ICD 08241

Amateur Radio

SERVING AMATEUR RADIO SINCE 1945
FEBRUARY 1999

CQ

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On the cover: Bruce Gragg, K4ZO, Newton, NC

THE RADIO AMATEUR'S JOURNAL

ICOM IC-746

HF/6M/2M with IF-DSP and 100 Watts, Even On 2 Meters

PC Remote Control
Windows™ software, RS-746, developed by ICOM

Pull out more signals. DX'ing? Even faint signals buried in noise can't hide from the '746's adjustable IF-DSP noise reduction.

Eliminate adjacent channel interference with Twin Passband Tuning, 3 optional filter slots (front panel selectable), and a selectable DSP Audio Peak Filter (320/160/80 Hz). The '746's DSP Auto Notch eliminates multiple heterodyne signals.

One look at the large LCD display says it all. A glance "above the line" instantly lets you know all operating conditions and settings. Look "below the line" for menu selection, 5 soft key functions (which vary with the menu), passband width, and a band scope to search for signals.

Time to Upgrade
Solar Cycle 23 is just coming in to full swing. With the HF and 6 meter bands starting to opening up, there'll be more amateur fun, day and night!

***QST* bottom line:**
"An impressive transceiver for HF, 50 MHz and 144 MHz work. With loads of those features desirable to the serious HF operator *and* all modes at 100 W on both 6 and 2 meters, the IC-746 is a fine choice in a mid-priced rig."
– *QST*, September, 1998

SPECIFICATIONS

Transmit: ..... HF/6 Meter/2 Meter, 100% Duty Cycle
Receive: ..... 30 kHz-60 MHz, 108-174 MHz Quadruple conversion superheterodyne
Mode: ..... AM, FM, FM-N, SSB, CW, RTTY
Power: ..... 5-100 Watts (2-40W, AM)
Power Supply Requirement: ... 13.8 V DC
Memory Channels: ..... 102 total, 99 regular, 2 scan edges, and 1 call
Size: ..... 11.3(W) x 4.7(H) x 12.5(D) in. 287(W) x 120(H) x 316.5(D) mm.
Weight (approx.): ..... 19 lb, 10 oz / 8.9 kg

FEATURES

- **IF-DSP (15.625 kHz)**
  - Noise Reduction
  - Automatic Notch Filter
  - Selectable Audio Peak Filter
- **Twin Pass Band Tuning (PBT)**
- **Multi-Function LCD Display**
  - Band Scope, Memory Names, Key Assignments, PBT Settings, Split Frequency, Memory Keyer Contents
- **3 Optional Filter Slots**
  - 2 for 9 MHz, 1 for 455 kHz
  - All Front Panel Selectable
- **Digital, Multi-Function Metering**
  - Signal Strength, RF Output, SWR, and ALC levels
- **Auto Antenna Tuner**
- **RF Speech Compressor (not AF)**
- **Tone Squelch and Tone Scan**
- **Auto Repeater Duplex Setting for 2 Meters**
- **Quick Split Function**
- **Complete CW Functions**
  - 4 Ch. Memory Keyer
  - Electronic Keyer
  - CW Pitch Control
  - Full Break In (QSK)
- **VOX**
- **Voice Synthesizer (opt)**
- **Triple Band Stacking Register**
  - Remembers tuner selection, preamp, antenna, mode and frequency for last 3 frequency selections

Call Button
One touch recall of user programmed frequency and mode

RF Gain and Squelch
Programmable RF gain, squelch, or both

Continuously Adjustable Power Level
5-100 watts variable

3 Antenna Connectors
Two for HF & 6M, and one for 2M

Digital Metering (on LCD)
Measures three parameters, all at once

SmarTune™
Automatically senses how fast you want to tune by how fast the knob is turned

Quick RIT/XIT Access
with zeroing function for today's crowded bands

Built in Auto Antenna Tuner
No external antenna tuner is required for HF and 6M operation.

Upgrade 1998 HEAR comes the Sun by ICOM

Get more out of your HF. Let the digitally-advanced '746 give you the edge, and still hand you the best of 6 & 2 meters. For a brochure, call **425-450-6088**

ICOM options required for PC operation:
CT-17 Level converter
RS-746 Windows™ Remote Control Software
OPC-478 Connection Cable

PC Ready!

ICOM®

www.icomamerica.com

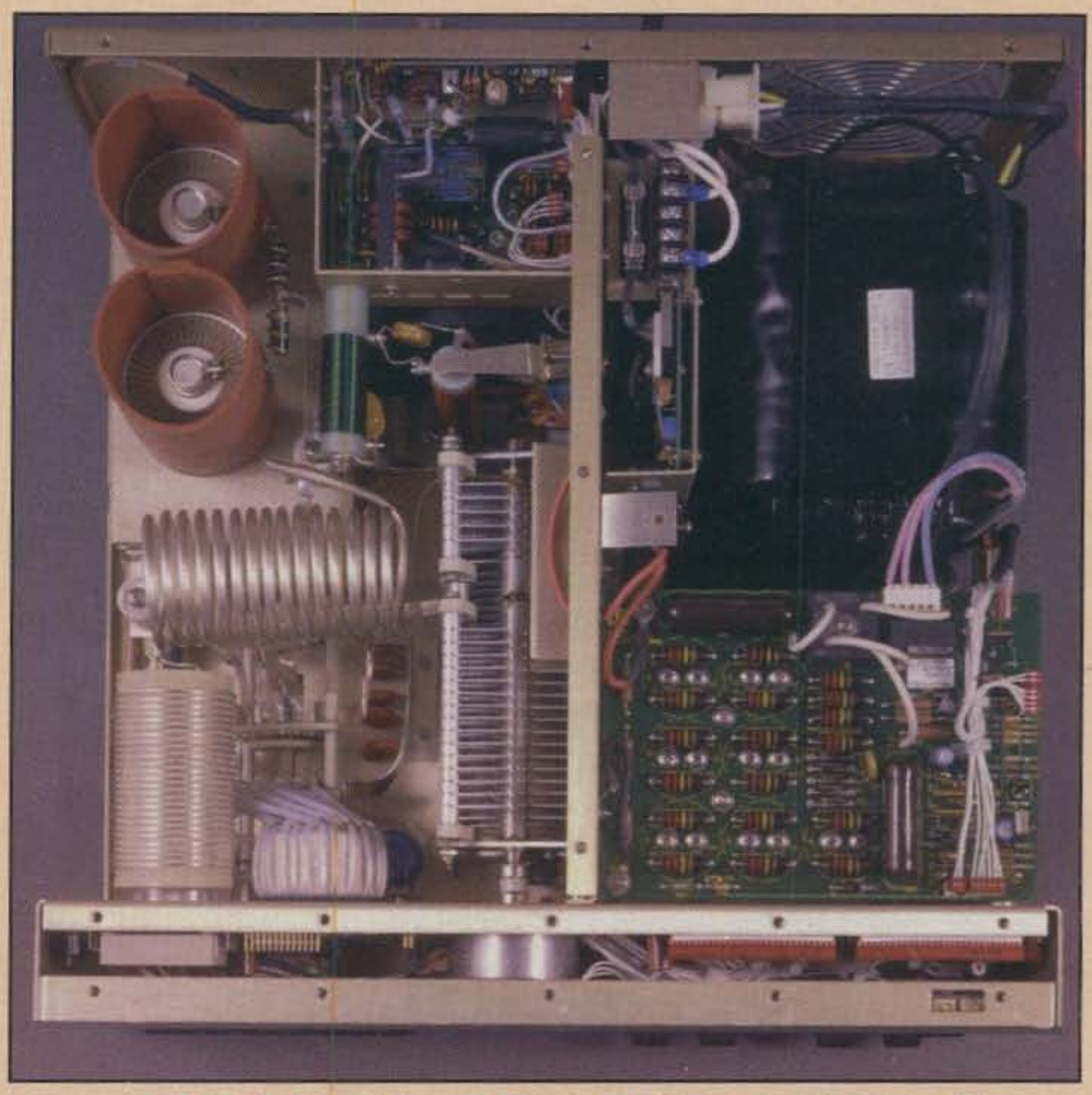
If you're serious about amateur radio communications…

YOU SHOULD OWN AN ALPHA!

The professional quality of *ALPHA/POWER* linear amplifiers is conspicuous at a glance.

10 *powerful* reasons to buy a new *ALPHA*:

1. *Cool and conservative 1.5 kW rf output*, all modes with no time limit
2. *Superlative operating convenience*
   - Fast automatic ***('87A)*** or by-the-numbers ***('89, '91B)*** tune-up
   - Quiet, fast T/R-QSK
   - Bright, instant-responding LED bargraphs, visible at a glance
3. *Rugged & proven ceramic-metal tubes*
   - ***'87A & '89***: 2 Eimac 3CX800A7s
   - ***'91B***: 2 Svetlana 4CX800As
4. *Comprehensive self-protection*
   - Plate, grid, VSWR/wrong antenna, overdrive, rf arc, hot switching
5. *Low input VSWR* on all hf bands including WARC, without user adjustments
6. *Unequalled owner protection*
   - 4 year non-prorated limited warranty, optional extension to 4 years (US/Can)
   - 30 day money-back guarantee (US/Can)
   - Factory & overseas authorized service
7. *Designed & supported by professional rf engineers* who are also active amateurs
8. *Three decades of innovation and excellence* in amateur and professional rf power
9. *The **ALPHA** technology* that made ***ETO* #1 worldwide** (1984 to present!) in design, manufacture and sales of sophisticated rf linear amplifiers to 25 kW output for medical MRI imaging
10. *First choice for over two decades* of the most critically-demanding DXers, contesters, traffic handlers and other serious amateur radio operators who demand and appreciate fine equipment!



ALPHA 87A – "The Ultimate Linear"

The ALPHA 87A, 89 and 91B share basic layout and many major components. Top views of the '87A and '89 are virtually identical; the '91B is very similar. ALPHA 87A's microprocessor-based control system provides <1 second fully automatic band-changing and tune-up, while the '89 and '91B are manually band-changed and tuned.

You can see, feel and enjoy the big difference between an *ALPHA* and *all* other amplifiers!

Why not prove it in your station at no risk? Buy an ***ALPHA 87A, 89 or 91B*** and, if you wish, *any other* amplifier. Compare performance, convenience, feel and appearance. ***We GUARANTEE you'll conclude that the ALPHA is far superior!*** If you don't, just return it undamaged within 30 days and we'll refund your full purchase price, shipping excluded. Will "the other guys" allow you the same opportunity? If not, *why could that be?*

Why not order your new *ALPHA now*? To order, visit *ALPHA/POWER*'s web site at www.alpha-power-inc.com or call/FAX Scott Ehrhorn or John Brosnahan.

ALPHA POWER

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As part of a major expansion of *Alpha/Power's* product lines and capabilities, we have acquired the "*rfconcepts*" line of VHF and UHF solid state amplifiers from Kantronics. *Alpha/Power* will provide full service and warranty repair for these products effective immediately, and will begin manufacturing the line in Colorado shortly. Stay tuned for announcements of other exciting new products coming soon from *Alpha/Power*. ***—John, Dick, & Scott***

CQ Amateur Radio

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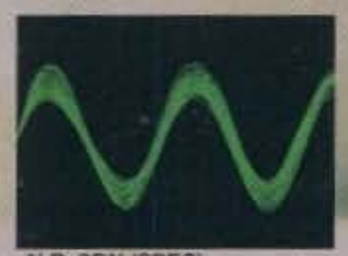
ON THE COVER: Some of the narrow-minded among us have declared CW to be dead. Absolutely wrong! Pounding brass is alive and well, particularly at the QTH of Bruce Gragg, K4ZO, in Newton, NC. Bruce spends his operating time on all bands from 160 to 440 (except 6, which will soon be added), but when he's on HF, it's strictly CW DXing. Bruce sits at 337 on the DXCC Honor Roll, and should P5 show up any time soon, count on hearing him in the pile-up. An Electrical Engineer with the local electric utility, Bruce had been licensed since 1968 as WA4EGP and AG4L before landing K4ZO. (Photo by Larry Mulvehill, WB2ZPI)

A Breath of DSP Fresh Air

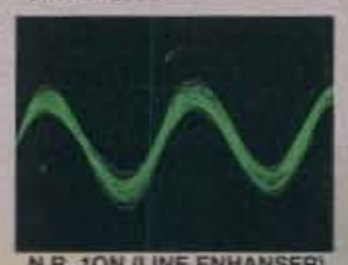
Kenwood was the first to offer DSP in the legendary TS-950SDX. Now you can enjoy the affordable benefits of Advanced Digital Signal Processing with the all new TS-570D/S(G)

Let the fresh air and sun shine in on your new HF experience.

N.R. OFF SINAD=6dB



N.R. 2ON (SPEC)
SINAD=25dB



N.R. 1ON (LINE ENHANSER)
SINAD=18dB

Advanced Technology Upgrade

TS-570D(G) HF TRANSCEIVER/TS-570S(G) HF + 6M TRANSCEIVER

Kenwood has not been standing still since the introduction of the TS-570D/S HF Transceiver last year. Now you can command even more of Kenwood's advanced DSP technology with the G model.

The **DSP** filters and extracts signals with digital technology that is unmatchable with standard analog circuits. It provides **CD-class transmit and receive audio quality** that can be shaped to your needs, and two powerful noise reduction systems: **Line Enhancer Method** for SSB/AM modes, and **Speech Processing by Auto Correlation** (SPAC) for CW mode. DSP also enables the **CW-Auto Tune** feature that automatically zero-beats CW signals.

The **Extensive Memory Functions** provide a bank of 100 memory positions split into 90 standard channels for general operation and 10 for programmable VFO, programmable scan and long-term memory. Memory contents can be scrolled, copied or locked out. In addition there are **5 quick memories** for storing frequencies and modes on the fly, perfect for the busy DX contester.

The powerful **Menu System** incorporates **46 menu features** and an **on-line guide** for instant reference. The **large amber backlit LCD display** provides 4 light levels for clear readability under any lighting conditions.

The TS-570D/S has no shortcomings in the construction and performance area. The **continuous-duty 100 watt transmitter** incorporates a large heavy-duty heat sink with integrated cooling fan for non-stop operation even under extreme environmental conditions. The **wide-band receiver** is rock-stable from 500 kHz through 30 MHz with **dual pre-amps** and **dual bandpass filters** for exceptional selectivity and sensitivity.

With the features and performance of a high-end radio integrated into an affordable mobile-size package, the TS-570D/S is the perfect choice for the field or to build a full station around at home.

***FREE** operating manual via FTP site*
ftp://ftp.kenwood.net

- Beat cancel
- 2 position antenna switch
- CW auto tune adjust (a world's first)
- Channel scan, program band scan, memory scan with channel lock-out and group channel scan, all with TO (time operated) or CO (carrier operated) resume modes
- Compact 10-5/8 inch by 3-3/4 inch front panel size for any travel or installation requirement
- Preset auto antenna tuner with 18 sub-bands
- Variable electronic keyer (0 and 100 wpm)
- Packet and FSK features
- RCP-2 software for PC-based display and memory configurations available via the Internet
- Full functionality on 6M (TS-570S) including DSP, 100 watts output and preset Auto Antenna Tuner
- QRP output adjustable from 5 to 100 watts

TS-570D/S (G) new features

■ TX sound quality monitor with 9-step monitor volume for absolute control over voice quality ■ NR1 (SSB) is operator controllable in 9-step increments, or automatically tracks input signal strength ■ New CW DSP Filters (80 Hz, 150 Hz and 500 Hz) give you a total of 11 user-selectable filters ■ NR1 and NR2 settings can now re-configure automatically when changing mode groups (SSB/AM/FM to CW/FSK) ■ Manual weight feature (with built-in electronic keyer) for adjusting the relative length of dots and dashes in 16 steps between 1:2.5 and 1:4.0 ■ Equalize receive signals, and use different settings for both TX and RX ■ "One-touch" DSP filter wide mode allows 'resurfacing' to check the band conditions when operating in narrow mode ■ Dual selectable Beat Cancel (BC) works against intermittent beat interference (except in CW mode) ■ CW auto tune mode links only with the RIT frequency without changing the transmit frequency.

Advance Technology Upgrade is available in new production models and for pre-existing TS-570D/S; contact you dealer for details.

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ZERO BIAS

AN EDITORIAL

Last month, as I was writing my editorial, I included the reference to those little yellow and green pads used to physically record "radiograms." Most of us can remember the pads, and some of us still have one or two around the shack. If you don't know what a radiogram is, you're probably well below the median age. Let's just say that when I described it, I did so in the context of an anachronism. Over the 45-plus years that I have been involved with amateur radio, I received three or four of these messages, usually a forty six or fifty (they have to be spelled out). I could have answered these simply with a fifty four, but I usually opted to pick up the phone and call. In the event that you might suspect, but question, that I have a phenomenal memory, rest easy. A recent club bulletin I received after I wrote the editorial had a full page of the ARRL Numbered Radiograms. While I get a load of e-mail these days, I do not get even one radiogram.

I don't advocate giving up the tradition of radiograms simply because we have e-mail. They're a nice, warm touch and a link to the past just like the young man in the visored cap, uniform, and leather puttees who delivered telegrams which are now, if used at all, phoned in. Things change and memories get sweeter and easier to assimilate. Perhaps we could use the numbered radiograms in our e-mail and link the two, forming a new classification of emission, EXX. It would also give us a new item for the amateur radio exam syllabus. Until then, why not try it out? Send an e-mail to the ARRL President, Rod Stafford, W6ROD, at <w6rod@arrl.org> and just simply say, "Dear Rod, Sixty Three," and sign your name. Don't worry. It's nothing bad or upsetting.

The operant word, in fact, for amateur radio is *upsetting*. We really fight tooth and nail over change (good or bad) and anything that removes us from our mind-set of how things should be. As a group, our comfort zone is best served by status quo. If we don't understand it, it can't be any good and certainly is not worth trying. As you know, we did get over the hurdle of computers, after initially vehemently denouncing them as having no place in amateur radio. Now most of us can't get along without them, and the bigger the better. True, we don't publish endless pages of code anymore. We simply buy software. We don't have to publish articles anymore on how to build the hardware and how it works (that turned a lot of people off), as it's readily available all over the place. In fact, we don't even have to buy the software anymore. A few people do buy it and then make copies for all their friends. It saves a few bucks and cuts out the middleman. It's amazing what can happen in a few short years.

About fifteen years ago, when I first met Buck Rogers, K4ABT, we talked about his packet column and the marvelous ability to pass pictures via packet radio, and color pictures, at that. It was truly amazing, especially fifteen years ago. I won't pretend that I fully understood what Buck was talking about, but it was evident to me that he understood it, was excited about it, and wanted to tell everyone else about it. We established the "Packet User's Notebook" column so he could let all of us know about the wonderful world of digital electronics and the things to come. Even then some readers really didn't want to know about things to come. To them it was an unwelcome, uncomfortable change from all the things they had gotten used to. Besides, it took spectrum space from them. Everything new seemed to have a price—and that price was a piece of the old.

Now packet radio, using techniques that were not even dreamed of fifteen years ago, is the backbone for amateur radio emergency communications in many areas of the country. In fact, we accept it as normal now—certainly not amazing, but normal. We've begun to lose the ability to comprehend what actually goes into the technology that we can glibly use and manipulate. It's still truly amazing, but fewer and fewer of us can appreciate how amazing it really is. We've lost the "feel" for how it goes together and how it works, but we consider ourselves technologically facile if we can use the equipment.

It's not uncommon now to have elaborate logging programs, spotting networks, DX clusters, weather nets, and all sorts of ancillary technology the purpose of which is to support and advance our traditional forms of communication. The times once again are changing, and somewhere on down the road we all will be impacted. The wonderful world of high-tech digital electronics is sort of wasted on our narrow-bandwidth, high-powered communication tradition.

In December, just as 1998 was drawing to a close, two things happened which in a way indicate where we all will be going somewhere on down that familiar road. The first thing involved Buck, who called me to discuss ways we could move towards having the ARRL finally come up with a band plan for the ten channels between 219 and 220 MHz. He talked about what could be done on those ten channels, and the vast number of amateurs who could simultaneously use that spectrum digitally. He pointed out that next month it will be four years since the ARRL started working on this plan, with nothing firmly resolved as yet.

My first thought was that Buck had something in mind for that space and increased speed of transfer. It took less than a week to find out from him that on December 11, 1998 he and another amateur had passed pictures and audio at the same time through two nodes at a distance of 250 miles. I'm sure you'll read all about it in his column next month. The ten channels now had the potential of supporting a lot of people exchanging very large amounts of information in relatively short periods of time using relatively low power.

The second thing happened a few weeks later, on the Monday before Christmas. The Monday, December 21, 1998 issue of *The New York Times* had a feature article in its business section (page C1) entitled "F.C.C. Mulls Wider Commercial Use of Radical Radio Technology," written by John Markoff. Basically, the author reported on three companies that have persuaded the FCC to rethink their regulations on "broadband, low power, digitally formatted pulsed information." Whatever they want to call it, it sounds as if spread spectrum is rearing its head for commercial use. When you read about and hear about what is being done right now, you have to think about the possibility of some profound author out there taking notes for the second volume of Clinton B. DeSoto's work "200 Meters and Down." Perhaps we (or our offspring) one day may be reading "6 Meters and Down." If you think about the possibilities and potential, it truly is amazing. At some point down the historical road, when the ten channels are finally allocated for use, it definitely will be possible (even now) to transmit and receive audio and video in real time at 64kb on packet.

No, I don't know for certain where it's all going to go. I just know that it's not staying here. We've been moving all along. It's just that we're moving faster than a lot of us thought. The great debates over licensing and CW are really anachronistic when we simply look at the technology in wide use today, not twenty years from now.

I guess if I had to come up with some sort of analogy as to where we are, I would probably look to the automotive industry. It's 1999 and all the beautiful, sleek, new model cars are out. They're all filled to the brim with some of the greatest electronics and audio systems known. Everything is marvelously displayed and controlled by a myriad of microprocessors to ensure our ultimate comfort, safety, and ease of driving. The only small problem in this luxurious experience of perfection is that the automobile itself is powered by an internal combustion engine, basically designed 100 years ago. While we love that engine and its horsepower, a thing of infinite memories, we really can't even do too much of our own work on it anymore without specialized knowledge and equipment for the electronics. It is safe to predict that at some point there will be something powering these automobiles equal in efficiency to the electronics, and then all we'll have are plug-in modules. We'll still have the car, but what it can do and how it does it will be far more complicated to explain. However, it will be a lot easier to use.

73, Alan, K2EEK

SPECIFICATIONS

FREQUENCY
10, 12, 15, 17, 20, 30, 40 M
(80 M with optional
R80 add-on)

HEIGHT
R7000 - 24 feet (7.3 M)
R7000+ (w/80m)
- 32 feet (9.8 M)

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

Outstanding Performance, Reliability, and Looks

The Cushcraft R7000 delivers top performance on seven bands in a package ready for home or portable use. The R7000 offers easy assembly, a small footprint, and a "stealthy" appearance in a manageable size. The R7000 is the best choice for all around HF use.

Our customers say it best!

Great Performer

"Making great DX contacts to South America and Europe - in poor propagation conditions. My God what will it be like when conditions improve? . . . can hardly wait . . . will add 80 meters soon. Thank you for an excellent product." N1XAE

Reliable

"The R7000 withstood several New England ice/snow storms with no damage." KA1WIU

Outstanding in its field!

Slim Silhouette

"I have antenna restrictions, but no complaints from neighbors!" KS4VN

Easy Installation and Tuning

"The use of similar size hardware is appreciated as this minimizes the number of tools I have to carry up the ladder . . . After following the R7000 printed instructions the antenna worked the first time. It has been a pleasant experience to put up a vertical antenna which performs to the manufacturer's specifications." K1NB

Automatic Band Changing

"Seven bands right out of the box with no tuning is impressive." WV0H

So, if you want an R7000 in your field…or yard… on the roof, or even on the RV for Field Day, contact your dealer today!

Visit our web site (**http://www.cushcraft.com**) for the latest R7000 news and details of our other fine products. You can review the manual and learn how the R7000 and R7000+ work.

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ANNOUNCEMENTS

K4US, from George Washington's birthday celebration, Alexandria, VA; Mount Vernon ARC; 1600–2100Z February 13–14 on 7.240 and14.240 MHz SSB and 10.110 or 18.080 MHz CW. For certificate send QSL and SASE to MVARC, P.O. Box 7234, Alexandria, VA 22307.

The following hamfests are scheduled for February and late January:

Jan. 31, **Maryland Mobileers ARC Post Holiday Hamfest**, Odenton Volunteer Fire Dept. Hall, Odenton, MD. Contact Bill Hampton, N3WGM, phone 410-766-2199; e-mail: <diamondB@space4less.com>. (Exams, by preregistration with Jerry Gavin, NU3D, 410-761-1423.)

Feb. 1, **West Valley ARC Radio Equipment Auction,** Clement of Rome Catholic Church Social Hall, Sun City, AZ. Contact WVARC, P.O. Box 1573, Sun City, AZ (602-582-8208; e-mail: <wødno@worldnet.att.net>).

Feb. 6, **West Memphis, AR First Hamfair Ever,** Eugene Woods Civic Center, West Memphis, AR. Contact Kellye Farris, KB5RCE, 432 Ross Avenue, W. Memphis, AR 72301 (870-732-8724; fax 870-732-5540; <dixiefest@media-two.com>; web: <http://www.media-two.com/DARG>. (Exams.)

Feb. 6, **26th Annual Charleston Hamfest,** Stall High School, North Charleston, SC. Contact Jenny Myers, WA4NGV, 2630 Dellwood Avenue, Charleston, SC 29405-6814 (843-747-2324; or e-mail: <brycemyers@aol.com>). (Exams.)

Feb. 7, **Chestnut Ridge ARC 5th Hamfest & Fleamarket,** Latrobe American Legion, St. Latrobe, PA. Contact Chris Weiss, K3JDU (724-537-6068); or C.R.A.R.C., P.O. Box 175, Loyalhanna, PA 15661-0175.

Feb. 13, **Westfield, NY Hamfest/Computerfest,** Westfield Exempt Volunteer Fireman's Assn., Westfield, NY. Contact Eric Kroon at: <ekroon@netsync.net> or 716-595-3220. (Exams.)

Feb. 13, **Algonquin RC Fleamarket,** Marlborough Middle School, Marlborough, MA. Contact Ann Weldon, KA1PON, before 9 PM at 1-508-481-4988; or AARC, Box 258, Marlborough, MA 01752.

Feb. 13, **Hiawatha ARA 20th Annual Swap & Shop,** Negaunee Township Hall, Negaunee, MI. Contact Bob Serfas, N8PKN, 906-226-9782, or John Veiht, N8RSE, 908-228-9417.

Feb. 13, Cherryland ARC 26th Annual Swap-n-Shop, Immaculate Conception Middle School, Traverse City, MI. Contact Joe, W8TVT, 616-947-8555, or Chuck, W8SGR, 616-946-5312.

Feb. 13, **Harrisburg RAC Valentine Hamfest,** Oberlin Fire Company, PA. Contact N3NJB, 2501 S. 2nd St., Steelton, PA 17113-3009 (717-939-4825; e-mail: <n3njb@juno.com>). (Exams)

Feb. 14, **Mansfield Mid*Winter Hamfest/Computer Show,** Richland County Fairgrounds, Mansfield, OH. Contact Pat Ackerman, N8YOB, 63 N. Illinois Ave., Mansfield, OH 44905 (SASE), or call 419-589-7133 after 2 PM EST.

Feb. 14, **Aurora Repeater Assn. Swapfest,** Adams County Fairgrounds, Brighton, CO. Contact Wayne NØPOH, P.O.B. 473411, Aurora, CO 80047-3411 (303-699-6335; e-mail: <nrclog@aol.com>. (Exams.)

Feb. 14, **Davenport, IA ARC 28th Annual Hamfest/Computer Show,** QCCA Expo Center, Rock Island, IL. Contact (with SASE) Kent Williams, K9UQI, 4245 10th Street, East Moline, IL 61244-4154 (309-796-0718 [4-9 PM only]; fax 309-796-0629 [24 hour]; e-mail: <k9uqi@arcsupport.com>).

Feb. 20, **Salem Hamfair,** Polk County Fairgrounds, Rickreall, OR. Contact website: <http://sra.goldcom.com/sraflyer.htm>, or call Evan Burroughs, N7IFJ, 503-585-5924 (before 8 PM), or e-mail: <n7ifj@teleport.com>.

Feb. 20, **Hernando County ARA 17th Hamfest,** Spring Hill VFW Post 10209, Brooksville, FL. Contact Ralph Wilson, AF4FC, 352-754-9653 or Jim Angello, KE4SZP, 352-688-5214; e-mail: <iangello@fiber-net.com>.

Feb. 21, **Winter 1999 Long Island Indoor Hamfest,** Freeport Armory, Freeport, NY. Call LIMARC 24 hr. infoline: 516-520-9311, or write to: LIMARC Hamfest, P.O. Box 392, Levittown, NY 11756; web: <http://www.limarc.org>; e-mail: <hamfest@limarc.org>. (Exams.)

Feb. 21, **Burnaby ARC 11th Annual Fleamarket,** New Westminster Armouries, New Westminster, BC, Canada. Contact Harry, VE7HNC, 604-530-3962 (7–9 PM PT).

Feb. 21, **Greater Boston Antique Radio Collector's Fleamarket**, Westford Regency Inn, Westford, MA. Contact ARC, 978-371-0512, e-mail: <arc@antiqueradio.com>.

Feb. 21, **Livonia ARC Swap 'n Shop,** William M. Costick Activities Center, Farmington Hills, MI. Write to Neil Coffin, WA8GWL, Livonia ARC, P.O.B. 51532, Livonia, MI 48151 (SASE); 734-261-5486; web: <www.larc.mi.org>, e-mail: <swap@larc.mi.org>.

Feb. 27, **N. Vermont Winter Hamfest & ARRL State Convention,** Milton High School, Milton, VT. Contact W1SJ, 802-879-6589, e-mail: <w1sj@vbimail.champlain.edu>, or web: <http://www.ranvtogether.com>. (Exams.)

Feb. 27–28, **Great Lakes Division Communications & Computer Convention,** Cincinnati Gardens Exhibition Center, Cincinnati, OH. Contact Bob Garfield, W8MRG, 513-791-6300; <bobgarfield@juno.com>. (Exams.)

Feb. 28, **4th Annual South Hills Hamfest,** Castle Shannon Volunteer Fire Dept. Memorial Hall, Castle Shannon, PA. Contact Steve Lane, W3SRL, 412-341-1043; <slane@adelphia.net>; web: <http://www.hky.com/~sanfordb/index.htm>.

Feb. 28, **Vienna Wireless Society 23rd Winterfest,** Annadale, Virginia campus of the Northern Virginia Community College, in gym of Ernst Cultural Center, Vienna, VA. Contact Jim Parsons, WA4LTO, 703-392-0150; e-mail: <k3mt@erols.com>; web: <http://www.erols.com/k3mt/vws>. (Exams.)

Feb. 28, **21st Annual Fayetteville Hamfest,** Fayetteville HS, Fayetteville, WV. Write to PARA Hamfest Committee, P.O. Box 96, Fayetteville, WV 25840, or call Mike Skaggs, 304-658-5789. (Exams.)

Feb. 28, **Cuyahoga Falls ARC Hamfest, Electronic & Computer Show,** Emidio & Sons Party Center, Cuyahoga Falls, OH. Contact Carl Hervol, N8JLQ, 11192 Cottingham Circle, Uniontown, OH 44685-9185 (330-497-7047).

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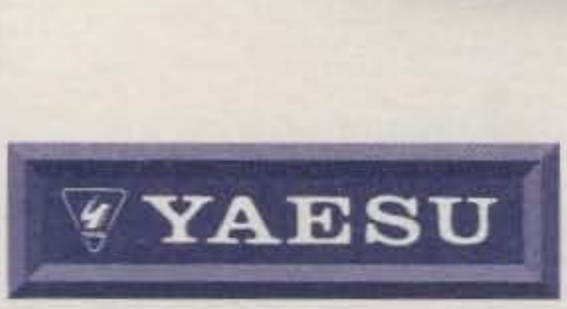

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The term "sea level" in Lesotho is probably an abstraction, as everything there is thousands of feet above sea level. ZS6HZ tells us about his group's DXpedition to Lesotho to give out RTTY and SSTV contacts.

7P8 DXpedition to Lesotho

BY MARC LURIE*, ZS6HZ

I own an amateur radio dealership in Johannesburg, and in early November 1997 Dave Plaskett, ZS6RVG, telephoned me and asked if I knew where to get a small Yagi antenna for a DXpedition he was planning in Lesotho. As luck would have it, I had just managed to get myself a Hy-Gain Explorer-14 that I was planning to use at my QTH. Dave was even more surprised when I told him that I knew Lesotho very well, having done extensive business there over the prior three years. When he found out that I owned a four-wheel-drive vehicle, the die was cast, and I was invited along for the DXpedition. The main purpose of the DXpedition was to operate RTTY and SSTV from 7P8. We knew there would be immense interest in these modes from all over the world, so we were very excited about the plan.

Lesotho is a very small and very poor landlocked country that is entirely surrounded by South Africa. It is only a little larger than Maryland and is known as "The Mountain Kingdom" or "The Roof of Africa" because of the majestic Maluti Mountains that make up almost 80% of the country. Some of the locals joke that if Lesotho were flattened out, it would be bigger than all the other African countries combined. Lesotho has the honor of having the highest and lowest point of any country in the world. The lowest part of Lesotho is 1400 meters (±4600 feet) above sea level, while the highest point in Lesotho (about 10 km from Sani Top) is 3482 meters (±11500 feet) above sea level. It gained independence from Britain in 1966, and is currently a Constitutional Monarchy under King Letsie III. It has practically no mineral wealth, but it does have an abundance of the Southern African region's most scarce commodity—water. The Lesotho Highlands Water Venture is an enormous venture to supply water from the massive Katse Dam to South Africa via an 86 km (54 mile) long, 5 meter (16 foot) diameter tunnel bored through basalt lava and dolerite.

The 1998 7P8 DXpedition QSL.

There were four of us involved in the Lesotho DXpedition: Evan, ZR6IRH; Dave, ZS6RVG; Dick, ZS6CAL; and myself, ZS6HZ. Licensing was no problem at all, and we obtained permission to use our own callsigns as long as we used the prefix "7P8.

It was decided that Dave, Dick, and Evan would leave Johannesburg on the morning of Thursday, 19 February, while I would leave the following afternoon because I couldn't leave sooner due to work commitments.

The first team set off on schedule and entered Lesotho through the picturesque Sani Pass in the east of the country. Access to this 20 km pass is restricted to four-wheel-drive vehicles only, and with good reason. While the path is easily negotiated in good weather, the climate has the reputation of changing very rapidly. You could start the ascent up the pass in clear, hot weather, only to find that the road has become a mud bath after a sudden downpour of rain. The top of Sani Pass is almost 3000 meters above sea level, and snow has been recorded there

*P.O. Box 314, Bergvlei, 2012 South Africa
e-mail: <zs6hz@global.co.za>

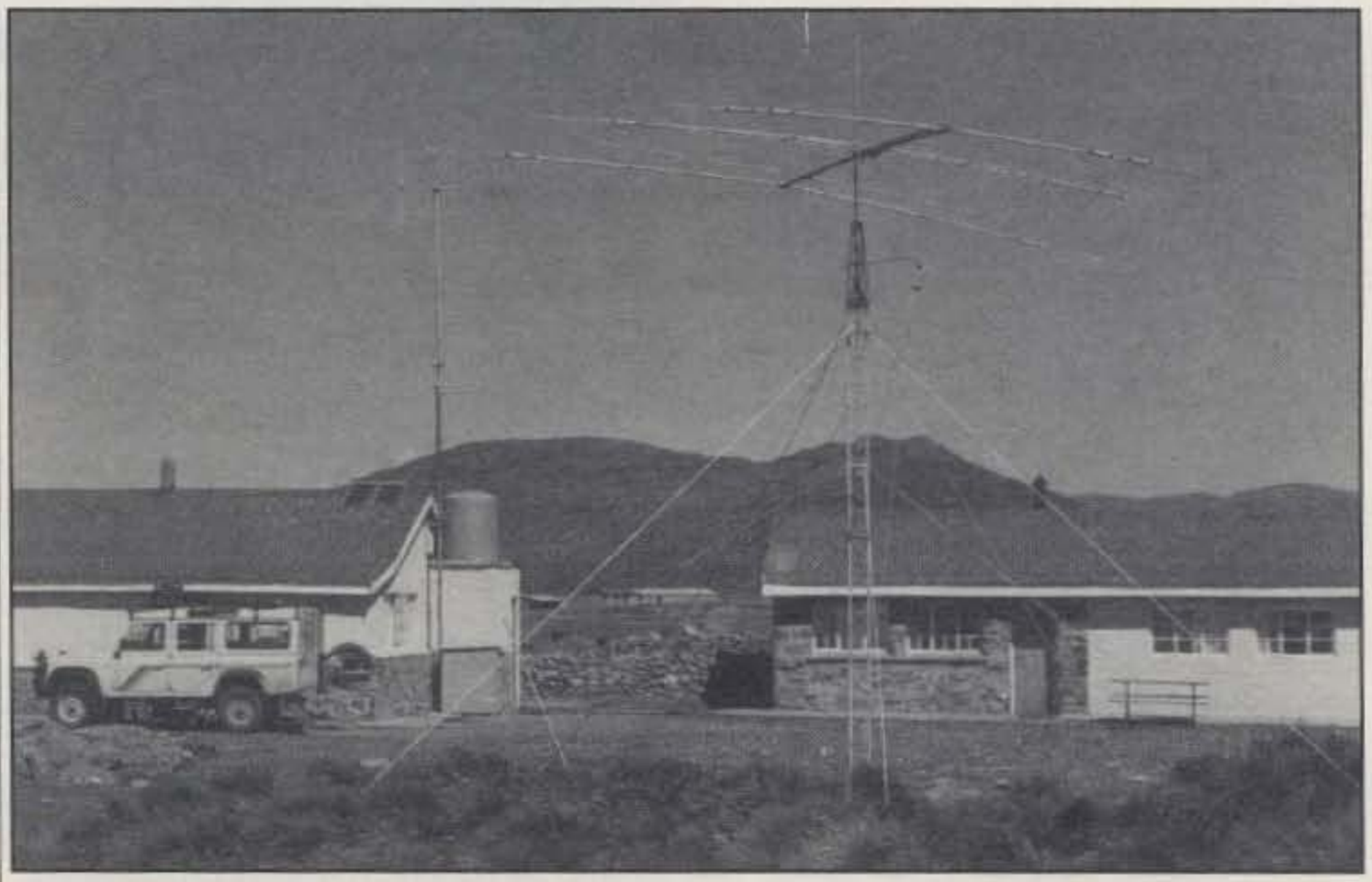
Dave, ZS6RVG, operating SSB on 14 MHz.

in every month of the year. It is well known among travellers in the rugged areas of Lesotho that one must take enough food, water, and clothing for 3 days in summer, and for at least 14 days in winter.

The final 7 km of the pass takes about an hour's drive, through tortuous hairpin bends and over jagged rocks and boulders. The Sani Top Chalets are situated about 200 meters past the Lesotho border post at the top of the Sani Pass, and are made up of several rooms, a bar (which is reputed to be the highest pub in Africa), a dining room, and a lookout lounge. Accommodations were basic, but at least there was hot water, good food, and warm beds.

It was too late that evening to set up the complete station, so after setting up the radios—an ICOM IC-735 and an ICOM IC-751—the team went to bed, exhausted from the 10 hour drive.

The next morning proved to be an example of how the weather can change in Lesotho. What had been a calm, clear morning turned into a freezing blizzard with gale-force winds. The antennas had to be erected somehow, though, and



View of our Explorer-14 antenna for 10, 15, and 20 meters, with Dick's Land Rover on the left the Sani Top Chalets in the background. Notice the commercial VHF antennas to the right of our HF beam. They are the only link to the rest of the world when Sani is snow-bound for weeks on end.

The team (from left to right): Evan, ZR6IRH; Dave, ZS6RVG; Dick, ZS6CAL; and Marc, ZS6HZ.

the team managed to erect the 8 meter high mast with the Explorer-14 without serious mishap. There were anxious moments when the wind suddenly picked up, and the winch on the front of the Land Rover had to be used to stop the whole structure from blowing over. With the antenna finally up, Dave set about trying to work DX.

I arrived late Friday night after an uneventful 10 hour drive to find Dave happily working RTTY with large pile-ups in the USA and Europe. There had been an emergency; the manager at the Chalets had suddenly become very ill. Evan and Dick drove her to the nearest hospital, about two hours away in Mokgotlong, where it was suspected that her appendix had ruptured. She was very lucky to have us around, as the only mode of transport would usually have been by pony.

Friday night's DXing was very productive, and we worked SSTV and RTTY into Europe and the USA, as well as South America. I also worked some SSB when the SSTV operators took a break and had some nice pile-ups into the USA on 20.

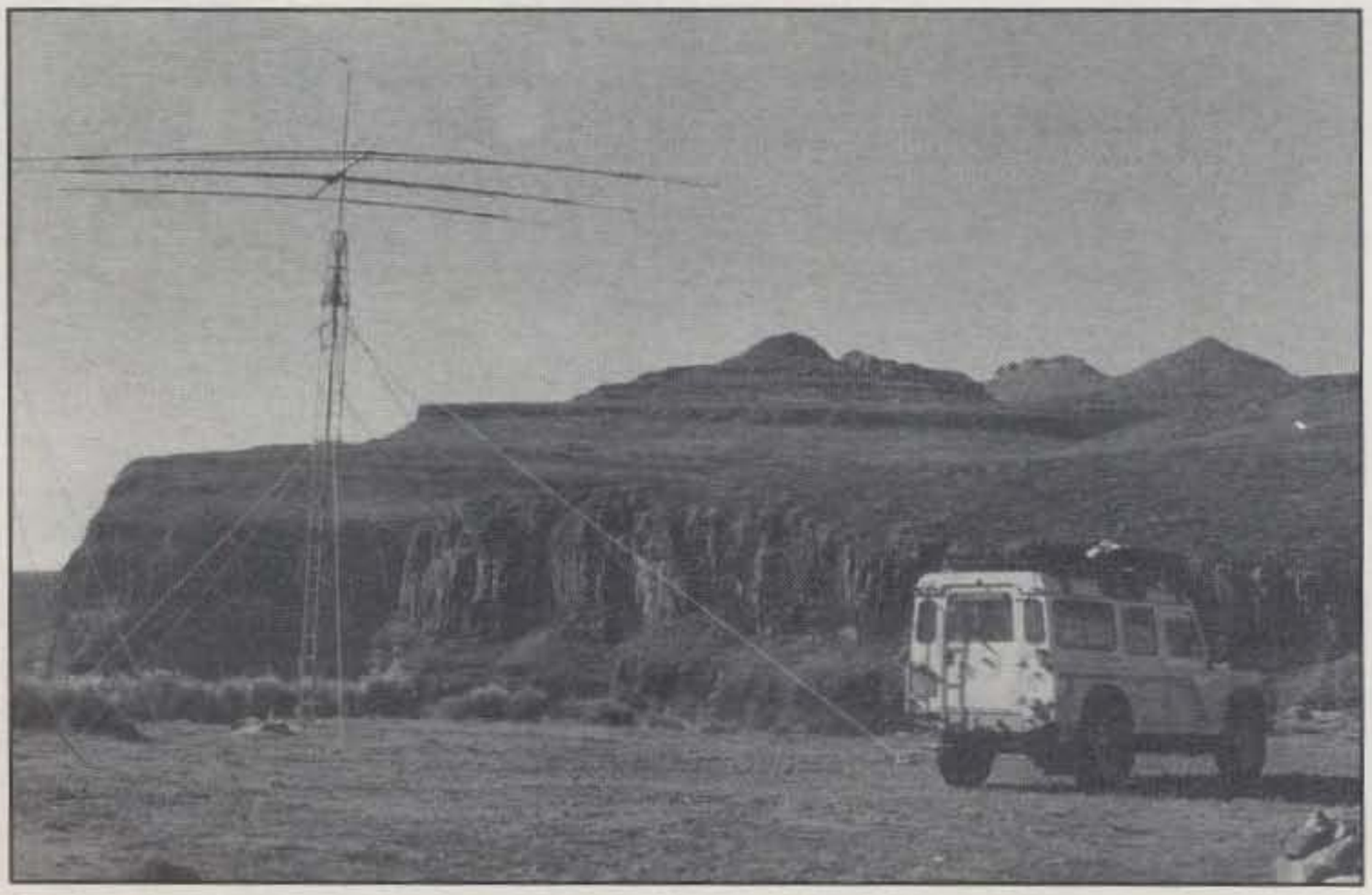
Saturday morning was overcast, wet, and cold. Dick and I erected the 12 meter pole for the 40/80 meter dipole, and by the time we finished, we were soaking wet and freezing. Operation during most of Saturday was disappointing. The bands remained relatively dead until around 1600 UTC when the USA started to come through. In spite of all our efforts, and skeds with Japanese stations on 14 MHz, we heard no Japanese or Pacific stations at any time or on any band for the entire four days. After the poor conditions during the day, we were unprepared for the opening that happened from around 1700 to 2200 UTC. The 20 meter band was wide open to all call areas of the USA and most of Europe. Dave and Dick worked RTTY and SSTV through most of this time, but gave me an opportunity to work SSB for about an hour and a half.

From left to right: Dick, ZS6CAL; Evan, ZR6IRH; Marc, ZS6HZ; and Dave, ZS6RVG; with our two trusty Land Rover four-wheel-drive vehicles.

Sunday was almost a carbon copy of Saturday. It was wet and cold, and DX conditions were poor. Several Southern African contacts were made on 7 MHz, as well as one ZS5 station on 50 MHz. The same band openings as had happened on Saturday happened from about 1600 UTC on Sunday.

Monday brought with it a beautiful, clear day. The wind had died down, and we sadly lowered the antennas and packed away the equipment. We had a final cup of coffee in Lesotho and wound our slow and tortuous way down Sani Pass back to South Africa.

All in all we had made 707 contacts in 56 countries: 39 on SSTV, 137 on RTTY, and 529 on SSB. In spite of the fact that all operators were relatively new to DX-peditioning, I think we did a very good job. We have a lot to learn about RTTY pile-ups, and we have to apologize to the many stations we didn't work due to our inexperience. We enjoyed the whole exercise fully, and have started making plans to visit some of the other countries in our area. Within easy reach of Johannesburg are Botswana (A22), Mozambique (C9), Swaziland (3DAØ), Zimbabwe (Z2), and Namibia (V5), and it is quite possible we will visit Mozambique in the near future. ■



View of Marc's Land Rover and the Explorer-14 antenna. In the background are some of the beautiful mountains of Lesotho. The cliffs behind the antenna plunge down the Sani Pass toward South Africa some 2000 meters (6500 feet) below.

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Power Curve -- typical B-310-G output power							
Watts Out	*25*	*50*	*75*	*95*	*100*	*100+*	*100+*
Watts In	*¼*	*½*	*1*	*2*	*4*	*6*	*8*

- *100 Watts out with all handhelds up to 8 watts*
- *All modes: FM, SSB, CW*
- *Great for ICOM IC-706*
- *15 dB low noise GaAsFET preamp*
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Power Curve -- typical B-34-G output power								
Watts Out	*18*	*30*	*33*	*35+*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*

- *35 Watts Output on 2 Meters*
- *All modes: FM, SSB, CW*
- *18 dB GaAsFET preamp*
- *Reverse polarity protection*
- *Includes mobile bracket*
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Power Curve -- typical BD-35 output power							
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Watts Out (440 MHz)	*16*	*26*	*32*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*

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6 Meter Amplifier

FCC Type Accepted

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70cm Amplifiers (420-450 MHz)

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Amateur TV Amps

Industry standard ATV amps -- **D-1010-ATVN, $414**, 82 watts PEP out / 10 in. **D-100-ATVN, $414**, 82 watts PEP out/2 in. (without sync compression).

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50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

1¼ Meter Amps (223-225 MHz)

Choose from 10 models -- 20 to 220 watts out for 2 to 50 watts in, $129 to $655.

Commercial Amps ($199 to $395)

FCC Type Accepted

Commercial amps for 150 - 174, 450-470 MHz and VHF marine bands, 70 -130 watts out.

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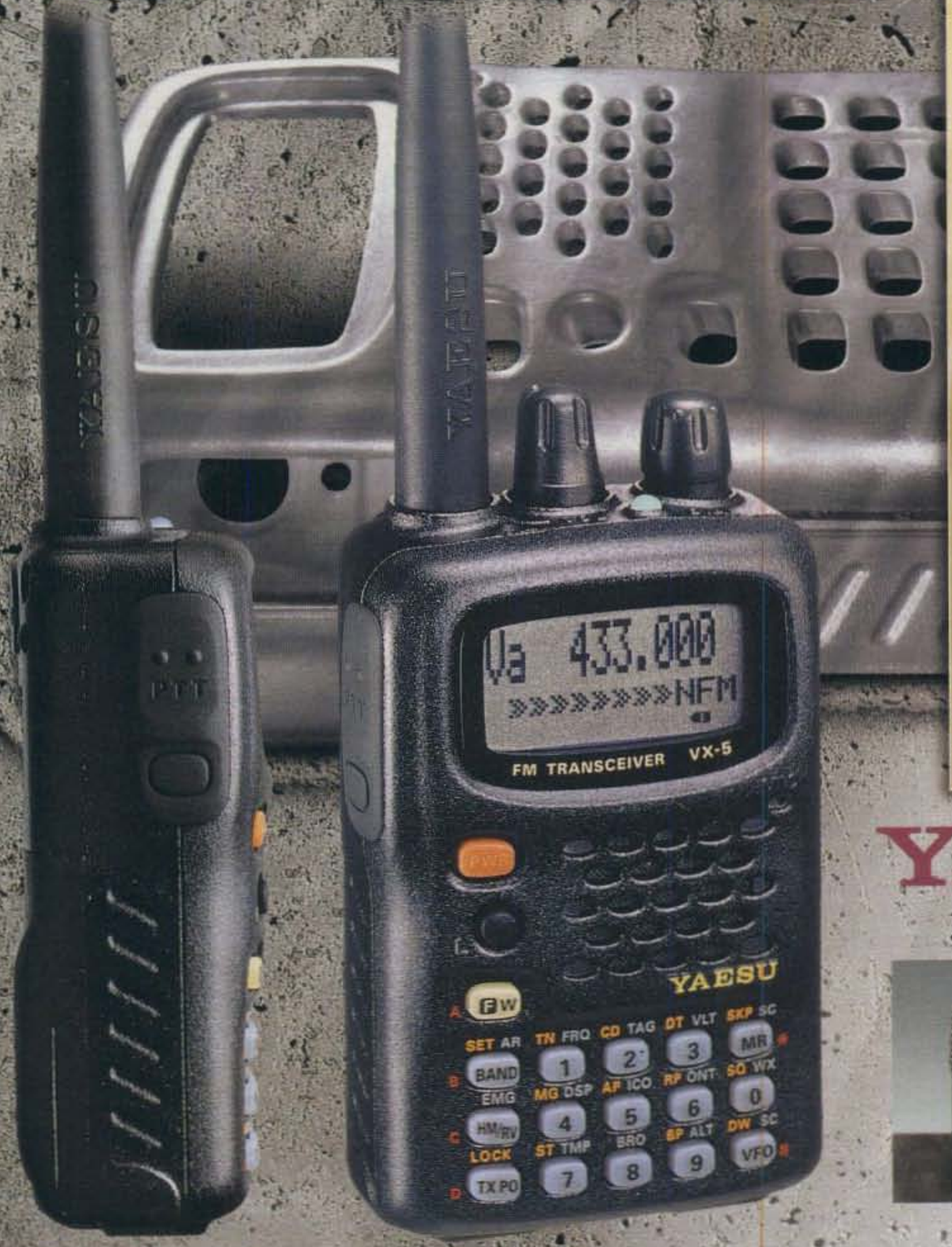

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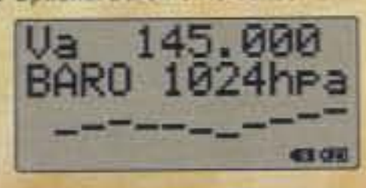

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CQ REVIEWS

The Heil Sound HM-10 Microphone and HMP ICOM Preamplifier

BY LEW OZIMEK*, N2OZ

I have been a satisfied user of an ICOM IC-735 transceiver for a number of years. It has performed reliably, and I have found that it includes many of the operating features I deem desirable. I have never had any complaints about the quality of my SSB transmissions and never suspected that ICOM transceivers, as well as those of other manufacturers, may have subtle audio deficiencies. This potential problem was disclosed in a brochure published by Bob Heil, K9EID, founder and guiding light of Heil Sound Ltd., Fairview Heights, Illinois. To say that this pronouncement was a surprise to me would be a significant understatement, as no such problem ever was reported to me during my many contacts on the air.

