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MAY 2004

CQ

1945 Our 60th Year 2004

BPL Battle Guide

Ham Radio on Cape Verde

Results: 2003 CQ WW RTTY DX Contest

A "Straight Key Keyer" to Build!

On the Cover: Looking past the QTH of "Pulu," D44AC, to the city and harbor of Mindelo, Sao Vicente Island, Cape Verde. Story on page 14.

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THE RADIO AMATEUR'S JOURNAL

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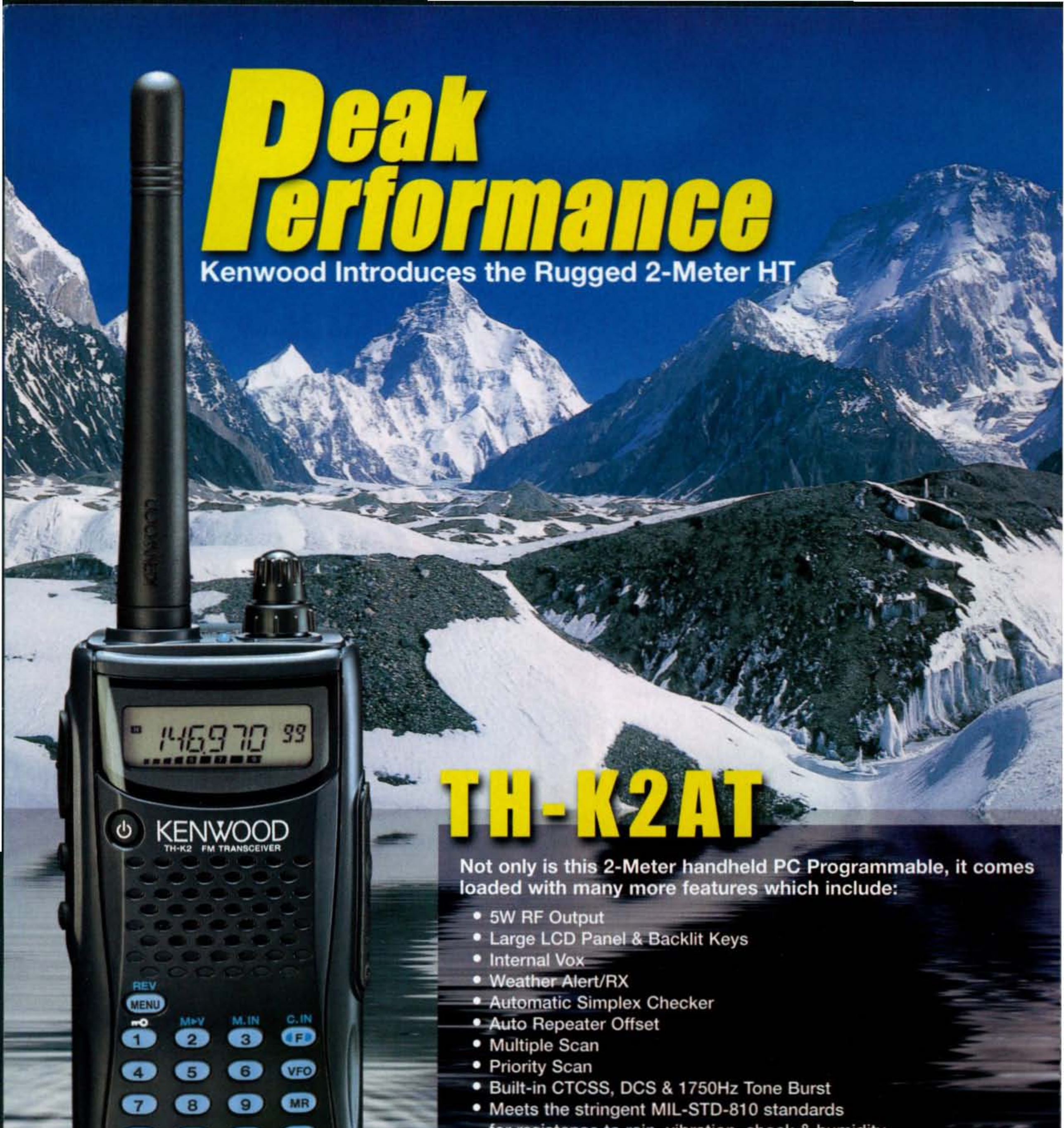

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Not only is this 2-Meter handheld PC Programmable, it comes loaded with many more features which include:

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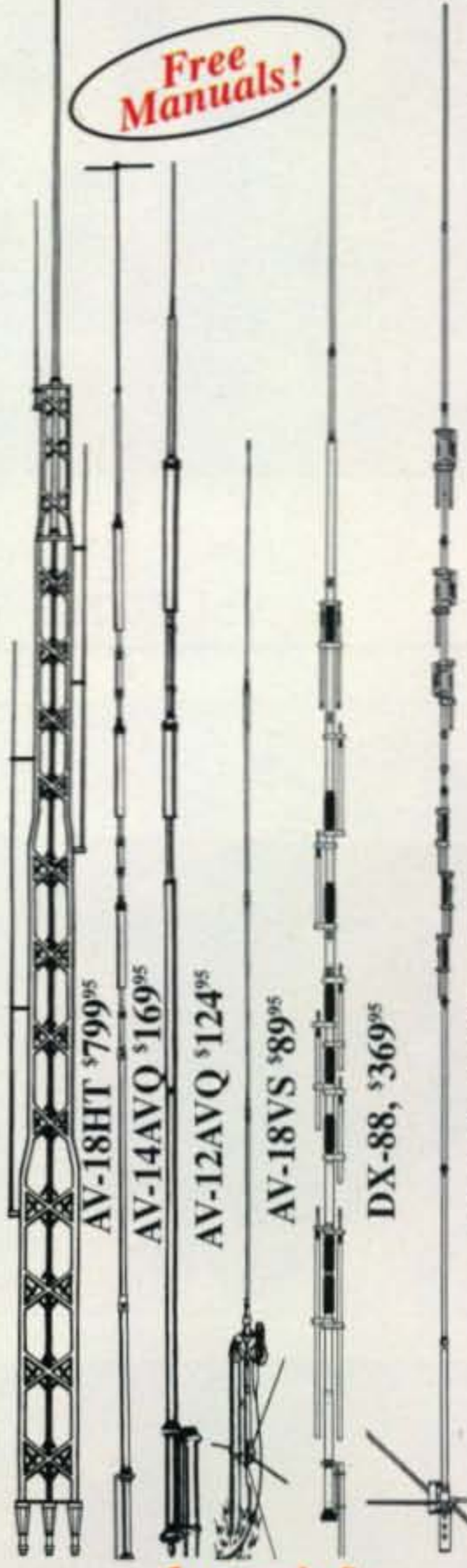

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Classics

All hy-gain multi-band vertical antennas are entirely self supporting -- no guys required.

They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

All handle 1500 Watts PEP SSB, have low SWR, automatic bandswitching (except AV-18VS) and include a 12-inch heavy duty mast support bracket (except AV-18HT).

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AV-18HT, $799.95. (10,12,15,20,40,80 M, 160, 17 Meters optional). 53 ft., 114 lbs.
Standing 53 feet tall, the famous *Hy-Gain HyTower* is the world's best performing vertical! The AV-18HT features automatic band selection achieved through a unique stub-decoupling system which effectively isolates various sections of the antenna so that an electrical 1/4 wavelength (or odd multiple of a 1/4 wavelength) exists on all bands. Approximately 250 kHz bandwidth at 2:1 VSWR on 80 Meters. The addition of a base loading coil (**LC-160Q, $109.95**), provides exceptional 160 Meter performance. **MK-17, $89.95**. Add-on 17 Meter kit. 24 foot tower is all rugged, hot-dip galvanized steel and all hardware is iridited for corrosion resistance. Special tilt-over hinged base for easy raising & lowering.

AV-14AVQ, $169.95. (10,15,20,40 Meters). 18 ft., 9 lbs. The Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

AV-12AVQ, $124.95. (10, 15, 20 Meters). 13 ft., 9 lbs. The AV-12AVQ also uses Thunderbird beam design air dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Roof mount with AV-14RMQ kit, $89.95.

AV-18VS, $89.95. (10,12,15,17,20,30,40,80 Meters). 18 ft., 4 lbs. High quality construction and low cost make the AV-18VS an exceptional value. Easily tuned to any band by adjusting feed point at the base loading coil. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs. All bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: 160 Meter add-on kit, KIT-160-88, $189.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs. *No ground radials required!* Off-center-fed Windom has 55% greater bandwidth than competitive verticals. Heavy-duty tiltable base. Each band independently tunable.

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$799.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$134.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$89.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

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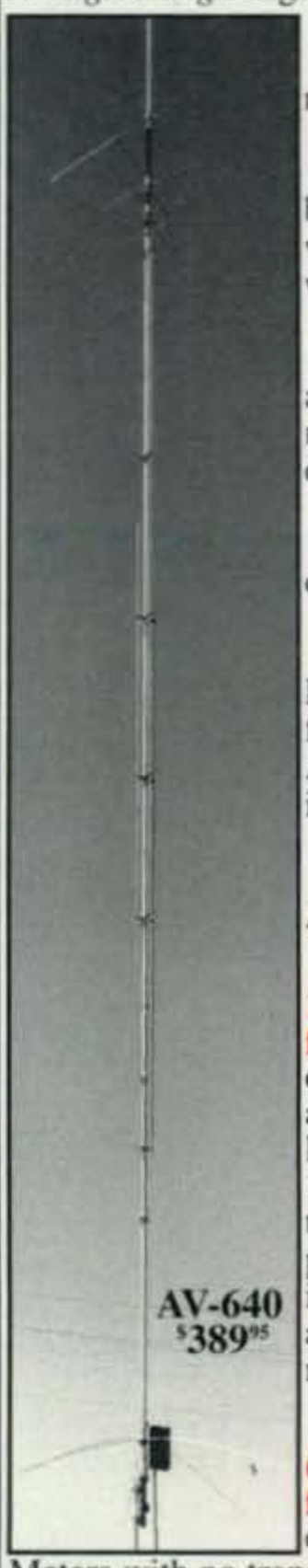
Hy-Gain's new **PATRIOT** HF verticals are the best built, best performing and best priced multiband verticals available today. For exciting DX make full use of your sunspot cycle with the **PATRIOT's** *low 17 degree angle* signal.



No ground or radials needed
Effective counterpoise replaces radials and ground.

Automatic bandswitching
Single coax cable feed. Each band is individually tunable. Extra wide VSWR bandwidth. End fed with broadband matching unit.

Sleek and low-profile
Low 2.5 sq. ft. wind surface area. Small area required for mounting. Mounts easily on decks, roofs and patios.

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Handles 1500 Watts key down continuous for two minutes.

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High wind survival of 80 mph. Broadband matching unit made from all *Teflon*[R] insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

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AV-640, $359.95. (6,10,12, 15,17,20,30,40 Meters). 25.5 ft., 17.5 lbs. The AV-640 uses quarter wave stubs on 6, 10, 12 and 17 meters and efficient end loading coil and capacity hats on 15, 20, 30 and 40 meters -- no traps. Resonators are placed in parallel not in series. End loading of the lower HF bands allows efficient operation with a manageable antenna height.

AV-620, $289.95. (6,10,12,15,17,20 Meters). 22.5 ft., 10.5 lbs. The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

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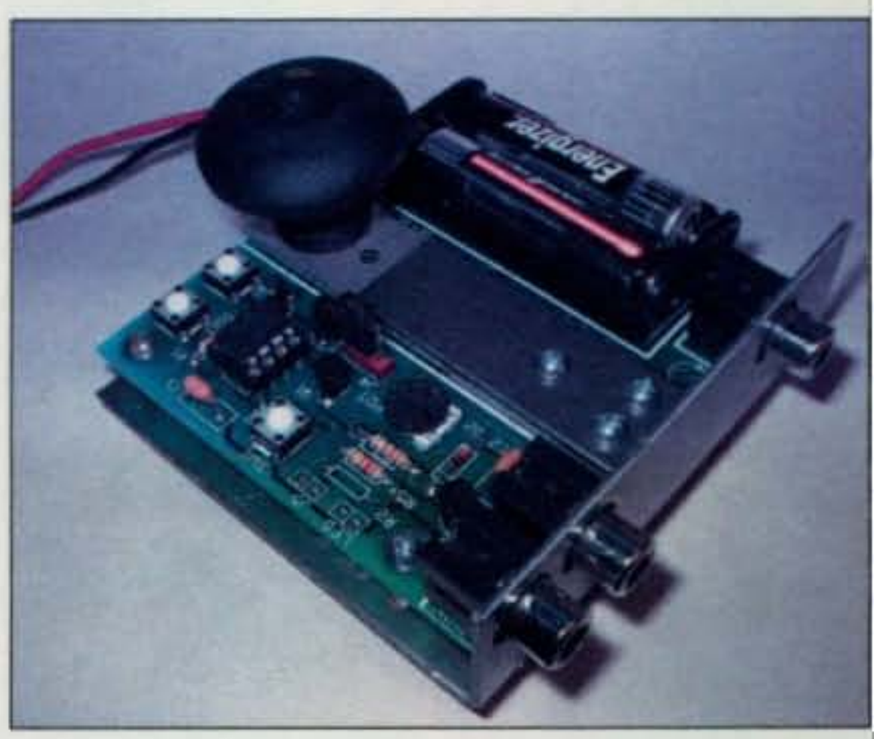

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ON THE COVER: The Republic of Cape Verde (D4) is not only beautiful, it seems to be the perfect location for winning DX contests. See story on Cape Verde on p. 14; CQ WW RTTY DX Contest results, with another D4 winner, on p. 20. (Cover photo by Henryk Kotowski, SMØJHF)

All-Terrain Performance

On or off the road, Kenwood's new TM-271A delivers powerful mobile performance with 60W maximum output and other welcome features such as multiple scan functions and memory names. Yet this tough, MIL-STD compliant transceiver goes easy on you, providing high-quality audio, illuminated keys and a large LCD with adjustable green backlighting for simple operation, day or night.

144MHz FM TRANSCEIVER

TM-271A

▮ 200 memory channels (100 when used with memory names) ▮ Frequency stability better than ±2.5ppm (-20~+60°C) ▮ Wide/Narrow deviation with switchable receive filters ▮ DTMF microphone supplied ▮ NOAA Weather Band reception with warning alert tone ▮ CTCSS (42 subtone frequencies), DCS (104 codes) ▮ 1750Hz tone burst ▮ VFO scan, MHz scan, Program scan, Memory scan, Group scan, Call scan, Priority scan, Tone scan, CTCSS scan, DCS scan ▮ Memory channel lockout ▮ Scan resume (time-operated, carrier-operated, seek scan) ▮ Automatic repeater offset ▮ Automatic simplex checker ▮ Power-on message ▮ Key lock & key beep ▮ Automatic power off ▮ Compliant with MIL-STD 810 C/D/E/F standards for resistance to vibration and shock ▮ Memory Control Program (available free for downloading from the Kenwood Website: ***www.kenwood.net***)

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ham radio news

BPL Comment Deadline May 3

The clock is running on filing comments with the FCC on its Notice of Proposed Rule Making (NPRM) on Broadband over Power Lines, or BPL (ET-Dockets 03-104 and 04-37). If you're planning to file comments, and we hope you are, we urge you to first read the NPRM itself (available on the FCC website), plus three articles in this issue: KN4AQ's "BPL Primer" on page 11, W5YI's "Washington Readout" column on page 34, and N6CL's "VHF-Plus" column on page 86.

While the FCC commissioners appear certain that interference problems can easily be resolved, the Enforcement Bureau may have a different perspective. Yet another letter to another utility—this time, Xcel Energy in Minneapolis—has been sent out by the bureau regarding interference to an amateur (even without BPL in service). This was the second letter in this case, noting that the company had responded to the original letter but that the interference remained. The letter warned of possible fines if the problem was not resolved quickly.

FCC Posts ARRL, NCVEC Petitions for Comment

The FCC in late March assigned rulemaking numbers to four additional petitions for license restructuring and changes in code requirements, including two filed by the ARRL and the National Council of Volunteer Examiner Coordinators (NCVEC). The ARRL petition, covered in detail in last month's "Washington Readout" column, has been designated RM-10867. The NCVEC petition, designated RM-10870, is similar to the ARRL petition but calls for the elimination of all code exams and would enlarge phone bands more than the ARRL would. In addition, the NCVEC petition would bar new entry-level hams from building their own equipment unless it came from a commercially-manufactured kit. W5YI will look at the details of that petition next month.

Two other petitions were released for comment at the same time; RM-10868 was filed by the Radio Amateur Foundation, and RM-10869 by Ronald Lowrance of Georgia. Both seek changes in amateur licensing requirements, particularly with relation to the code exam. A comment deadline of April 24 was set for all four petitions. They are available online via the FCC's Electronic Comment Filing System website at <http://www.fcc.gov/cgb/ecfs/ecfs_alt.html>.

ARRL Offers Online License Course

The ARRL has expanded its successful series of interactive online classes to include a Technician Class licensing course, which, according to the *ARRL Letter,* may be the first of this type in the United States. It allows prospective hams who don't live near clubs that offer courses to study in conjunction with a mentor, and to do so at their own pace. It takes 20–25 hours to complete. Two new classes are opening each month (the first two began in April) and cost $99 for ARRL members and $139 for non-members. The fee includes the *Now You're Talking* license manual. Prospective students may sign up online at <http://www.arrl.org/cce/courses.html#ec010> or by calling the League's New Ham Hotline at 800-326-3942.

Ham Named U.S. #2 in Iraq

Scott Redd, KØDQ, a retired Vice Admiral in the U.S. Navy, has been named Deputy Administrator and Chief Operating Officer of the Coalition Provisional Authority in Iraq. According to the *ARRL Letter,* Redd is one of two deputy administrators reporting directly to chief U.S. administrator Paul Bremer. Redd will be in charge of efforts to rebuild Iraq's infrastructure and its security programs. No word on whether he'll have time to get on the air.

Hamvention Award Winners Announced

The Dayton Amateur Radio Association (DARA) has announced its Hamvention® award winners for 2004. David Kopacz, KY1V, was named Radio Amateur of the Year; George Wilson, III, W4OYI, will receive the Hamvention's Special Achievement Award, and Barry Sanderson, KB9VAK is being honored with the Technical Excellence Award.

According to DARA, Sanderson is a pioneer in digital slow-scan television (SSTV) and is credited with developing software for transmission of binary files on HF to multiple recipients, and Redundant Digital File Transfer (RDFT), a multi-channel, multiphase modulation format that allows error-free transmission of computer files via standard amateur radio equipment.

W4OYI is President Emeritus of the American Radio Relay League. He served as League president for just over three years in the 1990s before suffering a stroke that forced him to step down. He is being honored for more than a half-century of service to amateur radio through emergency and public-service communications and leadership at section, division, and national levels of the ARRL.

David Kopacz, KY1V/VP5X, was named "Radio Amateur of the Year" for his work in creating and funding the "Young Ham Contest Program," in which a young amateur joins a group of veteran contesters operating from an exotic location during a major contest. Last year 14-year-old Daniel Bradke, W2AU, operated with the group from the Turks and Caicos Islands during the CQ World-Wide DX (CW) Contest. This year's winner will join the group for the SSB weekend of the CQWW in October. Watch K1AR's "Contesting" column for details in an upcoming issue.

The awards will be presented at the Dayton Hamvention on May 15.

Holding Out Hope for AO-40

A member of the OSCAR-40 command team in Australia reported on March 9 that he heard some noise that might indicate that the troubled ham satellite is still alive. It's been off the air since January 27, after a sharp voltage drop. According to the ARRL, Colin Hurst, VK5HI, noted a "noise peak" around the satellite's beacon frequency after he'd sent up a transmitter reset command. After about 15 seconds, he said, he transmitted a command to shut off the transmitter and the noise stopped. This, he said, indicates that the spacecraft's computer and 1.2-GHz receiver are still working. Controllers speculate that a cell in the main batteries short-circuited, both pulling the voltage down below operational level and preventing a switchover to the auxiliary batteries.

Meanwhile, AMSAT quietly celebrated its 35th anniversary in March. The group was formed in 1969 as the successor to Project OSCAR, which built and launched the first several amateur radio satellites.

Barton New House Telecom Chair

Rep. Joe Barton (R-Texas) has been named the new chairman of the House Energy and Commerce Committee, the parent committee of the Subcommittee on Telecommunications and the Internet. Barton replaces Louisiana Rep. Billy Tauzin, who earlier this year stepped down from the chairmanship and announced he would not seek re-election in November. According to the *ARRL Letter,* the telecommunications subcommittee is currently considering two amateur-radio related bills: the Spectrum Protection Act of 2003 (HR 713) and the Amateur Radio Emergency Communications Consistency Act of 2003 (HR 1478).

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

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HAM-IV

HAM-IV
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HAM IV and HAM V Rotator Specifications	
WindLoad capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power (in lbs.)	800
Brake Power (in lbs.)	**5000**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight (lbs.)	26
Effective Moment (in tower)	**2800 ft/lbs.**

TAILTWISTER SERIES II

For large medium antenna arrays up to 20 sq. ft. wind load. Available with *DCU-1 Pathfinder* digital control (T2XD) or standard analog control box (T2X) with *new* 5-second brake delay and *new* Test/ Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking steel wedge brake, North or South center of rotation scale on meter, low voltage control, 2 1/16 inch max. mast.

T-2X
$649.95

T-2XD
$1029.95
with DCU-1

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power (in lbs.)	1000
Brake Power (in lbs.)	**9000**
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight (lbs.)	31
Effective Moment (in tower)	**3400 ft/lbs.**

CD-45II

CD-45II
$389.95

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to 2 1/16 inches. MSLD light duty lower mast support included.

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power (in lbs.)	600
Brake Power (in lbs.)	**800**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight (lbs.)	22
Effective Moment (in tower)	**1200 ft/lbs.**

HAM-V

HAM-V
$949.95
with DCU-1

For medium antenna arrays up to 15 square feet wind load area. Similar to the HAM IV, but includes *DCU-1 Pathfinder* digital control unit with gas plasma display. Provides automatic operation of brake and rotor, compatible with many logging/contest programs, 6 presets for beam headings, 1 degree accuracy, auto 8-second brake delay, 360 degree choice for center location, *more!*

ROTATOR OPTIONS

MSHD, $99.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $39.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

AR-40

AR-40
$289.95

For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area. Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for any desired location. Solid state, low voltage control, safe and silent operation. 2 1/16 inch maximum mast size. MSLD light duty lower mast support included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power (in lbs.)	350
Brake Power (in lbs.)	**450**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight (lbs.)	14
Effective Moment (in tower)	**300 ft/lbs.**

HDR-300A

HDR-300A
$1379.95

For ***king-sized*** antenna arrays up to 25 sq.ft. wind load area. Control cable connector, *new* hardened stainless steel output shaft, *new* North or South centered calibration, *new* ferrite beads on potentiometer wires reduce RF susceptibility, *new* longer output shaft keyway adds reliability. Heavy-duty self-centering steel clamp and hardware. Display accurate to 1°. Machined steel output.

HDR-300A Rotator Specifications	
Wind load capacity (inside tower)	25 square feet
Wind Load (w/ mast adapter)	**not applicable**
Turning Power (in lbs.)	5000
Brake Power (in lbs.)	**7500**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
Mounting Hardware	stainless steel bolts
Control Cable Conductors	**7**
Shipping Weight (lbs.)	61
Effective Moment (in tower)	**5000 ft/lbs.**

Digital Automatic Controller

DCU-1
$649.95

Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1 degree accuracy, 8-sec. brake delay, choice for center of rotation, crisp *plasma* display. Computer controlled with many logging/contest programs.

AR-35 Rotator/Controller

AR-35
$69.95

For UHF, VHF, 6-Meter, TV/FM antennas. Includes automatic controller, rotator, mounting clamps, mounting hardware. 110 VAC. One Year Warranty.

RBD-5
$29.95

NEW! Automatic Rotator Brake Delay

Provides automatic 5-second brake delay -- insures your rotator is fully stopped before brake is engaged. Prevents accidentally engaging brake while rotator is moving. Use with HAM II, III, IV, V, T2Xs. Easy-to-install. Includes pre-assembled PCB, hardware.

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zero bias — a CQ editorial

BY RICH MOSESON,* W2VU

Meeting the Challenge

Ham radio today is facing a variety of challenges. Some would call them threats, but I prefer challenges, since that word suggests it's possible not only to survive them, but to find or create new opportunities for growth as a result of meeting each challenge. I have identified seven major challenges facing ham radio as a whole, and each of us individually. You will note that such topics as code tests, license structure and operating privileges are not on my list. The current discussion on these matters will sort itself out, the FCC will make a decision, and we'll all learn to live with it. The items that *are* on my list could threaten our future—directly or indirectly—if not dealt with head-on.

1. BPL

Broadband over Power Lines, or BPL, is the number one challenge facing amateur radio today. This issue covers the topic of BPL extensively, from KN4AQ's "BPL Primer" on page 11 to W5YI's look at the FCC's Notice of Proposed Rule Making on BPL (page 34)—with a May 3 comment deadline—and an excellent explanation of how "the system" works at the FCC, by K6DGW, in N6CL's VHF-Plus column on page 86. Rather than rehashing the issues here, we urge you to educate yourself quickly on this issue and file intelligent comments with the FCC, following the guidelines suggested by K6DGW.

2. Antenna Restrictions

If we can't put up antennas, we can't get on the air and if we can't get on the air, then the interference from BPL won't much matter. More and more homes in America are coming under the purview of home owners' associations, or HOAs, and as we learned in the two-part article in the March and April issues by Fred Baumgartner, KGØKI, of the National Antenna Consortium, this is almost never a good thing for hams. Hundreds of thousands of Americans are giving up vital freedoms to HOAs that have no legal accountability, and Congress needs to wake up to this threat to our freedom.

Regarding antennas, we think the National Antenna Consortium has the right idea of promoting a bill in Congress to establish uniform national standard for minimum allowable antenna installations, regardless of local ordinances or HOA regulations to the contrary. This effort needs support from every user of the public airwaves, commercial as well as amateur. NAC's (newly-remodeled) website is at <www.antenna-consortium.org>.

3. Bringing Back Inactive Hams

Contrary to popular conceptions that ham radio is slowly shrinking, we are actually at near-record numbers, we still have about 20,000 new people entering our hobby each year, and nearly three-quarters of the people whose licenses were up for renewal last year did renew them. But a lot of those licensees are inactive. Last month's feature, "A QSL Conspiracy," told of three hams' successful effort to get a fourth friend back on after nearly 50 years. We need more of that. Do you know any inactive hams? Encourage them to get back on the air. Invite them to operate your station if they don't have anything set up. Make up some project you need help with, if necessary, and ask them to help and then—of course—you'll need to make on-air tests!

4. Recruit One New Ham

We've been averaging about 20,000 new licensees a year for the past few years. And while that's good, it could be much better, especially since they're balanced out by a similar number of hams who don't renew their licenses or become Silent Keys. If each of us could recruit just *one* new person to ham radio each year—and stick around to be that new ham's mentor—then our growth rates would look *fantastic*!

5. Revitalizing Clubs

In our view, clubs are the glue that holds this hobby together—linking newcomers up with mentors, exposing even old-timers to new activities, being active in their communities, etc. Some radio clubs are active and thriving; others are slowly shrinking away to nothing. The most successful clubs minimize business during meetings, have interesting programs and activities beyond their monthly meetings, and sponsor licensing courses to not only recruit new people into ham radio but into their clubs as well.

6. Revitalizing Hamfests

Hamfests are often seen as barometers of amateur radio's health. The trend we've been seeing lately, even at some of the bigger shows, is that attendance is down even though sales are level or even better. At this year's Charlotte Hamfest, I made my usual pilgrimage to the Woodworking Show located in the same building. Once again, there are lessons we can learn from the woodworkers.

The hamfest forums were in meeting rooms three floors up from the main floor, accessible by only one elevator and what seemed like a mile of hallways. The forums at the wood show were right on the main floor—three or four going on at once—and the sound from one didn't seem to interfere with the others. And of course, they were active, generally with manufacturers demonstrating how to use a new tool.

Let's get our hamfest forums right out on the main floor where we can, so people who don't already know they're interested can wander in and discover something new. And why not invite manufacturers to do forums on the finer points of operating their radios? They've come all the way to your hamfest. Why not encourage them to share their knowledge in a forum instead of just one-on-one? Go beyond forums, have activities such as accessible special event stations, foxhunts, or ham radio balloon launches, that are part of the hamfest. Make them exciting and more people will come!

7. Your Individual Challenge

Each of us has the ongoing challenge to build our skills and expand our horizons. I spoke at a club meeting recently, but rather than my usual topic of ham radio's future or how a magazine gets made every month, I spoke this time about propagation. I'm conversant in the subject but not an expert. Making this talk required me to hit the books, review my knowledge and brush up on things I wasn't clear on. End result: In the process of preparing to teach other people about the basics of propagation, I learned more about it myself. Now maybe public speaking is not your "thing," and that's fine, but we each have something we want to learn more about, or something we can help other people learn more about ... and increase our own knowledge and understanding at the same time. Do it! Share it! Help yourself. Help your fellow hams. Help ham radio. If everyone does their part in striving to meet these challenges, amateur radio will emerge from them bigger and healthier than ever.

73, W2VU

*e-mail: <w2vu@cq-amateur-radio.com>

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announcements

The following Special Event stations are scheduled to be on the air in May:

N2UL, to remember those who made the supreme sacrifice for freedom, Fort Monmouth, New Jersey; Robert D. Grant United Labor ARA; 1200–2200Z May 31 on 14.260, 28.460, 449.975. For certificate QSL to RDGULARA, c/o WA2VJA, 112 Prospect Street, Nutley, NJ 07110-0716.

K4H, from Owensboro ARC 50th anniversary celebration, Owensboro, Kentucky; May 15–31 *(no frequencies given)*. Club members will sign K4H, plus their own callsign/K4H once per hour. See the club website: <http://www.k4hy.net>.

KD7VPH, commemorating Armed Forces Day, North West Military Radio Enthusiasts; 1600–2300Z May 15; vintage military gear on the air on 6–40 meters phone, CW, and digital; Certificates for former and active military personnel. QSL (with 9×12 SASE) via KD7VPH, P.O. Box 334, Corvallis, OR 97330-0334. (http://www.exchangenet.net/nwmre/)

W8YAF, from Memorial Day observance, Yankee Air Museum, Willow Run Airport, Belleville, Michigan; 1200–2000Z May 31 on 7.270 MHz. QSL to Frank Nagy, N8BIB, 24315 Waltz Rd., New Boston, MI 48164-9167.

Kurt N. Sterba, KØS Strange Antenna Challenge, May 29–31. Purpose is to assemble makeshift antennas made of anything except wire or pipe and contact as many fellow amateurs as possible. For more information, go to: <http://n0ew.radiomonkey.org/k0s/k0s_2004.html>; or e-mail: <dwayne@wb5plj.org> or <erik@n0ew.org>.

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

May 1, **Wexaukee ARC Amateur Radio & Computer Swap Meet**, Cadillac Junior High School, Cadillac, Michigan. Contact Brian Polk, 231-743-6860, or e-mail: <bandb@netonecom.net>. (Talk-in 146.98; exams 10:30 AM and must preregister starting at 8:30 AM)

May 1–2, **Key City ARC Hamfest**, Abilene Civic Center, Abilene, Texas. Contact Peg Richard, KA4UPA, 325-672-8889, e-mail: <ka4upa@arrl.net>. (Talk-in 146.160/760; exams)

May 2, **Antietam Radio Assn. Hamfest**, Washington County Ag Center Education Center, Hagerstown, Maryland. Contact Carl Morris, WN3DUG, 717-352-2865, e-mail: <cwmorris@pa.net>. (Talk-in 147.090; exams 12:30 PM)

May 8, **Johnson County ARC Swapfest**, National Guard Armory, Mountain City, Tennessee. Contact Danny, K4DHT, 423-727-0723, e-mail: <k4dht@preferred.com>. (Talk-in 145.470, 443.925, 146.520; exams 1 PM walk-in okay)

May 14–16, **Dayton Hamvention®**, Hara Arena, Dayton, Ohio. For more information: <http://www.hamvention.org>.

May 15, **East Carolina Antique Radio Club Swapfest**, Kiwanis Club, Winterville, North Carolina. Contact Herman Schnur, K4CTG, 252-752-2264, e-mail: <bschnur@cox.net>.

May 22, **Temple ARC's Ham Expo**, Expo Center, Temple, Texas. Contact Mike LeFan, WA5EQQ, 254-773-3590 (10 AM – 9 PM Central Time, Mon.–Sat.), e-mail: <hamexpo@tarc.org>; <www.tarc.org>. (Exams 1 PM)

May 22–23, **Reno Spring Ham Swap & Emcommwest**, Fred W. Traner Middle School, Reno, Nevada. Contact Don Carlson, KQ6FM, <kq6fm@arrl.net>; <http://www emcommwest.org/>. (Talk-in 147.150 + PL123, 147.210 + PL123; exams)

May 29, **New Brunswick Spring Hamfest & Fleamarket**, Gondola Point Recreation Center, Quispamsis, NB, Canada. Table reservations contact Kal White, 506-847-3744, e-mail: <kalwhite@nbnet.nb.ca>; more information: <www.qsl.net/VE9LC>. (Talk-in 147.270+)

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Power: 200 watts
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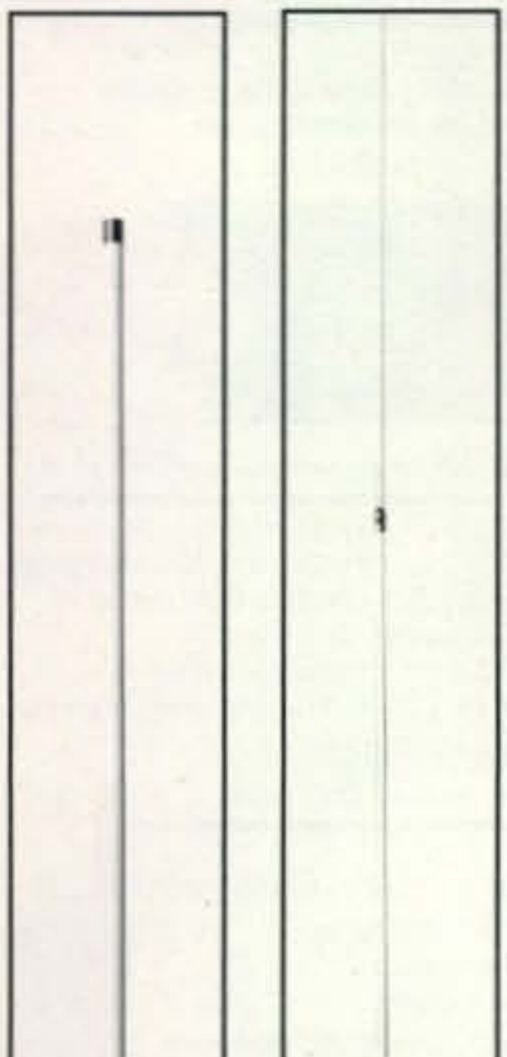
Height: 17.8 feet



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DPGH62 [1,6]	50	200	UHF	21.0	78
F22A	144	200	UHF	10.5	112
F23A	144	200	UHF	15.0	90
F718A [2]	440	250	N	15.0	90

DIAMOND Dual-Band Base/Repeater Antennas

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X50NA	144/440	200	N	5.6	135
X200A	144/440	200	UHF	8.3	112
X510NA [3]	144/440	200	N	17.2	90
X510MA	144/440	200	UHF	17.2	90
X500HNA	144/440	200	N	17.8	90+
X700HNA	144/440	200	N	24.0	90
X2200A	144/222	150	UHF	11.5	112
U200	440/1240	100	N	5.9	135

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U5000A	144/440/1240	100	N	5.9	135
V2000A [4,6]	52/144/440	150	UHF	8.3	110
X3200A [5]	146/222/440	100/200	UHF	10.5	112
X6000A	144/440/1240	100/60	N	10.5	112

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BPL—Broadband over Power Lines—is the talk of ham radio. But how many of us would recognize it if we heard it on the air? CQ VHF columnist Gary Pearce, KN4AQ, has been involved with one of the BPL tests now under way, and offers this beginner's guide to BPL interference.

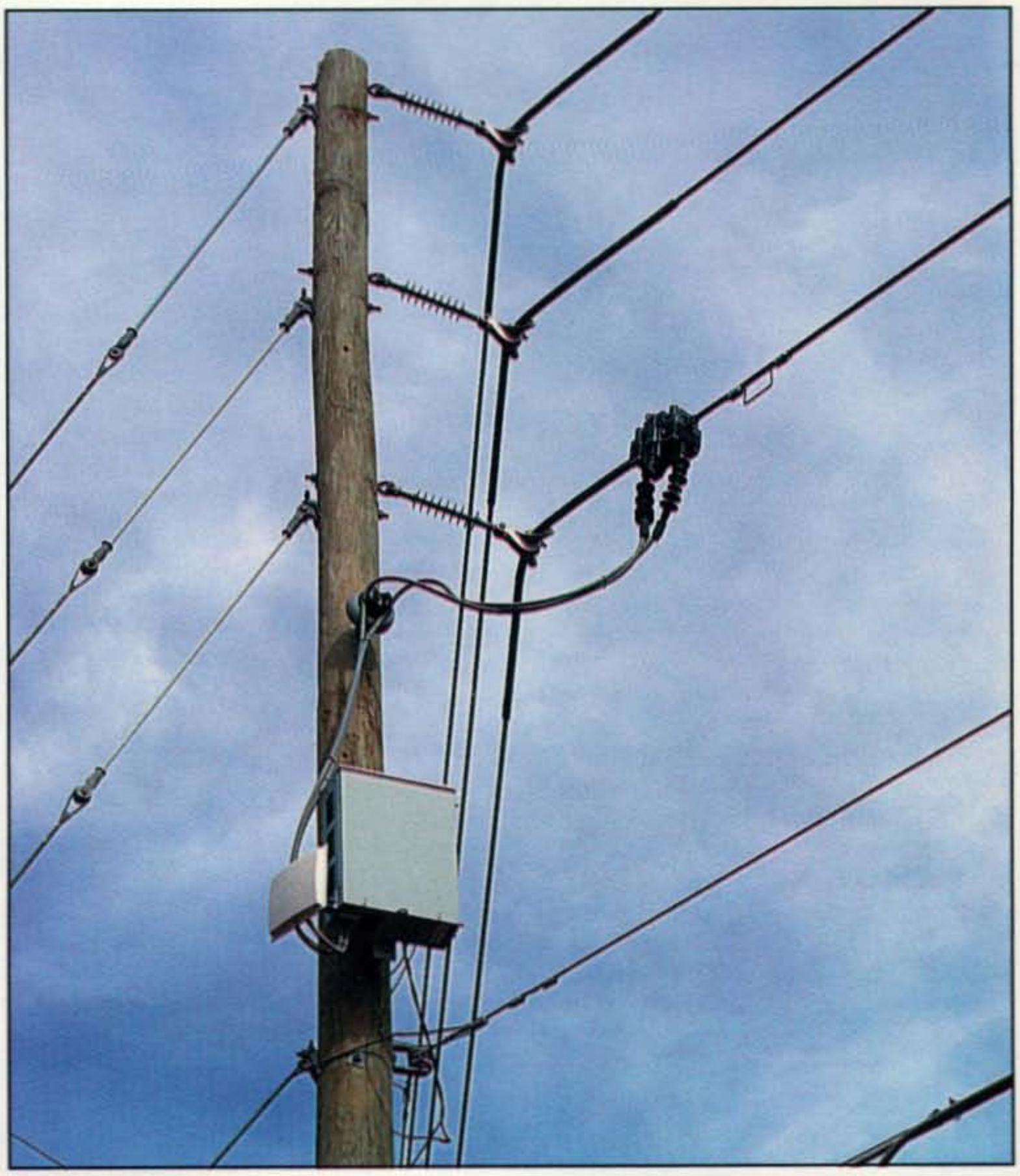
BPL Primer:
How Do I Know What I'm Hearing?

BY GARY PEARCE,* KN4AQ

Everybody's talking about BPL—Broadband over Power Lines—but few hams have actually heard it in person because there are still only a few active trial areas in operation. Thus, there are a lot of questions. Here in the Raleigh, North Carolina area, we've been "fortunate" enough to have a BPL trial nearby, courtesy of Progress Energy, and several of us have become intimately familiar with what one system sounds like and how it operates.

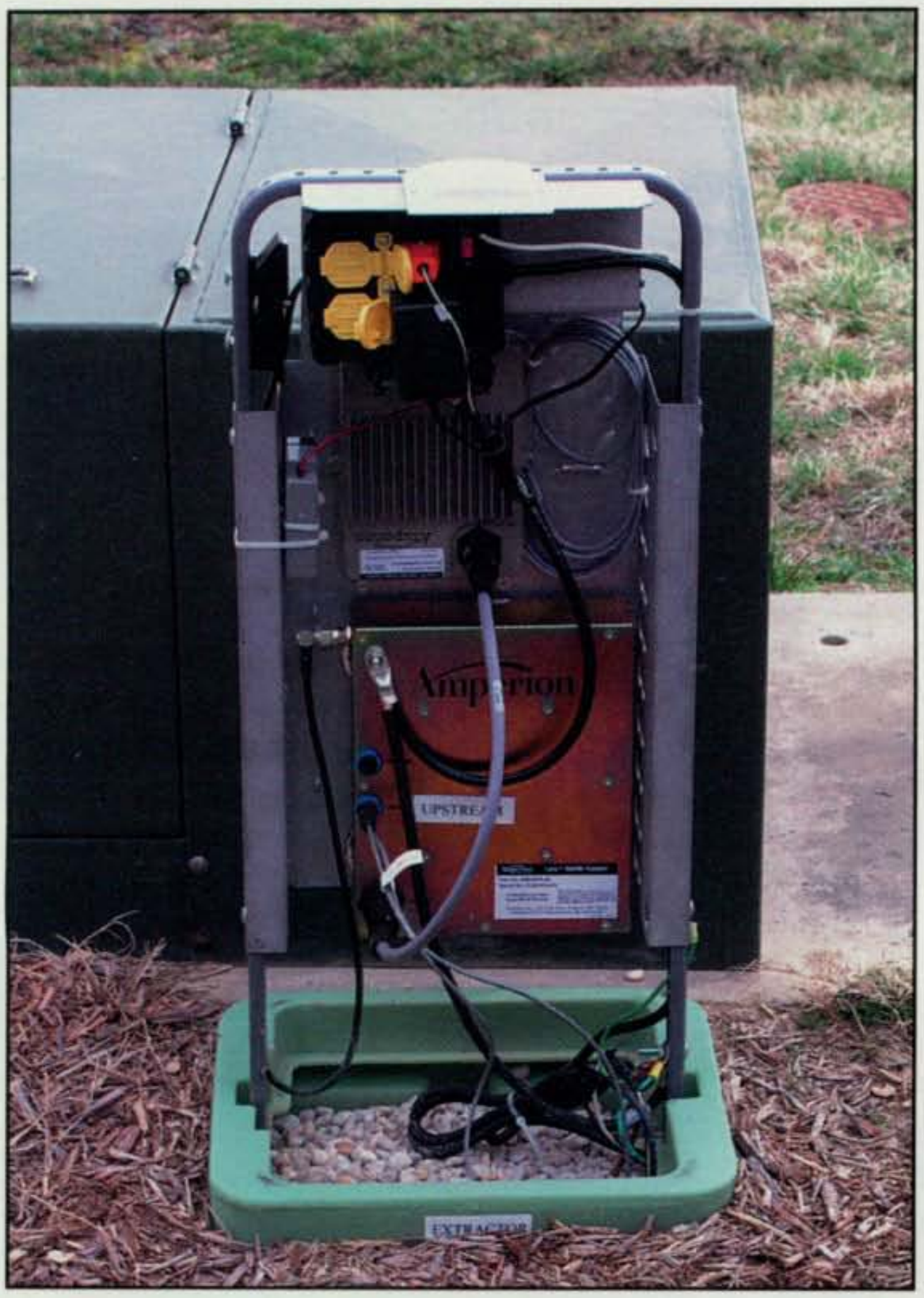
BPL is a means of delivering broadband internet data to homes and businesses using the power lines as the transmission medium. The other methods of delivery are the telephone lines (DSL, or Digital Subscriber Line service), cable TV, and wide-area microwave. BPL will be carried on the "local" power lines, feeding neighborhoods and business districts, not the big "high-tension" lines that carry power across a region. To be really specific, I'll call this "Access BPL." There are two other flavors of BPL—"in-house," where BPL is used to distribute data inside a home or office using the AC power wires, and PLC (Power Line Carrier), which uses very low-frequency signals (below 200 kHz) to send low-speed data across the power lines. Energy companies use PLC to control their networks. I'll mostly be talking about Access BPL here, but some of the same problems occur with in-house BPL.

DSL, cable, and BPL all use radio-frequency energy to carry their data, and they have a variety of modulation schemes. DSL and cable haven't come



The box on this power pole is called an "injector" and it injects the BPL signals onto the overhead power line. The small white box on the left of the bigger gray box is a Wi-Fi antenna, which receives data from a substation a few blocks away. It is then inductively coupled to one phase of the power line with the two big clamps seen on the wire. (Photos by the author)

*116 Waterfall Court, Cary, NC 27513
e-mail: <kn4aq@arrl.net>



Inside the BPL "extractor," the broadband signals are taken off the power line and fed to a "Wi-Fi" antenna for final transmission into subscribers' homes. Amperion uses Wi-Fi for this last leg; other companies take the signal all the way into each house on the power line.

under fire for causing interference because they generally use lower frequencies (below 4 MHz), and because they don't radiate much signal. The TV cable is shielded, and the phone lines are balanced. If you go looking for signals with an antenna close to the lines, you'll probably hear something.

BPL is causing bigger problems because it uses more of the HF spectrum (from 2 to 80 MHz is the common description), and because the RF is placed on unshielded power lines, where it can radiate like any other antenna—and it *does* radiate.

There are four principal vendors offering BPL equipment, and each uses a somewhat different technical scheme. I'll describe in detail the one with which I'm most familiar, and then tell you a little about the others.

Progress Energy is using a system manufactured by Amperion (www. amperion.com). It places a series of close-spaced carriers, about one kHz apart, on the power line. Most of the time they are just clean, unmodulated carriers, although I hear a clock signal, a little tick-tick-tick at about 2 Hz, on many of them. Occasionally I'll also hear what sounds like a burst of data "ring" across the carriers. The trial system I've observed has few subscribers. The carriers are always present, but would carry the sound of more data if they were more heavily used.

The carriers are placed on the power line in two "blocks" of spectrum. One block, used for downloading data, is 3.5 MHz wide. The other, for upstream data, is a bit smaller, 2.5 MHz wide. These two blocks carry the BPL signal for about 2000 feet, where it is picked up by a "repeater" and converted to two new spectrum blocks for the next 2000-foot run. The two blocks on one wire can be anywhere in the available spectrum, which for Amperion is from 2 to 50 MHz, and they can be as close as 100 kHz apart. A block of spectrum can't be reused for several 2000-foot legs of power line so that one repeater is sure to hear data only from its adjacent neighbor.

A BPL system can bring the data on the power line right into your building. In that case, you plug a BPL modem into any AC outlet, and connect an Ethernet cable between the modem and your computer. Amperion and Progress Energy don't bring the BPL that far. They have standard wireless networking (802.11b "Wi-Fi") nodes scattered about their trial neighborhoods, and users receive the internet via this 2.4-GHz connection.

How Much Interference is There?

Once again, the BPL RF placed on the power lines *does* radiate. The Progress Energy trial uses a half-mile of overhead power line along the main highway to bring BPL to a neighborhood. Then the signal goes onto buried lines for distribution to the homes, with repeaters in ground-mounted pedestals. They have been using spectrum near 25 and 29 MHz for the overhead line, and many blocks of spectrum from 6 to 31 MHz on the buried segments. Most of those spectrum blocks cross ham bands.

My mobile, driving along the road directly under the line, receives a signal strong enough to obliterate all but the loudest ham signals on 10 meters, in this case. When I turn and drive away from the line, the signal fades quickly and is barely audible at about 400 feet. There are no hams living in our trial sites, but hams a half-mile to three-quarters of a mile away, using dipole antennas, are receiving weak but audible signals from the overhead line.

Inside the neighborhood, I can hear signals from the buried line when I'm within a hundred or so feet of one of the pedestals. The signal is audible, but never very strong. Our hams living a half mile away do not hear the signals from the buried lines, and again there are no hams *living in the* trial neighborhoods, so we can't test how well a home station in the immediate vicinity of buried lines would hear those signals. (*It's important to note that underground electric lines and feeders that come up from the ground have much less interference potential than overhead lines with "drops" to each building. A BPL system in an area fed by overhead lines would be* much *noisier.—ed.*)

The Other Systems

Ed Hare, W1RFI, the ARRL's lab manager, is probably the ham most familiar with BPL, and he filled me in on the other systems. Ambient Corporation (www. ambientcorp.com) uses the same technology as Amperion, but it brings the BPL signal into the building on the power line, so its system uses more spectrum.

Main.net is different, using a spread-spectrum system that sounds like a clicking Geiger counter. Ed observed a Main.net system using 3 to 25 MHz continuously. Duke Power, which serves western North Carolina, is about to test a Main.net system in Charlotte, and an engineer told me it would use from 2 to about 9 MHz.

