO is calibrated to NEC for high accuracy and has been extensively validated against real antennas. YO is intuitive, highly graphical, and fun to use. YO 4.0, $100. YOC 4.0 (1.7-2.7 times faster, coprocessor required), $130.

NEC For Yagis 1.0 provides highest-accuracy analysis of Yagi designs with the professional-standard Numerical Electromagnetics Code. NEC For Yagis 1.0, $50. Coprocessor, hard disk, and 640K memory required.

MN and YO come with comprehensive antenna-design libraries and include both coprocessor and extra-fast no-coprocessor versions. All programs include extensive documentation and an easy-to-use, full-screen text editor. Add 6% CA, $5 overseas. VISA, MasterCard, U.S. check, cash, or money order. For IBM PC, 3.5" or 5.25" disk.

Brian Beezley, K6STI, 507-1/2 Taylor, Vista, CA 92084
(619) 945-9824, 0700-1800 Pacific Time

FREE SAMPLE COPY!



ANTIQUE RADIO CLASSIFIED

Antique Radio's Largest-Circulation Monthly Magazine

Articles - Classifieds - Ads for Parts & Services
Also: Early TV, Ham Equip., Books, Telegraph, 40's & 50's Radios & more...

Free 20-word ad each month. Don't miss out!

VISA **1-Year: $27 ($40 by 1st Class)** MasterCard
6-Month Trial - $15. Foreign - Write.

A.R.C., P.O. Box 802-C10, Carlisle, MA 01741

★ MADISON SHOPPER ★

ORDERS: 1 (800) 231-3057
1 (713) 729-7300 or 729-8800
FAX 1 (713) 729-4766

New and Used Meters, Tubes, Transformers, Filter Capacitors And More

VISA **FREE List Call** MasterCard

Madison Electronics
12310 Zavalla Street
Houston, TX 77085

CIRCLE 86 ON READER SERVICE CARD

SUPER PACKS FOR ICOM 2/4SAT & 24AT

BP-83 7.2V 600mah	$33.50
BP-83S 7.2V 750mah	$38.00
BP-84 7.2V 1000mah	$50.00
BP-84S 7.2V 1400mah	$60.00
BP-85S 12V 800mah	$60.00

SPECIALS

Sanyo 600mah AA NiCad	$1.25
Sanyo Sub C NiCad	2.00
Gel Cell 12V 6.5AH	15.00
Yaesu FNB-2	18.00
Yaesu FNB-4 Insert	22.00
ICOM BP-3 Insert	10.00
ICOM BP-5 Insert	19.00
ICOM BP-8 Insert	19.00
KENWOOD PB25/26 Insert	15.00

*Add $3.00 Shipping FREE Catalogue
VISA MasterCard Discover

TNR Your Battery Store
279 Douglas Ave., Suite 1112
Altamonte Springs, FL 32714
1-800-346-0601

CIRCLE 72 ON READER SERVICE CARD

WASHINGTON READOUT

BY FREDERICK O. MAIA, W5Y

REGULATORY HAPPENINGS FROM THE WORLD OF AMATEUR RADIO

Your Questions on Amateur Examinations Answered!

Since we are a nationwide coordinator of amateur radio operator license examinations, we get tons of inquiries concerning entry into the service and upgrading. This month we will try to cover a few of the general-interest questions.

Q: I want to upgrade my amateur radio license class. How do I go about getting exempted from the Morse code test?—A.S., N. Bergen, NJ.

A. The subject of handicapped telegraphy exemptions has indeed generated many letters from readers! Some of you are completely opposed to anyone being able to forgo a code test, while others believe it is a good idea. Here are the rules for obtaining a telegraphy test exemption.

Only a severely handicapped applicant may be excused from having to pass the higher speed telegraphy examinations. The disability must prevent a person from being able to pass the 13 (or 20) words-per-minute telegraphy examination in a normal manner. There are no telegraphy waivers available to anyone except those certified as disabled.

Amateur radio is a worldwide telecommunications service. Due to international amateur service requirements, even handicapped applicants must demonstrate knowledge of the required 43 telegraphy characters at a speed of at least 5 words-per-minute. Where warranted, this may be accomplished in a manner that takes the examinee's disability into consideration. These accommodations include pausing the telegraphy message transmission after each sentence, phrase, word, or character, or the use of special equipment. Any necessary special equipment—such as blinking lights, vibrating surfaces, braille typewriters—and so forth should be supplied by the applicant. A sending test may also be substituted for Morse code receiving.

The procedure to request telegraphy credit is by submission of an original physician's certification indicating the applicant has a severe disability that will last for more than a year. Only an M.D. or D.O. (Doctor of Osteopathy) licensed to practice in the United States is authorized to complete the certification. In addition, the applicant must agree to release to the Federal Communications Commission any medical information deemed necessary to process the application.

A special form is available from any VEC for this purpose. The original form must be submitted to the VE team. A photocopy will not suffice. The newer amateur radio application forms have the "Physician's Certification of Disability" right on the back of the Form 610 application itself.

The physician's certification is used by an examinee to receive telegraphy examination credit toward a General, Advanced, or amateur Extra Class amateur operator license. All Form 610 applications requesting telegraphy credit must be submitted to an accredited VE (volunteer examiner) team. Do not send the application to the FCC, even when no further written testing is needed, such as when an applicant already has examination credit.

If everything is in order, the VEs will place the letter "H" (for handicapped) under Element 1C (the 20 words-per-minute telegraphy test element) in the Administering VEs section of the application form. They will also issue a Certificate of Successful Completion of Examination (CSCE) for Element 1C and any other examination element passed at the test session.

Always retain the original CSCE. While the original Doctor's Certification form must be submitted to the FCC, only a copy of the CSCE is attached to the Form 610 to support examination credit. Disabled applicants will need the original CSCE to show the VE team when they again request examination credit for the 20 words-per-minute telegraphy (Element 1C) examination.

Handicapped amateurs, who already have been issued a callsign, may then begin using their new frequency privileges immediately. When operating on the new bands, however, they must append their station callsign with the words "temporary" plus AG (General Class), AA (Advanced Class), or AE (for Amateur Extra Class) until their new license arrives from the FCC.

Many VEs have questioned whether or not an applicant holding a doctor's disability certification is really severely handicapped to the point where he/she is unable to pass a normal telegraphy examination. This is a medical opinion, one that the examiners are not permitted to protest. The VE may, however, attach a letter to the Form 610 application if they believe the applicant is abusing the handicapped telegraphy exemption policy. The VEC will forward the letter along with the application to the FCC, who will look into the matte

Q. I am opposed to bringing Novic testing under the VEC System. Wh make this change? If it ain't broke, wh fix it!—C.R., Yakima, WA.

A. We mentioned a couple of month ago in this column that both the America Radio Relay League and the W5YI-VE had petitioned the FCC to include the e amination of Novice operators under th more formal VEC System. Since that tim we have gotten several letters, both agre ing and disagreeing with the concept. Mo readers wanted to know why it was ne essary and what were the advantage Some felt it might interfere with their abi ty to indoctrinate newcomers into th hobby.

First of all, there are now two amate radio entry routes. The new code-fre Technician class has been very succes ful, and there can be no doubt that it is no the path of choice for people who want get into amateur radio. So far this ye about 4500 newcomers are joining th hobby monthly. For 3300 (about thre quarters) their first amateur radio licens is the codeless Technician.

In 1990, the last year of the Novice-or entry level, about 2000 beginners a mon received their first amateur radio ticke and almost all came in at the Novice lev The popularity of the Codeless Technici has had a very significant impact on th Novice class as an entry level. The numb of newcomers choosing the Novice rou has been declining dramatically. So far th year an average of 1150 newcome monthly are choosing the Novice path- a decrease of more than 40%.

Novice testing has been conducted volunteers for many years. The VEC Sy tem which examines Technician and th higher class licenses got its start in 198 At that time the FCC elected to exclude th Novice class from the VEC System sin it was a new testing program which had y to prove itself. There was also a feeling th its inclusion might result in a decreas availability of examinations for newcome

Today the VEC System has develop into a very large, efficient, and smooth functioning testing program with ma checks and balances. About one milli test elements have now been administer

---

**National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)*

under the program since its inception. More than 100,000 persons took examinations under the VEC System last year alone. And it appears that the VEC System can handle the additional burden of the Novice program without difficulty. Frankly, many Novices are already being examined at VEC System test sessions.

The advantages of VEC System testing are many. First of all, all Novice (Element 2) questions are maintained by the Question Pool Committee. The QPC is an internal committee of the National Conference of VECs. This maintenance consists of periodically revising all questions and deleting questions made obsolete by changes in the rules. While the VEC System has a mechanism for notifying their testing teams of changes in the question pools, no such mechanism exists in the Novice program, since the Novice examiners are unknown to the QPC. There is simply no line of communication between Novice examiners, the Question Pool Committee, VECs, or even the FCC.

It was necessary for the QPC to eliminate six obsolete questions from the various pools when the Codeless Technician took effect last year. Three of the questions deleted were from the Novice pool. While VEC System testing teams were routinely notified and new testing material made available, most Novice examiners never got the word. Publishers were notified to drop those questions in their next printing, but Novice examiners were never notified. The QPC simply did not know whom to contact.

While both the ARRL and W5YI-VEC also have Novice up-to-date testing materials available, most examinations are administered by simply selecting an appropriate number of questions from a Novice study manual. Most study guides in the marketplace contain questions which have been deleted by the QPC.

We also find that most Novice telegraphy examinations are not properly administered. Most do not contain all 43 characters as required by the rules. Many examiners are not aware of the examination rules and most do not take the effort to prepare a properly constructed code test. While the Form 610 clearly states that "Every amateur should have a copy of the FCC Rules . . . ," there is no requirement that they do so. Frankly, we would like to see every new amateur provided with a copy of the Part 97 FCC Rules as part of the examination process.

The VEC System has many checks and balances to reduce the incidence of examination fraud. Every VEC routinely archives all testing records from every VEC System coordinated test session. If they are needed, the FCC need only contact one of a relatively few VECs to obtain the needed test session paperwork. When the amateur service Rules were rewritten in 1989, the §97.28(d) requirement that a Novice examiner retain " . . . the test papers including the answer sheets as part of the volunteer examiner's station records for one year from the date the examination is administered" was eliminated. Neither does the instructions to Novice examiners that appears on the Form 610 require retention of test papers.

There is also evidence that Novice applications are being submitted to the FCC with falsified signatures. Examination integrity will be improved when all applications are only accepted into the system from VEs who have been approved for testing.

The application error rate on Novice applications is more than ten times that of the VEC System. This is because every VE team is furnished with a very detailed set of examination instructions and every application is further screened by VEC staff. The FCC should be spending their time processing and issuing licenses, not correcting and returning applications.

Incorporating Novice testing under the VEC System will also allow VEs to use standardized forms, such as Certificates of Successful Completion of Examination (CSCE). At present, photocopies of Form 610 applications are used to show that one or both Novice elements have been passed.

Much confusion also exists as to which test elements may be administered under the Novice program. The rules require that

the Technician and higher class examinations be administered under the VEC System. This means that applicants holding Codeless Technician licenses must be administered Element 1(A) at a VEC coordinated test session. The same holds true if an applicant passes Technician written Element 3(A) first. A Codeless Tech who passes 5 words per minute does not become a Novice. He/she upgrades to Tech Plus. And neither can an applicant whose initial test Element is Element 3(A). His/her first license can never be a Novice ticket since passing Element 2 makes him/her a Codeless Technician and Element 2 and 1(A), a Tech Plus licensee. Many Novice-level examiners believe that they can administer the 5 words-per-minute and Element 2 examinations under the Novice program to anyone who has not passed them, since they are considered Novice level tests. Not true.

Bringing Novice testing under the VEC program will have little impact on Novice-level examiners and applicants. Many General Class VEs are under the mistaken impression that they will not be able to conduct Novice examinations, or that their students will have to be examined at a different more formal location. Again, not true. There will basically be only four changes.

1. General Class examiners will have to be accredited, primarily so the VECs will know where to send updated testing information.

2. Three VEs will be required to certify Novice applications rather than two.

3. Instead of sending the Form 610 application direct to the FCC in Gettysburg, VE teams will send the application, answer sheets, and a couple of forms to the VEC who accredited them to conduct examinations.

3. You must make a public announcement of your examination session, which may be made any time (even one hour prior on a repeater) before the test session.

It is not known at this point whether or not expense reimbursement (a test fee) will be authorized by the FCC. If it is, the VEC will share expense reimbursement with the examiners. It is also possible that youngsters under the age of 18 might be exempted from any test fees.

Our understanding at press time is that the FCC will be issuing a Notice of Proposed Rulemaking which looks toward adopting the ARRL and W5YI-VEC petitions. The public will be given an opportunity to comment on the proposal.

The VEC's Question Pool Committee is in the process of making a major revision to both Element 2 and 3A, the Novice and Technician question pools. It is hoped that the new rules bringing the Novice examination under the VEC System will be in place by year end, or Spring 1993 to coincide with the issuance of the new question pools. The new Element 2/Novice and 3A/Technician pools will be released at year end, and the new questions will begin appearing in all Novice and Technician written examinations on July 1, 1993.

Q. Where can I get copies of the various question pools?— C.S.,Jamaica, NY.

A. The exact questions, answers, and distractors may be purchased in study manual form from most amateur equipment outlets and Radio Shack stores. License preparation material and each of the five (Novice, Technician, General, Advanced, and Amateur Extra Class) pools are available from: The W5YI Group, Inc., P.O. Box 565101, Dallas, TX 75356 (telephone toll-free 1-800-669-W5YI [9594]). Cost for each question pool is $2.00 each, which includes postage.

Q. The only Form 610 amateur radio application I have has expired. May I still use it?—R.J., Sioux City, KS.

A. Yes. Each version of the Form 610 is approved for use by the Federal Office of Management and Budget for a specified length of time--usually two or three years. But even expired application forms may be used. They never really ever expire. The current Form 610 carries an expiration date of February 28, 1995. You can get one or two from us at no cost by calling our VEC office at 817-860-3800 during regular business hours, or by writing to W5YI-VEC, P.O. Box 565101, Dallas, TX 75356. A self-addressed, stamped envelope will be appreciated.

Q. What's the difference between a preparing VE and an administering VE? I thought they were the same.—E.S., Peoria, IL.

A. Public Law 97-259 (signed into law by President Reagan on September 14, 1982) authorized the use of volunteers to prepare and administer amateur exams. The law requires they hold an amateur station operator license of a higher class than the class license for which the examination is being prepared or administered, if one is available.

The FCC saw fit to go along with this on test preparation but not on administration. For example, a Technician Class licensee may "prepare" Novice and Technician code exams and question sets since they hold a higher class license. They may not, however, administer those examinations.

While General Class VEs may only examine the Novice Class, they may also prepare Technician examinations. The Advanced Class may examine both the Novice and Technician Classes and additionally prepare General Class questions and telegraphy tests. Only the Extra Class level volunteer examiner may administer all written examinations and any of the code tests above the 5 words-per-minute Novice level. A preparing VE need not be accredited. Administering VEs above the Novice class must be approved by a VEC.