To provide a solution to amateurs, Heil Sound developed a series of products which culminated in the current "Key Element™" microphone series. Two different microphone elements are offered, the HC5 Key Element and the HC4 DX Dream Machine Element.

The HC5 provides full-range SSB audio with a shaped response in the frequency spectrum of 350 to 4000 Hz. A 6 dB peak was added at 2100 Hz along with a sharp roll-off of frequencies under 300 Hz and above 3100 Hz.

The other element, HC4, provides a high-pitched, pile-up busting frequency response covering 500 Hz to 3800 Hz. It has a 10 dB peak at 2100 Hz and a sharp 12 dB per octave roll-off below 500 Hz and above 3800 Hz. The specifications for the HC4 were selected by Heil Sound as those they considered necessary to develop the audio punch needed for SSB DX. The criteria used was based on the Fletcher-Munson Curves created in 1933 to define the detection capability of the human ear. These curves are universally used, even today, in the analysis of typical human audio perception.

Since the Fletcher-Munson Curves showed that humans lost ability to detect in the 1500 to 2100 Hz range, Heil Sound concentrated their compensating factors in that area. The response curves of the Heil elements are shown in fig. 1. The

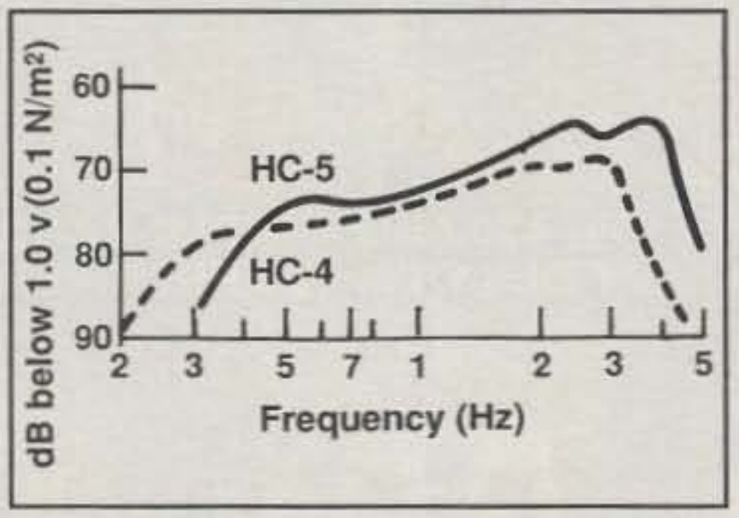

Fig. 1– The typical response curves for Heil Sound microphone elements as measured with a 2000 ohm resistive load.

impedance for either one is 2000 ohms at 1000 Hz and they work well into low (500 to 600 ohms) and medium (2000 to 5000 ohms) inputs.

These microphone elements are small enough (0.530 × 0.850 × 0.310) to be installed as direct replacements in existing transceiver microphones. If the user prefers to purchase a completely assembled microphone, Heil offers boom or hand-held units (with desk stand option) which include these microphone elements. The standard studio-style hand-held, HM-10, is available with either type of element. The HM-10 Dual Unit includes both element types built into a single body; either element can quickly be selected by a micro-switch located on the microphone assembly. These microphones can be used with any amateur transceiver, but the manufacturer must be specified at the time of purchase, as interface cables vary for different makes of transceivers.

The normal installation procedure of the HM-10 in most commercial transceivers merely requires removal of the microphone provided by the transceiver manufacturer and plugging in the Heil microphone using the appropriate interface cable. If the original microphone element only is removed and replaced by a Heil Key Element, no new cable is required.

The Heil Elements are designed with a gain factor 10 dB lower than other microphones to minimize pick-up of stray noise which may exist in the shack. Some increase in the setting of the transceiver microphone gain control, however, is usually required as compensation for the reduced gain of the microphone. Once the controls are properly set, per Heil Sound, speaking into the microphone held about an inch away from the lips creates an articulate signal with no external noise.

With ICOM, however, some special changes must be made in order to use the Heil Key Elements because of the following factors:

1. ICOM designed their transceiver pre-amp section about 10 dB low in gain and supplied a mic with a built-in amplifier to correct for low gain in the transceiver.

2. A +8 volts is superimposed on the audio lead by the transceiver to power the amplifier in the microphone.

Because of the reduced gain in the Heil microphone coupled with the inherent low microphone pre-amp gain of the ICOM, the ICOM transceivers usually cannot generate enough gain, even when set at their maximum, to operate with the Heil microphone. Also, the bobbin-wound dynamic Heil Elements *must* be de-coupled from the DC voltage supplied by the transceiver. The AD-1 interface cable, which is provided for an installation of an HM-10 microphone in an ICOM, includes a 0.47 mFd capacitor in series with the audio lead to block the DC voltage and prevent it from being applied to the Heil Element. In those installations in which the Heil element alone is installed as a replacement in the ICOM microphone and the special interface cable is not used, the source of the +8 volts must be cut or removed in the transceiver. In either case, the problem of inadequate gain still remains to be solved.

Both problems can readily be corrected in the transceiver. Fig. 2 is a typical circuit diagram of the affected area in an ICOM transceiver. Cutting the lead to or removing resistor R81 will effectively break the DC path of the +8 volts. Increasing the resistance of resistor "FDB" to a total of about 270 K ohms will restore the microphone pre-amp gain of the transceiver and permit full operation.

These changes are easy to make because the resistors are mounted vertically on the internal printed circuit board.

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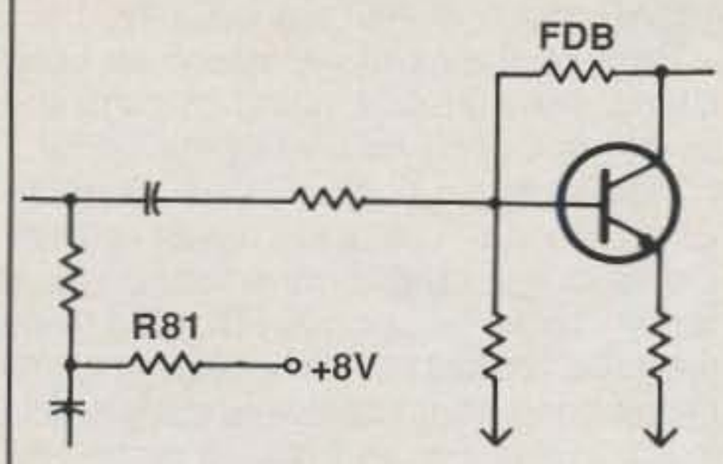

a. Remove resistor R81 (or cut leads) to remove DC voltage on audio line going to microphone.

b. To increase transceiver microphone preamp gain, increase resistance of feedback resistor "FDB" by adding 150 K to 220 K ohm resistor in series. (Total resistance approx. 270 K ohms.)

Model	Resistor	Original Value
IC-781	R308	56 K
IC-735	R235	100 K
IC-765	R305	82 K
IC-751	R264	82 K

Fig. 2– Typical ICOM transceiver circuitry showing the areas where changes are required in order to use it with an HM-10 microphone.

The component part numbers, however, should be verified with the schematic which applies to your model and serial number before making any changes. If these modifications are being made by the user, it is also recommended that the DC grounds on pins 6 and 7 of the 8-pin Foster plug be checked to ensure that they are at the same ground potential. Tying these two pins together and connecting the resultant pigtail lead to a small Phillips-head screw on the cable clamp will prevent ground problems and solve any RFI and audio feedback problems which have been traditionally reported in ICOM units.

To simplify the entire process for ICOM users, Heil Sound has developed an adapter, Model HMP, which permits direct use of the HM-10 microphone without any need for modifying the ICOM transceiver. The HMP is actually a pre-amp which provides 8 dB of gain to compensate for the ICOM reduced pre-amp gain. This increase restores the full operational capability of the ICOM with the Heil Key Element. The HMP also includes 4dB of equalization at 1500 Hz, the center of the voice range, to improve the quality of the transmitted signal.

After reading the literature describing the problems involved and the corrections required, I was quite anxious to determine the extent of audio deficiency in my ICOM, if any, and to evaluate performance using the Heil Sound Key Elements. I checked my transmitter settings using the ICOM microphone and found that setting the transceiver mic gain approximately at the halfway point gave me full ALC. Substituting the HM-10 Dual Microphone and "close speaking" into it as recommended by Heil Sound also gave me a full ALC reading without changing the gain of the transceiver microphone amplifier.

Heil Sound did report that tests run by a team of ten DX contest operators showed that the Key Elements provided a capability of breaking through pile-ups and otherwise improved overall ability to make contacts. The balance of my evaluation of the Heil Sound Key Elements then was aimed at seeing how readable my voice transmissions would be when signal conditions were poor and competition to make contacts was strong.

I decided to run additional tests on 20 meters with the ICOM 735 operating barefoot. My first contacts were made using the original ICOM-provided microphone. When I shifted to the HM-10, however, the other stations reported that my audio signal was very distorted and difficult to copy. Reverting back to the ICOM microphone restored the quality of my audio.

The first step which seemed appropriate was to have the new Heil microphone checked out by Heil Sound. Bob Heil himself checked out my microphone and found it to be operating properly in all

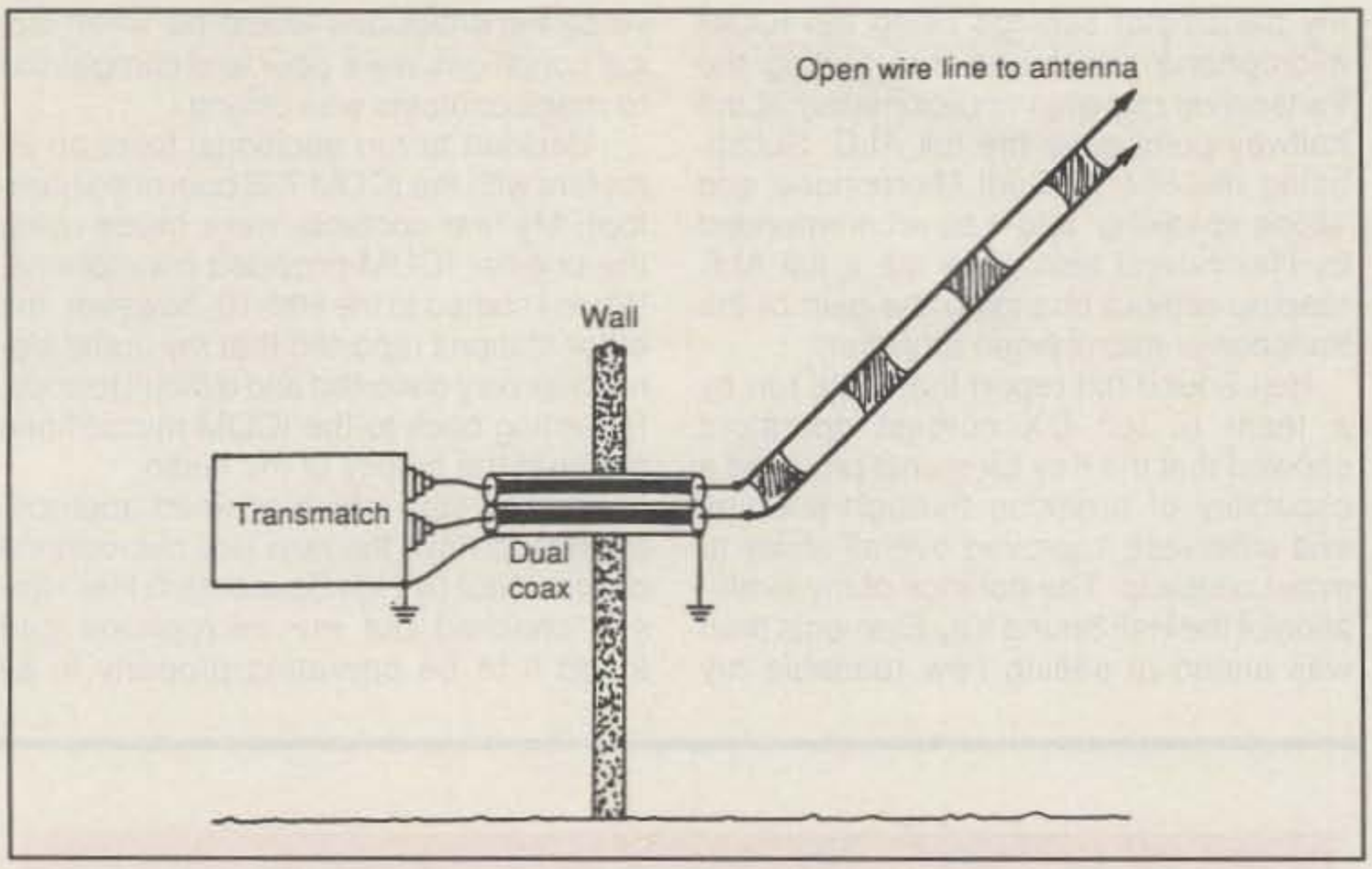

Fig. 3– The method used to remove stray RF in shack. By running dual coax, with the shields grounded, from the transmatch to the open-wire feeder, the problem was cured.

respects. The problem then had to be with my station setup or possibly my transceiver. After discussion with Bob, I came to the conclusion that I was probably having a problem with stray RF in my shack which was being picked up by the microphone and distorting the voice transmissions. This most likely did not occur in the earlier tests because the power output level was so low. The only possibility of RF feedback had to be from my open-wire feed lines which run from my transmitter, through a plastic window pane, and outside directly to a horizontal loop antenna. If RF truly existed in my station, I would never have been aware of it had it not been for the tests of this microphone.

I replaced the open-wire feed line in my operating area with two parallel sections of coax. The center conductors were used to carry the signal and the shields were connected to ground. Replacement of that section of feed line only took a few minutes, but I was very careful to ensure that the outside shields were properly connected to ground. A drawing of this installation is shown in fig. 3. The insertion of the approximately 8 foot lengths of parallel coax lines into the antenna feed path did not adversely affect my transmitter performance. My antenna tuner was able to achieve a 1 to 1 SWR match without any difficulty.

Back on the air at my station on Long Island, New York, I tuned through the spectrum looking for a likely station for a contact. I heard a good signal from Orlando, Florida. A call gave me an immediate response and a reasonable signal report with some fading (QSB). I had made the initial contact using the original ICOM microphone. My contact was happy to help in my evaluation, so I shifted to the Heil HM-10 microphone. The reports I received were outstanding! My RF problem was gone and my audio quality was excellent. The Florida operator was able to identify differences in the highs and lows between the ICOM and Heil, and he even detected the difference between the HC 5 and HC 4 Elements. In fact, when I used the HC 4 Dream Machine unit, he reported that my signal was readable even though there was a significant amount of fading on the signal—that is my voice was perfectly legible despite a significant drop in signal strength. This was an identical report to that given to Bob Heil by his DX Test Team.

I repeated the test with a number of other stations and received equivalent reports. These contacts included a station in Sweden, one in Wales, one in California, and one in South Africa. These results, made under typical day-to-day operating conditions, were enough to convince me that the performance of the Heil Key Elements were accurately described by Heil Sound. It is of interest to note that the voice compressor in the ICOM 735 is fully operational when using the Heil unit. In fact, most listeners preferred the signal with the compressor on.

I have put away my original ICOM microphone and am now using the HM-10 exclusively. A flick of the thumb is all it takes to switch from the HC-5 to the HC-4 DX unit. No change in control settings is required. My only negative is the fact that the hand-held unit is a little heavy and after using it for a while my arm got tired. It probably will be beneficial to add a table base mount, such as the Heil TB-1 or the Heil MA-1 Boom and Clamp Assembly, as well as a foot switch to improve the comfort of operating and to free my hands. I plan to continue testing the microphone assembly and expect it to continue to provide improved performance over that of the original microphone. One big bonus is that I detected a potentially dangerous situation in my shack, stray RF, and was able to correct it easily. And to top it all off, I was able to improve audio performance despite the fact that I originally did not even know I had an audio quality problem.

The HM-10 is priced at $63.96 and the HMP $54.99. Both are products of Heil Sound Ltd., 5800 N. Illinois, Fairview Heights, IL 62208, 618-257-3000, fax 618-257-3001. ■

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Last month we began with identifying some of the components of antenna pattern graphics. In this concluding part we will examine remaining details as well as points of comparison. These patterns are not just pretty pictures. They convey a tremendous amount of information either by inclusion or exclusion, and we should know the difference.

How To Get the Most Out of Antenna Patterns—Part II

BY L. B. CEBIK*, W4RNL

This month we take up with the discussion of antenna patterns by considering what happens to the azimuth pattern when we place our Yagi over real ground.

An azimuth pattern at zero degrees elevation—the horizontal plane—will show nothing. In fact, most NEC-based programs will disallow your attempt to take that pattern. Instead, we take azimuth patterns at some higher angle of interest. The question now is what is interesting.

In the absence of any other considerations, most folks who present azimuth patterns over real ground do so at the take-off angle. Fig. 11 is an illustration using our handy Yagi. The pattern shape is quite similar to the free-space azimuth pattern in figs. 4 through 7. However, there are some important differences.

The free-space azimuth pattern was a true horizontal pattern. The pattern over ground is a cone elevated from the horizontal by the specified elevation angle. Since the take-off angle of this antenna is 14 degrees, the azimuth pattern is a cone 14 degrees above the horizon. You can picture this best by drawing a line straight across the elevation pattern at a point 14 degrees up from the horizontal on each side of the graph.

The pattern shows a front-to-back line. This ratio is not necessarily the maximum front-to-back ratio for the antenna (although it often is). Rather, it is the front-to-back ratio for the chosen angle (14 degrees). Maximum front-to-back ratio (or front-to-rear) may be at some other angle. To get an idea of where it may be—or whether it might be different enough to be notable—simply look at the elevation pattern in the rearward direction. Or, specify some other elevation angles for the azimuth plot.

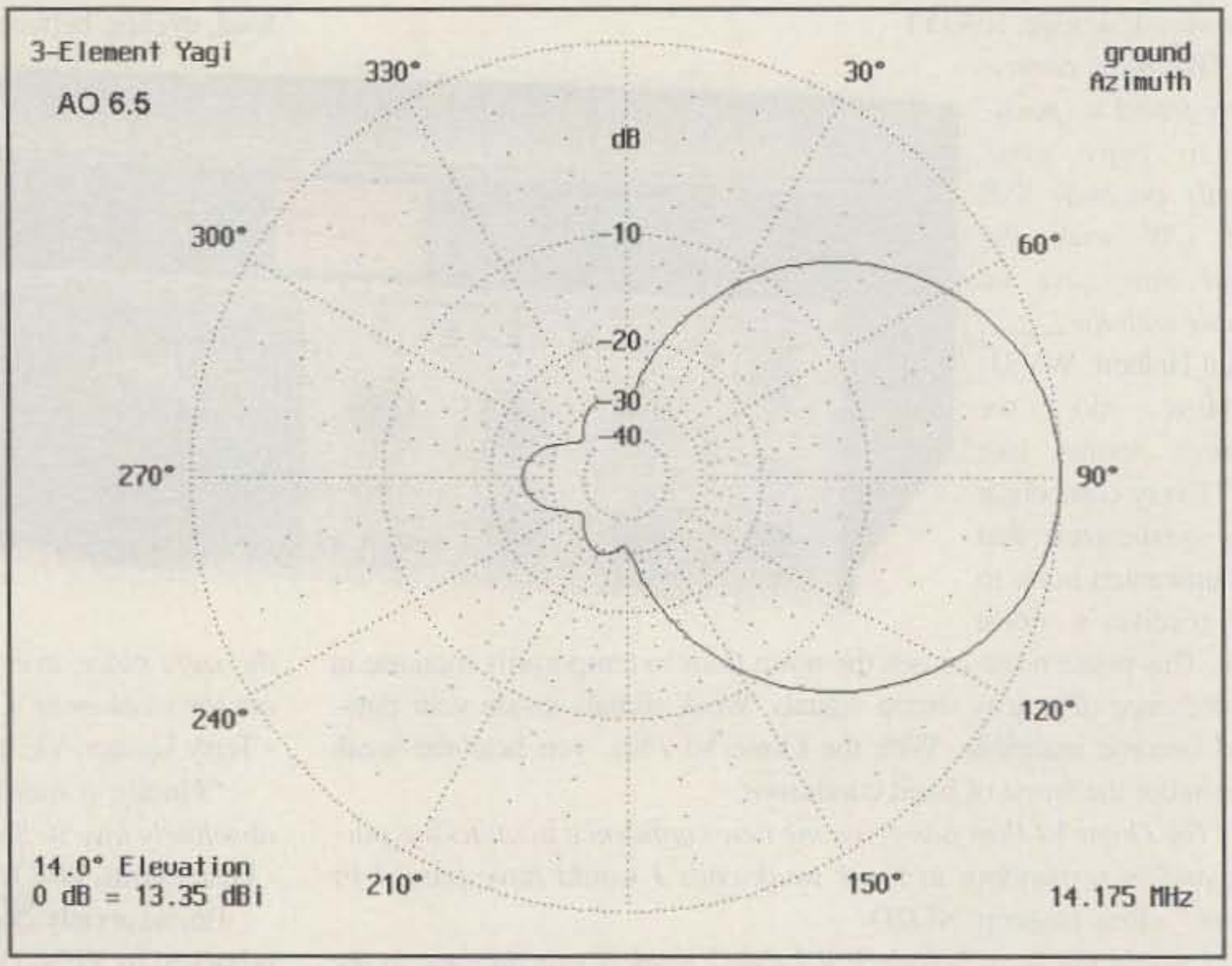

Fig. 11– Azimuth pattern of a 3-element Yagi one wavelength over average ground, at an elevation angle of 14 degrees (elevation angle of maximum radiation).

Although the take-off angle is a handy reference point in many cases, it may not be the most important one. Antenna builders may be more interested in particular paths to the stations they wish to work. If we work a lot of DX, then lower angles—perhaps in the 5- to 10-degree range—might interest us for some paths. In these cases, the antenna modeler and builder might show a lower angle for his or her chosen azimuth pattern. Fig. 12 shows the azimuth pattern for our one-wavelength high Yagi at a 5-degree elevation angle. Note the reduced gain and slight change of pattern shape. In contrast, near-vertical incidence skip is of interest to a number of amateurs, and very high angle radiation may dictate what azimuth pattern they choose. Hence, it

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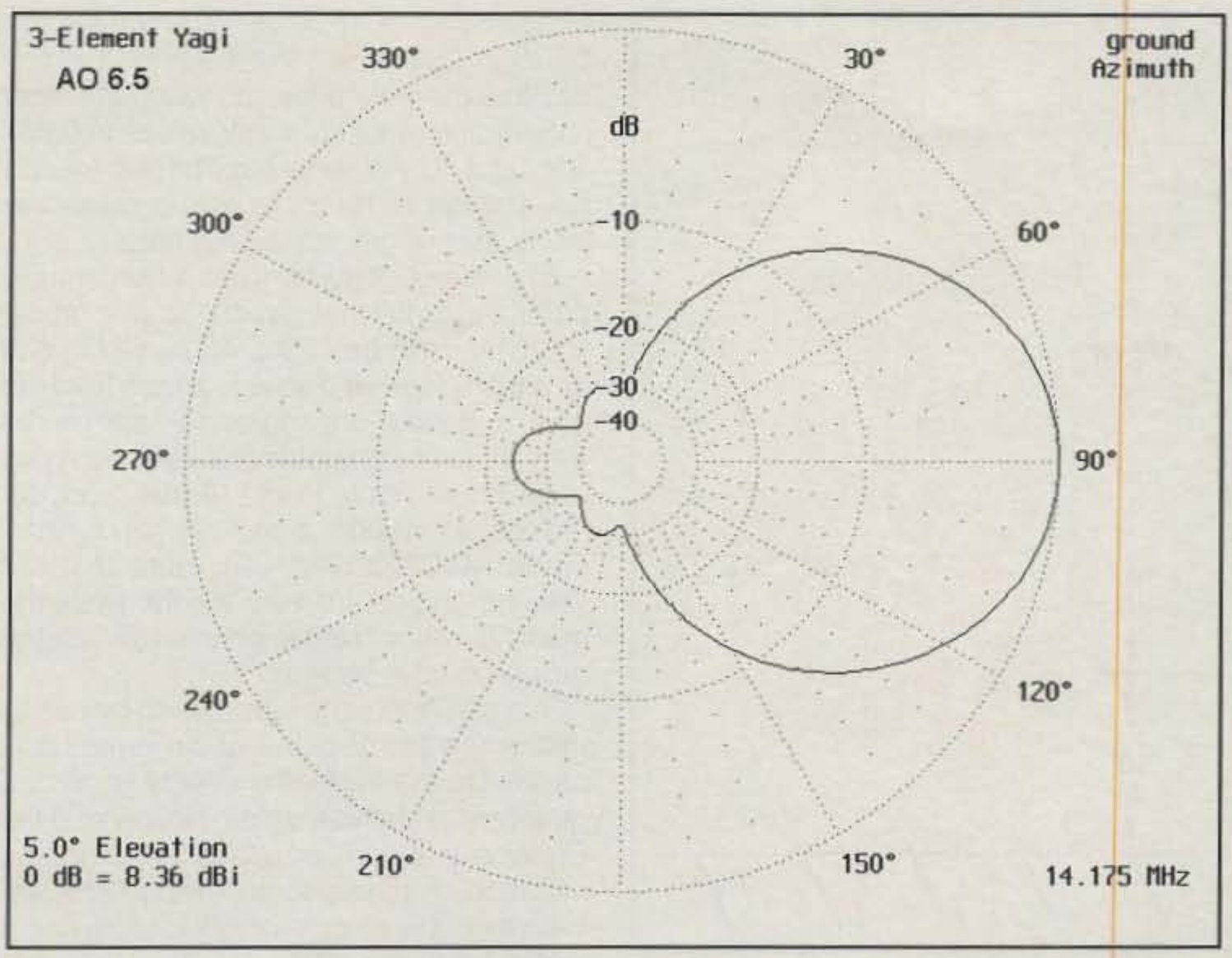


Fig. 12– Azimuth pattern of a 3-element Yagi one wavelength over average ground, at an elevation angle of 5 degrees.

pays always to (1) compare both elevation and azimuth patterns and (2) read any accompanying text to find out why the pattern variables were chosen.

Finally, note that the maximum gain in both our patterns over ground is considerably greater (when taken at the take-off angle) than the same antenna in free space. The signal reflected off the earth is not lost. Rather, it combines with the unreflected signal. At some elevation angles, the two are in phase and add up to a stronger signal—between 5 and 6 dB stronger. At other angles, they are out of phase and cancel, resulting in nulls rather than lobes. In general, for horizontal antennas the number of lobes counting from the ground up to a point overhead (90 degrees up) is about one more than the number of wavelengths in height of the

Gain and Take-Off Angle of a 3-Element Yagi Over Various Soil Conditions

	Ground Type		
	Very Poor (C=0.001/DC=5)	Average (C=0.005/DC=13)	Very Good (C=0.0303/DC=20)
Antenna Height (wavelengths)	Gain (dBi) / TO angle	Gain (dBi) / TO angle	Gain (dBi) / TO angle
0.50	11.7 / 24	12.3 / 25	12.8 / 26
0.75	12.6 / 17	13.1 / 18	13.4 / 18
1.00	13.0 / 13	13.4 / 14	13.7 / 14
1.25	13.2 / 11	13.6 / 11	13.8 / 11
1.50	13.4 / 9	13.7 / 9	13.9 / 9
1.75	13.5 / 8	13.7 / 8	13.9 / 8
2.00	13.6 / 7	13.8 / 7	14.0 / 7

Note: Model used for these representative figures is aluminum and the check frequency is 14.175. As always, modeling is done over flat terrain and does not account for terrain variations. **C** is conductivity as measured in S/m; **DC** is a dielectric constant and has no units. **TO** angle is the elevation angle of maximum radiation and is in degrees above the horizon.

Table I– Representative figures for gain and take-off angle of a 3-element Yagi over various soil conditions.

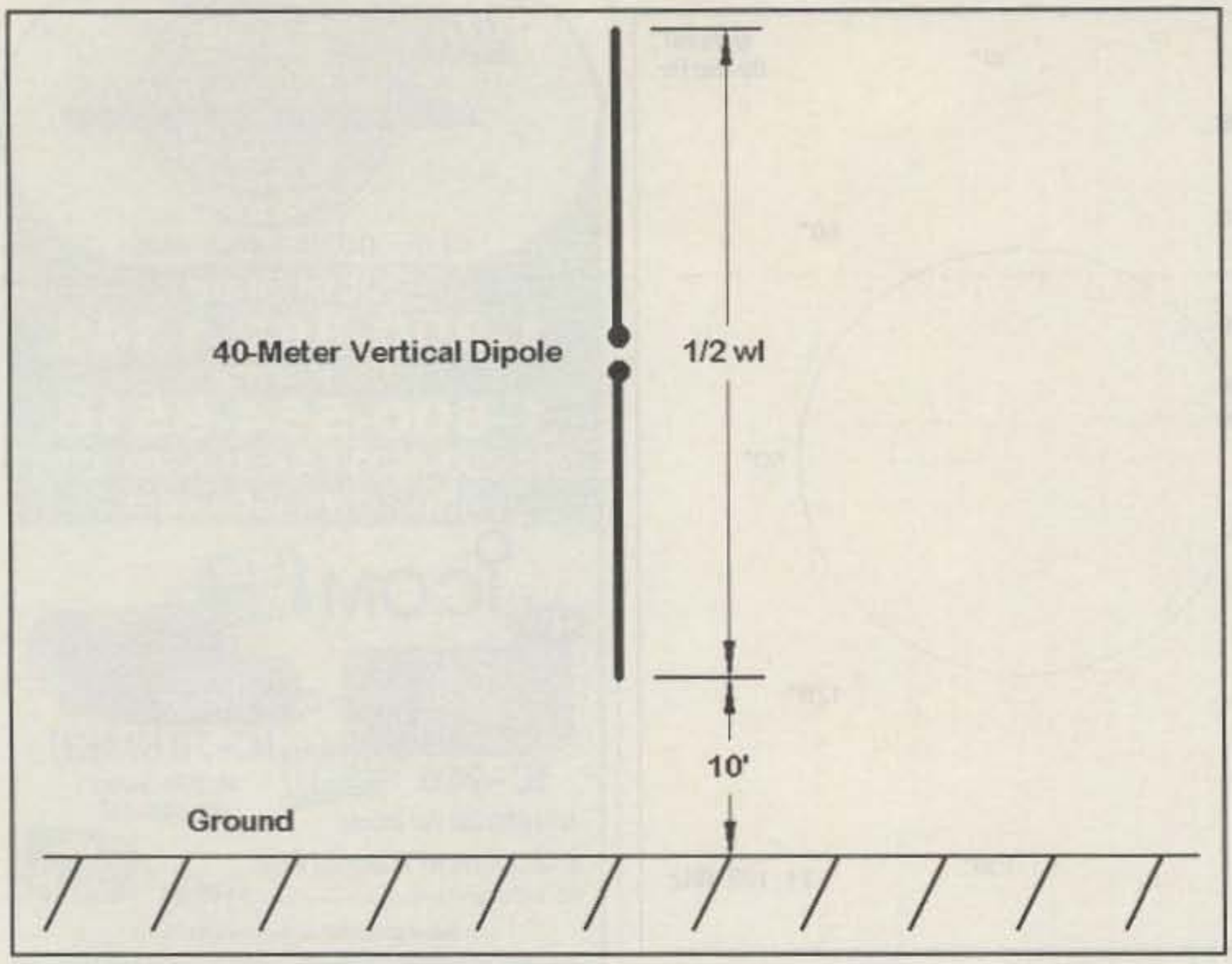


Fig. 13– Vertical dipole for 40 meters placed 10 ft. above ground at the antenna base.

antenna. Remembering this fact will help you both to understand antenna patterns and to anticipate them as you read specifications in the text.

As a rule of thumb, the lobes and nulls above the horizon can be calculated by a simple equation:

$$A_e = \arcsin \frac{N}{4h}$$

where $\mathbf{A_e}$ is the angle of the lobe or null, **N** is the lobe or null number counting from the ground up, and **h** is the antenna height in wavelengths or a fraction of a wavelength. For lobes, the value of **N** will be an odd integer (1, 3, 5, 7, etc.), while for nulls, the value of **N** will be even (0, 2, 4, 6, etc.). Our Yagi at a one-wavelength height has lobes at about 14 degrees (the main lobe) and at 49 degrees. This calculation is only a rough guide, since the exact structure of the antenna and the terrain may alter the angles by small amounts.

Does the Good Earth Make a Difference?

Most antenna patterns derived from antenna modeling software presume a flat, uncluttered terrain for the antenna. Because we live in spaces that may be littered with building, objects, and vegetation, and also because our terrain, both near and far, may be anything from flat to mountainous, model patterns only approximate the actual antenna performance we can achieve.

In general, the ground immediately beneath and around an antenna affects antenna efficiency and the feedpoint impedance. The far-field pattern is most affected by the quality of earth several wavelengths from the antenna and beyond.

The quality of the ground beneath an antenna can vary from exceptionally poor to salt-water good. Modeling software records the quality of the earth in a composite of two figures: **conductivity**, which is measured in Siemens per meter, and a **dielectric constant**, which has no unit of measure. For the most part, the larger either of these figures, the better the quality of ground. The range of possible ground conditions is very wide. Average soil has a conductivity of 0.005 S/m with a dielectric constant of 13. Salt-water values are 5.0 S/m and 81. At the other end of the scale, extremely poor soil found in heavy industrial areas may show values of 0.001 S/m and 3. Antenna handbooks usually have tables and maps to help to determine the quality of ground in your area.

The effect of terrain upon horizontally polarized antennas, such as our model Yagi, tends to be slight. To see this point in action, look at Table I, which lists the gain and take-off angles for our model Yagi at various heights above three types of ground: "Very Poor" (0.001 S/m; 5), "Average" (0.005 S/m; 13), and "Very Good" (0.0303 S/m; 20). Note that the take-off angles are very stable, while the gain figures increase only a little as the ground quality increases.

We can make the same point by noting that when the E-plane of an antenna is parallel to the earth, the effects of ground quality are relatively small. However, if the E-plane is at right angles to the earth, the situation changes considerably. This situation of course corresponds to having a vertical antenna.

Using the same three soil types, we can take a simple vertical dipole and illustrate the difference. In this case, I modeled a full-length vertical dipole with the bottom 10 ft. off the ground, as shown in fig. 13. The resulting patterns for the three ground qualities can be combined in a single graphic of the multiple polar plots, as shown in fig. 14. Note that the best ground quality produces the lowest take-off angle and the greatest signal strength, while the worst produces a weaker field strength at a higher angle.

At the same time, notice the absence of strong higher angle lobes in any of the three patterns in fig. 14. You will begin to see why many operators prefer vertical antennas for DX work, especially on the lower HF bands, where getting a horizontal antenna high enough to have a low-angle lobe of maximum radiation is often not feasible.

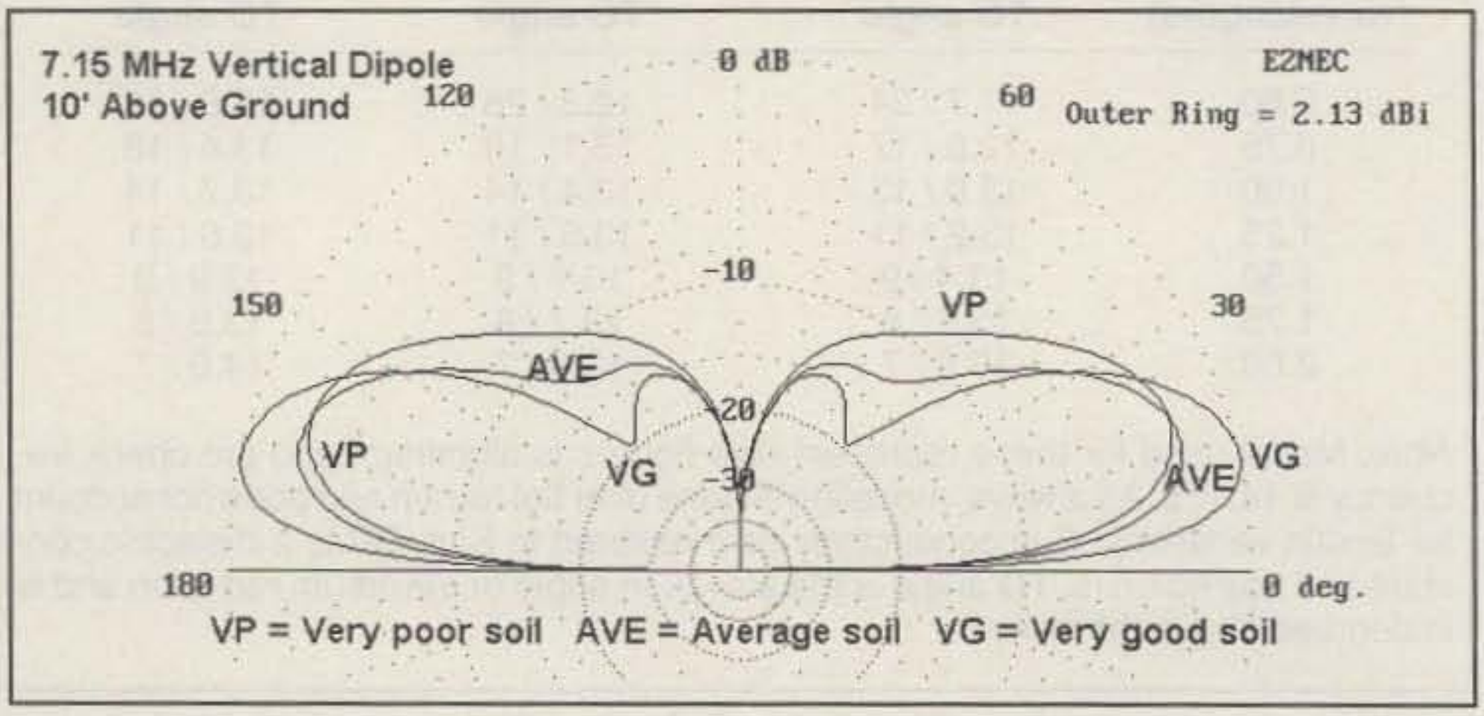
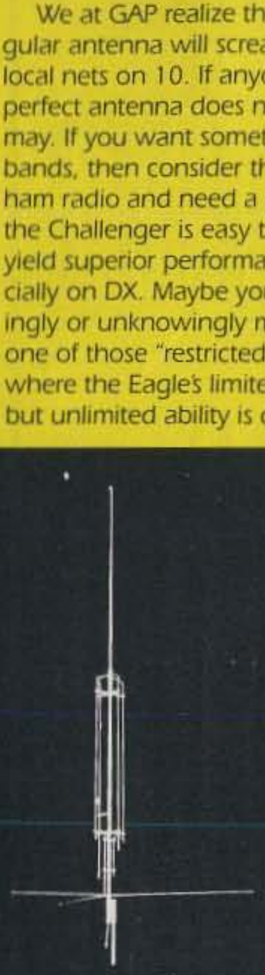


Fig. 14– Elevation patterns for the 40 meter vertical dipole over three different soil types.

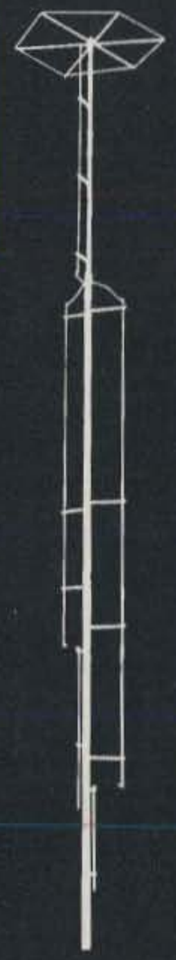
GAP: THE PERFECT ANTENNA

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.



Eagle DX

Challenger DX



Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas. .and was quieter."

73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

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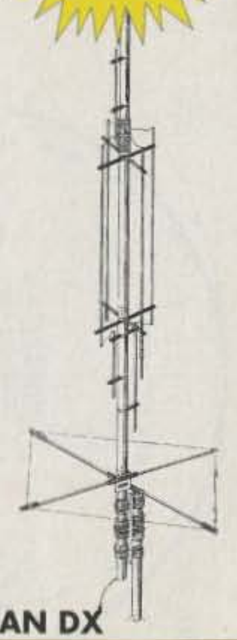

TITAN DX

This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$279
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$289
Titan DX			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$319
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

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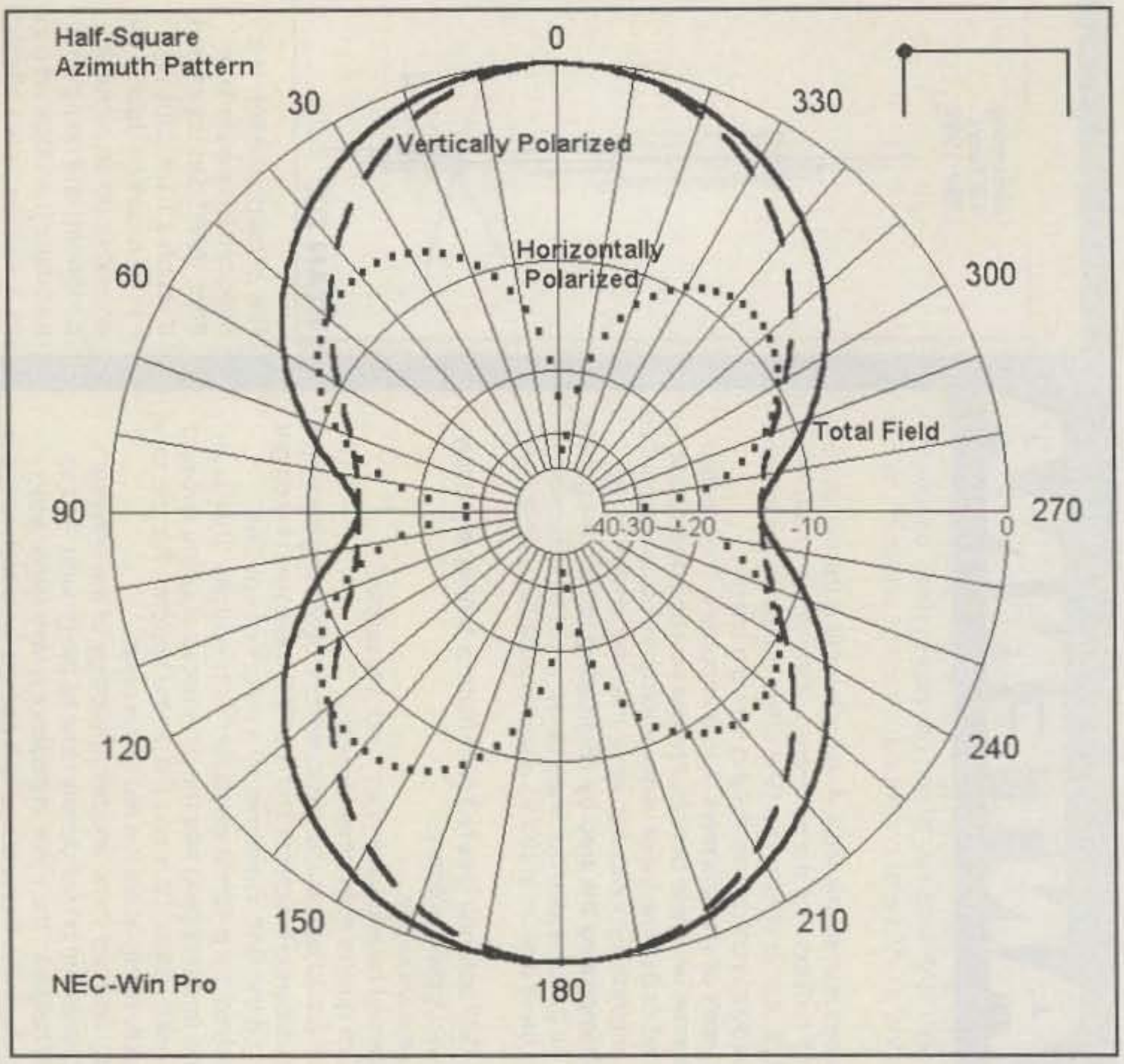

Fig. 15– Azimuth pattern of a half-square antenna at a 16-degree elevation angle over average soil showing the total field and its horizontally and vertically polarized components.

These sample patterns should do more than acquaint you with the terminology and geometry of antenna patterns. They should be the beginning of the development of your expectations when seeing antenna plots of either horizontal or vertical antennas.

Polarization: The Simple And The Complex

Most modeling programs from which antenna patterns emerge can show not only the total far field of the antenna, but also both the vertically polarized and horizontally polarized components of that field. Linear antennas, such as the vertical dipole or the Yagi, tend to have negligible radiation cross polarized to the general orientation of the antenna. However, many antenna types yield both types of radiation. Fig. 15 shows the azimuth pattern at 19 degrees elevation of a half square, the general outlines of which have been superimposed on the plot. Although the maximum gain of the antenna's total field is a function of the vertically polarized radiation, the width of the field is considerably enlarged by the presence of horizontally polarized radiation, which shows itself in the cloverleaf pattern.

At HF, polarization becomes skewed in the ionosphere, and we normally think of the total field as making up the effective far field. However, for many types of loop antennas (quads, deltas, rectangles, etc.), where we feed the antenna can make a difference in the ratio of horizontally to vertically polarized radiation, and this in turn can have an effect on the overall total field of the antenna. Consider fig. 16, which shows elevation patterns of the same delta loop. On the right it is fed at the center of the horizontal wire, while on the left it is fed 1/4 wavelength down from the triangle's apex. The patterns are significantly different, to say the least.

Even where antennas are linear, we should expect pattern differences according to whether they are set up for horizontal or vertical polarization. Consider a small Yagi for 2 meters, elevated about 30 ft. up. Fig. 17 shows the azimuth pattern at the take-off angle for the antenna when it is horizontal and when it is vertical. Vertically, it shows less gain and a much wider beam width than when horizontal. If we want to achieve a vertically polarized pattern the shape of which resembles that of the horizontal Yagi, we have to turn to a different antenna design. Despite its higher gain, we cannot simply press the horizontal Yagi into service, because in line-of-sight, we shall likely

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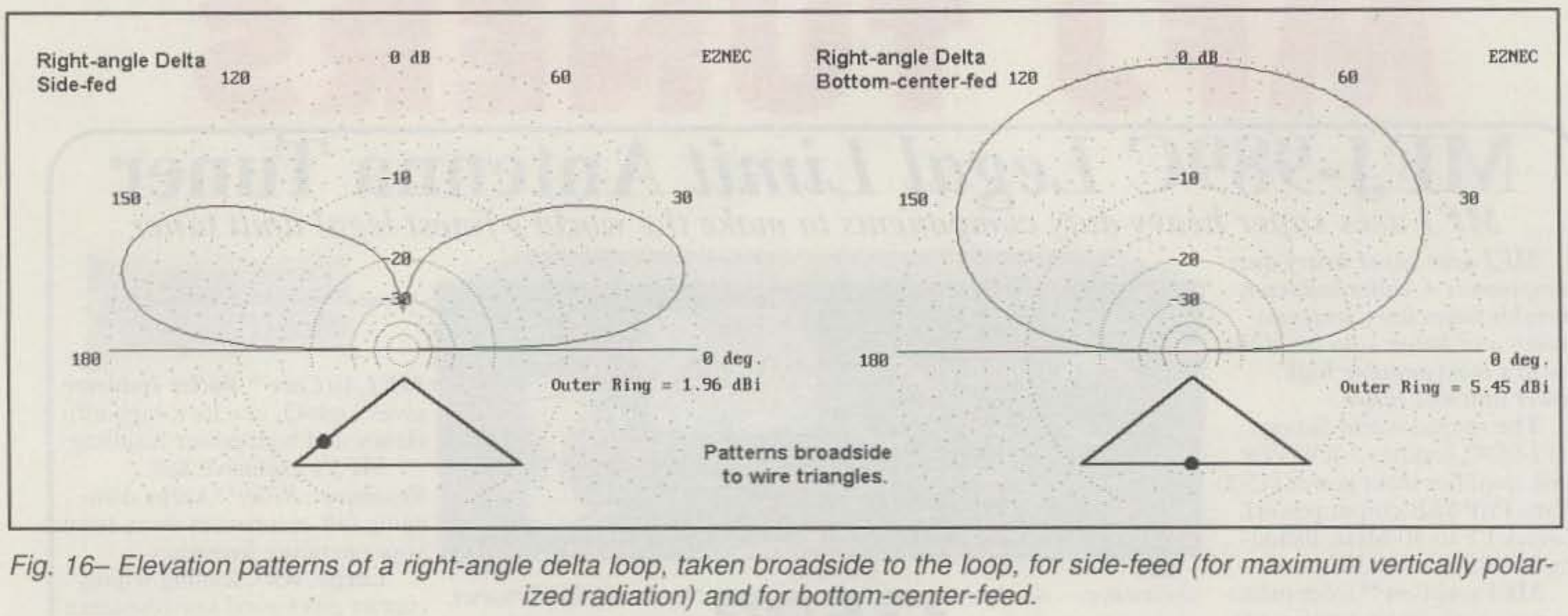

Fig. 16– Elevation patterns of a right-angle delta loop, taken broadside to the loop, for side-feed (for maximum vertically polarized radiation) and for bottom-center-feed.

lose more to cross-polarization losses than the extra gain will give us.

Comparisons, Both Educational and Practical

Now that we know how to read antenna patterns with reasonable accuracy, let's look at some ways in which comparing antenna patterns can assist us in understanding antennas. The following examples are only starters, chosen for their variety. Taking a comprehensive look at antennas is a lifetime's vocation.

1. **The Center-Fed Doublet**: One of the most common antennas is still one of the most misunderstood. Because the center-fed doublet yields a dipole-like pattern at its lowest frequency of operation, many amateurs believe that it provides a dipole-like azimuth pattern at all its frequencies of operation. Generating some azimuth patterns can tell us very quickly whether this belief is true or false.

Let's make our doublet 135 ft. long and use it from 80 meters through 10 meters. We will make it of #14 copper wire and place it at 50 ft. in the air. Ignoring ground clutter and terrain variables, we would get the patterns of fig. 18 on 80, 40, 20, and 10 meters. Notice that the elevation angle of maximum radiation is different for each band. In fact, on 80 meters, because the take-off angle is so high, an arbitrary angle of 45 degrees was selected for the azimuth pattern.

The antenna is 1/2 wavelength long at 80 meters, one wavelength long at 40 meters, etc. For your reference file, you can count the number of lobes and relate them to the antenna length in terms of wavelengths. Also note that as the antenna becomes longer relative to the frequency of operation, the direction of the strongest lobes moves from a broadside direction toward the ends of the antenna.