Current Technologies (www.currenttechnologies.com)

uses HomePlug equipment (HomePlug is an in-house BPL system), with RF from 4 to 20 MHz, and notches or RF "masks" to reduce radiation on the ham bands.

Interference Mitigation

The FCC's recent Notice of Proposed Rule Making (NPRM) on BPL (see this month's "Washington Readout" column for details) proposes that BPL operators must be able to reduce power, move in frequency, or turn off their systems by remote control in response to complaints of interference. Amperion's engineers claim to be able to do that now, although they were unable to demonstrate that during our visit. The 12- and 10-meter signals have remained on the overhead lines for more than 60 days, despite calls to the power company's customer-service center to complain (it's possible, since this is just a test, that the customer-service reps haven't yet been trained on how to deal with BPL interference complaints). We have begun filing more formal complaints with Progress Energy lawyers and the FCC. Promptness and effectiveness of response to interference complaints is as great a cause for concern as the technology itself.

Another problem is a lack of understanding by the utilities of how hams operate—that we don't use just a few discrete frequencies that can easily be notched out, and that we often tune the bands, searching for weak signals, signals that would be covered over by an increase in the noise floor.

The Biggest Unknown

One area of great concern for hams (as well as other HF spectrum users) is also the one about which the least is known: skywave, or "BPL skip." The BPL signals are essentially QRP (low power) radio transmissions. We hams know from broad experience that QRP signals are capable of being propagated over very long distances. Any HF signal strong enough to be heard a half mile away on a simple dipole antenna is also strong enough to travel up to the ionosphere and be bent back to Earth hundreds or thousands of miles away.

As of yet, there have been no studies of BPL skywave. What will happen when QRP signals from a BPL system in North Carolina bounce off the ionosphere and come back to Earth in New York, causing interference to an HF signal from an aircraft over the Atlantic Ocean? What happens when a shortwave listener in Texas can't tune in Deutsche Welle (Germany's shortwave broadcast service) because of interference from a BPL system in Pennsylvania? And when multiple systems are active, will it be possible to identify individual signals in order to determine their source and file a complaint? Or will there just be that much more noise on the bands—a higher noise floor—making it impossible to hear weaker shortwave signals, ham signals, aircraft, or military signals, and equally impossible to identify the source of the interference?

Hams everywhere need to start listening to the HF bands for the telltale sounds of BPL signals (as described here and heard on W1RFI's tape on the ARRL website, www.arrl.org) even if there are no test sites nearby, and reporting suspicious signals to the ARRL, which hopefully will be able to track down the source and pass along any interference complaints.

To Learn More...

For more detail on BPL, including my very brief meeting in February with FCC Chairman Michael Powell, see "The BPL Dilemma" in the upcoming Spring 2004 issue of *CQ VHF* magazine and on the *CQ VHF* website at <http://www.cq-vhf.com>. There is also a link to the article from the May highlights page on the *CQ* website at <http://www.cq-amateur-radio.com>. Plus, we have an MP3 file with a sample of what Amperion's BPL signals sound like on the air, narrated by yours truly. It's on the web at <http//www.cq-vhf.com/BPL.html>. In addition, see W5YI's "Washington Readout" column this month (on page 34) and N6CL's "VHF-Plus" column in the April issue of *CQ*, on page 62. ■

BPL Comment Deadline May 3

The FCC Notice of Proposed Rule Making on BPL, ET Docket 03-104, was published in the Federal Register on March 17. Comments are due by May 3, with reply comments due by June 1. We urge you to learn all you can from articles here and elsewhere, read the NPRM, and file comments via the FCC's Electronic Comment Filing System, or ECFS, at <http://gullfoss2.fcc.gov/ecfs/Upload/>.

If you're active in DX contests, chances are you've worked one of the "big gun" contest stations in D4, Cape Verde. Globetrotting author/photographer SMØJHF decided to pay the islands a visit and find out more about Cape Verde, the hams who live there, and the hams who don't...

Ham Radio on Cape Verde

BY HENRYK KOTOWSKI,* SMØJHF

Most people who see my pictures from Republica de Cabo Verde (The Islands of The Green Cape) exclaim with surprise, "The islands are not green at all!" The truth is that they're not. The climate has changed in this area since the islands were discovered, named, and colonized by the Portuguese.

I became interested in Cape Verde sometime in 1998 mainly because of its music, which is a mixture of African rhythms, Portuguese blues (known as *fado)*, and Caribbean *calypso*. I sent an e-mail to Julio, D44BC, and he promptly informed me, "a visitor's license is impossible." About that time I saw an in-flight movie, *Mission Impossible,* which inspired me to believe that there are no impossible things.

I contacted the Embassy of Cape Verde at the end of 1999, and a few months later, in March 2000, they telephoned me and asked me to come by and collect my D44CF amateur radio license. Julio, D44BC, had become a Silent Key in October 1999. Had he actually been hampering the issuance of licenses to visitors? Some people say so.

Several Sets of Helping Hands

I flew to Cape Verde for the first time in November 2000. The final international leg went from Amsterdam to Sal, the flat island with an international airport. It was a TACV flight, the Cape Verdian airline for which one of the late D44BC's sons, Aginaldo VeraCruz, is a pilot. From Sal we were supposed to fly a smaller aircraft the same evening to Sao Vincente Island, but in spite of having booked the seats, I spent one night in Sal at the airline's expense.

The focus of my first visit was the new house built by Carlos, D44AC, nicknamed "Pulu." Our group—Waldemar, SMØTQX; Manolo, EA8BYG; Jose, EA8EE; and myself—stayed nearly a week in Mindelo, the main town of Sao Vicente, and helped get Pulu on the air. Waldemar repaired the rotator, and we all lifted the old triband antenna and worked the HF and 6-meter bands. I made a 300-foot longwire and could work all bands from 6 to 160 meters during the three weeks I stayed in Mindelo. Pulu's hospitality and generosity were just great.

Later I flew to the island of Sao Tiago and visited Angelo, D44BS, who, being close to the government, managed to arrange a short contest callsign, D4A. He did it to please the two Italians who guest operated from his station in the 2000

Black-and-white image of Julio, D44BC, now a Silent Key. (Courtesy Ondina VeraCruz)

CQ WW Contest: Alberto, IV3TAN, in the SSB part and Georgio, I2VXJ, on the CW weekend.

Alberto, IV3TAN, was looking for a better place for contesting from D44, and in October 2001 he came along with a few friends to the house that Xara, CT1EKF, was building in Santa Maria on the island of Sal. They arranged licenses

Pulu, D44AC, in the well-equipped radio room of his new house in Mindelo, Sao Vicente Island, November 2000 (All photos except D44BC and D44CF by the author)

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Pulu, D44AC (left), and his family with the city of Mindelo in the background, along with the 774-meter-high Monte Verde, where the D4B contest station was built in 2002 by Al, 4L5A/D44TT, and Nodir, EY8MM.

An international team of hams helps raise Pulu, D44AC's tribander on his new house. From left: Manolo, EA8BYG; Waldemar, SMØTQX; Pulu, D44AC; and a local boy, Nevi.

and were issued the following callsigns: Gabrielle, IK4UPB – D44TA; Fabio, I4UFH – D44TB; Alberto, IV3TAN – D44TC; and Xara, CT1EKF – D44TD. Using Alberto's D44TC callsign, the group participated in, and won, the 2001 CQ WW DX SSB Contest Multi-Single category. I spent a week with the group and later flew to Mindelo and visited Pulu, D44AC, again. He likes entertaining visitors, so when I returned home, I put suitable information on the web.

Very Serious Visitors

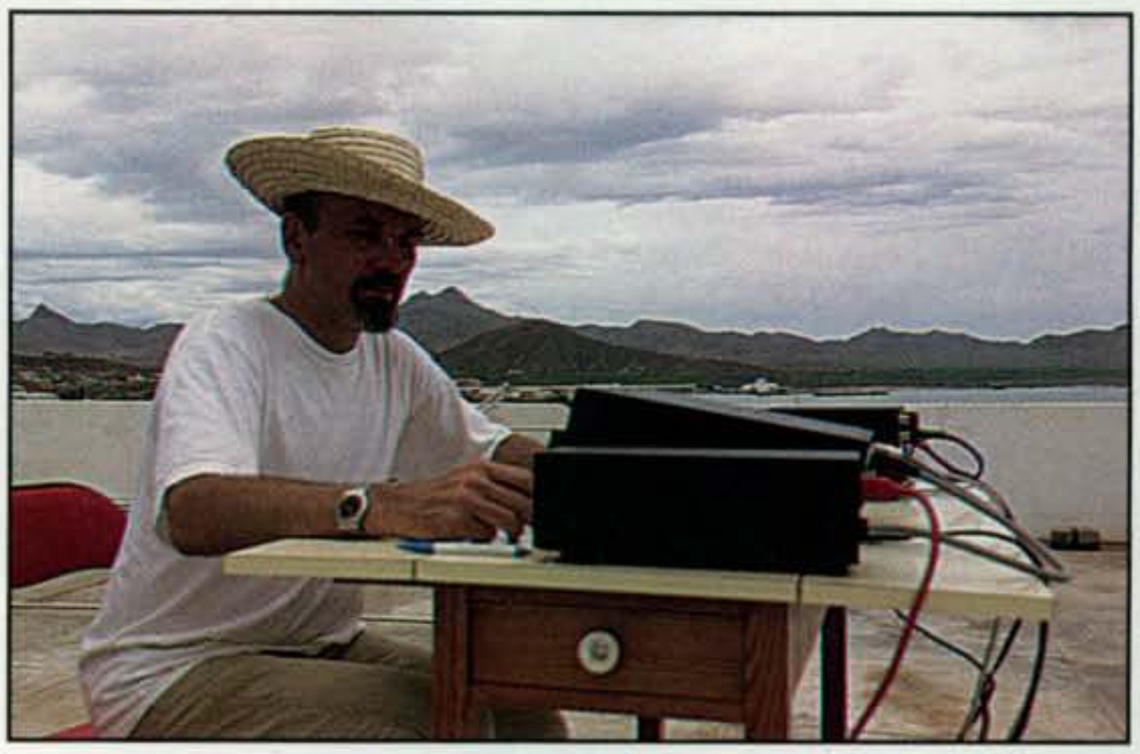
A few months later, two very serious visitors came to see Pulu—Al, 4L5A, and Nodir, EY8MM. They brought a lot of equipment, erected a few antennas on the highest point of the island, and Al won the 2002 CQ WW WPX SSB Contest Single Operator, Single Band category on 10 meters as D44AC.

In the fall of the same year, they brought even more equipment and more antennas and had a small house built on top of Monte Verde (at 774 meters). It turned out to be a very advanced contest station with three large multiband quad arrays and verticals. Pulu arranged a short contest callsign for them, D4B, and Al also received his own temporary callsign, D44TT. He has done extremely well in recent contests and has been in almost all the major ones, including the CQ WW Contests, and also winning the world Single-Op, All-Band in the 2003 WPX CW Contest and setting a world record in the process (see <http://www.qsl.net/d44tt> for more). Today the antenna farm includes multi-element arrays for the 160- and 80-meter bands.

Italian guest operators keep Xara's D44TD callsign on the air in many contests, too. Two big guns from the same DXCC entity is nothing any ambitious contester investing a huge amount of money dreams of. The pileup gets divided roughly by two, and the QSO rates and final results suffer. Still, it doesn't seem to have hurt D4B too much!

The authority issuing licenses in Cape Verde makes things even more confusing. Last year the same callsign (D44TA) that Gabrielle, IK4UPB, had received in 2001 was issued to an Austrian group that was active for a few days from Sao Tiago. The policy is to issue a D44T... (temporary) callsign

Inside the radio corner of their living room, Zizi, D44BW (left), and Angelo, D44BS (right), with the equipment brought by Alberto, IV3TAN, and Giorgio, I2VXJ, for the 2000 CQ WW DX Contests.



The author on the air as D44CF from Mindelo, Sao Vicente Island. (Courtesy of Pulu, D44AC)

Alberto, IV3TAN/D44TC (wearing the white CQ WW T-shirt), watches from the doorway as a Cape Verdian TV crew shoots Matteo, IK2SGC (left), and Fabio, I4UFH, at the run station of their Multi-Single effort during the 2001 CQ WW DX SSB Contest.

for six months, and if the license is not renewed, the same callsign can be issued to someone else.

In the past few years the amateur radio situation in Cape Verde has changed radically. According to my research, there are nine active licenses—issued to not-so-active native operators and to a few very active visitors. They are: Vlademiro, D44CA, and his wife Raquel, D44CC; Pulu, D44AC; Angelo, D44BS, and his wife, Zizi, D44BW; Xara (CT1EKF) and his guests, D44TD; Al (4L5A), D44TT and D4B in contests; and mine, D44CF.

Angelo, D44BS, who is 70 years old, spends much of his time in New England, where his daughter lives. Daniel, D44AB, has lived in the U.S. for many years and has not been on the air from Cape Verde for a very long time. He told me once, though, that he occasionally listens to amateur radio stations.

The Cape Verdian authorities' approach to amateur radio makes me think of some oil-producing countries: They don't know what to do with it themselves, but since others are interested in it, it gives an imaginary feeling of being important. The legal act regarding amateur radio in Cape Verde is dated December 30, 1997 and is called Decreto Lei No.77/97; the office issuing permits is called Direccão Geral das Comunicacões, and its address is C.P. 07, Praia, Cabo Verde. ■

If You Visit...

There are several flights from the U.S. to Sal. The U.S. Embassy is located in Praia, Sao Tiago. The Cape Verdian community in the U.S. is probably larger than the population at home. During the first half of the 20th century more than 100,000 people starved to death in Cape Verde, which was a province of Portugal until 1975.

Today tourism is a growing business and the most up-to-date information can be found in a brand new travel guide, *The Bradt Cape Verde Islands Travel Guide*, by Aisling Irwin and Colum Wilson.

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Maldol NEW EX-510B/EX-510BNMO • Tri-band 6M/2M/70cm with fold-over • Gain & Wave: 52MHz 1/4 wave 146MHz 2.15dBi 1/2 wave 446MHz 5.5dBi 5/8 wave x 2 VSWR • Length: 37" • Conn: PL-259 or NMO style • Max Power: 50W FM

COMET **SB-15** • Tri-band 6M/2M/70cm with fold-over • Gain & Wave: 52MHz 0dBi 1/4 wave • 146MHz 4.5 dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

NEW

NEW UHV-4 • Quad-band 10M/6M/2M/70cm with fold-over hinge • Gain & Wave: 10M & 6M 1/4 wave 2M 2.15dBi 1/2 wave 70cm 5.5dBi 5/8 wave x 2 • Length: 55" • Max Power: 10M 120W SSB 6M2M/70cm 100W FM • Conn: PL-259

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Maldol NEW AX-75 • Dual-band 2M/70cm w/fold-over
• Gain & Wave: 2M 1/2 wave center load 3.2dBi • 70cm 5/8 wave x 2 5.7dBi • Length: 30" • Conn: PL-259 • Max Power: 60W

NEW

Maldol NEW AX-95 • Dual-band 2M/70cm w/fold-over
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COMET SBB-2/SBB-2NMO • Dual-band 146/446MHz
• Gain & Wave: 146MHz 2.15dBi 1/4 wave, 446MHz 3.8dBi 5/8 wave center load • VSWR: 1.5:1 or less • Length: 18" • Conn: SBB-7 PL-259/SBB-7NMO NMO • Max Pwr: 70W

Maldol NEW EX-107B/EX-107BNMO • Dual-band 146/446MHz
• Gain & Wave: 146MHz 2.6dBi 1/2 wave, 446MHz 4.9dBi 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 29" • Conn: PL-259 or NMO Style • Max Pwr: 100W

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

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

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Results of the 2003 CQ WW RTTY DX Contest

BY GLENN VINSON,* W6OTC, AND JOE WITTMER,† K9SZ

The 17th Annual CQ WW RTTY DX Contest was held September 27– 28, 2003 with solar Cycle 23 continuing its slow decline. However, with solar flux still hovering around a respectable level of 138 and atmospheric noise fairly low, participation soared. More than 1140 logs—by far the largest participation in *any* RTTY contest in history—were submitted, and many new regional (notably, Single Op High Power Oceania and North America) and world records were set, including Single Op 21 MHz, Single Op 7 MHz, and Multi-Single High Power, and most impressively an extraordinary new Single Op High Power world record. As in prior years, interest in this contest continues to grow as new participants from the CW and SSB CQ WW DX contests add RTTY to their repertoire and overall RTTY contesting skills continue to improve.

Single Operator

Single Operator, High Power (SOH). After having seen big new Single Operator records established in 2000 (SOH) at EA8BH by Tim, N4GN (5.012 million points), and again in 2001 (SOL) at P43P by Tyler, K3MM (5.578 million points), the Single Operator bar was raised this year by the contesting equivalent of a full order of magnitude when D4B (Op: EY8MM) in Cape Verde scored an incredible 7,384,560 points (3544 QSOs, 696 mults). Operator skill, location, and a continually increasing number of RTTY contesting participants were all factors in this great win. Nodir deserves our hearty congratulations. From Hawaii, Mike, KH7X (Op: KH6ND), moved from world third in 2002 to world second, beating his own 2002 Oceania record with an excellent score of 3,886,200 points (2176 QSOs, 591 mults). This performance confirms that KH6 is not a disadvantaged place from which to work CQ WW RTTY (see Mike's soapbox comment). Barry, W2UP, was world third, moving back to the SOH class from two years in SOL, winning the North America championship with a new record score of 3,818,880 points (2323 QSOs, 663 multipliers). This score was 600,000 points higher than Barry's 2002 NA SOL record and about 150,000 points higher than AA5AU's NA SOH record. Continuing the geographic distribution in this class, 5B4AGN won world fourth from Cyprus (3,438,756 points), while world fifth was won from Europe by RK4FF (3,028,965 points).

Single Operator, Assisted (SOA). Scores in SOA decreased across the world this year, perhaps raising the issue of how useful packet or other spotting assistance was in this year's contest (see AA5AU's comments in the soapbox). Masa, JH4UYB, moved up from world second to world first with a score of 2,699,550 points. Ulf, DL5AXX, dropped from world first to world second with a score of 2,681,662 points. Don, AA5AU, was a surprised, although not such a happy, entrant in SOA category, winning world third with a score of 2,329,440 points.

Single Operator, Low Power (SOL). Most scores in SOL showed no improvement over prior years. With solar flux in decline the bands are still open, but with lower power, particularly for RTTY, it is more of a challenge to high run rates than it is for high power. The winner in SOL was Jacobo, P43P, with a score of 3,449,640 points. World second was perennial Brazilian champion Wanderley, ZX2B (Op: PY2MNL), achieving a score of 3,150,072 points. Mohamed, CN8KD, won world third from Morocco with a score of 2,291,943 points.

Single Operator, Single Band 28 MHz (28). Ten-meter scores reflected the reality of lower solar flux; namely, stations whose major paths are north-south will do relatively better in

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†e-mail: <k9sz@wittmer.us>

Chris, N1XS, Yankee Clipper Contest Club vice president, at K1TTT station #1. The K1TTT team was the world champion in the Multi-Op, Single Transmitter, Low Power category.

Lianna, the 7-year-old daughter of Mike, KA4RRU, at the 10-meter station during the contest. Notice her finger on the F2 key; she was actually working guys while Dad was next to her to help. The KA4RRU team operated Multi-Multi.

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TOP SCORES

Single Op High Power

D4B (Op: EY8MM)	7,384,560	5B4AGN	3,438,756
KH7X (Op: KH6ND)	3,886,200	RK4FF	3,028,965
W2UP	3,818,880		

Single Op Low Power

P43P	3,449,640	ON4ADZ	1,999,386
ZX2B (Op: PY2MNL)	3,150,072	CQØT (Op: CT1ILT)	1,735,690
CN8KD	2,291,943		

Single Op Assisted

JH4UYB	2,699,550	DK3GI	2,180,790
DL5AXX	2,681,662	JY9QJ	2,122,514
AA5AU	2,329,440		

Multi-Op Single Transmitter High Power

P3A	6,624,885	RL3A	3,397,941
HG1S	3,799,764	OH1F	3,121,765
OM5M	3,507,518		

Multi-Op Single Transmitter Low Power

K1TTT	2,565,760	FG/EA2RY	1,742,820
PJ2P	2,295,503	DL2DBH	1,374,912
KP2D	1,898,016		

Multi-Op Two Transmitter

HC8N	9,284,716	9H3M	3,487,040
RU1A	4,921,264	PI4COM	3479,938
RM6A	3,944,290		

Multi-Op Multi-Transmitter

LY5A	6,033,786	KA4RRU	3,505,480
K9NS	5,775,588	OL7R	3,428,436
RK2FWA	5,711,146		

Single Operator

3.5 MHz

S54E	104,857	HA8BE	66,384
NB1B	70,224	EU1AZ	56,000
9A7R	66,450		

7.0 MHz

S50A	334,558	HA1A	225,720
OL5Q (Op: OK1HRA)	248,115	V8A (Op: JO1RUR)	203,814
S51DX	238,710		

14 MHz

9A2DQ	495,830	SP4TXI	284,004
IT9BLB	402,727	VE2RYY	282,129
YU7NW	293,880		

21 MHz

9A5W	686,742	S57IIO	453,944
EO6F (Op: UXØFF)	505,352	IK4MHB	440,680
S51FB	466,200		

28 MHz

LU1HF	611,902	LU9EV (Op: LW9DMM)	195,909
LW7EIC	305,613	K4EA	134,168
HC1JQ	234,610		

To his surprise, Jim, AD4EB's XYL Melody delivered dinner, with table, to the shack during the contest so he could eat and operate at the same time. Also pictured is a family friend, Sarah. Jim entered the contest in the Single Op, All Band, High Power category.

Charlie, KI5XP, operated Single Op, All Band, High Power from W5WMU. He looks like nobody brought him dinner!

low solar flux times than those who depend on east-west propagation. Accordingly, it was no accident that LU1HF repeated as world first at 611,902 points—a fine score, but short of his own world record. Second was LW7EIC with 305,613 points. Completing the South American sweep, in world third place was HC1JQ with a score of 234,610 points.

Single Operator, Single Band 21 MHz (21). In contrast to 10 meters, a new world record was set on 15 meters. Three-time winner Nikola, 9A5W, not only continued his dominance, but again set new world and Europe SO 21 records with a score of 686,742 points. Nikolay, UXØFF, operating this year as EO6F, remained world second with a score of 505,352 points. Third in the world was S51FB, scoring 466,200 points.

Single Operator, Single Band 14 MHz (14). Twenty-meter scores were down in 2003. The world winner was veteran (and two-time past world winner) 9A2DQ, scoring 495,830 points. World second was IT9BLB with 402,727 points. In third place was YU7NW, who made 293,880 points.

Single Operator, Single Band 7 MHz (7). After several years of predicting better results for the low bands, we were finally rewarded with a new world record this year. S57AW's 1999 world record score of 245,055 points was decisively beaten by Tine, S50A, who repeated as world winner and scored 334,558 points. However, we will again fearlessly predict that this record will be in jeopardy for each of the next few years as the solar flux stays relatively low. For example, Dan, OL5Q, also beat the old world record, although coming in second this year with 248,115 points. Europe completed its dominance on 40 meters with S51DX coming in world third with 238,710 points, also almost equaling the old world record.

Single Operator, Single Band 3.5 MHz (3.5). On 80 meters, the 1997 world record of GIØKOW, at 137,862 points, continues to reign supreme. However, this cannot last. This time S54E

moved up from second to first place with 104,857 points. NB1B, in a breakthrough for a North America station, won world second and set new USA and North America 3.5 MHz records with 70,224 points. 9A7R won world third with 66,450 points.

Multi-Operator

Multi-Operator Two Transmitter (M2). For the third year running, the M2 class has produced the largest score in CQ WW RTTY, and HC8N has repeated as the winner. This year's crew (Ops: N5KO, W6OTC, N6OJ) made 9,284,716 points (4189 QSOs, 746 mults). Repeating as world second this year in M2 was the veteran RTTY contesting team at RU1A (Ops: RA1ACJ, UA1AKC, RW1AC, RA1ARJ, RN1AM, RU1AA, UA1ARX, UA1ANX), who scored 4,921,264 points. RM6A (Ops: RN6BN, RA6CM, RA6CO, RU6CQ, RN6AA) placed third with 3,944,290 points.

Multi-Operator Multi-Transmitter (MOM). MOM is the hardest class to enter because of its requirement of multiple transmitters and antennas, all working with minimal inter-station interference, for the full 48 hours of the contest. Successful MOM stations require an enormous amount of work to set up and maintain, and lots of skilled operators to keep on the air throughout the contest. One station that has met this challenge is LY5A (Ops: LY2PAJ, LY2IJ, LY1BA, LY2KW, LY3MM, LY2BIG), which repeated this year as the world winner with 6,033,786 points (3360 QSOs, 726 mults). World second was K9NS (Ops: K9DX, K9HMB, K9PW, K9RO, KG9X, KS9W, N9BR, N9NCX, W9MU), scoring 5,775,588 points and moving close to W3LPL's 1999 NA MOM record of 6,280,423 points. RK2FWA (Ops: RA2FA, RN2FA, RV2FW, UA2FB, UA2FF, UA2FM, UA2FX), from Kaliningrad, followed very closely behind with 5,711,146 points.

Multi-Operator Single Transmitter, High Power (MOH). Each class of multi-operator, single transmitter receives a large number of entries every year, many more than the other multiple-operator classes. This year in MOH the winner was the well-known Cyprus station P3A (Ops: RA9JX, RW9CF, UA9CDV, UA9CGA), which established a new world record with 6,624,885 points (3242 QSOs, 705 mults). This was a great performance from AS, overtaking the 2000 world record previously held by HC8N. Last year's MOL winner, HG1S, moved to MOH and exceeded its 2002 MOL score, but was world second in 2003 MOH at 3,799,764 points (the 2003 Ops: HA1TJ, HA1DAE, HA1DAC, HA1DAI, HA3UU, HA3LN, HA1SN, HA1AV, HA1AR, HA1SD). Close behind in world third place was OM5M (Ops: OM3RG, OM2RA, OM2KW, OM4DW), with 3,507,518 points. As we mention annually, the 1999 KH7R Oceania (2. mm points) and 1996 TY1RY Africa (2.7mm points) MOH records continue to survive without serious challenge.

Multi-Operator Single Transmitter, Low Power (MOL). While the second largest multi-op category is MOL, no new records were set in 2003. K1TTT (Ops: K1TTT, K1MK, N1MM, N1XS, N2AMG, WØBR, W1TO) moved up from world fourth in 2002 to world champion in 2003, scoring 2,565,760 points, just shy of their 2002 U.S. record score. World second was the team at PJ2P (Ops: NH7C, DL6LAU, KD4FRP, KG6ITP), with a score of 2,295,503 points. Repeating as world third was KP2D (Ops: KP2N, NP2M, NP2W, NP2DJ, NP2DZ), achieving a score of 1,898,016 points.

Summary

This RTTY contest remains "The Big One," with more entries, more contacts, more mults, and more action than any other RTTY contest. To check out all-time CQ WW RTTY Records, go to <www.rtty-contesting.com>, maintained by Don, AA5AU. For comments by participants, see the soapbox below.

We continue to progress with the electronic submission of logs, with *approximately 99% of all logs (and 100% of competitive logs) submitted via e-mail* to **<rtty@cqww.com>**. However, because the participation in this contest continues to grow so rapidly, some newer participants still have problems with recording the required exchanges (for example, including state/province and zone information) and submitting logs in proper Cabrillo format. The major problem this time was inattention to including all required log information when generating a Cabrillo format log from popular programs such as MMTTY. If the submitted log does not include all of the critical exchange data (including zones, states, provinces) from the raw log, the log-checkers can do little to salvage the log. Accordingly, ***please carefully follow the instructions in your logging software (or your Cabrillo-conversion program) to be sure that all of the required fields have been included in your final log before submitting it to the robot.***

Around 300 other logs received some editing by Joe, K9SZ, and Trey, N5KO, to correct other issues, while Paulo, I2UIY, and Chuck, N6OJ, converted non-Cabrillo logs to Cabrillo format prior to their being submitted to the master log-checking process.

As in 2002, we received a large number of checklogs which were very helpful for log checking. Thanks to all who submitted these logs.

The 2004 CQ WW RTTY Contest

The 18th Annual CQ WW RTTY Contest will be run on September 25–26, 2004. Please note that *Cabrillo*-format logs are *highly* encouraged for *all* entrants, with ***e-logs required from all potential high-scoring entrants in any category. Also, any computer-generated log with more than 100 contacts must be submitted via e-mail or on a 3.5" diskette via snail mail.*** For those who submit diskettes, please remember to send the diskettes in a protective envelope. E-mail is clearly the most reliable and easiest mode for log submissions, but we welcome all logs, including (subject to the restrictions described above) paper logs, no matter

how they may be sent. Finally, the ***deadline for log submissions is November 12, 2004.*** The full text of the 2004 rules will be published in the July issue of *CQ* and on the *CQ* website at <www.cq-amateur-radio.com>. Please read the rules carefully prior to the contest, and please note that *all* logs submitted via e-mail go to **<rtty@cqww.com>.**

73, Glenn, W6OTC, and Joe, K9SZ

Soapbox

D4B ... Many thanks to all who helped me make this operation possible, particularly 4L5A (for letting me use his station), EY8CQ, and D44AC. *JH4UIB* ... Great activity. *W2UP* ... I have a feeling this could be the last year of increasing scores for a while. The great increase in RTTY contesting activity has to be offset by decreasing sunspot activity sooner or later. *9A5W* ... Saturday conditions were bad; Sunday was much better. I got a better score than in 2002 when I set a record. *KP2D* ... Not as good as last year's record-setting effort. We were hampered by equipment problems during the contest that caused loss of operating time. Looking forward to next year's contest. *CT1ILT* ... Tnx to K9SZ, Joe, for converting my log into Cabrillo; I am only 17 years old. *AA5AU* ... I'll never go Assisted again in this contest. It took away from my concentration and my lack of experience using the cluster in a major contest hurt me. I was chasing stuff I shouldn't have been even looking for.

W1ZT ... Best score ever. In spite of declining propagation the activity was the best I've seen. Thanks to all for the contacts and to the sponsors for their continued support. *N6TQS* ... 40 was great. I need an amp if I want to play on 80. *5B4AGN* ... what a blast this was! Ten meter propagation was way beyond my expectations with lots of loud signals. It was a heap of fun. *KI6DY* ... Even with the new AA5AU rtty.dta file there are still a lot of undetected calls. Great; means more new RTTY contesters. *S50A* ... Score this year higher than last despite high bands staying open long into the night. It seems that more and more stations are on RTTY. Sorry for those who couldn't be pulled out of the EU QRM. *W4GKM* ... RTTY operators are really polite. I did not experience anything but complete politeness at anytime during the contest. *PI4COM* ... First 12 hours we had Murphy around practically eliminating one of the two stations. The remaining 36 hours were more or less trouble free. It sure was fun.

NB1B ... My first serious effort at this. Using the great 80m 4-square in W1KM's saltwater marsh helps more than a little. *K8RT* ... Great contest with the bands wide open most of the time. *W6JOX* ... Operated only first 24 hours. Getting too old for 48-hour operation. Conditions seemed to be unusually good from the black hole of California. *SM1TDE* ... Very nice indeed. Worked 11 new DXCC entities bringing my total on RTTY up to 139. Biggest thrill was working V8A on 40m. *WM7A* ... Amazing to hear YI9X. Even more amazing to get the QSO! *W7GG* ... Record outdoor temps coupled with RTTY duty cycle opened the door to Murphy and made shack temps nearly unbearable. Conditions better than usual, especially Sunday. *KH4ND* ... Astonishing conditions on Saturday night: 40 meter short path to Europe, 10 meter long path to Europe, and in the same time frame, 15 and 20 meters were open to Europe over both poles, all with strong signal levels. Yet the bands were whisper quiet. Two radios not enough! *M3MLR* ... First ever RTTY contest but not the last. It's more fun than phone.

(Continued on page 107)

2003 CQ WW RTTY CONTEST PLAQUE SPONSORS AND WINNERS

Single Operator High Power

World: Sponsored by John Orton, WA6BOB. Winner: **Nodir Tursoon-Zadeh, D4B (Op: EY8MM)**
N.A.: Sponsored by Doug Faunt, N6TQS. Winner: **Barry Kutner, W2UP**
USA: Sponsored by Joseph Young, W6RLL. Winner: **George Johnson, W1ZT**
Canada: Sponsored by *CQ* Magazine. Winner: **Scott Nichols, VE1OP**
Oceania: Sponsored by Sid Caesar, NH7C. Winner: **Michael Gibson, KH7X (Op: KH6ND)**
Europe: Sponsored by Chuck Ternes, N6OJ. Winner: **Vlad Zaitsev, RK4FF**
Asia: Sponsored by Bruce Lee, KD6WW. Winner: **Bob Henderson, 5B4AGN**

Single Operator Low Power

World: Sponsored by Don Hill, AA5AU. Winner: **Jacobo Oduber, P43P**
N. A.: Sponsored by Joseph Young, W6RLL. Winner: **Tom Moore, WX4TM**
USA: Sponsored by Larry Lindblom, WØETC. Winner: **Michael McAmis, W1ECT**
Canada: Sponsored by Scott Nichols, VE1OP. Winner: **Don Cassel, VE3XD**
S.A.: Sponsored by Trey Garlough, N5KO. Winner: **Wanderly Ferreira Gomes, ZX2B (Op: PY2MNL)**
Africa: Sponsored by Doug Faunt, N6TQS. Winner: **Mohamed Kharbouche, CN8KD**

Single Operator Assisted

World: Sponsored by Barry Kutner, W2UP. Winner: **Masaki Okano, JH4UYB**
N.A.: Sponsored by Brian Preas, AC6JT. Winner: **Don Hill, AA5AU**
Europe: Sponsored by Joe Wittmer, K9SZ. Winner: **Ulf Ehrlich, DL5AXX**

Single Operator 21 MHz

World: Sponsored by Charles Anderson, KK5OQ. Winner: **Nikola Percin, 9A5W**

Single Operator 7 MHz

World: Sponsored by *CQ* Magazine. Winner: **Tine Brajnik, S50A**
N.A.: Sponsored by Frank McGonigal, W6DSQ. Winner: **Wayne King, N2WK**

Single Operator 3.5 MHz

World: Sponsored by Steve Merchant, K6AW. Winner: **Tone Crv, S54E**
N.A.: Sponsored by Wayne King, N2WK. Winner: **Dennis Egan, NB1B**

Multi-Op Single Transmitter High Power

World: Sponsored by Glenn Vinson, W6OTC. Winner: **P3A (Ops: RA9JX, RW9CF, UA9CDV, UA9CGA)**
Europe: Sponsored by David Robbins, K1TTT. Winner: **HG1S (Ops: HA1TJ, HA1DAE, HA1DAC, HA1DAI, HA3UU, HA3LN, HA1SN, HA1AV, HA1AR, HA1SD)**

Multi-Op Single Transmitter Low Power

World: Sponsored by Ron Hall, KP2N. Winner: **K1TTT (Ops: KITTT, K1MK, N1MM, N1XS, N2AMG, WØBR, W1TO)**
N.A.: Sponsored by David Robbins, K1TTT. Winner: **KP2D (Ops: KP2N, NP2M, NP2W, NP2DJ, NP2DZ)**
S.A.: Sponsored by *CQ* Magazine. Winner: **PJ2P (Ops: NH7C, DL6LAU, KD4FRP, KG6ITP)**

Multi-Op Two Transmitter

World: Sponsored by John Fleming, WA9ALS. Winner: **HC8N (Ops: N5KO, W6OTC, N6OJ)**

Multi-Op Multi-Transmitter

World: Sponsored by KA4RRU—Woodbridge Wireless. Winner: **LY5A (Ops: LY2PAJ, LY2IJ, LY1BA, LY2KW, LY3MM, LY2BIG)**

Important On-Line Resources

To prepare for the 2004 contest, please refer to the following on-line resources:

Contest rules: <www.cq-amateur-radio.com>
Contest records: <www.rttycontesting.com>
Cabrillo specifications: <www.kkn.net/~trey/cabrillo/spec.html>
Cabrillo template for this contest: <www.kkn.net/~trey/cabrillo/cqww-rtty.txt>
Log Submissions: <rtty@cqww.com>

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You're probably familiar with a straight key—a hand key for manually sending Morse code—and with a keyer, which automatically repeats dits and dahs to make sending easier. Well, how about this project from WØXI? A straight-key keyer! Read on for details...

Build a Straight-Key Keyer

BY PHIL ANDERSON,* WØXI

Off and on for some time now, I've been musing about designing and constructing my own simple, inexpensive CW station. Each new QRP and construction article that comes along catches my attention. Wouldn't it be fun to design a straight-key keyer, a direct-conversion receiver, a companion QRP transmitter, and an antenna tuner, and string up a multi-band dipole in the back yard and operate the station?! At the same time, I've spent the last few years at my 8-to-5 job enjoying designing and programming micro-computer-based products.

Finally, while on vacation in December, I decided it was time. Go for it. Let's design that station and let's use PIC micro-controllers wherever possible.[1] What fun! Like all New Year's resolutions, the full station may never get built, but it's my intention to do so. I've lost that first pound already; this article presents the station input, a straight-key keyer with on-board key (see photo A).

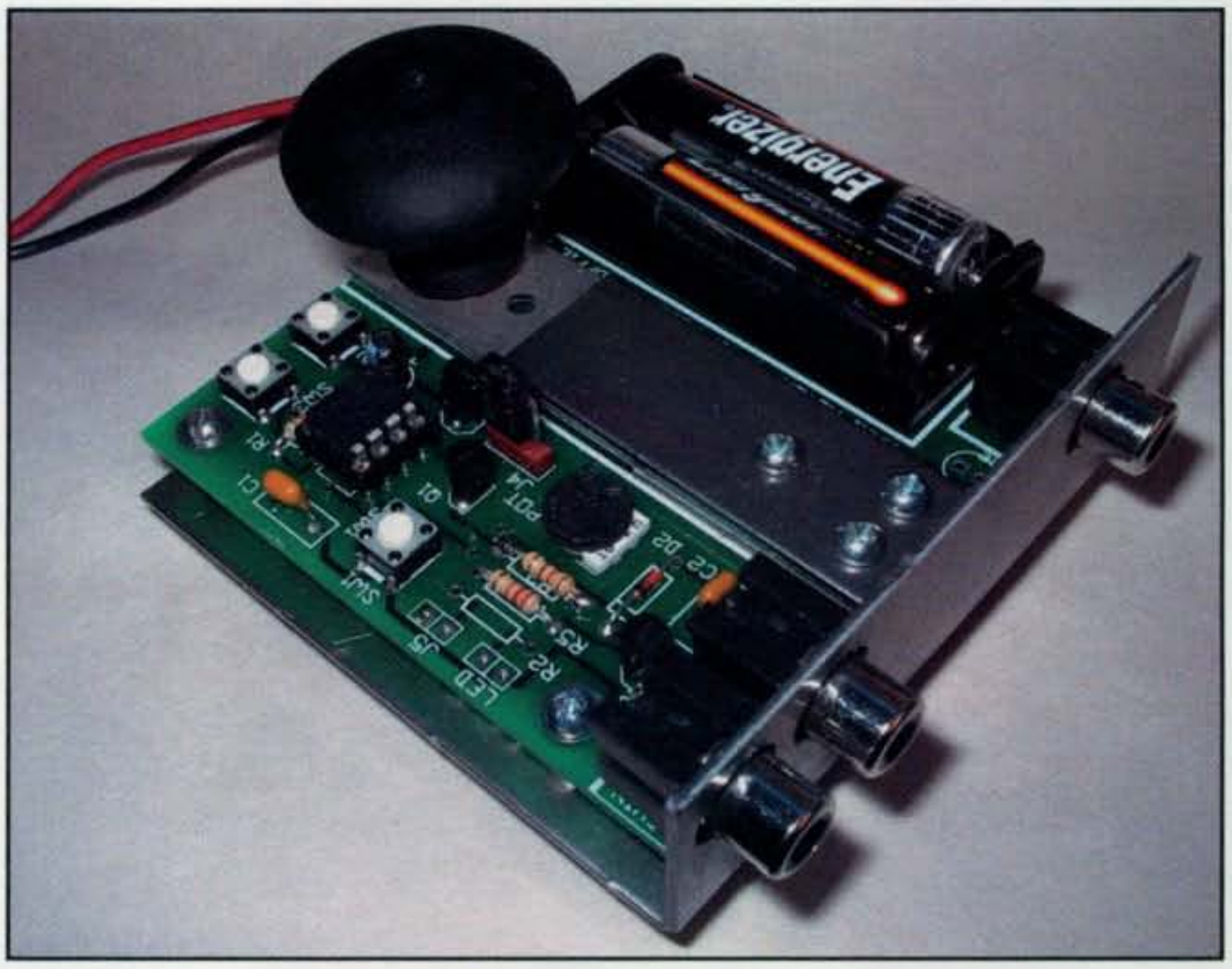

Photo A– The WØXI Straight-Key Keyer. It's shown from the rear so you can see the connectors. If you buy the complete kit, a case is included. (Photos courtesy of the author)

What's a Straight-Key Keyer?

Why a keyer for a straight key? Why not go for an iambic keyer? My choice doesn't have to be logical; this is for fun! Actually, while thinking about using a straight key or a paddle, it occurred to me that it might be easy to fabricate a simple key attached directly to the keyer printed-circuit board, and I wondered what it would be like to send a sequence of dashes by holding the key down. Thinking further about that and using a PIC—an 8-bit micro-computer on a chip made by Microchip—the keyer's features scintillated in my head. The keyer could include a side-tone generator, it could have message memory, the PIC could assist in sending better code, and the PIC's sleep mode could cut battery drain during idle periods. So, you see, I was hooked on building the Straight-Key Keyer.[2]

The Straight-Key Keyer (SKK) features an on-board key, dash-repeat on key down, 5–21-wpm speed control (when dash-repeat is enabled), side-tone generator for 8-ohm speaker or phones, dot memory, open-collector keying for transmission (TX), +12 VDC or battery operation, and current draw of less than one micro-ampere during sleep. Printed-circuit-board (PCB) inputs include pad contacts for the on-board key, three pushbuttons, phono jack for external key, and a battery holder for two AAA batteries. PCB outputs include phono jacks for side-tone generator and transmitter (TX) keying. Layout is provided on the PCB for optional installation of a +5-volt regulator if +12-VDC operation is desired. A footprint and jumper are also provided on the PCB for an optional LED to blink in concert with the side-tone.

The schematic (fig. 1 and photo B) is laid out with inputs on the left and outputs on the right. After all, we are a western civilization, right? Switches S1, S2, and S3 are used to start a message recording, play that message, and set transmitted CW word-per-minute (wpm) rate, respectively. Power may be supplied by two AAA batteries or from an external +12-VDC supply. (The schematic lists a 3-volt battery; that actually represents a two-battery holder.) Choice of supply is made by putting a two-position jumper left or right on header J4. Diodes are included in the schematic, and hence on the PCB, if one wishes to include them. I do, since I'm prone to reversing the power leads!

U1 is the 12F629 8-bit micro-controller produced by Microchip. Two neat features attracted me to it: programmable internal pull-up resistors to accommodate switch attachment and an internal clock, eliminating these as required parts. Transistors Q1 and Q2 buffer the two outputs

**c/o Alden McDuffie Inc., P.O. Box 3636, Lawrence, KS 66046-3636*
e-mail: <w0xi@aldenmcduffie.com>

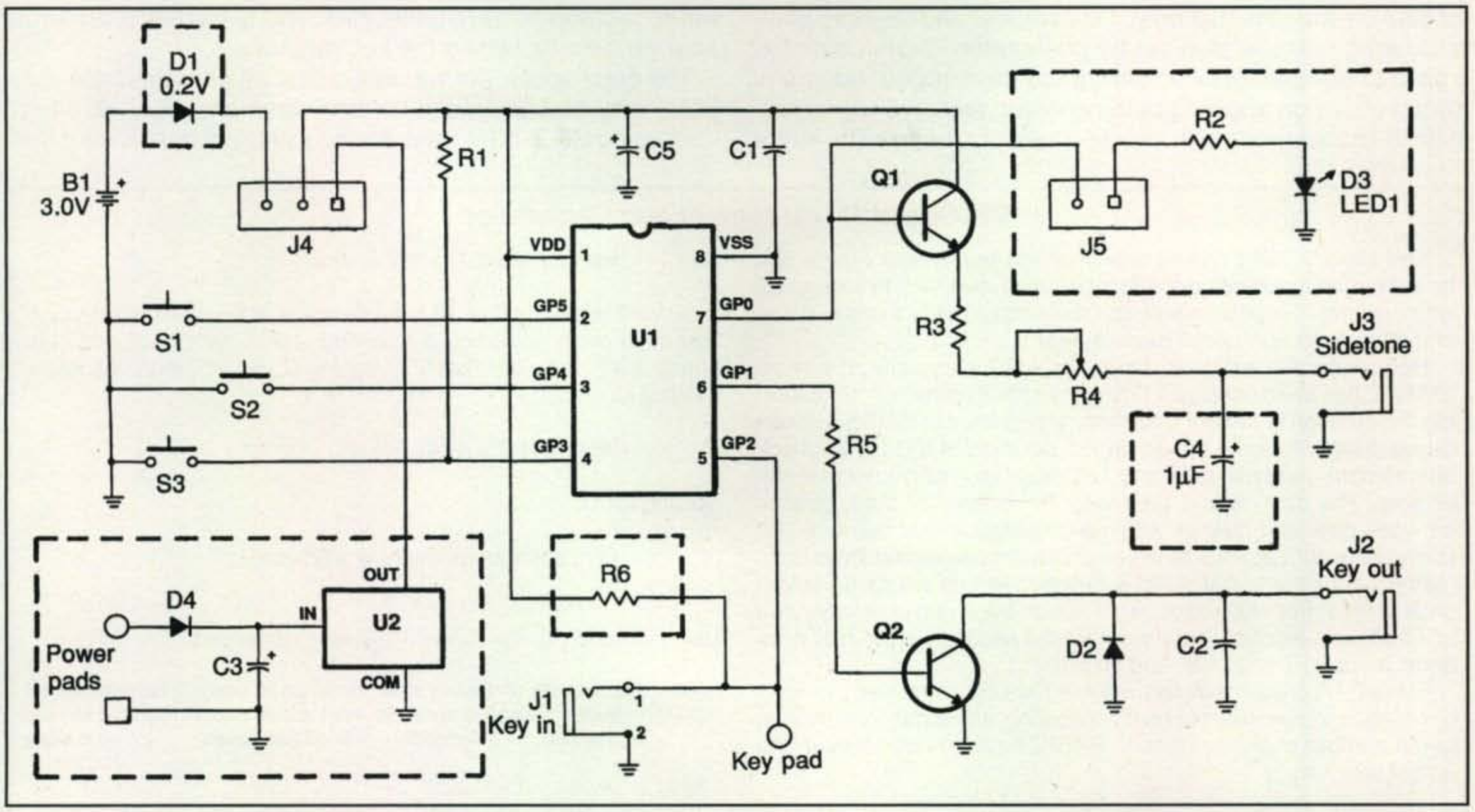

Fig. 1– Schematic of the WØXI Straight-Key Keyer. Note that the circuit calls for a 3-volt DC supply (2 AAA batteries), but it can also be set up to run off a 12-volt DC supply. (See text for details.)

of U1 from the side-tone and keying outputs. Q1 provides for adequate volume when attaching an 8-ohm speaker. Potentiometer R4 can be increased to accommodate hi-z headphones. Q2 is used in an open-collector configuration to provide a pull-down output of most transmitter CW KEY inputs.

The On-board Key

I wanted a key that could be included on the PCB, thus making the key and keyer easy to pack and carry for portable operation. I wanted to keep the mechanics of the key simple, with no springs, pivot joints, or the usual knurled brass bolts. After some bench trial and error, I created a key that looks like a leaf spring, mounted on an L-shaped steel chassis for stability.

The leaf-spring key consists of a stack of three metal strips. The shortest strip, 1.25 inches long, mounts directly on top of the PCB; the middle length strip, 3.0 inches long, stacks on top of the first; and the top strip, 2.0 inches in length, goes on top. All are 0.7 inch wide. The stack is held to the PCB with three 4-40 screws, nuts, and star-washers. The triangular mounting pattern is visible at the left, middle of the PCB. The contact for the key is a filed-down 4-40 pan-head machine screw mounted upside down on the middle leaf. If desired, a knob with a 4-40 nut wedged into its bottom can then be screwed to the contact screw on the top side, as shown in the keyer picture. To complete the key-down circuit, a large pad is included on the right side of the PCB. I included printed wire runs to a PHONO jack at the left to accommodate connection of some old-favorite straight keys.

I was surprised with the performance of this simple key; it provides reasonable keying action in the range of 10 to 20 wpm. With rubber feet attached to the bottom of the steel chassis, I experienced no movement while keying. Total keyer weight is 1/2 pound.