Q. How do I know if I have the most recent license test questions?—N.T., Bangor, ME.

A. Most study manuals for the various question pools contain an expiration date on the cover. If the ending date is not known, then there is generally a notation that the questions are valid at least through a specific date. The question pools are changed on a four-year cycle with Novice and Technician questions being revised together, since they are the sole requirement for the Codeless Technician Class. The current Element 2 and 3A questions will be valid through June 30, 1993.

The VEC's Question Pool Committee anticipates that the General (Element 3B) questions will be changed on July 1, 1994, Advanced (Element 4A) on July 1, 1995, and Extra on July 1, 1996. This schedule could be changed, however, if the FCC makes monumental changes in the rules, such as they did in 1989 when they completely revised and rewrote the Part 97 regulations.

73, Fred, W5YI

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Sunspot Cycle Progress

The Royal Observatory of Belgium reports a mean sunspot number of 102 for April 1992. There was considerable day-to-day variation reported, with a high of 185 recorded on April 21 and a low of 54 observed on April 10.

The mean value for April results in a 12-month running smoothed sunspot number of 142 centered on October 1991. This is a drop of three points from September's level, leading many veteran solar-cycle observers to suggest that this may mark the beginning of a steady decline from the high-value plateau which has held up since the beginning of 1989.

A smoothed sunspot number of approximately 115 is predicted for August 1992.

A corresponding decrease was reported in the 10.7 cm solar flux level. Canada's Dominion Radio Astrophysical Observatory in Penticton, B.C., in a smoothed value of 200 centered on October 1991. A smoothed level in the low 180s is forecast for August 1992.

Cycle 22 Minimum Predicted for 1997

With the exceptionally high-level plateau of solar activity now apparently at an end, I am going to make my first prediction for the remainder of Cycle 22.

Since solar activity is a function of nature, for which present-day scientists have no full explanation, an accurate prediction based on scientific facts is not possible.

Various methods have been devised in an attempt to predict sunspot cycle progress. In almost all cases, whether the method is relatively simple or extremely advanced, they are based on an analysis of past cycle characteristics. My present analysis is based on matching the progress to date of Cycle 22 to four somewhat similar cycles—namely, Cycles 11, 18, 19, and 21.

Table I lists the major characteristics of the four cycles (11, 18, 19, and 21), selected to match the progress to date of Cycle 22.

Cycle 22 began during September 1986 (1986.7) with a count of 12.3. It reached its peak intensity during July 1989 (1989.6) with a count of 158.1. This rise in 2.9 years from beginning to maximum intensity is a historic record.

If Cycle 22 is to follow the course of the average cycle length of the four cycles to which it is being compared, it would be expected to end 10.7 years after it began, or

1986.7 + 10.7 = 1997.4 = May 1997

However, if the average time from fall to minimum is used, the end of Cycle 22 would be expected to occur on:

1989.6 + 7.3 = 1996.9 = Nov. 1996

Based on these two comparisons, the end of Cycle 22 could be expected to occur sometime between November 1996 and May 1997.

The latest available smoothed sunspot number for Cycle 22 is 142 centered on October 1991, or 1991.8. This marked the 61st month of Cycle 22. Table II lists the smoothed sunspot number in the 61st month of each of the four cycles under study, and the time it took to decline to minimum from the 61st month.

Based upon this analysis, and using the average fall to minimum from the 61st month for the four study cycles, the end of Cycle 22 can be expected on:

1991.8 + 5.2 = 1997.0 = Jan. 1997

This falls between the previous predictions of November 1996 and May 1997, and appears to add a degree of confidence to this prediction method.

Based upon the progress to date of Cycle 22, and a comparison with the average characteristics of four similar cycles, it can be expected that Cycle 22 will reach its minimum level and a new cycle will begin sometime between November 1996 and May 1997.

According to this analysis, Cycle 22 should decline from its latest value of smoothed sunspot number (142 for October 1991) to a predicted low level of approximately 7 in approximately five years. This would be an average monthly drop of 2.25 in the smoothed sunspot numbers. Later this year I plan to have a further analysis which will fine-tune the monthly smoothed sunspot numbers expected for the remainder of Cycle 22.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for August 1992

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 5, 7, 16, 23	**A**	**A**	**B**	**C**
High Normal: 4, 6, 8, 11, 14, 17-18, 22, 24	**A**	**B**	**C**	**C-D**
Low Normal: 2-3, 9-10, 13, 15, 19-21, 28-30	**B**	**C**	**D**	**D-E**
Below Normal: 1, 12, 25	**C**	**C-D**	**D-E**	**E**
Disturbed: 26-27	**C-D**	**D**	**E**	**E**

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.
3 dB 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 fair-to-poor (C-D) on August 1, good-to-fair (B-C) on the 2nd and 3rd, good (B) on the 4th, excellent (A) on the 5th, etc.

Sunspot Smoothed Number	Minimum Smoothed Number	Maximum Smoothed Number	Rise to Maximum (Years)	Fall to Minimum (Years)	Cycle Length (Years)
11	5.2	140.5	3.4	8.3	11.7
18	7.7	151.8	3.3	6.8	10.1
19	3.4	201.3	3.6	7.0	10.6
21	12.2	164.5	3.4	6.9	10.3
Average	**7.1**	**164.5**	**3.4**	**7.3**	**10.7**

Table I– Basic characteristics of sunspot Cycles 11, 18, 19, and 21.

Sunspot Cycle	Smoothed No. at 61st Month in Cycle	Fall to Minimum from 61st Month (Years)
11	99	5.0
18	135	5.1
19	169	5.6
21	141	5.1
Avg.	**136**	**5.2**

Table II– Progress at 61st month of study, cycles 11, 18, 19, and 21.

A note of optimism: There is no need to panic or start thinking of taking down your antenna or seeking other hobbies because the sunspot count is declining. Whatever the sunspot count, even at the very minimum of a cycle, there will be plenty of DX to work on the HF bands used by radio amateurs. Indeed, a bit more patience may be required durng low periods of solar activity, and the DX openings may occur for shorter periods of time, and peak on different bands than during periods of high solar activity, but the fun and excitement will still be there. Take it as a guarantee from someone who has operated on the HF bands through five sunspot cycles!

August Propagation

Late August and early September are dog-days for propagation forecasters. This is the time when many of us go around in disguised so that we will not be recognized. It is the most difficult time of year for which to make accurate band predictions because conditions can change drastically from day to day. On many days typical summertime conditions will continue much as they were during June and July.

On other days conditions may sound typically fall-like, with somewhat higher daytime frequencies and somewhat lower nighttime usable frequencies. Add to this *equinoctial* conditions which can begin as early as late August. This can often result in optimum openings between the northern and southern hemispheres on the one hand, but periods of severe radio storminess on the other.

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 bands 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.

For *short-skip* openings during August and early September, try *80* meters during the day for distances less than *250* miles,

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( )after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, *not* GMT. To 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 CW, or 1 kw, PEP 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 *propagat'on index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

August 15 - September 15, 1992
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) 10-12 (2) 12-15 (3) 15-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-10 (3) 10-11 (2) 11-13 (1) 13-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 20-21 (1)* 21-00 (2)* 00-02 (1)*
Northern Europe & European USSR	09-13 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-16 (1)	05-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-22 (1) 22-00 (2) 00-01 (1)	19-21 (1) 21-00 (2) 00-02 (1) 20-21 (1)* 21-00 (2)* 00-01 (1)*
Eastern Mediterranean & Middle East	11-14 (1)	08-09 (1) 09-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	07-09 (2) 09-14 (1) 14-16 (2) 16-20 (3) 20-22 (2) 22-01 (3) 01-03 (2) 03-07 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Western Africa	11-14 (1) 14-16 (2) 16-17 (1)	07-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-23 (4) 23-02 (3) 02-06 (2) 06-09 (1)	20-23 (1) 23-02 (2) 02-03 (1) 21-02 (1)*
Eastern & Central Africa	13-16 (1)	10-12 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-03 (1)	20-02 (1) 21-01 (1)*
Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	09-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	08-15 (1) 15-17 (2) 17-21 (3) 21-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	20-22 (1) 22-01 (2) 01-03 (1) 21-02 (1)*
Central & South Asia	*NIL*	09-12 (1) 20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 19-20 (1) 20-22 (2) 22-00 (1)	05-07 (1) 19-21 (1)
Southeast Asia	*NIL*	08-10 (1) 10-12 (2) 12-14 (1) 18-19 (1) 19-21 (2) 21-22 (1)	06-08 (1) 08-10 (2) 10-11 (1) 19-22 (1) 22-00 (2) 00-01 (1)	*NIL*
Far East	*NIL*	09-11 (1) 18-20 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-13 (1) 18-20 (1) 20-22 (2) 22-00 (1)	05-06 (1) 06-07 (2) 07-08 (1) 06-07 (1)*
South Pacific & New Zealand	11-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	09-15 (1) 15-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	12-20 (1) 20-22 (2) 22-00 (3) 00-01 (4) 01-03 (3) 03-05 (2) 05-07 (1) 07-08 (2) 08-10 (3) 10-12 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-07 (2) 07-09 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Australasia	16-17 (1) 17-19 (2) 19-21 (1)	09-11 (1) 16-18 (1) 18-21 (2) 21-23 (1)	06-08 (2) 08-10 (3) 10-11 (2) 11-16 (1) 16-18 (2) 18-22 (1) 22-01 (2) 01-03 (1)	03-04 (1) 04-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 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)	07-08 (1) 08-09 (2) 09-11 (3) 11-14 (4) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-18 (3) 18-21 (4) 21-23 (3) 23-01 (4) 01-03 (3) 03-04 (2) 04-06 (1) 06-07 (2)	19-20 (1) 20-21 (2) 21-03 (4) 03-05 (3) 05-06 (2) 06-08 (1) 20-00 (1)* 00-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	07-08 (1) 08-11 (2) 11-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	13-16 (1) 16-18 (2) 18-19 (3) 19-23 (4) 23-03 (3) 03-04 (2) 04-06 (1) 06-07 (2) 07-09 (3) 09-10 (2) 10-12 (1)	20-23 (1) 23-05 (2) 05-07 (1) 03-06 (1)*
McMurdo Sound, Antarctica	*NIL*	14-16 (1) 16-18 (2) 18-19 (1)	18-20 (1) 20-21 (2) 21-01 (3) 01-03 (2) 03-07 (1) 07-09 (2) 09-10 (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	09-14 (1)	09-11 (1) 11-12 (2) 12-13 (3) 13-15 (2) 15-17 (1)	05-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-00 (1)	19-22 (1) 22-01 (2) 01-02 (1) 20-01 (1)*
Northern & Central Europe & European USSR	08-12 (1)	11-16 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1) 21-00 (2) 00-01 (1)	19-20 (1) 20-00 (2) 00-01 (1) 20-00 (1)*
Eastern Mediterranean & Middle East	*NIL*	10-11 (1) 11-13 (2) 13-15 (1)	06-08 (1) 08-10 (2) 10-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-22 (1) 22-00 (2) 00-02 (1)	19-00 (1) 20-23 (1)*
Western & Central Africa	10-12 (1) 12-16 (2) 16-17 (1)	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-19 (3) 19-21 (2) 21-22 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (4) 22-01 (3) 01-02 (2) 02-09 (1)	20-23 (1) 23-01 (2) 01-02 (1) 21-00 (1)*
Eastern Africa	13-15 (1)	11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	13-15 (1) 15-17 (2) 17-22 (3) 22-00 (2) 00-02 (1)	20-00 (1) 21-23 (1)*
Southern Africa	11-13 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	06-09 (1) 13-15 (1) 15-18 (3) 18-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	19-21 (1) 21-00 (2) 00-01 (1) 21-00 (1)*
Central & South Asia	*NIL*	09-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-11 (1) 17-19 (1) 19-21 (2) 21-23 (1)	06-08 (1) 19-21 (1)
Southeast Asia	*NIL*	10-12 (1) 17-18 (1) 18-20 (2) 20-21 (1)	07-08 (1) 08-10 (2) 10-13 (1) 19-21 (1) 21-23 (2) 23-01 (1)	06-08 (1)
Far East	*NIL*	09-11 (1) 15-16 (1) 16-19 (2) 19-21 (1)	19-22 (1) 22-00 (2) 00-02 (1) 07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-15 (1)	03-06 (1) 06-07 (2) 07-08 (1) 05-07 (1)*
South Pacific & New Zealand	09-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	09-13 (1) 13-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	08-10 (3) 10-13 (2) 13-18 (1) 18-20 (2) 20-23 (3) 23-03 (4) 03-05 (3) 05-08 (2)	00-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-03 (1)* 03-06 (2)* 06-07 (1)*
Australasia	09-11 (1) 14-16 (1) 16-19 (2) 19-20 (1)	09-11 (1) 15-16 (1) 16-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	08-10 (3) 10-13 (2) 13-20 (1) 20-22 (2) 22-23 (3) 23-02 (4) 02-03 (3) 03-08 (2)	02-04 (1) 04-05 (2) 05-06 (3) 06-07 (2) 07-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-13 (3) 13-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	08-10 (4) 10-12 (3) 12-16 (2) 16-18 (3) 18-23 (4) 23-02 (3) 02-05 (2) 05-07 (3)	19-20 (1) 20-21 (2) 21-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 20-23 (1)* 23-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	12-16 (1) 16-17 (2) 17-19 (3) 19-22 (4) 22-02 (3) 02-04 (2) 04-07 (1) 07-09 (2) 09-10 (1)	20-22 (1) 22-05 (2) 05-07 (1) 02-05 (1)*
McMurdo Sound, Antarctica	*NIL*	13-15 (1) 15-17 (2) 17-20 (1)	17-19 (1) 19-21 (2) 21-01 (3) 01-04 (2) 04-07 (1) 07-09 (2) 09-10 (1)	01-06 (1)

Time Zones: PDT (24-Hour Time) WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	*NIL*	09-11 (1) 11-13 (2) 13-15 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-18 (1) 22-23 (1) 23-01 (2) 01-02 (1)	20-21 (1) 21-23 (2) 23-00 (1) 22-23 (1)*
Central Europe & European USSR	*NIL*	09-11 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-17 (1) 22-00 (1)	18-20 (1) 20-22 (2) 22-23 (1) 21-22 (1)*
Eastern Mediterranean & Middle East	*NIL*	08-09 (1) 09-11 (2) 11-12 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (1) 19-20 (1) 20-22 (2) 22-23 (1)	20-22 (1)
Western & Central Africa	13-16 (1)	08-11 (1) 11-13 (2) 13-16 (3) 16-18 (2) 18-19 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-01 (2) 01-07 (1) 07-09 (2) 09-10 (1)	21-00 (1)
Eastern Africa	*NIL*	09-13 (1) 13-16 (2) 16-18 (1)	13-15 (1) 15-18 (2) 18-20 (3) 20-22 (2) 22-23 (1)	20-22 (1)

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 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

Sporadic-*E* propagation usually tapers off during August, but it should continue to occur fairly frequently. Some *6* meter sporadic-*E* openings are expected during the month over distances of approximately *750* to *1300* miles. During periods of intense and widespread sporadic-*E* ionization, two-hop openings may be possible considerably beyond this range. Also check the *2* meter band for an occasional sporadic-*E* short-skip opening between approximately *1200* to *1400* miles. While sporadic-*E* short-skip openings may occur at any time, there is a tendency for them to peak between 8 AM and noon and again between 6 PM and 9 PM local daylight time.