Besides acquainting you with the antenna patterns on various bands, the azimuth patterns are also useful for practical antenna planning. First, decide which bands are your favorites and, as well, which directions from your station are best for making your most desired contacts. If you have a choice of directions in which

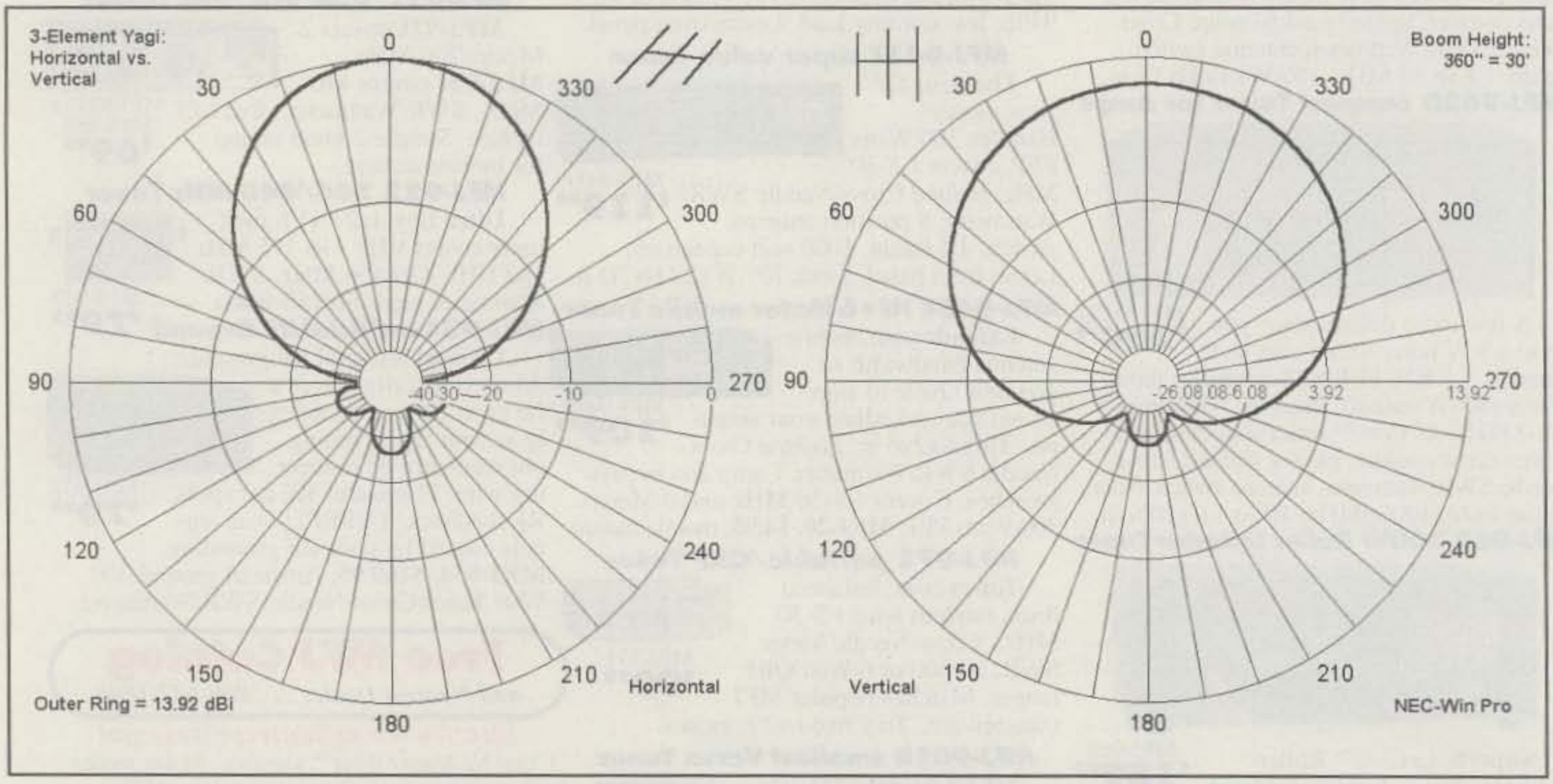

Fig. 17– Azimuth patterns for a 3-element 2 meter Yagi 30 ft. above average soil for both horizontal and vertical orientations of the beam. The outer ring represents the same field strength in both patterns.

to string up the doublet, you can to some measure erect the antenna for maximum signal strength on your favorite bands in your most desired directions. The azimuth patterns can be a useful planning tool.

2. **Directional Beams and Elevation Patterns**: In the maze of antenna materials, we often find it difficult to see how antennas are related. For example, in a number of talks I have given to beginners in amateur radio, questions have arisen about how dipoles and various size Yagis may be kin to each other. The questioners are often surprised by how close the relationship is.

One simple demonstration I have used is to combine the elevation patterns of a dipole, a 2-element Yagi, and a 3-element Yagi, all at the same height. A representative version of this pattern combination appears in fig. 19. I have added labels to the portions of the curves that might get confusing.

From the figure, two significant features appear. First, all three antennas have the same lobes and nulls at almost identical angles. Second, the symmetry of the dipole pattern fore and aft of the vertical center line disappears steadily as the parasitical elements direct the main lobe in one direction. Hence, both kinship and differences appear at once.

Combining curves is something that an antenna modeler can do with ease. The casual reader of amateur magazines may see only individual patterns. However, by examining either the graphic or the text for further information on gain, front-to-back ratio, and other features of the antennas, one can get a pretty good view of two or more antennas in combination. In fact, one can transpose the pattern of one antenna upon the other for greater clarity. However, be sure that the transposed patterns are truly comparable before transposing them.

3. **Directional Beams and Azimuth Patterns**: There is a myth that pervades amateur radio—that is, for every operating purpose whatsoever, always choose the highest gain, highest front-to-back antenna you can afford. Like all myths, this one has some truth, but not all truth.

To sort out what is true and what is false in the myth, let's combine in one graphic the azimuth patterns for a good 2-element Yagi and a good 3-element Yagi. We will place both at one wavelength in height so that the elevation angles for the patterns will be the same. The result is shown in fig. 20.

Obviously, the 3-element Yagi has superior gain and front-to-back ratio. As such, it may indeed be the better antenna for serious DXing, where we wish to maximize our signal to the distant receiving station and suppress as much as possible all the potential QRM from the sides and rear of our station. However, serious DXing is not the only important type of amateur operating activity.

Many contesters and net operators do not want to suppress signals completely from the sides and rear. They wish to know that someone worth working is present, but not so loud as to interfere with the current station being worked. Hence, they tend to prefer antennas with some front-to-back ratio and some gain, but not the ultimate in each. For their type of operation, the 2-element Yagi may in fact be the preferred antenna.

In this example, I have given a choice of only two antennas. However, the basic principle can be applied to a host of antenna types. A comparison of antenna patterns, when placed against a list of operating goals and the needs one has to achieve those goals, can be a valuable tool in antenna selection.

4. **Truth—Pattern Shape and Pattern Detail**: The shape of an antenna pattern is not the whole story, and one easily can

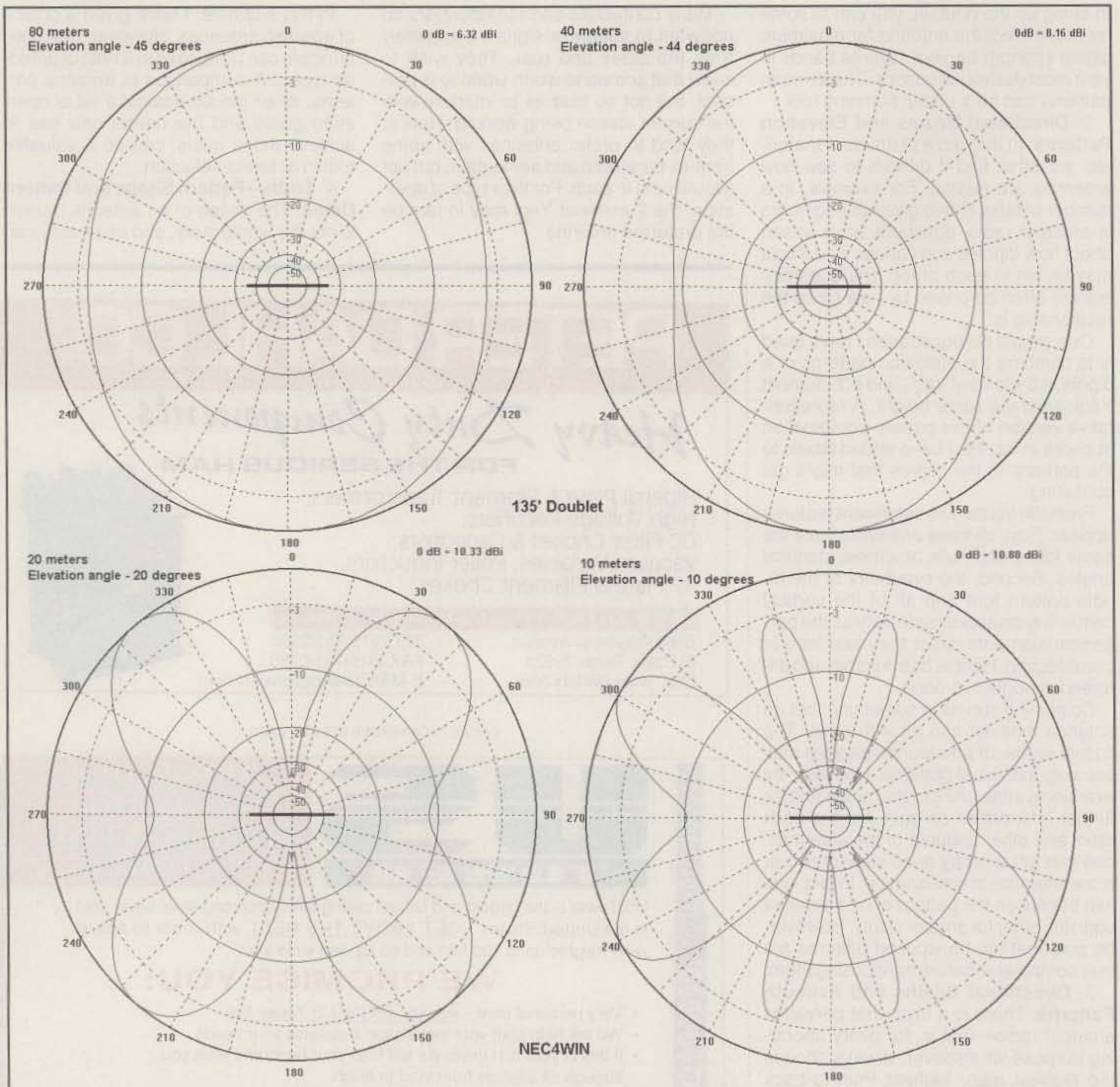

Fig. 18– Azimuth patterns for a 135 ft. doublet 50 ft. above average soil when used on 80, 40, 20, and 10 meters. In each case, the doublet is oriented left-to-right in the pattern graphic.

fall into traps of hasty interpretation. To illustrate the point, let's look at fig. 21 and fall into one kind of trap together.

Part (A) of the figure shows the free-space azimuth pattern of a 2-element Yagi. The main lobe is, as expected, quite round with a good beam width. The rear quadrant shows a very high 180-degree front-to-back ratio. In most respects, this pattern appears to be superior to the free-space pattern shown in part (B), where the 180-degree front-to-back ratio is under 20 dB.

Part (C) of the figure springs the trap. The patterns in parts (A) and (B) are overlaid, demonstrating the far lower gain of the initial pattern. In fact, the gain for (A) is only 3.8 dBi, while the gain for (B) is nearly 6.6 dBi. In addition, the 180-degree front-to-back ratio for (B) is a little under 19 dB and is the worst case of the entire rear quadrant. By contrast, the 29 dB 180-degree front-to-back ratio of (A) covers only a small part of the rear quadrant and drops to a worst-case value of just over 16 dB.

Without the added data, we might not have realized that the performance of the two antennas was so radically different. Even without the pattern overlay, the data for both the forward and rear quadrants of the antenna pattern make those differences clear. In fact, (A) is based on a model of a highly loaded and shortened 10 meter beam, while (B) is based on a model of a full-size 10 meter beam with phasing line connecting the two elements.

When comparing antenna patterns, be certain that you have a complete data set before you start the work of comparison. As we have seen, free-space patterns are not directly comparable, even though similar, to patterns over ground. When comparing patterns taken over ground,

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> Based on our proven C-3, multi-monoband, no trap design
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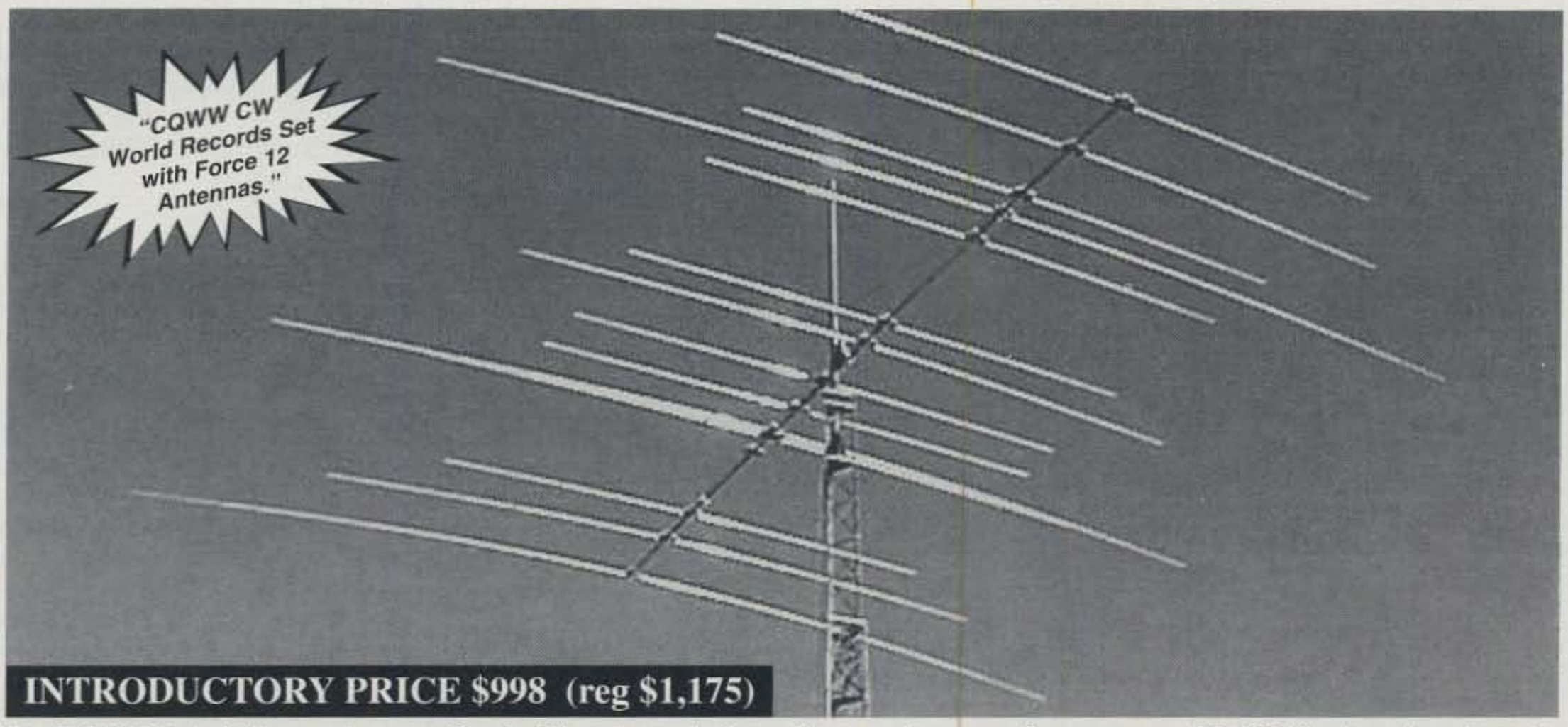

The **C-31XR** is truly the next generation in tribanders; designed for maximum performance on 20-15-10 mtrs, plus strength, ease of assembly, low mast torque, side mounting and stacking. The **C-31XR** is 3 monoband Yagis overlaid on the same boom. There is a wide spaced 3el 20, a wide spaced 4el 15 and 7 elements for 10 mtrs. The gain target to beat was our own **C-3**, which was shown to have the most gain across 20 & 15 mtrs according to independent testing by K7LXC and NØAX. We did it! The **C-31XR** exceeds the C-3 by 1.4dB on 20, 1.5 on 15 and 3dB on 10 mtrs. F/B and side nulls are exactly what you would expect; excellent. There is nothing better than the **C-31XR**.

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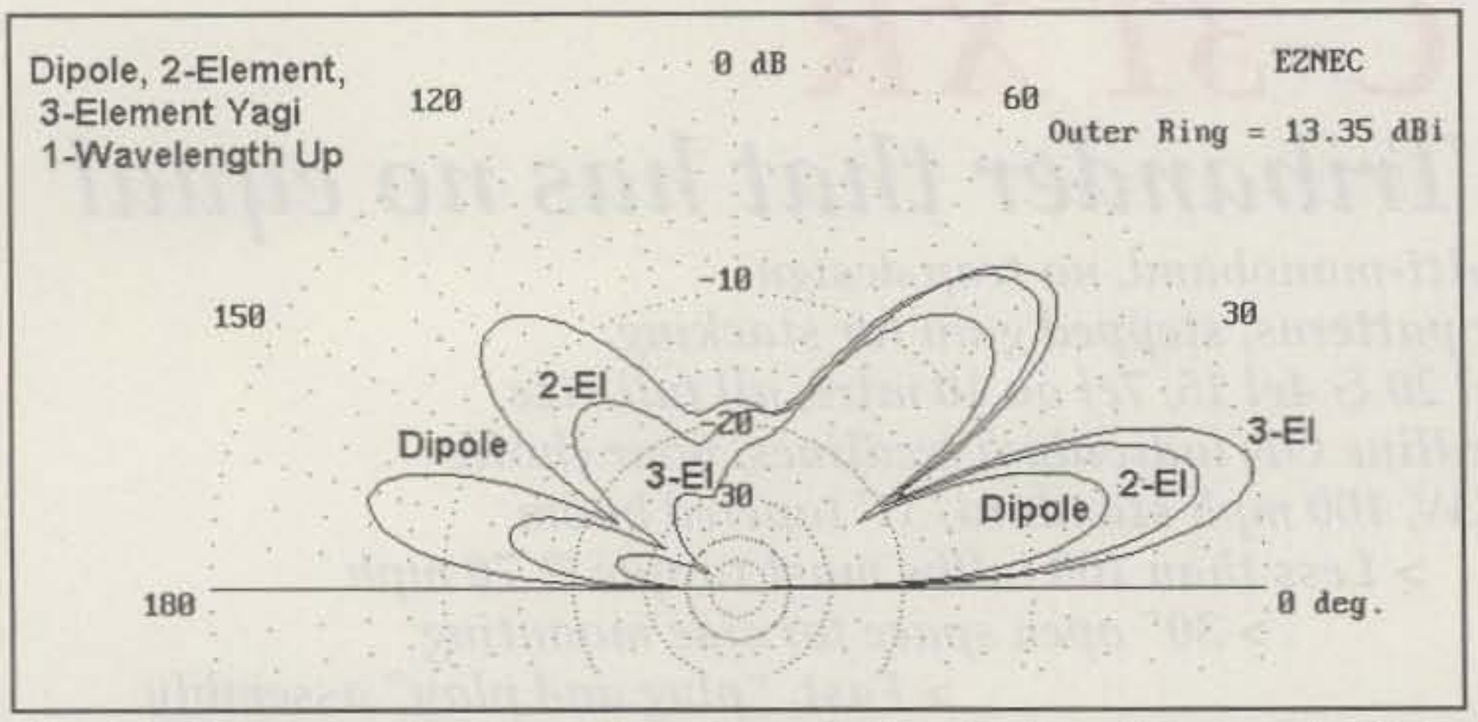

Fig. 19– Composite elevation patterns for a dipole, a 2-element Yagi, and a 3-element Yagi, each placed one wavelength above average soil.

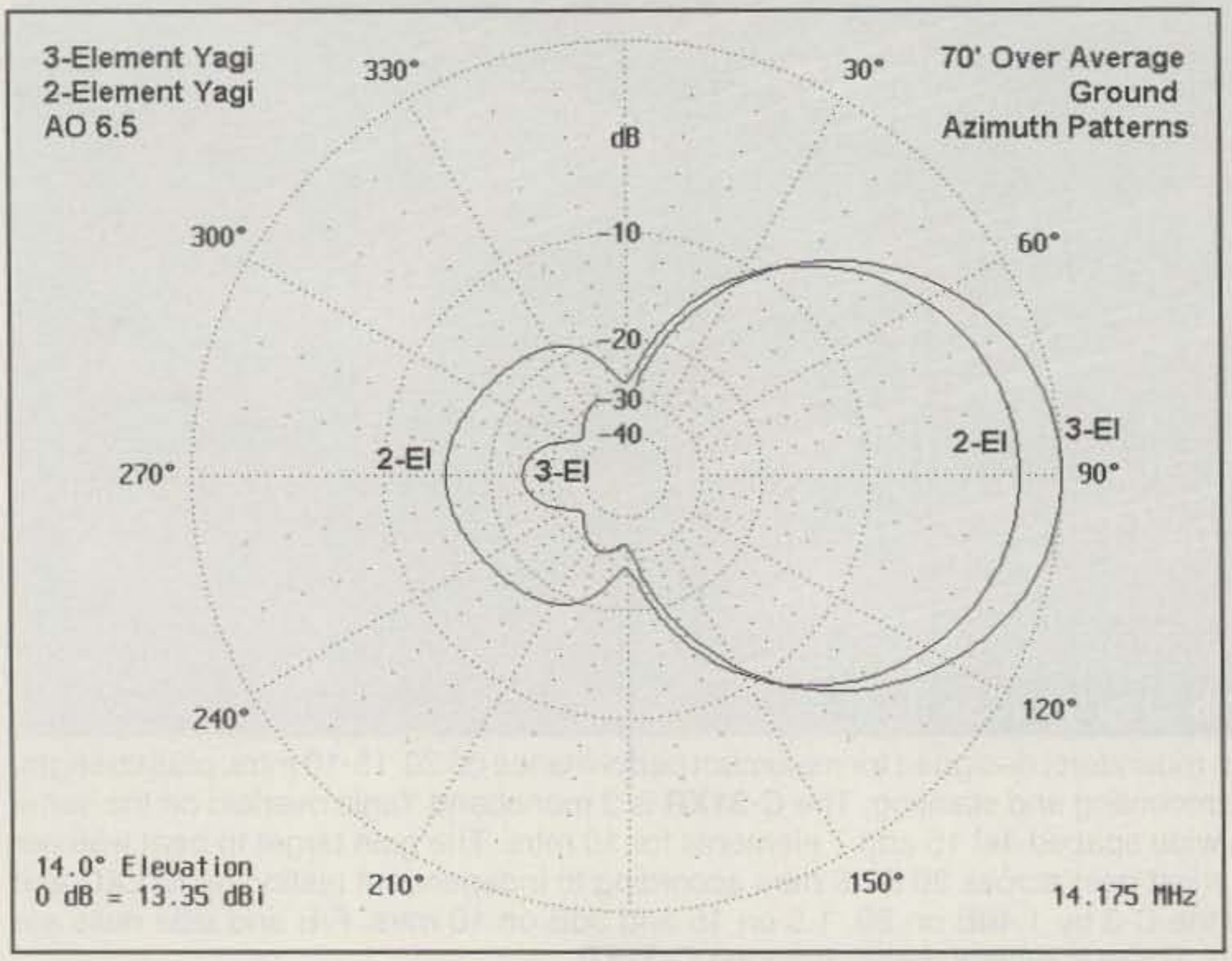

Fig. 20– Composite azimuth patterns at 14 degrees elevation of a 2-element Yagi and a 3-element Yagi, each one wavelength above average soil.

be certain the heights are comparable and the ground types are similar. Wherever antennas are of different types, examine both the azimuth and elevation patterns of each. These considerations become very important when trying to make purchase decisions among commercial beams. The manufacturers do not present their information with a common format, and therefore comparisons are very difficult, even where patterns are offered.

Antenna patterns do not tell anything like the whole story with antennas. We have already seen the need to place the performance figures in juxtaposition with our operating goals and needs. In addition, we shall have to factor in considerations such as cost, weight, available space, installation complexity, and maintenance, not to mention the legalities which are becoming an increasing burden to antenna installation.

In the End, There is No End

We barely have scratched the surface of the things we can learn from antenna patterns when we learn to read them accurately and carefully. By examining the azimuth and elevation patterns for single antennas, we can gauge their performance in terms of gain, front-to-back specifications, lobes and nulls, beam width, and polarization composition. We also can compare antennas, both within a single type and among types, analyzing high- and low-angle lobes, lobe direction and shape, and numerous other properties.

In the end, the information you can gain from antenna patterns will help you make intelligent decisions about the best antenna for your station location. When combined with all of the other types of information you can and should gather, the more information you draw from antenna patterns, the more satisfying your ultimate decision is likely to be. ■

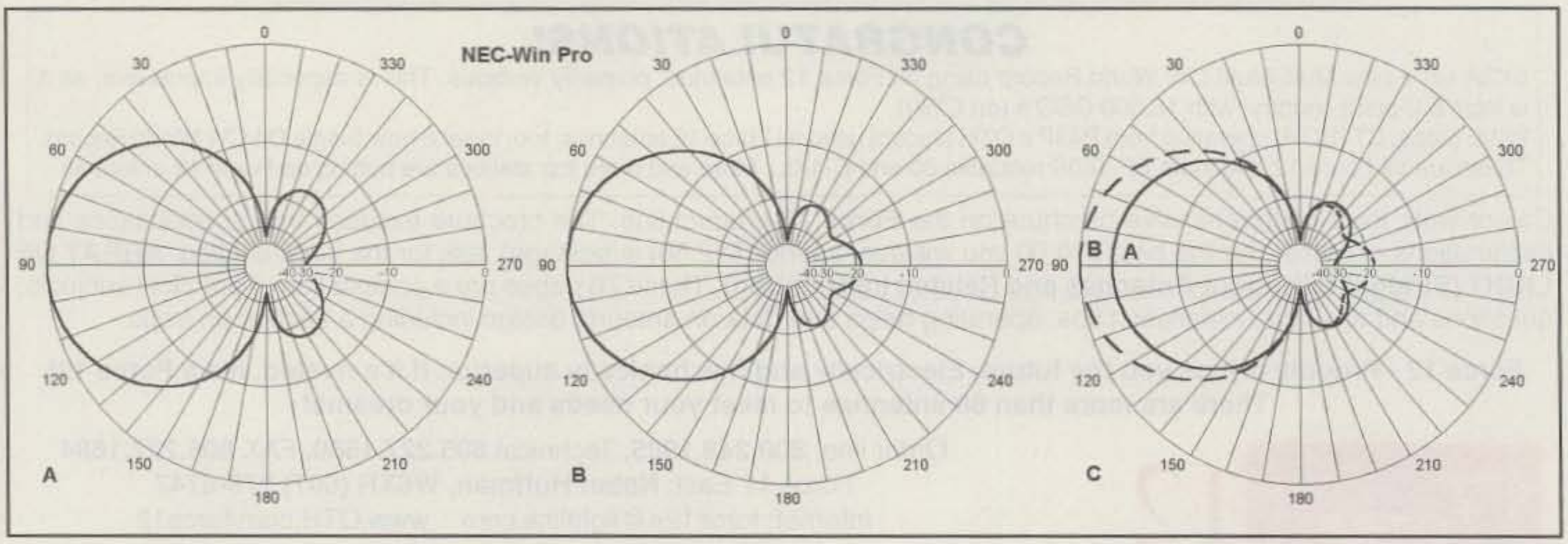

Fig. 21– Azimuth patterns for two 2-element Yagis (A and B) along with a composite pattern graphic of the two (C), with each antenna one wavelength above average soil.

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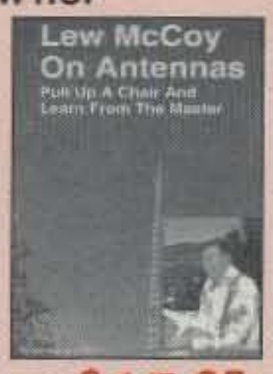

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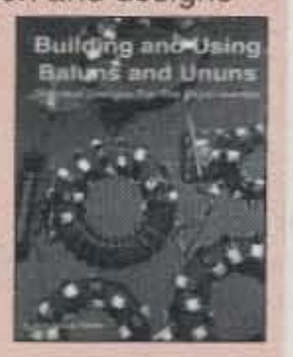

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Ingenuity and necessity work together to provide some interesting solutions for amateur radio installations. WB9YBM offers some food for thought in our next mobile installation.

Coax Cable Protection For Mobile Radios

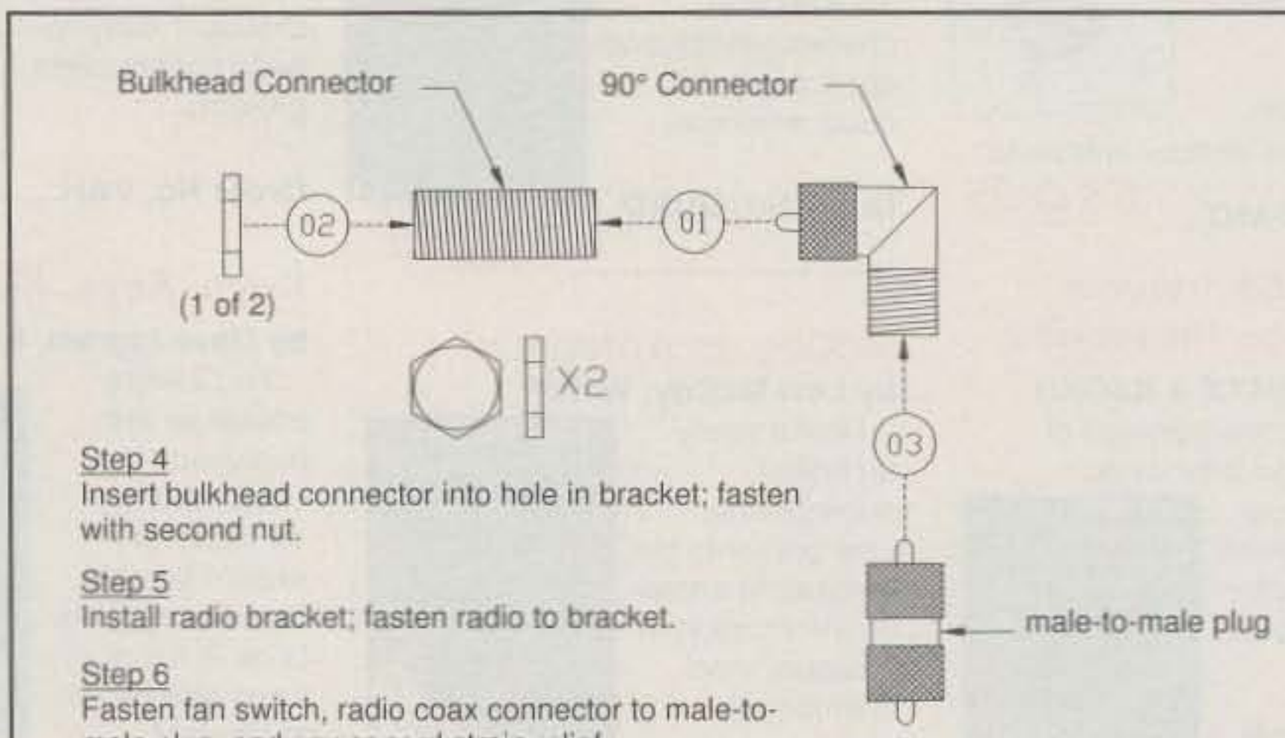
BY KLAUS SPIES*, WB9YBM

Many of the modern mobile radios no longer have the coax connector mounted directly on the rear of the transceiver, but instead have it on a type of pigtail arrangement. While this space-saving design might have the advantage of allowing more heat-sink on ever-shrinking radios, even a small amount of flexing over long periods of time will cause the cable to break. This may lead to very long down time as the radio is sent in for repair (or at the very least, the more handy owner waits for spare parts to arrive from the manufacturer).

Here's a way I've been able to avoid this problem with my ICOM IC-38A. This idea can easily be adapted to almost any other radio out there. I added the length of my radio (over-all depth) plus one inch (to allow for the coax and connectors) plus five inches for the rear bend. This became the length of a piece of sheet metal; the width was the same as the width of the transceiver.

Armed with these numbers, I went to my local heating and air-conditioning supply shop (one of the ones that do the metal work for home heating ducts) and asked them for a piece of metal of the appropriate size. If they have different thicknesses of metal available, I'd recommend a heavier gauge so that the end product (a type of "L" bracket) provides a good solid base. I was lucky in that I found a piece of scrap close to the right size, so I saved a few cents by not needing to have it cut (and since they were about to throw it out

*8502 N. Oketo Ave., Niles, IL 60714-2006

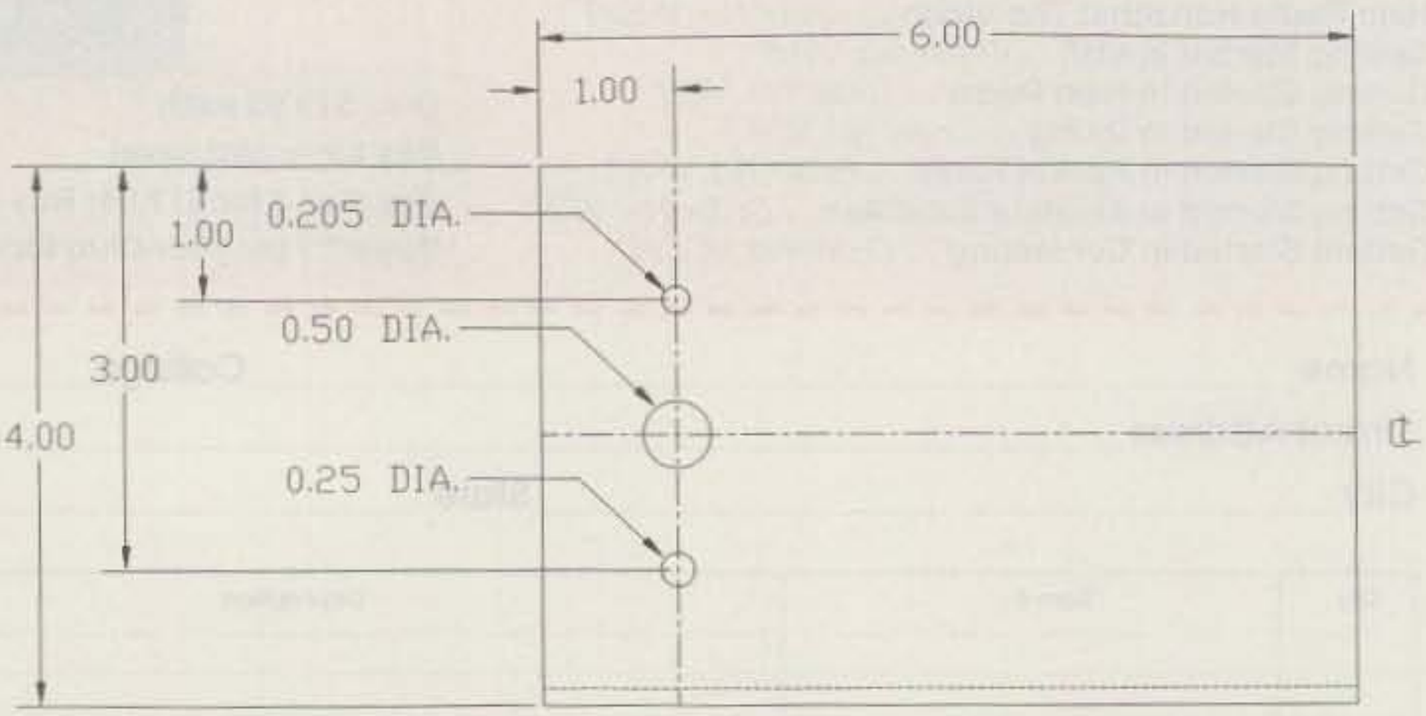


Step 4
Insert bulkhead connector into hole in bracket; fasten with second nut.

Step 5
Install radio bracket; fasten radio to bracket.

Step 6
Fasten fan switch, radio coax connector to male-to-male plug, and power cord strain relief.

Step 7
Gently check that all screws and connectors are snug (but not overtight) using appropriate pliers.



anyway, it cost even less!). The only other thing I needed help with was making the bend in the metal. Since these shops are fully equipped to create complete ductwork, this was no problem. (The entire project so far only cost me a cup of coffee and a donut!)

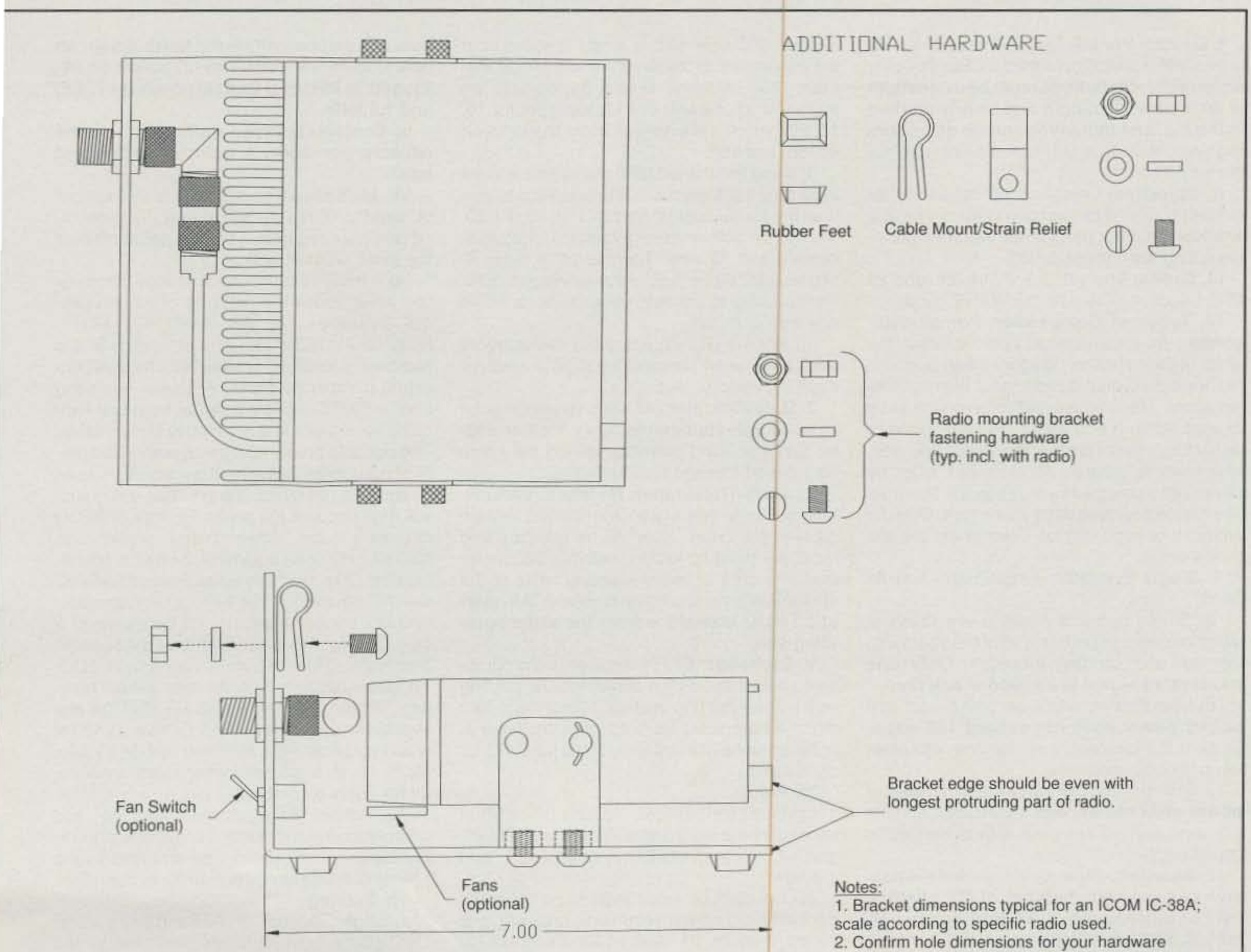
Armed with my "L" bracket, I made a quick sketch of where I needed other holes, then went at it with a drill press. For mounting the radio to the base, I used the radio's mobile mounting bracket as a template; all the other holes are less critical. Fig. 1 shows the process I followed to create the bracket, as well as the design considerations and parts I used. The rubber feet (available at Radio Shack) are almost mandatory to avoid scratching the table-top when the radio is used in a base station setup. For a mobile environment the bracket can be inverted, and the same holes used to mount the "L" bracket to the mobile mounting bracket can be used to mount the radio under the vehicle's dash (and if needed, a washer or three on the rear set of screws provides enough tilt to see the front panel of the radio clearly).

The entire arrangement will hold the coax cable and connector solidly enough to avoid unwanted flexing. The purist may be concerned that the connectors used may provide attenuation of "x" dB per connector. I hasten to assure you that I'm using this arrangement on 220 MHz without difficulty (the signal strengths vary more due to propagation than they do to connectors!).

With the room remaining on the back panel, I was able to mount a fan switch to turn on two small fans I bought at Radio Shack (mounted with tie-wraps under the bottom of the heat sink) to cool the radio during ragchews, as well as to add a strain relief for the power cord.

During the initial design process, another benefit of this bracket occurred to me. By making the bottom of the bracket long enough, it would be even with (or slightly farther out than) the biggest protruding item on the radio. This provides extra protection to the radio, since if the radio moves (or if something gets pushed towards the radio), the bracket would take the punishment, instead of the more fragile (and expensive) radio. ■

Fig. 1– Mechanical diagram for the adapter plate used in the mobile installation.



Announcing:

The 42nd Annual CQ World-Wide WPX Contest

SSB: March 27–28, 1999
CW: May 29–30, 1999

Starts: 0000 GMT Saturday Ends: 2400 GMT Sunday

I. Contest Period: Only 36 hours of the 48 hour contest period permitted for Single Operator stations. **Off periods must be a minimum of 60 minutes in length and clearly marked in the log. Listening time counts as operating time**. Multi-Operator stations may operate the full 48 hours.

II. Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III. Bands: The 1.8, 3.5, 7, 14, 21, and 28 MHz bands may be use. No WARC bands.

IV. Types of Competition (for all categories): All entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score. Transmitters and receivers must be located within a 500 meter diameter circle or within the property limits of the station licensee, whichever is greater. All antennas must be physically connected by wires to the transmitters and receivers used by the entrant. Only the entrant's callsign can be used to aid the entrant's score.

1. Single Operator (Single Band and All Band)

(a) Single operator stations are those at which one person performs all of the operating, logging, and spotting functions. **Only one transmitted signal is allowed at any time.**

(b) **Low Power:** Same as 1(a) except that **output power shall not exceed 100 watts.** Stations in this category will compete with other low power stations only.

(c) **QRP/p:** Same as 1(a) except that **output power shall not exceed 5 watts.** Stations in this category will compete with other QRP/p stations only.

(d) **Assisted:** Same as 1(a) except the **passive use (no self-spotting) of DX spotting nets or other forms of DX alerting are permitted.** Stations in this category will compete with other Assisted stations only.

(e) **Tribander/Single Element (TS):** Tribander (any type) with a single feedline from the transmitter to the antenna and single element (TS) category. During the contest, an entrant shall use only one (1) tribander for 10, 15, 20 meters and single-element antennas on 40, 80, and 160.

(f) **Band Restricted (BR):** An eligible entrant must hold a license restricting operation to less than the six (6) contest bands (160, 80, 40, 20, 15, 10) on both modes. Examples of such licenses are: Novice, Technician, 4 class license, etc. Since frequency privileges differ from country to country, competition is within one's own country.

(g) **Rookie (R):** An entrant in this category shall have been licensed as a radio amateur three (3) years or less.

2. Multi-Operator (All band operation only)

(a) **Single-Transmitter:** Only one transmitter and one band permitted during the same time period (defined as 10 minutes).

(b) **Multi-Transmitter:** No limit to transmitters, but only one signal and running station allowed per band. *Note:* All transmitters and receivers must be located within a 500 meter diameter area or within property limits of the station licensee, whichever is greater. **All operation must take place from the same operating site.**

V. Exchange: RS(T) report plus a progressive contact three-digit serial number starting with 001 for the first contact. (Continue to four digits if past 999.) Multi-operator multi-transmitter stations use separate serial numbers for each band.

VI. Points:

(a) Contacts between stations on different continents are worth three (3) points on 28, 21, and 14 MHz and six (6) points on 7, 3.5, and 1.8 MHz.

(b) Contacts between stations on the same continent, but different countries, are worth one (1) point on 28, 21, and 14 MHz and two (2) points on 7, 3.5, and 1.8 MHz. **Exception: For North American stations only—contacts between stations within the North American boundaries are worth two (2) points on 28, 21, and 14 MHz and four (4) points on 7, 3.5, and 1.8 MHz.**

(c) **Contacts between stations in the same country are worth 1 point regardless of band.**

VII. Multiplier: The multiplier is the number of "**valid**" prefixes worked. A PREFIX is counted only once regardless of the number of times the same prefix is worked.

(a) A PREFIX is the letter/numeral combination which forms the first part of the amateur call. Examples: N8, W8, WD8, HG1, HG19, KC2, OE2, OE25, etc. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix. A station operating from a DXCC country different from that indicated by its callsign is required to sign portable. The portable prefix must be an authorized prefix of the country/call area of operation. In cases of portable operation, the portable designator will then become the prefix. Example: N8BJQ operating from Wake Island would sign N8BJQ/KH9 or N8BJQ/NH9. KH6XXX operating from Ohio must use an authorized prefix for the U.S. 8th district (W8, K8, etc.) Portable designators without numbers will be assigned a zero (0) after the second letter of the portable designator to form the prefix. Example: N8BJQ/PA would become PA0. All calls without numbers will be assigned a zero (Ø) after the first two letters to form the prefix. Example: XEFTJW would count as XEØ. Maritime mobile, mobile, /A, /E, /J, /P, or interim license class identifiers do not count as prefixes.

(b) Special event, commemorative, and other unique prefix stations are encouraged to participate. Prefixes must be assigned by the licensing authority of the country of operation.

VII. Scoring:

1. Single Operator: (a) All Band score = total QSO points from all bands multiplied by the number of different prefixes worked (prefixes are counted only once). (b) Single band score

= total QSO points on the band multiplied by the number of different prefixes worked.

2. Multi Operator: Scoring is the same as Single Operator, All Band.

3. A station may be worked once on each band for QSO point credit. **Prefix credit can be taken only once.**

IX. QRP/p Section: Single Operator only. Output power must not exceed 5 watts. **You must denote QRP/p on the summary sheet and state the actual maximum output power used for all claimed contacts.** Results will be listed in a separate QRP/p section and certificates will be awarded to each top-scoring QRP/p station in the order indicated in Section XI.

X. Low Power Section: Single Operator only. **Output power must not exceed 100 watts. You must indicate low power on the summary sheet and state the actual maximum output power used for all claimed contacts.** Results will be listed in a separate low power section and certificates will be awarded to each top-scoring low power station in the order indicated in Section XI.

XI Awards: Certificates will be awarded to the highest scoring station in each category listed under Section IV—

1. In every participating country

2. In each call area of the United States, Canada, Australia, and Asiatic Russia

All scores will be published. To be eligible for an award, a single operator station must show a minimum of 12 hours of operation and multi-operator stations must show a minimum of 24 hours of operation.

A single band log will be eligible for a single band award only. If a log contains more than one band, it will be judged as an all band entry unless specified otherwise.

In countries or sections where entries justify, second- and third-place awards will be made.

XII. Trophies, Plaques, and Donors:

SSB

Single Operator, All Band

WORLD – Stanley Cohen, WD8QDQ
USA – Atilano de Oms, PY5EG
EUROPE – Jim Hoffman, N5FA
SOUTH AMERICA – Ron Moorefield, W8ILC
OCEANIA – Phillip Fraizer, K6ZM Memorial
AFRICA – Peter Sprengel, PY5CC
*JAPAN – The DX Family Foundation
WORLD Low Power – Steve Bolia, N8BJQ
CANADA Low Power – Amateur Radio League of Alberta
WORLD QRP/p – Dayton Amateur Radio Association
USA QRP/p – Doug Zwiebel, KR2Q

Single Operator, Single Band

WORLD – John N. Reichert, N4RV
WORLD 7 MHz – William D. Johnson, KVØQ
OCEANIA - D. Craig Boyer, AH9B
USA 28 MHz Novice/Tech – Jon Engelhardt, KAØZFX
USA 21 MHz – Bernie Welch , W8IMZ Memorial
USA 3.7 MHz – Lance Johnson Digital Graphics

Multi-Operator, Single Transmitter

USA – D. Craig Boyer, AH9B

Multi-Operator, Multi-Transmitter

NORTH AMERICA – Burt Curwen, KL7IRT Memorial
USA – Glenn Tracey, KC3EK

Contest Expedition
WORLD – Kansas City DX Club

CW

Single Operator, All Band
WORLD – Steve Bolia, N8BJQ
USA – Dennis Motschenbacher, K7BV
EUROPE – Ivo Pezer, 5B4ADA/9A3A
OCEANIA – Tom Morton, K6CT
CANADA – Radio Amateurs of Canada (RAC)
*JAPAN – The DX Family Foundation
WORLD LOW POWER – Steve Bolia, N8BJQ
USA LOW POWER – Ron Stark, KU7Y
CANADA LOW POWER – Amateur Radio League of Alberta

Single Operator, Single Band
WORLD – Pedro Piza, Sr., KP4ES Memorial
WORLD 7 MHz – William D. Johnson, KVØQ
WORLD 3.5 MHz – Lance Johnson Digital Graphics
OCEANIA – D. Craig Boyer, AH9B
USA – Kansas City DX Club
USA 28 MHz – Bernie Welch, W8IMZ Memorial
USA 21 MHz – Wayne Carroll, W4MPY

Multi-Operator, Single Transmitter
WORLD – Ron Blake, N4KE
USA – Austin Regal, N4WW

Contest Expedition
WORLD – Ed Roller, K4IA

Combined SSB/CW

Single Operator, All Band
WORLD – Al Slater, G3FXB Memorial
EUROPE – Les Nouvelles DX Group
USA – D. Craig Boyer, AH9B

Club (SSB & CW)

WORLD – *CQ* Magazine
USA – Oklahoma DX Association

* *Donor is responsible for this trophy*

A station winning a World trophy will not be considered for a sub-area award. That trophy will be awarded to the runner-up for that area if the returns justify the award.

XIII. Club Competition: A trophy will be awarded each year to the club or group that has the highest aggregate scores from logs submitted by members. The club must be a local group and not a national organization. Participation is limited to members operating within a local geographical area **(exception: DXpeditions specially organized for operation in the contest and manned by members)**. Indicate your club affiliation on the summary sheet. To be eligible for an award, a minimum of three logs must be received from a club.

XIV. Log Instructions:

(a) All times must be in GMT. All breaks must be clearly marked. Single operator and multi-single logs must be submitted in chronological order. Multi-multi logs must be submitted chronologically by band.

(b) All sent and received exchanges are to be logged.

(c) Prefix multipliers should be entered only the FIRST TIME they are worked.

(d) Logs must be checked for duplicate contacts, correct QSO points, and prefix multipliers. Duplicate contacts must be clearly shown. Computerized logs must be checked for typing accuracy. Original logs may be requested if further cross-checking is required.

(e) **An alpha/numeric check list of claimed PREFIX multipliers must be submitted with your log.**

(f) Each entry must be accompanied by a Summary Sheet listing all scoring information, the category of competition, and the entrant's name and mailing address in BLOCK LETTERS. Also submit a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

(g) Official log and summary sheets are available from *CQ* for an SASE with sufficient postage. If official forms are not available, you may make your own.

(h) Disk submission of logs is encouraged. CT's *.BIN file or *.ALL file, N6TR's *.DAT file, NA's *.QDF file are preferred. An ASCII file containing all required information is also acceptable. Disk files must be in chronological order for single operator and multi-single stations and chronological by band for multi-multi stations. Please label your disks and name your files with the call used (for example: N8BJQ.BIN or N8BJQ.DAT). **Disks or electronic files are required from all top-scoring stations and those which use a computer to prepare the logs.**

(i) Logs may be submitted via e-mail to <N8BJQ@ERINET.COM>. Internet submissions will also require a summary sheet and prefix multiplier sheet. Logs received via e-mail will be confirmed via e-mail upon receipt.

XV. Disqualification: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts, unverifiable QSOs or multipliers will be deemed sufficient cause for disqualification. An entrant whose log is deemed by the WPX Contest Committee to contain a large number of discrepancies may be disqualified as a participant operator or station for a period of one year. If within a five-year period the operator is disqualified a second time, he will be ineligible for any *CQ* contest awards for three years.

The use of non-amateur means such as telephones, telegrams, packet, etc., to solicit contacts or multipliers **during** the contest is unsportsmanlike and the entry is subject to disqualification. Actions and decisions of the WPX Contest Committee are official and final.

XIII. Deadline:

(a) All entries must be postmarked NO LATER than May 10, 1999 for the SSB section and July 10, 1999 for the CW section. E-mail logs are also subject to these deadlines. **Indicate SSB or CW on your envelope.** One extension of up to 30 days, for legitimate reasons, may be granted if requested from the contest director. Logs postmarked after the deadline, or extension deadline if granted, may be listed in the results, but will be ineligible for any awards.