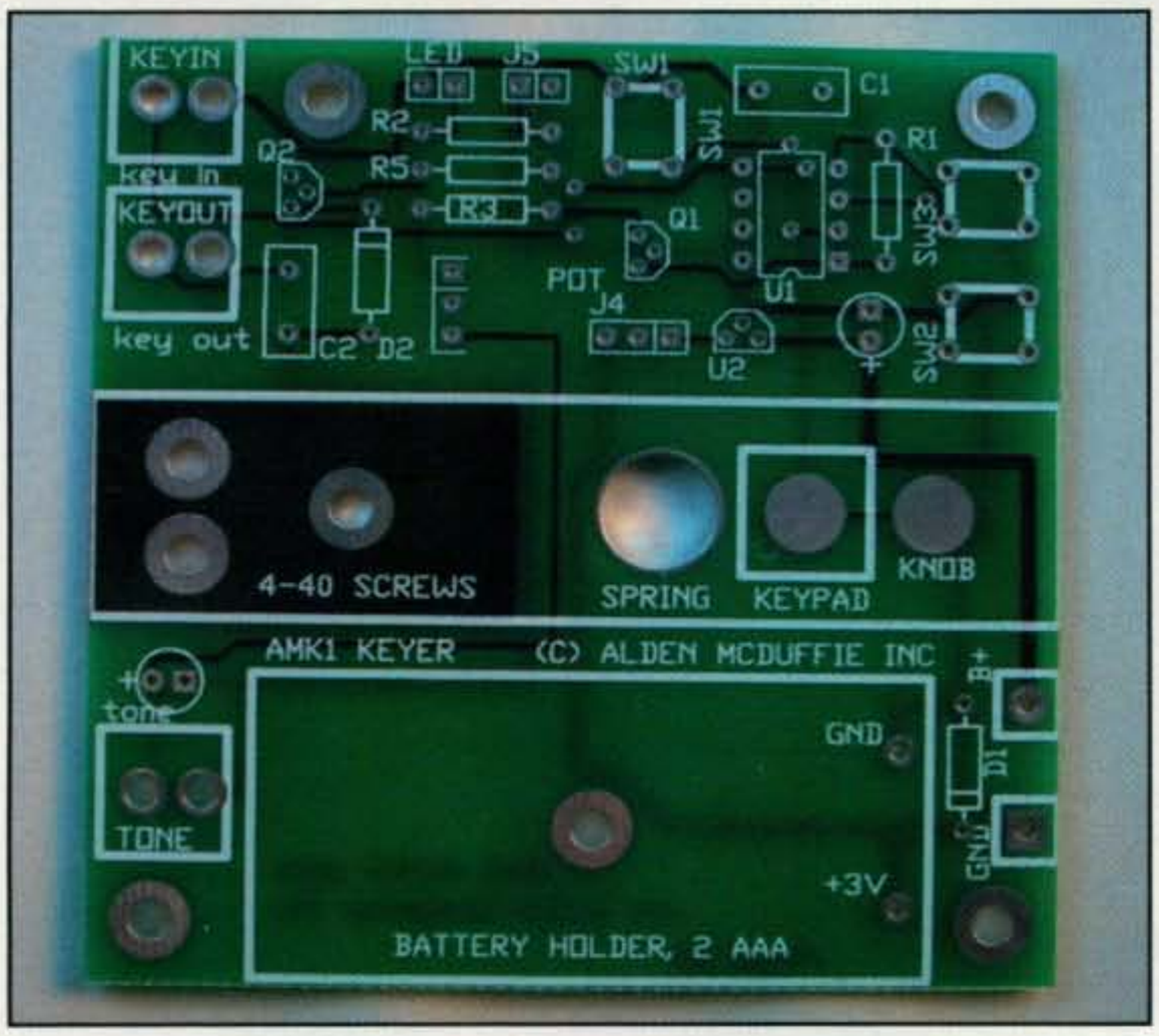

Photo B– The printed circuit board (PCB) for the Straight-Key Keyer. See notes on availability of complete kits or, for the junkbox enthusiast, only the PCB and programmed chip.

Keyer Operation

Code may be sent using the on-board key or an external key of your choice. Dashes are repeated if the key is held down, improving code-sending accuracy. This feature may be turned off at any time to enable traditional keying. Dot memory size is 192 bits, enough memory for a useful message such as a CQ. The message is entered by pushbutton and stored in EEPROM as described below and is available any time, even after a power cycle (see "Recording a Message"

for step-by-step instructions). Dash repeat and memory playback wpm rate are also set by pushbutton. Wpm control is limited to dot memory playback if the dash-repeat feature is turned off. Upon applying battery power, the keyer comes up in dash-repeat mode with a code speed of 13 wpm. The keyer will go to sleep, to save battery life, approximately one minute after no activity. Hitting the key awakens it.

The code speed (for repeating dashes and message playback) may be changed in 2-wpm increments (5, 7, 9, 11, 13 . . .) using S3. If S3 is held down, a string of dots is sent con-

CW Speed Measurement and Calculation

The keyer's CW transmit rate in words-per-minute (wpm) can be estimated by counting the number of dashes sent in 5 seconds with no inter-character spacing. One simply holds the key down and counts the number of dashes heard.

How does this estimate measure up? Historically, the word "PARIS" has been used as a CW word-speed reference. By counting the duration of the dots, dashes, and spaces in PARIS, we can derive a wpm formula based on the duration of a dash to check our measurement rule of thumb. Let's start by giving a dot one unit of time. The dash would then take three units of time; spaces between dots and dashes within a character would last one unit (same as a dot), spaces between characters would be three units (same as a dash), and spaces between words would be seven units of time. For calculation, we'll assign each unit of time a value of T seconds. As such, a dot would last T seconds, a dash 3T seconds, a space T seconds, and so on.

Since PARIS is considered one word, we can formulate the number of seconds per word to be the following: seconds/word is equal to the number of units of time in PARIS times the duration of one unit of time, or

(1) $\text{sec/word} = 51 \times T$

If you'd like to check 51, the units of time in PARIS, don't forget to add the 7 spaces after the last "dot" to complete sending the word. Inverting (1) and converting to minutes, we obtain

(2) $\text{wpm} = (60/51) \times 1/T = \sim 1.2/T$

Since T is the duration of a dot or space, it follows that the *duration of a dash, including a following space,* sent over and over again, is 4T. Let's call that D. Plugging D into (2) brings us to our desired formulas:

(3) $\text{wpm} = (1.2 \times 4)/4T = 4.8/D$

Solving for D,

(4) D (a continuous dash) = 4.8/(wpm)

Using (3) and (4), the following table is generated:

wpm	dashes with added space/sec.	# dashes with added space in 5 seconds	duration of dash with added space in milliseconds	**recommended rise time in msec for best copy (CCIR)
20	4.16	20.8	240	15
10	2.08	10.4	480	30
5	1.04	5.2	960	60

Note that the number of dashes recorded in 5 seconds is within 4% of the calculated wpm rate, verifying our wpm rule of thumb.

tinuously at the current wpm setting to the speaker but not to key out. The rate tops out at 21 wpm—fast enough for a straight key—and cycles around to 5 wpm. Wpm is equal to twice the number of dots repeated in a 5-second period. At higher rates, some may find it difficult to count the dots. If so, it is easier to release S3 and press the key for 5 seconds, counting the number of dashes. See "CW Speed Measurement and Calculation" for a derivation of this measurement rule of thumb.

The dash-repeat feature can be toggled ON/OFF at any time by using the following switch and key sequence: *press and hold S3, then press the KEY and release it, and then release S3.* Dash-repeat is restored when power is turned on. Sleep mode is not considered a power off, so if the dash-repeat feature is turned off and the keyer goes to sleep, dash-repeat will still be off once the keyer is awakened.

The Program

The listing for the program is 455 lines. That's too many pages to print, so we'll discuss the trade-offs made during program development and inspect some key portions of the listing instead, as these are nearly always more interesting than just reading through line-by-line.

I like to outline the organization of a program first and considered the resources available. Some call this design approach top-down. The 12F629 micro-controller was attractive because it met my cost goals, so it remained to be seen if the peripheral modules on the chip and ROM, RAM, and EEPROM memory would support the keyer as envisioned. The chip has 1024 bytes of ROM programming memory, 64 bytes of RAM, and 128 bytes of EEPROM. I wasn't concerned about the default clock speed of the chip, 8 MHz, since the rate of CW is quite low, leaving many instruction cycles available between any key-downs by the operator or frequency of interrupts required to support a data clock. I *was* concerned about available coding and data space.

Nearly every system needs a clock, and the keyer also needed a side-tone source. It was natural to assign these to the timer modules. Since the keyer is a real-time system, the program had to either poll or interrupt for switch and key closures. One could do it either way, but since the keyer acts upon just one switch or key closure at any time, polling was chosen as a straightforward method.

With these ideas in mind, I coded and tested the basic flow control of the program first—again, the top-down approach. An infinite loop for polling was created in the "main" section of the program, and within that I used a "switch" statement to branch to a switch or key routine. Here's the core polling routine:

```
while(keyin && button1 && button2 && button3)          //await action
{
      {
            ++sleepcount;
            if(sleepcount==SLEEPCOUNT)      //~one minute
            sleepfunc( );                   //save battery!, sleep
       }
       continue;
}
if(keyin==0)
      return(4);              //key action
if(button3==0)
      return(3);              //set CW WPM
if(button2==0)
      return(2);              //play back dot memory
if(button1==0)
      return(1);              //record dot memory
else
      return(0);
```

The "while" loop does nothing but wait for switch or key action and update a sleep counter. If a minute goes by without any operator action, the keyer is put to sleep. A tap on the key, handled by the routine within switch case 4, brings the keyer back to life in a fraction of a second. The other returns listed branch the program off to handle duties called for by those switches.

The initialization routine, which is run first to set up the chip, is shown below:

```
OSCCAL = _READ_OSCCAL_DATA;
{
        dashfeature=1;
        TRISIO=0x3C;            //set pins and inputs or outputs
        ANSEL=0;                //make pins digital, not analog
        CMCOM=0;                //disable comparator
        GPIO=0;
        OPTION=0b00000001;
        {
                for(i=0,i<24,++i)
                {
                        addr=i+24;
                        dotmemory[i] == EEPROM_READ(addr);
                }
        }
        T0IF=0;
        T0IE=1;
        TMR1L=0x24;
        TMR1H=0xFA;
        T1CON=0b00110001;
        INTCON=0b11100000;
        TMR1IF=0;
        TMR1IE=1;
}
```

The READ_OSCCAL_DATA macro is important in that it takes factory data stored in high memory of the chip and places it in the oscillator calibrate register. This action puts the chip's clock right on the money at 8 MHz; hence, no external crystal is needed.

The TRISIO and ANSEL statements configure the use and direction of the I/O pins on the chip. I chose to make them all digital, with four inputs and two outputs. Bit seven of the OPTION register is set to zero to enable weak pull-ups for the input pins. By doing this we don't have to add external resistors for these, except for pin 4, which has no internal weak

Recording a Message

Recording a message—such as CQ CQ CQ DE callsign—is straightforward using switches S1, S2, S3, and the key. A dot takes up two bits, a dash four bits, and each key hit two bits. The message wraps around and overwrites at 192 bits. The message is entered as follows:

Step #1 To start recording a message, press and release switch S1.
Step #2 To enter a character, press switch S2 for a dot or S3 for a dash. The space following each dot or dash is added automatically.
Step #3 To enter an inter-character period, hit the code key once. To enter an inter-word period, hit the code key three times.
Step #4 Repeat steps 2 and 3 until complete.
Step #5 To complete the message, hit the code key four times.
Step #6 To play the dot memory message, hit switch S2. The message will be played out at both the side-tone and keying outputs. The message will repeat until the key is hit.

pull-up, thereby saving board space and assembly time. The remaining statements are used to initialize the timers.

Recall that one concern I had at the beginning of the design cycle was whether or not the chip would have enough program memory to handle my desired features. It turns out that the concern was valid. After coding the outline, I added features—each type of switch closure and its action—and tested them one at a time. When I reached the last feature, sleep, I was out of memory. Fortunately, I was able to recode a few of the other features more efficiently, leaving enough room for sleep. This scenario is not an uncommon occurrence when programming micro-controllers! Here are the final program statistics:

ROM	978 of 1024	words
RAM	50 of 64	bytes
EEPROM	24 of 128	bytes

I have to admit, this was fun! It's a simple thing, but sending a sequence of dashes by just holding down the key was and is a delight! It's also always a pleasure to populate the PCB of a new design for the first time, solder in the parts, and give the unit a smoke test. No smoke this time!

On to Part 2

Now that I have the keyer finished, it's time to get to work on part two of my complete homebrew QRP station . . . whichever piece that turns out to be. When I have it ready, *CQ* readers will be the first to know! ■

Notes

1. Tools used for this project included a 150 MHz scope, PC with USB port, CAD software for mechanicals, HT-SOFT's PICC "C" cross-compiler for coding, Microchip's MPLAB for debug and PICSTART PLUS for burning the program into the 12F629, and the usual hand tools.

2. The keyer is available in kit form or PCB and programmed chip only from Alden McDuffie Inc., <http://www.aldenmcduffie.com>.

Bill of Materials

Item	Count	Label-Value	Attributes	Designation
1	1	FR4	3" × 3"	PCB
2	2	0.1 µFd	RAD0.2	C1,C2
3	2	1N914	DIODE0.4	D1,D2
4	3	PCB connector	PHONO JACK	J1,J2,J3
5	3	solder-type	PHONO PLUG	for J1, J2, J3
6	2	PN2222	TO-92A	Q1,Q2
7	1	10K	AXIAL0.4	R1
8	1	150 ohms	AXIAL0.4	R3
9	1	10K var	SIP3POT	R4
10	1	2.2K	AXIAL0.4	R5
11	3	pushbutton	NO BUTTON	S1,S2,S3
12	1	IC socket	DIP8	for U1
13	1	IC 12F629	DIP8	U1
14	1	na	2 AAA	BATTHOLDER
15	1	na	3" × 3", 064	PCB
16	1	056 steel	.7" × 1.25"	spacer
17	1	050 alum	.7" × 3.0"	leaf key
18	1	056 steel	.7" × 2.0"	leaf
19	1	056 steel	1" × 3" × 3"	L chassis
20	5	3/8 inch	4-40	machine screw
21	4	1/2 inch	4-40	machine screw
22	10	hex	4-40	nut
23	3	star	4-40	washer
24	4	1/4 inch	#4	standoff
25	1	1/2 inch	#83	spring
26	4	na	rubber	feet/bumper
27	1	na	wooden knob	key knob
28	1	na	8 1/2" × 11"	manual

Noise. It's an inescapable fact of radio life, and it's getting worse. Can we do anything about it? WB6NOA says SGC's new ADSP² Speaker is a good start.

CQ Reviews:

The SGC ADSP² Speaker

BY GORDON WEST,* WB6NOA

More background noise is on its way. I had an opportunity to witness an ever-encroaching noise floor during my visit to the Consumer Electronics Show in Las Vegas, Nevada, last January. My receiver was a portable Yaesu FT-817, and my noise "sniffer" antenna was a homebrew ferrite-rod affair that peaked at around 10 MHz and was tied into an SGC ADSP² speaker in addition to the built-in FT-817 speaker.

My mission was to see what types of new home electronics may cause a jump in our neighborhood HF noise floor and to see how effective the SGC speaker was at reducing it. Of specific interest were those new 50-inch plasma, color LCD and thin-film-transistor, high-definition TV sets. I also prowled around the home automation booths and saw some in-house broadband technology that was carried on both wires and wireless—yet one more addition to our ever-increasing HF noise floor. Yes, there were birdies all over the VHF and UHF bands, too, from almost any type of home appliance and office equipment without a well-shielded microprocessor clock.

After multiple days at the show, there was not one specific home-entertainment box that significantly stood out as an RF noise emitter. This is the good news. Even standing in front of those big high-definition televisions, the noise floor didn't cause the little Yaesu to pop out of my backpack. However, the collection of all of the running electronics *did* raise the noise floor considerably on HF.

I confirmed this *outside* several CES display areas while tuning in the 10-MHz WWV time signal out of Colorado. Within a couple of hundred feet of the CES facility the time signal was tough to hear. When I walked farther out in the parking lot, though, background noise dropped and the time signals came in relatively clearly. During each test I had a clear shot at the sky, so signals were not attenuated by building walls or overhangs.

The SGC ADSP² speaker offers two levels of noise reduction: One push of the top button drops the noise by 13 dB, best for SSB; pressing it a second time puts in 26 dB of DSP noise reduction, best for CW or data signals in a high-noise environment. A third push returns you to normal audio.

Neighborhood Noise Problems

What happens if you live in a neighborhood that has big-time home automation; big-screen, high-definition TVs; and even a couple of those noisy, pesky touch lamps thrown in, too? And why not add in a couple of noisy fish-tank heaters along with that new, cool neon clock you can see the kids next door hanging up in their garage?

Your HF antenna is already in place; a good key to minimizing your neighborhood noise floor is to get any HF antenna up as high as possible. Give me a nice 3-element beam up 75 feet, and few new TVs are likely to bother it. However, your 7-band vertical is on the roof, and it's not going to move. Your neighbors are staying put, and your noise floor hangs around S-7 on 40 meters, just the point where you can barely hear all the early-morning check-ins on your favorite net.

If you have one of the newer rigs, take advantage of built-in digital signal processing. On CW, sideband, or data, DSP many times will help pull weak signals out of the roar of consumer-electronics broadband noise. Your rig probably has many levels of DSP adjustment, so play with the knobs and listen to the results on sideband and CW, or watch the noise floor and data signal strengths on your computer, if it's

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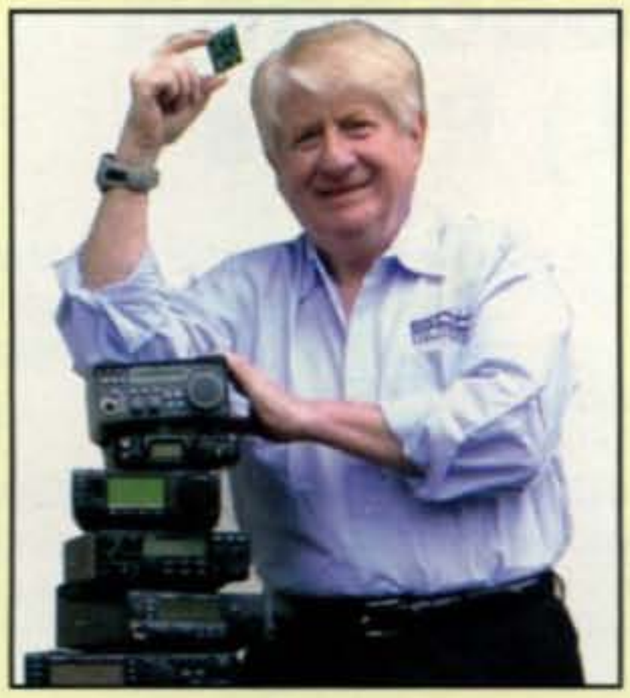

SGC Co-Founder Pierre Goral, SK

Pierre Goral, KI7UA, President and co-founder of SGC, became a Silent Key on February 12, 2004. He and the late Don Stoner, W6TNS, founded the company (as Stoner-Goral Communications) in 1971, and the company has become a major supplier of rugged portable HF SSB radios to military, government, and commercial users as well as the amateur market. A company statement says that while they mourn the loss of their friend and leader, "SGC will continue to move forward and produce products to the standards the industry has come to rely on after more than 30 years of successful business." *CQ* extends its condolences to the Goral family and the SGC family as well.

tied in to the rig. But if that's not enough, or you have an older rig without built-in DSP, SGC's new ADSP^2 speaker may be able to help.

The ADSP^2 Speaker

Back in Las Vegas, I tested the two-position SGC ADSP^2 speaker on my FT-817 out in the parking lot with my little broadband HF antenna, and the results were promising. The "A" in ADSP, by the way, stands for "automatic," meaning that manual adjustments are not necessary for the filtering to do its job.

Simple hook-up and operation are part of the beauty of the speaker. Plug the speaker's miniature plug into your transceiver, and add 12 volts at 110 ma. For the CES tests, I ran the FT-817 on its own internal battery pack and plugged the SGC speaker into a compact, 3-amp/hour, nickel metal-hydride pack that gave me more time than I needed to conduct my four days of testing inside the building.

When the SGC speaker receives 12 volts, it springs to life and lights up a small red light-emitting diode (LED) behind the front grill. Push the white button once to activate the ADSP^2 with about 13 dB of noise reduction, and a single green LED will be lit from behind the front grill in the lower right corner. Press the button one more time for 26 dB of noise reduction, and you now see two green LEDs behind the front grill.

I tuned into a local morning net on 40 meters, and within 100 feet of the CES building with home automation, signals were right at the noise floor. With one push of the speaker button, the noise went way down and voices magically appeared. The improvement in reception was dramatic. Voices that a moment ago had been covered by the electronics hash were not only audible, but also reasonably intelligible. The voices sounded a bit pinched, but this is the normal sound of digital signal processing.

On CW the results were even more dramatic; code in the noise was now code in the clear. It was the same thing for several PSK-31 whistles—from out of the noise came relatively clear reception.

Pushing the SGC ADSP^2 speaker button a second time takes the noise-reduction circuitry from 13 dB to 26 dB. The result on sideband was not impressive. Sure, the noise floor even went further down, but the characteristics of everyone's voices made it hard to understand what they were saying.

"In some situations—especially on single sideband—a second push of noise reduction is not necessarily better, and it pays to be flexible in the use of noise reduction when trying to copy SSB signals," comments an SGC rep. However, SGC was quick to add that the second push of the ADSP^2 button makes a remarkable reception difference when trying to pull out weak CW signals, packet and PSK-31 signals, along with the reception of weather facsimile on a laptop computer.

He was right. On CW the double push of the ADSP^2 button remarkably cleaned up any noise off weak incoming signals, and the improvement was worth the second push. Same thing for PSK-31 signals—the noise floor went even further down to allow the whistle to completely stand out from the almost hushed background noise.

Pushing the button on top of the ADSP^2 speaker a third time returns the speaker to normal, straight-through audio. All the noise coming out of the nearby CES building was back! One more push of the button, though, and 13 dB of noise reduction was just right for hearing the gang on 40 meters, plus WWV at 10 MHz, and later during a nighttime drive home on 75 meters. The ADSP was quite effective in reducing the elevated noise floor in my mobile caused by a noisy fuel pump.

The circuitry that SGC offers in its little speaker is part of a much wider range of ADSP equipment that the company puts into its marine and military radios. They even have a small board that will fit into most portable ham transceivers and that includes a pair of filters to further quell the hash. Their three proprietary band-pass filters and 26-dB ADSP^2 circuit can be fitted to nearly any transceiver to enhance your ability to pull signals out of the background noise.

One warning: Once you begin using the ADSP^2 for the majority of your mobile HF communications, you will quickly become spoiled when you listen to any other mobile rig on the same band *without* ADSP.

From what I could hear inside and outside the CES show, I saw that a digital-signal-processing setup placed inside a speaker as SGC has done is a practical way to reduce the noise floor caused by new types of consumer electronics emitting broadband noise.

List price for the SGC ADSP^2 speaker is $129.95. For more information on the speaker and other SGC products, visit the company's website at <http://www.sgcworld.com>. ■

FCC Proposes New Broadband Over Power Lines (BPL) Rules

BY FREDERICK O. MAIA,* W5YI

"With these proposals, we take an important step towards promoting the deployment of new broadband networks that are expected to enhance the economic, educational and social well-being of all Americans. ...we believe that the benefits of Access BPL for bringing broadband services to the public are sufficiently important and significant as to outweigh the potential for increased harmful interference that may arise."

From NPRM, ET Docket No. 03-104

In a 38-page Notice of Proposed Rulemaking, the FCC in late February released its much anticipated proposal to amend its Part 15 (unlicensed device) rules to provide new requirements and measurement guidelines for a new type of carrier current system that provides access to broadband internet services using electric utility company power lines. A carrier-current system transmits a radio frequency signal over an electric power line to a receiver also connected to the same power line.

The FCC said that since electric power lines reach virtually every home and community in the country, "Access broadband over power line (BPL) ...could play an important role in providing additional competition in the offering of broadband services to the American home and consumers...."

The Commission also said it was aware that widespread use of BPL raises interference concerns and that it "...must protect licensed radio services from any harmful interference that might occur."

Toward that end, the FCC will require that BPL systems and devices incorporate the capability to alleviate harmful interference should it occur. Also proposed were administrative requirements to aid in the identification and resolution of harmful interference from BPL systems and new measurement guidelines for BPL systems that use electric wiring and electrical outlets within homes and buildings to transfer information between computers and other electronic devices.

The FCC said the new rules "...will remove regulatory uncertainties and facilitate the introduction and use of this promising new technology."

Description of BPL

Low-power, unlicensed devices have been used for years to carry information by coupling an RF signal to a home's or building's AC electrical wiring. Among these are AM radio systems on school campuses and devices intended for the home, such as intercom systems and remote controls for electrical appliances and lamps. Until recently, carrier current devices have operated generally on frequencies below 2 MHz with relatively limited communications capabilities.

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Recently, the availability of faster digital processing and sophisticated modulation schemes has led to the development of new BPL systems that use spread-spectrum or multiple-carrier techniques to counter the noise in the line.

High-speed digital communications are attained when RF energy is injected into existing electric power lines and later separated using a low-cost plug-in power-line modem. The house wiring becomes a ready-made network offering 2–4 megabits per second at any outlet. BPL systems may operate either inside a building ("In-House BPL") or over utility poles and medium-voltage electric power lines ("Access BPL").

In-House BPL systems use the electrical outlets available in a building to transfer information between computers and other in-the-home electronic devices, eliminating the need to install new wires between devices. Using this technology, consumers can easily install home networks.

Access BPL systems are used to provide high-speed internet and other broadband services to homes and businesses. The FCC believes it also has the potential to be an effective means for "last-mile" delivery of broadband services, since it comes with the delivery of electric power and could offer a competitive alternative to digital subscriber line (DSL), cable-modem services, and other high-speed internet delivery technologies.

BPL systems carry high-speed data and voice signals outdoors over the medium-voltage line from a point where there is a connection to a telecommunications network. This point of connection may be at a power substation or at an intermediate point.

In a residential neighborhood, Access BPL can be brought into the home over an exterior power cable from a low-voltage power-line transformer or distributed over a wireless link between a transceiver mounted on the power pole and a companion transceiver located inside a user's home.

Most unlicensed Part 15 Access BPL systems operate on HF/VHF frequencies with very low-power signals spread over a broad range of frequencies. These frequencies are also used by licensed radio services and must be protected from harmful interference.

These incumbent licensed radio services include fixed, land mobile, aeronautical mobile, maritime mobile, radiolocation, broadcast radio, radio-astronomy, public safety, amateur radio, and Federal government agencies.

Carrier-current devices, including BPL equipment, fall under the FCC's Part 15 low-power, unlicensed equipment rules and operate on a non-interference basis. Currently, the rules specify radiated signal limits when operating below 30 MHz.

Comments from the Public

A year ago, the FCC issued a Notice of Inquiry asking the public about BPL technologies and systems and whether it would be possible to develop

a standardized measurement method for testing BPL. These comments have now been analyzed and used to rewrite the Part 15 rules allowing Access BPL to be deployed while supposedly still protecting licensed services from interference.

Over five-thousand comments were received addressing: (1) the potential benefits of Access BPL systems; (2) the potential for harmful interference from Access BPL to licensed services; and, (3) measurement procedures for evaluating emissions from Access BPL systems. Most proponents said BPL would increase the availability of broadband and ultimately would mean better service and lower prices in the broadband marketplace. The National Telecommunications and Information Administration agreed that "...BPL holds great promise as a new source of innovation and competition in the broadband marketplace. It has the potential to open new avenues of internet access, to enable new and expanded services for utility companies, and to create a new platform for further advances in communications technology." NTIA, a government agency, is the telecommunications advisor to the White House.

A number of parties told how BPL will make it possible to bring the internet to rural and other underserved locations, since the electric power grid is so widespread. The American Public Power Association (APPA), for example, said that 75 percent of its members serve communities with populations less than 10,000, many of which do not have access to high-speed broadband.

Harmful Interference from BPL

There is significant disagreement, however, about the interference potential of Access BPL, with many commenters contending that it presented the potential for new interference to a variety of radio services. Amateur operators and their organizations were particularly opposed and wanted emission limits even lower than those now in existence.

The American Radio Relay League (ARRL) steadfastly believes that BPL will cause severe interference to amateur operations if not appropriately restricted. "Amateurs use very sensitive receivers and high-gain outdoor antennas that could be located in close proximity to electric power lines," the ARRL said, adding that most radio amateurs have an outdoor antenna located less than 100 feet from overhead power lines. "The current Part 15 limits are not sufficient to protect against interference in this situation."

The ARRL also believes that entire communities will be affected by radiat-

ed BPL emissions, with power lines acting as efficient antennas and causing widespread interference to amateur operations. The League said it conducted tests of radio reception using a mobile radio in residential BPL test areas and found interference so bad "...as to warrant its exclusion from all bands allocated for amateur use."

The ARRL cited power-line noise as the single most frequently identified source of high-frequency (HF) interference to licensed amateur operations. The League and many ham operators also raised the concern that high-powered amateur operations could interfere with Access BPL.

While NTIA recognized the potential benefits of Access BPL, it also said the Commission must ensure that other communications services, especially Federal Government operations, are adequately protected from unacceptable interference. It noted that there are over 18,000 Federal Government frequency assignments in the 1.7–80 MHz spectrum range, where Access BPL is proposed to operate.

While generally supportive, the Federal Emergency Management Agency (FEMA) commented that it has become aware that certain approaches to BPL may have the potential to cause interference to its high-frequency radio emergency communications system. FEMA believes that there may be ways to provide the public with the benefits of BPL without compromising emergency communications.

On the other hand, BPL equipment manufacturers and service providers flatly state that Access BPL does not pose an unacceptable risk of increased interference to licensed radio services. They note that there have been no complaints of interference from BPL and that the existing Part 15 rules adequately protect incumbent spectrum users.

The BPL industry in general believes that Part 15 rules are not only adequate to protect other users of the spectrum, but that higher emission limits are warranted in the 30–50 MHz band. Some parties proposed higher emission limits, especially at frequencies above 200 MHz. Parties advocating higher power argue that operation of Access BPL under power levels higher than currently allowed in Part 15 would enable utility companies to serve more homes, thereby bringing broadband access to a greater number of people.

The HomePlug Powerline Alliance states that its member companies have widely deployed In-Home BPL equipment in the consumer market over the last two years and there have not been complaints of interference. HomePlug contends that joint testing by the ARRL and HomePlug has demonstrated a very low probability of interference between its devices and amateur radio use. Ambient Corporation (Newton, MA) said it is possible to avoid interference to nearby transceivers using technology that "notches out" certain sub-bands.

In the Inquiry, the FCC requested comment on authorization and compliance measurements for BPL equipment. At the present, carrier-current equipment is subject to a verification procedure.

There was a general consensus that all components of an Access BPL system should be part of the equipment authorization process. With the exception of parties representing amateur interests, most commenting parties recommend retaining the current verification procedure. Amateurs argued that Access BPL equipment should be subject to a far more stringent certification process.

The Proposed New Rules

The Commission said it recognizes the potential for harmful interference to existing radio service users from Access BPL operations, but strongly feels that these interference concerns can be adequately addressed.

"We believe that Access BPL systems can operate successfully under the non-interference requirements of the Part 15 rules," the FCC said. "Under these rules, operators of Access BPL systems will be responsible for eliminating any harmful interference that may occur."

"Furthermore, we believe that the current Part 15 emission limits for carrier-current systems in conjunction with certain additional requirements specific to Access BPL operations will be adequate to ensure that existing radio operations are protected against harmful interference from such operations."

The FCC proposed the following five changes to the Part 15 rules which it says will facilitate the deployment of Access BPL technology while still protecting licensed users of the spectrum:

1. Define Access BPL

Access BPL will be defined as a carrier current system that transmits radio-frequency energy by conduction over

electric power lines owned, operated, or controlled by an electric service provider. The electric power lines may be aerial (overhead) or underground.

The FCC requested comment on this definition and invited suggestions for alternative definitions. It also wanted to know whether there might be instances where BPL providers might not be an electric-power distributor or a subsidiary.

Two non-electrical power providers, AT&T and Atlanta-based Internet Service Provider Earthlink, are among those which are clearly paying attention to the potential of BPL. Both know that high-speed internet access over a digital subscriber line (DSL) is limited to areas surrounding telephone companies; cable generally is not available outside of populated areas for cable-modem connections, and satellite internet connectivity suffers lag issues (it takes time for signals to go back and forth thousands of miles to orbiting satellites). However, the power grid is already installed everywhere.

Earthlink has invested in privately held BPL equipment supplier Ambient Corp. and sits on its board. Working with electric utility companies, Ambient is in the process of rolling out pilot BPL residential trials over leased power lines in several states. Last fall the FCC approved a nationwide license for Ambient, allowing the firm to initiate field trials with partners anywhere in the United States without having to apply for individual licenses for each trial.

AT&T is also rumored to be in BPL trials with an unnamed power company, but declines to elaborate on progress, partners, or capital investment. AT&T feels BPL could extend the reach of its broadband applications such as high-speed internet and Voice-over-the-Internet (VoIP).

2. Maintain the existing Part 15 emission limits for Access BPL

The FCC said there was a wide difference of opinion on the interference potential of Access BPL. Existing spectrum users, and especially ham operators, believe Access BPL systems will adversely affect their operations. BPL proponents, on the other hand, contend that any impact will be minimal.

The Commission tentatively has concluded that the interference potential will be low. However, in order to better ensure protection of existing radio services, the new rules propose to continue the existing Part 15 emission limits for carrier-current systems to Access BPL systems.

In the NPRM, the FCC noted: "We recognize that amateur operations are likely to present a difficult challenge in the deployment of Access BPL in cases where amateurs use high-gain outdoor antennas that are located near power lines. In considering this interference potential, we note that ARRL acknowledges that noise from power lines, absent any Access BPL signals, already presents a significant problem for amateur communications. We therefore would expect that, in practice, many amateurs already orient their antennas to minimize the reception of emissions from nearby electric power lines."

3. Require Access BPL systems employ interference reduction techniques

The FCC is proposing to require that Access BPL systems incorporate features that would allow the operator to modify system performance to reduce or avoid harmful interference to existing radio services. "There are remedies that the Access BPL operator can employ to eliminate such interference where such interference does occur," the FCC said.

Such interference-reduction techniques would include the ability to reduce power levels and to include or exclude specific operating frequencies or bands. This capability would allow operators to avoid localized and site-specific harmful interference.

Furthermore, the FCC is proposing that Access BPL devices incorporate a shut-down feature that would deactivate units found to cause harmful interference. The Commission also invited additional suggestions for alternative interference-reduction approaches.

4. Require Access BPL providers to maintain a database of installation locations and technical information

Access BPL system operators would be required to submit information on their systems to an industry-operated entity. A publicly available database would ensure that the Access BPL system location, the type of modulation used, and the frequency bands of operation and their operating characteristics are identified if harmful interference occurs.

"We also seek comment on other approaches for making this information available. For example, would it more reasonable to allow each Access BPL operator to maintain a database of its own rather than require a more centralized data base?"

5. Adopt specific measurement guidelines for Access BPL

The FCC said it would retain the current verification procedure for Access BPL and additionally require that all BPL systems and electronic devices be measured on-site at multiple locations to demonstrate compliance with the Part 15 rules. Appendix "C" of the NPRM contained very detailed instructions as to how these measurements should be taken.

The Commission concluded by saying, "We believe that these proposals to adopt new Part 15 technical and administrative rules for Access BPL will help promote and foster the development of this new technology with its accompanying benefits while at the same time ensuring that existing licensed operations are protected from harmful interference."

Comments from the public are due 45 days from date of publication in the Federal Register (about April 1st) and reply comments 30 days thereafter (about May 1st). Comments may be filed using the Commission's online Electronic Comment Filing System located at <http://www.fcc.gov/e-file/ecfs.html>, or by filing paper copies. To file electronically, go to the ECFS main page, click on Submit a Filing, enter "03-104" in the Proceeding field, and then complete the form as indicated.

73, Fred, W5YI

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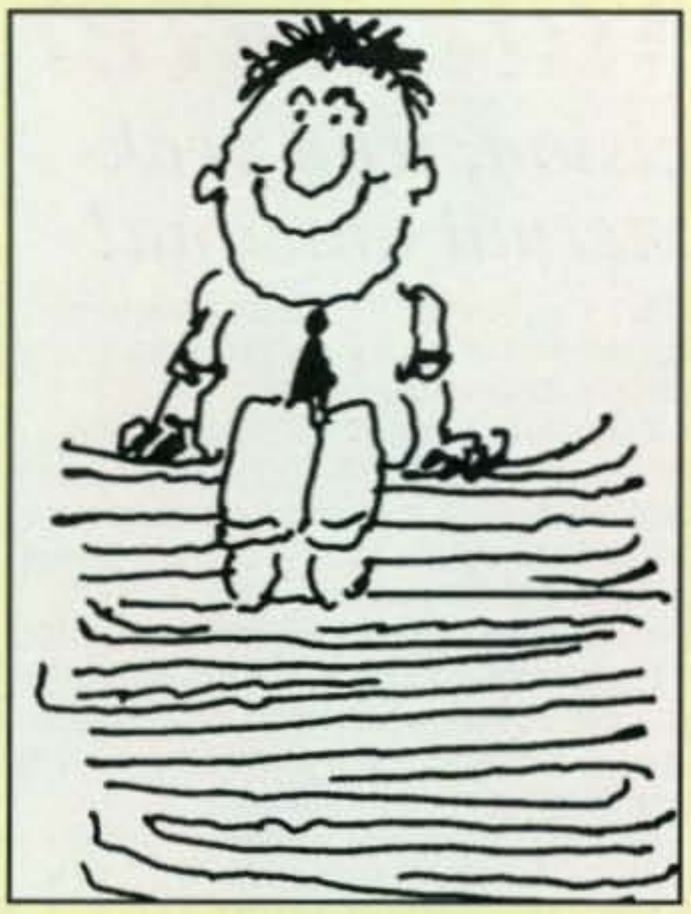

What You've Told Us...

Our March survey asked about your involvement in emergency and disaster preparedness, and 61% of the readers who responded said they are currently involved in emergency/disaster preparedness at some level. Another 19% reported having been involved in emergency response/preparedness in the past but not now.

Two thirds of you report currently being involved with at least one emergency/disaster response organization. Among that group, 72% belong to the ARRL's Amateur Radio Emergency Service or ARES; 55% are affiliated with SKYWARN, and 53% are members of RACES, the Radio Amateur Civil Emergency Service. In addition, 26% are involved with providing communications for the American Red Cross; 20% "other" groups; 8% belong to SATERN (Salvation Army); 5% are members of MARS (Military Affiliate Radio System), and 4% each work with REACT and search-and-rescue groups.

Most of you limit your emergency/disaster activities to those related to amateur radio, as 57% of you report no additional affiliation. Among the 43% involved with other groups, 38% work with groups other than those we listed; 21% volunteer with the Red Cross in non-communication roles, 17% are on Local Emergency Planning Councils, 11% are in Police Auxiliary groups, 9% belong to CERT (Community Emergency Response Team), and 2% each work with the Citizen Corps and the Salvation Army.

Finally, we asked about your emergency/disaster preparedness training, and 77% of you report some sort of formal training. Of that group, more than two-thirds (69%) have CPR/first aid training; a majority (54%) has taken SKYWARN weather-spotter training; 43% have "other state/local training;" 32% have taken the ARRL's Emergency Communications course; 29% have "other federal training;" 28% have been trained in the Incident Command System; 20% have had organizational training (such as Red Cross), and 10% have CERT training.

This month's free subscription winner is R. A. Embleton, KB3DAI, of Montrose, PA.

Reader Survey
May 2004

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 Survey Card and returning it to us. 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 and next, we're going to be asking questions about hamfests and you.

Please answer by circling the appropriate numbers on the reply card.

1. When was the most recent hamfest you attended?
   - Within the past 12 months 30
   - 1–2 years ago 31
   - 3–5 years ago 32
   - More than 5 years ago 33
   - Never been to a hamfest 34

2. What type(s) of hamfest(s) have you attended in the past three years?
   - Local hamfest 35
   - Small regional hamfest (major manufacturers *not* present) 36
   - Large regional hamfest (major manufacturers present) 37
   - Dayton 38
   - None 39

3. What type(s) of hamfest(s) do you *plan to attend* in the next 12 months?
   - Local hamfest 40
   - Small regional hamfest (major manufacturers *not* present) 41
   - Large regional hamfest (major manufacturers present) 42
   - Dayton 43
   - None 44

4. What is your *main* reason for attending a hamfest? (Just one, please)
   - Attend forums 45
   - Browse 46
   - Buy new equipment from dealer 47
   - Buy used equipment at the flea market 48
   - Learn about new equipment from dealers/manufacturers 49
   - Sell used equipment at the flea market 50
   - Socialize with other hams 51
   - Staff a booth/exhibit or as hamfest staff (including VEs) 52
   - Other 53
   - Never attended a hamfest 54

5. Have you ever helped staff a hamfest?
   - Yes, as an organizer/leader 55
   - Yes, as a volunteer helper 56
   - Yes, as a volunteer examiner 57
   - Yes, as a forum speaker 58
   - Yes, as a vendor/exhibitor 59
   - No 60

Thank you for your replies. We'll continue this topic next month.

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BY BOB JOSUWEIT,* WA3PZO

Feds Adopt National Incident Management System (NIMS)

In March U.S. Homeland Security Secretary Tom Ridge approved the National Incident Management System. According to a Department of Homeland Security (DHS) news release, NIMS is the nation's first standardized management plan that creates a unified structure for federal, state, and local lines of government for incident response. "NIMS gives all of our nation's responders the same framework for incident management and fully puts into practice the concept of, 'One mission, one team, one fight,' " Ridge said. This month we take a look at NIMS and offer some ideas as to what it will mean for amateur radio emergency communication.

In announcing the implementation of NIMS on March 1, Ridge said, "This unique system provides all of our nation's first-responders and authorities with the same foundation for incident management, in terrorist attacks, natural disasters, and other emergencies. From our nation to our neighborhoods, America is safer."

Last June, Citizen Corps White House Liaison Liz DiGregorio called ham radio operators the "first of the first responders." She said, "You are there. You are part of that very, very first response when it happens locally, especially in the initial stages of an emergency or disaster."

The DHS news release says "NIMS strengthens America's response capabilities by identifying and integrating core elements and best practices for all responders and incident managers." According to the plan, execution during a real incident will be consistent and seamless by having a balance between flexibility and standardization. There will be the use of common doctrine, terminology, concepts, principles, and processes during an incident. Responders will be able to focus more on response, instead of organizing the response, and teamwork and assignments among all authorities clearly will be enhanced.

Homeland Security Secretary Tom Ridge introduces new National Emergency Response Plan. (Photos & graphics courtesy U.S. Department of Homeland Security)

The Plan

Key elements and features of NIMS, as described by the Homeland Security department, include:

• **Incident Command System (ICS).** NIMS outlines a standard incident management organization called ICS that establishes five functional areas—command, operations, planning, logistics, and finance/administration—for management of all major incidents (*see November 2003 CQ "Public Service" column for an introduction to ICS.—ed.*). To ensure further coordination and during incidents involving multiple jurisdictions or agencies, the principle of unified command has been universally incorporated into NIMS. This unified command not only coordinates the efforts of many jurisdictions, but provides for and assures joint decisions on objectives, strategies, plans, priorities, and public communications.

• **Preparedness.** Responder readiness to manage and conduct incident actions is significantly enhanced if professionals have worked together before an incident. NIMS recognizes this and defines advance preparedness measures such as planning, training, exercises, qualification and certification, equipment acquisition and certification, and publication management. Preparedness also incorporates mitigation activities such as public education, enforcement of building standards and codes, and preventive measures to deter or lessen the loss of life or property.

• **Communications and Information Management.** Standardized communications during an incident are essential and NIMS prescribes interoperable communications systems for both incident and information management. Responders and managers across all agencies and jurisdictions must have a common operating picture for a more efficient and effective incident response.

• **Joint Information System (JIS).** NIMS organizational measures further enhance the public communication effort. The Joint Information System provides the public with timely and accurate incident information and unified public messages. This system employs Joint Information Centers and brings incident communicators together during an incident to develop, coordinate, and deliver a unified message. This will ensure that Federal, state, tribal, and local levels of government are releasing the same information during an incident.

• **NIMS Integration Center (NIC).** To ensure that NIMS remains an accurate and effective management tool, the NIC will be established by the Secretary of Homeland Security to assess proposed changes to NIMS, capture and evaluate lessons learned, and employ best practices. The NIC will provide strategic direction and oversight of the NIMS, supporting both routine maintenance and continuous refinement of the system and its components over the long term. The NIC will devel-

*c/o CQ magazine
e-mail: <wa3pzo@cq-amateur-radio.com>

op and facilitate national standards for NIMS education and training, first responder communications and equipment, typing of resources, qualification and credentialing of incident management and responder personnel, and standardization of equipment maintenance and resources. The NIC will continue to use the collaborative process of Federal, state, tribal, local, multi-discipline and private authorities to assess prospective changes and assure continuity and accuracy.

Local Adoption Necessary for Success

In order for state and local organizations to receive Federal preparedness assistance through grants and other activities, NIMS has to be adopted in those jurisdictions by Fiscal Year 2005. Jurisdictional compliance with certain aspects of the NIMS will be possible in the short term, such as adopting the basic tenets of the Incident Command System (ICS). Other aspects of the NIMS, however, will require additional development and refinement to enable compliance at a future date (e.g., data and communications systems interoperability). This may include the flow of data and information from amateur radio networks to other emergency management officials.

Preparedness is Key

Effective incident management begins with a host of preparedness activities conducted on a "steady-state" basis, well in advance of any potential incident. Preparedness involves an integrated combination of planning, training, exercises, personnel qualification and certification standards, equipment acquisition and certification standards, and publication management processes and activities. Each area should include amateur radio representation and participation. Relevant excerpts from the NIMS Manual follow:

(1) Planning: Plans describe how personnel, equipment, and other resources are used to support incident management and emergency response activities. Plans provide mechanisms and systems for setting priorities, integrating multiple entities and functions, and ensuring that communications and other systems are available and integrated in support of a full spectrum of incident management requirements.

(2) Training: Training includes standard courses on multiagency incident command and management, organizational structure, and operational proce-

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TX-472	72'	22'8"	1040	$3,462	$3,099
TX-472MDP	72'	22'8"	1210	$5,571	$4,899
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• Heavy duty, handles 44.7 square feet of antenna load at 50 MPH, 35 square feet at 70 MPH.

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MA SERIES CRANK-UP MASTS

• Handles up to 22 square feet of antenna load. (See chart below)

• MDP models include motor drive.

• All models supllied with anchor bolts, load-actuated hand winch, and house bracket.

• Options include coax arms, raising fixtures, motor drives, self-supporting and rotator bases, remote control panel, and more!

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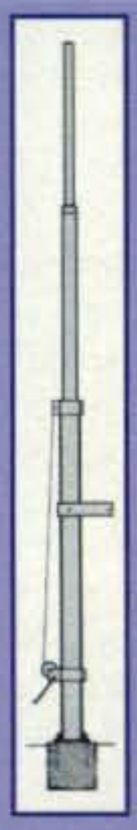

MA SERIES CRANK-UP MASTS

MAST MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	50 MPH (sq. ft.)	70 MPH (sq. ft.)	LIST PRICE	SALE PRICE
MA-40	40'	21'6"	242	16.5	6.8	$1,209	$1,079
MA-550	55'	22'1"	435	22	9	$1,875	$1,669
MA-550MDP	55'	22'1"	620	22	9	$3,584	$3,179
MA-770	71'	22'10"	645	15.5	5.5	$3,091	$2,789
MA-770MDP	71'	22'10"	830	15.5	5.5	$4,890	$4,329
MA-850MDP	85'	23'6"	1128	15.3	6.3	$6,591	$5,889

TMM SERIES COMPACT CRANK-UP TOWERS

• Handles 20 square feet of antenna load at 50 MPH, 8 square feet at 70 MPH.

• Compact design is great for areas with tower restrictions, or where a less intrusive installation is desirable.

• All models supllied with hinged T-base, anchor bolts, load-actuated hand winch, 8' steel mast, top plate, and rotor plate.

• Options include coax arms, raising fixtures, motor drives, thrust bearing, remote control panel, and more!