The *Perseids*, which is expected to be one of this year's major meteor showers, should take place between August 9th and 14th. Up to 50 meteors an hour are expected to enter the earth's atmosphere during the shower's peak intensity. Ionization produced by this meteor shower, particularly during the period of maximum intensity, is expected to make possible frequent meteor-scatter-type openings on the *6* and *2* meter bands over distances of several hundred miles. The *Perseids* shower is expected to reach peak intensity on August 10th and 11th.

Although auroral activity is usually at a seasonal low during August, some is likely to occur during periods of radio storminess on the HF bands. Check the Last-Minute Forecast which appears at the beginning of this column for those days during August that are expected to be Below Normal or Disturbed. These are the days on which auroal activity is most likely to occur. Auroral-scatter-type openings, on both *6* and *2* meters, can range from a few hundred up to about a thousand miles, and they are usually characterized by very rapid flutter fading and Doppler shift on SSB signals.

For the very patient, check the *6* meter band for possible trans-equatorial (TE) openings between 8 and 11 PM local daylight time. This type of propagation favors openings from the southern tier states into deep South America, with the signal path crossing the magnetic equator at a right angle. TE openings during August are rare, but they can occur. They are usually characterized by very weak signals and severe flutter fading.

73, George, W3ASK

Southern Africa	10-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-22 (1) 22-23 (1) 23-00 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
Central & South Asia	*NIL*	09-11 (1) 17-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1) 20-22 (2) 22-23 (1)	06-08 (1)
Southeast Asia	16-19 (1)	09-11 (1) 15-17 (1) 17-20 (2) 20-21 (1)	21-01 (1) 01-03 (2) 03-04 (3) 04-07 (2) 07-09 (3) 09-10 (2) 10-12 (1) 19-21 (1)	03-07 (1)
Far East	15-18 (1)	09-11 (1) 14-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	21-23 (2) 23-01 (3) 01-04 (2) 04-07 (1) 07-08 (2) 08-10 (4) 10-11 (3) 11-12 (2) 12-14 (1)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (1) 02-05 (1)* 05-06 (2)* 06-07 (1)*
South Pacific & New Zealand	09-15 (1) 15-16 (2) 16-19 (3) 19-20 (2) 20-21 (1)	09-13 (1) 13-17 (2) 17-18 (3) 18-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	05-09 (2) 09-11 (3) 11-13 (2) 13-17 (1) 17-19 (2) 19-22 (3) 22-02 (4) 02-05 (3)	22-23 (1) 23-04 (3) 04-06 (4) 06-07 (3) 07-08 (1) 23-01 (1)* 01-03 (2)* 03-05 (3)* 05-06 (2)* 06-07 (1)*
Australasia	09-14 (1) 14-18 (2) 18-20 (1)	09-11 (1) 14-18 (1) 18-19 (2) 19-21 (4) 21-22 (2) 22-00 (1)	13-20 (1) 20-22 (2) 22-23 (3) 23-03 (4) 03-05 (3) 05-08 (2) 08-10 (3) 10-13 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-07 (2) 07-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (3) 15-17 (2) 17-18 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-21 (4) 21-01 (3) 01-05 (2) 05-06 (3)	19-20 (1) 20-21 (3) 21-04 (4) 04-05 (2) 05-06 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-15 (3) 15-16 (2) 16-18 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-07 (1) 07-09 (2) 09-11 (1)	20-23 (1) 23-04 (2) 04-05 (1) 00-04 (1)*
McMurdo Sound Antarctica	*NIL*	13-17 (1) 17-19 (2) 19-21 (1)	09-11 (1) 17-19 (1) 19-21 (2) 21-01 (3) 01-03 (2) 03-04 (1)	23-03 (1) 03-05 (2) 05-07 (1)

*Indicates best times to listen for 80 meter openings. Openin on 160 meters are also likely to occur during those times wh 80 meter openings are shown with a propagation index of (2) higher.

**Indicates best times to listen for F-2 layer openings or meters.

For 12 meter openings interpolate between 10 and 15 met openings.

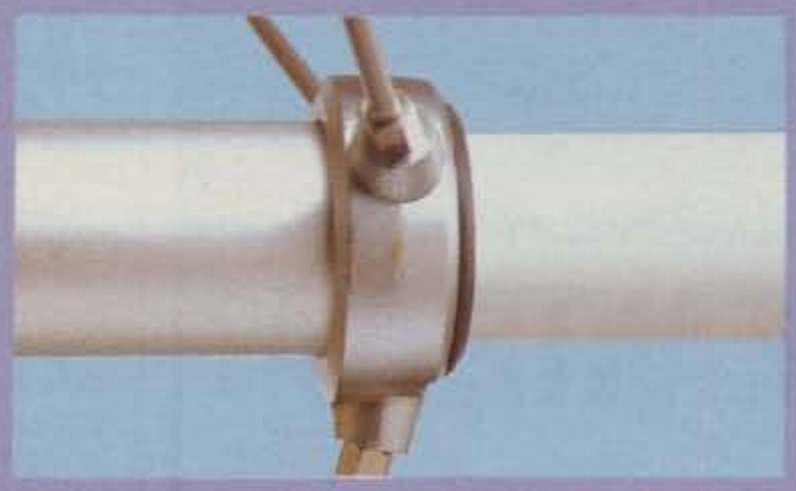
For 17 meter openings interpolate between 15 and 20 met openings.

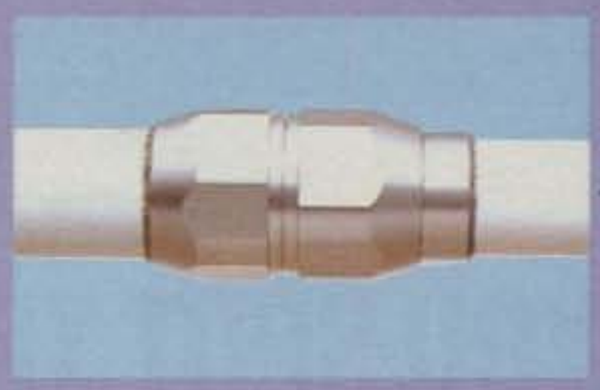
For 30 meter openings interpolate between 40 and 20 met openings.

HE DIAMOND ANTENNA
HE STANDARD BY WHICH ALL OTHERS ARE JUDGED.

DIAMOND ANTENNA

ASE/REPEATER ANTENNAS





X series

X-500HNA DUAL-BAND REPEATER VERSION

X-500NA DUAL-BAND REPEATER VERSION

X-200A DUAL-BAND REPEATER VERSION

X-50A DUAL-BAND REPEATER VERSION

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
X-500HNA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-500NA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-200A	2m/70cm	6.0/8.0	200	8.3	UHF	112.5	2m:2-5/8λ,70cm:4-5/8λ
X-50A	2m/70cm	4.5/7.2	200	5.6	UHF	135	2m:6/8λ,70cm:3-5/8λ

U series VHF/UHF MULTIBAND

U-5000A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
U-300A	70cm/23cm	8.6/13.2	150	8.3	N	110	70cm:4-5/8λ, 23cm:10-5/8λ
U-5000A	2m/70cm /23cm	4.5/8.3 /11.7	150	6.0	N	135	2m:6/8λ,70cm:3-5/8λ, 23cm:7-5/8λ

F series VHF/UHF MONOBAND

F-23A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
DP-GH62	6m	6.0	200	21.0	UHF	78	2-5/8λ
F-22A	2m	6.7	200	10.5	UHF	112	2-7/8λ
F-23A	2m	7.8	200	15.0	UHF	90	3-5/8λ
F-142A	1 1/4m	5.5	200	6.0	UHF	110	2-5/8λ
F-718A	70cm	11.5	250	15.0	N	90	18-1/2λ
F-1230A	23cm	13.5	100	10.5	N	90	25-1/2λ

*F-718L:420~430MHz,F-718J:430~440MHz

FEATURES

WIDE-BAND performance
VSWR 1.5:1(nom.)
Factory adjusted, no tuning required
Weatherproof
Stainless steel radials & hardware
UPS shippable

- Rugged fiberglass radome(DP-GH62 thick-wall aluminum)
- Wind speed ratings in excess of 90MPH

RF PARTS
1320-16 Grand Avenue
San Marcos, CA 92069

Announcing *(from p. 6)*

city of Berezhany, Ukraine (Zone 16, Oblast 076); 0000Z Aug. 28 through 2359Z Sept. 2; operation on all bands and will include CW, SSB, RTTY, SSTV. For QSL and certificate, send QSL and 5 IRCs to: P/S 12 UB4BYU, Berezhany, Ternopilska Obl., Ukraine, 283150.

VE2FRV, from Radio Day honoring Fessenden, Knowlton Museum, Knowlton, Quebec, Canada; Bell Pioneers AR Group; 8 AM Aug. 12 to 8 AM Aug. 13; 10 meters 28.300–29.300 MHz, 15 meters 21.100–21.350 MHz, 20 meters 14.125–14.300 MHz, 40 meters 7.100–7.275 MHz, 80 meters 3.750–3.900 MHz. For QSL send QSL and SASE to Box 207, Knowlton, Quebec, Canada J0E 1V0 (certificates for contacts on three or more bands).

VI4FOW, from Festival of Whales, Hervey Bay, Australia; Hervey Bay ARC; Aug. 1–31 *(no times given)*; on approximately 3.794, 7.100, 14.235, 21.250, 28.495 MHz (plus or minus QRM), and Australian Novice freqs. as much as possible. For QSL and application for an award, send to Hervey Bay ARC, P.O. Box 829, Hervey Bay, Queensland 4655, Australia.

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

Aug. 1, **Aladdin ARC Hamfest,** Aladdin Shrine Temple, Columbus, Ohio. Contact James C. Caines, KB8KME, 1056 Erickson Ave., Columbus, OH 43227-1241. (Exams, walk-in)

Aug. 1–2, **19th Greater Jacksonville Amateur Radio & Computer Show,** Prime Osborn Convention Center, Jacksonville, Florida. Write to P.O. Box 10623, Jacksonville, FL 32207 (SASE). (Exams Sunday)

Aug. 2, **Portage ARC Hamfair,** Portage County Fairgrounds, off Interstate 76 between Akron and Youngstown. Contact Joanne Solak, KJ3O/8, Portage ARC, Inc., 9971 Diagonal Rd., Mantua, OH 44255 (216-274-8240).

Aug. 2, **SWAP '92 Hamfest,** St. Clair County Community College Student Center, Port Huron, Michigan. Contact Hank Kohl, K8DD, 1640 Henry St., Port Huron, MI 48060 (313-982-7088). (Exams, walk-in)

Aug. 2, **Fox River Radio League Hamfest,** Waubonsee Community College, Sugar Grove, Illinois. Call 708-584-1806. Exams 10 AM)

Aug. 8, **Tri-State Hamfest '92,** Huntington Civic Center, Huntington, West Virginia. Contact Bill KF8QK, 304-522-1933. (Exams, walk-in)

Aug. 9, **Hamfesters' 58th Annual Hamfest & Computer Festival,** Will County Fairgrounds, Peotone, Illinois. Contact David F. Brasel, NF9N, 7528 W 109th Pl., Worth, IL 60482 (708-448-9432).

Aug. 9, **ARRL Central Kentucky Hamfest,** Western Hills High School, Frankfort, Kentucky. Contact Bobby Rolph, KB4QNR, 2117 Winternerry Rd., Lexington, KY 40504 (606-278-7570). (Exams)

Aug. 9, **Paulding County AR Group Hamfest** Paulding County Fairgrounds, Paulding, Ohio. Contact Jerry Rhodes, KB8MAF, 10392 SR 500, Paulding, OH 45879 (419-399-3641). (Exams by preregistration)

Aug. 9, **Mid-Atlantic ARC Hamfest,** Bucks County Drive-In, Warrington, Pennsylvania. Contact Al Maslin, W3DZI, 215-446-4936.

Aug. 14–16, **WIMU '92 & ARRL RMD Convention** Olympia Hotel, Parl City, Utah. Contact WIMU '92, P.O. Box 67, Bountiful, UT 84011-0067. (Exams Friday at 6 PM, contact NV7V, 801-465-3983)

Aug. 15, **Golden Spread Hamfest,** Amarillo Civic Center, Amarillo, Texas. Contact Leland Carpenter N5VRN, 806-352-8759. (Exams; handicapped accessible)

Aug. 15–16, **Duke City Hamfest,** New Mexico National Guard Armory, Albuquerque, New Mexico. Contact Duke City Hamfest, P.O. Box 6552, Albuquerque NM 87197. (Exams)

Aug. 15–16, **1992 Huntsville Hamfest,** Von Braun Civic Center, Huntsville, Alabama. Call 205-880-8004 or FAX 205-534-5557.

Aug. 16, **21st Annual Lafayette, Indiana, Hamfest,** Tippecanoe County Fairgrounds, Lafayette, Indiana. Contact Bruce Stewart, N9GKE, 315 Hamilton St., West Lafayette, IN 47906 (317-463-2379). (Exams)

Aug. 16, **Warren ARA Hamfest,** Trumbull Branch Campus of Kent State University, Warren, Ohio. Con

tact Dave Metzendorf, KD8JJ, 216-395-5416. (Exams 9 AM)

Aug. 16, **Tri-States Swapfest,** Eagles Alps Lodge, Quincy, Illinois. Contact Jim Funk, N9JF, c/o Western Illinois ARC, P.O. Box 3132, Quincy, IL 62305-3132 (217-336-4191).

Aug. 16, **Original Delmarva Hamfest,** Delaware Technical & Community College, Georgetown, Delaware. Contact Bruce Palmer, KD3WL, 302-539-0781. (Exams)

Aug. 22, **Bellingham Radio Fleamarket,** Ferndale Band Boosters Bingo Hall, Ferndale, Washington. Contact Mount Baker ARC, c/o Gary Prowse, KB7IGR, 7646 Terrace St., Ferndale, WA 98248 (206-384-3204). (Exams)

Aug. 23, **Tri-County Radio Group Radio & Computer Fest,** Crystal Lake Holiday Inn, Crystal lake, Illinois. Contact Bob, N9KXG, or Ken, N9KSP, 708-658-1678 or 708-658-3566.

Aug. 23, **Marysville Hamfest,** Fairground in Marysville, Ohio. Contact Gene Kirby, W8BJN, 13613 US 36, Marysville, OH 43040 (513-644-0468).

Aug. 23, **St. Charles ARC Hamfest '92,** Blanchette Park, St. Charles, Missouri. Contact Ron Ochu, KØOZ, 5 Cricklewood, St. Peters, MO 63376 (314-278-2510).

Aug. 23, **Gloucester County ARC Hamfest & Computer/Electronics Fair,** 4H Fairgrounds, Mullica Hill, New Jersey. Contact GCARC, P.O. Box 370, Pitman, NJ 08071 or call 609-478-4738. (Preregistration exams 9-9:30, exams at 10)

Aug. 28-30, **1992 Sky High Hamfest,** Silver Star Mountain & Resort Area, Vernon, BC Canada. Contact P.O. Box 1706, Vernon, BC, Canada V1T 8C3.

Aug. 28-30, **1992 Reunion of Gallups Island Radio Assn.,** Ramada Renaissance Hotel, Long Beach, California. Contact Bob Clough, K6RS, 1324 Buckingham Drive, Thousand Oaks, CA 91360.