All logs go to: CQ Magazine, WPX Contest, 25 Newbridge Road, Hicksville, NY 11801 USA. Questions pertaining to the WPX Contest can be sent to WPX Contest Director, Steve Bolia, N8BJQ, 7354 Thackery Road, Springfield, OH 45502 USA, or via e-mail to <N8BJQ @ERINET.COM>.

Please remember to send in early for WPX contest log and summary sheets.

The WPX Home Page: <http://ourworld.compuserve.com/homepages/n8bjq>.

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NEW **SBB-7/SBB-7NMO** • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: SBB-7 PL-259/SBB-7NMO NMO • Max Pwr: 70W

NEW **SBB-5/SBB-5NMO** • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
Gain & Wave: 146MHz 2.5dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 3 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO •
Max Pwr: 120W

CX-224/CX-224NMO • Tri-band 146/220/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 220MHz 3.5dBi 5/8 wave • 446MHz 6.0dBi 5/8 wave x 2 •
Length: 36" • Conn: CX-224 PL-259, CX-224NMO NMO • Max Pwr: 100W

B-20/B-20NMO • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.0dBi 5/8 wave x 2 • Length: 30" •
Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W

SH-55 • Super Flexible 146/446MHz HT Antenna
Gain: 146MHz 1.5dBi • 446MHz 3.2dBi • Length: 15.5' • Conn: BNC •
Max Pwr: 10W

B-10/B-10NMO • Dual-band 146/446MHz cellular look-a-like • Gain & Wave: 146MHz 0dBi 1/4 wave • 446MHz 2.15dBi 1/2 wave • Length: 12" •
Conn: B-10 PL-259/B-10NMO NMO •
Max Pwr: 50W

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CIRCLE 112 ON READER SERVICE CARD

As the announcer on the late-night news asks, "Do you know where your signal is tonight?" we turn to VE3ERP, who provides the answer. Don't be frightened or turned off by the math. The machine does it all.

Do You Know Where Your Signal is Tonight?

BY GEORGE MURPHY*, VE3ERP

Most of your signal is probably getting out as it should. However, some of the signal may be getting frittered away on its journey from transmitter to antenna because your antenna impedance does not match your feed-line impedance.

Many antenna design descriptions will tell you the feed point impedance of a dipole can be *assumed* to be a pure radiation resistance load of "*about*" 70 ohms, or a vertical "*approximately*" 35 ohms, or a mobile whip "*as little as*" 5 ohms, or some other vague assumption. These values may apply in the Land of Oz, but in the Real World, the many on-site variables affecting an antenna installation rarely result in the antenna being a purely resistive load. Furthermore, the real load (which usually contains other AC current impediments besides radiation resistance) almost never has the same total impedance as the transmission line used to feed it. Therefore, an impedance transformation device to match the actual complex load impedance to the feedline impedance is often necessary to provide the most efficient operation. There are many ways to do this, one of the *least* popular of these being the use of a series-section transformer[1] made entirely of coaxial cable (see fig. 1[A]).

A cursory glance at the equations in Table I[2] will immediately reveal two reasons why the average amateur radio experimenter has avoided these physically simple, easy-to-construct impedance transformers like The Plague. First, the mathematics involved are frightening (unless you are an algebra freak), and second, you have to know the antenna's complex impedance $R_L + jX_L$ (I can't even pronounce it, let alone understand it).

**77 McKenzie Street, Orillia, ON L3V 6A6 Canada e-mail: ve3erp@encode.com*

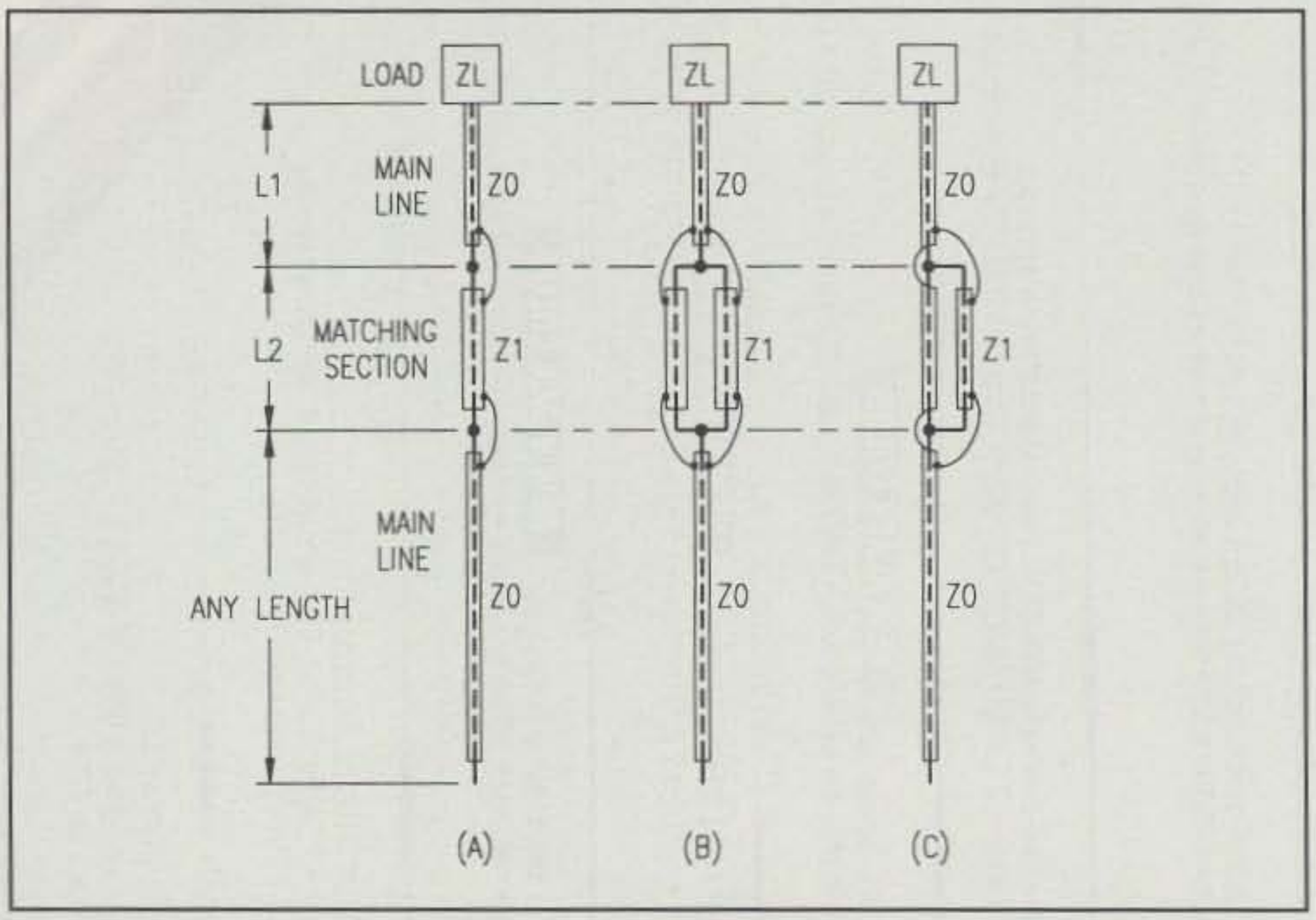

Fig. 1– Series-section impedance transformers made of coaxial cable. (See text for description.)

Don't let the equation scare you, though. Just ignore it for now while I tell you the good news.

Modern Technology To The Rescue

If you have a computer and *HAMCALC*[3] software (version 37 or later), forget the equation altogether. *HAMCALC* will do all the math for you. Fig. 2 is a hard-copy printout of a typical screen display produced by this program.

With the advent of small, affordable complex antenna analyzers such as the MFJ-259B and AEA SWR-121 HF, you can make direct readings of your antenna's resistive component *(R)* and reactive component *(X)*. If *(X)* is negative, it is a capacitive reactance *(–jX)*; if positive it is an inductive reactance *(+jX)*. In the jargon of antenna-speak, the antenna impedance therefore is $R \pm jX$ ohms[4].

The only other factors you need in order to design a series-section transformer are the operating frequency and the characteristic impedances (Z_0 for the main line and Z_1 for the matching section) of the coaxial cables you intend to use. The *HAMCALC* program "Series-Section Transformer" will take care of all this and design a transformer in a few seconds, or

Table I– Equations for determining values for series-section impedance transformers. You can leave this in a conspicuous spot to impress visitors while you simply ignore it and use your computer. →

Series-Section Transformer Equations

$$Z_L = R_L + jX_L$$

$$n = \frac{Z_1}{Z_0} \qquad r = \frac{R_L}{Z_0} \qquad x = \frac{X_L}{Z_0}$$

L2 = arctan B where:

$$B = \pm \sqrt{\frac{(r-1)^2 + x^2}{r(n - \frac{1}{n})^2 - (r-1)^2 - x^2}}$$

L1 = arctan A where:

$$A = \frac{(n - \frac{r}{n})\,B + x}{r + xnB - 1}$$

$$p = \sqrt{\frac{(R_L - Z_0)^2 + X_L^{\,2}}{(R_L + Z_0)^2 + X_L^{\,2}}}$$

$$SWR = \frac{1+p}{1-p}$$

$$L_M = \frac{299.9\ V_F\ L_d}{360\ f_{MHZ}}$$

Z_L = Load, in ohms
R_L = Resistive component of load ZL, in ohms
X_L = Reactive component of load Z_L, in ohms
Z_0 = Characteristic impedance of main line
Z_1 = Characteristic impedance of matching section
$L1$ = Electrical length of main line, matching section to load
$L2$ = Electrical length of matching section
p = Reflection coefficient
L_m = Line length in meters
L_d = Line in length in electrical degrees
V_f = Velocity factor of line
f_{MHZ} = Frequency in MHz

(Main line from transmitter to matching section can be any length)

you can do it yourself using the equations in Table I[5].

Some Design Variations

Fig.1(A) shows the textbook configuration—a section of dissimilar coaxial cable spliced into the main feed line. But there is more to this than meets the eye. In the course of discussions with Roger Johnson, N1RJ, Roger pointed out other configurations are also possible:

Fig. 1(B) shows two lengths of a dissimilar cable in parallel spliced into the feed line. This provides a matching section with an effective characteristic impedance one-half the impedance of the cable used, thus providing a greater range of design options than available with the fig. 1(A) configuration.

Fig. 1(C) shows an L2 length of the same cable as the main line connected to the main line at two points L2 apart. This will be of particular interest to pecuniarily aware (–•–• •••• • •– •––•) amateurs who only have one type of coaxial cable on hand.

It is best to avoid using foam-type coaxial cable in this application. Due to practical limitations in maintaining a constant ratio of air to dielectric in the foam during manufacture, the properties of foam cable from different production runs may vary considerably from the textbook values.

A Design Example

Let's assume you are *not* living in the Land of Oz and you have a 7.15 MHz antenna with an impedance at the feed point of 35–j15 ohms (35 ohms radiation resistance and 15 ohms capacitive reactance). You don't have to know what these numbers mean. You just have to know that they exist, since they are needed for the equations or the computer program. You want to use RG-8 for the main line, and there happens to a bit of RG-11 on hand for the matching section.

Using *HAMCALC* if you have a computer, or the equations if you don't, you design a fig. 1(A) configuration to find that L1 = 36.64 ft. and L2 = 9.01 ft., for a total length of 45.65 feet. This is longer than the total length of feeder you need, so you try a fig. 1(B) configuration. This calculates L1 as 10.77 ft. and L2 as 9.98 ft., totalling 20.75 feet. Much better, but you only have 6 feet of RG-11 so you try fig. 1(C), using RG-8 for everything, and arrive at L1 as 14.93 feet and L2 as 4.93 feet. (see fig. 2).

That's it. Three possible solutions to an antenna problem you probably didn't even know you had until you started reading hi-tech articles such as this one.

Footnotes

1. Described in detail by Frank Regier, OD5CQ, in the July 1978 issue of *QST*.

2. From *The ARRL Antenna Book*, 17th edition, page 26-15.

3. *HAMCALC* is *free*—over 200 programs of interest to amateur and professional radio buffs. *HAMCALC* runs in either MS-DOS or Windows™. Written in GWBASIC, it requires a GWBASIC.EXE file installed in your hard drive. For a free HAMCALC 3½" diskette send US$5.00 (send US$6.00 if you want a copy of GWBASIC.EXE included) to cover costs of materials, packaging, and airmail delivery anywhere in the world to the author at the address shown at the beginning of this article.

4. For some other ways to measure antenna impedance, see the *HAMCALC* programs "Impedance—Antennas," "Impedance Bridge (3 meter)," and "Transmatch Design (ZL1LE)."

5. You will need a handbook to look up the impedances and velocity factors of the cable types you want to use, access to an expanse of smooth beach or desert, and a pointed stick for solving the equations in the sand. ■

SERIES-SECTION TRANSFORMER

Frequency of operation.....	7.150 MHz	
Impedance of antenna.....	35-j15 Ω	
Impedance of main feed line.....	52.00 Ω RG-8	Vel.Fac.=.657
Impedance of matching section.....	26.00 Ω RG-8	Vel.Fac.=.657
SWR.....	1.69:1	
Line from antenna to matching section..	57.351° length of RG-8	
Matching section.....	19.651° length of RG-8	

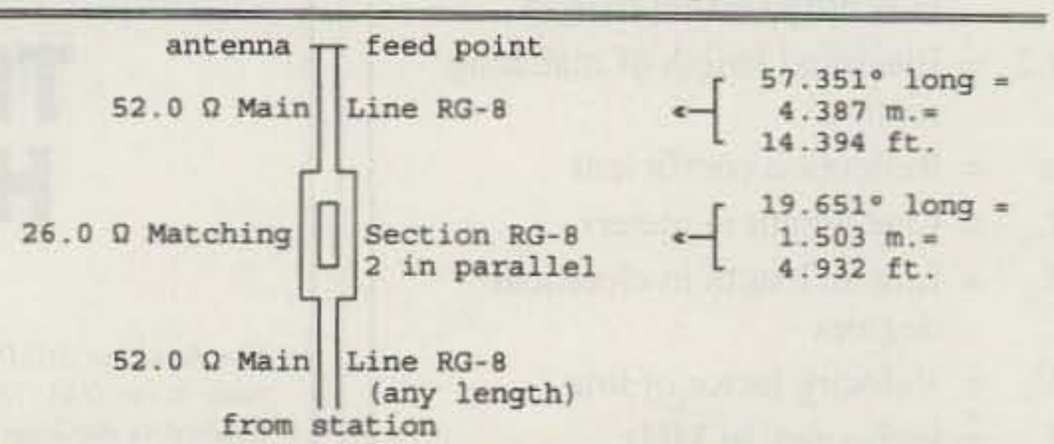

Fig. 2 – A typical printout using HAMCALC to determine values for a series-section impedance transformer.

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CIRCLE 175 ON READER SERVICE CARD

BY IRWIN MATH, WA2NDM

MATH'S NOTES

WHAT'S NEW AND HOW TO USE IT

It's Receiver Time Again!

Every time we describe a new receiver chip or circuit, we get lots and lots of mail. I expect this month will be no different. I'm not sure why that is, but if that's what it takes to spark some homebrewing, I certainly will pass along as much information in this vein as possible.

The latest offering is from Micrel Semiconductor, who, interestingly enough in this digital world, tout themselves as providing "total analog solutions." The MICRF001 is the first member of their new QwickRadio™ family that "even your granny could design with." As shown in fig. 1, a modified block diagram, the device is a single-chip UHF receiver that operates over the range of 300 to 440 MHz. All that is necessary for operation is a low-cost ceramic resonator, a couple of capacitors, an antenna, and a 5 volt power supply. The chip does the rest.

Contained within the 14-pin DIP package is a basic superheterodyne receiver that contains all normal functions including mixer, local oscillator IF strip, and detector. Also included is circuitry to reshape digital logic signals that the receiver is normally intended to receive. The design of the MICRF001 is such that virtually no external components of any real significance are required. Fig. 2 from the data sheet shows just how simple a receiver can be. This example is for a 387 MHz 1200 baud receiver for remote-control applications such as garage-door openers, but can be used for data rates of up to 4.8 kbps by changing the position of the jumpers on pins 1 and 12. Although the chip is normally intended for remote-control applications, the undigitized output could be obtained from pin 7. More on this subject later.

In operation, RF from the antenna is applied to pin 1, where it is amplified and then applied to a mixer. Also applied to the mixer is the output of a synthesizer driven by an on-chip oscillator that is controlled by an external ceramic resonator or crystal. This synthesizer is unique in that it may be used in two different modes. Pulling pin 14 high enables a so-called "SWP mode." This causes the local oscillator to sweep about ±3% around a chosen center frequency so that signals not precisely at the center frequency can be received. If this mode is chosen, a low-cost ceramic resonator may be used as the frequency-controlling device, since the sweeping of the unit requires a less-demanding local oscillator.

When pin 14 is pulled low, the circuit reverts to a standard superhet configuration and only receives the chosen frequency commensurate with the 1 MHz IF bandwidth. In this mode the recommended frequency-determining device would be a quartz crystal. In either case, the resonator frequency is determined by dividing the desired receiving frequency by 130.7. As an example, operation at 420 MHz would require a 420/130.75, or 3.212 MHz crystal. After mixing (or down converting—the "modern" term), the signal is applied to the IF strip and then to a peak detector. The recovered signal is then shaped up be a comparator. The final

c/o CQ magazine

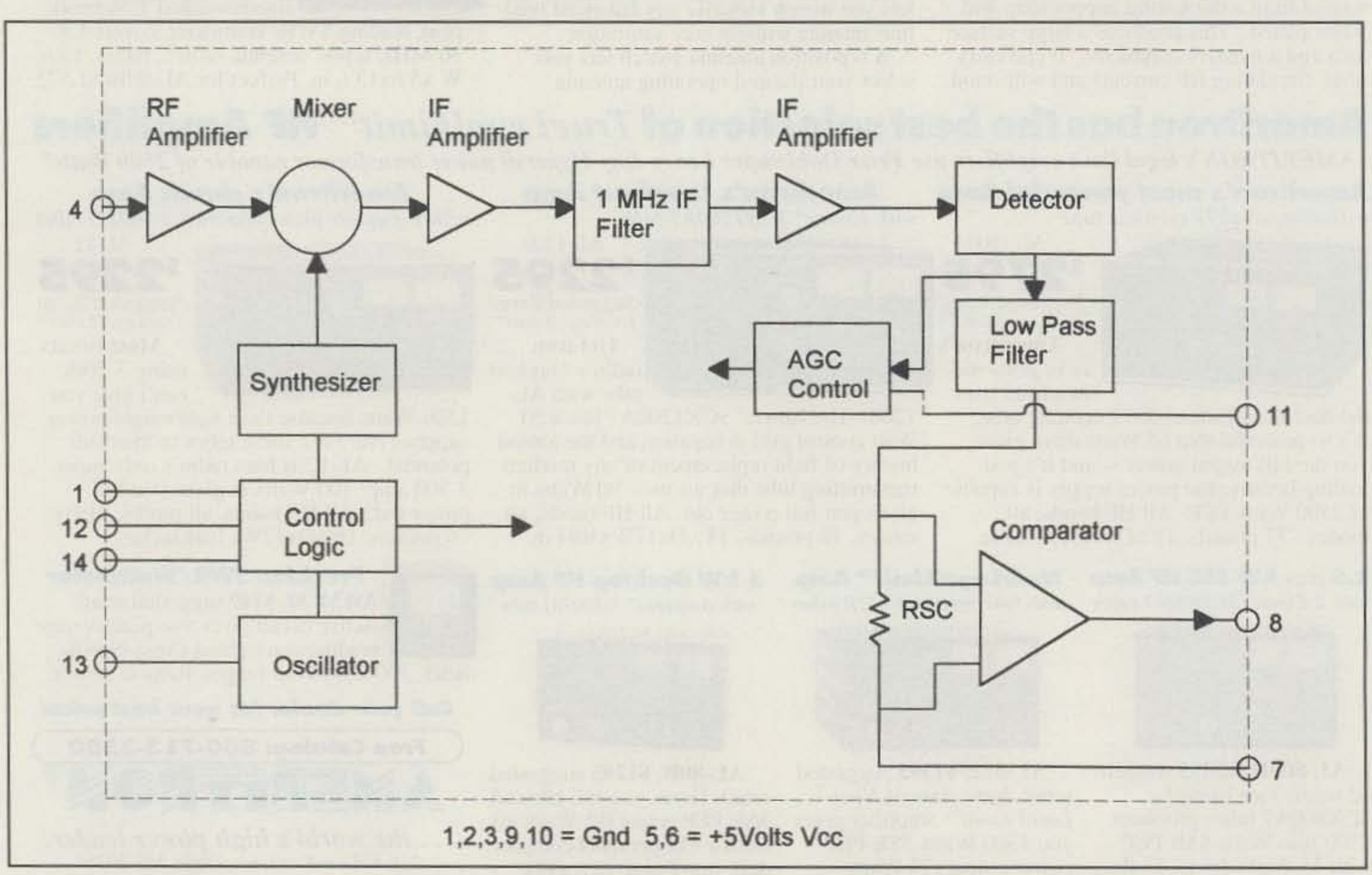

Fig. 1– Internal block diagram of the MICRF001.

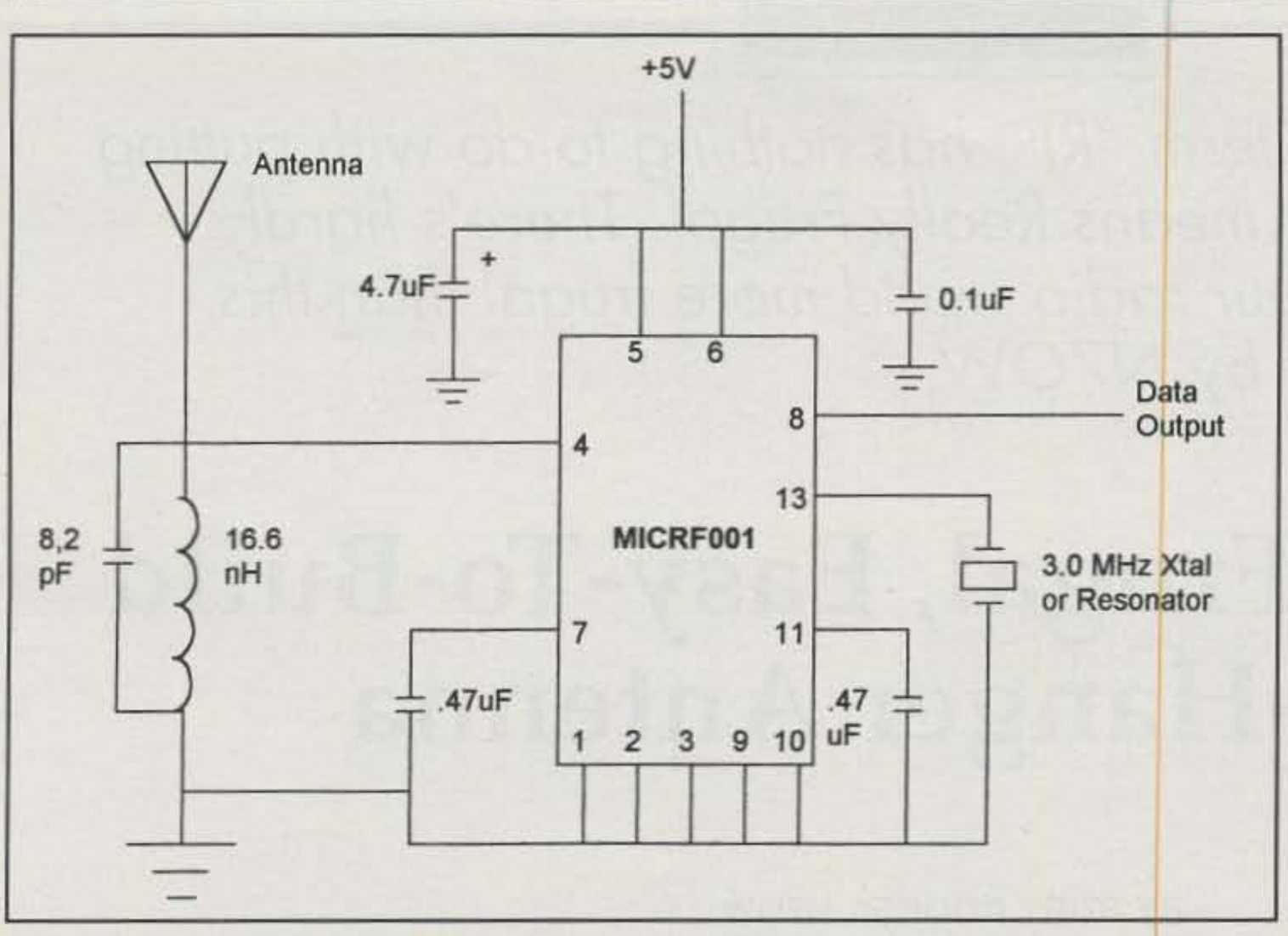

Fig. 2– The 387 MHz remote-control receiver.

CMOS-compatible digital output appears on pin 8.

Other features and specifications for the MICRF001 include an AGC time constant that may be varied by changing the value of the capacitor on pin 11 and a programmable low-pass filter (pins 1 and 12) that covers the range of 600 Hz to 4.8 kHz. Sensitivity of the chip is said to be –95 dBm, which if I have done the math correctly, works out to approximately 2.5 microvolts across 50 ohms. The operating temperature range is –40 to +85°C, making both indoor and outdoor applications possible. The recommended supply voltage is 5 volts at 6.3 ma, making this a low-power device as well.

As already noted, the MICRF001 is normally intended for remote-control digital applications. Examining the internal circuitry, however, shows that pin 7 is used to connect a capacitor to the internal RSC resistor, which then forms a filter that is used to develop the reference voltage for the internal data comparator. If this capacitor is not used, the comparator will not operate properly. However, the analog output of the detector should be present at this pin.

Although we personally have not tried this approach, it looks as if it could work, and if it does, the chip could be used for audio as well. How well it would work for narrow-band FM also remains to be seen, although the IF bandwidth is certainly adequate. Nevertheless, here is a good opportunity for experimentation. To get you going, fig. 3 is a proposed 420 MHz AM (or FM?) receiver circuit that I would use as a first approach.

Again, I have not tried this circuit, so please bear in mind that it almost certainly will need some "tweaking." Also please let me know how you make out. I will be glad to publish a couple of working approaches in a future column.

If this sort of thing "turns you on," I would strongly suggest that you get on the Internet, contact Micrel at <http://www.micrel.com>, and download the data sheet for the MICRF001 as well as the detailed 20-page application note #22. Both contain a wealth of information on the use of this versatile chip. Oh, yes. Before I close, cost of the device is only $3.25 in 1000 piece quantities and somewhat more for a few pieces.

See you next month!

73, Irwin, WA2NDM

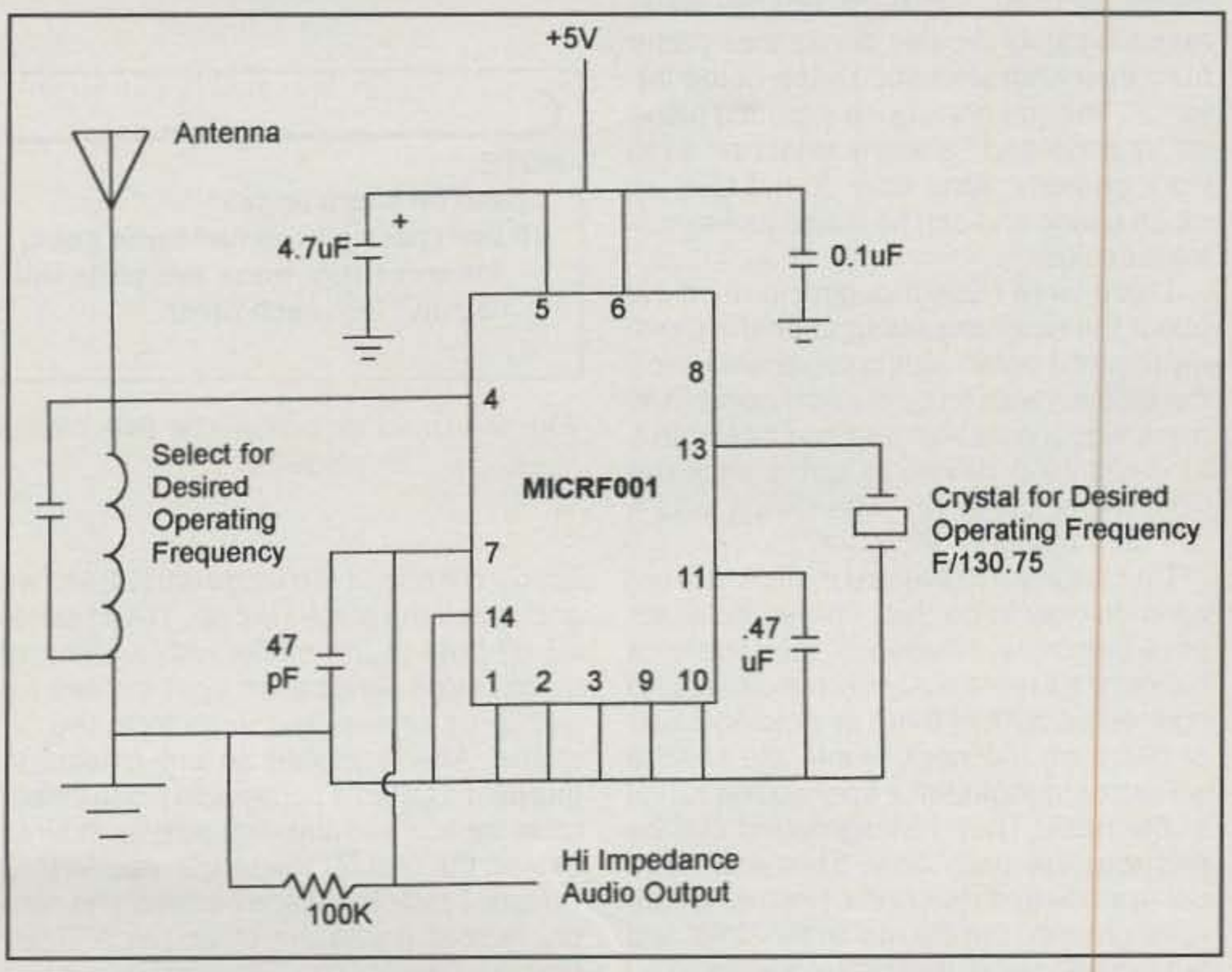

Fig. 3– Starting point for the AM (FM?) audio receiver.

To most amateurs the term "RF" has nothing to do with putting out a signal. It simply means Really Frugal. There's hardly anything in the amateur radio world more frugal than this easy-to-build antenna by N7OW.

A Really Frugal, Easy-To-Build Coat-Hanger Antenna

BY BURT ROOKE*, N7OW

If there is anything an amateur loves, it is getting something for free or next to nothing. Read on for directions on how to make a good antenna that will cost you about 10 minutes of your time and virtually pennies, if anything at all.

"Hello, the name here is Burt, and I'm talking to you on a coat hanger!"

The amateur operator on the other end of the QSO, Al Schwartz, W7LAH, a retired broadcast engineer, replied, "That's a first for me."

So went my first QSO on a coat hanger. Al went on to say that the signal report was great and to compliment the audio. I sat there afterward looking at my 2 meter J-pole, which took less than 10 minutes to build and cost me literally nothing. The J-pole was made of two coat hangers put together. Sometimes, I thought, our hobby is so much fun.

The idea for construction of this antenna started while I was driving through Portland and saw a faded green Opel station wagon. The vehicle had seen better days. Two of the fender colors did not match the rest, and being an amateur, I noticed the antenna. It was a coat hanger bent into a diamond shape. Through the years I had seen other cars with the same replacement antenna. Once I talked to an individual who told me that the coat hanger worked fine—even better than the original antenna.

Why not? A receiving antenna doesn't need to resonate on the exact frequency. A coat hanger is made of metal and therefore conductive.

Recently I had built several J-pole antennas, some from 450 ohm ladder line and some from 300 ohm twin lead. Their performance was great. I also had read an article on the Internet, a 38-page thesis on J-Poles entitled "From a J to a Zepp—The truth and its consequences" by Gary E. O'Neil, N3GO.

In summary, a J-pole antenna is a version of a dipole consisting of a half-wavelength radiator fed by a quarter-wave matching stub. J-poles derive their name from their characteristic shape of the letter "J." They do not require a ground plane as 1/4 wave and 5/8 wave antennas do to work properly. Also, they do not take up much space and can be made for various frequencies.

There were fresh thoughts in my mind about the receiving antenna on the Opel, my recent J-pole building experience, and the article. I walked by my workbench and there was a coat hanger I had bent into a long-reaching device to get a sock out from under our dryer. The shape was a "J." So, I thought, "Why not?"

Don't worry. I'll give you explicit instructions on how to do this. This is the executive summary, however. I took two coat hangers surreptitiously from a closet and opened up both of them by holding a pair of pliers on the neck where the twisted wires come together. I opened the twists at the neck. Then I straightened out the twists at the neck only. This was done using a vise and vise-grips. Following that, I straightened out the rest of the kinks and left the end twists in. They would be used later. I cut one of the lengths at 22 inches and saved the piece I cut off. Then I sanded off both of the necks with a piece of medium-grit sandpaper. I put the two together by reversing one to form the "J" shape. After I applied an anti-oxidant to this joint, I taped it tightly with plastic electrical tape. Then the real puzzle: how to extend the rest for the length needed.

Here I took the piece I saved and simply twisted it into the other piece. They matched perfectly. I sanded the parts

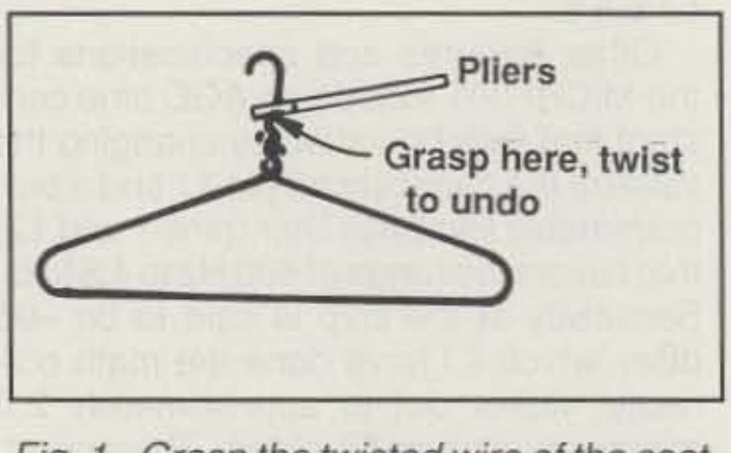

Fig. 1– Grasp the twisted wire of the coat hanger here and unwind.

NOTE:
Sand off sharp edges
If both neck pieces had turns going the same way, these two parts will "screw" into each other.

Fig. 2– Braid or screw the two pieces together.

*3321 SW Fairmount Blvd., Portland, OR 97201-1478
e-mail: <n7ow@teleport.com>

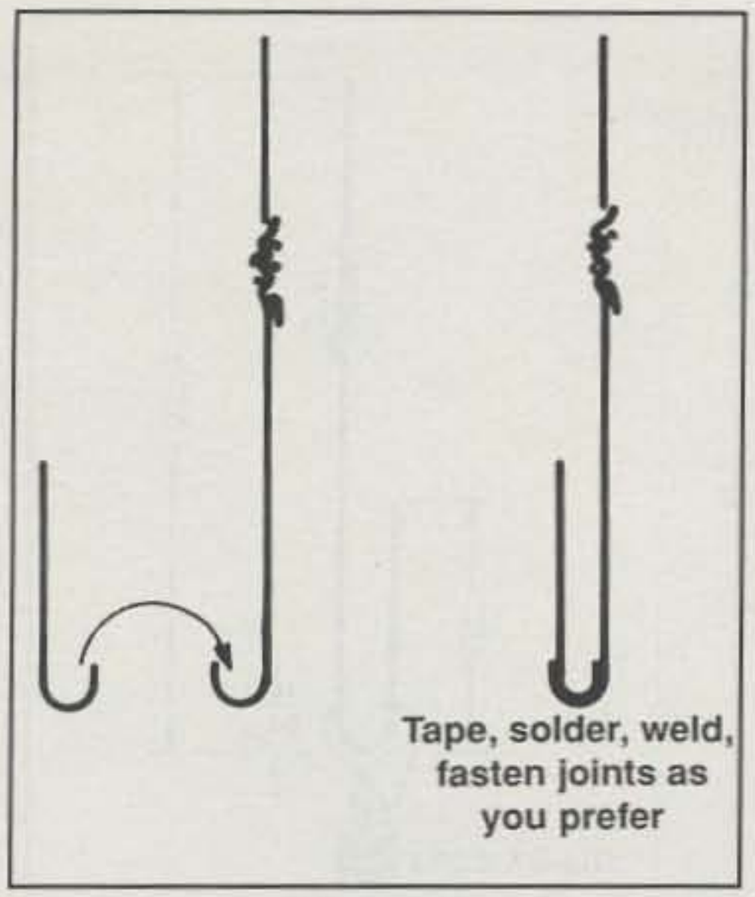

Fig. 3– The final steps to complete the assembly.

where they touched, used an antioxidant, and taped them tightly together. Now my antenna was 55 1/2 inches long on one side and 22 inches long on the other. I took an 8 foot piece of RG-8X, Belden 9258X, and stripped back the coax outer insulation about 2 inches. Then I stripped the center conductor and coax shield bare leaving a 1 inch bare wire on both sides. After experimenting with the feed-point height, I attached the shield to the short stub at 2 3/4 inches from the bottom of the "J." The center conductor attaches at the same height on the long side. I checked with my SWR meter, and the coat hanger resonated at 1:5:1 or less across the entire band!

Now I had an antenna that cost me nothing but the price of a length of coax and a connector! I wrapped a rubber band tightly around the top, hung it by a push-pin to a door frame, and dialed around listening for simplex conversations, as I didn't want to put this out on a repeater yet. That's where I found Al, W7LAH, and had my first QSO on a coat hanger.

Now here are the step-by-step instructions for building your coat-hanger J-pole antenna.

What You Will Need

- Two coat hangers. Use the type that is a continuous metal loop, not the kind with a cardboard interruption. Also, use two with similar metal and similar twisting construction at the top—viz., both twisting the same way.
- One vise or vise grip pliers with a wide jaw.
- Some electrician's tape, conductive epoxy, or liquid steel.
- Six to 8 feet of RG-8X coax with your

choice BNC or PL-259 on one end, bare at the other end.

- Small piece of sandpaper, medium grit.
- About 10 minutes of your time.
- Antioxidant such as Burndy No-Ox.

Construction

- Put the pliers on the top of the twisted wire at the neck at the place where the wires are parallel and one end is open. (See fig. 1.)
- Hold firmly and twist counter-clockwise about three turns, undoing the wire.
- Duplicate the above with the other coat hanger.
- Straighten the twists in both coat hangers *at the neck only*. (Be careful not to over torque and break the wire.)
- Straighten out the rest of the bends. Leave the end twists in.
- Sand or file off all the sharp ends.
- Cut one hanger at 22 inches from the bottom of the "J." Save the cut piece.
- Sand to bare metal 2 to 3 inches above each neck on the straight part.
- Sand to bare metal each neck.
- Sand to bare metal the kinks (twisted part) on the now straightened pieces.
- Take the short piece cut off earlier, reverse from the original angle (sharp side up), and twist into the longer piece. They will twist right into each other. (See fig. 2.)
- Apply antioxidant and tape, or heat-shrink this joint. (Epoxy, solder, weld, or crimp as you wish.)
- Apply antioxidant and put the two sanded necks together, forming a J-pole. (See fig. 3.)
- Tape, heat shrink, epoxy, solder, weld, or crimp this joint as you wish.
- Install the feed line at 2 1/4 inches from the bottom of the "J." (See fig. 4.)
- The center conductor goes to the long side; the ground shield to the short side.
- Solder, tape, heat shrink, epoxy as you wish.
- Pound the tall end flat and drill a 1/16 inch hole for push-pin or fishing line for mount.
- Sand the edges smooth.
- Use finish of your choice—paint, heat shrink, chrome plate, etc. I left mine bare.
- Make a contact on your coat hanger.

Notes

I was able to solder this metal using a lot of liquid flux. The coat-hanger antennas work fine with no welding. I taped all joints together very firmly. For long-term use I do recommend a more permanent method of joining such as welding or soldering suitable for this metal. I like leaving mine the way it is for now, because it looks like a bent-up coat hanger and starts conversations. It's a great icebreaker.

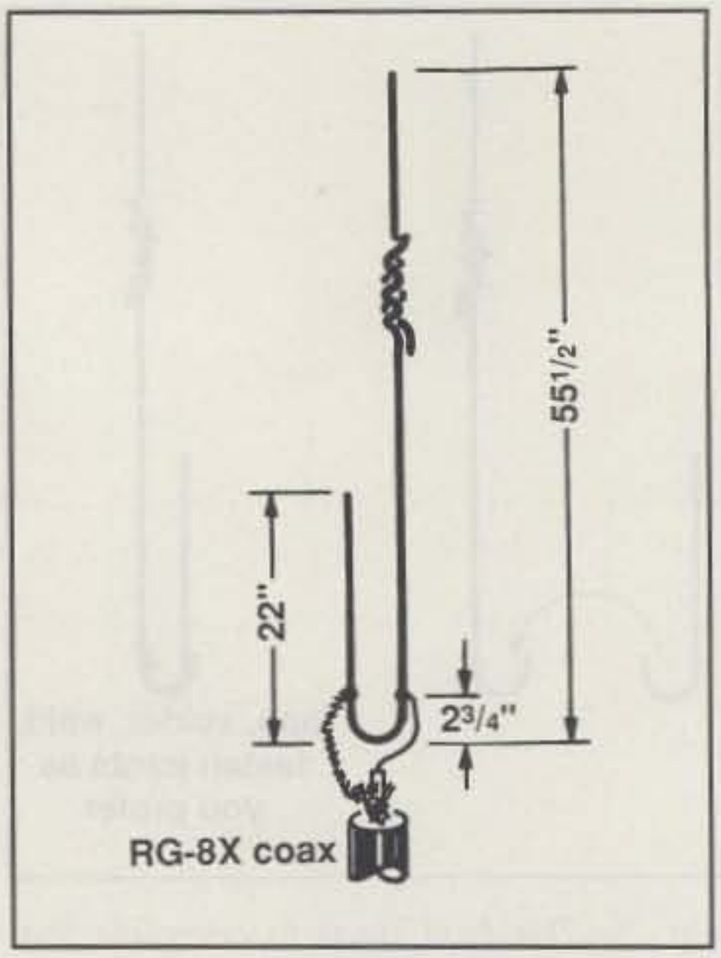

Fig. 4– Install the feed line and you're ready to go.

Tuning can be done by changing the length of your antenna. To do this, use the twisted connection at the top to lengthen or shorten the antenna , "pruning," as you would a dipole. You can also play a bit with the feed-point connection points to shorten or lengthen the antenna. Moving the feed point down towards the bottom lowers the frequency and moving it upward raises the frequency. Advantages with this type of antenna over ladder line or twin lead are that you don't need to cut insulation to locate the feed point. You can "slide" feed point contacts to find the perfect attachment point.

My total cost for the coat hanger antenna was a BNC connector and 8 feet of RG-8X, both of which came out of my junk bin. That's very reasonable for a good antenna. The antenna itself costs nothing. Not bad for something that would normally be recycled. So far this is an indoor antenna. Maybe some of you will have thoughts on weatherproofing the coat-hanger antenna. I have made contacts with 50 milliwatts and 50 watts with this antenna.

That is the fun of this hobby—the experimentation. I'm sure there are clever amateurs and engineers out there who will provide solutions to the above and even better ways to put together the coat-hanger antenna. In the last few weeks I have come up with a few ways to mount this antenna as well.

My thanks to the guy in the green Opel. If he hadn't passed by on that day, I may not have put this together. If you have any thoughts about this after trying yours, or if you have some comments, upgrades, or solutions, please e-mail me at: <n7ow@ teleport.com>. ■

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CIRCLE 126 ON READER SERVICE CARD

BY BUCK ROGERS, K4ABT

PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

The BayPac BP-96A

After talking with some friends about their new 9600 baud modems (TNCs) in an RS232 connector shell, I decided to look into the BayPac BP-96A (photo A), a new, souped-up version of the old BayCom serial port 1200 baud modem. The BayPac is a product manufactured by John Olson (President/CEO) and the folks at Tigertronics in Grants Pass, Oregon.

The BayCom was not quite what we'd call a terminal node controller (TNC), because the "terminal" part of this modem was in the software that runs on the PC. The PAD—that is, the Packet Assembler/Dissembler (for the lack of a better definition)—was in the small DE9 shell that was attached to the RS232 port of the PC. From this modem, the signal lines, ground, and PTT were attached to the transceiver for receive, transmit, and control.

There are several differences in the new design, in that it is no longer attached to the serial port, but rather to the parallel (normally LPT1) printer port of our PC. The program runs easily in a Windows format (I run it under Windows98), where it performs quite well. More about the terminal software later in this column.

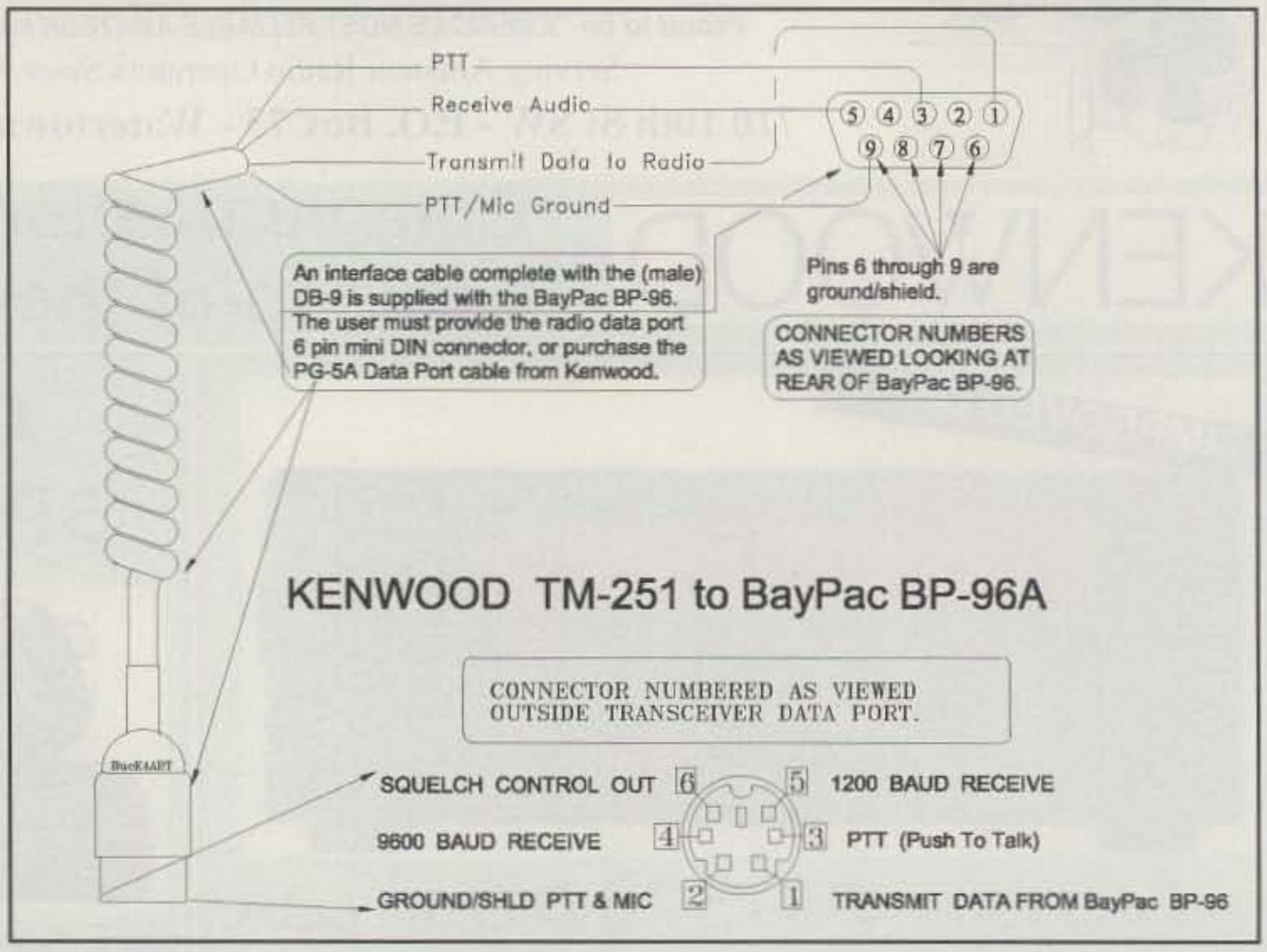

Fig. 1– This interface drawing is how the TigerTronics BayPac BP-96A is connected to the Kenwood TM-251A. The DB-9 connectors are pre-assembled and are supplied with the BP-96A. Only the radio data port I/O connector will be needed to complete this interface.

Introducing:
The BayPac BP-96A

The BayPac Model BP-96A is an enhanced version of the BayCom team's 9600 baud PICPAR modem, which is sold in Germany as a kit. The Tigertronics version of this modem employs "surface-mount technology" (photo B) and comes completely assembled and tested. This technology permits use of robotic assembly, resulting in a vastly smaller unit with enhanced reliability and lower cost—a mere $96. And it works great, right out of the box—well, that is as soon as you make up the radio end of the BayPac 96A to transceiver interface cable. The cable for

211 Luenburg Drive, Evington, VA 24550
e-mail: K4ABT@PacketRadio.com

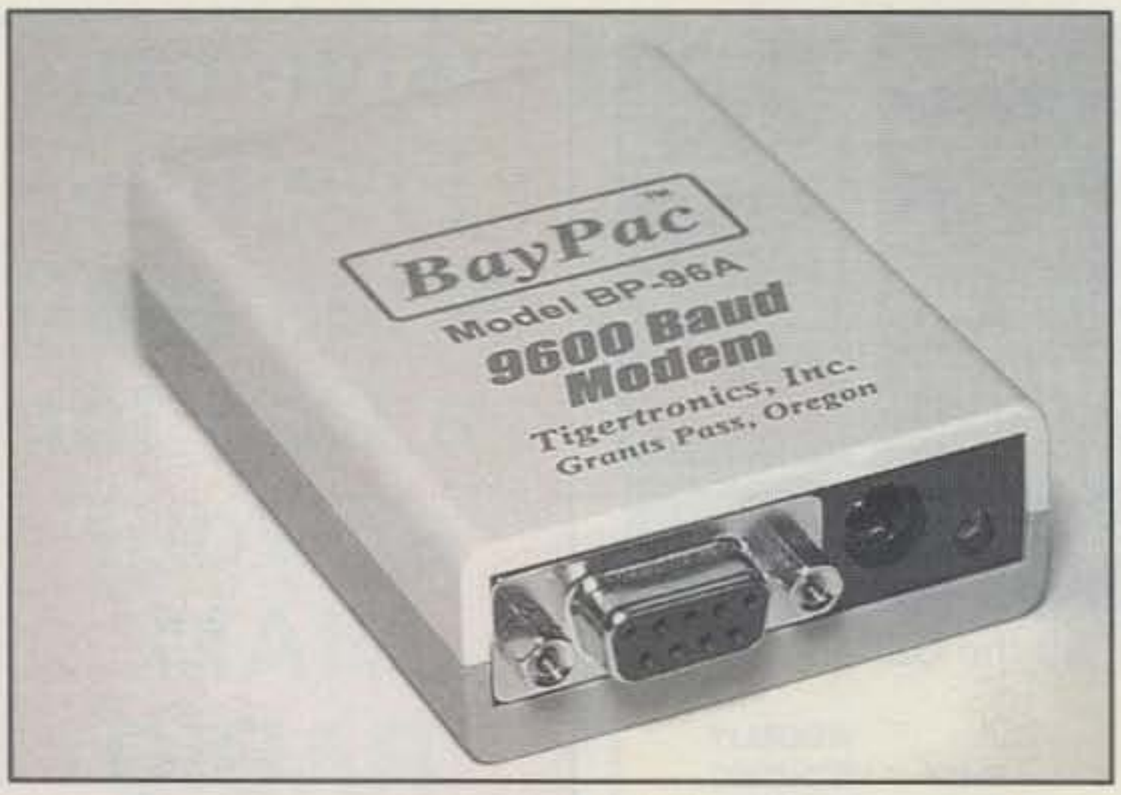

Photo A– This photo may appear larger than the super-compact enclosure of the Tigertronics BayPac BP-96A really is. It measures in at 2.25" × 3" × 0.8".

