Amateur Radio

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CQ

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JULY 2000

In This Issue:

Plus...

Dave Siddall, K3ZJ, perches halfway up
er outside his Romney, West Virginia
ion. (Details on p. 108)

THE RADIO AMATEUR'S JOURNAL

Dreams Do Come True

IC-T2H
LAND MOBILE RUGGED
2M • 6W@9.6V Standard • 500 mW Audio • 8 Front Panel or PC Programmable Keys • Includes "AA" Ni-Cds and Charger • MIL STD 810 C/D/E*

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ICOM IC-207H

Dual Band Features at a Single Band Price

ICOM RUGGED
One piece, die cast aluminum chassis makes a large heat sink.

REMOVABLE, REMOTABLE CONTROL HEAD. An optional feature of the '207H lets you separate the control head from the main unit. Only 4.3 inches wide, this little powerhouse is easy to fit on even the most crowded dashboards.

WORKS ONE BAND AT A TIME. Switch between bands with a single push of the large blue "BAND" key.

SMALL SIZE, BIG VALUE. ICOM's most affordable mobile dual bander features 50 watts of power (35W UHF), multiple power settings, 182 memory channels, PC programming, and much more.

SPECIFICATIONS

Transmit: ..... 2 Meter, 440 MHz (70 CM)
Receive: ..... 118-174 MHz*, 440-450 MHz
Includes Air Band (*guaranteed 144-148 MHz)
Mode: ..... AM (Rx only), FM
Power: ..... 2 Meter: 50W/20W/10W/5W
440 MHz: 35W/20W/10W/5W
Power Supply Requirement: ... 13.8 V DC
Memory Channels: ..... 182 Total,
150 regular, 10 scan edges, 2 call ..... RL
20 scratch pads ..... FR
Size (approx): .. 5.5(W) x 1.6(H) x 7.3(D) in.
140(W) x 40(H) x 185.4(D) mm.
Weight (approx): ..... 2 lb, 6 oz /1.17 kg

FEATURES

- **Removable, Remoteable Control Head (optional operation)**
  - Super compact size
  - Big keys, big dials, big bright LCD
  - Optional separation cable required
- **Tone Squelch (CTCSS Encode) and Tone Scan (CTCSS Decode) Standard**
  - 50 independently programmable tone frequencies for repeater and tone squelch use, respectively
- **Built to Military Specifications (MIL STD) 810 C/D/E shock/vibration**
- **On-Screen Menu "Soft Keys"**
- **9600 BPS Packet Capable**
- **Fast Scanning**
- **Attenuator**
- **Rugged ICOM Construction**
- **Auto Repeater Function**
- **Built-in Duplexer**
- **Wireless Mic Operation (optional)**

ONE TOUCH BAND SWITCHING
Easy operation on the go. Work one band at a time.

9600 PACKET CONNECTION POINT
A 6-pin connection point on the back panel is provided for up to 9600 packet operation.

LARGE LCD DISPLAY
Contains "soft keys" menu information, SWR meter, big-sized frequency identification, and more.

50 WATTS
A full 50 watts of output power on 2 meters gives you a commanding on-air presence. 35 watts on 440 MHz.

DTMF MIC
Allows for easy control of most rig functions. Optional wireless mic available.

MIL STD 810 C/D/E VIBRATION

ISO 9002 ✓ DIGITS

ISO 9001 ✓ DIGITS

PC Ready!

ICOM options required for PC cloning:

CS-207 Cloning Software
OPC-646 Cloning Cable

A third party 6-pin serial cable is required for PC packet connection

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The '207H head fits on just about any boat, plane, motorcycle, or tractor dashboard. Heck, it'll even fit in a car or truck. Visit your ICOM dealer today or call our 24-hour free brochure line. **425-450-6088**

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CQ

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FEATURES

Special Focus on Antennas:

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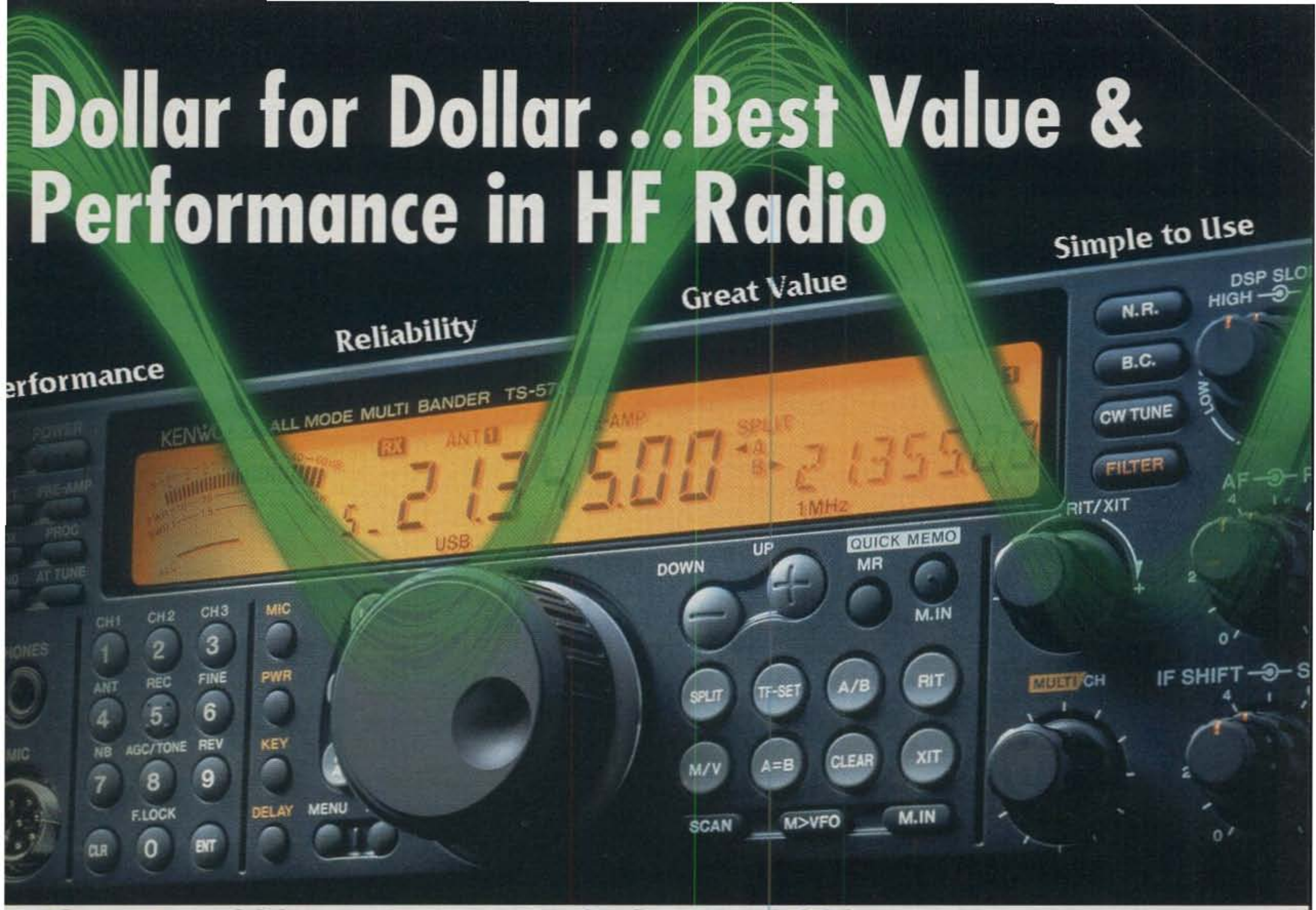
DEPARTMENTS

Dollar for Dollar...Best Value & Performance in HF Radio



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

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.

ISO 9001
JQA-1205
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

KENWOOD
Amateur Radio Products Group

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Ham Radio News

From The CQ Newsroom

Los Alamos Hams Provide Vital Fire Communications

The wildfire that destroyed hundreds of homes and businesses in Los Alamos, New Mexico in early May also wiped out the area's entire communications infrastructure, except for an amateur repeater that survived despite the fact that the fire burned right over it. Leave it to hams who work in a nuclear weapons laboratory; the 145.190 MHz repeater in Los Alamos is buried several feet underground inside an oil drum, according to one of those hams who spoke at the Dayton Hamvention. Its antenna obviously is above ground, but it also managed to survive. Hams were thus able to provide the only reliable communication from Los Alamos to the state Emergency Operations Center in Santa Fe, 75 miles away but within line-of-sight range in the wide-open southwest. In addition, according to "Newsline," hams provided communications for Red Cross shelters opened to house those burned out of their homes by the fire, which was intentionally set by federal officials as a "controlled burn" that quickly roared out of control.

FCC Puts Restructuring Petitions on Public Notice

Five petitions for partial reconsideration of the FCC's amateur radio license restructuring ruling were put on public notice by the Commission in mid-April, giving the public a brief opportunity to comment on them. One of the petitions, filed by the ARRL, asked the FCC to continue keeping track of which Technician licensees had passed their code exams, rather than making that record-keeping the responsibility of the licensee and the Volunteer Examiner Coordinator whose examiners gave the code test. According to the *ARRL Letter*, the League's petition also asked that the permanent code credit given to any former Novice or Technician Class ham be extended to include those who had previously passed higher speed code exams.

A second petition asked the FCC to retain Technician-Plus as a distinct license class and to retain higher speed code exams for Extra, a request also made by a third petitioner. The other petitions asked for a special license class for people under age 17, and for automatically upgrading pre-1951 "Class A" operators from their current Advanced Class status to Amateur Extra. The comment period ended May 10.

It's OK to Identify with Phonetics

FCC Amateur Enforcement Chief Riley Hollingsworth, K4ZDH, created quite a stir in the amateur community when he advised listeners to his weekly "column" on the *RAIN Report* audio news service that it was illegal to identify using only phonetics. Hollingsworth retracted the statement after being challenged by a variety of hams, most of whom cited Section 97.119(b)(2) of the FCC Rules, which states, "Use of a standard phonetic alphabet as an aid for correct station identification is encouraged."

ARRL Plans Emergency Communications Certification

Emergency communications will be the first topic for which the ARRL will offer certification, and possibly Continuing Education credits, as part of a broad specialty-certification program for hams approved at last January's ARRL board meeting. The *ARRL Letter* reported that comments and suggestions received from League members on its website prompted the decision to offer emergency communications as its first certification topic. The ARRL is now looking for existing training materials that can be used in preparing a curriculum. Anyone who can help is encouraged to e-mail program coordinator Dan Miller, K3UFG, at <k3ufg@arrl.org>, or to contact Dan via regular mail c/o ARRL Continuing Education Pilot Program, ARRL, 225 Main St., Newington, CT 06111.

Ham Leads WRC-2000

The International Telecommunications Union's World Radiocommunication Conference 2000 (WRC-2000), held in May and June in Istanbul, Turkey, was presided over by the chairman of Turkey's Telecommunication Authority, Fatih Mehmet Yurdal, who also happens to be TA2MY. He is one of only about 1000 licensed hams in the country, according to the *ARRL Letter*. The WRC sets worldwide telecommunication policy, including spectrum allocations and minimum licensing requirements. There were no direct amateur-related items on the agenda, although the gathering seemed likely to approve setting an agenda item for its next conference (2003) to discuss realigning amateur and broadcasting services in the 40 meter range to eliminate interference between the services in different parts of the world.

Special Event station TA1ITU operated from the conference site. QSLs may be sent via the TA QSL Bureau.

UO-36 Hosts First Space Internet Node

An amateur satellite—UoSat OSCAR-36—has become the first spacecraft with its own internet address as part of a NASA experiment spearheaded by engineers at the Goddard Space Flight Center. The AMSAT News Service says the satellite, also known as UoSat-12 and carrying commercial as well as amateur payloads, is the first ever to function as a fully-compliant active World Wide Web node. For more information, see <http://www.spacedaily.com/news/internet-001.html>.

(For more ham radio news see the CQ *web site: <www.cq-amateur-radio.com>)*

An APRS® transceiver built for tomorrow's communication needs with advanced features available today.

NEW!

TM-D700A DATA COMMUNICATOR 144/440MHz FM Dual Bander

Conspicuous with its extra-large amber & black display, Kenwood's new TM-D700A is fully equipped to make the most of the exciting opportunities offered by the Kenwood Skycommand System, SSTV, GPS and APRS® –the Automatic Packet/ Position Reporting System that is rapidly gaining popularity worldwide. This mobile transceiver with built-in TNC offers a wide range of data communications options, including simple packet operation using the AX.25 protocol. You can also send and receive SSTV images using Kenwood's VC-H1. Ham radio is truly entering a new era.

APRS® (Automatic Packet/Position Reporting System)

- **Position/directional data**
  With an NMEA-0183 compatible GPS receiver you can transmit position data for automatic calculation of distance, current speed and heading. Last 4 digits can be masked for position ambiguity. Manual input of latitude/longitude is also possible.
- **Versatile messaging**
  Transmission of position data can be accompanied by a choice of programmable status text (up to 28 characters), position comments (15 settings), icons and bulletins. For added messaging flexibility, individual alpha messages (up to 64 characters) can also be sent.
- **Station list**
  Store received APRS® data in up to 40 station reports.
- **Grid square locator**
  Position data is displayed on the grid square locator for visible reference.
- **BCON TX interval (0.2/0.5/1/2/3/5/10/20/30 min.)**
- **Packet path selection for Digipeat**
- **Weather station & PHG data reception**
- **Digipeat station and DIGI function capability**
- **Auto Message Reply**
- **Audible APRS® message receive (call sign) notification (requires VS-3)**
- **Waypoint position data output**

FEATURES

◗ Full Dual-band operation: VHF x VHF/ VHF x UHF/UHF x UHF ◗ Wide-band receive: 118–524, 800–1300 MHz (excluding cellular blocked + frequencies) ◗ Detached panel (extension cable and panel holder supplied) with extra-large (188 x 54 dots) backlit LCD and multifunction key display (reversible) ◗ Improved key operation announcement with optional VS-3 voice synthesizer ◗ Built-in 1200/9600bps TNC compliant with AX.25 protocol and KISS mode ◗ Simplified packet monitoring ◗ SSTV functions with Fast FM for transmission of images in just 14 secs (approx.) and dual receive for voice and image transmissions (two frequencies simultaneously) ◗ 200 memory channels with 8-character memory name input ◗ Up to 10 programmable memory scan banks ◗ Easy-to-use menu system similar to the TH-D7A ◗ Built-in DCS (Digital Code Squelch) and CTCSS encode and decode ◗ CTCSS tone frequency scan ◗ DCS code scan ◗ 9600bps PC-based packet communications for chat, BBS ◗ Kenwood Skycommand System (KSS) II for remote control of fixed HF transceiver (TS-570S/D(G) or TS-870S) ◗ DX packet cluster monitoring ◗ Cross-band repeater ◗ Wireless remote controller ◗ 1750Hz tone burst ◗ D-sub 9 pin terminal (for PCs) ◗ GPS input terminal (NMEA-0183) ◗ Visual band scope ◗ Mute function ◗ Memory control program available via Internet access ◗ New backlit microphone with alphanumeric message input.

Example A: with GPS receiver & laptop

Example B: with VC-H1

ISO 9001
JQA-1205

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Zero Bias

BY RICH MOSESON, W2VU

An Editorial

Progress Report

I'm writing this on the morning after the Dayton Hamvention weekend, and believe me, it's quite a "morning after." I'd much rather be sleeping, but a deadline is a cruel master, and if I don't put fingers to keyboard today, you'll be reading one-and-a- half blank pages a few weeks from now. Besides, it's good to write this while the people and events of the 2000 Hamvention are still fresh in what's left of my mind.

My most overwhelming impression of the weekend was *busy*, the busiest I remember it being in several years. The corridors were often so packed with people that it was difficult to move from one end to the other, and just about every vendor I spoke with went home happy.

My favorite part of going to Dayton is the opportunity to meet and talk with so many *CQ* readers. Some conversations were brief; others extended. Most of the extended conversations, it seemed, had to do with both the new direction *CQ* has been taking in the past several months, and the new direction ham radio is taking in the aftermath of restructuring.

Several former readers of *CQ VHF* were unhappy that we haven't been able to provide the same level of VHF coverage, and especially weak-signal VHF coverage, that we could and did in a magazine devoted to VHF and UHF ham radio. At the other end of the spectrum, one noted DXer was worried that *CQ* would no longer be devoting enough space to DXing and DXpeditions. For those of you who share these concerns, I would like to take the advice of one reader to bring you up to date on where we've gone in the last several months, and where we're hoping to go in the next several.

Sunday of Dayton 2000, some of the members of the CQ team still standing—and smiling! Left to right: Jon Kummer, WA2OJK; Gail Schieber, K2RED; Arnie Sposato, N2IQO; Dottie Kehrwieder; and Rich Moseson, W2VU.

CQ and DX

Let's talk first about DX. ... In my view, DX always has been and always will be the glue that binds our hobby together, and the essence of the "magic" that sets ham radio apart from the internet, from cell phones, etc. It will always hold a position of critical importance in *CQ*. Our ability to make contact with faraway places is central to ham radio's identity, and that ability is enhanced by DXpeditions to remote corners of the world. The tremendous excitement generated by these activities, both on and off the air, was clear in Dayton, as I watched the physical "pile-ups" of hundreds of hams waiting in line to get their QSL cards directly from participants in recent DXpeditions to Bhutan (A52) and the Chesterfield Islands (TX0).

DXing Above 30 MHz

Keep in mind, though, that DX is not limited to DXpeditions, nor is it frequency-dependent. The desire to see how far you can talk, and then try to talk a little bit farther, is not something that infects only hams who enjoy HF. Weak-signal VHFers are DXers, too.

I had a chance to speak at length in Dayton with one of this year's inductees into the *CQ* DX Hall of Fame, John Kanode, N4MM, who is also an ARRL Vice President and former Director. I asked John about his DXing accomplishments, and he told me that the one he's proudest of is persuading the ARRL Board of Directors to establish a special DXCC award for 6 meters. It took several years, he said, to overcome the objections of other directors and supposed "experts" that it was impossible to work 100 countries on 6 meters and therefore pointless to establish an award that no one would ever win. To date, several hundred amateur —DXers to the core—have accomplished the "impossible" on 6 meters (not to mention those who have worked DXCC on 2 meters as well). HF DXers who have "worked them all" and are looking for new challenges might do well to look above 50 MHz at the same time that long-time VHF ops, thanks to licensing restructuring, are starting to discover the joys of HF DXing.

Do you want a real DXing challenge? The Brendan Trophy is still waiting to be won. It's offered by the Irish Radio Transmitting Society to the first two stations that successfully bridge the Atlantic Ocean on 2 meters without the use of artificial relays such as satellites. Today's state-of-the-art ham gear should be up to the challenge. Our collective understanding of VHF propagation has grown to a point where we know the types of conditions that should make such a contact possible. What we need is a concerted effort on both sides of the Atlantic to find the right time and the right places to make it happen. Top-notch DXers will be a necessary element of any such effort.

Where's the VHF?

What about VHF coverage in *CQ*? Granted, there hasn't been as much as was possible when we had an entire magazine devoted to VHF and UHF. Unfortunately, the sad but simple economic fact is that *CQ VHF* never got the market support it needed—neither in terms of advertising nor circulation—to remain viable as a distinct publication.

Has there been as much VHF coverage as I'd like in the combined magazine? No, and there are several reasons. First of all, a succession of time-dependent stories has conspired over the last several months to delay publication of planned features. We've had restructuring, a dramatic rescue at sea, and other articles that needed to run as quickly as possible. On the other hand, WB2AMU's upcoming (but not this month) primer on the ultimate DX—EME (Earth-Moon-Earth) communication—can run anytime. In addition, with restructuring bringing many thousands of hams onto the HF bands for the first time, we feel a special responsibility to offer help and guidance in correct procedures, etc., to smooth their entry into HF and help them feel welcome on the "low bands." This focus of recent months, again, has forced postponement of some VHF-

Do the math!

2:1 Bandwidth (kHz)

40M	150
30M	>50
20M	>350
17M	>100
15M	>450
12M	>100
10M	>1500
6M	>1500

6 10 12 15 17 20 30 40 Meter Vertical Antenna

For more information on this outstanding HF Multiband Vertical Antenna, visit our web site at:
http://www.cushcraft.com
or contact any one of our dealers worldwide.

Rig+Amplifier+Tuner+R8=Performance

What happened to the multiband vertical antenna? For years, multiband verticals with their own counterpoise systems have been the answer for operators in need of a single omnidirectional antenna capable of working all of the desired bands within a small footprint. They were compact, easy to install and didn't require radials making them the perfect choice in many instances.

What happened?? The tuner is what happened. Thanks to the tuner, Hams are now capable of running more mismatched power from their solid state rigs to their antennas than ever before. Although the tuner has obvious merits, combining eight HF bands into thirty odd feet of antenna does not come without some concessions to the laws of physics. Clearly, the ability to tune across the bands combined with an amplifier adds new elements to the traditional multiband vertical equation.

The R8 is the obvious answer. The R8 will allow you to safely run a 3.0:1 VSWR mismatch at 1500 watts CW without damaging its sophisticated components*. The antenna is also quite broadbanded and is less likely to be as sensitive to its surroundings. Equally important, the antenna only has two traps that have been designed to virtually eliminate damage due to moisture induced arcing.

Call your dealer and order one today! The end result will be another equation that you will grow to appreciate.

The R8 = operating confidence, versatility and fun.

** Check VSWR graphs for actual 2.0:1 VSWR bandwidth.*

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related topics in both features and columns.

Along similar lines, we have regular features, such as market surveys and contest results, that tend to run long and to limit the number of other features that can appear in a particular issue. Finally, our supply of VHF-related articles "in the bank," ready to be "withdrawn" and published, is very low compared with other topics. I encourage active VHF operators to write about what they're doing and to share their fun with all of our readers, just as W8ZCF has done in this month's lead feature (a VHF story, by the way) on the return of slow-scan TV from the Mir space station.

One of the major problems we have faced in recent years is long-time hams dropping out of the hobby and letting their licenses lapse. In many cases, it seems that they've gotten bored with what they've been doing but either didn't know about or weren't interested in other activities. So, rather than shift gears and try something new within amateur radio, they choose to drop out and eventually let their licenses expire (for the record, these are all *pre*-no-code hams, as the first no-code licenses won't begin to expire until next year). A ham who drops out won't become a VHFer, a contester, or a DXer—just a statistic.

The vast majority of *CQ* readers are active on both HF and VHF/UHF, which means we need a mix of articles that covers all areas and all frequencies. A broad-spectrum magazine will help all hams realize there's a never-ending variety of things to try and challenges to seek. It is *CQ*'s goal to be that magazine—one which promotes *active* participation in whatever aspect of ham radio appeals to you at any given time.

The words in large type across the cover of this magazine read "Amateur Radio," with no mention of frequency or specialized activity. Our job, therefore, is to provide a mix of articles that covers the very broad spectrum of interests and activities in our hobby... from "top band" to TeraHertz.

Hall of Fame Hitters

One of the ways in which we help promote certain activities and keep people interested is by recognizing those amateurs who have made special contributions to our hobby. This year we inducted four new hams into the *CQ* DX and Contest Halls of Fame, the ultimate recognition in these two areas of amateur radio.

The contesters recognized at the annual Dayton Contest Dinner this year are Larry "Tree" Tyree, N6TR, who appeared on the cover of last month's issue, and Walter Skudlarek, DJ6QT, a frequent DXpeditioner who has opened up more than three dozen rare countries, generally during contests. The new inductees into the *CQ* DX Hall of Fame are the late Chod Harris, VP2ML, a former *CQ* DX Editor, and John Kanode, N4MM. We congratulate all of our new inductees, and regret that Chod could not be with us to enjoy the honor with his many friends around the world. Look for details on each of them next month.

More Changes...

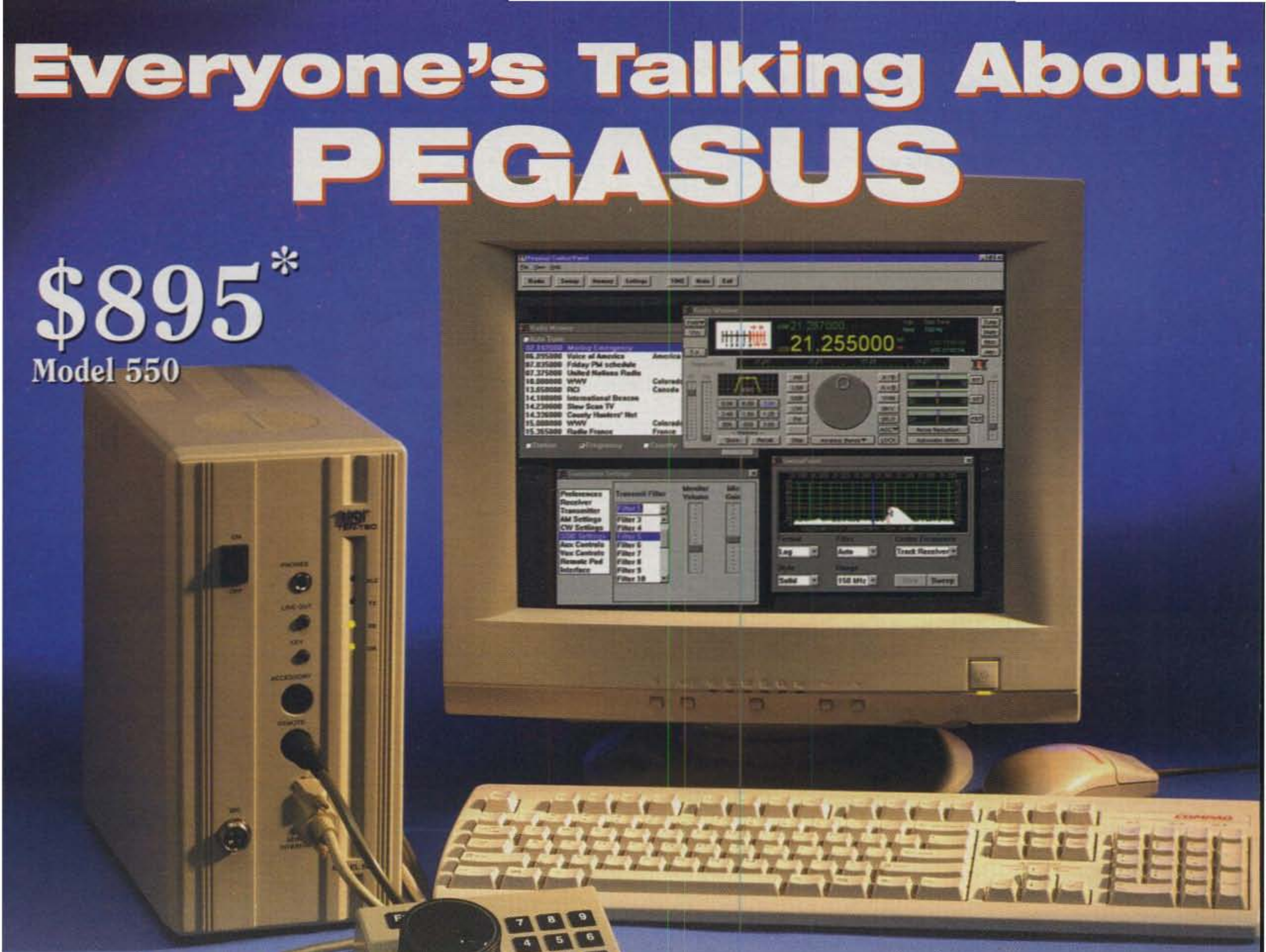
This issue marks the departure of two long-time fixtures on the *CQ* masthead, one who has shared his knowledge with you every month for a dozen years, and one behind the scenes, whom you might have met at a hamfest or would certainly know if you were an advertiser.

Buck Rogers, K4ABT, first opened his "Packet Users' Notebook" in the pages of *CQ* in 1988. He chronicled the entrance of amateur radio into the digital age and provided countless hams with practical tips on getting their packet stations on the air. Regretfully, Buck will be leaving us after this issue, which carries the final installment of the "Packet Users' Notebook." We will miss his depth of knowledge and experience, and wish him well.

And finally, *CQ* Advertising Manager Arnie Sposato, N2IQO, has decided after 17 years that it's time for a change. He will be leaving at the end of June. Filling Arnie's shoes will be Jon Kummer, WA2OJK. Jon has been a ham for 30 years and is currently Associate Publisher and Advertising Manager of our sister magazine, *Electronic Servicing and Technology*. We will miss Arnie greatly and wish him all the best in his new endeavors. We are confident that *CQ*'s advertising department remains in excellent hands.

73, Rich, W2VU

Everyone's Talking About PEGASUS



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Announcements

• The following Special Events will take place during July:

K1USN, from Museum Ships Radio Event, Massachusetts; USS Salem Radio Club; 1330Z July 15 to 1900Z July 16; CW, AM, SSB, RTTY on 40, 20, 15, 10 meters. QSL to W1QWT. For details see the USS Salem web page: <http://www.uss-salem>.

W1B, from National Baby Food Festival, Fremont, Michigan; Newaygo County Amateurs; 1500Z July 18 to 1900Z July 22 on 7.250, 14.250, 21.350, 28.350 MHz. For certificate send QSL and SASE to Leo Woodard, WD8DCA, 304 N. Stone Rd., Fremont, MI 49412.

N2B, from Op Sail 2000 and Safe Boating trhoguh Education, Liberty State Park, Jersey City, New Jersey; US Power Squadron's Amateur Radio Net; 1300–2200Z July 1–4 on 7.257, 14.257, 21.357, 28.357 MHz. For certificate send QSL and SASE to Donald Stark, N3HOW, 65 Stark Spur, Eighty Four, PA 15330-2547.

W2ZZJ, from 174th anniversary of birth of Mahlon Loomis, radio pioneer, Stratford, New York; Fulton County Dr. Mahlon Loomis Committee; 1300–2000Z July 21 in General class phone portion of 75, 40, 20 meters and Novice 10 meters, plus area 2 meter FM repeaters. For certificate send QSL, contact number, and #10 SASE (55 cents) to George Sadlon, W2ZZJ, 5738 STHWY 29A, Stratford, NY 13470. (Mahlon Loomis web site: <http://members.xoom.com/mahlon/>)

AF7E, from anniversary of first meeting of Masons in Independence Rock, Wyoming; July 4 (and possibly 3) on 10, 15, 20, 40, 80 meters. For certificate send QSL and 9×12 SASE to William Wright, AF7E, 1304 E. Sheridan, Laramie, WY 82070.

K7H, from Utah Hamfest 2000, Bryce Canyon, Utah; 1400Z July 8 to 0000Z July 9 on 7.260, 14.260, 21.260, 28.460 MHz (±QRM). QSL with SASE to Utah Hamfest, P.O. Box 382, Bountiful, UT 84011-0382.

W8AL, from Pro-Football Hall of Fame Festival, Canton, Ohio; Canton ARC; 1300Z July 21 to 2400Z July 23 on 7.265, 14.265, 21.350, 28.350 MHz. For certificate send QSL and 9×12 SASE to Donald Perry, WQ8J, 968 Culverne Ave. NW, Massillon, OH 44647.

W9C, from Great Circus Parade Showgrounds, West Allis Radio Amateur Club; 1800–0200Z July 12–15 on 3890, 7240, 21340, 28400 kHz. For certificate send QSL to W9C, 5436 Scenery Road, Waterford, WI 53185.

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

July 4, **Firecracker Hamfest**, Emerick Cibort Park, Bressler (near Harrisburg), Pennsylvania. Contact Harrisburg Radio Amateurs Club, 119 Catalpa St., Middletown, PA 17057-2013 (717-232-6087); web: <www.members.tripod.com/hrac>; e-mail: <HbgRAC@excite.com>. (Exams 9 AM nearby)

July 7–9, **Utah Hamfest 2000**, Ruby's Inn near Bryce Canyon, Utah. Contact Kathy Rudnicki, N7JSH, 801-547-9218; web: <http://www.utahhamfest.org>; e-mail: <aa7tr@arrl.net>. (Exams)

July 7–9, **International Peace Garden Hamfest**, Peace Gardens on ND/MB border on Hwy USA 281. For more info web: <http://www.mts.net/~holderr>; or e-mail: <dsnydal@mb.sympatico.ca>.

July 8, **Salisbury Firecracker Hamfest**, Salisbury Civic Center, Salisbury, North Carolina. Contact Rowan ARS, P.O. Box 593, Salisbury, NC 28145; KA4MPP, 704-278-4960; e-mail: <rbrown@salisbury.net>. (Talk-in 146.73 W4EXU tone 94.8, back up 146.52; exams)

July 8, **PEI, Canada Amateur Radio Fleamarket**, Wilmot Community Center, Summerside, PEI. Contact Ella McCormick, VE1PEI, 902-886-2280; e-mail: <mccormick@ns.sympatico.ca>. (Talk-in 146.850[–])

July 8, **Straits Area ARC Swap & Shop**, 4H Building, Emmet County Fairgrounds, Petosky, Michigan. Contact Box 416, Pellston, MI 49769; or Tom, W8IZS, 231-539-8459. (Talk-in 146.68–; exams 1 PM American Red Cross Building)

July 8, **Swapfest '2000**, American Legion Post #434, Oak Creek, Wisconsin. Contact South Milwaukee ARC, P.O. Box 102, S. Milwaukee, WI 53172-0102 (414-762-3235 days and early evening CST). (Talk-in 146.52)

July 9, **KARSFEST 2000**, Will County Fairgrounds, Peotone, Illinois. Contact Chip Moore, K9IOC, 289 S. Euclid Ave., Bradley, IL 60915 (815-933-1323); e-mail: <karsfest@yahoo.com>; web: <www.w9az.com>. (Talk-in KARS W9AZ 146.94 (–600).

July 9, **North Hills ARC Hamfest**, Northland Public Library, Pittsburgh, Pennsylvania. Contact Keith Ostrom, KB3ANK, 205 Poplar Dr., Pittsburgh, PA 15209 (412-821-4135); web: <www.nharc.pgh.pa.us>; e-mail: <n3dok@pgh.net>.

July 15, **North Texas Hamfest**, Silver Wings Club, Grayson County Airport, Sherman-Denison, Texas. Contact Wilmer Kinsey, WB5DCU, 350 Mitchell Rd., Sherman, TX 75090-3223 (903-893-5872); on the web: <http://home1.gte.net/wb5dcu/nortex00.html>; e-mail: <wb5dcu@get.net>. (Talk-in 147.00 ±600)

July 15, **NCARC Summer Superfest**, Larimer County Fairgrounds, Loveland, Colorado. Information call 970-352-5304. (Talk-in 145.115 –offset, 100 Hz PL, or 146.52; exams)

July 16, **Zero-Beaters ARC Hamfest**, Bernie E. Hillerman Park, Washington, Missouri. Contact Zero-Beaters ARC, P.O. Box 2007, Washington, MO 63090; Keith Wilson, KØZH, 636-629-2264 phone/fax; e-mail: <n0mfd@arrl.net>. (Talk-in on 147.24+; exams registration 9 AM)

July 16, **Valley Forge Hamfest & Computer Fair**, Kimberton Fire Company Fairgrounds, Valley Forge, Pennsylvania. Contact MARC, P.O. Box 2154, Southeastern, PA 19399; Bill Owen, W3KRB, 610-325-3995; on the web: <http://www.marc-radio.org/hamfest.html>; e-mail: <hamfest-info@marc-radio.org>. (Talk-in 146.835– and 443.80+)

July 21–22, **Milton ARC Hamfest 2000**, Santa Rosa County Auditorium, Milton, Florida. Contact Walter Yarbrough, WA4TFR, 805-994-7335, e-mail: <wa4tfr@worldnet.att.net>.

July 22, **Dayton, TN Hamfest**, Dayton, Tennessee. More info on the web: <http://webcube.volstate.net/~ko4sy/>.

July 23, **Fox River Radio League Hamfest**, Waubonsee Community College, Sugar Grove, Illinois. Contact Maurice Schietecatte, W9CEO, c/o FRRL, P.O. Box 673, Batavia, IL 60510 (815-786-2860; e-mail: <w9ceo@arrl.net>; web: <http://www.frrl.org/hamfest.html>). (Talk-in 147.210 [+600] PL 103.5/ 107.2; exams 10 AM)

July 28–29, **Ham Holiday 2000**, Ham Holiday 2000, Oklahoma State Fair Park, Oklahoma City, Oklahoma. Contact Ham Holiday 2000, P.O. Box 850771, Yukon, OK 73085-0771; e-mail: <N1LPN@swbell.net>; on the web: <www.geocities.com/heartland/7332>. (Talk-in 146.82; exams)

July 29, **SNARS Hamfest 2000**, International Game Technology, Reno, Nevada. Contact Bill, K7NHP, 775-246-3756; e-mail: <k7nhp@arrl.net>; on the web: <http://wadg.greatbasin.net/snars/>. (Talk-in 146.610– PL, 123; exams 9 AM preregistration requested, walk-ins okay)

July 29, **Western Carolina Hamfest**, Haywood County Fairgrounds, 25 miles west of Asheville, North Carolina. Contact Pat Kelsey, AB5RB, P.O. Box 16858, Asheville, NC 28816 (828-236-0181; e-mail: <ab5rb@bellsouth.net>; on web: <www.wcars.org/hamfest2000>). (Talk-in 146.91, PL 91.5; exams 2 PM at Haywood Community College)

July 30, **BRATS Hamfest 2000**, Timonium Fairgrounds, Timonium, Maryland. Call 410-461-0086; e-mail: <hamfest@bratsatv.org>; web: <http://www.bratsatv.org>. (Talk-in 147.030+, 224.960–, 448.325–; exams 9 AM, check-in 8:30 AM, by preregistration only, call 410-461-0086)

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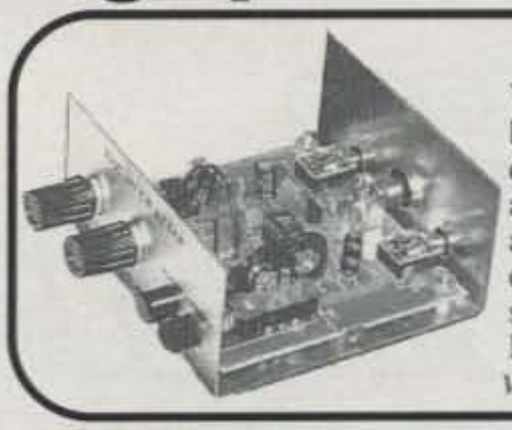

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Cosmonaut Alexander Kaleri, U8MIR, working on a laptop computer in the Mir-Core module. Above his head and to his left (to the right in the photo) are two glowing objects. The larger square object is the display on the MAREX-NA Tasco SSTV system. Just above the display is a bluish rectangle display of the Kenwood TM-V7 transceiver which is used to receive images from Earth and send images from Mir to the ground. This photo was received in Portugal by Francisco Costa, CT1EAT, and is the first Mir SSTV picture ever received in Europe.

Here U8MIR is floating next to Mir's work desk. He is located in the Mir-Core module or Base-Block module of the space station, at a table which doubles as a workbench and oven for heating food. This photo was received by Gerald Klatzko, ZS6BTD, in South Africa.

Russia's Mir space station is occupied again, and one of the first things the new crew brought back to life was the ham station—including Mir's ham TV station!

Mir SSTV Station Back on the Air

By Farrell Winder,* W8ZCF

Hundreds of amateur radio operators were thrilled and delighted on April 16, 2000 to experience the return of SSTV (slow-scan TV) images from the Mir space station. Mir was unoccupied from August 27, 1999 until April 6, 2000, and Russian space authorities considered de-orbiting the station. Ultimately, however, they decided to send up another crew.

Many excellent pictures were received as Mir and its new crew orbited Earth over areas which included Australia and the United States. A few of these images—scenes both inside and outside the spacecraft—are presented in this article. On April 16 the crew attached the camera to a window and transmitted a series of Earth pictures at precisely two-minute intervals (activated by the SSTV auto controller) as Mir orbited the planet.

Despite concerns that the SSTV system might have problems after lying dormant for eight months, it performed flawlessly when re-activated by the crew. In fact, most systems seemed to be in good shape. As reported by Chris van den Berg in his *Mir News Report 477*, the crew found the space ship in good standing, but noted "the fact that there was no

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A wide shot of the Mir control room. It is presumed Mir was on autopilot/computer control while the crew was attending to other duties, as none of the crew members are visible. Photo received by the author.

A closeup of Flight Engineer Alex Kaleri, U8MIR, working on his floating laptop computer. This photo was received by Tom Daniels, N3CXP, of Allentown, PA.

This photo is typical of a series of pictures automatically taken through the window of the space station, showing portions of Mir's solar panels and the Earth with clouds below. This was recorded by the author in Cincinnati, Ohio.

dinner ready after their arrival. When in the past a new crew arrived, all was ready and that is very convenient."

Many messages flooded the SAREX and AMSAT internet bulletin boards as the crew activated the amateur radio equipment and began voice and video transmissions. It was great to have the recipients of Mir contacts share their excitement of initial QSOs for this latest Mir Mission 28. The earliest noted contacts came from "down under" in Australia and included contacts by George, VK2WEL; Grant, VK2TU; Doug, VK3TRD; B.R. Golla, VK2JAI; and Derek, ZL1AKJ, in Auckland, New Zealand. There were no doubt many other unreported contacts.

There were also .wav files of several voice contacts made available. There was obvious real excitement in one of these. Apparently Alex, U8MIR, had attempted to locate Maggie, VK3CFI, via the Mir radio. Then it seemed that all of Australia helped notify Maggie, who was later successful in a documented excellent, clear recording on a .wav file. In one of the exchanges with Maggie, Alex discussed the beginning of his third stint on Mir and said, "For the first time, I arrived at the station which was unmanned *hez lade"* (without people).

From what was learned at this writing in the third week of April, the crew remains very busy with scheduled experiments, including preparation for an EVA (extra-vehicular activity, also known as a spacewalk). At some later date, a school schedule is planned with a Q&A session and including SSTV, time permitting in the crew's duties.

Mir's SSTV History

For those who would like to know how the Mir Amateur Radio SSTV system came into existence, it was conceived by Dr. Don Miller, W9NTP; Hank Cantrell, W4HTB; and your author,

What is SSTV?

SSTV (Slow Scan Television) was originated in 1957 by Copthorne MacDonald, VY2CM (formerly W4ZII), and is a system which has been developed *entirely* by amateur rRadio. The definition of SSTV as pro,vided to the FCC by Don Miller, W9NTP, during the early days of development is: "SSTV is the transmission of a 'live picture' over a voice communications channel in real time."

SSTV is basically a technique which arranges a slowdown in video to transmit, then speeds up to receive. This technique allows for a 3 kHz bandwidth for transmission and makes it suitable for use on HF, as it is no wider than a single sideband voice signal. Because of this narrow bandwidth, single frames of video are transmitted, so only still images are seen. Today, amateur radio SSTV produces pictures that are transmitted around the world and that are of a quality equal to that of commercial TV. Both hardware and software techniques are used to transmit and receive SSTV. One of the most informative web pages available, covering almost *all* aspects of SSTV is located at <http://www.tima.com/~djones/>.

SSTV may be transmitted on any voice frequency. Generally, though, as a matter of courtesy, it is transmitted on some commonly accepted spots. Some of the most common currently used SSTV frequencies include 3.845, 7.171, 14.230, 14.233, 18.160, 21.340, 24.975, 28.680, and 144.360 MHz. SSTV is also being sent via several of the amateur satellites. The Mir Space Station transmits on 145.985 MHz. Specific info on Mir SSTV can be found at: <http://www.siliconpixels.com/marex/>.

The only photo in this series showing Mir Commander Sergei Zalyotin (left) as well as Flight Engineer Alexander Kaleri, U8MIR (on the right). This photo was received by Murray Peterson, VK2KGM, in Wiley Park, Australia (a suburb of Sydney).

Farrell Winder, W8ZCF. Dr. Dave Larsen, N6CO, and Miles Mann, WF1F, of MAREX (Mir Amateur Radio Experiment) initiated and received approval for the system via Sergej Samburov, RV3DR. Miles arranged for the delivery of three of four systems to Russia and journeyed to Russia to train the cosmonauts in operating the equipment.

The Mir SSTV System consists of a Tasco Electronics TSC-70 Color Scanner and Docking Station with a 5-inch LCD screen. Integrated with this equipment is a Kenwood TM-V7A transceiver, a W4HTB Auto Controller, and a PictureTel or Apple Computer NTSC camera. A new SSTV system utilizing a software approach as opposed to the hardware system now aboard Mir is being developed and completed by Jim Barber, N7CXI, and is being tested for consideration and possible use aboard the International Space Station (ISS).

A new QSL card is being prepared by MAREX-RU and MAREX-NA. It is expected that this card will be available sometime in June 2000 to cover the requests of all those stations who have heard or contacted Mir during this current or past missions. Details will follow in various media as to contacts for these QSL cards.

The crew is to be greatly thanked for their taking time in their busy schedule to provide voice contact and the transmission of very exciting and informative pictures to us from outer space via the Mir Space Station. Thanks also to the hams who relayed the SSTV photos seen here, and to Miles Mann, WF1F, for helping identify what is shown in the various photos.

Mir's amateur radio station is currently operating on 145.985 MHz FM. Everyone is encouraged to listen for the crew and copy pictures when the crew has some free time (*if it's not voice and it doesn't sound like packet, it's probably SSTV! — ed.*). ■

A Note on Color

You'll note that some of the photos from Mir are in color and some are not. This is not just a function of whether or not *CQ* printed them in color. Nearly all SSTV pictures today are sent in a color mode. However, color is affected by tuning off frequency from the transmitted signal, and a receiver that's slightly off frequency may lose some or all of the picture's color information.

This effect is very evident in receiving SSTV from satellites (or space stations), where there is considerable Doppler shift, and especially if single sideband transmissions are used. FM is more forgiving but still sensitive to transmit/receive relationships. Because Doppler shift causes the apparent transmit frequency to change, and because receiving a single SSTV frame can take nearly a minute, the frequency can appear to change during the course of receiving a single photo (This is why the color varies in some of our photos.).

Not much noticeable color shift occurs in a Robot 36 (36 second) FM transmission. If a longer mode is used, such as Scottie 1 or Martin 1, and Doppler shift is present, then the receiving frequency should be adjusted to get good pictures.

The government's decision to shut down "selective availability" means the Global Positioning System receiver now has better accuracy, but not necessarily "pinpoint" nor "spot-on," as some news articles may suggest. However, even greater GPS accuracy is on the way.

GPS: Better, But Not Perfect ... Yet

BY GORDON WEST,* WB6NOA
Contributing Editor-at-Large

The Global Positioning System (GPS) receiver is quickly becoming a piece of standard equipment in many ham shacks, especially among amateurs who use APRS (Automatic Position Reporting System), who are active in public service and emergency communications, or who operate "rover" stations in VHF contests. Any ham who needs to know precisely where he/she is at any given time, or how fast and in what direction he/she is traveling, is finding a GPS receiver to be an essential tool.

GPS is a satellite-driven global location service, using signals from a fleet of satellites to let an often inexpensive handheld receiver calculate your exact position ... as long as you consider +/–300 feet to be exact. This 600 foot "gap" existed primarily because of something called *selective availability* (S/A), position errors intentionally introduced by our Defense Department to degrade the accuracy of GPS receivers in general use.

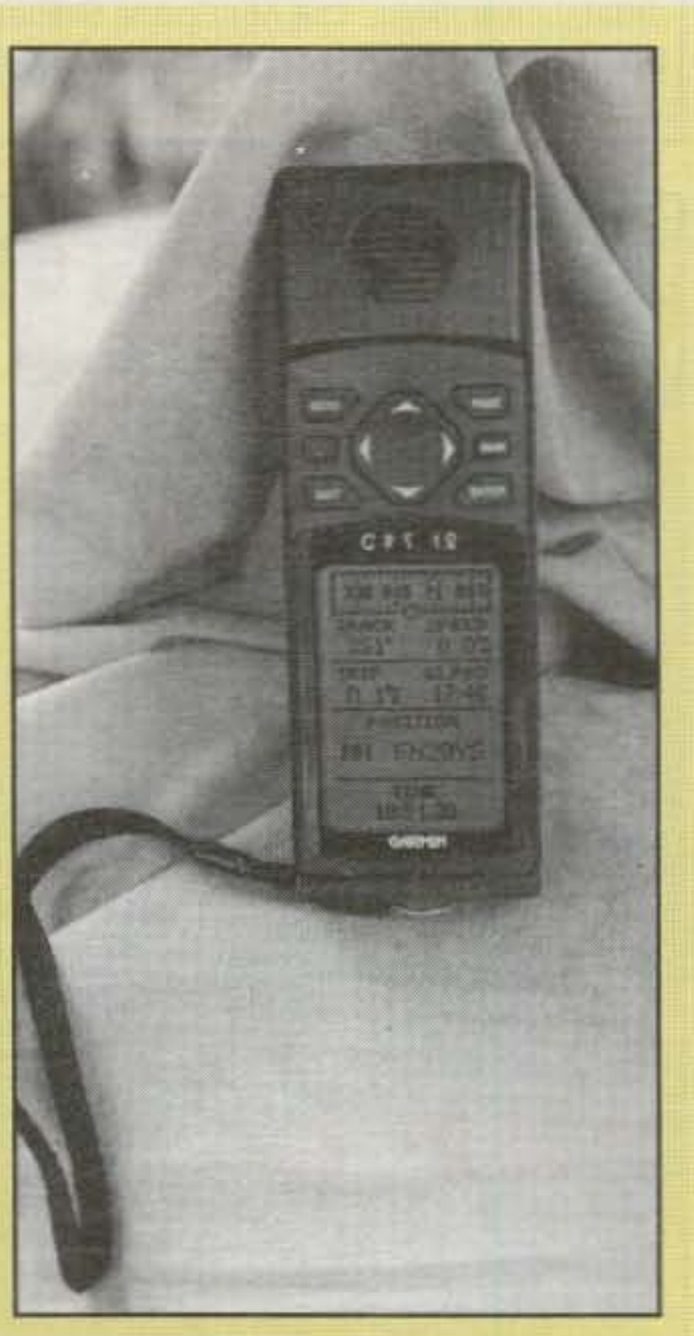
Selective availability was the Department of Defense's effort to control access to satellite-system performance in civilian single-channel receivers. Civilian receivers (as opposed to ultra-expensive classified military receivers) operate on a single channel at 1575.420 MHz called Channel L1 CA—"CA" for course acquisition of the pseudo-random, spread-spectrum, digital code. Selective availability allowed the Department of Defense to introduce small clock errors in the satellites to constantly run your received position all around the radius of a 300 foot circle. This led to position errors that would seem to "float slowly" within the radius of this circle, sometimes putting you at the right edge of the circle, and then in a few minutes all the way to the left of the circle, with a *total* error of up to 600 feet!

Officially, this was done in the interest of national security. Without S/A turned on, one might assume that unfriendly forces could launch a warhead and use civilian frequencies to guide it to the big open mouth of that nuclear reactor sitting on 5 Mile Island. The way I see it, even if they missed by 600 feet, they probably would be close enough to consider their distant target via GPS a direct hit! Plus, when the U.S. military first used GPS on a large scale during Desert Storm, S/A was turned off because most of the receivers were off-the-shelf civilian units!

Goodbye to "S/A"

Well, we've got good news and bad news for you: At midnight on May 2nd, the Defense Department pulled the plug on S/A. Contrary to news reports, however, we are not magically acquiring the more-precise military signal, and most important, while the position accuracy of civilian GPS receivers certainly will improve, they will *not* be within the radius of a manhole cover, as several news services described. With selective availability turned to zero, your *position probability* shrinks from the radius of a 300 foot circle to the radius of a 60 foot circle.

The government's decision came in response to growing pressure on the Department of Defense to "get real" about its civilian channel GPS fears, turn off S/A, and let millions of Americans get the most out of their inexpensive GPS receivers. The Commerce Department estimates the commercial GPS market, made up of civilian and commercial users, will reach $16 billion this year and could easily double during the next three years. President Clinton indicated years ago he was trying to work out this S/A issue, and in a



The Garmin GPS-12 is typical of inexpensive handheld Global Positioning System receivers whose accuracy should be significantly improved by the U.S. government's decision to stop introducing intentional errors into GPS signals.

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surprise move somehow pulled it off seconds before midnight on May Day.

In a statement the President said, "I am pleased to announce that the United States will stop the intentional degradation of the Global Positioning System (GPS) signals available to the public...This degradation feature we called Selective Availability (S/A) ... will mean that civilian users of GPS will be able to pinpoint locations up to 10 times more accurately than they do now..."

Will the improvement truly give us *pinpoint* readouts? No, it will not. Signals from the GPS satellites alone, without ground timing checks, may suffer some unexpected non-predictable and non-modelable slowdowns or accidental equipment speed-ups as seen in this error budget summary:

Satellite clock error: 10–20 feet
Ephemeris error: 10–20 feet
Receiver error: 15–40 feet
Atmospheric & ionospheric errors: 100–200 feet

When you add up all of these possible errors, you now can begin to see why repeatability errors of a specific position fix might be hundreds of feet off. Even with S/A turned to zero, those atmospheric and ionospheric anomalies might change dramatically over a 24 hour period.

Toward Greater Accuracy

Military receivers using parallel L1 and L2 receivers would help minimize atmospheric and ionospheric errors by comparing incoming time delays to the passing satellites. However, even the military equipment can't get down to feet and sub-meter accuracy without help from land-based monitors which are designed to compare incoming pseudo-random signals from precise geodetic positions they have located, and coming up with error correction signals (differential) that are then transmitted to local strap-on GPS receivers attached to your civilian-type GPS equipment. This error-corrected signal is known as DGPS, or *Differential GPS*.

Thanks to the United States Coast Guard, these "strap-on" receivers can pick up free differential signal reception from low/medium-frequency transmitters, but these signals are tough to receive more than 50 miles away from the transmitter. Also, as soon as you turn on any type of noisy electronic equipment nearby, Coast Guard differential beacon reception might only be possible within 10 to 20 miles of their shore-based transmitters. Inland, for the time being, no low-frequency corrections are readily available free of charge. There are commercial correction services available elsewhere, but you have to pay for them.

Enter the Federal Aviation Administration (FAA) and military/marine electronics manufacturer Raytheon, which jointly have developed the *wide area augmentation system*, nicknamed "WAAS." This may be the ultimate free way to upgrade your portable or fixed-mount GPS unit's accuracy from the radius of a 20 yard circle down to a couple of feet. WAAS incorporates land stations at specific geodetic-surveyed spots that compare satellite-arriving GPS signal-position readouts to their own known position. The ground station then crunches the data into a differential correction and uploads the information to the geosynchronous INMARSAT satellite system. The satellite repeats the differential correction as one of the L1 civilian GPS channels. Raytheon WAAS-equipped receivers take this one additional channel of satellite-borne information and correct the mid-earth orbit calculations to the more precise WAAS corrected readout.

The FAA is now in its first phase of installing and testing numerous reference stations, two master stations, and two leased INMARSAT satellites, all with the hope of someday having WAAS and GPS replace aeronautical instrument landing systems and other older navigation systems. It may be years before WAAS is a sole aeronautical navigation system, but it is looking quite probable that there may be other transportation groups that may jump aboard the WAAS bandwagon.

Find Yourself!

Enjoy improved GPS accuracy *right now* thanks to the Department of Defense finally giving in to the millions of Americans who said it's absurd to purposely reduce GPS accuracy, which is then easily reinstated with local or WAAS correction signals. Now that S/A is turned to zero, local differential beacon signals and those from WAAS can live up to the President's expectation of being "spot on." ■

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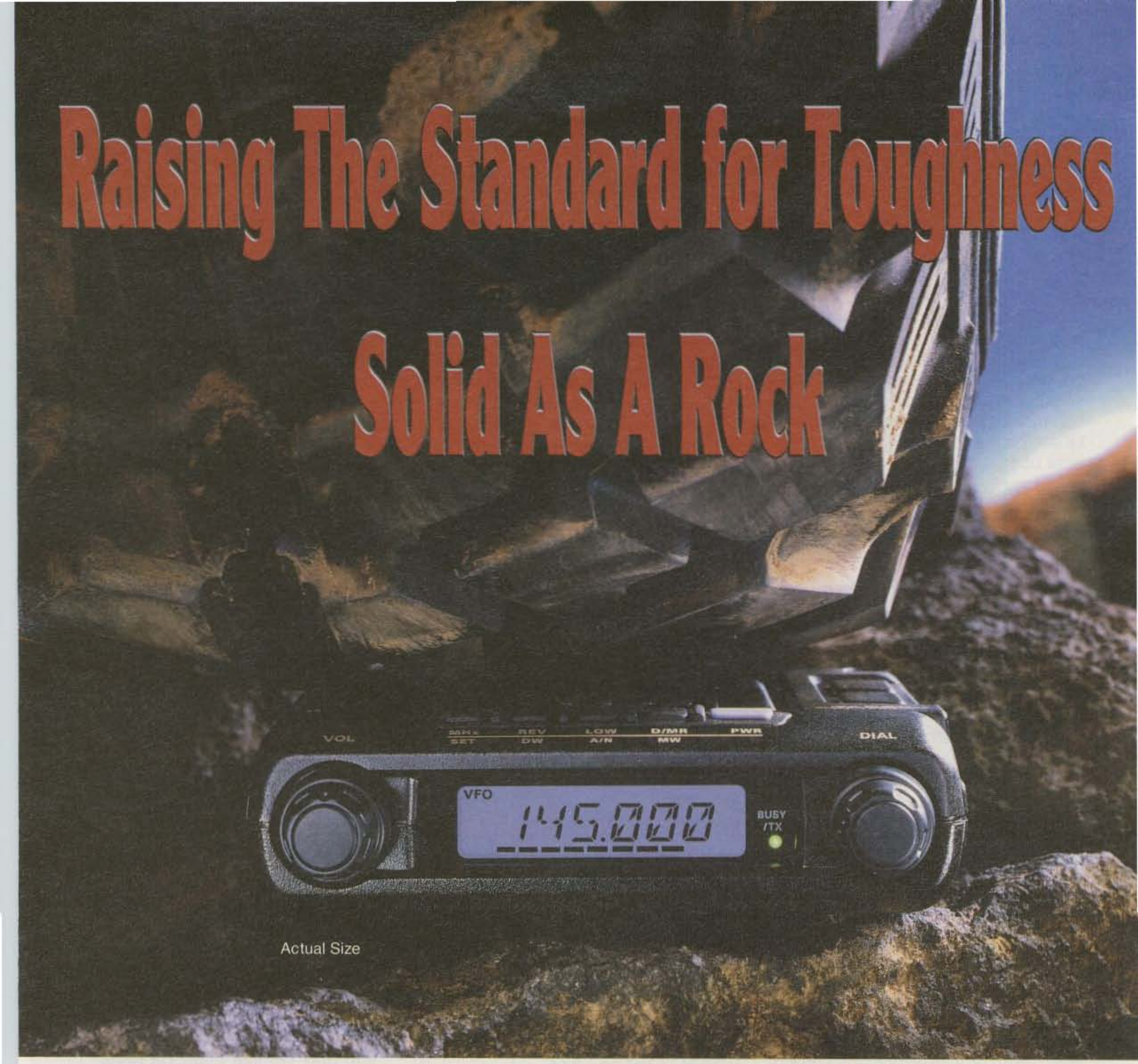

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* Cellular Blocked

VR-500
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TOUGH GUYS.

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YAESU ...leading the way.

Most hams really want to be good operators—even most of those who aren't! The trouble, says W6BNB, is that nobody has ever taken the time to show them what makes a good operator.

How Good an Operator Are You?

BY BOB SHRADER,* W6BNB

Are you really the radio operator you think you are? In many cases the struggle to get a license has by-passed the requirements of learning proper operating. Maybe some of our dedicated "Elmers" are not fully versed in this feature of ham radio. Here are some ideas on good radio operating picked up by a former commercial shipboard CW radio operator, a deputy sheriff radiotelephone ("phone") and CW operator, a broadcast and CW radio communications instructor, and an active phone, CW, and RTTY amateur radio operator for over 68 years.

There are several things that amateurs operating 'phone, CW, etc., may do while on the air that really prove they are good radio operators and not just run-of-the-mill button pushers and yakkers. Apparently, some hams do not care if they are not operating properly, which tends to spoil it for the rest of us. However, for all the others there are at least six things that we should be doing if we are not on the lid list. Unfortunately, all of these things are being abused on the bands every day. How do we score on them?

#1 Checking Your Frequency

Any frequency you want to use, for tuning your rig, making on-the-air tests, or calling CQ, should be monitored for at least 20 seconds before making any transmissions on it. Stations may be working there but may not be audible for several seconds due to a deep fade. If operating CW, always send the internationally recognized "Q" signal "QRL?" twice, separated by about 5 seconds, before using the frequency. This is asking the question, "Is this frequency in use?" If only "QRL" is sent (no question mark), you are making the statement, "This frequency is in use and you are interfering." It also infers, "Please do not use this frequency." If you are going to call CQ on that frequency, you certainly do not want other stations to tune away! *Be sure to add that question mark!* When operating on SSB 'phone, after monitoring for 20 seconds or so a good operator will ask, "Is this frequency in use?" or words to that effect. Before transmitting, however, be sure you know the frequency to which your receiver and transmitter are tuned, and that brings up item number two.

#2 Transmitting and Receiving on the Same Frequency

If you are going to call a CW on CQ on some frequency, you must be sure that your receiver is set to receiver any answer that comes back on that frequency. Too many operators do not seem capable of doing this! There are many less-sophisticated transceivers that have their receiver section offset 700 Hz or so from the transmitter's CW frequency, because they have been manufactured to tune properly only when used for SSB operation. Be careful with transceivers that have RIT or XIT (Rcvr or Xmtr Incremental Tuning) controls. If these controls happen to be turned on but are detuned, they may put their receiver's frequency several kilohertz away from the transmitter's frequency. Always be aware of how your RIT/XIT controls are set! Normally they should be at their center or zero setting. After calling CQ on CW, if no answering signal is heard on your frequency, immediately turn the RIT control back and forth 500 Hz or so to pick up any answer coming from one of those stations who does not know how to tune the transmitter to the frequency of a received signal. If you are using a separate transmitter and receiver, always tune the receiver at least 500 Hz both sides of your transmitting frequency after a CQ.

Related to this, it is important when operating CW that you know how to set your transmitter to a frequency of any signal being heard. This is known as "zero-beating." CW CQs should be answered as close as possible to the calling station's frequency. Stations should never be using two separated frequencies on a band when in a QSO, except perhaps when calling some DX stations who are known to be listening up or down the band. How you are going to zero-beat another station's frequency depends on your receiving and transmitting equipment. Many modern transceivers, when tuned to the loudest received CW signal, often to a tone of about 700 Hz, will find that their transmitter is set very close to the received

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station's frequency. (A 700 Hz tone is about the second "F" tone above middle "C" on a musical instrument, a tone near the frequency to which normal ears are most sensitive.)

To zero-beat when using a separate receiver and transmitter, as soon as a CQ is heard (1) determine the callsign and then (2) quickly tune your receiver to a very low frequency received tone (the lower the better). (3) Immediately hold your key down and tune your transmitter until it produces the same low tone on your receiver. (4) Release the key and quickly retune the receiver back to the CQing station's 700 Hz signal. Practice doing this until you can do it rapidly, perhaps in less than 5 seconds. Usually, if the final amplifier and antenna tuner are already properly tuned to the mid-portion of the part of a band you normally use, you will not have to spend time retuning them unless you are using a short, high-Q, narrow bandwidth antenna.

Whatever method you use to zero-beat another station, check with other amateur stations to see if you are doing it properly. You may be several hundred hertz off, enough so that your answer to a CQing station may not be heard, or you will not be able to hear a station answering your CQ. You could be wasting your time and be QRMing the band needlessly.

Zero-beating when using SSB with a transceiver comes naturally. As you probably know, with transceivers set for SSB, if the voice of the other station's operator sounds normal, you will be zero-beat with him or her, unless your RIT/XIT is detuned! It is not a bad idea to turn off the IIT/XIT controls for normal SSB operations. Zero-beating a SSB station when using a separate receiver and transmitter is a challenge and takes some practice and testing with other stations.

#3 Using Proper "Break-in" Procedures

Here is another indicator of good operating ability. Check the instruction manual of your equipment and see if it can be set up to operate *fast break-in* (not semi-break-in), which is the most rewarding method of operating CW. If you have never done this, give it a try. To reduce receiver noise when you are key-up, it may be advisable to reduce the receiver RF gain somewhat when receiving strong signals. On CW the Q signal "QSK" means, "I am able to hear your signals in between my dots and dashes." While sending, whenever you hear another signal between your dots and dashes, stop transmitting for a second. Then send "BK K" (Breaker, go ahead). The breaking operator then sends the information he or she wants to give you.

When you first sign over to another CW station it is good to send "QSK BT QSK?" meaning, "I am using QSK – Are you?" If the answer is "QSK" or "Yes," you can use break-in on the other station also. If you *cannot* operate QSK, it may be a good idea to tell the other station "No QSK here" at the beginning of your QSO. If you are listening on a CQing station's frequency, try sending "BK." If the other station is using QSK, it will probably stop CQing and immediately sign over.

If you are using a separate receiver and transmitter, you probably will have to develop some kind of double-relay system to shift the antenna from receiver to transmitter when the key is closed to provide QSK operation. Sometimes using a short, separate antenna for your receiver may allow break-in if your transmitting power is not too high.

With SSB 'phone, if your transceiver can be set up for VOX operation, tell the other operator(s), "I am using VOX (Voice Operated Xmsm." This advises the other operator(s) that you are able to use *voice* break-in. On 'phone you can be broken whenever you take a breath, *provided* your transceiver is adjusted for fast VOX drop-out operation. Adjust your VOX control for short "Delay" or hang time so that your transmitter stops immediately every time you pause to take a breath. At that time another operator only has to say, "Can I break you" or some words to that effect. If you hear a breaking voice, stop talking and say, "Breaker, go ahead." Break-in operators must make sure that their break-in has been acknowledged and that the frequency is clear and ready for them to talk, or they will be "doubling" and confusion will result.

The use of the voice word "Break" may be frowned upon by some. There are nets in which this term is reserved for emergency breaking, although a double break ("Break break") is probably more often considered an emergency break.

Stations not using VOX break-in are missing some of the niceties of radio communicating. However, it is not good policy to break-in too often, as it can become annoying if used excessively.

The mouth-to-microphone distance should be maintained at about three inches for best understandability and voice break-in. If you are back a foot or more from the microphone and turn up the microphone gain, you usually will be transmitting many unwanted room-noise signals which can hold your microphone open.

#4 Proper Speed of Operation

The speed at which information is conveyed on either 'phone or CW is very important. Operators should always be alert to the possibility that their speed of communication may be too fast. The things that may interfere with understanding between stations are weak signals, other stations interfering (QRM), man-made or other noises (QRN), speaking or sending too fast, any accent you or the other operator may have if on 'phone, and subject matter. Speaking more slowly and distinctly, and sending CW slower with better spacing usually will help all but the "subject matter" difficulty. In this last case, it isn't very smart to talk about things that are not understood by the other operator; it only results in short, uninteresting QSOs!

On CW speed is a paramount consideration. Many possibly enjoyable QSOs are cut short because one of the operators cannot copy at the speed the other operator is sending. Of course, "QRS," meaning "Send slower," should be used. Many operators, though, do not like to indicate that their ability with Morse code may be inferior to that of the sending operator. However–and this is a big however–QRS may also mean that the sending operator is sending poorly and hopefully will do better if he or she sends more slowly!

Always try to send at the speed used by the other station. In many cases beginning operators learn to send fairly well at a pretty rapid speed, but their receiving speed is often much slower. If you send to a station at the speed it is using but you receive no answers to questions asked, slow down and try again. Make sure that your spacing between letters and words is adequate. Slower sending and somewhat exaggerated letter and word spacing usually works wonders with slower receiving operators, and they will appreciate it. Make the spacing between words much longer than the spacing between letters so that the words stand out on the receiving operator's note paper. Insufficient letter and word spacing is probably the one worst problem involved in CW communications.

Try not to use too many abbreviations when in a QSO with beginning operators. If you are not in a hurry, a lot of abbreviations you may think up are not all that important and may not be under-

stood by many operators. Remember, slower operators are usually copying letter by letter and must go back and read what was sent to them before they can answer you. With these operators it is a good idea when signing back over to them to send their call twice, a slow "de" and then your call twice, giving them a little time to read what they have copied! Normally you can just start your transmissions with the other operator's name, only signing your own call once every 10 minutes, or when you sign over.

Fast and light dots are hard to read when conditions are poor. Bugs, and keyers having the required adjustments, should be set with dots coming at the speed the operator feels the most comfortable sending. The length of dots should be adjusted to be longer than the space between them, which is known as "heavy dots." Weak signals with heavy dots are much easier to read than if they have light dots. Too often bug dots are set for perhaps 35 words per minute, for example, but the operator is actually sending words at only 20 wpm. The longer and slower the dots, the better they will get through noise and the easier they are to copy. A burst of static can confuse reception of letters or numbers having a series of fast dots but may allow fairly good guessing of letters or numbers if the dots are being made slower. If conditions are not good, a QSO may be much more enjoyable at 15 wpm rather than at 30 wpm, even if both operators are capable of operating at fast speeds.

Always use your highest transmitter power output when conditions are bad. Under poor conditions, using QRP is unfair to the operator's ears if he or she is using today's more common ±100 watts output.

#5 Correcting Errors

This is very important on CW. In too many cases, less adept CW operators will try to send too fast, will run letters and words together, or will make a lot of uncorrected errors. It is surprising how many CW operators do this. They must think the other operator is a mind reader! The basic theory of correctly in improperly sent letter in a word is to stop, send eight dots, or perhaps a question mark, or maybe three or four slow dots, or some other pet error indicator you like to use, and *return to the beginning of the word* in which the error was made. (Never just correct the improperly sent letter and continue on!) An error sign only has to be something that cannot be copied as a letter or number. If an error is made on the *first letter* of a word, stop, send an error sign, but return to the beginning of the last correctly sent word, send it again and continue. If this is not done, other operators copying on paper may become confused! In message handling, proper error corrections are imperative! Uncorrected sending errors on CW can result in unrewarding and shortened ragchew QSOs.

Although it probably is not understood by beginning operators, leaving a long space between letters in the middle of a word is an error. So is running two words together by not leaving a longer space between them. If not corrected, these sometimes can completely confuse the receiving operator. When operators recognize that they have left too long a space between letters in a word, or that they have made too short a space between words, it should be treated as a mistake. This is true with *real-time* keyboard CW operations too. With most keyboarders at least, the space bar used at the end of every words sets off the beginning of each word. Still, however, with slow hunt-and-peck keyboard operators, if the letter spacing of a word is excessive or the spelling is incorrect, the error signal and repeat of the word is required, particularly if the other operator is not receiving by machine. When sending keyboard code to a copy-by-ear receiving operator, a good error sign is the letter "e" sent three or four times with spaces between. "XX" is a good error sign with any keyboard sending, CW, RTTY, etc.

#6 Copying CW in Your Head

This is the best way to really enjoy CW when contesting, DXing, or QSOing. It eliminates the tedious writing down of all letters and words that are sent, and will result in learning to copy faster code. It also eventually results in faster sending. A good operator just sits back and listens to what the other operator is sending, maybe once in a while jotting down notes on a topic being transmitted.

Learning to copy in your head usually begins by first learning to "copy behind." This means whenever you are writing down words being sent, you *never* put a letter on your paper until the next letter has been completely sent, except perhaps at the end of a sentence. This requires a lot of will power; you will find it very hard not to put down a letter as soon as you recognize it. After you learn to copy behind by one letter, then try copying behind by two letters. By the time you can copy three letters behind you will find you probably can sit back and the received letters and words will be formed on the blackboard of you mind! You will be copying in your head, and CW will become pure pleasure—assuming, of course, that the other operator is sending properly!

How Are You Doing?

If you practice all, or even most, of these 'phone and CW niceties when operating on the ham bands, you are probably a good operator. Congratulations! If not, then consider this some friendly advice from your magazine "Elmer" and start working your way toward improved operating skills. You may find your QSOs more enjoyable than ever. ■

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It looks more like a computer than a radio, but it won't do much as a radio unless you connect it to a computer. Ten-Tec's Pegasus is the amateur industry's second foray into radios controlled entirely by and from your personal computer.

CQ Reviews:

The Ten-Tec Pegasus—Part 1

BY SCOTT PRATHER,* N7NB

This is a more detailed and technically focused review than you're used to seeing in CQ. *With the absorption of* Communications Quarterly *into* QEX, *we have decided to occasionally devote space in* CQ *to the highly technical type of articles that were* Quarterly*'s bread and butter. Don't worry, though. It's thoroughly readable, even for the non-technical among us. Dig in and enjoy.*
—W2VU

Amateur radio equipment has certainly come a long way from its humble beginnings during the early part of the 20th century. From the earliest detector, the coherer, amateurs progressed to the crystal detector, the vacuum tube regenerative receiver, and eventually, the superheterodyne. Today, nearly 80 years after Major Edwin Armstrong's paper on the superheterodyne was published[1], our implementation of the superheterodyne receiver has been updated to include digital signal processing (DSP) in lieu of analog techniques. As DSP technology continues to progress, the processor will move ever closer to the front-end, and at some point in the not-so-distant future, hams will be using HF receivers with DSP at the antenna. Before we get to that point, there are a multitude of technological challenges to be met if performance will ever equal that of our current analog designs. In the meantime, the state of the art still relies heavily on the concepts put forth in Major Armstrong's groundbreaking paper.

As technology continues to advance, there's always an expectation from the amateur community that the manufacturers will keep pace. The folks at Ten-Tec, Inc., based in Sevierville, Tennessee, are keenly aware of the fact that keeping up with the competition's "rig of the month" is impractical when manufacturing equipment in the United States. Furthermore, with today's technology it just doesn't make sense to them to continuously release new radios. Consequently, it comes as no surprise that Ten-Tec decided to take a somewhat unique approach to the design of an amateur radio transceiver.