Aug. 28-30, **New Orleans International DX Convention,** Royal Sonesta Hotel, New Orleans, Louisiana. Contact Silvano Amenta, KB5GL, 504-454-6184; or John Wondergem, K5KR, 504-837-1485.

Aug. 29, **Lake of the Woods Repeater Assn. Hamfest,** Roseau, Minnesota High School Gym. Contact David Landby, KBØHAP, Rt. 3 Box 10, Warroad, MN 56763 (218-386-1092). (Exams)

Aug. 29, **Sugar River Amateur Radio Summer Festival,** Meadow Field, Newport, New Hampshire. Contact Bruce Beford, KA1ORB, 178 Summer St., Newport, NH 03773 (603-863-1698). (Exams)

Aug. 29, **The All-Iowa Hamfest,** Ottumwa Coliseum, Ottumwa, Iowa. Contact NØIJP, 1204 N. Elm St., Ottumwa, IA 52501. (Exams 10 AM Ottumwa High School, walk-ins okay)

Aug. 29, **Snowbelt Ham & Computer Fest,** Manion Park, Chaffee, New York. Contact Terry Ross, KB2JAG, 716-492-2537.

Aug. 30, **Bristol County Repeater Assn. & Fall River ARC Fleamarket & Hamfest,** Bank Street Armory, Fall River, Massachusetts. Contact Tom LaPointe, WA1LBK, 40 Albion St. Fall River, MA 02723, or call 508-674-4163. (Exams 10 AM, walk-ins okay)

Aug. 30, **Short Mountain Repeater Club Hamfest,** Cedars of Lebanon State Park, Lebanon, Tennessee. Contact Mary Alice fanning, KA4GSB, 4936 Danby Drive, Nashville, TN 37211 (615-832-3215).

HAM SHOP

FREE TO CQ SUBSCRIBERS

Advertising Rates: Non-commercial ads are 20 cents per word including abbreviations and addresses. Commercial and organization ads are 60 cents per word. Boldface words are $1.20 each (specify which words). Minimum charge $2.00. No ad (non-subscriber) will be printed unless accompanied by full remittance. Non-commercial ads free to CQ subscribers, as space permits, maximum 3 lines each. All ads must be typewritten double-spaced. Recent CQ mailing label must accompany ad.

Closing Date: The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of *CQ* cannot vouch for the merchandise listed therein. The publisher reserves the right to reject any paid or nonpaid advertisement. Direct all correspondence and ad copy to: CQ Ham Shop, 76 N. Broadway, Hicksville, NY 11801.

LIGHTNING BUSTER. Protect your investment before it's too late! Gas discharge arrestor, DC to 500 MHz, 500 Watts PEP, SO-239. **ELECTROMAN,** Dept CQ, P.O. Box 24474, New Orleans, LA 70184.

KIY COMPUTER INTERFACE, one interface for all Kenwood, ICOM, and Yaesu, selectable with DIP switch. $59.95 plus $2 shipping. Rich Assarabowski, K1CC, 306 Vernon Avenue, Vernon, CT 06066 (203-875-0166).

CW? No Problem. You can increase your speed, no matter how many times you've failed before. **Results guaranteed** when you follow the instructions. PASS Publishing's **CW Mental-Block Buster** program helps you **explode mental blocks** that hold you back. Based on 40 years of research, the **CW Mental-Block Buster** uses guided meditation, dynamic visualizations and powerful affirmations to blast through mental blocks. **You can do code!** That means new bands, more contacts, more fun! (This is not a CW practice tape.) The **CW Mental-Block Buster** audio cassette and practice booklet are only $25.95 ppd. in the US (NY residents add $2.08 sales tax). (Quantity discounts available for classes.) VISA, MC, COD: 516-584-8164; FAX: 516-584-9409. PASS Publishing, P.O. Box 570, Stony Brook, NY 11790.

FREE HAM BBS: 904-542-3028.

DX QSLs. THE "GO LIST." We make getting the QSL cards as much fun as the QSO itself. Over 5000 QSL managers. Updated and published monthly. The **W6GO/K6HHD** QSL Manager List, POB 700C, Rio Linda, CA 95673. $25/yr/USA.

RADIO TRANSCRIPTION DISCS WANTED: W7FIZ, Box 724, Redmond, WA 98073-0724.

AFRAID OF FCC TESTS? Let your C64/128 drill you. All questions on 5¼ inch disk. With instructions. Full screen diagrams if used. Your call on screen and optional printed summary. PPD. Novice, Tech or General $19.95. Advanced or Extra $24.95. New NOCODE (2 disks) $34.95. Ralph Parlette, WB6JOY, 27 Morning Sun, Mill Valley, CA 94941 (415-383-0507).

HAM TRADER YELLOW SHEETS. In our 31st year of publication. Buy, sell, trade ham radio gear. Published twice a month so ads quickly circulate. No long wait for results. **Mailed first class.** For sample copy send #10 SASE (2 stamps). ONE YEAR SUBSCRIPTION (24 issues) $16.50. P.O.B. 2057, Glen Ellyn, IL 60138-2057, or P.O.B. 15142, Seattle, WA 98115.

VHF WEAK SIGNAL NEWSLETTER: Large SASE. Box 685, Holbrook, AZ 86025.

Morse code got you down? Why let a mental block stand between you and upgrading? Use PASS Publishing's **CW Mental-Block Buster** to **blast through those barriers.** Just follow the instructions for 30 days—**Results Guaranteed!** Based on 40 years of research, the **CW Mental-Block Buster** uses guided meditation, dynamic visualizations, and powerful affirmations to blast through mental blocks. **You can do code!** That means new bands, more contacts, more fun! (This is not a CW practice tape.) The **CW Mental-Block Buster** audio cassette and practice booklet are only $25.95 ppd. in the US (NY residents add $2.08 sales tax). (Quantity discounts available for classes.) VISA, MC, COD: 516-584-8164; FAX: 516-584-9409. PASS Publishing, P.O. Box 570, Stony Brook, NY 11790.

SAMS for HAMs: Photofacts of vintage HAM gear. We also buy used SAMS. A.G. Tannenbaum, WA2BTB, call 516-887-0057.

THE DX BULLETIN is your premier weekly source of all DX information: DXpeditions, propagation, QSL routes, and much more. SASE or call for samples. Box 50-C, Fulton, CA 95439 (707-523-1001).

50 MHz DX BULLETIN: $20/18 issues p/y. Sample $2. P.O. Box 1222, Keaau, Hawaii 96749.

LAMBDA AMATEUR RADIO CLUB international for gay and lesbian hams. Box 24810, Philadelphia, PA 19130 (215-978-LARC).

AA1A SIDEKICK ANTENNAS 617-837-2880.

X-BAND MARINE, AVIATION RADAR EQUIP. WANTED. Older sets WW II to 1970. Also Delay Lines For AN/UPM 11A. And complete or incomplete AN/PPS4, 4A. VA201B Klystrons, VMX1025, L3431A Magnetrons. SHF, Box 10215, Pittsburgh, PA 15224.

COBRA, ICOM, K40, RANGER, UNIDEN, WILSON: Call C/N Electronics, 703-978-6268, Fairfax, Virginia.

AMATEUR RADIO REPAIR: FCC licensed, 17 years experience, lab-quality NBS traceable test equipment, reasonable rates. G.B. Communications, Inc., 963 Birch Bay Lynden Road, Lynden, WA 98264 (206-354-5884).

COLLEGE $$$$$ for ALMOST ANYONE! CALL for your **FREE** copy of "10 Ways To Stretch Your Scholarship Chances" **1-800-524-4916** (73 DE NX7T).

PILL BOTTLE ANTENNA TUNER! Really works!! Plans $3.00. DWM ENTERPRISES, 1709 N. West, #103, Jackson, MI 49202.

MANUALS WANTED: 1940 to 1960 Navy Rating Manuals I&C 2&3 for the following rates: Torpedoman, Mineman, Radarman. Krajovic, 546 Sheridan, Pittsburgh, PA 15206.

JUN'S ELECTRONICS

Out of State 1-800-882-1343

(310) 390-8003 FAX 310-390-4393

HOURS M-F 9:00 - 6:00 SAT 9:00 - 5:00 SE HABLA ESPANOL
QUICK SERVICE CENTER FOR REPAIR NEEDS

5563 SEPULVEDA BLVD., CULVER CITY, CA 90230

About 2½ miles from LAX-North on I-405

ICOM

HF Equipment	List	Jun's
C-781 Super Deluxe HF Rig	$5995.00	Call $
C-765 New, Loaded with Features	3149.00	Call $
C-735 Gen. Cvg. Xcvr	1099.00	Call $
C-751A Gen. Cvg. Xcvr	1699.00	Call $
C-728 New, All-Band HF	1099.00	Call $
C-726 HF/50 MHz All Mode	1299.00	Call $
C-2KL 500w, Amp	2079.00	Call $
C-4KL 1 kW Amp	7275.00	Call $
Receivers		
C-R9000 100 kHz to 1999.8 MHz	5459.00	Call $
C-R7000 25-1300 + MHz Rcvr	1199.00	Call $
C-R71A 100 kHz - 30 MHz Rcvr	999.00	Call $
C-R1 100 kHz - 1300 MHz	624.00	Call $
C-R72 30 kHz - 30 MHz Rcvr	972.00	Call $
C-R100 100 kHz - 1856 MHz Rcvr	707.00	Call $
VHF		
C-229A/H, 25/50w, 2 Meter Mobile	449./479.	Call $
C-P2AT New 2 Meter HT	424.00	Call $
C-2GAT, New 7w HT	429.95	Call $
C-2SAT Micro Sized HT	439.00	Call $
C-2SRA, 2m, HT/Scanner	599.00	Call $
C-901 New Remote Mount Mobile	1199.00	Call $
UHF		
C-P4AT New 70cm HT	467.00	Call $
C-4SAT Micro Sized HT	449.00	Call $
C-4SRA, 70cm w/Scanner, HT	600.00	Call $
C-4GAT, New 6w HT	449.95	Call $
C-3220A/H Dual Band Mobile	659./699.	Call $
C-2410A, 2m/70cm, Mobile	889.00	Call $
C-24AT New 2m/440 mini HT	629.95	Call $
C-W2A, 2M/70cm NEW HT	629.95	Call $
220 MHz		
C-3SAT Micro Sized HT	449.99	Call $
1.2 GHz		
C-12GAT Super HT	529.95	Call $

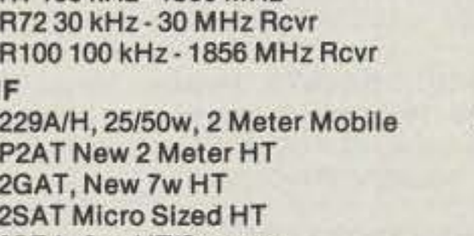
KENWOOD

HF Equipment	List	Jun's
TS-950SD New Digital Processor HF	$4499.95	Call $
TS-850S New, All Mode, All Band	1899.95	Call $
TS-450S/AT New HF Xcvr	1549.95	Call $
TS-450S New HF Xcvr	1349.95	Call $
TS-140S Compact, Gen. Cvg. Xcvr	949.95	Call $
TS-690S HF Plus 6m Xcvr	1549.95	Call $
TL-922A HF Amp	1982.95	Call $
Receivers		
R-5000 100 kHz - 30 MHz	1049.95	Call $
R-2000 150 kHz - 30 MHz	799.95	Call $
RZ-1 Compact Scanning Recv.	599.95	Call $
VHF		
TH-28A New 2 Meter HT	389.95	Call $
TM-741A FM, 2M/440, Triple Receive	849.95	Call $
TM-641A 2M/220 Triple Receiver	849.95	Call $
TR-751A All Mode Mobile 25w	669.95	Call $
TM-241A 50w Mobile FM	469.95	Call $
TH-77A 2m/440 HT	599.95	Call $
TH-78A New 2m/70cm HT	599.00	Call $
UHF		
TH-48A New 70cm HT	419.95	Call $
TM-941A 2M/440/1.2 GHz	1199.95	Call $
TS-790A All Mode, 2m/70cm/1.2 GHz	1999.95	Call $
TR-851A 25w SSB/FM	771.95	Call $
TM-441A Compact 35w Mobile	479.95	Call $
TH-55 AT 1.2 GHz HT	524.95	Call $
TM-541A Compact 1.2 GHz Mobile	579.95	Call $
220 MHz		
TM-331A Compact Mobile	469.95	Call $
TH-315A Full Featured 2.5w HT	419.95	Call $

YAESU

HF Equipment	List	Jun's
FT-1000D Top Performer	$4399.00	Call $
FT-990 All Mode "NEW"	2399.00	Call $
FT-747 GX Economical Performer	889.00	Call $
FT-757 GX II Gen. Cvg. Xcvr	1280.00	Call $
FT-767 4 Band New	2299.00	Call $
FL-7000 15m-160m Solid State Amp	2279.00	Call $
Receivers		
FRG-8800 150 kHz - 30 MHz	784.00	Call $
VHF		
FT-2400 50 Watt, Mobile	419.00	Call $
FT-411 New 2m "Loaded" HT	406.00	Call $
FT-290R All Mode Portable	610.00	Call $
FT-26 Mini, 2 Meter HT	329.00	Call $
FT-415, 2m, HT	409.00	Call $
FT-23 R/17 Mini HT	351.00	Call $
UHF		
FT-76 Mini, 440 MHz HT	359.00	Call $
FT-815, 70cm, HT	439.00	Call $
FT-911 Compact 1.2 GHz HT	505.00	Call $
FT-811 Compact 70cm HT	410.00	Call $
FT-790 R/II 70cm/25w Mobile	681.00	Call $
FT-912 1.2 GHz, 10w Mobile	581.00	Call $
VHF/UHF Full Duplex		
FT-736R, New All Mode, 2m/70cm	2025.00	Call $
FT-690R MKII, 6m, All Mode, port.	752.00	Call $
Dual Bander		
FT-5200 Ultra Compact 2m/440 Mob.	749.00	Call $
FT-6200 Ultra Comp. 440/1.2 GHz Mob.	899.00	Call $
FT-470 Compact 2m/70cm HT	576.00	Call $
Repeaters		
FTR-2410 2m Repeaters	1154.00	Call $
FTR-5410 70cm Repeaters	1154.00	Call $
Rotators		
G-400RC light/med. duty 11 sq. ft.	242.00	Call $
G-800SDX med./hvy. duty 20 sq. ft.	390.00	Call $
G-1000 SDX Heavy Duty, 22 sq. ft.	466.00	Call $

ALINCO



R-590
R-590T, New Twin Band Mobile
R-570T, 2 Meter/70 cm Mobile
R-112T, Value Loaded, 2M Mobile
J-160T, Feature Packed 2M Handy
J-F1T, 2M, Mini HT, 40 Mems.
J-580T New 2M/440 HT

STANDARD.

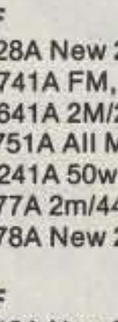
C228A
2M/220 HT
List **$689.** **CALL!**

C5608DA
2M/440 MOBILE
List **$1149.** **CALL!**

C168A
2M Mini HT
List **$489.** **CALL!**

C468A
440 Mini HT
List **$499.** **CALL!**

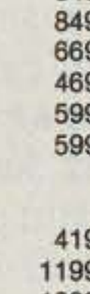
C558A
New 2M/440 HT **CALL!**



COMET

NEW!
B-Series Mobile Dual Band Antennas.
- **Black-Anodized**
- **Light Weight**
- **Cellular appearance**

Choose either PL-259 or NMO style mounts!