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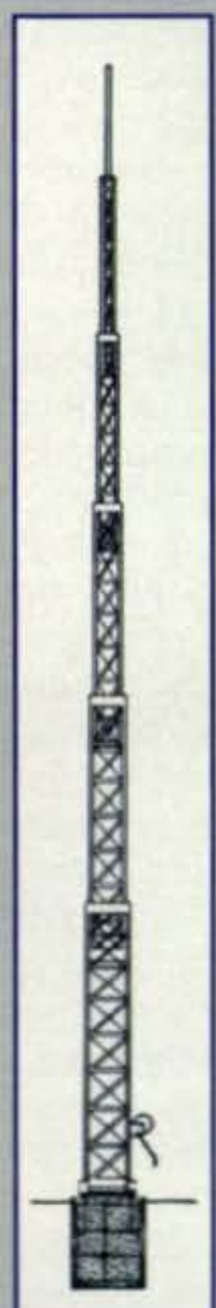

TMM SERIES COMPACT CRANK-UP TOWERS

TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
TMM-433SS	33'	11'4"	315	$1,626	$1,459
TMM-433HD	33'	11'4"	400	$1,970	$1,759
TMM-541SS	41'	12'	430	$2,135	$1,899

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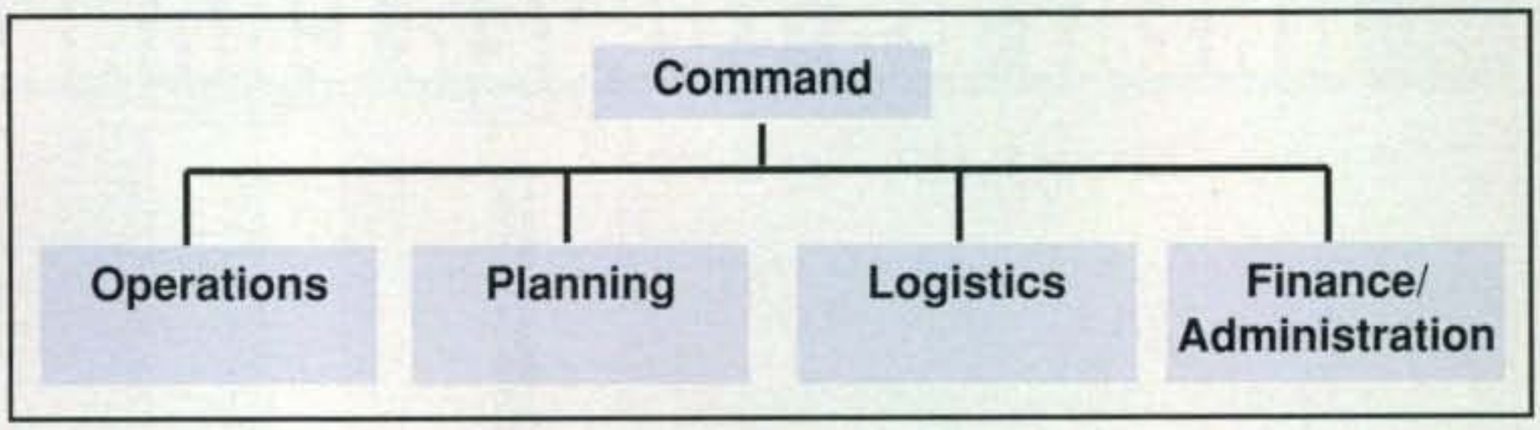


The are five main components to the Incident Command System, which is an integral part of the new National Incident Management System.

dures, discipline-specific and agency-specific incident management courses, and courses on the integration and use of supporting technologies.

(3) Exercises: Incident management organizations and personnel must participate in realistic exercises—including multidisciplinary, multijurisdictional, and multisector interaction—to improve integration and interoperability and optimize resource utilization during incident operations.

(4) Qualification and Certification: Qualification and certification activities are undertaken to identify and publish national-level standards and measure performance against these standards to ensure that incident management and emergency responder personnel are appropriately qualified and officially certified to perform NIMS-related functions.

(5) Equipment Acquisition and Certification: Incident management organizations and emergency responders at all levels rely on various types of equipment to perform mission essential tasks. A critical component of operational preparedness is the acquisition of equipment that will perform to certain standards, including the capability to be interoperable with similar equipment used by other jurisdictions.

(6) Publications Management: Publications management refers to forms and forms standardization, developing publication materials, administering publications—including establishing naming and numbering conventions, managing the publication and promulgation of documents, and exercising control over sensitive documents—and revising publications when necessary.

(7) Resource Management: The NIMS defines standardized mechanisms and establishes requirements for processes to describe, inventory, mobilize, dispatch, track, and recover resources over the life cycle of an incident.

(8) Communications and Information Management: The NIMS identifies the requirement for a standardized framework for communications, information management (collection, analysis, and dissemination), and information-sharing at all levels of incident management. These elements are briefly described as follows:

(1) Incident Management Communications: Incident management organizations must ensure that effective, interoperable communications processes, procedures, and systems exist to support a wide variety of incident management activities across agencies and jurisdictions.

Integrated Communications: Incident communications are facilitated through the development and use of a common communications plan and interoperable communications processes and architectures. This integrated approach links the operational and support units of the various agencies involved and is necessary to maintain communications connectivity and discipline and enable common situational awareness and interaction. Preparedness planning must address the equipment, systems, and protocols necessary to achieve integrated voice and data incident management communications.

(2) Information Management: Information management processes, procedures, and systems help ensure that information, including communications and data, flows efficiently through a commonly accepted architecture supporting numerous agencies and jurisdictions responsible for managing or directing domestic incidents, those impacted by the incident, and those contributing resources to the incident management effort. Effective information management enhances incident management and response and helps ensure that crisis decision making is better informed.

Technology and technological systems provide supporting capabilities essential to implementing and continuously refining the NIMS. These include voice and data communications systems, information management systems (i.e., record keeping and resource tracking), and data display systems. Also included are specialized technologies that facilitate ongoing operations and incident management activities in

situations that call for unique technology-based capabilities.

Talking to the Comm Unit

In both the NIMS and the Incident Command System (ICS), the Communications Unit develops a Communications Plan to make the most effective use of the communications equipment and facilities assigned to the incident, installs and tests all communications equipment, supervises and operates the incident communications center, distributes and recovers communications equipment assigned to incident personnel, and maintains and repairs communications equipment on site.

The Communications Unit's major responsibility is effective communications planning for the ICS, especially in the context of a multiagency incident. This is critical for determining required radio nets, establishing interagency frequency assignments, and ensuring the interoperability and the optimal use of all assigned communications capabilities.

The Communications Unit Leader should attend all incident-planning meetings to ensure that the communication systems available for the incident can support tactical operations planned for the next operational period. Incident communications are managed through the use of a common communications plan and an incident-based communications center established solely for the use of tactical and support resources assigned to the incident.

Advance planning is required to ensure that an appropriate communications system is available to support incident operations requirements. This planning includes the development of frequency inventories, frequency-use agreements, and interagency radio caches.

Most complex incidents will require an Incident Communications Plan. The Communications Unit is responsible for planning the use of radio frequencies; establishing networks for command, tactical, support, and air units; setting up on-site telephone and public address equipment; and providing any required off-incident communication links. Codes should not be used for radio communication; a clear spoken message—based on common terminology that avoids misunderstanding in complex and noisy situations—reduces the chances for error.

According to the plan, radio networks for large incidents will normally be organized as follows:

1. Command Net: Links together incident command, command staff, section chiefs, branch directors, division and group supervisors.

2. Tactical Nets: Several tactical nets may be established to connect agencies, departments, geographical areas, or specific functional units. The determination of how nets are set up should be a joint planning, operations, and logistics function. The Communications Unit Leader will develop the overall plan.

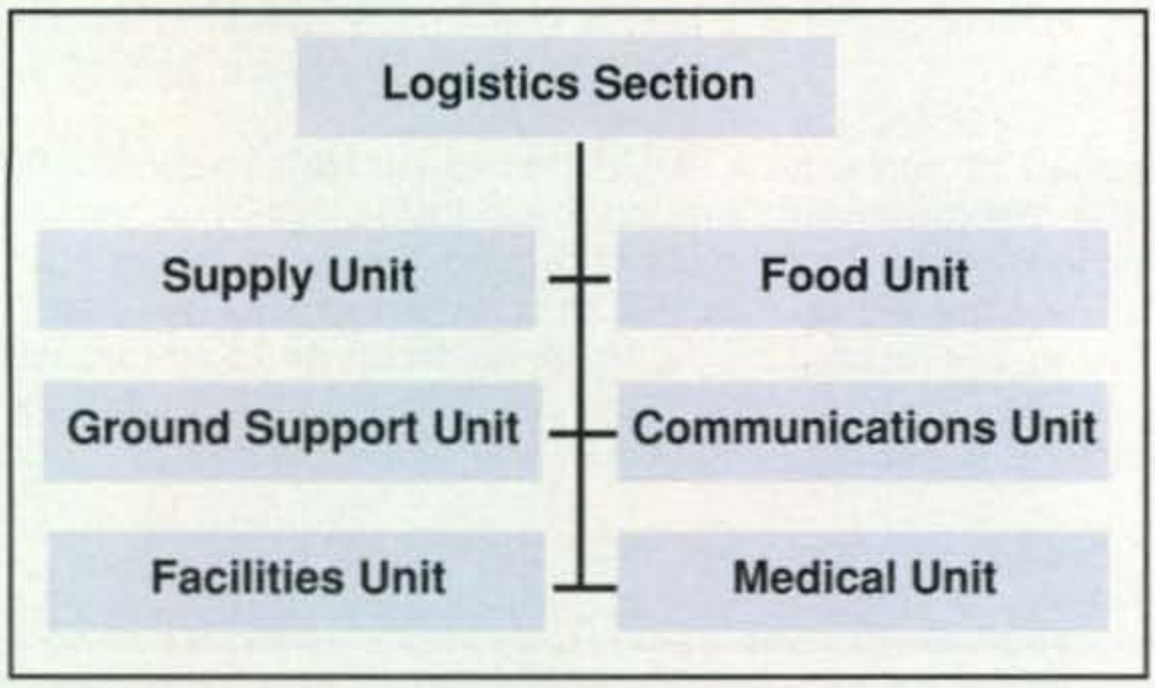
3. Support Net: A support net may be established primarily to handle changes in resource status but also to handle logistical requests and other nontactical functions.

4. Ground-to-Air Net: To coordinate ground-to-air traffic, either a specific tactical frequency may be designated, or regular tactical nets may be used.

5. Air-to-Air Nets: Air-to-air nets will normally be predesignated and assigned for use at the incident.

Time to Speak Up

We've outlined some of the key ele-



Amateur Radio communications falls under Logistics in the Incident Command System.

ments of the National Incident Management System plan. With each community working to implement the plan in its area, this provides hams with a good opportunity to work with local emergency management agencies and become part of the plan. This could include identifying how or what type of information will be passed from the amateur radio networks to other agencies; agreeing on common wording to make sure there are no mistakes made between agencies or groups; and determining whether digital data can be handed off to emergency managers in a useful manner that will not require the information to be retyped into another system.

Training will have to include not only amateur radio procedures, but an understanding of NIMS, ICS, and other protocols or background information that will make the ham radio operators truly trained communicators.

If hams are going to be working side by side with other agencies in the communication unit, there is also a need to identify any potential radio interference. The time to learn of a problem is during a drill.

In virtually every drill and exercise, emergency management officials respond that one of the key areas to work on is communications. As one local Alabama emergency management official said following a hazardous material drill in which ham radio operators supplied communications, "You can always have better communication. Getting the word out to the public, hospital, and our responders went very well. Communication is the key."

That's a Wrap...

This month we changed gears to bring you the latest news from the emergency management community and highlighted areas to which amateur radio emergency communication responders will have to pay attention in the near future. This may open up the doors for discussion in your community. If local plans have to be updated or changed because of the new guidelines, it is an opportunity to better define the role of amateur radio.

Let us know how the new guidelines are affecting the way amateur radio communications are handled in your area. The complete NIMS manual can be found on the Department of Homeland Security website at <http://www.dhs.gov>. Ham radio operators who serve as their group's public information officer should read the guidelines for working with the press during a disaster. Until next time . . . 73, Bob, WA3PZO

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AL-80B kilowatt output *desktop* linear amplifier doubles your average SSB power output with high level RF processing using our exclusive *Dynamic ALC*™!

You get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias*™ completely turns off the 3-500G tube between words and dots and dashes. Saves hundreds of watts wasted as heat for cooler operation and longer component life.

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New class of *Near Legal Limit*™ amplifier gives you 1300 Watt PEP SSB power output for *60%* of price of a full legal limit amp! 4 rugged 572B tubes. Instant 3-second warm-up, plugs into 120 VAC. Compact 14½Wx 8½Hx15½D inches fits on desktop. 160-15 Meters. 1000 Watt CW output. Tuned input, instantaneous RF Bias, dynamic ALC, parasitic killer, inrush protection, two lighted cross-needle meters, multi-voltage transformer.

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AL-800
$1825
Suggested Retail
1 tube, 1250 W

AL-800H
$2695
Suggested Retail
2 tubes, 1.5 kW *Plus*

These HF linears with *Eimac*® 3CX800A7 tubes cover 160-15 Meters including WARC bands. Adjustable slug tuned input circuit, grid protection, front panel ALC control, vernier reduction drives, heavy duty 32 lb. grain oriented silicone steel core transformer, high capacitance computer grade filter capacitors. Multi-voltage operation, dual lighted cross-needle meters.

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math's notes

BY IRWIN MATH,* WA2NDM

Diode-like Circuits

This month we would like to describe several diode-like circuits of which you might not be aware. These versatile devices simulate the operation of a diode but have more uses than just AC to DC conversion, as you soon will see.

Most hams are familiar with zener diodes for use as voltage regulators, but what if the particular voltage you require is not available? Fig. 1 is a circuit that can be used in the same way as a zener, but it is adjustable. The conventional zener circuit is also shown in the figure for comparison. In operation, the transistor will turn on when the base-to-emitter voltage reaches about 0.7 volts, so by adjusting the 10K pot you can determine where this will happen. When the transistor does turn on, it will only stay on as long as the base voltage is maintained. As a result, the collector voltage will remain stable. By changing the value of the fixed resistor and pot you can vary the final collector voltage. Be careful not to exceed the collector-current-carrying capacity of the transistor, however. You can use this circuit as shown or almost anywhere a zener diode is used. The "anode" portion of the circuit is the collector/1K resistor junction; the "cathode" portion is the emitter/bottom of the 10K pot junction.

There is an interesting device available called a *current regulator diode.* This device will only allow a predetermined amount of current to flow through it regardless of the applied voltage; its use (and

*c/o CQ magazine

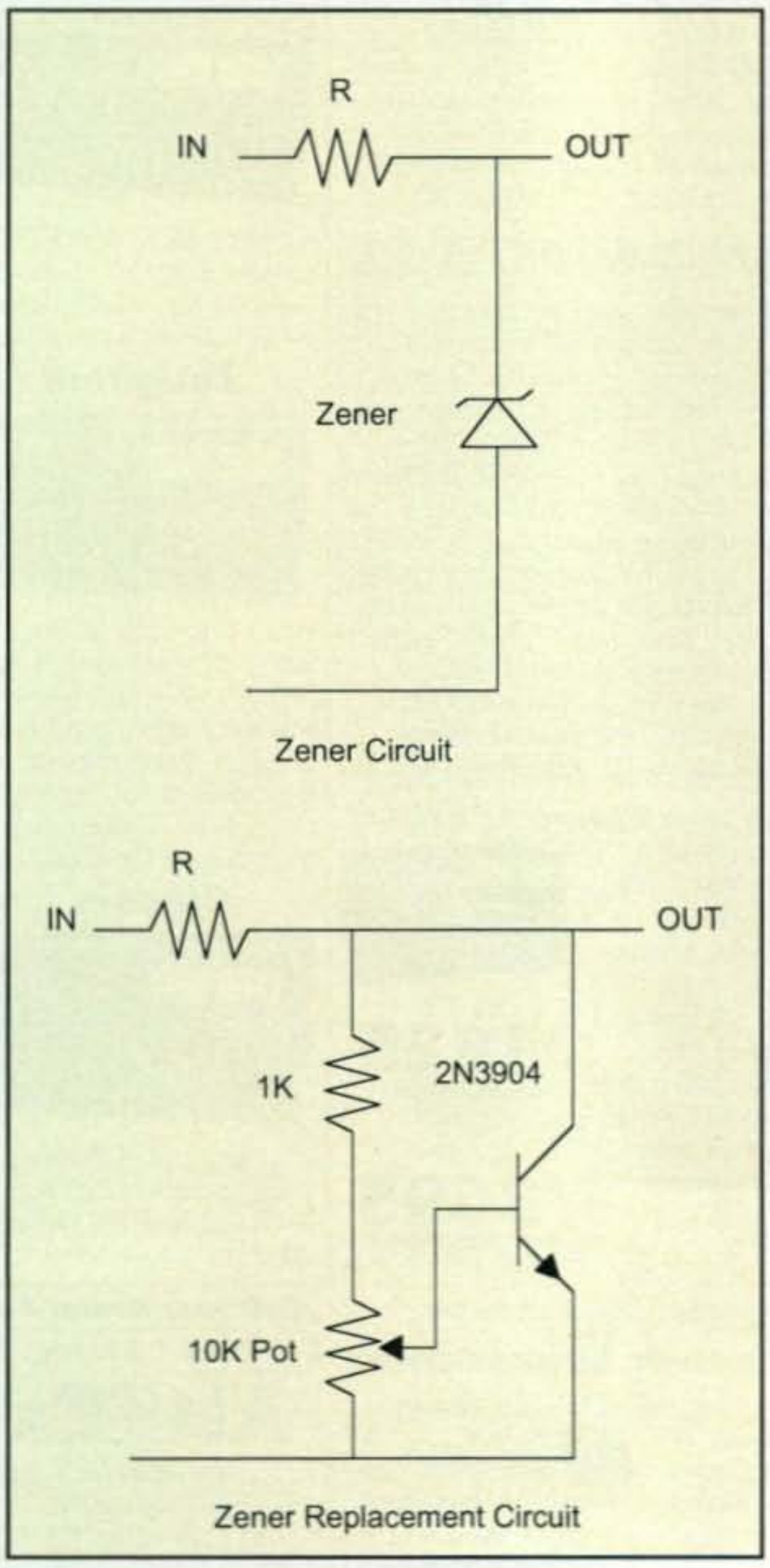

Fig. 1– A zener-diode replacement circuit.

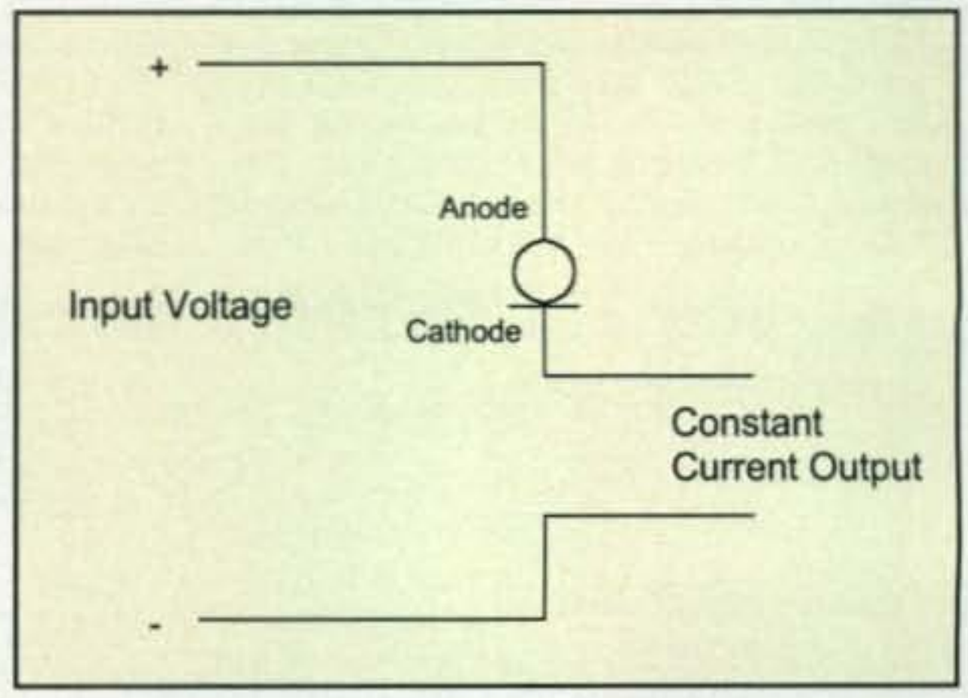

Fig. 2– The current-regulator diode circuit.

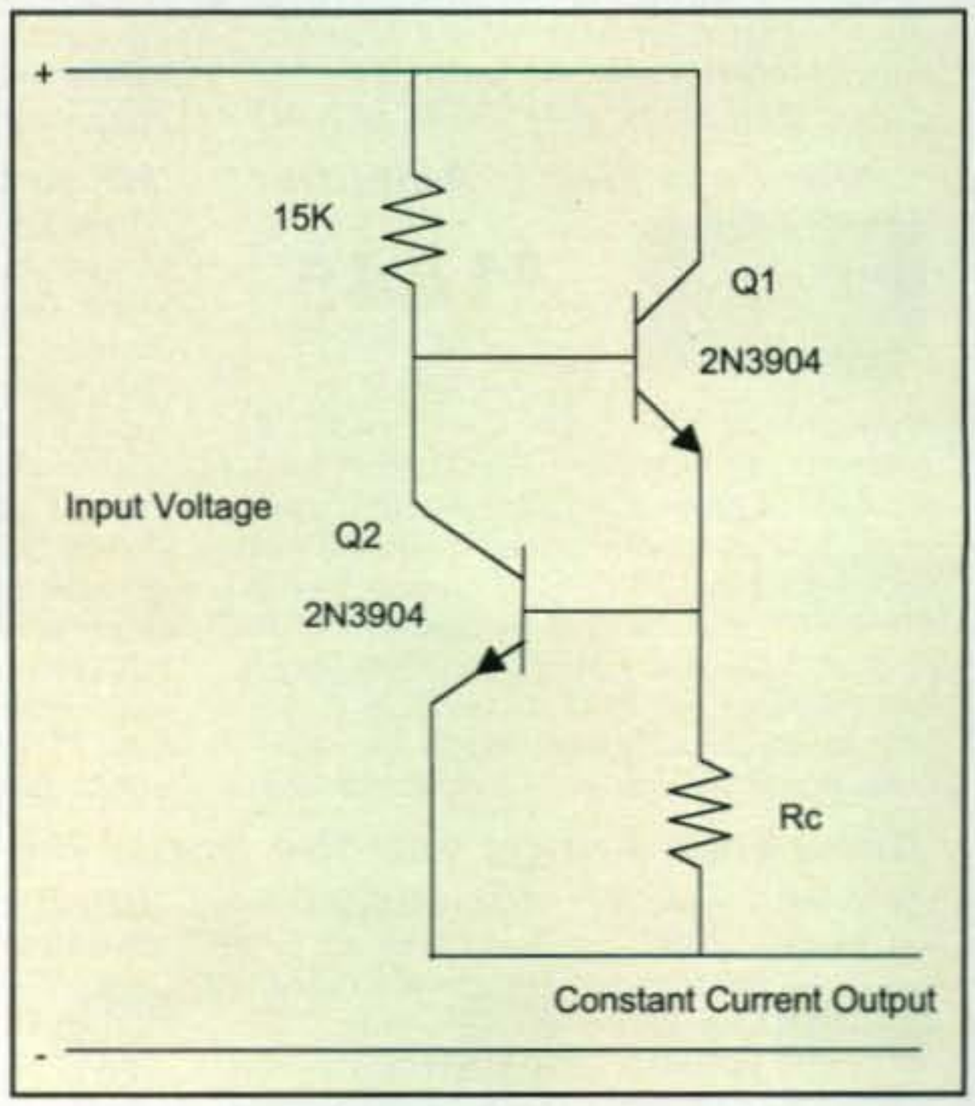

Fig. 3– Current-regulator circuit.

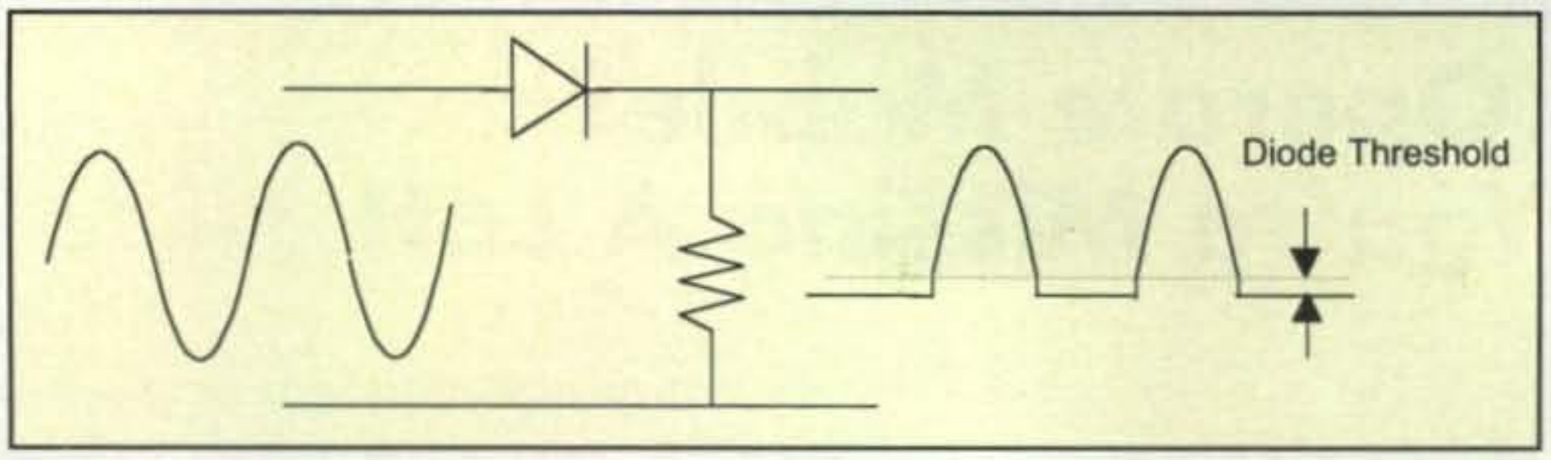

Fig. 4– Common half-wave rectifier.

schematic symbol) is shown in fig. 2. Like the zener, it is available in various ranges (but this time for current) from 0.43 to 4.7 ma. Fig. 3 is the non-diode equivalent. The value of Rc is determined by the amount of current you wish the circuit to regulate according to the formula Rc = 0.7/desired current. In operation, current flowing through Rc develops a voltage across it that at approximately 0.7 volts turns on Q2. When Q2 turns on, it shorts the base of Q1, turning it off. This results in a stable current flowing through the circuit. Unlike the current-regulator diode, however, you can set the circuit to almost any current you wish as long as you do not exceed the maximum current-carrying capacity of Q1. As in the case of the zener equivalent, this circuit can also "float" as a two-terminal device when required.

The circuit in fig. 4 is the standard diode half-wave rectifier. This circuit is used for applications that range from power supplies to RF detectors. There is one drawback, however; the diode has a forward voltage drop of about 0.7 volts for silicon and 0.5 volts or so for Schottky variations. This means that you must exceed this "threshold" value in order for the circuit to conduct. For large voltages this usually is not a problem, but if you are trying to rectify or detect levels under a volt, severe distortion can result. Fig. 5 is the non-diode equivalent. Although not strictly diodeless, the circuit neatly eliminates the forward drop of the diode. The op-amp in the circuit has a gain of 1 (R feedback/R input), and positive input signals are simple inverted. The negative output of the op-amp reverse biases the diode (keeping it cut off) so the gain is solely determined by the 1K feedback resistor. For negative-going input signals the op-amp output is positive, forward biasing the diode which feeds back the signal to the input, resulting in an output of zero. The op-amp neatly eliminates the forward drop of the diode. The frequency response as well as the maximum current-carrying capacity of the circuit are determined by the op-amp and diode chosen. Good operation can be achieved into the tens of MHz if desired.

I hope the above information is of interest to you and that you will feel free to contact us with interesting applications of these non-diode circuits.

73, Irwin, WA2NDM

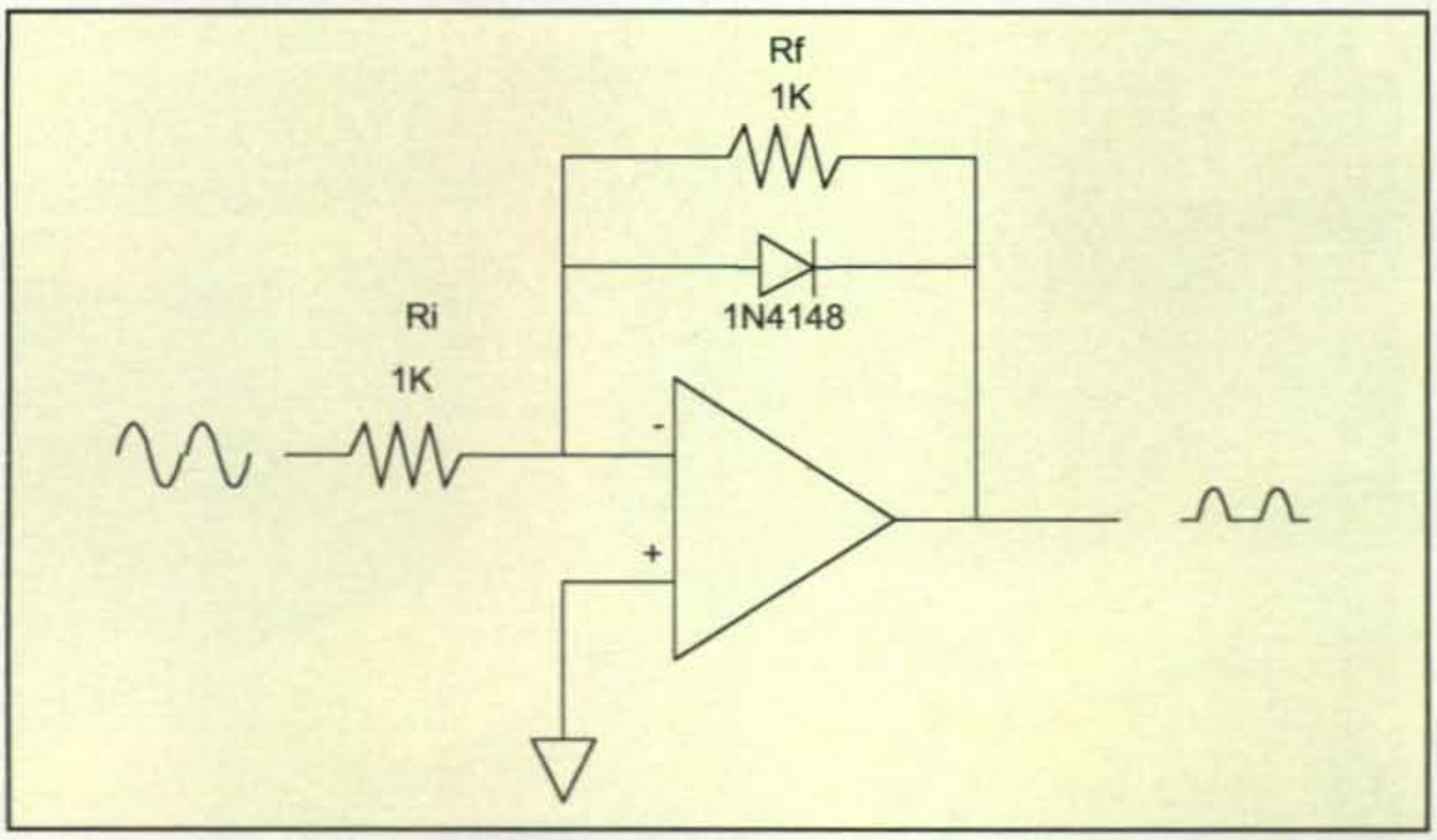

Fig. 5– Non-diode precision rectifier.

mobiling

BY JEFF REINHARDT,* AA6JR

Do You Operate Mobile? If Not, You're Missing A Lot!

It's spring, and time for hams in most of the country to once again enjoy the pleasures of mobile operations. If you're part of this mode of operation, you know the joys of making a transceiver part of your commuting or leisure time. However, if you have yet to try a quality mobile installation, read on. Let's start with a look at some of the reasons *why* you should operate mobile.

No Antenna Restrictions!

Too many hams now find themselves in antenna-restricted communities. Whether it is local ordinances or the dreaded CC&Rs—"covenants, conditions and restrictions"—found in many housing tracts, your ability to operate mobile is *not* restricted. Why feel frustrated by such rules, when for a few dollars and some time spent on a quality installation you can "work the world" or across town from the comfort of your car, practically anywhere, practically anytime?

Newer, smaller radios make multi-band operations a snap, and antenna technology has advanced to the point where a huge antenna is not needed for most mobile operations.

Kenwood, Yaesu, ICOM, and Alinco all make capable radios, including some models that are available for under $1000, yet they put out a full 100 watts. Recently, Kenwood introduced a mobile transceiver capable of 200 watts.

With more hams now qualifying for operation on the HF bands, and the prospect of more coming, it makes sense to look at a mobile shack to make the most of your ham radio enjoyment. Imagine the thrill of commuting to work while you chat with an operator hundreds, or even thousands, of miles

Today's compact equipment allows hams to have a complete "shack on wheels" without occupying the whole car or looking unsightly. This is N6FM's very neat HF/VHF/UHF installation of a Kenwood TS-480 mobile HF rig (control head on dashboard, RF unit behind VHF rig), an Alinco DR-605T 2-meter/70-centimeter FM transceiver, a remote-control unit for his SGC 500-watt HF amplifier, and a Heil headset mic for safe operating while driving. (N6FM photo)

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Mobiling hams attending the Dayton Hamvention® can benefit from the expertise of representatives from major automobile manufacturers, there specifically to give installation tips and help resolve problems with mobile operation in their vehicles. (W2VU photo)

away. Beats listening to the same old drone from the broadcast radio!

An Added Layer of Safety

You also have the added security of radio communications no matter where you travel. There are several HF nets and many more repeaters on VHF and UHF that provide aid to the traveler. Whether it's help with directions or reporting a mishap, your transceiver can be everything from a timesaver to a lifesaver.

Many of today's transceivers have extended receivers that go beyond the ham bands. Some even receive FM broadcast signals. Imagine listening to shortwave broadcasts, air traffic control, weather bulletins, or CB channels for highway information; it's all possible when you select the right gear.

More Than Just a Rag Chew

The mobile shack can also add to the modes you enjoy. VHF and UHF "hill-toppers" often enjoy contesting from the comfort of their vehicles (and some of those hilltops can be pretty chilly *outside* the car or truck). There are also very competitive hidden-transmitter hunts in communities across the country, where a good radio is only half the equation; a skilled operator is also required.

A mobile unit is also a nice addition to a motor home, adding a world of enjoyment while barely taking up any room. Also, it's great to set up a schedule with other hams in the family to tell them of your latest travels and where you've parked the RV for the night.

I'm not a shopper, but my XYL is a world-class bargain hunter. Thus, instead of being bored while she peruses the mall, I stay in the car making contacts from a parking lot that's pretty much clear of obstacles. Living just a few miles from the Pacific Ocean, it's also a short drive to the beach, where it's a nice clear shot across the water to Asia, Australia, and the exotic islands of Oceania.

Going Afield

If you are a ham who's "antenna challenged," going mobile can allow you to take your rig to some great antenna sites. It's not at all difficult to drive to a park and string a half-wave dipole in the trees, and connecting it to your transceiver is easy. One ham I know drove to an abandoned broadcast antenna site and was working 160 meters through an antenna tuner into a nice tall tower! The possibilities are almost endless if you use a little imagination. *(Be sure to get permission before operating from private property, and we've been hearing about a growing number of parks that are requiring a permit for anything that involves setting up something outside of your vehicle.—ed.)*

Installing and operating a mobile transceiver will make you a better operator. You face a wide variety of challenges, but you also get to operate from exotic locations under many different types of conditions. On my last trip to Hawaii, I took along mobile gear and even from a rental car I was able to enjoy being the subject of many calls, including several happy county hunters who needed the contact.

Beat the Boring Commute

I have a ham friend who commutes in a van pool. Several days a week he brings along his mini HF rig and works CW without disturbing the driver or other passengers. Another friend works 2-meter SSB, catching those nice skip openings that come along from time to time. That's not to take anything away from the VHF and UHF repeaters that make a nice chat possible just about anytime, and with more repeaters being linked through the internet, your commute can be en-

hanced by conversing with a ham on the other side of the planet.

If you think you've "done it all" in ham radio, think about what you can do with a good mobile station. You're free of many constraints and always looking for that next opportunity to make a new friend.

Tap into Expertise

Setting up your mobile station requires some planning and drawing on the expertise of others. There are a lot of good ideas out there, and this column is one of the places where information is exchanged. Talk to other hams. With the longer days of summer coming, too, maybe your next club meeting could be a place where members show off their mobile rigs and share their tips on how to set up a great-looking installation.

For those who travel to Dayton, the radio manufacturers can show you a wide variety of options. Ditto for the antenna designers, builders, and retailers. Several of the major vehicle manufacturers also have a presence at Dayton, and you can speak with their personnel about the best way to install and operate from their particular brand of vehicle. It's a great asset to tap into that kind of expertise.

You can also set up a vehicle "tracker" using the APRS packet radio format which can transmit the location, course, and speed of your vehicle. Think of what an asset that can be when coordinating coverage of the next foot race or cycling event your club helps with. APRS is even used on floats in the annual Rose Parade!

The world of mobile operations is diverse and fascinating. All it takes to start the ball rolling is for you to get going on creating your "dream station" in your vehicle. Who knows? You may even make contact with the "ultimate" mobile station riding a few hundred miles overhead in the International Space Station!

More on "Supertuners"

I'm always impressed with the broad knowledge and experience base found in the ham community. A few issues back you may recall we discussed "supertuners" that can find a "match" for just about anything as an antenna (I exaggerate). Here's a note that comments on the use of coax coming out of a "supertuner":

> I was surprised to read in your article that SGC is saying that it is okay to use coax between the antenna and an SGC tuner. I think perhaps Terry's statement is a bit too broad. Certainly if the impedance at the base of the antenna is not too terribly far off from 50 ohms, then use of the coax is fine. If, on the other hand, we are talking about using something like a 102-inch whip on 75 or 40 meters, then coax should not be used. As the whip becomes short in terms of wavelength, then the feed impedance becomes very high. The capacitance of even a short piece of coaxial cable will present a low-impedance (as compared to the high-impedance antenna) path to ground, bypassing a good deal of the signal around the antenna. Even if the tuner is able to find a match, the antenna system efficiency will be very low if you attempt to use coax cable to feed a short whip. It is not a matter of added loss in the coax due to the high SWR; it is a matter of the capacitance between the center conductor and the shield which winds up being in parallel with the antenna feed point.
>
> *73, Bob (AA4PB)*

Thanks, Bob. You ably indicate that conditions vary widely from band to band and even over a just a few kHz, as the match for mobile antennas tends to be very narrow. A supertuner can add some bandwidth, but like everything else, there are limitations.

Keep sending those ideas and photos. If you're sending digital photos, please be sure to send high resolution shots. We'd love to show off your mobile station! Happy mobiling!

73, Jeff, AA6JR

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DUAL RECEIVER CONTROLS

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DUAL RECEIVER CONTROLS

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DUAL RECEIVER CONTROLS

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DUAL RECEIVER CONTROLS

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The Joys of Outdoor HF'n – Part I (plus Uncle Dave's Car-Care Guide)

BY DAVE INGRAM,* K4TWJ

It's springtime and the season for outdoor hamming and big-time mobiling is once again in full swing. What a terrific time it is to enjoy HF'n on the road, at the beach, or portable from some unique landmark or vacation site. DXing is good, QRM is light, and even low-power mini rigs are reaching out in high style. It is genuine amateur radio fun at its best. There is plenty of terrific gear to use, and everyone is heartily invited to join the action. Go for it! Need an extra nudge? Maybe our accompanying views and helpful tips will help. First, however, let's take a quick peek at some unusual HF mobiles.

Off the Beaten Path

Tweaking our interest in classic delights from yesteryear, Mike Zane, N6ZW, shows us the Webster Band Spanner mobile antenna mounted on his pickup truck (photo A). The Band Spanner was quite popular during the 1950s and '60s and operates much like a manually tuned version of today's well-known screwdriver-type antennas. It stands 10 feet tall, has a 1-inch diameter base mast section with integral coil and a stainless-steel upper whip, and covers 75, 40, 20, 15, 10, and 11 meters (which was a ham band during the 1950s). Band selection (and SWR pruning) is accomplished by moving the whip in/out of the base mast section, causing it to slide inside the coil and short the appropriate number of turns for resonance. Notice the similarity here, friends: The loading coil moves on contact "fingers" in a screwdriver-type antenna and the whip moves a coil-contact ring in the Band Spanner. Both types of antennas are continuously variable and both can cover WARC bands, 60 meters, and/or other ranges. Assuming a Band Spanner has been stored in a cozy shack and protected from rough weather, it should work as well today as it did 50 years ago—or even better with good base impedance matching. Our compliments to Mike, N6ZW, on his attention-grabbing mobile 'tenna.

Continuing along the unique-antenna path, Budd Drummond, W3FF, the same friendly chap who produces those hot Buddipole portable antennas (www.buddipole.com), recently shared sketches of his 1990-style mobile sloper antenna (fig. 2). Budd mounted a 10-foot tall mast to the rear bumper of his pickup truck and installed a short piece of PVC pipe near the front bumper. He then installed a full-quarter-wave 20-meter wire sloper (16 feet) between the supports, with the coax feed point at the top of the 10-foot mast. The coax center conductor connected to the sloping 16-foot wire and its shield connected to the mast, which in turn connected to the vehicle's bumper and frame to produce a good counterpoise. The setup looked unusual but worked out great. Clever, Budd!

Photo A– Check out this classic mobile antenna Mike Zane, N6ZW, mounted on his pickup truck. It is a 50-year-old, immaculately preserved Webster Band Spanner. It covers 75 through 10 meters and works like a manually tuned screwdriver-type antenna. Big-time radio glamour for sure! (Photo courtesy of N6ZW)

Tips for New Mobileers

Would you like to expand your mobile horizons but consider putting an HF rig in the car too challenging? No problem. Just remember a few fine details and you will emerge a winner, possibly doing better than many old-time mobileers. What kind of fine details? First and foremost is solid vehicle-frame grounding at both the transceiver and antenna. Second is good impedance matching at the antenna's base, and third is proper DC power cabling. Each of these considerations is very important yet easily overlooked. Avoid that pitfall and you will enjoy top mobiling results.

*4941 Scenic View Drive, Birmingham, AL 35210
e-mail: <k4twj@cq-amateur-radio.com>

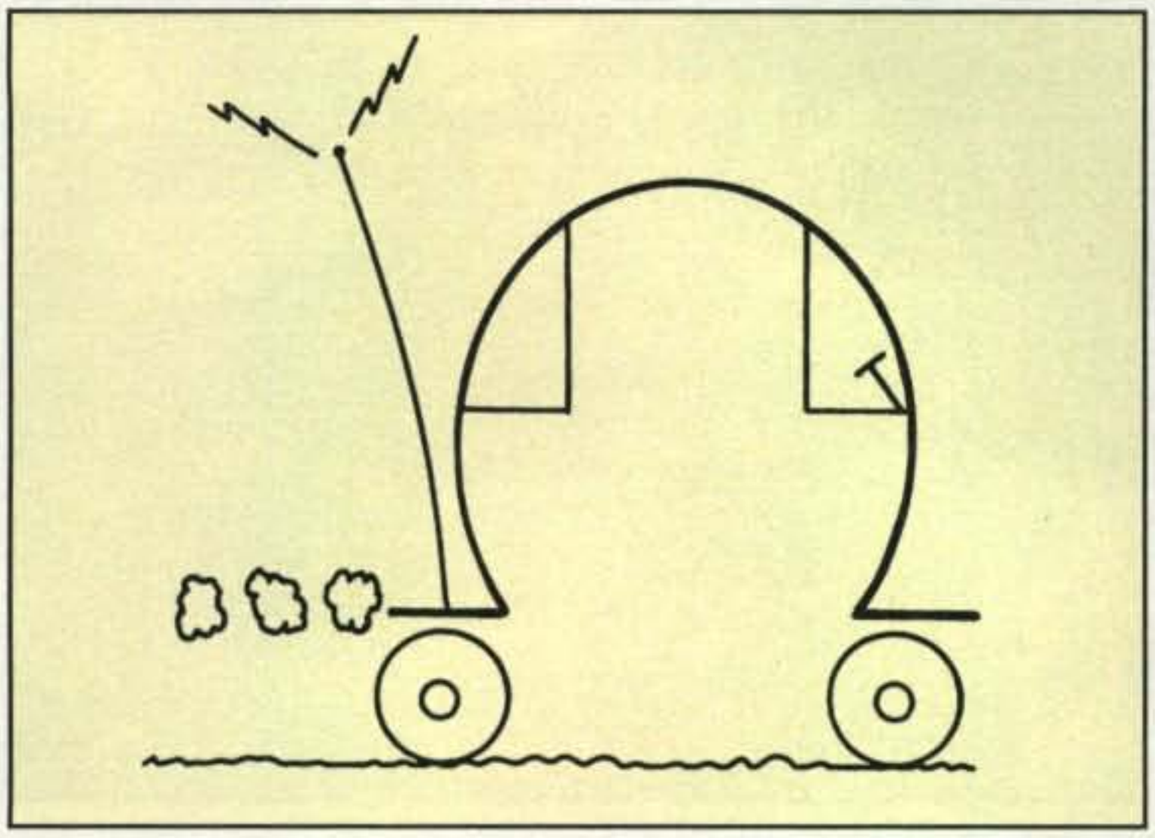

Fig. 1– What is it? A mobile ohm, naturally!

Photo B– If you have ever considered bicycle mobiling for fun or health, maybe this view of John Cummings, VE3JC, and friends will encourage you to give it a go. There is nothing like a quiet back road or peaceful meadow for impromptu mobile fun. (Photo courtesy of VE3JC)

The "instant mobile" technique of powering a small transceiver from a vehicle's accessory socket and snapping a magnetic-mount antenna on the roof may work for 2-meter FMing, but "low band" HF'n requires a slightly more up-front effort. Why? HF transceivers usually run more power than tiny 2-meter rigs, and HF antenna setups require actual electrical connections to ground rather than just capacitive coupling through a mag mount's feet. An HF antenna mount serves two purposes here: It supports the antenna and it ensures solid electrical grounding for the coax shield and impedance-matching system right at the antenna's base. The vehicle's frame and/or body then serves as a rolling ground or counterpoise. Yes, a multi-foot mag mount will support an HF antenna, but an added-on ground strap must connect between the auto's metal body and the coax shield *at the antenna's base* to be effective. Otherwise the antenna will be little more than a piece of rod at the end of a coax cable, and a fair amount of power will be lost rather than radiated. Usually, ineffective grounding can also be recognized by an SWR that cannot be reduced below 1.4 or 1.5 to 1, and the SWR fluctuates noticeably (up to 2.2 to 1) according to movement of nearby vehicles.

Trunk-lip and hatch mounts are dandy for supporting HF antennas, but do not assume that they magically produce a good vehicle ground at the antenna's base. Check it with your trusty ohmmeter to be sure. Start by installing the mount in its desired location, and then remove it and use a knife to scrape through paint and expose shiny metal precisely where setscrews left their indentations. Reinstall the mount, ensuring setscrews contact metal and install the setup's coax feedline to the mount. Next, touch one of your ohmmeter leads to the coax shield (at the far/rig end's PL-259 plug) and the other ohmmeter lead to a frame or body bolt or the trunk's lower latch assembly. *This way, you must read continuity through the coax connector, the coax shield, the shield-to-antenna-mount connection, through the mount-to-trunk junction, on through trunk hinges, to the body, and back to the ohmmeter.* Should the meter read over 3 or 4 ohms, start hunting down the poor connection point(s). Stay with it and be diligent. Remember, this step makes the *big difference* between a ho-hum and a super-performance HF mobile setup, and it also helps avoid RF feedback (stumbling engine, blinking dash lights, etc.).

Finished? Add a base impedance-matching coil between the bottom of the antenna and one of the mount's grounding setscrews as shown in fig. 3. Then experimentally move the coil's tap position until you find the spot of lowest possible SWR (using an MFJ-259 Antenna Analyzer is heartily suggested; it makes

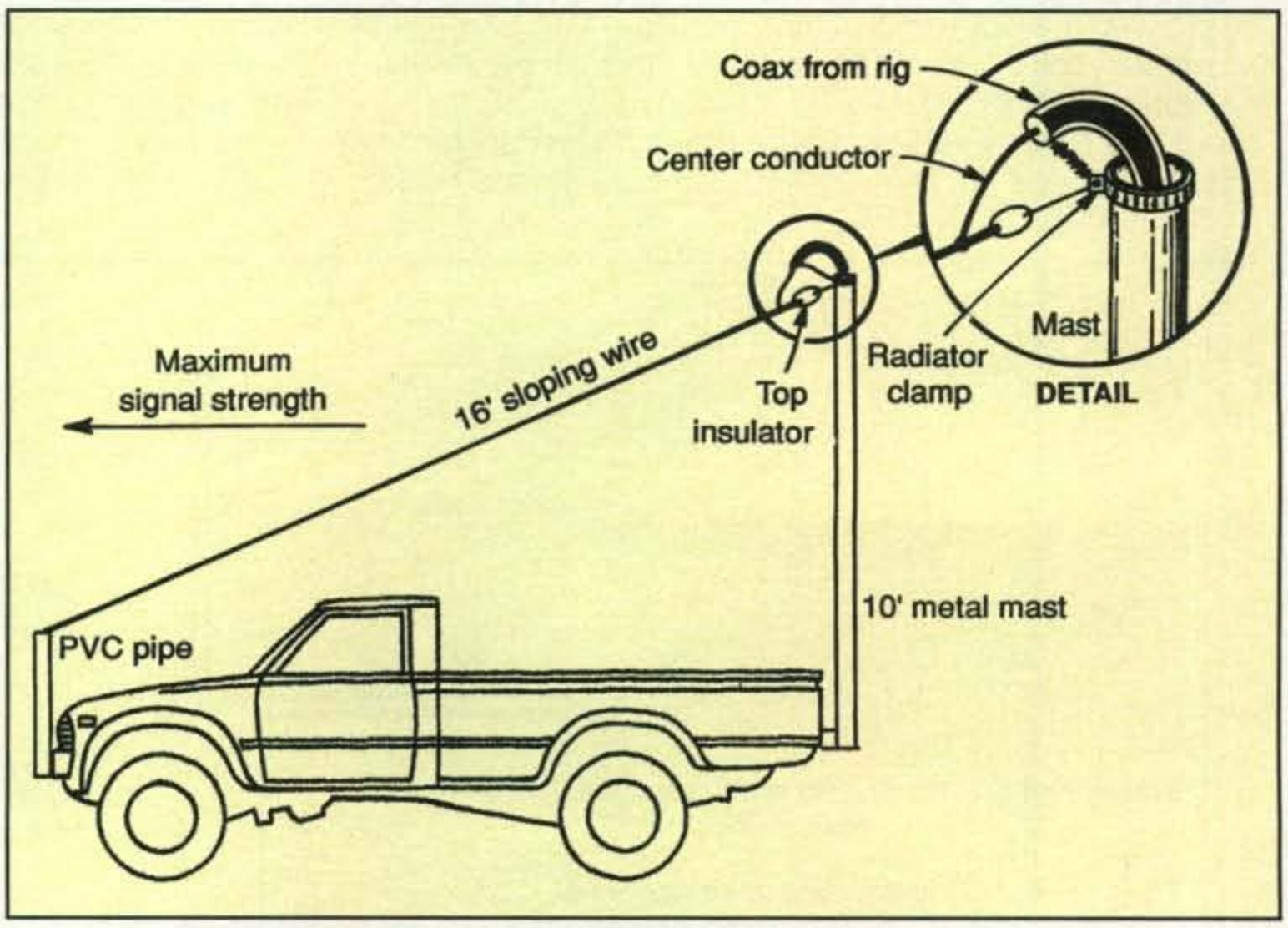

Fig. 2– Outline of the 20-meter mobile sloper devised by Budd Drummond, W3FF, for use on his pickup truck. Coax routes through the center of the 10-foot mast and the center conductor connects to a sloping wire at top. Coax shield connects to the mast, which is bolted to the frame. The sloper is full quarter-wave long and radiates an outstanding signal.