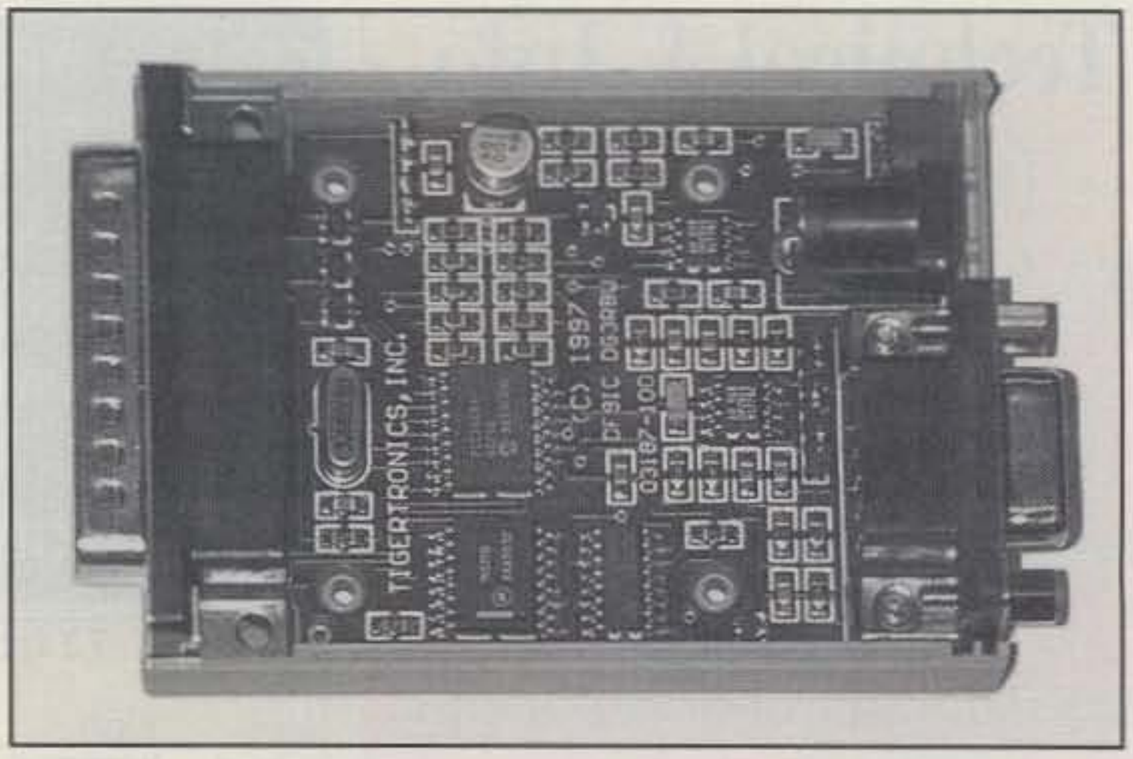

Photo B– Although the BayPac BP-96A is compact, there are many small, surface-mounted devices inside this 9600 baud power pack. Size is not always important; it's what's inside that counts. This package delivers the packets and is a true performer.

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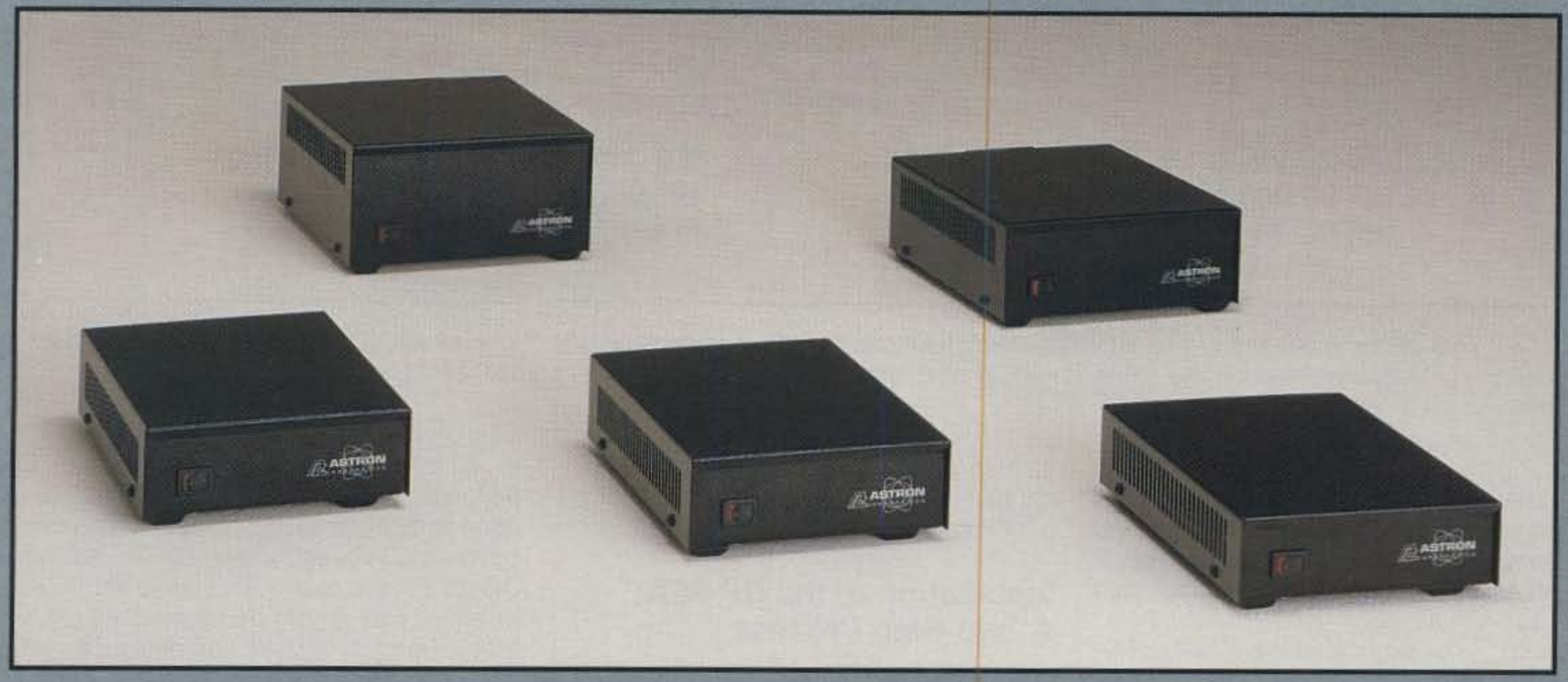

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SPECIFICATIONS:

INPUT VOLTAGE: 90-132 VAC 50/60Hz
OR 180-264 VAC 50/60Hz
SWITCH SELECTABLE

OUTPUT VOLTAGE: 13.8 VDC

MODEL	CONT. AMP	ICS	SIZE (Inches)	WT.(LBS)
SS-10	7	10	2.3 x 6 x 9	3.2
SS-12	10	12	2.3 x 6 x 9	3.4
SS-18	15	18	2.3 x 6 x 9	3.6
SS-25	20	25	2 7/8 x 7 x 9 3/8	4.2
SS-30	25	30	3 3/4 x 7 x 9 5/8	5
SS-25M*	20	25	2 7/8 x 7 x 9 3/8	4.2
SS-30M*	25	30	3 3/4 x 7 x 9 5/8	5

- *with separate volt & amp meters
- All SS power supplies are available in a RACK MOUNT VERSION (3.5 x 19 x 9 3/8)
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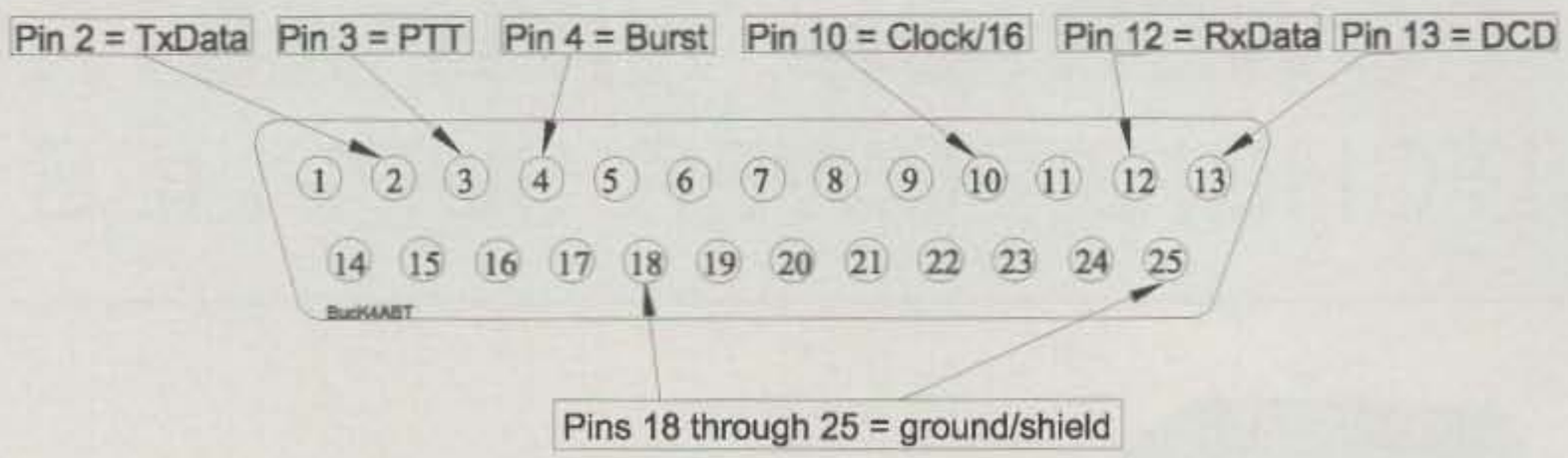


DB-25 VIEW OF PINS ON BayPac BP-96 defining signals to and from the PC Parallel (LPT1) port.

If a cable is used to interface the BP-96, it must not exceed 3 feet in length. Use shielded cable.

Fig. 2– This drawing identifies the signal(s) and their related pin numbers on the Tigertronics BayPac BP-96A. This is for reference only, since the BP-96A should plug directly onto the PC parallel printer (LPT1) port as supplied.

the BayPac 96A to the transceiver is supplied with the 96A. Only the transceiver connector for the other end of the cable is needed to put the unit into operation (see fig. 1).

In fig. 1 I've interfaced the BayPac BP-96A to the Kenwood TM-251A 9600 baud DataPort. If you use the interface drawing at fig. 1 with a different radio, then apply a variation of the signal and PTT lines to adapt the BP-96A to the respective transceiver 9k6 baud I/O.

Before I forget: Power consumption for the BayPac BP-96A is under 10 mA. In fact, power consumption is now so low that the BP-96A can get all of its operating power from your computer's parallel port! Just so you are prepared ahead of time, yes, there is a barrel jack to supply external power, but only in extreme cases will it be needed. I attached my BayPac BP-96A to three different PCs in my lab, and all three powered the BP-96A with ease. For my part, then, the external power input jack on the BP-96A is for naught.

Make a Few Notes

It should be noted that installation and setup of *any* high-speed modem requires some technical expertise and access to the proper test equipment. Operation at 9600 baud is much less "forgiving" than at 1200 baud, so proper adjustment of both receive level and transmit deviation is critical for reliable operation. You will need a radio that is "9600 baud ready" or one that has undergone appropriate modification for high-speed operation. Normal "voice grade" radios won't work properly without some modification. These instructions assume that your radio is "9600 baud ready."

For the record, I made several BP-96A-to-radio interface cables. In every case where I connected the radio to the BP-96A, including the Kenwood TM-251A, the BP-96A worked right out of the chute—that is, it performed well with no additional tweaking or level setting.

Installation of the BP-96A: A Two-Step Process

The first step involves connecting the unit to your radio and computer. A five-page, easy-to-understand installation manual comes with the BP-96A. It walks you through the process, and you are 9600 baud airborne in no time.

The second step involves setting the transmit audio level. *Do not be too hasty with step two*. As I mentioned earlier, I made several BP-96A-to-radio interface cables. The radios I connected to the BP-96A were the MFJ-8621 DataReady transceiver, a Mitrek 60 watt transceiver (modified for 9600 baud use), and the Kenwood TM-251A. The BP-96A worked right out of the chute, and with no tweaking or level setting. So before you get out the tune-up equipment and screwdrivers, give it a toot as received.

In addition, you of course will need to install the BayPac BP-96A "TNC emulation" PC compatible software on your computer. Currently, only BayCom version 1.6 supports 9600 baud operation. When you order your BayPac BP-96A 9600 baud TNC/modem from Tigertronics, the TNC emulation software version 1.6 is supplied as part of the package. Note that previous (shareware) versions of Bay*Com* do not support 9600 baud operation and *will not* work with the BayPac BP-96A.

What You Will Need

To run the software you will need a 10 MHz IBM AT compatible computer (or better) with a parallel interface port. You also will need one Centronics-type extension cable (DB-25 *male* to DB-25 *female*). For the record, the Tigertronics BayPac BP-96A will plug directly onto the DB-25 female parallel printer port of most PCs without having to construct the DB-25 *male* to DB-25 *female* cable. The cable *must be shielded* and should be no longer than 3 feet in length. If your computer cannot supply sufficient power to the modem, you will also need an external power source of 8 to 14 VDC at approximately 10 mA.

You will also need a cable with a DB-9 male connector *(supplied with the BayPac BP-96A)* on one end. This end attaches to the modem. The other end of this cable will need whatever connectors (not supplied) are appropriate to attach to your particular radio equipment (see fig. 1).

How It Works

The RX and TX data is transmitted in 16-bit bursts each via the interface. The 16 bits of TX data are written via TxD into the modem's TX buffer (shift register). This data transfer is controlled by the BURST line (see fig. 2). Once in the TX buffer, the bits are clocked out by the TX clock and sent through a digital filter. An analog filter removes the unwanted sampling signals from the digital filter. Although necessary for a G3RUH-compatible signal, the data is not scrambled in the hardware. This is done in the software, such that the data reaching the modem is already scrambled and NRZI coded.

On the RX side, the demodulated AF from the receiver is fed into a low-pass filter and then into a binary discriminator. The discriminator compares the signal with the average of the bit stream. The raw data bit stream now needs to be sampled at the right time—i.e., in the middle of each bit. To do this, the clock of the received signal is recovered by a digital phase locked loop circuit (implemented in the PTC I 6CS4). The raw data bit stream is then sampled at this clock rate and fed into the RX buffer. The CLK/I6 line then tells

the PC that the RX buffer is full and should be read again by the BURST line.

The Interface

The buffering and the burst transfer of data between the modem and the PC are the most complex part of the modem. The interface circuitry is used for both TX and RX data. The direction of the data is determined by the PTT signal, so the modem will only support semi-duplex operation.

During transmission, the PC sends 16 bits of TX data into SR1 via a serial line, controlled by the BURST signal. At the same time, SR2 is being read bit-wise by the modem at a rate determined by the modem's TX clock. Once SR2 has been emptied, the contents of SR1 are shifted into SR2 at high speed. Then the CLK/I6 line signals the PC that SR1 has been emptied and that another 16 bits of TX data may be written into SR1 with the burst signal.

During reception, the functions are reversed. The regenerated RX clock writes RX data into SR1. After 16 clock cycles, SR1 is full and its contents are transferred to SR2 at high speed. The PC is then signaled with the CLK/I6 line that SR2 is full and can be read using the burst signal.

The complete control circuitry is built using a PIC 1 6C84 microcontroller. All control signals for the shift register toggling and the data transfer between the shift registers are derived from the RX and TX clocks as well as the BURST signal and an 1.228 auxiliary clock. A 4517 dual shift register is used for the RX and TX buffers.

Auxiliary Circuits

The BP-96A can be powered by either the computer's parallel port or by an external power supply. If an external power supply is used, then the external power (8–14 VDC) is shunt regulated (by R1, R2, and D1) to a constant 4.5 volt level. Power obtained from the parallel port is not regulated, since the voltage levels on the parallel port are no more that 5 volts.

The radio's PTT line is controlled by a FET transistor (Q4) which is capable of sinking about 75 mA at 12 volts. This transistor keys the radio by shorting the PTT line through ground. If your radio needs some other keying arrangement (which is not likely), then you will need to provide it. If your radio is an older model with high voltage or high current on the PTT line, you will need to install a small relay to do the keying.

Installation

The installation of the modem is relatively straightforward. However, before you begin, be sure you have reviewed your radio's documentation to verify that it is 9600 baud compatible and that you have the correct connectors on hand to interface to it. You may also want to check your

computer's documentation to determine the address and interrupt number for the parallel port you intend to use. You will be prompted to enter that information during software installation. Be sure you have a copy of BayCom version 1.6 (or later) and have thoroughly reviewed the manual.

Connecting the Computer

As I stated earlier, *the modem can be plugged directly into the PC parallel printer port connector* or attached with a "Centronics" type extension cable (DB-25 male to DB-25 female). The cable should be as short as possible and under no circumstances should it be longer than 3 feet. Note that many ready-made "serial" cables of this type *do not* contain all the necessary lines. If you wish to construct your own cable, only the wires shown in fig. 2 need to be wired.

The male DB-25 connector on the cable is plugged into the parallel port of the computer (as a printer would be).

Connecting the Radio

All wires required for connecting the radio to the modem are available on the DB-9 connector on the front of the modem (see fig. 1).

At this stage it is appropriate to mention that most radios must be converted for 9600 baud operation. Most radios of recent manufacture are being built to allow for the direct connection of 9600 baud Direct FSK modems. When choosing a radio, please keep in mind that the receive and transmit switching time on most synthesized radios is very long and will therefore limit throughput, since you will require a rather long TX Delay setting. The PTT line is active low (grounded during transmit).

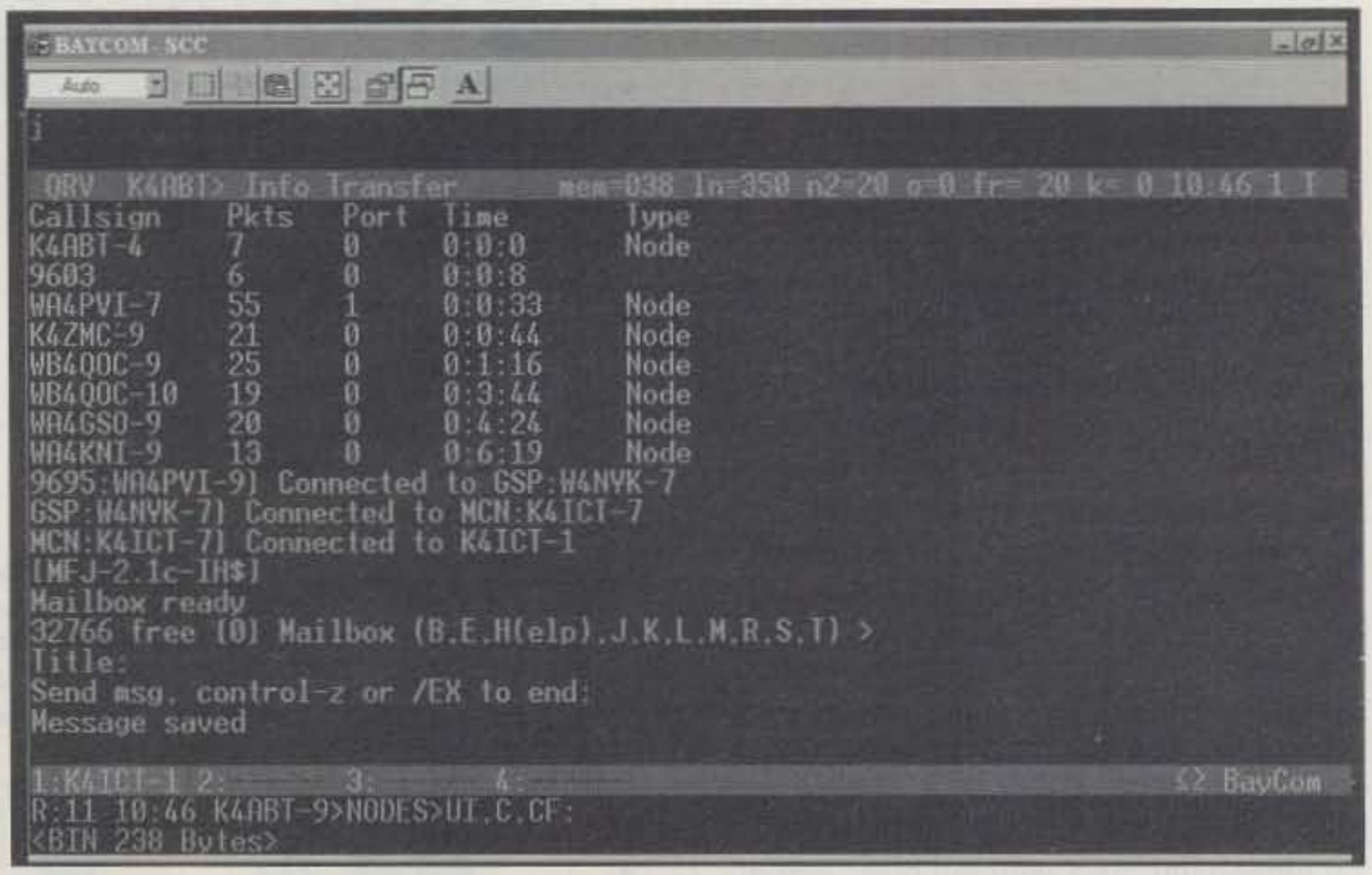
In the radios I used for this application and article, I set the TXDelay to 20 and then began to lower the TXDelay in 20 millisecond (TXDelay 2) increments (each number associated with TXDelay, 1 = 10 milliseconds).

Connecting the Modem

Connect the modem to the radio with the appropriate cabling. Next turn on the computer. In rare cases, it is possible that the radio will go into transmit mode immediately. This is because sometimes the computer's parallel port powers up without resetting its output lines. If this happens, *simply turn off the radio until BayCom software is installed and running.*

Software Installation

Before you can operate the modem, you will need to install BayCom version I.6 (or higher) software on your computer. To install the software, insert the program disk into your floppy drive and type A:INSTALL. Follow the on-screen instructions and the software will be installed and configured for LPT1. If you wish to install the modem on a different printer port, you will need to manually edit the SCC.INI file after installation is complete. Refer to the BayCom program manual for instructions.



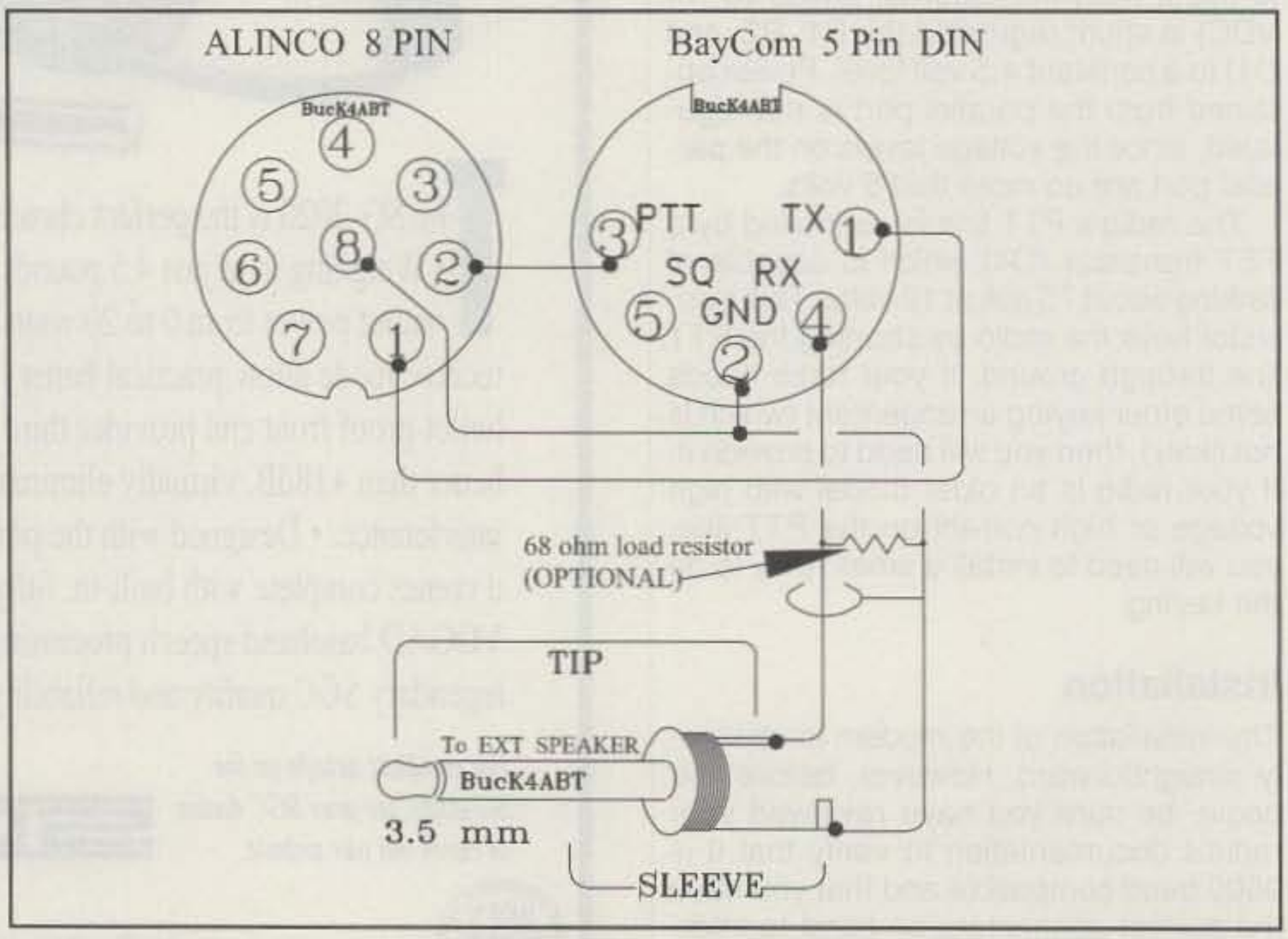
Screen 1– A screen shot of the first link with the Tigertronics BayPac BP-96A. From the get-go, it was plug-n-play all the way. All I had to do was interface the radio and plug it into the Pentium 400 parallel printer port. I booted the BayCom version 1.6 TNC emulator software, and I was off and running—9600 bauds.

Starting the BayCom Software

Start the program by entering L2 at your DOS-prompt (make sure that the BayCom directory is your working directory). There should be an all-English message and a flashing rectangle in the upper right corner of the screen. If this is the case, just enter SCC at the prompt and the familiar BayCom screen should appear. If the last line of the message that appears is in German, it means that the software could not detect the modem.

Exit and restart L2 again. If the modem still isn't detected, then you should recheck your cables and verify that you have selected the correct parallel port, interrupt, and base address in the software.

Let's assume that all goes well and the BayCom screen appears (see screen 1).



For the notebook: Alinco 8-pin mic IO to the BayCom 1200 baud modem.

Turn on your 9600 baud radio and set it to a packet frequency. If there is traffic on the frequency, you should now be able to monitor it in the bottom window.

Alignment (if necessary)

Proper alignment will be easiest if you have an oscilloscope. However, if an oscilloscope is not available, you should have little difficulty doing the alignment without it. Before you start, you will need to make a few changes to your station setup. If your radio is a high-power synthesized radio (anything above 2 watts is high power), set your DWait on the channel in question to about 20 to allow for long switching times.

Set TXDelay to 200 milliseconds (TXDelay 20) and switch to a monitor port by pressing F10. You can now send unproto packets simply by pressing ENTER. Have another radio tuned to the transmit frequency and keep it unsquelched. Now adjust the Level control on the front of the modem so the noise level of the test packets is just below the normal channel noise. If you have an oscilloscope or millivolt meter, you can consult your radio manual for the signal level required to produce a 3 kHz shift at the radio's modulator. Adjust the level as required. This is best done with a deviation meter, since the deviation is critical for reliable operation.

After you have adjusted the transmit audio level, you need to find a good station to connect to. If you see another station's packets on the monitor, you probably will be able to connect to them. While you are still in the monitor window, enter **:c callsign**. Now send an unproto test packet by pressing ENTER in an empty line. If the station receives your packet, the station will respond with a packet with a DM,F at the end. If you get no response, try again a few times if necessary. If you get no response at all, try it again with a slightly longer TXDelay or a better antenna location. If the DWAIT (the time that your partner station will wait before responding if you have just transmitted; DWAIT is the relevant BayCom parameter for this) at your partner station is too low and you are using a synthesized radio, this could be a problem.

If all (or a majority) of your packets get acknowledged, you are ready for the next step. Using the same method as above, try to lower your TXDelay as far as you can without increasing the number of unanswered packets (I was able to bring the TXDelay below 10 on the Kenwood and below 5 on the MFJ-8621 DataReady Radio). Once you get the TXDelay as low as you can (while maintaining good performance), record this value and enter it into your SCC.INI file.

RF Interference

The BP-96A modem was designed with RF immunity in mind. Not only is its circuitry designed to minimize generation of radio emissions, it is also designed to suppress emissions from your computer.

Contacting Tigertronics

If you have Internet access, you can visit the Tigertronics page on the World Wide Web at <http://www.tigertronics.com>. Their site contains the latest news about Tigertronics products, as well as a wealth of information of interest to all amateur radio operators and SWLs. This site is also your best source for the latest updates to all of the software.

You can also contact Tigertronics at 400 Daily Lane, P.O. Box 5210, Grants Pass, OR 97527 (phone 541-474-6700; fax 541-474-6703).

That's it for this month. Be sure to visit the packet radio pages on the WWW at:

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http://www.sedan.org
http://www.qsl.net/k4abt
http://www.angelfire.com/va/buck4abt

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BY KARL T. THURBER, JR., W8FX

THE DIGITAL DIPOLE

FROM SOFTWARE THROUGH ANTENNAS FOR THE SHACK

From the Notebook—Part I

This month, we'll open the "Digital Dipole" notebook for a look at a potpourri of antenna, software, and book topics. We'll kick things off by opening the notebook to antennas.

Antenna Notes

New from Norm's Rotor Service. Norm Jeweler, W3NRS/K3LYW, offers a variety of rotor services, including rebuilt rotors, rotor parts, and repairs. Norm says parts are available for most U.S. makes and models, and repairs are offered for many popular rotors. He also buys used rotors, controls, and parts.

Norm recently announced two new products. One of these is the BD-189 Brake Delay Unit for CDE and Telex rotors, priced at $30. The BD-189 is a simple but very high-quality time-delay device for rotor systems with a solenoid brake.

Many amateurs have learned the often nasty consequences of accidentally applying the rotor brake before the rotor and antenna both have come to a complete stop. Gears, brake wedges, rotor castings, and other components all can be damaged by premature braking. The BD-189 automatically delays insertion of the rotor brake for five seconds after the rotor motor is de-energized, providing a safety factor to allow all component system parts to come to rest before the brake is applied.

The second new product is the HAM-SP rotor control unit for visually impaired operators. The advanced, solid-state control unit has operational functions marked visually and in Braille. The $249.95 unit's circuitry automatically extracts the wedge brake, starts the rotor turning, turns the antenna to the selected bearing, stops the rotor, pauses five seconds to allow the antenna to come to rest, and then resets the wedge brake. The unit stops when the antenna has reached the desired direction.

The three front-panel controls include a specially designed tactile compass dial knob, a pushbutton start switch, and a power on/off switch, all marked on a Braille faceplate. (Some rotors require modification for use with the unit.)

Further information is available from Norm's Rotor Service, 5263 Agro Drive, Frederick, MD 21703 (301-874-5885).

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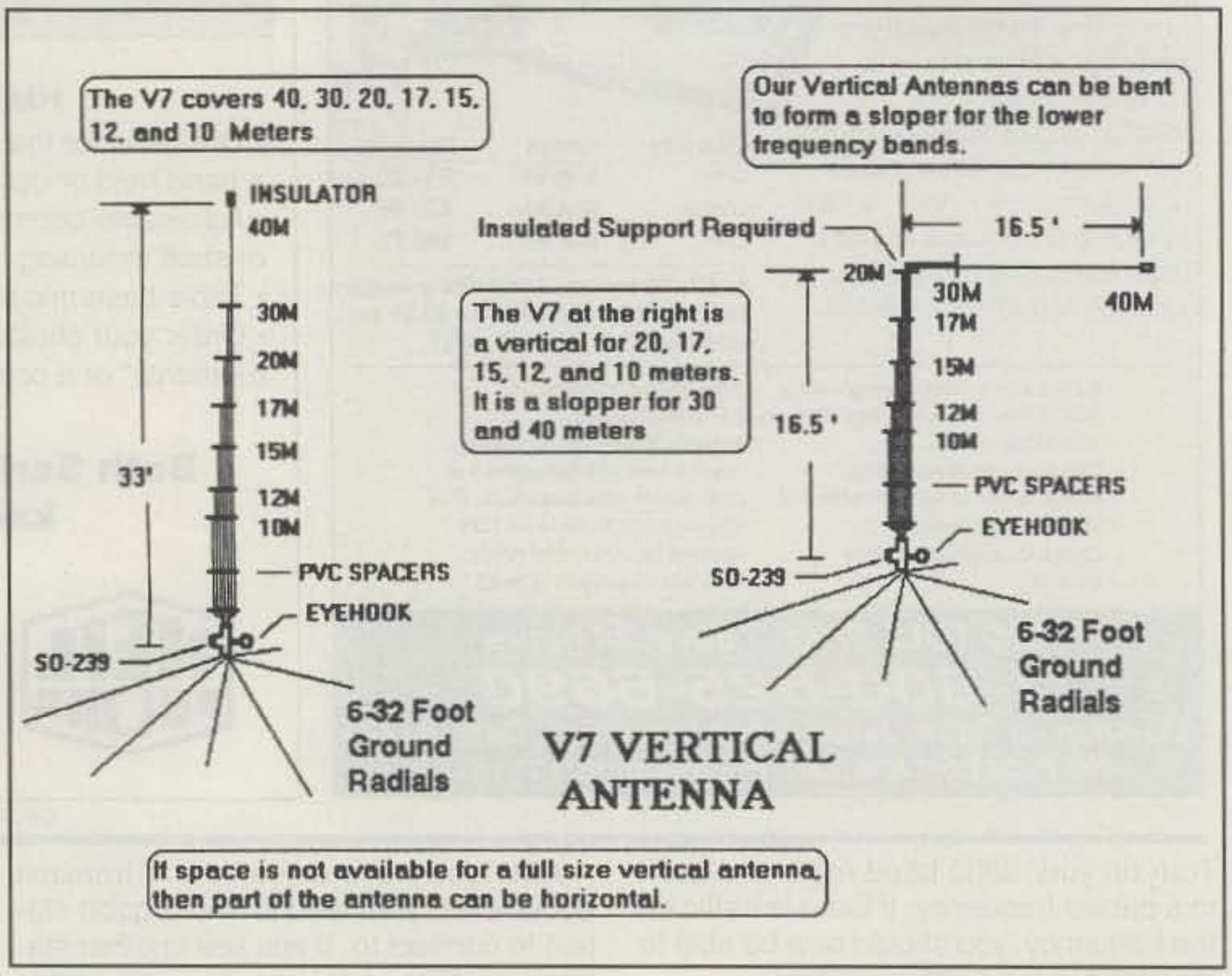


Fig 1—Dynamic Electronics offers several new vertical/sloper variations that cover from one to nine HF bands in various combinations. These range in length/height from 33 ft. to 124 ft. and in price run from $40 to $179 (plus shipping). A variety of possible mounting and installation configurations are shown here for the V7 vertical antenna. An extensive line of multiband dipoles also is offered. (Source: Dynamic Electronics product literature)

Alpha Delta DH-1 and DH-2 Fixtures. Alpha Delta Communications, which has the advertising slogan "compelling you into the 21st century," has introduced two foldover mast fixtures for small HF verticals, VHF/UHF ground planes, and discones, permitting their raising and lowering on a user-supplied mast of up to 20 ft. in length. The two new devices can greatly simplify antenna adjustment and maintenance, and they claim to let you raise and lower an HF vertical in a simple 30 second operation. The fixtures have an adjustable pre-load/pivot bolt feature that allows you to adjust the tension of the pivot bolt, so that in addition to the action of the hydraulic module, the antenna glides smoothly and safely down to the horizontal level with one-hand operation. Ground hardware is included for use with ground rods or radials.

Both units feature aircraft-grade aluminum and "post hole" type mounting for use with premix concrete. They're preassembled and include a hydraulic dampener for safe operation. The Model DH-1 fixture includes a powder-coated steel pedestal and is $249.95. The Model DH-2 excludes the pedestal and mounts on a "4×4" post or sturdy wood fence post; it's $229.95.

For a free, well-illustrated product information flyer and spec sheets, contact Alpha Delta Communications, Inc., P.O. Box 620, Manchester, KY 40962 (1-888-302-8777).

Multiband Vertical Slopers from Dynamic Electronics. In last March's column, we profiled the Dynamic Electronics DP-8 Multiband HF and VHF antenna. As we noted, the $139 antenna essentially is a parallel-dipole skyhook consisting of

Definitely in the "lovable boat anchor" category, the Heath Mohawk RX-1 receiver was a massive, $274.95 tube-type kit that Heath sold from 1958 through 1963. The double-conversion set covered seven HF amateur bands, from 160 through 10 meters. Many amateurs used it in conjunction with its transmitter counterpart, the TX-1 Apache. (Photo by Tom Bonomo, K6AD, via Barry Wiseman, N6CSW/Ø, Editor and Publisher, Electric Radio *magazine).*

This photo presents a nice display in the vintage hamshack of Dennis Petrich, KØEOO. The transmitter in the center is a Hallicrafters HT-9; on top of it is a Hallicrafters S-38. To the left is a National HRO rackmount receiver, and on the right is a National NC-303 receiver. On top of the NC-303 is a Collins 75A-4. To round things out, the two microphones in the front are both Astatic D-104s, the mics of choice for many vintage AM radio operators. (Photo by Dennis Petrich, KØEOO, via Barry Wiseman, N6CSW/Ø, Editor and Publisher, Electric Radio *magazine.)*

eight full-size dipoles, one for each HF band, 80/75 through 10 meters. The DP-8 is 125 ft. long and uses 16 inch PVC spacers to separate the individual antennas. An SO-239 coaxial cable socket is used to accept a standard PL-259 coax connector.

We also noted that Dynamic Electronics offers a large number of multiband dipoles in various combinations; these range in length from 65 ft. to 245 ft. (the latter being the nine-band DP-9). Most variations involve how 80/75 and 160 meters are handled, and several "S-suffixed," half-size versions also are offered. The antennas vary in price from $45 to $210, depending on length and band combinations that are covered.

Dynamic Electronics advises that what's new is a family of multiband vertical slopers designed for mounting on the ground; these take the form of active parallel elements for each of the bands covered. Included with the verticals are six 32 ft. ground radials that are placed symmetrically on the ground or buried. If space is at a minimum, then the radials can be bent or folded back on themselves. A tree limb or other support is required for the other half of the antenna. The radiating element can be vertical, or it can be a combination of vertical and horizontal (a sloper). As with the multiband dipoles, several vertical/sloper variations are available that cover from one to nine HF bands in various combinations. These range in length/height from 33 ft. to 124 ft., and they range in price from $40 to $179, plus shipping. An example of the possible mounting and installation configurations for the V7 vertical antenna is shown in fig. 1.

Contact Dynamic Electronics, Inc., P.O. Box 896, Hartselle, AL 35640 (256-773-2758; e-mail: <dei@whnt19.com>; web: <http://www.hsv.tis.net/~dei>). The website has complete information on both types of antennas, as well as amateur radio accessories, shareware software, and computer upgrades.

Soft Stuff

New HAMCALC 35 de VE3ERP. In a number of our columns we have profiled George "Murph" Murphy, VE3ERP's excellent, free, DOS-based HAMCALC software series of math and design programs, which he bills as providing "painless calculations for amateur radio operators." Murph just keeps cranking out new versions of the popular diskette, and so a short while ago we received Version 35. (By the time you read this, HAMCALC probably will be in another, even more improved version.) Murph says the freeware diskette continues to prosper since its introduction as a reference and learning tool in 1993, thanks to the interest, encouragement, and suggestions from its many amateur and professional users. HAMCALC 35 now includes over 200 math and design programs and program upgrades, routines of interest not only to radio amateurs but to professional engineers and university faculties.

The sole method of distributing the program is by people ordering copies after reading about it in *CQ* and other amateur radio publications, and so we'll tell you just how to obtain a free copy. (Murph says that the program, which is freeware and not to be sold, is offered "for sale" on the Internet and in some CD-ROM disc sets. These versions invariably are outdated, he says, and so he suggests disregarding any version of HAMCALC you may see elsewhere.) For a copy on a 1.44 Mb IBM-PC format diskette, send $5 U.S. funds (no stamps or IRCs) to cover the cost of materials and airmail worldwide, to George Murphy, VE3ERP, 77 McKenzie St., Orillia, ON L3V 6A6, Canada. (Note that the program is written in GWBASIC and requires you to have GWBASIC.EXE installed on your hard drive. The disk tells you how to obtain this program easily if you don't already have it.)

Projeto Radioamador 2000 CD-ROM. Do we have any Portuguese-speaking, especially Brazilian, *CQ* readers out there? Recently we received a pilot edition of the specialized Projeto Radioamador 2000 CD-ROM from Ronaldo Bastos Reis, PS7AB. Rony tells us that the CD-ROM is designed to document the history of radio amateurs and amateur radio in Brazil. It's mostly in Portuguese, though a few items on the disc are in English.

According to Rony, the noncommercial project is under continuous development by radio amateurs like himself, not by professionals. Information is continually being added to the CD-ROM to ultimately amass a great deal of information about radio amateurs and the amateur radio hobby in Brazil. Rony plans to release the final version in January 2000.

The latest pilot version of the CD-ROM

is available for $20 (U.S. funds, checks or cash), or 20 IRCs, for airmail shipping. For more information, contact Ronald Bastos Reis, PS7AB, P.O. Box 2021, 59094-970, Natal/RN, Brazil (tel. (084) 219-2343;e-mail: <ps7ab@digi.summer.com.br>).

DeLorme Topo USA ™. Among the many highly capable CD-ROM products we have reviewed over the years are the excellent mapping and navigation software packages from DeLorme. These packages include Street Atlas USA™, the first consumer mapping software; Global Explorer®; AAA Map'n'Go®; Phone Search USA®; and several others. They also publish the popular Atlas & Gazetteer® series of state recreational atlases.

Mountaintoppers and hiking hams take note: Recently, DeLorme has delved into customizable topographic maps on CD-ROM with its introduction of DeLorme Topo USA™. It's billed as a "desktop adventure," a four CD-ROM set that features customizable, topographic maps of the entire United States, in three views. A 2-D view, complete with topographic contour lines displayed at 50 to 100 ft. intervals, allows you to access elevation data. Thirteen different magnification levels are available in this view, and you can mark and detail routes. You also can print full-color maps from this view.

Once you've marked a route, the program provides a cross-sectional profile with information on the average grade, the elevation gain, the horizontal distance, and the terrain distance. A 3-D overview of the region completes the package, giving you a panoramic view of the terrain from any point, or the ability to tether around a point looking in. The program even works in conjunction with DeLorme GPS receivers as well as 3Com Palm Computing® or Windows® CE hand-held computers. Estimated street price is $99.

For additional information, contact DeLorme, Two DeLorme Drive, P.O. Box 298, Yarmouth, ME 04096 (1-800-452-5931; e-mail: <info@delorme.com>; web: <http://www.delorme.com>.

From the Bookshelf

Aerials III. We noted in previous columns that *Worldradio* offered collections of the entertaining and provocative "Aerials" columns that appear in each issue, and "Aerials II." The columns and the collections are by Kurt N. Sterba and Lil Paddle, the pen names of the husband and wife team who write the column.

Now, *Worldradio* has issued a new, updated collection of the columns in "Aerials III." The 160-page collection is presented in the same irreverent tradition. The Sterba columns are more than technical treatises. Rather, they're witty "uncoverings" of antenna-related myths, misconceptions, and misinformation the pair have found over the years in antenna articles published in the amateur press and in the erroneous and exaggerated claims of some antenna manufacturers.

Just who are they? We don't know, and Armond M. Noble, N6WR, Worldradio's publisher, isn't telling. Some time ago, Armond told us: "Where did we find Kurt? He was an instructor at the same institution where I was a student long ago. Was that the Army, technical school, a college, or the university? I'll never tell."

"Aerials III" is $14 plus $2 s/h from Worldradio, Inc., P.O. Box 189490, Sacramento, CA 95818 (1-800-366-9192). *Special note:* If you buy the book, be sure to read the unusual copyright notice and disclaimer. And above all, don't neglect the fictitious, tongue-in-cheek "testimonials" in the foreword by notables of yesteryear such as Guglielmo Marconi, Major Edwin Armstrong, Lee De Forest, and General David Sarnoff. They're great fun.

Mahlon Loomis Book Reprint. A very interesting old-time radio personality is Dr. Mahlon Loomis, who now is accorded some credit as having "fathered" radio, or at least having contributed greatly to its development. A little history is in order.

Loomis (1826–1886) was a Washington, D.C. dentist. An almost forgotten name today, he became interested in electricity and conducted "radio" experiments early-on. His early work on wireless communication could have been more important had it not been for the poor economy of his day: He never had the financial backing he needed to continue his work commercially.

In 1868 Loomis experimented with wireless communications by developing a system of transmitting and receiving telegraph messages using the Earth's atmosphere as a conductor. Loomis' system involved conducting large currents of electricity through salt-water puddles and kites flown by wires, conveying a signal some 18 miles through the ether using "natural electricity."

Loomis sent up kites about 18 miles apart from two West Virginia mountaintops. The kites were covered with a copper screen as aerials and were connected to the ground with copper wires. The wire from each kite string was connected to one side of a galvanometer; the other side was held by Loomis, who was ready to make a connection to a coil buried in the Earth.

Although his "communications experiments" generally were successful, they hardly were recognized in his time. But in retrospect, his work did constitute transmission of a manmade signal predating Marconi's accomplishment by more than 30 years, and it might have been exploited had he and others realized the potential. Instead, Loomis fell into obscurity, his contributions were forgotten, and he died considering himself a failure.

Johan K. V. Svanholm, N3RF/V73RF, has reprinted the long-unavailable 1967 Thomas Appleby book, *Mahlon Loomis, Inventor of Radio*. The 188-page book is sure to put a different complexion on things, especially since in July 1998 there was belated official recognition when the Library of Congress publicly displayed an exhibit of Mahlon Loomis manuscripts.

For a copy, contact Svanholm Research, Attn: Johan K. V. Svanholm, N3RF, P.O. Box 81, Washington, D.C. 20044 (e-mail: <N3RF@aol.com>). The Appleby' book reprint is $25 plus $5 s/h.

ARRL Educational Workshop Proceedings. For the past several years, amateur radio has been "on the ropes" for a variety of reasons, including things such as the lure of the Internet as a hobby replacement for ham radio, as well as a lack of new blood entering the hobby to replace oldtimers.

The ARRL is trying to do something about these two problems, especially the latter one, with its educational and public affairs efforts. To this end, it has embarked on annual publication of the Proceedings of the ARRL National Educational Workshop. The 162-page, large-format book documents the July 1998 workshop and includes articles on recruiting new amateurs, teaching amateur radio courses, bringing amateur radio into the classroom, and getting new hams on the air. Over 40 interesting and useful articles are included. The book is $12 plus $4 s/h.

Contact the American Radio Relay League, Inc., 225 Main St., Newington, CT 06111-1494 (1-888-277-5289; e-mail: <pubsales@arrl.org>; Internet: <http://www.arrl.org>.

***Electric Radio* Update.** While most receivers, transmitters, and transceivers today are solid state, and many hobbyists thumb their noses at tubes, you'll find many older rigs still do a creditable job. To many amateurs, in these days of solid-state rigs, Internet connections, and digital modes, the best part of radio may lie in the nostalgia that goes with the hobby. Too, there's a sort of magic in the old sets, the tube filaments of which glow brightly and warmly in the dark and possess a unique character not found in modern-day radios (see photos).

Published by Barry R. Wiseman, N6CSW/Ø, *Electric Radio* is committed to older, tube-type receivers and transmitters. Barry hopes the magazine will stimulate the collecting of, and interest in, vintage equipment. Despite this interest in tube-type gear and amplitude modulation (AM), *ER* puts this bygone equipment into perspective, acknowledging the technical superiority of modern equipment but also lamenting its expense and complexity.

While *ER* appeals to all amateurs, it wins special approval from those who were first introduced to amateur radio in the 1940s, 1950s, or 1960s, and who appreciate older tube type equipment. Each issue explores vintage radio gear and the people who produced it. Issues provide information regarding the modification, repair, and building of equipment; it has a classified ad section; and it works toward a greater understanding of AM, both its attractions and its problems.

Subscriptions are $28 in the U.S. for second-class mail, or $38 for first-class mail. For more information, contact *Electric Radio* Magazine, Barry Wiseman, N6CSW, 14643 County Road G, Cortez, CO 81321-9575 (970-564-9185; e-mail: <er@frontier.net>).

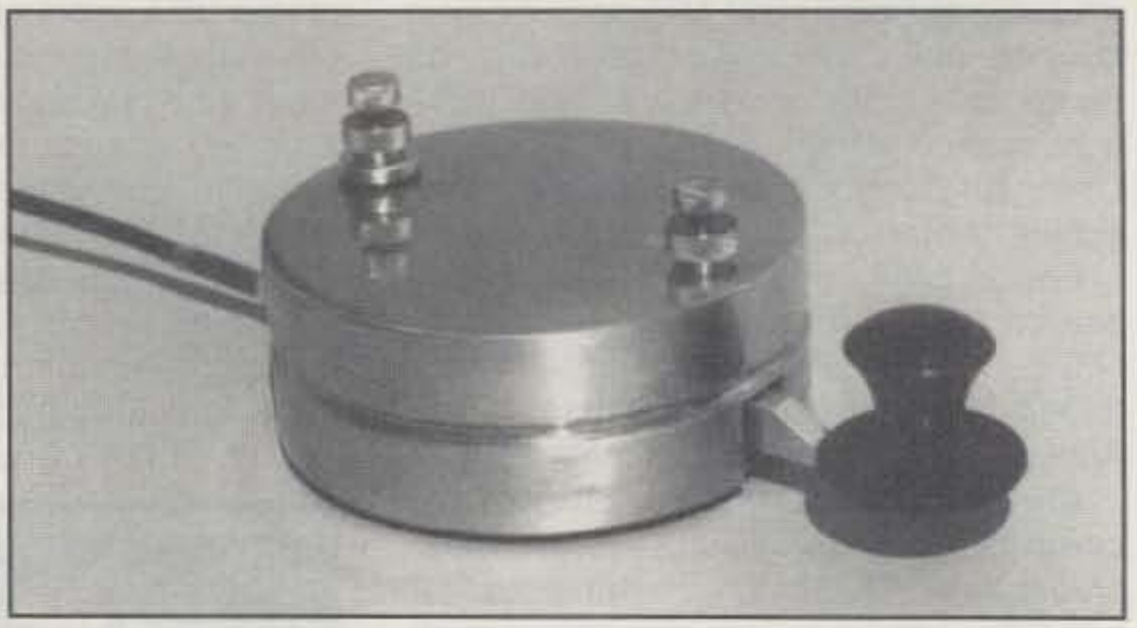
Wrap-Up

That's all for this time, gang. Next time, more "Digital Dipole" topics of current interest. See you then.

Overheard: We're all different, and after a while in the hobby you realize that there is neither a "perfect antenna" nor a "perfect rig" for your hamshack.

73, Karl, W8FX

CQ SHOWCASE



Eureka Morse Key From CAL-AV Labs

CAL-AV's Eureka is a straight Morse hand key built into its own base in an inverted design, which protects the mechanism and allows the armature and knob to be very close to the sending desk. The key utilizes magnetic attraction in place of a tension spring, providing a decrease in the force required as the knob starts downward, accelerating the armature. The result is a positive contact closure similar to a snap-action switch. It is difficult to depress this key only part way.