First, Ten-Tec developed a solid RF platform, using DSP to replace as many analog components as possible. Next, they designed a virtual front panel that can be customized to a wide variety of applications. Finally, they defined the operation of the RF platform in software using flash memory technology, making the radio upgradable without ever removing the top cover. The result: a radio that's relatively inexpensive to manufacture and easily upgradable at a fraction of the expense of a traditional hardware implementation. Best of all, the radio has the potential to become, quite literally, whatever you want it to be.

The use of DSP in amateur communications equipment is not new. DSP-based receivers have been released by several manufacturers, including Ten-Tec. DSP-based amateur radio transceivers have been marketed by Kenwood, Yaesu, ICOM, and Kachina Communications, and all of them have appealed to a portion of the amateur radio market. However, the price of these transceivers has kept them out of reach of the amateur on a tight budget.

Ten-Tec's Model 550 Pegasus DSP-based transceiver, the newest addition to its line of amateur radio equipment, is particularly remarkable not only because of its low cost and impressive performance, but also its open-architecture interface design. Unlike other manufacturers that closely guard their communications protocols in order to maintain control over their interface, Ten-Tec made it a point to release a programmer's manual early in the marketing of this transceiver. The company actively encourages others to develop new control applications for the Pegasus. This is a refreshing approach in today's highly proprietary world.

An Overview of the Pegasus Hardware

The Ten-Tec Pegasus was designed to be controlled with an external PC. Other than the DSP itself, there isn't any computing power in the Pegasus. Instead, Ten-Tec relegated the burden of number-crunching to the host computer. Consequently, all computations necessary for user functions (such as tuning the radio to a specific frequency) are carried out in external software. Offloading these processor-intensive aspects of the unit enables the Pegasus to be integrated easily into any system requiring an HF RF platform.

*2335 NE 127th Street, Seattle, WA 98125-4224

[1]*"A New System of Short Wave Amplification," Edwin H. Armstrong, Proceedings of the IRE, February 1921, pp. 3-27*

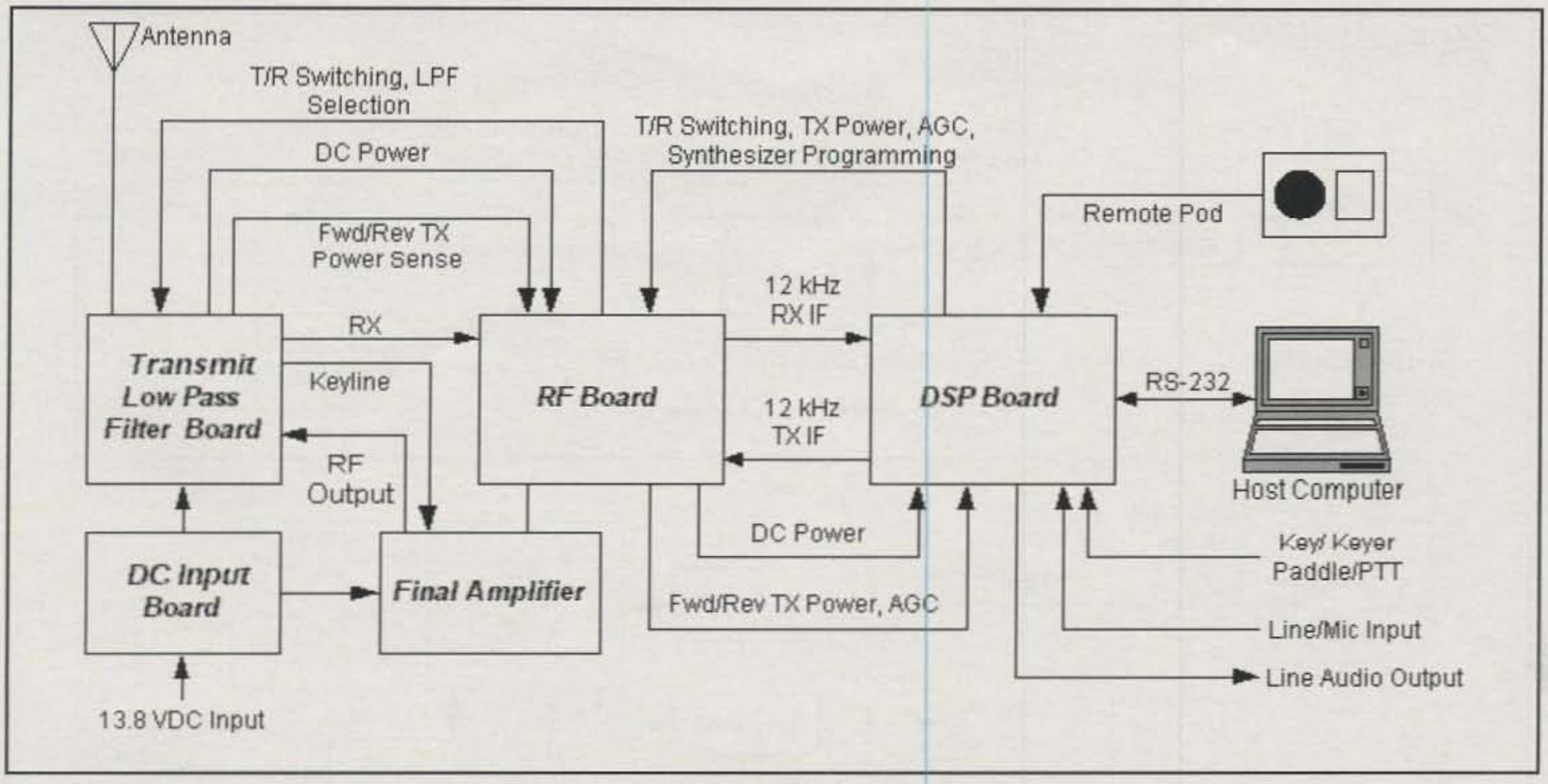

Fig. 1– Pegasus block diagram.

The five modules that make up the Pegasus hardware platform are depicted in the block diagram shown in fig. 1 and are also listed below:

- DSP Board
- RF Board
- Power Amplifier Module
- Transmit Low-Pass Filter Board
- DC Input Board

A brief description of each individual board follows.

DSP Board: This board supports both the digital signal processor and the interface circuitry necessary for it to communicate with its host. All transmit and receive audio is processed on this board, as well as other basic interface functions, such as a keyer paddle and/or hand key input and microphone PTT.

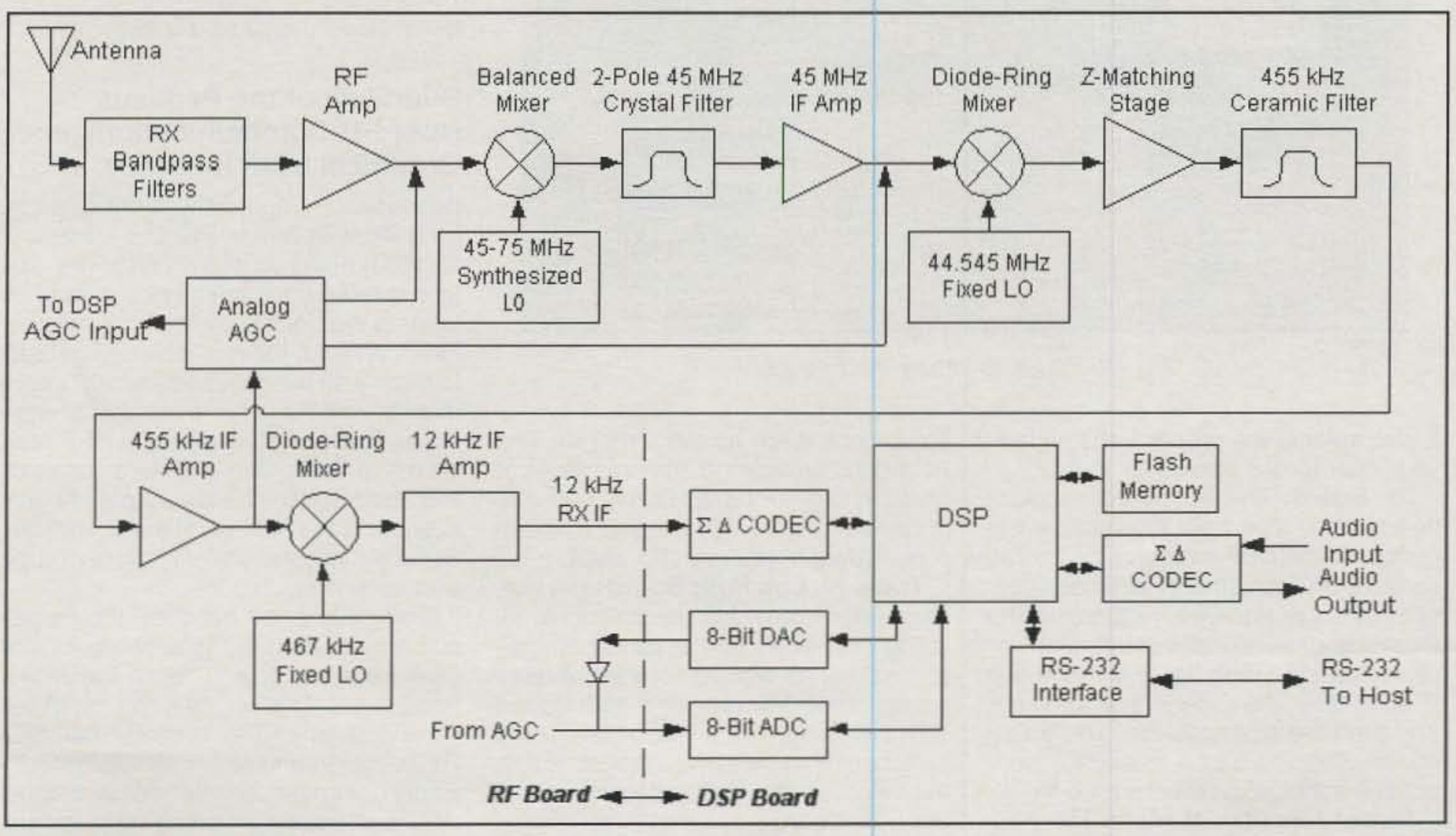

Fig. 2– Pegasus receiver block diagram.

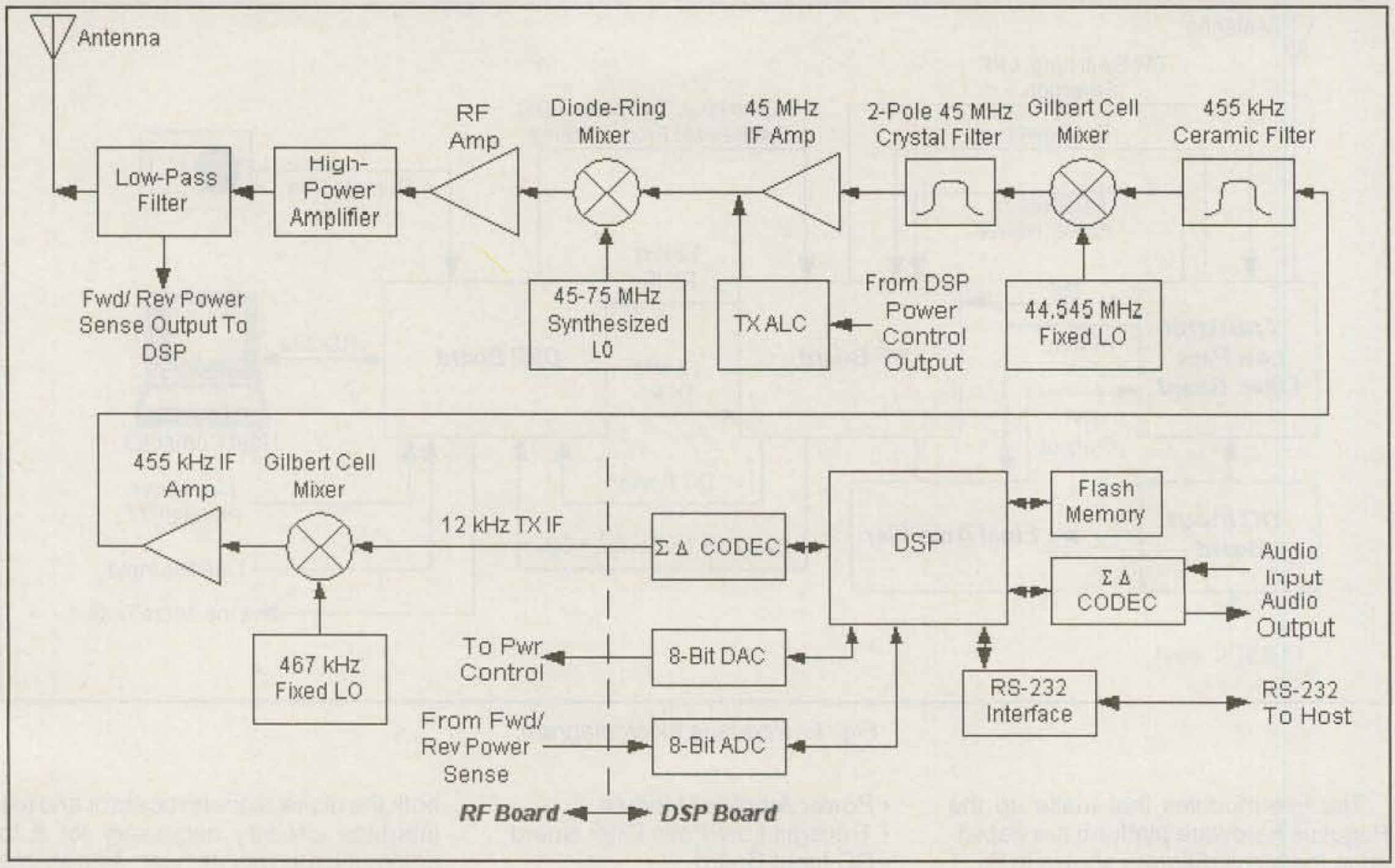

Fig. 3– Pegasus transmitter block diagram.

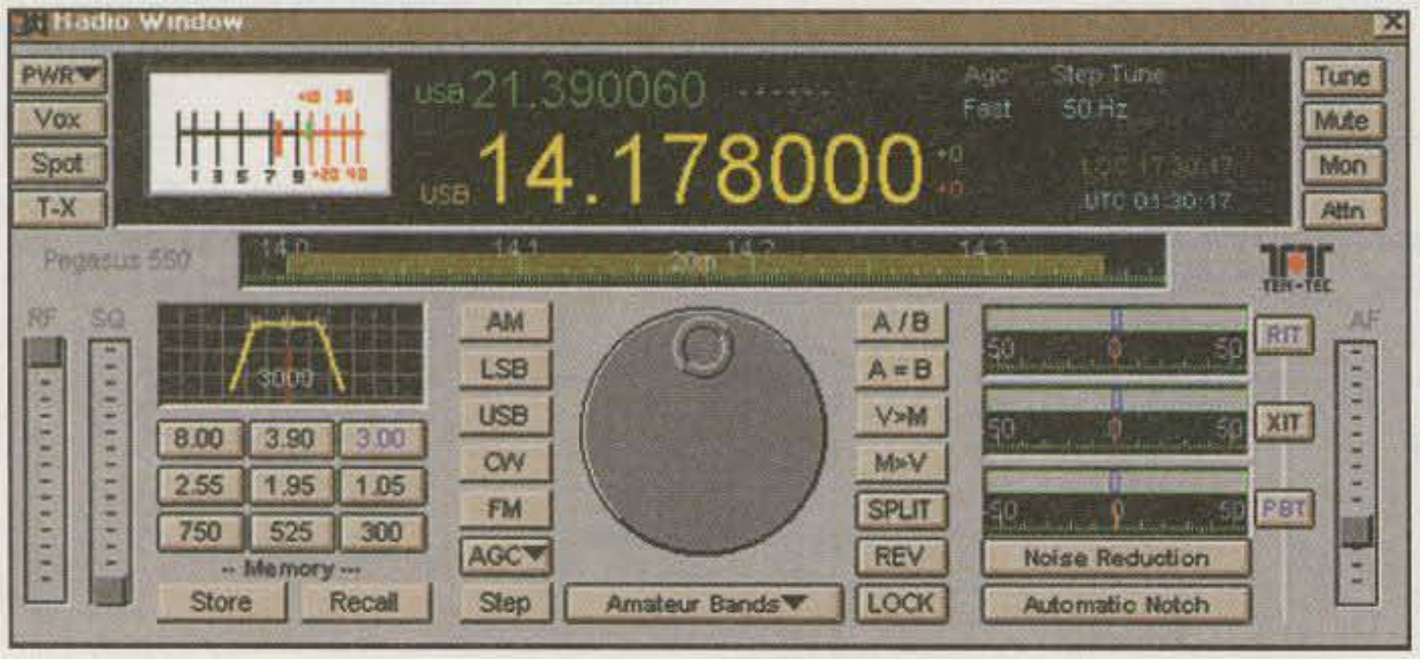

Fig. 4– Pegasus virtual front panel.

It also selects the proper transmit low-pass filter for the frequency in use.

RF Board: The RF board supports down conversion from the receive frequency to the DSP's receive IF, and up conversion from the DSP modulator output to the transmit frequency. The Pegasus uses a triple-conversion receiver scheme (see fig. 2) with the first IF at 45 MHz, the second IF at 455 kHz, and the third IF at 12 kHz. The transmitter uses the same frequency conversion scheme in reverse (see fig. 3).

Power Amplifier Module: The Pegasus power amplifier (PA) module doesn't differ much from other Ten-Tec equipment, such as the Omni VI. The RF board provides a transmit level of about 1 watt to the amplifier. The output power of the PA is variable from approximately 5 watts to 100 watts.

Transmit Low Pass Board: The low-pass board provides the harmonic filtering necessary for the power amplifier module, as well as forward/reverse power measurement and high-speed T/R switching. Each low-pass filter is switched by a pair of mechanical relays, the selection of which is determined by the DSP board.

DC Input Board: The DC input board serves as a distribution point for the nominal 13.8 VDC input voltage from the rear-panel power connector. It also provides active T/R switching for an external device, such as a linear amplifier.

Overview of the Pegasus Host-PC Communications and Graphical User Interface

Because the Pegasus was designed to be used with a host PC, the hardware can do nothing on its own on power-up, as the radio does not have a means of loading the DSP from flash memory by itself. Instead, the host PC is expected to supply all the required start-up information. The Pegasus is capable of storing as many as eight different DSP programs in flash memory. As a result of this, the Pegasus hardware may be utilized for a number of different applications, with unique DSP firmware to support each one.

Communication between the Pegasus and its host PC is supported by a 56.7 kbps serial port using hardware flow control. The Pegasus command set (an extension of Ten-Tec's RX-320 "PC Radio" command set) is simplicity itself. Each command consists of a unique ASCII character followed by a binary command and an ASCII carriage return. Ten-Tec's use of binary along with hard-

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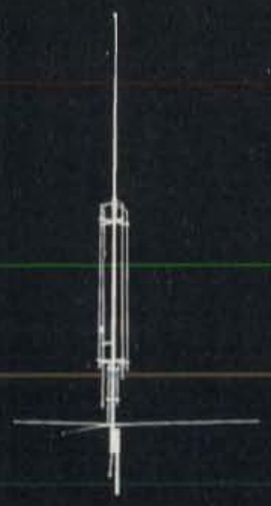

Eagle DX

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.

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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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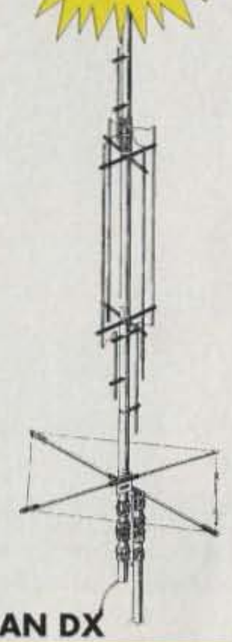

TITAN DX

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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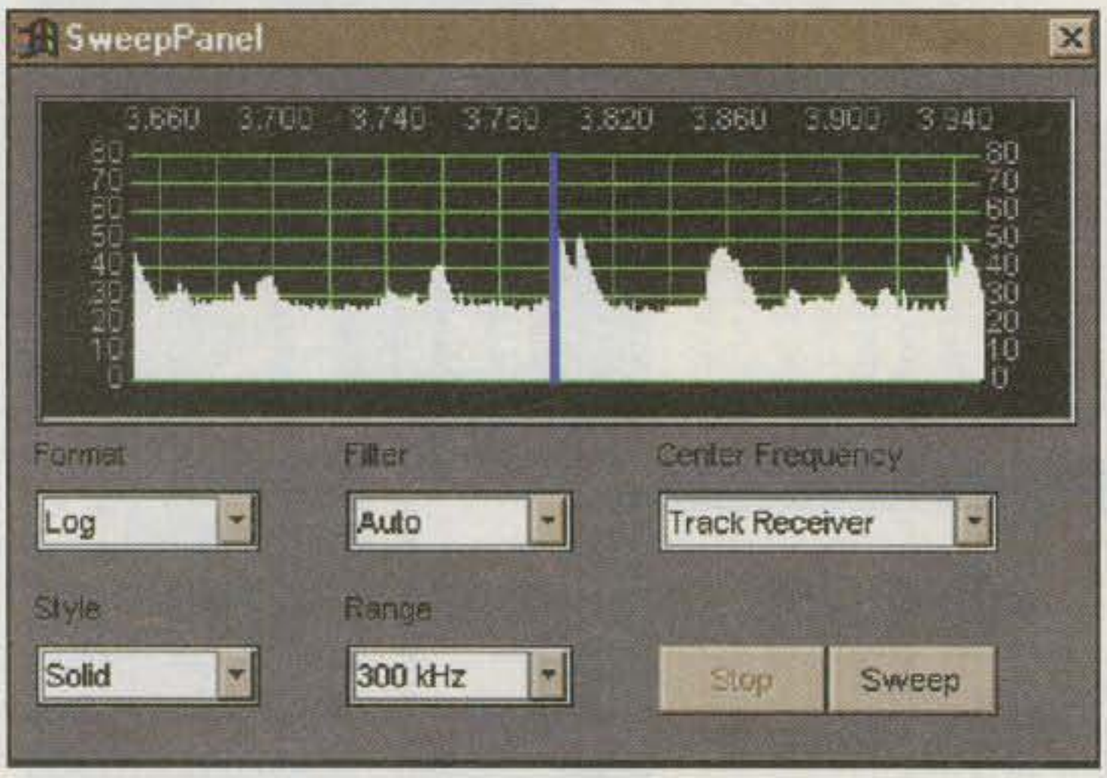

Fig. 5– Pegasus band scan window.

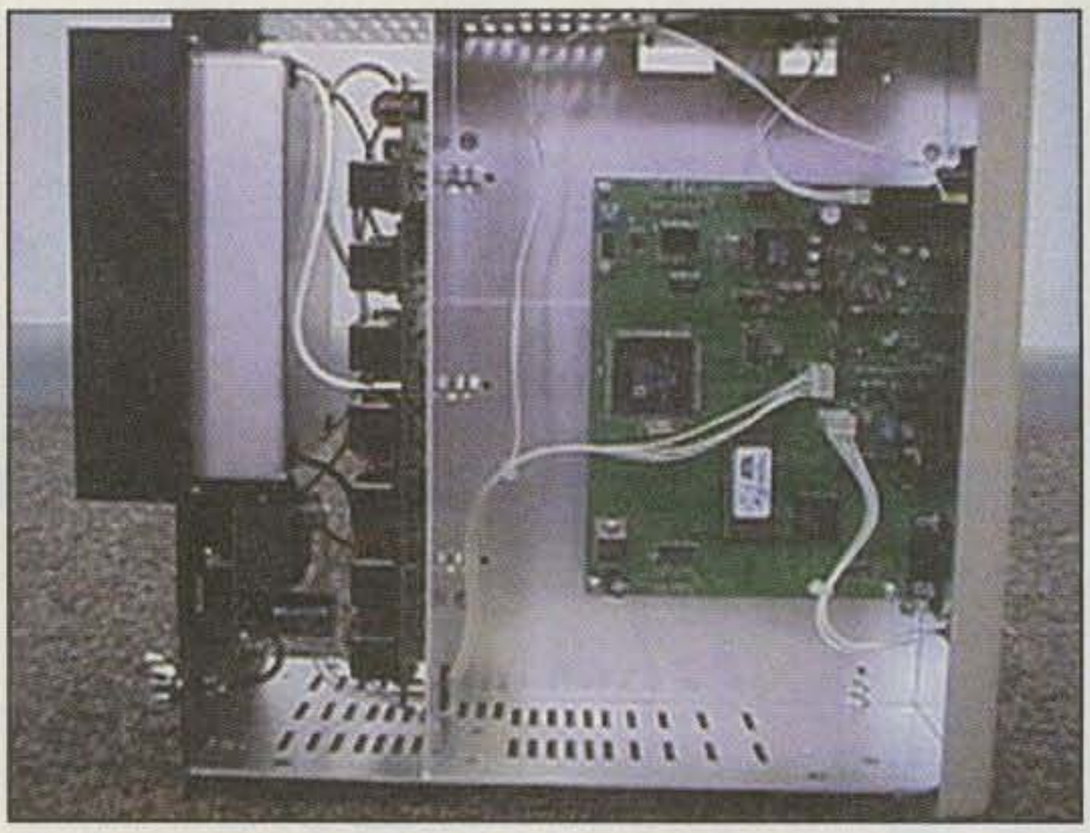

Fig. 7– Pegasus chassis (DSP side).

Fig. 6– Pegasus front panel.

ware flow control provides an efficient means of sending commands from the PC to the radio with minimal processing effort and overhead.

Because the Pegasus lacks a command processor, the PC must take on tasks that might otherwise be handled by the radio platform. For example, setting the Pegasus to a specific operating frequency cannot be accomplished simply by sending a single command. Changing frequency involves computations that affect the radio's Local Oscillator (LO) and DSP. To select a specific frequency, the Pegasus will only accept tuning factors, of which there are three. These tuning factors are:

- First LO frequency (adjusted in 2.5 kHz steps)
- DSP Fine Tuning (adjusted in 1 Hz increments)
- DSP BFO Tuning (adjusted in 1 Hz increments)

The host PC must also take the operational mode and filter bandwidth into account, as these settings will affect the calculations necessary to arrive at the tuning factors.

The Pegasus Graphical User Interface (GUI) is a relatively simple 16-bit Windows' application that provides a user interface for the hardware platform. All of the controls that one normally would find on the front panel of a conventional microprocessor-driven amateur transceiver are emulated on the Pegasus virtual front panel (see fig. 4). These controls are addressable from the keyboard, by a simple mouse click, or by a mouse "click and drag."

In addition to the virtual front panel, the GUI also provides the following windows:

- Band Scanning
- Memory Configuration & Selection
- Callsign Lookup
- Hardware Settings

Let's take a quick look at each of these windows.

Band Scanning: The virtual front panel provides a scanning function, the display of which resembles a spectrum analyzer with a user-selectable log or linear y-axis (see fig. 5). The width of the frequency scan—between 3 kHz and 1.5 MHz—is selected by the user. The display's center frequency may be configured to track the receiver, or it may be set manually to a user-specified frequency. For example, the manual-entry feature allows the user to operate 20 meters and occasionally scan for signals on 10 meters without ever changing bands to perform the scan. After scanning a band, the radio will return to its previous operating frequency. The user can tune the receiver by placing the display's mouse-driven cross-hairs over the signal of interest and left-clicking.

Memory Configuration and Selection: The ability to save callsign, country, frequency, mode, and filter bandwidth information is almost unlimited in the Pegasus. Memory parameters are simply written to a file stored on the host PC's hard drive, so most machines can store far more entries than a typical user could possibly enter. Inside the memory window, one can add, delete, edit, and tune to a selected memory location. Three search fields are available, listing entries in memory by callsign, frequency, or country.

Callsign Lookup Window: The Ten-Tec Pegasus ships from the factory with Buckmaster's HamCall CD-ROM, which allows the user (when running the Pegasus GUI on a machine with a CD-ROM) to look up callsigns and obtain name, address, and license class information.

Settings Window: While most of the "settings" available to the user within this window have been considered standard in analog amateur transceivers for many years now (e.g., VOX settings, CW keyer settings, transmit output power, etc.), the flexibility of the DSP in the Pegasus provides some unique capabilities not possible in an analog radio. For example, it's possible to select the transmitter filter bandwidth in 18 steps across a range of 900 to 3900 Hz. The selected bandwidth is independent of the selected receiver filter, making this feature highly advantageous to some users. For example, operators participating in a local ragchew on 10 meters when the band is closed would benefit from the improved audio fidelity afforded by a wide trans-

mit filter. Contesters, on the other hand, might benefit from a slightly narrower filter to concentrate their voice power under adverse interference conditions.

Construction

The Pegasus is utter simplicity in its construction. To a great extent, this is due to the fact that the designers were free to take some liberties that would not have been possible if they had to design a radio with a front panel. Essentially, the radio takes the form of a mini-tower computer, complete with a "putty"-colored front panel and cover. The top of the radio contains a 3 inch speaker that provides amazingly good sound quality. The front panel supports basic I/O connections such as a headphone jack, keyer paddle/straight key jack, serial port to the host computer, etc., plus a power switch and status indicators (see fig. 6).

The "DSP" side of the Pegasus chassis is shown in fig. 7. As you can see from this photograph, the chassis is divided vertically by an aluminum partition which extends to about two thirds of the unit's depth. This partition serves to strengthen the chassis and provides much-needed shielding between the digital signals from the DSP board on one side of the partition and the sensitive analog receiver on the other. Another vertical partition across the back of the unit provides additional mechanical rigidity to the chassis, and also shields the LPF (low-pass filter) board from both the DSP and RF cards. Thus, this simple chassis design forms three electrically shielded compartments that seem to be quite effective in taming the noise problems so often encountered when combining digital and analog circuitry in the same housing.

This method of construction also means that very few interconnect wires are required. Boards are connected via simple PC board interconnect headers that pass through cutouts in the chassis partitions. On the other hand, it can make servicing difficult. Because of the manner in which connectors mate on these cards, the RF board cannot be removed without first taking off the front panel and then removing the DSP board. Once the RF board is out of the chassis, it is impossible to apply power to it and conduct any troubleshooting. The board may be operated outside the chassis only by fabricating a set of extender cables. It goes without saying that future repairs and/or hardware modifications to the RF or DSP cards of the Pegasus will be a bit of a challenge.

Another consequence of the compartmentalized chassis design is that external interface connectors wind up in places that might not seem appropriate. For example, I feel that the DB-9F serial connection should really be on the rear panel. However, doing so would compromise the isolation Ten-Tec has tried to maintain between the analog and digital circuitry by passing data cables past the LPF board. In the same vein, it seems that there's no good reason why connectors for the key and the line output are on the front panel. Again, the design of the unit (with as many components as possible mounted to PC boards to eliminate wiring) restricts their location to the front panel.

All cards in the Pegasus are etched on thick glass-epoxy circuit board stock. Surface-mount (SMT) construction practices are used only on the DSP and RF cards, on which the majority of devices are SMT components. All of the SMT components on the RF card are mounted to the side of the board facing the shield. As a result, the RF board looks deceptively simple on the side that's visible.

Access to the PA module and DC input card is possible by removing four screws that hold the rear panel to the chassis. With the exception of the high-current DC power feed to the PA module and the coax cable to the antenna jack, all wires to this sub-assembly are connectorized. Troubleshooting the assemblies on this panel should be relatively simple. The low-pass filter card can only be accessed by first removing the rear panel as described above. The LPF board uses conventional leaded components.

When the Pegasus ships from the factory, the package contains all the electrical connectors the user will need to interface his or her external equipment to the radio. In addition to a power and RS-232 cable, Ten-Tec includes a microphone connector, an empty two-conductor power connector (to make a custom power cable), a phono plug, a 1/8 inch stereo plug for the Line Output or Key jack, and an interface cable that provides line-level transmit and receive audio, as well as a PTT line. This audio cable should be very useful when connecting the Pegasus to a computer sound card or an external modem.

The Rest of the Story

This in-depth look at the Ten-Tec Pegasus was too long to run in one issue. We will continue in Part II with our performance tests, both in the lab and on the air. ■

Most antenna optimizing programs do a great job of helping you design a single, specific antenna. However, they're little help in developing general antenna designs. K6STI offers an approach to solving this problem.

Global Optimization of Yagi Designs

BY BRIAN BEEZLEY,* K6STI

You're hiking. You decide to check out a ridgetop to see if it looks like a good site for this year's Field Day. As you head off, fog moves in. Soon you can see only a few feet in front of you. No problem, you simply head uphill. As you reach the crest, the sun breaks out. But instead of the summit, you find yourself on a little knoll partway down the ridge. You've reached a *local* peak. The highest point of the ridge, the *global* peak, is visible off to your left.

Optimization of antenna designs is subject to a similar problem. Optimization seeks a maximum of some kind. For the hiker it was elevation. For antenna design it may be forward gain, front-to-back ratio, input impedance, SWR (seek a minimum), or some combination of these. Whenever knowledge is limited to local information, optimization may fail to locate the highest overall point—the global peak. In fog, hiking information is limited to the local terrain slope. You can't see distant points. When optimizing antennas, information is limited to the performance of the current design. Just as you can't see a distant ridgetop, you can't determine the performance of a different antenna design without computing it.

When hiking in fog, you may fail to reach the summit whenever the terrain isn't smooth. Antenna optimization may miss the global optimum whenever the performance space is irregular. When fog clears, it's easy to tell whether you've reached the very top of a ridge. Your eyesight instantly provides elevation information at a great number of individual ground locations. However, there is no such global vision for antenna design.

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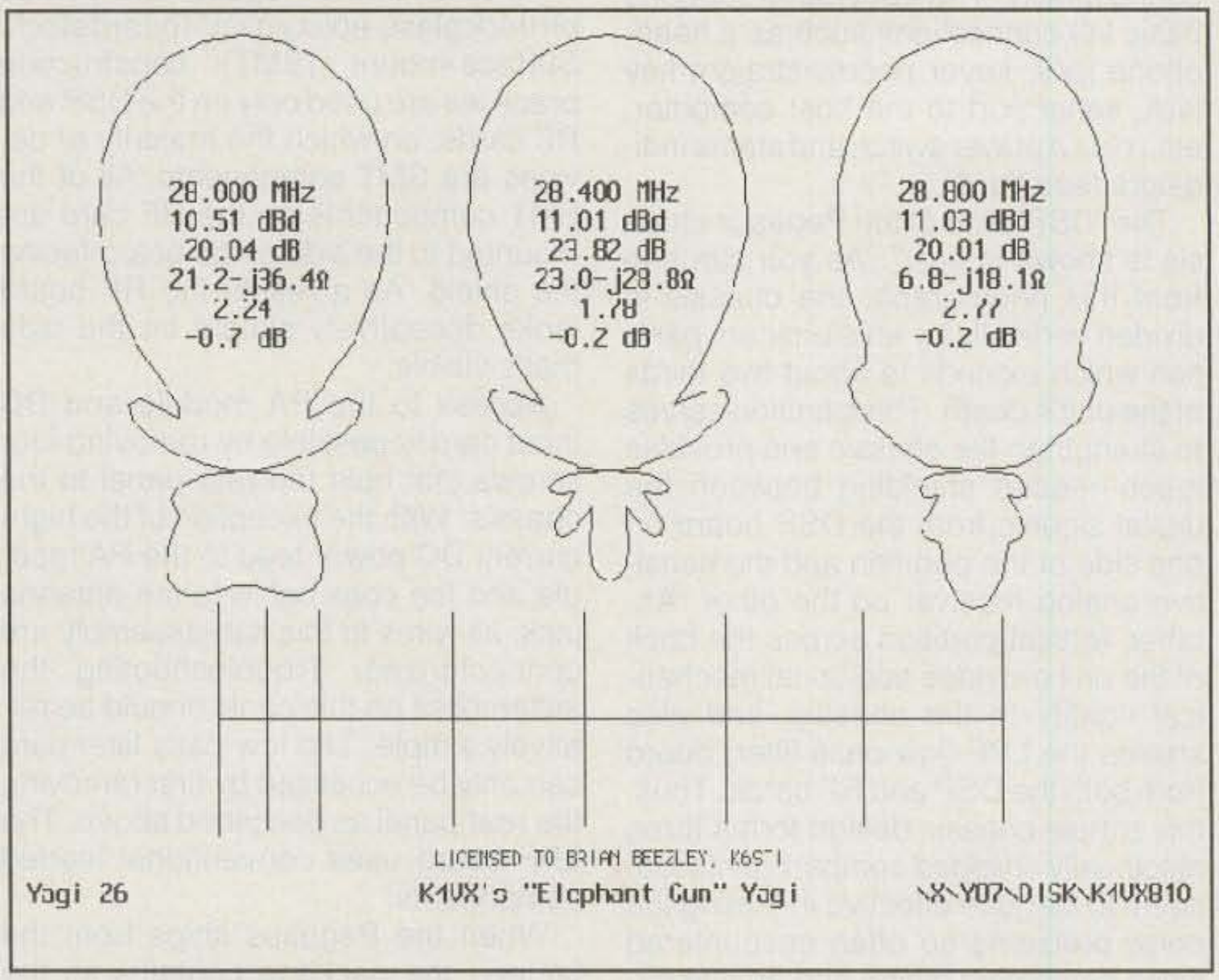

Fig. 1– Original design characteristics of a K4VX 10 meter Yagi.

How can you tell whether you've reached a global peak or a local peak? Without doing an exhaustive search of the entire performance space, you can't be certain. One confidence test is to *re-optimize* from different starting points. You might send several hikers up from different locations around the base of a fogged-in ridge. If all converge at the same peak, you have some evidence it may indeed be the global peak. In antenna optimization you can try various initial antenna geometries and see whether the optimized designs are identical. If so, you can't be positive no better design exists, but the more designs you try and the more varied you make them, the greater your confidence.

Yagi designs with just a few elements generally can be locally optimized for simple objectives with little chance of missing much performance. The performance space for such designs usually has few local peaks, and the performance at local optima generally is not far from that at the global optimum. As the antenna and optimization criteria become more complex, however, all bets are off.

Here's an example of complex optimization criteria for a simple Yagi. Find the 4-element, 20 meter Yagi that maximizes forward gain on a boom no longer than 35 feet, with the largest backlobe no less than 20 dB down, SWR below 2:1 across the band, input impedance no

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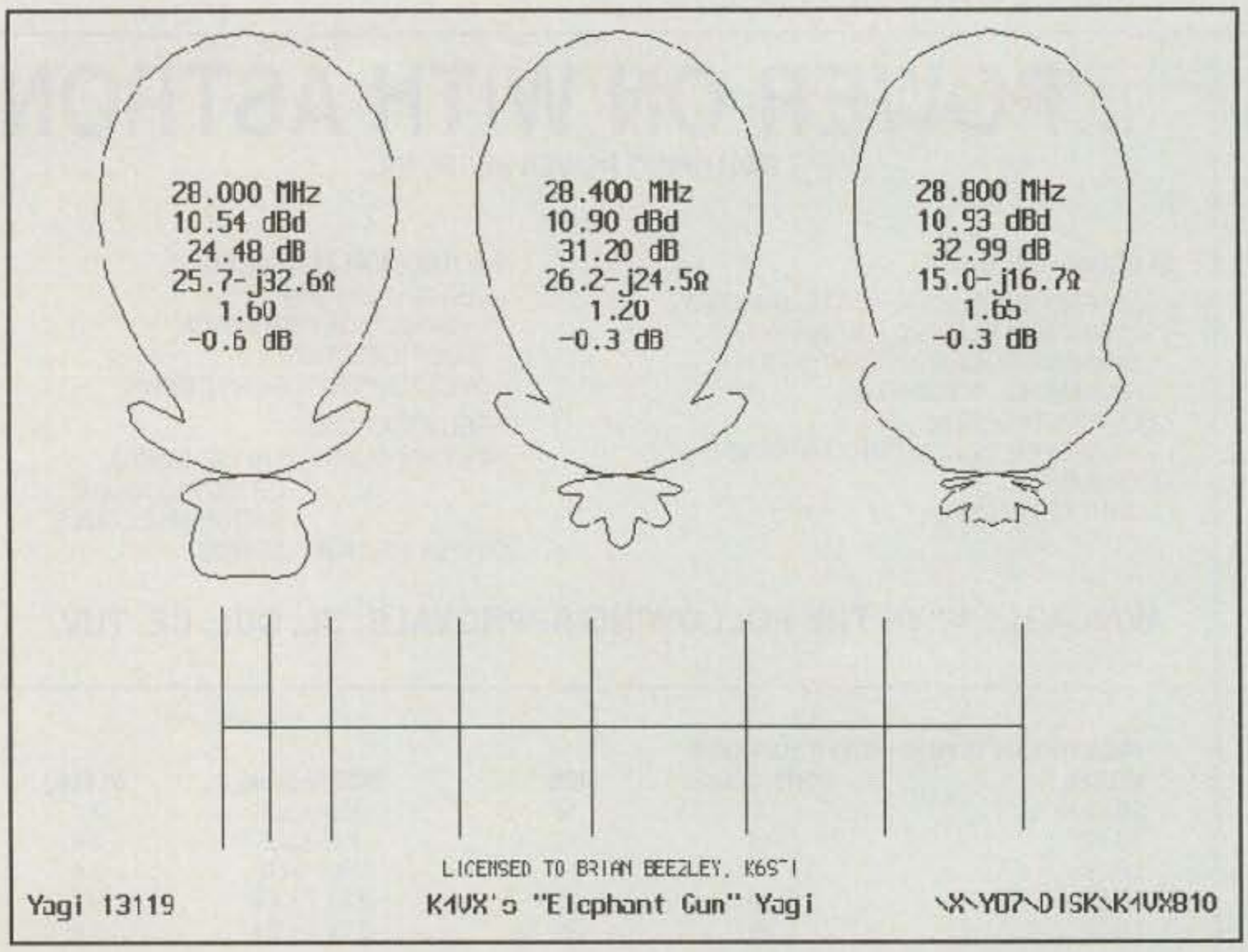

Fig. 2– The K4VX design after local optimization.

less than 10 ohms, and a reflector no longer than a specified length (you broke a tip and can't stretch it farther). It's unlikely the performance space for this problem has just one peak.

Local Optimization

Local optimization itself isn't trivial. In hiking, the most basic method is to head along the east/west axis until you can go no higher, then head north or south and do the same; head east/west again, and so on. You wouldn't actually do this when hiking, of course, because without obstacles it's just as easy to head obliquely uphill and ignore the compass. But to optimize an antenna that way you must simultaneously change two variables. For a two-element Yagi with a fixed driven element, for example, the east/ west axis might represent reflector length and the north/south axis reflector spacing. Although it's easy to alternately vary these dimensions to seek a performance peak, you'll find that doing so takes many iterations. If you've ever tried to dip and load a pi-network output circuit for maximum power into a reactive load (such as a tube-type transmitter or amplifier), you'll appreciate the difficulty of trying to adjust two interactive variables one at a time. It's better to change both at once.

To change more than one variable at a time, it helps to determine how the objective changes in the immediate vicinity (its slope). This is easy when hiking, but it requires extra calculation when optimizing an antenna. You must make a tiny change in each variable, with all others fixed, and calculate the performance sensitivity to that variable. With this set of sensitivities you can determine the slope and head uphill.

This method, known as the *method of steepest descent* (when seeking a minimum), is more efficient than simply changing one variable at a time. However, it has problems of its own along a narrow ridge where its path may repeatedly crisscross the ridgeline rather than run straight up it. (This does not happen when hiking uphill because there's no cost to continually reassessing the ground slope and adjusting your heading. When optimizing an antenna, though, it is computationally too expensive to recalculate the slope at each step. Instead, you head in the direction of maximum slope until performance levels off, there recomputing the slope, and repeat.)

Mathematicians have devised optimization methods more sophisticated than the method of steepest descent. Some don't even require slope calculation. While complicated, the best methods perform their calculations in a way that minimizes unnecessary crisscrossing of ridgelines and other wild goose chases.

I became interested in computer optimization of Yagis in 1987. The first time I analyzed a 4-element Yagi my coprocessorless 8088 system took 8 minutes to calculate forward gain and F/B (front-to-back ratio) at a single frequency. To optimize a design you changed a dimension by hand, waited for the calculation to complete, determined whether performance improved, retweaked the design, waited for recalculation, and so on. It was faster than experimenting with a real Yagi in your backyard, but it was insufferably slow. You settled for whatever performance you had when you finally ran out of

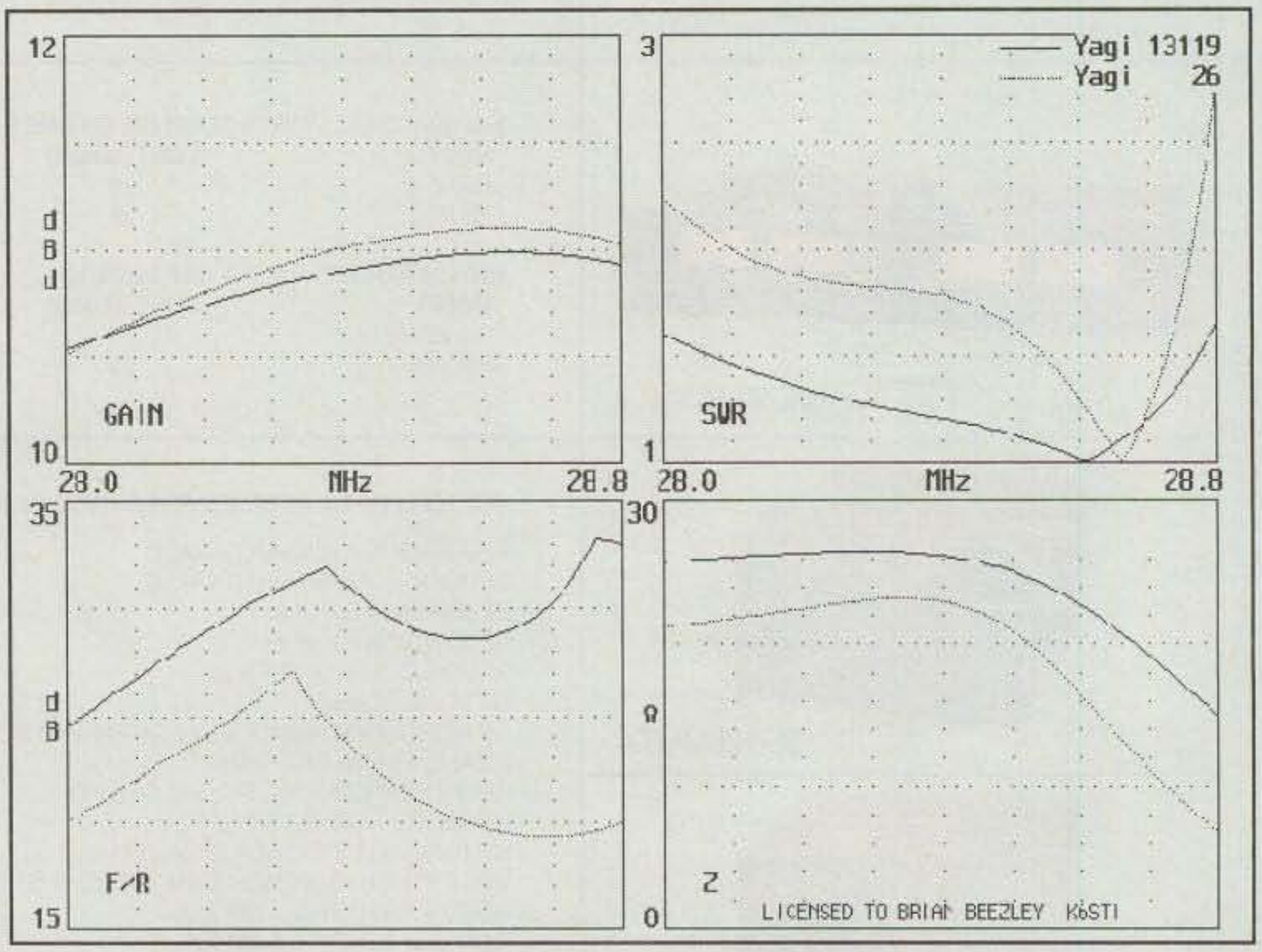

Fig. 3– Overlay of locally optimized design (solid) and original design (dotted).

patience, still somewhere on the slope of a performance peak.

Global Optimization

Today with a computer that costs less than my 8088 did, in seconds you can automatically find a local optimum for gain, pattern, SWR, and impedance at multiple frequencies for the largest HF Yagi you'd care to build. If your patience extends beyond the immediate moment, you can launch a search for the global optimum.

A search is necessary to find the global optimum, because Yagi performance for one set of dimensions in general cannot predict performance for another. You must recalculate. Now experience tells you that making small changes in antenna dimensions seldom, if ever, results in an abrupt change in performance. While the dimensions of some designs may be critical, performance varies smoothly if you alter them slowly enough. Not all complex systems behave this way (the weather doesn't), but Yagis do. This means to be reasonably sure you haven't missed the best possible design, you don't have to try an infinite number of possibilities. If you can come close, a quick climb up the hill with a local optimizer will land you on the global optimum.

The hiking example has two variables or two dimensions. You can think of them as distance along the east/west axis and distance along the north/south axis from the starting point. The two coordinates determine the elevation at any point. An exhaustive search with, say, 10 foot resolution in each dimension over the entire ridge might be out of the question when seeking a Field Day site (Why not just wait for the fog to clear?), but is often done when searching for a missing person. Similarly, it wouldn't take long to search in small steps for the best reflector length and spacing for a 2-element Yagi. Two-dimensional exhaustive search can be practical.

Exhaustive Search

Now consider a 6-element Yagi. Let's assume element diameter is determined by mechanical considerations and is fixed. That leaves six lengths and five spacings to vary. Somewhere among those eleven dimensions is the very best design according to whatever design criteria you choose to apply.

What does it take to do an exhaustive search for the best 6-element 20 meter Yagi? Let's say you believe that if you come within four inches in element length and two feet in element spacing you can then light off your local optimizer and climb the nearby global peak. Let's also assume that you have good reason to believe that optimum elements will be between 0.38 and 0.54 wavelength long and won't be spaced closer than 0.03 wavelength. Finally, assume that the boom length is limited to 65 feet. With these assumptions a quick back-of-the-envelope calculation yields roughly 10,000,000,000,000 possible Yagi designs. That's 10 trillion, each of which you must optimize locally to find the globally optimal design.

You can tighten the dimension constraints and recalculate the numbers, but I think you'll still conclude that exhaustive search is out of the question. For example, even if you somehow manage to reduce the number of candidate designs by a factor of one million, that still leaves 10 million Yagis to locally optimize. And the numbers get much worse for larger Yagis.

Is there any way to reduce the number of candidate designs?

Design Rules

All Yagis look pretty much alike. Elements lengthen more or less regularly from front to rear. They are distributed more or less uniformly along the boom, although sometimes you find the first few bunched near the reflector. What you don't find is highly irregular spacing with gaps, sudden jumps in element length, and so on. There are good reasons such odd designs aren't successful, but it's not necessary to understand the electromagnetics. A little time spent doodling with an antenna analysis program and a collection of Yagis will convince you that there's some sort of basic pattern in good designs.

With this insight you might try to create a few simple rules based on the general uniformity of good designs. You hope to tighten the limits on element dimensions and make exhaustive search practical. For example, you might insist that element lengths decrease monotonically, that element spacing varies regularly, or some other reasonable constraint. Still, as suggested above, I think you're unlikely to reduce the candidate designs to a manageable number. There's also one great danger: What if hidden away in performance space are terrific Yagi designs that happen to violate your rules?

It's happened. Sometime in the 1970s, James Lawson, W2PV, who pioneered amateur Yagi design on computers, decided that good Yagis could be restricted to those with uniform element spacing. From his work on mainframe computers, which probably was not interactive, he concluded that there was no advantage to non-uniform element spacing. He was wrong, and none of the innovative designs he published in the 1980s are today state-of-the-art.

Another example is the Optimized Wideband Antenna, or OWA, developed a few years ago by Jim Breakall, WA3FET. This design uses a very

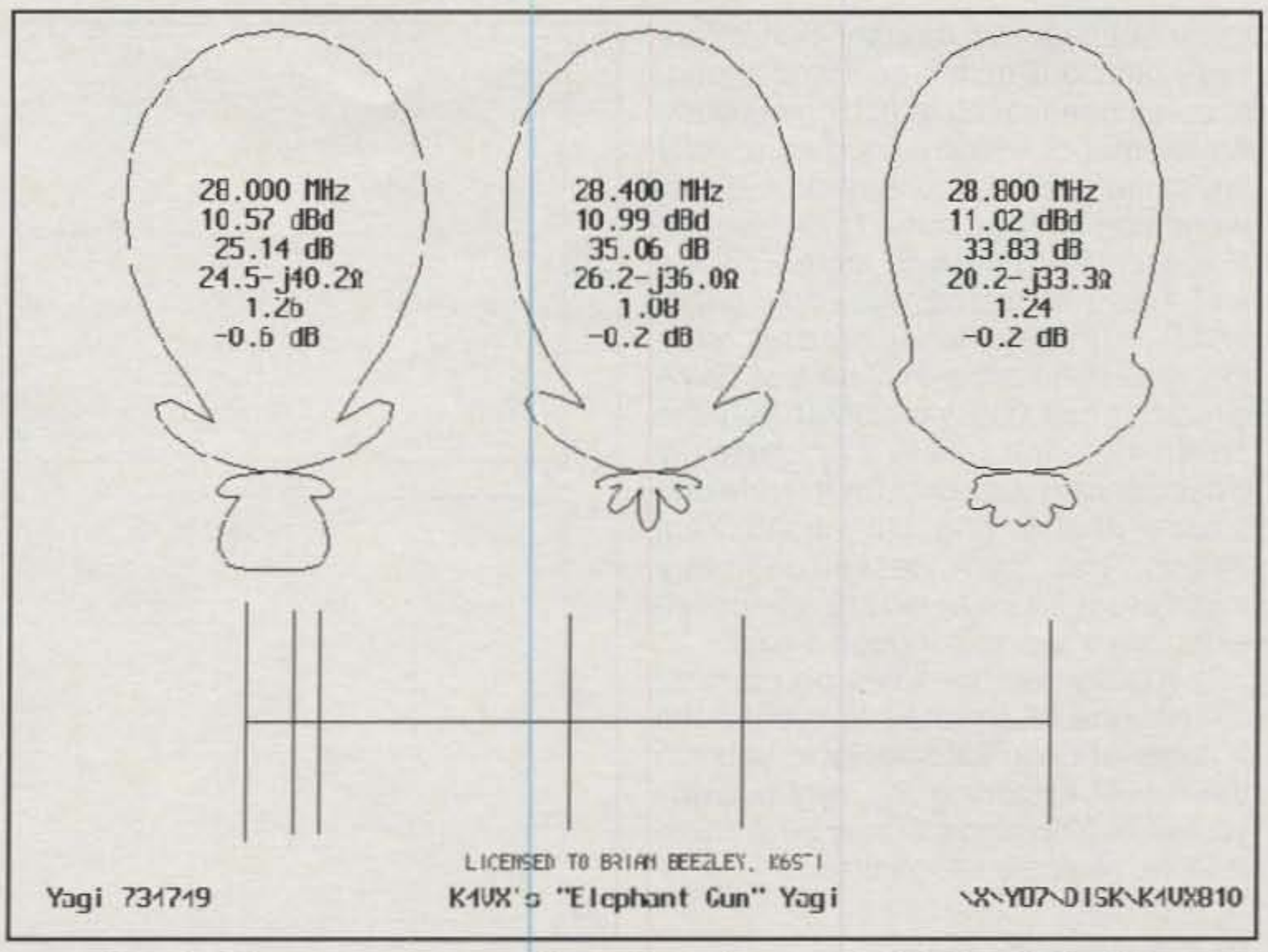

Fig. 4– The same antenna after a few minutes of global optimization.

close-spaced first director that effectively functions as a broadband impedance-compensating matching network. A 4-element OWA provides essentially the same gain and pattern as a 3-element Yagi on the same boom length. However, SWR for a 40 meter OWA is less than 1.3:1 across the entire band, and feeding the antenna requires nothing more than a balun. The first OWA director is just .035 wavelength from the driven element. I think this unusually close spacing accounts for the late discovery of this odd but useful Yagi design. The OWA design geometry might easily be excluded in a rule-based exhaustive search for good Yagis.

If you tighten the limits on element dimensions in an effort to reduce the number of candidate designs, you run the risk of excluding the very designs you seek. You also still may be left with millions of Yagis to optimize.

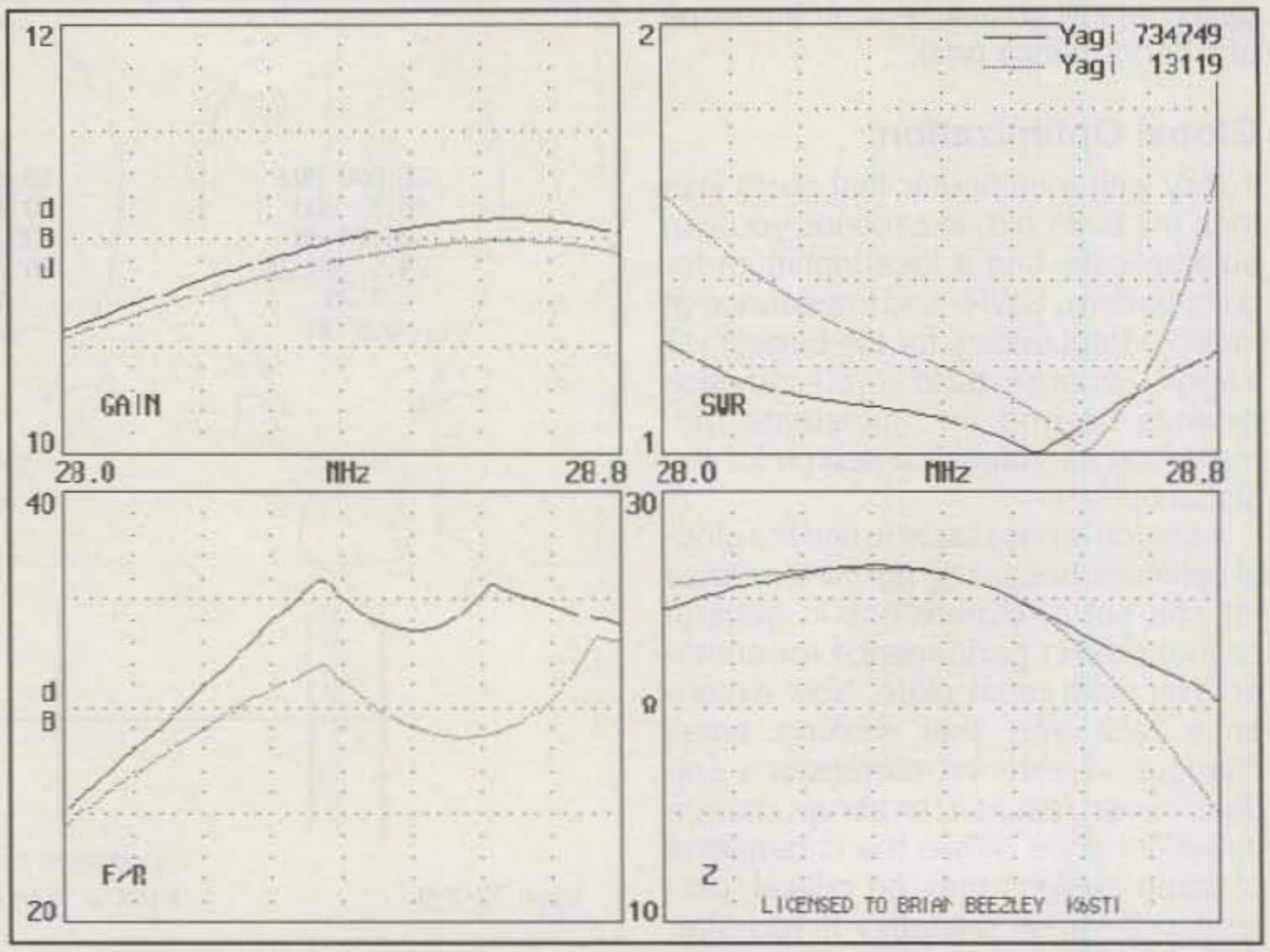

Fig. 5– Overlay of globally optimized design (solid) and locally optimized design (dotted).

Stochastic Search

An approach that takes advantage of the uniformity of good Yagis without excluding pleasant surprises is the following: Start with a good design, randomly alter its dimensions, and then locally optimize the result. If the performance of the newly optimized design is better, keep it. If not, throw it away and generate another random trial. Repeat this process indefinitely. This method, called *stochastic search*, is simple but powerful. (Stochastic is a mathematical term applied to random processes.)

The statistical properties of the random numbers that alter dimensions determine the range and density of the random search in performance space. In particular, a bell-shaped Gaussian distribution excludes no region, but clusters trial designs about the current design. The standard deviation (width of the bell) controls the clustering and novelty of the trials.

This scheme comes no closer to examining all possible designs than does systematic exhaustive search. It does, however, have several desirable properties.

First, stochastic search takes advantage of the similarity of good Yagi designs by always starting from one and by evolving each trial design from it in a controlled way.

Second, it's easy to tailor the search spectrum. Long Yagis with good performance generally look very much alike. Small dimension variation is all that's needed to root among the numerous local optima these designs typically exhibit. Smaller Yagis require wider searches for designs of exceptional performance in unexpected places. And because their performance spaces are smoother, small Yagis can better tolerate sparse distribution of design trials.

Third, exhaustive search must start at one corner of performance space and systematically work its way across all possible dimensions. (If it doesn't, it's burdened with keeping track of everything it's tried.) You can't stop exhaustive search early without excluding entire regions and classes of Yagis. In contrast, stochastic search is unordered with no beginning or end. It sprays trial designs every which way. When you interrupt it, you're merely limiting the density of the search, not its range or reach.

A Real-Life Example

Fig. 1 shows the performance of a 10 meter Yagi designed some years ago by Lew Gordon, K4VX. This Yagi has eight elements on a 58 foot boom and is described in the *ARRL Antenna Compendium, vol. 3*. The numbers within the patterns are frequency, forward gain, F/R (ratio of forward power to that of the largest lobe in the rear half-plane), input impedance, SWR when optimally matched with a broadband matching network, and an approximate figure for the difference between forward gain and maximum-possible gain for the boom length.

Fig. 2 shows the performance after a quick local optimization with the YO 7.0 Yagi Optimizer. Fig. 3 compares the optimized design (solid traces) and the original (dotted traces) over the operating bandwidth. The optimization criteria placed roughly equal importance on forward gain, pattern, and SWR. The optimizer traded 1/10 dB forward gain for smaller backlobes and lower SWR.

Fig. 4 shows the performance after a few minutes of global optimization on a Pentium-100 with YO 7.0's stochastic search. Fig. 5 graphs the globally optimized design (solid traces) and the locally optimized design (dotted traces). Stochastic search discovered a design that reclaimed the lost gain and improved the pattern and SWR still more. Had I let the global optimizer run longer, it may or may not have come up with something even better.

This example is typical of what global optimization can do. Seldom will it provide dramatic improvement in forward gain. A few tenths of a dB is all you're ever likely to see when starting from a good design. Pattern quality is another matter. Many Yagis have good patterns over a narrow frequency range but degraded performance away from the central design frequency. SWR often behaves the same way. Some commercial Yagis address this problem by providing tuning charts that let you assemble the antenna for best performance in one part of a band. One benefit of global optimization is that it may permit you to extend the narrowband performance of a favorite design across an entire frequency band.

Happy hiking! ■

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2. **Single Operator Assisted, All Band Only.** One person performs all operating and logging functions. The use of DX spotting nets or any other form of DX alerting assistance **is** allowed. The operator can change bands at any time. Single operator stations are allowed only one transmitted signal at any given time.

3. **Multi-Operator, Single Transmitter.** All band entry only. More than one person operates, logs, checks for duplicates, use of a spotting net, etc.

(a) Only one (1) transmitter and one (1) band permitted during the same time period (defined as ten [10] minutes). Once the station has begun operation on a given band, it *must* stay on that band for 10 minutes; listening time counts as operating time.

Exception: One—and only one—other band may be used during the same time period if—and only if—the station worked is a new multiplier. Logs found in violation of the 10-minute rule automatically will be reclassified as multi-multi to reflect their actual status.

4. **Multi-Operator, Multi-Transmitter.** All band entry only. No limit to the number of transmitters, but only one (1) signal per band permitted.

(a) All transmitters must be located within a 500 meter diameter or within the property limits of the station licensee's address, whichever is greater. The antennas must physically be connected by wires to the transmitter.

V. **Entry Categories:** Single Operators may enter as (a) All Band High Power or Low Power; (b) Single Band; or (c) Single Operator Assisted All Band.

Multi-Operators may enter as (a) Multi-Op Single Transmitter, High Power or Low Power, All Band; or (b) Multi-Op Multi-Transmitter, All Band.

VI. **Modes:** Contacts may be made using Baudot, ASCII, AMTOR, PACTOR (FEC & ARQ), CLOVER, and Packet (no unattended operation or contacts through gateways or digipeaters).

VII. **Bands:** 80, 40, 20, 15, and 10 meters.

VIII. **Valid Contacts:** A given station may be contacted only **once** per band regardless of the digital *mode* employed. Additional contacts are allowed with the same station on each of the other bands as well.

IX. **Exchange:** Stations within the 48 continental United States and the 13 Canadian areas must transmit RST, State or VE area, and *CQ* Zone number. All other stations must transmit RST and *CQ* Zone number.

X. **Countries:** The ARRL and WAE country lists will be used.

Note: The USA and Canada count as country multipliers. *Example:* The first US State and Canadian area you work not only count as a multiplier for the state or area, but also count as a country multiplier for each band.

XI. **QSO Points:** One (1) QSO point for contacts within your own country. Two (2) QSO points for contacts outside your own country but within your own continent. Three (3) QSO points for contacts outside your own continent.

XII. **Multiplier Points:** One (1) multiplier point for each US state (48) and each Canadian area (13) on each band. One (1) multiplier point for each DX country in the ARRL and/or WAE lists on each band. *Note:* KL7 and KH6 are country multipliers *only* and *not* state multipliers. One (1) multiplier point for each *CQ* Zone worked on each band. Maximum of 40 Zones per band.

Note: Canadian areas are VO1, VO2, VE1 NB, VE1 NS, VE1 PEI, VE2, VE3, VE4, VE5, VE6, VE7, VE8 NWT, and VY Yukon.

XIII. **Final Score:** Total QSO points times the total multipliers equals the total claimed score.

XIV. **Contest entries and logging instructions:** CQ WW RTTY DX logs and forms should be used to facilitate scoring and checking. All logs **must** show:

1. Times in UTC.

2. All sent and received exchanges are to be logged (callsign, RST, Zone, country, State/VE, points claimed).

3. Indicate State/VE area, Zone, and Country Multiplier only the *first* time they are worked on *each band.*

4. Use a separate log sheet for *each band.*

5. A check list of duplicate contacts for *each band* (dupe sheet). Logs must be checked for duplicate contacts, correct QSO points, and multipliers. Submitted logs must show duplicate contacts clearly marked.

6. A *multiplier* check sheet for each band.

7. An overall *summary sheet* showing total QSOs, Points, Zones, Countries, and States/VE areas worked.

8. Each entry must be accompanied by a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

Contest forms are available from *CQ.* Please include a large SASE with two units of US first-class postage or IRCs.

9. **Disks:** Logs may be sent on disk. Clearly label the outside of the disk with the call, file names, and type of program. All disks **must** be accompanied by a printed summary sheet, **not** the entire log.

10. **E-mail:** Logs may be e-mailed to: <cqwwrtty@kkn.net>.

XV. **Disqualifications:** Operating in an unsportsmanlike manner, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are grounds for disqualification. The use of non-amateur means such as telephones, telegrams, the internet, etc., to elicit contacts or multipliers **during** the contest is unsportsmanlike, and

the entry is subject to disqualification. Actions and decisions of the Contest Committee are official and final.

XVI. **Awards:** Plaques will be awarded to the first-place finishers in each of the operator classes. Certificates will be awarded to second and third places. Certificates will be awarded to the first-place finishers in each DXCC country. In countries or sections where returns justify, certificates may be awarded to second and third place. All scores will be published. To be eligible for an award, a Single Operator station must operate a minimum of 12 hours, and a Multi-Operator station a minimum of 18 hours. A Single Band entry is eligible for a single band award *only*. If a log contains more than one band, it will be judged an an all band entry, unless specified otherwise. All certificates and plaques will be issued to the licensee of the station used.

XVII. **Deadline:** All entries must be postmarked **no later** than December 1, 2000. An extension may be given if requested. Logs should be mailed to: CQ RTTY DX Contest, 25 Newbridge Road, Hicksville, NY 11801 USA (or e-mailed to: <cqwwrtty@kkn.net>).

XVIII. **Plaques (Donors):** Single Operator and Multi-Operator All Band plaques are awarded to the high scorer, either High Power or Low Power, whichever is highest.

Single Operator, All Band, High Power
World—Nick Smith, W4GKM
North America—TG9VT Memorial by K1RY & W2JGR
Europe—HAL Communications Corp.
Asia—Don Busick, K5AAD
Africa—Doug Faunt, N6TQS
United States—John (Bob) Orton, WA6BOB

Single Operator, All Band, Low Power
World—Amateur Radio Trader
North America—Dick Stevens, N1RCT
South America—Doug Faunt, N6TQS
Europe—Don Hill, AA5AU
Asia—Bruce D. Lee, KD6WW
Oceania—Dave Barr, K2YG
Africa—Bill Gallier, W4WX
USA—The New RTTY Journal

Single Operator Assisted
World—*CQ* Magazine
North America—Barry Kutner, W2UP
Europe—The New RTTY Journal
Asia—ICDXA
Africa—John Fleming, WA9ALS
South America—Great Lakes DX and Contest Club (K9PXV)
USA—RTTY by WF1B

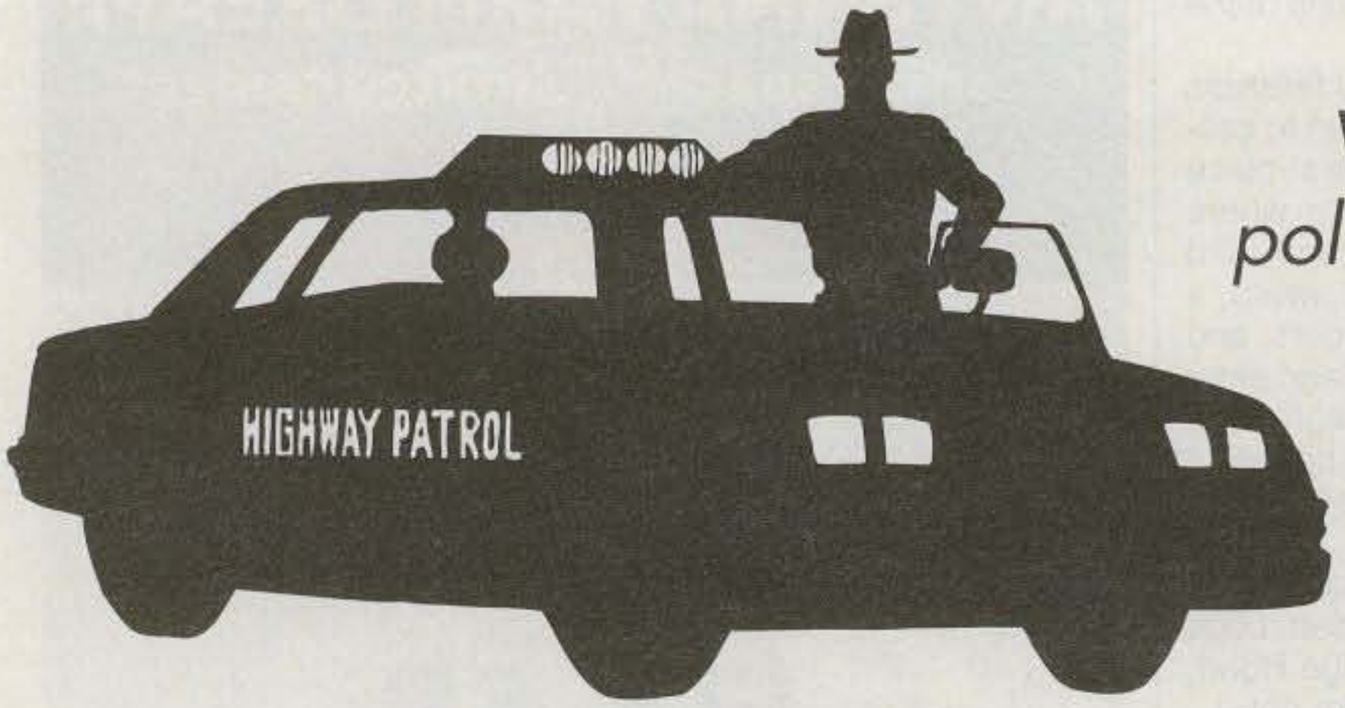
Single Operator, Single Band
3.5 MHz—Neal Campbell, K3NC/ON9CNC
7.0 MHz—Tri-County DX Association
14 MHz—Kunihiko Fujii, JH1QDB
21 MHz—Denis Catalano, W4DC & Mike Trowbridge, KA4RRU
28 MHz—N1JJ, Johnson Joules Contest Club

Multi-Operator, Single Transmitter, High Power
World—Amateur Radio Trader
North America—Larry Lindblom, WØETC
USA—Bob Brehm, AK6R
Europe—Rodrigo Isola Tarikian, PY2KC/PW2C
Asia—Tom Moore, WB8RPK

Multi-Operator, Single Transmitter, Low Power
World—HAL Communications Corp.
North America—Jim Mortensen, N2HOS
Oceania—Sam Leslie, W4PK
South America—Tom Morton, K6CT
Europe—Euraf Communications, Benin (by Peter Schulze, TY1PS)
USA—WriteLog for Windows

Multi-Operator, Multi-Transmitter
World—*CQ* Magazine
North America—The New RTTY Journal
Europe—The W3LPL RTTY Contest Group

There are many plaques available for sponsorship. If you are interested, contact CQ RTTY Contest, 25 Newbridge Road, Hicksville, NY 11801 (e-mail: <cqmagazine@aol.com>).