JUN'S BARGAIN BOX LIMITED QUANTITIES

	SALE	LIST
ICOM		
IC-03AT, 220 MHz HT **CLOSEOUT**	**$269.95**	$319.95
IC-02AT w/BT-7, 5W, HT	**289.00**	499.00
KENWOOD		
TH-77A, 2M/440 HT **CLOSEOUT**	**399.95**	599.95
TH-27A Compact, 2M, HT	**299.95**	419.95
TS-950 **CLOSEOUT**	**CALL FOR SPECIAL PRICE**	
YAESU		
FT-23R, 2M, Mini HT	**225.95**	290.95
FT-470, 2M/440 HT	**399.95**	499.95
ALINCO		
DR-590T, 2M/70cm Mob. **CLOSEOUT**	**499.95**	799.95

CIRCLE 30 ON READER SERVICE CARD

One Program Lets Your Computer Do All This...

- Amateur Radio Logbook/Callsign Search/Dupe Check
- Prints QSL Cards & Logbook
- Local & DX Antenna Beam Directions From Any QTH Including Distances & Local Time, Prefix, Zone
- Morse Code 1 WPM & up w/Memory Send
- ID Reminder & Dual Schedule Alarm
- World Time Clock • Keys Rigs
- Amateur License/Mode Frequency Chart
- Packet Function w/Memory Send

$69.95 + $4.00 S/H TX Residents Add Sales Tax
Includes 5¼ or 3½ Disks Check or MO
System Req: IBM or Compatible with 640K Memory

Amateur Radio Station One
10755 Meadowglen Lane #280
Houston, TX 77042
(713) 974-7838

CIRCLE 34 ON READER SERVICE CARD

COMMODORE/AMIGA
Replacement Chips/Upgrades

6526A CIA, 6510, PLA/906114, 6567 VIC, 6581 SID, All 901/225-226-227-229 ROMS	$9.95 each
8520A CIA (the most problematic chip)	9.95
8372A 1MB Agnus	44.95
8373 Super Denise (gives productivity + scan modes)	35.95
C64 Keyboard (NEW)	19.95
1750 512K Original REU RAM Expander Unit by Commodore	99.95
Computer Saver II (prevents overload from P.S.)	17.95
C64 Repairable 1.8 amp Power Supply	24.95
C64 Repairable heavy duty 4.3 amp Power Supply	37.95
A2000 P/S 200 Watt/fan original	142.50
A500 PC Motherboard (populated & tested)	99.95
Switch-Itt—Amiga electronic ROM selector switch. Keyboard or mouse controlled. Now with speaker	32.95
A500 200 watt Big Foot Power Supply/fan	83.95
A500 Keyboard (New, exact replacement)	54.50
A2000 Keyboard (New, exact replacement)	89.95
Commodore Diagnostician: Save money by promptly locating faulty chips, 98% success rate (35K sold.)	6.95
Advanced Amiga Analyzer (hardware & software). Checks all ports & chips.	79.95

We Have All Amiga Chips & Upgrades in Stock.

THE GRAPEVINE GROUP, INC.
3 Chestnut Street, Suffern, NY 10901
VISA **ORDER LINE: 1-800-292-7445** MasterCard
Customer Service Line: 914-368-4242
914-357-2424 Hours: 9-6 ET M-F Fax: 914-357-6243
We Ship Worldwide Prices Subject to Change
15% restocking charge

CIRCLE 139 ON READER SERVICE CARD

Free Sample ▲ RADIO AGE

Since 1975, true collectors of antique radios, early TV's and test equipment have relied on **Radio Age** for historical articles, classified ads and restoration hints. FREE 100-word "For Sale" ads and 40-word "Wanted" ads for subscribers.

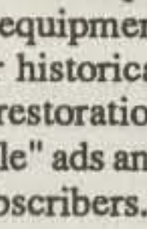
- ❑ 1st Class Mail $24 (2 yrs. $45)
- ❑ 2nd Class Mail $19 (2 yrs. $35)
- ❑ Canadian $25 (2 yrs. $47)
- ❑ Foreign $41/yr.

RADIO AGE - 636 Cambridge Road
Augusta, Georgia 30909
(404) 738-7227

CIRCLE 29 ON READER SERVICE CARD

ROBERT HALL ELECTRONICS
AMATEUR RADIO REPAIR
1660 MCKEE RD.
SUITE A
SAN JOSE, CA 95116
(408) 729-8200

THIS MONTH'S GOODIE FROM THE CANDY STORE
RDC
YAESU
FT-411E/17
UNDER $285.00



Similar Savings On Yaesu, Astron, Kenwood, Hy-Gain, Alinco, Etc. All L.T.O.
MFJ-815B $54.00
Over 9039 Ham Items in Stock, all Prices, Cash FOB Preston.
More Specials in HAM-ADS. Looking for Something not Listed?
Call Today (208) 852-0830
ROSS DISTRIBUTING COMPANY
78 S. State Street, Preston, Id. 83263
Hours Tue.-Fri. 9-6 - 9-2 Mondays. Closed Sat. & Sun.

CARRIZO SOLAR CORPORATION

Cheapest Photovoltaics in the world

Available through dealers
800-776-6718

5 BAND QUADS

$289 2 Element Complete
UPS Shippable

4 Elements Available, HF, V/UHF, Delta Loops Also.
Quality Construction And Years Of Experience.

Lightning Bolt Antennas
RD #2, RT 19, Dept. Q, Volant, PA 16156
412-530-7396
APO/FPO Shippable

Dish System
LIFETIME WARRANTY

Quality Microwave TV Antennas
WIRELESS CABLE - IFTS - MMDS - Amateur TV
Ultra High Gain 50db(+) • Tuneable 1.9 to 2.7 Ghz.

- 55-Channel Dish System $199.95
- 36-Channel Dish System $149.95
- 20-Channel Dish System $124.95
- Optional Commercial Grid Antenna (not shown) Add $50.00
- Yagi Antennas, Components, Custom Tuning Available
- Call or write (SASE) for **"FREE"** Catalog

PHILLIPS-TECH ELECTRONICS
P.O. Box 8533 • Scottsdale, AZ 85252
(602) 947-7700 ($3.00 Credit all phone orders)
MasterCard • Visa • American Express • COD's • Quantity Pricing

CIRCLE 140 ON READER SERVICE CARD

Marine Grade Coax!

Introductory PRICE
100 ft RG-213/U
$84.95
+tax/shipping

For uncompromising performance, new marine grade coaxial cable features:

Super Tough White PVC Jacket for excellent abrasion and ultra violet protection. RG-213/U and RG58C/U have non-contaminating jacket. RG-8X also available.

100% Tinned copper braid and center conductor for extra long life.

Weather Tight Antenna Connection with exclusive adhesive lined heat-shrink tube.

96% Braid Coverage for maximum shielding, minimum signal loss while maintaining flexibility.

Pre-Cut Lengths of 100, 75, 50 and 25 feet. Bulk quantities too.

Soldered silver plated/teflon insulated PL-259 connectors.

Made in U.S.A. to marine grade standards and U.L. ratings.

1-(800) 634-9903
Amateur Radio Specialties
P.O. Box 7086, Newport Beach, CA 92658

CIRCLE 33 ON READER SERVICE CARD

REVOLUTIONARY HYBRID AERIAL WIRE: 168 strand copper **FLEX-WEAVE™**, #14, ropewoven strong. Ultra Flexible, ties in knots, non-stretch, won't rust/kink like copper weld, $36.95 first 275 feet (minimum), $.13/ft. thereafter, includes shipping! Catalog $1.00. DAVIS RF Co., P.O. Box 230-C, Carlisle, MA 01741; 508-369-1738 or ORDERS ONLY 1-800-484-4002, CODE 1356. COPPERWELD WIRE, TOP QUALITY, 40% conductivity, LOWEST COSTS. DAVIS RF Co., 1-508-369-1738.

CALIF. HOME & ACREAGE, top of mountain with ocean views and privacy. Large family home with detached 2 car garage. Excellent DX Contest site. For pictures, floor plan, and more info. Call or write: Jennifer Larzelere, ERA American Dream Realty, 5523 Scotts Valley Drive, Scotts Valley, CA 95066 (408-438-5700).

ESTATE SALE: Kenwood TS-930S, very fine condition, recently professionally gone over, has all Kenwood updates, $1050. Kenwood SW-2000 SWR/Power meter, $125. Heath 2200, 2 KW amplifier with spare 3-500Z, completely modified, $725. MFJ986 tuner, 2 KW, $225. Bird Wattmeter, Model 43, new condition, with 2000 watt, 2–30 MHz slug, $150. Also 2 to 30 MHz, 5 KW slug, $50. U pay shipping. Many other items (keys, keyers, preselectors, etc.) Lew McCoy, W1ICP/5, 505-388-4862.

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio PD software, $4.00 disk. Two-stamp SASE brings catalog. Specify computer! Kinetic Designs Hamware, Box 1646, Orange Park, FL 32067-1646.

TEN-TEC 10 to 80 meter CW transceiver 70 watts, MFJ 1225 RTTY CW ASCII computer interface with cables, Commodore 64 software, Uniden HR2600 10 meter mobile rig, 10 meter Hustler antenna. Will ship. All $425 or separate. KA4HMN, Dom (813-345-0507 (after 6 P.M.).

ICOM IC735 with mic and FL32 filter $800. Heath HM 102 SWR/wattmeter $35. Microlog "SWL" RTTY/ASCII/CW interface for C-64 $35. All mint, with manuals. UPS extra. D. Sowers, K4SUE, 5197 Burnt Quarter Dr., Vinton, VA 24179 (703-890-2372).

WANTED: Regency HR-25; also HR-2 for parts. Rod, W7OM, 5632 47th Ave., SW, Seattle, WA 98136.

SOLAR PANELS 105 watt set $469.95, unframed $300, 35 watt panel $189, all panels 5-year warranty. VISA/MC. Call 602-276-5083.

HELP WANTED: Ham operator to do office work and production for radio station. Salary open. Call 916-233-3570 (California).

COAX, GROUND RADIAL WIRE, LOWEST COST, top quality, MilSpec RG213 $.38/ft.; RG8X $.19; RG58 $.18; LOW LOSS Belden equiv. RG 9913 $.39; any lengths. Radial wire #16 $39.50/1000 ft., radial INCLUDES SHIPPING cont. US! Immediate shipment. Catalog $1.00. DAVIS RF Co., P.O. Box 230-C5, Carlisle, MA 01741. RADIAL ORDERS ONLY: 1-800-484-4002 CODE 1356. Info: 508-369-1738.

DIGITAL AUTOMATIC DISPLAYS. Kenwood, Yaesu, Collins, Drake, Atlas, etc. No bandswitching required. Business 52¢ SASE. Specify radio. GRAND SYSTEMS, POB 2171, Blaine, WA 98230. Phone/FAX 604-530-4551.

COMMODORE 64 HAM PROGRAMS: 8 disk sides, over 200 Ham programs, $16.95. 29¢ stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. Home-Spun Software, Box 1064-AR, Estero, FL 33928.

ALUMINUM HEAVY WALL TUBING: Type 6061-T6, 2"OD × .25" wall. Great for masts, booms, projects. SASE: WS9W/Doug, Box 384, Stoughton, WI 53589.

SALE: Excess Ham Gear. Henry 2K4, 8877, 3-500Z plus much more! Large SASE (2 stamps) for LARGE LIST! George Churpek, N6FL, 839 Cambon Circle, Ojai, CA 93023 (805-646-5296).

BULGARIAN RADIO AMATEUR (LZ1BB) seeks help in obtaining an inexpensive or donated SSB Citizens Band (CB) transceiver. Write H.D. Popov, "Bratya Bakston," Blok 207-A, A-6, 1618 Sofia, Bulgaria.

WANTED: Drake R4C Digital with Sherwood Mods and CW filters or a good CW RCVR. Bill, WA2VLE, 516-281-6498 eves. EST.

TENNATEST*ANTENNA NOISE BRIDGE***NOTHING ELSE LIKE IT * OUT-PERFORMS OTHERS * Costs less. Compare 1–40 MHz $48; 1–150 MHz $72. Satisfaction guaranteed *** ASK THE HAM WHO OWNS ONE *** Send stamp for details to TENNATEST, W8URR, 1025 Wildwood Road, Quincy, MI 49082.

WANTED: Volumes 2, 3, and 4 of Telecommunications Research and Engineering Report 13, *Ionospheric Predictions*, consisting of world maps of MUF(ZERO)F2, MUF(4000)F2, and MUF(2000)E. K9LA, 219-637-6988.

CELLULAR HACKERS BIBLE. Theory, Hacks, Modifications. $53.95. **TELECODE**, P.O. Box 6426-CQ, Yuma, AZ 85366-6426.

FINALLY HEAR THOSE UNREADABLE SIGNALS buried in noise, etc. REVOLUTIONARY JPS Co. DSP NIR-10 Audio Filter, DISCOUNTED: $379 delivered cont. US (vs. $400). Also, NF-60 DSP Notch Filter for MULTIPLE tones, DISCOUNTED: $139.50 delivered. DAVIS RF Co. ORDERS ONLY: 800-484-4002 CODE 1356. Info: 508-369-1738.

JOBS in Electronics. Companies are still hiring for positions in US and Overseas. For a listing of 400 companies plus resume guide send $10.00 to Benthos-CQ, POB 23336, Barrigada, GU 96921.

10 METER ANTENNAS FROM $19.95. Free flyer. RT Electronics, P.O. Box 2123, Warren, OH 44484.

PREMIUM QSL CARDS by N6ID. Choose from a large variety of unique colorful designs. $1.00 for samples. BVE Professional Printing, 2023 Chicago Avenue, Suite B13-1, Riverside, CA 92507 (714-781-0252).

ANTENNA MAST. Why not use the good stuff? Aluminum 6061-T6, 2" OD × .25" wall. 6 foot $39.95, 9 foot $59.95, UPS paid lower 48. 24 foot available. Doug, WS9W, Box 384, Stoughton, WI 53589.

QSL CARDS—Look good with top quality printing. Choose standard designs or fully customized cards. Request free brochure, samples, (stamps appreciated) from CHESTER QSL's, 310 Commercia, Dept. C, Emporia, KS 66801. FAX 316/342-4705.

FOR SALE New, Unused, in original cartons: Radio Shack DMP 130A dot matrix printer, PTC-64, C-64 printer controller. $160.00. K2EEK, CQ Magazine, 76 N. Broadway, Hicksville, NY 11801.

"MAC-KEY Blue Book," 16 pages, $4.50. "Introduction to Key Collecting," 64 pages, $9.95. Add $2.00 s/h to total. Illustrated references from Artifax Books, Box 88-C, Maynard, MA 01754.

QSLs BY K5KRN. Computer labeled or write-in. Gloss, 2-Color $39.95/1000. SASE to J-Comp, P.O. Box 060185, Palm Bay, FL 32906-0185.