The case is machined from a single piece of solid brass. Case finish is a non-glare matte. Polished brass, chrome, or gold plating can be added at additional cost. The key is 4 inches in diameter and weighs 4.6 pounds. The aluminum armature's axle rotates in a pair of sealed, stainless steel ball bearings. Both the contact gap and the force adjustment are on the case and are therefore stationary. The contacts are coin silver. Knob style is derived from the U.S. Navy type 26003A key. A brass cover plate with neoprene anti-skid surface offers additional protection and eliminates the need for a dust cover. A rear connector facilitates easy cable change.

Production is limited and each key is serialized. The key comes with a lifetime warranty and is priced at $530. For more information, contact CAL-AV Labs, Inc., 1802 W. Grant Road, Suite 116, Tucson, AZ 85745 (520-624-1300; fax 520-624-1311; e-mail: <calav@flash.net>; web: <http://www.cal-av.com>), or circle number 102 on the reader service card.

Ratcheting Cable Cutter From Jensen Tools

Jensen's new ratchet tool will cut hard-drawn copper up to 400 KCMIL and soft copper, aluminum, and multiple conductor cable up to 600 KCMIL. Its 5-tooth ratchet system can supply maximum cutting force, and the high-leverage foot minimizes effort when making multiple cuts. The compact size allows it to work in confined areas and to fit easily in a pouch or belt. The cutter comes with quick release and locking handles.

For more information and a copy of Jensen Tool's latest catalog, contact them at 7815 S. 46th Street, Phoenix, AZ 85044 (602-968-6231; fax 602-438-1690; web: <http://www.jensentools.com>), or circle number 103 on the reader service card.

Adonis AM-7500E and AM-708E Amplified Desk Microphones

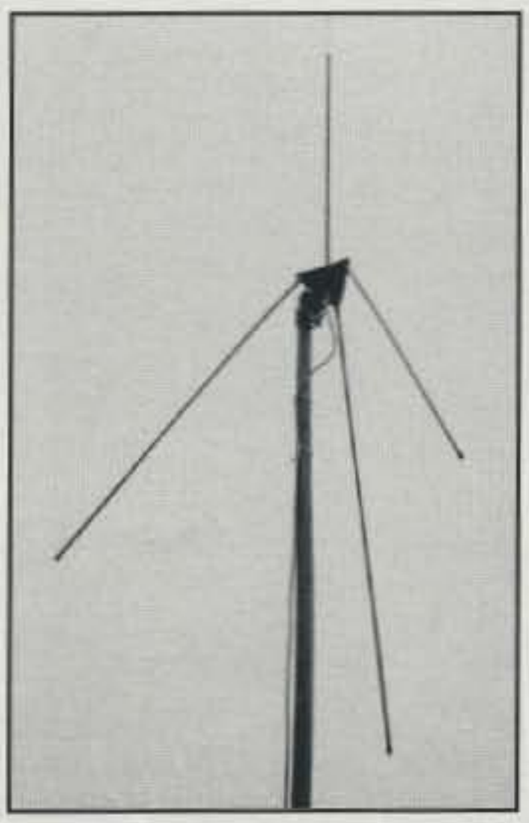
The AM-7500E amplified desktop microphone has a four-band graphic equalizer and three-stage speech compressor for use with amateur and other two-way radios. The four-band graphic equalizer provides tone control over the user's transmitted voice, while the speech compressor and audio amplifier allow control over the strength and consistency of the user's transmitted audio. Other features include a sensitive electret microphone element, output level control, both momentary and locking push-to-talk switches, up and down frequency controls, VU meter, battery level tester, and alarm that warns if the AM-7500E has accidentally been left in transmit.

The AM-708E has two transceiver outputs and a variable speech compressor for use with amateur, commercial, and other two-way radios. It has two microphone outputs for operating two different transceivers with one microphone. A two-position switch on the AM-708E allows the user to select and operate either transceiver. A speech compressor with a high, low, and variable manual setting allows precise control over compression levels. Other features include: electret microphone element, power output level control, FM/SSB mode switch, both momentary and locking push-to-talk switches, up and down frequency controls, VU meter, battery level tester, and more.

Both the AM-7500E and AM-708E are constructed of an anodized aluminum body and have a flexible metal gooseneck microphone. The microphones are powered by either four AA batteries, an optional DC power adapter, or can be powered directly by some two-way radios. The unit uses Adonis Adapter Cables (available separately) to connect to the transceiver.

The AM-7500E is priced at $269.95 and the AM-708E is $219.95. For a catalog that features the units' specifications, contact Adonis USA, P.O. Box 1124, Issaquah, WA 98027 (425-558-9592; fax 425-558-9704; e-mail: <info@rflimited.com>; web: <http://www.rflimited.com>), or circle 104 on the reader service card.

Quarter-Wave Ground Plane From Lakeview Company



The GP-28 from Lakeview is a new quarter-wave ground plane antenna for 28 MHz. It is also tunable to nearby frequencies. It is manufactured with the company's famous "Hamstick" technology of fiberglass and aluminum and comes with all hardware needed for a mast mount. It is slightly less than 10 feet tall with a power rating of 600 watts and a 2:1 bandwidth of 1 MHz.

The GP-28 is $54.95. For more details, contact Lakeview Company, Inc., 3620-9 Whitehall Road, Anderson, SC 29626 (864-226-6990; e-mail: <hamstick@hamstick.com>), or circle number 105 on the reader service card.

BY JOE LYNCH, N6CL

VHF PLUS

ALL ABOUT THE WORLD ABOVE HF

Leonids Summaries from Shelby Ennis, W8WN

There is going to be much written about the 1998 *Leonids* meteor shower. Among the first definitive reports are those from Shelby Ennis, W8WN. Shelby gleaned reports from over 1500 e-mail messages and developed the following report distributed to various VHF editors. It is quoted and presented here courtesy of Shelby, W8WN.

A number of reports have arrived. In general, they show a picture that is similar to, but differing just slightly from, the early visual reports. Since radio waves at the frequency usually used (144 MHz) are not hindered by clouds or daylight, this seems to be the primary explanation for several of the differences. Other reasons, some comments, and one interesting new report will be discussed below.

Time of the peak: *Europe* is consistent with a peak on the 17th, about 0600 Z ±1 hour. This peak was quite broad, with exceptional conditions between 0300 and 0700 Z.

Eastern North America is consistent with a peak about the same time, approximately 0700 Z, and covering a broad time period. Both the 16th and 17th were very good for hours at a time! A number of additional reports have arrived. They do not change the radio peak times as given in the preliminary summary, but they do provide a few more details (and questions). In general, they show a picture that is similar to, but differing just slightly from, the early visual reports. Since radio waves at the frequency usually used (144 MHz) are not hindered by clouds or daylight, this seems to be the primary explanation for several of the differences. Other reasons, some comments, and one interesting new report will be discussed below.

"It is the *Western U.S.* that differs somewhat. Several minor peaks are noted. On the 16th, at about 1400–1700, and on the 17th at about 0800–1000 (two mentioned the 0700 period), and 1300–1700. Actually, as several pointed out, there seemed to be no true peak for those west of approximately 100 degrees W. long. While the 0800–1000 time on the 17th was mentioned by several as a "good" time, more commented that the Western U.S. may have done better on the 16th. As more operators were available on the 17th, this appears to be a valid conclusion. (The radiant would not be above the horizon for most of them until approximately 07 Z.)

P.O. Box 73, Oklahoma City, OK 73101
(phone 405-528-6625; fax 405-528-0746)
Internet jlynch@post.cis.smu.edu
Compuserve 72124.2734@compuserv.com

VHF Plus Calendar

February 1	Full Moon.
February 7	Poor EME conditions.
February 8	Moon Apogee.
February 12	Lowest Moon declination.
February 14	Poor EME conditions.
February 16	New Moon.
February 20	Moon Perigee.
February 21	Moderate EME conditions.
February 25	Highest Moon declination.
February 28	Very Good EME conditions.

EME conditions courtesy W5LUU.

As in the visual reports, many said that this was one of the most spectacular showers they had ever experienced. The (overdense) burst rate was not quite as high as it was during the peak time of several of the early *Perseid* peaks earlier this decade. But, instead of lasting for an hour or two, it just kept coming back again and again, with one minor peak after another, apparently as the Earth intercepted yet another filament of debris. Short, underdense "pings" were almost non-existent (as has been true during the best peaks of the *Perseids*). However, several commented that the signals, in general, were not quite as strong as those experienced during the *Perseids* peaks recently. This is surprising, in light of the number of very bright visual fireballs reported.

There were reports of a large number of long-distance contacts (beyond 1200 miles/1930 km, with several beyond 1400 miles/2270 km). This would imply strong ionization and a greater than average altitude, as would be expected due to the velocity of this shower and the large number of fireballs reported. The ionization of the E layer should have been increased by this bombardment. However, only four reports mentioned a residual background signal. Three of these (from North America) said that this was present in the 50–65 MHz range. One report from Europe said, "we had an Ionization of the E-layer, for example SM5BSZ (1200 km) was readable for almost 2 hour continuous with an 'auroral' sound."

Two North American reports brought the first examples ever noted on propagation changes going in "waves" from east to west, over periods of an hour or two. At first this simply appeared to be caused by the radiant's rising in the east and moving west. However, one of the reports indicated two or three of these "waves" each day.

Forward scatter of radio waves is most "efficient" or "effective" at different times for different directions, depending upon the geometry of the incoming meteors as determined by the position of the radiant. The *Leonid* shower is considered to be primarily a north/south-path shower.

Several said that they did not find the "effectivity" charts to be valid for this shower (perhaps not surprising, with the large number of fireballs), while several others said that the charts were quite accurate.

A quick examination was made of best "effectivity" or "efficiency" in different directions at different times for the part of the midwestern U.S. where this "east to west movement" was reported. MSSoft V. 5 was used for this. There seemed to be a small correlation, especially for the northeast. As the antennas commonly used at this frequency are highly directive (that particular station's antenna should have a forward gain of about 14 dBd, with the expected sharp pattern), signals off the side of the antenna would be greatly attenuated. So when pointing NE, little would be expected from the NW, etc. As the "effectivity" to the NE lessened while increasing slightly to the NW, this would normally cause an operator to rotate the antenna toward the direction of the best signals. Thus, the two effects together—changing effectivity and a highly directional antenna—would possibly explain this observation. This still does not completely cover four separate "waves" noted on the 17th. But the "effectivity" plots are simplified; and there is always the subjective element involved, when routine contacts are being made instead of continuous recording of a signal. As this is the first time this effect has been reported, it is impossible to draw any further conclusions. Thus, it is most likely a real phenomenon, but also caused somewhat by the subjective element introduced by the directional antenna.

Reasons for the Differences in Peaks and Times between Radio and Visual Observations.

Due to the hopes for a major shower or even a "storm," there were hundreds, probably several thousand, amateur radio

operators worldwide operating VHF meteor scatter during the *Leonids*. Thus, most of Europe and North America should have been well covered (almost no radio reports have been received from eastern Asia or Australia). Because of the directional nature of the high-gain antennas (and the geometry of the shower) and the fact that communication with a number of stations is the goal, it requires a number of reports to even out these differences. But, as was learned at the time of the early *Perseids* peaks a few years ago, the observed peak times can be quite accurate. At the time of the reported peak (06–07 on the 17th), it would have been daylight in Europe, while the radiant would still have been rather low in North America until about this time.

The 1998 Leonid shower was a "very" unusual phenomenon. It is "not" likely to be repeated many times, if it all, within the next generation! (Though we can always hope that the 1999 *Leonids* will be as good.)

Most showers build up over a day or two, with a rather sharp peak of only a few hours, then drop off even more quickly. And most showers, even the major ones, produce only a few fireballs (though some are noted for having more than others).

Science writer Daniel Fischer (who observed with several international expeditions in Mongolia) writes and quotes astronomer Col. S. P. Worden: "Amazingly the fireball storm—if one chooses to call that rare phenomenon that—had been a global phenomenon: It had "persisted obviously for at least 18 hours, because we have reports from across Europe and N. America, some of them visible in daylight —this is a very unusual situation .. . . "

We consider a visual ZHR of 60 to be a major shower (e.g., the *Perseids, Geminids, Quadrantids*). When one of them hits 120 or higher and sustains it for a while, we get excited. It is estimated that this year's *Leonid* ZHR was about 500. And, instead of the usual extremely sharp peak, the early "fireball" peak was extremely *broad*.

While the *Leonid* activity this year was generally unexpected, note that the possibilities of both the broad, early display and also the large number of fireballs had been anticipated by several. This simply proves that meteor showers are, and will always be, a very inexact science. It is the "alert" operator who will bag the contacts! Just don't make future plans based entirely upon this year's *Leonid* display!

For nearly all radio operators and for the visual observers who were not clouded out, the *Leonids* shower was spectacular. Yet while it was an extremely good shower, it was not a storm. In fact, the ZHR probably was no higher than during some of the early *Perseid* peaks a few years ago! But we'll have to wait for the International Meteor Organization to digest the reports before we know for sure what has happened.

What should have been learned? Primarily, that our plans for anything like this have to be modified in real time. For example, while nearly everyone expected the peak to be near November 17 at 1945 Z, ±2 hours, it apparently was quite a bit earlier. However, *note* that this is exactly what Joe Rao warned about [in his November *Sky and Telescope* article], giving some careful reasons. It will be interesting to learn exactly when the peak occurred, as it seems to have been quite a few hours earlier than predicted. (See below for how the predictions are actually made).

It was noted that SSB was much more effective than HSCW. It is usually recommended that HSCW be used at all times "except" during the peak of a major shower. However, there was an additional factor involved this time. *This* was the year of the *fireballs*. Again, this was expected! Next

year it is expected that there will be fewer. (But if the shower next year is much larger than this year's, that might not matter).

"Some felt that the times of best "effectivity" or "efficiency" to different directions were not accurate, while a few others found them to be close. Remember that the formula for figuring this is simply a "best geometry" type of thing. When you have this many large, overdense trains, higher in the atmosphere than average, it probably won't matter much which way you aim your antenna.

"The *Leonids* peak is usually very brief. Again, based on last year's shower, a long, broad maximum had been expected by many. Therefore, for most major showers, HSCW is probably a good idea in the days (and hours?) prior to the peak. But *if* and when long bursts start appearing, this is the time when SSB is *far* more effective. But note that there is mass sorting of the particles in a number of the showers. That is, the long, overdense bursts appear at a different time than the actual peak due to the larger particles following a slightly different orbit.

What is in the future? First, there are the three big, popular showers, dependable, with high ZHR's. The December *Geminids*, the January *Quadrantids*, and the August *Perseids*. These are the three that all VHF operators wait for. Second, there are a number of smaller (and two or three almost unknown daylight showers) that have been generally overlooked in recent years. However, most of these do not produce many fireballs, and in general have a low ZHR count; so HSCW is probably going to be more effective than SSB, even near the peak time. Third, there is next year's *Leonids*. This is likely to be one of the last, if not the last, really big shower in our generation! How big? Maybe similar to this year, maybe smaller (the *Leonids* most years is a minor shower), or maybe "very" big. Until it happens, no one will know for sure!

Many people, especially a lot of first-time visual "meteor watchers," were disappointed that the shower peaked so much earlier than the predicted 1945Z time. Yet, as noted above, everyone was warned to be watching a day or two earlier. So just how are these predictions made? It really is rather simple. First, the peak is generally expected about the time that the Earth crosses the path of the comet's orbit. But this is modified slightly because of the gravitational attraction of Jupiter on the meteor stream; they may be deflected from this. So (second), to determine the probable time of the peak, records from the past few years are studied. (This is why radio observations can be so important, if the peak happens during daylight hours or if the moon interferes.) Third, the records are studied for other years when the relative positions of the Earth, the meteor stream, and the parent comet were in similar relative positions to this year (it is in years when the comet is close to the Earth that the large showers appear). And finally, with all of these studies in hand, everybody makes their best guess! And this is the best we will ever be able to do at predicting meteor showers! It is only after the event that we can have a relatively good idea of what happened.

So are the predictions any good? Yes, they're usually quite good, within the limits of the available information. So use your computer programs (but be sure they are updated with the latest information). Pay attention to the predictions made by those in the field. But always notice the "fudge factors" as a particular year is compared with other, similar years, for this may or may not modify the basic prediction.

Again, what can we expect for this time next year? Completely unknown. First guess (mine only) is that it will be about as big as this year's, but with fewer fireballs (and thus fewer of those super, long, overdense bursts).

For more information on all of this, see the articles by W4LTU, the *IMO Observer's Handbook*, and the other references listed at the end of the "Semi-Technical FAQ" on the W6/PAØZN Web site. Also, from that same site, go to the "Hot News" and follow

the Leonids hyperlinks before they are deleted later this week. These Web sites either have, or are linked to, sites that contain general information on meteor showers, in addition to the Leonids.

In summary, the long, broad maximum period of overdense bursts is unlike anything ever experienced. It covered most of the time on the 16th that the radiant was above the horizon (especially for those in Western North America) and then repeated on the 17th, with this being the better day for most European and Eastern North American operators. The greatest peak seemed to be about 0700Z on the 17th. While there have been better one-hour peak periods in the past, this may have been the best shower ever experienced. *—end quote*

The following is from Joe Rao, who commented to Shelby about his Leonids prediction which he published in the November issue of Sky and Telescope *magazine:*

In my original manuscript for the Leonid article in the November *S&T* I made the following comment concerning 1998:

"... modest rates and rich fireball activity observed in 1965 seem to suggest that, in an area within at least 200 days behind the comet, there appears to be less in the way of dust, while larger (1 to 0.01 gram) particles are in greater abundance. From (roughly) 300 days and beyond, we appear to be in a region where there is more in the way of smaller dust particles. . .

"In 1998 Earth will follow 55P/Tempel-Tuttle to the node by 257.3 days—nearly the midpoint between the case of the 1965 display and the 1866 storm. So while there is certainly a chance that the *Leonids* could storm (in 1998), one should seriously consider the possibility that the 1998 *Leonids* may merely produce another modest showing with hourly rates being measured only in the hundreds and not thousands, with a large proportion of fireballs.

"A word of caution: unknown perturbations . . . might have shifted *Leonid* particles somewhat above or below the orbital plane of the comet. The 1965 *Leonids*, for instance, peaked . . . about 13 hours before the Earth arrived at the comet's orbital plane.

"I'll leave it to all of you to decide how accurate this prediction for 1998 was. I also cited that if a meteor storm appeared in 1998, it would be a first of sorts in 'modern' *Leonid* history, since going back over the past six *Leonid* cycles no storm had ever occurred less than 299.4 days from the comet's nodal crossing. It appears that this oddity remains intact."

The following is from Shelby Ennis, W8WN: Leonids *DX contacts:* Leonids *144 MHz QSOs greater than about 2000 km (1243 mi) that have been reported:*

"NØKQY – and W2UAD, 2077 km. WA2AEY, 2215 km. VE3SXE, 2310 km, longest reported (1435 miles). K2TXB and K5IUA, 2255 km (twice). G4ASR and RW1AW, 2231 km. PAØJMV – and UT5ER 2086 km. UT5EC, 2139 km. UA3PTW 2214 km. KN4SM and N0KQY, 2200 km. K8BHZ and W5UWB, 2187 km. PE1BVM – and UT5EC, 2123 km. UT5ER, 2071 km. RX1AS, 1820 km. PA2TAB and UA3PTW, 2103 km. W3UUM and VA3ST, 2095 km. LY2SA and EI4DQ, 2076 km. VE5UF and N5TML, 2045 km. N7EIJ – and KØMQS, 2011 km. WA2VOI, 1840 km. EA3ADW and LA3BO, 2018 km. W3SZ and N5HHS, 2110 km.

"G7RAU – and OH6KSR, 2078 km. OH5LK, 2077 km. W1FIG and K0WLU, 2007 km. WW2R – 2130 km. LY2MW – 2106 km. G4DHF – OH8HDL, OH8UV, RU1AA, RW1AW, RX1AS, LZ3UF. EA7GTF – five beyond 2000 km. OH8UV – several beyond 2000 km. W6OAL – 2040 and 2204 km. And NJ7A – one at 2000 km.

"On 432 MHz – W7XU and N6RMJ, 2036 km (new North American – and world – MS record, it is believed).

"No doubt there were a number of others, and we probably have overlooked a few that were sent to us. Our apologies. We have had to wade through some 1500 pieces of e-mail in the past ten days, and it was impossible to catch everything!

"Besides the reported contacts, there were a number of other reports of stations beyond 2000 km being heard well. (I was heard, but did not hear the station on the other end. But just wait until next year!) Perhaps this year's *Leonids* should be called 'the shower of the long DX.'"

And Finally . . .

As I mentioned in the opening paragraph, there will be much written about the *Leonids* shower. Next month I will have some selected individual operating reports that appeared on the Internet, as well as other VHF Plus news.

Until next month . . .

73, Joe, N6CL

DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

St. Peter and St. Paul Rocks

The Natal DX Group of Brazil will make its fourth DXpedition to the remote St. Peter and St. Paul Rocks next month. The group intends to take four operators, including two with considerable experience with the Rocks. Karl Leite, PS7KM, and Tino, PT7AA, were on the 1989 and 1994 DXpeditions to the Rocks. Joining them are Randy, WX5L, and JA4MRL.

Planned callsigns are **ZYØSP** on SSB and RTTY and **ZYØSZ** on CW. QSL ZYØSP to PS7KM and ZYØSZ to PT7AA, using 1998 or later address information. The group plans to remain on the Rocks for 12 days, depending on the weather.

The Rocks lie just north of the equator in the middle of the Atlantic, at 56 minutes north and 29 degrees west, some 600-plus miles from the mainland of Brazil and some 330 miles from Fernando de Noronha PYØF. Many DXpeditions to the Rocks stop on the way at Fernando de Noronha for fuel and provisions.

Due to the prevailing winds, the Rocks are best visited early in the year. The main group of "islands" (and these "islands" *really* are just rocks) lie in a u-shaped formation, open to the northwest. In the spring months, the winds from the northeast are moderate, and the surf, while high, permits landing in the partially sheltered interior. At other times of the year, high winds and waves and heavy rain make the Rocks even less hospitable than in March.

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Karl Leite, PS9KM, leads the March DXpedition to the Rocks.

Tides range up to 15 feet, significantly reducing the amount of dry land at high tide. Most DXpeditions from the Rocks choose the old lighthouse base as their operating site. In 1930 the Brazilian Navy built a lighthouse on the high point of the Rocks, some 25 meters above the ocean at high tide. The lighthouse was abandoned in 1933, and fell into ruins. All that remains is the flat concrete base and some stairs.

Although this represents the best operating site the Rocks has to offer, it is scarcely ideal. To get from the landing spot to the lighthouse base involves a 600 foot scramble over sharp rocks, lugging all the equipment, shelter, antennas, water, generator, fuel, food, and everything else necessary to remain on a barren rock for two weeks.

St. Peter and St. Paul Rocks at low tide.

The WPX Program

CW

2998.....JP1IXV 2999.....VE6BF

Mixed

1821.....VE6BF

CW: 350 VE6BF, 400 VE6BF, 450 VE6BF, JA1GTF, 500 VE6BF, JA1GTF, 550 JR3TOE, VE6BF, JA1BTF, 600 JR3TOE, VE6BF, JA1GTF, 650 VE6BF, JA1GTF, 700 N3KR, VE6BF, JA1GTF, 750 VE6BF, JA1GTF, 800 VE6BF, JA1GTF, 650 VE6BF, JA1GTF, 900 VE6BF, JA1GTF, 950 VE6BF, 1000 VE6BF, 1050 VE6BF, 1100 VE6BF, 1150 VE6BF, 1200 VE6BF, K2LUQ, 1250 JG2LGM, VE6BF, 1300 JG2LGM, 2100 KS3F.

SSB: 350 JL6IPK, 400 JL1IPK, 1650 W9JDX, 2500 KS3F.

Mixed: 450 VE6BF, 500 VE6BF, 550 VE6BF, 600 VE6BF, 650 VE6BF, 700 VE6BF, 750 VE6BF, 800 VE6BF, 850 VE6BF, 900 N3KR, VE6BF, 950 VE6BF, 1000 VE6BF, 1050 VE6BF, 1100 VE6BF, 1150 ON4CAS, JR3TOE, VE6BF, 1200 ON4CAS, JR3TOE, VE6BF, 1250 VE6BF, 1300 VE6BF, 1400 AA1KS, 1800 HB9BIN, 4400 W2FXA.

10 meters: VE6BF
15 meters: VE6BF, ON4CAS
20 meters: VE6BF
40 meters: VE6BF, AG42
80 meters: JR3TOE

Asia: VE6BF, AG4W
Africa: K2YJL
N. America: ON4CAS, VE6BF
S. America: VE6BF, K2LUQ
Europe: VE6BF, DL6UAA
Oceania: VE6BF, IK5TSS

Award of Excellence: SM5DAC, OH2BLF, RW9SG
Award of Excellence with 160 meter bar: SM5DAC

Award of Excellence Plaque Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, YU2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S5ØA, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, S57J, EA8BM, DL1EY, KUØA, KØDEQ, VR2UW, 9A9R, UAØFZ, DJ3JSW, OE6CLD, HB9BIN, I7PXV, N1KC.

Award of Excellence Plaque Holders with 160 Meter Endorsement: K6JG, N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, K9BG, W1BWS, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S5ØA, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, VR2UW, DJ3JSW, OE6CLD, HB9BIN, N1KC.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA.

The Rocks have always been relatively rare on the amateur bands. Teams from Brazil have DXpeditioned to the Rocks every few years, but these operations have often been plagued by bad luck. The 1987 operation of ZYØSA/B by Paul, PY1ZT, and Ron, PY1BVY, lost their ability to operate split, with predicable consequences. However, they still managed to make more than 6000 contacts.

The 1989 ZYØSS/ZYØSW/ZYØSY operation arrived at the port of Natal only to find that their chartered boat was no longer available. A storm blew down their antennas the second night, and Karl, PS7KM, broke a toe on the third day. The next day a computer crash took out the RTTY station after only 37 contacts. The six-day operation netted over 5000 contacts.

When Karl and Tino returned to the Rocks in 1994, they ran into very bad weather, complicating the landing. Also, both generators failed in the first few days, limiting operation to battery power. Despite the difficulties, the operators managed more than 5,000 contacts.

The Don Miller Era

The amateur radio history of St. Peter and St. Paul Rocks is packed with controversy, including that swirling around the most notorious DXer of the 60s—Don Miller, W9WNV. In 1965, a couple of German amateurs operated from the Rocks in what became the first DXCC-approved DXpedition from the entity. However, the Brazilian IARU society, LABRE, claimed that the CONTEL authorization for this operation was for maritime mobile in the waters surrounding the Rocks and not for operation from the Rocks themselves. The Germans made some 50 contacts total, most with members of what Don Miller called "that certain East Coast club," which was the North Jersey DX Association. Miller was convinced that the NJDXA controlled the DXCC desk and was slanted against Miller's operations. This German operation, which appeared to favor the members of the NJDXA, was but another example of this alleged domination of DXCC by the NJDXA, according to Don Miller.

The subsequent events demonstrate two important points. First, Don Miller was capable of saying anything that benefitted his activities, true or false. Furthermore, Miller's actions led to long-standing and positive changes to the way the DXCC is administered.

In 1967 the ARRL Awards Committee made several allegations against a few of Miller's many DXpeditions. The League claimed, among other items, that Miller

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 the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive. Lifetime Honor Roll fee is $4.00 (U.S.) for each mode, with no fee for additions.

MIXED

4773 F9RM	3405 YU1AB	2940 K9BGF	2573 KØDEQ	2218 F6IGF	1851 VE4ACY	1591 W7CB	1264 VE5BF	1059 RAØFU
4740 9A2AA	3390 I2PJA	2926 YU7BCD	2546 SM6DHU	2175 W9IL	1836 F5NBX	1478 I1-21171	1257 WT3W	989 US7MM
4080 W2FXA	3386 N9AF	2852 I2MQP	2512 JH8BOE	2169 W8UMR	1767 IØAOF	1396 YU1ZD	1245 N1KC	906 N3KR
3899 EA2IA	3364 SM3EVR	2831 KF2O	2500 HA5NK	2165 W6OUL	1765 K5IID	1389 K0KG	1198 S52QM	708 K6UXO
3775 W1CU	3262 N5JR	2784 WB2YQH	2484 K8LJG	2140 YU7JDE	1759 I2EAY	1378 Z32KV	1192 KW5USA	
3718 K6JG	3240 9A2NA	2776 W2ME	2376 HAØIT	2138 W4UW	1746 PY2DBU	1373 AA1KS	1162 JR3TOE	
3623 N4NO	3103 I1EEW	2776 I1POR	2281 N6JM	2019 G4OBK	1732 LU8DY	1371 F6HMJ	1151 VE6BMX	
3554 N6JV	3039 WA8YTM	2669 S53EO	2264 K2XF	2001 OE6CLD	1653 AE5B	1328 W9IAL	1142 VE6FR	
3538 F2YT	3005 PAØSNG	2660 4N7ZZ	2254 S58MU	1919 SM6CST	1628 JN3SAC	1311 WB2AQC	1110 W2CF	
3472 VE3XN	2990 HA8XX	2645 I2EOW	2238 9A4RU	1875 HA9PP	1625 KØNL	1307 NH6T	1100 KB5OHT	
3424 N4MM	2966 YU7SF	2631 IK2ILH	2229 K5UR	1871 DJ1YH	1607 OZ1ACB	1293 WØIZV	1074 W2EZ	

SSB

4180 IØZV	2827 I4CSP	2382 CT1AHU	2131 CX6BZ	1714 K2XF	1518 AE5B	1299 SV3AQR	1017 IK4HPU	894 EA3EQT
3743 VE1YX	2772 N4NO	2378 KF2O	2033 IN3QCI	1703 N6FX	1508 K8MDU	1288 I3UBL	1016 WT3W	894 EA5DCL
3715 ZL3NS	2731 HA8XX	2360 EA5AT	1956 W4UW	1681 YU7SF	1489 I3ZSX	1271 W2FKF	1004 LU3HBO	836 AG4W
3453 K6JG	2725 I1EEW	2296 I8KCI	1906 K5UR	1659 K8LJG	1451 IT9SVJ	1252 T30JH	965 DJ4GJ	792 EA5GMB
3405 F6DZU	2714 N5JR	2291 YU7BCD	1881 SM6DHU	1649 EA5CGU	1450 K2EEK	1229 YC2OK	954 EA1AX	778 N3DRO
3384 I2PJA	2673 I2MQP	2281 I2EOW	1867 OE6CLD	1590 KS4S	1395 EA5KY	1196 K0NL	936 I2EAY	697 I2VGW
2993 N4MM	2612 PAØSNG	2281 KF7RU	1809 LU8DY	1569 K3IXD	1377 LU5DV	1145 K4CN	933 DF1IC	675 VE6BMX
2976 F2VX	2507 9A2NA	2260 KD9OT	1802 OE2EGL	1544 DK5WQ	1366 DF7HX	1127 EA8AG	924 N1KC	660 F5UW
2935 EA8AKN	2434 LU8ESU	2257 I1POR	1760 HA0IT	1536 HA5NK	1353 K5IID	1061 KI7AO	921 HA9PP	613 SM5DAC
2921 OZ5EV	2385 4X6DK	2138 EA1JG	1754 W2WC	1535 CT1BWW	1346 W9IL	1030 NH6T	919 CP1FF	605 N7IY
2911 EA2IA	2383 WA8YTM	2134 K5RPC	1741 KBØC	1522 W6OUL	1336 G4OBK	1028 DL8AAV	896 JR3TOE	

CW

3912 WA2HZR	2674 YU7SF	2194 9A2NA	1927 SM6DHU	1750 K2XF	1514 EA5YU	1168 AC5K	1006 9A3UF	759 VE6BMX
3539 N6JV	2468 W2ME	2124 JA9CWJ	1906 G4SSH	1730 IT9VDQ	1513 IK5TSS	1156 4X6DK	998 K2LUQ	741 DL3NEO
3176 N4NO	2465 VE7DP	2067 KA7T	1876 HAØIT	1711 LU2YA	1457 I2EAY	1136 I2MQP	993 HA9PP	730 WT3W
3119 VE7CNE	2423 N5JR	2046 HA8XX	1871 OZ5UR	1641 G4OBK	1411 SM5DAC	1124 LU3DSI	906 YU1TR	728 K0NL
3098 UA3FT	2415 LZ1XL	2035 HA5NK	1863 N6FX	1641 W6OUL	1349 N1IA	1074 W9IL	884 PY4WS	685 K6UO
2978 K6JG	2409 N4MM	1980 KF2O	1816 SM6CST	1676 DJ1YH	1298 EA6AA	1058 DF6SW	870 HB9CSM	678 IK8VRP
2887 EA2IA	2401 G4UOL	1973 G3VQO	1799 I7PXV	1603 IK3GER	1270 K5IID	1042 W4UW	847 NH6T	600 N1KC
2881 N4UU	2362 YU7BCD	1956 K8LJG	1798 W2WC	1590 JA1GTF	1268 DJ4GJ	1041 W9IAL	844 JK1AJX	
2857 YU7LS	2335 WA8YTM	1954 S58MU	1795 W1WAI	1537 JN3SAC	1249 VE6BF	1033 I2EOW	821 RAØFU	
2811 K9QVB	2196 VR2UW	1954 TI4SU	1755 K5UR	1527 EA6BD	1175 EA2CIN	1033 LU7EAR	820 K3WWP	

lacked appropriate Coast Guard permission to operate from Navassa Island, Indian PTT permission to operate from the Laccadives, and permission from the Department of External Affairs to land on Heard Island. Miller and the ARRL reached a "gentlemen's agreement" on these and other items, resulting in the ARRL denying DXCC credit for Miller's operations from these three locations, but in their accepting many of his other DX operations.

As part of this process, Miller circulated a petition to allow Miller to present his case directly to the League's Board of Directors, which he subsequently did. In his statement which accompanied this petition is Miller's announcement that "this document is Prepared at my own Personal Expense and I Assume Full Responsibility for its Contents."

In discussing what he claims to have been an illegal operation from the Rocks by the German team, Miller says, "There was therefore great impetus for Chuck and I to attempt a legal and ethical DXpedition to 'The Rocks' and try to contact those who were 'missed' by the first DXpedition."

In August 1966 Miller obtained a license to operate from the Rocks. The **PYØXA** operation made several thousand contacts with DXers around the world, the first serious operation claiming to be from the Rocks. Despite some photographic evidence, the anti-Miller faction within the DX community said that Miller had never actually landed on the Rocks, and that he actually had operated from the boat instead.

Miller is unambiguous in describing his PYØXA operation: "After a difficult trip and landing, our operation was enthusiastically received by thousands of Amateurs throughout the World. . . Although there was no evidence against us to support these charges, and could not be, since we operated from the Rocks, the Awards Committee undertook an investigation. . ." Remember that Miller stated up front that he assumed "full responsibility" for these statements.

The League continued its investigations into Miller's operations in 1967. In the September issue of *QST* that year, the DXCC desk announced that it was deleting DXCC credit for four of Miller's operations: those from Navassa, the Laccadives, Chagos, PYØXA, and Heard Island. The League said that the PYØXA operation was denied DXCC credit "because of the inability of the licensee to establish that he was actually present on the Rocks."

A year later the League published more details about its decision. Regarding the PYØXA decision, John Huntoon said: "Word shortly reached [ARRL] Hq. that Dr. Miller had been in Caracas, Venezuela, 'within hours' of the claimed PYØXA operation and thus could not have reached the Rocks some 2000 miles away. Accordingly, the Awards Committee in early October 1966 requested both him and Mr. Kline to furnish information on the journey."

Describing an in-person meeting on March 3, 1967, Huntoon quotes Dr. Miller as saying: "There can't be any evidence that anything was wrong with the St. Peter & St. Paul because that expedition was 100% okay licensewise and everyway."

On May 4, 1967 Huntoon quotes Miller in an address to the Board of Directors as follows: "Herb Klein and I are both willing to sign affidavits that we were on St. Peter and St. Paul Rocks. . . . We were there and the pictures we took were from there. It couldn't have been anywhere else. . . . I was there and I won't have anyone saying I wasn't there."

Despite this plea, Miller's request for DXCC credit for his PYØXA operation was denied. Miller had threatened to sue the ARRL if it denied such DXCC credit, and he followed through with this threat in early

The same view of St. Peter and St. Paul Rocks as in the previous photo, but here it is at high tide!

1968. In a sworn deposition in Hartford in June 1968 Miller admitted that the PYØXA operation took place from a boat in the vicinity of Trinidad and Tobago, some 1800 miles from the Rocks.

In a letter to the editor of *CQ* magazine in November 1968, Miller goes into more detail: "Under oath, I volunteered the statement that this operation took place from the boat. . . . The PYØXA operation took place from a ship, not from the rocks. We were unable to reach the rocks before the license's 30-day term expired and it was non-renewable. . . . Never during the PYØXA operation did I state we were at St. Peter and St. Paul Rocks."

Clearly Don Miller was not above telling flat-out lies to further his own DXpedition cause. To the best of my knowledge, this is the only operation in which Miller admitted publicly that he lied to the DX community. His strong claims that the operation was legitimate, followed by his public statement to the contrary, highlight the reasons why many DXers feel ambiguous about Don Miller. He may have been the most talented DXpeditioner ever, and he

QSL INFORMATION

3D2JG to JA3JA
3W6US to N2OO
4L4KK to SV2AEL
4S7AHG to JA4AHV
4U1VIC to DL5IO
5B4/EW1AR to NP3D
5B4/NP3D to W3HNK
5H3US to WA8JOC
5J8IB to HK3DDD
5J9A to HJ3PXA
5N1ANE to N5DRV
5N9EAM to IK7JTF
5R8GC to DJ6SI
5U7DG to K4SE
5W1BV to KØBJ
5W1EA to KØCS
5X1DX to NY3Y
5Z4GC to WB2YQH
5Z4YN to KØBJ
8P9HT to K4BAI
8P9Z to K4BAI
9A98JP to 9A7W
9A98PAX to 9A2TW
9J2WS to W4LF
9N1HA to N5VL
9Y4VU to NY3Y
A35ZL to DJ7RJ
A35ZZ to KØCS
A45XU to A92BE
AYØZ to pirate
B1A to KU9C
B4R to BY4RSA
BA4TB to BY4RSA
BQ9P to KU9C
C56A to DL5NAM
C56HP to JA1OEM
C56T to DL5NAM
C6A/KA6WHA to KI6T
C6A/WR6O to KI6T
C6AEP to WØCP
C6DX to WZ8D
CN2UN to ZP6CU
CO8JY to KU9C
CQ9K to CS3MAD
CS3GU to F6FNU
CT3GU to F6FNU
CU2V to DL4XS
CW2CP to CX6FP
CW4CC to CX2ABC
CYØNR to VE1NR
DAØHQ to DL5AXX
DU2ABE to JA4DOB
DU4/GM4DKO to RSGB
DU6/K9AW to WF5T
E3ØHA to HA5YPP
EA2ADT to AG4T
EA9EA to EA9AZ
ET2A to F6HIZ
FM/EA3WL to EA3BT
FOØQA to KØCS
FP4EK to K1RH
FP5EK to K1RH
FR5ZU/G to VE2NW
FS7/FMØAMF to K2KGB
GM8V to ZS5BBO
GT3FLH to GDØTEP
GUØLYQ to AA6MV
H2ØA to 9A2AJ
H73C to HR1RMG
HBØ/HA5RT/P to HA6NL
HI8/DK8YY to DL4JAN
HL9BK to K2KSY
HO3A to HP3XUG
HR6/WP3A to W4DN
HSØAC to HSØ/G3NOM
HSØZAA to KM1R
J48ISL to SV2AEL
J67AH to K2IGW
J6LBH to K2IGW
J79LI to AA6MV
J79MV to AA6MV
JT1FCP to W8JAY
JW9XGA to LA9XGA
KH6/AA6MV to AA6MV
KZ5BU to KØBJ
LRØH to LU9HS
LX1JAV to LX2AJ
LX9KGS to LX2AJ
LX9LGS to LX2AJ
LZ1JAV to LX2AJ
N98ITU to WØAIH
OHØAW to OH1EH
OH1AF to OH1XT
OK8PDX to AI5P
OM9AIP to AI5P
P4ØW to N2MM
PTØF to N5FA
S92A to NJ2D
S92YN to HB9CYN
S92YV to HB9CYV
SN2ØJP to SP9PKZ
SN4JP to SP6GFG
SUØERA to WA3HUP
SUØERA/8 to WA3HUP
SU1JOTA to WA3HUP
SU1MR to WA3HUP
SU1RR to WA3HUP
SU1SR to WA3HUP
SU8LXR to WA3HUP
SVØFE to KØTLM
SVØSS to WA3HUP
T24JA to JA3JA
T2DX to W4WET
T32BI to KH6DFW
T32LI to AA6MV
T32MV to AA6MV
T88X to JA6VZB
T94MV to F6HIZ
TAØS to DL6DB
TJ1PD to N5DRV
TM5CW to F5SJB
TO8B to EA3BT
UE6YUS to KD6GC
V26AK to N2TK
V26R to KA2AEV
V63HC to KQ1F
V63HO to WA1S
V63YP to K1XM
V8A to JH7FQK
VJØARY to JA3JA
VKØXX to pirate
VK2BJZ to KØBJ
VK3AKK to K1UO
VK6SJS to JM1LJS
VK6SJS/HRP to JM1LJS
VK9CL to JM1LJS
VK9CQR to HB9TL
VK9CTL to HB9TL
VP2MCO to AA6MV
VP2MCP to AA6MV
VP9/US5I to N5FG
VR2SS to JK2PNY
VR6BJ to KØBJ
VS6WB to KØTLM
VS6WV to KØTLM
WØYZS to KØTLM
WHØV to WHØAAV
WP3R to W3HNK
XE1FES to W3HNK
XR3J to HB9AOF
XR3M to W3HC
XT2HP to JA1OEM
XT2JF to N5DRV
XT2JT to N5DRV
XT2LT to N5DRV
XT2PT to N5DRV
XT2RT to N5DRV
XU6WV to KØTLM
XU7AAE to JA1OEM
XV1Z to K6SGD
XW8DX to F6HIZ
XX9CS to KØCS
XX9TAR to KU9C
XX9TBH to AB6BH
XX9TJL to K6JL
XX9TOT to KU9C
XX9TXD to KU9C
XX9TYD to K8PYD
XZ1N to W1XT
YBØDX to W3HNK
YB2PBX to W3HNK
YB2UU to W6MD
YI1UNH to WA3HUP
YJØARY to JA3JA
YJ8BJ to KØBJ
YL8ØYZ to YL2MR
YM75DS to WA3HUP
YS1RR to W3HNK
YS1RRD to W3HNK
ZD8Z to VE3HO
ZF2CM to KØBJ
ZF2KI to K1KI
ZF2NJ to KØBJ
ZF2UH to KE5BR
ZK1XS to KØCS
ZLØADB to KØBJ
ZS6YG to WØYG
9G1PD to Patrick John Dzadze, P.O. Box 771, Takoradi, Ghana
BD4RE to Yee, P.O. Box 10, #38 Guangdong Road, Nanjing 210003, China
BG6JW to Cui, P.O. Box 074, Luoyang 471000, China
BV2KI to Bruce, P.O. Box 84-609, Taipei, Taiwan
BV4RA to Pang Shon-Ywu, P. O. Box 922, Taichung, Taiwan
DSØUP to Seo-Pusan Technical High School, 45-6, Dukpo-2 dong Sasang-Gu, Pusan 617-042, Korea
DS1IBD to Nam, #501-1209, Chamsil APT., 27 Chamsil-dong, Songpa-ku, Seoul 138-225, Korea
DS1IEX to Yongmann Lee, 331-48 Sinwel-7dong, Yangchen-go, Seoul 158-097, Korea
DS4AKP to Park Soon-Bok, P.O. Box 15, Kwang-Yang 545-010, Korea
DS4BXZ to Park Sang-Yoon, P.O. Box 2, Kwang-Yang 545-010, Korea
DS5RYB to Kim Yun-Yeol, Green APT 206-303, Chikokdong, Namku, Pohang 790-390, Korea
DS5WKN to Kim Dae-Yong, 340-27 Sung Gun Dong, Kyong Ju 780-180, Korea
DS5WXM to Kim Hyun-Suk, 340-27 Sung Gun Dong, Kyong Ju 780-180, Korea
HL5PVN to Kyung Chang Kang, P.O. Box 12 Tong-Nae, Pusan 607-600, Korea
J39BW to Graeme Stratton, P.O. Box 703, St. George's, Grenada
JA1RJU/JD1 to Kazuo Ogasawara, 13-12, 4 chome Kamirenjaku, Mitaka, Tokyo 181-0012, Japan
JT1CJ to P.O. Box 100, Ulaanbaatar-44, Mongolia, via Japan
LX1JH to Jean-Marie Juchemes, 2, Haaptstrooss, L-6869 Wecker, Luxembourg
P43T to Anthony Thiel, P.O. Box 4234, Noord, Aruba
SV1EDY to Apostolos Bourousis, 1 Anaximandrou Str., GR-116 33 Athens, Greece
SV1ENG to Antonis A. Parashis, El. Venizelou 203, GR-141 22 Athens, Greece
VU2JBK to Jagdish Kumar, Amateur Radio Club, D.E.A.L., Raipur Road, Dehradun 248 001, India
WH0V to Jun C. Mercado, P.O. Box 1941, Saipan, MP 96950
YC9YKI to Bachrun Betta, P.O. Box 37, Serui 98211, Indonesia
ZP6VLA to Victor Hugo Sosa, C. C. 22065, 2160 San Lorenzo, Paraguay

The table of QSL managers is courtesy of John Shelton, K1XN, editor of The GOLIST, P.O. Box 3071, Paris, TN 38242 (phone 901-641-0109; e-mail: <golist@wk.net >).

certainly gave many DXers many New Ones for DXCC. On the other hand, several other of his operations, not counting those denied DXCC credit, are certainly suspect. The recent activity from Burma, for example, showed that neither Don Miller nor Romeo Stepanenko had legitimate Burma licenses. (Both of the operations have been accepted for DXCC credit, however.)

As with most clouds, this one has a silver lining. In the DX desk's announcement in September 1967 that it was deleting credit for the PYØXA operation, they continued: "In an attempt to avoid future difficulties such as were involved in the above actions, no credits will be allowed for future DXpeditions until there has been a submission of evidence that the DXpedition was properly conducted in all respects, including licensing authority, actual presence at the claimed location, and so on." In other words, the ARRL DXCC desk would no longer simply take DXpeditioners at their word; they would have to supply supporting documents. This is the beginning of formal accreditation procedures, something we now take for granted in DXCC.

Just as Don Miller's other actions led to the formation of the DX Advisory Committee, his false statements and improper operation of PYØXA led to the important concept of DXCC accreditation. Don Miller "pushed the envelope" of DXCC. Actually, he ripped the envelope to shreds at times. But the DXCC program, and DXing in general, is stronger and more widely accepted as a result of his activities.

Insurance Contacts

A recent thread (topic of discussion) on the Internet DX reflector (run by the same NJDXA that Don Miller so hated) concerned so-called "insurance" contacts. These are contacts with a DXpedition on the same band and mode as a previous QSO. Many DXers argue against making such contacts, as these QSOs may prevent another DXer from making even a single contact with the DXpedition. Others say they are necessary to avoid the dreaded "not in log."

CQ DX Awards Program

SSB

2263 .....SV1RK
2264 .....CE3CDV
2265 .....W8DMC

SSB Endorsements

320 .....K2ENT/330
320 .....W7BOK/330
320 .....K7LAY/330
320 .....I4LCK/330
320 .....K6YRA/330
320 .....K4MQG/330
320 .....PY4OY/330
320 .....KØKG/328
320 .....IK8CNT/328
320 .....VK4LC/328
320 .....ZL1AGO/328
320 .....KZ4V/328
320 .....W6BCQ/328
320 .....VE2GHZ/325
320 .....W8KS/325
320 .....N2VW/325
320 .....W6SHY/322
310 .....KG6LF/319
310 .....F6BFI/319
300 .....VE3CKP/307
300 .....K3LC/300
275 .....SV1RK/295

CW Endorsements

320 .....K2ENT/330
320 .....K6LEB/330
320 .....K1MEM/330
320 .....KZ4V/329
320 .....WØHZ/329
320 .....I4LCK/327
320 .....W7CNL/327
320 .....WB5MTV/326
320 .....DJ2PJ/326
320 .....VE7CNE/323
320 .....KA7T/322
310 .....K6CU/318
310 .....N5HB/316
200 .....K6HMS/237

RTTY Endorsements

320 .....K2ENT/325
275 .....K3UA/296

Total number of active countries is 330. The basic award fee for subscribers to *CQ* is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

In an ideal world, there should be no need for insurance contacts. If a DXer has a doubtful contact with the DXpedition, he or she should made an "insurance" contact on another band or mode. Further, as pointed out by the always sage Wayne Mills, N7NG, is the dual responsibility of both the DXer and the DXpeditioners to ensure that the first contact is a complete one. That is, information is exchanged and *acknowledged* by both sides. The information exchanged is usually the callsigns and reports. However, to be a valid contact, both parties must acknowledge the exchange.

What leads to insurance contacts are exchanges that are incomplete or unacknowledged. This often happens when the DX "policemen" or others transmit on the DXpedition's frequency, blotting out part of the exchange. The DXer calling the DXpedition might not hear his or her report acknowledged by the DXpedition. While the DXpedition operator may have logged the contact, the DXer can't be certain of this without hearing the proper "roger."

Again, in the perfect world there are no such things as DX policemen. Would that they would go away with a pluck of the magic wand. In the real world, we must put up with these problems. So how to handle insurance contacts? First, try to get the DXpedition to immediately confirm your contact. If you are quick enough and the pile-up isn't too intense, you may be able to get your confirmation before the DXpedition operator makes another contact. Failing this, try to make the backup contact on another band or mode. Only if this doesn't work should the DXer attempt to make a duplicate contact.

If the DXpedition operator comes back with "B4," at least you know you are in the log. Many DXpeditioners find it faster to simple work the dupe and get on with the next contact. Remember to ensure both the exchange and the acknowledgment for a valid two-way contact. There is no excuse for making yet another insurance contact; a single backup, properly executed, should always be enough.

DX Hall of Fame Nominations

Do you know of a DXer who deserves consideration for election to CQ's DX Hall of Fame? The candidate DXer should have an international, positive, long-lasting effect on DXing. Nominations must come from a club or group, not an individual. The nomination should include the reasons why the candidate should be considered. Nominations should be sent by Feb. 15 to Bob Cox, K3EST, c/o of *CQ* magazine.

Potential candidates may be either DX-

Brian Santos, DU1SUN, is, at 19 years old, one of the youngest DXers in the Philippines.

peditioners or "support" personnel, such as software writer, DX editor, QSL manager, etc. This honor is not restricted to US DXers; nominations from overseas groups and clubs are welcome as well as those from US groups.

DX News and Events

Experienced Islands On The Air (IOTA) DXpeditioner Bernhard Stefan, DL2GAC, returns to the Solomon Islands and plans to operate as **H44MS** Feb. 5–10, mostly SSB on the IOTA frequencies. QSL his home call.

Oleg, UA1PBA, is operating as **R1ANF** from Bellingshausen Base on King George Island in the South Shetlands. His tour of duty is one year. **LU1ZI** is another King George Island station. QSL to Direccion Nacional del Antartico, Cerrito 1248, Buenos Aires, Argentina.

JY9NE is the Jordan callsign of N3FNE. Look for him on 40–10 meters until June of the year 2000. QSL home call.

Joel, F5AOW, and Michel, F5RLE, plan to operate from Burkino Faso as **XT2OW** and **XT2DM** respectively Feb.–Mar. 1. Joel will be on SSB and Michel on CW, running barefoot to a two-element tribander and a G5RV antenna. QSL via F5RLE.

Charlie, WØYG, and George, W8UVZ, will operate from Christmas Island Feb. 6–13 as **VK9XX**. The next week, Feb. 13–20, they will operate as **VK9YY** from Cocos-Keeling. The main emphasis will be on 80 and 160 meters. Sunrise/sunset for Christmas is 2300Z/1116Z. For Cocos-Keeling, it is 2330Z/1150Z. QSL both calls to WØYG.

Cedric Baechler, HB9HFN, plans to operate from Wallis and Futuna FW Feb. 23–Mar. 8. Emphasis will be on CW and Europe. More information is available at his home page: <http://www.qsl.net/hb9hfn/pacific99.html>.

"The Daily DX" is a daily electronic DX newsletter and provides much of the DXpedition information for this column. For more information on "The Daily DX," see <www.dailyDX.com> or call editor Bernie McClenny, W3UR, at 301-854-5650.