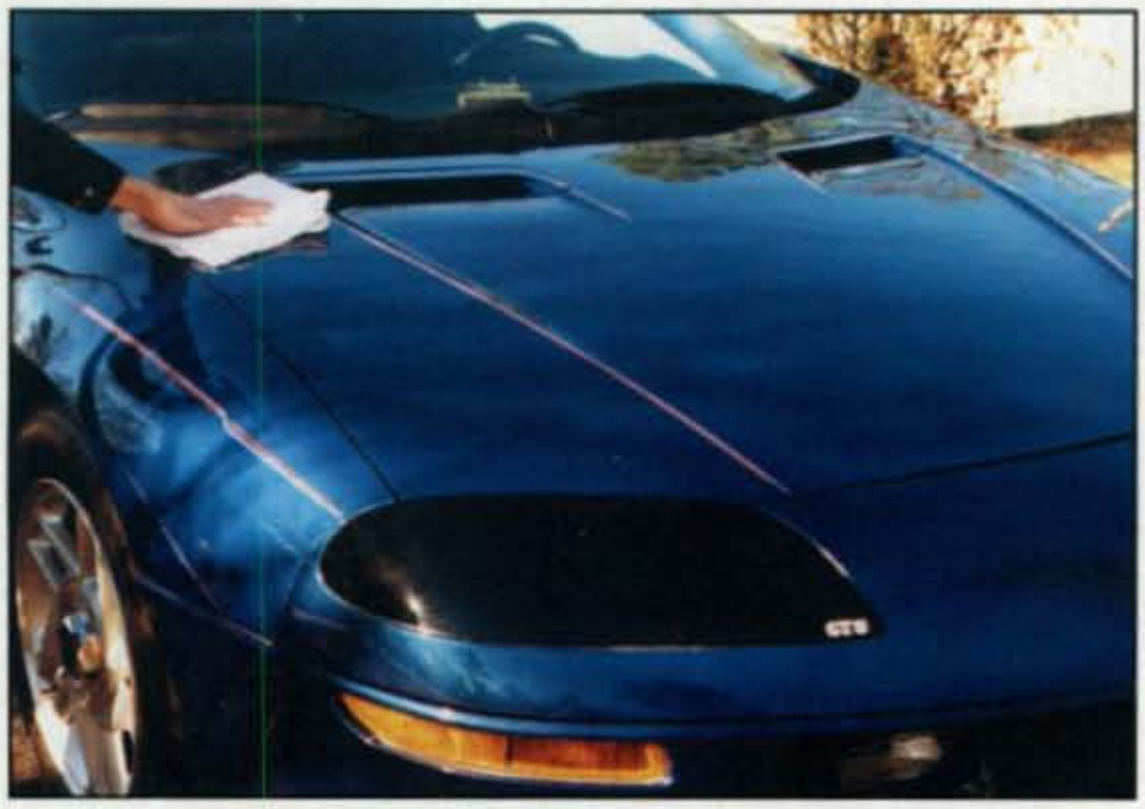

Photo C– Serious car care begins with a good vehicle wash by hand, not by a machine, which can leave scratches and swirls and eats mobile antennas. Wash the vehicle in the shade with a packet of wash-and-wax liquid, and then dry it with slightly damp hair-salon towels or hand towels to prevent unsightly water spots. Look at your vehicle under fluorescent lights at night to fully understand those statements.

Photo D– A low-cost, lightweight rotary buffer makes auto waxing quick and easy. Use a clean pad on the buffer, apply only light pressure, and keep the buffer moving to avoid burns or swirls.

the step a 5-minute cinch). I find a coil 2 1/2 inches in diameter and approximately 2 1/2 inches tall with four turns per inch of number 12 or 14 solid wire works fine here. (B&W coil stock #3034 also works well here, but you must buy a 10-inch section.) Approximate tap points are six turns for 40 meters; four turns for 30, 20, and 17 meters; and three turns for 15 meters (no coil used for 10 meters; remove it). You may also need to re-tweak stinger length to resonance during the tap-hunting process. For neatness, add a large spade lug to one coil end and bend it so the antenna's base sits through the coil. A photo that clarifies this appeared in our February 2004 KX1 review, and another coil photo will appear next month in our review of Iron Horse mini-HF antennas.

Next, prepare a vehicle frame-grounding strap for your transceiver—and no, the trunk/hatch-mount ground connection at the antenna's base is not sufficient here. *The transceiver's case/ground must connect to vehicle's metal framework precisely where it is installed so the vehicle's full body/frame will serve as a ground.* This is probably the most often overlooked step in any rig's installation. Do not skip it. In most cases, a short strap or piece of braid routed from a seat bolt to the transceiver works great. Since you previously confirmed the PL-259's shell on your antenna's coax is grounded (and you have now routed that coax inside the car), touch one ohmmeter lead to the PL-259's shell and the other lead to your seat-bolted strap. If resistance is over three or four ohms, again start hunting down the poor or paint-insulated connection. An easy way to connect the ground strap to your transceiver, incidentally, is by clipping or clamping it to the PL-259's shell so both antenna and frame ground connections are made in one step.

Powering any transceiver running over 10 watts from a vehicle's accessory socket is asking for problems with over-

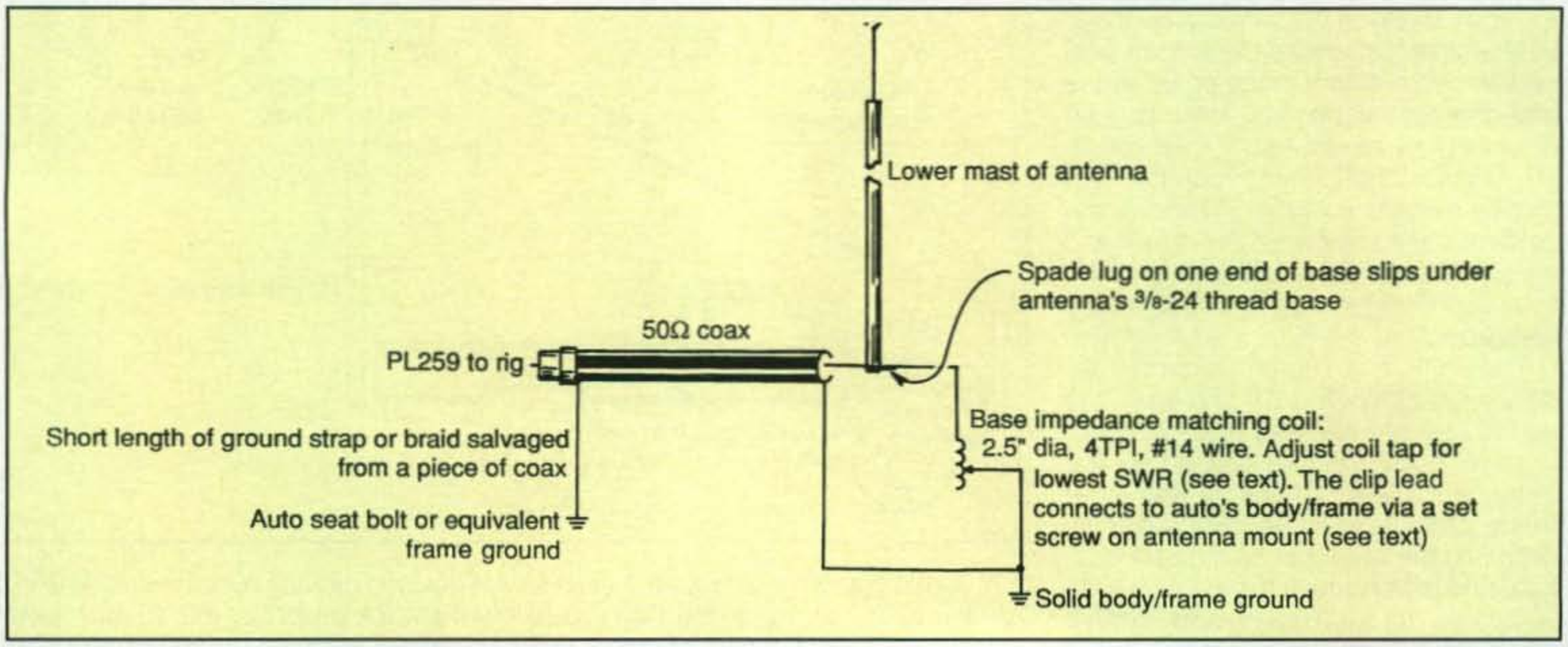

Fig. 3– Interconnection guide for putting together a top-notch HF mobile setup with antenna base impedance-matching coil and solid vehicle-frame ground system. (Discussion in text.)

Photo E– Attention to all fine details, such as cleaning inside wheel rims (behind spokes) and applying STP all the way out to the tread, gives a professional touch to car care for classy mobiling.

heated wiring and onboard-computer entanglements. Routing a cable direct from the battery and through the car's firewall or bulkhead is heartily encouraged. Many times, the cable can be snaked between the steering column and its large (and tight-fitting!) grommet. Use a large screwdriver to open the grommet enough to slip the cable through, and then add in-line fuses, connect to the battery, and get ready for some big-time mobiling!

Car Care

What is the perfect way to complement a classy mobile setup? With a sparkling clean and well-manicured vehicle, of course. How to do it? Start with a hearty interior and exterior cleaning, which includes door jambs, fender wells, wheels and their inner rims and tires—all the way out to the tread. Clean the interior with a good vacuum and quality velour and carpet cleaners. Then apply at least two coats of top-grade wax, taking care to buff it before it becomes hard and crusty. Not up to the rigor? Use a liquid wax such as "Mother's Gold" or Meguire's "Gold Class" and a lightweight rotary buffer, and it is a no-effort job. Repeat the procedure every two weeks until the finish acquires a glowing luster. Add a smooth coat of STP to rubber trim and tires (again, all the way out to the tread), and then top your chariot with a ham tag bearing your call letters (check with your local Department of Motor Vehicles for details).

Those tips again overflow our space for another month. Stay tuned for more news, views, and details in Part II next month. 73, Dave, K4TWJ

what's new

BY KARL T. THURBER, JR.,* W8FX

Receiver Test Oscillator, Master Antenna Controller, Repeater Book, and more

This month in your "What's New" column we'll narrow our focus to some noteworthy, even terrific, hamshack accessories, antennas and antenna accessories, software, books, and several other items we think will be of real interest to you. Let's dig right in.

Accessories for the Shack

Elecraft XG1 Receiver Test Oscillator. We have profiled Elecraft's radio gear and accessories, including many innovative kits, in previous columns. Now we believe we have another winner from Elecraft's Eric Swartz, WA6HHQ.

Eric notes that hams often wonder how well an HF receiver is really working, or how one receiver compares to another. One of the most important performance measurements is sensitivity. However, measuring sensitivity usually requires an expensive, lab-grade signal generator.

Elecraft's new XG1 Receiver Test Oscillator is an inexpensive alternative. The XG1 is a fixed-frequency (7.040 MHz) signal source with highly accurate 1-microvolt and 50-microvolt output levels. The XG1 achieves absolute output accuracy of better than ±2 dB, and an extremely small unit-to-unit variation of typically ±1 dB. This ensures that measurements made with different XG1s can be compared, which is helpful when evaluating used equipment found at flea markets or on the web.

The 1-microvolt level can be used to determine a receiver's MDS (minimum discernible signal), as well as its overall receive gain. Fifty microvolts is widely used as the standard "S9" reference, so this level can be used for S-meter calibration.

Step-by-step procedures are included for receiver performance measurement and S-meter alignment. The XG1 also can be used as a reference to calibrate other lab instruments. Additional features include an on-board 3-volt battery (a standard coin cell), yellow low-battery LED, green power-on LED, and red reverse-transmit warning LED. The unit is protected against brief accidental transmit, and it has been tested at up to 10 watts for 2 seconds.

An output frequency of 7040 kHz was selected, because nearly all multiband HF transceivers, as well as many monoband QRP transceivers, cover 40-meter CW. However, the XG1 also offers reduced output at harmonics of 7040 kHz, so it can be used for receiver alignment and qualitative tests on 20, 15, and 10 meters.

The XG1 is quite small: the PC board is just 1.5 inches wide by 3.5 inches long (see photo A). You can use a BNC male-to-male adapter such as Elecraft's BNC-MM to eliminate the coax and directly connect the XG1 to the back of a receiver or transceiver. Rubber feet also are included so the unit can be used on the workbench.

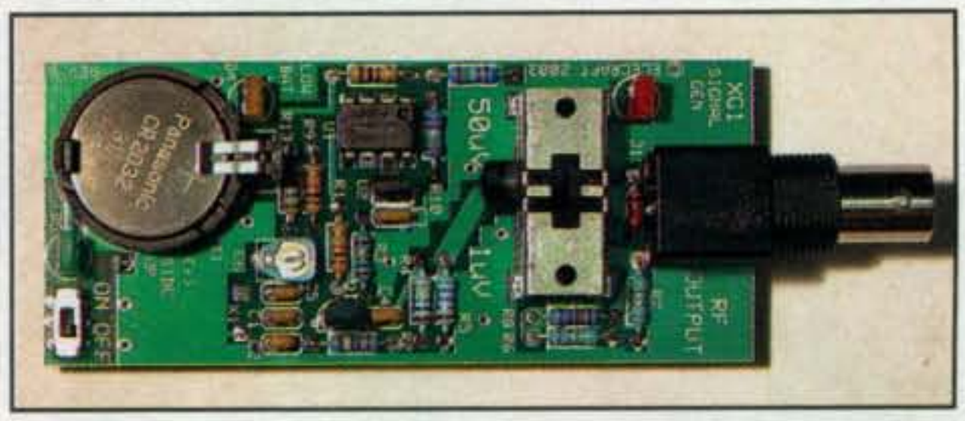

Photo A– One of the most important receiver-performance measurements is sensitivity. However, measuring sensitivity usually requires an expensive, lab-grade signal generator. Elecraft's new XG1 Receiver Test Oscillator is an inexpensive alternative. (Photo courtesy Elecraft)

The XG1 is $39; the BNC-MM adapter is $5. For further details on the XG1 and other Elecraft products, contact Elecraft LLC, P.O. Box 69, Aptos, CA 95001-0069 (831-662-8345; e-mail: <sales@elecraft.com>; <http://www.elecraft.com>).

MFJ High Current DC Multi-Outlet Strips. MFJ Enterprises offers four new flexible High Current DC Multi-Outlet Strips for the ham shack. With them, you can provide multiple DC outlets from your transceiver's DC power supply. The multi-outlet strips have five-way binding posts and/or Anderson PowerPole® connectors, depending on the model. Each Anderson PowerPole outlet can carry up to 40 amps. You can fuse each outlet as needed to protect your accessories or transceiver. The fuses are the widely available ATC/ATO automobile fuses, and can be used for 6-, 12-, or 24-VDC systems.

The heavy-duty DC input cable is built-in. It's a high-current capacity, eight-gauge, flexible, stranded six-footer. Extra connectors, contacts, and fuses are included free.

A heavy duty, 0.062-inch thick, double-sided, plated-through PC board with wide traces is used.

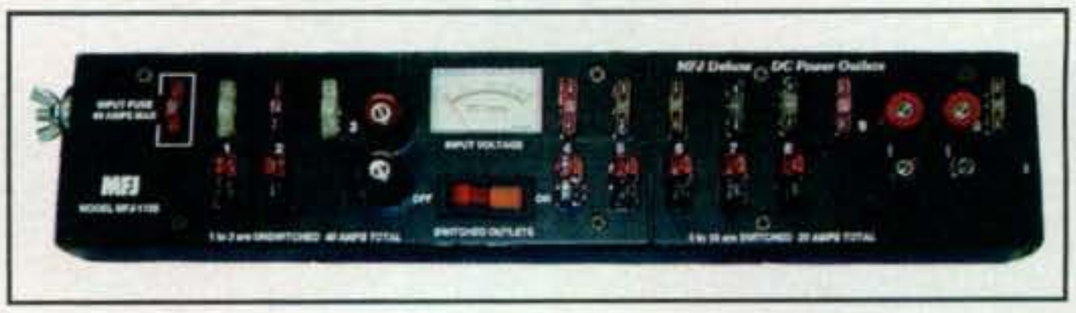

Photo B– MFJ offers four new flexible High Current DC Multi-Outlet Strips for the ham shack. The multi-outlet strips have five-way binding posts and/or Anderson PowerPole® connectors, depending on the model. The MFJ-1129 has both types of connectors. (Photo courtesy MFJ Enterprises)

*289 Poplar Drive, Millbrook, AL 35054-1674
e-mail: <w8fx@cq-amateur-radio.com>

Study with the Best!
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Get into ham radio the right way – studying with Gordo! His *Technician Class* book reorganizes the Q&A into logical topic groups for easier learning. His new audio course – now on 6 audio CDs – brings ham radio to life and is a great study companion to his book. W5YI interactive study software includes pop-up explanations from his book, making learning easy and fun! Answer wrong and his explanation appears!

Technician Class book	GWTM	$15.95
Technician audio theory course on 6 audio CDs	GWTW	$34.95
Tech book + software pkg.	NCS	$39.95

General Class

Upgrade to the HF bands by earning your General Class ticket using Gordo's new *General Class* book for the 2004-08 written theory exam. All the Q&A are reorganized into logical topic groups. His fun explanations make learning easy! Gordo's audio CD course is a great way to learn if you spend a lot of time in your car or truck. The W5YI interactive study software now includes Gordo's explanations from his book.

General Class book	GWGM	$17.95
General audio theory course on 4 audio CDs	GWGW	$24.95
General book + software pkg.	GUS	$39.95

Extra Class

Let Gordo help you earn your top ham ticket – Amateur Extra Class! His book includes memorable answer explanations to help you learn the material and understand the correct answer. His audio theory course reinforces learning and is a great study companion to the book. The W5YI interactive study software now includes the explanations from Gordo's book and helps you prepare for that tough Element 4 exam.

Extra Class book	GWEM	$19.95
Extra audio theory course on 6 cassette tapes	GWEW	$29.95
Extra book + software pkg.	ECS	$39.95

Tech + General Value Package

Package includes both Gordo books – *Technician Class* & *General Class* and W5YI study software for Elements 2 and 3, along with the W5YI Morse code software program to teach you CW for your Element 1 test, and free Part 97 rule book.

TPG $59.95

Get Your FCC Commercial Radio License

GROL-Plus book by Gordo & Fred Maia, W5YI, includes FCC Elements 1, 3, and 8 for MROP, GROL, *plus* Radar Endorsement. The best study manual for these valuable commercial licenses!

GROL-Plus book	GROL	$39.95
GROL-Plus book + W5YI study software pkg.	GRSP	$69.95

Let Forrest Mims teach you about electronics!

W5YI Ham Operator Software

Software includes Elements 2, 3, and 4 for all written exams, with Gordo's explanations from his Tech, General and Extra study manuals, along with the W5YI Morse code software on CD-ROM, with free Part 97 rule book. All W5YI software has been upgraded to work on the latest operating systems.

HOS (software only – no books)	$39.95
HOSB (software + 3 West books)	$79.95

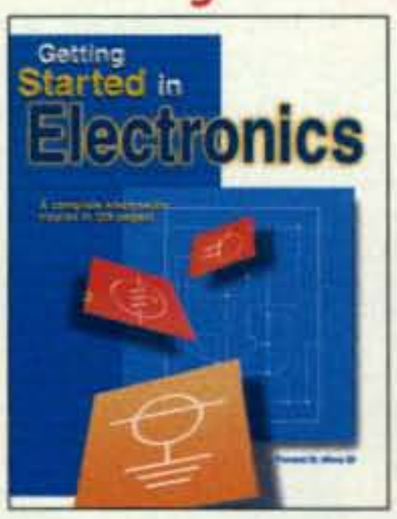
Learn Morse code for your upgrade to General & HF fun!

Morse code teacher course 0-5 wpm on 2 audio CDs	GWCT	$14.95
W5YI code software 0-48 WPM	WMC	$14.95

6-tape audio courses recorded by Gordo!

Morse code 0-5 wpm	GW05	$29.95
Morse code 5-16 wpm	GW13	$29.95
Morse code 10-28 wpm	GW20	$29.95

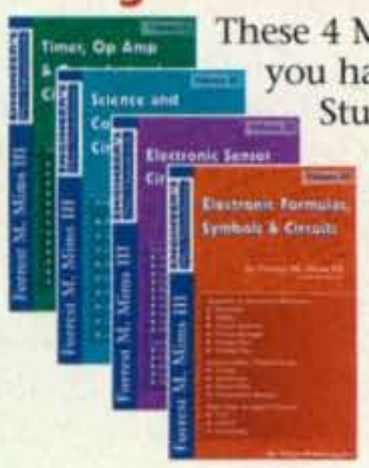
Getting Started in Electronics



A great introduction for anyone who wants to learn the fundamentals of electronics. Begin by learning about basic electronic components; study diodes and transistors. Explore digital and analog integrated circuits. Learn assembly tips for making temporary or soldered circuits. Includes 100 projects you can build, and great experiments that demonstrate how electricity works! Lots of great ideas for science fair projects!

GSTD $17.95

Engineer's Mini Notebooks



These 4 Mims classics teach you hands-on electronics! Study and build 100's of practical circuits and fun projects. Each volume contains several of his famous Mini Notebooks. Great experiments and science fair ideas!

Vol. 1: Timer, Op Amp + Optoelectronic Circuits & Projects	MINI-1	$10.95
Vol. 2: Science + Communication Circuits & Projects	MINI-2	$10.95
Vol. 3: Electronic Sensor Circuits & Projects	MINI-3	$10.95
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Want to learn more? Our *Basic Electronics* series is for you!

Each of our 3 *Basic* books takes you from fundamental concepts to solid understanding of the material. If you're a teacher, these books are for you & your students!

Basic Electronics	BELC	$17.95
Basic Digital Electronics	BDIG	$17.95
Basic Communications (analog) Electronics	BCOM	$17.95

Order today from W5YI: 800-669-9594 or on-line: www.w5yi.org

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Photo C– SGC's MAC-200 Master Antenna Controller is said to be the answer to multiple antenna matching. The MAC-200 is an entirely new entry in the antenna tuner market, a fully automatic switch and tuner integrated into a single box. (Photo courtesy SGC, Inc.)

It's said to offer the equivalent current-carrying capacity of a 4-oz. trace. The RF-tight aluminum cabinet has mounting ears and a ground post with wing nut.

Several models of High Current DC Multi-Outlet Strips, with varying configurations, are available and priced from $59.95 to $109.95. The MFJ-1129, at the high end of the line, lets you have the best of both types of connectors; you'll find it shown in photo B.

For additional information or a free 2004 catalog, contact MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759 (1-800-647-1800; e-mail: <mfj@mfjenterprises.com>; on the web: <http://www.mfjenterprises.com>).

Antennas and Accessories

SGC MAC-200 Master Antenna Controller. SGC, Inc. has been providing solutions for HF communications problems for about 34 years. SGC transceivers and Smartuners™ have held an enviable reputation for quality and reliability since 1970. *(Also, elsewhere in this issue see Gordon West, WB6NOA's review of the SGC ADSP²Speaker—ed.)*

The firm's newest product, the MAC-200 Master Antenna Controller (photo C), brings SGC's coupler technology to the radio room to control up to five antennas automatically. The MAC-200 is an entirely new entry in the antenna tuner market. It's a fully automatic switch and tuner integrated into a single box and is loaded with important features for both amateur and professional radio operators. Antenna selection is automatic under internal computer control, based on the frequency of operation. Once the antenna is selected, the tuning settings for the frequency are applied to assure an instant match.

Once it's "trained" to select the desired antenna, the MAC-200 frees the operator from any need to worry about the proper antenna or tuning. Front-panel meters provide an indication of power and SWR for use in evaluating operation.

For more information, contact SGC Inc., 13737 SE 26th Street, Bellevue, WA 98005 (1-800-259-7331; e-mail: <sgc@sgcworld.com>; on the web: <http://www.sgcworld.com>).

(We regret to report that Pierre Goral, KI7UA, President and co-founder of SGC, became a Silent Key on February 12, 2004. For details, please see the sidebar in WB6NOA's review noted above. Our condolences to his family and his co-workers at SGC.—ed.)

Antenex® 2.4 GHz Trapper™ Lightning Arrestor. Antenex is known for its high-quality antennas and antenna accessories. One new accessory is the 2.4 GHz Trapper™ Lightning Arrestor (photo D). The model is specifically

Photo D– An important Antenex accessory is the new 2.4 GHz Trapper™ Lightning Arrestor, which is specifically designed for use using Type N female connectors. The unit also features both extremely low insertion loss and high power-handling capability. (Photo courtesy Antenex)

designed for use with Type N female connectors, with gold-plated contacts and Teflon® dielectric. The unit also features low insertion loss and high power-handling capability (up to 70 watts). A patented gas-tube technology with extremely low capacitance is used, giving the unit capability in wideband applications ranging from DC to 4 GHz. The gas tube changes from an open circuit to a short circuit in the presence of a voltage surge; redirecting the energy surge to ground can help

Photo E– Nemal Electronics has introduced a new series of 75-ohm BNC connectors for use in broadcast, audio, video, and communications applications. The NE8000 series includes models for most popular 75-ohm cables. Construction is very user-friendly, both in terms of installation and mating. (Photo courtesy Nemal Electronics)

protect sensitive wireless equipment from this energy. The firm also offers models for 1 GHz and below that have a higher, 1000-watt PEP transmitting power capability.

For more information and pricing, contact Antenex, 2000-205 Bloomingdale Road, Glendale Heights, IL 60139 (1-800-323-3757; e-mail: <sales@antenex.com>; on the web: <http://www.antenex.com>).

Nemal NE8000 Series BNC Connectors for Serial Digital Applications. Nemal Electronics International enjoys a reputation as a quality manufacturer and distributor of a wide variety of electronic cable, connectors, cable assemblies, and patch panels. Recently, Nemal introduced a new series of 75-ohm BNC connectors for use in broadcast, audio, video, and communications applications. The NE8000 series (photo E) includes models for most popular 75-ohm cables. Construction is very user-friendly, both in terms of installation and mating. Each individual connector package contains appropriate cable information, as well as a diagram of strip dimensions.

For more details, contact Nemal Electronics International, 12240 N.E. 14th Ave., North Miami, FL 33161 (1-800-522-2253; e-mail: <info@nemal.com>; <http://www.nemal.com>).

Software and Computers

RT Systems Controllers. RT Systems is back, developing software for Yaesu's new radios, according to the company's Rod Thompson, KU4HP, and Karin Thompson, KD4DXX. From the people who first developed amateur radio computer programming come programmers for the latest Yaesu handhelds and mobiles (see figs. 1 and 2). The new programmers include the ADMS-1G for the VX-7, ADMS-1H for the VX-2, ADMS-2H for the FT-8900, ADMS-2I for the FT-8800, and ADMS-2J for the FT-2800. ADMS programmers for the FT-7800 and FT-857/897 also are available.

RT Systems programmers let you program your radio like a pro. The Windows®-based programming software allows you to easily manage several files at once for all those different events in which your radio is used. Memory information can be copied between two files, making setup of a new file quick and easy. You can manage all the special memory types in the new radios, including Hyper Memories and Memory Banks.

Available from your local Yaesu deal-

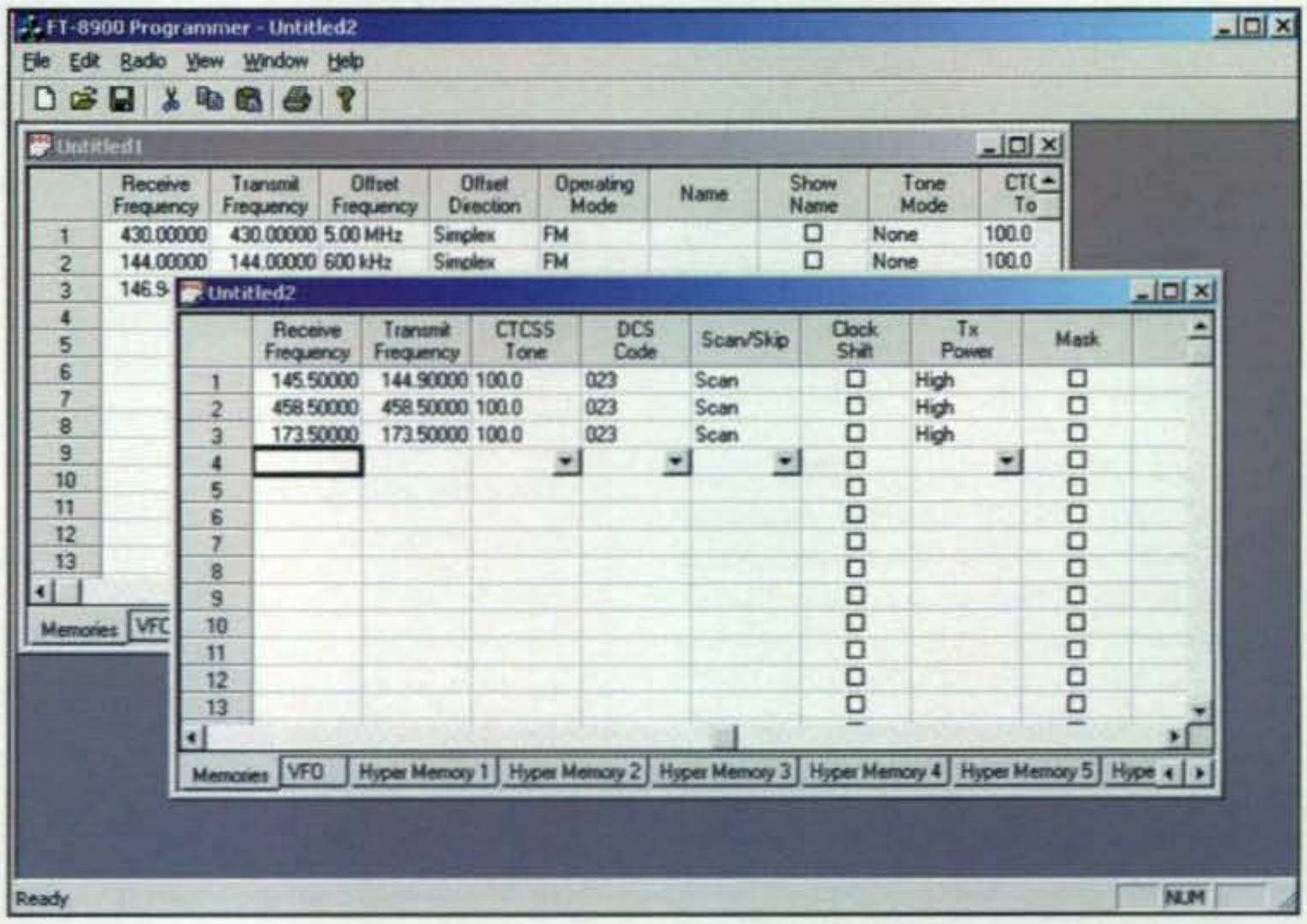


Fig. 1– Programming your transceiver or receiver has never been easier, and RT Systems has the software for Yaesu's new radios. The Windows®-based programmers open to a spreadsheet-style layout screen that's ready for data entry; there's no need to read from the radio, and no additional screens are needed for entering memory channel detail. Shown here is a typical RT Systems Programmer Main Screen, open for multiple files. (Graphic courtesy RT Systems)

er, from Yaesu, or from RT Systems, the ADMS programmers contain RT Systems software, so check the box label to be sure that's what you're getting. The new programmers are compatible with Windows versions 98 through XP and are now distributed on CD for convenient installation.

Contact RT Systems, P.O. Box 491660, Lawrenceville, GA 30049 (770-967-0945; e-mail: <sales@cloningsoftware.com>; on the web:

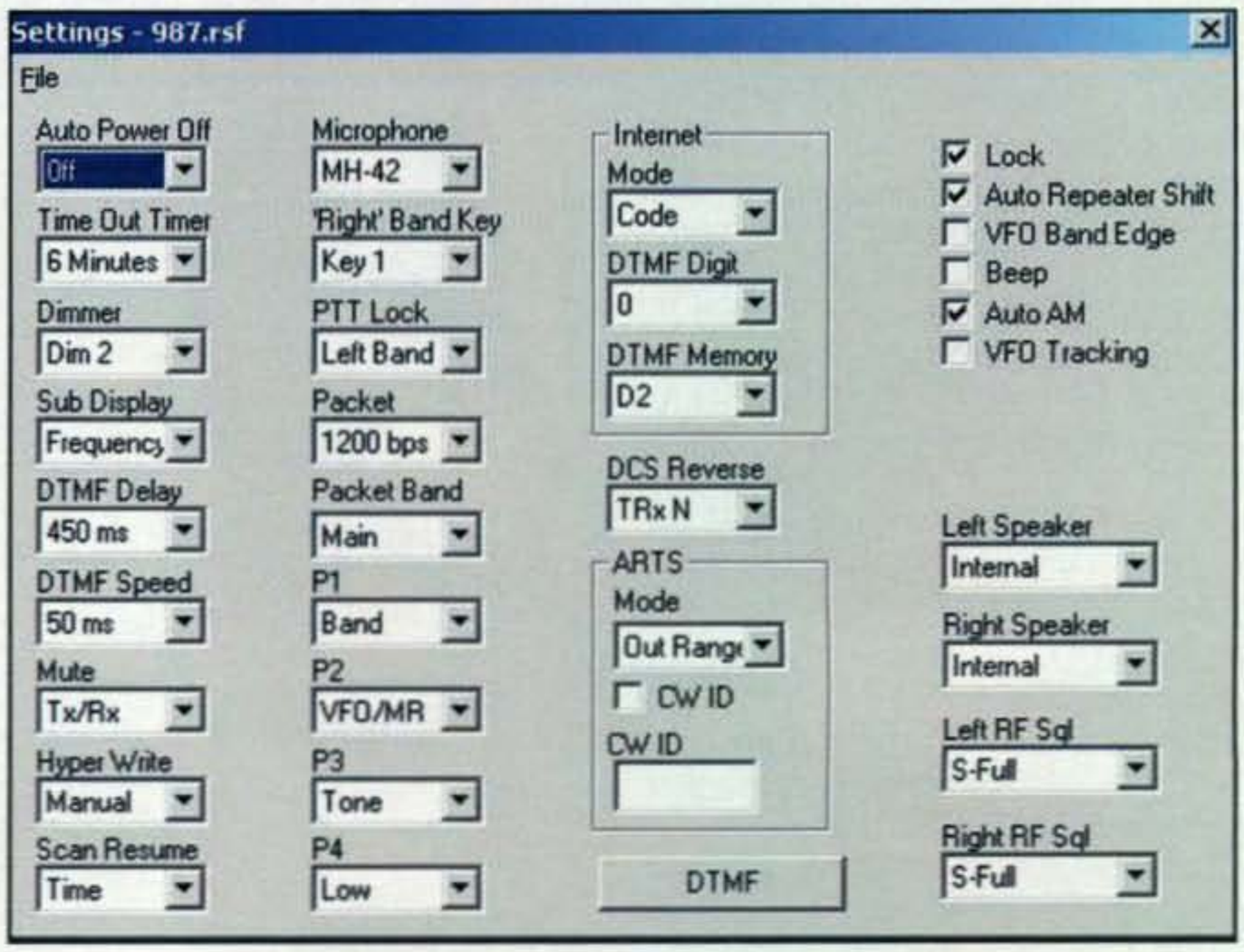


Fig. 2– RT Systems programmers let you program your radio like a pro and enter settings with ease. Shown here is an RT Systems Programmer Setting Screen with its "set and forget" design. Once these settings are set and saved, you don't have to touch them again when a new file is created. (Graphic courtesy RT Systems)

<http://www.cloningsoftware.com>). We also should mention that RT Systems has developed programmers for ICOM, Alinco, and ADI radios. Check out their informative website for further information on this fascinating new technology.

Two from Copernic®. In several columns, we noted various Copernic® programs, especially the Copernic search tools. These very capable programs help you find what you're looking for on the web by simultaneously using several user-selected search engines. In March 2003 we noted the new, sixth-generation Copernic Agent search software, including the free Copernic Agent Basic. Now Copernic has done it again with two innovative new search tools, Copernic Meta and Copernic Tracker.

Copernic Meta (fig. 3) is said to take internet searches to another level. This free meta-search application lets you search multiple engines in less than a second directly from your Windows desktop bar, which integrates with the Windows operating system and Internet Explorer. The software gives you quick and easy access to information on the internet by letting you start a search without even opening your browser, getting results in under a second.

In addition, a number of search categories are just a click away. These include the web, images, audio, multimedia, news, shopping, auctions, and more. Other optional categories are available, and you can add the search sites of your choice.

With Copernic Meta, which is always easy to access whatever the application, you no longer need to type a term in a text box to search the web. Instead, you can simply "Alt+Click" on a term to start a search. You can even use the handy keyboard shortcut "Windows Key + S" instead of the mouse for faster access. You can do various things such as meta-search the web for better search results vs. traditional search engines; compare prices at online stores; search for images, audio, multimedia, news, and auctions; search directly from any application; easily locate search keywords in found pages; "Alt+Click" any word on a web page to start a search on it; define keyboard shortcuts to query a specific search engine; add your favorite search engines and information sources easily; and much more.

Copernic Meta works with Windows 98, Me, NT, 2000, and XP, and it can be downloaded free at <http://www.copernic.com/meta>. You'll find the application program also is available for

other systems online at <http://www.copernicmeta.com>.

Lest we forget, Copernic also has introduced Copernic Tracker (fig. 4), an accessory exclusively for users of its popular Copernic Agent search software. Copernic Tracker ($49.95) keeps you up-to-date on what's new on the web by constantly monitoring the sites you're interested in and alerting you of changes. With it, there's no need to keep going back to the same sites for hobbies, work, news, shopping, and more, always looking for updates. You can let Copernic Tracker automatically watch them for you and be the first to know when there's something new! Key features include the ability to track sites for text changes and new images; receive update alerts by e-mail, on your desktop, and even on your cell phone; view updated pages with changes highlighted; schedule monitoring to run daily, weekly, or even up to the minute; watch for specific keywords on pages; archive different versions of tracked pages; and track any page you browse with a single click.

Contact Copernic, 360 Franquet St., Suite 60, Sainte-Foy, Quebec, Canada G1P 4N3 (418-527-0528; e-mail: <sales@copernic.com>; web: <http://www.copernic.com>).

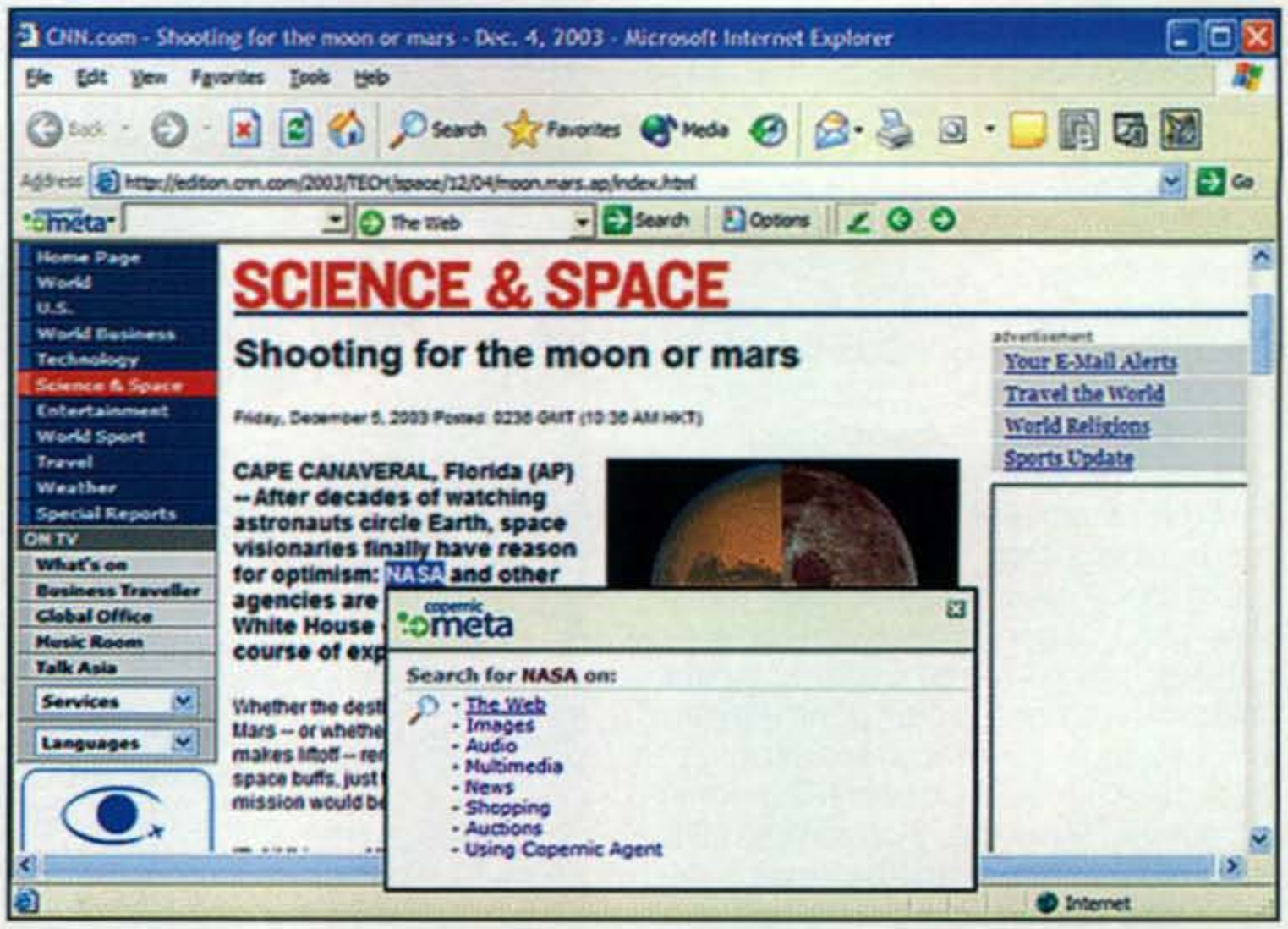


Fig. 3– Copernic®, a free meta-search application, lets users search multiple engines in less than a second directly from their Windows® desktop bar, which integrates with the Windows® operating system and Internet Explorer. (Graphic from the Copernic website)

From the Bookshelf

***Repeater MapBook* from ArtSci.** Artsci Publications has been producing books and manuals for the amateur radio community since 1989. The firm prides itself on providing straightforward instructions and drawings to make complicated aspects of the hobby simple to understand.

Artsci offers several reference publications for the radio amateur, SWL, and scanner buff. Among the most popular

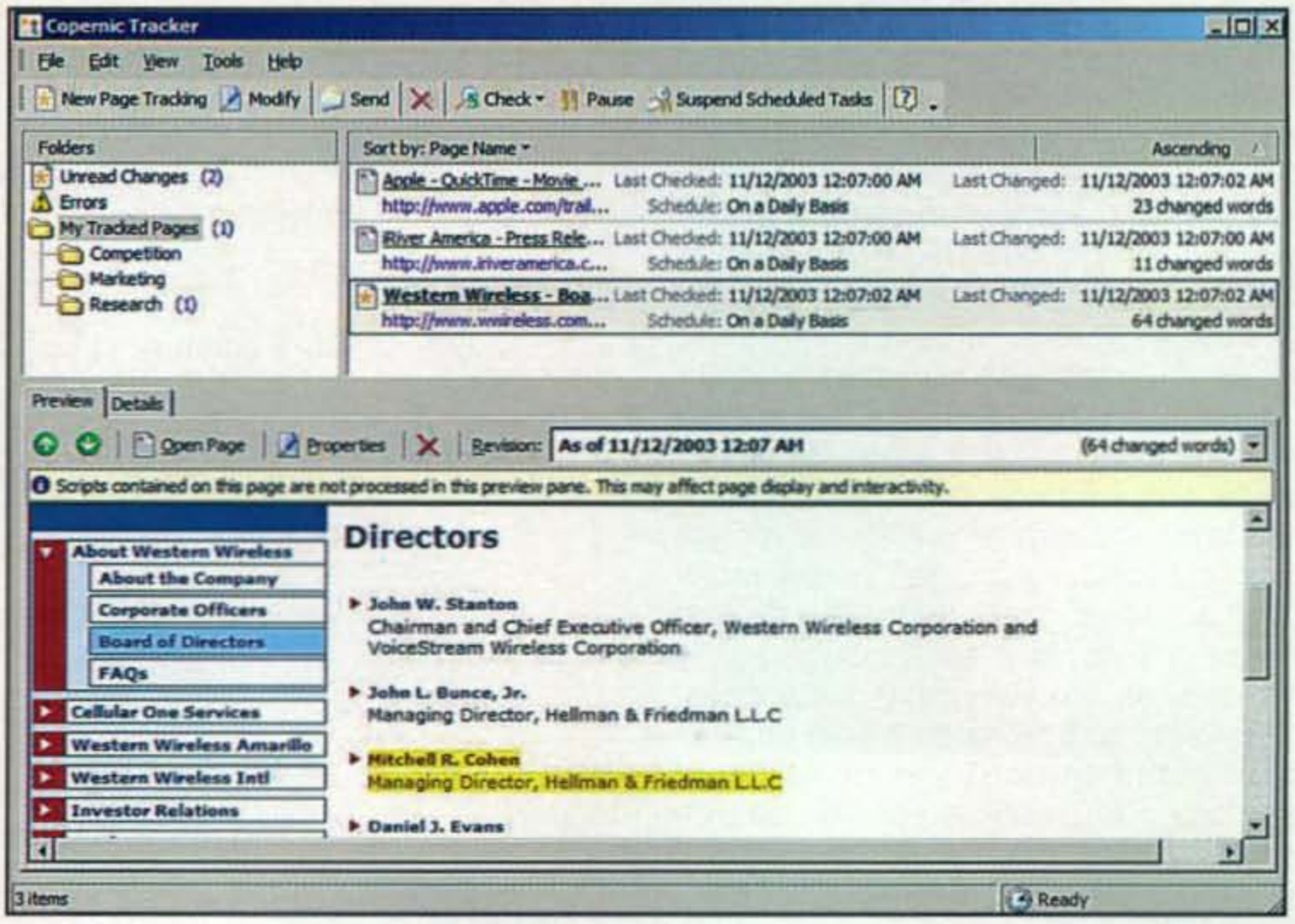


Fig. 4– Copernic® also has introduced Copernic Tracker, an accessory exclusively for users of its Copernic Agent search software. Copernic Tracker is unique software that keeps you up-to-date on what's new on the web by constantly monitoring the sites you're interested in and alerting you of changes. (Graphic from the Copernic website)

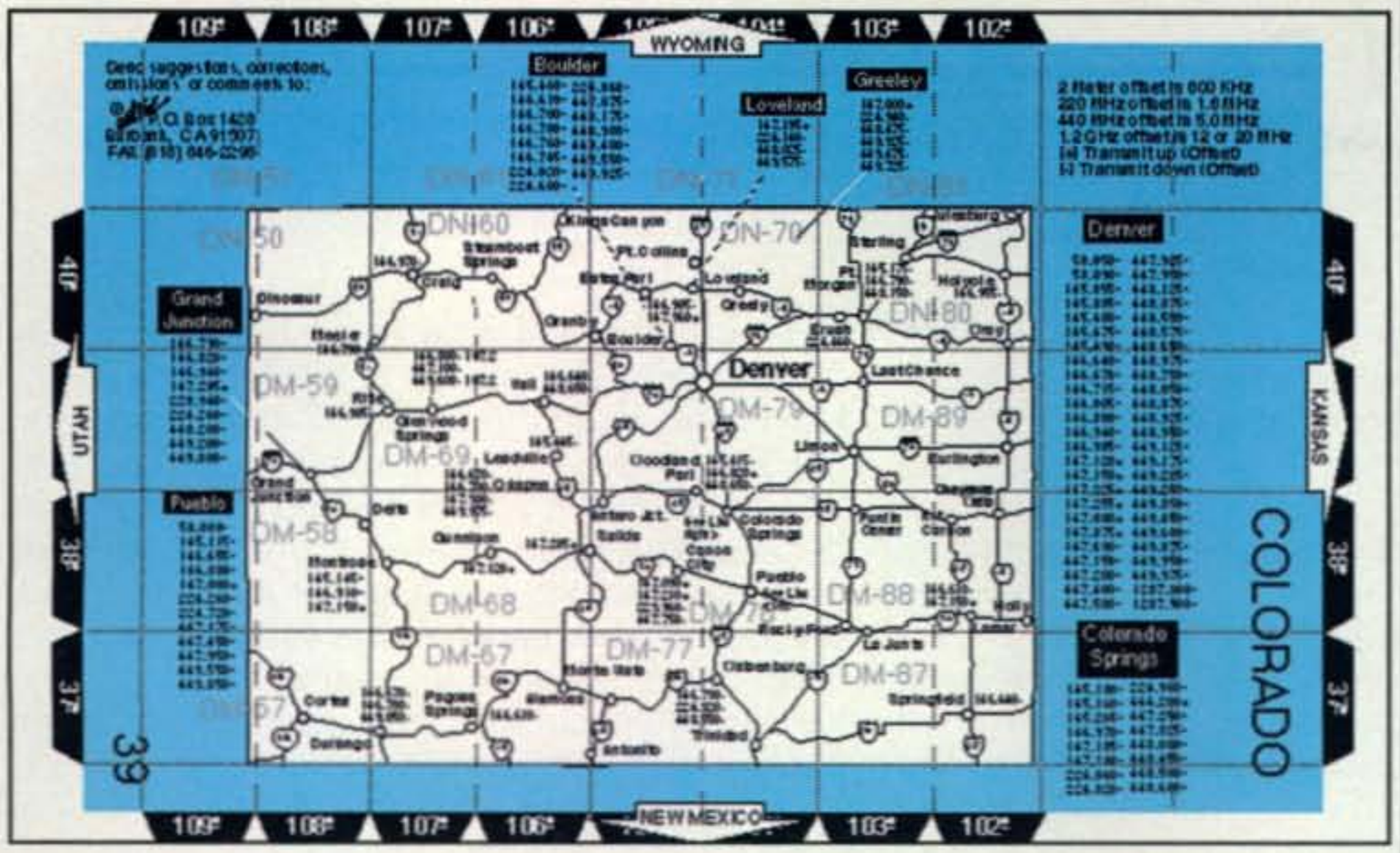


Fig. 5– The Repeater MapBook *from Artsci contains the locations of many hundreds of open repeaters throughout the United States, Canada, and Mexico. The detailed maps show all highways and major cities in each state, and grid-square information is provided for all 50 states. (Graphic from the ArtSci website)*

is the *Repeater MapBook* (fig. 5), which features grid squares on every U.S. map. The new 11th Edition, considered by many to be an indispensable travel companion, has been completely updated using Artsci's Open Repeater Database, which you'll find at <http://www.artscipub.com/repeaters>. Artsci claims that its database, which is updated daily and available for review online, is the largest and most accurate repeater database available.