QSL CARDS. Fast, quality service. Samples $1.00 (refundable with order). WordWise Services, 16 Kent Drive, Foxmeadow, Hockessin, DE 19707.

WANTED: H.H. Scott 222C power transformer. Also pre-1950 radios and TVs. Jon Kummer, 23-35 Bell Blvd., Bayside, NY 11360 (718-428-9070).

MORSE CODE COMPUTER INTERFACES with Software for IBM ($49.95) or COCO ($39.95). Ham License Study Programs $14.95. Free Shareware and Ham Catalog for IBM or COCO. Dynamic Electronics, Box 896, Hartselle, AL 35640 (205-773-2758).

WPX RECORD KEEPING PROGRAM: Dupe check, sort, print; 3 modules of 3 files each, "chained," for each mode, CW, SSB and Mixed for call and prefix logging and submission; 17 ancillary and utility files; logging for 3000 calls and prefixes, your call on printout; IBM compats, HD required, on three 5.25 inch 2S/2D disks; compressed type, requires standard character printer (IBM Graphics, etc.). W4UW, 719 Quarterstaff Rd., Winston-Salem, NC 27104. Price $35.95 ea. See W4UW on WPX Honor Roll!

BUILD YOUR OWN WIRE ANTENNAS, parts, feedlines, various wire, insulators, vertical phasing (COMTEK), coax, Dacron rope, baluns. LOWEST PRICES Catalog: $1.00. DAVIS RF Co., POB 230-C22, Carlisle, MA 01741. Voice or FAX: 508-369-1738.

QSLs & RUBBER STAMPS—Top Quality! Card Samples and Stamp Information $1.00 (refundable with order). Ebbert Graphics D-2, Box 70, Westerville, OH 43081.

MRA-International Mission Radio Assn. helps missioners—equipment loaned; weekday net, 14.280 MHz, 1:00–3:00 PM Eastern. Sr. Noreen Perelli, KE2LT, Fletcher Street, Goshen, NY 10924.

KNOW FIRST! Ham radio fanatics—you need THE W5YI REPORT, a twice-monthly award-winning Hot Insider Newsletter. Acclaimed best! Confidential facts, ideas, insights, nationwide news, technology, predictions, alerts. Quoted coast-to-coast! We print what you don't get elsewhere! $21.00 annually w/money-back guarantee! FREE SAMPLE for S.A.S.E. (two stamps). W5YI, Box 10101-C, Dallas, Texas 75207.

FOR SALE. CQ/Ham Radio/QST/73 magazines @ 75¢ (thru 1975) and $1.00 (1976-up) each, including shipping. $3.00 minimum order. W6LS, 45527 Third Street East, Lancaster, CA 93535-1802.

CERTIFICATE for proven contacts with all ten American districts. SASE to W6LS, 45527 Third Street East, Lancaster, CA 93535-1802.

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette, $10. LEARN MORSE CODE IN 1 HOUR. Amazing new supereasy technique, $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, 7320-D1 Greenfield, Bloomingdale, IL 60108.

MAUI, HAWAII: B&B with a Ham, KH6SQ. For brochure send 75 cents for postage to P.O. Box 351, Pukalani, HI 96788.

RADIO TRANSCRIPTION DISCS WANTED: W7FIZ, Box 724, Redmond, WA 98073-0724.

RCI-2950 OWNERS: New modification manual including Power Increase, Clarifier Modification, Modulation increase, Operating Hints, and More. Parts included. Only $20.00 ppd in U.S. (MO residents add $1.15 tax). Scott, P.O. Box 510408, St. Louis, MO 63151-0408 (314-846-0252). Money Orders, or C.O.D.

The SCANNER HACKERS BIBLE. 112 modifications. Includes: Pro-2004/5/6, Yaesu, Kenwood, Bearcat, ICOM, and others. Frequency Fixes, Modifications (Scan Rates, Interfaces, Programmable Channels, Improving Operation, etc.), Antenna Plans, Operation, Laws, Cellular Telephone Operation and Frequencies, Accessories, 10-Codes, and more. $33.45. CODs 1-602-782-2316 or FAX 1-602-343-2141. **TELECODE**, Box 6426-CQ, Yuma, AZ 85366-6426.

VACATION & Ham Colorado Mt. Chalet, fully furnished. Ham rig. Giant 20 mtr beam. By week or month. SASE: WØLSD, Ken, Box 156, Buena Vista, CO 81211 (719-395-6547).

QRP Transceiver Kits. Details: LECTROKIT, 401 W. Bogart, Sandusky, OH 44870.

LOW COST Ham Gear. Send stamp for list to: Jim Braddy, WA4DSO, 3037 Audrey Dr., Gastonia, NC 28054.

MIAMI SCANNER ACTION is Hot. Hear the cops & more. One call does it all. (305) 460-3374.

APPLE II: Find out why you should own one. Already own one? Write for support information. The Alliance, P.O. Box 20756, Louisville, KY 40250.

SATELLITE HACKERS BIBLE. Covering: Satellite Data Communications, RTTY, SCPC, WEFAX, Frequencies Lists, BMAC Receiver Schematics, AFSK/FSK Demodulators for RTTY/CW/FAX, SlowScan Receiver Schematics, Stock Market Quote Receiver Schematics, SuperGuide Schematics, SCA, Plus 144 IBM-PC Software files, and more! $56.95. CODs 1-602-782-2316, FAX 1-602-343-2141. **TELECODE**, Box 6426-CQ, Yuma, AZ 85366-6426.

The *World Ham Net Directory* lists special interest ham nets for DXers, missionaries, weather watchers, retired persons and many other interests. $9.95 plus $2 shipping ($3 foreign US funds from Tiare Publications, P.O. Box 493, Lake Geneva WI 53147. Catalog $1.00, free with order.

Ready to explore VHF/UHF operating? Get Ed Noll's *Basic Guide to VHF/UHF Ham Radio*. Covers equipment, antennas, propagation, repeaters, contesting, band plans, and more. All the basics you need! Just $6.95 plus $2 shipping ($3 foreign US funds from Tiare Publications, P.O. Box 493, Lake Geneva WI 53147. Catalog $1.00, free with order.

VIDEOCIPHER II: THEORY OF OPERATION. Volume 8—EXOTIC. Covers: **DECTEC** Liberty 1 (BlackCipher) Schematics, Data Sheets, Software Tools, Test Software, Theory, Tier code Level Information, SUPERCHIP Plans and Software, 68705P3 8-Bit Microprocessor Programming Module Plans, 018-9 Seed key Puller Plans (new model) with software, and more. $73.45. CODs 1-602-782-2316 or FAX 1-602-343-2141. **TELECODE**, Box 6426-CQ, Yuma, AZ 85366-6426.

HAVE AM CAPABILITY? Join SPAM (Society for the Promotion of AM). For information and membership, send $1 and SASE to SPAM, WB6TRQ, Box 62, Potrero, CA 92063.

CB-TO-10M CONVERSIONS: FM kits, frequency modification hardware, books, plans, high-performance CB accessories. Catalog $2. CBCI, Box 31500CQ, Phoenix, AZ 85046.

RTTY JOURNAL: Published ten times per year. Covering the digital modes of RTTY, AMTOR, FAX, PACKET, plus technical and other interesting articles about this fascinating phase of Ham radio. $15.00 per year USA, foreign slightly higher. RTTY JOURNAL, 9085 La Casita Ave., Fountain Valley, CA 92708.

BLACK BOX BIBLE: A collection of Cable, Satellite, and Video Stabilizer schematics and plans including: (7) video descramblers for VideoCipher, (2) for Oak Satellite, (7) for cable (Sinewave, Jerrold 6 dB, Tri-Mode, Universal, SSAVI, and others), Macrovision stabilizers and more. $33.45. Catalog $3.00. CODs 602-782-2316, FAX 602-343-2141. **TELECODE**, Box 6426-CQ, Yuma, AZ 85366-6426.

PATCHES, PINS, RIBBONS. All custom designed. Free brochure. NDI, Box 693944Q, Miami, FL 33269 (305-653-9434).

WANTED: SP-940 speaker for Kenwood TS-940. Pete O'Dell, WB2D. Days: 516-681-2922; Evenings: 516-862-9025

IBM PC AND LAPTOPS VIDEO DIGITIZER 640 by 480 resolution. 256 gray levels $89.98. Demo disk $3, information $. COLORBURST, Box 3091, Nashua, NH 03061.

VIDEOCIPHER II: THEORY OF OPERATION. Volume 1 (Hardware) $36.45, Volume 2 (Software) $36.45, Volume 3 (Projects/Software) $46.45, Volume 4 (Repair/Software) $99.45, Volume 5 (Documentation) $46.45, Volume 6 (Experimentation) $46.45, Volume 7 (032/Hacking) $56.45, Volume 8 (Exotic) $73.45, The VideoCipher Video $43.45, CLONE HACKERS BIBLE $36.45. SATELLITE HACKERS BIBLE $56.95/software. CABLE HACKERS BIBLE Volume 1 $43.95. CABLE HACKERS BIBLE Volume 2 $44.95. OAK ORION $36.45. SATELLITE EXPERIMENTERS HANDBOOK $28.45. SATELLITE ANTENNA CONSTRUCTION $28.45. BLACK BOX BIBLE $34.95. SATELLITE RECEIVERS SCHEMATICS Vol. 1 $39.95. CELLULAR HACKERS BIBLE $53.95. SCANNER HACKERS BIBLE $33.95. CODs 1-602-782-2316 or FAX 1-602-343-2141. Catalog $3.00. **TELECODE,** Box 6426-CQ, Yuma, AZ 85366-6426.

FOR SALE: Pair of Kenwood TR2600 A's, with microphones, base, charger, and two mobile chargers. Complete $400. Les Hunter, N4MUK, Box 29, Westfield, NC 27053.

WANTED: 6146/As/Bs/Ws, unused, no Chinese, for ham repeater. Also, 4-125As, GE 4EP3A1, 4EP4A3. W4BUZ, 1703 Verdun Dr., Greensboro, NC 27410.

DXers! Improve DX QSL return by copying ham sentences in 64 languages on your card! K3CHP's DX QSL GUIDE, $9.95 pp. Joe Mikuckis, 6913 Furman Pkwy, Riverdale, MD 20737.

HOW TO BUY YOUR FIRST PERSONAL COMPUTER—$5.00: New easy reading booklet for non-experts. New or used, save $$$. Read this first! Avoid costly mistakes. SASE brings free details. Or send only $5.00 for immediate shipment: IPR Corp., Box 1236-HS, Benicia, CA 94510. Satisfaction Guaranteed.

LARSEN KG 2/70 $68.95. Also A/S, Valor, Astron, Unadilla, Mobile rig mounts, hard to find parts. Write for catalog. Mobile installations available at our retail store. Custom Auto Radio of Watertown, 660 Arsenal St., Watertown, MA 02172 (617-923-2122).

FOR SALE: Heath ET-3100A Experimenter $40, Heath HD-1986 Microlizer $15, Palomar R-X Noise Bridge $ 12, Palomar P-310X preamp $20. Bob Talaga, 7248 E. 38th St., Tucson, AZ 85730 (602-571-0673).

VERTICAL PHASING, SINGLE OR 5-BAND, COMTEK NETWORKS! DAVID RF Co., POB 230-C4, Carlisle, MA 01741. Voice or FAX: 508-369-1738.

Fastest HURRICANE Tracking Program for IBM-compatible computers, all video modes. Order ATLANTIC or EASTERN PACIFIC. Storms to 1991 included. $39.95 + $1.50 S/H. (FLA residents add 7% tax.) WEBBS SOFTWARE, Box 30102, Pensacola, FL 32503-1102.

YOUR QSL CARD AS WALLPAPER for Windows 3.X. Or your favorite photo, license, award, drawing, etc., turned into a vivid BITMAP-Image File (B/W & 256 color) to be used as **WINDOWS WALLPAPER.** Send photo or copy (we'll return them) along with $9.95 + $2.50 S & H for each image. Specify 5¼" or 3½" diskette. To: Wallpaper Concepts of America, P.O. Box 2399-188, Scottsdale, AZ 85267.

OPEN WIRE LINE: 450 ohm, high UV polyeth. Insulated copperweld, 100 ft. rolls, $20.00 DELIVERED cont. US. DAVIS RF Co. ORDERS ONLY: 800-484-4002 CODE 1356. Info: 508-869-1738.

CLANDESTINE CONFIDENTIAL NEWSLETTER: Latest info on secret broadcasters. Six issues $10 US, $13 foreign, US funds. RR4 Box 110, Lake Geneva, WI 53147.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. C, Berwyn, IL 60402.

WANTED: Older model bugs, unusual bugs, and miniature hand keys. State price, condition. Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210.

THE DX MAGAZINE is your monthly DX reference: DXpedition reports, equipment and software reviews, six meters, awards, QSL information, and more. Sample only $1.00. Box 50-C, Fulton, CA 95439 (707-523-1001).

SERIALS! Great antenna book by Kurt N. Sterba. $ 10, $2 s/h, CA 78¢ tax. Worldradio, POB 189490C, Sacramento, CA 95818.

ROSS' $$$$ NEW August (ONLY): KENWOOD TS-940SAT 2,049.90, TS-450SAT 1,195.90, AT-230 $259.90, VFO-700S 249.90. ICOM O4AT $249.99, 735 $848.00, AG-35 $59.99. MFJ 25 $69.99, 815B $52.00, 1278 $249.90. AEA PK-232MBX 304.90, PK-88 $129.90, MP-64 $69.99. ALLIANCE HD-73 $52.90, U-105 $51.90. ALL LIMITED TIME OFFERS. CALL OR SEND 2 STAMPS FOR MORE SPECIALS. Looking for something not listed or hard to find? Call or write. Over 9000 ham-related items in stock for immediate shipment. Mention ad. Prices cash, M.O.B. Preston. Hours Tuesday–Friday 9:00 to 6:00, 9:00 to 2:00 P.M. Mondays. Closed Saturday & Sunday. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263 (208-852-0830).

Amateur Radio Catalog • *Summer 1992*

Order Toll Free: 1-800-558-0411 *FAX: (414) 358-3337*

AMATEUR ELECTRONIC SUPPLY® Inc.

5710 W. Good Hope Road; Milwaukee, WI 53223 • Phone (414) 358-0333

AES® BRANCH STORES

WICKLIFFE, Ohio 44092	ORLANDO, Fla. 32803	CLEARWATER, Fla. 34625	LAS VEGAS, Nev. 89106
28940 Euclid Avenue	621 Commonwealth Ave.	1898 Drew Street	1072 N. Rancho Drive
Phone (216) 585-7388	Phone (407) 894-3238	Phone (813) 461-4267	Phone (702) 647-3114
1-800-321-3594	1-800-327-1917	No Toll Free Line	1-800-634-6227

Watch for Future AES® Branch Store Openings!

The famous . . AES® Catalog!

for Years used as the "Bible of the Industry"

- Big! - 148 Pages
- Beautiful! - 4-Color
- Manufacturers' Pages
- Loaded with Goodies
- Closeouts • Refurbs
- Used Gear Listing
- Demonstrators

HOW TO GET YOUR FREE AES® CATALOG

The only way to get the **Big AES Catalog FREE** every 4-months is to be on our Customer Mailing list. You can get and stay on the mailing list by making at least a $100 purchase at least every 2-years, from any of our stores. Persons on our customer mailing list will also receive a smaller mailing piece 3 times a year. If all goes as planned, our customers will receive a mailing approximately every 2-months.