QSL News

QSL Special Event station **YM75ROT** to Nuri Boylu, TA3BN, P.O. Box 976, TR-35214 Izmir, Turkey. QSL **YM75TR** via Huseyin Ates TA7HA, P. O. Box 294, TR-38000 Kayseri, Turkey.

QSL **YOØHD** via Adrian Voica, YO2BPZ, Calea Zarandului 43/17, 2700 Deva, Romania. This station marked 50 years of amateur radio in Hunedoara County.

QSL **TF3AO** via his new address: Arsaell "Seli" Oskarsson, Laekjasmara 78, IS-200 Kopavogur, Iceland.

QSL the IOTA station of **PV2E** via PY2YW.

QSL Juan Carlos Veranes, **CO8TW**, direct to him at P.O. Box 8, Santiago De Cuba, CP 90100, Cuba, or via his QSL manager W3HNK.

Gene Shcumat, **UA9AB**, QSL manager for many ex-USSR stations, can be contacted at P.O. Box 17, Troitsk 457100, Chelyabinskaya Obl., Russia.

Kappy Kaplan, WA4WTG, adds the CQWW CW contest operation of **6Y2A** to the list of stations he manages. Kappy's address is 718 S.E. 3 Lane, Dania, FL 33004. *PS:* He likes foreign stamps.

WAZ Update

As of this writing in mid-December, we are still trying to determine how best to handle the existing backlog in WAZ applications and paperwork and the processing of new applications. For the moment at least, please send all queries, applications, QSLs, and related paperwork to CW WAZ Award here at CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801.

73, Chod, VP2ML

BY JOHN DORR, K1AR

CONTEST CALENDAR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Do You Have A Favorite Contest?

February's Contest Tip

When things break in your ham station, the next logical step is *not* to put your climbing belt on. Two events in my contest operating this past fall prove this point: 1) An intermittent in the 80 meter system turned out to be a bad barrel connector in the shack and 2) a seemingly faulty rotator turned out to be a connector that fell off the back of the control box. In both cases, I was ready to go outside and start climbing towers. In both cases, I didn't even need to put my shoes on. When in the heat of battle, think about the "easy stuff" first when you have station problems. Contest operating takes enough out of you without climbing towers unnecessarily.

When you ask a fellow contester what he/she considers to be the favorite contests, you get an incredibly wide range of responses. In part, I think it's because we operate contests for so many reasons. And I suspect it's also due to the large number of operating events that are sponsored throughout the year (more on that later).

When it comes right down to it, most of us have one or two favorite contests that stand out above all the others. It could be based on our station's limitations or strengths, or simply it could be just the first one we ever operated, offering some level of nostalgic value.

Without a doubt, and having nothing to do with where you are reading this (honest!), my favorite event is the CQ World-Wide DX Contest. In fact, I suppose that I have to concede that DX contests in general are where my interests lie. This is, for the most part, a very widely held feeling on the East Coast of the U.S. As with any geographical area, the contests that afford the best results are usually the most popular. If you pose the same question to someone in Texas or Nevada, he or she would probably tell you about the benefits that come from operating domestic contests such as the ARRL Sweepstakes.

As I mentioned earlier, there is a nostalgic part of this equation, too. Like many of you, my first "contest" was the ARRL Field Day. It was my first exposure to amateur radio as well. For that reason, Field Day has always had a special spot in my contesting interest curve—so much so that I've never missed operating one (albeit from home many times) in 30 years of hamming. I'm sure there are scores of you who can relate a similar story from events such as the now defunct ARRL Novice Roundup. When I look back at the 20+ hours of operating I did to make 230 QSOs in the 1969 NR, it's amazing that I ever operated another contest. But to tell you the truth, it was one of the best times I've ever had in a contest!

From an international perspective, DX contests are hu gely popular—and not just the CQ WW and ARRL DX. There are literally dozens of national contests, some permitting international participation and others limited to domestic QSOs. Maybe some of you can recall an experience such as listening to a buzzsaw of weak JA stations on 80 meters working each other at high QSO rates, wondering what it would be like to work them yourself.

Another breed of favoritism comes with contests that focus on special operating skills. The North American Sprint is a good example. Ever since its inception, this contest with its special QSY rule has driven a more even-handed result to geographical advantages. With operators being required to QSY after every QSO, operating skill uniquely comes to play, as you can no longer sit and call endless CQs from a loud run station. If you've never given it a try, I suggest you check out this month's events. But put on your seatbelt on; there's nothing like it.

And finally, there's those good 'ole organizational contests. You know the ones: QCWA QSO Party, YLRL events, Classic Radio, FOC, etc. They're great in that they increase HF activity while advancing the fraternal aspect of our hobby. Who can question those motives?

CALENDAR OF EVENTS

Jan. 23-25	ARRL VHF Sweepstakes
Jan. 29-31	**CQ WW 160 M CW Contest**
Jan. 30-31	REF CW Contest
Jan. 30-31	UBA SSB DX Contest
Feb. 6-7	Classic Radio Exchange
Feb. 6-7	New Hampshire QSO Party
Feb. 6-7	Vermont QSO Party
Feb. 6-7	Ten-Ten Int. Winter QSO Party
Feb. 6-8	Delaware QSO Party
Feb. 7	NA SSB Sprint
Feb. 13-14	World Wide RTTY WPX Contest
Feb. 13-14	Dutch PACC Contest
Feb. 13-14	RSGB 1.8 MHz CW Contest
Feb. 13-15	YLRL YL-OM Contest
Feb. 13-15	QCWA QSO CW Party
Feb. 14	NA CW Sprint
Feb. 20-21	ARRL Int'l DX CW Contest
Feb. 20-22	YLRL YL-OM CW Contest
Feb. 26-28	**CQ WW 160 M SSB Contest**
Feb. 27-28	REF SSB Contest
Feb. 27-28	North Carolina QSO Party
Feb. 27-28	UBA CW DX Contest
Feb. 27-28	RSGB 7 MHz CW Contest
Mar. 6-7	ARRL Int'l DX SSB Contest
Mar. 9-10	CLARA Family HF Contest
Mar. 13-14	RSGB Commonwealth CW
Mar. 13-15	QCWA QSO SSB Party
Mar. 14-15	Wisconsin QSO Party
Mar. 20-21	Bermuda Contest
Mar. 20-22	BARTG Spring RTTY Contest
Mar. 27-28	**CQ WW WPX SSB Contest**

Here's the Punch Line

The preceding discussion cannot be concluded without some comments on the number of contests currently being sponsored throughout the year. I think about this topic in months such as February, where the contest calendar burden is especially stressful. One of the most common complaints I receive from non-contesting amateurs is that there are too many darn contests. When you look at the contest calendar (or even better, the annual list in *CQ's Almanac*), it's easy to see that point of view. Some weekends four or five operating events are underway at various times.

Hopefully, most contests have some goal in mind. Some are trying to stir up activity from rare states. Others are attempting to increase activity on certain modes or bands. Still others are designed to encourage newcomers or those with small stations to join in on the fun. My question for the contest community to consider is, if there's no significant goal you're trying to achieve by sponsoring a contest, or the organizational support for the event is minimal at best, then why conduct the contest in the first place? The concept is something like the banking system. What the world does not need is another generic credit card with a great interest rate.

We've all heard the arguments, however. Many of these contests have little or no activity, so what's the big deal! Well, my view is that this is precisely the point. If a contest has little or no activity, then why sponsor the contest at all? It sure seems like common sense to me.

The contest and non-contest community will never completely see eye to eye on the virtues of contest operating. It's no different than the conflicts that SSTVers and non-SSTVers suffer from on 20 meter SSB—or, net operators and non-net operators, and 2 meter packet operators and non-packet operators for that matter. The

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e-mail: K1AR@contesting.com

list just goes on and on. Fortunately for the hobby, our self-policing approach works very well—for the most part. What are your thoughts on this subject? The 1995 CQ Contest Survey asks about your favorite contest(s). If you can, take a few minutes and send us your response.

Where Can I Get My Radio Fixed?

This is a question I hear more and more lately. Now that many manufacturers are outsourcing their equipment repair function, it's becoming harder to find organizations that can quickly and reliably fix amateur radio equipment. I had such a situation with a TS950SDX this past fall immediately preceding the CW CQ WorldWide Contest.

Fortunately, I had the opportunity to rediscover Groton Electronics. While there are many good repair shops servicing amateur equipment, it's hard to know who is reliable and does competent work. So with that in mind, a little personal endorsement is in order: check out Jacques Patry, WD1I, at Groton Electronics for your next repair need. Able to service most major brands on a nationwide basis, they are located at 12 Hemlock Road, Groton, MA 01450 (phone 978-448-3322).

Remember also that there are other alternatives. However, wherever you take your business, remember that positive references and experience count more than price.

Final Comments

Well, that's all for this month. As always, please remember that the deadline for the May issue is March 1st.

73, John, K1AR

The Classic Exchange Contest

2000Z Sat. to 0500Z Sun., Feb. 7–8

The Classic Radio Exchange ("CX") is a contest celebrating the older commercial and homebrew equipment that was the pride of our ham shacks and our bands just a few short decades ago. Our object is to encourage restoration, operation, and enjoyment of this older equipment. A "Classic Radio" is at least ten years old (age figured from first year of manufacture), but *not* required to participate in the Classic Exchange. You may use anything in the contest, although new gear is a distinct scoring liability.

Exchange: Your name, RST, QTH (state/province for US/Canada; country for DX), receiver and transmitter type (homebrew entries send final amp tube or transistor), and other interesting conversation. The same station may be worked with different equipment combinations on each band and on each mode. Non-participants may be worked for credit.

Frequencies: CW 60 kHz up from lower band edge; Novice/Tech Plus 20 kHz up from lower band edge; Phone 3880, 7290, 14.280, 21.380, 28.320. Note that 7060 and 3560 kHz tend to be the most popular CX frequencies.

Scoring: Multiply total QSOs (all bands) by the total number of different receivers plus transmitters (transceivers count as both xmtr. and rcvr.) plus states/provinces/countries worked on each band and mode. Multiply that total by your CX multiplier—the total years old of all receivers and transmitters used, three QSOs minimum per unit. For transceivers, multiply the age by two. If equipment is homebrew, count it as a minimum of 25 years old unless actual construction date or date of its construction article (in the case of a "reproduction") is older.

Final Score: Total QSOs all bands times RCVRs + XMTRs + states/provinces/countries (total each band and mode separately; add totals together) times CX multiplier.

Awards: Certificates and appropriate memorabilia are awarded every now and then for the highest score, the longest DX, exotic equipment, best excuses, and other unusual achievements.

Send logs, comments, anecdotes, and pictures to Jim Hanlon, P.O. Box 581, Sandia Park, NM 87047. Be sure to include a two-unit SASE for the next CX newsletter and CX announcement.

Vermont QSO Party

0000Z Sat. to 2400Z Sun., Feb. 6–7

This is the 41st annual Vermont QSO Party sponsored by the Central Vermont Amateur Radio Club. It is a great opportunity to work one of the rarest states on several bands. Participation is open to all licensed radio amateurs worldwide on 160–2 meters.

Classes: Single or multi-operator all bands, club, QRP, mobile.

Exchange: Vermont stations send RS(T) and county (14 total). Others send RS(T) and state/province or DXCC country.

Frequencies: Phone—first 25 kHz up from the beginning of the General band and the entire Novice 10 meter band. CW—40 kHz up from the bottom edge of the bands and 20 kHz up from the bottom of the Novice subbands. VHF—50.20, 144.20, and 146.69 MHz. Other modes can be used. Repeater contacts do not count.

Scoring: Credit 1 point per phone QSO and 2 points for CW or digital mode QSOs. Non-Vermont stations multiply total QSO points by the number of VT counties and special-event QSOs with W1BD. Vermont stations follow similar format with the addition of states/provinces/DXCC country multipliers. Stations may be worked up to four times per band (i.e., SSB, CW, RTTY, and so on).

Awards: Special certificates will be awarded to the three highest scoring Vermont stations. Certificates will also be awarded for the highest scoring station in each state, province, and DXCC country. In addition, there will be a QRP category with the high-scoring station winning a certificate.

Send your postmarked entries no later than March 7th to: Central Vermont Amateur Radio Club, Vermont QSO Party, Barry Driscoll, KE1BV, P.O. Box 674,

Montpelier, VT 05602. Be sure to include an SASE for final results.

New Hampshire QSO Party

0000Z Sat. to 2400Z Sun., Feb. 6–7

This year's party is again sponsored by the NH Amateur Radio Association. It's New Hampshire stations working all other stations. As with most QSO Parties, the same station may be worked once on each band mode. Total operating time is limited to 24 hours. Off-times must be a minimum of 15 minutes and be clearly indicated in the log.

Classes: Single or multi-operator all bands low power <150 watts or high power > 150 watts), club (large 50+, small <50), QRP, and mobile (allowed to operate the entire contest period).

Exchange: RS(T) and QTH. County and state for NH stations; state, province, or country for others.

Scoring: All stations credit 1 point/SSB QSO and 2 points for digital QSOs (RTTY, CW, packet). NH stations multiply QSO points by number of NH counties, states, provinces, and DXCC countries. Others simply use counties. Count 5 points for phone and 10 points for CW when working the bonus stations: W1FGM, K1BKE, W1FZ, W1WQM, N1FD, and K1NCR. Stations may be worked once per band and mode.

Final Score: Final score is calculated by multiplying QSO points times total multiplier and adding bonus points.

Frequencies: CW—1830, 3530, 7030, 14030, 21030, 28030. SSB—the first 25 kHz up from the bottom of the General band plus 50.20, 144.20, and 146.55 MHz. Repeater QSOs do not count.

Awards: Awards are available, although no details were provided in the contest announcement.

Logs must be received no later than March 31, 1999. Be sure to include an SASE for final results. Send logs and comments to: NHARA, P.O. Box 119, Goffstown, NH 03045.

Delaware QSO Party

1700Z to 0500Z, Sat., Feb. 6
1300Z to 0100Z Sun. to Mon., Feb. 7–8

This is a banner weekend for QSO Parties with the addition of Delaware. This year's edition is sponsored by the First State Amateur Radio Club and is open to everyone. Stations may be worked once per band and mode.

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

Frequencies: CW 50 kHz up from lower band edge; SSB 1860, 3940, 7260, 14260, 21360, 28560. Novices use 25 kHz above the lower subband edge.

Certificates will be awarded to category winners (categories not provided in rules). Logs must be submitted no later than March 9th and should be sent to: Contest Chairman—FSARC, Inc., P.O. Box 1050, Newark, DE 19715 or via e-mail at <QSOparty@fsarc.org>.

Dutch "PACC" Contest

1200Z Sat. to 1200Z Sun., Feb. 13–14

Sponsored by the Vereniging voor Experimenteel Radio Onderzoek in Nederland (VERON), it's the world working The Netherlands on all six bands, 1.8 through 29.7 MHz in the 42nd PACC Contest. The same station may be worked on each band, but on one mode only, phone or CW, for QSO and multiplier credit. Note that SSB QSOs are not allowed on 160 meters.

Categories: Single operator, multi-operator, and SWL.

Exchange: RS(T) plus a QSO number starting with 001. Dutch stations will add two letters to identify their province. There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, FL, ZH, and ZL.

Scoring: Each QSO with a PA/PB/PI station counts one point. DX stations determine their multiplier by the number of provinces worked on each band (maximum of 72).

Final Score: Total number of QSOs times the number of provinces worked on each band.

Awards: Certificates will be awarded to the top scoring station in each category in each country.

SWLs must log the call of the Dutch station as well as the station being worked and both serial numbers. Scoring same as above. Indicate the multiplier in a separate column in your log only the first time it is worked on each band. Include a summary sheet showing the scoring, your name and address in block letters, and the usual signed declaration.

Mailing deadline is March 31st to: PACC Contest, Hans P. Blondeel Timmerman, PA3EBT, Nieuweweg 21, 4031 MN Ingen, The Netherlands.

World Wide RTTY WPX Contest

0000Z Sat. to 2400Z Sun., Feb. 13–14

This is the 5th annual running of this fine digital mode contest sponsored by Hal Communications Corp. This event is open to amateurs worldwide using any digital mode, including Baudot, AMTOR, PACTOR, G-TOR, and CLOVER. Although inspired by the CQ WW WPX Contest, this contest is not affiliated with *CQ* magazine in any way.

Classes: Single Operator (all band-high and low power, single band), Multi-Single, Multi Two Transmitters (new), Multi-Multi, and SWL. All categories are limited to 30 hours of operating except for Multi-Multi entries. Packet spotting is allowed in all categories.

Exchange: RST and serial number. Multi-multi stations may use separate numbers on each operating band.

Scoring: QSOs between stations on different continents are worth 3 points on 20–10 meters and 6 points on 40–80. QSOs with stations on the same continent but different countries are worth 2 points on 20–10 meters and 4 points on 40–80. QSOs with stations on the same continent and in the same country are worth 1 point on 20–10 meters and 2 points on 40–80. Each valid prefix is counted as a multiplier. Multipliers are only counted once (not per band). The CQ WPX rules are used to determine valid prefixes. Final score is calculated by multiplying total QSO points time total multiplier.

Awards: A wide range of certificates and plaques are available for category winners. Contact K5DJ for more info.

Entries must be postmarked no later than 30 days after the end of the contest. Hard copy logs and/or disks may be sent to: Eddie Schneider, W6/GØAZT, 1826 Van Ness, San Pablo, CA 94806. Electronic logs can be sent via Internet to: <edlyn@global.california.com> (MIME encoded).

YLRL YL-OM Contest

SSB: 1400Z Fri. to 0200Z Sun., Feb. 13–15
CW: 1400Z Sat. to 0200Z Sun., Feb. 20–22

Sponsored by the Young Ladies Radio League, this annual event is open to all licensed men and women operators around the world.

Exchange: Callsign, QSO number, RS(T), ARRL section/VE province/country.

Scoring: Phone and CW are considered separate contests. Score 1 point for each station worked. YLs only work OMs and OMs only work YLs. Credit a special multiplier of 1.5 if you are using 100 watts or less on CW and 200 watts PEP on SSB. Final score is the total QSO points times the sum of ARRL sections, provinces, and countries worked per band.

Frequencies: CW 3540–3570, 7040–70, 14040–070, 21120–150, and 28180–210 kHz. SSB 3940–70, 7240–70, 14250–280, 21380–410, 28280–410 kHz.

Awards: Special award cups will be awarded to the winning phone and CW YL and OM. Certificates will be sent to the high scorers in each US call area, VE province, and DX country provided there are at least 10 valid QSOs in the log.

All logs are to be postmarked no later than 30 days after the contest and should be sent to: Nancy Hall, KC4IYD, P.O. Box 775, N. Olmsted, OH 44070-0775.

ARRL International DX Contest

CW: Feb. 20–21 Phone: March 6–7
0000Z Saturday to 2400Z Sunday

This is a great DX contest you shouldn't miss. I strongly recommend that you study the rules on the ARRL's Web site for more details. Send a large SASE (2 IRCs for DX) for sample log and entry forms.

All bands may be used, 1.8 through 28 MHz, but not 10, 18, or 24 MHz. Aeronautical or maritime mobile stations cannot be worked for contest credit.

Categories: Single Operator, both single and all band, and Single Operator assisted. Multi-operator, one transmitter and two transmitters. Also Multi-Operator, Multi-Transmitter. QRP, all band only (5 watts or less output). Multi-transmitter stations must remain on a band at least 10 minutes once a contact is made.

Exchange: RS(T) and state or province for W/VE; RS(T) and power input for DX stations (three-digit number).

QSO points: W/VE stations earn three points for each W/VE contact.

Multiplier: Each DXCC country worked on each band for W/VEs. DX stations use US states (48), District of Columbia (DC), and VE provinces (13) for their multiplier. (Maximum multiplier of 62 per band.)

Final Score: Total QSO points times the sum of the multiplier from each band. Entries with 500 or more QSOs must include a QSO check sheet.

Awards: Certificates given in each category, in each country, and in each ARRL section, plus a wide selection of plaques. Also certificates are awarded to DX stations making over 500 QSOs.

Disqualification regulations will be strictly enforced and are listed in the official rules. Mailing deadline for all entries is April 8th and go to: ARRL DX Contest, 225 Main Street, Newington, CT 06111 or via the Internet to <contest@arrl.org>. Send your summary sheet file (make sure it includes all the pertinent information outlined in the official ARRL summary sheet) and your log file following the ARRL Suggested Standard File Format.

CQ WW 160 Meter SSB Contest

2200Z Fri. to 1600Z Sun., Feb. 26–28

Just a reminder that the SSB section of our 160 Meter Contest will be coming up the last full weekend of this month.

Extensive coverage has been given to this event, with complete rules in the December 1998 issue. With the exception of the new "DC" multiplier, the rules are the same that have been used these past many years and are well known around the world.

Mailing deadline for your entry in last month's CW contest is February 28th, and March 31st for this month's SSB section. They can be sent directly to the 160 Contest Director, David L. Thompson, K4JRB, 4166 Mill Stone Court, Norcross, GA 30092. And of course, they can always be sent to *CQ's* office. (Be sure to indicate CW or SSB on the envelope.) ■

BY TED MELINOSKY, K1BV

AWARDS

NEWS OF CERTIFICATE AND AWARD COLLECTING

On September 23, 1998 Rodney Crawford, WD8CTX, made contact with a fellow amateur radio operator in Henderson County, Kentucky, bringing to a conclusion a 7 1/2 year quest to work all U.S. counties. Operating from his station in the small rural town of Buford, Ohio, Rodney makes his contacts with a Kenwood TS-450S. He also operates a 2 meter Kenwood TS-700A.

Rodney's interest in amateur radio began one evening after working in a factory. He stopped in to see a former teacher and good friend, Millard Gorman, K8NTZ, now a Silent Key. With encouragement from his brother-in-law, Ed Winkle, WA8RQQ, Rodney studied hard to get his Technician's license in 1976.

When Rodney had to give up his job due to health reasons, his radio became an important facet of his daily routine. Over the past 22-plus years Rodney has received many awards and recognitions. He has Worked All States awards on both 6 and 10 meters. He received first place in Ohio on 6 meters in the VHF QSO Party in 1984 and 1985. In September 1989 he was #1 in Ohio's 10 meter contest. He joined the "600" Club on 6 meters.

Rodney says, "I have been working on getting my County Hunter's Award on 20 meters from my home QTH to mobiles with 100 watts of power. It took me approximately 7 1/2 years to get all 3076 counties. Before I got into County Hunting, I was a Technician and was working on the bands of 6, 2, and 432 SSB and listening to the County Hunter's Net on my Galaxy GT-550A. Then in 1991 I upgraded to General and went right to the 20 meter mobile, emergency, and independent County Hunter's Net on 14.336.

"Back in 1991, when I started working on the All Counties award, Al Norris, WB8UJM, came to help me put up my wire antenna. It was wet and cold. As we worked, he said when I got down to my last two counties, he would be there to transmit them to me. True to his word, when I got down to my last two—Christian County, Illinois and Henderson County, Kentucky—Al was on the road!

"I'm proud to be associated with ham radio. I've made friends to last a lifetime. I proudly display my award #956, and I've started my second go-around. 73, Rodney, WD8CTX"

65 Glebe Road, Spofford, NH 03462-4411
e-mail: k1bv@top.monad.net

USA-CA SPECIAL HONOR ROLL

Chuck Imsande, K6RLS
USA-CA All Counties #960
October 20, 1998

Don Simpson, W3EYF
USA-CA All Counties #961
November 16, 1998

Thomas Artman, KD9OD
USA-CA All Counties #962
November 20, 1998

USA-CA HONOR ROLL

500

K6RLS	3046
LU5DV	3047
KB8UUZ	3048
VK4SJ	3049
KD9OD	3050

1000

K6RLS	1495
VK4SJ	1496
KD9OD	1497

1500

K6RLS	1243
KD9OD	1244
K1BV	1245

2000

K6RLS	1141
KD9OD	1142

2500

K6RLS	1067
KD9OD	1068

3000

K6RLS	978
KD9OD	979

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $4.00. For nonsubscribers it is $10.00. To qualify for the special subscriber rate, please send a recent *CQ* mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from *CQ* Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated March 1, 1997. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

New Zealand Awards

This is the second installment of the comprehensive award series offered by the New Zealand Association of Radio Transmitters (NZART).

General Requirements for all of the following NZART certificates are as follows: Applicants do not have to possess the cards, but must certify that the contacts were legitimately made. Endorsements for special band or mode are available at your request. Application forms are available for most of the awards from either the sponsor or K1BV for an SASE or IRC. Costs for DX applicants are $US2 each except WAP ($US3) and 5X5 ($US5). If airmail is requested, add $US2. Applications should be sent to: NZART Awards Manager, P.O. Box 1733, Christchurch 8015, New Zealand.

The Worked All Pacific Award is offered by the New Zealand Association of Radio Transmitters (NZART).

Worked All Pacific Award. Contacts are required with any thirty (30) different "Oceania Countries." Eligible countries are any which may be counted as Oceania for Worked All Continents. The DXCC list is used as an official reference.

Worked New Zealand Counties Award. The basic award requires the contacting of twenty (20) different New Zealand Counties. There are endorsements for 40, 60, 80, and 100 with a special certificate being offered for 112. A map showing counties is provided in the New Zealand Call Book, while a check sheet is available as noted above. Cost for endorsements is NZ 20 cents or 1 IRC plus SASE.

There is also an NZC 224 Shield instituted to recognize the very outstanding achievement of earning the 112 level under two different certificates. Cost for the shield (plaque) is NZ$15. The cost for

The Worked New Zealand Counties Award requires contacting 20 different New Zealand counties.

overseas applicants is an extra $US8 for surface postage only.

The operator on a "County DXpedition," whether Mobile, or Fixed, or Portable, may claim that county to their own NZC totals. The original "Counties List" will be maintained regardless of deletions or additions. The criteria will be the actual area of operation, which must be determined by the honor of the operator.

The NZART National Parks Award may be earned by contacting stations that are operating within the boundaries of New Zealand's national parks.

National Parks Award. New Zealand is justly proud of its national parks system. This award may be earned by making contact with stations that are operating *within* the boundaries of these national parks. The basic award requires two such contacts. An endorsement is available for each additional two contacts, as well as for all VHF simplex, VHF repeater, or for different bands. Contacts with the same station are allowed if made on different amateur bands, or different days, or from different parks. Contacts must be made on or after January 1, 1988.

France SSTV Awards

And now for something completely different. The following two award samples were provided by the French Radio Club "Pierre Coulon" and are designed to encourage DX activity by SSTV enthusiasts. Both are very colorful and look to be a very effective use of ink-jet printing technology. I think

The second level of the "Pierre Coulon" SSTV award is for working 50 different countries on SSTV.

that at least for small or specialty groups such as this, the expense of having to buy large quantities of printed certificates is about over. High-quality (600–1200 dot per inch) ink -jet color printers are very inexpensive, and coupled with the newest digital cameras, they open new doors in award design. These tools allow full control over design and keep costs to very reasonable levels. These next two awards are winners on both counts. The samples kindly provided by Nicolas used my call for the samples only, as I don't use SSTV mode. Here are the rules.

Two levels of the award are available. The first requires contacting 20 different countries using SSTV (any of the modes such as Martin M1, etc.). The second is for working 50 different countries. GCR list is accepted. The costs are 4 IRCs for stations outside of France, and French stations need send only 3 stamps of 3 Francs each. Apply to: Radio Club Pierre Coulon F5KMB, c/o Nicolas, BP152, F-60131 Saint Just en Chaussee Cedex, France.

Internet Site of the Month

There are several sites where U.S. counties are listed. The best, run by County Hunter KK7X, is found at the following URL: http://countyhunter.web2010.com/counties.htm

After you've downloaded the counties list, you might want to check out the rest of Dennis Hall's site. There's information on every aspect of U.S. County Hunting from a very basic description of what it's all about, to lists of the latest certificate holder numbers, rules for USA-CA and MARAC awards, and conventions or special activities. What's even more impressive is that Dennis is a long-haul truck driver who updates the site on a regular basis while on the road.

A Request for Reasonable Requirements

During the past ten years of publishing my *DX Awards Directory* and in the past year as *CQ* columnist, I've reviewed the rules for several thousand awards, certificates, pennants, and plaques. There is a lot of fun, to be sure.However, there are some things the sponsors could do to reduce the frustration level for all too many awards. Let's face it: Many awards are nearly impossible for even the most dedicated awards hunter—in two lifetimes. My suggestions for sponsors are:

1. Write *reasonable* requirements.Offer several levels of achievement, recognizing DX stations who will not have a chance to contact large numbers of stations in your country.

2. Let's not be greedy. Even recognizing that postage costs are higher in Europe (especially Germany) and Asia, most amateurs will not spend $US10–20 on a certificate. A great number of U.S. clubs charge only $US1–2, and some just ask for postage. The postage difference isn't *that* great overseas. We're not willing to support your club's expenses.

3. Rapid response. Why not provide same-day service? If you're waiting for the printer, tell us with a postcard or e-mail. Don't make applicants wait six months or longer for a certificate.

4. Make sure your group or club is active if the award requires contacting members. Offer a membership list. Sponsor activity weeks and specify frequencies where members will be active.

With these thoughts in mind, I'm still looking for your club or groups award to give you publicity. 73, Ted, K1BV

The first level of the "Pierre Coulon" French radio club's SSTV award requires the applicant to contact 20 different countries using SSTV.

BY DAVE INGRAM, K4TWJ

WORLD OF IDEAS

A LOOK AT THE WORLD AROUND US

A New Mode for the New Millennium

As Alan Dorhoffer, K2EEK, has discussed in past "Zero Bias" editorials and as seasoned amateurs are aware, each new sunspot cycle brings new ideas and innovations, changes that directly influence the future of amateur radio. During past 11-year cycles, for example, we have seen SSB supersede AM as our main form of voice communications, plus we have watched transistors capture the limelight from soft, glowing vacuum tubes. We have also seen (or read about) CW replace spark during radio's early years, and AMTOR gain favor over RTTY during more recent times.

In light of those established facts and solid track records, we logically can surmise or assume the main form of voice communications in use by the end of sunspot Cycle 23 may be noticeably dif-

4941 Scenic View Dr., Birmingham, AL 35210

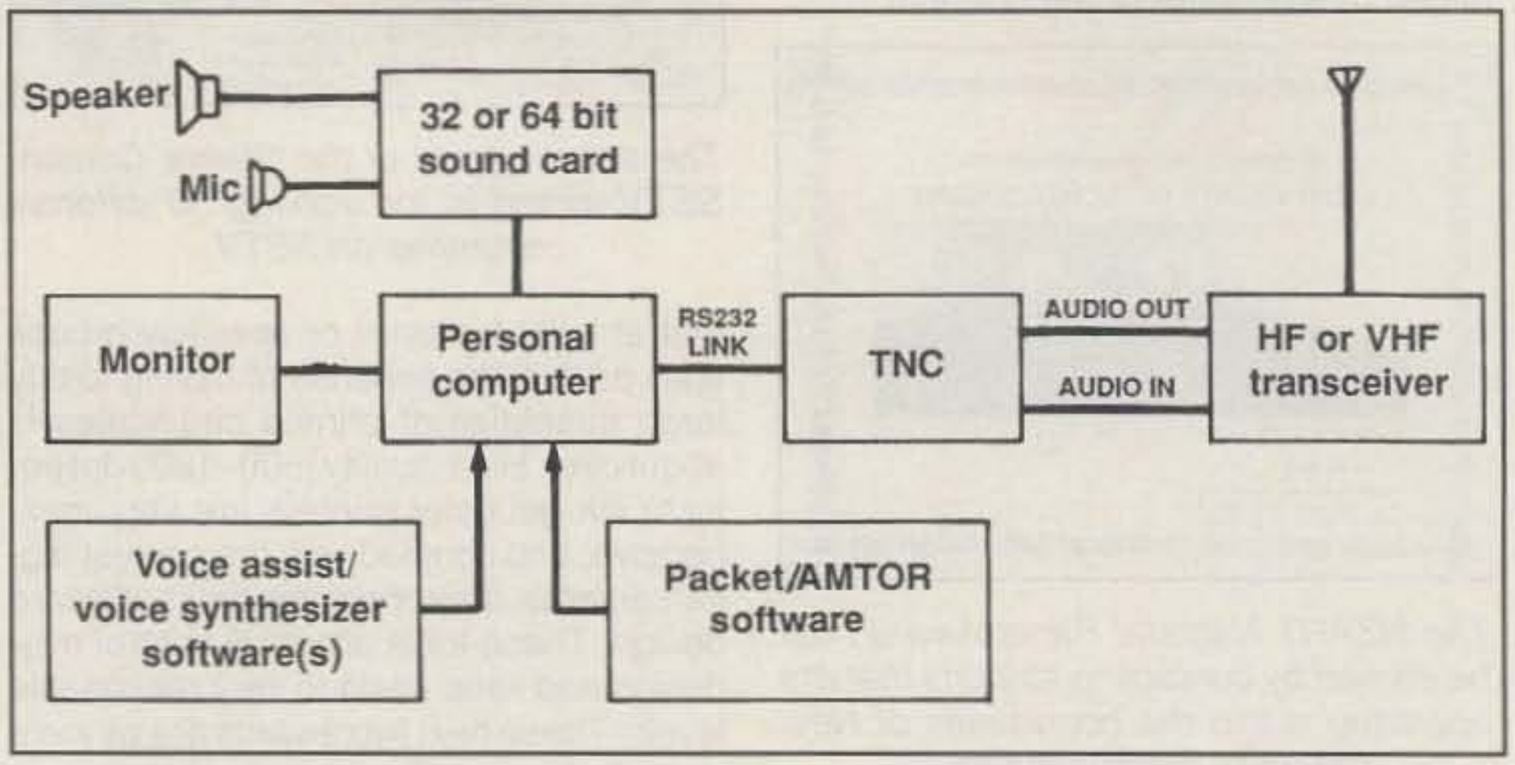

Fig. 1– Outline of a "level one" digital audio system. Initial concept will permit operators to work packet or AMTOR by voice, then progress into a new stand-alone voice communication mode. The computer is a 166 MHz MMX or better IBM- compatible with a 32- or 64-bit sound card, 16MB or more of RAM, and 45MB or more hard-drive space for the audio program.

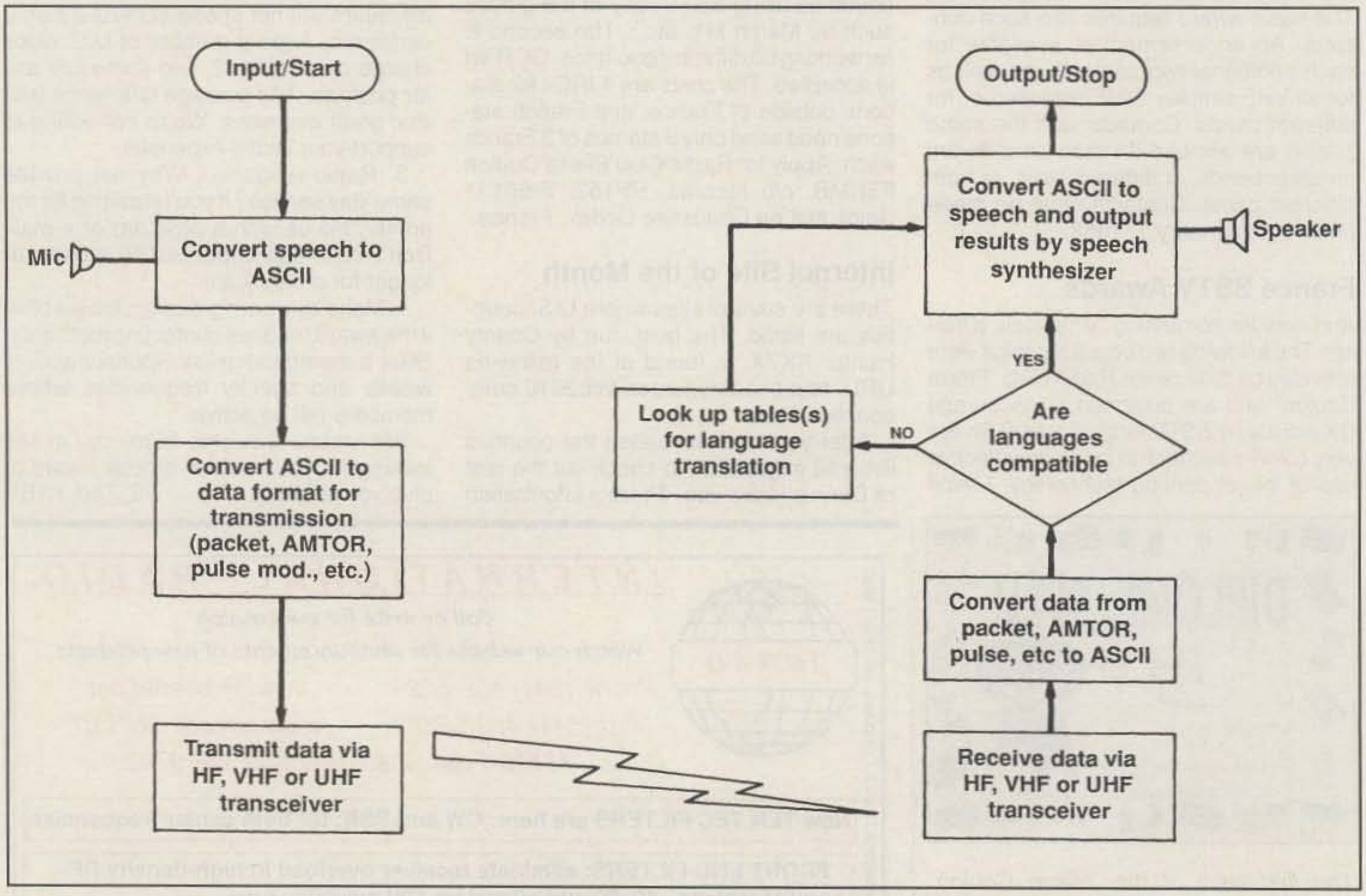

Fig. 2– Flow-chart-type overview of the steps or functional sequence associated with digital audio communications. The concept is compatible with amateur radio's existing modes used on the air, yet has the ability to progress in new directions and interface with new on-the-air modes.

ferent from what we presently enjoy using.

A bold and over-enthusiastic statement? Not at all. Change is constant in our modern world, and technology is also moving faster and faster with each passing year. Expansions and growth in new directions are both natural and eminent. By welcoming and endorsing change, we evolve and grow. That is our key to long-term existence.

This month's column thus takes a first look at a promising new concept destined to emerge and flourish during the months and years ahead—a new form of voice communications. Understand I am not describing a plug-and-play system you can mail order ready to use today, but rather I am presenting a ground-floor idea for development by members of our society with an irresistible urge to "do something special" and/or "write their name in the pages of communications history."

When you think about that, it is an admirable accomplishment! Both software and hardware that can be adapted or modified to produce a barebones starting point are readily available today. Blank areas in their capabilities can be filled in by creative-minded programmers and software analysts within our amateur radio world.

Fine, you say, but every imaginable form of voice communications seems to have already been investigated, plus any new form or idea should be compatible with existing concepts and equipment. We cannot simply outmode all presently in-use transceivers in a couple of years, right? True! Staying within those guidelines, let's look at the "whys" of a new system. We can then progress to the "whats" and "hows," and plans for development of the new system.

Why Change?

SSB seems like such an ideal form of voice communications that one might understandably ask, "Why argue with perfection?" Good point! That also reminds me of AM's plight for continuance when SSB came on the scene. Sideband definitely did not exhibit the robust and full-bodied sound of AM (sigh!). Never has, never will. By comparison, however, SSB exhibits a more narrow bandwidth and higher signal-to-noise ratio—two prime considerations for supporting a large number of stations on a band and delivering more audio punch for longer range communications.

There are also additional "fringe benefits" to a new digital audio system—benefits such as intelligently filling in missing words and performing language translations. Sound interesting? Read on!

Digital Audio in Amateur Radio

Audio communications concepts have traditionally been analog in nature, but future techniques are destined to be digitally based and computer oriented. Logically speaking, this next voice mode will probably be a spin-off of recent innovations such as "voice assist" programs/software and voice-mail systems.

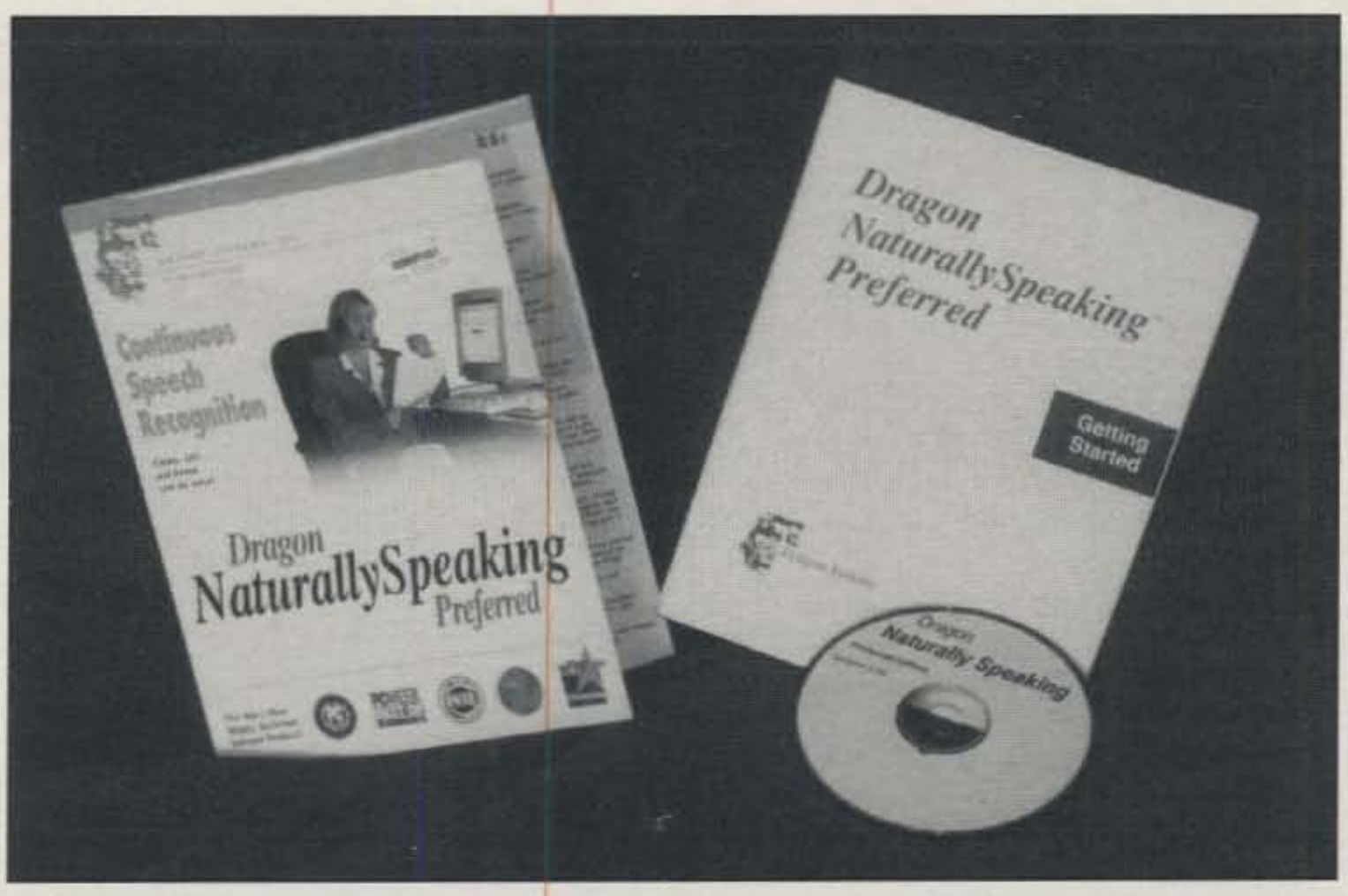

Fig. 3– Voice-assist software packages such as the Dragon "Naturally Speaking" shown here are used with IBM-compatible computers for dictating letters or memos on a PC, and hold merit for digital audio applications in amateur radio. (Photo courtesy Chet Lambert, W4WDR)

Simply explained, voice-assisting and voice-synthesizing programs enable us to dictate notes or memos on a PC, and read books or articles in ASCII text form to blind

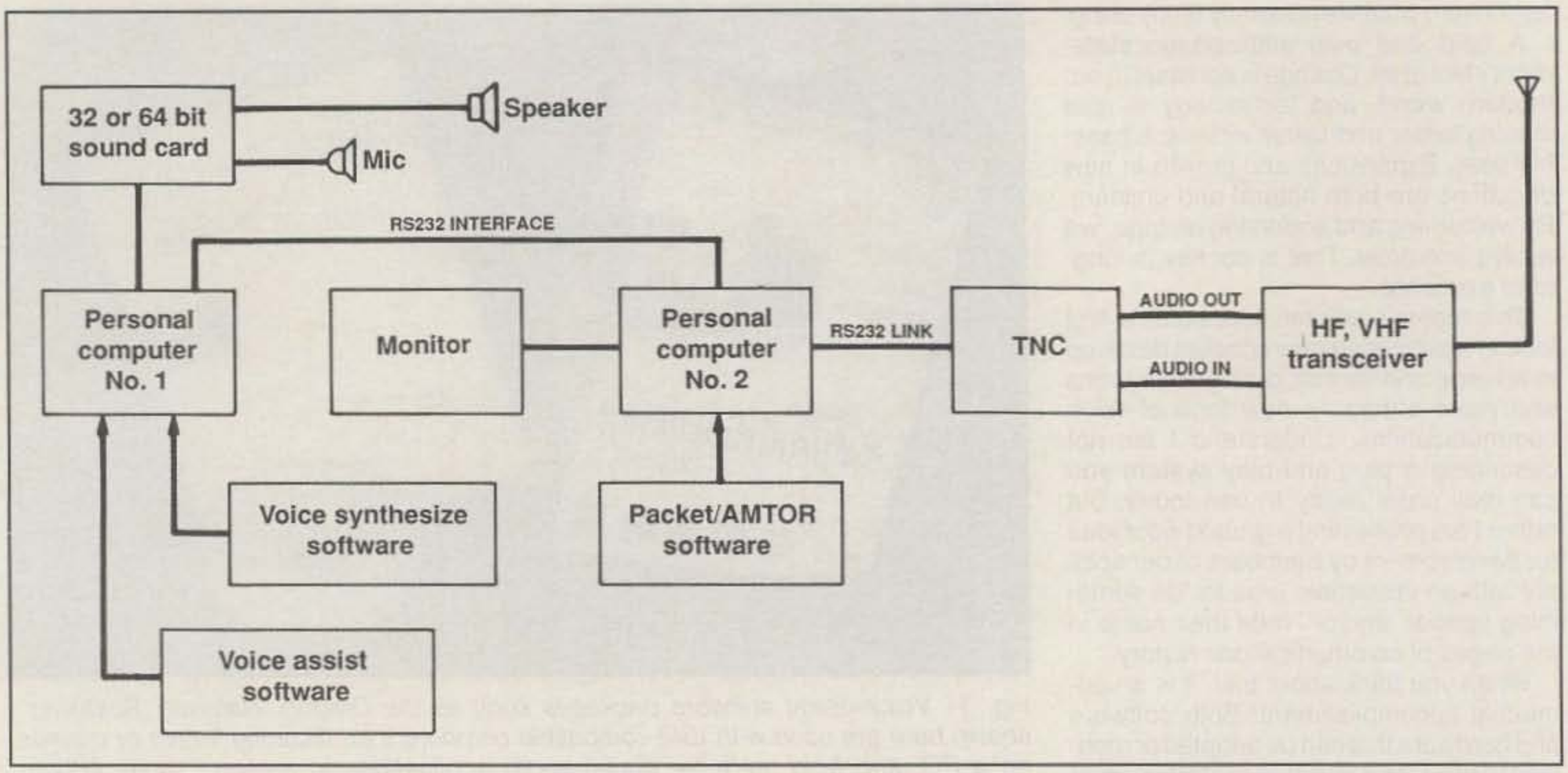

Fig. 4– As an "early stage of development" solution to both software and hardware limitations, two computers might be RS-232 linked to produce a working system. (Discussion in text.)

or severely handicapped individuals. Capabilities of low-cost programs/software are presently limited, but amateur radio applications offer a special advantage here: Our "usual QSO vocabulary" is somewhat repetitive and consists of minimum words and syllables.

Generally speaking, voice-mail systems fall into two categories: analog units with "parrot" memories (glorified telephone answering machines) and digital units that work with a personal computer. The latter item is particularly interesting, as it listens, records,. and plays back spoken words stored on a computer disk or hard drive. Are you getting the picture here, gang? Through clever selection, we can find adaptable programs that can convert speech to ASCII data and vice-versa. The program(s) may not work in tandem with other programs we need for communications, but they can be modified or altered for our expanded applications. Can you imagine the thrill and excitement of being in the first group of amateurs to accomplish this feat?!

If a selected voice assist/speech synthesizing or voice-mail system can convert spoken words to and from ASCII, and if a packet radio system can also access that ASCII data, operators can talk rather than type their messages (an outline of this concept is shown in fig. 1). On-the-air signals would be conventional ASCII, AMTOR, or packet radio type transmissions, so no Special Temporary Authorizations (STAs) or other stipulations need be attached to pioneering and using the new system. In fact, both voice and keyboard-interfaced packeteers could communicate directly, and each might be totally unaware of the others input/output setup.

Notice the full compatibility here. The setup works with one's existing HF or VHF/UHF transceiver, interconnects via microphone and speaker sockets, works SSB or FM, runs at any popular speed/baud rate, and appears on the air as regular ASCII, AMTOR, or packet. No other "new" mode has ever been so easy to develop! I should also point out "voice packeting" is only a convenient starting point in developing a new digitally-based audio system, and second- or third-generation systems may be quite different in nature or means of implementation. A pulse modulation system using a newly developed digital code is one close-to-reality example of that fact.

Selected voice-assist/synthesizing programs and packet software will require careful merging or combining so one program can non-evasively insert and extract data from the other. This is the area I mentioned earlier where development by computer programmers and systems analysts will be rewarding and significant (Heads up, friends; fame may be calling you!).

Presently Available Resources

Amateurs interested in homebrewing a "level one" audio system right now will find a variety of speech-related software available from computer suppliers nationwide. The main consideration to bear in mind during selection is how easily the software can be altered so its ASCII data can be remote-accessed from software for packeting or other data modes.

Another not-to-be-overlooked consideration is the computer must be elaborate enough to accommodate voice interfacing rather than just packeting. This necessitates using a 32- or 64-bit sound card which in turn dictates using a 486DX or better IBM-compatible computer.

Quickly recapping, our concept (which is outlined "flowchart style" in fig. 2) consists of four main steps:

1. Convert regular voice/speech to ASCII data.
2. Convert that ASCII data to packet, AMTOR, etc.
3. Transmit the data in regular packet or AMTOR format.
4. Convert received packet or AMTOR back to ASCII and then to regular speech.

Some of the voice-assist software that appears attractive and affordable (typically less than $100) are "Voice Xpress," "Naturally Speaking," and "Say It." (fig. 3). These software work with IBM-compatibles and word-processing programs such as Microsoft Word and WordPerfect (several versions of each). Particularly appealing is Symantec's "WordPerfect Suite 8 Upgrade with Dragon "Naturally Speaking." Two appealing voice-mail software packages are the "Hot Fax Message Center" from Smith Micro and "Talk Works" by Symantec. Typically, software producers specify system requirements for use as a 166 MHz MMX or higher computer with 16

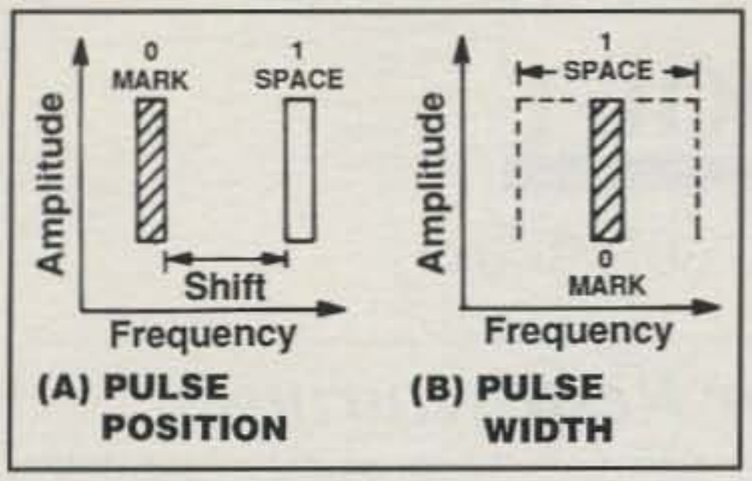

Fig. 5– Outline of pulse position and pulse-width modulation techniques for transmitting digital data. (See discussion in the text.)

megabyte of RAM and 32 to 48MB of hard-drive space.