The printed *Repeater MapBook* contains the locations of many hundreds of open repeaters throughout the United States, Canada, and Mexico. Repeater bands covered include 10, 6, and 2 meters, as well as 200 and 400 MHz and 1.2 GHz. The detailed maps show all highways and major cities in each state, and grid-square information is provided for all 50 states. NOAA weather frequencies also are listed. The book is $14.95.

For more information on the *Repeater MapBook* and other products, contact Artsci, Inc., P.O. Box 1428, Burbank, CA 91507 (818-843-4080; on the web: <http://www.artscipub.com>).

Ramsey Catalog. Have you checked out the impressive Ramsey Electronics catalog? Especially if you're a diehard kit-building enthusiast, I think you'll be duly impressed, since Ramsey seems to be helping to fill the "radio kit void" left by kit maker Heathkit and others long absent from the amateur marketplace. Since Ramsey has been around for over 30 years, we should expect them to be around for some time to come.

The latest Ramsey Electronics catalog I received tops out at more than 50 pages. It describes many inexpensive amateur radio, electronics, learning lab, hobby, and mini kits. The catalog includes amateur radio gear, personal AM-FM radio broadcasters, small FM radio transmitters, video cameras and transmitters, web cams, receivers and converters, test equipment, Van DeGraff generators, time- and weather-related products, antennas and antenna kits, kit-building tools, and considerably more.

Ramsey's kits are fun to build. They include clear, step-by-step instructions, along with ideas for additional uses. Ramsey also is careful to see that the components they supply are properly packaged and marked; you don't just get a "bucket of parts" as is often found in kits.

For a free catalog, contact Ramsey Electronics, Inc., 500 Fishers Station Dr., Victor, NY 14564 (1-800-446-2295; e-mail: <sales@ramseymail.com>; on the web: <http://ramseykits.com> or <http://www.ramseyelectronics.com>). The Ramsey Electronics websites present clearance specials and sales, limited-availability products, user forums, updates, and even a museum.

Wrap-Up

That's all for this time, gang. Next time more "What's New." See you then.

Overheard: It's probably a good idea to judge others by what they actually do, rather than what we think their intentions are. 73, Karl, W8FX

beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

Okay, I Passed the Exam . . . Now What?

All licensed radio amateurs went through the "rites of passage" in getting their first license. It does not matter *when* you became licensed; the fact is that you *passed* your exam and now *possess* the Amateur Radio Station and Operator license. It's the "ticket" to an incredible journey that can last a lifetime and can affect lives in a very significant way.

Unless you were born with the knowledge of radio and electronics, everything you've learned so far means that you worked hard to earn your place among the ranks of the ham radio kingdom. If this sounds rather lofty, remember that radio amateurs are a very small percentage of the world's population. Even so, we are among some very special people around the world, including astronauts, scientists, musicians, actors, and professional athletes.

So here we are in the beginner's corner. You have that official FCC license in your filing cabinet someplace, or you have it proudly framed and displayed on the wall of your "shack." Now what?

As a newly licensed ham, you have a lot of decisions to make, decisions that you hopefully have been thinking about for a long time, even before you started studying Ohm's Law. If you studied for your exams through a radio club, you've probably taken several steps in the right direction already. Most radio clubs are filled with very helpful and generous people who are ready to lend a hand. Your radio club is your connection to great deals on used equipment, or even "loaner rigs" that will cost you nothing to get on the air. If you need help with building an antenna from scratch or assembling a store-bought one, a quick call to your fellow club members will surely generate responses from a group of antenna experts.

Okay, so what if you studied on your own or bought those lessons on-line or from the radio store? You probably feel very lonely right about now. Whom are you going to call? Once again, I must re-emphasize that joining a club is your best resource.

In the meantime, here are some pointers for any "fresh" ham radio operator. I guess we can call this an article on "What you always wanted to know about ham radio, but were afraid to ask."

Life is Full of Questions

I started working on this section by making a list of questions I had when I started out in ham radio. However, there turned out to be several pages of questions, and I am still searching for some of the answers! Therefore, let's begin at a practical beginning. Let's start with the things you *must* have to set up a ham radio station of your own.

Before you spend any money, you first should do some research. Decide what frequency bands you would like to try. The "lower bands" (oddly referred to as "HF," or the high-frequency bands) are full of activity, including worldwide contests, operating award opportunities, and the excitement of worldwide propagation, but require large antennas for you to be effective. As you go up in frequency, the distances covered will shorten, but effective antennas can be much smaller. Of course, this is an oversimplified generalization, and if you have your ham ticket, you already know this. In any case, think very carefully about what frequencies you would like to start with, since the necessary antennas may heavily influence the amount of enjoyment you will get from your station.

*16428 Camino Canada Lane, Huntington Beach, CA 92649
e-mail: <kh6wz@cq-amateur-radio.com>

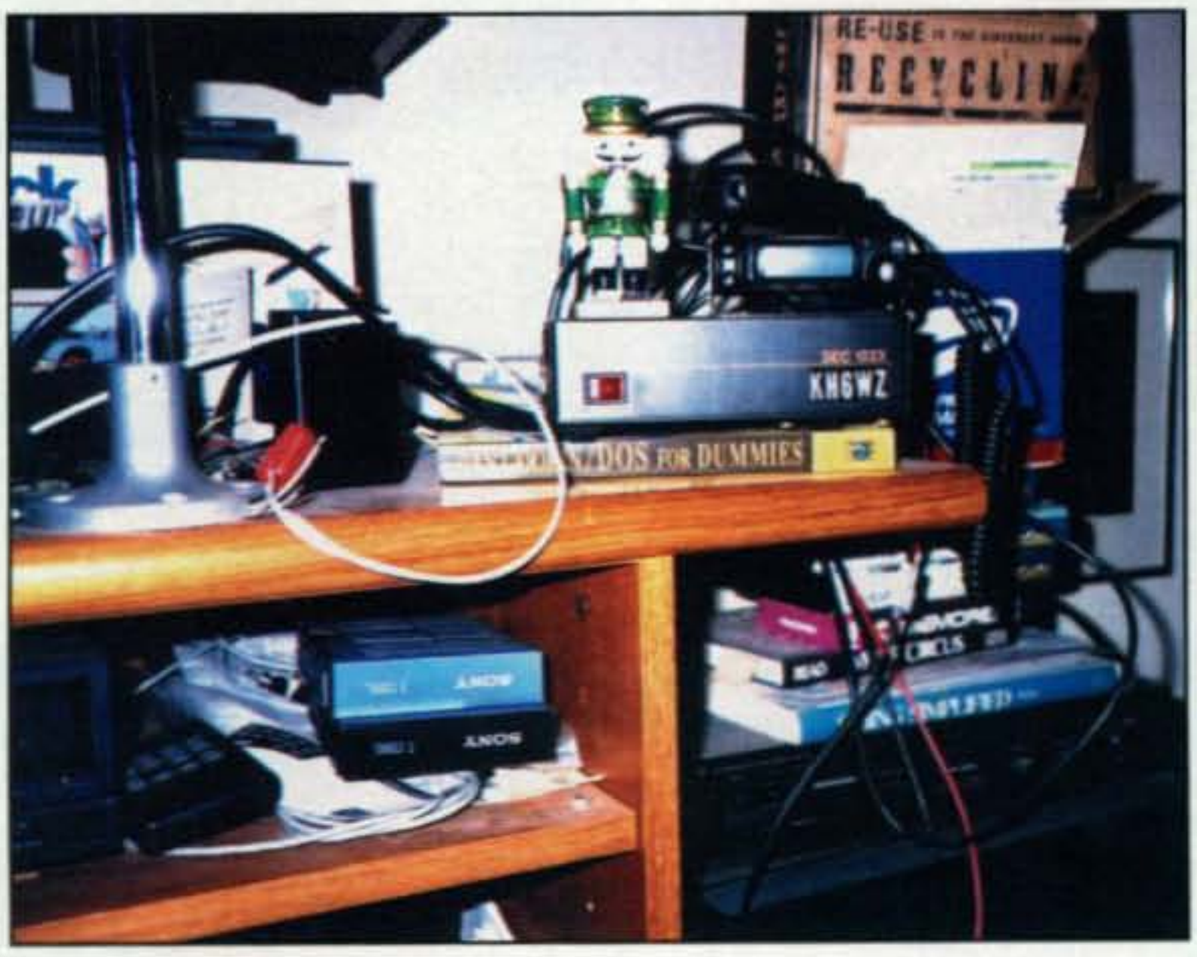


Photo A– No, this is not an entry for a "messy shack" contest. This is the living room station of KH6WZ. It is effective for local RACES activities. All you really need is a place for your gear, and the electronics—power supply, transceiver, and antenna.

What You Really Need

You need a place to put all this new stuff. You can operate just about anywhere you can fit your equipment. As long as you can get power and an antenna feedline to your rig, you can (and should)

books calendars • videos

W6SAI HF Antenna Handbook

by Bill Orr, W6SAI

Inexpensive, practical antenna projects that work! Guides you through the building of wire, loop, Yagi and vertical antennas.

Order No. HFANT **$19.95**

The Short Vertical Antenna and Ground Radial

by Jerry Sevick, W2FMI

This small but solid guide walks you through the design and installation of inexpensive, yet effective short HF vertical antennas. With antenna restrictions becoming a real problem, this book could keep you on the air!

Order No. SVERT **$10.00**

Keys, Keys, Keys

by Dave Ingram, K4TWJ

You'll enjoy nostalgia with this visual celebration of amateur radio's favorite accessory. This book is full of pictures and historical insight.

Order No. KEYS **$9.95**

The Mobile DXer

by Dave Mangels, AC6WO

An in-depth look at Mobile DXing-includes its language; versatility; selecting and installing mobile HF radios; mobile HF antennas and tuners; tuning HF antennas; utilizing tools, tactics, and techniques; and more!

Order No. DXER **$12.95**

Understanding, Building & Using Baluns & Ununs

by Jerry Sevick, W2FMI

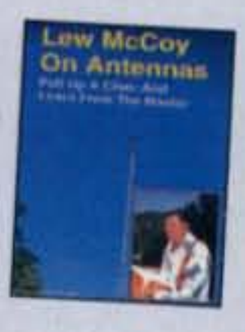
The successor to the popular and authoritative *Baluns and Ununs*. Great deal of new tutorial material, also includes new designs not in his previous book, and crystal clear explanations of howand why they work.

Order No. 2BU **$19.95**

McCoy on Antennas

by Lew McCoy, W1ICP

Unlike many technical publications, Lew presents his invaluable antenna information in a casual, non-intimidating way for anyone!



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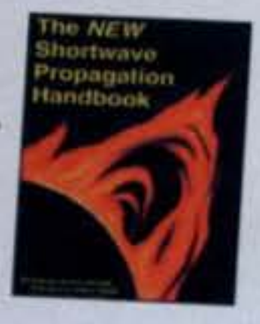

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Photo B– This is a typical "serious" HF contesting station. A custom console houses the equipment and accessories. This is one of three operating positions. Several operators can control multiple transceivers and antenna systems at the same time.

operate from just about anywhere. If you are lucky enough to be able to dedicate an entire room for your new station, so much the better!

I once had a complete station in my bedroom closet. I moved it out because I just got tired of sending CW while lying on the floor. This is hard to describe, but I think you can imagine what that was like.

These days, most of my "casual operating" is limited to VHF and UHF FM simplex and repeater operations for RACES. RACES is the Radio Amateur Civil Emergency Service (see "Beginner's Corner" for April 2003).

See photo A for an example of a very small, very simple station. This is my "setup" on top of the entertainment center in my living room. The VHF/UHF dual-band FM mobile radio is so small it can be installed anywhere. The power supply is a "modern" switch-mode power supply rated at 23 amps. A mobile antenna is clamped to the other side of the cabinet (I'm not sure, but I think all the stereo equipment may be working as an effective ground system). One good thing about this station is that it can easily be pulled apart and carried out in case I need it in an emergency. As mentioned in "Beginner's Corner" in the February issue, I have several 12-volt gel-cells on charge/standby for power.

Upstairs, in my "laboratory" (spare bedroom), I keep a 12-volt uninterruptible power supply (UPS) connected to my dual-band HT, so it is also ready to go for an emergency. A "roll-up" J-pole antenna made from TV twinlead is thumb-tacked to the ceiling. See the July 2002 issue of *CQ*, page 77. (My "serious" radio operations these days include "roving" with a *microwave* station; see the "Beginner's Corner" column in the December 2003 and January 2004 issues.)

At the other end of the scale, photo B is a picture of a competitive HF contest station somewhere in the Pacific Northwest. The custom-made console houses several transceivers and related equipment such as rotor controls, amplifiers, and computers. Wires and cables are contained within the cabinet to keep things on the outside as tidy as possible. However, if you take a look at this station console, you will see that it really is not too much different from my RACES station. In essence, it is still just a "radio on a table." Well, okay, it's lots of bigger radios on a bigger desk....

Once you settle on a location for your station, the second most important piece of equipment is your operating desk. When I lived in an apartment in New England, I made an operating desk with two two-drawer filing cabinets and the bedroom closet door as the top. This was inexpensive, attractive, and very portable. The filing cabinets had lots of room to store lots of papers and other junk that tends to accumulate. Also, the closet door was easy to replace when I moved out. (I turned the door back-

wards when I re-installed it, so it looked even better than when I first moved in!)

These days, inexpensive "computer desks" can easily be turned into "ham radio desks." Don't forget to check your local thrift store for something suitable. Recently, I went to a swap meet ("tag sale" or "flea market" elsewhere) and saw a beautiful oak desk for $25 that would have made a perfect station desk. Unfortunately (or fortunately), I did not have a truck to take it home!

Of course, you cannot have a desk without a comfortable chair. In fact, there are entire articles on the perfect station chair (see <http://ergonomics.ucla.edu>, <http://www.office-ergo.com>, and <http://ergonomics.org>, for example). Just get one you like and make sure it is both comfortable and "ergonomically sound." Be especially careful about twisting and reaching when you set up your station.

The Goodies: Your First Station Equipment

Now comes the fun part—selecting your equipment. A long time ago, most new hams would first get on HF with a separate receiver and transmitter. The path to take would have been to get the receiver and some sort of antenna so you could listen to Morse code and learn by listening to the bands. Later the transmitter would be added to the setup, spreading the payments out to make things more affordable. Today the "separates" no longer exist in the new equipment market, and the "transceiver" is the way to go on the HF bands.

Today there is another entirely different path to take: The very-high-frequency (VHF) bands, which include the "fun mode" (FM) and repeaters on 6 meters and up. Here equipment can be simpler and a lot less expensive. Antennas are much smaller, too. Take a look at "Market Survey: VHF/UHF FM Mobile Transceivers," by Gordon West, WB6NOA in the February issue for a comprehensive look at what's available in the FM mobile category.

If you want to explore VHF DXing (working stations far away), most of that happens on single sideband (SSB) on 6 meters, 2 meters, and 70 cm (there is also satellite operation, OSCAR, on 2 meters and above). If you want SSB capability, then your new rig choices are very limited, since the new multi-mode VHF/UHF radios also have HF capability thrown in. You should expect to pay quite a bit more for one of the "all-band, all-mode" rigs than for an FM-only rig, but then you will have a radio you can "grow into" with all that capability.

Speaking of the amounts to pay, good used gear can be a very economical and enjoyable way to get on the air. Check the ham radio classified ads in the magazines as well as dealers (many sell used gear), hamfests, and the online auction sites such as eBay. You may want to take a look at the "Going, Going, Gone" article by Gary Shea, KC9CRZ, in the November 2003 isue of *CQ* for hints on ham gear and auctions.

Antennas

Of course, all this stuff is no good unless you have an antenna to get the signals into the air. There are many references and resources on antennas, and so I will offer some personal advice for the very first antenna for your very first station: Keep it simple.

If you decide to get on the HF bands, throw up a dipole or inverted-Vee. Such wire antennas are simple, easy to build, and can be quite effective. For the VHF and higher bands, you can build or buy a vertical antenna to start. The ground plane can be made with an SO-239 chassis-mount connector and some stiff wire. Store-bought verticals can also be effective, if you are able to mount them outdoors.

This month's column just "scratches the surface," but I hope these hints and ideas will get you going. As I said, the best idea of all is to join a local ham radio club for hints, tricks, new friendships, and good deals on equipment.

73, Wayne, KH6WZ

how it works

BY DAVE INGRAM,* K4TWJ

Basics of HF Signal Propagation

Our ongoing studies of basic radio communications facts, details, and newcomer guidance continue this month with a ground-floor discussion of HF signal radiation and propagation, or how radio signals travel around the world. Specifically, we will look at how signals are reflected off the Earth's ionosphere and how energy from the sun affects the ionosphere's role in this game. A complex subject? It can be, but as you know, we strive to keep explanations simple and easy to understand in this column. Relax and read on as we discuss information you will find beneficial for many years to come! Let's open with some notes on how radio signals are radiated and intercepted by antennas.

Photo A– Contacting radio amateurs in distant and exotic lands, or DXing, is one of the most exciting aspects of operation on the HF bands, especially when you receive QSL cards as written proof of memorable QSOs. The first steps to successful DXing are to understand how antennas radiate signals and how the Earth's ionosphere reflects those signals over long distances.

Radiating Radio Signals

Whether simple or elaborate, vertical or horizontal, the main purpose of every antenna is radiating and intercepting radio signals in the most effective manner possible. Investigating the basic concepts of how that is accomplished is also a very interesting study. As illustrated in figs. 1(A) and (B), transmit-

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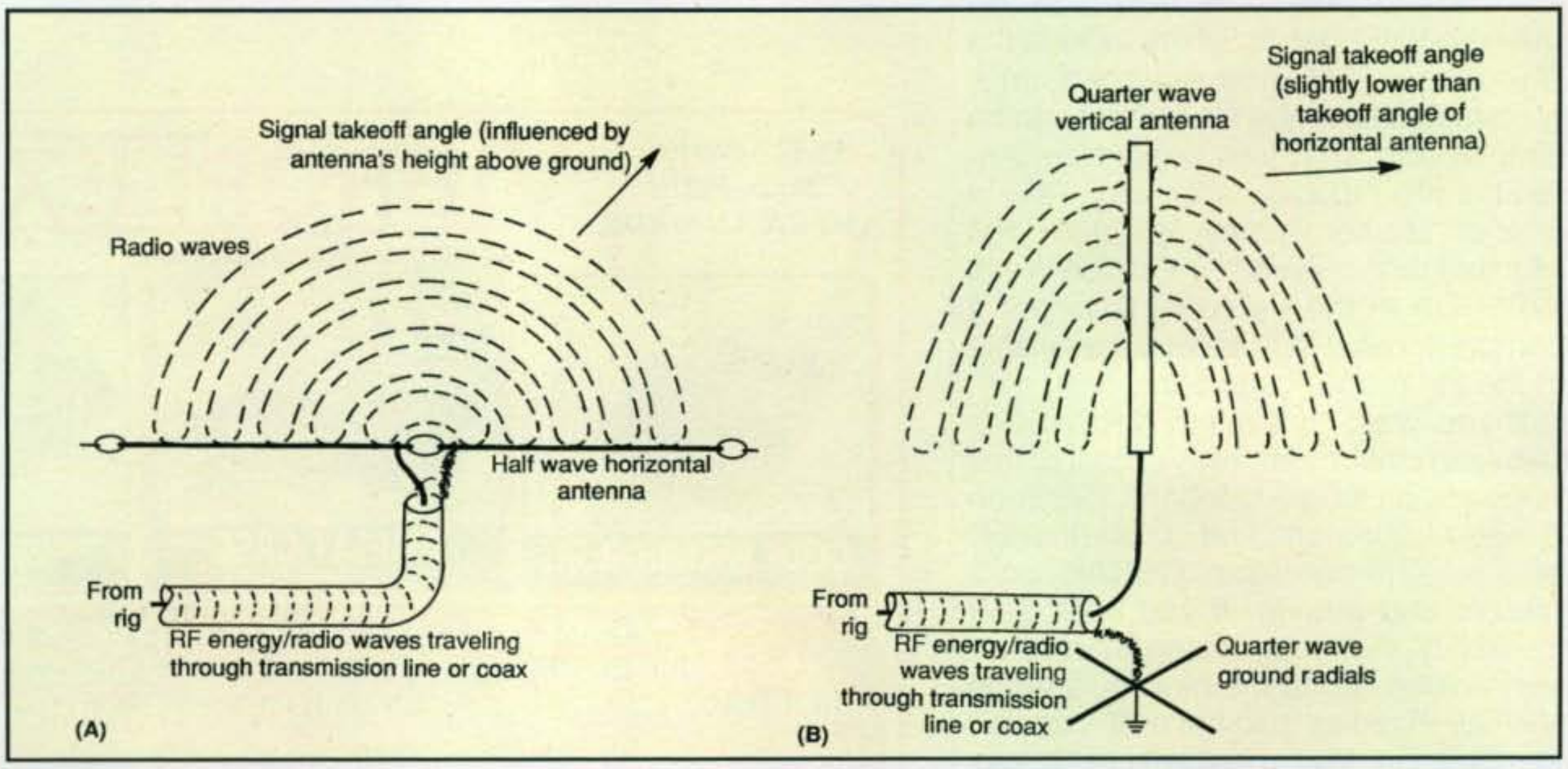

Fig. 1– The general concept of how radio waves generated by a transmitter or transceiver travel through a transmission line and are radiated into free space by an antenna. Some waves reflect off the ground and reinforce other waves to produce an overall signal take-off angle. This angle directly influences signal strength at a distant receiving point. (Discussion in text.)

ter-generated signals or RF energy traveling along or through a transmission line continuously forces radio waves off the antenna so they radiate into free space. During receive, those same radio waves traveling through free space act like microscopic lines of magnetic flux from a tiny generator and induce very small voltages into receiving stations' antennas. That voltage in turn goes through the transmission line and is tuned in, amplified, and reproduced into audible sounds by the receiver.

Now look back at fig. 1 and visualize RF energy emanating broadside to and along the full length of either antenna element, with minimum radiation from each end—just like a long neon light. Then visualize ground conductivity/reflectivity near the antenna reinforcing radiated waves to yield a general area where that energy is greatest; that is called *signal take-off angle* (fig. 2). The lower that signal take-off angle, the farther out your signal will reflect off the distant horizon (ionosphere), the farther away that most important first skip will occur, and the stronger your received signal will be in distant areas. Reflectivity depends on the state of the ionosphere, the number of signal skips, etc., but that first skip always "sets the pace" for good or poor results. Now let's bring in a couple of notes to "tie everything together."

A vertical antenna's signal take-off angle is lower than a dipole or beam's take-off angle, but elevating the horizontal antenna 100 feet or more minimizes the difference (that's why hams like tall towers). A vertical can "work out" surprisingly well, but ideally it should be positioned so its take-off angle is not blocked by trees or houses (mounted in a clear area and/or above roof lines). Finally, understand that when any signal reflects off the ionosphere, its polarity is susceptible to change: It may become vertical, horizontal, or any angle between the two, and that signal polarity difference can be up to 10 dB. That is why received signals are sometimes stronger on dipoles and sometimes on verticals, that is why "Li'l Pistols" occasionally beat out "Big Guns," and that is the fun in chasing DX on our HF bands!

The Ionosphere

Regardless of how well any type of antenna radiates and intercepts radio signals, a station's globe-spanning abilities are directly related to how effectively the Earth's ionosphere reflects those signals (fig. 3). As we learned in

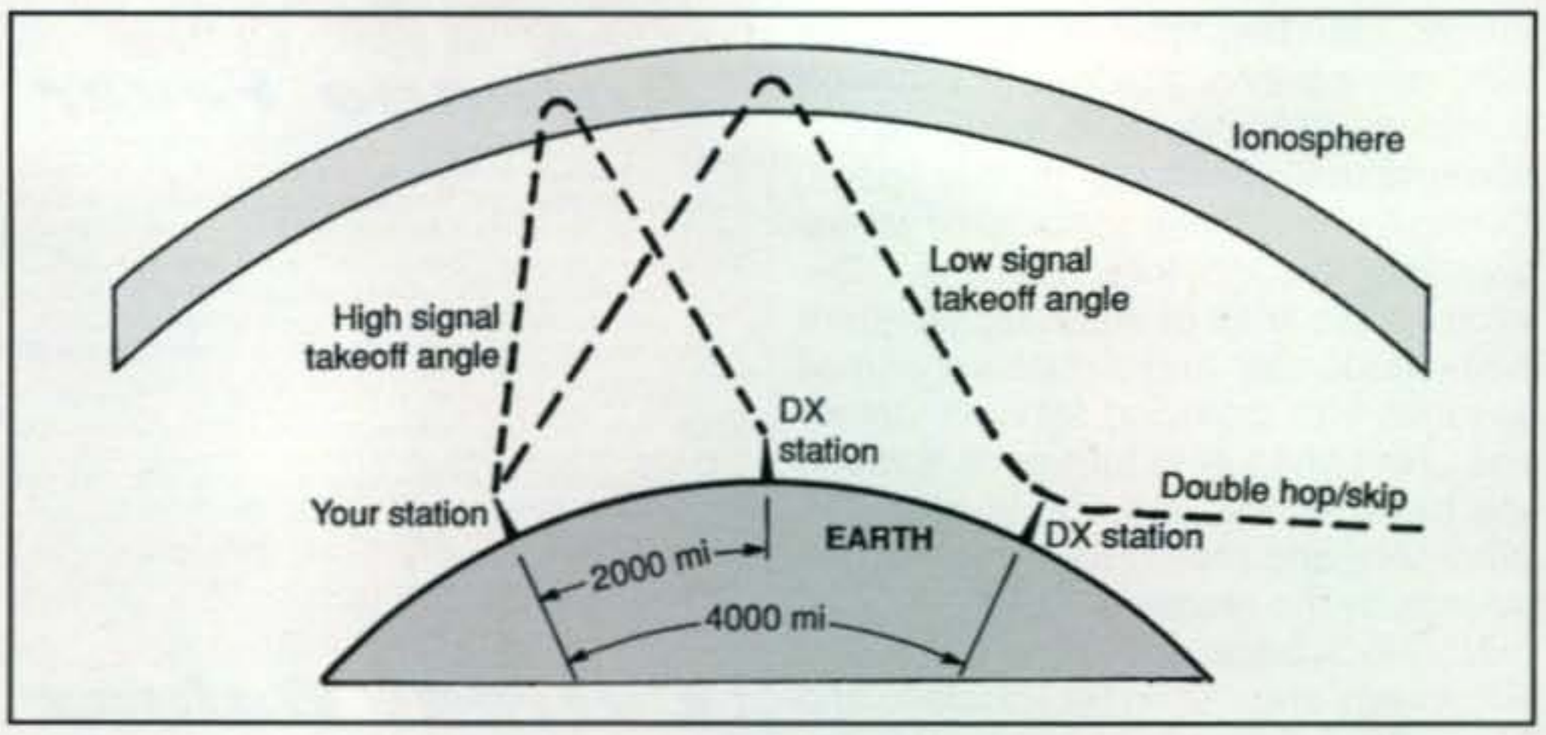

Fig. 2– Comparison of high and low signal take-off angles from antennas. Notice the lower angle reflects lower on the horizon and first skip covers a longer distance. Signal(s) may continue to skip two or more times, but attenuation by each Earth and ionospheric reflection usually reduces signal strength.

science studies in school, the Earth is surrounded by an atmosphere of various density gases that protect us from harmful solar radiation. The upper layer of gases, or the ionosphere, is unique in that it is also a magic mirror in the sky that reflects radio signals in the approximate 1- to 30-MHz/HF range (occasionally up to 50 MHz) back to Earth while passing higher frequencies into space. That is why our upper frequencies (VHF, UHF, and microwaves) are used primarily for line-of-sight work such as radio astronomy, moonbounce, satellite communications, etc., and lower frequencies are used for "skip-type" global communications.

Although the ionosphere acts like a giant reflector for radio signals, it continuously changes in density or reflectivity according to its temperature and the amount of energy from the sun hitting it. As a simple, non-technical analogy, you might visualize it like a bathroom mirror that steams up or fogs over during a hot shower, but reflects perfectly after being cleared off with cool air. Unlike a bathroom mirror, however, the ionosphere is bombarded with HF signals on different frequencies. How well

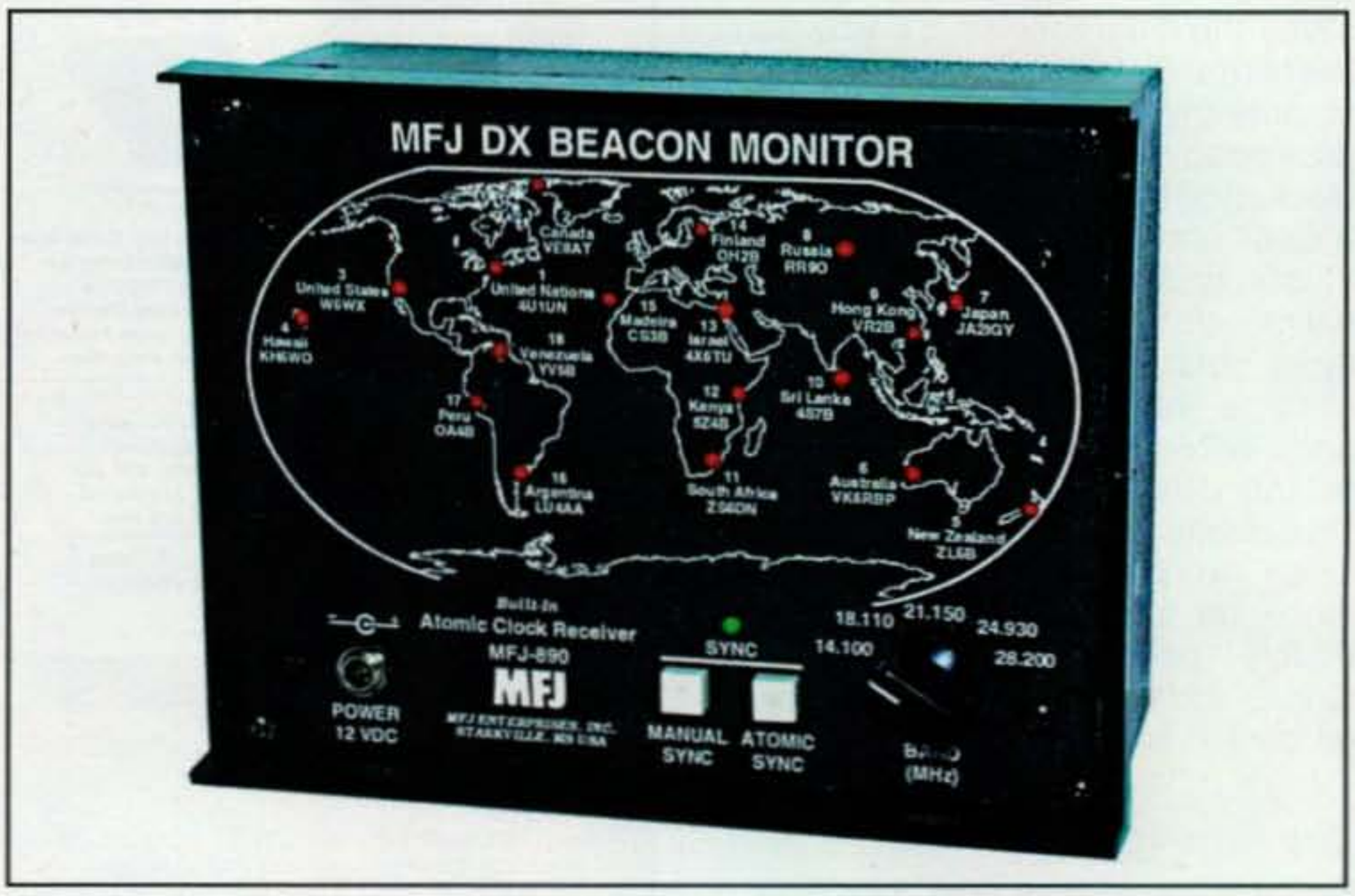

Photo B– This MFJ DX Beacon Monitor uses atomic-clock-referenced signals from WWVB to precisely simulate timing of the NCDXF worldwide HF Beacon Network. With 18 LEDs it continuously displays on its map which network station is transmitting. Just tune your receiver to a beacon frequency and note which LED lights when you hear a beacon signal. (Photo courtesy MFJ Enterprises)

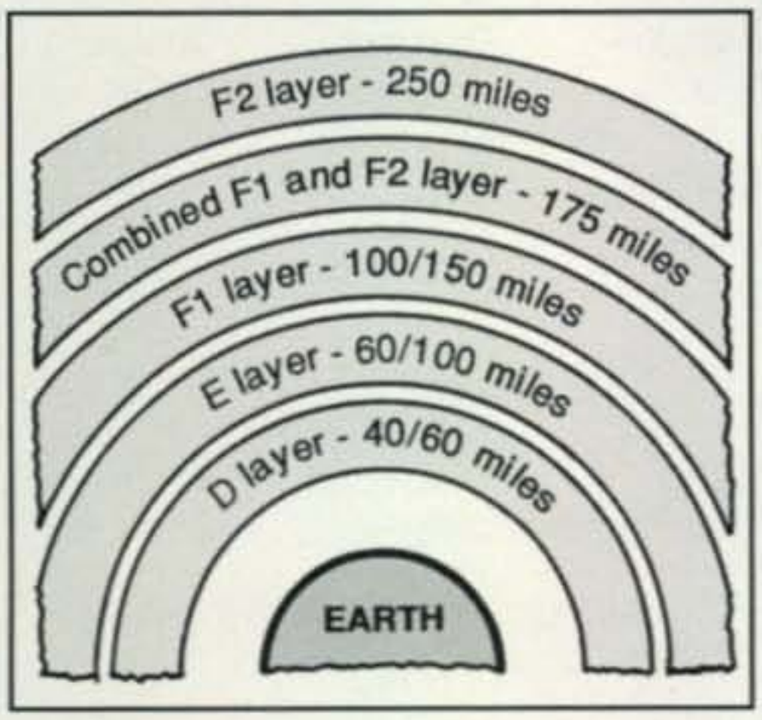

Fig. 3– Primary layers of our Earth's ionosphere and approximate height of each layer. Density or signal reflectivity of layers varies according to yearly seasons and daily sunspot activity. (Discussion in text.)

the signals are reflected depends a variety of factors. Generally speaking, frequencies above approximately 14 MHz are reflected best when sunlight is midway between the two areas of a signal path, and frequencies below approximately 10 MHz are reflected best when cool darkness is midway between the areas. Finally, we should point out that the ionosphere's signal-reflecting ("propagating") abilities change not only with day or night, but also with daily sunspot activity, the seasons of the year, and within an 11-year sunspot cycle. These factors—of calculating and predicting which bands "work out" best with each day's changing solar conditions—are also a complete study in their own right and the subject of *CQ*'s monthly "Propagation" column. As a very brief "getcha going guide," an overview of HF bands follows.

What's "Open" When

Our HF spectrum of 1 to 30 MHz supports nine amateur radio bands plus a five-channel miniband, and each is quite special in its abilities and general range for communication. The upper bands of 10 and 12 meters are real fans of warm sun energy, and the more the better. They typically "open" toward the east soon after your local sunrise and "close" toward the west around or within a couple hours after sunset, depending on the solar activity during that time of day. These bands are also open best in the summer rather than the winter and during peak years of each 11-year sunspot cycle. As a reference here, we are presently midway down the curve of sunspot Cycle 23, which has been dropping

Call	Location	14.100	18.110	21.150	24.930	28.200	Operator	Status
4U1UN	United Nations	00:00	00:10	00:20	00:30	00:40	UNRC	OK
VE8AT	Canada	00:10	00:20	00:30	00:40	00:50	RAC/NARC	OFF[2]
W6WX	United States	00:20	00:30	00:40	00:50	01:00	NCDXF	ON
KH6WO	Hawaii	00:30	OFF	00:50	OFF	01:10	NOARG/HARC	OK
ZL6B	New Zealand	00:40	00:50	01:00	01:10	01:20	NZART	OK
VK6RBP	Australia	00:50	01:00	01:10	01:20	01:30	WIA	OK
JA2IGY	Japan	01:00	01:10	01:20	01:30	01:40	JARL	OK
RR9O	Russia	01:10	01:20	01:30	01:40	01:50	SRR	ON[6]
VR2B	Hong Kong	01:20	01:30	01:40	01:50	02:00	HARTS	OK
4S7B	Sri Lanka	01:30	01:40	01:50	02:00	02:10	RSSL	OK
ZS6DN	South Africa	01:40	01:50	02:00	02:10	02:20	ZS6DN	OK
5Z4B	Kenya	01:50	02:00	02:10	02:20	02:30	ARSK	OK
4X6TU	Israel	02:00	02:10	02:20	02:30	02:40	IARC	OK
OH2B	Finland	02:10	02:20	02:30	02:40	02:50	SRAL	OFF[1]
CS3B	Madeira	02:20	02:30	02:40	02:50	00:00	ARRM	OK
LU4AA	Argentina	02:30	02:40	02:50	00:00	00:10	RCA	ON[6]
OA4B	Peru	02:40	02:50	00:00	00:10	00:20	RCP	OFF[5]
YV5B	Venezuela	02:50	00:00	00:10	00:20	00:30	RCV	OK

Fig. 4– Outline of the Northern California DX Foundation worldwide beacon network which all radio amateurs can use to evaluate band conditions on a real-time basis. Each station transmits for 10 seconds every 3 minutes, 24/7. Read vertically to visualize station sequence for individual bands or horizontally to visualize when a specific station transmits on various bands. (Details in text.)

steadily since a peak in November 2001 and should hit bottom plus start up the curve of Cycle 24 around the end of 2006.

At the other end of the scale are 160 and 80 meters, bands that flourish when the ionosphere is at its coolest, such as around midnight or 1 AM. These bands typically open around dusk, close around dawn, and work out best during winter and years of low sunspot activity. Forty meters almost fits in this category, but being higher in frequency, it is more tolerant of a warm ionosphere and is thus open nights over long distances and days (except for a noon slump) over shorter distances.

The mid-bands of 20, 30, and 17 meters are our most long-range and ionosphere-friendly bands, and 20 meters especially is known as the focal point of HF action both nationally and internationally. If you elect to operate on only one HF band, 20 meters is top choice! Twenty meters likes both a warm and cool ionosphere, and thus is open almost 24 hours a day—every day. Signals tend to peak around dawn and dusk daily. Thirty meters slightly favors dark (naturally, as it is lower in frequency), and 17 (plus 15) meters slightly favors daylight (you guessed it—because they are higher in frequency). If you visualize our new channelized 60-meter/5.2-MHz range as a nighttime band, you are right on track and getting a good idea of what's open when on HF.

Band Checking the Easy Way

Thanks to the Northern California DX Foundation, keeping track of which HF bands are open to distant areas at various times is both easy and enjoyable. The foundation, in cooperation with the International Amateur Radio Union, constructed and operates a network of 18 beacon transmitters located in various countries around the world (see fig. 4). Each beacon transmits every three minutes day and night throughout the year on 20, 17, 15, 12, and 10 meters. Just monitor the beacon frequency on any band of interest for only three minutes, and you will have a real-time analysis of signal-propagating conditions regardless of how quiet or active a band seems to be. It is amazing, and all you need to copy network stations is an SSB/CW receiver.

Each beacon transmits for approximately seven seconds on each band every three minutes. Each transmission consists of the beacon's callsign (sent at 22-wpm Morse code) followed by four one-second dashes. The callsign and first dash are sent at 100 watts (into a vertical antenna). The following dashes are sent at 10 watts, 1 watt, and 100 milliwatts. If you listen on a beacon's frequency, copy the CW callsigns, and note your received signal strength for a transmitted power level, you immediately know to what area(s) of the world a band is open. As an alternative, you can listen for a beacon on all five bands and determine which band exhibits the best signal propagation into a selected area of the world.

Some amateurs may cringe at copying beacon IDs on CW, and signals from some beacons occasionally may be fluttery or too weak to accurately determine their call letters, but that is no problem. The MFJ 890 DX Beacon Monitor (photo B) is an intelligent display unit with 18 LEDs for the 18 NCDXF beacons marked with their callsigns and locations overlaid on a world map. A built-in microprocessor and receiver for atomic-clock-referenced signals from WWVB duplicates the network's timing sequence with precise accuracy and lights each LED as its related beacon is transmitting. Just tune your receiver to a selected band's beacon frequency, watch the LEDs, and in three minutes you will know the status of band conditions. Nice!

Conclusion

That wraps up our notes for this time, but stand by for more antenna and signal-propagating views next time. In the meantime, remember the real fun and excitement of amateur radio is *communicating*. Get on the air and enjoy a few good QSOs every day!

73, Dave, K4TWJ

Hidden Antennas & Ferrite Beads

BY KENT BRITAIN,* WA5VJB

With all the various deed restrictions and covenants out there, many of you have a few problems putting up a tower and a triband beam. Back in my Novice days, my first antenna was a 40-meter folded dipole made of out recycled twinlead from a neighbor's old TV antenna, stapled to the rafters inside my parents' attic. I even had some teenage notion that a 40-meter folded dipole would also work on 80 meters, but many hours of pounding out CQ without an answer (the only crystal I owned was 3720 kHz) convinced me I was wrong about folded dipoles. A few years later I took an old conical TV antenna, added 6 inches to the elements, put it up in the attic, and made my first 6-meter AM contacts.

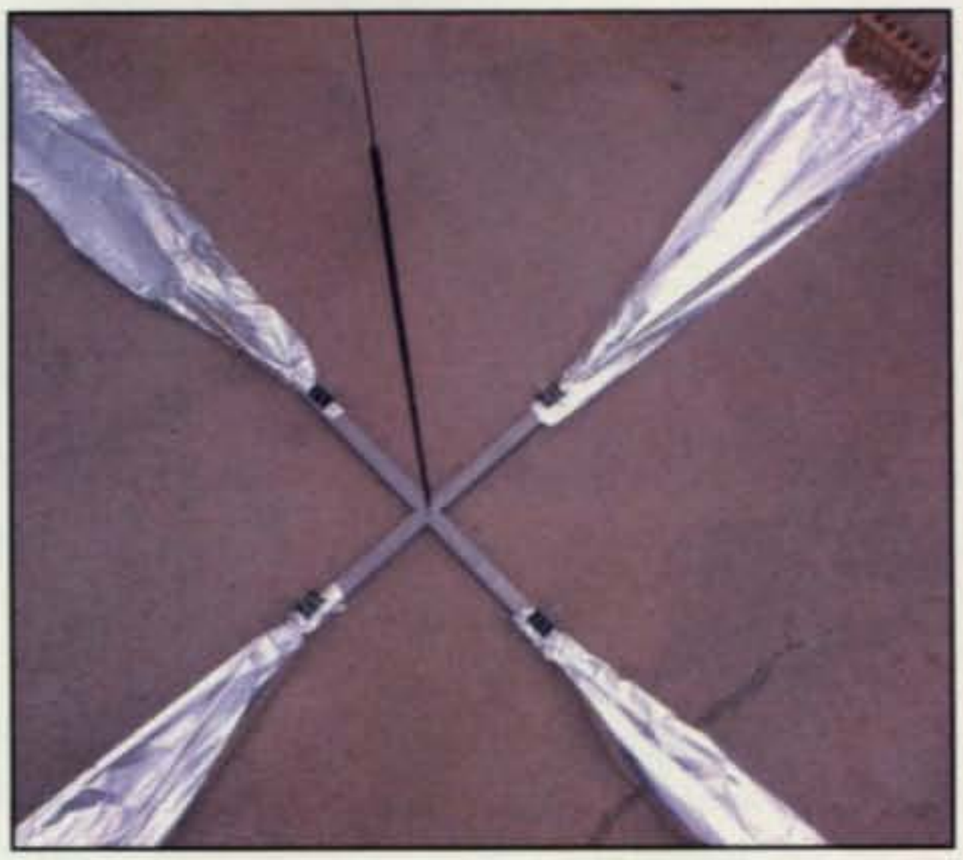

Photo A– Using a mobile antenna in the attic. Just keep headroom issues in mind, especially with motorized multiband antennas.

Up in the Attic

Today, attic antennas are still one way of staying on the air. In photo A, we are using a mobile antenna mount (see several options in photo B) and one of the "stick" type mobile whips chosen for your favorite band. The base is made from a couple of pieces of aluminum L section, each two to three feet long. Certainly there's a lot of other stuff you can use; you just need something electrically conductive and long enough to rest on a couple of rafters.

I like cheap projects and wanted some radials with lots of surface area and, of course, cheap. As a result, I used a couple of rolls of aluminum foil from a local dollar store and some binder clips. The total tab was less than $5. It may be hard to get the aluminum foil 1/4 wavelength long on the lower bands, but it's easy to get more ground plane than the antenna has when it's used on a car! The longer you can make aluminum-foil ground radials, the better off you are.

There are many different mobile whips on the market. The mount shown in photo A should work with any of them, or with one of the motorized multiband antennas. Of course, if you need to put the antenna back on the car, just unscrew it and put it back on the car.

I'm sure glad I shot some photos of the antenna in the driveway, since I couldn't get a good photo up in my attic—where, of course, you won't need the bricks. In the photo I have four long radials, but up in the attic I added several smaller radials using up the last of the rolls of aluminum foil. You can hold a lot of foil with a binder clip.

Making the Antenna Multi-Band

It's a bit tiring to crawl up in the attic every time you want to change bands, so you might want to make this antenna operate on more than one band. There are two ways to multiband this ground plane. The first would be to use one of those motorized vertical antennas. I wasn't able to test one out (I don't have a motorized vertical as yet, but just might haul one home from Dayton this year!), but I have put two verticals on the same ground plane before (see photo C), and they *do* work.

In the photo you can see I just have two whips on the same coax. Electrically the "wrong" antenna has a high impedance and very little of the energy goes into that one. Thus, one antenna resonates and the other just sits there. There are some loading effects from the non-resonant whip, but this tunes out easily. I've never tried using more than

Photo B– Various mobile antenna mounts are available to meet your needs in whatever type of setup you decide to build.