Persons not on our mailing list may pick up a Catalog or Flyer FREE in any of our stores (subject to availability), or send $5 to cover First Class Postage and handling to:

AES Catalog, P.O. BOX 23370, Milwaukee, WI 53223.

Why not shop for gifts in the AES Catalog? . . . to help ensure your place on our mailing list. Some gift suggestions for friends would be items like: Shortwave Receivers, Police-Aircraft Scanners, Radar Detectors, Cordless Phones, Answering Machines, Marine Radios, Personal Communications Equipment & Consumer Electronics thru Audio Plus.

Order Toll Free: 1-800-558-0411 *FAX: (414) 358-3337*

AMATEUR ELECTRONIC SUPPLY® Inc.

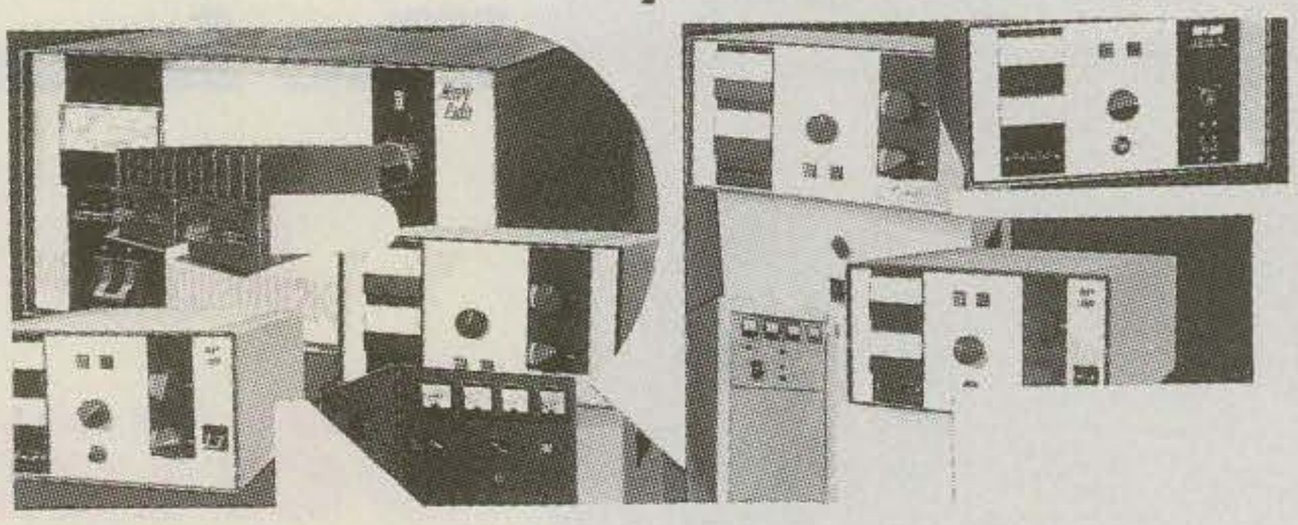
5710 W. Good Hope Road; Milwaukee, WI 53223 • Phone (414) 358-0333

AES® BRANCH STORES

WICKLIFFE, Ohio 44092	ORLANDO, Fla. 32803	CLEARWATER, Fla. 34625	LAS VEGAS, Nev. 89106
28940 Euclid Avenue	621 Commonwealth Ave.	1898 Drew Street	1072 N. Rancho Drive
Phone (216) 585-7388	Phone (407) 894-3238	Phone (813) 461-4267	Phone (702) 647-3114
1-800-321-3594	1-800-327-1917	No Toll Free Line	1-800-634-6227

Watch for Future AES® Branch Store Openings!

At Henry Radio,



should be our middle name

We're aiming this message at the thousands of amateurs who are also electronics engineers. . . . because we may have just what you are looking for.

We started building amplifiers for amateur use more than 25 years ago. We know that we build the broadest line in the world and we also believe they're the best. A lot of people must agree with us because 40,000 of our amplifiers are in use throughout the world. And because we are so versatile and quality conscious, hundreds of our amplifiers, both stock and custom designed, are being used by commercial, industrial and military users worldwide. They are key components in scores of high tech systems used in a broad range of applications.

Thousands of Henry amplifiers are still used for communications. . .amateur, commercial, MARS, military, short wave broadcast, FM broadcast, VHF link, domestic, foreign. . .Henry amplifiers go everywhere for diverse services. HF point-to-point, VHF, UHF, SSB, AM, FM, RTTY, packet, meteor burst, digital, marine shore station. Are you beginning to get the idea? If you need a special purpose vacuum tube amplifier for a specific frequency from 2 MHz to 500 MHz at power levels up to 10,000 watts, we invite your inquiry.

But communications is only the beginning. Think about plasma generation, sputtering and etching, thin film deposition, laser excitation, nuclear magnetic resonance (NMR), photo-emissions and mass spectrometry, scientific research, industrial production. . .Henry equipment is used in all of these applications. We have always been customer driven and still are.

Recent projects include:

2KW 1600 KHz AM Broadcast Transmitter — Africa
10KW 40 MHz Cyclotron Exciter — Belgium
3KW 400 MHz Linear Accelerator Exciter — United States
50KW 6 MHz Industrial Heater — United States
1KW 100 MHz FM Broadcast Transmitter — Canada
10KW 4-28 MHz Test Amplifier — United States
4KW 4-20 MHz AM Shortwave Broadcast Transmitters — Africa
10KW 13 MHz Sputtering Power Generators — United States
3KW 13 MHz Plasma Etch Power Generators — United States
2KW 27 MHz ICP Test Power Generators — Great Britain
2KW 40 MHz ICP Test Power Generators — Australia
3KW 70 MHz Cyclotron Exciter — Belgium
3KW 190 MHz Linear Accelerator Exciter — Japan
25KW Tube Ager — United States
5KW 28 MHz - 50 MHz Communication Amplifier — Italy
1KW 1 to 2 MHz Test Amplifier — United States
5KW PEP 1.8-3.0 MHz Remote Tune Communications Amplifier
10KW 41 MHz Meteor Burst — United States
5KW Various Marine HF frequencies — Shore station, 14 units
4KW 145 MHz Indonesia

If you have a requirement for high power RF, please call Ted Shannon, Meredith Henry or Ted Henry. And don't forget, Henry Radio still produces the world's broadest line of fine Amateur amplifiers.

HENRY RADIO 65 YEARS OF SERVICE **Henry Radio**

2050 S. BUNDY DR. ● LOS ANGELES, CA 90025 ● (310) 820-1234

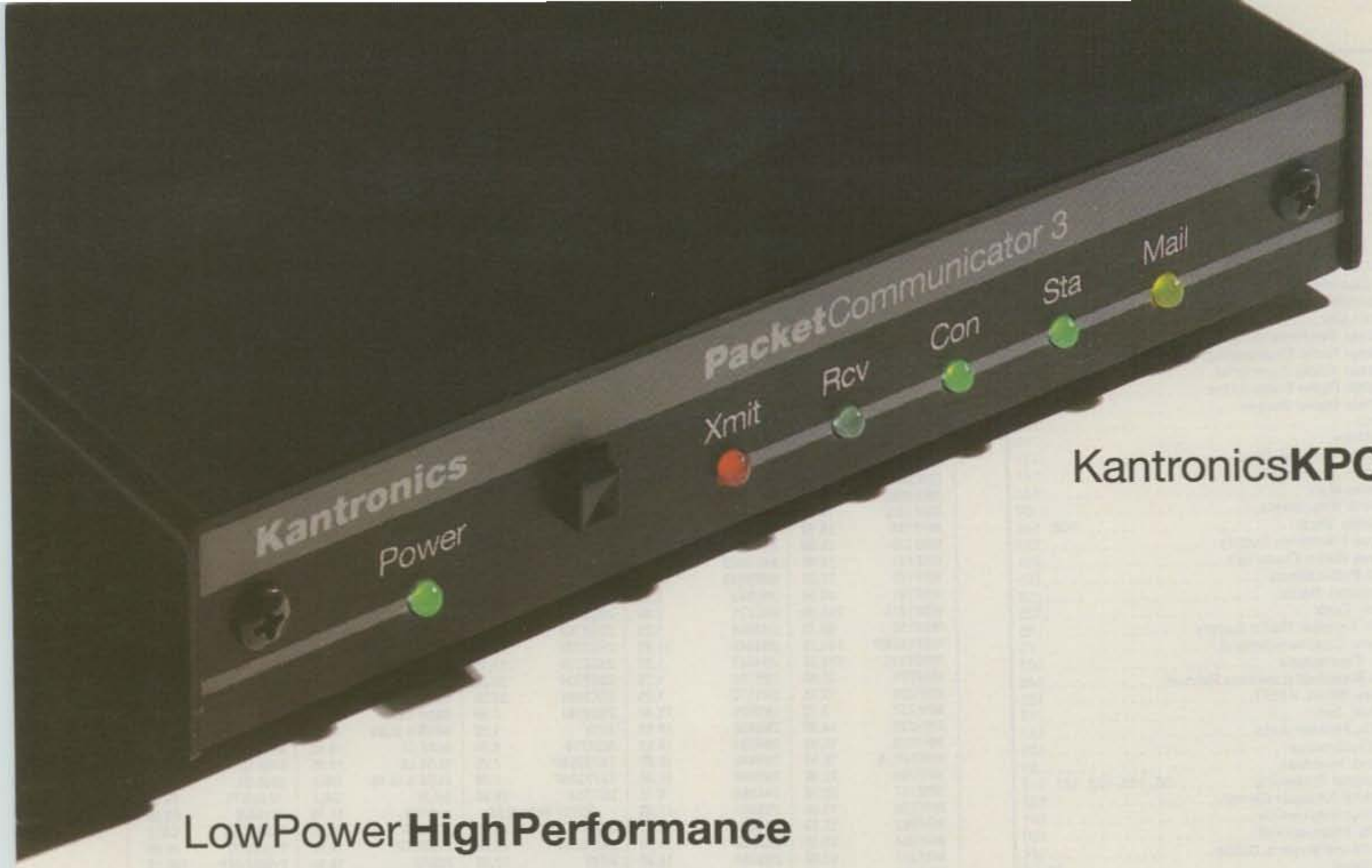
Toll free order number: (800) 877-7979 FAX (310) 826-7790

CIRCLE 167 ON READER SERVICE CARD

Advertiser's Index

A & A Engineering 150
AEA/Adv. Elec. Applications 5
AMSAT 101
ARRL 116
ASA 122
AVC Innovations Inc 101
Ace Communications 37
Alfa Electronics 114
Alinco Electronics 2, 71
Alpha Labs 149
Amateur Electronic Supply 21, 75, 82, 83, 151
Amateur Radio Engineering 123
Amateur Radio Specialist 146
Amateur Radio Station One 146
Amateur Radio Supply 135
Ameco 123
Ameritron 19
Anli International Corp 115
Antenna Dimension 147
Antenna Mart 133
Antenna Specialists 89
Antennas West 108, 148
Antique Electronic Supply 131
Antique Radio Classified 131
Artsci Publications 101
Associated Radio 56
Astron Corp 125
Austin Amateur Radio Supply 85
Azimuth Communications 70
Barry Electronics 107
Bed & Breakfast (Lawalloa Retreat) 148
Beezley, Brian, K6STI 131
Bencher, Inc 77
Bial Co./Isotron Ants 137
Bird Electronics 105
Boxboro Hamfest 33
Buckmaster Publishing 35, 108, 122, 137, 149
Burghardt Amateur Center 137
Butternut Electronics 101
CB City International 150
CQ Antenna Buyer's Guide 144
C & S Sales 36, 65
Cable X-Perts, Inc 118
Carrizo Solar Corp 146
Colorado Comm. Center 91
Command Productions 45
CommPute, Inc 114
Communications Concepts Inc 134
Cushcraft Antennas 7
DX Engineering 61
Delta Loop Antenna 150
Diamond Antennas 141
Diodah Publishing 144
Digital Communications 135
Down East Microwave 122
Drake, R.L. 65
ECO 149
Electronic Engineering 150
Electronic Equipment Bank 18
Electronic Specialists 43
Engineering Consulting 97
Fair Radio Sales 101
Forbes Group, The 142
G2ZPY Paddle Keys 51
GAP Antennas 44, 119
Gilfer Shortwave 114
Grapevine Group, The 146
Greater Louisville Hamfest 97
HAL Communications 63
Ham Bookstore 117
Ham Companion 137
Ham Contact, The 47
Ham Pro Antennas 131
Ham Radio Outlet 12, 17
Ham Station, The 111
Hamtronics 64
Hight Towers 135
Henry Radio 152
Hustler Antennas 16
ICOM America, Inc ..... 9, 11, Cov. IV
Info Inc 143
Inphase Publications 147
Interactive Image Tech 6
International Components Corp 62
Isotron Technologies 123
Jerrom 31
Jan Crystals 35
Japan Radio 15
Jensen Tools 105
Jesse Jones Industries 128
Jun Sunn Enterprises 127
K's Electronics 145
KEA Software 150
KW's "Silicon Alley" 150
Kiwiquest 144
Kitsutronics 154

(continued on page 155)



KantronicsKPC3

LowPower **HighPerformance**

Designed for user friendly operation, but with an eye to the advanced packeteer too, the Kantronics Packet Communicator 3 delivers high TNC performance with low power in a compact package.

The **KPC**3 features an improved **Dual**Level™ command set. The NEWUSER level provides 23 commands most often used in basic packet while an expert level provides access to the **KPC**3's full 130 plus command set. The **KPC**3 also has Kantronics version 5.0 firmware. Add the **KPC**3 "Getting Started" and advanced reference manuals and you have a TNC that not only gets you up and running fast but a TNC sophisticated enough to keep you running with the state of the art.

The **KPC**3 provides status information at a glance via its six LEDs.The unit may be powered by an external supply or an internal 9-volt battery and features 32K of battery backed RAM expandable to 512K.

Additional features include Kantronics PBBS with reverse forwarding, message header editing, a mail waiting LED, remote sysop access and Kantronics KA-Node. Kiss mode and Kantronics Host mode are also provided for TCP/IP compatibility and advanced operation.

Options include Hostmaster Terminal Software for PC compatible, Macintosh and Commodore 64/128 computers, Weather Facsimile (WEFAX) reception, and real time clock.

The Kantronics **KPC**3: low power, high performance, and user friendly operation at a user friendly price.