What can you do when policemen assume the role of the FCC? K7RI found out that one answer lies in using the political system to educate the police.

You CAN Fight City Hall—and Win

BY THOMAS J. OWENS,* K7RI

Operating an amateur radio station can be an enjoyable pastime. One's interests within the hobby are likely to evolve over the years, but there is something of appeal for practically everyone. However ...

A Knock At The Door

If you have ever operated from a highly populated area, you know that neighbors have a variety of electronic devices that can take on minds of their own. Although not designed or intended to receive amateur radio signals, much to our chagrin they often become unwanted interlopers that eavesdrop on our transmissions.

In a recent Public Notice the Federal Communications Commission (FCC) stated that most complaints of interference to radios, stereos, televisions, and telephones are not due to violation of any FCC rule. Rather, they are most often attributable to the design or construction of the products themselves. The Commission concluded, therefore, that responsibility for resolving such interference problems lies with the product manufacturers and consumers, not the amateur. The consumer must contact the manufacturer for a remedy.

Unfortunately, most people find that difficult to comprehend, let alone accept. They maintain that the fault lies with the amateur whose signals they are receiving. Herein lies the problem for most hams. Their equipment is performing as designed, they are operating legally, and they are in full compliance with all regulations. Nevertheless, the blame all too often falls upon them.

Some people will come and calmly talk to you about radio frequency interference (RFI). Others who knock may be a bit more agitated, but are civil and willing to have a constructive conversation. In both cases, the amateur can begin by making sure that the person is actually receiving his or her signals. That's a good starting point.

Most hams are willing to help reasonable neighbors try to find a workable solution. I have an offer I make to neighbors who grace my doorstep with an RFI complaint. Over the years it has worked well for me. After introductions and listening to the person verbalize his or her woes, I make a statement something like this:

The Standing Offer

Mike, I've been licensed by the Federal Communications Commission as a ham radio operator since 1962. My wife and I have lived here 27 years, and I've operated my station in this house that entire time. As you can probably guess from the tower and antennas, I've got some money tied up in it. It's my hobby, like someone else's yacht or sailboat.

I'm gonna be honest with you, Mike. You're not the first person to come to my door. Over the years other neighbors have had similar difficulty. Believe me, I want the problem to go away as badly as you do.

My interest is contesting, talking to people all over the world. Contests are on weekends and last Friday night through Sunday evening. There are 365 days in a year. My contests take up about 10 of them. I also have a schedule with a friend in New York every Sunday morning after church. It starts at about 10:30 and lasts about an hour. Other than that, I'm almost never on the air.

Mike, there are two ways we can go. We can run a bunch of tests and try to see if we can identify the cause of the interference and eliminate it. There are all kinds of variables, and the testing could easily take 10 to 20 hours, or more, for each of us. Most home electronic devices are not manufactured with adequate filtering, so I can't guarantee we'll be able to solve the problem. Even so, if you want, I'm willing to try.

Here's an alternative. It works for many people. If you're gonna have company, a party, or whatever, let me know in advance. Other than contests and my Sunday morning schedules, I'll put it on my calendar and simply stay off the radio. If you like, I can let you know ahead of time when the contests are. And if I'm on some other time and it's bothering you, call me and I'll shut down. Does that sound fair?

In my experience, most folks these days do not want to take time to diagnose the problem and try to solve it, especially when they understand what may be involved. With an ever-increasing number of dual-income families, time has become a more precious commodity. Accordingly, compromise is often more palatable. Regardless of the choice, it is always a good idea to get each person's name, address, and phone number for follow-up purposes. A short, handwritten note thanking them for bringing the matter to your attention is a nice touch that can pay dividends in terms of goodwill.

If your operating habits are different, this approach may not work for you. In that case, you may want to encourage the first option—trying to track down

3955 Southwest Ida Street, Seattle, WA 98136

and resolve the interference problem. In any event, it always pays to be as friendly and cooperative as possible with your neighbors.

Encounters of Another Kind

There is another type of person who is more difficult to satisfy. For reasons known only to them, they never mention a word about the problem to the amateur. Instead, they stew in their juices, become increasingly agitated, and finally reach critical mass. Then they complain to anyone and everyone who will listen. Often, this is the FCC. The amateur, at this point, has no idea who the complainants are, or even that they exist. Eventually, the ham may hear from the FCC, but sometimes the neighbor stays closer to home and complains to the local police. That's what happened to me.

About 10 o'clock at night on Saturday, November 18, 1995, I was sitting in my kitchen musing over a new jigsaw puzzle, a seemingly benign activity. Downstairs a fellow ham was guest operating my station in the ARRL Sweepstakes.

Tap. Tap. Tap. A faint knocking sound came from outside. It sounded as if it was coming from the side of the house. I went to the front door to see what was happening. Two policemen were standing next to the basement window. A man and woman whom I did not recognize were standing behind them. The police officers came to the door, but the couple remained by the window. Neither officer bothered to introduce them. We'll just call them Mr. and Mrs. Uptight. Had the pair spoken with me in the first place, chances are everyone would have had a better taste in their mouths. As it stands, I have no idea who they were or how to contact them. In all likelihood, the Uptights are still uptight.

Prove It

For the sake of discussion, we will call the police officers Jones and Smith. Jones did most of the talking. He said neighbors had complained of radio interference in their telephone and stereo. Jones asked, "How much power are you running?" Although I knew that was a question that more appropriately would be asked by the FCC, I nevertheless responded, "a little less than 1500 watts." I pointed out that my station is licensed by the FCC and may run that amount of power. By this time the guest operator was also at the door, as the officers had told him through the basement window to quit operating and come out to speak with them. Jones said, "Show me something that says you can run 1500 watts."

The ensuing conversation was getting nowhere, so I invited them into my home. I figured showing them a copy of my FCC license and *FCC Rule Book* would satisfy them that I am, indeed, appropriately licensed and my station is authorized to run up to 1500 watts.

The four of us went to the radio room. The Uptights remained outside. Jones and Smith said they had witnessed interference on the neighbor's telephone and stereo and were not going to permit it to continue. It is possible that these people were receiving our transmissions, but there was no way to know for sure. There is a Citizens Band station up the block with a 50 foot tower and Yagi. Could that installation have been the culprit? Apparently, that possibility never occurred to the two officers, nor to the man and woman.

I handed Jones a copy of the *FCC Rule Book*. Power is clearly discussed on page 9-4. Smith was across the room and made some challenging comment about my right to operate my station. To assure them I was legally licensed, I asked Smith to look at my license. It was clearly posted on an ink board no more than three feet from where he stood. In that way the officers could take down my name and call letters in order to check with the FCC if they felt a need to verify my assertions. Neither of them made any attempt to look at the license. Jones did look at the rule book, but gave no indication as to whether or not he read the section on power. He muttered something like "power" as if scanning the table of contents. I'm not sure if he read the section or not, as I was looking at and talking to Smith at the time.

An Ultimatum

We reiterated that we were operating legally and pointed out that the FCC regulates radio transmissions. We explained that it has long been established in the courts that the federal government regulates radio stations and local authorities have no jurisdiction over such operations. The FCC, we said, would be the proper place for any such complaint, not the police. Apparently, that did not sit well with Jones and Smith.

They told us to turn down our power or quit operating. Otherwise, they said, "We will come back and issue you a citation." That didn't leave much wiggle room for someone competing in the high-power category. The impression clearly was conveyed that they were going back to the Uptight household,

and if there was any more interference, they would return.

"On what grounds?" we asked. The officers looked at each other pensively for a moment. One of them responded, "For making noise." Seattle, where I live, has a noise ordinance that governs audio in excess of certain decibel levels. Efforts to explain to them that RFI is neither audio nor "noise" met with deaf ears. Smith said, "If you don't like it, you can go to court."

The entire incident consumed at least an hour of critical operating time, perhaps more. This was time that could better have been spent in a constructive dialog with Mr. and Mrs. Uptight, had they been introduced and willing to sort things out. At one point, near the end of the encounter, Smith interrupted me and told me to "shut up!"

Intimidation is one thing. Patently rude behavior is another. The two in concert exhausted my patience. I said, "Come back if you feel you have to. If you do, the first thing Monday morning I'm going to call the head of Internal Investigations and file an official complaint. Now, I'd like you to leave." Smith made some sarcastic remark, and then Jones said, "Well, I can see we aren't getting anywhere here." Then they left.

My guest operator and I discussed what had happened and decided not to be badgered in this manner. The contest was resumed with full power. Both of us felt that we would be seeing Jones and Smith later that night, but they did not return.

On Second Thought

Over the balance of the weekend the officers' demeanor did not sit well with me. The event caused me to ponder what we are coming to if police can take the attitude "I don't care if I have authority; I'll force you to go to court and prove at your expense that you're right!" On Monday, November 29, 1995 I sent the following letter to Seattle Mayor Norman Rice. Attached were notes detailing the incident.

Dear Mayor Rice:

Congratulations on your recent award as the nation's most humorous mayor. Great job.

This letter, however, is not about humor. Rather, it has to do with two Seattle police officers and their misbelief that they have authority to tell owners of federally licensed radio stations how they may or may not operate their radio stations.

Over the weekend I had a guest operator in my home operating my "ham" radio station. He was in compliance with all applicable federal regulations and was doing nothing illegal. About 10:10 PM, on Saturday, November 18, 1995, officers R. C. Jones and M. G. Smith [names changed and badge numbers omitted] came to my home regarding what they said was a neighbor's complaint about radio interference. My notes of the incident are enclosed for your perusal.

As Mayor of Seattle, you probably already know that it is the federal government (FCC) that has sole authority to make and enforce regulations pertaining to the operation of federally licensed radio stations. It is not my intent to file a formal complaint against the officers. Maybe they believed they were acting within the scope of their authority. However, as anyone familiar with applicable statutes and court decisions will attest, that simply is not the case.

Would you please ask the Seattle Police Department to establish a formal written policy for its officers that enables them to respond properly to such complaints in the future. This does not just impact me. There are thousands of other "hams" in Seattle who could just as easily have had the same experience.

I look forward to hearing from you. In the meantime, Happy Thanksgiving.

Sincerely ...

Over a month passed with *no* response. After several unproductive phone calls, I finally asked the mayor's office for names and addresses of all members of the city council. Perhaps a petition from several hundred hams to attend and address the next city council meeting might yield results. *Bingo!* That turned out to be the locomotive for action. On January 31, 1996 a letter arrived from the mayor. It said:

I share your concern that our police officers all be aware of the applicable federal statutes which regulate the operation and enforcement of federally licensed 'ham' radio stations. I have forwarded your letter to the police department and asked that their legal advisors coordinate with the City Law Department to research the federal statutes and devise police officer training bulletins on this issue to educate our officers.

Another month passed. A follow-up call to the mayor's office, on March 6, 1996, produced a phone call later that day from the chief of police's legal advisor. He was very cordial. During the ensuing conversation, he acknowledged that the officers were out of line and apologized for the incident. He said someone in his office would be appointed to research the topic to see what policy other police departments have for handling this type of situation.

A Policy At Last

On July 10, 1996, I received a nice letter from the person in charge of 911

operations for Seattle. Enclosed was a copy of the new written policy for Seattle's finest. It is Seattle Police Department Notice 96-54.1. Subject: Radio Frequency Interference Complaints. It reads:

Any Department personnel receiving complaints regarding RFI (radio frequency interference) such as that which might be created by HAM operators, television stations, CBers, etc., and results in interference with certain electronic equipment, such as cordless telephones, television sets, or other electronic devices, should refer those complaints to the Seattle District Office of the Federal Communications Commission (FCC) at 821-9037.

To be sure, the city moves slowly. Nevertheless, patience and persistence paid off. The city of Seattle is to be congratulated for addressing the issue and promulgating the above policy.

This concludes the saga of the harried hams. There are two morals. First, do not succumb to this type of intimidation. Doing so sets a dangerous precedent for ham radio, not to mention the civil liberties of the populace as a whole. Some police intrusions and ultimatums are legal. Others are not. Second, when you're up to your *** in alligators, it's difficult to remember that the main objective is to drain the swamp—in other words, in this case to dissipate neighbor discord. *Don't lose track of that goal.*

The following steps can help.

1. Put yourself in the other person's shoes. Approach all RFI complaints with an open mind and sincerely try to resolve problems to the neighbor's satisfaction. Do everything reasonably expected, and more, even though the problem may not be your fault.

2. Consciously strive to make friends with the complainants. Invite them to see your station and involve them in the solution. Who knows? Maybe they will end up seeing your side and soften an otherwise hard-line position.

3. Enlist the support of technically competent fellow amateurs who are more objective than either you or your neighbor. Their help will be invaluable if the neighbor opts to run tests, as that will require you to operate your station and someone else with technical knowledge to observe the interference and come up with some suggestions on how to resolve it certainly may be of help.

4. Thoroughly document all conversations and actions taken. After receiving an RFI complaint, it is a good idea to keep a written log of all future transmissions. Ask the neighbor to write down dates and times of the interference, what device is being affected ,and the symptoms observed. This can be important, especially if there are other sources of RFI in the immediate area. It is possible your neighbor may be receiving someone else's transmissions and erroneously you are blamed.

5. If the FCC becomes involved, cooperate fully. Budget considerations preclude Commission engineers from coming out often these days, but such a visit actually can result in a clean bill of health for your station. This happened to me on two occasions several years ago. In both cases the fault was found to be defective equipment in a neighbor's home.

In closing, happy hamming and keep on smiling! ■

You've heard of microwave ovens and microwave popcorn, but what is a "microwave vacation"? And how about volcanic ash scatter? Read on...

A Microwave Vacation

BY ROD RODERIQUE,* WAØQII

Each October Hawaii's Kona Coast is host to the world famous Ironman Triathlon event. After five years of research, planning, preparation, and patience, I was ready to participate. Yes, I was ready, but my goal was to focus on just one event, perhaps a Hawaiian first, VUCC on 10 GHz wide-band FM (WBFM).

For those of you who don't know me, one of my amateur radio passions is to experiment with and demystify the microwaves. This is not to say I'm an expert, but I enjoy helping other amateurs get active on the microwaves. Does this make me a micro-Elmer? For those of you who *do* know me, "Here he goes again with that microwave stuff."

Throughout 1995 I collected all of the technical information I could find regarding *10 GHz rainscatter,* and while on vacation in Kona I studied the literature in detail (see "Resources" at the end of this article for sources of additional information). Before everyone jumps on me, you enjoy your vacation your way, and I'll enjoy my vacation my way!

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e-mail: <k3qii@erols.com

Volcanic Ash Scatter

While touring the volcanoes and lava flows on the Big Island of Hawaii, I became intrigued with the possibility of *volcanic ash scatter* (VAS). Admittedly, the utility of VAS is limited to

10 GHz Gunn-Plexers ready to go, in pursuit of volcanic-ash-scatter contacts from Hawaii. (Photos courtesy of the author)

View of the 5000 foot operating location in grid BK29ar.

Bill Graham, KV6J, at 5000 feet facing Maui, grid BL10.

geographic areas with active volcanoes, but the study of any and all propagation modes is interesting to me. Could volcanic ash enhance microwave scatter? Each subsequent vacation (1996–1998) included some form of VAS study and/or experimentation.

The Island

Most people don't realize it, but the island of Hawaii (the Big Island) is quite large and diverse. The highest point on the Big Island is the summit of Mauna Kea at 13,796 feet, and the lowest point is sea level. The island of Hawaii is approximately 93 miles long (north to south) and 76 miles wide (east to west). This creates an above-ocean area of 4,038 square miles (three times the size of Rhode Island) and a coastline 266 miles long (comparable in length to the Connecticut coast).

In the winter both Mauna Kea and Mauna Loa (13,677 feet) are sometimes snowcapped, while the beaches, just 40 miles away, have sunshine and 80-degree temperatures. One can snow ski and SCUBA dive on the same day!

In 1997 we surveyed a variety of candidate microwave operating locations and measured cloud reflectivity using 10 GHz Gunn-Plexers (commonly used 10 GHz FM equipment). Hawaiian grid-square boundaries were identified using detailed topographic maps and the information provided at web site <http://krypton.nmr.hawaii.edu/uham/grids.html>.

There is a 5000 foot vantage point above the town of Kona, near Kaupulehu Crater (BK29ar, 155 degrees 55.4' west, 19 degrees 43.1' north), with free public access, providing optical line-of-sight (LOS) to many grids (BL10 Maui, BL20, BK19, BK28, BK29). Could five land-based (not Pacific Ocean) VUCC contacts be made from there? This became my challenge.

The People

As part of our 1998 vacation we had the distinct pleasure of meeting two Kailua-Kona hams—Bill Graham, KV6J, and his charming wife Sandi, KD6ZJP. Bill is an accomplished 144 MHz EME (moonbounce) operator, breath-hold diver, marathon runner, and endurance cyclist. Now that's Ironman material! Who could be more qualified for this 10 GHz effort than an EME guy?

At dinner one night the conversation turned to planning the 10 GHz WBFM VUCC activity during our next vacation. My attention immediately turned to the southernmost point in the

What is VUCC?

VUCC is the American Radio Relay League's "VHF-UHF Century Club" award, a VHF/UHF equivalent of DXCC. Rather than contacting 100 countries, one qualifies for VUCC by contacting a specific number of 2×1-degree "grid squares." The number of grids required to earn the award varies with the DX potential of each band, ranging from 100 grids required on 6 and 2 meters to only five grids required for VUCC on 10 GHz and other SHF bands. For more info, visit the ARRL web site at <http://www.arrl.org/awards/vucc/>.

U.S.—no, not southern Texas (EL15), not southern Florida (EL94), but South Point (Ka Lae), Hawaii (BK28).

A simple review of topographic maps revealed that the BK28 to BK29 path (58 miles) is not optical LOS, but well within the traditional 4/3 Earth radius used to calculate radio horizons. Could we use rainscatter—better yet, VAS—to complete the BK28 to BK29 contact? A detailed BK28 "site survey" was conducted. The proposed South Point site (BK28dv, 155 degrees 40.9' west, 18 degrees 54.8' north) was ideal. It had no near-field obstructions and a clear over-water (Pohue Bay) view of the BK29 signal path.

From a few simple calculations it became pretty clear that traditional weak-signal equipment (1 watt CW plus dish antennas) could easily close the link along this path. Such an operation would present no challenge and certainly would not demonstrate the utility of VAS. For more of a challenge, we wondered, could WBFM Gunn-Plexers do the job? More research was needed.

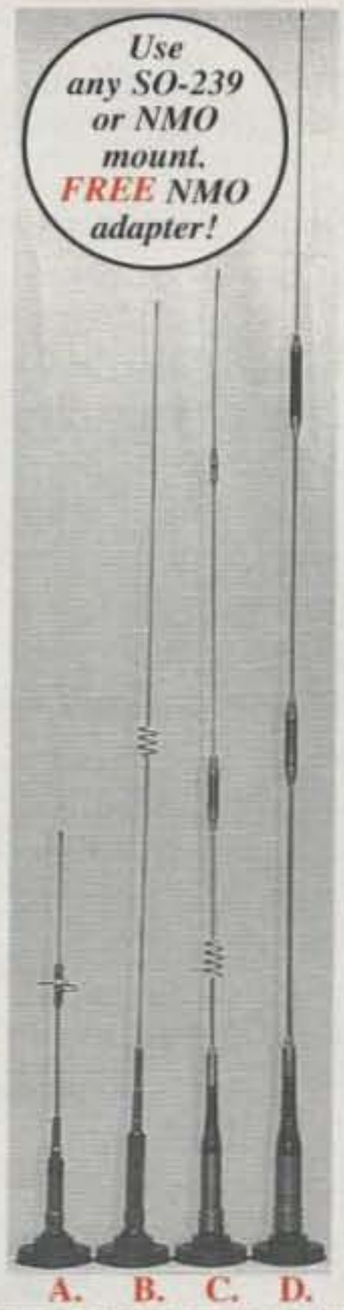
After some more calculations we determined that 100 milliwatt Gunn-Plexers and +17 dBi horn antennas could provide enough signal-to-noise to complete a contact along this path *only* if some form of *enhancement* (rainscatter or VAS) was available. Perfect!

VAS Theory

If you have ever looked up at the sky and observed ominous, dark storm clouds which obviously contain a tremendous amount of moisture, you have observed the kind of weather

The author operating from South Point, Hawaii, BK28dv. (WAØQII has been licensed since 1965, holds an Extra class license, has achieved VUCC awards for 5.7 GHz and 10 GHz, and has operated from more than a dozen countries.)

MFJ *RuffRider*™ High Gain Mobile Antennas



Shown on mini mag mounts, not included.

Each MFJ RuffRider™ mobile antenna comes with MFJ's unique 90 degree "fold-over" feature -- lets you pull into your garage without knocking your antenna over!

MFJ's heavy duty bases are extremely strong to handle super rugged rides and day-to-day highway abuse.

MFJ's *RuffRider*™ High Gain dual band 144/440 MHz mobile antenna series is for the serious mobile ham who demands the highest quality, premium products at reasonable prices.

They feature the finest quality construction using precision machined components. *RuffRiders*™ battle the elements, handle rugged rides and day-to-day highway abuse.

Stacked elements with high-Q phasing coils give you outstanding gain. Stay in solid contact!

Phased Radiators

Phased radiators flattens the radiation pattern and concentrates your power to give you *super gain.*

High-Q phasing coils are housed in weather proof high-tech plastic insulation. They're attached to stainless steel stacked radiators by solid metal end sections.

Heavy Duty Base

Rigid, heavy duty solid metal base reduces SWR flutter due to wind vibration. Two Allen set screws securely fastens radiator.

Specially treated center pin provides excellent electrical connection.

Quickly screws off -- helps prevents theft of your expensive rig.

Use SO-239 or NMO Mounts

RuffRiders™ have a PL-259 base mount for quick installation to your heavy duty SO-239 magnet, trunk/hatch, gutter or mirror mount.

A *free* NMO adapter is included for use with an NMO mount.

MFJ mounts are recommended.

All MFJ *RuffRiders*™ are dual band 144/440 MHz antennas and factory tuned for SWR less than 1.5:1 and have 50 Ohm impedance.

MFJ's *No Matter What*™ Warranty

All *RuffRider*™s are covered by MFJ's famous *No Matter What*™ one year limited warranty. MFJ will repair or replace (at our option) your antenna for one full year.

Choose from several different length and gain antennas . . .

A. ***RuffRider Junior™.*** Premium, short 16½" antenna fits in any garage on any auto. ¼ Wave on 2 Meters, ½ Wave, 3 dB gain on 440 MHz. 100 Watts. No fold-over.
MFJ-1402 **$34.95** add s/h

B. ***RuffRider High Power™.*** Just 40" long handles full *200 Watts.* Great for high power mobile amp. ½ Wave, 3 dB gain on 2 Meters, ⅝ Wave, 5.5 dB gain on 440 MHz.
MFJ-1412 **$49.95** add s/h

C. ***RuffRider High Gain™.*** 41½" long antenna gives extra gain with little height increase. Handles 150 Watts. ½ Wave, 3.2 dB gain on 2 Meters, ⅝ Wave, 5.7 dB gain on 440 MHz.
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D. ***RuffRider Hyper Gain™.*** 62½" brute gives a whopping 5 dB gain on ⅞ Wave 2 Meters, ⅝ Wave, 7.6 dB gain on 440 MHz. Our highest gain antenna. Handles 150 Watts.
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144/440 MHz Antenna Tuner with *built-in SWR/Wattmeter*
Covers 136 to 175 MHz. Handles 150 Watts. Compact 4x2⅛x1¾". *New!* MFJ-922 **$79.95**

MFJ *RuffRider*™ super heavy duty Antenna Mounts

Trunk/Hatchback *Lip* Mount

MFJ-345 Lip Mount is shown mounted vertically to a mini-van's angled hatchback lip. Note extra-wide mount with reinforcing tab at right -- safely secures heavy antennas. Swivel mount is adjusted so antenna is near vertical away from mini-van to clear luggage rack.

MFJ-345 **$34.95** add s/h

MFJ's *RuffRider*™ super heavy duty solid steel Trunk/Hatchback *Lip* Mount mounts to any lip on your vehicle.

Extra-wide *four* inch lip and large reinforcing tabs on each side safely distributes the load over your vehicle's lip.

Two large set screws on each end of the mounting lip locks your mount in place. A scratch-proof rubber guard protects your vehicle's finish.

Secures large VHF, UHF and medium size HF antennas even at highway speeds.

Mounts on lips at any angle. Two axis of rotation lets you position your antenna vertically, horizontally or at any desired angle. Serrated swivel joints locks securely in place with huge 3/8 inch set screw.

Has SO-239 base mount. Use adapter for NMO. Includes low loss coax with PL-259 connector, Allen wrenches and protection caps for SO-239 and locking screw, One year MFJ *No Matter What*™ limited warranty.

Mirror/Luggage *Pipe Clamp* Mount

MFJ-340 Pipe Clamp Mount is shown clamped solidly to vertical mirror support rod on a pickup truck. Antenna is slightly swiveled to the left and positioned about 30 degrees from vertical to clear cab of the pickup truck.

MFJ-340 **$34.95** add s/h

MFJ's *RuffRider*™ Mirror/Luggage *Pipe Clamp* Mount mounts on support rod of mirror, luggage rack or spare tire carrier of your truck, van, RV or SUV. Mounts on any horizontal, vertical or angled rod or pipe up to 5/8 inches in diameter.

Secures VHF, UHF and medium size HF antennas even at highway speeds.

Two axis of rotation lets you position your antenna to any desired angle. Serrated swivel joints locks securely in place with huge 3/8 inch set screw.

Convenient *Thumb and Finger* turn knob makes fold-over operation quick and easy. Locks in twelve positions.

Fold down your antenna at night when pulling into your garage and quickly put it back up to its operating position in the morning.

Has SO-239 base mount. Use adapter for NMO. Includes low loss coax with PL-259 connector, Allen wrenches and protection caps for SO-239 base mount and locking screw, MFJ's famous One year *No Matter What*™ limited warranty.

MFJ's *MaxStrength*™ Hi-Flux Antenna Magnet Mounts

MFJ's *MaxStrength*™ high-flux magnet mounts give you maximum pull strength -- your antenna stays on top of your vehicle at highway speeds.


MFJ-333 **$14.95** add s/h


MFJ-335 **$19.95** add s/h

Base is *Euro-style*, black poly or chrome finish with a Mylar protective undersheet.

MFJ magnet mounts come with 17 feet of tough RG-58 coax with a PL-259 connector. Easily reaches operating position.

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situation that can provide microwave enhancement, sometimes called "rainscatter." On the other hand, big, white, fluffy clouds (cumulus), while very pleasant to look at, generally do not possess the density (reflectivity coefficient) required for useful microwave scatter. If, however, volcanic ash particles attach themselves to the moisture molecules of cumulus clouds, the density increases and useful microwave scatter can be obtained without storm conditions—i.e., via VAS.

When I mention volcanic ash, most people visualize the enormous Mt. St. Helens eruption of June 1980. That eruption certainly did produce massive quantities of volcanic ash, but large eruptions are not needed to produce VAS. In fact, *any* active volcano produces enough gas and particle discharge to support VAS. The Big Island of Hawaii is no exception. The numerous "vents" on the southern half of the island continuously discharge gases and particles.

In order to be useful, a VAS cloud must be positioned so that the two microwave stations attempting a contact can both "see" the cloud. While the following is not perfectly analogous, the banking of a billiard ball off the side cushion is very much like scattering microwave energy off a cloud. The geometry is important.

The geometry of the signal path between the 5000 foot elevation BK29ar location and the near sea-level BK28dv location presented some interesting challenges. The required scatter enhancement cloud had to be at just the proper altitude and azimuth. If the cloud was too high, the enhanced signal would skip over the distant station and out to sea. If the cloud was too low, below the 5000 foot site, it would produce a propagation barrier between the two stations and prevent contact with the sea-level station, underneath the enhancement cloud.

From our vacation lanai (porch/patio) we clearly could see the 5000 foot mountain site. For two years worth of vacations I observed and recorded the time each day the cloud layer reached the 5000 foot site. In the morning the clouds would form at 10,000 feet and slowly creep down the mountain. Often they would continue down to 2000 feet, below the site. It was going to be tricky to catch the needed VAS cloud at exactly the optimum altitude.

The drive to South Point (BK28) takes almost two hours, and the cloud layer moves up/down the mountain much more quickly than that. Oh, great. Now we had to predict and anticipate the VAS altitude two hours in advance. How many attempts would it take before we got one that worked?

The prevailing trade winds (from east to west in October, when I was there) move the volcanic ash particles into the leeward, forming clouds. These particles attach themselves to moisture droplets in clouds, and the position where these clouds form is directly along the BK29 to BK28 azimuth path—nature's microwave reflector.

Off We Go!

Jay Rusgrove, W1VD, of Advanced Receiver Research (ARR), quickly supplied the needed equipment (two 100 mW WBFM stations with +17 dBi horns attached). The microwave equipment and suitable 2 meter liaison radios were packed into an appropriate travel case. A quick e-mail confirmed that KV6J was scheduled to be home, near Kona, during our vacation. Our tickets in hand, swim suits, SCUBA gear, and suntan lotion packed—enough planning. Kona, ready or not, here we come!

It was very pleasant to find that all of the equipment had made the Maryland to Hawaii journey without any damage. Bill and I proceeded to start making contacts. The first was the traditional "same grid" contact (BK29/BK29). A short distance to the west is the local boat harbor (located in BK19), and a quick contact was made from there. Two down and three more to go.

SCUBA was scheduled for the next morning. On our way to the Keauhou marina, between dives and during our return boat ride, my attention was on the 5000 foot operating location. The clouds had been at exactly the desired altitude for most of the morning. The decision was made: We would attempt the South Point (BK28) contact the next day.

The next morning the weather was a little wetter than desired, but perseverance took over and off we went. The drive was particularly slow due to multiple road construction sites.The operation was complicated by the fact that we probably would not have a 2 meter liaison channel due to the geography, and we would be operating using schedules, similar to EME. You can guess who came up with that idea! Thanks, Bill. (*EME-type schedules involve each station alternately calling and listening for predetermined time periods, based on the clock, not on what is or isn't heard.—ed.*)

So we began. I called, he called, I called, he called, nothing. Then, like magic, I started hearing small syllables of my own transmit audio in my headphones. For those of you who have operated Gunn-Plexers, you know what that means: There is enough signal being reflected from the distant station for your Gunn-Plexer to detect signal, full-duplex. Hurray!

For about ten minutes we were able to exchange information very reliably. The signal strength was only S1/S2, but perfectly readable. As I logged the contact, BK29/BK28 at 2015Z, I noticed there was something very familiar about that time. That evening it finally hit me. My prediction for optimum VAS, from the previous years of observations, was between 2000 and 2030Z. Science is great, and BK28 (the long-path) was history!

The next two grids (BL10 and BL20) came later in the week. I'll save the story describing these contacts for another day.

In Closing

How many 10 GHz VUCC awards have been issued for operation in KH6? How many amateurs have operated from the southernmost point of the U.S. on any band? How many microwavers have used VAS for enhancement? Now, that's fun!

If anyone has conducted experiments, knows of additional reference material, or has interest in volcanic ash scatter, I would very much like to talk with you. Please e-mail me at <k3qii@erols.com>.

I wish to thank Pele (the Hawaiian fire goddess) for creating this magnificent location, Bill and Sandi Graham for their hospitality and friendship, Jay Rusgrove (of ARR) for satisfying my ridiculous schedules, and Kathrine Kraemer, N7NTR, for her never-ending support and understanding.

Resources

For more information on 10 GHz WBFM, check WA1MBA's web site: <http://www.wa1mba.org/10ggunn.htm>.

If you are interested in learning more about rainscatter, try WA1MBA's paper at <http://www.wa1mba.org/10grain.htm> or his article "10 GHz—A Good Band for a Rainy Day" in the February 1997 issue of *CQ VHF* magazine.

For more on Mt. St. Helens, see <http://www.aone.com/~robert/helens.html> ■

The RF Applications VFD RF Power/VSWR Meter

VHF VERSION now available

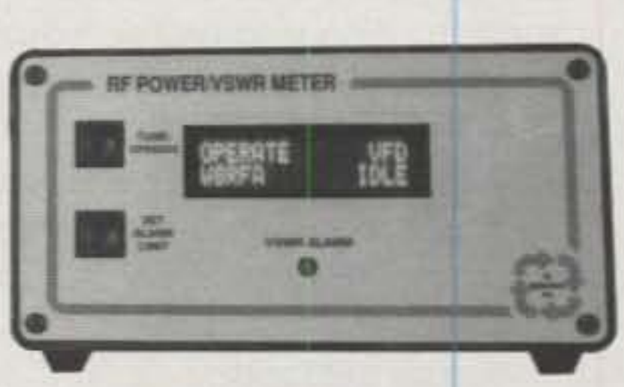
The ONLY Wattmeter for the Serious Operator

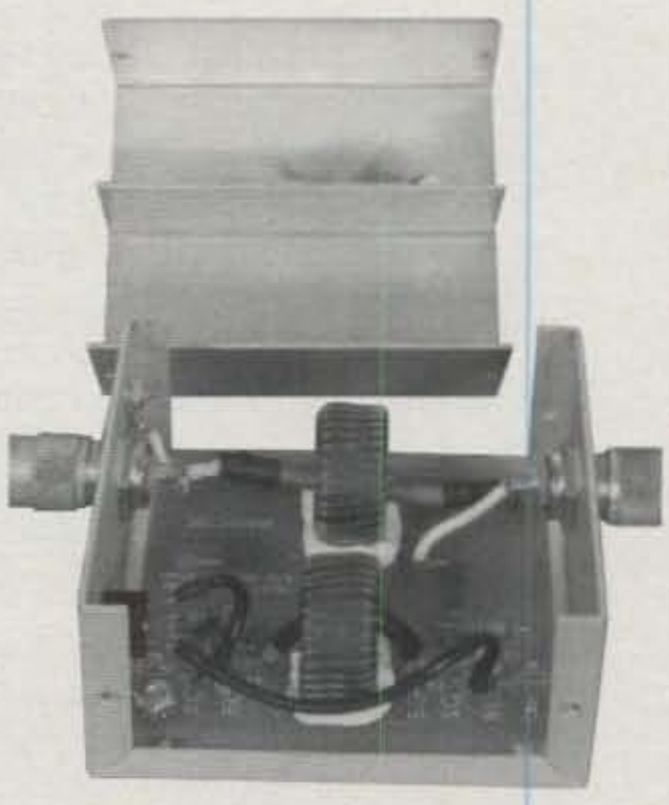
EXCITING NEW TECHNOLOGY

RF Applications, Inc. VFD Series Wattmeters represent breakthroughs in microprocessor, display and software technology. These units feature a 2 line by 16 character vacuum fluorescent display, tuning and operate modes, and a settable VSWR alarm limit. With our VFD External Relay Option, you can use this instrument to interrupt your transmit control circuitry to protect your valuable station equipment in high VSWR conditions (wrong antenna, bad cable, ice, etc.).

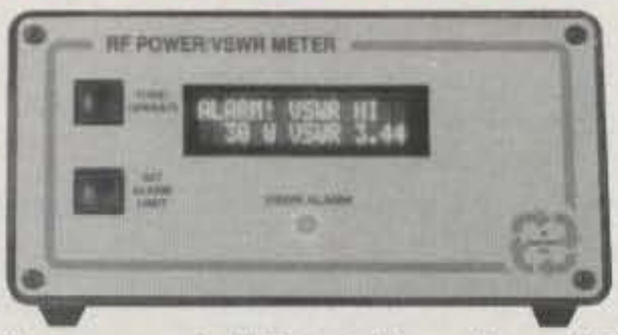
We can even *personalize* your wattmeter with your callsign (11 characters maximum). The Vanity Option is supplied as a separate chip (you keep the original), so your VFD can still be used by someone else!

Housed in a compact (5.75" by 3.0" by 2.0") enclosure, the VFD Series Wattmeters offer many features you cannot find anywhere else. The VFD Wattmeters use our "battle proven" remote sensor design being used around the world today. All this at a price you can afford.





ALARM INDICATION



You can set the VFD to tell you if your VSWR has exceeded a preset limit. A bright red LED tells you if you have exceeded 1.5:1, 2.0:1, 2.5:1 or 3.0:1 (the default). If you have installed the optional relay, you can disable your amplifier to prevent damage to your system.

THE BEST SENSOR

The VFD uses our P-3000-D sensor. Insertion loss and VSWR are minimal, and the sensor uses large cores that will not saturate, even above 1.5 kW. Network analyzer plots of the sensor's performance are available on request.

The VFD gives you a real time peak and hold display of your actual power and VSWR *every time you transmit*. This means that you'll always know that your system (exciter, amplifier, feed lines, antennas, etc.) are operating the way you intend them to. Tuning an amplifier has never been easier because the VFD's 65 element bar graph gives you better resolution than a meter. In addition, you can select a quick update for the displayed power (Tune Mode).

IS IT ACCURATE?

The VFD uses sophisticated technology that achieves remarkable accuracy in a low cost package. Compare it with your Bird™ or other accurate meter. You'll be amazed at this unit's performance.

WHAT YOU GET

The VFD is shipped with a display unit, the P-3000-D sensor and a 12 VDC power cable. This product is covered by RF Applications' standard two year warranty.

KEY SPECIFICATIONS

Frequency range:
1.8 to 30 MHz (60 MHz with recalibration)

Power:
5 - 2,955 watts (VSWR accuracy suffers below 20 watts)

Nominal impedance: 50 ohms

Accuracy:
Better than ± 10% of the displayed reading

Operating power:
12 VDC at 130 mA average, 200 mA max

Connectors: SO-239 (2)

Signal cable length: 62" (24.4 cm)

Shipping weight: 3 pounds

COST AND OPTIONS

The VFD sells for $249.00, and the following options are available:

Vanity Option ($20.00)—You can special order a replacement chip for your VFD that can contain up to 11 characters of your choosing.

VSWR Alarm Relay Option ($20.00)—This option adds a reed relay output to the VFD that you can use to inhibit a radio or amplifier when your preset VSWR limit is exceeded.

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CIRCLE 74 ON READER SERVICE CARD

Reader Survey July 2000

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Reader Service Card and returning it to us (we've already paid the postage). As a bit of an incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

This month we'd like your help in figuring out why in recent years a lot of hams have not renewed their licenses, thereby letting them expire.

What You've Told Us...

Our April survey, which reached readers just before FCC license restructuring took effect, asked about recent upgrades or upgrade plans, and about bands and modes on which you are active. First of all, nearly four readers in ten have held an Extra Class license for two years or longer, and another 2% are not yet licensed. Among the rest of you, one third have upgraded in the past two years—one quarter within the past six months, apparently trying to beat the restructuring clock. As for future upgrading plans, 50% of you already hold an Extra Class license. Of the rest, more than two thirds plan to upgrade within two years, and most within the next six months.

An astounding 98% of *CQ* readers are active on the air, with 81% active on HF and 86% active on VHF/UHF. Favorite bands are 2 meters (83% of total), 10 meters (70%), 20 meters (63%), and 40 meters (60%). Only the microwave bands (902 MHz and up) dip below 10% overall activity. The 222 MHz band sneaks in at 11%, followed by 160 meters (25%) and 6 meters (29%), with all the other bands reporting activity rates between 30 and 60%. Single sideband is the single most popular operating mode, used by 80% of our active readers. It's followed closely by FM at 73% and CW at 55%. VHF digital (including packet) is used by one reader in five, and HF digital (RTTY, PSK31, etc.) follows closely at 14%, as does AM. Only amateur television is below 10%. We hope this month's feature story on slow-scan TV from the Mir space station will help increase that number.

As always, thank you for your responses. This month's winner of a free *CQ* subscription is Rick Stevehler of Reno, Nevada.

Please indicate... **Circle Reader Service #**

1. ... the current state of your own amateur license

Current; not within 90-day renewal period....138
Within 90 days of expiration; renewal applied for....139
Within 90 days of expiration; renewal not yet applied for....140
Expired; within 2-year grace period....141
Expired; beyond 2-year grace period....142
Never been licensed....143

2. ... whether you plan to renew your license when it's time to do so

Yes....144
Probably....145
Probably not....146
No....147
Don't know....148
Not currently licensed....149

3. ... whether you know anyone who has not renewed his/her license when it expired

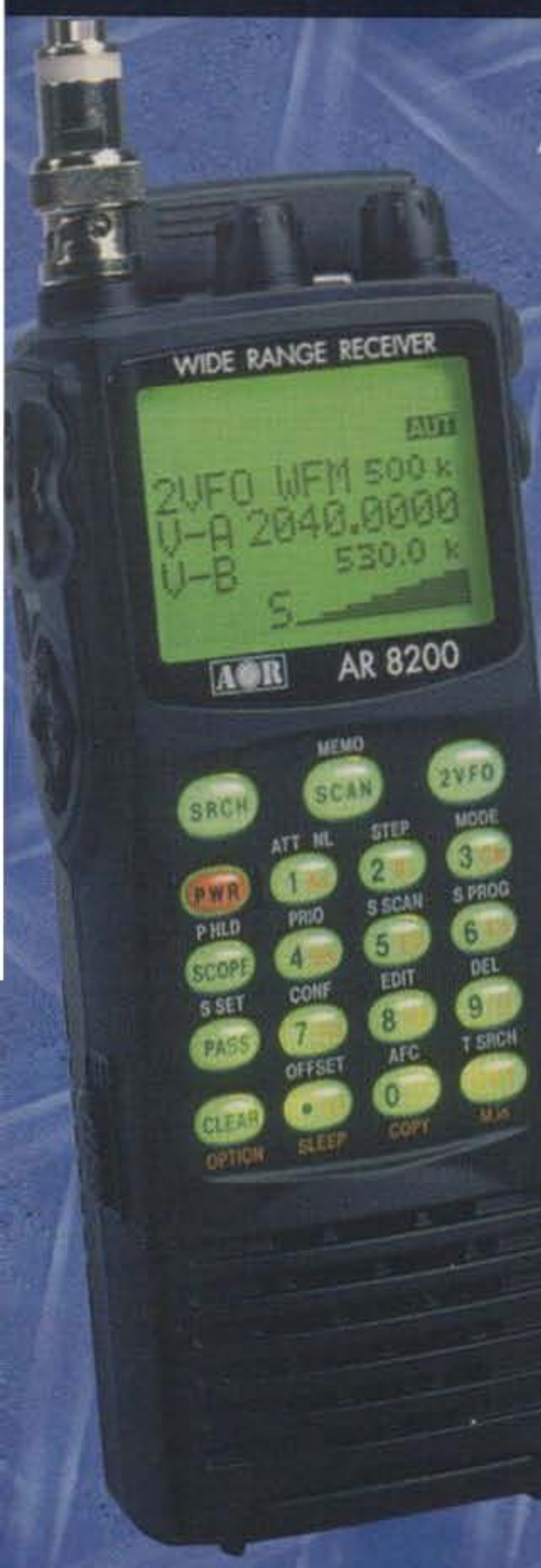
Yes....150
Not sure....151
No....152

4. ... IF you or someone you know has let his/her ham license expire and has not renewed it, please indicate the reason(s), if you know them

Lost interest....153
Too busy....154
Moved into antenna-restricted area; cannot operate....155
Ham radio didn't meet expectations....156
Other hams were unfriendly....157
Just forgot....158
Unable to operate due to health....159
Passed away....160
Other....161
Don't know why....162
Um, uh, I'm sending in the renewal form today!....163

Thank you for your responses. We will have more questions for you next month.

The Best Just Got Better!



AOR has just improved its world-class AR8200 B portable receiver. The AR8200 Mark II B leaves others behind, with a new Temperature Compensated Crystal Oscillator that maintains frequency stability without regard to changing ambient temperatures. A new keyboard layout and improved illumination allow easy operation in a variety of conditions.

Discover why AOR receivers are the choice of many federal, state and local government agencies. Military users, laboratories and professional news-gathering operations also use AOR receivers.

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NEW! AR8200 Mark II B

- **New TCXO for greater stability – performance not found in most desktop units!**
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- Four-way side panel rocker switch allows one-hand operation
- Large display includes A and B VFO frequencies and signal strength meter
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Sometimes it just isn't practical to rotate the antennas on your tower. What to do? W8CM found one solution . . .

Turn The Tower Hold The Antennas

BY MIKE BAKER,* W8CM

Sometimes things just sort of seem to take their own course. When I moved to the Dallas area from Virginia, I sold my VHF beams in Virginia and planned to try something else at my new home. I was getting my thoughts organized for the new location and a 6 meter beam when a major ham dealer decided to have a sale. The next thing I knew, I was the proud owner of a pair of 7-element, 6 meter long-boom beams and was contemplating putting up a stacked pair for the "magic band."

Why go to all the trouble of installing a stacked pair when a longer boom single Yagi might seem to produce about the same gain? For one thing, the longer boom antenna would have a much sharper directivity pattern than a stacked pair (down from about 42 degrees to about 33 degrees), which I felt would be too narrow. Second, while the gain might appear to be the same on paper, it is commonly recognized that there can occur a phenomenon called "stacking gain" in which the stacked pair appears to have more gain than from a single, equivalent, long Yagi. Further, while either approach yields a nice low takeoff angle, having the stacked pair offers some interesting possibilities for switching between the antennas.

I considered the usual approach of putting up a mast on top of a tower for the pair of antennas, and then discovered that the stacking distance suggested by the manufacturer was "only" 20–22 feet apart, which is about a wavelength. Actual recommended stacking distances are influenced by the boom length of the antenna, which in my case is about 26 feet.

*335 Hidden Trail, Van Alstyne, TX 75495
<w8cm@arrl.net>

Photo 1– Components of the main rotating bearing assembly of the Rotating Tower System (RTS) designed by Dick Weber, K5IU. (Photos by the author)

After doing some calculations, I determined that the mast required to support the pair of beams would have to be a real monster; it would be expensive, heavy, and complicated to build and install. Even if I somehow managed to get the mast and the antennas up, then there would be an ongoing maintenance access problem with the top antenna. I briefly considered cutting back on the spacing from a wavelength to 5/8 wavelength (12 ft.), but while that would have made the project easier, it also would have compromised the performance of the antenna system.

I investigated several other possible solutions, such as sidearm mounting and ring rotators, but I finally came to the conclusion that in this case the most effective solution, albeit not the cheapest, was to use the Rotating Tower System (RTS) by Dick Weber, K5IU. This system uses your rotator to turn the top section(s) of the tower itself (see the box "How the Rotating Tower System Works" for details).

After reading the RTS brochure and trading some e-mail with Dick, I decided to install the RTS system with a Rohn 25G guyed tower. RTS also makes systems for the Rohn 45G and 55G towers, but I determined that the 25G would be plenty strong enough to support my antennas. The 25G system of course would be less expensive than the other tower types, but perhaps even more

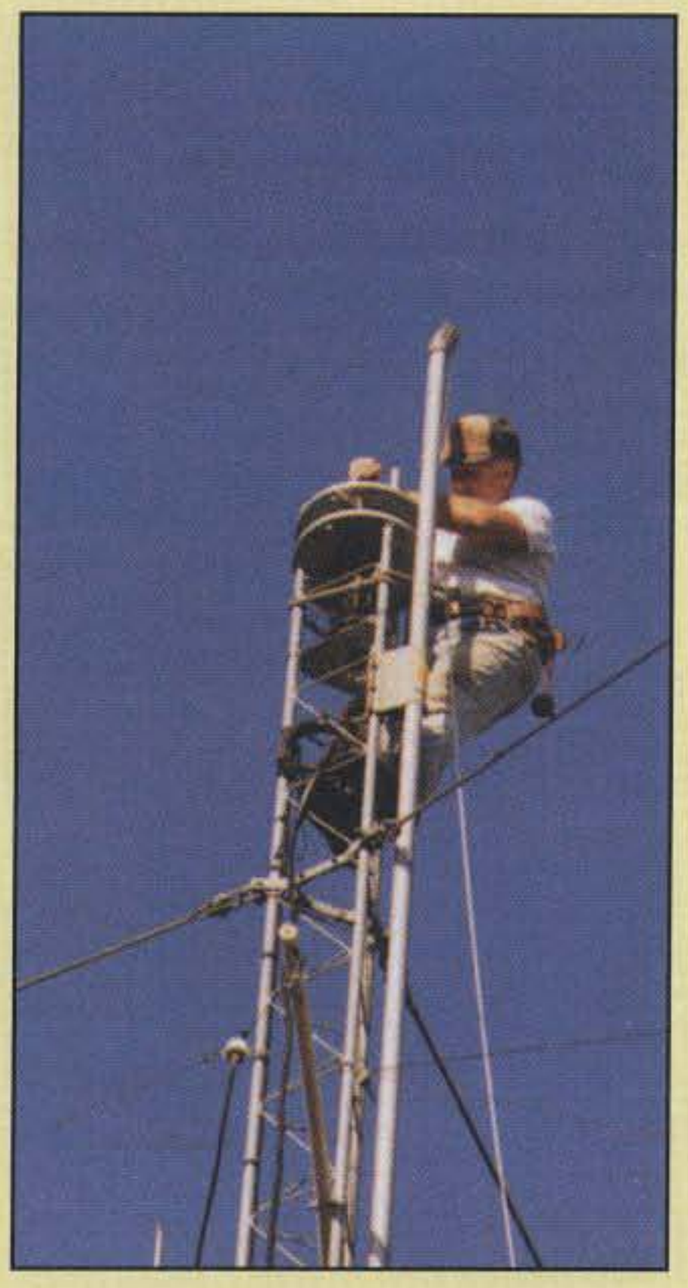


Photo 2– The author attaches the bearing assembly at the 60 foot level of his 90 foot tower. The top 30 feet will be rotatable.

important to me was that only the 25G system turns at the same speed as the rotator, or about one revolution per minute (rpm). The 45G and 55G systems, by comparison, turn at half of the rotator basic speed with the RTS package. Turning a VHF beam at 1/2 rpm seemed too slow to me, since it usually seems that I manage to have the beam pointed in the wrong direction when openings occur on 6 meters.

I first put up 60 feet of the Rohn 25G tower with one of the antennas and operated that way for a year while I gathered my courage (and money). Finally, right after the September VHF contest, I took the antenna and rotator back down and began to install the Rotating Tower System. Since I live in the Dallas area, Dick actually made personal delivery of the system and spent some time showing me the components and giving some helpful hints on the installation. I immediately was impressed with the quality and workmanship of the RTS components, and Dick's helpful attitude was as excellent in person as it was by e-mail. I was also *very* impressed with the hefty quality of the major components.

The first thing you have to do when getting ready to install the main rotating bearing is "modify" the top tower section by cutting out the three diagonal braces at the top of the section so the rotator mounting shelf and rotator can be installed later. Taking a hacksaw to the tower really tests the courage of your convictions! This may even be more of a test of your commitment than cutting a hole in the roof of your new car to install that VHF mobile antenna.

The first unit to install is the main rotating bearing assembly, the components of which are shown in photo 1. The unit on the left of the picture is the lower plate and bearing assembly that fit onto the top of the stationary, non-rotating part of the tower. The plate is solid steel and about 1 inch thick, and you'll grunt when you pick it up. To be safe, lift carefully with your legs instead of your back.

The plate has three machined solid-steel stubs which mate perfectly with the Rohn 25G legs and bolt holes. The bearing and plate then have another large plate mounted on top to begin the rotating part of the tower; it is this top plate that rests on the bearing. Connecting the two plates through the bearing is a shaft assembly made of solid steel. The top shaft is 3 inches in diameter and bolts to the top plate with five bolts supplied by RTS complete with anti-seize compound pre-applied. The lower shaft piece is 2 inches in diameter and fits into your rotator. The two shafts are connected by a sprocket and chain drive that allows for minor alignment corrections and serves to buffer some rotational torque. The chain drive also allows system disassembly later for maintenance if needed.

For initial assembly of the system, and later if necessary for maintenance, RTS supplies three large threaded rods to pin the two plates together (foreground in photo 1). Yours truly can be seen putting the bearing assembly on the tower in photo 2. Hang on to those three threaded rods, for if you ever have to service the rotator or bearing, they can be used to pin the rotating plates. The rods are also used in the unlikely event that you ever have to replace the main bearing. They perform as jacks to lift the top plate a fraction of an inch above the bearing, so the bearing can be removed, serviced, and replaced without having to disassemble the tower and antenna system. One other tip: It will be easier to install the top plate and shaft assembly with the rotor if you have a helper up there with you. I did it

Photo 3– The RTS guy bearing assembly. This lets you secure the rotating portion of the tower with guy lines.

Photo 4– Gin-pole adapter designed to permit you to work around the guy ring. Photo 5 shows it in use on the tower.

How The RTS Works

The Rotating Tower System (RTS) has three main components: (1) a heavy-duty bottom bearing to support the load of the tower sections and antennas that are to be rotated; (2) a solid-steel shaft to connect the top, rotating tower segment through the bearing into the fixed part of the tower and the ham's rotator unit; and (3) one or more bearing assemblies that surround the part of the tower that will be turning, and allowing the guy lines to be attached. The system uses a sprocket and chain system to connect the upper and lower shafts, and allows needed flexibility for minor alignment tolerances as well as performing as a torque absorber to protect the tower and rotator.

The RTS is available for three sizes of Rohn tower: 25G, 45G, and 55G. The bottom rotating assembly for the 25G fits entirely inside the tower and turns the tower at the same speed as the rotator. For the larger 45G and 55G towers, part of the bottom rotating assembly attaches outside the tower, and the tower turns at half the speed of the rotator. A unique feature of the RTS is that the bottom rotating bearing can be serviced and even replaced without having to dismantle the top tower sections or antennas.

The RTS also allows the ham to decide how much of the tower to keep fixed and how much to rotate, depending on the antenna system to be installed; the only thing that varies with more rotating tower sections is the use of additional rotating ring bearing units.

solo, and it took some careful mechanical work to get the rotor on the tower rotor plate while fitting the RTS shaft to the upper plate and into the rotor.

After installing the main bearing, you next install sections of tower above the top plate until it is time to install a set of guys. For Rohn 25G towers, the RTS system uses guy bearings that must be installed at the junction between two tower sections, so your guy bearing(s) will be at exact 10 foot increments. In my case, I had 60 feet of fixed tower with two sets of guys up to the main bearing, and was installing 30 feet of rotating tower, so the third guy set had to be at the 80 foot point.

Photo 3 shows the guy bearing assembly. It has the usual heavy steel plates, guy anchor lugs, and solid-steel tower leg stubs. An interesting feature I had not anticipated until the system was delivered is that the guy ring is so wide that the normal gin-pole clamp will not allow the gin pole to clear the guy ring. The RTS system was a step ahead of me on this point; the system includes a gin-pole adapter, shown in photo 4, which as usual is heavy-duty steel and hot-dip galvanized. Photo 5 shows how the gin-pole adapter is installed and used during installation of a guy bearing ring, and also the first tower section that fits onto the top of the guy bearing ring.

At this point, I had a 90 foot tower with the top 30 feet rotatable. All I had to do was take the three pins out of the main bearing, align the tower so the anten-

Photo 5– Upper portion of the tower seen with the guy ring installed and gin-pole adapter attached.

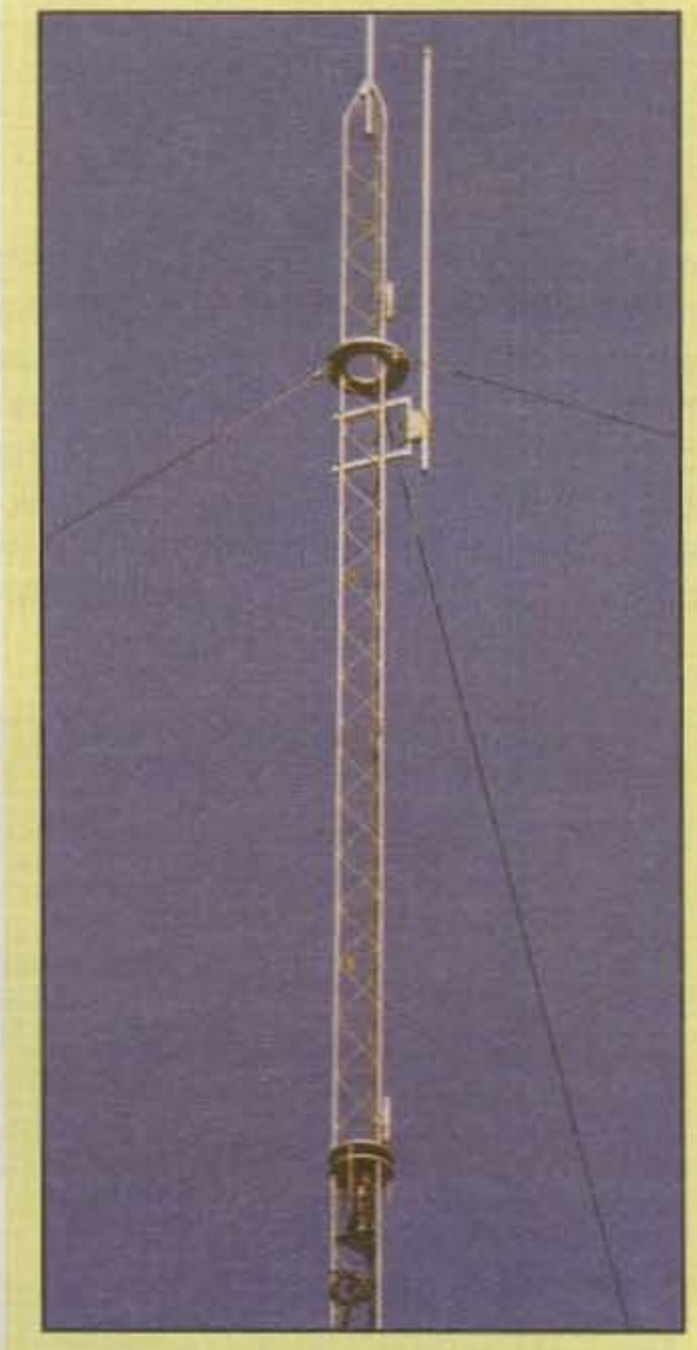


Photo 6– The rotating section of the author's tower. Working up from the bottom of the photo, you have the rotator and main bearing, the rotatable tower sections, the guy ring, and the gin pole and adapter.

Photo 7– Job complete. The rotating section turns two 7-element, 6 meter beams installed at 61 and 83 feet, respectively. As you can see, it's very important to plan your installation so that the lower Yagi can turn freely between the top two sets of guy lines. The antenna below the rotating section is a half-wave vertical for 6 meter FM.

nas subsequently would point north when installed, and tighten the clamps on the rotor. In Photo 6 you can see the rotor, main bearing, rotatable tower sections, and guy bearing with the bearing gin-pole adapter still installed.

At this point, all you have to do is mount your antennas, run the coax, and enjoy your new system. Photo 7 shows the system with the pair of 7-element long-boom 6 meter beams installed at 61 and 83 feet.

It is very important to *carefully* plan your tower system and guy lines so that the bottom beam will turn between the top and middle sets of guys. I found that the easiest way to solve this was not by fancy algebra or trigonometric calculations, but just by drawing everything to scale on some graph paper. If you do not find the value for your antenna's maximum turning radius in your manual, contact the manufacturer for this data. Incidentally, the vertical antenna on the fixed tower in the picture is a half-wave vertical for 6 meter FM.

When installed, this system gives you a neat way to stack a pair of large 6 meter beams with easy maintenance access to all components. Plus, there is some room left over along the tower and at the top for some other antennas as long as you stay within the wind-load ratings of the tower. See you on 6 meters!

Resources

The system described in this article may be purchased from:

Rotating Tower Systems, Inc
Dick Weber, P.E., President (K5IU)
Box 44, 2 Hickory Creek Drive
Prosper, TX 75078
972-347-2625
e-mail: <dickrts@texoma.net>

You know that spool of feedline in your attic that was just too good to pass up at the hamfest? The one you might actually use if only you knew what it was? Well, KA4LBE may be able to help.

Identify That Unknown Feedline

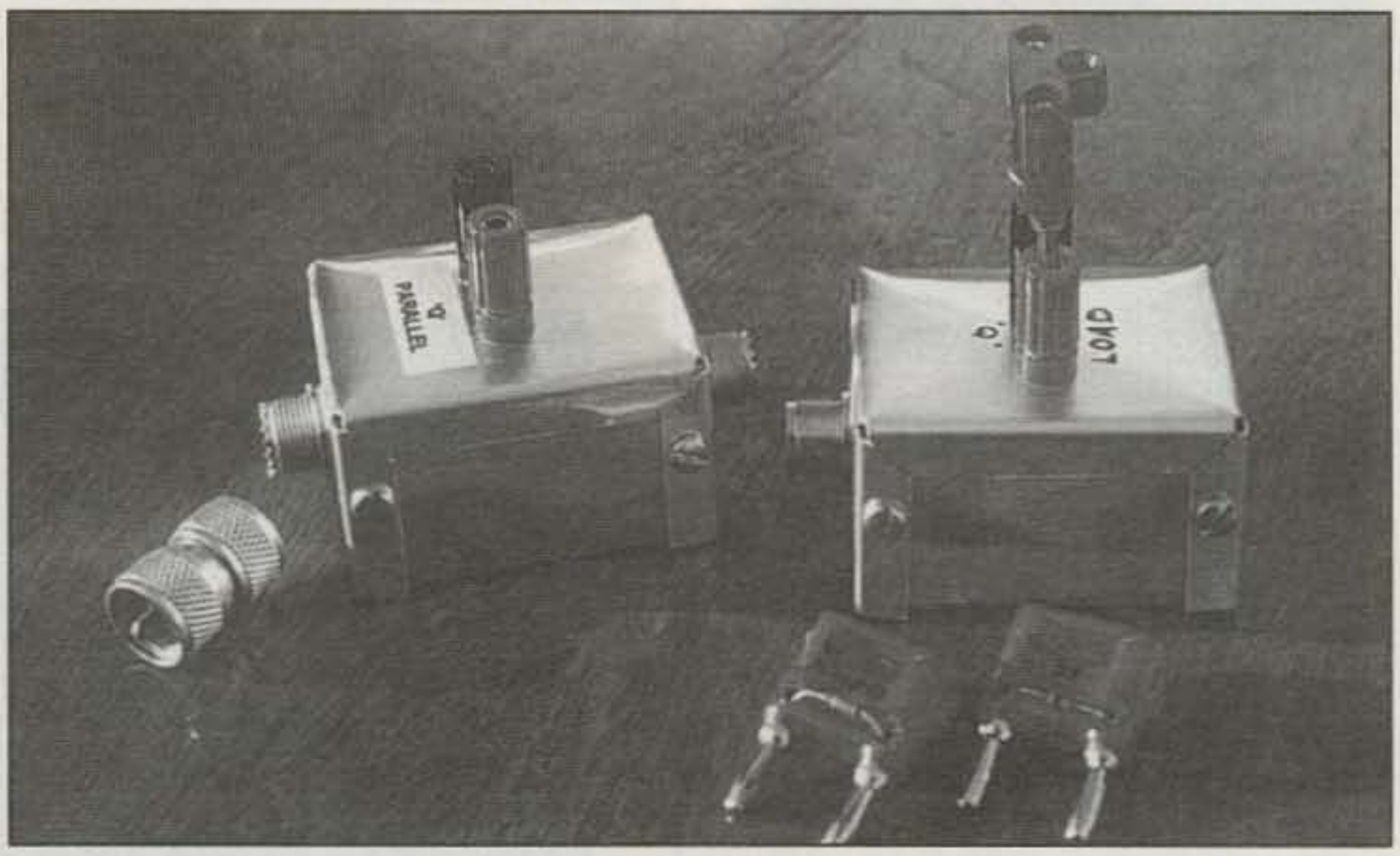
BY BENSON SMITH,* KA4LBE

We hams tend to accumulate "goodies." In the corner of the shack where these are kept, we probably have some pieces of good-looking yet unidentified feedline. Being good hams, we don't want to throw them away, but they are not marked! The purpose of this article is to show how to determine important parameters of that feedline. This might expand to be a club meeting project, a hamfest service project, or a picnic activity. In the process you may find this interesting and the information useful for other purposes.

You'll need an antenna analyzer and a couple of additional devices—a load adapter and a test adapter—which this article will show you how to build. You'll also need to make a *quarter-wave stub* of the feedline in question to help solve your mystery. But don't start cutting yet.

A quarter-wave stub has interesting characteristics. If that stub is connected to an RF source and if the end opposite the source end is shorted, then at the frequency at which the line is a quarter-wave in length the RF source "sees" an open or very high impedance at the input end. At other frequencies the line is shorted. This is a *shorted quarter-wave stub*. If the end opposite the RF source connector is left open, with no connection between the two conductors, then a short or very low impedance is present at the input terminals when the source frequency is adjusted to the frequency where the line is one quarter-wave in length. This is an *open quarter-wave stub*.

There are a couple of characteristics of a quarter-wave stub that we will use in determining two of the more important traits of transmission lines. We will determine the *velocity of propagation* (VoF) of the line and then its *characteristic impedance*. To determine the VoF, we will make and use a very simple adapter for an antenna analyzer. To determine the characteristic impedance we will employ the unknown line in a "Q" section.



The Q adapter box (left) along with a male-male PL-259 adapter. On the right is the load adapter box and three plug-in test loads.

A quarter-wave length of feedline is found by using equation 1:

$$Q = [246/f] \times VoF \qquad \text{eq. 1}$$

where:
Q is an electrical quarter-wave in feet
f is frequency in MHz

By solving eq. 1 for VoF, we have:

$$VoF = Q \times [f/246] \qquad \text{eq. 2}$$

The test to determine the VoF of an unidentified transmission line is then to determine the actual length of a quarter-wave of that transmission line. To do this, we will use the entire sample as an open quarter-wave stub and find the frequency where it is a quarter-wave in length. Then, using eq. 2, we will calculate its VoF.

Our next step then will be to determine the characteristic impedance of the transmission line. To transfer power most efficiently, we need to have the load (antenna) impedance "match," or be very close or equal in value to, the feedline impedance. If the two do not match, then we need to add a device to transform the value of the load impedance to that of the line impedance. One method is to use a Q Section (also known as a Q Transformer).

In fig. 1, Z1 is the feedline impedance. Z2 is the impedance of the coax Q Section, and ZL is the impedance of the load. Mathematically they are related as follows:

$$Z2 = \sqrt{[Z1 \times ZL]} \qquad \text{eq. 4}$$

As an example, let's assume we have an antenna with impedance of about

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e-mail: <ka4lbe@mindspring.com>

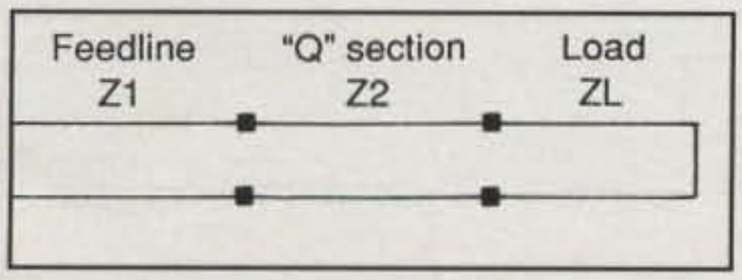

Fig. 1– Arrangement of a "Q section" between an unknown feedline on the left and the load (antenna) on the right.

110 ohms, fed by a 50 ohm feedline. Using eq. 4, we have:

$$Z2 = \sqrt{[50 \times 110]}$$
$$= \sqrt{[5500]}$$
$$= 74.16, \text{ or about 75 ohms}$$

If we make a Q Section of 75 ohm coax, we would achieve a very good match from our 50 ohm transmission line to the 110 ohm antenna.

By solving eq. 4 for ZL, we have:

$$\sqrt{[Z1 \times ZL]} = Z2 \quad \text{(rearranged eq. 4)}$$
$$Z1 \times ZL = Z2^2$$
$$ZL = Z2^2/Z1 \qquad \text{eq. 5}$$

Many coax impedance types exist, and you may want to explore them. We will consider only commonly-used 50 ohm, 75 ohm, and 93/95 ohm coax for the example tests. With Z1 = 50 ohms, use these impedance values as Z2 in eq. 5. From this we get Table I:

ZL (ohms	Q Impedance (Z2 ohms)
50	50
112	75
173	93/95

Table I– ZL loads that match selected Q impedance values.

This gives us the math tools. Next you'll need a couple of other tools, and then we'll show you how to put them all together and make your tests.

First, to identify a quarter-wave length of the unknown line, you'll need to build an antenna-analyzer adapter box. Use a small metal box to house the parts. You will need three 1/2 watt carbon-composition resistors having 5 percent tolerance, along with two SO-239 chassis connectors and two binding-post-type insulated connectors (see the parts list). One of the SO-239 connectors is used with the appropriate adapter to connect to your antenna analyzer. The other is to connect to a coax type feedline. The two test pin connectors are to connect parallel line. The adapter box is wired as in fig. 2. Also see the photo, which shows the test adapters used in this project. This is a very handy addition to your antenna analyzer for many purposes.

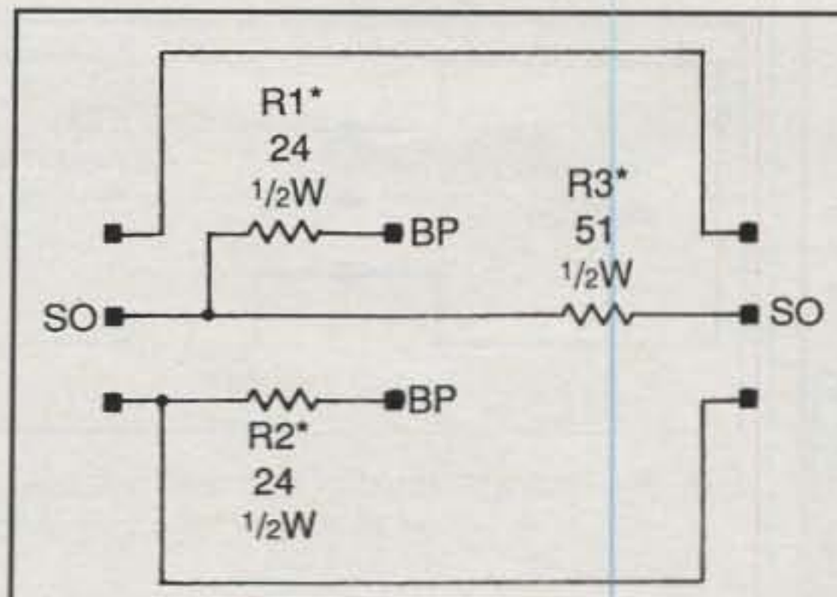

Fig. 2– Schematic of the Q adapter box described in the text and seen in the photo.

A second small metal box can be used to make the "load adapter" we will use later. The circuit is simple, requiring only a box, one SO-239 connector, two binding posts, and one or more sets of banana plugs. For a quick check method I made three resistor plug sets using one set of banana plugs for each. One holds a 51 ohm carbon resistor, the second holds a 110 ohm resistor, and the third holds a 180 ohm resistor. These values closely approximate those found in Table I.

With our tools and calculator in hand, we will now test an unidentified coax sample. Parallel line can be tested using the same procedures.

First, select a carefully measured length of the coax to be the test sample. It should be of sufficient length to be one quarter-wave at a convenient frequency. I try to use the *entire* sample, assuming it will be a quarter-wave in length *somewhere* above 1.8 MHz, which is the lowest practical frequency range for my antenna analyzers. Using eq. 3 and guessing at a VoF (roughly 0.8 for solid dielectric, 0.66 for foam dielectric), you can estimate the frequency at which the sample will be one quarter-wave in length.

We'll start by rearranging eq. 1 (Q = [246/f] × VoF) to solve for *f*:

$$f = [246/Q] \times VoF \qquad \text{eq. 3}$$

where:
Q = accurately measured length of coax
VoF = best guess based on dielectric type used in coax (see above)

Next, connect the adapter box and the unidentified coax to your antenna analyzer as shown in fig. 3. Those parts used for testing parallel line are omitted from the drawing.

When the analyzer is tuned to the frequency at which the coax is one electrical quarter-wave in length, the input appears to be shorted, so the analyzer "sees" the 51 ohm (R3) resistance from center to ground. This is a good match, so the analyzer indicates a VSWR of 1:1 at this frequency. As we tune above or below the stub frequency, the VSWR rises. Record the frequency at VSWR of 1:1 (or at null). We will call this frequency *f1*.