*1626 Vineyard, Grand Prairie, TX 75052
e-mail: <wa5vjb@cq-amateur-radio.com>

Photo C– Using two "stick" style antennas on your new ground plane. See text for details on using two antennas and just one feedline.

Photo D– Ferrite beads come in a variety of shapes and sizes, depending on your specific needs.

two, but there's no electrical reason why you couldn't have more than two whips on this ground plane, or even one of those spider assemblies that lets you put several loading/band coils on the end of the same vertical.

Good DXing!

The Care and Feeding of Ferrite Beads

You see "ferrite beads" these days on just about every computer product (photo D). If you're throwing out something that has some ferrite beads on it, at least scrap out the ferrite. I'll be covering many uses for these devices in the coming months.

The construction of a ferrite bead is pretty straightforward. Take some ground-up iron or other magnetic material. Mix it in with pottery clay. Extrude the clay into a bead instead of a tea cup. Put it in a kiln and cook until well done. You have a ferrite bead!

At low frequencies putting a bead over a wire will greatly increase its inductance. At high frequencies, above about 100 MHz for most ferrites, the bead starts to look absorptive. There are many ways to take advantage of this absorption. For example, take a handful of ferrite beads, grind them back into a powder, mix the powder into a good grade of paint, and paint it on your stealth airplane or stealth pickup truck.

We will be using the inductive properties of these ferrites to tackle many antenna and RF problems. In the classic drawing of a dipole, fig. 1, we show the signal coming up the coax and traveling out the elements. In reality it's more like fig. 2. Much of the current

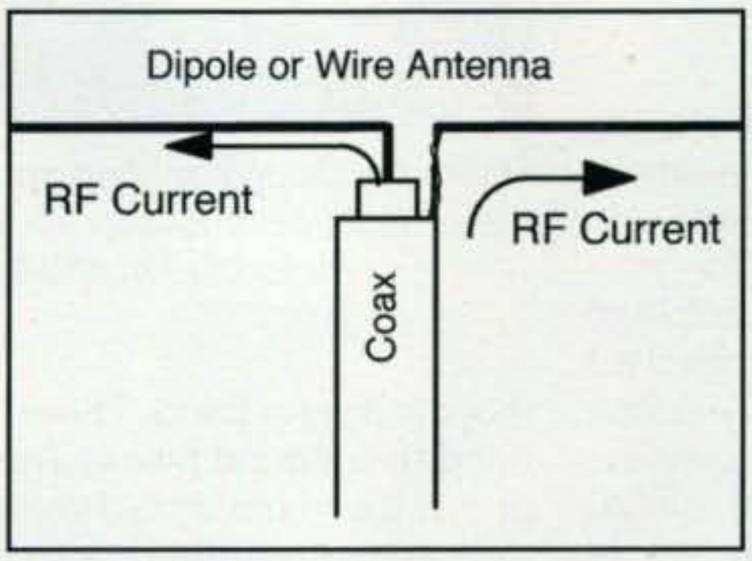

Fig. 1– The classic illustration of RF current coming up through a feedline into a dipole or other wire antenna. In reality, however, the current flow is more like that shown in fig.2.

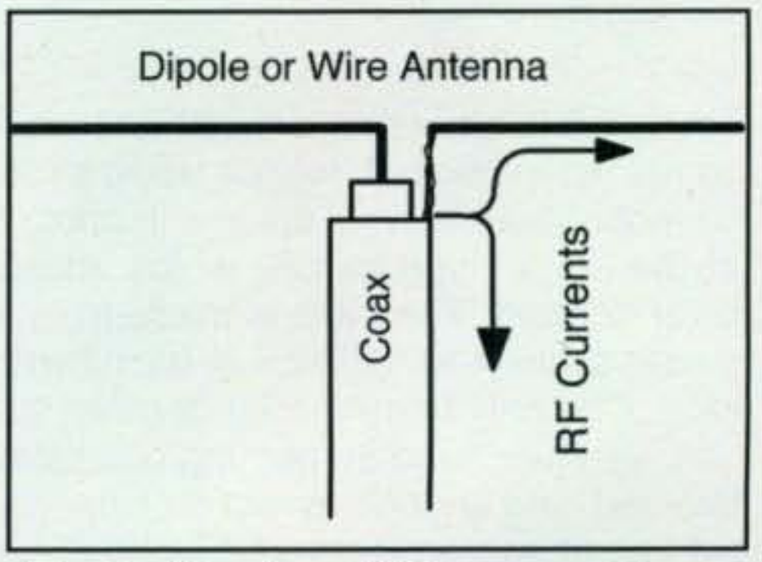

Fig. 2– "Real-world" RF current flow at the feedpoint of a dipole or other wire antenna. Much of the current "thinks" the coax shield is the other half of the antenna and flows back down the outer conductor of the cable. An RF choke (see fig. 3) will help block that flow and redirect the RF to where it belongs.

thinks the coax is the other half of the antenna, so a lot of the power just comes back down the outside of the coax. Ever have a station with a "hot" mic? One that burns your lips when you get too close? RF on the coax is usually the problem. Antennas with RF on the outside of the coax usually have a poor SWR as well, and a lousy pattern. RF on the outside of the coax is also a good path for the signals getting into the AC power lines. Now your QSO comes out of the clock radio, stereo, etc. You need an RF choke on that coax!

The best fix is a proper balun,[1] but a few ferrites on the coax will work almost as well (see photo E). I learned the hard way about using the split-type ferrites outdoors. Those plastic snap holders last just a few months in sunlight, and the ferrite halves make interesting noises when they go clunk on your roof. Therefore, if you're using the split types, put a few turns of electrical tape or a cable tie around them. They make less noise on your roof that way. If the ferrite core is big enough, loop the coax back though it as many times as is practical. This really helps the inductance (see fig. 3).

Build a Noise Balun

Field Day, portable operation and no ferrites around ... another quick fix is the *noise balun,* or *choke balun* (photo F). Here we are winding the shield of the coax itself into an RF choke. For 6 meters, three or four turns of RG-58 about 6 inches in diameter work well. For HF, you need about ten turns. More is better, but you are trading off coax loss and the weight of the extra coax.

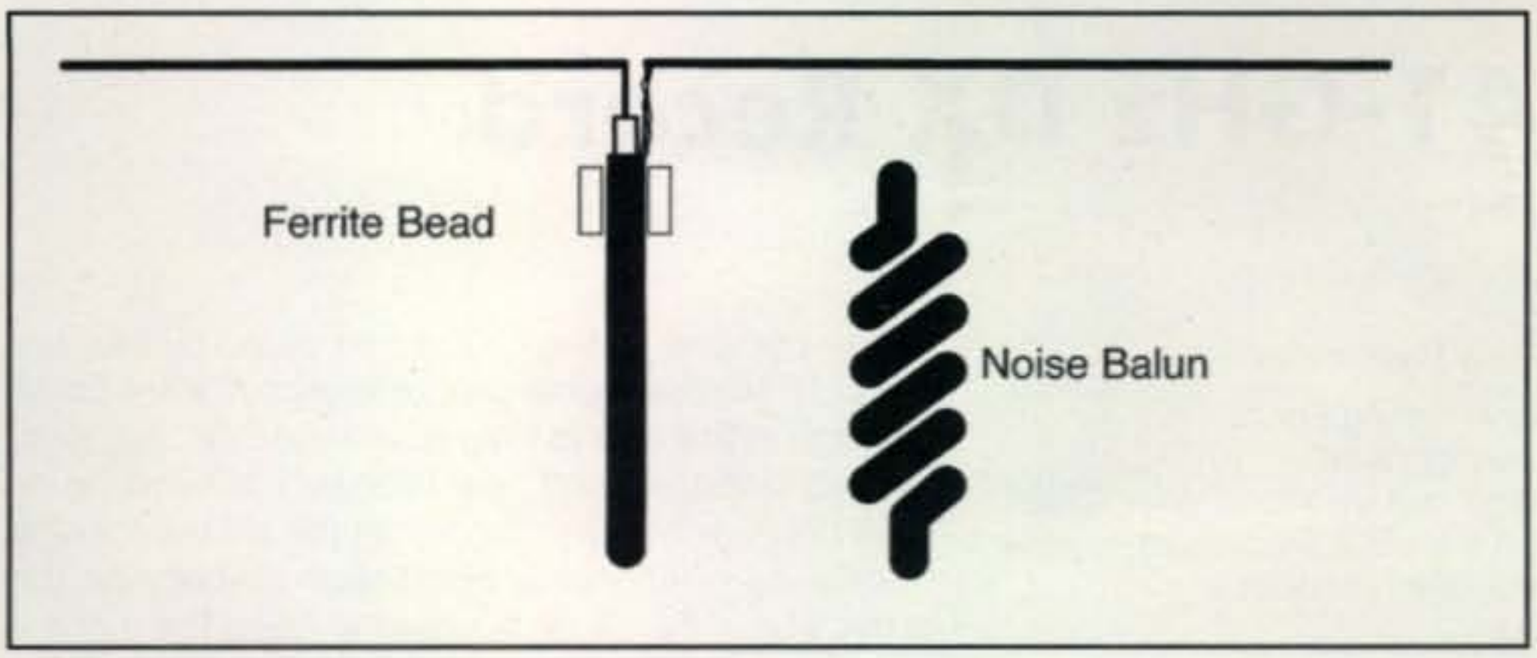

Fig. 3– Either a ferrite bead or a coaxial "noise balun" (see text) at the antenna feedpoint will create an effective RF choke to prevent RF energy from flowing back down the shield of the coaxial cable.

Photo E– Some common examples of ferrite beads used as RF chokes.

I've held the coils in shape with garbage-bag ties, cable ties, and tape.

Letters, Letters...

Dick, Ron, and a couple of others got quite a side discussion going on the Q of a dummy load from the last column.

Photo F– If you don't have ferrite beads handy, several turns of coax will have a similar effect, creating what's known as a "noise balun." (See text for details.)

If you use the fundamental definition: Q = Energy Stored/Energy Dissipated, you get a Q of zero for a dummy load. If you use the bandwidth definition: Frequency/Bandwidth, you can get a Q of 1 using an old HeathKit Cantenna, with its 30 MHz or so limit, on 10 meters; or a Q of .001 for a microwave load operated at VHF. Finally, if you just point a piece of waveguide up in the air and use the universe as your dummy load, the final answer can depend on the nature of the universe! I think I'm going to stay away from dummy-load Qs in the future, and we'll talk about some "cheap" 2-meter beams next time. For those of you who remember this antenna from a few years back in *CQ VHF*, I promise some new material.

Remember: There just is no substitute for a piece of wire in the air.

Notes

1. To learn more about baluns and their cousins, ununs, see the book *Understanding, Building and Using Baluns and Ununs*, by Jerry Sevick, W2FMI, available from the CQ bookstore and at many ham dealers. ■

vhf plus

BY JOE LYNCH,* N6CL

New 241-GHz DX Record

VHF Plus Calendar

May 1	Microwave Spring Sprint (See text for details)
May 1–2	The 2 GHz and Up World Wide Club Contest (See text for details)
May 2	Moderate EME conditions
May 4	Full Moon
May 6	Moon Perigee
May 8	Richardson Regional Medical Center Wild Ride (See text for details)
May 8–9	CQ National Foxhunting Weekend
	50 MHz Spring Sprint (See text for details)
May 9	Very Poor EME conditions
May 11	Last Quarter Moon
May 14–16	Dayton HamVention®
May 16	Moderate EME conditions
May 19	New Moon
May 21	Moon Apogee
May 22	Belton Hamfest (See text for details)
May 23	Poor EME conditions
May 27	First Quarter Moon
May 30	Moderate EME conditions

-EME conditions courtesy W5LUU.

Brian Justin, WA1ZMS, has accomplished a new world and North American distance record and VUCC (VHF-UHF Century Club, sponsored by the ARRL) number one for the 241-GHz amateur radio allocation. On February 17, 2004, Brian and Pete Lascell, W4WWQ, using the call W2SZ/4, completed the longest distance contact to date (79.6 km) on 241 GHz, while at the same time giving the W2SZ callsign its fifth QSO necessary for the first VUCC award on that frequency. The contact was completed using very slow-speed CW.

Here are the details of the QSO: February 17, 2004; 0015 UTC; W2SZ/4 in FM07fm (37-31-00N 79-30-35W) and WA1ZMS/4 in EM96wx (36-59-28N 80-07-17W); and distance 79.6 km. The weather at the W2SZ/4 QTH was as follows: temperature –8° C, dew point –26° C, relative humidity 22%, station pressure 884 mb, and atmospheric loss 0.273 dB/km. The weather at the WA1ZMS/4 QTH was temperature –8° C, dew point –16.1° C, relative humidity 53%, station pressure 932 mb, and atmospheric loss 0.681 dB/km.

Pete, W4WWQ, was the CW op at W2SZ/4. Brian, WA1ZMS/4, was the op of his own station at the EM96 QTH. Both ends of the QSO used Spectran software to aid in receiving the slow-speed CW at a rate of approximately 1 second per dot and 3 seconds per dash. The entire QSO took well over an hour to complete, with both stations having to send the exchanges several times. Some portions of the CW were copied by ear, but the DSP (digital signal processing) software came through in the end to help make the QSO happen.

Both stations used new Wenzel ultra-low-noise 5-MHz reference oscillators as the phase-locking frequency references. Short-term stability on the order of 4 × 10-13 is required to keep the signals within a 1-Hz filter bandwidth of the demodulating software. The stations were keyed using Island Keyers with custom QRSS firmware from Charles Olsen, WB9KZY.

This QSO is also the fifth grid needed for the ARRL VUCC award for the 241-GHz band for Mount Greylock Expeditionary Force's use of the W2SZ callsign. This claim should be the very first VUCC for that band, and according to Brian, it took many months of hard work and many very cold-night DXpeditions to make it all happen. This latest DX record of 79.6 km occurred on their fourth attempt, so they were not without their failures. For more information, see the MGEF website: <http://www.mgef.org/zms_241_vucc.htm>.

More on Broadband over Power Lines (BPL)

As mentioned in last month's column, we are on a short deadline for responding to the FCC's Notice of Proposed Rulemaking (NPRM) pertaining to BPL internet services. The deadline for filing comments is May 3, 2004, and the Reply Comments deadline is June 2, 2004.

The following very insightful guest editorial by Fred Jensen, K6DGW, first appeared on his website (http://www.foothill.net/~andreaj/Files/Sierra_Signals_BPL.pdf). It is reprinted here with his kind permission:

Editorial Observations from Sierra Signals

By Fred Jensen, K6DGW

The FCC, on Feb 23, 2004, issued a Notice of Proposed Rule Making adding Broadband over Power Lines (BPL) as a Carrier Current application under Part 15. Several hams have pointed out that while we are fairly good with the technical aspects and issues of FCC actions, we are woefully uneducated about the administrative and political workings of the agency that regulates our hobby. It's via this editorial that I will try and rectify that.

I have had some experience in both written and oral appearances before the FCC. Admittedly, it was always as an engineer, with one or more (usually more!) lawyers next to me. I am thus far from an expert, but I viewed it as a learning experience. We'd all like to have our comments to the FCC regarding BPL viewed positively and constructively, so what follows are a few of the things I learned.

What has happened? The FCC is required to follow a defined process when it crafts regulations, and the process must include public input. Last summer, the FCC issued a Notice of Inquiry (NOI) regarding BPL.

*e-mail: <n6cl@fuller.edu>

The NOI is a broad request for information, ideas, and comments from industry and the public on an issue or technology the FCC has under consideration. The FCC will usually ask a series of questions on which they'd like comments, and they did on this one.

Following the NOI and whatever time the FCC staff requires to digest all the comments, one of two things will usually happen: (a) They will drop the matter; or (b) they will issue a Notice of Proposed Rule Making (NPRM). Since the FCC had reasons for issuing the NOI in the first place, option "a" is quite rare.

The NPRM is a formal proposal by the FCC that discloses exactly the language they propose to place in the Federal Regulations (FCC Rules are codified in Title 47 of the Code of Federal Regulations, or CFR. For example, rules for the Amateur Service are in 47CFR97). Again, there are comment periods. However, now, with specific proposed rules, the comments must be directed at those proposed rules. This is where we are now with BPL.

Comments, Comments, and more Comments: Generally, the FCC provides two comment periods for all of its actions. The first (just called "Comments") requires that we directly address the proposed rules, their suitability, possible impacts, etc. The second period ("Reply Comments") provides the opportunity for us to comment on the comments ... sort of like rebuttal testimony in a trial. We must discuss the validity of the comments that have been filed, and it's too late to bring up new issues. The two periods run concurrently, so you are free to file Reply Comments before the Comments period is over.

How to Read the NPRM: You will find the NPRM on the FCC website at: <http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6515783485>. It is also available in MS Word and ASCII text format, but I strongly recommend the pdf version because it preserves all of the typography, such as footnotes one would find in a printed document. You can ignore the other files; the above link is a consolidated document.

The body of the NPRM is the FCC's discussion of the process, the motivation for the new rules, background, some analysis of the NOI comments, and the staff observations. Appendix A is good bedtime reading, and you can safely skip it. Appendix B is the real guts of the NPRM -the proposed rules and changes to existing rules. To really understand it, you need a copy of the current Part 15, also available through the FCC's website at <http://www.fcc.gov>. Appendix C contains the proposed measurement guidelines for BPL compliance with the new rules. The rest of the appendices are just political statements of the individual commissioners, who all think BPL is wonderful.

What Does the NPRM Do? Part 15 covers unlicensed RF energy radiators, and divides them into three categories: intentional, unintentional, and incidental. Intentional radiators are devices that must radiate RF energy to function. The remote

temperature sensor for your atomic clock, garage-door openers, and the keyless device on your key ring are examples. Unintentional radiators require RF energy internally for operation, some of which is radiated. Best example is your computer. Incidental radiators are noisemakers, such as power lines, motors, dimmers, and other such things that generate RF incidental to their operation.

Part 15 devices must not interfere with licensed services, and must accept any and all interference from licensed services. The BPL NPRM proposes to classify BPL as an unintentional radiator in the class of Carrier Current Systems (CCS), and to make all of the existing rules for CCS applicable to BPL. That's really all it does! It appears very innocuous, benign, and simple, at least superficially, and this poses a big challenge for amateurs' comments. We're going to have a hard time convincing the FCC and our elected officials that it is bad.

Unconditional surrender? Brace yourself ... not likely there will be an unconditional surrender on the part of the BPL industry, and BPL will happen in some form. We can, however, affect how it happens and how we can enhance its compliance with Part 15 requirements.

Things We Can Do: Here's a list of some issues we can attack in our comments that can improve our situation. It is not exhaustive, but it is a start, and each speaks to the proposed rules. Note that the FCC, in the body of the NPRM, again asks for comments on specific issues. Your comments will get further if you do that.

• CCS is typically VLF and LF signals with wavelengths in thousands of meters. BPL uses HF signals with wavelengths in tens of meters. Is it reasonable to classify BPL with the same limits and measurement techniques as traditional CCS?

• The NPRM requires BPL providers to establish a centralized database describing their BPL deployments and managing complaints. What should that database look like? Who should have access? How?

• Part 15 assumes CCS devices are point sources-i.e., field strengths fall rapidly as you move away from the device along the power line. This is valid for VLF and LF CCS. Is it valid for BPL at HF?

• Once deployed, it will be nearly impossible to "undeploy" BPL if interference problems materialize. Does the FCC really want to take an irreversible action? Would a stepwise approach make more sense?

Some Things You Might Want to Avoid: In the body of the NPRM, the FCC goes to some length to describe the various interference modes, and expresses its belief that this interference can be mitigated. Thus, just railing against interference potential in your comments isn't going to get much accomplished. They've already made it clear they believe it can be mitigated.

Part 15 already regulates carrier current systems, and has for years. Arguing against current regulations is a non-starter. The NPRM does not increase field-strength limits over what they are and have been for years, although many hams seem to believe it does. Complaining about emission limits is thus also a non-starter (however, whether or not those limits are applicable to BPL at HF is a major issue).

What's Next? The NPRM gives us 45 days (until May 3) to file comments. It gives us 75 days (until June 2) to file reply comments. The ARRL will file both sets of its comments on the last days. For us, waiting and reading the comments that have been filed on the FCC website is a good idea, but as individuals, waiting until the very last day is probably not so good a plan!

—73, Fred, K6DGW

Earthlink Buys Into BPL

Earthlink, which was a bit of a thorn in the ARRL's side last fall when it temporarily refused to accept e-mail with the @arrl.net address, has figured out another way to be on the wrong side of the League. As one of the largest broadband internet service providers in the United States, with over 5 million internet subscribers, it has, according to an article written by Jim Wagner for internetnews.com (see <http://www.internetnews.com/xSP/article.php/3315881>), invested $500,000 in BPL technology.

With its half-million dollar check to Ambient Corp., a Newton, Massachusetts communications company specializing BPL internet service, Earthlink has bought an ownership position in the corporation and a seat on its advisory

Looking Ahead in CQ

Here are some of the stories we're working on for upcoming issues of *CQ:*

"Rise of the Phoenix Transceiver," by K8JWR
"Secrets of Top DXers," by W1HEO
"Long-Delayed Echo Mystery," by W6BNB

Plus...
"Breaking the Language Barrier," by KD5HTB
"Wireless Signaling Without Radiated Power," by W4LTU
"Still Chasing the Invisible Wave," by RV3IZ

Do you have a ham radio story to tell? See our writers' guidelines on the CQ website, <http://www.cq-amateur-radio.com>, in the CQ Information Center.

board. According to Wagner, Earthlink is the first ISP to join their ranks.

Wagner went on to write that according to Ambient officials, "Earthlink and Con Edison have been working side-by-side with them the past two years on a BPL pilot. And even though they provide cable, DSL, and satellite internet connectivity, officials said it's part of the company's strategy to look at next-generation technologies as well."

Wagner quotes Dave Blumenthal, Earthlink spokesperson: "We look at it as our role to support companies and encourage development of broadband. We plan to participate in trials of a broad array of alternative broadband technologies."

Wagner cites one such trial that began on February 18, in which Earthlink launched a BPL pilot program with Progress Energy in North Carolina. According to Wagner, "The test bed involves 500 homes and costs $19.95 for the first three months and $39.95 afterwards." For more information on this North Carolina BPL experiment, see Gary Pearce, KN4AQ's BPL primer elsewhere in this issue. Also, see his expanded article in the Spring 2004 issue of *CQ*'s sister publication, *CQ VHF* magazine.

Concerning Earthlink's investment, Wagner states: "For a company the size of Earthlink, a half-million bet on a BPL carrier is a slight risk for the company if the technology doesn't pan out; on the other hand, it is positioned to reap bigger rewards if BPL is successful. The investment contract includes the option to buy more shares of the company down the road."

Yet, he continues, "It's uncertain whether BPL will pay off in the long run, despite Earthlink's increased interest and the well-wishes of the FCC. Amateur radio enthusiasts claim the interference issues caused by BPL more than offset the advantages to the technology." Even so, your columnist is of the opinion that Earthlink would not have taken such a financial position unless the upside potential far outweighs the downside threat that we amateur radio operators presently pose.

Richardson Regional Medical Center Wild Ride

The Richardson Regional Medical Center Wild Ride is expected to draw 1000 cyclists to Richardson and the north Dallas, Texas area on Saturday, May 8, 2004. Cyclists may register to ride 30, 50, or 62 miles through Richardson, Murphy, Wylie, Lavon, Nevada, and Josephine. This new rally will be held in conjunction with the City of Richardson's Wildflower Festival.

Ham radio operators are needed to provide communications over the route. In addition to the typical voice communication over VHF repeaters and APRS, this year they hope to connect the rest stops with 802.11 wireless internet. The goal is to have a webcam at each rest stop uploading pictures to a website. Especially needed are hams who have 802.11 equipment with directional antennas and/or laptop computers with webcams. Also hams with high-speed internet connections living in those towns can assist.

Additional information about wireless internet plans are available on the Dallas Area Working Group, High Speed Multimedia website: <http:// www.hykkonen.net/dawg-hsmm/>. Please volunteer as early as possible to help with the planning. The contact person is Doug Kilgore, KD5OUG,

Richardson Wireless Klub, e-mail: <kd5oug@arrl.net>, or telephone 972-231-8539.

Current Contests

Spring Sprints: These short-duration (usually four hours) VHF+ contests are held on various dates (for each band) during the months of April and May. This month's dates and times are as follows: Microwave, May 1, from 6 AM to 1 PM local time; and 50 MHz, May 8, from 2300 UTC Saturday until 0300 UTC Sunday. Sponsored by the East Tennessee Valley DX Association, information on these contests can be found on the association's website: <http://www.etdxa.org>. Click on the VHF/UHF link to get to the contest information.

2 GHz and Up World Wide Club Contest: Sponsored by the San Bernardino Microwave Society, this contest runs from 6 AM on May 1 to 12 midnight on May 2 (36 hours). The object is for worldwide club groups of amateurs to work as many amateur stations in as many different locations as possible in the world on bands from 2 GHz through Light. Rules are available at: <http://www.ham-radio.com/sbms/club_contest/2GHzUp.pdf>. For more information, contact Pat Coker, N6RMJ, <n6rmj@sbcglobal.net>.

CQ National Foxhunting Weekend: Whether you prefer to fly the freeways or beat the bushes in search of hidden transmitters, be sure to get together with other hams in your locality for foxhunting fun during the 7th annual CQ National Foxhunting Weekend (NFW). On May 8–9, ham clubs and non-club groups across the country (and elsewhere in the world) will hold mobile and on-foot RDF (radio direction finding) contests.

There are no formal rules for the NFW. You can be as creative as you like, as long as your hunts are fair and safe for everyone. For some ideas, read this year's announcement and the results of last year's NFW in the April 2004 issue of CQ magazine. After the NFW, be sure to write up your results and send them to Joe Moell, KØOV, CQ NFW Moderator, at <homingin@aol.com> and send some photos of the hiders and hunters. Maybe your hunt will be included in a follow-up article.

2004 CQ World-Wide VHF Contest: Starts 1800 UTC Saturday, July 17, 2004; ends 2100 UTC Sunday, July 18, 2004. *Bands:* 50 MHz (6 meters); 144 MHz (2 meters). *Categories:* Single-Op All Band; Single-Op Single Band 6 meters; Single-Op Single Band 2 meters; Single-Op QRP All Band (<10 watts); Single-Op QRP Portable Limited (maximum of 6 hours continuous); Rover (1 or 2 ops mobile/portable operating from two or more Grid Locators); and Multi-Op.

QSO Exchange: Maidenhead Grid Locator to 4 digits (e.g., FN41).

Multipliers: Total number of different Grid Locators worked per band.

Scoring: Work stations once per band regardless of mode. Count 1 point per QSO on 50 MHz and 2 points per QSO on 144 MHz. Total QSO points × Multiplier = Final Score. Rovers only: Final Score = Sum of QSO points made from each Grid Locator visited × sum of different Grid Locators worked from each locator visited.

Awards: Certificates and plaques will be awarded to high-scoring stations in each USA state, Canadian province, and DX country in categories with outstanding effort. See <http://www.cqww.com/VHFplaques.htm> for more information on plaques.

Log Submissions: Send Cabrillo-formatted logs via e-mail to <cqvhf@cqww.com> with subject line: Call CQ-VHF 2004. Paper logs can be entered on-line: <http://www.b4h.net/cabforms/cqwwvhf_cab.php> or postmarked by September 1, 2004 to: CQ VHF Contest, 25 Newbridge Rd., Hicks ville, NY 11801 USA. Electronic logs received are posted hourly on <http://www.cqww.com/2004vhflogs.htm>.

Complete rules can be found at www.cq-amateur-radio.com and will be published in the June issue of *CQ*.

Current Conventions and Hamfests

Dayton Hamvention®: The Dayton Hamvention® will be held at the Hara Arena in Dayton, Ohio, May 14–16. For more information, go to: <http://www.hamvention.org>. Your editor is scheduled to be one of the speakers for the VHF forums.

Belton Hamfest: The Belton Hamfest is scheduled for May 22, in the Belton Arena, Belton, Texas, from 7 AM until approximately 2 PM. For more info, go to: <http://www.tarc.org/hamradio/hamexpo/oct2002early.html>.

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' Proceedings, or both. For more information, questions about format, media, hardcopy, email, etc., please contact the person listed with the announce-

ment. Currently, the following organizations or conference organizers have announced calls for papers for their forthcoming conferences:

The **38th annual Central States VHF Society Conference** will be held July 22–25, 2004 at the Delta Meadowvale Resort and Conference Centre in Mississauga (Toronto), Ontario, Canada. Deadline for submitting final papers is May 1. Submit your proposal to Bob Morton, Technical Chairman and V.P., at <ve3bfm@csvhfs.org>.

The **11th International EME Conference** will be held on the campus of the College of New Jersey, in Ewing, New Jersey, August 6–8. Submit your proposed paper/talk topic as soon as possible to Marc Franco, N2UO, at <eme2004@qsl.net>.

The North Texas Microwave Society is the sponsor of **Microwave Update 2004**, which is to be held in Dallas, Texas on October 15 and 16 at the Harvey Hotel DFW Airport, just minutes from the north end of DFW Airport. Contact conference organizer Al Ward, W5LUA, at <al_ward@agilent.com> for submission information.

Silent Keys

The following VHFers became Silent Keys earlier in the year: Bob Sutherland, W6PO; Alvino Rey, W6UK; and Hank Arsaga, W5VAS. Obits of Sutherland and Ray, excerpted from the *ARRL Letter, follow:*

Moonbounce Pioneer Bob Sutherland, W6PO: Robert I. "Bob" Sutherland, W6PO (ex-W6UOV), of San Mateo, California, died January 11. He was 78. An active VHF-UHF operator in the 1960s through the 1980s, Sutherland was on the West Coast end of the first amateur radio moonbounce (EME) contact in 1960, when the Eimac Radio Club's W6HB and W1BU worked each other on 1296 MHz EME. An employee of tube manufacturer Eimac for nearly 50 years, Sutherland, who directed the Advanced Products Lab, developed some of the more famous Eimac tube-based amps. *His Eimac* 8877 VHF amplifier design still is referred to as "the W6PO amp."

Music Pioneer Alvino Rey, W6UK: Alvino Rey, W6UK, of Sandy, Utah, died February 24. He was 95 and had been in failing health. An ARRL member, Rey was a well-known musician for several decades and was considered "the father of the pedal steel guitar." Born Alvin McBurney in California and raised in Cleveland, Rey was an inveterate tinkerer who gained a reputation both as a musician and an electronics whiz who got his ham ticket at an early age. During the Big Band era he was a star of the Horace Heidt and his Musical Knights and later formed his own ensemble. The Alvino Rey Orchestra's biggest hit, "Deep in the Heart of Texas," came in 1942, but his trademark was novelty music and creating new sounds. An active amateur, Rey and his "talking guitar" performed at more than one ARRL Southwestern Division convention in past decades.

Hank Arsaga, W5VAS: Hank Arsaga, W5VAS, became a Silent Key on March 2, 2004. No details pertaining to his passing were available at press time. Hank, who was very active on 6 meters, also operated a high-power 6-meter beacon near his QTH in Metairie, Louisiana.

And Finally . . .

Again, publishing of activity reports, which were sparse when this column was written in mid-March, was suspended this month due to the need to publicize the pressing threat of BPL that is upon all of us amateurs. Please take the time to respond to the NPRM and also write to your congressman and senator voicing your concern over the implementation of BPL technology and the potential adverse effect on Homeland Security, as well.

Until next month... 73 de Joe, N6CL

dx

BY CARL SMITH,* N4AA

Charlotte Hamfest Highlights

Hamfest season has started here in early March, as I write this column. The annual Charlotte North Carolina Hamfest was quite interesting this year. Someone thought I might know something about DX, so I was asked to conduct a DX Forum on Saturday of the hamfest. Never having done that before, I had to scramble a bit to come up with a program that would appeal to the group of dedicated DXers I knew would be there. I finally decided that since the solar cycle is on the decline, I would concentrate on the low bands and other things DXers can do to maintain their interest during the "lull."

As I started the program, I was interrupted by one of the members of my local Quarter Century Wireless Association chapter. He came to the microphone and proceeded to read off a list of places and things which I recognized as my own history. To make a long story short, I was presented with a QCWA certificate for 50 years of being licensed. I was surprised! Even though I knew I'd been around a long time, I didn't expect recognition in this manner. Thanks to my fellow QCWA members for acknowledging my "age."

Left to right: Carl, N4AA, was emcee for the DX Forum at the Charlotte Hamfest; Lynn, W4NL, provided tips on QRP DXing; Dave, K4SV, presented ideas for low-band antennas, especially receiving antennas such as the "flag"; George, W4UWC, is known locally as "The King" of 17 meters. (Photo courtesy of Lynn, W4NL)

QRP DXing

I was pleased to have with me my friend Lynn Lamb, W4NL, from Maryville, Tennessee, who gave the audience an introduction to QRP DXing. Lynn has been chasing DX for the last four years with an Elecraft K2. In that time he has racked up some very impressive totals. He readily admits that the Elecraft runs a hefty 10 watts, and to some that is not considered QRP. Try it sometime, as it takes a lot more effort to work DX with 10 watts than it does with an Alpha amplifier! Anyway, Lynn's QRP country numbers read like this: Mixed total 313, Phone 283, and CW 296. That's impressive enough, but then we look at individual bands: 160 meters 54, 80 meters 102, 40 meters 186, 30 meters 190, 20 meters 273, 17 meters 254, 15 meters 266, 12 meters 249, and 10 meters 243. Folks, that's 5-band DXCC in four years, running 10 watts! If you want something to challenge your skills for the next few years, try QRP.

The Flag Antenna

Following Lynn was my friend Dave Anderson, K4SV. Dave has been very active on DXpeditions in the last few years, operating from places such as Bhutan, Kermadec, Baker Island, Swaziland, etc. Dave presented us with a program on the low bands and antennas of interest for those bands—in particular, receiving antennas of various types, such as the "flag," the "pennant," and of course beverages. The one which stirred the most interest was the flag antenna. Measuring only 14 feet high and 29 feet in length, this rectangle-shape antenna compares favorably with a 540-foot beverage, according to Dave. For transmitting, Dave has just finished fabricating a unique vertical antenna for 80 and 160 meters. By scrounging, he came up with 60 feet of Rohn 25G tower, which became the 80-

Jim, NW6S (left), discusses 160-meter operation with Bill, W4ZV, following the DX Forum at the Charlotte Hamfest. Bill had 312 countries on Top Band as of March 13. (Photo courtesy of Lynn, W4NL)

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Itice, K4LVV, and her husband Ted, W4VHF, pose with a Kenwood TS-2000 they bought at the Charlotte North Carolina Hamfest in March. Itice needs only two more cards to have DXCC on 6 meters. (Photo courtesy of Carl, N4AA)

Bob Davies, K7BHM (right),receives the prestigious Central Arizona DX Association's "2003 DXer of the Year" award from 2002 recipient Dave Hollander, N7RK, at the group's annual awards banquet this past January. (Photo courtesy of Bob, K7BHM)

meter radiator. He then utilized the hardware section of the Home Depot store to come up with the necessary materials to mount a 45-foot section of telescoping aluminum tubing inside the tower. It is motorized, and with the push of a button, the 45-foot "stinger" rises out of the tower to become a 104-foot radiator for 160. The entire antenna system actually is ground mounted in trees behind Dave's house, where he laid out a number of radials. He says he plans to add more radials for improved performance, but even now it is performing very well on both 80 and 160 meters.

With the declining solar cycle, we need to be looking for ways to improve our stations/antennas for those low bands. Dave certainly gave us some excellent ideas we might consider for our own situations in time to make the most of 160, 80, and 40 meters over the next four to six years.

Logbook of The World

On Sunday morning I had the pleasure of attending yet another DX Forum conducted by Gary Dixon, K4MQG, and Wayne Mills, N7NG/1, from ARRL HQ. Wayne brought us a lot of information about the Logbook of The World. As of early March, some *40 million* QSOs have been uploaded to the server, from around 39,000 logs covering mostly the last ten years. Wayne said some logs contained QSOs dating back to the 1950s. Testing of the "credit" software has begun, and it is expected that we will be able to start using the system to claim DXCC credits from those 40 million QSOs within "weeks, not months," according to Wayne. The only cost will

The WAZ Program

6 Meters

66 ..... KØSQ

10 Meter SSB

559 ..... K8IHQ 560 ..... JR2KDN

15 Meter SSB

607 ..... JR2KDN

20 Meter SSB

1123 ..... N2NB 1124 ..... JR2KDN

40 Meter SSB

100 ..... WP4U 101 ..... JR2KDN

80 Meter SSB

80 ..... WP4U

15 Meter CW

317 ..... JA7OYM 318 ..... K9UQN

20 Meter CW

541 ..... SMØPSO 542 ..... K9UQN

30 Meter CW

58 ..... W1MK

40 Meter CW

237 ..... HA5FA

All Band WAZ SSB

4901 ..... K9DXR 4904 ..... K9UQN
4902 ..... HA5VZ 4905 ..... JA3MLJ
4903 ..... K6VWE

Mixed

8287 ..... EU1SA 8293 ..... K6VWE
8288 ..... EW1CQ 8294 ..... PAØJSE
8289 ..... VK3DBQ 8295 ..... OH2BLF
8290 ..... JA7LGE 8296 ..... DL5SL
8291 ..... WA5YNB 8297 ..... 7K3BKZ
8292 ..... DF7TG

All CW

398 ..... AA6NP 412 ..... K9UQN
409 ..... LY2PCN 413 ..... HB9APT
410 ..... EA6BF 414 ..... IZ1DFI
411 ..... YU1YO

Satellite

21 ..... AA6NP

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 Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577.** 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 Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

The WPX Program

CW

3130 ..... N6QZS

SSB

2890 ..... IK1SPR 2893 ..... N1BCL
2891 ..... K7SAM 2894 ..... EA2BNU
2892 ..... AP2IA 2895 ..... KB3DAI

Mixed

1934 ..... IK1SPR

CW: 1450 F5YJ. 1550 JA6GWU. 2600 W8UMR. 2950 KD6WW. 3400 W4VQ.
SSB: 600 K7SAM. 650 EA2BNU. 850 W8UMR. 1000 N1BCL. 1050 G3TSZ. 1100 NØYO. 1150 NØYO. 3100 KD6WW.
MIXED: 450 IK1SPR. 550 W3UTD. 2750 W8UMR. 3750 KD6WW.

Award of Excellence 160 Meter Bar: KUØA

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, 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, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, ONL-4003, W5AWT, KBØG, HB9CSA, 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, 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, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4BP, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX.

160 Meter Endorsement: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SM0DJZ, 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, HB9DZZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP, DL6ATM, W2OO, RU3DX.

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. *Note: WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*

Please Note: As of February 2004, the price of the 160 meter bar for the Award of Excellence is now $6.50.

5 Band WAZ

As of March 3, 2004, 645 stations have attained the 200 zone level and 1377 stations have attained the 150 zone level.

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

K4TEA EU7SA

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
NN7X, 199 (34)
IK1AOD, 199 (1)
DF3CB, 199 (1)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
HB9BGV, 199 (31)
N3UN, 199 (18)
OH2VZ, 199 (31)
K5MC, 199 (22)
W1JZ, 199 (24)
K2UU, 199 (26)
W1WAI, 199 (24)
W1FZ, 199 (26)
SM7BIP, 199 (31)
PY5EG, 199 (23)
SP5DVP, 199 (31 on 40)
W8AEF, 199 (40)
K8RR, 199 (26)
UU5JR, 199 (4)
W8GF, 199 (22)
N4NX, 199 (26)
N4MM, 199 (26)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
KF2O, 198 (24, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
N4XR, 198 (22, 27)
N4PQX, 198 (24, 26)
RU3DX, 198 (1, 6)
UT5JAJ, 198 (12, 30)
N6HR/7, 198 (34, 37)
OE2LCM, 198 (1, 31)
EA7GF, 198 (1, 27)
W7SX, 198 (18, 23)
UT3UA, 198 (1, 6)
HA1RW, 198 (1, 31)

The following have qualified for the basic 5 Band WAZ Award:

K4TEA (150 zones)
EU7SA (200 zones)
HB9DDO (171 zones)
UY5AA (190 zones)
PY2DBU (160 zones)
EU1SA (170 zones)
EW1CQ (161 zones)
K2BSA (158 zones)
JR2KDN (160 zones)

Endorsements:

K4TEA (200 zones)
OE2BZL (200 zones)
EU7SA (200 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

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 Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577.** The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

be when you actually claim credits, and the cost per QSO will run from a maximum of 25 cents for a single credit, to as little as 15 cents for 500 or more credits claimed at one time.

With the ARRL's Challenge award drawing more and more attention (see the ARRL webpage, <www.arrl.org>), those DXCC credits will take on an ever-increasing importance. I'm sure many of you are anxiously awaiting the day when you can claim those credits using the Logbook of The World. Another fea-

For old timers and others interested in classic radio gear, on the left is a Collins KW-1, a full kilowatt of AM. On the desk in the middle of the photo is what appears to be Collins 75A/32V (receiver/transmitter stacked), along with a Hallicrafters receiver. The desk on the right is really a Johnson Desk KW with a Johnson Ranger and a National HRO (probably a 60 model) with a rack full of coils for it on the wall. All beautiful gear. W9CTO advertised the KW-1 for sale in early March . . . ← $17,000. (Photo from the QTH.com website)

ture of LoTW will be the ability to use the system to also eventually use it for credits for other awards. Details of that still have to be worked out, but I believe it will come in due time.

DXCC on 6 meters

Also on Sunday, I came across an interesting item when Rich, W2VU, talked to me about Itice, K4LVV, and her efforts to achieve DXCC on 6 meters. There is a photo of Itice and

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 335 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 stickers 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 334	K4MQG 334	N5FG 333	K6LEB 331	G3KMQ 329	W6OUL 327	W6SR 323	F5OIU 317	VE7KDU 300
K2FL 334	EA2IA 334	N7RO 333	VE3XN 331	KZ4V 329	IT9TQH 326	N5ZM 323	YT1AT 317	W9IL 300
K9BWQ 334	PA5PQ 334	K4CN 333	W1WAI 331	N5HB 329	I2EOW 326	KUØS 322	K8JJC 315	KØHQW 299
K9MM 334	K3UA 334	W4MPY 333	K2JF 331	W4UW 329	W7IIT 326	KE5PO 322	CT1YH 313	WG7A 295
W7OM 334	DL3DXX 334	PY2YP 333	K3JGJ 331	K1HDO 328	SM5HV/HK7 326	K6CU 321	PY4WS 313	KE3A 295
K2JLA 334	K2ENT 334	W8XD 333	PT2TF 331	K7JS 328	W4LI 325	HA5DA 321	N1HN 313	K4IE 291
N7FU 334	OK1MP 334	W2VJN 333	N4CH 331	K9OW 328	I5XIM 325	IKØTUG 321	W6YQ 313	KD8IW 288
K2OWE 334	NC9T 334	KA7T 332	W2UE 330	WA8DXA 328	K5UO 325	VE7DX 320	K9DDO 312	EA3BHK 282
N4MM 334	WB5MTV 333	WØJLC 332	I4LCK 330	K8PV 327	IK2ILH 325	IKØADY 320	W3II 312	YC2OK 282
F3TH 334	W7CNL 333	K8LJG 332	VE7CNE 330	W4QB 327	N5FW 325	WG5G/QRPp 320	UA9SG 309	DJ1YH 281
F3AT 334	YU1HA 333	YU1AB 332	4N7ZZ 330	I1JQJ 327	9A2AA 325	N7WO 320	KF8UN 308	XE1MD 278
DJ2PJ 334	IT9QDS 333	K5RT 332	W6DN 330	I4EAT 327	N4OT 325	HA5NK 319	YU7FW 306	EA2CIN 278
WA4IUM 334	G4BWP 333	YU1AB 332	K7LAY 330	DL8CM 327	LA7JO 324	F6HMJ 319	LU3DSI 302	I3ZSX 276
W4OEL 334	K4CEB 333	NØFW 332	WB4UBD 330	SM6CST 327	K1FK 324	OZ5UR 319	N1KC 302	G3DPX 275
W2FXA 334	K4IQJ 333	N4AH 332	YU1TR 330	N4KG 327	9A2AJ 323	G3KMQ 317	KH6CF 301	WA4DOU 275
N4JF 334	WØHZ 333	HB9DDZ 332	K9IW 330	K4JLD 327				

SSB

K6YRA 335	4Z4DX 335	N4CH 334	W7FP 332	DU1KT 329	IØSGF 327	EA3CYM 323	IZ6CST 314	VE7SMP 297
K2TQC 335	N7RO 335	K3UA 334	K9HQM 332	I2EOW 329	IT9TGO 327	F6BFI 322	K9YY 313	AC6WO 297
W6EUF 335	IØZV 335	K4JLD 334	CT1EEB 332	VE7DX 329	IT9TQH 327	K6CF 322	NØMI 313	WA1ECF 295
K2JLA 335	EA2IA 335	N5ZM 334	W2FKF 332	W2FGY 329	DK5WQ 327	LU7HJM 322	W7GAX 312	KW1DX 295
K4MQG 335	IN3DEI 335	PY2YP 334	DL9OH 331	CT1EEN 329	UY5XE 327	K5NP 322	VE3CKP 311	N5WYR 293
IK1GPG 335	EA4DO 335	AA4S 334	N2VW 331	CT1CFH 329	KE5K 327	WA4ZZ 322	CT1YH 311	K7ZM 292
K5OVC 335	PA5PQ 335	CT3DL 334	YV1JV 331	EA1JG 329	I1JQJ 327	WN9NBT 322	YV5NWG 311	OA4EI 292
NØFW 335	K9OW 335	NC9T 334	WA4WTG 331	KE4VU 328	CP2DL 327	WW1N 322	LU3HBO 310	KØOZ 291
K9MM 335	W6DPD 335	W9SS 334	W8KS 331	K1HDO 328	NI5D 327	W6OUL 322	HA6NF 310	W9ACE 291
W6BCQ 335	XE1VIC 335	VE7WJ 334	YV5IVB 331	K5UO 328	EA1JG 327	N3RX 321	WA5MLT 310	W4PGC 290
XE1AE 335	K2ENT 335	VE2PJ 334	KX5V 331	KF8UN 328	W6SR 326	XE1CI 321	XE2LV 310	I3ZSX 290
W7OM 335	OK1MP 335	W3AZD 334	I8LEL 331	EA3EQT 328	N4KG 326	CT1ESO 321	EA3BHK 307	WØROB 287
KZ2P 335	IZ6GPZ 335	YZ7AA 334	K3JGJ 331	WØULU 328	K7TCL 326	EA8TE 321	RW9SG 307	KKØDX 285
IK8CNT 335	K1UO 335	4N7ZZ 333	N5ORT 331	K1EY 328	W9HRQ 326	W6MFC 321	XE1MDX 305	VE7HAM 285
VK4LC 335	WDØBNC 334	KE5PO 333	PT2TF 331	KZ4V 328	W4QB 326	N4CSF 320	EA5OL 305	F5RRS 284
OE7SEL 335	DU9RG 334	VE1YX 333	CT1AHU 331	XE1D 328	K8PV 326	N4HK 320	WB2AQC 305	N8LIQ 284
VE3MR 335	K2FL 334	I4LCK 333	EA3JL 331	KD8IW 328	DL6KG 326	KØFP 320	KC4FW 304	WØIKD 283
VE3MRS 335	WØYDB 334	W2JZK 333	W6DN 330	KE3A 328	W4LI 326	EA7TV 320	K3BYV 303	KBØRNC 282
K4MZU 335	W4UW 334	K8LJG 333	K8CSG 330	W9IL 328	WR5Y 326	SV1RK 320	YC2OK 303	WN6J 281
OZ5EV 335	K9BWQ 334	VE4ACY 333	YV1CLM 330	K3LC 328	W5LLU 326	N1KC 320	WB2NQT 303	IK8TMI 281
N7BK 335	W4NKI 334	KØKG 333	LA7JO 330	K8DXA 328	N1ALR 326	W5GZI 320	VK3IR 303	F5JSK 281
K7LAY 335	WB4UBD 334	W4WX 333	AB4IQ 330	LU5DV 328	HB9DDZ 326	SV3AQR 320	KK4TR 303	KA5OER 280
ZL3NS 335	W4UNP 334	VE2WY 333	AE5DX 330	I1EEW 327	WA4JTI 325	WA4DAN 319	VE7KDU 302	KK5UY 280
N4MM 335	W8AXI 334	WB3DNA 333	KB2MY 330	SV1ADG 327	KC4MJ 325	CE1YI 318	W2GZI 302	F5INJ 279
OZ3SK 335	VE2GHZ 334	K9PP 333	K3PT 330	DL8CM 327	PY2DBU 325	W5OXA 317	N5QDE 302	K7SAM 279
K7JS 335	OE2EGL 334	W2CC 333	ZL1BOQ 330	F9RM 327	IKØIOL 325	YV4VN 317	KD4YT 302	EA3CWT 278
XE1L 335	WA4IUM 334	DL3DXX 333	K9IW 330	XE1MD 327	YT1AT 325	EA5GMB 317	VE7SMP 301	VE2DRN 277
YU1AB 335	K5RT 334	EA3BMT 333	KW7J 330	I4EAT 327	K7HG 324	KD5ZD 317	SV2CWY 300	9A9R 277
OE3WWB 335	W2FXA 334	YV1KZ 332	WS9V 329	W3GG 327	AC7DX 324	KE4SCY 317	4X6DK 300	W6UPI 276
K5TVC 335	N4JF 334	YV1AJ 332	K2JF 329	AA6BB 327	KØHQW 324	K6RO 316	YT7TY 300	Z31JA 275
N5FG 335	W6SHY 334	KSØZ 332	ZL1AGO 329	SM6CST 327	EA3BKI 323	N5HSF 316	XE2NLD 300	G4URW 275
DJ9ZB 335	W5RUK 334	I8KCI 332	N5FG 329	WD8MGQ 327	K4JDJ 323	N8SHZ 316	K4IE 300	VE2AJT 275
PY4OY 335	K4CN 334	LU4DXU 332	W9OKL 329	CX4HS 327	W6WI 323	WZ3E 314	K6GFJ 299	4Z5FL/M 275
VE3XN 335	EA3KB 334	VE4ROY 332						

RTTY

K2ENT 333	K3UA 327	EA5FKI 320	G4BWP 312	PA5PQ 311	KE5PO 297	I2EOW 291	W4QB 280	YC2OK 280
WB4UBD 330	NI4H 325	W2JGR 316	OK1MP 312	N5FG 305	W4EEU 296	I1JQJ 289		

her husband Ted, W4VHF, in the column this month. She now has 98 countries confirmed on 6 meters. While at the Hamfest, they bought a new Kenwood TS-2000 radio. Together they will be spending a lot of time at their North Carolina mountain home this year, and Itice hopes to work those last two for DXCC. I wish Itice well in her quest.