Development and Implementation

First versions of this digital voice system will probably exhibit limited capabilities, but they will prove the idea works and also inspire further development. First systems might even utilize two computers for quick and easy implementation as illustrated in fig. 4. One computer could handle voice-to-ASCII conversion (and vice versa), while the second computer handles ASCII-to-packet (or AMTOR) conversion. The two computers could be linked by their RS-232 ports. Crude maybe, but effective. As the system is fine-tuned, word resolution plus the ability to copy through QRM, QRN, and QSB will increase. Eventually, we will reach the point of perfection.

How much time, fumbling, and effort might typically be associated with turning this idea into reality? If a few really sharp computer programmers and software analysts dedicate their knowledge and expertise to the effort, working prototypes/models could be on the air within a few months. I do not envision that happening, however, as the idea needs time to die down and be resurrected as someone else's idea to gain widespread favor. No, I am not being cynical, just factual. I have said it before and I will say it again: There is no limit to what you can do and how far an idea can go provided you are not adamant about who gets the credit.

In the unlikely chance you are thinking I would be the logical candidate to head up this project, I will change "head up" to "coordinate efforts of others and report results as we go" and say sure. What is one more project when you are already working on five times the number of projects one can handle (translation: When you want something done, assign it to a busy person!). Let me know your opinion and your area of project interest/expertise. I will be pursuing this task unassisted and unpaid, so include a couple of SASEs with your letter for information exchange when there is sufficient news to report.

Growth and Expansion

After a level-one system has proven its merit, developing additional versions with more elaborate capabilities should prove feasible (expanding on an existing concept is always easier than starting from scratch). Greater speech resolution, a larger word "look up" vocabulary, and language translations so operators of all lands can converse in their native tongues are three easy-to-visualize examples of that statement.

Over a period of time, special forms of narrowband data transmission and reception could further support the setup. This idea is particularly attractive, as it would more effectively utilize quiet subband ranges such as 14.090 to 14.150 MHz and diversify the load on SSB/voice frequency allocations. It is a "win-win" or "get something without sacrificing something" situation!

With regard to special data modes, pulse position and pulse width modulation concepts as illustrated in fig. 5 should prove appealing for both HF and VHF plus moonbounce work. In fact, it would make EME pioneering by voice as effective as using CW—a real step forward in technology. Our friend and colleague Chet Lambert, W4WDR, of *Computer Trader Magazine* fame, suggests yet more visions of future applications. He foresees digital audio applications such as voice encrypting for military and/or airline security. Chet's right. Since the system is computer based, the sky is the limit.

A new mode of voice communications is destined to become reality. Let's help it get started and pull together to ensure amateur radio receives well-deserved credit for once again leading the way in the evolution of wireless communications!

Closing Notes

Now answer truthfully, friends. Isn't amateur radio terrific? We can enjoy homebrewing, experimenting, developing new techniques, using classic gear, and/or simply chatting with fellow amateurs to our heart's content. No other hobby/pursuit compares with amateur radio! Regardless of change, we will always be 20 dB above Toyota's advertised "everyday people"!

More late-breaking news and more hot views in keys and QRP are coming soon. Stay tuned! 73, and may the force of good signals be with you!

73, Dave, K4TWJ

BY FREDERICK O. MAIA, W5YI

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

ZL2CA Files Comments on U.S. Amateur Restructuring

New Zealand's Bob Vernall, ZL2CA, believes the international law that requires Morse code proficiency is a form of discrimination. In formal comments filed with the FCC, Vernall says requiring Morse code proficiency violates international and national freedoms.

ZL2CA is one of the six managers of ORACLE, the New Zealand-based Organization Requesting Alternatives by Code-Less Examinations Incorporated. ORACLE is a break-away group managed by previously high-level NZART members who were unable to gain support for a change in the amateur telegraphy requirements. NZART, New Zealand Amateur Radio Transmitters, Inc., is New Zealand's national ham radio society. Vernall is also one of ten directors in the more recently formed USA-based organization No-Code International (NCI).

It was Vernall who convinced his government in March 1995 to propose elimination of the manual Morse code examination. It led to New Zealand's Minister of Communications issuing the following policy statement:

"At the present time, RR2735 effectively requires all administrations to verify a competence in Morse code before the issue of an amateur license to operate below 30 MHz. The Ministry now has considered that it is no longer appropriate as a treaty requirement for Government."

The startling statement went on to say that the following regulation, RR2736, contains " . . . ample scope . . . to require competency in Morse code or not as deemed appropriate. RR2735 adds a specific obligation in regard to Morse code and in doing so limits national freedom but without providing any greater benefits. The Ministry has therefore formed a view that it is appropriate to propose a deletion of RR2735 at the forthcoming WRC-95 and will now work toward that end."

The New Zealand government did indeed propose on October 31, 1995 at WRC-95 to suppress RR2735 (which was later renumbered to S25.5) in favor of RR2736 (now S25.6), which allows administrations to have in place and agree on any technical or operational provisions that may be deemed necessary.

The ultimate action by the ITU was to delay further consideration until a future World Radio Conference and a preliminary Amateur Service agenda item was designated for WRC-99. Item No. 2.2 simply authorized "Consideration of Article S25 concerning the Amateur Service and the Amateur-satellite service." While not the result that New Zealand wanted, it did open up the debate on Morse code testing around the world, since every nation had to come up with a position. Thus, ZL2CA and ORACLE are thought to be single-handedly responsible for the initial worldwide effort to reduce the emphasis placed on manual CW testing.

ZL2CA Files Comments on U.S. Amateur Restructuring

Comments on FCC rulemaking normally come only from American citizens. But since amateur radio is a worldwide hobby governed by both international and national regulations, Vernall chose to file comments on WT 98-143 directly with the Commission. WT-98-143 is the FCC's Notice of Proposed Rule Making which looks toward restructuring the U.S. Amateur Service. His comments were mostly in response to the NPRM request " . . . seeking comments on changes to the telegraphy requirements for the amateur radio service and to the written examinations that must be passed to qualify for an amateur radio license."

Basically, Vernall believes the main problem in amateur radio is the "imbedded discrimination" associated with the Morse code requirement. He wrote:

> Amateur radio rulemaking needs modernization. I find that the discussion in the 1998 NPRM falls well short of solving discrimination or proposing new rules that are genuinely fit for the purpose of regulating amateur radio in modern times.

In support of his position, Vernall said the United Nations (UN) International Covenant on Civil and Political Rights defines a wide range of ethic and human freedom issues:

> That Covenant has been ratified or acceded to by 132 administrations, including the USA. The theme of Article 26 of that Covenant is: " . . . the law shall prohibit any discrimination."

"FCC Part 97 rules are the most discriminatory without good reason of any amateur radio rule making in the world today."
—Robert Vernall, ZL2CA

ZL2CA believes "An issue arises with discrimination where a claimed requirement is without good reason." He feels that the Morse code requirement in today's Amateur Service is totally without merit. He says the following:

> Decades ago there may have been some claim for a Morse code requirement when Morse code was the main form of communication technology in several radio and communication services. However, as the NPRM outlines, technology and practices have moved on since those times—e.g., machine teletype, automatic error correction, facsimile, e-mail, and telephony rather than telegraphy is the most used way of amateur intercommunication today. Amateur radio continues to provide a means for recreational use of Morse code, but that involves *personal preference* and is quite different to an international requirement applying to all candidates.
>
> Further, there is no regulation that requires a licensee to actually use Morse code at any time after being licensed. Nor is there any requirement to have or use any radio equipment, so any mode specific qualification requirement that has a pass/fail implication on the issuing of a license is very questionable indeed. . . .
>
> The formulation of S25.5 is irrational as there is no logical linkage known between personal proficiency with Morse code and the safe and effective use of radio spectrum. Not surprisingly, no other radio service attempts to use such a formulation.
>
> The explanation that best fits the claim for "the Morse code requirement," including why the frequency above which it may be waived has changed over the years, is that Morse code testing was mainly intended to be used as a restrictive practice to limit the number of participants on certain bands, while still encouraging new usage on the higher bands that are under possible threat of shared use by other radio services.
>
> Sheltering the interests of the incumbent licensees who have passed a Morse code test is discrimination without good reason when viewed from the public perspective. The public interest should be a main element in determining policies for amateur radio, as the spectrum allocated to the Amateur Service is basically a public resource. One of the main

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public benefits of amateur radio is in provision of emergency communications when other media may not be functional.

The ITU Constitution claims that "rational use of telecommunications of all kinds" is to be maintained by all members. This causes a credibility problem for alleged irrational formulations. Making telecommunications services (which includes the amateur service) "so far as possible, generally available to the public" also causes a credibility problem when restrictive practices are involved, without good reason.

The above factors expose the case that S25.5 is a restrictive practice that has been a cause of controversy and discrimination for many years.

The so-called incentive licensing arrangements in the USA are mainly based on specifying by conditions of license the sub-band segments that various grades of licensee can access, according to what mixture of graded Morse code speed test and graded written examination a candidate has passed. This is alleged to involve discrimination of several types, without good reason.

Morse code proficiency is not a genuine pre-requisite for any amateur license.

ITU radio regulation S25.5 does not mention speed testing, error rate or other criteria that could be used to gauge proficiency of a candidate. For the purposes of illustrating a range of interpretation, even a "one word per hour" test could be debated as being able to satisfy S25.5, but whatever, that too would also be alleged to be discriminatory, on the basis of there being no genuine need for a Morse code requirement of *any* kind.

Multiple Morse code speed tests are not genuine pre-requisites for any amateur license.

The introduction of 5, 13 and 20 words per minute (wpm) tests seem to be artificial creations to expand the scope of the incentive licensing arrangements. If 5 word per minute proficiency is deemed to be sufficient to issue one type of license to access amateur spectrum below 30 MHz in the USA, then it follows that it is accepted as satisfying S25.5 (ignoring that S25.5 itself is very questionable).

Given the clear evidence that a pass in a 5 word per minute Morse code test is sufficient qualification element, then any higher speed Morse testing for licensing is superfluous for regulatory purposes and is thus alleged to be discrimination without good reason. Any "hazing" of candidates is hardly a role of any government to indulge in.

Nor should there be a government role to limit the number of certain types of licenses by means such as setting of arbitrary Morse code speeds. . . . there is no justification for USA licensing arrangements to test Morse code at any higher speed than 5 words per minute. . . . Morse code operation at higher speeds may impress some individuals but that does not make it into a genuine licensing requirement.

Specifying sub-bands is discrimination without good reason.

The USA "incentive license" scheme divides up most of the amateur HF bands into sub-band segments, and by conditions of license permits access by respective classes of license to transmit in specified segments. The reality is that nearly all transmitters and receivers have frequency coverage of most or all of a given amateur band, so the conditions of license have the effect of preventing some individuals from transmitting in certain sub-band segments (the segments they are deemed to not be qualified to use).

There appear to be no genuine factors as to why different qualifications should be required to access sub-band segments that are essentially the same in physical and technical characteristics. . . Segregation of licensees on the basis that different qualifications are required for transmitting on different sub-band segments within a given band is an artificial formulation alleged to be blatant discrimination without good reason. This allegation applies to all USA amateur bands with sub-band segments specified by conditions of license.

Specifying sub-band segments by condition of license amounts to a government mandate of a particular amateur band plan, and that is a very questionable practice. This could also be alleged to be another human rights issue: that of freedom of speech, in the general sense (for intercommunication by radio, by any of several methods). By selectively specifying sub-band segments by condition of license a government could be said to be restricting without good reason the freedom of speech of amateur radio licensees who cannot access adjacent segments (listen but not speak).

The highest qualified licensees can use any segments, but restrictions are applied to others, which is where the freedom of speech problem arises. Free speech amongst US citizens is of course guaranteed by the First Amendment to the US Constitution. Freedom of speech is also an international right.

The USA "incentive licensing" scheme would appear to be the most discriminatory and most questionable of any amateur radio licensing arrangement anywhere in the world. Worst issues are with human rights, not technical matters.

The number of USA license classes is excessive.

At present, the six classes of amateur license appear as a convoluted mess of imbedded discrimination and irrationally based prescriptions. In an updated arrangement, suitable for use well into the future, an appropriate number of license classes is two, as follows:

Basic—with band access to 3.5–3.9 MHz, 21.0–21.45 MHz, 28.0–29.7 MHz and 144–148 MHz and specified limits on transmitter power output (to some low level commensurate with lower qualifications).

General—with access to all amateur bands and with (full) power as appropriate for each band.

There is no need for any specific Morse code examination element, as no Morse code proficiency is actually needed to access amateur spectrum. Freedom of choice in operating preferences rests with individuals.

Only two examination elements are needed for the above suggestion, which greatly simplifies the setting and running of examinations compared to the present multiple element arrangements. Having only two license grades and two examination elements not only reduces the inherent discrimination with the existing arrangements, but it reduces costs to candidates and examiners.

The suggested license class names of "basic" and "general" are considered to have

much lower discriminatory overtones than some of the existing names. The word "Novice" means a new convert or beginner, which is hardly an appropriate name for a license that can be renewed for the lifetime of the holder (as it can be at present).

The term "Technician" is also the name of a profession that can involve many subjects and it is folly to link it to persons who are permitted to transmit on frequencies above some waiver limit.

Apart from "general," the names used for existing Part 97 rules seem to me to reinforce discrimination and create needless segregation in amateur radio licensing (in the USA). While there is inevitably some "one-upmanship" at a personal level, one would hope that "the law shall prohibit any discrimination" could apply to all government processes.

It is discriminatory for FCC to confine licensees to sub-band segments. Access to bands should include the whole of that amateur band (the band that is listed in national frequency allocations). The main regulatory control on suggested *basic* licensed operation is to place a limit on transmitter power, which is the same concept as applies to an existing Novice licensee.

The lower level of knowledge and experience needed to obtain a pass for a *basic* license reflects in lower power limits (could be different for some bands). This is consistent with the public interest being served in terms of minimization of potential for harmful radio interference and control of exposure to non-ionizing radiation.

The higher power limit for *general* license does need the topics of radio interference and human exposure to non-ionizing radiation to be included in the qualifications. Once again, personal proficiency with Morse code has no rational relationship with safe and effective use of amateur spectrum.

The granting of waivers to persons with disabilities is a form of "reverse discrimination."

. . . the FCC grants licenses with a waiver for a Morse code element to candidates (with medical certificates) who can show they have disabilities that preclude being able to pass a Morse code test. . . . such granting of waivers reinforces the evidence that "the Morse code requirement" is a bogus affair if a person with disabilities is considered to be able to access and use certain radio spectrum with no proof of Morse code proficiency, when others are treated differently and denied access.

If a person with disabilities can safely and effectively use amateur spectrum with little or no Morse code proficiency (and that is evidenced by the lack of any problems reported concerning operators with disabilities), then others are entitled to similar treatment.

The ethic of "the law shall prohibit any discrimination" strongly suggests that the way ahead is to desist from restrictive practices without good reason and to have an infrastructure that treats *all* candidates equally and fairly, and certainly with no disadvantage to persons with disabilities.

Discrimination within the amateur service.

Comment would be incomplete without mention of discrimination at personal and other levels in amateur radio. Discrimination on the basis of Morse code proficiency is alive and well in some parts of amateur radio, and there are some strong feelings about keeping others out who are not interested in learning or using Morse code. Decades of indoctrination and discrimination reflect, unfortunately, in some quaint and unbalanced components of current policies and give a false or distorted view of what amateur radio is, and could be, as seen from a public perspective.

Surveys on Morse code issues amongst incumbent licensees can be expected to reflect many polarized views, with those respondents who have passed a Morse test tending to support a Morse code requirement, and those who have not passed a Morse code test tending to reject a Morse code requirement. The higher the qualifications and privileges, then generally the higher the sensitivity to protection of self-interest and generally keeping others out. The existence of polarization can be found in the responses to the ARRL survey, and surveys done in other countries.

Fair application of "the law shall prohibit any discrimination" will have a big impact on modernization of amateur radio and associated rulemaking, even if some individuals and some non-government organizations continue to have a preference towards discrimination of others.

Deregulation in telecommunications.

The Internet is an example of a publicly accessible communications media of an international scale that is contemporary and popular. There are no formal qualifications needed for individuals to connect and communicate as they choose. It would be ludicrous to require users to show they had first passed a DOS test before being allowed to use a personal computer, or to pass an ACSCII code test before they were allowed to access the Internet.

As for most forms of human communication, there is no meaningful result without the use of language, and the English language seems to be the most used for web sites and information broadcasting on the Internet. Whatever practices are used, individuals are free to exercise personal preference and enjoy the benefits of modern communications media.

If Morse code was an effective "international language" like some claim then it would be expected to have natural usage for international intercommunication by means of the Internet: however there is no such support or popularity, and can be taken as another public reaction to the Morse code requirement being a bogus requirement.

. . . while technology changes, some fundamental factors do not, and one that does not change is that amateur licensees are permitted to use variable frequency operation. Variable frequency operation in any of several licensed frequency bands has risks to harmful interference to other radio services. It is likely that some bands are harmonically related to local television channels (varies with location) so it is in the public interest for amateur licensees to be knowledgeable about potential interference and how to minimize arising problems. With the general density of commercial radio services increasing over time, an amateur operator needs to be aware of several potential interference scenarios, including those to their own reception.

For safe and effective operation there is certainly a need for more technical knowledge and operating skills than for the likes of the Citizen Band (fixed channels, relatively low power, small bands, so risks are less). Exposure to non-ionizing radiation is another factor for licensees to be aware of and be able to tailor a solution that allows for practical operation while still complying with radiation limit guidelines.

Thus there are some issues that will continue to justify that any candidate needs to be technically and operationally qualified to be issued with a license. As suggested earlier, two categories of license would suffice, with transmitter power output privileges being the main factor in why more qualifications are required to operate with higher power.

There are reasonable limits on the degree of deregulation that is appropriate for amateur radio, while on the other hand there should be no artificial barriers or restrictive practices.

While this submission has described serious flaws in amateur radio licensing regarding discrimination, it is also suggested that in an overall deregulated environment it is "politically incorrect" for a government to "over-prescribe" how the licensees should progress their interests.

One of the strengths of amateur radio is with "hands-on learning" and the wide variety of possible subjects. Most amateur radio licensees progress their knowledge and experience over time, mainly arising from natural interest (as in

any hobby, but amateur radio has more emphasis on technical subjects).

This could be considered to be another human rights issue: freedom of choice. The role of Part 97 rules should be as light-handed as is practicable for prescribing qualifications, with the basic objective of setting minimum but sufficient conditions for licensees to be able to safely and effectively use amateur spectrum.

Platform for self-training and career advancement.

The contribution of effective telecommunications services to the economy of a nation is high. Commerce is becoming increasingly reliant on information technology and telecommunications. Telecommunications industries will need to maintain levels of expertise to support existing services and to remain competitive with future services. There is an important segment of radio services in overall telecommunications, so the industry will have a need to continue to cultivate technical and other expertise in radiocommunications for many years to come.

Amateur radio is a significant source of young persons with technical interests having an avenue for self-training and experimentation before they make choices on careers. The "hands on" aspect of amateur radio experimenting is good for expanding practical and theoretical knowledge of radio and electronics. It is also low cost compared to formal training. This of course also applies to other than young persons, but it is mainly young persons who have the most impact on future careers.

The role of amateur radio on influencing career paths that support telecommunications services should not be underestimated. It makes no sense to have rules that keep people (and more particularly young people) out of amateur radio without good reason. A Morse code requirement is rather unconvincing to many young persons who are literate in computer and Internet matters.

Discussion on the threat of spectrum crowding.

The possible fear of some for "dropping the Morse code requirement" is that there could be an upturn in use of certain bands. As mentioned multiple times above, this attitude is discrimination without good reason, so is hardly a valid ground for incumbent licensees claiming exclusivity. In any case, inspection of trends in amateur license numbers shows that a turning point in popularity occurred in many countries, including the USA, during the 1990s.

The average age of amateur licensees seems to be increasing year-by-year because of reduced recruitment of younger persons, and attrition in an aging group has some predictable outcomes. There are probably a combination of factors at play in the turning point in popularity, including much reduced mystique of long distance radiocommunication, the popularity of recreational computing and ease of surfing the Internet.

There is no convincing evidence that amateur spectrum crowding has been or will be a problem, and could hardly be the case if numbers are reducing. Amateur radio operation is purely voluntary and operating densities adapt to prevailing circumstances. There is no reason why new technologies cannot be developed that result in better spectrum utilization than at present (this is happening in other radio services, adapting to providing satisfactory operation in finite allocations of radio spectrum).

Individual licensees continue to make personal choices. Thus there appear to be no convincing reasons as to why there should be policies to restrict numbers of amateur licensees who can access any band. In any case there should be no discrimination without good reason. The role of a government is to implement fair and reasonable processes for members of the public to qualify to become amateur radio licensees. The government does not attempt to place limits on the number of Internet or PCS users, and likewise should not try to limit the number of amateur radio licensees without good reason. Even if some governments may have good reasons to limit access, there is no good case in support of international restrictions.

International issues.

A bogus Morse code requirement permeates several layers of administrative arrangements. This results in direct and indirect discrimination without good reason, in international and national regulations, as well as what are generally called "reciprocal agreements" for operation in foreign territories. Beginning with removal of S25.5, the bogus requirement needs to be systematically removed from national laws and various inter-government agreements.

The stimulus to do so is the UN International Covenant on Civil and Political Rights ethic of "the law shall prohibit any discrimination," as agreed to by at least 132 administrations. The continuing presence of S25.5 in ITU regulations, in apparent contradiction to the UN Covenant, is offensive for a United Nations affiliated organization. As well S25.5 presents ethical questions to all ITU member administrations who also uphold the International Covenant on Civil and Political Rights.

. . . it is quite clear that review of the whole of Article S25 involves debate on text amendment and replacement so there are complicated editorial implications (noting that the ITU uses multiple languages). On the other hand, it is also quite clear that S25.5 is very easy to deal with, by simple deletion.

Deletion is clear in any language and anywhere where discrimination is to be prohibited in any law. On this basis, deletion of S25.5 can and should be completed at the very next ITU conference, and review of the substantial remaining parts of Article S25 can take its course in being programmed at a suitable future conference, as it does not have the urgency or simplicity of solution that applies to S25.5.

Moving forward.

Human rights issues need the most attention in amateur radio rulemaking. To simply adjust the present incentive licensing arrangements, as outlined in the NPRM, will fall well short of what is actually needed. While interim adjustments could be made, that would amount to tinkering in an already flawed arrangement, and in any case the allegations of discrimination have legal implications regarding "the law shall prohibit any discrimination."

The FCC should initiate without delay a public inquiry into what amateur radio license qualifications are genuinely fit for the purpose, in modern times. ■

BY GEORGE JACOBS, W3ASK

PROPAGATION

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Flash: Great CW DX Contest Weekend!

Better than the expected good propagation conditions took place during the CQ World-Wide DX CW Contest weekend of November 28–29. The solar flux climbed to 165 on the 28th and inched up to 168 on the 29th. The sunspot count was 106 on the 28th and 98 on the 29th. The geomagnetic field was exceptionally quiet, and the ionosphere was stable. Overall conditions ranged from Low Normal in polar and auroral regions; to High Normal at mid-latitudes; and between High and Above Normal in low and equatorial latitudes. There was no significant solar flare activity reported during the contest weekend. The favorable solar/propagation/geomagnetic conditions experienced during the 1998 CW WW DX Contest weekend should result in exceptionally high scores, with possibly new records set.

Conditions were noticeably better during the CW weekend than during the October SSB weekend, with more widespread 10 and 15 meter openings. Thank you, Mother Nature!

Table I summarizes worldwide HF propagation conditions based upon reports jointly made by the USAF and NOAA through the Space Environmental Services Center, Boulder, Colorado.

Table II shows the level of geomagnetic activity taken every three hours during the contest weekend as measured by the Kp worldwide, or planetary, index.

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for February 1999

	Expected Signal Quality			
Propagation Index.....	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 6, 17-18, 21, 27	**A**	**A**	**B**	**C**
High Normal: 1, 7-8, 10-11, 20, 22, 28	**A**	**B**	**C**	**C-D**
Low Normal: 5, 9, 12-15, 25-26	**B**	**C-B**	**C-D**	**D-E**
Below Normal: 2, 4, 19, 23	**C**	**C-D**	**D-E**	**E**
Disturbed: 3, 24		**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 and noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the 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 path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of (3) will be good (B) on Feb. 1st, fair-to-poor (C-D) on the 2nd, poor (D) on the 3rd, fair-to-poor (C-D) on the 4th, fair-to-good (C-B) on the 5th, etc.

Sunspot Cycle Progress

The Royal Observatory of Belgium reports a mean sunspot number of 56 for October 1998. A high count of 99 was recorded on October 18th, with a low of 19 reported on the 4th. October's mean value results in a 12-month running smoothed sunspot number of 57 centered on April 1998. This is a 3 point increase from March's level.

A smoothed sunspot number of approximately 110 is forecast for february 1999, as Cycle 23 continues its climb towards what is expected to be an exceptionally high peak.

Canada's Dominion Radio Astrophysical Observatory in Penticton, British Columbia reports a 10.7 cm solar flux level of 117 for October 1998. This results in a smoothed value of 111 centered on April 1998. A smoothed 10.7 cm solar flux level of approximately 137 is predicted for February 1999.

Sunspot Cycle Comparison

Dr. Pierre Cugnon, head of the Sunspot Index Data Center (SIDC) at the Royal Observatory of Belgium, the world's official keeper of sunspot records, has sent via the web a graphic comparison of Cycles 19 (the most intense cycle recorded to date), 20, 21, and 22, and progress of the newest cycle, Cycle 23 (see fig. 1).

February Conditions

DX propagation conditions will continue to be excellent on five bands during the daylight hours of February. Fifteen meters is likely to be the best band from shortly after sunrise until just after sunset, with 10, 12, 17, and 20 meters not far behind. The 6 meter band should be an extra DX bonus this month during the hours of daylight. Be sure to check this band for unusual DX openings, particularly when conditions are expected to be High Normal or better. Look for openings towards Europe and the east before noon, towards the South Pacific and the west during the late afternoon, and towards Central and South America throughout most of the daylight hours. The best times to listen for 6 meter DX openings are shown in the DX Propagation Charts by a **.

During the period from sundown to midnight as many as seven bands may be available for DX. Fifteen meters should hold up well past sundown for DX openings towards Central and South America, the Pacific area, and the Far East and Asia. Twenty meters should remain open to most areas of the world during this period, but with signals strongest from southerly and westerly directions. Good DX towards the east and the south should also be possible on 30, 40, and 80 meters, with some openings in the same directions also possible on 160 meters.

Between midnight and the sunrise period it should be a toss-up among 20, 30, and 40 meters for worldwide DX honors. Good DX openings to most areas of the world should also be possible on 80 meters. Be sure to also check 160 meters for some unusual DX openings during this period.

Beginning late in February and continuing through March and early April, expect

Geographical Area	November 28	November 29
Polar	Low Normal	Low Normal
Auroral	Low Normal	Low Normal
Middle Lattidue	High Normal	High Normal
Low Latitude	High Above Normal	High Above Normal
Equatorial	High Above Normal	High Above Normal
10.7 cm Radio Flux	165	168
Sunspot Count	106	98
WW Geomagnetic A_p Index	5	6
WW Geomagnetic K_p Index	1.5	1.8

Table I- Summary of HF propagation conditions reported jointly by USAF and NOAA during the CQ WW DX Contest CW weekend of November 28–29 and from initial reports received from contest participants.

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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 (15 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. An ** indicates best time to check for 10 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts 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 *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

February 15 - April 15, 1999
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

	10 meters	*15 meters*	*20 meters*	*40/80 meters*
Western & Central Europe & N. Africa	08-09 (1) 09-10- (2) 10-12 (3) 12-13 (4) 13-14 (2) 14-15 (1) 09-11 (1)**	06-07 (1) 07-08 (2) 08-11 (3) 11-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	00-03 (1) 03-06 (2) 06-09 (3) 09-11 (2) 11-13 (3) 13-18 (4) 18-22 (3) 22-00 (2)	17-18 (1) 18-19 (2) 19-22 (3) 22-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-00 (2)* 00-02 (1)
Northern Europe & European CIS	08-09 (1) 09-10 (2) 10-11 (3) 11-12 (2) 12-13 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-14 (1)	00-02 (3) 02-03 (2) 03-05 (1) 05-07 (2) 07-09 (3) 09-14 (2) 14-18 (3) 18-21 (2) 21-00 (1)	17-19 (1) 19-22 (2) 22-01 (3) 01-02 (2) 02-03 (1) 20-01 (1)*
Eastern Mediterranean & Middle East	08-09 (1) 09-11 (2) 11-12 (3) 12-13 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-13 (4) 13-14 (2) 14-15 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-20 (3) 20-22 (2) 22-02 (3) 02-04 (2)	18-20 (1) 20-23 (2) 23-00 (1) 20-23 (1)*
Western Africa	07-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-18 (2) 18-19 (1) 08-12 (1)**	06-09 (1) 09-11 (2) 11-14 (3) 14-17 (4) 17-18 (3) 18-19 (2) 19-21 (1)	02-06 (2) 06-13 (1) 13-15 (2) 15-17 (3) 17-00 (4) 00-02 (3)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 22-02 (1)*
Southern Africa	07-08 (1) 08-10 (2) 10-11 (3) 11-13 (4) 13-14 (2) 14-15 (1) 11-13 (1)**	06-10 (1) 10-12 (2) 12-14 (3) 14-17 (4) 17-18 (2) 18-19 (1)	05-07 (2) 07-14 (1) 14-15 (2) 15-17 (3) 17-20 (4) 20-21 (2) 21-23 (1) 23-02 (2) 02-03 (2) 03-05 (1)	18-20 (1) 20-23 (2) 23-00 (1) 21-23 (1)*
Eastern & Central Africa	09-11 (1) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1) 09-11 (1)**	07-09 (1) 09-11 (2) 11-13 (3) 13-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-23 (4) 23-02 (3) 02-03 (2) 03-05 (1)	19-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Central & South Asia	08-11 (1) 19-21 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1) 19-20 (1) 20-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-19 (1) 19-21 (3) 21-22 (2) 22-00 (1)	19-22 (1) 04-06 (1)
Southeast Asia	10-13 (1) 18-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-18 (1) 18-21 (2) 21-22 (1)	05-07 (1) 07-09 (2) 09-11 (1) 14-17 (1) 19-20 (1) 20-23 (2) 23-01 (1)	05-07 (1)
Far East	09-11 (1) 18-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 15-16 (1) 16-17 (2) 17-19 (3) 19-21 (2) 21-22 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-13 (1) 17-19 (1) 19-22 (2) 22-00 (3) 00-02 (2) 02-03 (1)	05-08 (1)
South Pacific	08-12 (1) 12-14 (2)	07-08 (1) 08-10 (2)	11-19 (1) 19-21 (2)	00-01 (1) 01-02 (2)

Time Zones: CST & MST (24-Hour Time) CENTRAL USA TO:

	10 meters	15 meters	20 meters	40/80 meters
Western & Central Europe & N. Africa	08-10 (1) 10-12 (2) 12-13 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-16 (1)	00-06 (1) 06-09 (2) 09-11 (1) 11-13 (2) 13-15 (3) 15-17 (4) 17-20 (3) 20-00 (2)	17-19 (1) 19-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Northern Europe & European CIS	08-09 (1) 09-11 (2) 11-12 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-14 (1)	07-10 (2) 10-13 (1) 13-15 (2) 15-18 (3) 18-20 (2) 20-22 (1) 22-02 (2) 02-07 (1)	19-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Eastern Mediter-ranean & Middle East	09-10 (1) 10-11 (2) 11-12 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-14 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-18 (3) 18-20 (2) 20-23 (3) 23-01 (2) 01-02 (1)	19-22 (1) 20-22 (1)*
Western Africa	08-09 (1) 09-11 (2) 11-12 (3) 12-14 (4) 14-16 (3) 16-17 (2) 17-18 (1) 08-10 (1)**	06-08 (1) 08-10 (2) 10-13 (3) 13-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	04-06 (2) 06-12 (1) 12-15 (2) 15-17 (3) 17-23 (4) 23-01 (3) 01-02 (2) 02-04 (1)	18-20 (1) 20-23 (2) 23-01 (1) 21-00 (1)*
Southern Africa	07-08 (1) 08-10 (2) 10-11 (3) 11-12 (4) 12-13 (2) 13-14 (1) 11-13 (1)**	07-09 (1) 09-11 (2) 11-12 (3) 12-16 (4) 16-17 (2) 17-18 (1)	05-07 (2) 07-13 (1) 13-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-22 (2) 22-00 (3) 00-02 (2) 02-05 (1)	19-20 (1) 20-21 (2) 21-22 (1) 20-21 (1)*
Eastern & Central Africa	09-11 (1) 11-13 (2) 13-16 (4) 16-17 (2) 17-18 (1) 13-15 (1)**	08-09 (1) 09-12 (2) 12-16 (3) 16-18 (4) 18-19 (2) 19-20 (1)	12-14 (1) 14-16 (2) 16-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
Central & S.Asia	07-09 (1) 18-20 (1)	07-08 (1) 08-10 (2) 10-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-02 (1)	05-07 (1) 18-20 (1)
Southeast Asia	09-10 (1) 10-12 (2) 12-14 (1) 16-17 (1) 17-19 (3) 19-20 (2) 20-21 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-17 (1) 17-21 (2) 21-22 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-18 (1) 18-21 (2) 21-23 (1)	04-07 (1)
Far East	15-16 (1) 16-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	09-11 (1) 14-16 (1) 16-17 (2) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (2)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-20 (2) 20-22 (1) 22-00 (3) 00-02 (2) 02-03 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)*
South Pacific &	10-12 (1) 12-14 (2)	08-12 (1) 12-14 (2)	17-19 (1) 19-21 (2)	22-00 (1) 00-01 (2)
& New Zealand	14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1) 16-18 (1)**	10-13 (1) 13-16 (2) 16-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	21-23 (3) 23-03 (4) 03-05 (3) 05-07 (2) 07-09 (3) 09-11 (2)	02-05 (3) 05-07 (2) 07-08 (1) 01-03 (1)* 03-06 (2)* 06-07 (1)*
Austral-asia	09-11 (1) 14-15 (1) 15-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1) 17-19 (1)**	08-09 (1) 09-12 (3) 12-15 (1) 15-16 (2) 16-19 (3) 19-21 (2) 21-22 (3) 22-23 (2) 23-00 (1)	06-08 (2) 08-10 (4) 10-12 (2) 12-15 (1) 15-17 (2) 17-21 (1) 21-23 (2) 23-02 (3) 02-03 (2) 03-06 (1)	02-04 (1) 04-05 (2) 05-06 (3) 06-07 (2) 02-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	07-08 (1) 08-09 (2) 09-16 (4) 16-18 (3) 18-19 (2) 19-20 (1) 09-11 (1)**	05-06 (1) 06-07 (2) 07-11 (4) 11-13 (3) 13-19 (4) 19-21 (3) 21-22 (2) 22-00 (1)	03-05 (2) 05-06 (2) 06-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-00 (4) 00-03 (8)	18-19 (1) 19-20 (2) 20-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)**
Peru, Paraguay, Brazil, Argentina, Uruguay, Bolivia, & Chile	07-08 (1) 08-10 (3) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (2) 18-19 (1) 01-12 (1)** 15-17 (1)**	06-07 (1) 07-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	15-16 (1) 16-17 (2) 17-18 (3) 18-02 (4) 02-03 (3) 03-04 (2) 04-05 (1) 05-07 (2) 07-09 (1)	19-21 (1) 21-00 (2) 00-03 (3) 03-04 (2) 04-06 (1) 21-05 (1)**
McMurdo Sound, Antarctica	16-17 (1) 17-19 (2) 19-20 (1)	12-16 (1) 16-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-05 (2) 05-06 (1) 06-08 (2) 08-09 (1)	23-01 (1) 01-05 (2) 05-06 (1)

Time Zones: PST (24-Hour Time) WESTERN USA TO:

	10 meters	15 meters	20 meters	40/80 meters
Western Europe & N. Africa	08-09 (1) 09-11 (2) 11-12 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1) 19-21 (1)	00-06 (1) 06-09 (2) 09-11 (1) 11-14 (2) 14-16 (3) 16-19 (2) 19-22 (1) 22-00 (2)	19-20 (1) 20-22 (2) 22-00 (1) 20-22 (1)*
Central & Northern Europe & European CIS	08-09 (1) 09-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (1) 19-21 (1)	05-06 (1) 06-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Eastern Mediter-ranean & Middle East	o8-09 (1) 09-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (1) 20-22 (1)	05-06 (1) 06-09 (2) 09-12 (1) 12-16 (2) 16-18 (1) 18-22 (2) 22-02 (1)	18-21 (1)
Western & Central Africa	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	01-06 (1) 06-08 (2) 08-12 (1) 12-15 (2) 15-17 (3) 17-21 (4) 21-00 (3) 00-01 (2)	18-22 (1)
Eastern Africa	09-12 (1) 12-14 (2) 14-15 (1)	08-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-08 (1) 12-14 (1) 14-16 (2) 16-20 (3) 20-22 (2) 22-23 (1)	18-20 (1)
Southern Africa	07-08 (1) 08-11 (3) 11-12 (2) 12-13 (1)	06-09 (1) 09-12 (2) 12-15 (3) 15-16 (2)	04-06 (1) 06-08 (2) 08-13 (1) 13-15 (2)	18-21 (1)
Southern Africa		16-17 (1)	15-18 (3) 18-19 (2) 19-21 (1) 21-23 (3) 23-00 (2) 00-02 (1)	
Central & S. Asia	07-09 (1) 17-18 (1) 18-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-10 (2) 10-11 (1) 16-17 (1) 17-19 (2) 19-20 (3) 20-21 (2) 21-22 (1)	16-18 (1) 18-21 (2) 21-23 (1) 02-03 (1) 03-05 (2) 05-07 (1) 07-09 (3) 09-10 (2) 10-12 (1)	05-07 (1) 18-20 (1)
Southeast Asia	08-09 (1) 09-11 (2) 11-12 (1) 14-15 (1) 15-16 (2) 16-18 (4) 18-19 (2) 19-20 (1) 16-18 (1)**	07-08 (1) 08-10 (4) 10-12 (3) 12-17 (1) 17-20 (3) 20-21 (2) 21-22 (1)	23-01 (1) 01-03 (2) 03-06 (3) 06-07 (2) 07-09 (3) 09-11 (2) 11-14 (1)	00-02 (1) 02-05 (2) 05-07 (1)
Far East	14-15 (1) 15-16 (2) 16-18 (4) 18-19 (2) 19-20 (1) 15-17 (1)**	08-10 (2) 13-14 (1) 14-15 (2) 15-17 (3) 17-20 (4) 20-21 (3) 21-22 (1)	04-06 (2) 06-07 (1) 07-08 (3) 08-09 (4) 09-10 (3) 10-11 (2) 11-19 (1) 19-21 (2) 21-23 (4) 23-00 (3) 00-03 (2) 03-04 (3)	00-02 (1) 02-05 (2) 05-06 (3) 06-07 (2) 07-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
South Pacific & New Zealand	09-10 (1) 10-12 (3) 12-16 (2) 16-20 (4) 20-21 (3) 21-22 (1) 10-12 (1)** 18-20 (1)**	07-08 (1) 08-09 (2) 09-11 (3) 11-17 (2) 17-18 (3) 18-22 (4) 22-23 (3) 23-01 (2) 01-02 (1)	06-07 (3) 07-09 (4) 09-10 (3) 10-11 (2) 11-17 (1) 17-19 (2) 19-20 (3) 20-01 (4) 01-04 (3) 04-06 (2)	19-21 (1) 21-22 (2) 22-23 (3) 23-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 22-01 (1)* 01-05 (2)* 05-06 (1)*
Austral-asia	11-13 (1) 13-14 (2) 14-16 (3) 16-19 (4) 19-20 (3) 20-21 (1) 16-18 (1)**	06-07 (1) 07-09 (3) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (1) 17-18 (2) 18-21 (4) 21-22 (2) 22-23 (1)	12-20 (1) 20-22 (2) 22-00 (3) 00-04 (4) 04-06 (3) 06-08 (4) 08-10 (3) 10-12 (2)	00-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	07-08 (1) 08-09 (2) 09-10 (3) 10-16 (4) 16-17 (3) 17-18 (1) 09-11 (1)**	05-06 (1) 06-07 (2) 07-09 (4) 09-14 (3) 14-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	05-07 (4) 07-09 (3) 09-14 (2) 14016 (3) 16-22 (4) 22-00 (3) 00-03 (2) 03-05 (3)	18-20 (1) 20-01 (3) 01-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-04 (1)*
Peru, Bolivia Paraguay, Brazil, Argentina, Uruguay, Chile	07-08 (1) 08-09 (3) 09-11 (2) 11-14 (3) 14-17 (4) 17-18 (2) 18-19 (1) 09-11 (1)**	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-15 (3) 15-20 (4) 20-23 (3) 23-00 (2) 00-01 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-01 (4) 01-02 (3) 02-06 (2) 06-08 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 22-02 (1)*
McMurdo Sound, Antarctica	13-14 (1) 14-18 (2) 18-19 (1)	14-16 (1) 16-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-02 (4) 02-04 (3) 04-05 (2) 05-07 (1) 07-08 (2) 08-09 (1)	22-02 (1) 02-04 (2) 04-06 (1)

*Indicates best times to listen for 80 meter openings. Openings on 16o meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.
**Indicates best times to listen for F-2 layer openings on 6 meters.
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

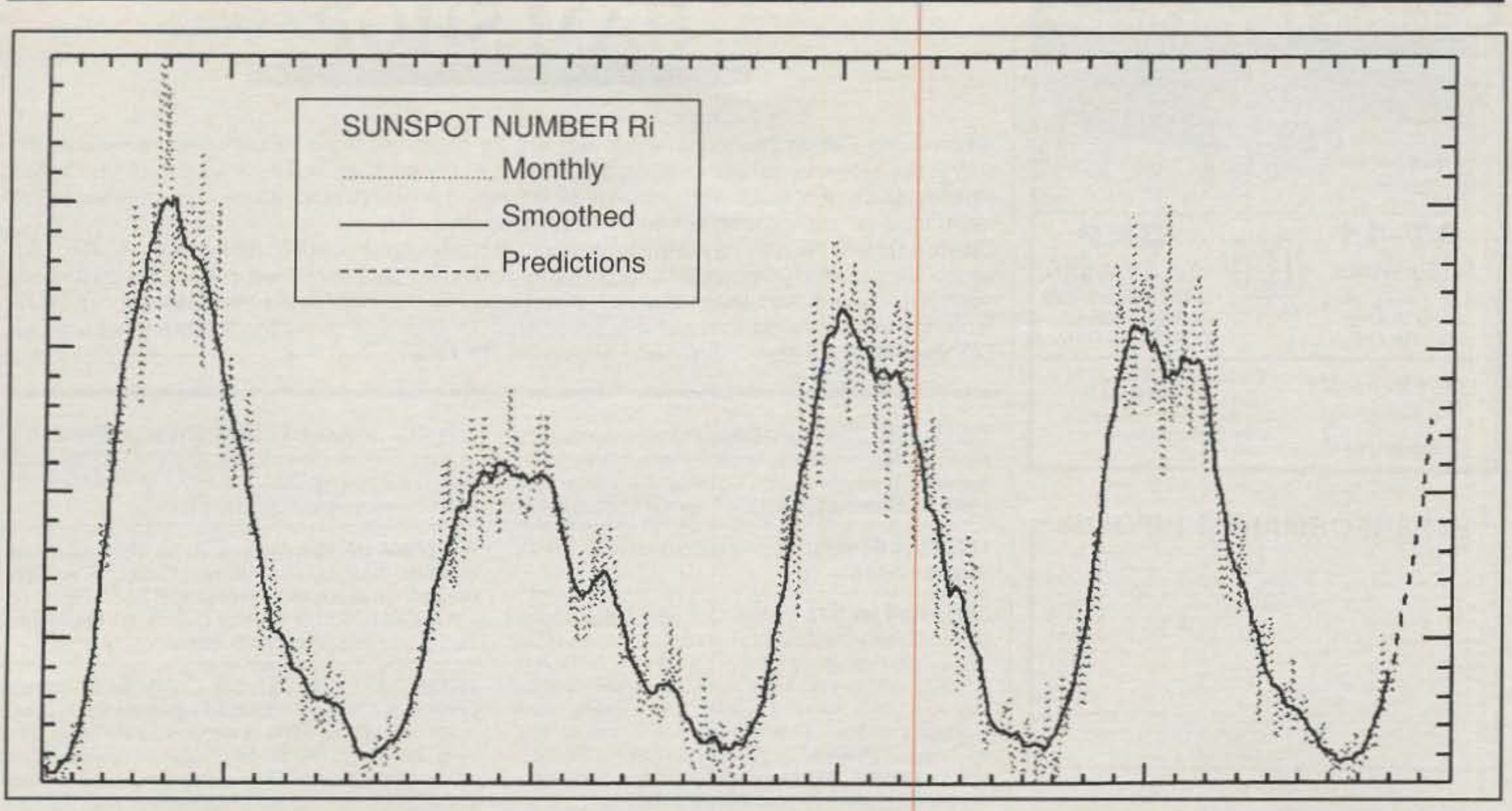

Fig. 1– A comparison of sunspot Cycles 19 (the most intense recorded to date), 20, 21, and 22, and the progress of the new cycle, Cycle 23. (Provided by Dr. Pierre Cugnon, Royal Observatory of Belgium.)

considerable improvement in DX conditions between the northern and southern hemispheres. This will result from the effects of the spring equinox period, as the sun crosses the equator in its apparent travels toward northern skies. These improved inter-hemispheric conditions should be noticeable on all bands 6 through 160 meters, and on circuits mainly between the United States and South America, southern and central Africa, Australasia, Antarctica, and parts of Asia. Equinoctial propagation conditions tend to maximize during the sunrise and sunset periods, and over both short- and long-path openings.

This month's Propagation Charts contain band-opening predictions for major DX paths for the period February 15 through April 15, 1999. A short-skip propagation forecast for February appeared in last month's column.

VHF Ionospheric Openings

As mentioned earlier in this column, expect unusually good DX conditions on the 6 meter band during the hours of daylight, with F-layer openings to many areas of the world from the United States. Another form of 6 meter propagation, trans-equatorial scatter (TE), usually peaks during the equinoctial period. Some TE openings should be possible during February between the southern tier states and South America. The best time to check for such openings is between the 7 and 10 PM local time. Some TE openings may also be possible on 2 meters at the same time.

No significant meteor showers are expected during February. Radio storminess expected during the month should produce some widespread auroral activity, with increased chances for short-skip openings on both 6 and 2 meters, for distances up to approximately 1300 miles. Check the Last-Minute Forecast at the beginning of this column for those days during February that are expected to be Disturbed or Below Normal. These are the days on which unusual ionospheric short-skip openings on the VHF bands are most likely to occur.

73, George, W3ASK

	UT							
Planetary K_p index	00–03	03–06	06–09	09–12	12–15	15–18	18–21	21–24
November 28	2	2	1	0	1	2	2	8
November 29	2	2	1	1	1	1	3	2

Table II- Worldwide geomagnetic indices (planetary K_p) reported every three hours during the CW Contest weekend of November 28–29. All values indicate exceptionally quiet, stable, non-storm geomagnetic conditions (0/1) Above Normal, (2) High Normal, and (3) Low Normal. (Data provided by NOAA and SEC.)

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ORLANDO HamCation (sm) and Computer Show: Feb. 12–14, Central Florida Fairgrounds. ARRL North Florida Section. Commercial areas feature over 200 vendors, and swap area includes over 400 tables, tailgating, forums, testing, overnight RV parking with electric and water. Commercial information, Tim Starr, 407-850-9258. E-mail: <AE4NJ@aol.com>. Visit our web page at <WWW.OARC.ORG>. Or send SASE to: Orlando HamCation(sm), P.O. Box 547811, Orlando, FL 32854.

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TESLA. WIZARD by Marc Seifer. Citadel Press. Definitive biography. "A SERIOUS PIECE OF SCHOLARSHIP," *Scientific American*. **www.netsense.net/tesla**

RAINBOW AMATEUR RADIO Association, the gay/lesbian club. Active HF nets, newsletter, uncensored listserv, web page: <www.rara.org>. Privacy respected. E-mail: <rara@en.com> or Dept. A, P.O. Box 191, Chesterland, OH 44026-0191.

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DTMF Computer Decoder with two relay drivers for remote control, $89.95. DP-9S Multiband Antenna has 9 closely spaced dipoles for 160–10, 140' $210. DP-8S for 80–10, 70' $159. DP-6S for 40–10, 38' $139. Free ham and shareware catalog. Dynamic Electronics, Box 896, Hartselle, AL 35640 (phone 256-773-2758; fax 256-773-7295; <dei@whnt19.com>; <http://www.hsv.tis.net/~dei>).

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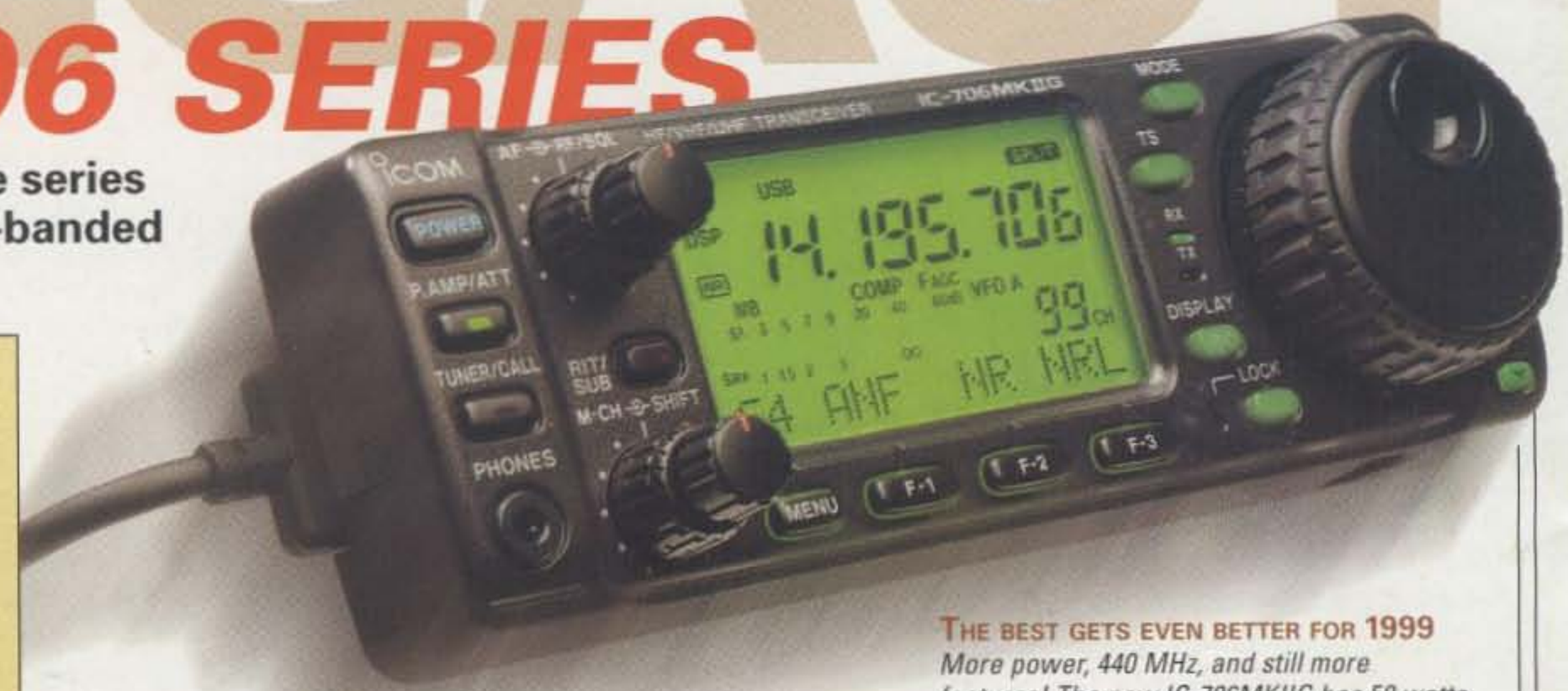

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