Before leaving the setup, tune the frequency upward to 3 × f1 and you will note a second null. If you continue tuning upward in frequency, you will notice nulls at every odd multiple of f1. If we hadn't initially estimated the probable quarter-wave frequency, we could have

Parts List for Q Adapter Box

2—24 ohm, 1/2 watt, 5% tolerance, carbon-composition resistors
1—51 ohm, 1/2 watt, 5% tolerance, carbon-composition resistor
2—binding posts (RadioShack #274-662A)
1—small metal box (such as RadioShack #270-235)
2—SO-239 antenna sockets (assuming PL-259s on coax and antenna analyzer; male-male adapter may be needed to attach adapter to analyzer)

Parts List for Load Adapter Box

1—small metal box (such as RadioShack #270-235)
1—SO-239 antenna socket
2—binding posts (RadioShack #274-662A)
1—51 ohm, 1/2 watt, 5% tolerance, carbon-composition resistor

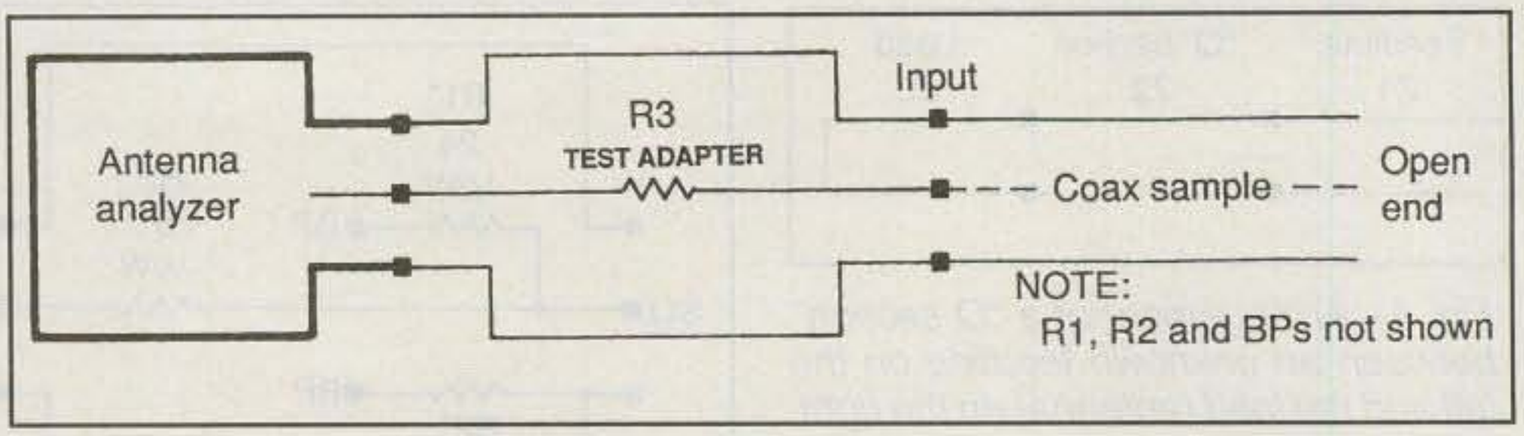

Fig. 3– Arrangement of the test adapter (Q adapter) between an antenna analyzer (left) and a sample of unknown coax (right).

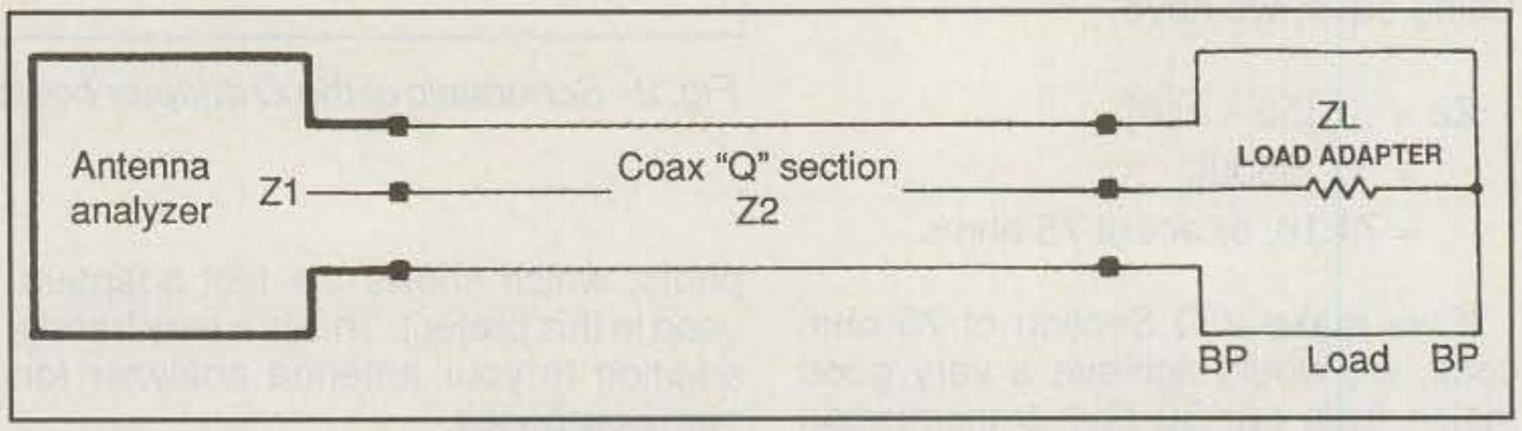

Fig. 4– Using a coax Q section between an antenna analyzer (left) and the load adapter (right) described in the text and shown in the photo.

gone directly to this test and looked for the lowest frequency null. That occurs, as we've seen, at the one-quarter-wave frequency point. If you use this short cut, be careful to determine that you are at the lowest frequency null or your calculated VoF will be incorrect.

Now we can determine the actual VoF of the sample by using eq. 2. Let's assume we have a piece of feedline which is 33 feet and 8 inches in length. We found it nulled at 5.7 MHz.

$$VoF = 33.67 \times [5.7/246] = 0.79$$

Thus, we have our first property of the unidentified coax. It has a VoF of about 0.79.

Next we will employ a second use of a quarter-wave stub. This is to make a *Q section transformer,* as shown in fig. 4. Most antenna analyzers used by hams have an output impedance of 50 ohms. To match, the load impedance should also be 50 ohms. If not, we can add a matching transformer that has 50 ohms input and an output impedance to match the load impedance. The Q section acts as the required transformer.

A listing of some common coax impedances vs. Q impedance required to match these lines is in Table I. By using selected resistors having the values listed next to the appropriate line impedances in our test setup, we can determine the matching value of the Q section impedance.

To test, attach the Q section to the analyzer with the "load adapter" attached, as shown in fig. 4.

Tune the analyzer to the frequency at which the Q sample is one electrical quarter-wave. Plug in the resistor loads, one at a time. The load which results in a VSWR of about 1:1 will align in the table with the value of the Q impedance.

As an example, in our test we find that when a 110 ohm resistor is attached, the VSWR drops to nearly 1:1. Referring to Table I, we find the Q impedance is 75 ohms when the load is about 112 ohms.

Now we know the VoF and the characteristic impedance of our coax. We can add some physical observations such as outer diameter and type of shielding used. Then, using all your compiled information, look at a table of coax types (such as found in the *ARRL Handbook*) and you will probably discover your sample's identity. Even if you don't, you have the critical data you would need for using the coax.

Don't Throw it Out!

The devices you've built and the knowledge you've gained here can have other uses as well. For example, you may want to make a multiple step Q transformer system. Do so by analyzing one section at a time. Or you may need a special transmission line. I just found some very interesting clear audio twin-lead output cable that tested to have a characteristic impedance of about 70 ohms and a VoF of 0.64—very useful in phasing a certain quad I was planning! These tools should make a useful permanent addition to your ham workshop.

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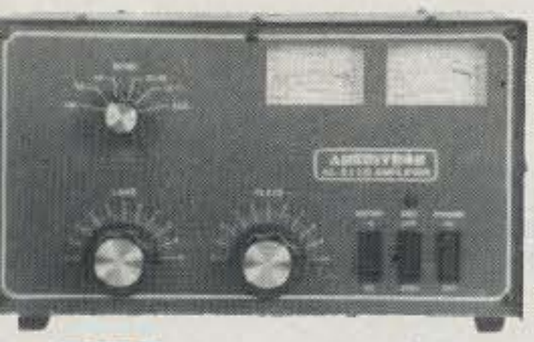

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BY PAUL CARR, * N4PC

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A Brief History of The Half-Square Antenna

The half-square antenna was designed shortly after WW I by Woody Smith, W6BCH. Woody had experimented

*97 West Point Road, Jacksonville, AL 36265

Where is that DX antenna? A good stealth antenna, you can barely make out the balun against the tree at the far left. (Photo by the author)

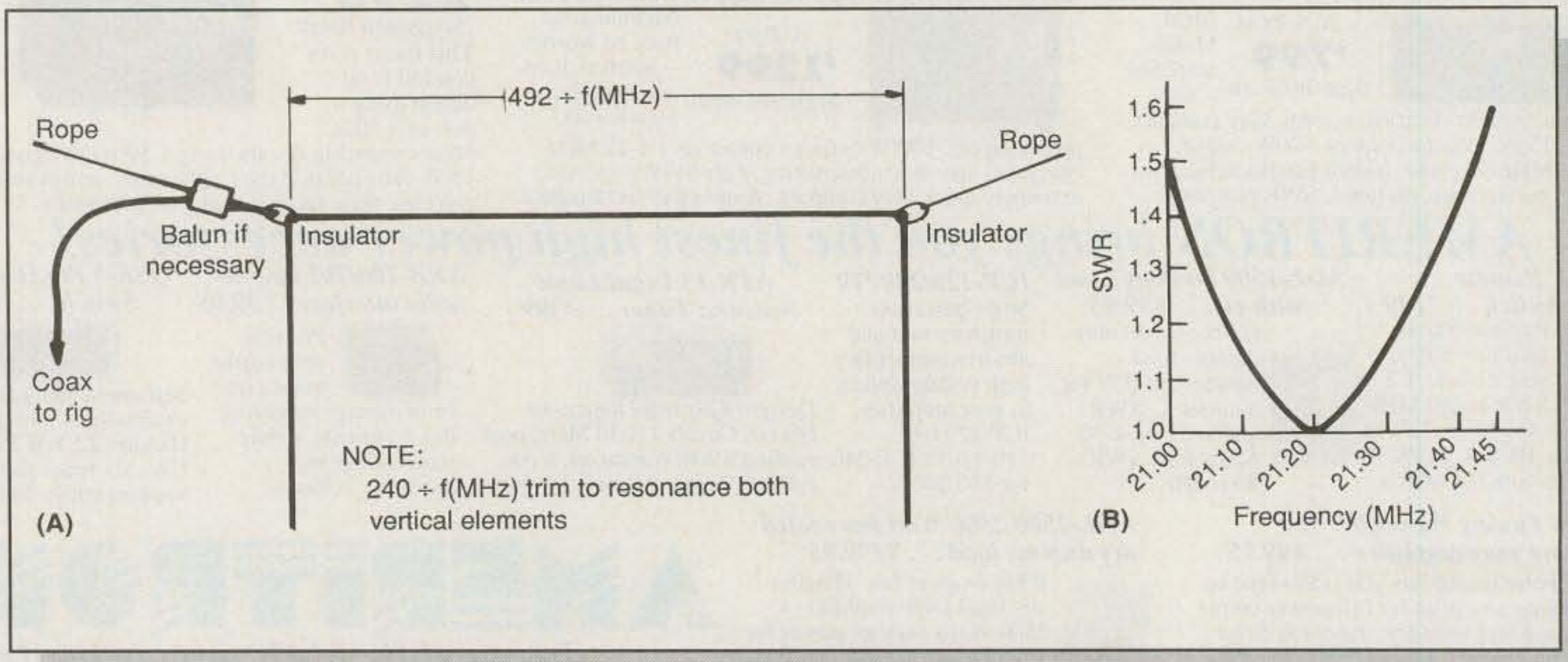

Fig. 1– (A) The 15 meter half-square. (B) Resulting SWR curve.

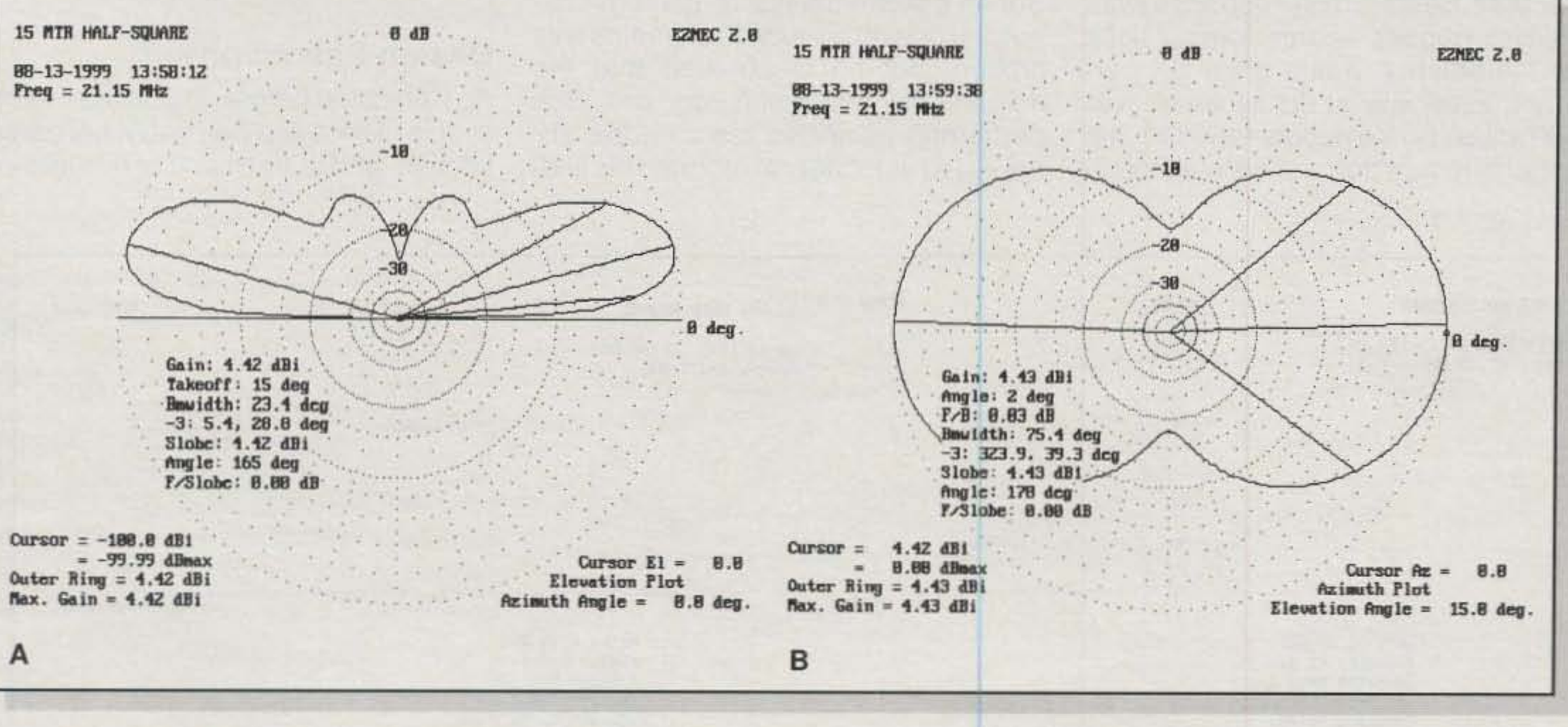

Fig.– 2(A) Elevation pattern with horizontal wire at 19 feet. (B) Matching horizontal pattern. Note the pattern is slightly off-center due to the corner feed.

with an inverted ground plane before the war, and he planned to extend the concept to two or more elements. After the war, his plan became a reality. The two-element version consisted of a full-wavelength wire bent at a 90-degree angle one-quarter wavelength from each end and mounted in an "upside down U" configuration. This is what we know as a half-square.

A problem arose. Before Woody could build the antenna, he had to move. He tried to interest some of his friends in building and testing the antenna. He met with rejection. The response was "Nothing that simple could be any good or other people would be using it!" Well, Woody's friends were wrong.

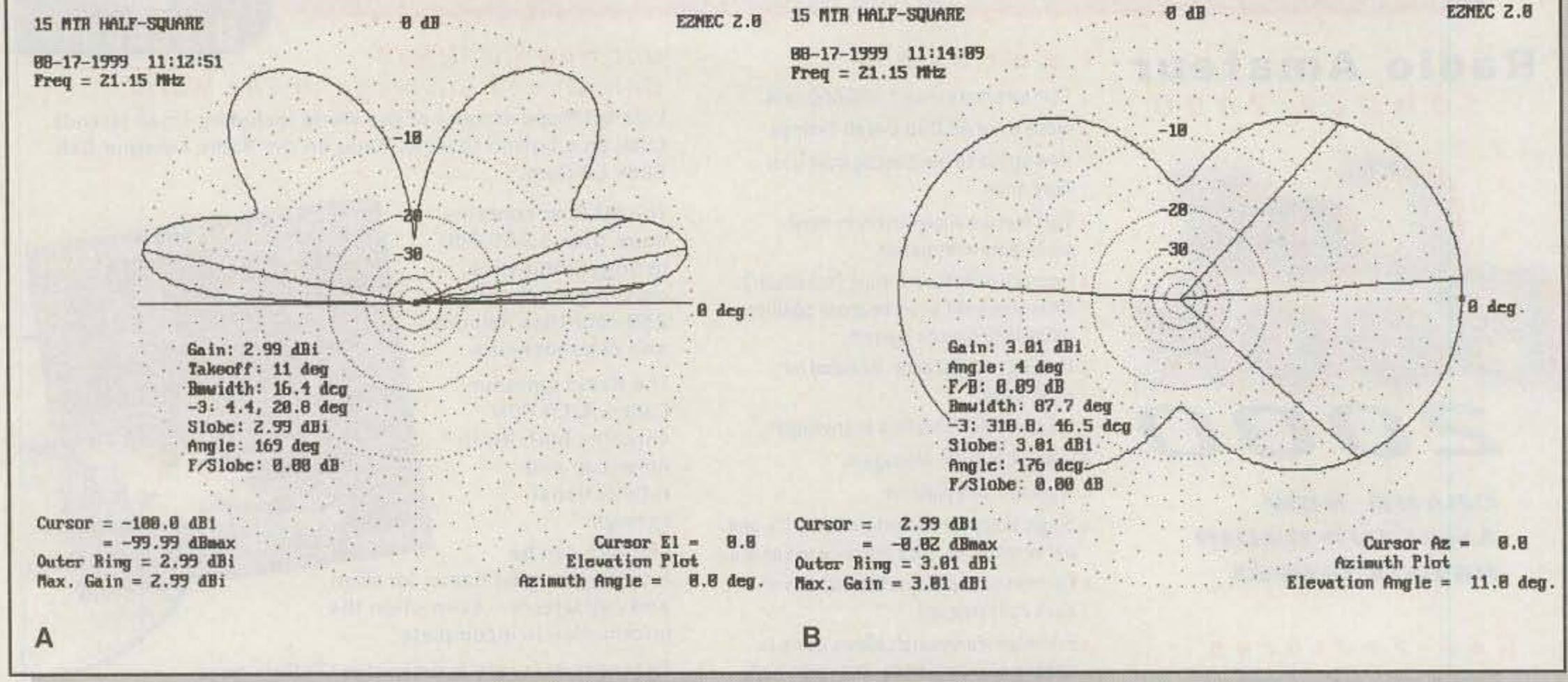

Fig. 3(A)– Elevation pattern with horizontal wire at 28 ft. (B) Matching horizontal pattern.

Perhaps a more complicated design would attract attention. Thus entered a second design. This design consisted of a full-wave horizontal element with three quarter-wave vertical elements attached at half-wave intervals. The design known as "The Bobtail Curtain" was published in the April 1948 issue of *CQ* and was entitled "Bet My Money on a Bobtail Beam." The response was positive. Reports began coming back that the antenna was a great DX performer, especially at distances of over 2500 miles. Some people reported that their antenna performed well, although they could build only two vertical elements. I'm sure Woody smiled.

I became aware of the antenna through a March 1974 article in *QST* written by Ben Vester, K3BC, and entitled "The Half-Square Antenna." Ben had been using an 80 meter Bobtail Curtain to maintain a DX schedule, and Mother Nature played a trick on him. During a storm the horizontal wire connecting one of the outside elements was broken, but he discovered that the antenna still performed very well. Ben performed extensive tests on the abbreviated antenna and reported his findings in the *QST* article. Woody's antenna was now in print.

I have built many half-square antennas in the past, and I am happy to say that I have never been disappointed with their performance. They are very good low-angle radiators and really begin to show their outstanding performance at distances of 2500 miles or greater.

Design Philosophy

As I indicated before, the design is very simple. There is a half-wave horizontal section, and at each end of this section

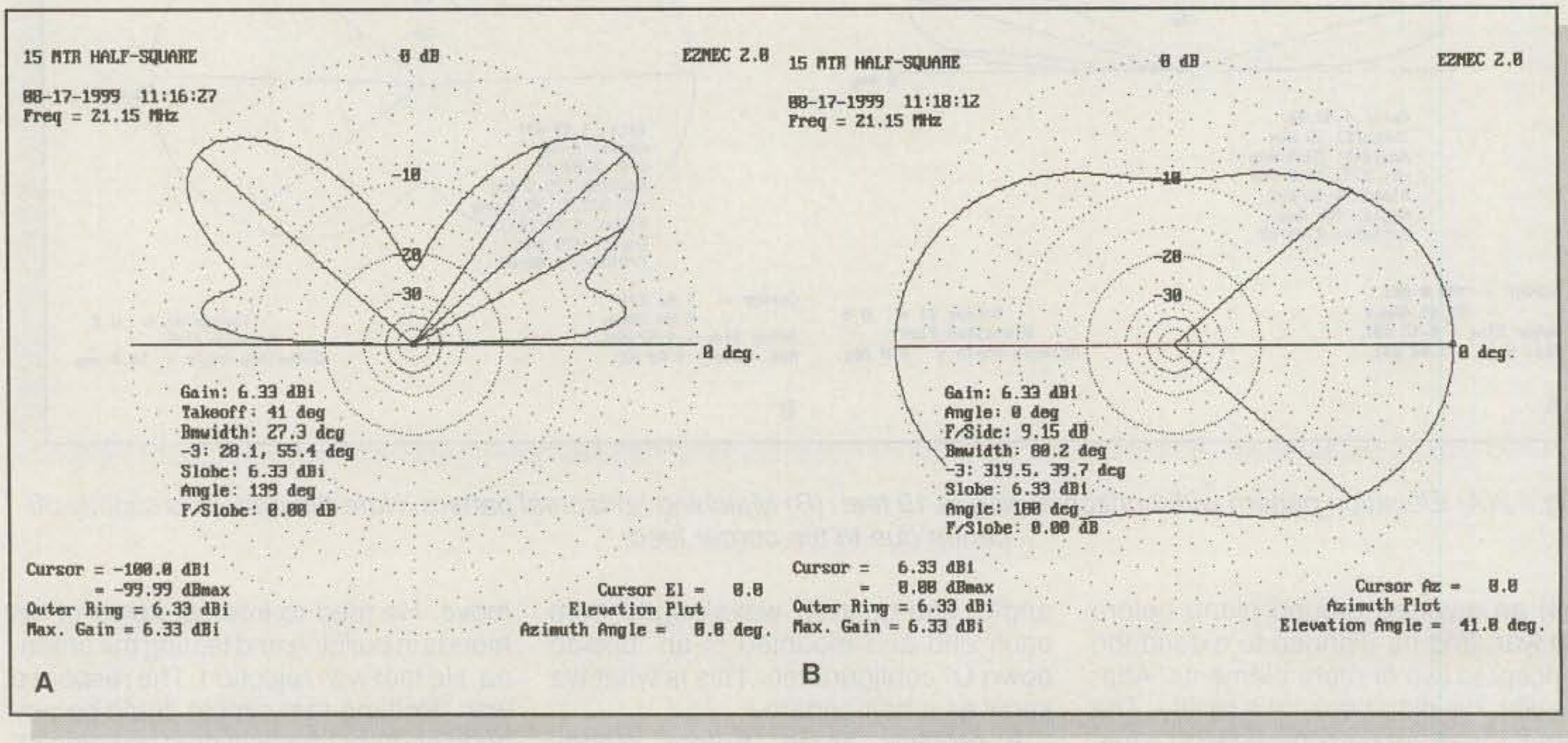

Fig. 4(A)– Elevation pattern with horizontal wire at 36 ft. Don't place the antenna too high. (B) Matching horizontal pattern.

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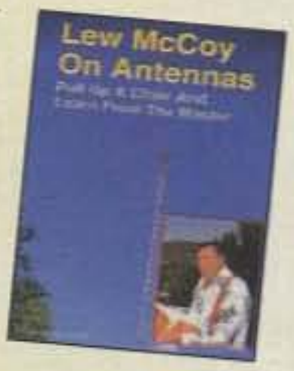

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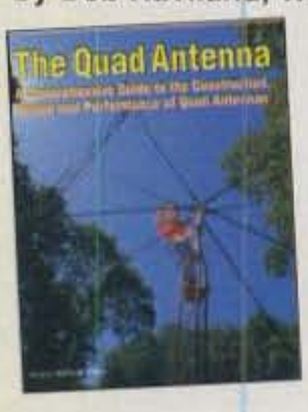

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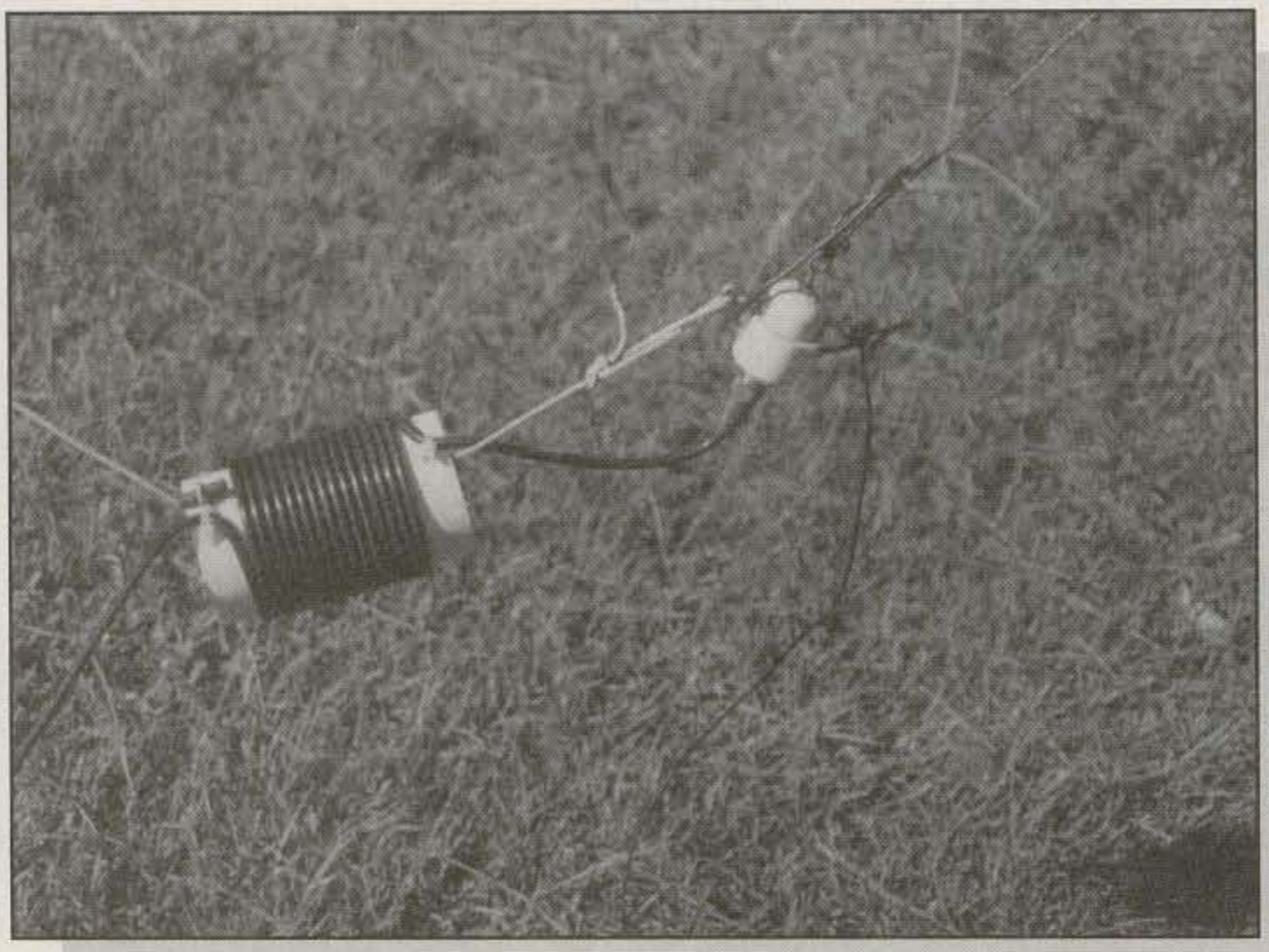

Detail of the balun, halyard, and corner coax connector.

there is a quarter-wave vertical section attached. The formula to determine the length of the horizontal section is l = 492/f, where "f" is the frequency in MHz. If you do not have room for the full length, you may shorten the horizontal section and increase the length of the vertical sections. The antenna does not seem to care if the horizontal section is exactly 180 degrees long; it works just fine if you are close to that length. The formula that I use to calculate the length of the vertical sections is l = 240/f, where "f" is the frequency in MHz. This length is too long for resonance in most cases, but it is easier to remove wire to achieve resonance than it is to add wire. Now for specific construction details.

Construction Details

Start by cutting 35 feet of wire for the horizontal section and one vertical section. The wire can be 16 gauge or heavier, and stranded wire is a bit easier to work with. Measure about 12 feet from the end of the wire and fold the wire back on itself. Push the folded wire through one eye of a standard insulator, form a loop, and loop the wire around the insulator to form a cinch knot. This technique saves a solder joint, and the wire will hold very firmly when pressure is applied. Attach the other end of the horizontal section to another insulator with a cinch knot (see fig. 1).

Cut another wire to a length of 12 feet, 3 inches. This will form the other vertical element. Route this wire through the remaining eye of the insulator and secure the wire with a cinch knot.

Build A Simple Coax Connector

There is an easy way to build a very functional coax connector. I went to my local hardware store and found two schedule 40 PVC end caps that would nest nicely into one another. I also purchased three small "eye bolts" to provide strong connecting points for the wire and halyards. I soldered a wire about 6 inches long to the center connector of an SO-239 coax connector and a second 6 inch wire to a solder lug to mount to the shield side of the connector. I then drilled the PVC caps and mounted the hardware. I extended the wires through holes drilled in the side of one of the caps. Then I coated one of the caps with PVC cement, pressed the two caps together, and allowed the cement to dry. Where the wires extended through the caps, I sealed the places with silicone cement and allowed everything to dry. That's it. Believe me, it's easier to build than it is to write about!

Next I connected the coaxial feed line (I used 50 ohm) with the center conductor connected to the horizontal phasing line and the shield to the vertical element. Be sure to waterproof the end of the coax to prevent moisture from entering. Secure the coax to the insulator with nylon cable ties. Attach a halyard (rope) to each insulator and the antenna is ready to hoist into the air.

Place the antenna in the air by tossing the halyards over a convenient tree branch and raise the antenna until the vertical elements are at a convenient height for trimming. Try to keep the coax away from the vertical element by about one-quarter wavelength. This will ensure that the coax does not adversely affect the SWR readings. (If you have room, route the coax along the halyard for the necessary distance.)

What About a Balun?

A balun may not be necessary, but here is an easy way to tell. As you are taking preliminary SWR readings, move the coax a few feet. If the SWR reading changes, there is probably RF on the shield and it needs to be isolated. I built a simple balun by winding several turns of coax around a piece of 4 inch schedule 20 PVC, but any convenient coil form of that diameter will suffice. Be sure the material is lightweight, because it will be supported on the halyard.

Final Tuning . . .

Next hoist the antenna into the air and trim for best SWR. As I indicated earlier, the vertical elements are going to be too long in most cases, so the point of resonance probably will be slightly below the lower band limit. I trimmed the wires until the antenna was resonant at the low end of the band as indicated by an MFJ 259 antenna analyzer. I then folded the antenna wire back on itself and taped it in place to attain final resonance at 21.2 MHz. If I ever decide that I want the antenna to resonate at a lower frequency, it is a simple matter to lengthen the vertical elements. When completed, the antenna should have an SWR of less than 1.4:1. The SWR on my antenna varied from 1.5:1 at 21.0 MHz to 1.6:1 at 21.45 MHz with a 1:1 resonant point at 21.2 MHz. Remember, these were my test results and your situation will be different. So much for the construction. How about the predicted results?

Predicted Results

As can be seen in fig. 2, the vertical pattern is what you would expect from a vertically polarized antenna. The vertical angle of radiation is predicted to be 15 degrees even when the antenna is very close to the ground. (I used a height of 19 feet for the horizontal phasing line for this computer model.) The horizontal pattern is about the same as you would expect from a dipole—namely, perpendicular to the horizontal phasing line. It is very close to the classic "bow-

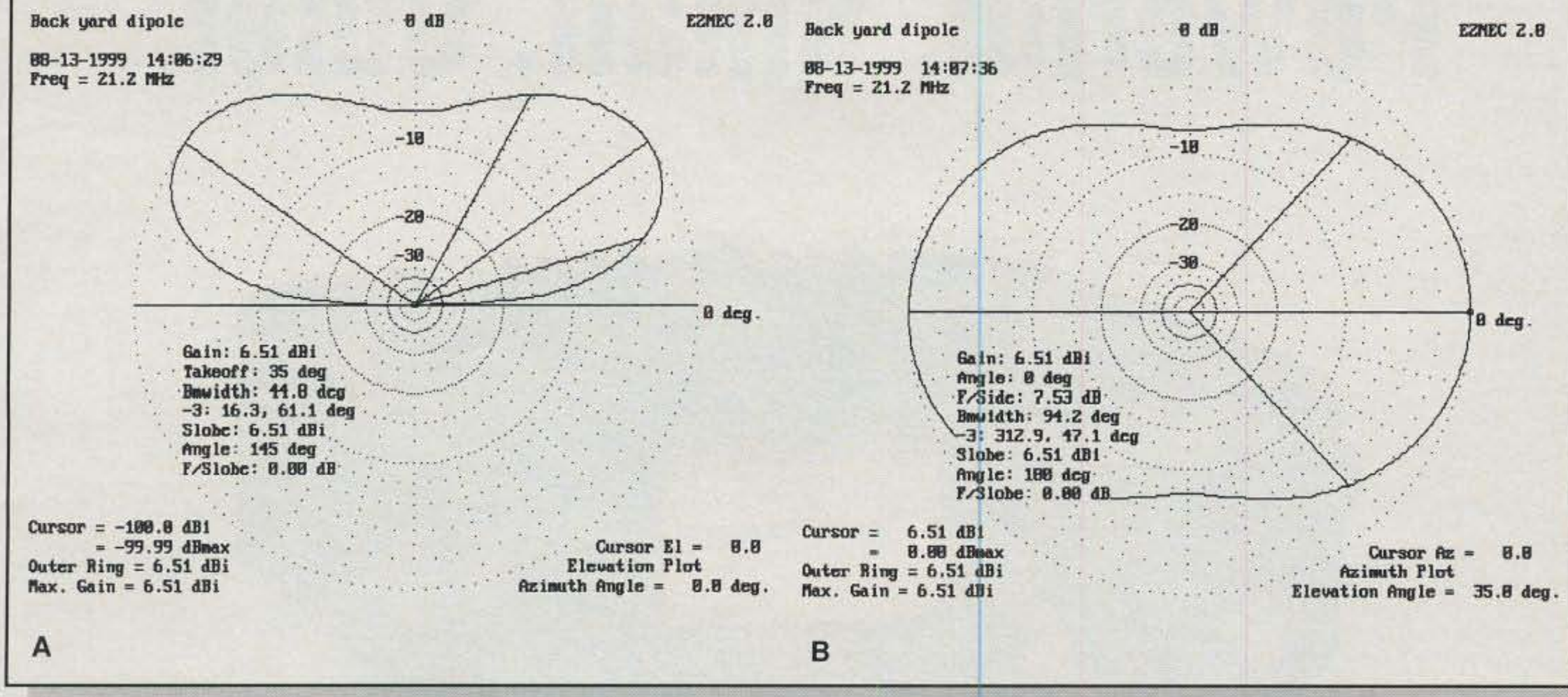

Fig. 5(A)– Elevation plot for a half-wave dipole placed at 22 ft. (shown for comparison). (B) Matching horizontal pattern for the half-wave dipole.

tie" pattern. Remember, this will not be an omnidirectional pattern, since we have a pair of phased verticals. If you desire an antenna for both high and low angles of radiation, raise the height of the horizontal section to about 28 feet. This gives a second lobe that is considerably higher while still maintaining good low-angle characteristics.

As can be seen from the comparative computer model of a dipole at 19 feet, the half-square gives great performance for an antenna at low heights. At a height of 28 feet a secondary lobe appears. This is good if you desire a dual-purpose antenna (both stateside and DX). A word of caution: Do not place the antenna too high, or you will lose the DX lobe.

On-the-Air Results

I have been very pleased with the antenna's performance. My initial test was at night on SSB. While running only 80 watts PEP, my first two contacts were with Misha, RU9VA, zone 18 in Siberia, and with Alex, UN7PCV, in Kazakhstan. Needless to say, I was very pleased. Even after 42 years of operating, I still get excited over contacts such as these.

Afterthoughts

I would be remiss if I did not include a bit about safety precautions. Never place an antenna near a power wire. Furthermore, try to place your antenna so that if a power line should fall, it will not touch the antenna. If you place the antenna close to the ground, be sure to take precautions so that people and animals cannot touch the end of the antenna. Remember, the end of the antenna is a high impedance, and very high voltages can develop even when operating at low power levels.

If you have questions that I have not been able to answer in this article, give me a call. My phone number is 256-435-3642.

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Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

A Digital Primer—Part II

Last month, you will recall, we looked at the differences between digital and analog signals and discussed the significant advantage of digital over analog as far as transmission is concerned. We also examined a simple digital transmission scheme for slowly moving analog signals and saw how simple digital "words" (made up of Morse code symbols) could convey information. This month we will continue the discussion with faster signals, such as speech, and see how they are digitized.

Converting an analog signal into a varying frequency as we did last month obviously requires that the varying frequency be many times higher than the analog signal being converted. Once we move into the audio range, however, the frequencies and linearity required (of a V/F, F/V system) become so high that proper implementation is difficult. As a result the conventional analog-to-digital converter uses a different scheme. The amplitude of the input signal is sampled at a rate that is several times faster than the signal. Digital "words" that convey information as to the absolute amplitude of the signal at each particular instance are created in much the same way that Morse code "words" convey information as to the particular letter. These words are then transmitted as a continuous series of words, just like a Morse code message.

Fig. 1 shows a very simple way in which this can be done. While not exactly the circuit of a modern A/D converter, it does serve to show the basic principles involved. For simplicity, the input signal is shown as a ramp. You will note that at the beginning of the ramp all comparators are at logic zero (or untriggered). As the ramp rises in amplitude, each comparator triggers as its preset threshold is reached. At any given point in time, therefore, the amplitude of the ramp can be determined by the combined output states of the comparators. This combination of outputs is called a digital "word," and in our example it is a four-bit word, since there are four outputs.

In the example shown, the comparators are constantly changing as the signal changes. Transmitting usable infor-

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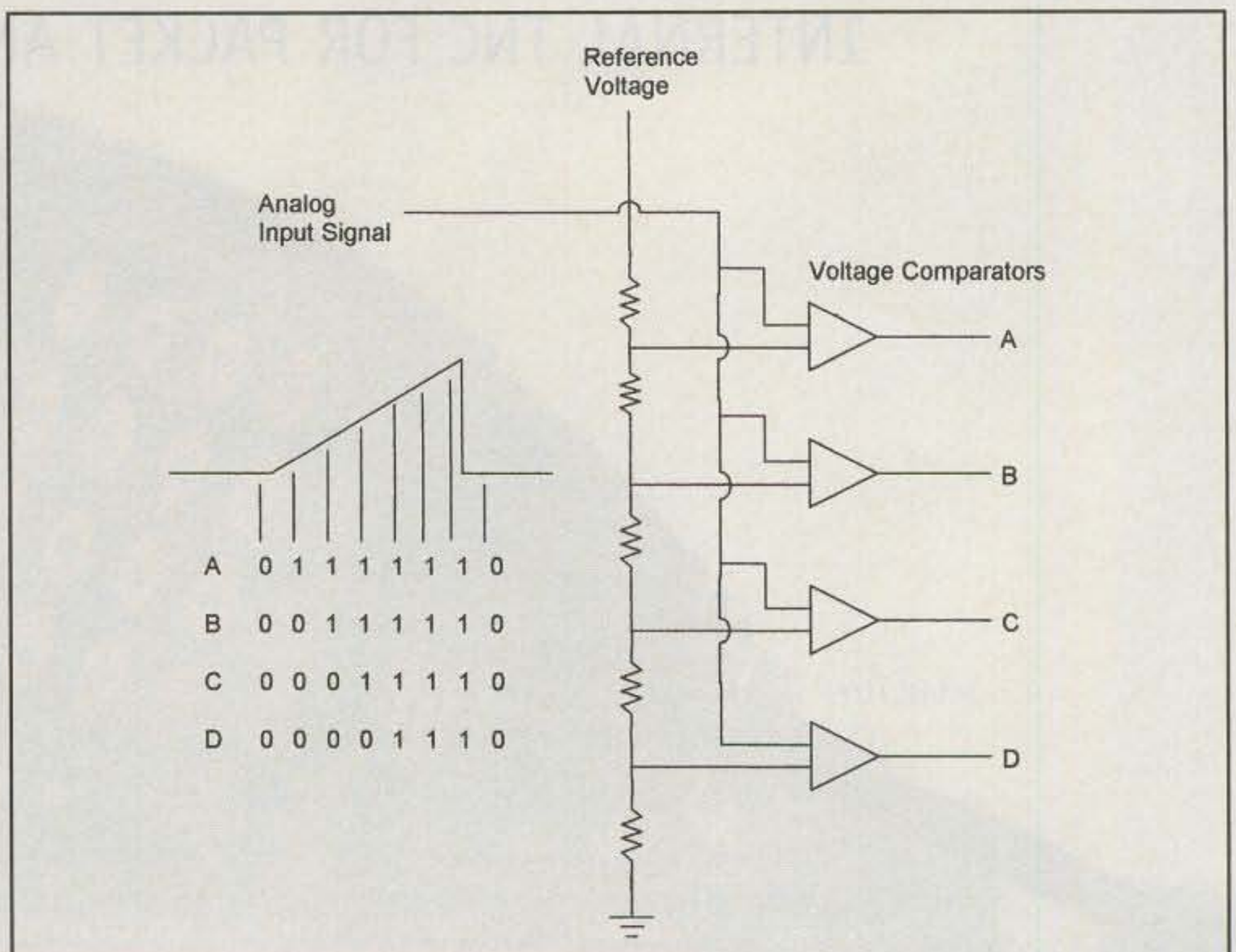

Fig. 1– Simple A/D converter with input and output signals.

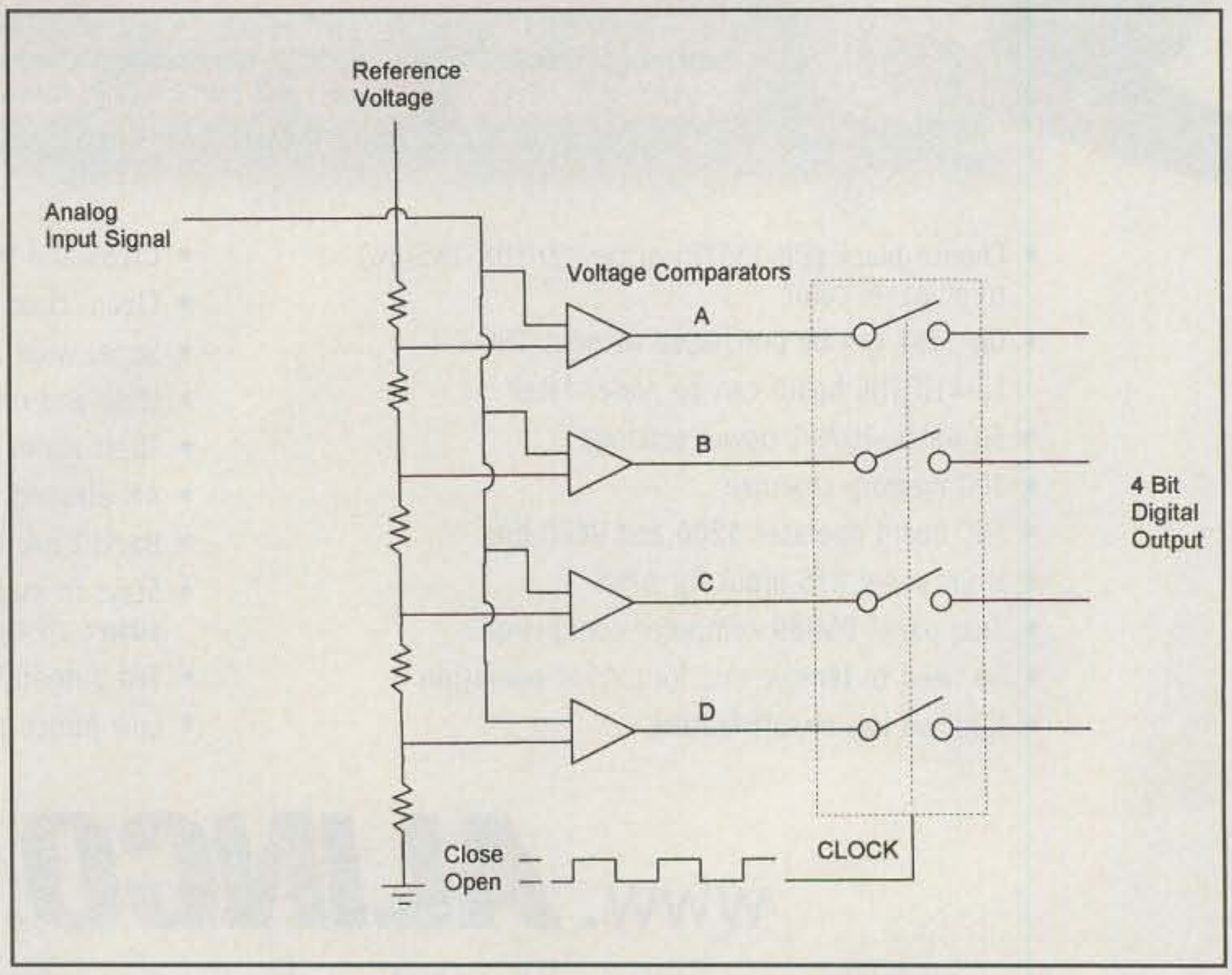

Fig. 2– A/D converter with clocked digital output signal.

mation requires a method of synchronizing the signals so that individual words can be transmitted on a regular basis. Fig. 2 shows how this can be done. The outputs of the comparators are gated by a square-wave clock at a rate that is many times faster than the signal being digitized. Whenever the clock is high, the outputs are present. Whenever the clock is low, the outputs are not present. If the clock is fast enough, any variation in the signal is faithfully converted to a word. Now the parallel data words are ready for transmission.

You will note that in our example there are four lines that represent the data. For transmission these must be converted into one signal. This is done with a parallel-to-serial converter or serializer (which is just a fancy name for a multiplexer). Fig. 3 is a simplified form of such a circuit. A clock is applied to a four-bit shift register, which enables each of the parallel input lines, one after the other. Therefore, at any point in time only one input is routed to the output. The others are blocked. As a result, in one complete cycle all inputs are routed to the output, but again, one at a time. The resulting serial bit stream is then transmitted.

The reverse occurs at the receiver. The serial input signal must now be switched to each of the various output lines in direct synchronization with the transmitted data. To do this, it is imperative to recover the clock so that the individual serialized bits can be routed to the correct parallel outputs at the correct time. This is done by manipulating the transmitted data before transmission so that every rise and fall time of a data bit is equal to a clock pulse. There are a number of ways to do this.

A simple, easy to explain method is to employ pulse-width modulation. A logic 0 would be represented by one pulse width, and a logic 1 would be represented by another width. This is shown in fig. 4. You will note that every logic 1 is sent as a narrow pulse, while every logic 0 is sent as a wide pulse. All of the rise times then can be detected and used to derive the original clock. We also can employ various coding techniques such as Manchester, where a transmitted logic 1 to logic 0 transition signifies a logic 1 data bit, and a transmitted logic 0 to logic 1 transition signifies a logic 0 data bit, and "scrambling," where the bits are mixed so that there are always transitions. These are more complex techniques and beyond the scope of this discussion, but all serve the same purpose—to provide enough transitions in the transmitted signal so that the original clock can be derived.

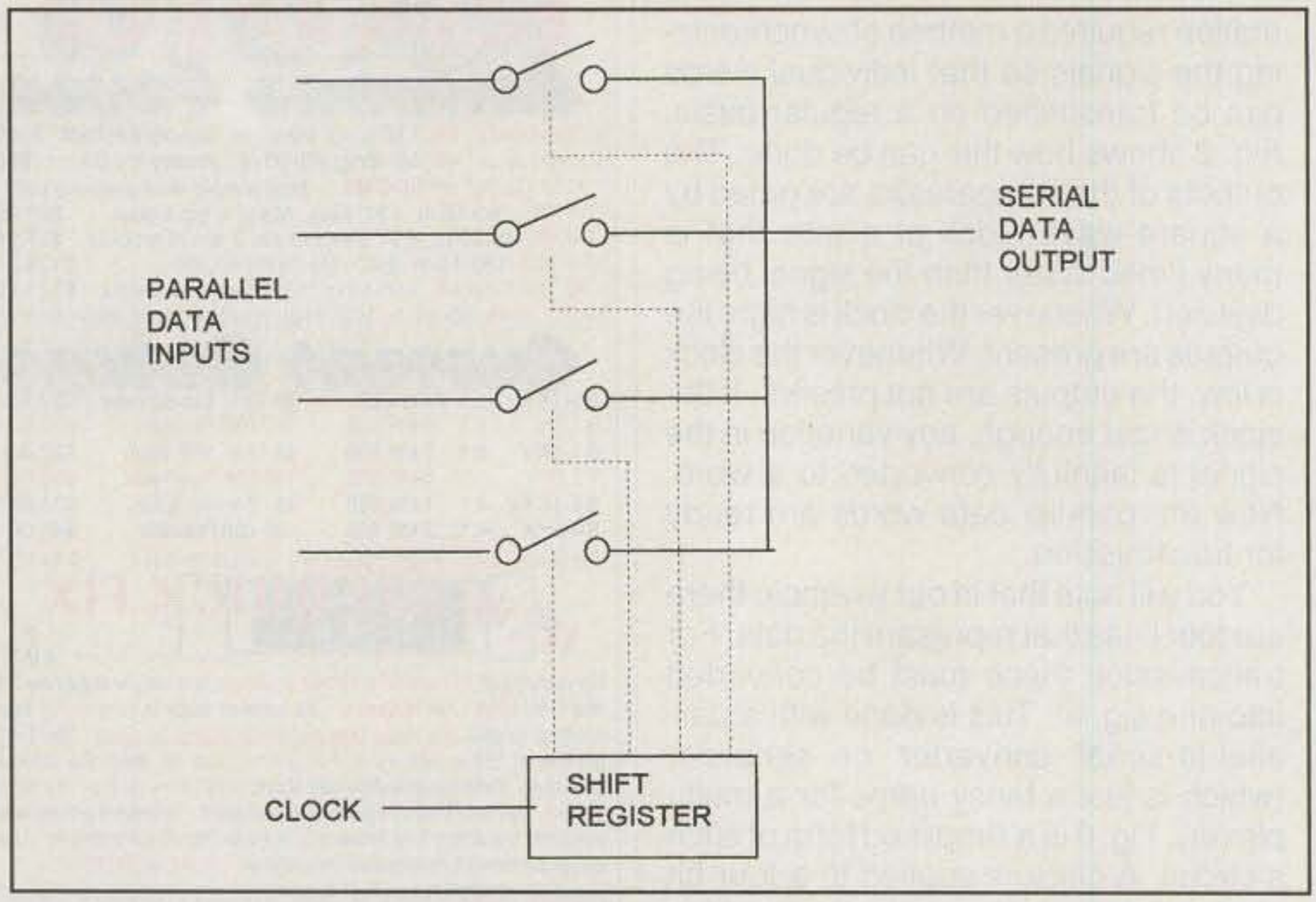

Fig. 3– Operation of serializer.

Once the clock is actually recovered at the receiver, there is one more piece of information necessary. This is a sync pulse that indicates where the start of the data cycle begins. This information is transmitted by means of a so-called "header." Such a header is a unique combination of bits that is transmitted along with the data at the beginning of a cycle. The receiver circuitry recognizes this header and then sets its demultiplexer circuitry accordingly.

As you can see, it all becomes fairly complex rather quickly. Fortunately, chip sets exist which combine many of the needed functions in a single package.

Next month we will look at the digital-to-analog function in the receiver and complete our discussion of digital techniques. In the meantime, the experimenters in our midst might consider learning more about these details by visiting the web sites of companies such as Analog Devices (www.analoq.com), Maxim Integrated Circuits (www.maxim-ic.com), and the Crystal Division of Cirrus Logic (www.crystal.com). All of these companies manufacture both A/D and D/A chip sets and have application notes that explain the techniques in much more detail.

73, Irwin, WA2NDM

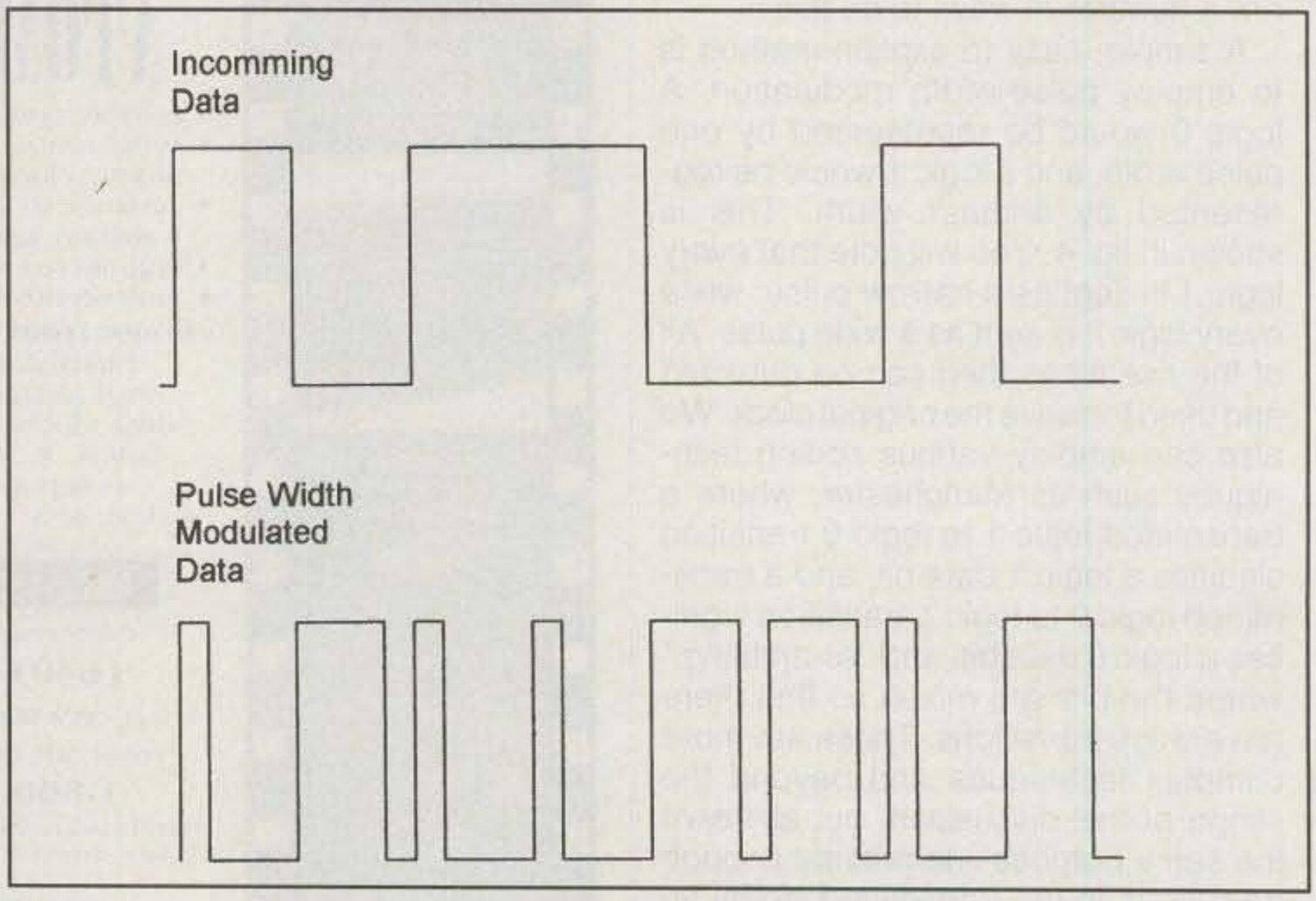

Fig. 4– Pulse-width modulation of data.

Packet User's Notebook

BY BUCK ROGERS, K4ABT

Connecting You And Packet Radio In The Real World

Sound-Card Hamming: PSK31 and Other Hot Digital Modes!

By my standards, the life I've lived has been a good one. Throughout the years many interesting changes have taken place in the world, and by some noble and mysterious power I've been treated to an immense wealth of knowledge and enjoyment. Many of my pleasurable experiences have come about through the auspices of amateur radio. I have related a variety of those moments here in this column over the years, and this month I bring you yet another.

Robotics

In the early days of slow-scan television (SSTV) I used hardware that was large and cumbersome to manage. As time progressed, so did the technology that surrounded my SSTV hobby. I went from an old P-11 phosphor tube to a CRT screen. At best, I could now take a photo of the CRT screen with my Polaroid "Land Camera™," but only if the picture I had received via SSTV stayed displayed long enough to get a good shot of it, if the room light level was low enough to allow the CRT to impress the film of that old camera, and if the SSTV picture was one I wanted to keep.

Then in the late 1970s and early '80s came the CoCo™. Sure, there were TRS-80 models I, II, and III, but the CoCo with its 6809E processor had something the rest didn't have—*color!* From that moment on, SSTV (analog) and the digital modes of communicating would never again be the same.

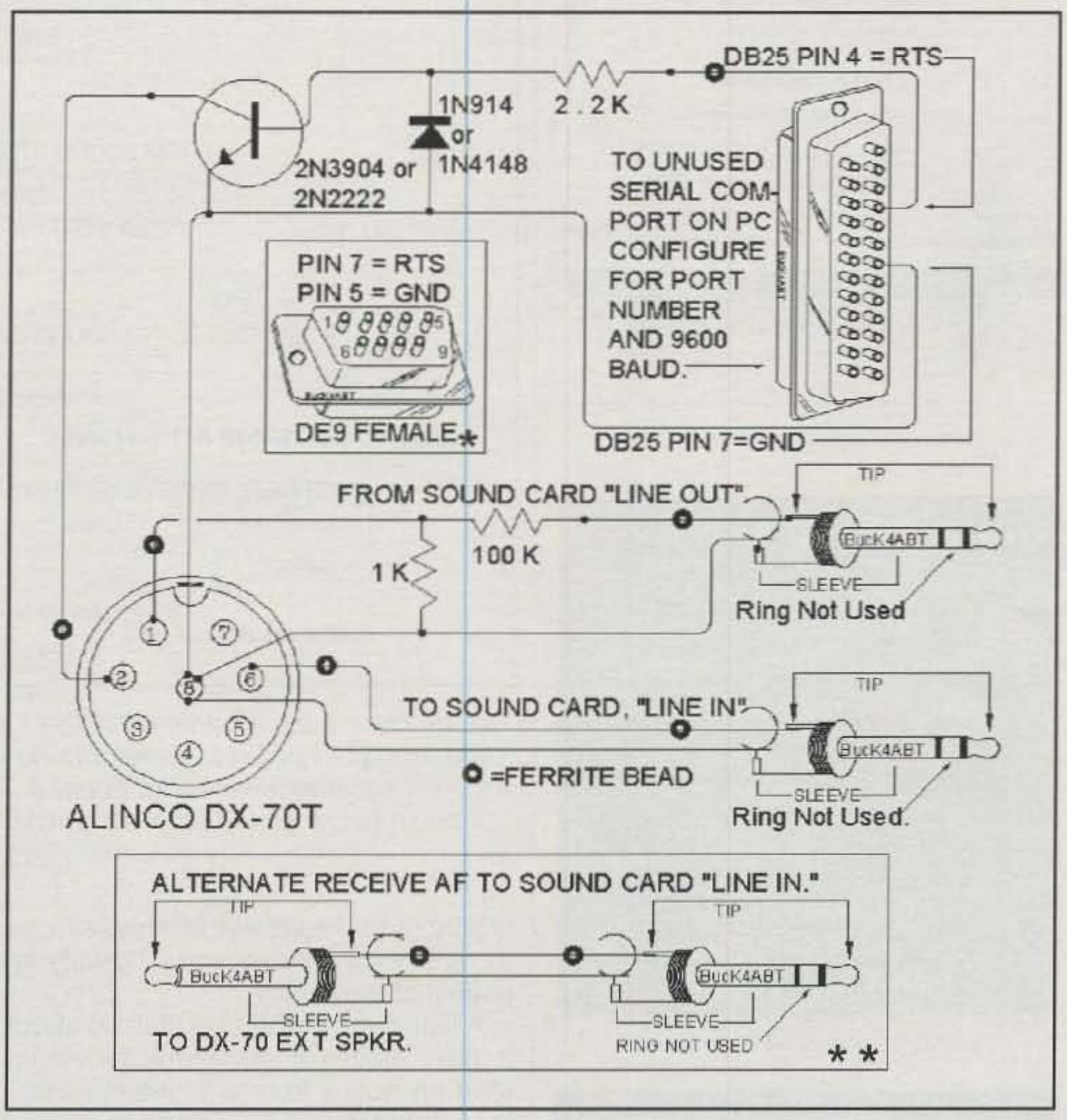

Fig. 1– The method I used to interface my PC sound card to my Alinco DX-70T HF transceiver. This interface is simple and gets the job done. Note the ferrite beads in the mic input line and on the sound-card I/O lines. If your transceiver has VOX and you prefer to omit PTT via the RTS circuit shown at the top of this drawing, you can enable PTT by using the transceiver VOX.

Back to the Future

On HF there have been several modes tried for various kinds of digital communications. First it was RTTY, with the old model 15, 19, and later model printers. Many of us still enjoy an occasional RTTY QSO.

Next I found AMTOR to be fun, with one exception. I'll never forget my first stint on AMTOR. When I completed my first AMTOR interface, I connected it to my Yaesu FT-101 transceiver, which had relays in it that switched between transmit and receive. I'm not talking about little relays, either. These were *real relays . . .big relays . . .* relays that went "clunk" when they were switched between Tx and Rx modes. You probably already know the rest of this story. When I attempted my first link to another AMTOR station, my FT-101 began a "table dance" the likes of which I will never forget.

Somewhere about that same time I tried packet radio. Both of these new digital modes were lots of fun. Packet made a big splash and became a true networking device that has made great strides over the last two decades.

A few other modes such as PacTOR, Clover, and G-Tor also have made their entry into the ranks of our hobby. However, today we are finding that most of the digital modes surfacing are coming in the form of software that accesses and implements the sound cards within the computer in the ham shack.

Okay, so you didn't have a sound card in the ham shack computer. If you still don't have one, after reading this month's "Packet User's Notebook" you definitely will want to get one.

Digital Signal Processing

It seems that each time I think I've reached the highest level of enjoyment

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e-mail: <K4ABT@PacketRadio.com>

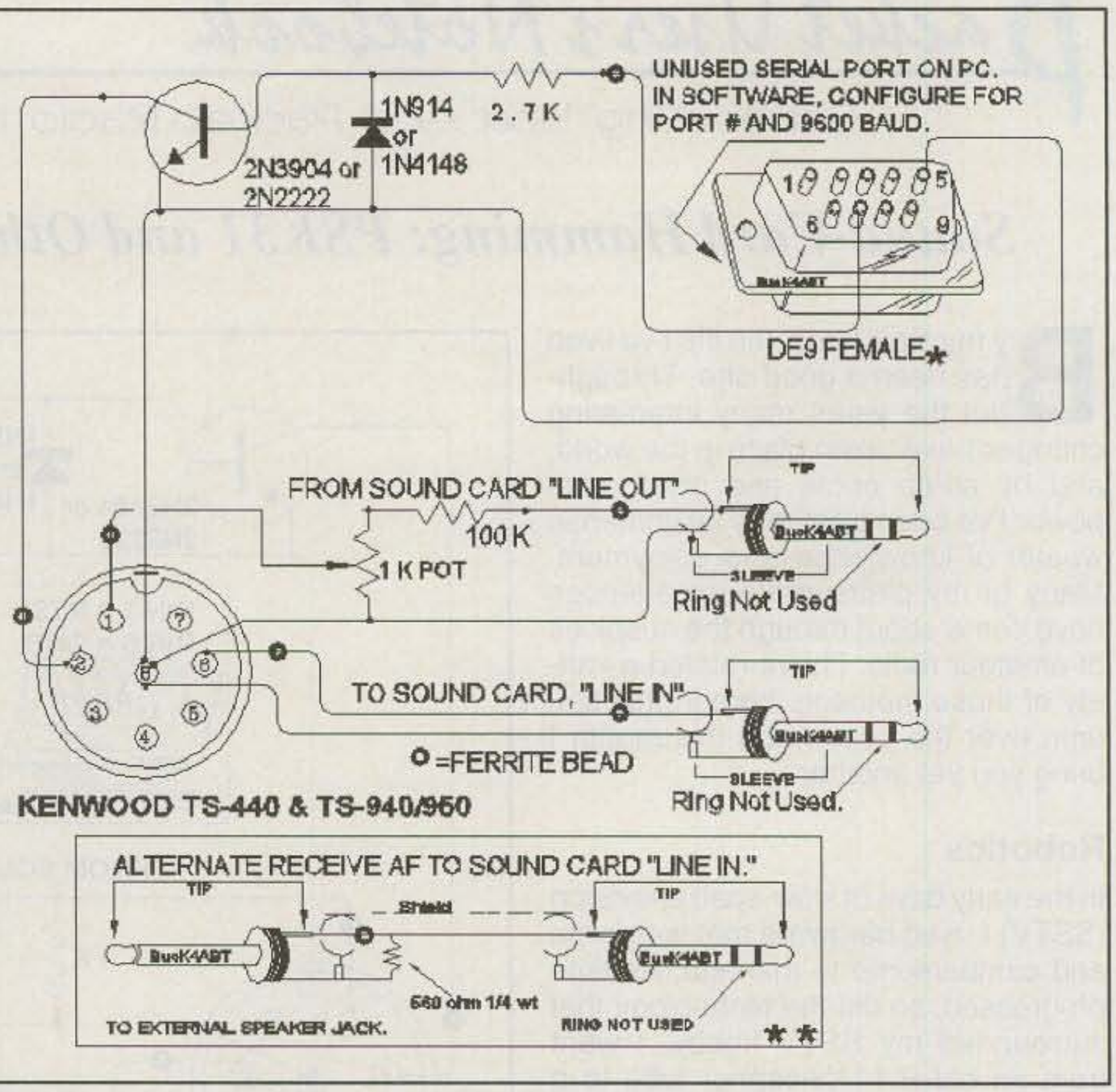


Fig. 2– Here I use a variation of the theme shown in fig. 1 by placing a variable 1000 ohm (1K) pot at the microphone input. Note that all Kenwood transceivers may not have receive audio at pin 6. An alternate method for applying receive audio to the sound card is shown in the box in the lower portion of fig. 2.

in ham radio, I suddenly find myself face to face with an even more gratifying aspect of the hobby.

A little over a year ago I talked about a new mode of communications I'd learned about from a news release I received in the mail. Reading about and researching the new digital modes that come down the pike provides plenty of new fodder for this column. I've reached a point now where I can write about some of the many digital signal processing (DSP) projects.

Without a doubt, most of the DSP projects are now built around the personal computer (PC), or to be more precise, around the sound card within the present-day PC. When most PC speeds reached 75 MHz and above, the fun really began. I suppose we could say the 486 and early Pentium processors opened the flood-gates for the DSP modes to run within the firmware of the PC.

Without a lot of fanfare, the software writers found that the new speed-machines could be made to support software that would perform several functions at the same time. Moreover, they made good use of this speed by building various filtering methods into the software drivers supported by the higher speed PCs. Once they had the filters set to a "step-switching" level, they began to build software that would perform in a "variable" manner. Some of the present-day filters even track signal processing as if they are automated to follow signals under varying signal-level conditions (signal-seek).

How Do You Top This?

This month most of my column is built around the digital modes that utilize the sound card in the PC. Most of these applications require that your PC be running in the Windows™ 95, 98, or NT environments. I've found that when trying to run some of the software in earlier Windows™ environments, the software becomes sluggish and often crashes.

In almost every area of the amateur radio hobby you will find hams using a PC in an on-the-air related application. There is one common denominator that surfaces each time I look at one of these new PC-based modes—the *sound card* in the ham shack PC.

The sound card may be used by some to play games and listen to sound effects, by others to listen to midi music, and even more by PC users who like to hear a classical CD playing in the background. However, when it comes to the PC in the ham shack, that's an entirely different story. The "sound-blaster™" or other sound card has but one purpose in the ham shack computer: It is for the sole enjoyment of the operator to access and use the many digital modes now built around the PC sound card.

Sound Blaster by Creative Labs is one of the sound cards that set the industry standard early on. Today they continue to be one of the best for our application. Most software applications written around the sound card use the SB 16 as a base for the execution of the application. As a result, most sound cards now are designed to be compatible with the Sound Blaster series. There are a few sound cards on the market, however, that will not, and cannot, be considered Sound Blaster compatible. In several instances these cards will not work in the applications we discuss this month. I have seven PCs here in my lab, and most of the sound cards are from either C-Media or Sound Blaster/Creative Labs, or compatibles. In my newest PC I have a 64-bit sound card that performs very well when using the amateur-radio-related sound-card digital applications.

Just as a reminder, you should always try to use at least a 16-bit Sound Blaster compatible sound card. The 32- and 64-bit cards support the same applications software as well. For the record, I tried and tested an 8-bit sound card, and it will *not* work with PSK31. Others will attest to this also. It also fails with most CW and SSTV sound-card software.

When setting up the sound card for most applications, set the on-screen "wave" volume (software) control to about one third open, and then slide the main volume control to the desired signal level.

Talk to Those Who Have "Been There, Done That"

In conversations with Ernie, WM2U, and Skip, KH6TY, I was told that if I had not used the ferrite beads on all my sound-card I/Os (input/output) and the transceiver I/O, I may have encountered some RF problems. Well, believe me, I learned that lesson years ago. Operate a bit of HF packet and the lessons come hard and fast.

The point that Ernie Mills, WM2U, and Skip Teller, KH6TY, made to me was that

when the operator does not have a handful of ferrite beads, use the next best method. Go to RadioShack and download a couple of their 1:1 and 100:1 turns ratio transformers. This is one sure means of discouraging RF from your system I/O audio circuits.

The idea is to have as clean a signal as possible when you put the new sound-card generated signal on the air. I still like to make sure the levels into and out of the transceiver are at 250 millivolts, or as near as possible. Then if the levels are too high or too low, I make the necessary changes up or down, knowing that I'm at least in the ballpark of an I/O that will be easier to tame.

In some of my interface drawings you will notice that I do use a pad, and often a low-value resistor across the audio line in port. I do this at both the sound-card line in and the transceiver audio in ports to reduce the chance of RF feedback into the audio circuit by providing a low impedance input.

A word to the wise: A high-impedance I/O on the order of 47,000 to 100,000 ohms is an open invitation to RF components staging a ringing audio component. Once RF has entered your radio, the first stage it gets to is an audio stage. This is where most problems occur. When RF hits the base of the first transistor, a diode actions occurs and RF (base rectification) squeals begin.

PC to Transceiver Interfacing

We can now use the PC and sound card to communicate using just about every digital mode employed by the amateur today. The most important part of sound card to amateur radio application is the kind of interface we use between the PC sound card and the transceiver. Before we go any further in this month's topic, let's talk about PC sound card to transceiver interfaces.

Fig. 1 shows one method I used to interface my PC sound card to my Alinco DX-70T HF transceiver. This method is simple and does the job. However, there are better ways to accomplish this interface. Some of them are on the main interface pages of my web site: <http://www.packetradio.com/tnc2rad.htm>.

One very important point is that we should provide some form of audio impedance and level control in our interface. Yes, there is already some degree of level-setting capability within the PC, but let's not make that our means of controlling the host software. Thanks to Skip, KH6TY, I've found that when I change the sound-card level for receiving, chances are it will cause a change in the transmit level. In talking on the phone with Skip, I found out that it is related to the manner in which some sound cards are wired. In addition, the sound-card I/O is unbalanced and has very little isolation. In almost all instances I've come across, he is correct. The common ground between the sound-card "line-in" and "line-out" can create some real headaches for those who are not familiar with remedial ground loop cures.

In fig. 2 I show a variation on the same theme by using a variable 1000 ohm (1K) pot that enables me to adjust the BPSK signal to the microphone input. Please note that all Kenwood transceivers mentioned in the drawing may not have

DigiPics via DigiPan

Have you ever wished you could see what the person on the other end of a QSO looks like? Skip Teller, KH6TY, has put together a collection of utilities that makes it possible to send a postage-stamp-size color photograph of yourself, during a PSK31 QSO, to the person on the other end in about 8 minutes. Here in his own words is how this is accomplished using PSK31.

In the same time, you can also send a card, such as my PSK31 QSL card shown at: <http://members.home.com/hteller/psk31pictures/> and in a larger size, but using only 16 colors. The communication path must be perfect for this to happen. (This is very often the case with PSK31!) The technique is simply to encode pictures as text, transmit the text by PSK31, and then decode the text back into a picture at the other end. I will use my call, KH6TY, for the following example, which assumes the operating system is Windows™ 95 or 98. Just replace KH6TY with your own call.