Kantronics 1202 E. 23rd St., Lawrence, KS 66046 913.842.7745 TELCO BBS 913.842.4678 FAX 913.842.2021

Advertiser's Index (cont'd)

Kenwood, USA ..... Cov. II-IIA-IIB, 1
Lakeview Co. 69
Larsen Antennas 10
LaRue Electronics 27
Lentini Communications 31
Lewallen, Roy, W7EL 114
Lightning Bolt Antennas 146
LogiKey 36
M² Enterprises 87
MFJ Enterprises 55, 57
Mackey, James E. 150
Madison Electronics 131
Martin Engineering, Glen 113
Memphis Amateur Electronics 70
NCG Company (Comet Antennas) 72, 73
NX2P Electronics 140
Namlulu Communications 89
National Amateur Radio Assoc 105
National Radio Center 147
Nemal Electronics 64
Northern Lights Software 91
ONV Safety Belt Co. 144
OPTOelectronics Inc. 49
Oak Bay Technologies 121
Ocean State Electronics 149
Oklahoma Comm. Center 25
Orion Business Int'l. 51
PASS Publishing 46
PC Electronics 121
PDK Software 150
Pac Comm 135
Palomar Engineers 42, 155
Periphex Inc. 51
Phillips-Tech Electronics 146
PolyPhaser 96
Pop Comm Summer Comm. Guide 111
Pouch, The 117
Project Pro 42
QSLs by W4MPY 89
R.A.I. Enterprises 108
R&L Electronics 29
RF Connection 137
RF Enterprises 143
RF Parts 153
RT Systems 148
Radio Age 146
Radio Amateur Callbook 92
Radio Center USA 156
Radiocom Sales 143
Radio Engineers 148
Radio Place, The 129
Radio Works 117
Renaissance Development 97
Robert Hall Electronics 146
Ross Distributing 146
Rupp Electronics 148
Sagant Antennas 39
Satellite City 86
Scrambling News 148
Solder-It Company 64
Spectrum International 113
Spider Antennas 24
Standard Amateur Radio 78, 79
Star Electronics 142
Startek International 93
Surplus Sales of Nebraska 69, 148
Synthetic Textiles 148
TE Systems 139
TNR Technical, Inc. 131
Texas Towers 67, 109
Tigertronics Inc. 65
Townsend Electronics 64
Trionics 127
UNR-Rohn 94
Universal Amateur Radio 143
VHF Communications 147
VIS Study Cards 148
Vector Control Systems 108
Vectronics Corp. 8
Versatel Communications 148
W5YI Marketing 38, 118, 147
W9INN Antennas 148
WJ2O Master QSO Logging Program 144
W & W Associates 88
Wacom 44
Wallace & Wallace 122
West Radio School, Gordon 95
Williams Radio Sales 121
Wireman Inc. (Certified Comm.) 150
Wyvern Technology 148
Yaesu Electronics ..... 41, Cov.III-IIIA-IIIB
Yagistress by NI6W 117
Yost & Co. 118

We'd like to see your company listed here too. Contact Arnie Sposato, N2IQO, at 516-681-2922 or FAX 516-681-2926 to work out an advertising program tailored to suit your needs.

VISA MasterCard COD

AEA • ALINCO • ALLIANCE • ASTRON • ALPHA-DELTA • AMERITRON • BENCHER • BUTTERNUT • CUSHCRAFT • DIAMOND • HUSTLER • HYGAIN • ICOM

RADIO CENTER USA

EAST/MIDWEST TOLL FREE
1-800-821-7323

Kansas City, MO 64150
102 N.W. Business Park Lane
(816) 741-8118 • M-F 8-5, Sat 9-2
314-351-4949, **St. Louis**

WEST TOLL FREE
1-800-345-5686

Sparks, NV 89431
12 Glen Carran Circle
(702) 331-7373 • M-F 8-5, Sat 9-1

KENWOOD

TS-850S
ALL BAND, ALL MODE, HF
- Dual VFO's
- Multi-Mode Scanning
- 100 Memories
- Optional Digital TX and RX

CALL NOW!

YAESU

FT-1000
NO COMPROMISE ULTRA HF
- 200 Watts Output
- Super Quiet Receiver
- Main and Sub VFO's
- 99 Memories
- Built-in Antenna Tuner And Power Supply

CALL NOW!

ICOM IC-728

HF ALL BAND TRANSCEIVER
- General Coverage Receiver
- Direct Digital Synthesis
- Triple Conversion Plus Noise Blanker
- Compact Size and Compact Price

CALL FOR DETAILS!

ALINCO

DR-599
2 METER/440 MOBILE
- 45 W/2 Meter 35 W/UHF
- Cross Band Repeater Function
- Receiving and Scanning On Both Bands
- Detachable Front Control Panel

CALL FOR DETAILS!

KENWOOD

TM-732A
V/UHF MOBILE

- 144 MHz/440 MHz Dual-Band Operation
- Dual Receive On Same Band
- 50 Split Memory Channels
- Detachable Front Panel
- Multiple Scan Functions

CALL TODAY!

YAESU

FT-2400
TESTED TOUGH 2 METER MOBILE
- 3 Power Levels with a High of 50 Watts
- Receive 140-174 MHz
- CTCSS Encode Built-in
- Automatic Repeater Offset

CALL FOR DETAILS!

ICOM

SALE

IC-229H
STATE OF THE ART MOBILE
- Ultra-Compact 2 Meter Operation
- 20 Memory Channels
- Big 50 Watts Output
- Auto Dialing For Autopatching And Repeater Control

DON'T DELAY—CALL!

ALINCO

DR-112
COMPACT FULL FEATURED 2M MOBILE
- 45 Watts Of "True FM"
- Multiple Scanning Modes
- 14 Memory Channels
- DTMF Encoder Built-In

CALL TODAY!

KENWOOD

TH-28A VHF HANDHELD
- Transmit-2 Meter Receive-2 Meter & 440MHz
- 40 Memory Channels
- Message Paging

TH-78A
V/UHF HANDHELD
- RX 118-173.995 MHz TX 144-147.995 MHz UHF 438-449.995 MHz
- Dual Band Receive
- Message Paging
- 50 Memory Channels

CALL FOR DETAILS!

YAESU

FT-470
2 METER/70CM PERFECTED
- Simultaneous Receive On Both Bands
- Built-In PL Encode/Decode
- 10 Memories Each Band
- 2.3 Watts with 5W Optional

CALL FOR ALL THE DETAILS!

ICOM

IC-W2A
DUAL BAND HANDHELD
- Full Operation On 2 Meter And 440 MHz
- Extra Wideband Receive Capability
- Simultaneous Receive On Both Bands
- Three Tuning Systems
- 60 Memory Channels
- 5 Watts Output
- DTMF Pad For Memory Channel Auto Patching

CALL FOR ALL THE DETAILS!

ALINCO

DJ-580T
TWIN BAND HANDHELD
- Rx 130-173.995 MHz 400-519.995 MHz
- Up to 5 Watt Output
- Multiple Scanning Modes
- Direct Freq. Selection
- 40 Memory Channels
- Cross Band Full Duplex

CALL TODAY!

ASTRON

• SL-11A	$69	• RS35M	$162
• RS12A	$73	• VS35M	$179
• RS20A	$90	• RS50A	$205
• RS20M	$112	• RS50M	$225
• VS20M	$128	• RM50M	$259
• RS35A	$144	• VS50M	$237

CALL TODAY!

STANDARD.

C-628
440 MHz/1.2 GHz HANDHELD

- Receive 300-475 MHz 1200-1300 MHz
- Lo, Med, Hi Power Output
- Output 2.5 W UHF Up to 5W 1 Watt 1.2 GHz
- CTCSS En/Decode Built In
- Cross Band Repeat Capability

CALL TODAY!

ALLIANCE

HD-73
REPUTATION EARNED FROM QUALITY

ONLY $159.95
UPS PAID
- Dual-Speed Rotation
- Lifetime Factory Lubrication
- Aluminum Casings and Hardened Steel Drive Gears
- Easy to Install

Hy-Gain Rotors In Stock

MFJ

NEW!

MFJ-247
SWR ANALYZER w/LCD FREQUENCY COUNTER
- Reads SWR 160-10 Meters
- Use as 150 MHz Counter And As A Signal Generator

CALL FOR ALL YOUR FAVORITE MFJ ACCESSORIES

QUALITY SERVICE WITH "LOW" RADIO CENTER PRICES

CASH FOR QUALITY USED GEAR—SEND SASE FOR USED LIST

Ahead of the Competition...

...Again.

NEW!

et Yaesu give you what the competition can only dream about: powerful atures, simple operation and streamlined styling in one amazing package.

he new compact FT-415/815 handheld radio deliver more than a dozen ew features, including backlit keypad and display, louder audio output nd large, easy-access buttons. Both the FT-415 and FT-815 offer 41 emories, built-in DTMF calling and paging, and four power levels via the NB-27 battery. As if that's not enough, you can customize your T-415/815 handheld with an array of optional accessories.

he competition is still working on a radio that's as powerful and easy to se as the FT-415/815 handheld. But why wait? Visit your Yaesu dealer day and leap ahead of the competition.

hown Actual Size

cifications subject to change without notice
cifications guaranteed only within amateur bands
Year Limited Warranty on all Amateur Products

FT-415/815

2M/UHF Handheld Transceivers

FT-415: 130-174 MHz Rx 140-150 MHz Tx

FT-815: 430-450 MHz Rx/Tx

41 Memories (All memories store separate transmit and receive frequencies for "odd splits")

2 VFOS

① DTMF Calling and paging built-in

Built-in VOX

② Back-lit Keypad and Display (with time delay)

③ DC Direct Operation (Automatically Charges Battery with 12 Volts, FNB-25 only)

④ Four Power Levels (With FNB-27 Battery)

Direct Keyboard Entry for All Functions

Programmable and Automatic Battery Saver (ABS)

⑤ CTCSS Encode/Decode Built-In

5 Watts Output With FNB-27 or DC Direct

⑥ Rugged Case Construction

Automatic Power-Off (APO) Turns Radio Off Automatically After 30 Minutes

DTMF 10 Memory Autodialer, Built-In

Selectable Frequency Steps (5,10, 12.5,15,20 or 25 KHz)

Four Ways to Scan (Band Scan, Memory Scan, Memory Skip, Programmable Scan)

Optional Accessories:

NC-42 1-Hour SMART Desk Charger

E-DC-5 DC Adaptor With Noise Filter

MMB-49 Mobile Mounting Bracket

YH-2 Headset for VOX Operation

FBA-12 AA 6-Cell Holder

Some accessories and options are standard in certain areas. Check with your Yaesu Dealer for details.

YAESU

Performance without compromise.

FT-990 High-Tech Innovation

The advanced RF front end design similar to the FT-1000 allows for superior receiving performance. In addition to CW spot, IF notch, IF shift, independent mode and IF filter selection and Yaesu's exclusive DDS, the FT-990 features the industry's only dual digital SCF high performance filters providing unsurpassed receiver selectivity as never before obtained. And the CPU controlled RF FSP gives you that extra pile-up punch when you need it most. A high speed antenna tuner with memories and built-in switching power supply are included.

FT-890 Light Years Ahead

World's smallest premium high-performance mobile includes Yaesu's exclusive DDS, IF notch, IF shift, built-in iambic keyer, general coverage receiver and built-in high-speed antenna tuner with memories. Outstanding receiver front end with IPO (Intercept Point Optimization), selectable AGC and all-mode squelch. DFCS (Duct Flow Cooling System) for 100% duty cycle at 100 watts output for up to 30 minutes. A great Field Day or DX-pedition rig!

FT-747GX Small Wonder

Features include ultra-lightweight design, multiple scan functions, selectable noise blanker, 20 memories, all-mode squelch, separate drive and mic gain controls. The simplest full-featured 100 watt HF radio, with general coverage receiver at an affordable price.

know a world leader, know us.

Keeping our world leadership position in HF radio products means knowing what you need to make DX'ing more fun and challenging, then interpreting those needs into technical improvements and innovative features. We're hams too, so we know how exciting advanced engineering can be.

Being a world leader in HF technology doesn't mean anything to us though, unless there are real benefits to you. Like peak performance and unfailing durability – the very qualities that keep our HF equipment on top; the best benefits you can have – and our design goals since 1956 the year Yaesu was formed.

This lineup of radios exemplifies the achievement of those goals and over 35 years of manufacturing "the best of the best" amateur radio equipment.

You see, you do know a world leader – but more importantly, we know you.

Experience the best of the best today! Contact your nearest Yaesu dealer.

YAESU

Performance without compromise.℠

"The magazines judged the FT-1000 world's best in it's class. That's leadership!"

K. Karamanos
National Sales Manager
WD6DIH

"Leadership means innovation, and since we're hams too, we understand what you want."

C. Margelli
Customer Service Manager
K7JA

"We keep our HF leadership position by constantly improving our products."

M. Maruya
Executive Vice President
WA6F

FT-1000 Best of the Best

Unmatched performance, the ultimate DX and Contest radio. Unlimited simultaneous crossband dual receive, 200 watts power output, with heavy duty power supply. World's best receiver performance utilizing quadruple conversion, Yaesu's exclusive DDS, IF notch, IF shift, IF variable bandwidth, CW APF, independent mode and IF filter selection. Also, CW spot and built-in high speed antenna tuner with memories. Proven performance: The choice of the world's top DX'ers.

You may not think you
but you

All of Yaesu's quality HF radios come available with a wide selection of accessories. Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

More for Less!

The First High Performance HF Under $1100.

ICOM Unveils the New IC-728!

The HF All-Band Transceiver offers the high-performance features previously available only on higher priced models. And we mean *features* — not just bells & whistles. The amazing IC-728 sells for under $1100, yet has more of what you want in a radio for — *to hear and be heard* — than any other transceiver in its class.

More Clarity!

All other radios in this price class use double conversion circuitry. ICOM uses more advanced **Triple Conversion** technology because it improves incoming signal quality and suppresses interference better. And a **Noise Blanker** reduces pulse-type noise interference instantly!

More Selectivity!

You won't find **PassBand Tuning** on some radios at twice the price! PBT is the most effective interference rejection system ever developed. It lets you narrow the IF passband width to cut out nearby signals and zero in on just the one you want to hear.

More Flexibility!

High-performance **AT-160 Antenna Tuner** (opt.) detaches for mobile operation.

More Punch!

ICOM's dynamic **Speech Compressor** increases the transmitter's output signal strength. This gives you the power to punch through when the bands are crowded or conditions are less than perfect.

More Speed!

Band Stacking Register automatically snaps you back to the last frequency and mode you were using — perfect for contesting, multibanders. **Direct Digital Synthesis,** gives you fast T/R switching for digital modes. **DDS** also improves your carrier-to-noise ratio by blocking interference, and it gives you the fast switching times you need for packet radio.

More Value!

We invite you to compare the IC-728 with any other HF. See how much you would pay for another transceiver with all of these performance features!

	ICOM IC-728		
Triple Conversion	✓		
Passband Tuning	✓		
DDS	✓		
Speech Compressor	✓		
Sugg. Retail Price*	$1,099		

* AT-160 Antenna Tuner is priced separately.

More Audio! Low-noise front-end technology means high sensitivity. A sharp IF and clear audio amplifier combine for excellent sound reproduction.

More Mobile! The IC-728 is more than a radio — it's a *system*. For example, the optional AT-160 ANTENNA TUNER can be "built-on" (it's not built-in), for optimal base station operation. Remove it, and you have a supercompact, light weight unit for mobile use, field days, etc. The bright LCD display is easy to see in vehicles (fluorescents aren't), and its superior noise blanker makes auto electrical noise a problem of the past!

And Even More! All-band, all-mode,† general coverage receiver, 26 memory channels, 3 types of scanning, plug-in (solderless) CW filters... plus the same superior quality and reliability you've come to expect with every ICOM transceiver.

† With optional IC-U17

ICOM America, Inc., 2380-116th Avenue N.E.
Bellevue, Washington 98004
Brochure Hotline 1-800-999-9877

ICOM

Experience the Quality