Getting the necessary freeware utilities

1. Download and install the picture viewing and editing utility, IrfanView32 at: <http://members.home.com/rsimmons/irfanview/>.
2. Download the encoding utility, BIXHEX.EXE, at: <http://members.home.com/hteller/psk31pictures/binhex.exe>.
3. Download and install the decoding utility, Decode Shell Extension, at: <http://www.searchandreplace.com/dwld/dxedown.cgi>.

Preparing a picture for sending

1. Extract (crop) and save a 60×80 pixel image (4800 pixels) from a larger .JPG picture file using IrFanview.
2. Using BIXHEX.EXE, encode the picture, which will automatically create a file entitled KH6TY.HQX.
3. Save KH6TY.HQX in your PSK31 "send" folder. This needs to be done only once per picture.

Transmitting the encoded picture file

1. Instruct the receiving station to open a log file called "KH6TY.TXT."
2. When the receiving station is ready, transmit DE KH6TY followed by a carriage return (this is very important), and send the file, KH6TY.HQX.
3. At the end of the picture transmission, transmit END DE KH6TY.

Receiving the picture

1. When the receiving station sees END DE KH6TY, he closes the receive log.
2. The receiving station then goes to the PSK31 log folder, right-clicks on KH6TY.TXT, and decodes KH6TY.TXT into KH6TY.JPG.
3. To view the picture, he simply double-clicks on KH6TY.JPG.

Tips

Put a shortcut to the PSK31 log folder on the Windows™ Start menu. This will give you easy access to all the picture files with all the functions of Windows Explorer. An easy way to do this is just to hold down the left mouse button, "drag" the folder onto the Start button, and release the mouse button.

If you send the same picture most of the time, prepare the picture by editing the picture file to add DE KH6TY and a carriage return to the beginning of the picture file. The carriage return will help to isolate the picture file from any garbage characters already accumulating in the log file of the receiving station before the picture is sent. It is also helpful to add END DE KH6TY to the end of the picture file, so sending your station identification is not forgotten and does not have to be typed every time.

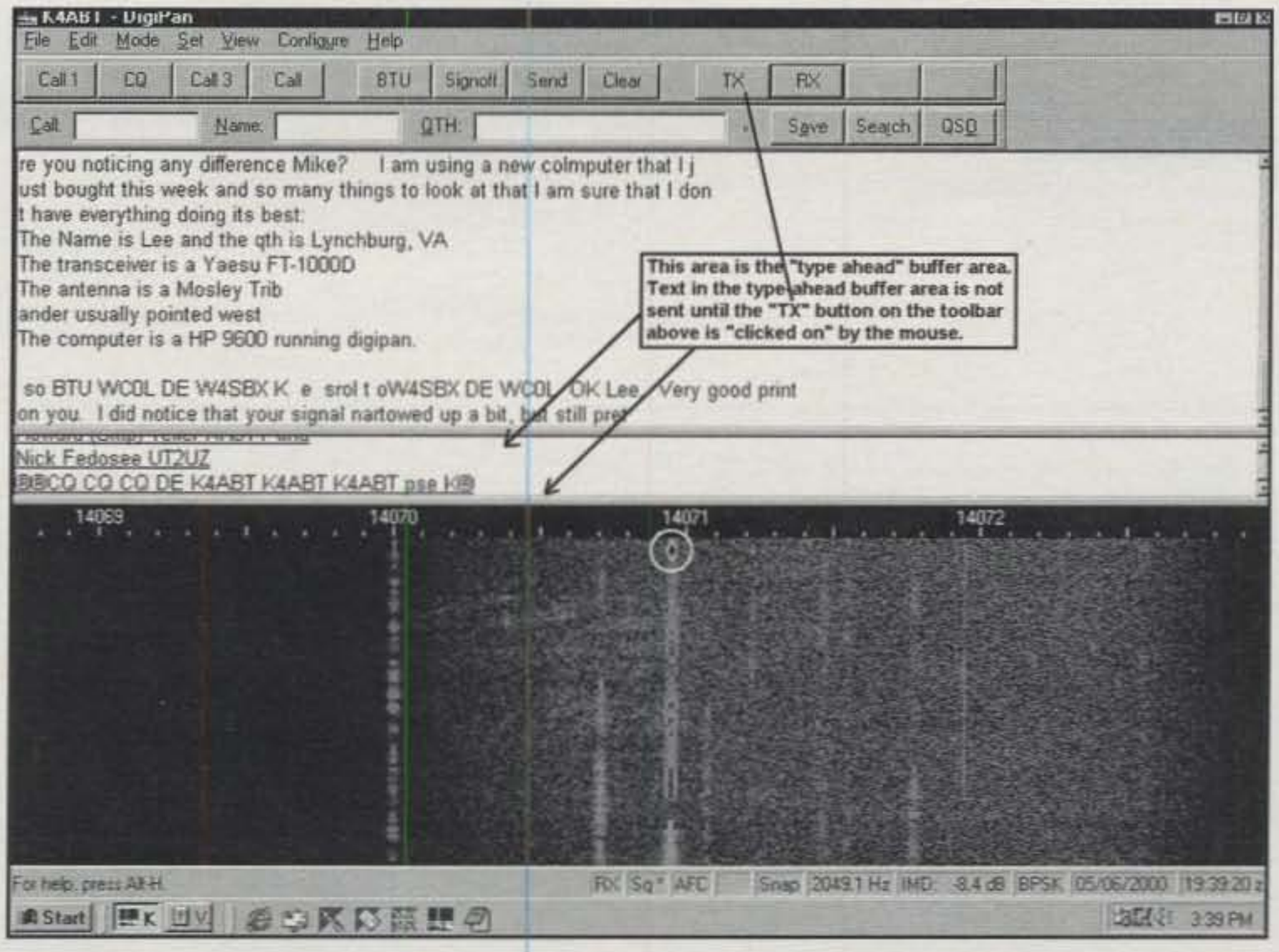
If you are sending a picture of yourself, use a close-up image for the best likeness of yourself in postage-stamp size. If you crop out a picture from a digitized photograph that is about 640×480 pixels in size and the width of that picture section is about 1/10 of the original picture width, you will be able to use it without resizing, and it will be as sharp as the original. Try to use as few colors as possible and keep the image file size under 1.3K. There is a neat $15 shareware utility, *Explorer Extensions*, that can encode a picture directly into a text file(.txt) and will decode it back into a picture, with nothing more than a few clicks of the mouse button.

If you want to experiment with sending pictures without having to create one, just right-click on any image on this page, save it to disk, encode the picture, and try sending it. All these images are under, or around, 1.3K in size and will transmit in about 8 minutes, leaving plenty of time for station identification before and after picture transmission.

For all the details for sending PSK31 pictures, go to: <http://members.home.com/hteller/psk31pictures/>.

73 de Skip, KH6TY

Fig. 3– This is a screen photo of DigiPan II. I have my favorites, and of the freeware PSK31 programs I tend to lean toward DigiPan. Of the COTS purchase software, I like MixW32 the best by far. MixW32 is a more powerful version in that it supports other digital modes besides PSK31. →



receive audio at pin 6, in which case you can resort to the "alternate" receive AF to sound-card method shown in the block at the bottom of fig. 2.

What About "Push-to-Talk"?

In most sound-card software the authors have made provisions to execute PTT circuits by using an unused (sounds contradictory) serial comport. Here we will address only the RTS method, as it is the most commonly used method for executing the transition between the transceiver's transmit and receive functions.

For the newcomer to this type of ham radio communications, I have drawn both types of serial-port PTT actuation. In fig. 1 note that I use the DB25 type serial comport; RTS is taken from pin 4 of the DB25 type port. In fig. 2 I extract the RTS command from pin 7 of the DE9/DB9 serial comport (Yes, Skip, you are correct; there are both kinds out there—en-mass). By illustrating both types of comport, you will be able to adapt either of the PTT circuits to fit your specific comport, be it 9 pin or 25 pin.

Please note that both connectors are female, or DB9"S" and DB25"S." "S" denotes "socket," while "P" identifies the male "plug." In both drawings, I have shown each connector viewed from the solder side, with the "socket" side away from you.

Oh, yes . . .While we're looking at the diagram, almost all 2N3904 plastic-case transistors have a pin-out for the *emitter, base, and collector* (left to right). With the pins pointing down, the flat part facing you, the pin-out should be E, B, C. I cannot say the same for the 2N2222, as I've found three different variations of its pin-out. If you have the 2N2222 that does not have the basing identified, then use a transistor tester to identify the base configuration of this device.

Ground Loops . . . Hmmm

Okay, so you are not familiar with the term *ground loop*. Then I'll say it another way: "hum," buzz, AC noise. Call it what you like, it will haunt you if you don't know how to administer a cure for it.

Now you have a "heads up" as to why I use a lot of ferrite beads in my sound-card interface construction.

Let's Begin Having Fun!

In addition to the many other sound-card applications, there is a recent mode of digital HF communications that is catching on fast. I mentioned it briefly in a previous column and earlier here. It is the mode developed by the father of AMTOR. You remember AMTOR, right? I sure do, as you've already read, and as a matter of fact, I don't think I'll

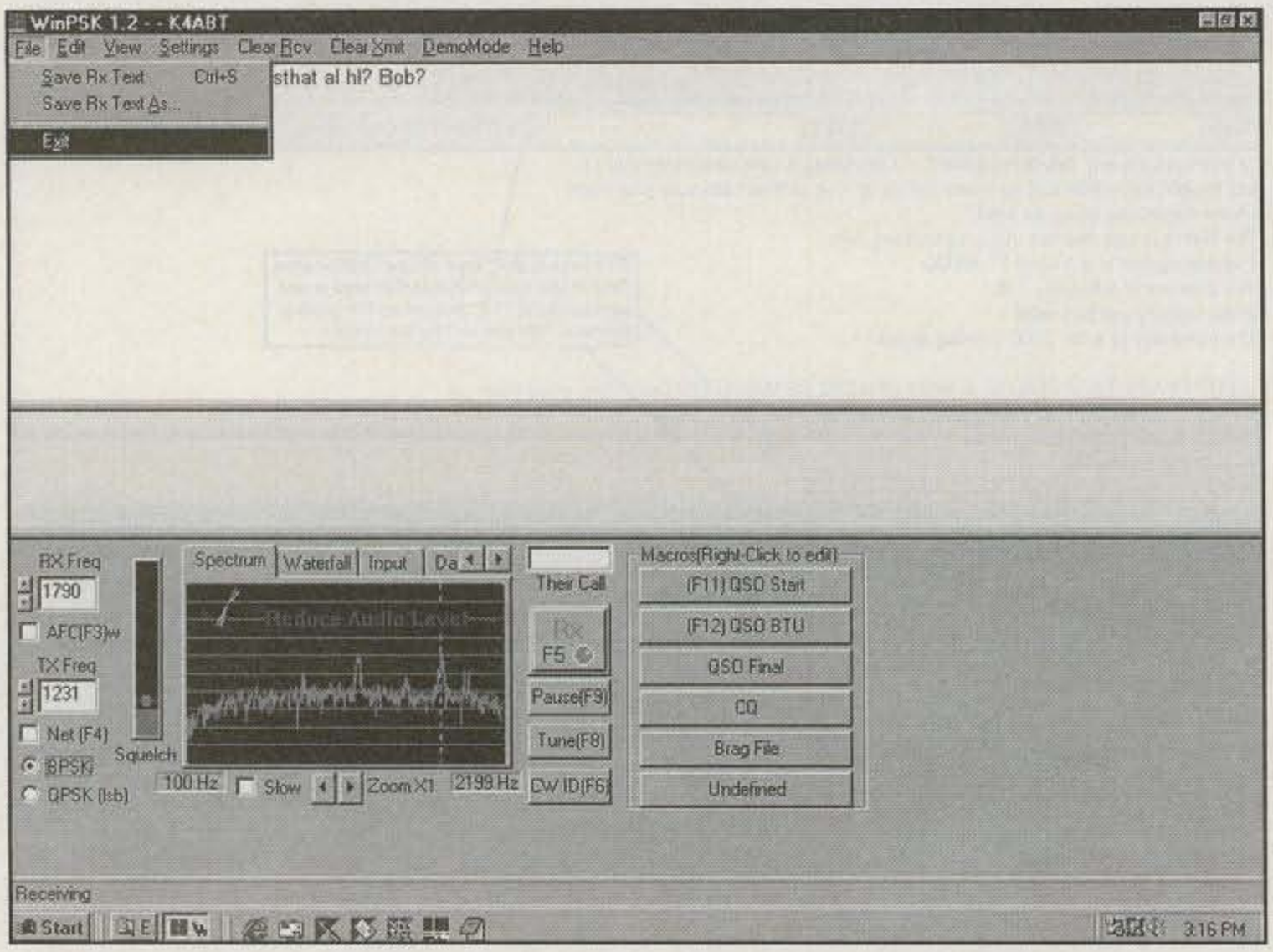


Fig. 4– A screen shot of WinPSK by Moe Wheatly, AE4JY. This software's features are impressive, to say the least. In addition, WinPSK supports a spectrum and/or waterfall display. The user can make the selection by using selectable tabs in the on-screen menu. While you're at this download site, be sure to get a PDF copy of the manual. Both the manual and PSK users' document are worth the times it takes to read them.

ever forget it. No one warned me, so the "leap'n lenna" FT-101 is still a picture well fixed in my mind.

To continue, Peter Martinez, G3PLX, has given us another fun-filled mode called PSK31. Just for the record, there are so many programs and so much software out there for this mode that no one can say they don't have a means of putting a PSK31 signal on the air.

After you've constructed the interface for your sound card to transceiver, go to Skip's site and download the freeware version of DigiPan (see fig. 3). Install it, and the rest is history. I cannot begin to tell you about the fun you will have. If you have problems downloading at Skip's site, then go to Ernie Mills' page at: <http://www.qsl.net/wm2u>.

Software Abounds

At this writing I know of eleven PSK31 software programs already in existence. Some of them are shareware, a few are "freeware," and some are outright purchase after they reach the end of a 30-day trial period or a predetermined number of executions.Three of the easy-to-use programs that I've come across are MixW, WinPSK, and DigiPan. MixW makes good use of the sound card in your PC, as it makes your sound card into a multimode controller for PSK31, RTTY, CW, and other amateur-radio-related digital modes. It is not freeware, but I have found it to be well worth the $50. MixW/MixW32 is authored by Nick Fedoseev, UT2UZ.

WinPSK by Moe Wheatly, AE4JY, features impressive, fully GPLed windows and SB implementation, which means the source is available for free for non-commercial use. The program supports a spectrum or waterfall display. Preference is set using selectable tabs in the on-screen menu (see fig. 4). To download WinPSK, go to*:* <http://www.geocities.com/ae4jy/index.htm>. The feature that impressed me the most is the well-written manual by Moe. It does support the software admirably, but even better, it provides a serious overview of PSK31 application theory. The manual is in Adobe PDF format.

DigiPan is the result of a joint effort by Nick, UT2UZ, who wrote the actual program, and Skip, KH6TY. It is freeware and downloadable at: <http://members.home.com/hteller/digipan>. This is one of the easiest to use software programs for PSK31 I've found.

RCKRTTY is another Windows™ Terminal template capable of working PSK31 with SCS PTC-II and DSPCOM units. I tried installing it twice and had fault messages come up each time I tried to run it. I e-mailed the author and was instructed to download it at: <http://www.rckrtty.de>. The problem continued, so I gave up on this program.

I don't want to forget the author of PSK31, Peter Martinez, G3PLX. Peter has a new version (1.08) for Windows™ 3.1, 95/98, and NT with Soundblaster. It has Soft-decision Viterbi, better squelch, and a much better AFC, and now Slash-zero configurable on reception. There is a new feature which will help users give accurate, useful signal-quality reports to other PSK31 users. You can download it at: <ftp://det.bi.ehu.es/pub/ham/psk31/p31sbw108.zip>.

If I had to make my choice today, I would opt for MixW or DigiPan, both by Nick Fedoseev, UT2UZ. For more information about these two programs go to: <http://users.nais.com/~jaffejim/mixwpage.htm>.

So Long, Internet

If you're an internet user, or "chat room" junkie, then you've not yet used PSK31. Once you go there, all the internet gigo becomes trash. You are soon into a full-blown, live QSO, keyboard-to-keyboard, on a mode that uses only 31 Hz.

You read it right the first time. Less than 50 Hz and you can view several stations at any one time on the panoramic screen. Move your mouse cursor to the signal you desire to read or call and "click." You will begin printing text almost immediately.

After using PSK31 for awhile, my gut instinct tells me that we may have an even better mode for long-haul emergency communications than ever. In one weekend I worked 26 countries using PSK31 and running less than 50 watts. One day after my evening meal I walked into the lab and set the rig and computer on at 14.073.000 MHz and called CQ once. I was pleasantly surprized when an HA9 came back to me. We had been in QSO for more than 20 minutes when I noticed the wattmeter on my MFJ antenna tuner. Whoa!! I had switched the 6 meter antenna on to the DX-70T HF port by mistake. The power output was less than 5 watts. That's now history, but the fun of knowing I was having a QSO with an HA9 running less than 5 watts gave me a real rush.

Is That Your Final Answer?

Where do you find all this narrow bandwidth activity? Believe it or not, you will

discover many of them in only 3 kHz of spectrum—yes, 3 kHz. We're talking about a lot of stations in a very small spectrum on 20 meters between 14.070.00 and 14.073.00 MHz. Do you realize how many 31 Hz signals you can cram into 3000 Hz? As long as there are no "wind-breaker" *TOR* stations gobbling the space, there are a bunch. You will find more activity on 15 meters at 21.070 MHz, on 40 meters at around 7.035.00 MHz, and on 75 meters at around 3.580.00 MHz.

PSK31 suddenly has become one of the hottest digital modes to hit amateur radio since packet and AMTOR. No, this is *not* just an HF fad. Unlike the modes just mentioned, PSK31 does not use synchronized linking or protocol that requires forward error checking (FEC) as in packet. It's more like super-fast CW that is psychic—so much so, that it appears to guess what the next letter of character is . . . if it misses one.

Oh, yes. That's another important feature of the very narrow-band communications mode. I personally have read signals that were so far into the mud (noise) that I could not hear them, and could barely make them out on the spectrum or waterfall screen in the program I was using to read them with. Still, they were printing clear text on the screen of my monitor.

I have used many modes of communications, but I truly feel that I've found the best one for defeating noise and QRM. You do not employ the sharp filters of your transceiver; the filters in the software are all you will ever need.

To run PSK31 you need a PC that runs Windows™ and is equipped with a sound card. PSK31 software is available via the web. Your HF SSB transceiver should be very stable and tune in 1 Hz increments. The connections between the radio and the sound card are very straightforward.

Mac Users, I Didn't Forget You

I don't want to leave the Macintosh users out of all this fun either. Go to: <http://www.blackcatsystems.com/software/multimode.html>, where you willl find a program called "MultiMode." This program allows the Mac user to decode and transmit Morse Code, RTTY, FAX, SSTV, PSK31, ALE, and many other modes without any extra hardware! MultiMode features sophisticated digital filters for pulling weak signals out of the noise.

My Final Answer

If you feel as if I've not given you enough software support for your sound card, go to: <http://leden.tref.nl/~nl9222tv/software.htm>, where you will find all the software you can use this month. It is for amateur radio, SSTV, FAX, WeFAX, PSK, QPSK, PSK31, CW, RTTY, AMTOR, PacTor, and more. And for continued updates on PSK31, check <http://www.packetradio.com/psk.htm>.

Having fun already!

73 de BucK4ABT
e-mail: <k4abt@packetradio.com>
visit: <www.packetradio.com> and <www.amateuradio.org>

73 to K4ABT

This is the final installment of "Packet User's Notebook." *CQ* packet editor Buck Rogers, K4ABT, will be leaving us after more than a dozen years at the helm of our packet column, which has appeared monthly since May 1988. We thank Buck for his many years of service to *CQ*'s readers, and for his ongoing leadership in the world of amateur digital communications. All of us at *CQ* wish him all the best in his future endeavors.

Public Service

BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Ham Radio in the Balkans—One Year Later

One year ago NATO forces were involved in an intensive bombing campaign against Yugoslavia and its leadership in response to aggression against ethnic Albanians in Kosovo. At that time we brought our *CQ VHF* readers the story of amateur radio operators in the war zone, serving in *their* countries' best interest, even though their efforts might not have been in *our* country's best interest. Today many amateur radio operators there are still unable to enjoy the hobby, but they are providing a valuable service that one Serb refugee calls a necessity. In this column we take a look back at *CQ VHF*'s coverage last year and current reports of ham radio public service communication in and around Kosovo.

Looking Back

During the 78-day NATO air campaign in 1999, many ham radio operators in Yugoslavia headed for the rooftops as NATO aircraft flew overhead. These hams were tuning in to aircraft communications—generally in the clear—from pilots easily identified as American. Robert Fisk, a reporter for the British newspaper *The Independent,* pointed out that if ham radio operators could pick up the conversations, the Yugoslav military was no doubt listening with much more professional ears than the men on the rooftops.

Journalists asked questions about the effect of amateur radio operators in Serbia. In May 1999 Pentagon spokesman Kenneth Bacon said, "We do know that he (Yugoslav President Slobodan Milosevic) has a network of ham radio operators who monitor, as best they can, communications among aircraft and try to pass on information to central sources about where these aircraft may be going and what they may be doing. Despite that, we've been able to fly with, I think, remarkable safety, given the type of informal network of ham radio operators and others he set up."

Hams also provided health and welfare messages, a service that amateur radio operators in the war-torn region have been providing for years. It was used extensively during the 1993 war in Bosnia, where hams were sometimes the only source of information. At the time, radio amateurs in Montenegro organized a network of clubs to help everyone in Bosnia (Serb, Muslim, and Croat) who lost contact with their parents elsewhere. The 80 meter band was used for communications between Sarajevo and Montenegro. Montenegran ham Dejan Tusup, YT6DTM, told *CQ VHF* last year that at one time there were so many people "that we had to form a line and to put a restriction to only one call per person. Can you imagine a situation when you have a room full of people begging you to help them, and you have only 10 minutes of time left, because the radio amateur from Bosnia has other clubs to work with?"

The Situation Today

At the end of the 1999 air campaign thousands of Serbs fled Kosovo because they feared revenge attacks by ethnic Albanians who had been persecuted for years by the Serb authorities. The Serbs who remain in Kosovo live in

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Amateur radio operators continue to provide valuable communications in Kosovo and the surrounding area. (Serbia Ministry of Information map)

The Gracanica Monastery, from which Father Justin provides a ham radio link to the world for Serbs living in enclaves without reliable telephone service. (Serbia Ministry of Information photo)

small villages that are guarded by well-armed NATO-led peacekeepers.

In these villages modern conveniences are rare. In fact, telephone service rarely works. It is here that amateur radio operators have once again become a lifeline to the outside world. The hams are helping relatives keep in touch with each other in different towns, or enclaves, with area monasteries serving as a focal point.

The Associated Press reported that "amateurs are the only connection from enclave to enclave," and that Kosovo's monasteries organized a ham radio operator network about three years ago when telephone lines became unreliable as armed conflict erupted between the Serb authorities and ethnic Albanian separatists.

Father Justin, a radio operator five miles south of Pristina, Kosovo's capital, said hams' help became essential after the end of NATO air strikes. "When the exodus of the Serbs began, we started exchanging humanitarian messages to connect families." Father Justin operates from a Christian Orthodox monastery in a town that is heavily guarded by Swedish peacekeeping troops.

News Reports

Radio amateurs are also reporting news of attacks or demonstrations around Kosovo to the Serbian media. Here are some examples from the Serbian Ministry of Information (all are direct quotes):

Pec, April 22: Around 6 p.m. this evening, ethnic Albanians fired nine shells at the Serb village of Gorazdevac in Pec municipality. The shells were fired from the direction of the ethnic Albanian village of Grabovac. According to amateur radio operators, one shell hit the yard of an abandoned house, the second one hit the walnut tree in front of the house, while the others fell on untilled ground near the house. Fortunately, there were no casualties in the mortar attack.

Kosovska Vitina, April 25 (Tanjug): On Monday evening at around 9 p.m. in Kosovska Vitina exploded a strong explosive device planted between two Serbian houses, damaging both, radio amateurs reported Tuesday morning. (*Tanjug is the official Yugoslav news agency—ed.*)

Pristina, April 28th (Tanjug): In Ajvalija, a place near Gracanica, Serbian orthodox cemetery was desecrated, radio amateurs from Kosovo-Metohija said today.

Kosovska Vitina, April 28th 2000 (Tanjug): Albanian terrorists blew up "St. Petka" church by a time bomb in village Grncar in Kosovska Vitina district, this morning around 7:45 a.m., on the day of Good Friday, radio amateurs from Kosmet reported.

Pristina, April 28th (Tanjug): In Ajvalija, a place near Gracanica, Serbian orthodox

Being Ready for Your Next Event

How often do you volunteer to help at a public service event and don't really know what to expect? Certainly hams new to the event feel that way. How about those of you who have been hams for some time, but who come out the day of the event and just stand around enjoying the sights because you're not sure what to do?

Here are some guidelines from the late Amy Zimmerman, KD3TI, from the Allentown, Pennsylvania area. Amy became a Silent Key just one month after she wrote these guidelines for the Delaware-Lehigh ARC. The guidelines are well thought out and good for a newcomer to public service as well as a seasoned pro. Zimmerman was very active in public service and often reminded participants that they are ambassadors of amateur radio and it is important to look presentable and sound professional.

Amy's Operating Tips

• *Arrive early*. You may be going to an unfamiliar location, and you want your station in place and ready to go as soon as the event kicks off. You may need to stake out a good spot from which to operate your radio. Arriving before the event is a smart move. In most instances, the coordinator for the ham activity will advise when they want you on site. (*Another good reason to arrive early is that access to certain areas may be restricted after a certain time, and you'll need to be in place before the roads are closed—ed.*)

• *Direct all traffic through net control.* These events are run as controlled nets. Please direct all traffic to net control, and request permission to talk directly to another station. Keep in mind that net control can be a very busy place both on-the-air and behind the scenes, so give the operator a moment to answer your call.

• *Contact net control before you give your message.* Again, net control can be very busy. Be sure that you have his or her attention before you give your message.

• *Check in with net control when you arrive at your assigned location.* This accomplishes two things: It lets net control know you are in place and it gives you a chance to assure that you can hear and talk to net control from your selected spot. You may need to move slightly, especially if using an HT, to get a good signal to net control. *Find and use this location to contact or answer net control.*

• *Keep your ears alert for your callsign or position.* When the event gets very busy, or the messages involve real emergencies, don't make net control call two or three times to get you to answer.

• *Keep traffic to a minimum.* It sounds counter to all other amateur operation, but it is essential to keep *off* the air as much as possible so that emergency traffic can be passed without delay. Also, if you are running on battery power and/or for extended periods, it will keep those batteries running longer.

• *Make your transmissions short but accurate.* It will reduce the time you spend on the air if you take a moment to think about what you need to say before you press the mic button.

• *Use tactical calls as assigned.* In an event, especially if there is more than one operator at a location, the net may opt to use tactical calls —ambulance one, staff two, St. Luke's Hospital, etc. Use these callsigns to contact and acknowledge net control. Use your FCC callsign when you end your transmission to stay in compliance with regulations.

• *Choose your HT wisely*. Important features for public-service-minded hams are ease of basic operation (event day is not the day to learn how to program your HT), 5W output, and a BNC antenna connection

Accessories

• *Have a spare battery; have all batteries fully charged.* Even if you're at a short event, have a spare battery pack. If you're on a longer, or uncertain length assignment, have several and have everything fully charged starting the event. If there's a storm forecast, put your batteries on charge. I've found that many HTs also have an alkaline battery case available which you open up and stuff batteries into.

• *Cigarette lighter cord* —in case you find yourself mobile, or in need of a charge. Also, some HTs can run a full 5W of power out from a 12V source. You'll find this can make all the difference in a marginal location. (*Be sure it's okay to run your HT directly from 12 volts before you plug it in. Check your manual.— ed.*)

• *Antenna*—the commonly supplied rubber duckie is cute, but more useful as a backscratcher than a good antenna. When you combine the low power of an HT with buildings, hilly terrain, metal-vehicle bodies, the rubber duck just doesn't cut it. Get a second, serious antenna, one of the 5/8-wave rubber ducks or a metal telescoping antenna. For fixed or mobile operation get a small, moderately priced, magnetic-mount antenna, and don't forget the adapter to connect it to your HT. A good antenna will do at least as much for your signal as several watts of RF power.

• *Headset*—You'll often find yourself next to equipment making a lot of noise or among crowds oblivious to the fact that you're trying to work the radio. All you need is an inexpensive headset that will plug into your speaker jack.

• *Do not use VOX* (voice-operated switching). If your radio has a VOX feature, please make sure it's turned off before the event starts. It can be triggered by background noise or inadvertent comments by the operator. This creates interference on the frequency and a most unprofessional image of amateur radio.

• *Hold the HT*—When transmitting, hold it as close to vertical as you can and in as clear a place as you can manage. *Do not leave it hanging on your belt!*

• *Repeater Directory*—In case you're caught in unfamiliar territory, or have another reason to change frequencies.

• *Pencil/Paper*—Even if you aren't the control operator and responsible for logging, you'll probably want to take note of some information, somewhere, sometime. A pocket-size notepad is fine. Note, I specified pencil, as pens have difficulty working in very cold weather or in the rain/snow. Also, there are inexpensive mechanical pencils that don't require a sharpener.

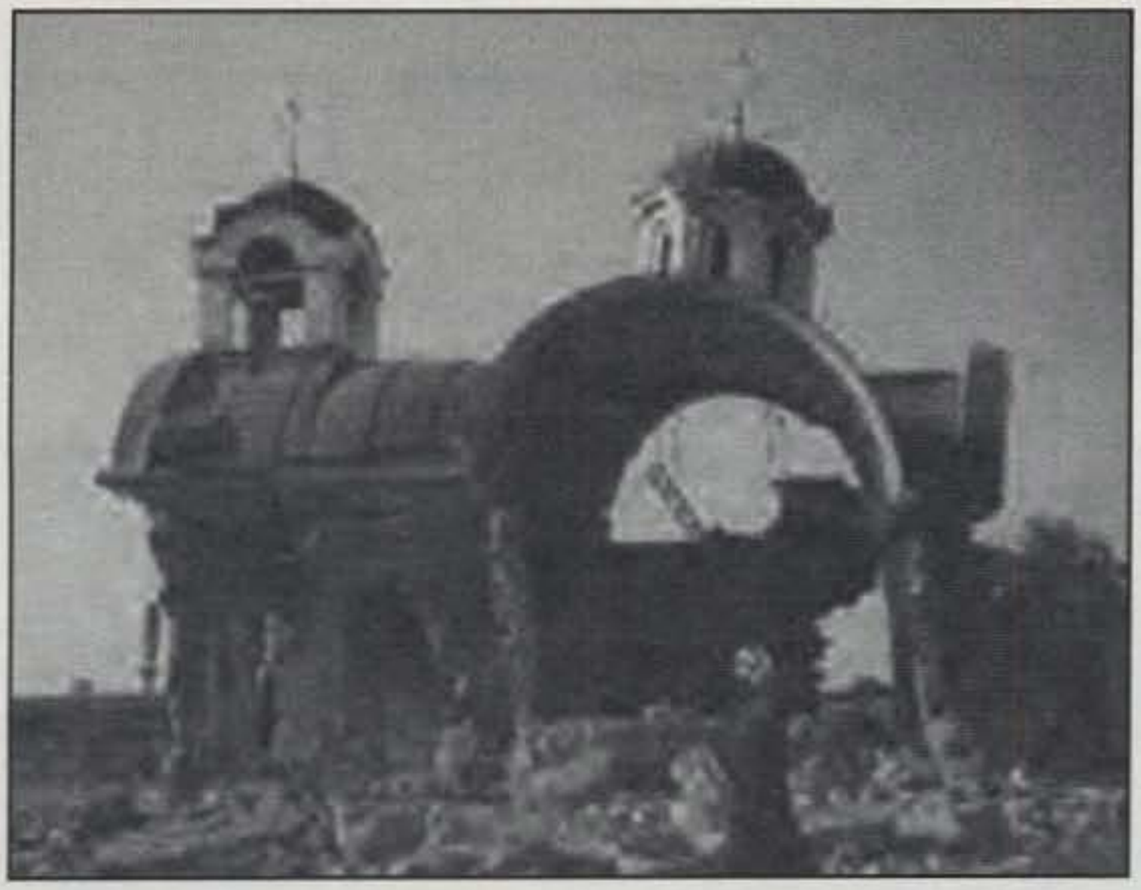
On a Personal Note

You can also add to your comfort and pleasure by adding a few personal necessities such as the following:

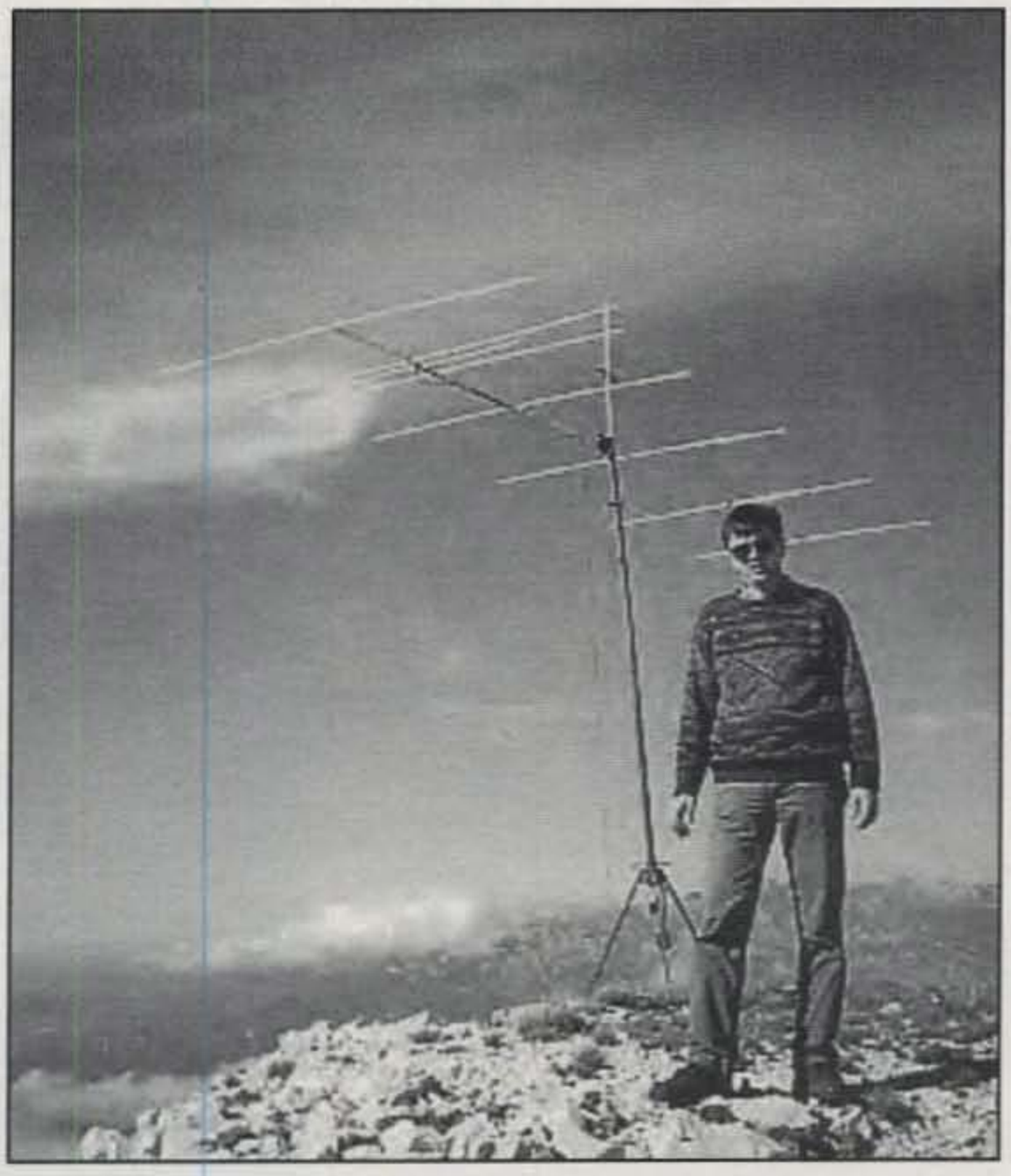
• *Dress appropriately for the weather.*

• *Sunscreen, insect repellent, headache pills.* And if you need prescription medicine on a certain schedule, be sure to include that.

• *Drinks/munchies*—While many events offer food, it may not be available at your location. Fill a small ice chest just in case. You may want to have a lawn chair with you in case you have the opportunity to sit down.



Hams have been reporting on the destruction of hundreds of churches in Kosovo. This is one of them. (Serbia Ministry of Information photo)



Contester Ranko Boca, YT6A, shows why his club is known as the SKY Contest Club. See text for information on the new contest station the club has planned for Montenegro. (Photo courtesy SKY Contest Club)

cemetery was desecrated, radio amateurs from Kosovo-Metohija said today.

Obilic, May 2nd: The ethnic Albanian terrorists threw two hand grenades from their car while they were passing through Crkvene Vodice in the municipality of Obilic, today, on Serb children, who were playing in that center of village, amateur radio operators from the crisis spots of Kosovo and Metohija reported.

Keep in mind that these reports come via the Serbian Information Ministry and tell only one side of the story.

It's Not All Bad News

During many disasters in the United States amateur radio operators quickly respond by assisting with Health and Welfare inquiries. Many of these are handled informally. In Kosovo most of the calls handled are referred to as "OK inquiries." A member of the Zvecan Radio Club explained that these are queries or requests from those unable to contact friends and relatives any other way, and from those concerned about loved ones after hearing about violence or attacks in the area. The communities are tightly knit, and it is usually a simple matter to locate the person. In one month there were about 3000 such calls, he said.

"No matter what the information is and which side it comes from, we're very interested in people having the correct information," Father Justin said. "It's in our interest for people to know the truth, no matter whether we like it or not.

"Obviously, we have to wait for a while for tension to decrease," Father Justin said. "I am dreaming about the day when we can do true radio amateur work—teach people, organize clubs where Albanians and Serbs can work together, supply each other with equipment."

Operations in Montenegro

Shortly after the bombing stopped, YT6DTM reported that before the war: "We had two main repeaters on the 2 meter band...covering 80% of the territory. There were two main digipeaters linked, also covering 80% of territory and serving as gateway from Italian to eastern Europe network. At least one radio club was in every city, active in all radio amateur activities. The State financed the clubs, because we were useful in civilian protection and army (our emergency network). A lot of young people gathered in clubs. Now, only one main repeater R3 (*a European repeater channel designator—ed.*) is in function. Digipeaters were destroyed because of their possible use in espionage, local repeaters survived, but the clubs are 'dead.'"

Making Contest Plans

The SKY Contest Club, which recently held an international hamfest, Skyfest 2000, sponsors contest activities from exotic locations. The station is owned by Ranko Boca, YT6A, from Herceg Novi, Montenegro. This year the club is setting up a new contest location on a hilltop on the coast of Montenegro. Club members say it is planned to be the ultimate station with the largest Yagi stack in the world. There will be 50 elements on 21 MHz and several remotely controlled Kachina radios.

We'll continue to provide information about Balkan amateurs serving in their countries' public interest as it becomes available.

A Final Note

This month we took a look at a very serious use of ham radio as well as preparing for some of the more fun types of public service events (see sidebar). In each case hams are serving in the public interest. Are you prepared for the next event?

We're looking for stories on how you are serving in the public interest. Drop us a note. Also take advantage of the Public Service Forum on the *CQ* web page. Until next month!

73, Bob, WA3PZO

Amateur Television

BY ED MANUEL, N5EM

All About Ham TV

Planning for ATV at Special Events—Part I

Over the last few years, the Houston Amateur Television Society (HATS) has provided video coverage of the Houston Marathon. I discussed this a number of times in columns for *CQ VHF*. I remember reading about the great public-service ATV work covering events such as the Rose Bowl Parade and hot-air balloon races. These types of events place a variety of special requirements on the ATV community. Often, special ATV link configurations are needed to serve distant or "geographically challenged" locations. These may dictate the creation of a special ATV repeater to serve that specific need. We have some similar needs in Houston with regard to ATV coverage.

In Houston a hill is any natural rise in local terrain that is more than 10 feet in height. Rarely are these "hills" greater than 20 feet above average terrain. You might say that Houston is flat! Since we rely on the local ATV repeater to provide reliable area-wide coverage, it is important that dispersed ATV teams be able to get their signals back into the repeater reliably. It doesn't take much of an obstruction to block access to the repeater when it's up only 400 or 500 feet.

One aspect of event planning that is absolutely necessary is the site survey process. Each team must check out its planned location to make sure that it has good access to the repeater. Hopefully, a short support mast for the antennas is all that is required.

In the past the ATV signal path has determined the selection of sites along the race course. While this was fine in the early stages of introducing ATV to marathon officials, we now are beginning to see a need to go where the marathon officials would like us to be, not just where we can get into the repeater reliably. This has caused us to begin thinking about portable/temporary repeater systems for extending the coverage of the ATV system.

Any discussion of frequencies and equipment to be used in creating these special systems is, necessarily, a function of the frequencies in local use. I will be using the ATV frequency plans that are used in Houston as an example of one approach (and there are many). Until recently, ATV in Houston used 1255 MHz FM as the user input and 421.25 MHz AM as the user output. Loss of our primary site and continued pressure on both equipment space and antenna mounts has forced us to rethink our plan. Additionally, the acquisition of a commercial 2.4 GHz AM ATV transmitter has allowed us to plan for a new user output that will permit the use of smaller antennas. Our final configuration is in some flux as I write this column. Unfortunately, publication dates will not wait for us to decide these issues, so onward we go.

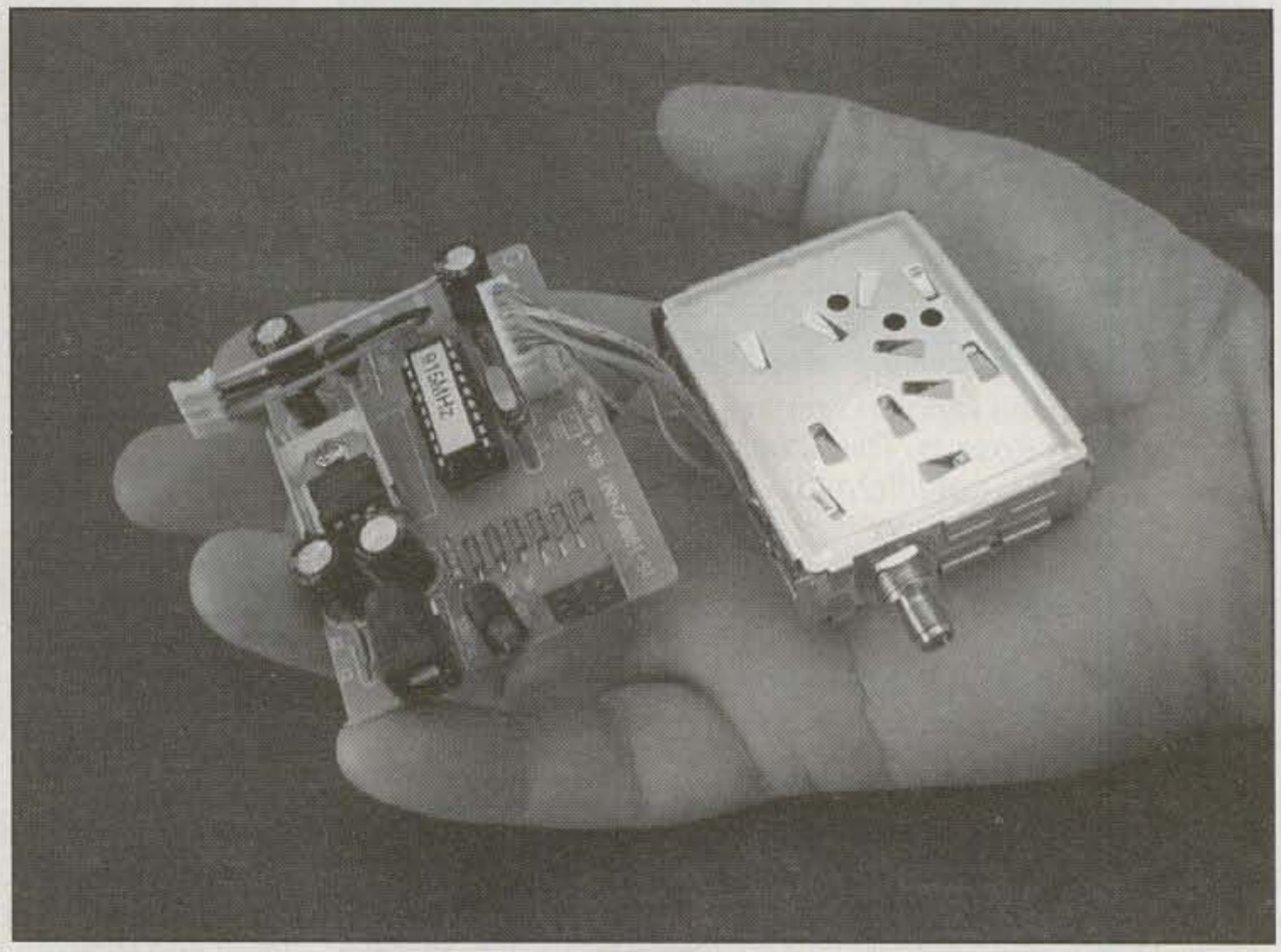


Photo 1– The 900 MHz FM ATV transmitter module from P.C. Electronics. It puts out 50–100 milliwatts, making it ideal for remote operation with a link back to the main repeater site. (Photos by George Pierce, WA5ABS, with his new Olympus digital camera.)

Planning for Portability

Aside from the requirement for a completely special link (I remember reading about some of these relating to long-haul ATV for hot-air balloon races), we find that we need a standard configuration for one of two basic conditions.

First is the situation in which a team has a location that is sited well for ATV access to the local repeater but is not convenient to the event for video coverage. For example, a small hill might be just perfect for erecting the antennas, but may be located across the street or around a corner from the place where the camera needs to be. What is needed here is a wireless camera (small camera-mounted transmitter) and a link (repeater) that receives the camera signal and retransmits it back on 1255 MHz to the ATV repeater. This link needs the basics of a repeater, video-operated-relay (VOR), and identifier. It needs properly sited antennas to receive the wireless camera's signals and to transmit back to the main ATV repeater. This might be set up to serve a single wireless camera or multiple cameras operating in a small area around the link system.

A second situation occurs when multiple teams need access from an area that is out of range of the main ATV re-

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peater system, but a geographically advantageous location is available within range of all of the teams. In Houston this might be a building top or parking garage that is available for use and is high enough for repeater access, and is also easily accessible by the nearby teams. In this case, a separate team would establish the portable repeater/link system to serve a small geographic area.

Selection of frequencies to use for these systems is again a function of the local frequency plan and available equipment. Let's consider the wireless camera transmitter first.

This link must be small and light (we would like to avoid 20 pound backpacks if possible). It should provide just enough power to do the job reliably. Several possibilities come to mind. Small 900 MHz AM transmitters (commonly called "Rabbits" for the readily available versions of a few years ago) might be used, as well as newer, currently available FM versions. If your band plan doesn't use 2.4 GHz, you can use the readily available FM transmitters and receivers for this band (for example, Wavecoms and their descendants).

For now, I'll assume the use of 900 MHz FM for my system. I ordered a new FM transmitter from P.C Electronics. (photo 1). You can tell from the photograph that this transmitter is small. It is rated to put out 50–100 milliwatts, which should be sufficient for my purposes and is low in power consumption. It will be installed in a small, lightweight box and mounted right on my camcorder. Power will come from a small battery pack on my belt.

This now requires that I have a receiver for this transmitter at the link site. Two possibilities are available for use here in Houston. P.C. Electronics (http://www.hamtv.com/) used to sell a receiver called the Bensat for 900/1200 MHz work. This receiver was able to operate from 12 volts DC, allowing portable or field use. While the Bensat is no longer available, a new unit has replaced it that is not only more sensitive, but also smaller. This receiver comes pre-programmed with eight commonly used frequencies on the 900 and 1200 MHz bands. It allows packaging of a compact and lightweight system (photo 2).

Your link might require 900 MHz AM reception. One way to accomplish this would be to use the standard Rabbit down-converter (900 MHz AM to Channel 3) and then use a small Channel 3 demodulator. P.C. Electronics stocks just such a unit identical in size to the

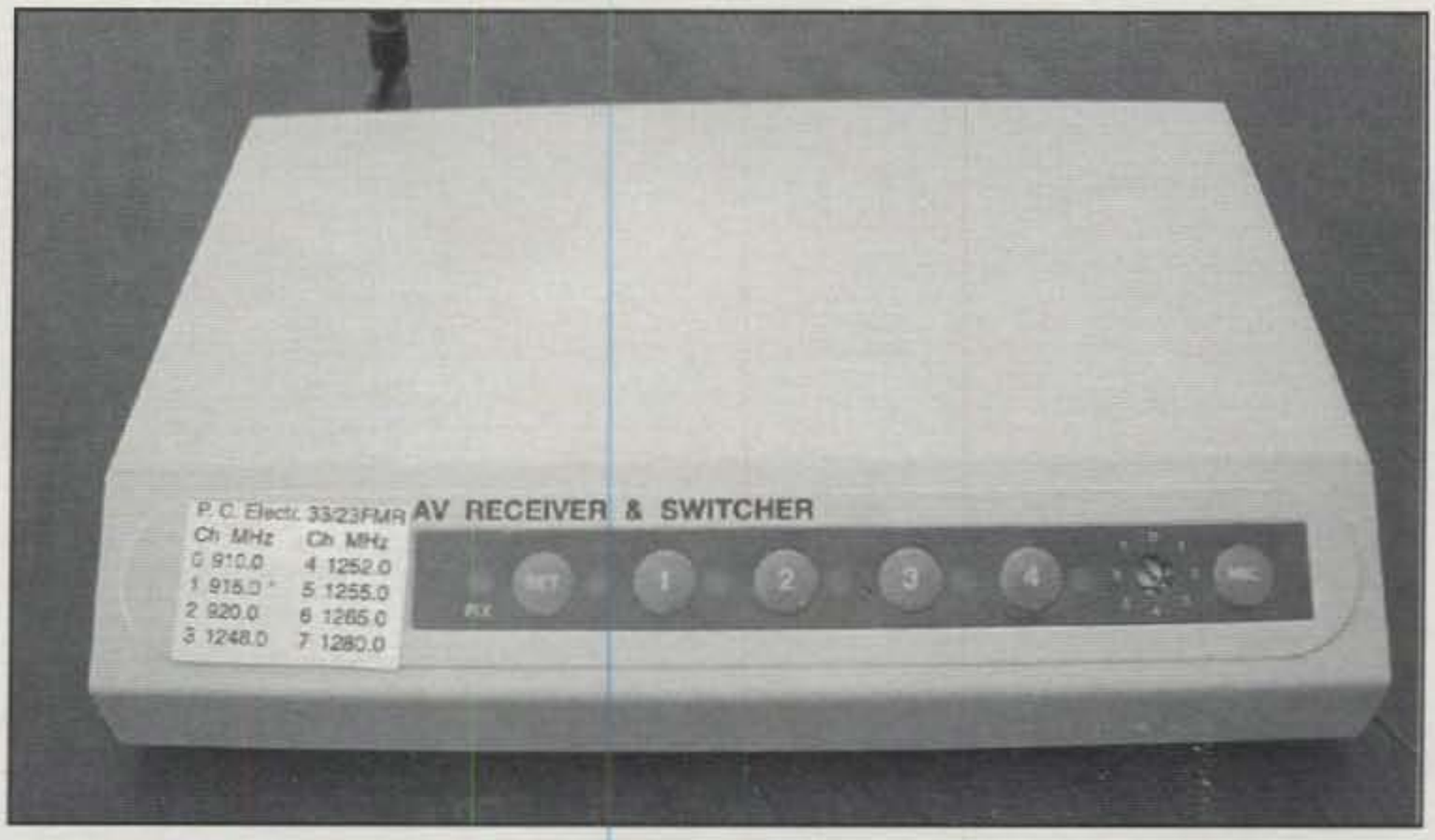

Photo 2– The now-discontinued Bensat receiver operates on both the 902 and 1270 MHz ham bands and comes pre-programmed with eight commonly used frequencies. Don't worry about it being discontinued; its replacement is both smaller and more sensitive.

Rabbit down-converter. This demodulator takes the Channel 3 signal and provides video and audio outputs for your link system.

Finally, if 2.4 GHz is the choice for your system, you can use the regular Wavecom or equivalent receivers for their intended purpose.

For repeater control, I chose the venerable VOR-2A, again from P.C. Electronics. This unit is small, lightweight, and relatively inexpensive. Other options exist, including more complex microprocessor-controlled units. Again, my goals focused on size, weight, and power consumption for highly portable operation, so this directed my decisions.

Finally, the link system needs a transmitter back to the repeater system, in my case on 1255 MHz. I'm using one of the COPS transmitters that were available last year (photo 3). These transmitter modules are now available from P.C. Electronics as well and provide the

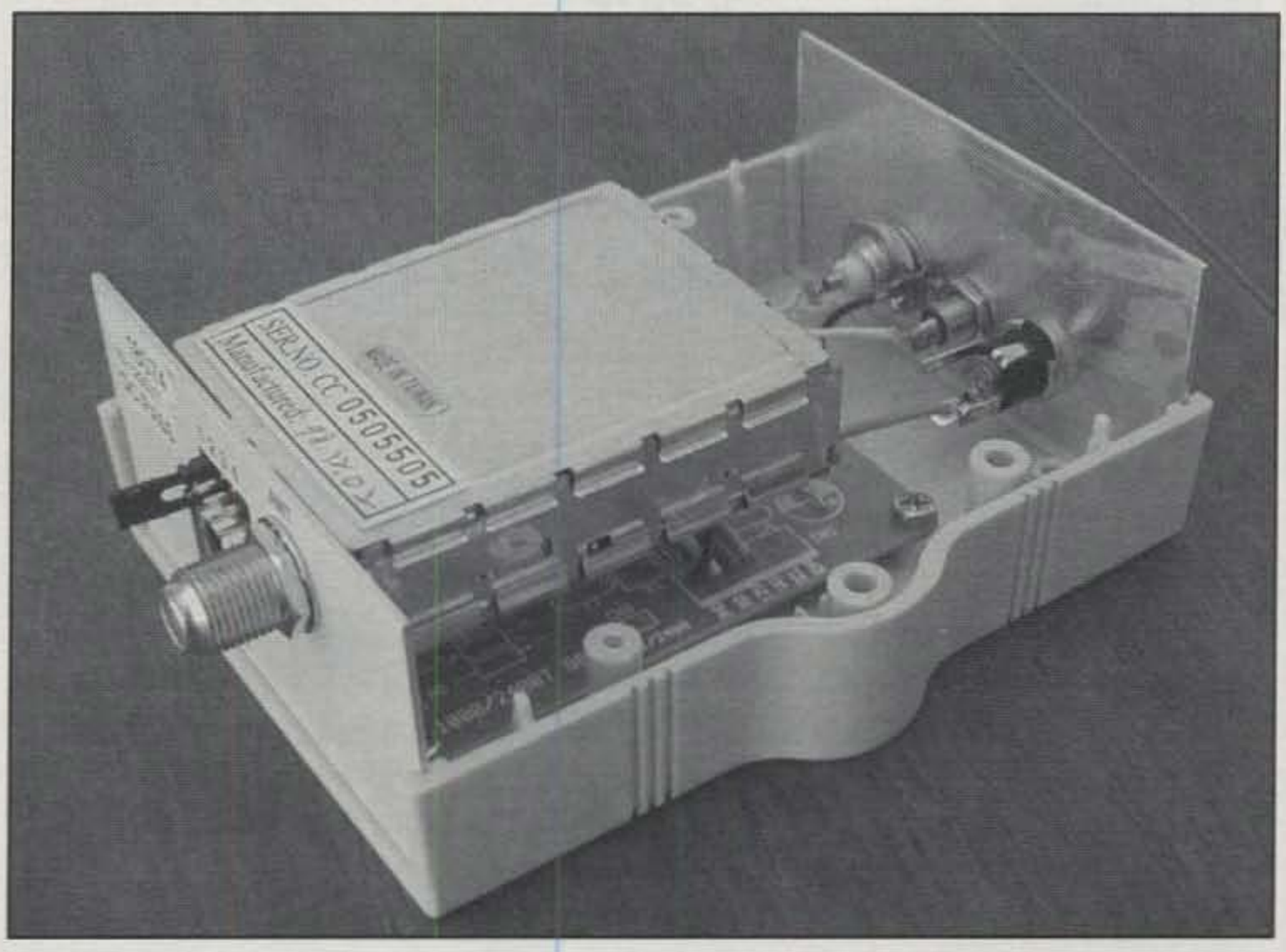

Photo 3– A commercial "Rabbit" type downconverter can output 902 MHz ATV signals on Channel 3 of a standard TV receiver. This particular unit includes a demodulator that produces separate video and audio outputs for your link system.

minimum power necessary for the job (again, 50–100 milliwatts). If more power is needed for the link, an inexpensive amplifier is available from Down East Microwave. Check out their on-line catalog (http://www.downeastmicrowave.com/) and look for Model 2303PACK. This is the complete kit, but it is also available assembled. This amplifier requires only 10 milliwatts of drive. If you use it, be sure to adequately attenuate the output of the 1255 MHz transmitter.

Antenna Considerations

After the decisions have been made as to frequencies and modes (AM/FM) and the modules have been acquired, you need to plan the physical arrangements. Antennas are important for any link system. I chose to use home-built antennas because this allows me to make them small and light, again important self-imposed characteristics. The selection of an antenna support will have much to do with the antennas chosen. I have several possible candidates for this, which I will discuss.

One choice for a portable mast is the painter's pole, available at home-improvement stores. These poles are designed to telescope for ease of transport and are available in lengths from 16 to 24 ft. The one I have extends to 16 ft. and collapses to 6 ft., allowing it to fit inside my car. I'd like to have the longer one, but I can't get that 8 ft. pole inside the car. These poles have a threaded coupling at the top for attachment of a variety of accessories. They are easy to extend, have compression locks to hold them in place, and can be guyed easily with lightweight Dacron or Nylon material.

Another choice comes in the form of fiberglass fishing poles. These particular poles are day fishing poles which telescope to a collapsed length of 4 ft. and extend to lengths of up to 24 ft. (available in 16, 20, and 24 ft.). They are not as strong as the painter's poles, but they are lighter and smaller to transport. In Part II of this article I'll show how these can be used with suitable thought given to keeping them up even with their apparent flexibility.

Finally, another choice comes from Germany. A 10 meter pole (about 33 ft.) was designed by German amateur radio operator DK9SQ specifically for use as an antenna pole. It is made from fiberglass, is very lightweight and strong, and collapses to a 4 ft. package. This is one of the longest poles of this type that I have found, even though its $104 ($99 plus $5 s/h) price tag makes it one of the most expensive (http://www.bright.net/~kanga/kanga/dk9sq.htm).

Selection of antennas is an easy task. For the 915 MHz receive antenna for the wireless camera link, a vertical is appropriate if the link is to be located in the proximity of the operational area. If, on the other hand, the link is to be sited atop a structure or some available high ground, it might be convenient to have a small beam pointed back to that area, providing some gain and reducing pick-up from undesired areas. Either is easy to construct using lightweight materials. For the small beam I use designs popularized by Kent Britain, WA5VJB, in his columns for *CQ VHF* and published in his design notes in *Feedpoint,* the journal of the North Texas Microwave Society. If the application requires a vertical, I simply use a ground-plane antenna constructed of brass welding rod and copper-clad printed-circuit material. I'll have pictures of these antennas in the second part of this article.

For the transmit antenna, a similar Yagi has been in use in Houston for a number of years as the standard 1255 MHz antenna. Commercial antennas are, of course, readily available. However, as mentioned before, they tend to be expensive and heavy compared to lightweight homebrew ones.

The Rest of the Story...

We have now located the RF hardware, the control hardware, the antenna support mast, and the antennas. In Part II of this article we'll take all the raw material and assemble a remote link, complete with power system. As I mentioned at the beginning of the article, the use of any particular frequency is based on local option and might change with different requirements. That's why I have chosen a modular approach, so any of the modules can be changed out quickly as needs dictate. I plan to build an assortment of modules for different bands so I can quickly assemble the system for a variety of applications.

As I write this column in May, I'm looking forward to June and Hamcom in Arlington, Texas. That's the big convention around here in Texas and a place to show off ATV. In the next column I'll have some pictures of the North Texas ATV booth at that show (http://www.hamtv.org/).

What are you doing to promote ATV in your area? Get out and tell the story and recruit a few new folks—then help them get operational.

Washington Readout

BY FREDERICK O. MAIA, W5YI

Regulatory News In The World Of Amateur Radio

Global Trend Moves Toward 5 wpm Morse Code Top Exam Speed

What began in the United Kingdom in 1998 is now spreading throughout the world like wildfire—that is, the trend toward de-emphasizing Morse code knowledge as an examination qualification in the Amateur Service. The Radio Society of Great Britain shocked the amateur world when they announced in the June 1998 issue of *RadCom*, the RSGB monthly journal, that they would no longer be supporting Morse code proficiency as a licensing requirement for HF operation. Here is what the lead article said:

In this year of 1998 Amateur Radio is one hundred years old. Yet although the technology used has changed dramatically during that period, with a multitude of new techniques, in some other respects there has been little change. ...

The maintenance of Morse as a mandatory requirement for access to the HF bands is IARU policy. Council, however, now believes that this position cannot be sustained in the longer term and will be opening discussions with IARU Societies and other interested bodies to reconsider the position to be adopted at the WRC ... when the matter of Morse as a necessary qualifier for access to HF bands is likely to be considered.

In taking its position on Morse, Council is mindful of the strength of feeling around this issue. Morse has many advantages, including spectrum utilization, relative simplicity of equipment and cost. The Society wishes to see Morse (and Morse segments of the HF bands) preserved as core elements of amateur radio globally. However, Morse is but one mode among many in current use, and it should take its place alongside the others as an equal.

Our hobby is in need of stimulation. The numbers of radio amateurs are falling in many parts of the world and this trend is an unhealthy one for the future of amateur radio. We must be seen as progressive and forward looking. We believe that this position will be welcomed by the majority of Radio Amateurs in the United Kingdom who share the view that the Society should take a forward looking and progressive stance on the future of our hobby.

This announcement was particularly important since it represented a complete "about face" on the part of the RSGB leadership and went against the results of an earlier RSGB membership survey on Morse code.

Both RSGB President Ian Kyle, GI8AYZ, and General Manager Peter Kirby, GØTWW stopped off at ARRL headquarters on their way to Dayton '98 and advised the American Radio Relay League. Kyle and Kirby said there no longer is any good reason to insist that applicants pass a Morse code test to operate on HF.

"It's stopping growth in the hobby," Kirby said, adding that he disagrees with those who think it will be the death of the hobby or will lead to lower operating standards. Kirby, a former professional CW operator, said that making someone pass a 12 wpm test "...doesn't make one a good operator."

Kirby said the RSGB Council had determined that it cannot support compulsory Morse testing in the long term, but also recognizes that it can't change things overnight. "This will ease things a bit," he said of the RSGB's "intermediate" proposal to go to a 5 wpm speed. That was the beginning of what has now become a landslide.

Australia to Join 5 wpm Nations

The Australian Communications Authority (ACA) has agreed in principle to implement changes in Australia's amateur licensing arrangements regarding the Morse Code requirement. At present, Australia has two telegraphy examination speeds, 5 wpm for the Intermediate license and 10 wpm for the unrestricted (full privilege) license.

Wireless Institute of Australia President Peter Naish, VK2BPN, received a reply from the ACA in response to WIA's letter requesting a change in the licensing conditions. The WIA is Australia's national amateur radio society.

The reply includes the following statement: "Given the overseas trends in relation to this matter, the ACA agrees in principle to implement changes to Australia's amateur licensing arrangements in relation to the requirements for Morse Code." The upcoming change is covered in this paragraph:

"It is proposed that the Radiocommunications License Conditions (Amateur License) Determination No. 1 of 1997 and other amateur documentation will be amended prior to the Sydney Olympic Games (in mid-July) to reflect the following:

"(1) The *Amateur Intermediate Station License* will authorize operation to the same extent as that currently authorized under the *Amateur Unrestricted Station License*."

The distinction between the Intermediate (5 wpm) and Unrestricted (or full privilege) license, which requires 10 wpm code proficiency, is in the frequency bands and transmitter power authorized. Intermediate holders have access to the Australian Novice bands —segments of the 80, 15, and 10 meter bands—at a maximum power of 100 watts. The Unrestricted license conveys all band privileges at a maximum of 400 watts.

It now appears that Intermediate license holders are due to obtain full privileges, an interesting way to reduce the Morse proficiency requirement to 5 wpm. The ACA in advising the WIA of its decision said that the Unrestricted license would still be available to new applicants. However, the authorities and other amateurs will still be able to determine the holder's license grade because Australia is not changing the callsign blocks. Intermediate license holders have three-letter suffixes starting with J or K. Instead of obtaining increased operating privileges, the incentive to upgrade now will be to have a preferential callsign with a higher power output.

The ACA added in their press release that "In recognition that it is likely that the international requirement for Morse code will be considered by the World Radio Conference in 2002/3, the proposed changes are minimal in scope."

The WIA had submitted that due to an expected increase in the number of visiting radio amateurs traveling to Australia for the 2000 Summer Olympics, it would be ideal to have the changes in place by then.

South Africa Adopts New 5 wpm HF Licenses

The future of amateur radio in South Africa has been given a boost by the announcement of two new licenses—a

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South Africa Amateur Radio

Grade A1 (All mode, privilege license, 400W max. power)	**ZS callsign.** Must pass the Radio Amateur Exam (RAE) + 12 wpm code exam
Grade A2: (Restricted to spectrum above 50 MHz)	**ZR callsign.** No code. Must pass the RAE only.
New Grade A3: (All HF bands at max. 100W)	**ZT callsign.** Must pass the RAE plus 5 wpm Morse code exam.
New Grade B: (Student HF, 2 meter, 70 cm license)	**ZU callsign.** Must construct a "modular" QRP amateur radio station plus 5 wpm Morse code.

*Notes: T*he Radio Amateur's Examination (RAE) consists of 90 multiple-choice questions from a pool of 600; 30 on regulations and operating and 60 on technical aspects. It is administered by ham radio clubs in May and October.

Table I– The new amateur radio classes in South Africa are structured as above. The Grade A3 license follows the trend of nations around the world toward requiring only 5 wpm code proficiency for full HF band access.

full HF band access license, and a practical-based (which requires no written exam) student license, both of which require a 5 wpm code test.

The South African Radio League (SARL) first sought reforms for the regulations governing the hobby in its country nearly two years ago. At that time it determined that their previous Novice license had not proven successful in recruiting newcomers to amateur radio. The SARL Council proposed to introduce a practical hands-on license based on a classroom-style course.

On October 3, 1998 the SARL Council agreed on a new initiative to make the HF bands more accessible to amateurs by addressing the Morse Code issue. Chris Turner, ZS6GM, then SARL president, issued the following policy statement:

> It is the opinion of the SARL, that there exists no good argument in favor of retaining Morse Code as the only qualifier for amateurs to have unrestricted access to the HF bands. ...If the Amateur Service is to remain relevant in the 21st Century, it needs to embrace and encourage the development and use of the newer technologies. Clinging to Morse Code as an entry requirement will impede rather than help this development.
>
> The Amateur Radio Service has an extremely important role to play in the education of engineers and technologists in the field of telecommunications. It is therefore vital that the Amateur Service attracts young people.
>
> To this end, the League after consultation with its members, the regulatory authorities and educationalists is in the process of developing a practical "hands on"' student amateur license, with a minimal 5 wpm Morse Code exam, which is aimed at schools and school-going young people.
>
> In order to encourage ongoing development, the League will request SATRA [the South African Telecommunications Regulatory Authority] to modify the regulations to permit student licensees full access to all HF bands but with limited power output.

Most of SARL's goals have been realized through the just announced new regulations. SATRA has now accepted the SARL submission that full HF band access should only require a 5 wpm code test, and that encouragement needs to be given to youth to take up the hobby.

Instead of just two license grades (A1 and A2), the new regulations, which the SARL says will be implemented shortly, will include the license grades shown in Table I. The new Class A3 license follows the trend of nations around the world towards requiring only 5 wpm code proficiency for full HF band access.

The new learner's license is to be directed at schools. It would require a 5 wpm Morse Code test and an oral examination on operating procedure and radio regulations administered by teachers. We have not seen the final rules, but the original proposal was to permit 80, 40, and 20 meter CW and SSB operation and all-mode access on 2 meters and 70 cm with a maximum output power level of 20 watts PEP in order to encourage homebrew and kit construction.

This license is now in the process of being implemented. The new Class "B" student license is aimed at youngsters at the 10-year-old level. To qualify for the license, candidates must construct a series of simple modules that, when complete, make up a fully functioning low- power transceiver. Although the details of the construction projects are not yet finalized, they consist of building sections of an amateur station from

a kit of parts. The modules include components such as an antenna, transmitter, receiver, and power supply.

A student is graded by an instructor on each module constructed. Once a section is completed, the candidate can move to the next module. There is no time limit on completing the required modules, which when lashed together form a fully functioning QRP station.

A student is issued a ZU callsign and can go on the air using his or her homebrew station once all of the projects have been completed successfully and the student passes the 5 wpm code test.

The Grade B Student License Program is a part of the ARISAS (Amateur Radio in South African Schools). The objective of the campaign is to increase science knowledge among students.

Europe Moving to 5 wpm Morse Proficiency

The next big step toward worldwide adoption of 5 wpm as the amateur license Morse code test speed for full HF band access is occurring in the European Community.

In a feature article "Global trend to lower code speed" in the May issue of the Wireless Institute of Australia (WIA) journal, *Amateur Radio*, Jim Linton, VK3PC, says that in late June this year radio societies in Europe will vote on adopting 5 wpm as the standard for full HF band access amateur licenses.

"The forum will be the EUROCOM working group meeting in Friedrichshafen, Germany on the 23rd of June," says Jim, VK3PC, the WIA Victoria president and also author of "Morse code watch" at <http://www.tbsa.com.au/~wiavic>. He says, "The Deutscher Amateur-Radio Club (DARC) is taking a lead position on the code issue and the EUROCOM meeting agenda includes a proposal by DARC for a modification of CEPT TR 61-02, to lower the Morse code examination speed from 12 wpm to 5 wpm." EUROCOM has a membership of those countries (radio societies) within the European Community, and it has influence over the widely-spread European Conference of Postal and Telecommunications Administrations (CEPT) licensing system.

Vereniging voor Experimenteel Radio Onderzoek in Nederland (VERNON), the IARU member society for Holland, at its board meeting on 16 April voted to support the DARC motion at EURCOM. Other European radio societies are expected to make or announce their decisions soon.

Jim says, "Several European radio societies, including Germany, have been reluctant to seek unilateral decisions of 5 wpm in their countries, and depart from the unified CEPT approach. Clearly a modification to the CEPT system to implement 5 wpm, as proposed by DARC, if approved, will result in a virtual worldwide adoption of the lower speed."

The CEPT system also applies for visitor licensing to various non-European nations, including Canada, Israel, New Zealand, Peru, South Africa, and the United States.

The WIA *Amateur Radio* magazine article also reports on the anticipated change in Australia that will only require the passing of a 5 wpm Morse code telegraphy test for full HF band access as part of an expanding global trend.

The New Zealand Association of Radio Transmitters (NZART) has received a similar "in principle" agreement from its radio administration, and while the switch to 5 wpm should occur in Australia before August, a definite timing for New Zealand has not been announced.

Nations that already have 5 wpm for full HF band access include Britain, Sweden, the United States, Gibraltar, and South Africa.

The Papua New Guinea Amateur Radio Society is also considering the issue, and other countries (Canada, Finland, India, Israel, Norway, Pakistan) are in various stages of policy making or discussion with their radio administrations. The issue also is to be discussed at the International Amateur Radio Union Region 3 conference in Darwin [Australia] in August, to be hosted by the WIA and attended by 100 delegates from countries in the Asia and Pacific regions.

Jim concludes, "We are experiencing the unfolding of an historic event for the Amateur Service, as its original licensing requirement established early last century when Morse telegraphy was the only mode of transmission, is now being overturned."

WIA Adopts New "No Code" Policy

The Wireless Institute of Australia at its 64th annual Federal Convention in Melbourne, April 29–30 has adopted a new policy in support of an end to mandatory Morse code amateur license testing.

In February this year the WIA adopted an "interim" policy to seek 5 wpm for full HF band access. The Australian Communications Authority in response to a WIA submission has since accepted "in principle" that 5 wpm be introduced, most likely in a few months.

In the latest development, the WIA Federal Council in considering the matter further resolved to support the removal of Morse code testing from the ITU Radio Regulation S25.5.

The WIA will take its new policy to the IARU Region III conference in Darwin in August, when the issue of mandatory Morse code amateur license tests will be reviewed.

The earliest opportunity to make a change to ITU RR S25.5 will be the World Radio Conference 2003.

73, Fred, W5YI

World Of Ideas

BY DAVE INGRAM, K4TWJ

A Look At The World Around Us

Expanding Your Mobile Horizons

Last month we discussed bicycle mobiling and looked at how a couple of silent-sport enthusiasts put together their unique setups. This month let's highlight traditional vehicle-type mobiling from the "new to HF" amateur's standpoint and visualize how you can assemble a good all-around setup at reasonable cost.

You say 2 meter FM seems to fill your needs and/or you do not spend enough time on the road to warrant "low band" operations? Maybe it's time to look at that viewpoint from a different angle. A modern HF setup need not be lavish in appearance to span the globe, you know (photos A and B). As I have also mentioned in columns past, there is no set stipulation requiring you to be in motion to enjoy the benefits of having a "go anywhere and use anytime" station at your fingertips. Nor are you required to stay on the air for more than a few minutes at a time. That's why transceivers have on/off switches. Also, many of your most memorable QSOs—such as contacting a large ship on the high seas, an airplane in flight, a rare DX station, or some other special operation—are often one- or two-minute affairs.

4941 Scenic View Drive, Birmingham, AL 35210

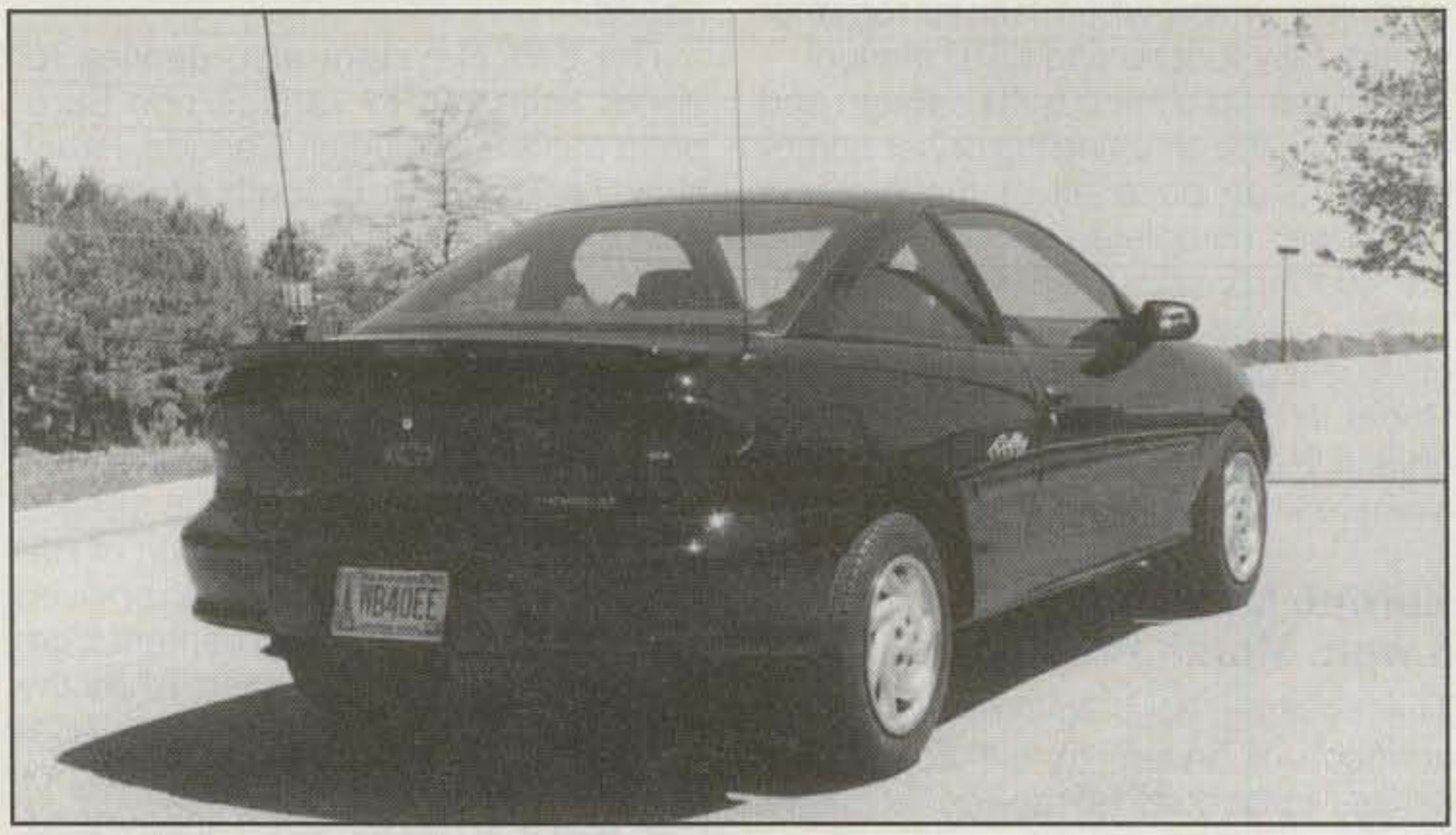


Photo A– HF mobiling with a small, clean-looking antenna system gives you the ability to work the world while maintaining a mild-mannered appearance. The setup shown here is a 4 foot tall mini-Hustler on a trunk mount. The antenna is painted to match the car, resulting in a "natural looking" setup with worldwide range.

The keynote in each case is an ability to get on the air at the right time, a time when switching on the home rig may not be feasible. That's when a mobile rig really shines. It goes where you go, does what you do, and proudly tells the world about it. Maybe a couple of real-life examples will illustrate that fact.

A friend telephoned me at work a while back and said a maritime mobileer aboard a nuclear submarine was looking for stateside contacts on 14.035 MHz. Could I get on the air and work him? Thirty seconds later I was unlocking my car and switching on my mobile rig. The maritimer was calling CQ with no takers. Wow! Everyone else also must have been at work but without mobile rigs. The maritime operator answered my first call (at low power, no less!), a brief chat followed, and I was back in my office four minutes later.

Another time while XYL WB4OEE and I were vacationing and shopping, she came out of a store and I grabbed an armful of bags while handing her our mobile rig's microphone. She worked her first 5Z4 on 10 meters before even one bag could hit the backseat. Exciting? You bet!

How do you also set up a smooth-operating mobile station? Read on as we move into high gear!

Photo B– Inside the car, an older model ultra-compact transceiver nestles between the dash and center console while a Tick Keyer and W3MKE paddle sit or strap to the leg. When leaving the car, a black cloth draped over the rig helps conceal it in the interior's dark shadows. The vehicle is mainly used to run errands, so the setup sees more use when the car is parked than when it is in motion.

Doing It Right

The simplicity of using a cigarette-lighter adapter and magnetic-mount antenna with a low-power FM transceiver or handheld talkie can lead one to visu-

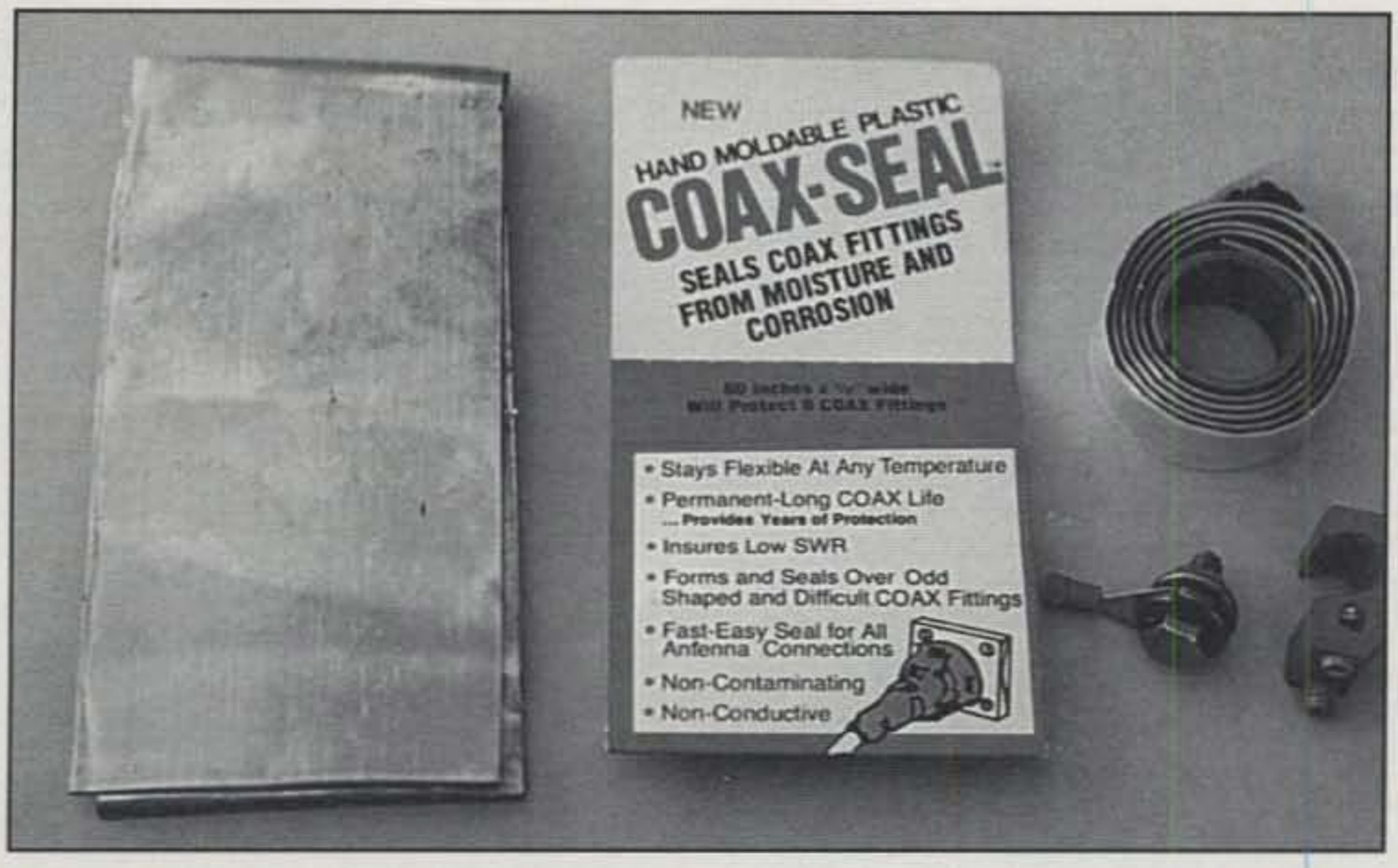


Photo C– Always beneficial hardware for a good mobile installation includes heavy-duty battery connectors for DC cables, wide copper foil for grounding, and Coax Seal® for weatherproofing antenna connections.

alize using a similar lashup for HF mobiling. This is not a good idea, however, and it can easily result in unnecessary entanglements. How so? First, capacitive coupling is acceptable for making ground connections on VHF and UHF band antennas, but direct physical and /or electrical connections are necessary for proper grounding at frequencies below 30 MHz.

The higher output power of most HF transceivers also necessitates connecting the DC power cable directly to the car's battery plus ground-strapping the transceiver's cabinet directly to the vehicle's frame to minimize fire hazards and RF feedback. Take a look at the thin wiring behind your vehicle's cigarette lighter socket to see the validity of that statement. In almost every case today, the wiring is too small to trust for any application—especially powering a transceiver running over 5 watts output.

Routing a hefty two-conductor and dual-fused cable to your car's battery is definitely a good idea. If you already use your rig's supplied DC cable with an AC supply in the home station, extras are available from the rig's importer or dealer. When purchasing that cable, I suggest also adding a couple of clamp-on battery connectors or crimp lugs plus some Coax Seal® and a roll of ground strapping material (photo C).

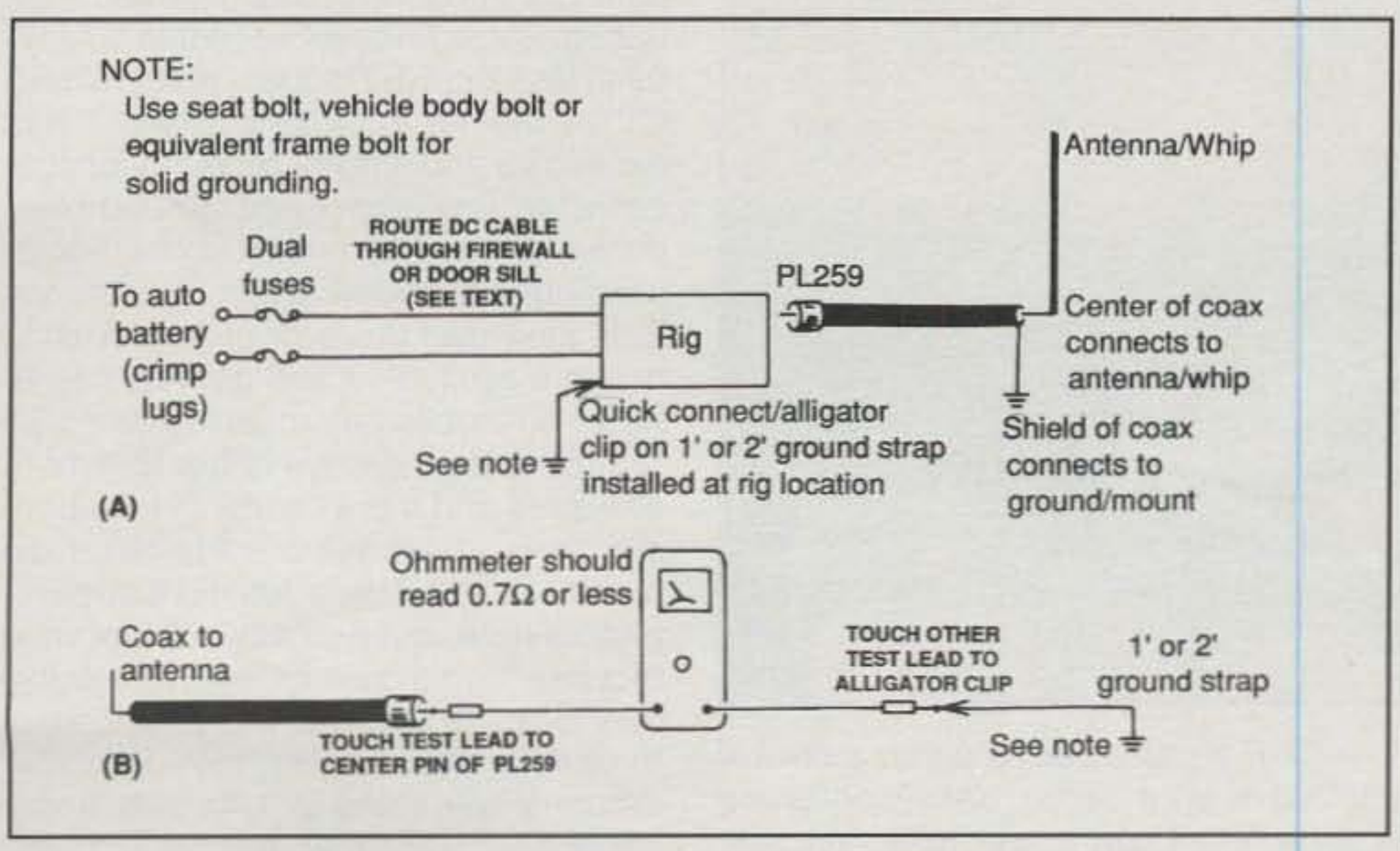


Fig. 1– Electrical outline of a well-planned, smooth-performing mobile system (A) and illustration of a quick overall checkout (B). (Discussion in text.)

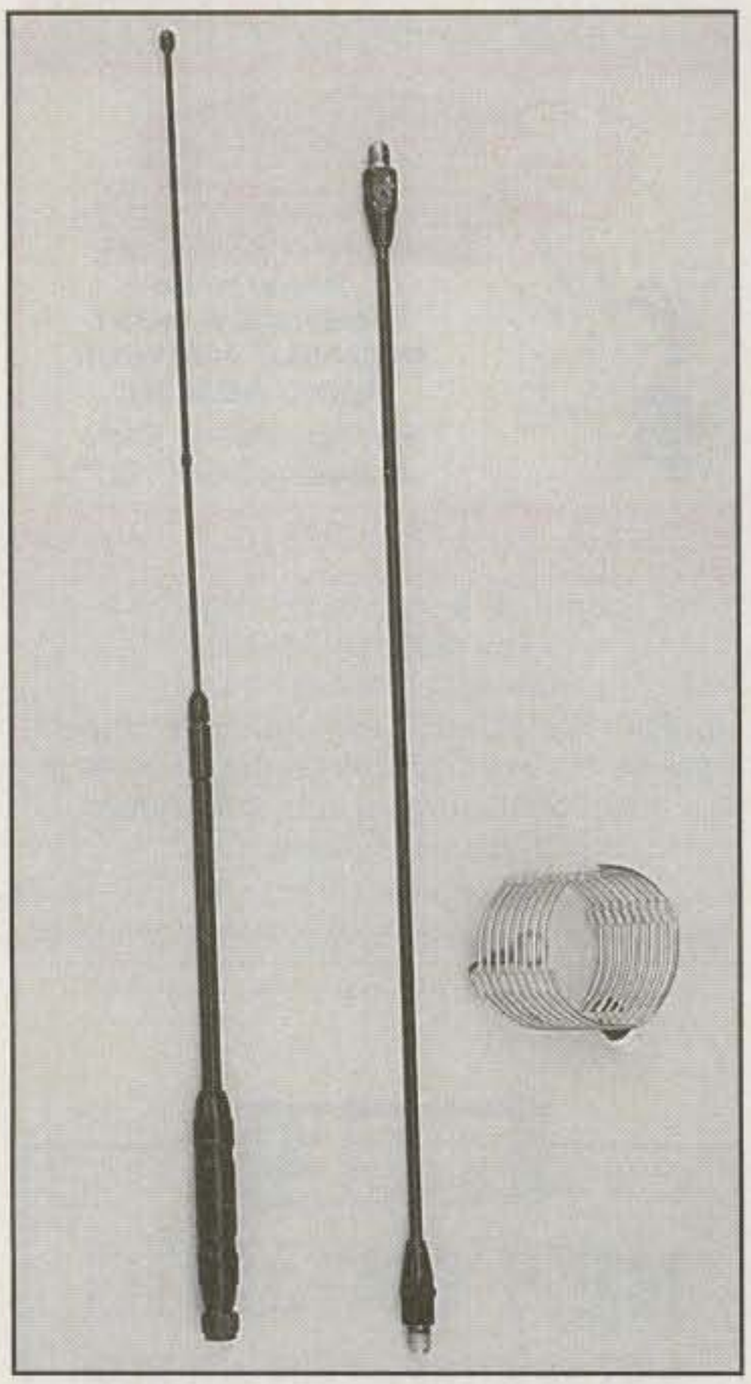


Photo D– Close-up view of this mini Hustler antenna reveals a 19 inch base section cut from a CB whip, a readjusted Hustler resonator, and a base impedance matching coil 2 1/2 inches in diameter and 4 turns per inch (available from the Radio Works).

Routing the DC cable through a car's firewall can challenge your patience and contortion agility, but think positively and you can do it. Poke around the steering column or speedometer cable's large grommets, and you probably will find extra space to pass the cable. No luck? I often route that cable between the windshield's lower corner, the front fender's upper corner, and the door's front edge near a hinge. Just be careful to ensure that only the door's weatherstripping closes on or squeezes the cable, and the idea should work for you, too.

When installing a trunk-lip, hatch-clip, or frame-type antenna mount, be sure its set screws make contact with the vehicle's metal frame or body for solid grounding. Scraping off paint to reach actual metal is often necessary here. Install RG-8X marine-grade or similar long-life coax cable between the mount and transceiver. Exercise care to ensure the cable's shield connects to the mount's body, and then check for good DC grounding between the coax shield and the car's metal frame. That's a very important step. Use your ohmmeter to check for and ensure good connections.

Next add a 1/2 or 1 inch wide ground strap between your transceiver and the car's frame or body. Here I typically use a one or two foot strip of grounding braid secured to a seat bolt and fitted with an alligator clip on the other end for "quick connect" grounding. *Do not overlook or shortcut this vital step, and do not assume the ground connection made through the coax shield or the DC cable's negative lead is adequate. It is not.* Both cables can and will radiate RF energy just like a phantom antenna (and play havoc with the vehicle's electronics or computer). The transceiver's cabinet must be grounded where it is actually mounted.

Finished? Okay, refer to fig. 1 and make this "overall system" check. Disconnect the ground strap and the antenna's PL259 plug from your transceiver, and then add a temporary jumper from your antenna mount's positive/center of coax connection and its ground/shell at the mount proper. Now slip in the vehicle and touch one lead from your trusty ohmmeter to the disconnected ground strap and the other ohmmeter lead to only the center pin of the coax cable's PL259. If the meter reads more than 0.7 ohm, your ground connections at the mount, at the seat, or between a trunk lid or body section and the vehicle's main body are inconsistent. Use your ohmmeter to track down the loose connection(s) in a step-by-step manner, correct that shortcoming, and you will be set to radiate a great signal without "RFing" half the vehicle's on-board electronics. Try this "check the whole system" idea. It works!

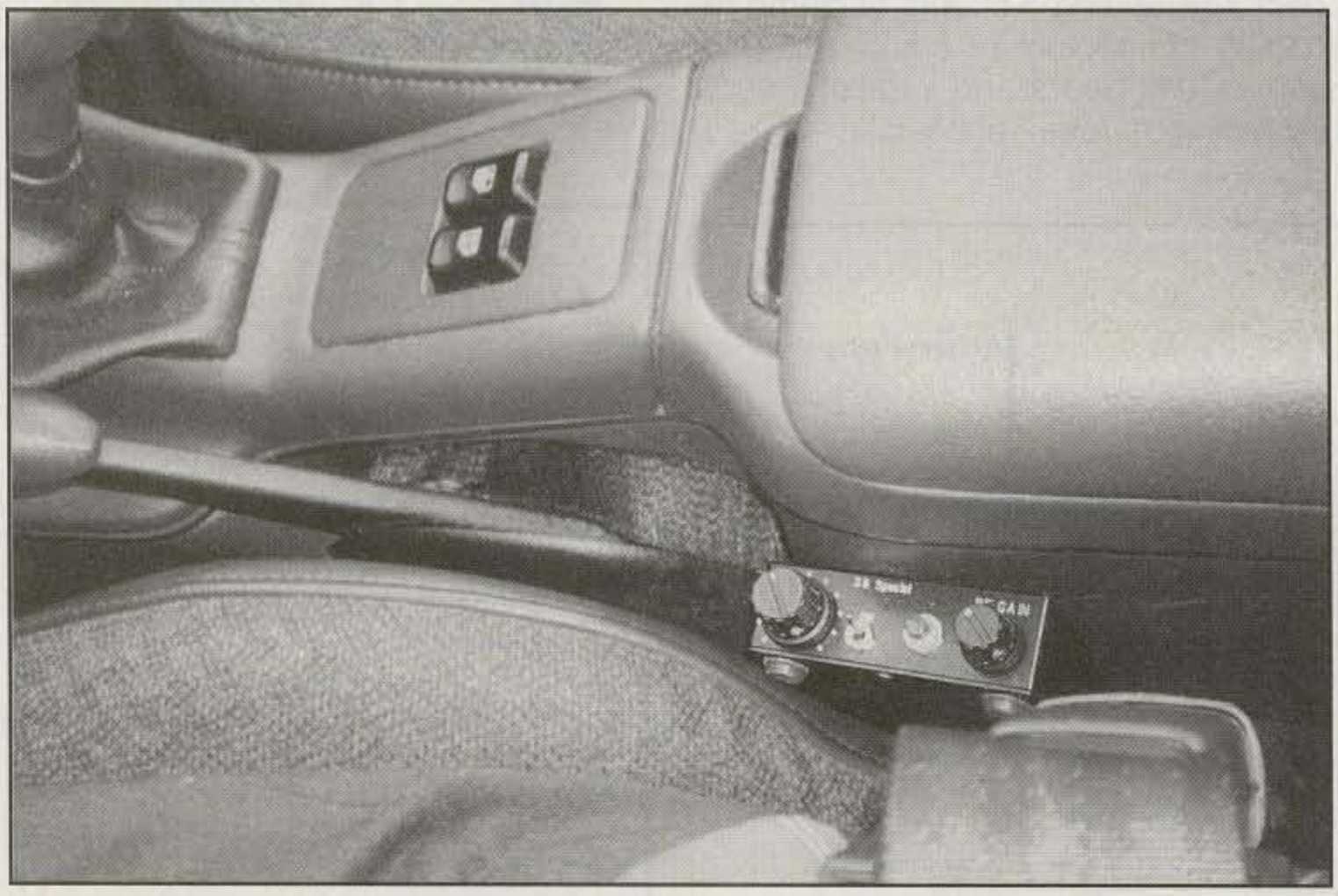


Photo E– Mounting a pocket-size miniature QRP transceiver between a bucket seat and the center console makes a clever "out of sight" setup. Small cables are easy to hide under the bottom edge of the console and low power works out surprisingly well from the car. No, this beside-the-seat setup is not used while the car is in motion unless it is moved to the passenger's side and the XYL drives.

Mobile Antennas

Surely the most often discussed aspect of mobiling on any band or combination of bands is antennas. Indeed, the wide variety of antenna designs and sizes available to modern mobileers is incredible. The choice of which one to use basically depends on each person's situation. Some folks will not settle for anything less than the biggest and the best. Others are more comfortable with a less expensive and smaller antenna for conservative appearance and "around town" convenience. Still others prefer homebrewing and modifying mobile antennas to fit their own ideas or criteria. Taking this into account, a few general helpful notes on mobile antennas follow.

First, taller is always better (but more obtrusive and more challenging to handle; there is always a trade-off). How much better? There are no set parameters here, but typically a 4 foot whip receives and transmits signals roughly two "S" units below a 6 to 8 foot whip. In other words, a low-profile 4 foot tall antenna will make a 100 watt transceiver sound like a 25 watt transceiver, and that's fine for general mobile use. Most bicycle mobileers run only 5 or 10

watts and usually work out great. If they can do it, so can you!

Next strive to mount your antenna so its near-center loading coil is slightly above your vehicle's roof line. This consideration ensures maximum signal-radiating effectiveness—typically one "S" unit greater than an antenna with its coil below the roof line. If your vehicle has composite/non-metal body sections, install several long lengths of copper-foil or wide ground straps out of sight at the antenna's base and connect them to the antenna's mount for radials. Many times those straps can be tucked into grooves of covers over rubber bumpers or crevices along lower sections of rear fenders. Clamps and tape will ensure they stay in place. With a little effort even a fiberglass-body car can become a rolling ground plane and radiate an impressive mobile signal.

Here are a couple of quick final tips for your experimenting pleasure. Opting for a longer top stinger and fewer loading-coil turns for a given band produces a creditable improvement in signal strength. Using a Hustler RM15 with a new/retrofitted 40 inch top stinger to operate 20 meters or a 42 inch stinger with an RM20 to work 30 meters are two examples. Similar modifications are applicable to Hamsticks, Bugcatchers, and short Outbackers. Small metal- rod couplers ideal for butting two stingers together can be found in many hobby stores. They are perfect for making long stingers.

Prefer a shorter antenna for easy garaging and a neat appearance? Consider homebrewing a 4 foot tall mini Hustler or two for your favorite band(s) of operation as shown in photo D. Begin by cutting an 18 1/2 inch section from the base end of a hefty 96 or 108 inch CB mobile whip, and then install a second 3/8 by 24 thread to 1/8 inch whip adapter on the whip's cut end. These adapters are sold at RadioShacks and are also plentiful in many hamfest fleamarkets. Then screw on a Hustler resonator for your desired band, readjust/extend its existing top stinger slightly (usually 1/2 inch), add a base impedance matching coil, then tweak both for lowest SWR. After adjustment, spray the whip with non-metallic Krylon paint to match your vehicle. This "Sunday Special" antenna works out surprisingly well. Try it! We will discuss antennas more in future columns. Now let's consider some mobile fun pursuits.

Unique Mobile Ideas

Say your vehicle's limited interior space or your hectic lifestyle precludes mounting even an ultra-compact rig around the dash area? Cringe at the thought of leaving an expensive transceiver exposed to curious eyes while the car is left unattended?

Have you considered going QRP mobile with a pocket-size transceiver such as the NorCal 38 Special, Wilderness SST, or new MFJ Cub fit between a front bucket seat and the center console as shown in photo E? QRP rigs are economically priced and easy to tuck into a small space, and you can operate them for hours while parked without running down the car's battery. QRP mobiling also sidesteps problems of "RFing" complex electronics in modern luxury cars, and it really kindles excitement on the air. Just do not use our "by seat" mounting idea for mobiling while driving (safety first, you know). Move the little rig to the passenger's seat, let the XYL (or OM) drive, and ham it up!

Do you occasionally look at your mobile setup from an office or apartment window and imagine adding a remote link so you could access it with an FM talkie and work DX from, say, a half block away? Setting up a full remote-controlled system is difficult, true, but a cool-going alternative can be assembled in a snap. How? Devise a simple 70 cm to 10 meter FM crossband repeater or "remote mobile" for your car.

As illustrated in fig. 2, all you need is a 10 meter FM transceiver, a low-power 70 cm FM transceiver, and a pair of VOX units. (You'll also need a second 70 cm rig as your remote-control/operation point.) Earphone or speaker audio from the 70 cm transceiver keys VOX 1, which activates the 10 meter transceiver's PTT line, and audio from the 10 meter transceiver keys VOX 2, which keys the 70 cm rig's PTT line. Resistor attenuators on each rig's mic input line reduce audio levels to avoid overdrive. Using low power plus an in-car ducky antenna limits 70 cm access range. Just tune the 10 meter FM rig to 29.480 or 29.600 MHz, set the 70 cm rig on an unused-in-your area channel, stay close to the car for manual control should unexpected problems arise (you need to be able to get to it in 3 minutes or less if remote control fails), and enjoy!

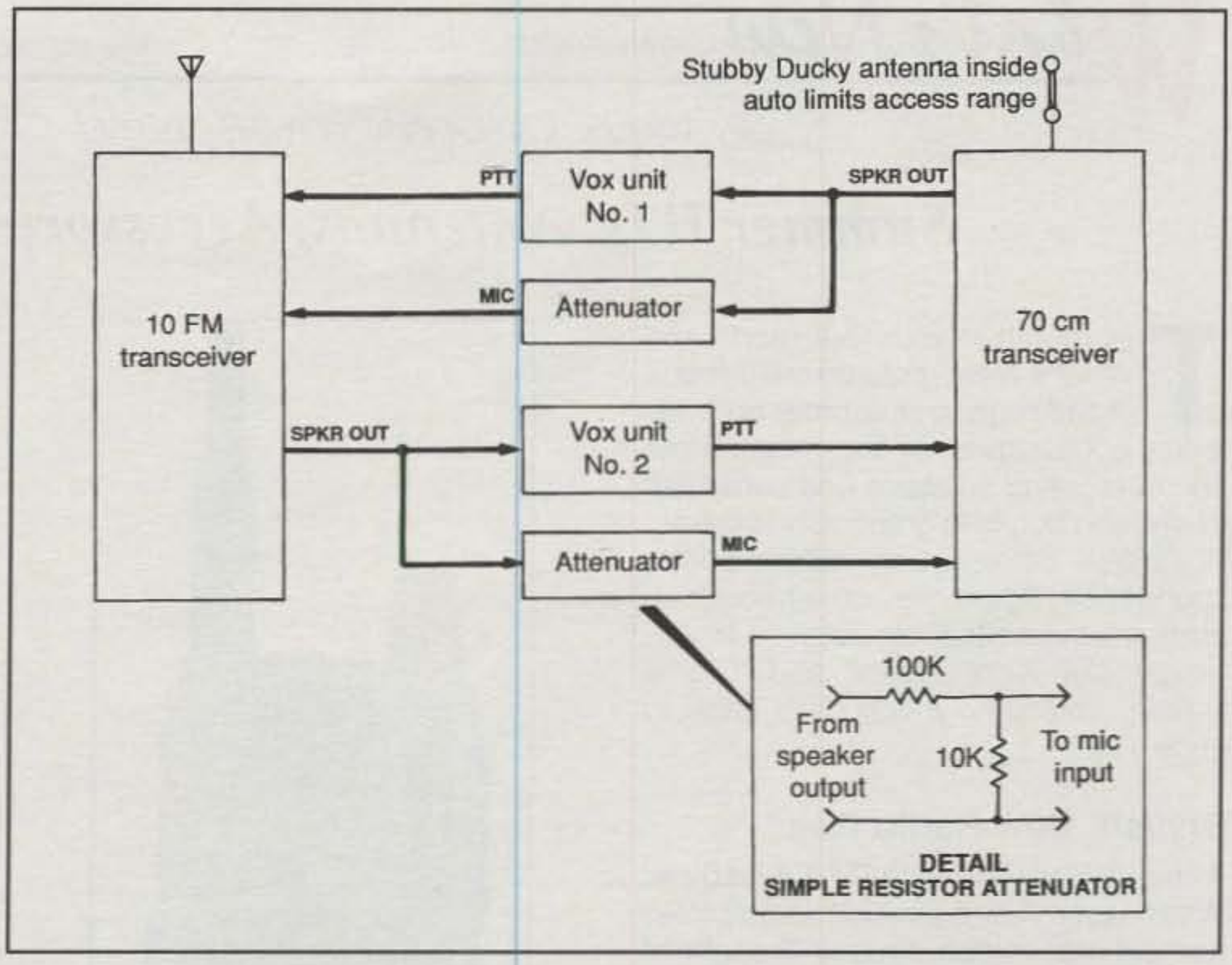


Fig. 2– "Napkin note" outline of an easy-to-assemble 70 cm to 10 meter crossband "mobile remote" setup. Arrangement is accessed with your nearby FM talkie and is capable of reaching out thousands of miles.

Conclusion

That's our available space for this time, friends, but more notes and ideas are already waiting for next time. Stay tuned. I am working on some unique designs for ground-independent antennas that will knock your socks off. All I need is a little more time to perfect them. These 24 hour days are just too short to get everything in. Does cloning really work? 73 and may the force of good signals ride with you!

Dave, K4TWJ

What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

Summer HTs, Antennas, Accessories, and More

This month in your four-month-old "What's New" column we'll focus on radio gear; antennas and antenna accessories for the shack; new and interesting software and computer treats; and books to grace your shelves. We'll also catch up on reader correspondence. Again, welcome to our column, which has its roots both in our "Antennas and Accessories" and "Digital Dipole" columns, which date back to early 1980.

Stylish, New Radio Gear

Alinco® See-Through DJ-V5 Radios. What next? A see-through radio? Yes, someone at Alinco already thought of that idea, which has taken the form of the "clear" versions of its popular DJ-V5 VHF+UHF handheld transceiver. You can even get the radios with decorator-matched NiCad packs to boot!

According to Alinco's Katsumi "Naky" Nakata, KE6RD, the new, avant-garde models are the DJ-V5TDC, powered by a transparent, dry-cell battery pack, and the DJ-V5TDCH, which comes with a black NiCad battery pack. Naky adds that the new radio is targeted to younger users who want a bit more style and to "techies" who enjoy seeing some of the internal components in their new HT. He adds, "We think it would look very good next to a clear iMac [a new, stylish Apple Macintosh computer] for use in packet operations."

Alinco's DJ-V5T models are compact transceivers designed to operate on the 2 meter and 70 cm bands. The HTs feature alphanumeric displays, up to 5 watts power output, 200 memories, expanded receive capability offering coverage from 76 to 999.995 MHz (with cellular frequencies blocked, of course), narrow and wide FM receive modes, and CTCSS encode and decode.

The DJ-V5TDC(H) model has only faint coloration that appears as a part of the manufacturing process. Most people see it as a slight blue tinge to the outer case that reveals the placement of the circuit board, display, lighting, speaker, keypad, switches, and more.

*289 Poplar Drive, Millbrook, AL 35054-1674
e-mail: <w8fx@cq-amateur-radio.com>

You can see right through the new "clear" version of Alinco's popular DJ-V5 VHF+UHF handheld transceiver. The see-through radios are targeted to younger users and to "techies" who enjoy seeing some of the internal components. (Photo courtesy Alinco USA)

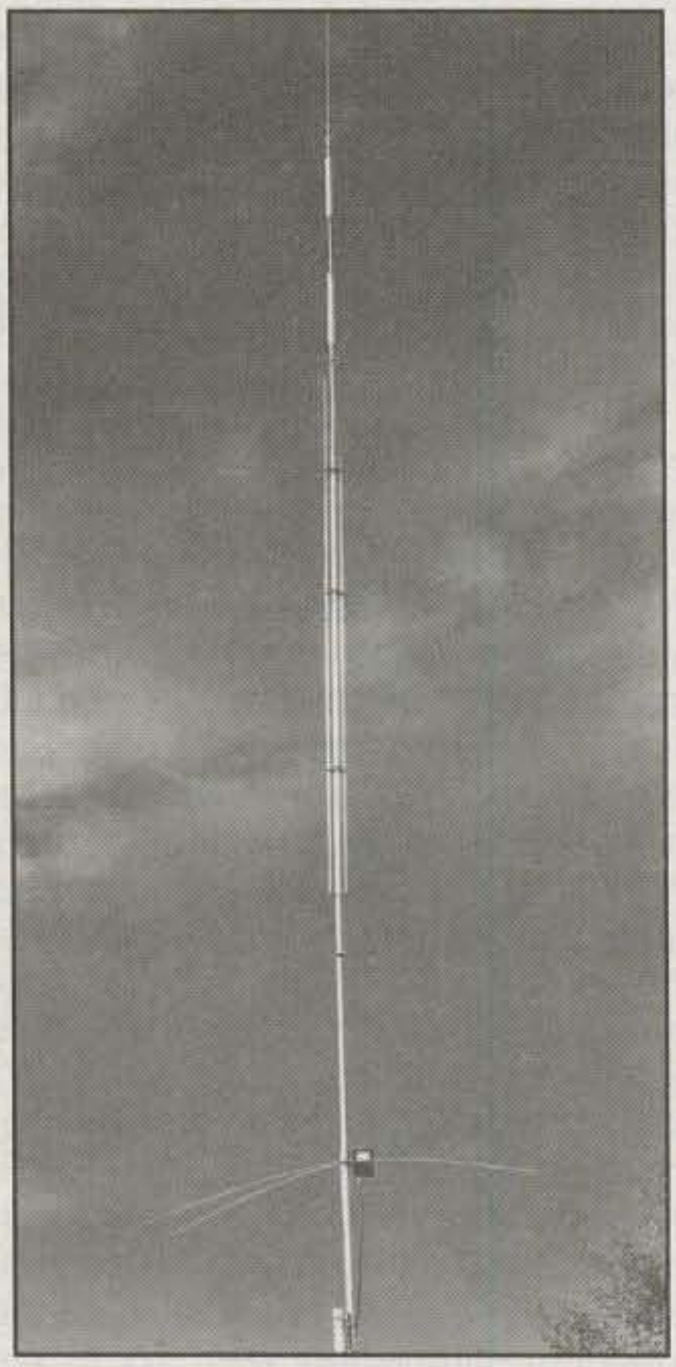
You can request a product flyer from Alinco U.S.A., 438 Amapola Ave., Suite 130, Torrance, CA 90501 (310-618-8616; web: <http://www.alinco.com>). Product information and instruction manuals for most Alinco equipment are available online at their website, where you also can have an Alinco newsletter e-mailed to you to keep up to date on Alinco happenings.

Antennas and Accessories

Cushcraft R8 HF Multiband Vertical Antenna. Cushcraft's multiband vertical antennas are well known for their high performance and quality. I'm a user myself. Now Cushcraft has updated its long-running R-series with the R8 HF Multiband Antenna. The antenna offers eight-band coverage encompassing the 6, 10, 12, 15, 17, 20, 30, and 40 meter bands.

Multiband vertical antennas have always been complicated designs with components as likely to be damaged by high levels of mismatched transmit power as the rigs to which they are attached. The rugged R8, however, is designed specifically for use with a tuner and amplifier under conditions of moderate mismatch. While the antenna is best operated within its 2.0:1 SWR bandwidth, it nevertheless allows safe operation at full power (1500 watts CW) under SWR mismatches as high as 3.0:1.

For more information and pricing, contact Cushcraft Corp., 48 Perimeter Rd., Manchester, NH 03103 (603-627-7877; e-mail: <sales@cushcraft.com>; web: <http://www.cushcraft.com>. You can download a copy of the Cushcraft catalog from the website, where you



Cushcraft has updated its long-running R-series of HF verticals with the R8 HF Multiband Antenna. The antenna provides eight-band coverage encompassing the 6, 10, 12, 15, 17, 20, 30, and 40 meter bands. (Photo courtesy Cushcraft Corp.)

A new Bucket Boss product Jensen features prominently in its catalog is the Tool Hog™. The case features three removable tool boards that can serve to make an on-the-spot workstation. See text for details. (Photo courtesy Jensen Tools, Inc.)

also can request a printed copy of their amateur catalog be mailed to you.

Giovannini Elettromeccanica D2T "Stealth" Antenna. Murray Neece, K5MDM, has been named the U.S. distributor for Florence, Italy based Giovannini Elettromeccanica Antennas, which is under the direction of Carlo Bavecchi, I5JVA. It's an antenna firm well-known in Europe since it began operations in 1983, but one which is relatively unknown in the United States.

Among the Italian firm's products is the innovative, compact D2T "Stealth" Antenna, which provides no-tune, continuous coverage from 160 through 2 meters. The directional antenna handles 1 KW PEP, has a 6.6 ft. boom, has two elements about 19.6 ft. long, and weighs only 19 lbs. It's designed especially for amateurs and shortwave listeners who have very limited space in which to construct an antenna—even attic installations are suggested by the manufacturer. (For a review of the antenna, see the June issue of *CQ*.)

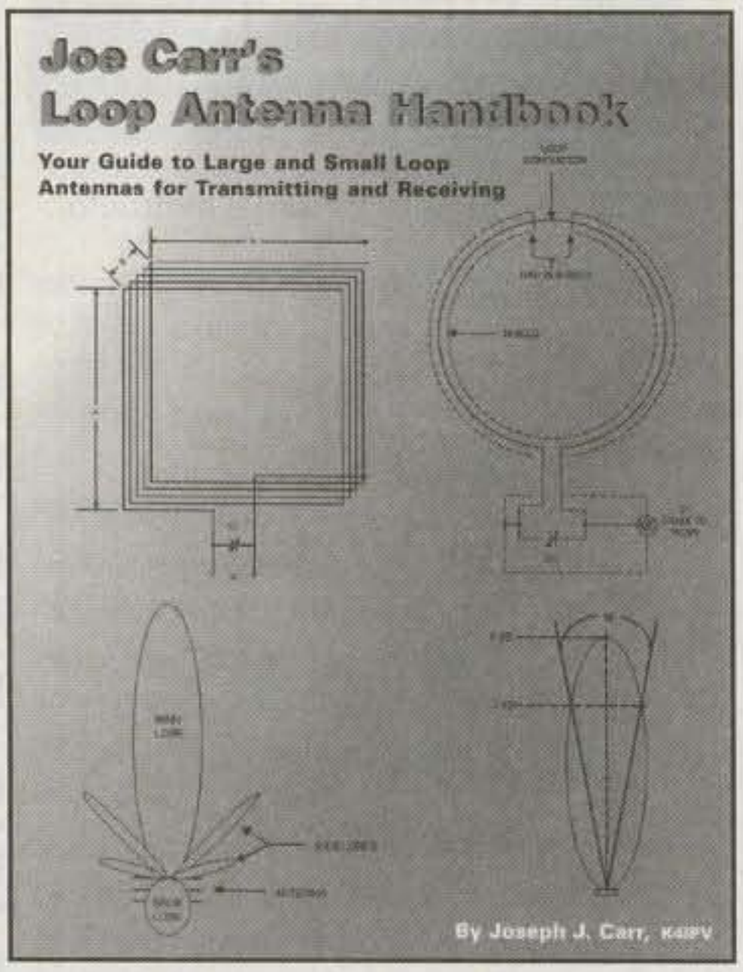
Also available are several optional D2T accessories, including the 24.6 ft. portable fiberglass MV75 mast, which weighs less than 15 lbs. and is less than 5 ft. long when dismantled. The K12 Extension Kit extends the mast to over 39 ft., while the K75 Kit includes a base, mast top for attaching an antenna, thrust ring to allow the mast to rotate while guyed, guy rope, and four stakes. Also offered are several single-band wire DX verticals for low-band DXing, 40 through 160 meters. Various broadband receiving antennas cover 0.3 to 30 MHz.

For more information and pricing, contact Murray Neece, K5MDM, 2543 E. 11th St., Odessa, TX 79761 (915-580-9051; e-mail: <antenna@QTH.com>; web: <http://www.qth.com/k5mdm>. You also can visit the very well-done, English-language Giovannini website at <http://www.antenna.it>.

New Tool Hog™ Case and Catalog from Jensen. Although Jensen Tools largely serves business, industrial, and service users, their 300-page catalog sports a number of useful products with possible amateur use. These products include tool kits, cases and carts, test equipment, computer accessories, wire and cable, hand and power tools, soldering equipment and accessories, workshop supplies, safety products, and much more.

One new product Jensen prominently features is the Tool Hog™ from Bucket Boss, which appeals to those folks who are always outside working on their antennas, towers, and feedlines. The case features three removable tool boards that can serve to make an on-the-spot workstation. For smaller jobs, you can turn the detachable shoulder bag into a convenient tool pouch. An internal file storage pocket is perfect for carrying paperwork, and the large main compartment opens wide to allow easy access. The 17½" × 12" × 12" Tool Hog™ has a padded wrap handle and shoulder straps and is constructed of two layers of rugged fabric sandwiching dense foam. It's $102.50.

For a catalog, contact Jensen Tools, Inc., 7815 S. 46th St., Phoenix, AZ



Joe Carr's Loop Antenna Handbook *may be what you need if you are looking for a high-performance antenna, but are short of space or are on a tight budget. Various easy-to-build designs are offered, and receiving and transmitting aspects are covered. (Cover courtesy Universal Radio, Inc.)*

85044-5399 (1-800-426-1194; e-mail: <jensen@stanleyworks.com>; web: <http://www.jensentools.com>).

Software and Computers

ProLog2K for Windows. Ed Longhi, W5VP, has a long tradition of producing high-quality Datamatrix QSL route management and logging software, which we have profiled in our column several times over the years. He publishes the ProLog QSL Route Management System, Prolog Logging Program, and ProLog98 for Windows Logging System (see "Digital Dipole," August 1998).

Ed's latest opus is the new ProLog2K for Windows Logging Program for Windows 95/98/2000. Its 36 logbooks offer plenty of room for multi-operator families and special event logs. The program's PacketCluster® support makes working DX almost effortless by providing an audible alert whenever a DX Spot arrives for a new prefix, zone, or continent. Rig control also is supported to automatically log the band and mode as you tune.

ProLog2K monitors and tracks DXCC, WAC, WAS, CQZ, ITUZ, and IOTA using all modes, including the increasingly popular PSK31 mode. The program lets you customize 16 additional awards of your choice. It also supports all callsign CD-ROM databases, as well as its own popular QSL Route Database (sold separately or in combination), which lists the routes for over 71,000 DX stations.

ProLog2K is $49; including the QSL Route Database, it's $64. Various upgrade, subscription, and CD-ROM database combination deals also are available. For more information, contact Ed at Datamatrix, 5560 Jackson Loop N.E., Rio Rancho, NM 87124 (1-800-373-6564; e-mail: <prolog@rt66.com>;. web: <http://www.qth.com/prolog>).

Goodies from Computer Aided Technologies. In the October 1992 and January 1995 columns we profiled a variety of Jim Springer, N5JMZ's software programs and products designed to enhance your scanning and shortwave listening pursuits. These programs included the comprehensive Scancat-Gold for Windows (as well as a surveillance-enhanced "SE" version), Scancat-Gold for DOS, PC-based CAT-5000 spectrum analysis software, MAGIC Scancat file conversion utility, COPYCAT-PRO menu-driven TNC terminal program, and various other scanning software and related products.

Computer Aided Technologies offers the high-quality Stridsberg line of passive and active receiver multi-couplers for use with a multitude of monitoring applications ranging from 40 kHz to 1 GHz plus. The firm also distributes the popular but often difficult-to-find HOKA CODE-3 and CODE-30 decoders.

Something caught my eye at the Computer Aided Technologies website: several sets of nostalgic OTR (old-time radio) audio data CDs, each chock full of files in the popular MP3 and RA (RealAudio) file formats. Each CD includes over 60 favorite OTR programs in classifications of comedy, detective, drama, mystery, science fiction, super heroes, westerns, and more. The disks include a selection of MP3 and RA format player software, which you'll need to play the CDs, since they are designed to play on your PC, not on a regular audio CD player. All CDs are $29.95 plus $5 s/h per order. An OTR sampler demo is $7.50 postpaid.

For more details, contact Computer Aided Technologies, P.O. Box 18285, Shreveport, LA 71138 (1-888-722-6228; e-mail: <scancat@scancat.com>; web: <http://www.scancat.com>).

N3FJP Amateur Radio Home Page and Amateur Radio Software. A number of useful shareware and freeware amateur radio programs are offered at the N3FJP Amateur Radio Home Page. You'll find the page, which is designed and operated by Scott Davis, N3FJP, at <http://members.aol.com/snkdavis/page1.html>.

The programs Scott offers include the International DX Contest, 10 Meter Contest, November Sweepstakes, Field Day, VHF Contest, and general amateur contact logging, among others. A check of Scott's website shows that most of the programs have recent updates, and they're all priced reasonably, or are completely free. Scott also offers a good selection of general-purpose software for personal and business use.

For more information, check out the N3FJP Amateur Radio Home Page.

From the Bookshelf

Joe Carr's *Loop Antenna Handbook.* Colleague Joe Carr, K4IPV, has an outstanding and well-deserved reputation as a "hands on" antenna designer and technical book author. In this connection, I should note that Joe is the author of over 85 books and 650 electronics- and communications-related articles.

Have you considered a loop antenna for your rig? Joe Carr's *Loop Antenna Handbook*, subtitled "Your Guide to Large and Small Loop Antennas for Transmitting and Receiving," may be what you need if you're looking for a high-performance antenna, or if you're short of space or are on a tight budget. Joe's book is worth a close look.

The new book is a complete guide to your understanding and building of high-performance, large and small loop antennas. Various easy-to-build designs are offered for models covering longwave, mediumwave, shortwave, and even VHF; both receiving and transmitting aspects of loops are covered. Joe's 133-page, perfect-bound handbook is $19.95.

The book is published by Universal Radio, Inc., 6830 Americana Pkwy., Reynoldsburg, OH 43068-4113 (1-800-431-3939; e-mail: <dx@universal-radio.com>; on the web: <http://www.universal-radio.com>).

Ham Price Guide, Second Edition. Determining prices for used amateur radio, shortwave receiving, test, and other electronic gear can be quite problematic. Another problem in buying such equipment at hamfests, swap meets, privately, through classified ads, or via internet auction sites is proper identification of the gear. Just what, exactly, is being offered, and what are fair prices for the gear?

Eugene Rippen, WB6SZS, recently introduced the *Ham Price Guide 2nd.* This second-edition reference book

serves as both a price guide and an identification guide, helping you to interpret the often cryptic equipment descriptions contained in many ads. Prices for some 3800 different transceivers, receivers, tuners, transmitters, amplifiers, antennas, and test equipment are provided. Prices also are given for books, tubes, and catalogs.

None of the prices listed in the book are the author's opinion. Rather, they are based on actual selling prices at auctions or elsewhere, or they are advertised "for sale" prices. The claimed condition of items is provided if available, and included options, accessories, and manuals also are mentioned.

The new book is $11.95 plus $2 s/h directly from the author, Eugene Rippen, WB6SZS, P.O. Box 9, Auburn, CA 95604 (530-888-6020).

New from PROMPT® Publications. Several recently released books bearing the PROMPT Publications imprint of the Howard W. Sams & Company should be of interest to *CQ* readers.

One such book is *Howard W. Sams Ham Radio Operator's Guide,* by Carl J. Bergquist, KG4AIC, a "how to" guidebook written from the perspective of a new user, while keeping the experienced operator in mind. Coverage includes getting your license, equipment selection, construction projects, education, contests, clubs, safety, jargon, and etiquette. The 320-page book is $29.95.

Several other new PROMPT books should be of interest, too. One covers a topic that perhaps ranks in importance next to the phenomenon of radio propagation itself. It's Irving M. Gottlieb's *Basic Modulation Principles,* a 176-pager covering the topics of modulation and demodulation from A to Z. The book's contents are portrayed in an easy-to-read format, using math only when and where necessary. It's $24.95.

Does your bookshelf still have room for a one-stop professional reference guide for formulas and calculations on nearly any electronic subject? If so, check out Newton C. Braga's *Sourcebook for Electronics Calculations, Formulas, and Tables.* This is a 440-page book priced at $34.95. Along with everyday AC, DC, and digital formulas, it covers cable resistance, basic capacitor formulas, inductance, permeability, time constants, resonance, gain, filter efficiency, harmonics, and much more.

For a copy of the Howard W. Sams & Company 2000 Annual Index for service data availability, contact PROMPT Publications, Howard W. Sams & Company, 2647 Waterfront Parkway E. Dr., Indianapolis, IN 46214-2041 (1-800-255-6989;. e-mail: <csmgr@hwsams.com>; <http://www.hwsams.com>).

We Get Letters

Once again we're just about out of space. Before wrapping things up this month, we'd like to acknowledge some of the good folks who corresponded with us. A tip of the W8FX hat goes to Monte Midkiff, N7TAU; Travis McKee, N5MQY; Al Simmons, W6MI; Spencer Laite, W5TPA; Rick Szajkowski, VA3RZS; Jim Springer, N5JMZ; Murray Neece, K5MDM; Scott Davis, N3FJP; Eugene Rippen, WB6SZS; and Susan and Ted, N4XX, Cohen. Keep the cards and letters coming, gang, and let us know what types of "new stuff" you'd like to see in your "What's New" column.

Wrap-Up

That's all for this time, gang. Next time, more "What's New." See you then.

Overheard: I learned a long time ago that when I get carried away in discussion on the air, one option I always have is to simply shut up and listen.

73, Karl, W8FX

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

CQ's 2000 Contest Survey

July's Contest Tip of the Month

There are a number of contest pile-up programs that are not only fun, but can help build your CW skills before the real events take place. If you've never given them a try, now's your chance. Here are a few that I recommend, with their associated Internet URLs:

JE3MAS PED Program—
<http://jzap.com/je1cka/ped/index.html>
G4ZFE Pile Up! Program—
<http://www.babbage.demon.co.uk/pileup.html>
DL4MM RUFZ Program—
<http://www.sk3bg.se/contest/rufz.htm>

A little "off-air" time will make your scores rise to new heights. Give it a try!

The time has come for yet another *CQ* Contest Survey. I started running these surveys almost ten years ago, with incredibly interesting results. We've learned a lot about each other and our views on contesting. One year we even took the pulse of our own operating integrity, resulting in a passing score (although not perfect!).

As we are now finally in the new millennium, there's a lot to consider from a contesting perspective. It begins by some of us wondering if this current solar cycle is ham radio's last hurrah. Still others may be speculating about the impact of the FCC's licensing restructuring on ham radio in general and contesting in particular. No matter what topic interests you, there's certainly something on your mind that many others are thinking about, too. A view into what you're thinking is what influences many of these surveys and makes them so useful for driving fascinating dialog in contest circles.

With this as a backdrop, let's go to the survey later on in this column. Please take a few minutes to voice your opinion. You'll find that in addition to being published in *CQ* magazine, I'll be making this survey available on most of the popular Internet e-mail reflectors and other electronic sources. Look for additional announcements as they become available. An electronic response is preferred and can be sent directly to my e-mail address at <K1AR@contesting.com>. Of course, you can "snail mail" your replies in the conventional manner as well to: John Dorr, K1AR, 2 Mitchell Pond Rd., Windham, NH 03087-1299.

2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

Calendar of Events

June 24-25	ARRL Field Day
June 24-25	Marconi Memorial Contest
July 1	Canada Day Contest
July 1-2	Venezuela SSB DX Contest
July 8-9	***New* CQ WW VHF Contest**
July 8-9	IARU HF Championship & WRTC 2000
July 15-16	SEANET Contest
July 15-16	North American RTTY QSO Party
July 22-23	Venezuela CW DX Contest
July 22-23	Georgia QSO Party
July 29-30	IOTA Contest
July 29-30	Russian RTTY WW Contest
Aug. 5-6	ARRL UHF Contest
Aug. 5-6	North American CW QSO Party
Aug. 6	YO DX Contest
Aug. 12-13	Worked All Europe CW Contest
Aug. 19-20	North American SSB QSO Party
Aug. 19-20	Oregon QSO Party
Aug. 19-20	SARTG WW RTTY Contest
Aug. 26-27	Ohio QSO Party

Closing Remarks

Well, that's all for this month. I expect by the next issue to announce other "electronic" methods to respond to this year's contest survey. In any event, your participation is greatly appreciated and provides useful input for future *CQ* "Contesting" columns.

As usual, please submit your contest announcements to me no later than August 1st for inclusion in the October issue of *CQ*.

73, John, K1AR

Venezuelan Contest

SSB: July 1–2 CW: July 22–23
0000Z Sat. to 2400Z Sun.

This is the 39th annual contest celebrating Venezuela's independence. It's a worldwide-type contest, so do not confine your activity to working YV's only. Working other DX is encouraged. Use all bands, 160–10 meters (no WARC bands).

Classes: Single operator, single and all band, and multi-operator, single and multi-transmitter. (No limit to transmitters, but only one signal per band.)

Exchange: RS(T) and QSO number (e.g., 59001).

Points: Contacts between stations in the same country count 1 point. QSOs between stations in different countries but the same continent count 3 points. QSOs between stations on different continents count 5 points.

Multiplier: One for each YV call area, and one for each different country worked on each band (including your own).

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

Awards: A plaque will be awarded to the highest scorer in each operating class. Certificates will be distributed to stations making more than 20% of the next highest score.

Use a separate log sheet for each band. Each YV call area (9) and each country (DXCC list) should be indicated in a separate column only the first time each is worked on each band.

Include a summary sheet showing the scoring, your name and address in block letters, and the usual signed declaration that all contest rules and regulations for amateur radio in the country of the contestant have been observed.

Mailing deadline is September 30th for SSB entries and October 31st for CW. They go to Radio Club Venezolano, Concurso Independencia de Venezuela, P.O. Box 2285, Carcas, 1010-A, Venezuela.

The *New* CQ WW VHF Contest

1800Z Sat. to 2100Z Sun., July 8–9

The complete rules for this new version of the CQ WW VHF Contest are in the June issue of *CQ* and the July/August issue of *CQ Contest*. Be sure to review them carefully, as there have been significant changes made to the old rules governing this contest. You may request log sheets from: CQ VHF Contest, 25 Newbridge Road, Hicksville, NY 11801. Include an SASE with your request.

Completed logs must be postmarked no later than September 1, 2000 to be eligible for awards. All logs should be mailed to: CQ VHF Contest, 25 Newbridge Road, Hicksville, NY 11801. We encourage logs to be submitted on disk or sent via e-mail. If you use a computer, please send your log on an IBM, MS-DOS-compatible computer disk. A disk containing your files may be submitted in lieu of a paper log, however a paper summary sheet satisfying all logging instructions must accompany all disks. Label your disk clearly with your call and category. If you submit your log in electronic form, we prefer one of the commonly available logging programs. You may submit your electronic log via e-mail to <cqvhf@kkn.net>. Questions may be sent to <questions@cqww.com>.

IARU HF Championship

1200Z Sat. to 1200Z Sun., July 8–9

This is the 15th annual IARU World HF

1999 CQ VHF Contest Partial Results

Please make a note to enter the *new* CQ VHF Contest on July 8–9. The rules were in the June issue of *CQ* and are in the July/August issue of *CQ Contest*. Rules and logs are available from *CQ* for an SASE. Questions may be sent to <questions@cqww.com>.

Single Operator Portable

	Score	QSOs	Grids
VE7DXG	18,036	164	41
W3SE	2,227	131	7
AA2DR	1,500	22	21
KG4BMH	264	2	11
AK4U	45	7	5
KB9NKM	6	2	2

QRP

VE2PIJ	24	4	4
KC8JTK	64	13	4

MULTI-OP CLASS I

NJ7A	2,912	57	32

MULTI-OP CLASS II PORTABLE

KH7L	160	20	8
	(Ops: KH7O, NH6OF, KH7L)		

ROVER

N7VM/R	4,608	78	48
	(Ops: N7VM, Debbie)		
NT4L/R	897	3	23
	(Ops: KQ4TV, KB4IDC)		

Championship and a special event, as it is also tied to the third World Radio Team Championship (WRTC-2000) being held this year in Slovenia. All six bands, 10 through 160 meters, and the full 24 hours may be used by both single and multi-operator stations (no WARC bands).

Categories: Single operator, CW only, phone only, and mixed modes. Multi-operator, single transmitter, mixed mode only. Stations must remain on a band for at least 10 minutes (exception: Only IARU member-society HQ stations may operate simultaneously on more than one band with one transmitter on each band/mode.).

Exchange: RS(T) and ITU zone. HQ stations send RS(T) and the official society abbreviation.

Points: Contacts within own zone or with an HQ station count 1 point. Contacts within own continent but different zone are 3 points. Contacts with different continents are 5 points.

Multiplier: Total number of ITU zones plus IARU member-society HQ stations and IARU officials worked on each frequency band, with IARU officials representing a maximum of four multipliers per band: AC, R1, R2, and R3. (Note: HQ stations and IARU officials do not count for zone multipliers.)

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

Awards: Certificates will be awarded to the top scorer in each category, state, ITU zone, and DXCC country. In addition, achievement awards will be issued to those making at least 250 QSOs or having a multiplier of 50 or more.

Entries with more than 500 QSOs are required to include a dupe sheet with the log. A three-QSO reduction will be assessed for each duplicate QSO for which credit has been taken. Disqualification may occur if the overall score is reduced by 2% or more.

You may submit your contest entry electronically. It is recommended that you check out the ARRL's web site at <www.arrl.org> for more detailed information. A large SASE with 2 IRCs (or equivalent) will get you official forms and an ITU zone/prefix/continent map. Mailing deadline for entries is August 11th to IARU HQ, Box 310905, Newington, CT 06131-0905.

North American QSO Party RTTY Contest

1800Z Sat. to 0600Z Sun., July 15–16

The object of this contest is to work as many North American stations (and/or other stations, if you are in North America) as possible during the contest. North American stations are defined by the rules of the CQ WW DX Contests, with the addition of KH6.

Classes: Single operator and multi-operator, two transmitters. Multi-operator stations must keep a separate log for each transmitter and must have at least 10 minutes between band changes. Use of helpers or spotting nets by single operator entries is not permitted. Single operator entrants may only have one transmitted signal at a time. Output power must be limited to 150 watts for eligible entries. Multi-operator stations may operate for the entire 12 hour period. Single operator stations may operate 10 out of 12 hours. Off-times must be at least 30 minutes in length and must be clearly marked in the log.

Bands: 80–10 meters only (no WARC bands). You may work a station once per band. Suggested frequencies are 3585, 7085, 14085, 21085, and 28085. Try 10 meters at 1900Z and 2000Z, and 15 meters at 1930Z and 2030Z.

Exchange: Operator name and station location (state, province, or country).

Scoring: Multiply total valid contacts by the sum of multipliers worked on each band. Multipliers are states (including KH6 and KL7), Canadian call areas (VE1–VE8, VO1, VO2, VY1, and VY2) and other North American countries. Do not count the US, Canada, KH6, or KL7 as countries. Non-North American countries do not count as multipliers, but may be worked for QSO credit.

Team Competition: Team competition is limited to a maximum of five single operator stations (two minimum) as a single entry unit. Pre-contest *requirement:* To qualify as a team entry, you must register the name, callsign of each operator, and callsign of the station operated should the operator be a guest at a station other than his/her own (e.g., N4RJ op. by W4AN). Teams must be registered with K5DJ.

Penalties: For each unmarked duplicate QSO, you lose that contact plus an additional three contacts; for each QSO for which you are not in the other station's log, you lose that QSO plus an additional one contact; and for each QSO for which the log data is incorrectly copied in any respect, you lose that contact. Entries with score reductions of greater than 5% will be disqualified.

Awards: Trophies will be awarded for the high score in each of the following categories: single operator (W6OTC sponsor) and multi-operator (WF1B sponsor). Certificates of merit will be awarded to the highest scoring entrant with at least 200 QSOs from each state, province, and North American country.

Send all entries to Ron Stailey, K5DJ, 504 Dove Haven Drive, Round Rock, TX 78664-5926. Entries must be postmarked no later than 30 days after the party to be eligible for awards. Logs may be submitted on disk in the form of MS-DOS compatible ASCII files or .BIN format from WF1B's logging program or via e-mail to <K5DJ@easy.com>.

Russian RTTY WW Contest

0000Z Sat. to 2400Z Sun., July 29–30

This one is sponsored by the Russian Central Radio Club (RCRC), Ulyanovsk State Technical University (USTU), and the Ulyanovsk Signal DX Club (SDXC). It is open to RTTY enthusiasts around the world on 80–10 meters.

Classes: Single operator, all band/single band; multi-operator, all band; and SWL. Single ops are allowed only 36 hours of operation. There are no restrictions on length of rest periods.

Exchange: RST plus CQ Zone. Russian stations send RST plus two letters to identify their oblast.

Multipliers: Count each DXCC country and each Russian oblast on each band (band multipliers). *Note:* CQ zones do not count as multipliers.

Scoring: Credit 5 points for QSOs with on your continent, and 10 points for QSOs outside of your continent. Final score is the total QSO points times total multipliers. SWL rules apply as above.

Use separate log sheets for each band. Logs must include: band, date, and time in UTC, callsign, exchange sent and received, country multiplier, and claimed points. Entries with more than 100 QSOs must submit duplicate check sheets. Multi-operator stations should include names and callsigns of all operators.

All logs must be send no later than September 1st to Russian RTTY WW Contest Manager, Yuri Katyutin, UA4LCQ, P.O. Box 1200, Ulyanovsk, 432035 Russia, or via e-mail to <ua4lcq@ulstu.ru>.

Georgia QSO Party

1800Z Sat. to 0359Z Sun., July 22–23
1400Z to 2359Z Sun., July 23

Sponsored by the South East Contest Club and Southeastern DX Club, this traditional QSO Party is designed for amateurs outside

2000 *CQ* Contest Survey: What's on Your Mind?

Your Callsign (optional): _____
Contesting Experience (years): _____
Age: _____

1. What is your occupation?

_____

2. We are at the peak of the current sunspot cycle. Do you believe that this cycle will prove to be the beginning of the end for contesting or will activity continue to increase for years to come (choose one answer)?

☐ This cycle is the beginning of the end.
☐ Activity will continue to increase.
☐ There will be little change as time goes on.

3. Do you feel that the FCC's recent licensing restructuring actions will have a positive impact on contesting?

☐ Yes
☐ No

4. How would you rate the overall quality of contest operating compared to years past?

☐ Improving
☐ Declining
☐ No change

5. There has been much discussion in recent years about equalizing the field in contesting. Do you feel that contest rules should be changed to make competing fairer across all geographic locations and types of stations?

☐ Yes
☐ No

6. When competing in a contest, do you feel that an operator is at a strategic disadvantage if he or she is not technically oriented?

☐ Yes
☐ No

7. If someone was starting out as a new contester, how much money and time (or experience) do you think it would it take to be a world-class competitor?

☐ $$: _____
☐ Time: _____

8. If you could operate from any station or location in the world in the next contest, what would be your first choice?

_____

9. What is your dream contest location (check one or suggest your own)?

☐ Mountaintop
☐ 360 ft. water view
☐ Rare callsign; location irrelevant
☐ Other _____

10. How many contesters do you know who are younger than 30 years old?

Additional Comments:

_____

_____

(use extra paper if necessary)

Return your survey responses to:
John Dorr, K1AR, 2000 Contest Survey, 2 Mitchell Pond Road, Windham, NH 03087 USA or: <K1AR@contesting.com>.

Deadline: October 1, 2000

the state of Georgia to make contact with as many Georgia stations as possible. Georgia stations may work everyone. All stations may operate the full 20 hours on SSB and CW.

Classes: Single operator; multi-operator multi-single, multi-multi; rover, and Novice/Technician. Three power output categories for all categories: QRP—5 watts output or less; low power—150 watts output or less; high power—more than 150 watts output. Logs not showing power output category will be listed as high power.

Exchange: Georgia stations send signal report and county. Non-Georgia W/VE stations (including KH6/KL7) send signal report and state or VE multiplier area. DX stations (including KH2/KP4, etc.) send signal report and "DX" or country abbreviation.

Scoring: Credit 1 point for each SSB contact and 2 points for CW. Final score is total QSO points times total multipliers per band. For Georgia stations: 50 states (including GA), Canada: NS, NB, PEI, NF (VO1, VO2), QC, ON, MB, SK, AB, BC, NW (VE8, VY1, VYØ). DX counts for QSO points, but not for multipliers. A multiplier may be counted once per mode; the maximum is 61 per mode, or a total of 122. For non-Georgia stations: Georgia counties per mode (a maximum of 159 per mode). Georgia mobile and portable stations which change counties are considered to be a new station and may be contacted again for point and multiplier credit.

Frequencies: CW—3.545, 3.685, 7.045, 7.110, 14.045, 21.045, 21.110, 28.045, 28.110. SSB—3.850, 7.225, 14.250, 21.300, 28.450. Look for SSB activity on the hour and CW on the half hour. No 160 meter, WARC band, or VHF band QSOs count for the contest.

Awards: Certificates to top scorers in each category and power level in each state, province, DX country, and GA county, plus second place where activity warrants. Also, special recognition will be made for the high GA and non-GA scorers in each category, high outside North America in each category, and non-GA station with the highest multiplier total.

Entries must be postmarked no later than August 22, 2000. Any logs, other than check logs, with over 100 QSOs are encouraged to be submitted in computer-readable (ASCII) format. Any entrants who submit paper logs with more than 100 contacts must also include dupe sheets.

You may submit your contest logs via e-mail to <k4ea@contesting.com>. Send your summary sheet file and your log file following the ARRL Suggested Standard File Format. Also, you may submit your logs on diskettes, IBM compatible, MS-DOS formatted, 3.5 inch. The log information must be in an ASCII file. Contest logs (paper or diskette) may be submitted via postal mail to Neal B. Sulmeyer, K4EA, 530 Old Doss Dr., Canton, GA 30114-8057.

Entry forms and a list of county abbreviations are available at the SECC web site at <http://secc.contesting.com>. Entry forms may be requested by mail. Send a business-size SASE to John Laney, K4BAI, P.O. Box 421, Columbus, GA 31902-0421.

DX

BY CARL SMITH, N4AA

News Of Communication Around The World

Operating Procedures

Can you believe all that has happened already this year? There have been so many DXpeditions to "new" and "rare" places it has been hard to keep up at times.

Operating Procedures

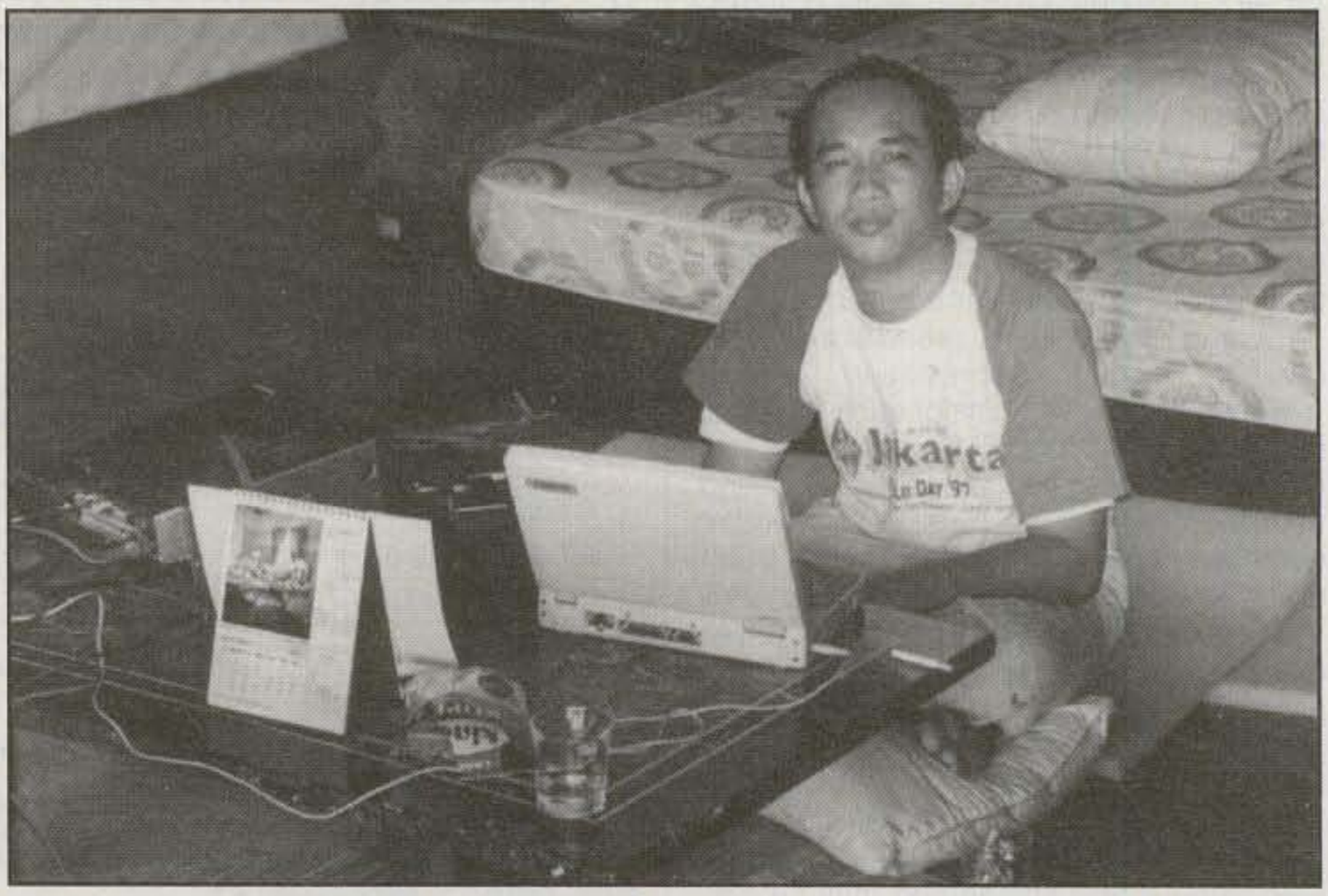
I read all the DXpedition stories and virtually all of them comment on the courtesy and discipline of the Japanese operators. When the DX station comes back to a call, the JA ops stand by until the contact is made. Gee, imagine doing such a novel thing! When the contact is finished, they call again until the DX station gives another callsign, and they stop calling. I seem to remember this style of operating being the rule, rather than the exception, many years ago. What happened to that style of operator? Where did he go? Is there some new operating strategy I missed hearing about? I don't think so!

It's just common sense to operate in a manner that will allow everyone to have a fair shot at a contact. Just because someone has a custom-built "4-holer" amplifier and "umpteen" elements at 173 1/2 feet doesn't necessarily mean that he will always be the "firstest with the mostest" when it comes to a pile-up. I have an excellent hilltop location, a legal limit amplifier, and better than average antennas. I've been beaten out in a pileup by someone behind a hill running 100 watts to a piece of wire thrown over a tree limb 20 feet off the ground. I'll even bet that you serious DXers out there can remember a time or two when the same thing happened to you.

So many times it isn't the power or the antennas, but rather the guy in the driver's seat who makes the difference. It's the guy (or gal) who knows when to call, how to call, and where to call who makes the contact. I challenge you old-time DXers out there to be the ones to set the example for those DXers who are just coming up to DXCC status and beyond. Let them hear you "do it right," and maybe, just maybe, they'll pass along the technique to someone else.

7O – Yemen

As I write this, the 7O1YGF operation by a German team in Yemen has just concluded with a rather sad final press release. The release indicated that the negotiations over their license had not been resolved and they had to cut short their operation. They were still hopeful that the final valid authorization would come and their operation would be accepted, however. With some 35,000 contacts in their logs, it would make a lot of DXers very happy if the situation were settled successfully. I certainly wish them good luck, as the operation was conducted very well. I congratulate them for their efforts.



Pri, YBØECT, was first licensed in 1982 at the age of 14. He upgraded in 1994 and started his DXing career. He says not many of the 60–70,000 hams in Indonesia work CW, but he does. Pri works in a law office and is single and 31 years old. Look for him on 20 and 15 meters. QSLs for Pri go to K5ZE. (Photo via John, KDØJL)

A5 – Bhutan

The first legal operation from Bhutan in many years came about on April 27 with the first contacts made by Yonten, A51TY. Yonten was licensed years ago and is very pleased to be able to once again operate under the new Telecommunications legislation. He can work CW, as he once operated CW professionally with Bhutan Wireless. Following Yonten's operation, Jim Smith, VK9NS/A52JS, was present and was able to operate with his new A52 prefix.

Starting May 2, the Bhutan 2000 DXpedition team began a 9–10 day run. With up to 15 operators manning as many as 7 stations, they were making a major impact on the need for Bhutan around the world, especially in Europe. Propagation was not kind to the team in the beginning, although they reported over 11,000 QSOs in the first 20 hours of operation. NA stations were worked, but it was very spotty and most of those reporting "easy" contacts were on the WARC bands. Although limited to a maximum of 120 watts, they did have a wide assortment of good antennas. The operation will not end before my deadline for this column, so I'll have to bring you the results of the operation in the next issue.

IOTA News

The RSGB's IOTA program has brought a lot of activity to the bands and a number of countries on the air. A relatively new group called the Island Radio Expedition Foundation, Inc. (IREF) was created a few years ago to financially assist these IOTA DXpeditions. It is chartered as a non-profit organization, with the United States IRS granting tax-deductible status for any contributions made to the organization. Also, the

P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

Besim, T94B, has been a ham since 1970. He got his first personal call, YU4WBM, in 1980. He later changed to YU4BM and finally to T94B. Besim has 335 countries confirmed. He says he prefers CW on 80 and 40 meters. (Photo via John, KDØJL)

Rod, VK3CR, has what he calls a "three-acre hobby farm where he grows antennas." The "farm" is 100 miles from Melbourne in a dairy farming area. His "crop" includes 5-element for 20 meters, 4-ele for 40, 3-ele for 15, 3-ele for 10; dipole and vertical for 80; dipole for 160, and 12-ele for 2. Rod has been licensed since 1970, is 58 years old, and retired from the Melbourne Fire Department after 29 years of service. He prefers 40 and 20 meters. (Photo via John, KDØJL)

IOTA Committee has authorized the IREF to distribute funds on their behalf. The IREF has provided funds to a number of operations, including 5Z4WI, 9G5MD, 3V8BT, AYØN/x, and SM3VLB/MMØBPP. They have committed to providing funds to the 3B6 and BI4L DXpeditions. Contributions to the IREF fund are needed to support the ongoing program. Mike Crownover, AD5A, is the President of IREF, Inc. You can contact him directly at <ad5a@sat.net> for further information, or you might want to look at the IREF web page at <www.sat.net/~iref>.

IOTA DXpedition to Kudiakof Islands, Northern Alaska Peninsula West group (unnumbered): Rick, KL7AK, along with Tom, WØGLG, Blaine, KL7TG, and Larry, KF6XC, will be operating from one of the two Kudiakof Islands August 3–9. Rick says they will be operating primarily around 14260 kHz with a TS-570S, Ameritron amp, and TH2 triband

The WPX Program

CW

3037	EA5DCL	3038	KQ6NS

SSB

2741	LU7DS	2744	K6IRA
2742	VE9FX	2745	DS5XEH
2743	CE8EIO		

Mixed

1856	IK2RPK	1857	UA4SKW

CW: 350 EA5DCL, KQ6NS. 400 EA5DCL, KQ6NS. 450 EA5DCL. 500 EA5DCL. 700 WA2VQV. 1050 F5YT. 1250 N5UR. 1300 N5UR. 1350 N5UR. 1400 N5UR. 1450 N5UR. 1500 N5UR. 1550 N5UR. 1600 N5UR. 2050 OZ5UR. 2100 OZ5UR. 4050 N6JV.

SSB: 350 LU7DS, VE9FX, KF3AA, K6IRA. 400 LU7DS, VE9FX. 600 VE9FX. 850 JN3SAC. 900 JN3SAC. 1400 K9GWH. 1450 K9GWH. 1500 IT9SVJ. 1550 IT9SVJ. 1600 IT9SVJ. 1650 IT9SVJ. 2100 N5UR. 2150 N5UR. 2200 N5UR. 2250 N5UR. 2300 N5UR. 2350 N5UR. 2400 N5UR. 2450 N5UR, KF7RU. 2500 N5UR. 2550 N5UR.

MIXED: 550 PY4AUN. 950 RW3AX. 1000 RW3AX. 1050 WZ4P. 1400 K9GWH. 1450 K9GWH. 1750 N5UR. 1800 N5UR. 1850 N5UR. 1900 N5UR. 2000 N5UR. 2050 N5UR. 2150 N5UR. 2200 N5UR. 2250 N5UR. 2300 N5UR. 2350 N5UR. 2400 N5UR. 2450 N5UR. 2500 N5UR. 2550 N5UR. 2600 N5UR. 2650 N5UR. 2700 N5UR. 2750 N5UR. 2800 N5UR. 2850 N5UR. 2900 N5UR. 2950 N5UR. 3000 N5UR. 4350 F2YT.

10 meters: LU7DS
15 meters: VE9FX
20 meters: VE9FX, K6UXO
40 meters: AI9L
80 meters: CE8EIO

South America: LU7DS, K1NU
Europe: LU7DS, UA9CES

Award of Excellence 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, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH,, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KB0G, NB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, 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, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL.

Award of Excellence with 160 meter Endorsement: K6JG, N4MM, W4CR2, N5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDE1, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV.

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 WAZ Program

Single Band WAZ

10 Meter SSB

499.....W6PGK 500.....N4CH

15 Meter SSB

532.....DL1NAI

15 Meter RTTY

6.....RK6CWA

17 Meter CW

28.....KØDEQ

20 Meter CW

506.....JA6BCI

40 Meter CW

207.....DF1RQ

160 Meters

150 ...UA4HBW (40 zones) 152 .....9A2AJ (31 zones)
151 .....K9YY (32 zones)
76 .....I4EAT (40 zones, endorsement)

All Band WAZ

RTTY

120.....UA9FAR

All CW

165.....IZ5BAM 168.....DS4CNB
166.....DL7VZF 169.....JR4DAH
167.....9A2TN 170.....UA9CES

SSB

4550.....CT3DZ 4553.....JA1EUI
4551.....KD2OV 4554.....I8TWB
4552.....IZ5BAM 4555.....IV3BKH

Mixed

7935.....K6GSL 7940.....DL6ATI
7936.....HJ3PXA 7941.....N3AO
7937.....GØWMW 7942.....DS4CNB
7938.....IZ5BAM 7943.....JAØADY
7939.....DJ5KM

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award, CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. The WAZ Award Manager is Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75088; e-mail: <k5rt@cq-amateur-radio.com>.

5 Band WAZ

As of May 1, 2000, 519 stations have attained the 200 Zone level and 1130 stations have attained the 150 Zone level.

New recipients of 5 Band WAZ with all 200 Zones confirmed:
UA4HBW S51GI

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI (AA4KY), 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
K1ST, 199 (26)
ABØP, 199 (23)
KL7Y, 199 (34)
NN7X, 199 (34)
OE6MKG, 199 (31)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
W6SR, 199 (37)
W3UR, 199 (23)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W3NO, 199 (26)
K4UTE, 199 (18)
K4PI, 199 (23)
HB9DDZ, 199 (31)
N3UN, 199 (18)
NØTN, 199 (6 on 40)
K4IQJ, 199 (23)
UA3AGW, 198 (1,12)
EA5BCK, 198 (27,39)
G3KDB, 198 (1,12)
KG9N, 198 (18,22)
KØSR, 198 (22,23)
K3NW, 198 (23,26)
UA4PO, 198 (1,2)
JA1DM, 198 (2,40)
9A5I, 198 (1,16)
K4ZW, 198 (18,23)
OH2VZ, 198 (31,18 on 10)
RAØFA, 198 (2 on 10,15)
LA7FD, 198 (3,4)
K5PC, 198 (18,23)
NT5C, 198 (18)
VE3XO, 198 (23,23 on 40)
K4CN, 198 (23,26)
KF2O, 198 (24,26)
K9YY, 198 (18, 18 on 10)

The following have qualified for the basic 5 Band WAZ Award:

****Please note: Cost of the 5 Band WAZ Plaque is $80**

Endorsements:
HA8IB, 200 zones
OE1ZL, 200 zones
N4CH, 200 zones
K9YY, 198 zones
HA9RT, 197 zones
OK1DWC, 195 zones
RW9SG, 191 zones

($100 if airmail shipping is requested).

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Yagi. QSLing for this operation will be handled by N6AWD.

Pirates and Others

We have been plagued with a series of pirates/slims over the years. The situation seems to have gotten worse in recent years though for some reason. I've given up trying to understand why anyone would want to get on the air and illegally sign a "rare" callsign. It creates unnecessary QRM, needless concern about "Is it real?" and all the other problems associated with such a fake operation. We have the term WFWL (work first, worry later), but is that a realistic approach? With all of the available resources these days, we should be able to "know" in a very short time if a station is who and where he says he is.

A recent example was the HMØDX who operated for nearly two weeks on most bands, both CW and SSB. He supposedly was in North Korea; he gave a P.O. Box address there, and so on. Eventually he stopped his operation, but not before he had worked hundreds of DXers. I saw one final report from Japan stating that their efforts indicated it was "probably" someone in the JA7 district of Japan. Chalk up another one to "slim."

Then we have those "frequency cops" who just insist on telling everyone on a DXpeditioner's transmitting frequency "split – split – split " or "up – up – up," or any number of other needless com-

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 331 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement sticker s is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K2TQC 331	W2FXA 331	K2JLA 329	I4LCK 327	WA8DXA 325	I2EOW 324	YU1AB 317	W3II 312	KF8UN 299
K2FL 331	N4MM 331	K4CN 329	N5FG 327	N5FW 325	N4AH 324	G3KMQ 317	K1FK 311	F6HMJ 296
K6JG 331	W2UE 330	K6GJ 329	I4EAT 327	IK2ILH 325	W6SR 323	K7JS 317	OZ5UR 311	WG7A 295
N4JF 331	W6DN 330	W7CNL 329	DL8CM 327	9A2AA 325	K7LAY 323	LA7JO 316	HB9DDZ 307	N7WO 285
K9BWQ 331	G4BWP 330	K9IW 329	SM6CST 327	OK1MP 325	9A2AJ 323	K4JLD 316	WG5G/QRPp 307	EA3BHK 282
K2ENT 331	EA2IA 330	WB5MTV 329	N4KG 327	W4LI 325	KU0S 322	YU1TR 316	W6YQ 305	F5OIU 282
K6LEB 331	W7OM 330	IT9QDS 329	W0JLC 327	K3JGJ 325	HA5DA 321	K8JJC 315	W7IIT 305	YC2OK 282
N7FU 331	W0HZ 330	K4IQJ 328	NC9T 326	K1HDO 325	K6CU 321	IK0ADY 315	KE5PO 304	KD8IW 279
K3UA 331	W8XD 330	W1WAI 328	IT9TQH 326	K5UO 325	N5HB 321	N1HN 313	LU3DSI 302	XE1MD 278
YU1HA 331	F3TH 330	PA0XPQ 328	4N7ZZ 326	DL3DXX 324	VE7DX 320	CT1YH 313	PY4WS 302	EA2CIN 278
K9MM 331	N7RO 330	DJ2PJ 328	VE7CNE 326	N4CH 324	HA5NK 319	W4UW 313	YU7FW 301	I3ZSX 276
WA4IUM 331	KZ4V 329	K8PV 327	K2JF 326	WB4UBD 324	N0FW 317	K9FYZ 313	KH6CF 300	G3DPX 275
K2OWE 331	K4CEB 329	W4QB 327	KA7T 326	K8LJG 324	SM5HV/HK7 317	K9DDO 312	K0HQW 299	W9IL 275
F3AT 331	W4OEL 329	I1JQJ 327	I5XIM 325					

SSB

K4MZU 331	K7JS 331	K0KG 330	W3AZD 329	WD8MGQ 327	VE3GMT 325	DL3DXX 320	K7HG 309	4X6DK 295
K2TQC 331	DU9RG 331	W0YDB 330	PA0XPQ 328	I1EEW 327	KC4MJ 325	AE5DX 320	EA3BHK 307	YT1AT 294
K2FL 331	VE3XN 331	WA4IUM 330	VE2WY 328	I1ZV 327	PT2TF 325	KB1HC 320	WZ3E 306	OA4EI 292
EA2IA 331	K9MM 331	YV1KZ 330	VE2PJ 328	SV1ADG 327	K3JGJ 324	I0SGF 319	WR5Y 306	K0OZ 291
W6EUF 331	W4UNP 331	YV1AJ 330	W2JZK 328	DL8CM 327	I0SGF 324	F6BFI 319	N1ALR 305	EA5GMB 287
K2JLA 331	PY4OY 331	W4NKI 330	LA7JO 328	KE4VU 327	AC7DX 324	N6RJY 319	XE1MDX 305	KK4TR 286
K6JG 331	W7BOK 331	I4LCK 330	YV1JV 328	I1JQJ 327	K0HQW 324	WA4DAN 319	EA5OL 305	VE7HAM 285
K6GJ 331	N7RO 331	4N7ZZ 330	KZ4V 328	XE1MD 327	VE4ROY 324	PY2DBU 319	WB2AQC 305	F5RRS 284
K2ENT 331	ZL3NS 331	IK8CNT 330	WD0BNC 328	VE2GHZ 327	K6BZ 324	CE1YI 318	K6CF 304	W0IKD 283
N4JF 331	I8LEL 331	W4UW 330	K1HDO 328	W2CC 327	W6MFC 324	K4JDJ 318	KC4FW 304	K7HG 283
VE1YX 331	OE3WWB 331	YV1CLM 330	VE4ACY 328	W5RUK 327	EA3BKI 323	ZL1BOQ 318	EA5GMB 304	K7ZM 282
K5TVC 331	IK8CNT 331	K8CSG 330	K5UO 328	W4QB 326	I8KCI 323	W9IL 317	YC2OK 303	WN6J 281
K6YRA 331	DL9OH 331	W2FXA 330	N5ZM 328	K8PV 326	W2FKF 323	EA1JG 317	WB2NQT 303	CP2DL 281
YU1AB 331	N4MM 331	W8ZET 330	W6SHY 328	W6SR 326	K4JDJ 323	WS9V 316	VK3IR 303	YU1TR 280
W7OM 331	EA4DO 331	VE7WJ 330	K9PP 328	W4LI 326	WW1N 322	CT1AHU 316	W5GZI 302	KK5UY 280
K4MQG 331	K9FYZ 331	WS9V 329	I4EAT 327	OE7SEL 326	F6BFI 322	N5HSF 316	N5QDE 302	EA3CWT 278
VE3MR 331	W6DN 330	W7FP 329	CT1EEB 327	DL6KG 326	LU7HJM 322	K6RO 316	KD4YT 302	N1KC 278
K7LAY 331	XE1L 330	N5FG 329	W9OKL 327	N4KG 326	K5NP 322	K7TCL 315	SV3AQR 302	9A9R 277
IK1GPG 331	ZL3NS 330	OE2EGL 329	F9RM 327	KD8IW 326	NI5D 322	WB8ZRV 314	LU3HBO 301	VE2DR 277
K5OVC 331	XE1VIC 330	K4JLD 329	AA6BB 327	WA4WTG 325	YZ7AA 321	K9YY 313	YT7TY 300	SV2CWY 276
DJ9ZB 331	XE1AE 330	I2EOW 329	SM6CST 327	KE5PO 325	W8AXI 321	N0MI 313	W5OXA 300	W6UPI 276
N0FW 331	VK4LC 330	K2JF 329	W3GG 327	N2VW 325	CT1EEN 321	KD5ZD 312	K3LC 300	KE4SCY 275
KZ2P 331	WB4UBD 330	WB3DNA 329	OZ3SK 327	IK0IOL 325	EA8TE 321	VE3CKP 311	WA4ZZ 300	VE2AJT 275
K1UO 331	K3UA 330	ZL1AGO 329	CX4HS 327	YV5AIP 325	XE1CI 321	CT1YH 311	LU5DV 300	Z31JA 275
OZ5EV 331	K9BWQ 330	I8KCI 329	KX5V 327	K9IW 325	K0FP 320	HA6NF 310	SV2CWY 300	KA5OER 275
W6BCQ 331	VE3MRS 330	4Z4DX 329	IT9TQH 327	WA4JTI 325	N4CSF 320	K3LC 310	K6GFJ 299	
YV5IVB 331	N4CH 330	K4CN 329	IT9TGO 327	W8KS 325	N4HK 320	W4WX 310	SV1RK 295	

RTTY

K2ENT 327	W2JGR 316	NI4H 305	G4BWP 287	W4EEU 284	YC2OK 280	I2EOW 278	KE5PO 274	PA0XPQ 272
WB4UBD 320	K3UA 311	I1JQJ 289	EA5FKI 284	W4QB 280				

Michael, U4HM (ex-UA0CA), is 72 years old and a WW II veteran. He lives in Kuybeshev and is shown here with his homebrew station. (Photo via John, W7KCN)

ments. Hey, gang, the people who are accidentally on the wrong VFO or who don't realize the station is working split will get the message soon enough. Leave the yelling, cursing, and other uncalled for comments in the locker room. Let's try to operate with a bit more discipline and courtesy, please. All of that senseless noise on top of the DX station just makes it more difficult for everyone. Of course, if the offending station is doing it just to cause intentional QRM, that's another matter. However, the more you yell at him, the more noise he is going to create, because he knows he is bothering you. Ignore him, ladies and gentlemen. He will get bored and go away if he doesn't get any response.

DXpeditioning Behind the Scenes

Neville Cheadle, G3NUG, presented me with a copy of the book *DXpeditioning Behind the Scenes* at the Visalia

CQ DX Awards Program

SSB

2307.....JR1DHD

CW

1007.....OH1JMH 1008.....YZ1DV

SSB Endorsements

320.....VE7DXO/329
320.....W3AZD/329
320.....W8AXI/327
320.....W5RUK/327
320.....F6BFI/322

CW Endorsements

320.....N4AH/324
320.....VE7DX/320
275.....F5OIU/282
275.....KD8IW/279

RTTY

310.....K3UA/311

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 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 331 active countries. Please make all checks payable to the award manager.

QSL INFORMATION

K2B to NO2T
KCØGPO/KHØ to JE1RXJ
KC4AAA to K1IED
KC4AAD to K4MZU
KHØ/AE4SU to JA3KWZ
KHØAC to K7ZA
KH2K/AHØ to JA1RJU
KP2AD (1998 CQWW CW) to OK1TN
L29AY to LU9AY
LA/OK5DX to OK1TN
LA7MFA to KK6HC
LA9DL to LA9DL
LM7SKI to LA7M
LU/KYØC to G4VGO
LX2PA to PA3DKC
LY2OX to ISØLYN
M2ØØØA to G4DFI
M2I to WW2R
NP2/K7BV to KU9C
NP4R to W3HNK
OD5/OK1MU to OK1TN
OG2R to OH2BH
OH/OK5DX to OK1TN
OH2MXS/CEØZ to OH2BOZ
OH2NSM/CEØZ to OH2BOZ
OH3JF/CEØZ to OH2BOZ
OK1KPX to OK1TN
OL5X to OK1TN
OM9ATN to OK1TN
OX/N6AA to K6VNX
OY3QN to OZ1ACB
P29KPH to K5YG
P29WK to KE1BT
P4ØMH to OH2BAD
PJ/XE1L to WA3HUP
PJ2I to ON4CFD
PR8/PS2NF to PS8NF
PS2V to PY2AA
R1ANA to RU1ZC
R1ANJ to RU1ZC
R1ANZ to RU1ZC
R3RRC to RW3GW
RA9LI/9 to DL6ZFG
S21AR to JA1UT
S21YJ to SM4AIO
S21YP to G3REP
S52OOO to S51DQ
S79LE to DL8LE
S79SXW to G3SXW
S79TXF to G3TXF
SM/OK5DX to OK1TN
SO7TN/1 to OK1TN
SU9ZZ to OM3TZZ
SV/OK1YM to OK1TN
T24DX to EA4CP
T3ØHC to DL9HCU
T32DA to W4ZYV
T88HK to JE6DND
T88LJ to JH8DEH
T92OOO to T93Y
T99RM to DL2JRM
T99W to DL1QQ
TE8CH to TI5KD
TI2WGO/4 to N5BUS
TM5SIA to F2WS
TU5IJ to I2AOX
TYD11 to FK8VHU
TZ6YV to WA1ECA
UXØZZ to KF3CD
V29TU to HB9TU
V44KJ to WB2TSL
V47XK to LA7XK
VP5/K4ISV to N2AU
VP8NJS to GM3VLB
VQ9NL to W4NML
VQ9PH to W2JDK
VQ9PO to W3PO
VYØTA to VE2BQB
WH7C/DU3 to JG1OUT
WY2OOO to K4MQG
XE1NVX to EA5XX
XE1UN to EA5XX
XQ3IDY to CE4NV
XT2DR to F6BZH
XU7AAV to G4ZVJ
XU7AKM to ES1AKM
XV6JP to JA1IED
XV7TH to SK7AX
XX9TUH to 7N2KUH
XZØA to W1XT
YC9MKF to VK4FW
YI2CL pirate
YM2ZW to OK1TN
YS1ECB to EA7BO
YS1X to DJ9ZB
Z24S to W3HNK
ZC4CM to GI4OYG
ZD9BV to W4FRU
ZF2MU to K4BI
ZF2ZZ to SM7DZZ
ZK1GNW to I2YSB
ZK1TNN to OK1TN
ZK1XXC to HB9BMY
ZV4D to PY4AUN
LY/UC2ABO to EU1EU, Igor Getmann, P.O. Box 143, Minsk-5, 220005, Belarus
LY7A to LY2ZO, Marius Adomkevicius, P.O. Box 210, Kaunas, LT-3000, Lithuania
LZØA to LZ1KDP, City Students Radioclub, P.O. Box 812, Sofia, BG 1000, Bulgaria
R1FJV to UA3AGS; CIS Countries: via P.O. Box 1, Moscow 109387, Russia; All others: via P.O. Box 196, Pepperell, MA 01463-0196, USA
UK8CK to RW6HS, RW6HS QSL Service, P.O. Box 0, Novopavlovsk, Stavropolckiy kr. 357830 Russia

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

DX Convention in mid-April. Along with Steve Telenius-Lowe, G4JVG, Neville edited this 216-page book. Although I have not read every word, I can tell you that from my basic review of the material, I think it should answer virtually any question one might have about putting together a DXpedition, large or small.

The book begins with "Project Planning" and progresses through chapters such as Marketing and Public Relations, Licensing and Permits, Sponsorship, Team and Management Structure, etc., ending with After the Event and 16 pages on QSLing. I found the chapter on QSLing particularly interesting, with extensive commentary on postal rates, IRCs, envelopes, and comments by Neville on electronic QSLs.

The basis for this book was the 9MØC Spratly DXpedition put together by the CDXC (Chiltern DX Club) in February 1998. As stated by Steve, G4JVG, in chapter one, "It is not specifically about the CDXC 9MØC Spratly DXpedition, although it certainly draws upon our experiences of, and what we learned from, that expedition. As joint editors of this book, Neville Cheadle, G3NUG, and I hope that the information contained herein provides a real service to aspiring DXpeditioners and that group of operators that might be termed 'armchair DXpeditioners'—those who would like to experience what it is like to be on the other end of a pile-up, but have never done it. Our advice to them is simple: don't be afraid to give it a try. You don't have to start with a DXpedition which aims to make 65,000 QSOs."

The book is priced at £16.95, or $28.00 US, plus postage and packing. Trade discounts are available from Nevada Communications, Unit 1, Fitzherbert Spur, Farlington, Portsmouth, P061TT, UK. (web: <www/nevada.co.uk>).

That concludes this month's column. I trust that I have given you some worthwhile information, and hopefully some food for thought. Your comments/feedback would be appreciated.

73 and Good DXing, Carl, N4AA

Looking Ahead in CQ

Here are some of the articles that we're working on for upcoming issues of *CQ*:

- "An Earth-Moon-Earth Primer" by WB2AMU
- "Antenna in the Sky ... and Power From It," by K8WPI
- "A 'Flying Solo' Cable Tester," by KB2YTN
- "Who Set the Stage for Radio?" by KA9BBV

Plus...

- "*CQ* Reviews: HAL DXP-38 DSP Modem," by W6IWO
- "*CQ* Market Survey: FM Mobile Transceivers," by WB6NOA
- "The Care and Feeding of Analog Meters," by VE3ERP

Writers wanted: If you have a ham radio story to tell, we'd like to hear about it and consider sharing it with our readers. If you'd like to write for *CQ*, please send a request for writers' guidelines, along with a self-addressed, stamped envelope (SASE) to: CQ Writers' Guidelines, 25 Newbridge Rd., Hicksville, NY 11801. An on-line version is available on our website: <http://www.cq-amateur-radio.com>.

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

Many radio clubs offer certificates and awards. Some are very successful while others languish shortly after being introduced. Here are some tips on developing a winning award program. This article is based on discussions I've had with John, WA4RYD, working on this kind of project for the Mobile (Alabama) Amateur Radio Club, W4IAX. The comments pertain to the development of a "permanent" award. Short- term awards will be covered in a future column.

Choose a basic theme. If your club has many active stations, then consider an award that is based on contacting club members. As an alternate idea, you may want to try to capitalize on a special attraction in your geographical area. If you live in a sparsely populated area (ham or otherwise), you might want to base the award on a wider area, such as the counties surrounding a famous site.

Try to be original. You should consider making the award fairly easy to achieve at a basic level, and then offer endorsements for higher and higher levels of achievement. Don't make the award impossible. I still remember a South African award sponsor saying his club's award was so difficult, no club members had yet qualified. What good is that? For US stations, is it possible for Europeans to earn the award? How about Japanese? These areas of the world are hotbeds of award interest. If they don't have a prayer, you won't get much interest at all.

Design. One word—*multicolor*. Use a photograph as the central motif if possible. Someone in your group will have a digital camera. Get that person to volunteer to take a few pictures. Color printers are affordable and the result is usually great. Text on the award certificate should be minimal, but always recap the nature of the achievement and show the winner's name prominently. One award from Israel has the local mayor's signature on it. Something different will distinguish your award from the others and provide free publicity for your group.

Printing. Don't go overboard. Face reality: Most awards are of limited interest. Don't go overboard and order hundreds of color certificates and wipe out the club treasury. I'd suggest using a color printer and printing them as needed. The cost of ink and good-quality paper probably will be under 25 cents a copy. That's even more reasonable than color-copying, and infinitely more so than full-color printing at a commercial printer.

Next month we'll go into some pricing and publicity issues. In the meantime, check to see if there's interest in your club. It's a great project and an interesting way to add value to any contacts with your club members.

65 Glebe Road, Spofford, NH 03462-4411
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Dennis P. Pugh K7VAY
USA-CA All Counties #998
April 19, 2000

USA-CA Honor Roll

500

NA6E.....3115
HS1NGR.....3116
EA8AM.....3117

1500

K7VAY.....1286

2000

K7VAY.....1186

2500

K7VAY.....1112

3000

K7VAY.....1016

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.

Short-Term Award

For the third year in a row, the *USS Salem*, K1USN will be hosting the Museum Ships Weekend, on July 15–16, 2000. About 40 vessels worldwide are expected to participate by making themselves available on the HF bands. These ships include famous names such as *USS Lexington* (Texas), *MV Rudolf Diesel* (Germany), and the battleship *USS Massachusetts* (Fall River, MA). The complete list of vessels can be found on the *USS Salem* WWW page at <http://www.uss-salem>.

A colorful certificate will be issued to anyone working five or more museum ships during the event. There's no charge. Just send log data to W1QWT along with a large SASE. The event runs from 1330Z July 15 to 1900Z July 16th. Many of the ships will be issuing special QSL cards and will provide specific information on obtaining them. Some of the frequencies they will be on are 14039, 14260, 21039, 21360, 28039, and 28360 MHz.

Hosted by the USS Salem, *K1USN, this award will be issued for working five or more ships during the Museum Ships Weekend, July 15–16.*

The Aruba Award

In November 1999 I had the pleasure of a week's vacation on lovely Aruba. This is a very popular contest locale. There are quite a few active stations on the island, which will make this award fairly easy to work for USA, and only slightly more difficult from other locations.

The Aruba Amateur Radio Club offers this award for contacting seven different Aruba stations, of which at least five must be P43's. The others may be P40, P49, /P4, etc. All modes and bands.

The Aruba ARC offers this award for contacting seven Aruba stations, of which at least five must be P43's.

Each P4 call counts only once, regardless of band or mode. Contacts must be made on or after January 1, 1998. Send GCR list and fee of $5US or 8 IRCs to: Aruba Amateur Radio Club, P.O. Box 2273, San Nicolas, Aruba.

On the Cover

Yes, there really is a person in our cover photo this month! If you look very carefully, you'll see a red dot about halfway up the tower. That's Dave Siddall, K3ZJ, and the 90 foot tower is one of three at his Romney, West Virginia contesting QTH, which Dave says he bought specifically for ham radio (he actually lives in Great Falls, Virginia). It's home to a pair of stacked 15 meter monobanders. A 70 foot tower holds 10 and/or 20 meter monobanders (depending on where we are in the sunspot cycle), and a 48 foot tower supports a TH-7 tribander. The key here isn't tower height, says Dave, but the fact that all of the towers sit on top of a 2340 foot ridge, looking down in all directions (except north, where the ground stays level for a few hundred feet before starting to drop). "Because of the height," Dave says, "anything above about 35 feet works very well." Translation of "very well": Since 1988 Dave has held the 8th call area single-band record for both 10 and 15 meter SSB in the CQ WW DX Contest.

Dave says his main passion in ham radio is contesting and the propagation and antenna analyses that go into designing a winning station, adding that he has spent a lot of time doing terrain analysis and getting the antennas positioned just right for the best takeoff angles (which, he notes, vary band-by-band).

When he's not contesting, Dave is practicing communications law. He spent many years with the FCC, where he held several high-ranking positions. He is currently with a large private law firm in Washington, DC. (Cover photo by Larry Mulvehill, WB2ZPI)

The Maple Leaf Radio Society Awards Series

Garry Hammond, VE3XN, is well known on the HF bands. His achievements include being among those on the top level of IOTA (Islands On The Air) with almost 900 islands confirmed. He is also a first-class promoter of Canadian awards, one of which naturally emphasizes the Canadian islands. Garry and John, WD8MGQ, maintain a truly gigantic listing of Canadian islands at the following internet address: <http://www.tir.com/~wd8mgq/index.html>.

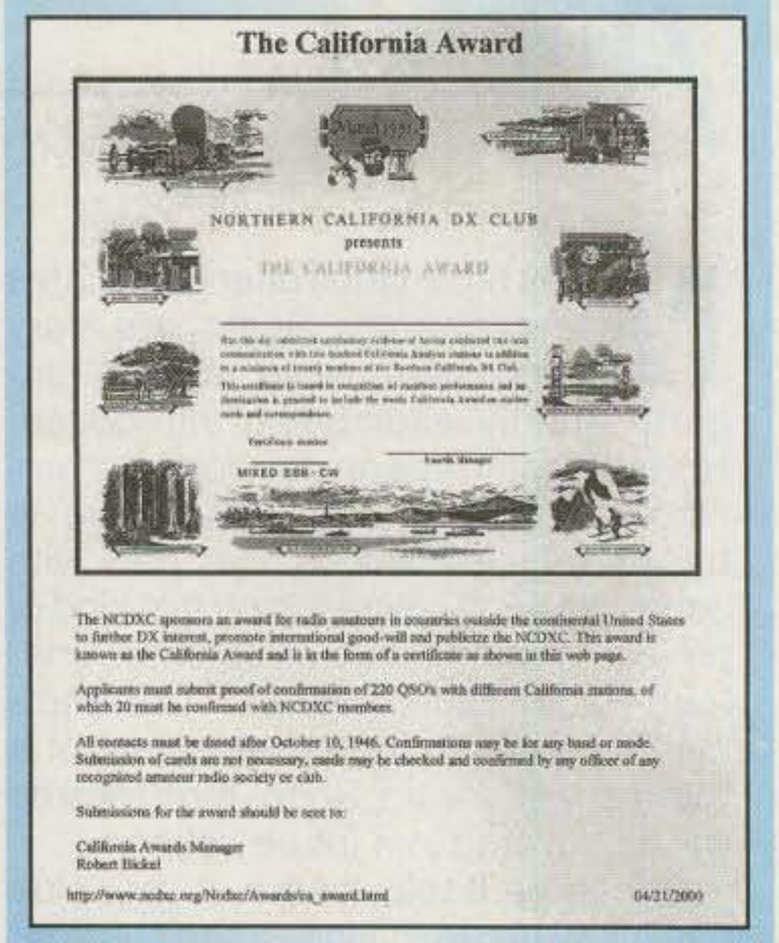
I love the Maple Leaf Award for working Canadian prefixes. This one gives you a perfect excuse for contacting the numerous special event stations the Canadians are always using. I have 125 prefixes so far!

Canadian Islands Award Program. Confirm (SWL okay) different stations operating from islands of Canada. All contacts must be with fixed, portable, or mobile stations on Canadian interior or exterior islands. The award is issued in different classes as follow: Class IV – 5 islands, Class III – 10 islands, Class II – 15 islands, and Class I – 20 islands.

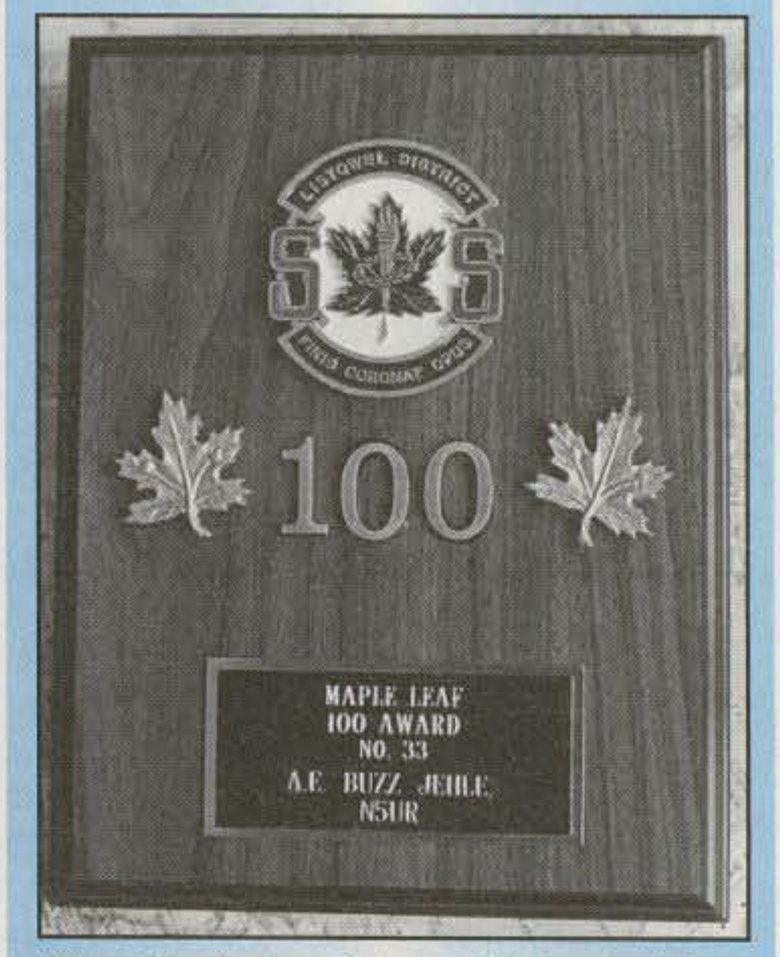
The fee for the certificate is $4 Canadian for VE applicants, $4US for US, and $5US for DX.

A black aluminum plate specially engraved and screened in gold is available for working 50 different islands. There also are endorsements above the 50 mark for 75, 100, 125, 150, 175, and 200 islands. The fee for the plate is $35 Canadian for VE's, $35US for US, and $40US for DX.

The Canadian Islands Award of Excellence requires confirmation of 300 or more Canadian islands. The fees are the same as for the 50 plate. Send log data and your check or money order payable to Garry V. Hammond to Garry at 5 McLaren Avenue, Listowel, Ontario,



The Northern California DX Club's award is available only to stations outside the continental United States.



The Maple Leaf Award is issued for contacting different prefixes of Canada.

The Canadian Islands Award is sponsored by the Maple Leaf Radio Society.

Canada N4W 3K1. The island list is available on the internet or from Garry for $2US and SAE (always appreciated).

Maple Leaf Award. Contact and confirm (SWL okay) different prefixes (not just stations) of Canada. All contacts must be made on or after February 15, 1965, the date on which Canada received its official flag, "The Maple Leaf."

Valid Canadian prefixes include CF, CG, CH, CI, CJ, CK, CY, CZ, VA, VB, VC, VD, VE, VF, VG, VO, VX, XY, XJ, XK, XL, XM, XN, and X (a theoretical total of 240 prefixes).

The award is issued in different classes as follows: Class IV – 10 prefixes, Class III – 15 prefixes, Class II – 25 prefixes, and Class I – 30 prefixes. An attractive walnut-finish shield, plaque, and scroll are available at higher levels as follows: MLA 50 Shield – 50 prefixes, MLA 100 Plaque – 100 prefixes,and MLA 200 Scroll – 200 prefixes.

The fee for the certificate is $4US or 7 IRCs. Write to Garry for current prices on the plaques, as they are subject to change. Send log data, not cards. Fees should be made payable to and mailed per the Canadian Island Award above.

NCDXC Award

The award sponsored by the Northern California DX Club is an outstanding example of doing it right (see my write-up at the beginning of this column). The NCDXC has capitalized on some of the scenic and historic areas of California. The award is moderately difficult, but only because of the quantity of stations needed. As a result, all W/K6 QSOs, and especially NCDXC members, are made just a little more valuable.

Only stations outside the continental United States are eligible. Applicants should submit a GCR list confirming 220 QSOs with different California stations, 20 of which must be confirmed with NCDXC members. Contacts must have been made on or after October 10, 1946. All bands and modes. Apply to: California Awards Manager, Robert Bickel, 1316 Deneb Ct., Walnut Creek, CA 94596.

Internet URL of the Month

Attention county hunters! You will need Adobe Acrobat to download and print an excellent map of Alaska with its Judicial Districts clearly displayed, along with the principal cities and towns within each district. The map is courtesy the Alaskan Court Library site located at: <http://www.alaska.net/~akctlib/map.pdf>. If you don't have WWW access, send an SASE to me and I'll be glad to send you one. 73, Ted, K1BV

How It Works

BY DAVE INGRAM, K4TWJ

Theory 'n Practice

A "Keep It Simple" Study of Amplifiers

As you know, this column's main purpose is to simplify the electronic theory behind modern communications equipment and help you prepare for future license upgrades. Rather than continuously following a rigid technical format, however, we occasionally spice things up by featuring some hot topic or interest of the day. Our last two columns were good examples of that philosophy. One examined new trends in vertical antenna designs and the other discussed using your FM talkie to work stations nationwide via microsatellites such as AO27, SO35, and/or UO14.

Now let's return to our original path of study with a plain-language introduction to amplifiers and amplifying circuits such as those used in transceivers, RF preamps, and high-power linear amplifiers. Let's begin by looking at types of amplifiers, the process of amplification, and circuit configurations. Then we can discuss amplifying devices, classes of operation, and biasing in a subsequent "How It Works" column. Overall, this "double shot" arrangement should give you a good, basic knowledge of how amplifiers work, why there are different types, and which one is best suited to your particular needs.

I might also point out that general circuit designs of amplifiers and their theory of operation form the basis of many test questions on both amateur and commercial radio exams. In addition, knowledge of how analog RF circuits operate in today's all-digital-oriented world gives you a special edge when pursuing a career in electronics. Really! An increasing number of young people (and schools!) are overlooking that fact and concentrating exclusively on computer-related systems. Those with a background in analog and RF circuitry are becoming "specialists" who can command very respectable salaries. Cell 'phones and other wireless gear require RF circuits; digital sections just add the frills. That's not just hype; it's straight fact. Now let's talk amplifiers, starting with the basics!

Photo A– Most stand-alone audio amplifiers are designed to boost microphone levels to room-filling volume. This famous Heil sound amplifier serves that purpose in high style. It is a 400 watt, full-range unit made by Bob Heil, K9EID, and used by several top bands during the early days of rock 'n roll. It also launched Bob's career in top-grade sound equipment. (Photo courtesy K9EID)

Types of Amplifiers

Some of you may assume that amplifiers are an overly complex subject and a full course in electronics is necessary to understand them. In some respects, that assumption holds merit. Indeed, many engineers (and companies) dedicate years to researching, developing, and perfecting various types of amplifiers. If we step back, separate amplifiers into general categories, and then explain each without hours of heavy mathematical calculations, however, they become surprisingly easy to understand. Let's follow that yellow brick road.

First of all, there are three main categories, or types, of amplifiers: audible sound or AF types, radio signal or RF types, and pure voltage or DC-boosting types. DC amplifiers are mainly used in control and metering circuits for industrial electronics and can be categorized separately. Let's thus focus our attention on AF and RF amplifiers.

AF amplifiers. AF amplifiers operate in the audio range of 20 to 20,000 Hz and are found in everything from radio receivers to auditoriums and churches. Small or low-level AF amplifiers utilize resistors as their output load impedance. Large or high-level AF amplifiers utilize iron-core transformers as their load impedance. You probably have seen 50 or 100 watt audio amplifiers made by well-known manufacturers such as Bogen in PA setups, so a slightly more unique AF amplifier is shown in photo A. This one is a 400 watt sound reinforcement amplifier made by Bob Heil, K9EID, of Heil Sound. Bob was responsible for introducing many famous-name bands to big-time sounding audio

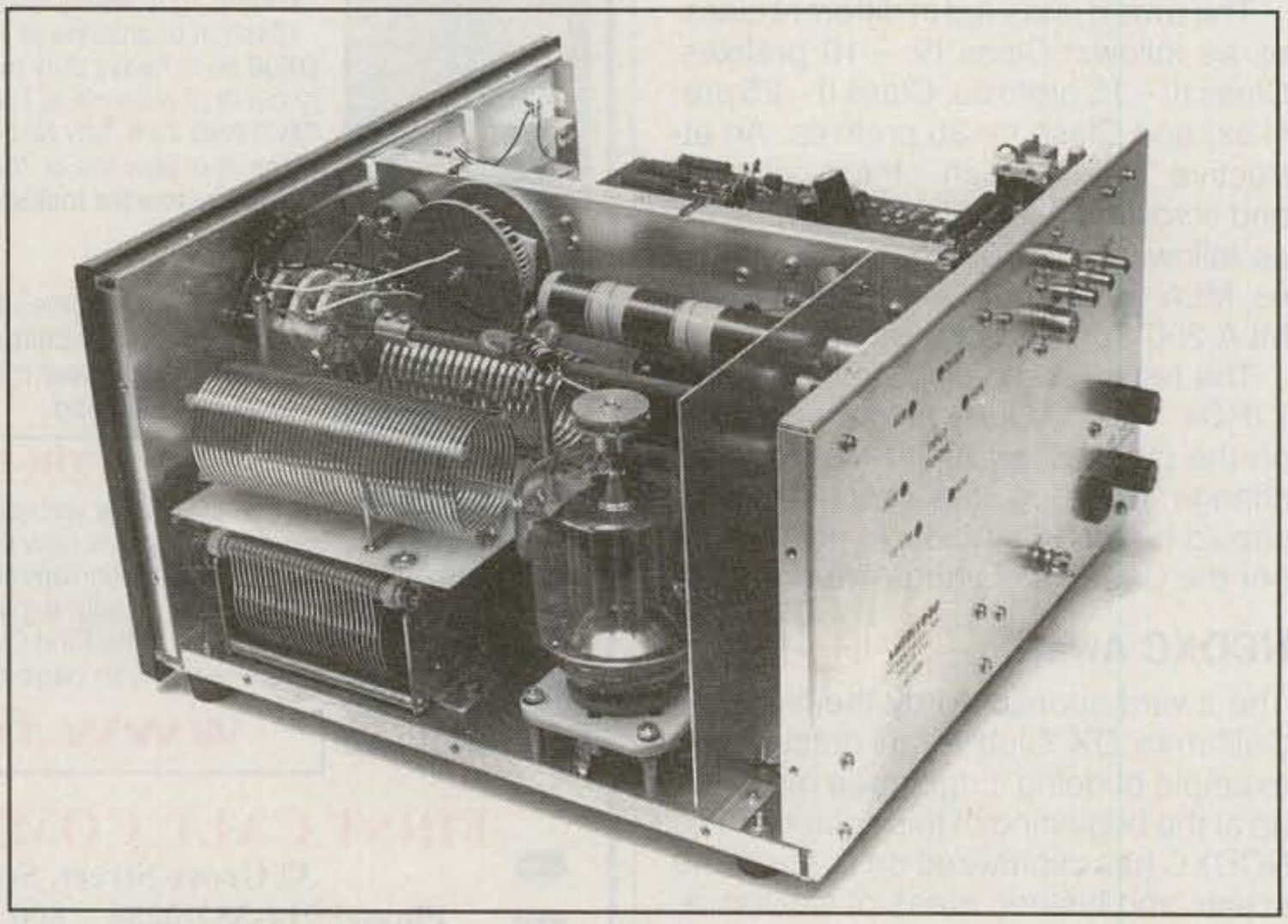


Photo B– RF linear amplifiers are available in all sizes and power levels. One popular "desktop kilowatt" version is this Ameritron AL-80. (Photo courtesy Ameritron, Inc.)

4941 Scenic View Drive, Birmingham, AL 35210

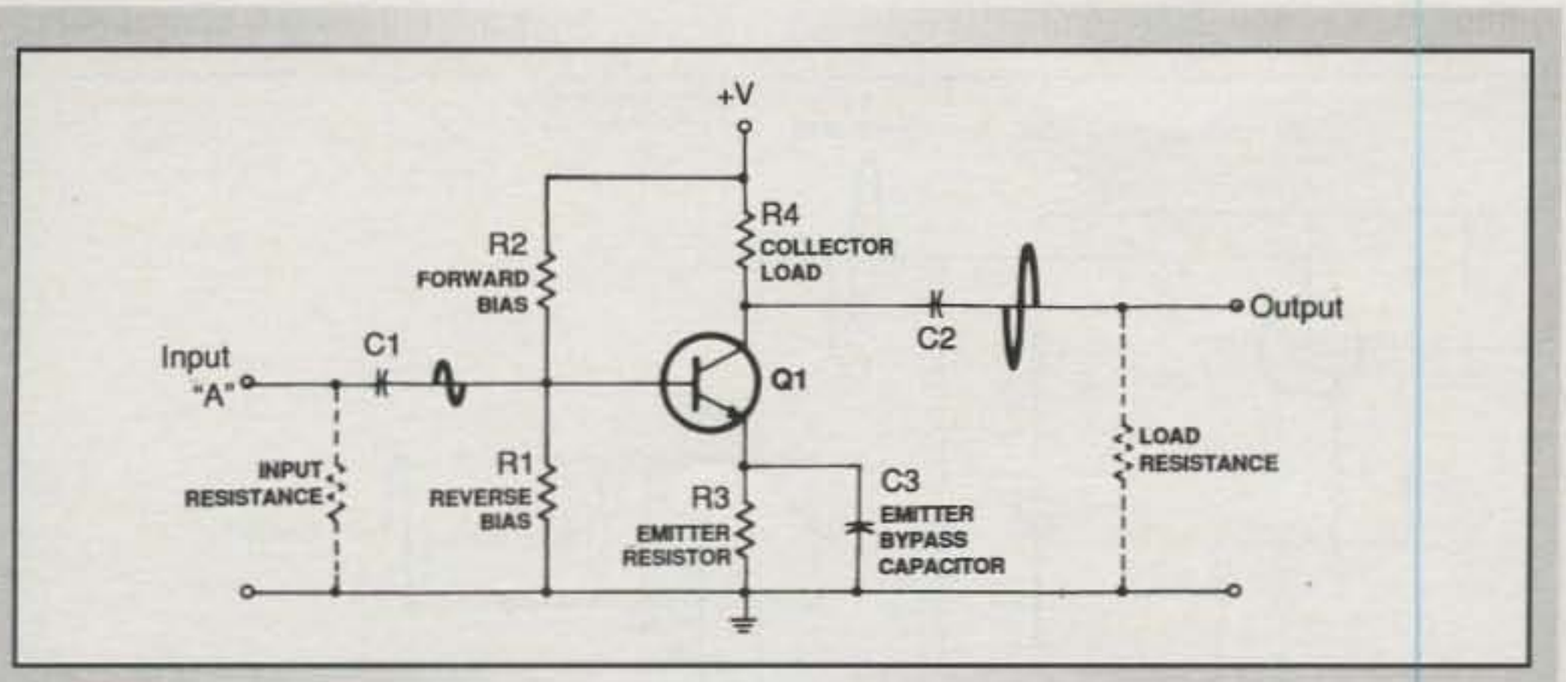


Fig. 1– Generic circuit diagram of a basic AF amplifier. A vacuum tube or a transistor could be utilized as the main amplifying device. We elected to use an NPN transistor, as voltage polarities applied to its emitter and collector are the same as those applied to a vacuum tube. (See the full "How It Works" discussion in text.)

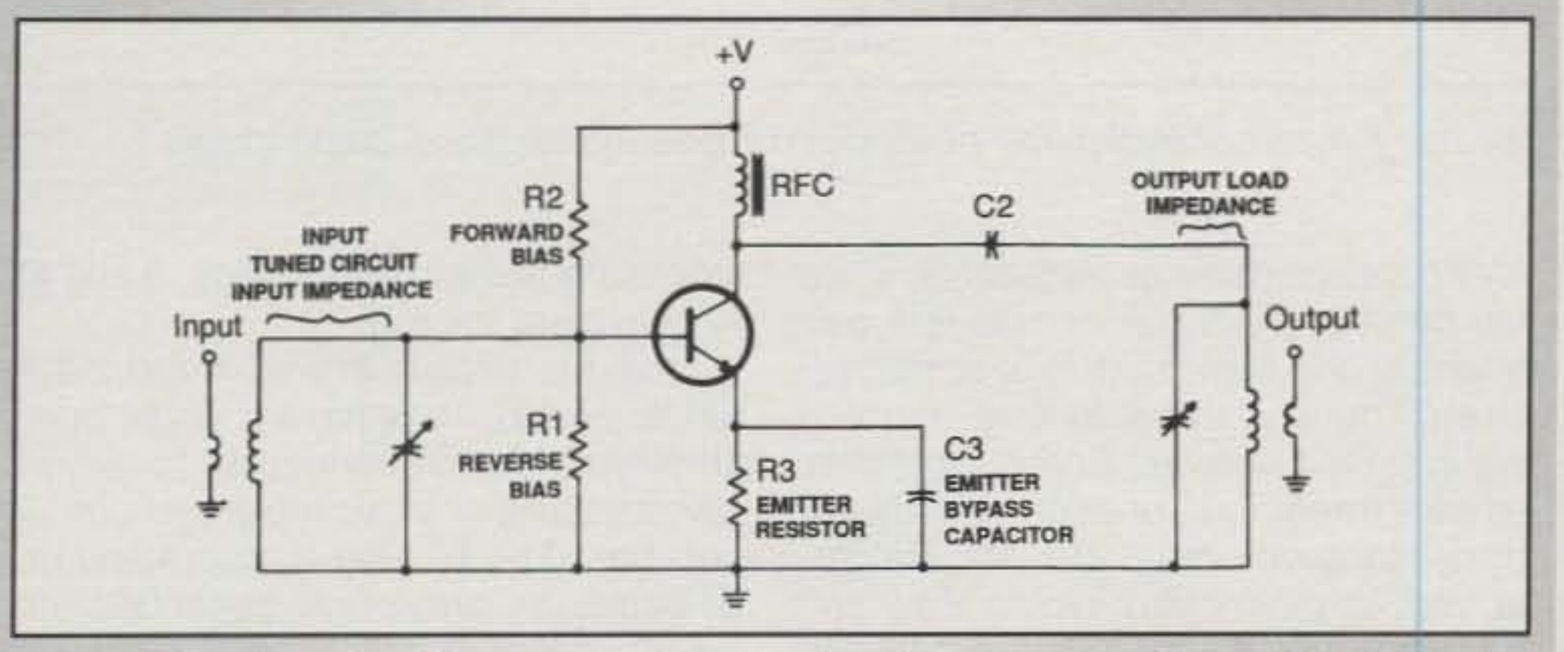


Fig. 2– By changing input and output/load resistors to tuned circuits, the audio amplifier in fig. 1 becomes an RF amplifier. (Discussion in text.)

during the early days of rock 'n roll, and this high-power unit was one of his original models. Heil supplied the big amplifier with several dimes and quarters for quick in-field repair. The coins were not used for loosening screws on plug-in modules (a clever design!), but were for telephoning Bob for "talk through" guidance on module changes (rock groups never carried pocket change).

RF amplifiers. RF amplifiers operate in the radio frequency range of 20 kHz to 300 GHz and higher (frequencies up to visible light. Both radio waves and light waves are electromagnetic radiation. Their only difference is frequency.). RF amplifiers are utilized in transmitters, transceivers, and stand-alone linear amplifiers, and typically employ ferrite-core coils or open-frame/air-wound coils in their output circuits. With the exception of input and output circuit variations, AF and RF amplifiers are very similar in their electrical designs. One example of an RF linear amplifier is shown in photo B. This one is an Ameritron AL-80, a 1000 watt unit turned to show its silver-plated output ("tank") coils and hefty 3-500Z tube.

Looking a bit more closely at amplifiers, we see both AF and RF types can be separated into vacuum-tube or solid-state/transistor types, single- or double-ended circuit configurations, and classes of operation. Yes, and even with such differences, all amplifiers have one (reassuring) aspect in common: Their output signal is always a higher amplitude copy or reproduction of their input signal. Note the key word here is "reproduction," as any amplifier's output signal is only a copy of its input signal, not the actual input signal. How closely that copy resembles its original (input) version is one of the main factors that make amplifiers different. This is where circuit designs, biasing, and classes of operation enter the picture, and this is also where I say, "Now hold those thoughts in mind while we discuss a few more introductory facts about amplifiers." Then we can merge the pieces to produce a more complete picture of both AF and RF amplifiers of various types.

The Process of Amplification

So how does the process of amplification actually work? Let's use the basic solid-state amplifier circuit shown in fig. 1 to help answer that question.

We'll begin by assuming a low-level or low-amplitude input signal is applied between terminal "A" and ground, and follow its action. The signal (which is a sine wave, or AC) passes through coupling capacitor C1 and causes the transistor's base bias to vary according to the incoming signal. This changing bias causes the transistor's conduction to vary accordingly, so voltage dropped across the transistor and its series-connected collector load resistor vary in a similar manner. This change corresponds to a larger copy, or amplified version, of the original input signal. This amplified signal is then coupled through C2 and output to a load such as a high to low impedance matching transformer or a medium to high impedance earphone.

Looking more closely at circuit operation, the low-level input signal passing through C1 is actually applied across R1. It thus adds to and subtracts from the transistor's reverse bias voltage (R1 establishes the reverse bias voltage level while R2 establishes the forward bias voltage level.). Emitter capacitor C3 has a low value of capacitive reactance for the amplifier's range of operation (which in this case is audio, or 20 Hz to 20 kHz). It thus bypasses both input and output signals (which, as you remember, are AC) around R3. This allows an input signal to vary, or "modulate," the transistor's internal collector-to-emitter resistance. The resultant voltage changes appear only across R4, because it is not bypassed with a capacitor. Likewise, the transistor's emitter is held at a steady DC operating voltage by R3, which is bypassed and thus not exposed to variations. If C3 does not bypass all of the output signal, incidentally, the remaining amount will be measured as AC superimposed on DC across R3. In that case, the signal across R3 will oppose the signal across R4 and reduce the amplifier's gain. This is called *degenerative* or *negative feedback*, and it is often used (in a very controlled amount) to improve the sound quality of audio amplifiers or the signal quality of RF amplifiers. A similar circuit, modified for RF applications by substituting tuned circuits for input and output load resistors, incidentally, is shown in fig. 2 so you can visualize its action and realize both types work the same way.

That describes the concept of amplification in simple terms. We will delve into more details later. Meanwhile, let's continue moving forward and building

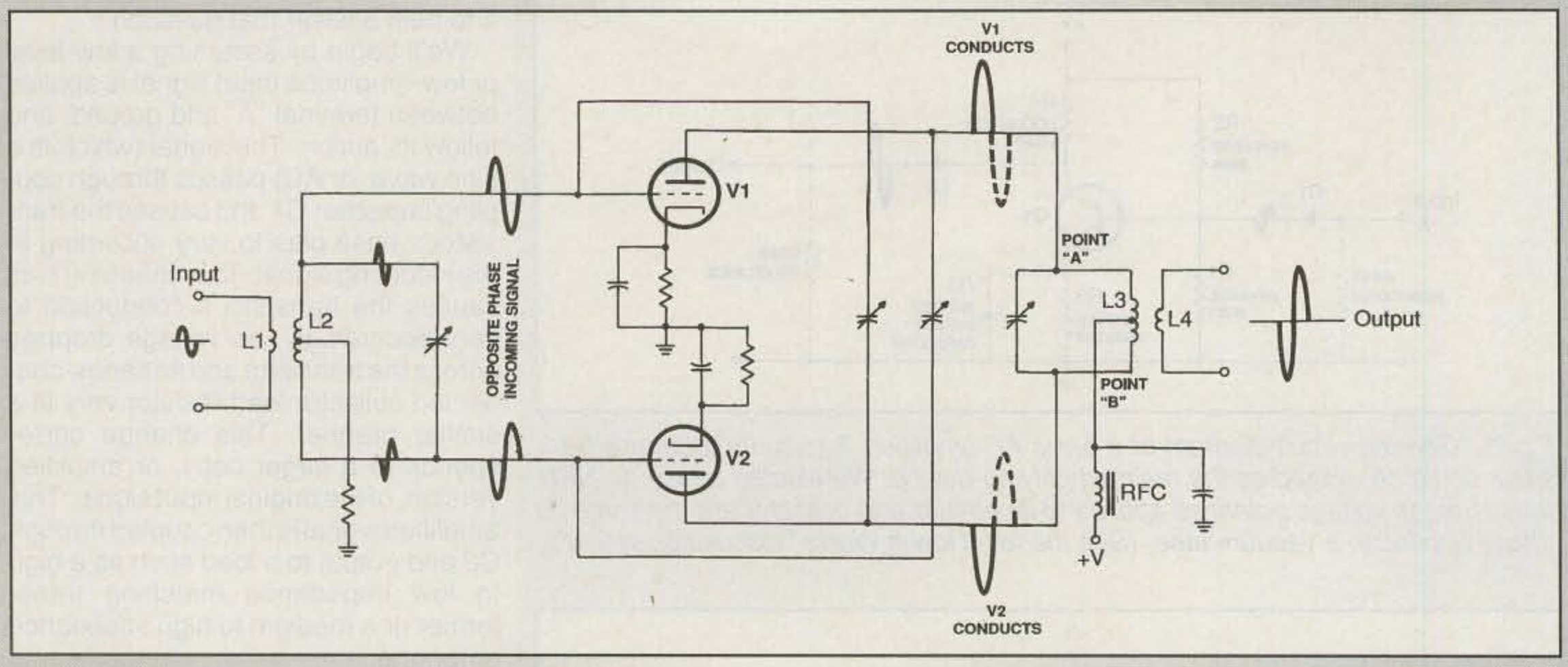


Fig. 3– A basic push-pull RF amplifier using a pair of Ballentine-neutralized triode tubes. (Discussion in text.)

our foundation of general electronic knowledge.

Circuit Configurations

Although every make and model of amplifier has its own special features and frills, the main circuitry upon which each one is based falls into one of two categories: *single-ended*, or *push-push*, and *double-ended*,or *push-pull*. What is the difference? The heart of *push-push* circuits is a *single main amplifying device* (tube or transistor), while the heart of push-pull circuits is a pair of amplifying devices (tubes or transistors). There is more to that opening statement, however. Some amplifiers employ three, four, or even six tubes or transistors yet they are still *single-ended*, or *push-push*, types. Why so? Because their tubes or transistors are wired in *parallel* (which is yet another term for single-ended or push-push) rather than in push-pull. Confusing? Let's use fig. 1 and/or fig. 2 plus some lunchtime "napkin notes" (figs. 3 and 4) to help clear the fog.

First, the circuits in figs. 1 and 2 are *single-ended*. They have a single main amplifying device connected to generally standard or basic input and output sections. The biasing is also standard or basic. As previously described, an incoming signal causes the amplifying device to vary in conduction from its preestablished bias point, and the resultant variations are ultimately coupled through C2 to yield an output signal. One amplifying device is "doing all the work." This is what we call *push-push*.

Next consider the basic *push-pull* circuit shown in fig. 3. Here we split the tube's input and output coils with center taps and then connected a second (an identical type) tube to each coil's freed end to produce a *balanced circuit configuration*. The circuit's original ground on the input coil connects equally to both tubes, and the original B+ voltage also connects equally to both tubes. *One alternation of an input signal's sine wave will now drive V1's grid positive while driving V2's grid negative*. As a result, V1 will conduct and produce half of the sine wave for an output signal at the "top" of L2 (point "A") while V2 is cut off and resting or cooling down. The *following alternation of an input signal's sine wave will drive V2's grid positive while driving V1's grid negative*. Then V2 will conduct and produce the other half of the output signal's sine wave at the "bottom" of L2 (point "B") while V1 cools down. The two halves of the output sine wave induce equally into L3, thus reconstructing the (amplified) out-

Oops...

It was brought to our attention by reader W1AM that our "Restructured HF Guide" on page 58 of the May issue might have given the incorrect impression that CW is permitted only in the designated CW subbands. Just so there is no confusion, CW is permitted on *all* amateur frequencies. While you're looking back at that chart, the FCC is reminding all Generals that they may operate *only* in the subbands designated for General Class use. There has been no change in frequency privileges, and the Advanced Class subbands are reserved for use *only* by Advanced and Extra Class licensees.

In addition, Satellite Editor KC4YER points out that RZ3DZR, the callsign assigned to the International Space Station (May "Ham Radio News"), is not the first callsign issued to a manned spacecraft. RØMIR is assigned permanently to the ham station aboard Russia's Mir space station (although licensed operators sometimes have used their own calls).

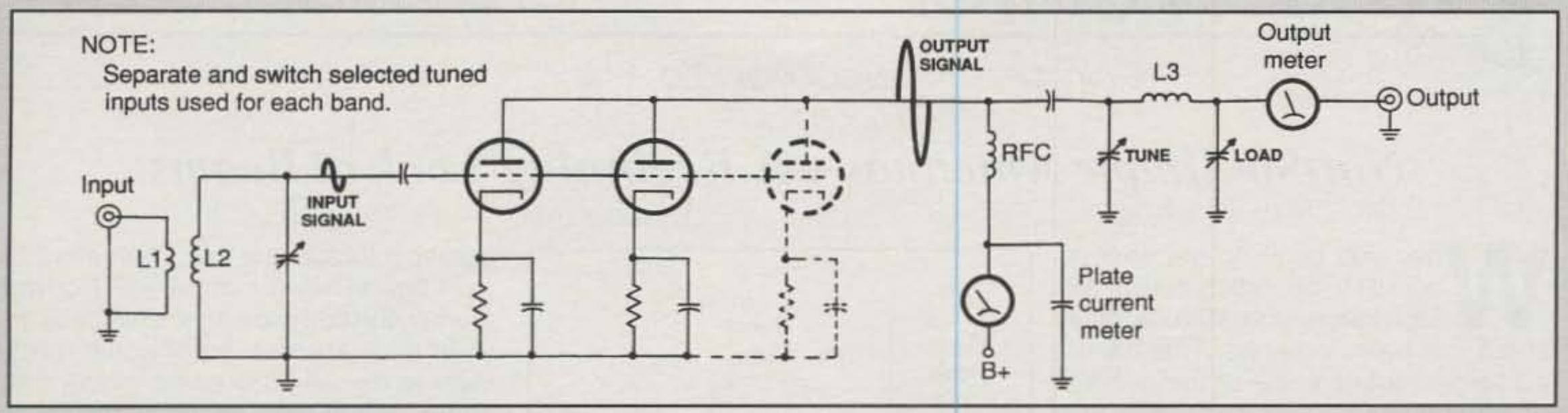


Fig. 4– A push-push, or parallel tube-wired, RF amplifier. This circuit configuration (with a Pi-net rather than a link-coupled "tank" circuit) is very popular in modern linear amplifiers. Understand that the circuit shown is stripped of "extras" such as full metering, switches, SWR monitors, etc.

put signal. Notice the two tubes shared their workload equally. This is what we call *push-pull.*

Now compare the *parallel-configured circuit* in fig. 4 to figs. 2 and 3. Here the tubes' grids are connected to the same input points, and their plates are connected to the same output points. When one tube is cut off, the other tube is cut off. *When one tube is driven into conduction, the other tube is also driven into conduction.* In other words, these parallel-wired tubes do not share their workload in a push-pull manner. They are thus in a *push-push configuration.*

Only two parallel-connected tubes are shown in fig. 4, but additional tubes may be added for increasing the output power level. Adding more such parallel-wired tubes might be compared to increasing the surface area of a single tube's elements, or "making a single tube larger in size," so-to-speak. SBE's little SB1LA kilowatt amplifier of eras past was a prime example of that concept. It used six 6JE6 tubes in parallel! The limiting factor in tube count was its overall distributed capacity, which reduced output power on 15 meters and precluded 10 meter operation.

We cannot simply integrate an SBE-type idea of adding more sockets and (parallel-wired) tubes to a favorite amplifier today, however. Such measures change an amplifier's total plate impedance (just as resistors in parallel change total resistance) and require reworking their "tank" circuits to match that new impedance.

I promised to keep this introduction to amplifiers simple and clear of engineering-level math, so we will postpone studies of tank-circuit designs until later. In the meantime, review our introductory facts on push-push/parallel/single-ended and push-pull/double-ended circuit configurations for better understanding. Study their related figures (1, 2, 3, and 4), and you will probably see or learn something you did not realize the first time.

Conclusion, Looking Ahead

We have covered a lot of ground in a short length of time, yet we have only skimmed the overall surface of amplifiers. The amount of power an amplifier delivers or outputs for a particular level of input, for example, depends on its overall efficiency, which in turn is influenced by its class of operation and its main amplifying device. How closely the amplifier's output signal resembles its input signal is determined by the circuit's linearity, and that also depends on its class of operation. These discussions and more will be the focus of our next "How It Works" column. Stay tuned and keep on learning!

73, Dave, K4TWJ

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

Not-So-Simple Antennas—A Beginning Look at Beams

When you begin to get serious about HF operation, one of the first things you start to think about is a beam antenna. This month we take a look at some of the general considerations.

First of all, you may be asking yourself if a beam is really worth the effort and expense. That depends on your interest level and the aspects of ham radio on which you focus. If your primary interest is ragchewing or local traffic nets, for instance, a beam may not be of all that much value. On the other hand, if you tend to focus on contesting and/or DXing, a beam antenna takes on a high level of significance. I'll give you an example.

A close friend of mine, Clark Stewart, W8TN, recently moved into a suburban development. It is not *conducive* for him to put up a 100 ft. tower with a lot of aluminum. At first he used a half-wave vertical, but as an experienced DXer, it was frustrating. Although he prefers phone operation, he found himself making mostly CW contacts for the new ones; he has been at this for a while and he is pretty good, so there aren't that many new ones/new bands for him. A couple of weeks ago he put up four sections of tower (40 ft.) and a small four-element multiband Yagi.

Clark told me in a note about his experience with the new antenna: "Here is what I've worked in a 12 hour period from Saturday night until Sunday morning (see Table I). Actually, I only spent three of those hours on the radio. All of these were on 20 meters, and *all* were worked on the first call—even if there was a pileup! Of course, I was using the Alpha (1500 watts) on three of the QSOs. For the rest I used between 1000 and 1200 watts. I was concerned about the beam's performance on 20 meters, because it is so close to the ground ... I heard lots more DX, including two Indian (VU) stations on SSB, which I certainly could have worked."

As the above illustrates, there is a definite value to having a beam, even at a low level. A height of 40 ft. is probably pretty typical for what the average homeowner can get away with in a city/suburban setting. We'll take a look at towers and "support structures" in a future issue. Now, back to beams.

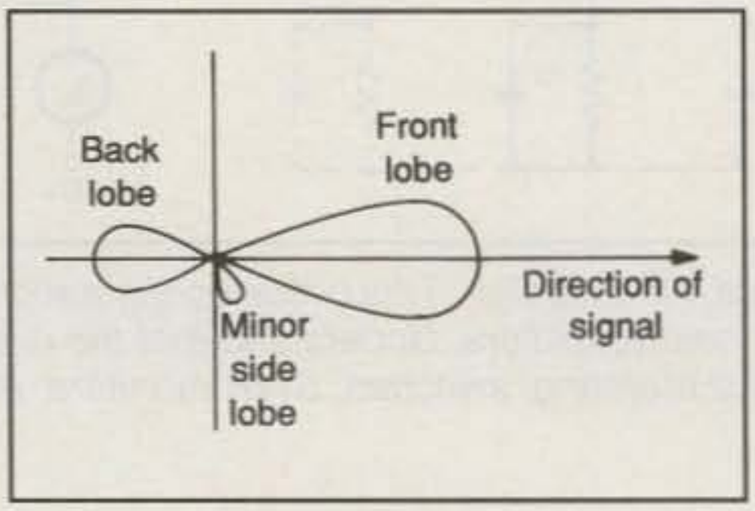


Fig. 1– An overhead view of a "typical" beam antenna pattern. This is roughly what your signal would look like if you could see RF energy and if you were floating above the antenna while it was transmitting.

A beam antenna is one which concentrates (points) the radiated energy of your transmitter in one (or more) directions. This is in contrast to an omnidirectional antenna, which, it is said, radiates equally poorly in all directions. We have a two-way street here, so there is a corresponding improvement on the receive end as well. Polarization and bandwidth mean pretty much the same thing with respect to beams as they do with the simple antennas we talked about in earlier issues.

Behind Those Gain Figures

Gain is defined as the measure of increased power in the desired direction as compared to a omnidirectional antenna. Here is where it can get a little tricky, particularly with respect to some of the marketing claims. No real antenna is truly omnidirectional. The so-called "isotropic" radiator exists only in the mind of an engineer. It is a point in space that radiates, and it has no size, nor is it connected to anything (a transmitter, for instance), since the act of connecting it would distort the pattern and it would no longer be truly isotropic. A dipole (real antenna) has 2.14 dB gain over the isotropic radiator (imaginary antenna).

The first thing you want to ask yourself when you start comparing antenna gain specifications is this: To what is this gain figure being compared? For my money, the comparison should be to an alternative antenna that I could really own—a dipole! If the specs simply talk about 3 dB of gain, you have no idea if it is 3 dB better than a dipole or only 0.86 dB better. Let's see . . . I can put together a dipole for about $10 worth of wire, or I can spend $300 to get this antenna. Okay, 3 dB better than a dipole is significant (not great, but significant), but I doubt that most of us would even notice a 0.86 dB improvement.

Reputable manufacturers will rate their products in terms of either dBi (measured with respect to the "isotropic" radiator) or dBd (with respect to a dipole). This is okay. You know your point of reference and can make informed comparisons. Suppose you are looking at three different antennas. Two of them are rated at 5. 2 dBd and 4.8 dBd, while the third one is rated at 6.5 dBi. To get an accurate idea of the gain comparison, all you need do is subtract 2.14 from the 6.5 dBi. Now you see that this third antenna actually comes in at about 4.4 dBd. Conversely, if you wanted to convert everything to dBi, you would just add 2.14 to all the dBd specs.

You can get a good idea of how your beam will perform by imagining that you are floating high above your antenna and looking down on it (see fig. 1). The radiated signal from it looks like loops drawn on graph paper—the bigger the loop, the more power. In fact, this is exactly the idea behind the charts that you see in articles and sales literature. Beam width refers the width in degrees of the front lobe of your antenna. In general, the higher the gain, the narrower the beam width. The only drawback to higher gain/narrower beam width is that aiming the antenna becomes more critical. I have used 10 meter antennas where shifting the direction by only 20 degrees or so meant the difference between solid copy and no copy at all.

Your antenna's ability to direct your signal means taking power away from the sides and back, and then "shooting" that power out the front. The ratio of power going out the front end of the antenna to that of the back is called the *front-to-back* ratio. It is not uncommon to find F/B ratios of anywhere from 5 to

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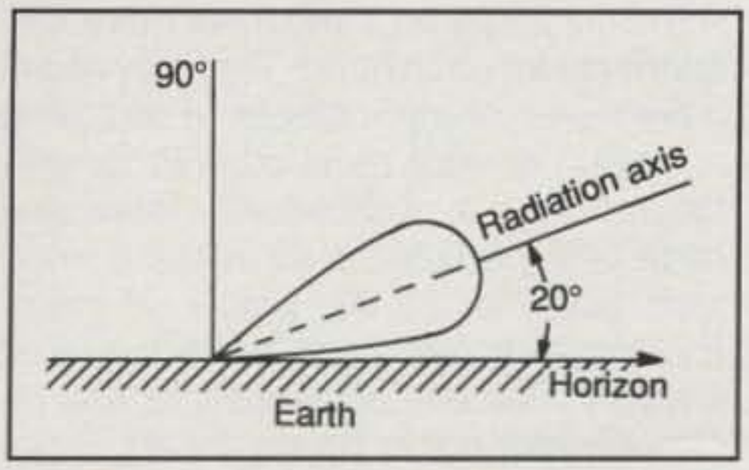

Fig. 2– Side view illustrating the vertical angle of radiation from a beam antenna. The 20 degree vertical angle is considered pretty good. If it's higher, your maximum range is decreased (see text) and if it's much lower, ground obstructions such as buildings and trees can become noticeable.

Call	Location	Mode	Distance (miles)
HV5PUL	Vatican City	CW	4714
UR4EYN	Ukraine	SSB	5057
4L4TL	Georgia (the country)	SSB	5980
T32RT	East Kiribati	SSB	5350
3D2AG	Fiji Is.	CW	7473
VQ9NL	Chagos Is. (Indian Ocean)	CW	9750

Table I– Log extract showing DX worked by W8TN immediately after putting up a small beam antenna.

30 dB. Here we are comparing two different qualities of the same antenna, so there is no concern about dBi or dBd. This rating seems to be really dependent on the frequency at which it is measured. Moving up or down a few kHz can sometimes give you very different ratings. Minor adjustments to element spacing can often have a dramatic effect on the F/B ratio, too. Because of these variations, most hams tend to focus on the gain of an antenna and pretty much accept whatever F/B they get.

There is one other characteristic of a beam antenna that is critical for DX operation. That is the *vertical angle of radiation* with respect to the horizon (see fig. 2). Remember that DX signal paths are based on the signal being reflected back from the ionosphere. It is just common sense that the lower the angle of radiation (closer to the horizon), the longer the path until the signal comes back to Earth. This is more a function of antenna height than design. In general, the higher the antenna, the lower the angle of radiation. By the way, it is not a specific number of feet or meters above ground that is critical, but rather wavelengths (or fractions).

How Driven Are You?

HF beam antennas tend to fall into two major categories—those with all the elements *driven*, and those which have one (or two) driven elements and one or more *parasitic* elements. What does this mean? A driven element is directly connected to the feedline, while a parasitic element is electrically isolated from the feedline. Parasitic elements function because they are resonant objects in the near field of the driven element. In other words, they are like tuning forks. Strike one tuning fork and set it next to a similar one, and the second one will start vibrating.

Look through some of the antenna books on the market, and you will find a few different "driven" designs. The lazy H is one which gets written up in magazine articles from time to time. The one design, though, with which you probably already are familiar is the *log periodic*. However, you may have not known its name. This the design of most VHF TV antennas—if you remember the good old days when everyone had his own TV antenna. If you look closely at those antennas, you find that all the elements are connected together electrically. The two sides of the feedline criss-cross back and forth in shoe-lace fashion.

What this design gives you is extremely good bandwidth. In the case of the VHF TV antenna, you had a reasonable SWR over a 150 MHz range. The compromise is that on any given frequency, you tend to have less gain than you would have for a monoband antenna of similar dimensions. A log periodic works well on HF, too. There was renewed interest in this design after

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

the 30, 17, and 12 meter bands were made available to hams in the 1980s. It is a practical way to get coverage of several HF bands (20 meters and up) on a single antenna. One additional caveat: You had better have a sturdy tower for this antenna, as it is big and heavy!

Another form of the driven antenna is the phased vertical array. Some hams find this form of beam antenna advantageous in cases where there is land available for use but a tower is not practical for one reason or another. In this design, several vertical antennas are mounted in very specific patterns and then connected with precise lengths of coax. Different radiation patterns can be achieved by switching in and out various lengths of feedline. One of the major drawbacks is that your ability to aim the antenna is quite limited.

Next time we will continue with a more detailed look at the two most popular beam designs—quads and Yagis.

Beginner's Mailbag

Some readers wrote to tell us about their experiences with some of the simple antennas we described in earlier issues. Here are a few of the comments :

"I just read your article in *CQ* on random wire antennas and I'm glad to know I'm doing it right. I live in a condo that has a very strict homeowners' association, so I had to be creative. My antenna is nothing more than a piece of 20-gauge wire 65 ft. long that I bought at RadioShack. I'm on the second level so I had to slingshot it over the roof. It is only up about 25 or 30 ft. at the apex. It's just lying on the roof, tied off to the wooden deck at the back, and the other end runs through my window right into my MFJ-949e tuner. I can tune easily 80 through 10 meters—and 160 meters with some difficulty, but it can be done. I do have a counterpoise that I made with one single wire and have quick disconnects for each band. That way I don't have seven or eight pieces of wire lying around. I'm very pleased with its performance! I've worked all states and have QSL cards from all over the world just from a $3.99 piece of wire. Everyone I know is amazed at how well it works. There is no excuse for any radio operator not to be on the air; it can be done regardless of living conditions."

—Brian, KM4PW

"Enjoyed ur article in March issue of *CQ*. I hooked ladder line to my metal roof and worked K2FOP NYC on 2-27 on 21.140 @ 2055 UTC. Used tuner and seems to work well on 40 to 10 meters."

—Dick, KK7RH

"I once read the old *ARRL Antenna Book* from cover to cover. I decided on a dipole in the attic (third floor). Our local club had a contest for us new Novices. The one with the most QSOs by the next meeting would be the winner. Surprise! I took my logbook to the meeting and got my butt kicked by a 16-year-old kid with a random-wire antenna and a tuner. Isn't life great!!"

—Skip, WB8OWM

Antennas

BY ARNIE CORO, CO2KK

Connecting Your Station To The World

A Dual Diamond Quad for VHF and UHF

The cubical quad antenna has proven to be an excellent performer since the very first one saved an international broadcaster from going off the air many years ago. Quad elements of square, rectangular, elongated, triangular, and of course circular shape have undergone a lot of both theoretical and practical tests, and according to some of those who have used them, quads seem to outperform Yagis in the HF region, especially when they are placed at the same height above ground.

Even the simple one-wavelength quad element is definitely a winner over a standard half-wave dipole. You get not only about 2 dB gain over the dipole, but also several additional advantages:

1. Your antenna is much quieter, as the closed loop element picks up less noise than the dipole with its sharp ends.

2. The sharp nulls provided by the quad element help to cancel interference, something that can be really useful for city dwellers, who are plagued nowadays not only by the sync pulses of TV sets, but also by the ever-present computers in the neighborhood.

3. The all-important TOA, or take-off angle, is lower than the one provided by a standard half-wave dipole when placed at the same height above ground.

A typical one- wavelength single quad loop shows an impedance of around 100 to 110 ohms, so you can feed it via a balanced open-wire line with a balun and tuner combination, or use one of my favorite feeders, the dual-balanced shielded transmission line, made from two coaxial cables, again ending at the transmitter's end with a balun and an antenna tuner. Using a coax matching section is possible, too.

Enough, however, about the benefits of quads in general. What I intend to show you here is one very special way of building an antenna array using quad elements.

The Side-By-Side Dual Diamond

Yes, side-by-side dual diamond—that's the name of this very special array for 6 and 2 meters, and also for 70 cm. We place two diamond-shaped quad loops side by side, connected in parallel and fed at the vertex of both elements, where typically the impedance is very close to 50 ohms.

I have used this configuration with excellent results on the 6 and 2 meter bands "as is" or by adding either a pair of parasitic reflector elements or a backplane reflector (I've also built one for 70 cm.). The dual diamond side-by-side quads, when placed in front of a big square-plane reflector of appropriate dimensions, becomes a remarkable antenna system, as it shows not only a nice gain figure, but also a rather broad bandwidth. Using the dual diamond driven element with just a parasitic reflector reduces the bandwidth, but you still have a very easy to build and adjust antenna system that provides quite some gain (see fig. 1).

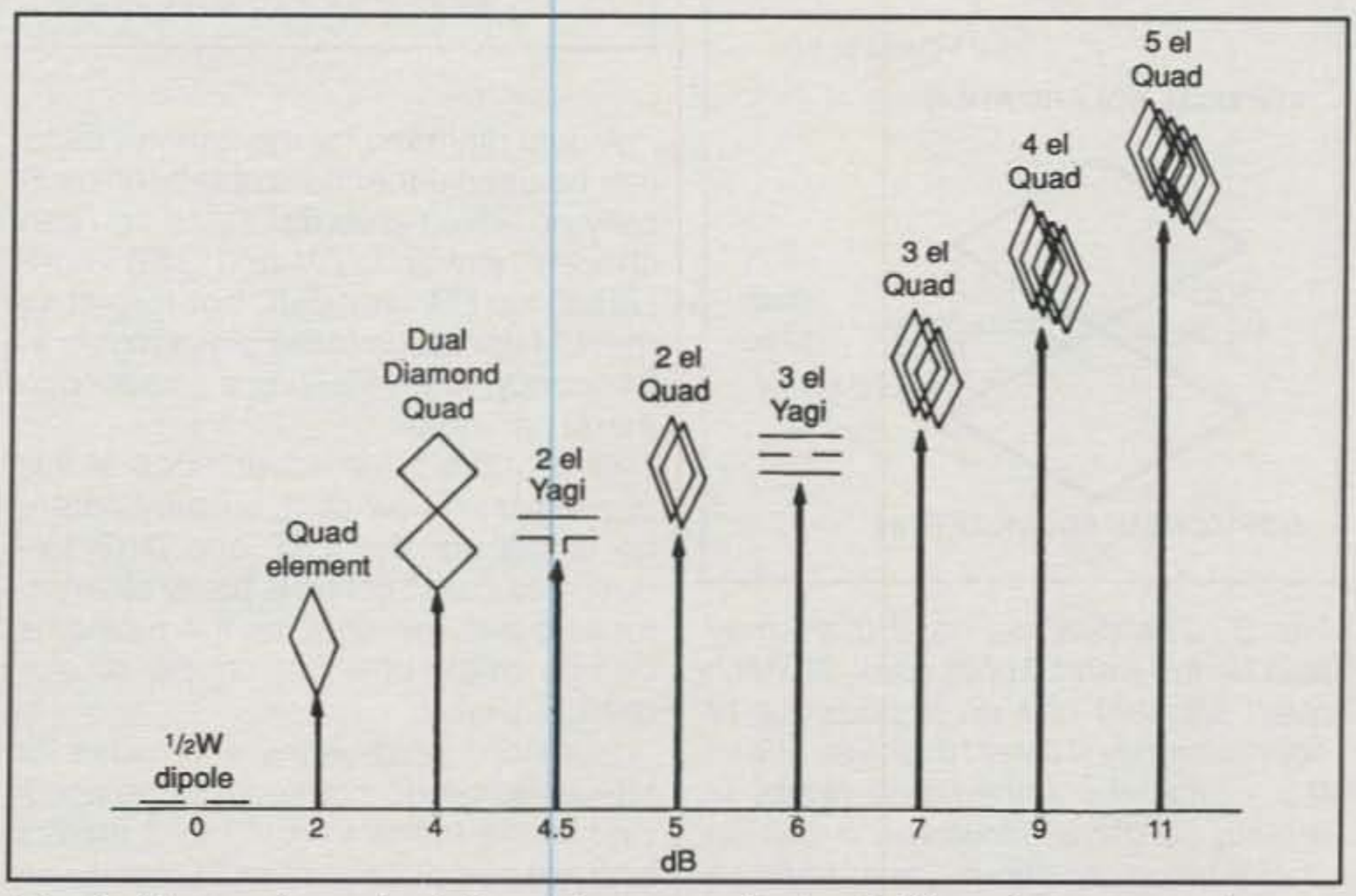

Fig. 1– Comparison of relative gain over a dipole of different common antennas in use by amateur radio operators worldwide. The dual diamond quad has a nice 4 dBd gain and is bidirectional.

Matching by Experimentation

By moving the dual diamonds nearer to or farther from the backplane, it is possible to obtain a good match, and hence a low SWR. Again, keep in mind that this plane reflector is pretty large even at 2 meters, and almost impossible to

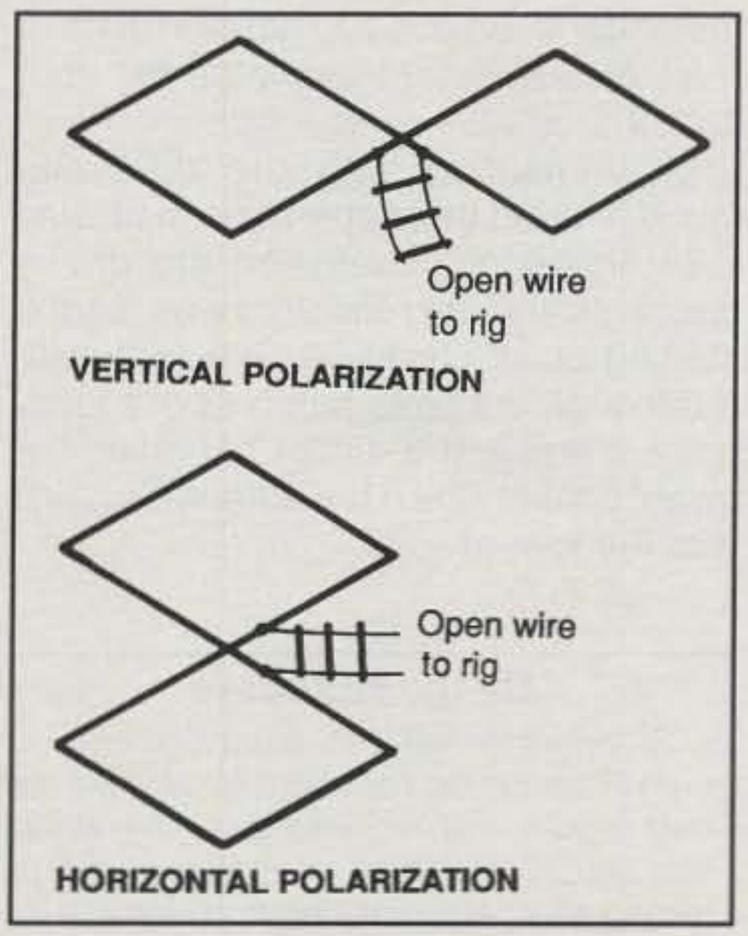

Fig. 2– Depending on how the diamond quad elements are placed, either vertical or horizontal polarization is obtained. The antenna can be fed with open-wire line of any length and connected to the rig via a balun and antenna tuner. For 6 meter DX work horizontal polarization is recommended, because, among other reasons, local noise (which is generally vertically polarized) will be reduced, making reception easier.

*c/o CQ magazine
e-mail: <co2kk@cq-amateur-radio.com>

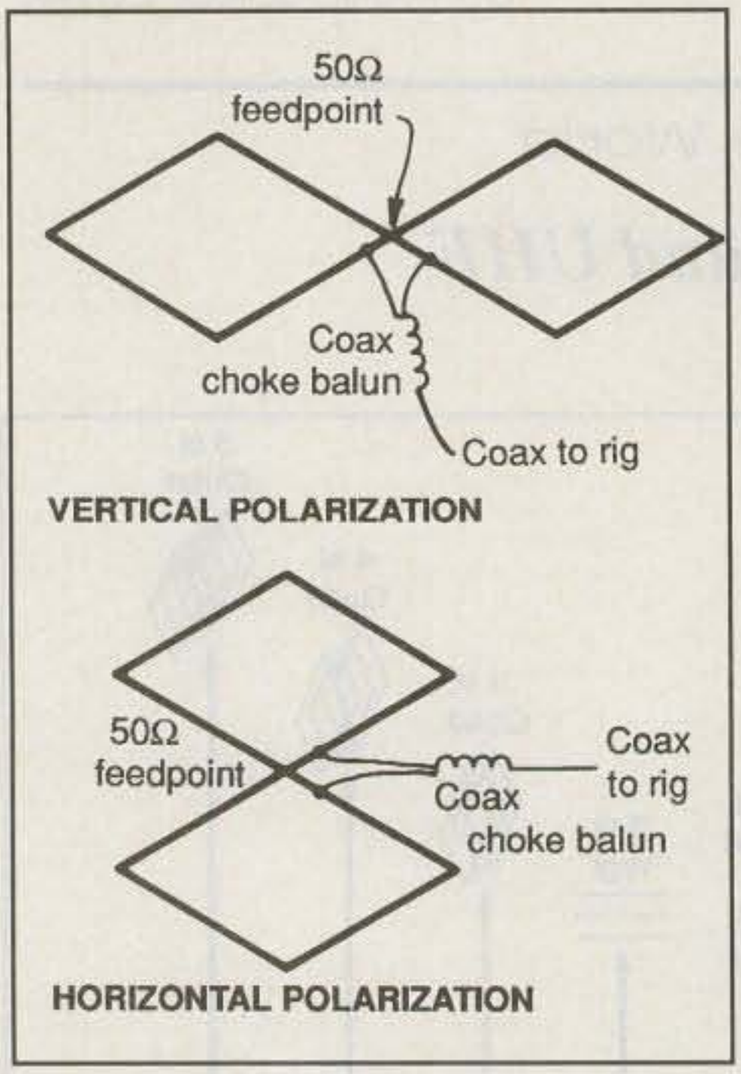

Fig. 3– The dual diamond quad may also be fed with 50 ohm coax, as each quad element has an impedance of approximately 100–110 ohms. When fed jointly, the impedance drops to around 50 ohms. However, a coaxial choke balun, as shown here, must be used to decouple the feedline from the antenna.

Why Two Quad Elements?

Although a single quad element is a nice antenna, the dual diamond has so many advantages that it is really worth the extra effort in building it. My experiments on the 6 meter band show that even without using reflectors, a north-south oriented dual diamond system erected at just 5/8 of a wavelength above ground provides not only a nice match to the transmitter's output stage, but also very good reception and excellent performance on the F2, TEP (transequatorial propagation), and sporadic-*E* modes (sporadic-*E* season this year is peaking now). I have never tried this system during tropo ducting events, so I can't tell you how it behaves on that particular mode.

A dual diamond for the 2 meter band can be used either horizontally or vertically polarized (see fig. 2), so you can choose between CW and SSB (horizontal) or FM (vertical), not forgetting that FM operation takes place higher in frequency, thus requiring a smaller diamond perimeter.

One of the other advantages of this easy-to-build, low-cost, efficient antenna is that for the VHF and UHF frequencies construction is pretty straightforward and low cost, as the elements can be made of either copper or aluminium wire.

Standard quad-element formulas for HF antennas do not seem to be accurate in the range from 10 to 2 meters and are completely off on 70 cm. Even so, they provide a good starting point. My advice is to take the wire diameter into consideration and build a single quad element using the "classical HF formula" (1030/f MHz = length in feet). Then very carefully, out in the clear, place the antenna at least two wavelengths from any nearby objects and test the element for resonance, pruning as required to obtain the best possible performance at the intended operating frequency. A high-quality grid-dip meter in the hands of an expert will tell you the antenna element's main resonant frequency, but I prefer that you test for resonance by finding the lowest SWR, and then correcting the element length according to the results.

Remember that you are *not* dealing with a 50 ohm feedpoint. The single element's impedance is going to be anywhere between 100 and 120 ohms when its perimeter is about 1.05 wavelength. Therefore, you should use them as a starting point, testing your particular diamond element for resonance as specified in the main text. The standard formula is 1030/ f MHz, providing length in feet. You may develop your own formula, valid for a specific wire diameter, frequency range, and type of mounting used for supporting the diamond quad elements.

I have found that on the 2 meter band a single vertical support is enough, while the 6 meter dual diamonds require both vertical and horizontal struts. Also, of course, using self-supporting elements is possible on the 70 cm band!

By the Numbers

Standard formulas for quad elements on the HF bands do not seem to provide the best results at 6 and 2 meters. Therefore, you should use them as a starting point, testing your particular diamond element for resonance as specified in the main text. The standard formula is 1030/ f MHz, providing length in feet. You may develop your own formula, valid for a specific wire diameter, frequency range, and type of mounting used for supporting the diamond quad elements.

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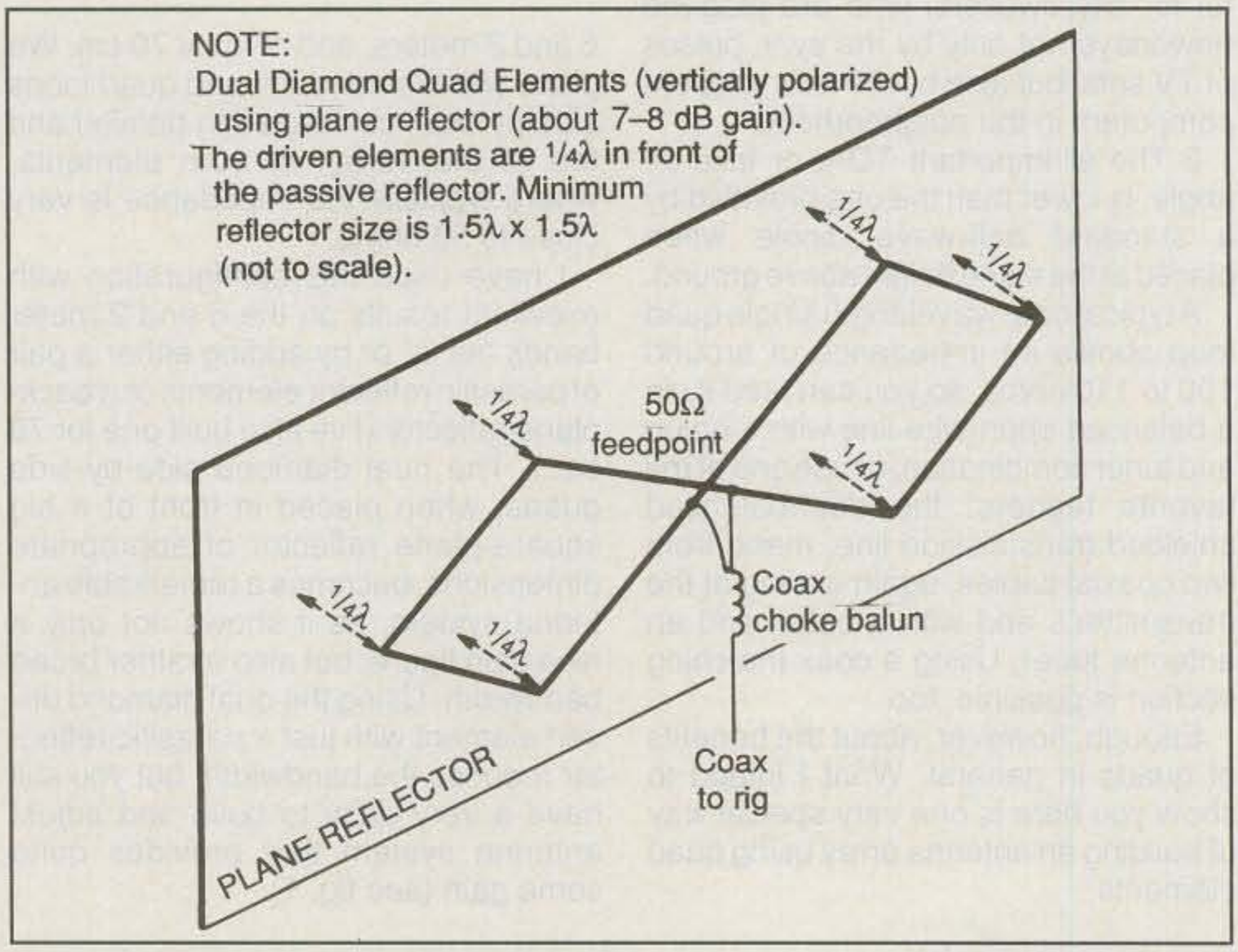

Fig. 4– A simple, yet highly effective and easy-to-adjust antenna can be built using a dual diamond quad as the driven element and adding a plane reflector of appropriate dimension. The reflector can be made of wire mesh or wire elements, depending on the operating frequency. This antenna shows a rather high front-to-back ratio and a broad horizontal radiation pattern, and it may form part of an array of several of these panels to achieve more gain. Generally, the dimensions are practical for use only above 220 MHz.

Resources

Although the list of references covering loop antennas is much longer than this, here are just a few you may want to check out.

De Maw, Doug, W1FB. *W1FB's Antenna Notebook,* Newington, Connecticut: ARRL, 1987. See Chapter 5, "High-Performance Wire Antennas," pp. 70–79 (formula for calculating loop dimensions 1005/ f MHz). Excellent basic reading on loops.

Haviland, Bob, W4MB. *The Quad Antenna,* Hicksville, New York: CQ Communications, Inc., 1993, reprinted 1996. While the book's primary focus is on HF quads, the principles apply to VHF/UHF versions also.

Stringfello, Michael, ZS6BUF. "Broadband Double Loops," as published by Pat Hawker, G3VA, in *Radio Communications,* journal of the RSGB, January 1984. A very interesting variation of the diamond loop, which offers exceptional broadband characteristics for VHF/UHF work.

Heys, John D., G3DBQ, *Practical Wire Antennas,* RSGB, reprinted 1990, 1991. "Full Wave Quad Loops," pp. 40–46, an excellent background in a few well-written pages.

Henk, A. J., G4XVF. "Loop Antennas: The Fact , Not the Fiction," published in *The ARRL Antenna Compendium,* Vol. 3 , 1992.

lengths. This means that you must install an appropiate matching section so that 50 ohm measuring equipment (VSWR meter) may be used.

One very important aspect that has to be taken into consideration is these measurements should be done using the best possible instrumentation, and the antenna feeder must be not only properly decoupled from the radiator, but also should be cut to an exact number of half wavelengths (not in free space, but in the coax, so the cable's velocity factor has to be known), something that often is forgotten by antenna experimenters who do not have a professional background.

Once you have the diamond quad element resonating at the desired center frequency, then go ahead and build the identical twin, place both elements side by side, and run another test before adding any parasitic elements. In this second test, with two side-by-side elements you can use direct 50 ohm coaxial feed, but without forgetting the coaxial choke balun (see fig. 3), or if you happen to have the appropiate ferrite rings to install, then by all means use the ferrite ring decoupler strongly advocated by antenna experts such as Joe Reisert, W1JR, and others.

A Great Portable Antenna

The dual diamond quad for the 6 meter band is an ideal solution for portable work. It provides gain over a dipole, directivity, and low take-off angle. Even without using parasitic reflectors, the estimated gain of a bit more than 3 dB over a dipole will double your effective radiated power, and the antenna can be easily transported, erected, and taken down by a single person. One additional benefit of the dual diamond for 6 meters, without parasitic elements, is that it matches 50 ohm coaxial cable, thus avoiding the need for an antenna tuner.

I would like to thank my wife, Olga Dalmau, for helping to prepare the illustrations for this article, as well as *CQ* illustrator Hal Keith for producing the final versions.

Questions? Just send them to me via e-mail at: <co2kk@cq-amateur-radio.com> or <inforhc@ip.etecsa.cu> and I'll be glad to try to answer them pronto!

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

A New Shack in Space Nears Reality

As the International Space Station (ISS) nears completion, Earth-bound amateur radio operators await their first opportunity to have a QSO with the newest orbiting ham shack. Dubbed Amateur Radio on the International Space Station (ARISS), it will be the second semi-permanent ham shack in space, along with the long-operating MIR space station.

Sometime this month the Russian-built *Zvezda* Service Module is scheduled for launch. When in place, it will provide the living quarters for the first ISS crew. Next month the initial amateur station hardware is supposed to be sent up to the ISS aboard shuttle mission STS-106. Then in October the Soyuz spacecraft is scheduled to be launched from Russia carrying the the initial crew of US astronaut Bill Shepard, KD5GSL, and Russian Cosmonauts Sergei Krikalev, U5MIR, and Yuri Gaidzenko for what's expected to be a long-duration mission.

It is planned that amateur radio will be available to these first crew members once it has been installed temporarily aboard the *Zarya* Functional Cargo Block module. The initial station will use the existing Sirius antenna on the Functional Cargo Block. The system is being adapted to support amateur radio operation on 2 meters.

Announced earlier this year (see May *CQ*) was the Russian station license and callsign, RZ3DZR. The license is valid for all amateur radio hardware located in Russian ISS segments, including the Functional Cargo Block module now in orbit and the Service Module. While this will provide licensure for the immediate use of the US and Russian hams, it creates problems for contacts with non-amateurs, such as school groups, in countries (including the US) that do not have third-party agreements with Russia. There is also the question of what callsign(s) to use in non-Russian parts of the space station. Therefore, an international callsign has been applied for via the International Telecommunications Union (ITU)—perhaps 4U1ISS?

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VHF Plus Calendar

July 1–2	Moon perigee, new Moon and highest Moon declination. Good EME conditions, but challenging.
July 8	First quarter Moon.
July 9	Moderate EME conditions.
July 14	Moon apogee.
July 15	Lowest Moon declination.
July 16	Full Moon. Very poor EME conditions.
July 20–22	Central States VHF Society Conference, Winnipeg, Manitoba. See May column for full details.
July 23	Moderate EME conditions.
July 24	Last quarter Moon.
July 28	*delta-Aquarids* meteor shower predicted peak.
July 30	Near new Moon, Moon perigee, and highest Moon declination. Good EME conditions.

• *EME conditions courtesy W5LUU.*

"A multinational callsign block is the most desirable route," said ARRL First Vice President Joel Harrison, W5ZN, after a meeting of the ARISS international partners earlier this year in the Netherlands. "However, these things move slowly."

The use of a common callsign would allow all crew members, regardless of nationality, to be able to operate the amateur radio equipment in any part of the ISS without concern over third-party traffic restrictions. Until an international callsign is available, the ARISS team will continue to pursue licenses in each of the member countries. A German callsign, DLØISS, has been issued and a US callsign has been applied for.

The initial ISS ham shack will provide primarily FM voice and packet capability on 2 meters. Eventually (after relocating the ham station to the Service Module) 70 cm, using Ericsson hand-held transceivers, will be added. Future plans call for slow-scan TV, various types of amateur TV, and experimental projects. Phase 2 of the initial station should incorporate a German-built digitalker/speaker-microphone, SSTV, and maybe an RF notch filter. Future stages of the ARISS effort may include a transportable station and ultimately a permanent station that will include HF through microwave capabilities on several modes. Details of the permanent station still are being finalized.

One of the primary goals of ARISS is to continue a schedule of amateur radio contacts with schools, so students can interview the astronauts and cosmonauts directly. This is something NASA clearly supports because of "the educational outreach aspects" of the ARISS project. US delegation member Frank Bauer, KA3HDO, told the Netherlands gathering (mentioned above) that amateur radio provides "a competent volunteer network" that would cost NASA and the other space agencies much more to replicate through other means.

Because of its popularity on the Russian Mir space station, SSTV is expected to become an integral part of the ham shack aboard the ISS. One of the proposals for using SSTV came from Miles Mann, WF1F, who was instrumental in putting SSTV aboard the Mir (see "Mir SSTV Station Back on the Air," by Farrell Winder, W8ZCF, elsewhere in this issue). Miles has proposed what he calls "SpaceCam1" for the ISS. This software-based system would use the onboard station support computer and common SSTV modes. Another proposal put forth by astronaut Ron Parise, WA4SIR, suggests complementing SpaceCam1 with a Kenwood VC-H1 hand-held SSTV system. The VC-H1 system would be used when the onboard computer is not available for SSTV.

So, space ham radio junkies, keep your ears peeled for future contacts with the ARISS, beginning as early as this fall. More information will be published as it becomes available.

Thanks to the ARRL for information from its "Members Only" page that contributed to this report.

Clinton Halts Degraded Signals for Civilian GPS Use

On 1 May President Clinton announced that effective immediately, he would order a cessation of the degradation of the signals from the GPS (Global Positioning System) satellite network. See WB6NOA's report elsewhere in this issue for details.

While we hams have been using GPS receivers equipped with grid-locator readouts for years, we have endured the degraded signals wondering how we could use our ingenuity to fix the problem, but without success. Now, thanks to President Clinton, the problem is fixed, not only for us, but for a wide range of civilian applications. Among such applications under development is a GPS-guided computer program for the visually impaired, something that really excited my wife, Carol, W6CL.

Phase 3D Set to Launch

Barring any last-minute hitches, the long-awaited Phase 3D satellite is set to launch on the Ariane 507 rocket late this month from Kourou, in French Guiana. For the latest details check out the AMSAT web page at: <http://www.amsat.org>.

Falklands Activated in April

Chris Gare, G3WOS, operating as VP8DBL, operated 6 meters from Port Stanley on East Falkland for approximately a week, from 12–18 April. In all, Chris worked a total of 33 countries during his stay, including 4X, 5B, 9A, 9H, CN8, CT, CT3, DK, EH, EH6, EH9, F, HB, I, ISØ, IT9, KP4, JY, LU, LZ, OE, S59, SV, SV5, SV9, LZ, PY, PYØ, YO, VP8, W4, ZD9, and ZS. Around 30 of these represent first-country contacts from the Falklands.

Chris plans to return to the Falklands some time in the future as finances and business trips permit. In the meantime, look for VP8AWU and VP8CMT, both of whom have had their appetites whetted in the aftermath of Chris's trip. For details and photographs, point your web browser to <http://www.uksmg.org/falklands-1.htm>.

6 meter Double-Hop E_S From the Mobile!

An earlier than expected sporadic-*E* opening surprised Mike Smith, VE9AA, on 27 April. Here is his story:

Yesterday, when I was away from home in FN76, I ducked out of a seminar I was in for a quick breath of fresh air (1:53 PM AST/16:53Z). I halfheartedly turned on the MFJ-9406 in the car and was surprised to hear N8PUM/b coming through at RST 539-559. Not especially unusual, even for using a 1/4 wavelength mobile whip, but a little outside the "normal" times for E_S here in NB and perhaps about 1–2 weeks earlier than we "normally" see daytime E_S this same time of year. (OK, I know there is nothing "'normal," nor predictable about *E*-sporadica, hence its name, but what-the-hey). It gets better.

Again, just for the heck of it, I called CQ (SSB) somewhere near 50.125 MHz. The dial is a bit off on this '9406. What can I say? I was elated to work Wilt, NØIPL/7 (DN62 in Wyoming) with about a 5/7 report.

Wilt was in here armchair copy, and I commend him for copying my ~5 watts from the car. I was also called by AEØG (or AE9G?) in reply to my CW CQs, but never made a full two-way. I installed the Embedded Research TiCK keyer a couple of weeks ago and am glad I did. CW is the only way to go for really weak-signal DX on 6 meters (that is with my peanut-whistle mobile signal to a 1/4-wavelength whip).

Also heard at the same time were the following: N8PUM/b RST 559; WBØRMO/b RST 519; and NØLL/b RST 519.

Last summer I heard the ZD8VHF/b via sporadic-*E* in the car and yesterday I worked Wyoming. (You have good ears, Wilt!) Not near as good as the worldwide DX being worked by some of the more southern latitude stations, but hey, it's something—hi, hi!

First ZL3 to Africa QSOs

The following was reported by Mike Foubister, ZL3TIC:

On 28 April at 2046 the first African to ZL3 South Island contact was made. CT3HF worked ZL3AAU, ZL3ADT, and ZL3NW. Well done, John, Ross, and Rod! The distance was 18560 km!

I was in the shack at that time and heard the boys working him, but not a sign of him here!! My QTH is on the eastern side of Christchurch City and closer to some local hills beaming that direction...bummer!

Soldering for Peace

It's been a rough three months, and a vote is scheduled for the next club meeting on the new repeater equipment. What has made it rough is that one faction in the club wants to spend money on the new repeater. Another faction is just as adamant about saving the money because, as they say, "The club can't afford it." The faction that wants the improvements is threatening to walk out, while the faction that wants to save the money is threatening to shut down the repeater.

Back at home, try as you might, you cannot seem to educate the guy down the street about where in the 2 meter

band FM operations are permitted—definitely not on 144.200 MHz, the SSB calling frequency! Day after day, there he is claiming that FM is permitted anywhere that phone operations are permitted. Nothing you can say will change his mind.

Do these scenarios sound familiar? They are fiction, based on fact. If you want to read more such negative scenarios, then do what I did the other day.

While I was looking at the QRZ.com web site, I decided to follow one of the links to a page listing several of the recent FCC enforcement actions. I discovered a rather lengthy list and asked myself, "What is happening to our ham radio hobby?" Actually, the answer is rather simple. Our hobby merely reflects our society and its changing norms.

What can we do to change this downward spiral? Basically, we need to get along better with our fellow hams. While this may seem a lot easier said than done, it isn't when we take a look at just how we can accomplish it.

In the May column I listed "Ten Sure-Fire Ways to Increase Club Membership." A month earlier I gave a talk on that subject to the Tulsa Amateur Radio Club. I discovered to my delight that they already were practicing many of those principles. Furthermore, they told me that they would make plans to implement most of the others.

This month I want to present another formula for success. This isn't going to be a 1, 2, 3 step process because it doesn't lend itself to that kind of structure. However, if you or your club follows it, a majority of conflicts will be minimized, if not eliminated altogether.

I call this formula "Soldering for Peace." What does soldering have to do with working for peace? Well, stay with me, because I will show you how the two relate.

An ancient saying states, in part, that we must "...work hard at living in peace with others." Hard work it indeed can be. Nevertheless, within the context of working at peace, we have a choice. We can have true peace or we can have a false peace that is gained through loss of integrity. Honestly and ethically working for peace requires us to find a common ground of shared values.

To illustrate how we can work through conflicts to a just resolution, I would like to look at the process of soldering. We all know that soldering, the technique of joining metals together, involves the use of flux, which is a substance that is applied to the metals to be joined so as to prevent oxidation. When oxidation occurs, a poor, or inferior, solder joint results. Such a solder joint can break down and come apart at the most inopportune time. This may be on a critical circuit board that is part of the electronic components that exist in our rig or as part of our antenna system. When the solder joint breaks down, the objects soldered together come apart, thereby causing failure of the whole component or system.

As part of the process of soldering, the flux is heated to a point where it becomes liquid. In so doing, the liquid flushes away the potential of oxidation by removing the air that can cause the oxidation. The heating of flux usually destroys it. The residue of the flux is then removed in the cleanup after the solder operation is completed. It is the same way in conflict resolution. The flux of constructive airing and dealing with differing sets of opinions clears the air as a way of solidly joining together. In the process, the flux is dissolved.

In both cases, soldering and conflict resolution, without the use of the flux, solid joining together is highly improbable, and the joining together that does occur will not stand the test of outside stress upon the metal joint, or the joining together in peace.

It is far better to have groups joined together via shared values than via dishonest unity that has unresolved conflict at its core. If groups of people who have differing opinions are joined together via their shared values, it is recognized that while beliefs differ, the goals that can be accomplished are much greater through such synergism than via dishonest unity that fails to recognize differences.

It is like the soldering of metals with and without the flux. As I stated above, with the flux, the shared value of the solder makes it possible for dissimilar metals to be joined. Without the flux, the solder is flawed and useless. The first instance of undue stress on the solder joint will cause the joint to break apart, thereby destroying it.

It is very difficult to work for peace. It requires that the flux of free and open discussions take place as a way of reconciling differences—or clearing the air of these differences. Such a free and open discussion should not be an end in itself, however. Rather, it needs to be the means to the end of the conflict.

For us as ham radio operators, the flux is composed of synergistic guidance accomplished when both factions agree to find the common values. Without our special kind of flux, it would be impossible for us to be joined together.

Practically speaking, how does this seeking after common values work? Let's take my opening vignette. Depending on the degree of escalation, there may or may not be the need for an outside arbitrator. What is important is that both sides discover their shared values. In the case of the club conflict, both probably will discover that they want the best, most reliable repeater equipment at the lowest price. Agreeing on this shared value, they can investigate a less-expensive alternative to the piece of equipment that the one side wants to purchase.

In the case of the neighbor, again arbitration may be necessary. However, it may be as simple as the weak-signal operator inviting his neighbor to a weak-signal club meeting or inviting the neighbor to accompany him on a contest or grid-locator outing. Perhaps this simple gesture of extending friendship will be enough to "break the ice" between these two hams.

I mentioned arbitration in the above two situations. I was ARRL Section Manager in Oklahoma for eight years. During my tenure I had my share of arbitration meetings with disagreeing factions. Furthermore, my Official Observer Coordinator had even more such meetings because he dealt with hams who deliberately chose to stretch the spirit of the intent of our official and unofficial regulations. Sometimes I said to myself, "I'm glad that I'm not the OOC!"

As we are experiencing increasing deterioration on our ham bands and among hams of differing opinions, perhaps it may be necessary to have hams trained as arbitrators. Perhaps assistant section managers can be appointed for the specific role of arbitration.

It is my opinion that enforcement action designed solely to beat someone into submission so that he or she does not break the rules will do nothing in the long run to solve the problem, because the problem will just manifest itself in some other form somewhere else. Therefore, again I return to the need for education, and this is best accomplished via the local club.

There you have it: a few ideas on how to resolve conflicts. Let's use them to make the necessary repairs to our hobby.

Central States VHF Conference

The annual Central States VHF Conference will be held in Winnipeg, Manitoba, Canada from July 20 through July

22. For more information, see the May column or the conference home page at <http://www.csvhfs.org>.

Current Meteor Showers

This month there are a number of minor showers. The most intense, the *delta-Aquarids*, is a southern latitude shower. It has produced in excess of 20 meteors per hour in the past. Its predicted peak is around 28–29 July.

The only northern latitude shower is the *alpha Cygnids*. It is supposed to peak around 20 July, but with a rate of only five meteors per hour.

Beginning around 17 July and lasting until approximately 14 August, you will see activity tied to the *Perseids* meteor shower. Its predicted peak is around 12 August. I will have more extensive coverage of this shower next month.

Samir Durakovic, T99S, SK

Samir Durakovic, T99S (ex-T94ON), was killed in a car crash 14 April near Sarajevo along with his friend Riad, T95MAW. Those of you who are long time readers of this column will remember my two trips to Bosnia. During my second trip, which took me to Sarajevo, I met Samir, along with a number of other hams in that war-torn city. On the first night that we could get together, my fellow team member, Lloyd Hansen, AA8PW, and I went to a clubhouse to join a group of Sarajevan hams. With them was Samir. Samir told me about his article in October 1995 *QST* entitled "Heroes under Siege." He and the others then proceeded to tell me of some of the heroic actions of the hams in Sarajevo during the war. One of the most regrettable things that he had to do was to tell relatives about the deaths of loved ones, adding (quoting from his *QST* article), "This work took a horrible psychological toll on us, as we listened to people's often-tragic fates."

Among his stories was one about the shelling in February 1994 that killed 70 and injured more than 200 in a downtown market area. (I walked past that spot several times during my almost daily trips downtown.) The night following the shelling Samir and other hams were on the air all night passing traffic to hams throughout Europe concerning the welfare of loved ones.

Samir outwardly expressed little concern for the dangers that he faced during the war. One of the major problems during the war was lack of reliable telephone communications. When Samir had traffic for someone whose phone wasn't working, he delivered it in person. This was a very dangerous task, as the lines of combat in Sarajevo were sometimes only blocks apart, which meant that one could be killed or seriously wounded by walking on the wrong street. Even so, for Samir, his helping fellow Sarajevans was paramount.

When Lloyd and I were in Sarajevo, peace was taking its tenuous hold. This gave us the freedom to visit the various hams quite often during our three week stay. We visited with Samir and the other hams several times. Despite the language barrier (Samir was still learning English), I got to know him and appreciate what a promising young man he was. Samir had a lot going for him, and I thought that Sarajevo was fortunate to have people like him who would be part of its future. That promising life was cut short by the accident. As a result, we in the international ham radio community have lost one of the heroes of our hobby.

Anyone wishing to express condolences to his family may write to his parents, Gospoda i Gospodin Durakovic, , Podcarina 48, 71000 Sarajevo, Bosnia and Herzegovina. As they are not fluent in English, a simple message would be sufficient.

My thanks go to Sharon Gartenberg, KC1YR, who was a close friend of Samir, for supplying information to me. For more about his life, visit a web page she maintains at: <http://www.applicom.com/twibih/twib0400.html# Samir>.

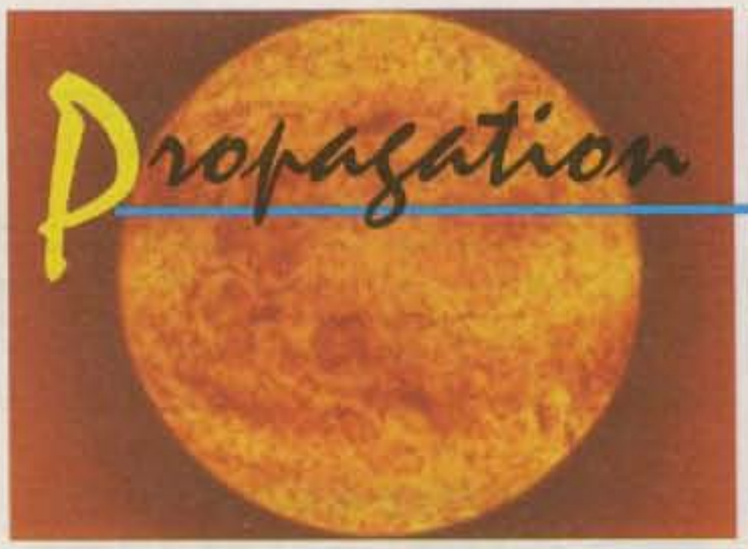
And Finally. . .

My recent talk at the Tulsa Amateur Radio Club represents a my return to the ham radio club circuit. Although my schedule restricts my travels quite a bit, I hope to do some other club visits in the future. As I write this, I am still hoping that I can make it to the CSVHF Society conference at the end of this month.

Ham radio is a really fun hobby. I have said it here before: I have had so much fun in our hobby over the nearly 40 years I have been licensed. I hope my suggestions on how we can make a few improvements now and then will bring back some of the good times we seniors pine about and make it better for those coming up in the ranks.

If you have any suggestions on improving our hobby, please let me know and I will get word out via this column. Thanks again for your support of this, your column. Until next month...

73, Joe, N6CL



Propagation

BY GEORGE JACOBS, W3ASK

The Science Of Predicting Radio Conditions

Intense Auroral Activity April 6–7

At 1630 UT April 6 streams of charged high-energy particles emitted from a solar flare were channeled to the polar regions by the Earth's magnetic field. They bombarded the rarified gases present in the polar atmosphere, causing a rare red auroral display more intense than any aurora observed since March 13–14, 1989. In the United States the aurora was visible as far south as Texas and Florida. Here are some e-mail reports describing the effects of the aurora observed on the HF and VHF bands. We also feature the dazzling photo of this aurora taken near Potsdam, Germany by Juergen Rendtel.

Karl Kruger, an SWL living in southeast England, reports the following: "Aurora was witnessed here April 6th first between 2020 and 2035 UT with red misty skies. Between 2100 and 2130 it became more intense, with the northern skyline lit up like almost day, and with a red flare filling the sky to right above my house from north to south. It was a lovely sight. That evening and on the following morning (April 7) noticed severe fading on reception of signals from outside Europe on frequencies as low as 7 MHz."

Alan Holder, another well-known SWL living on the Isle of Wight in the English Channel, reports the following observations on the HF bands: "George, I expect that you probably already heard about the severe geomagnetic storm that hit the Earth last Thursday and Friday (April 6 and 7). It practically wiped out most reception on HF. Even the 500 KW European broadcast stations were virtually inaudible at one stage, even as low as the 6 MHz band. Conditions were really strange. When I switched on my receiver at 6:15 UT on April 7 and checked the HF bands, only two or three stations were coming through. About a half hour later, the bands suddenly 'sprung back.' Reception seemed just about normal for stations coming from an easterly direction, but all North and South Americans were absent all day. I read in our local newspaper that two police officers on night patrol April 6 managed to see quite a fine display of the 'aurora borealis.' For some reason I did not think to look for myself that evening. I should have suspected that the aurora might follow the extremely disturbed HF radio conditions. It is quite a rare thing to see an aurora in this location, but no doubt there will be other occasions to see one now that the sun is in such an active state."

From this side of the Atlantic, John Butrovich III, W5UWB, e-mailed his observations on 2 meters: "George, FYI the massive aurora of April 6 local time reached as far south as my QTH (EI 17-ax) at Orange Grove, Texas, which is about 45 miles NW of Corpus Christi. I heard six stations on 2 meters and managed to work four: K5YY located at EM 26, WØRRY at EM 26, N5FAC at EM 35, and W7SAO at DM 59. Working stations via aurora is very rare indeed for me; my last auroral opening was in 1989. One definitely has to be in the right place at the right time, and have his radio on!"

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for July 2000

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 12, 16, 31	A	A	B	C
High Normal: 2, 4-5, 8, 11, 13 20, 24-25, 29-30	A	B	C	C-D
Low Normal: 1, 3, 7, 9-10, 15 17, 19, 21-22, 26, 28	B	C-B	C-D	D-E
Below Normal: 6, 18, 23, 27	C	C-D	D-E	E
Disturbed: 14	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and 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 fair to good (C-B) on July 1st, good (B) on the 2nd, fair-to-good (C-B) on the 3rd, good (B) on the 4th and 5th, fair-to-poor (C-D) on the 6th, etc.

More Info About Aurora

Aside from their interesting, different effects upon HF and VHF ionospheric propagation, of all natural phenomena auroras are probably the most breathtaking and spectacular. If you have not yet read "Amateur Radio and Aurora Research" by Ken Neubeck, WB2AMU, with spectacular photos by Howard Sine, WB4WXE, be sure to see it in the April 2000 issue of *CQ*, beginning on page 22. It is a very timely, in-depth, comprehensive review of the origins and characteristics of aurora, their effects on the ionosphere and HF and VHF propagation, and the important role that amateur radio has played and can continue to play in aurora research. More information can also be found at the following web sites: <http://www.geo.mtu.edu/weather/aurora> and <http://science.nasa.gov/headlines/y2000/ast25apr_1m.htm>. Real-time auroral maps can be found at: <http://ns2.qsl.net/propagation> and <http://sec.noaa.gov/pmap>.

Sunspot Cycle 23 Rises Above the 100 Mark

Dr. Pierre Cugnon, keeper of the world's official sunspot records at the Royal Observatory of Belgium, reports a mean sunspot count of 138.2 for March 2000. This is based upon daily observations made at more than three dozen solar observatories located throughout the world. The daily count varied between a high of 188 on March 24 and a low of 95 on the 17th. March's mean value results in a 12-month running sunspot number, upon which the cycle is based, of 102 centered on September 1999. This is an increase of four from the previous month, and marks Cycle 23 passing the 100 mark as it climbs towards its soon to be expected peak. There was a corresponding increase in the level of 10.7 cm solar flux as measured at

This photo of the rare, intense red aurora of April 6–7 was taken near Potsdam, Germany by Juergen Rendtel. (From NASA web site)

Canada's Dominion Radio Astrophysical Observatory located at Penticton, BC. A mean level of 207 was reported for March 2000. This results in a smoothed value of 165 centered on September 1999. A smoothed sunspot number on the order of 116 is forecast for July 2000, with an expected smoothed level of 168 for the corresponding 10.7 cm solar flux.

July Propagation

Fifteen, 17, and 20 meters are expected to share honors for optimum DX propagation during July. Good-to-excellent openings are forecast for 15 and 17 meters throughout much of the daylight hours, and to some areas into the early evening hours as well. Conditions will favor north-south openings and openings to tropical areas. Some openings should also be possible to Africa and Europe, particularly when the bands peak during the late afternoon and early evening.

Twenty meters should open for DX shortly after sunrise and remain open to most areas of the world for a period of about two hours. High solar absorption will reduce DX possibilities considerably from about 9 AM through the early afternoon hours. Expect signals to begin to increase again by 4 PM, with optimum conditions expected after sundown. Exceptionally strong signal openings to most areas of the world should be possible during the hours of darkness.

Although a seasonal decrease in 10 and 12 meter DX is expected during July and the summer months, some good DX openings still should be possible during the daytime hours of July. Best bets are for openings on north-south paths to the Caribbean and Central and South America, but occasional openings should also be possible to Africa and Australasia. Expect both bands to peak during the late afternoon hours.

During the hours of darkness look for some good DX openings on 30 and 40 meters, but seasonally high static levels may often make this band very noisy. High static levels are also likely to dampen DX openings on 80 meters, but some should be possible during the hours of darkness. Not many DX openings are expected on 160 during July because of seasonally high levels of static and increased solar absorption in the northern hemisphere. See last month's column for comprehensive band-by-band DX propagation predictions for July.

Short-Skip Openings

This month's column contains Short-Skip Charts for July and August 2000. Optimum short-skip conditions on most bands are expected during July, mainly as a result of the seasonal peak expected in sporadic-*E* propagation. During the daylight hours considerable short-skip openings are forecast for 10, 12, and 15 meters over distances ranging between approximately 500 and

1300 miles, with some double-hop openings extending out to as much as 2300 miles. Excellent short-skip openings on 20 and 17 meters, ranging between approximately 250 and 2300 miles, are expected almost around the clock, with conditions expected to peak during the late morning hours and again during the late afternoon and early evening. Good daytime short-skip openings can be expected on 30 and 40 meters ranging between approximately 100 and 600 miles. Excellent nighttime openings should be possible on these bands for distances between 250 and 2300 miles. Good 80 meter short-skip openings are forecast for the daylight hours up to distances of about 300 miles, with the range extending out to 2300 miles during the hours of darkness. While no 160 meter short-skip openings are expected during the daylight hours, some openings should be possible during the hours of darkness for distances up to approximately 1300 miles. When static levels are low, 160 meter nighttime openings may extend considerably beyond this range.

VHF Ionospheric Openings

With a seasonal peak expected in sporadic-*E* propagation, look for frequent short-skip openings on the 6 meter band. Most openings should fall within the 600–1300 mile range, but some may be as long as 2300 miles, and others may be somewhat shorter than 600 miles. The best times for these openings are a few hours before noon and again during the early evening hours, although they can take place at any time of the day or night. During many 6 meter sporadic-E short-skip openings, signal levels may reach exceptionally strong levels. Be sure to check the 2 meter band during intense 6 meter openings. Generally, 2 meter short-skip openings can take place when the shortest skip heard on 6 meters is on the order of 600 miles or less. Two meter openings, when they occur, are likely to range in distance between 1000 and 1300 miles.

Meteors

The best chance for meteor-scatter openings will be during the last week of July, when the *Delta Aquarids* shower is expected to intensify. It should peak on July 27 with approximately 25 meteors an hour entering the Earth's atmosphere. Several minor showers may permit meteor openings when they maximize. These are the *Pegasids,* which should peak on July 9; the *Phoenicids* on July 13; the *Draconids* on July 16; the *Piscis Austrinids* on July 27; and the *Alpha Capricornids* on July 29. During the peaks of these showers expect between three and five meteors an hour to enter the Earth's atmosphere. Although not expected to peak until mid-August, the *Perseids,* a major meteor shower, may be intense enough to permit some meteor-scatter openings during the last week of July.

Aurora

While peak sunspot activity, as is now occurring, generally produces much improved propagation conditions on the HF bands, periods of radio storminess also increase. Increased radio storminess produces more frequent "blackouts" on the HF bands and corresponding occurrences of aurora. During the next several months of peak or near-peak sunspot counts, expect an increase in the type of storminess and aurora that took place April 6–7. While these could play havoc on the HF bands, they often make possible aurora-type ionospheric reflection on the 10, 6, and 2 meter bands for distances up to approximately 1200 miles. Check the dates for expected Below Normal or Disturbed conditions during July in the Last-Minute Forecast at the beginning of this column. You can also check for real-time geomagnetic and auroral conditions at web site <http://ns2.qsl.net/propagation>. When there is a radio storm and an aurora in progress check 10, 6, and 2 meters for unusual short-skip ionospheric openings.

Trans-equatorial Openings

The possibility of 6 meter trans-equatorial openings is generally at its lowest

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates possible 10 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. In the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. 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.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. On the Short-Skip Chart appropriate *daylight* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EDT, on a circuit between New York and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones add 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone; and 6 hours in the EDT zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 PM in Los Angeles; 18 or 6 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA subtract 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone; and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave 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.

5. 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.

level during July. Since it is the middle of winter in the southern hemisphere and MUFs are at their highest, some type of TE may be possible through a combination of *F*-layer reflection in the southern hemisphere and sporadic-*E* reflection farther north. If such openings were to occur at all, they would favor the Caribbean and Central American areas and perhaps the southern tier states. The best time to check would be during the late afternoon and early evening hours, and when sporadic-*E* is observed in a southerly direction. The most likely direction for TE openings would be towards deep South America, with the path crossing the equatorial region at or near a right angle.

73, George, W3ASK

CQ Short-Skip Propagation Charts
July & August 2000
Local Daylight Savings Time At Path Mid-Point

Band Meter	*Distance Between Stations (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	08-10 (0-1)* 10-14 (0-3)* 14-18 (0-1)* 18-22 (0-2)* 22-08 (0-1)*	08-10 (1)* 10-14 (3)* 14-18 (1-2)* 18-22 (2-3)* 22-08 (1)*	08-10 (1-0)* 10-14 (3-1)* 14-18 (2-1)* 18-20 (3-2) 20-22 (3-1)* 22-08 (1-0)*
15	*Nil*	08-10 (0-2)* 10-14 (0-3)* 14-18 (0-2)* 18-20 (0-3)* 20-22 (0-2)* 22-08 (0-1)*	08-10 (2)* 10-14 (3)* 14-18 (2)* 18-20 (3)* 20-22 (2)* 22-00 (1-2)* 00-08 (1)	08-10 (2)* 10-14 (3)* 14-18 (2-3) 18-20 (3-4) 20-22 (2-3) 22-00 (2) 00-08 (1-0)
20	10-01 (0-1)*	07-10 (0-2)* 10-18 (1-4)* 18-22 (1-3)* 22-00 (1-2)* 00-07 (0-1)*	07-10 (2-4) 10-18 (4) 18-22 (3-4)* 22-00 (2-4)* 00-02 (1-3)* 02-07 (1-2)*	08-10 (4) 10-16 (4-3) 16-00 (4) 00-02 (3) 02-07 (2) 07-08 (4-3)
40	08-10 (2-4)* 10-15 (3-4) 15-20 (4) 20-22 (2-4) 22-00 (1-3) 00-08 (1-2)*	08-10 (4) 10-12 (4-3) 12-17 (4-2) 17-18 (4-3) 18-22 (4) 22-02 (3-4) 02-05 (2-4) 05-08 (2-3)	09-10 (4-1) 10-12 (3-1) 12-17 (2-1) 17-18 (3-1) 18-21 (4-3) 21-05 (4) 05-06 (3-4) 06-08 (3) 08-09 (4-2)	09-18 (1-0) 18-19 (3-0) 19-20 (3-1) 20-21 (3-2) 21-22 (4-3) 22-06 (4) 06-07 (3-2) 07-08 (3-1) 08-09 (2-0)
80	06-12 (4) 12-16 (4-3) 16-00 (4) 00-06 (3-4)	07-08 (4-2) 08-10 (4-1) 10-12 (4-0) 12-16 (3-0) 16-18 (4-1) 18-20 (4-2) 20-22 (4-3) 22-07 (4)	07-08 (2-1) 08-10 (1-0) 10-16 (0) 16-18 (1-0) 18-19 (2-0) 19-20 (2-1) 20-21 (3-1) 21-22 (3-2) 22-05 (4) 05-06 (4-3) 06-07 (4-2)	07-19 (0) 19-20 (1-0) 20-21 (1-0) 21-22 (2-1) 22-04 (4-3) 04-05 (4-2) 05-06 (3-1) 06-07 (1-0)
160	18-19 (0-1) 19-20 (1) 20-22 (3-2) 22-00 (4-3) 00-06 (4) 06-08 (3-2) 08-09 (1) 09-10 (1-0) 10-18 (0)	19-20 (1-0) 20-21 (2-0) 21-22 (2-1) 22-00 (3-2) 00-04 (4-2) 04-06 (4-3) 06-08 (2-1) 08-09 (0-1) 09-19 (0)	21-22 (1) 22-01 (2-1) 01-04 (2) 04-06 (3-2) 06-07 (1) 07-08 (1-0) 08-21 (0)	21-23 (1-0) 23-01 (1) 01-06 (2-1) 06-07 (1-0) 07-21 (0)

** Predominantly sporadic-E openings.*

HAWAII
July & August 2000
Openings Given in Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	13-16 (1)	06-09 (1) 09-12 (2) 12-16 (3) 16-18 (2) 18-20 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-22 (4) 22-00 (3) 00-02 (2) 02-04 (3) 04-06 (2) 06-08 (1)	18-20 (1) 20-00 (2) 00-02 (1) 21-00 (1)**
Central USA	12-14 (1) 14-16 (2) 16-17 (1)	05-06 (1) 06-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-21 (1)	06-08 (2) 08-14 (1) 14-16 (2) 16-18 (3) 18-00 (4) 00-02 (3) 02-04 (4) 04-06 (3)	20-21 (1) 21-22 (2) 22-01 (3) 01-02 (2) 02-03 (1) 20-22 (1)** 22-00 (2)** 00-02 (1)**
Western USA	10-12 (1) 12-14 (2) 14-18 (3) 18-20 (2) 20-21 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	05-08 (4) 08-10 (3) 10-13 (2) 13-15 (3) 15-22 (4) 22-00 (3) 00-05 (2)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-06 (1) 19-20 (1)** 20-22 (2)** 22-02 (3)** 02-03 (2)** 03-04 (1)**

ALASKA
July & August 2000
Openings Given in Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	NIL	21-00 (1) 00-02 (2) 02-03 (1)	12-15 (1) 22-00 (1) 00-02 (2) 02-04 (3) 04-05 (2) 05-06 (1)	07-10 (1)
Central USA	NIL	20-00 (1) 00-03 (2) 03-05 (1)	13-16 (1) 22-00 (1) 00-03 (2) 03-06 (3) 06-07 (2) 07-09 (1)	08-12 (1)
Western USA	01-04 (1)	17-22 (1) 22-00 (2) 00-02 (3) 02-04 (4) 04-05 (2) 05-06 (1)	13-14 (1) 14-15 (2) 15-19 (3) 19-01 (2) 01-03 (3) 03-06 (4) 06-08 (3) 08-09 (2) 09-11 (1)	07-09 (1) 09-12 (2) 12-13 (1) 09-12 (1)**

***Indicates best time for 80 meter openings. Openings on 160 meters are most likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
#See explanation in "How To Use Short-Skip Charts."
Note: The Alaska and Hawaii Propagation Charts are intended for distances greater than 1300 miles. For shorter openings, use the preceding Short-Skip Propagation Chart.

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ARIZONA STATE CONVENTION AND HAMFEST: Largest FREE ADMISSION hamfest in the Southwest. July 28, 29, and 30, 2000. I-17 exit 337 (Ft. Tuthill), Flagstaff, Arizona. Our 49th consecutive year. Manufacturers, Dealers, Exhibits, Seminars, VE Testing, Huge Swap, Camping, and more. Gordon West, WB6NOA, will present two of his famous seminars and will be the (TBA) guest speaker at the Saturday night BBQ. Other speakers, seminars, and forums include Dan Miller from ARRL HQ and Bill Pasternak from Newsline. AMSAT, APRS, Ten-Ten Int'l, QRP, ladies programs, and ARRL Forum. For more info, contact Amateur Radio Council of Arizona, POB 312, 16845 N. 29th Ave., Suite 1, Phoenix, AZ 85080-2003, or e-mail: <arcathill@aol.com>. Voice mail 1-602-779-2722; website: <http://www.Hamsrus.com>. Enjoy cool weather and the pines. An ARRL sanctioned event.

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HEARD ISLAND commemorative T-shirts, same shirt as team is wearing on QSL card. Proceeds benefit VKØIR DXpedition. Personal checks on U.S. banks okay. Please no credit cards. Sizes remaining: large, extra-large. 100% cotton, U.S. made. $20 Priority Mail stateside, $25 DX Air Mail, postage included. Tom Anderson, WW5L, 3505 Cliffwood Drive, Bedford, Texas 76021-2043 (phone 817-498-2820; e-mail <WW5L@gte.net>).

FOR SALE: Tristao Tower, Model TWS-72, four-section free-standing tower. Includes BTS base, with anchor bolts, template, and mounting hardware. Tower on the ground. Purchase price for pickup $3000, or shipping price $3500. SASE with 33 cents postage for manula copies or 55 cents, which includes Civil Engineer's report, to WN5N at CBA.

CERTIFICATE for proven contacts with all ten American districts. SASE to W6DDB, 45527 Third Street East, Lancaster, CA 93535-1802.

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FT-100D HIGHLIGHTS

The FT-100D is a high-performance, ultra-compact transceiver operating on the 160-10 meter HF bands, plus the 50, 144, and 430 MHz VHF/UHF bands. Known for its outstanding receiver performance, the FT-100D's easy-to-access DSP system is the cornerstone of the outstanding receiver capability. Providing Noise Reduction, Auto-Notch, and Narrow-Bandwidth Filter selection, the DSP system also includes a Microphone Equalizer for the transmit side.

The new and enlarged speaker of the FT-100D (ϕ66 mm) provides spectacularly clean audio output, to help you dig out those weak signals.

Whether at home or away, the fantastic new FT-100D is The Choice of the World's Top DX'ers. Step up to the FT-100D, and enjoy the thrill of the sunspot peak in style!

MICRO MOBILE

FT-100D

Ultra-Compact HF/VHF/UHF Transceiver

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"Brick-Wall" Selectivity

Today's elite-class operators demand the best RF weaponry available. Yaesu's exciting new MARK-V FT-1000MP answers the call, with an expanded array of receiver filtering, 200 Watts of power output, and Class-A SSB operation capability for the cleanest signal on the band. Enhanced front-panel ergonomics save you seconds in a pile-up or a contest "run," and Yaesu's HF design and manufacturing know-how ensures that no short-cuts have been taken in our effort to bring you the best HF transceiver money can buy. For more QSOs in your log, and more awards on your wall, there is only one choice: the MARK-V FT-1000MP from Yaesu!

I. IDBT: Interlocked Digital Bandwidth Tracking System

The IDBT feature greatly simplifies operation by matching the bandwidth of the DSP (Digital Signal Processing) system to the net bandwidth of the 8.2 MHz and 455 kHz IF stages. The IDBT system accounts for the settings of the IF WIDTH and SHIFT controls, and automatically sets a DSP bandwidth which matches the analog IF bandwidth.

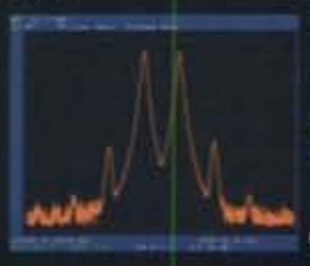
IDBT: A Breakthrough in Selectivity!

II. VRF: Variable RF Front-End Filter

Protecting the MARK-V's receiver components from strong out-of-band signals, the VRF system acts as a high-Q "Preselector," located between the antenna and the main bandpass filter networks, providing additional RF selectivity on the 160-20 meter Amateur bands for multi-operator contest teams, DX-peditions, or for operation near MW/SW broadcast stations.

III. 200 Watts of Transmitter Power Output

Utilizing two Philips® BLF147 Power MOSFETs in a 30-Volt, push-pull configuration, the MARK-V's transmitter puts out up to 200 Watts of clean output power, thanks to the conservative design of the PA section.



Class A 75 W PEP IMD

IV. Class-A SSB Operation

Exclusively available on the MARK-V FT-1000MP , a press of a front-panel button engages Class-A SSB operation of the transmitter, at a power output level of 75 Watts. Class-A operation produces incredibly clean signal quality, with 3rd- order IMD suppressed 50 dB or more, and 5th- and higher-order products typically down 80 dB or more!

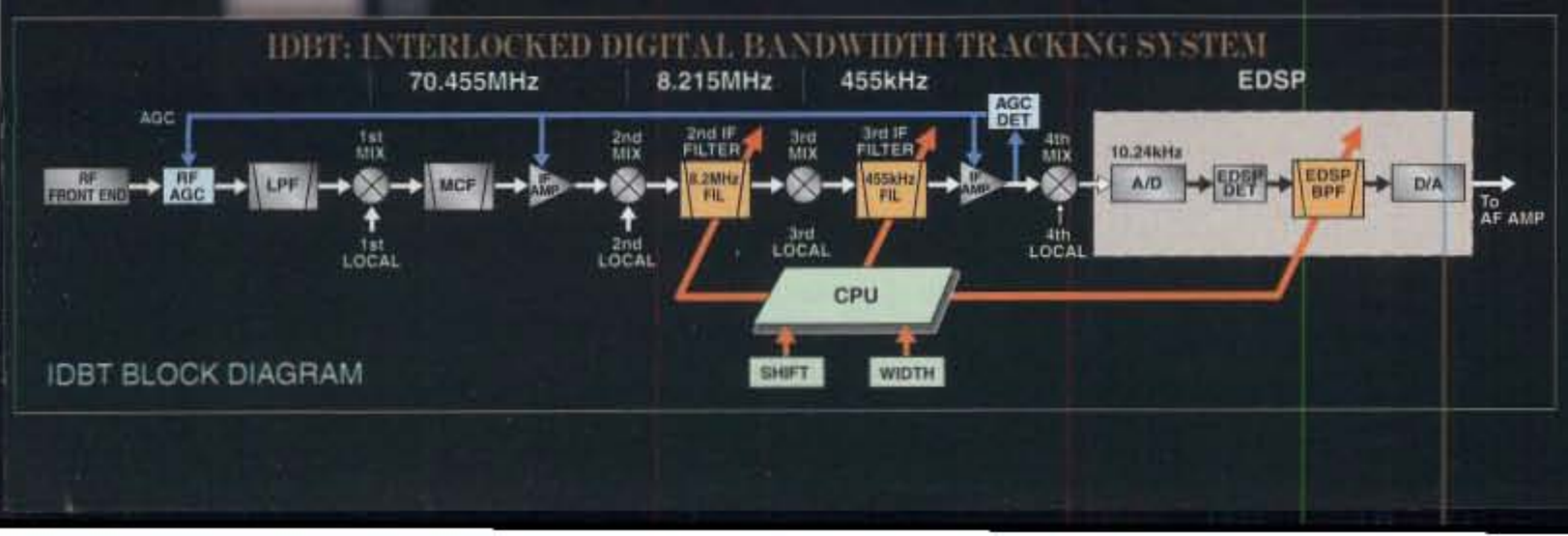
V. Multi-Function Shuttle Jog Tuning/ Control Ring

The immensely-popular Shuttle Jog tuning ring, which is concentric with the Main Tuning Knob, has a new look in the MARK-V: it now includes the activation switches for the VRF (left side) and IDBT (right side) features, so you don't have to move your hand position to activate these important circuits during contest or pile-up situations!

Photo shows optional MD-100A8X Deluxe Desk Microphone

HF 200 W All-Mode Transceiver

MARK-V FT-1000MP



IDBT BLOCK DIAGRAM

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HF

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Auto Notch Filter

Microphone Compressor

IF Shift

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Adjustable Noise Blanker

Built-in Keyer

VOX

Large Front Firing Speaker

Latest RF & Digital Technology

Optional Voice Synthesizer

Optional DSP

PC Controllable*

12V Operation

Internal Auto Antenna Tuner

Adjustable AGC

VOX

CW Memory Keyer

Adjustable Noise Reduction

Band Scope

32 Bit Floating Point Unit IF-DSP

5" TFT Color Display Shows Operating Conditions & Spectrum

Auto & Manual Notch Filter

Digital Voice Recorder

Dual Watch

Twin Passband Tuning

Taylor Your Transmit Audio

100W of Power (40W on AM)

All Mode

HF/6M

The best thing to hit HF since sliced bread

IC-756PRO

The digital revolution took a huge leap forward with the introduction of the IC-756PRO. With its 32-bit Floating Point DSP, built-in 24-bit AD/DA converter, and other advanced features, the IC-756PRO is quickly becoming the HF radio that others are measured against. And we're doing it again with the IC-718, an easy to use, compact, feature packed HF with advanced features that up until now have been available only on more expensive radios. So whether you're looking for just a snack or a full course meal, ICOM is serving up what you want. Take a bite out of HF with an ICOM.

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