Global Six Meter Marathon

Speaking of 6 meters, OH3AG has announced the first Global Six Meter Marathon. The objective is to work as many DXCC countries as possible between May 8 and August 8, 2004. For more details and to follow the contest online go to: <http://www.50mc.tk>. Only single operator entries can be made, no multi-operator. All modes will be permitted.

Entrants must update their "worked countries" by e-mail to the contest director, Hannu Saila, OH3WW, at <marathon@salia.org>. The update must include your call; number of worked DXCC countries; and list of new countries worked, including the date and time of the contact. Paper logs will not be accepted.

DX Here and There

The T33C operation from Banaba will have ended shortly before this column appears in print. This Pacific island is ranked #23 on *The DX Magazine* Most Wanted survey for Europe, and the team planned to do their best to make Europe a priority in their operating schedule.

CQ DX Awards Program

SSB

2426.....K7SAM 2428.....AE9DX
2427.....NI5F

CW

1057.....OK1FEK 1058.....K5HQV

SSB Endorsements

320.....YZ7AA/334 320.....LU5DV/328
320.....W3AZD/334 275.....K7SAM/279

CW Endorsements

320.....W2VJN/333 310.....W6YQ/313

RTTY Endorsement

275.....W4EEU/296

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. 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. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 335 active countries. Please make all checks payable to the award manager.

The major operation from Rodrigues Island as 3B9C also will have ended shortly before you read this. This group was scheduled to be on the island for nearly four weeks and was looking to set some new records. We'll be able to report on that next time.

"Tips To The Top From DX Pros"

I have to mention a 32-page booklet just published by "Dee" Logan, W1HEO, entitled, "Tips To The Top From DX Pros." Dee surveyed 100 top DXers around the world. Some 40% of them responded and provided Dee with their thoughts on various questions he posed to them. Topics included station equipment, antennas, QSLing, sources of DX information, etc. It ends with an explanation of the International Beacon Network funded by the Northern California DX Foundation (NCDXF). Included for easy reference is a list of the beacons, times, and frequencies. The book is available from Dee for $9.00 plus $1.50 shipping/handling. Order from DX Book, 9901 Cypress Circle, Mentor, OH 44060. A portion of the proceeds from the book will be donated to DX foundations.

I will not be going to Dayton this year, for a variety of reasons. I hope those who are going will enjoy the weekend.

Until next time, enjoy the chase and *have fun.*

73, Carl, N4AA

QSL Information

GM5BLT via LA4LN
GQ6YB via G3SWH
GT6YB via G3SWH
GU4VXE/P via G3SWH
GU6YB via G3SWH
GW4VXE via G3SWH
GW6YB via G3SWH
GX6YB via G3SWH
F/G3RTE via G3SWH
FF3TV via F6BEE
H40V via JA1PBV
H44V via JA1PBV
HBØ/DL6FDB via JA1LZR
HBØ/HB9LEY via JA1LZR
HC1/N1KO via W1ZS
HC8/N1KO via W1ZS
HGØ4HNY via HG4I
HG8EAC via HA8IB
HG8SDS via HA8IB
HI9X via W9AAZ
HKØM/HK3JJH via HK3JJH
HK3JJH via HK3JJH
HK3JJH/HKØM via HK3JJH
HLØGHQ via DS2CYI
HSØ/VK3DXI via DL4DBR
HSØZDJ via W2YR
IAØPS via IKØAIH
IQ9L via I2EOW
IR2W via I2EOW
IR7LH via IK7JWX
J20DA via DJ6SI
J37ZF via LA4LN
J37ZG via LA4LN
J64AS via N9AG
J68AS via N9AG
J68AZ via W9AAZ
J6A via N9AG
J6DX via N9AG
J6LAH via K4PHE
J6LSC via N9AG
J73ALN via LA4LN
J79AA via W9AAZ
J8DX via W8QID
JA6WFM/HI8 via JA6VU
JW4LN via LA4LN
JY40VJ via DL8YR
JY8VJ via DL8YR
JY8XX via N6ZZ
K1D via W1DAD
K9L via K9LSB
KG4DX via W4WX
KG4IZ via K4ZLE
KHØAC via K7ZA
KP2/KX8N via W9AAZ
KP2/W4CJK via W9AAZ
KP2/WB3JRU via W3UR
KV4/WB3JRU via W3UR
KX6BU via N6HR
L4D via G3SWH
LA1V via LA4LN
LA2SR via LA4LN
LA4JAM via LA4LN
LA4SS via LA4LN
LC1J via LA4LN
LG5LG via SM5DJZ
LN1V via LA4LN
LS4M via LU4AA
LU8XW via WD9EWK
LX/DL1VJ via DL8YR
M1BCG/P via G3SWH

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," 106 Dogwood Dr., Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

awards

BY TED MELINOSKY,* K1BV

DX and U.S. Awards

Every few months I insert a reminder that whenever you see the acronym "GCR" in award rules, all that means is that the sponsor will accept the signatures of two licensed amateurs as proof that the witnesses have seen the cards needed for the award. The General Certification Rule is used in about 99% of club, group, and individual awards. It does not work, however, for DXCC.

Brian Reed, KG4CRJ
USA-CA All Counties #1086

This month we hear from Brian, KG4CRJ, who achieved USA-CA All Counties #1086 on January 16, 2004:

I first got interested in radio when I was 11 years old. I bought a portable shortwave receiver, and the first time I tuned the dial and picked up a foreign broadcast station, I was hooked! I spent many happy hours as an avid SWLer and at times thought about getting a ham ticket, but never really pursued it.

All that changed when I met Tom Pennebaker, N4RS, who urged me to go ahead and get my license so I could get on the air. Tom has been the best Elmer any new ham could ever hope for and made my transition into the hobby much easier than it otherwise would have been. He helped me put up an antenna and even loaned me a rig to get started. Gotta love a guy like that!

I started out chasing DX, until Tom introduced me to county hunting. He warned me that it was very addictive, and boy, was he right. My DX chasing was out on hold, and I have spent the last 3 1/2 years chasing counties. It has been so much fun, and I have made a lot of friends in the process.

I would like to thank all the mobiles on both the CW and SSB nets who have put out all those counties. There are so many to thank that I couldn't begin to list them all here, but I do want to mention a few who went the extra mile for me in getting my last ones.

A big thank you to Lloyd, VE4AGT; Rick, AI5P; Dave, KE3VV; Joyce, KD8HB; Dan, KM9X; Jim, N9JF; John, W5UGD; and Dave, K4SSU, who finished me up on Christmas Eve in Murray County, Georgia.

I would also like to thank Ernie, W7KQZ, and Jeff, AA4UT, for the phone calls when someone ran into one of my needed counties. If there is one thing I have learned about county hunters, it is the camaraderie that exists between us.

Last, but certainly not least, I want to thank Jim, KZ2P, for his tireless efforts in running the SSB net. Without his help and the help of other net controls, it would have taken me much longer to obtain this USA-CA Award.

Thanks again to everyone, and I can't wait to get started on my second time around. I already have a new highlighter and county hunter's coloring book ready to go! *—73, Brian, KG4CRJ*

DX Awards

Ernst August Award. Ernst August (1771– 1851), King of Hanover, was the fifth son of the English King George III. He inherited the throne in Hanover in 1837. At that time Germany was composed of strong city/states. The award shows a monument to the king in front of the main train station in Hanover. It is especially well designed and printed on heavy chamois marble cardboard stock with a dramatic black background and inscribed in old German script.

Celebrating the 750th anniversary of Hanover, Germany, this award can be earned by contacting DOKs (the letter/number combination used by the DARC to identify regional radio clubs) in that city: H13, H31, H38, H45, H47 H48, H49, H56, H65, and Z08 after 1 January 1991. Only one contact per station and a maximum of 10 per single DOK.

The Ernst August Award, in celebration of the 750th anniversary of Hanover, Germany, is issued for contacting DOKs in the city of Hanover.

USA-CA Special Honor Roll

James R. Lauterbach, W9JL
USA-CA All Counties #1087
February 5, 2004

James W. Maxwell, N8RYD
USA-CA All Counties #1088
February 5, 2004

Philip Clifford Long, VE1WT
USA-CA All Counties #1089
February 13, 2004

USA-CA Honor Roll

500
N8RYD.....3287
JA7MGP...3288
KD7KST...3289
K9JF.....3290

1000
W9JL.....1651
N8RYD.....1652
N4EWK....1653

1500
W9JL.....1381
N8RYD.....1382

2000
W9JL.....1279
N8RYD.....1280
W4OV.....1281

2500
W9JL.....1199
N8RYD.....1200

3000
W9JL.....1108
N8RYD.....1109
VE1WT.....1110

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. 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 June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

*12 Wells Woods Rd., Columbia, CT 06237
e-mail: <k1bv@cq-amateur-radio.com>

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1¼ x 6 x 9	3.2
SS-12	10	12	1¾ x 6 x 9	3.4
SS-18	15	18	1¾ x 6 x 9	3.6
SS-25	20	25	2¾ x 7 x 9¾	4.2
SS-30	25	30	3¾ x 7 x 9¾	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2¾ x 7 x 9¾	4.2
SS-30M*	25	30	3¾ x 7 x 9¾	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9¾	6.5
SRM-30	25	30	3½ x 19 x 9¾	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9¾	6.5
SRM-30M	25	30	3½ x 19 x 9¾	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9¾	10.5
SRM-30-2	25	30	3½ x 19 x 9¾	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9¾	10.5
SRM-30M-2	25	30	3½ x 19 x 9¾	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

CIRCLE 134 ON READER SERVICE CARD

*ICS – Intermittent Communication Service

HF: DLs need 40 QSOs in 6 DOKs; EU stations need 30 QSOs in 5 DOKs; all others need 15 QSOs in 4 DOKs.

VHF Bands: Stations from Hanover need 40 QSOs in 6 DOKs; DARC DOK H, I, N, and F need 30 QSOs in 5 DOKs; other DLs 20 QSOs in 5 DOKs; all others outside DL need 15 QSOs in 4 DOKs. Club stations in these DOKs count double.

Send GCR list and fee of DM10, $US6, or 10 IRCs to: Klaus Brüger, DL2OCD, Hildeheimer Strasse 131, D-30880 Laatzen, Germany (see: <http://www.qsl.net/dl0hv/eadipl_dl.htm>).

Keymen's Club of Japan Award. Many countries have groups or associations of CW enthusiasts who sponsor awards promoting the use of Morse code. One of the most prominent Japanese CW groups is the Keymen's Club. The club's award requires contacting as many of the 47 different Japanese prefectures (roughly equivalent to a state or large county) as possible on CW using different bands. Bands go all the way from 1.8 MHz to 5600 MHz, plus any contacts by satellite. Practically speaking, stations outside of Japan will find only a few of these bands likely sources of JA contacts.

These rules pertain to all stations outside of Japan. Work at least 100 different Japanese prefectures on CW, with not more than one prefecture per band. The maximum number of prefectures per band is 47. Cross-band contacts are not permitted. Satellite contacts are counted as a separate band. All contacts must have been made from the same DXCC entity, and any number of your past and current callsigns are acceptable as long as you can prove you possessed the call. Endorsement stickers are provided in multiples of 50 between 100 and 400, in multiples of 25 between 400 and 600, and in multiples of 10 in excess of 600. SWL okay.

The award requires use of the club's application, available for SASE/IRC from the manager, or found in several formats on the website shown below. Fee for the basic KCJA is 4 IRCs, or $US4. Each endorsement costs 2 IRCs, or $US2. Apply to the manager: Ichio Ujiie, 162 Shionosawa, Kohata Towa, Adachi, Fukushima 964-0203, Japan (e-mail: <jh7fqk@jarl.com>; on the web: <http://www.jarl.com/kcj/>).

A prominent Japanese CW group, the Keymen's Club, issues an award for contacting Japanese prefectures on CW.

Polska Award. An administrative change effective 1 January 1999 re-organized and reduced the number of provinces in Poland from 49 to 16. With fewer provinces and typical good participation of Polish stations in most DX contests, this award should be relatively easy to earn. It is one of those marvelous European designs incorporating some beautiful coats of arms of the provinces.

Contact at least 16 provinces (*woejewodztwos*) since 1 January 1999. On HF, Polish stations need at least five different stations in each province. Europeans need two different stations in each province. All others need only one station in each province. VHF stations need five stations each in four provinces.

All bands and modes okay. No use of crossband QSOs or repeaters. Province identifiers are: B, C, D, F, G, J, K, L, M, O, P, R, S, U, W, and Z.

The award is available to licensed amateurs or SWLs. All contacts, with the exception of satellite or repeaters, regardless of band or mode, are valid. Send GCR list and fee of 5 Euros, $US5, or 5 "new" (large format) IRCs to: PZK Awards Manager, Augustyn Wawrzwnek, SP6BOW, P.O. Box 54, 85-613 Bydgoszcz 13, Poland (e-mail: <sp6bow@poczta.onet.pl>).

The Polska Award is available for contacting at least 16 of the provinces of Poland.

Baikal Islands Award. Lake Baikal is known as the deepest fresh-water lake in the world (5712 feet deep) and is located just north of Mongolia. Legend has it that Olkhon Island is the birthplace of the Mongolian ruler Genghis Khan.

Contact islands in Lake Baikal, Russia, to earn the Baikal Islands Award.

Baikal's volume makes up approximately 20 percent of the world's surface fresh water.

This impressive lake is the subject of three colorful awards offered by the Russian Robinson Group. These are the newest awards offered by this established and very active group, which has sponsored expeditions to islands and lighthouses. Each award is a separate design, and all are very well done. I used an internet translation facility and feel pretty sure that the rules are correct as shown below.

Contact (or SWL) stations operating from islands in Lake Baikal listed in the official Russian Robinson Award island listing. Contacts on or after 1 January 1995 count for the award. All modes and bands okay. Only one callsign from each group of islands regardless of band and mode used. The award is available in three levels, each with a different, beautifully designed multicolored certificate.

Class	Island Groups Needed
3	3
2	6
1	9
Honor Roll	12

Each claim for working the islands must be accompanied by a GCR list with complete details of the contact, including its RRC number, as well as a copy of the card received. Sponsor reserves the right to ask for original cards. Fees for Class 1–3: 100R for Russians, 10 IRCs or $US7 for all others. For the Honor Roll plaque, the fee for Russians is $US35, hams in other CIS countries is $US37, and all others $US40.

Apply to: Bobrysh Sergey Alexandrovich RZØOA, a/ya 7, g. Severobaykal'sk, 671701, Russia (e-mail: <bsa60@yandex.ru>). Plaque manager: Rochev Victor Ivanovich, RU3GN, a/ya 59, Lipetsk, 398006, Russia (e-mail: <v_.rochev@lipetsk.ru>). Website: <http://www.hamradio.ru/rrc/bia/bia.shtml> (in Russian).

6 Meter International Grid Field Award

This award is offered by K1MS and K1SG for working at least 50 of the 324 different major fields of the Maidenhead Locator System on 6 meters. We're well down from peak conditions of the last solar maximum that supported a lot of good 6-meter DXing. By now you should have those cards in your collection. Here's an award that will put them to good use.

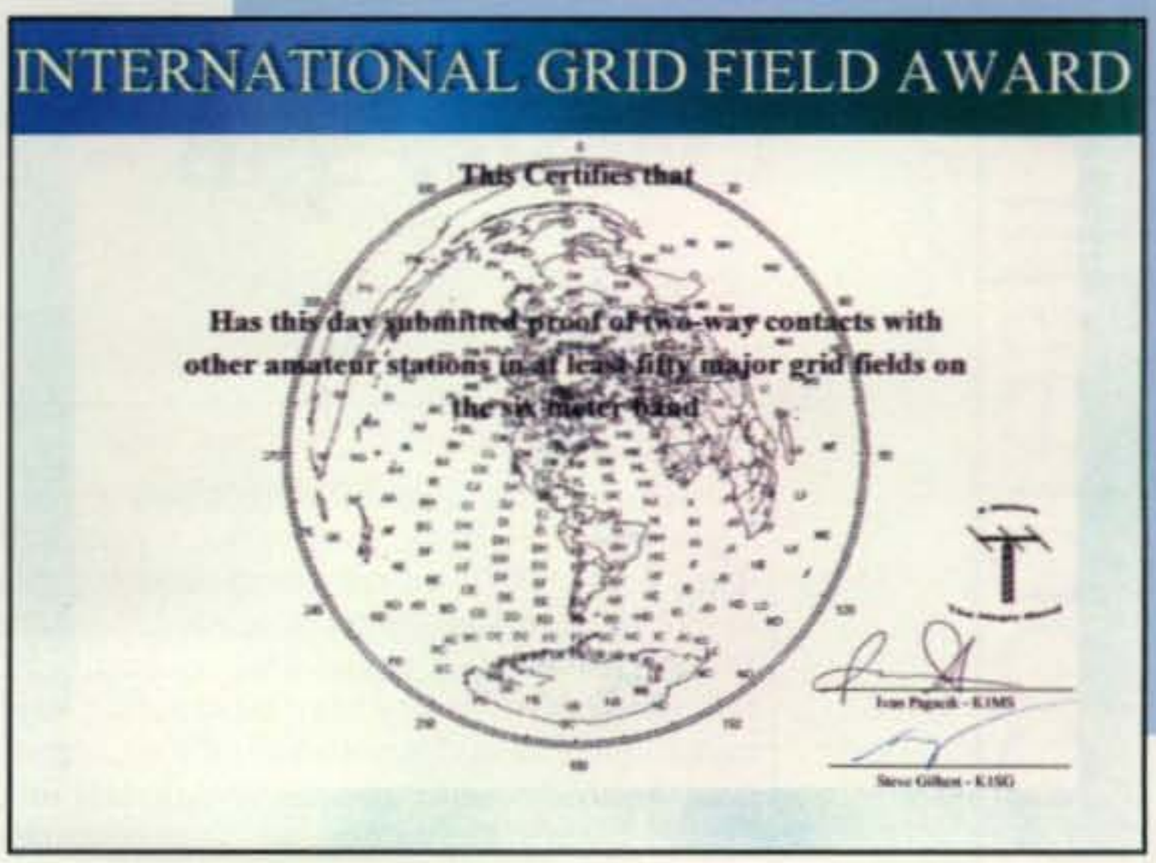
Contacts must be on or after 15 November 1945 and must have been made via any direct mode. No use of repeaters permitted. All contacts must have been made from a single DXCC entity. Endorsements in the form of a new certificate are available at the 75 level and every 5 grids thereafter. Send only those QSLs that qualify you for the requested endorsement. Photocopies and GIF/JPEG images are acceptable as long as the confirmation shows both calls (along with the standard date/ time/report/frequency).

The award fee is US$5 for US and Canada, and US$6 for foreign (air). The award and returned QSLs will be shipped in a sturdy mailer to ensure the award is not folded. Do not sent IRCs. Submit QSL confirmations and sufficient funds to cover return postage to: Ivan G. Pagacik, K1MS, 123 Whitcomb Avenue, Littleton, MA 01460 USA. (Website: <http://home.earthlink.net/ ~ivanpage/>)

Invalid contacts will be discredited and will be removed from your total count. If this brings your count below 50, the certificate, if issued, will be considered void.

URL of the Month

A good listing of most of the awards program of the Radio Amateurs of Canada may be found at the official RAC website: <http://www.rac.ca/opsinfo/awards.htm>. Application forms are available, as are links to images of the awards.



The 6 Meter International Grid Field Award is offered by K1MS and K1SG for working at least 50 of the 324 major fields of the Maidenhead Locator System on 6 meters.

I'm still looking for new and interesting awards sponsored by clubs and other groups. *CQ* magazine can provide excellent publicity for your wallpaper.

73, Ted, K1BV

BY JOHN DORR,* K1AR

CW vs. SSB – The Debate Rages On

May's Contest Tip

Have you had anyone listen closely to your transmit signal lately (SSB and CW)? If not, it wouldn't be a bad idea, especially if you're using anything new (radio, amplifier, computer, antennas, etc.). Also, be sure to check all bands. A signal that sounds good in your headphones, in reality may be creating key clicks or minor levels of audio distortion. It's a good plan to run your station through its paces with a local friend, returning the favor at the same time. Your contest score will never go down for trying it out!

Calendar of Events

Apr. 24–25	SP RTTY DX Contest
Apr. 24–25	Helvetia Contest
Apr. 24–25	Florida QSO Party
May 1–2	MARAC County Hunters CW Contest
May 1–2	Indiana QSO Party
May 1–2	ARI International DX Contest
May 1–2	New England QSO Party
May 8–9	CQ-M International DX Contest
May 8–9	Volta RTTY DX Contest
May 8–9	Oregon QSO Party
May 15–16	U.S. Counties QSO Party
May 15–16	King of Spain CW Contest
May 22–23	Baltic Contest
May 29–30	Great Lakes QSO Party
May 29–30	**CQ WW WPX CW Contest**
June 12–13	ANARTS WW RTTY Contest
June 19	Kid's Day Contest
June 19–20	All Asian CW DX Contest
June 19–20	West Virginia QSO Party
June 26–27	ARRL Field Day

What's your favorite contesting mode? SSB? CW? Or, for some, one of the digital modes of operation? It seems that of late I've been hearing some very strong opinions on this subject, and I have a few of my own that I'll be sharing with you this month.

Let me begin with some personal opinion. I have become, for the most part, a staunch CW man. Now don't get me wrong. There's never been a 300/hour QSO rate on SSB that I've wanted to pass up from the shaded comfort of Caribbean palm trees. However, as I glide in on the final approach to the ripe old age of 50, I'm discovering that for me, CW is a kinder and gentler mode for contest operating. Frankly, while in reality I don't support this, it would not bother me that much if all contests were conducted on CW. Now before you start to think that I've gone off the deep end this month, let's look at some of factors that create a bias toward one mode versus the other.

For the SSB Aficionados . . .

There are a number of factors that make SSB operating attractive to contesters:

• Rates are generally higher than on CW. If you're motivated by high-rate contesting, SSB is the place to be.

• Generally speaking, there are more DXCC countries available to be worked in an SSB DX contest.

• Many of us do not have strong roots in CW operating. In some countries, it's now not even a licensing requirement, and there continues to be movement in that direction, strengthening the position that SSB contesting will be here to stay for a long time.

• Even if you've satisfied the CW licensing requirements, many operators either don't enjoy it or simply are not very good at it.

• It's easier, or more enjoyable, for many operators to simply use the spoken word in contest operating (e.g., passing multipliers, frequency disputes, etc.) rather than convey the same information on CW.

• There are more stations to work on SSB, especially in DX contests. A contact with the recent influx of new operators in Europe (e.g., G1XXX, DH8XXX, M3XXX) is something that generally is not available on CW.

• According to some, the casual operator is more likely to enter a SSB contest than a CW contest.

For You CW Folks, Though . . .

There are some great reasons to dust off the old CW key:

• CW favors smaller stations. You simply don't need the same level of horsepower to produce a comparable contest score on CW.

• By definition, CW is less physically demanding. Given that the average age of today's contester is approximately 150 years old (hi), this is a real consideration in today's contesting world.

• CW definitely is not dead. Over 4000 logs were received from last year's CQ WW DX CW Contest. Top-scoring stations are logging record QSO/hour rates around the globe.

• Not everyone sends at 100 wpm in a CW contest. There is a place for newcomers who desire to build their skills in an orderly manner.

• There's a certain level of civility that exists on CW that you don't find on SSB. The screaming matches and poor operating practices seem to be much more uncommon in the digital world.

• It's simply easier to copy guys on CW. While certainly present on CW, QRM is less of a factor than on SSB. If you miss a second of a transmission on CW, you still are able to copy the majority of the text. A second on SSB could blow away an entire callsign.

*2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

• If you're inclined to try QRP or low-power categories, I think you'd have much more fun on CW than SSB (at least I would).

The Bottom Line

At the end of the day, the debate on this subject comes down to personal preference. From my own recent experience in the ARRL DX contests, I can say that I had much more fun on CW than I did on SSB. In both cases, I was unable to operate full-time. However, the SSB experience left me saying, "I can't wait until the next CW contest!" Maybe I'm just caving in to the inevitable stage of being old and cranky. I'm curious as to where you stand. Drop me a line and let me know.

Final Comments

Well, now that I've come out on the side of CW, I'm sure I'll be hearing from the SSB advocates. Again, don't read me wrong. SSB contesting is a great thing, too. Just don't expect to see my Bencher paddle up for auction on e-Bay anytime soon!

Also, after reading the accompanying sidebar on Jim, K4OJ, please take a few minutes to drop the White family a note. They'll appreciate hearing from you.

That's all for this month. . . .

73, John, K1AR

Jim White, K4OJ, Remembered

Ham radio and contesting lost a favored son on February 12, 2004—Jim White, K4OJ. When it comes to enthusiasm for the sport and commitment to excellence, Jim's name always rose to the top of our minds. We'll miss him terribly. Dan Street, K1TO, knew K4OJ about as well as anyone. As a tribute to Jim, I've included Dan's comments in this month's column. RIP, dear Jim.

One of the many wonderful things about ham radio is that it transcends age. Thus, as a teenager in Connecticut, I spent the majority of my free time with the Murphy's Marauders Contest Club members who had welcomed me enthusiastically into the group. The White family was a prominent segment of that group, and despite our minor difference in age, Jim and quickly became friends.

I remember driving to/from Dayton 1977 with Jim. My Opel Manta's water pump blew on Route 80 with Jim driving, and we spent the next hour sorting through incoming WA1QNF QSLs while we waited for help to arrive. Amazingly, there was an Opel dealership in the thriving metropolis of nearby Clearfield, and we were able to resume the journey home by Monday afternoon.

"Happiness is a good run." That was the byline on the 1977 ARRL DX Test results, authored by Jim White, K1ZX/WA1NNC, and Dan Street, WA1QNF. Along with Bill Jennings, WA1AHI/K1WJ, who tragically became a Silent Key himself two years ago, the three of us spent a fabulous summer checking logs and "yucking" it up. I had just graduated from high school, while Jim was dating the girl who ended up being his (first) wife.

Not long after that, the Whites moved to Homestead, Florida, just south of Miami. Bob, K1XA, another good ARRL friend, and I took a week of vacation in Fort Lauderdale one spring and made a special trip down to see Jim. Soon after that, Jim had a very serious auto accident and was laid up with multiple injuries for quite a while.

For a number of years from that point on, the only time I'd see Jim would be at Dayton.

Many have, very appropriately, chronicled Jim's adventures at Dayton. Despite being immersed in a ham radio family day in and day out, Dayton was consistently the highlight of Jim's year. It was during those years that Jim met and married Teresa, becoming an instant grandparent.

After Hurricane Andrew destroyed Ellen and Bob's home, the Whites all moved to the Tampa area on the other coast of Florida. There, collectively, they began to build a very solid contest station.

In March 1994 Jim established the Florida CW Contest Group, which soon became the Florida Contest Group. Jim served as president for the first four years of the club. When I took over in September 1998, the club foundation was solid, and it's been a pleasure to build and build upon that.

Jim's health declined over a long period of time, but as many of you have recognized and emphasized, his enthusiasm and positive outlook were staunchly consistent. In one of my last e-mail exchanges with Jim, he told me that I'd soon be able to retire from antenna work at the W1CW station, as he would once again climb proudly.

When WC4E and I wearily exited our plane returning from WRTC in Finland in July 2002, we were met with a K4OJ-organized group of FCGers waving banners and welcoming us back. It was quite amazing, since we were something like four hours late, arriving at 1 AM.

One of Jim's greatest pleasures was developing funny phonetics for callsigns. For some odd reason, N4BP and WC4E were the butt of many of those cracks. There are just a zillion stories like this, with no adequate way to provide a comprehensive recall here and now. I do hope this has provided a flavor of the man OJ was, from my personal perspective.

Thanks to all of you who have already offered your own tributes to Jim. Some of the suggestions regarding memorial awards are great, and the FCG will be setting up a number of awards as well. Thanks also to K5KG, W4IX, and K3TEJ for dedicating their J7 effort (using the callsign J7OJ) in the ARRL DX CW contest to Jim's memory. I'm also hearing of some plans to honor Jim at the 2004 Dayton Hamvention™.

Since promoting the Florida QSO Party was yet another source of joy for Jim, I encourage everyone to circle the last weekend of April on your calendars and get on the air as much as you can in the FQP in honor of Jim.

Jim was a devoted father and grandfather, in addition to all of his contesting interests. Teresa White would appreciate hearing from any of you at: 3527 King George Ln., Seffner, FL 33584-6117.

As an only child, Jim ("Jamie") was the apple of his mother's eye, and I just hope that we all can help Ellen through this staggering and difficult time of losing her husband and only son in less than 15 months.

At Ellen's request, the W1CW Memorial Fund is now the W1CW/K4OJ Memorial Fund. Ellen prefers that contributions be made to the fund in Jim's name. Any donation checks should be made out to the Florida Contest Group. Be sure to note that it is designated for the K4OJ Fund, and donations may be mailed to the FCG Treasurer, Fred Perkins, 3437 Lake Josephine Drive, Lake Placid, FL 33852.

R.I.P. and keep smiling, old friend.

—Dan, K1TO/4

propagation

BY TOMAS HOOD,* NW7US

On The Bands

A Quick Look at Current Cycle 23 Conditions

(Data is rounded to nearest whole number)

Sunspots
Observed Monthly, February 2004: 46
Twelve-month smoothed, August 2003: 60

10.7 cm Flux
Observed Monthly, February 2004: 107
Twelve-month smoothed, August 2003: 128

***Ap* Index**
Observed Monthly, February 20043: 13
Twelve-month smoothed, August 2003: 22

It is spring, and as we move closer to summer, DX signals on the higher bands become weaker and openings sparse, especially now that solar Cycle 23 is well into its decline. Ten meters through 15 meters will suffer this year due to the lower Maximum Usable Frequencies (MUFs) caused by an only moderately active sun. The middle HF bands will be the major players, with lower band propagation continuing to hold a lot of promise. Seasonal static is increasing during May, but perhaps not enough yet to overly degrade the lowest HF bands.

Fifteen meters will provide some great DX in May, especially on paths that cross the equator, running north and south. By June, however, most east-west paths will disappear. North-south long-path DX openings during May are rare on 15 meters and declining on 20. Static levels also increase noticeably during May, and signals may sound weaker on DX openings during the daylight hours. Nighttime openings on 20 meters will be more quiet, but rarer than in the peak years of this cycle.

Peak worldwide conditions are expected on 20 meters for an hour or two after local sunrise and during the afternoon hours. From sundown to midnight, moderate DX conditions should exist on 20 to many areas of the world. During this nighttime window, 40 meters should provide good openings toward Europe, Africa, and the east. Some DX should be possible on 80 and 160 meters, but seasonal noise might make it a challenge.

From midnight to local sunrise look for openings to most areas of the world on 20, 30, and 40 meters, with some DX possible on 80 and 160 as well. Forty meters will remain the most consistently reliable night-path band, where the signal path remains mostly in darkness. Look for the Far East, and long-path openings to southern Africa and the Indian Ocean, even to perhaps some rare islands. Russian and European signals will be strong from evening hours onward, during their local morning peaks. Exotic Pacific and Asian stations will be strong during pre-dawn hours. Australian stations might be workable on 80 meters during sunrise hours.

*P.O. Box 213, Brinnon, WA 98320-0213
e-mail: <cq-prop-man@hfradio.org>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for May 2004

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 1-2, 10-15, 17-18, 25-29	A	A	B	C
High Normal: 7-9, 16, 19-20, 22-24	A	B	C	C-D
Low Normal: 3, 6, 21, 30	B	C-B	C-D	D-E
Below Normal: 5	C	C-D	D-E	E
Disturbed: 4, 31	C-D	D	E	E

Where expected signal quality is:
A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D—Poor opening, with weak signals varying between S1 and S3, 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 excellent (A) on May 1st and 2nd, poor to fair (D-C) on the 3rd, poor (D) on the 4th, etc.

VHF Conditions

May should be a good month for ionospheric openings on the VHF bands. An increase in sporadic-*E*, with some continued trans-equatorial (TE) propagation, occasional *F*-layer propagation, and moderate auroral activity, will keep the VHF enthusiast happy. Solar activity is not expected to be high enough to support *F*-layer DX on 6 meters.

Sporadic-*E* ionization is expected to increase considerably during May, and fairly frequent 6-meter short-skip openings should be possible. These are likely to occur over distances of approximately 1000 to 1400 miles. Although sporadic-*E* openings can take place at just about any time, the best time to check is between 10 AM and 2 PM and again between 6 and 10 PM local daylight time.

During periods of intense and widespread sporadic-*E* ionization, two-hop openings considerably beyond 1400 miles should be possible on 6 meters. Short-skip openings between about 1200 and 1400 miles may also be possible on 2 meters.

A seasonal decline in trans-equatorial propagation is expected during May. An occasional opening may still be possible on 6 meters toward South America from the southern tier states and the Caribbean area. The best time to check for 6-meter TE openings is between 9 and 11 PM local daylight time. These TE openings will be north-south paths that cross the geomagnetic equator at an approximate right angle.

Auroral activity is generally lower than in March and April due to the change in the orientation and position of the Earth and magnetosphere in rela-

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.

CQ Short-Skip Propagation Chart
May & June 2004
Band Openings Given In Local Standard Time At Path Mid-Point (24-Hour Time System)

Band (Meters)	*Distance From Transmitter (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-230*
10	Nil	08-10 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	08-09 (1) 09-13 (2) 13-17 (1-2) 17-21 (2) 21-23 (1) 23-07 (0-1)	08-09 (1-0) 09-21 (2-0) 21-23 (1-0) 23-07 (1-0)
15	Nil	07-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-00 (0-1)	07-09 (1-2) 09-13 (2-3) 13-17 (1-2) 17-19 (2-3) 19-21 (2) 21-00 (1) 00-07 (0-1)	07-09 (2-0) 09-13 (3-1) 13-17 (2-1) 17-19 (3-1) 19-21 (2-0) 21-07 (1-0)
20	Nil	07-09 (0-2) 09-12 (0-3) 12-17 (0-4) 17-19 (0-3) 19-23 (0-2) 23-07 (0-1)	07-08 (2) 08-09 (2-3) 09-12 (3-4) 12-17 (4) 17-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-23 (2) 23-07 (1)	07-08 (2) 08-09 (3-2) 09-15 (4-2) 15-17 (4-3) 17-20 (4) 20-21 (3) 21-23 (2) 23-07 (1)
40	08-10 (0-2) 10-16 (1-4) 12-18 (3-4) 16-18 (2-4) 18-20 (1-3) 20-22 (0-2) 22-08 (0-1)	08-10 (2-4) 10-15 (4-2) 15-16 (4-3) 16-19 (4) 19-20 (3-4) 20-22 (2-3) 22-08 (1-2)	08-09 (4-3) 09-10 (4-2) 10-15 (2-1) 15-16 (3-1) 16-19 (4-2) 19-20 (4) 20-22 (3-4) 22-01 (2-4) 01-03 (2-3) 03-08 (2)	08-09 (3-1) 09-10 (2-1) 10-16 (1-0) 16-19 (2-1) 19-20 (4-3) 20-01 (4) 01-03 (3) 03-06 (2) 06-08 (2-1)
80	08-10 (4) 10-18 (4-3) 18-20 (4) 20-22 (3-4) 22-00 (2-4) 00-06 (2-3) 06-08 (3-4)	08-10 (4-1) 10-16 (3-0) 16-18 (3-1) 18-20 (4-2) 20-00 (4) 00-06 (3-4) 06-08 (4-3)	08-09 (1) 09-10 (1-0) 10-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-02 (4) 02-06 (4-3) 06-08 (3-2)	08-09 (1-0) 09-18 (0) 18-20 (1-0) 20-22 (3-2) 22-02 (4-3) 02-06 (3-2) 06-08 (2-1)
160	06-09 (4-1) 09-10 (2-0) 10-19 (1-0) 19-21 (3-1) 21-23 (4-2) 23-06 (4-3)	06-09 (1) 09-19 (0) 19-21 (1-0) 21-23 (2-1) 23-01 (3-2) 01-04 (3) 04-06 (3-2)	08-09 (1-0) 09-21 (0) 21-23 (1) 23-01 (2-1) 01-04 (3-2) 04-07 (2) 07-08 (1)	08-21 (0) 21-01 (1) 01-04 (2) 04-06 (2-1) 06-07 (1) 07-08 (0-1)

ALASKA
May & June 2004
Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	Nil	20-02 (1)	22-00 (1) 00-02 (2) 02-04 (3) 04-05 (2) 05-06 (1) 10-12 (1) 12-14 (2) 14-16 (1)	Nil
Central USA	Nil	21-04 (1)	22-02 (1) 02-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 12-13 (1) 13-15 (2) 15-16 (1)	08-12 (1)
Western USA	Nil	20-23 (1) 01-03 (1) 03-05 (2) 05-06 (1)	00-02 (2) 02-04 (3) 04-07 (4) 07-08 (3) 08-09 (2) 09-15 (1) 15-18 (2) 18-00 (1)	07-09 (1) 09-14 (2) 14-15 (1) 11-13 (1)*

tion to the solar wind. Some aurora can be expected during May, but I don't expect a high level such as we've seen in the last few years. Watch for *Kp* values above 6, which occur on days of Below Normal and Disturbed HF conditions. Refer to the Last-Minute Forecast for those days in May that are expected to be in these categories. Point your antenna north when this condition exists. You will find that CW is the modulation and mode of choice, as the signals you will hear on aurora will be raspy and very distorted. For a live viewing of aurora conditions, check out my propagation page, <http://prop.hfradio.org/ >.

May has one major meteor shower, the *Eta Aquarids*. This shower will be active between April 21 and May 12, peaking on May 5 at about 1625 UTC. It has a peak rate of 20 meteors per hour, or about one every three minutes on average. However, it might be more prominent in the Southern Hemisphere.

Most meteor showers are at their best after midnight. After midnight, you're on the leading edge of the Earth and you're meeting the meteors head-on. Before midnight, you're on the trailing edge of the Earth and the meteors have to catch up to you. As a result, not only are more meteors seen in the pre-dawn hours, but their impact speeds when encountering the Earth's atmosphere are much higher and the meteors are generally faster and brighter. This causes greater ionization, which is what you use to refract your radio signal.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for February 2004 is 46, up from January's 37. The 12-month running smoothed sunspot number centered on August 2003 is 60, down from July's 62. The lowest daily sunspot value during February 2003 was recorded on February 17, with a count of 18. The highest daily sunspot count for February was 67 on February 27. A smoothed sunspot count of 35 is expected for May 2004.

HAWAII
May & June 2004
Openings Given in Hawaiian Standard Time #

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	Nil	12-15 (1) 15-17 (2) 17-19 (1)	13-15 (1) 15-17 (2) 17-19 (3) 20-04 (2) 04-08 (1)	19-20 (1) 20-23 (2) 23-02 (1) 21-23 (1)*
Central USA	Nil	12-15 (1) 15-18 (2) 18-20 (1)	15-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-22 (2) 22-04 (1) 04-05 (2) 05-07 (3) 07-09 (2) 09-15 (1)	19-20 (1) 20-21 (2) 21-01 (3) 01-02 (2) 02-04 (1) 20-21 (1)* 21-00 (2)* 00-03 (1)*
Western USA	13-17 (1)	09-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	06-08 (4) 08-16 (3) 16-19 (4) 19-20 (3) 20-22 (2) 22-05 (1) 05-06 (2)	18-19 (1) 19-20 (2) 20-22 (3) 22-02 (4) 02-04 (3) 04-05 (2) 05-07 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 02-04 (2)* 04-05 (1)*

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

Propagation charts prepared by George Jacobs, W3ASK.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada reports a 10.7-cm observed monthly mean solar flux of 107 for February 2004, down from January's 114. The 12-month smoothed 10.7-cm flux centered on August 2003 is 128, slightly down from July's 130, continuing the downward trend. The predicted smoothed 10.7-cm solar flux for May 2004 is about 95, give or take about 17 points.

The observed monthly mean planetary *A*-index (*Ap*) for February 2004 is 13, down from January's 20. The 12-month smoothed *Ap*-index centered on August 2003 is 22, about the same as for July. Expect the overall geomagnetic activity to be quiet to active during most days in May.

You may e-mail me, write me a letter, or catch me on the HF amateur bands. I also have an EchoLink node where you might catch me; look for node number 152783, NW7US-L. Please come and participate in my online propagation discussion forum at <http://hfradio.org/forums/>. I look forward to hearing from you. Happy DXing!

73, Tomas, NW7US/AAMØEWA

Number groups after callsigns denote the following: QSOs, Points, Zones, Countries, US/VE, Final Score. Certificate winners are listed in boldface.

2003 CQ WW RTTY CONTEST

SINGLE OPERATOR ALL BAND HIGH POWER

D4B	**3544**	**10610**	**116**	**355**	**225**	**7,384,560**
KH7X	**2176**	**6477**	**121**	**250**	**229**	**3,886,200**
W2UP	**2323**	**5760**	**111**	**338**	**214**	**3,818,880**
5B4AGN	**2244**	**6476**	**96**	**309**	**126**	**3,438,756**
RK4FF	**2308**	**5361**	**109**	**338**	**118**	**3,028,965**
DL4MCF	**1772**	**4459**	**110**	**319**	**175**	**2,693,236**
W1ZT	**1926**	**4453**	**98**	**299**	**200**	**2,658,441**
EO3Q	**1867**	**4475**	**114**	**322**	**131**	**2,537,325**
UP5P	**1589**	**4383**	**104**	**305**	**58**	**2,046,861**
W3FV	**1490**	**3830**	**85**	**258**	**147**	**1,876,700**
LY2MW	**1389**	**3452**	**109**	**297**	**130**	**1,850,272**
WW7OR	**1541**	**3339**	**100**	**226**	**196**	**1,742,958**
KI5XP	**1480**	**3177**	**98**	**241**	**200**	**1,712,403**
7S6N	**1283**	**3189**	**100**	**281**	**132**	**1,635,957**
DKØEE	1211	3039	107	283	141	1,613,709
AI9T	**1319**	**3117**	**91**	**250**	**161**	**1,564,734**
W4GKM	**1372**	**3031**	**96**	**242**	**161**	**1,512,469**
EU1MM	**1324**	**3155**	**97**	**274**	**95**	**1,470,230**
SM5FUG	1212	2964	98	278	110	1,440,504
YL7A	**1176**	**2821**	**111**	**307**	**80**	**1,404,858**
OH2BP	**1228**	**2911**	**93**	**279**	**96**	**1,362,348**
K5AM	1351	2804	92	206	184	1,351,528
WA2ETU	**1163**	**2767**	**90**	**240**	**145**	**1,314,325**
UZ7U	1078	2681	105	272	113	1,313,690
WK6I	**1227**	**2660**	**100**	**193**	**180**	**1,258,180**
K4SV	1091	2645	82	231	142	1,203,475
RF4R	**1231**	**2875**	**91**	**247**	**76**	**1,190,250**
ZL2AMI	**1005**	**2990**	**86**	**174**	**125**	**1,151,150**
RZ3AZ	1119	2623	90	269	62	1,104,283
SP6EKS	**907**	**2291**	**98**	**276**	**108**	**1,104,262**
JF1PJK	**997**	**2734**	**94**	**202**	**93**	**1,063,526**
NØKE	**938**	**2048**	**94**	**199**	**161**	**929,792**
KI6DY	1052	2092	83	182	177	924,664
VR2BG	**1056**	**2634**	**99**	**203**	**43**	**908,730**
GM4FDM	**961**	**2424**	**77**	**186**	**98**	**875,064**
JA7IC	**892**	**2463**	**90**	**176**	**78**	**847,272**
SM4RGD	954	2374	67	189	98	840,396
W1GF	**820**	**2094**	**70**	**219**	**98**	**810,378**
VE1OP	**894**	**2338**	**52**	**167**	**117**	**785,568**
YBØZZ	**923**	**2733**	**72**	**184**	**22**	**759,774**
W1RY	816	1935	69	203	117	752,715
W7TI	834	1760	90	166	161	733,920
W3BP	839	2164	61	184	94	733,596
W4UK	955	1809	73	162	170	732,645
KK5OQ	874	1733	76	178	153	705,331
WØHW	799	1772	74	185	136	699,940
LX9SW	**997**	**2278**	**62**	**185**	**50**	**676,566**
WD4DDU	763	1809	67	184	120	671,139
W6IHG/4	689	1654	82	201	122	669,870
JM1XCW	765	2097	81	178	58	664,749
VE7CF	**821**	**1980**	**72**	**119**	**137**	**649,440**
K7ZUM	856	1755	76	148	145	647,595
JR3NZC	**715**	**1929**	**78**	**169**	**79**	**628,854**
K9DJ	892	2295	43	147	79	617,355
FO/DL1IAN	**677**	**2013**	**59**	**98**	**112**	**541,497**
AD4EB	656	1409	77	189	113	534,011
VE6YR	**668**	**1609**	**72**	**123**	**131**	**524,534**
JA2FSM	**616**	**1664**	**89**	**162**	**60**	**517,504**
K4YL	662	1494	63	156	116	500,490
N8BJQ	561	1386	76	174	102	487,872
EI4DW	**566**	**1423**	**68**	**166**	**100**	**475,282**
LY3BH	546	1365	80	188	66	455,910
ES2DJ	**581**	**1371**	**71**	**203**	**56**	**452,430**
LZ1NG	**580**	**1454**	**65**	**160**	**70**	**428,930**
KØFX	569	1291	81	139	103	416,993
G3OOK	**461**	**1200**	**77**	**168**	**101**	**415,200**
WR6M	542	1196	81	128	130	405,444
DF3IS	578	1438	61	152	65	399,764
YL2NN	621	1407	67	183	28	391,146
RZ6LG	563	1329	74	187	33	390,726
UX5UO	478	1169	70	184	64	371,742
XE1V	**484**	**1171**	**59**	**129**	**128**	**370,036**
VK6GOM	**545**	**1596**	**61**	**129**	**31**	**352,716**
K1US	544	1301	58	137	76	352,571
YR9P	**601**	**1418**	**62**	**167**	**17**	**348,828**
F5MOO	**601**	**1495**	**47**	**125**	**57**	**342,355**
LT1D	**508**	**1503**	**40**	**84**	**98**	**333,666**
NA2M	481	1035	66	148	102	327,060
YO2RR	517	1207	56	166	45	322,269
GI4KSH	**497**	**1218**	**45**	**140**	**69**	**309,372**
HL3AHQ	**504**	**1364**	**67**	**132**	**25**	**305,536**
AEØOQ	501	1006	62	109	115	287,716
F5CQ	394	987	66	149	74	285,243
WB2JEP	485	1104	49	130	78	283,728
HA3LI	**496**	**1181**	**48**	**135**	**52**	**277,535**
W1CX	483	1256	38	117	63	273,808
DJ1TU	368	928	71	157	63	270,048
I2SVA	**403**	**996**	**59**	**145**	**64**	**266,928**
I1WBW	552	1192	45	153	9	246,744
WM7A	453	868	60	99	111	234,360
WA2AGE	381	759	71	108	118	225,423
K5PI	392	899	55	112	83	224,750
DK7ZT	441	977	45	133	50	222,756
UA9KG/1	**421**	**1152**	**48**	**137**	**8**	**222,336**
S59AA	**344**	**834**	**61**	**146**	**57**	**220,176**
AD6KA	420	762	64	88	123	209,550
SM1TDE	315	788	67	164	33	208,032
ABØMV	456	853	52	84	102	203,014
JR1NHD	351	929	55	109	41	190,445
SP6ML	356	831	57	144	0	167,031
W2YE	298	762	49	120	46	163,830
K4RO	296	701	50	111	56	152,117
UT8EL	501	1041	26	120	0	151,986
DL5YM	326	790	47	114	29	150,100
TF3AO	**442**	**963**	**28**	**105**	**20**	**147,339**
OH4RH	298	699	56	122	29	144,693
N6NT	378	597	44	69	126	142,683
KØJPL	251	737	57	134	0	140,767
ON5KL	**279**	**692**	**61**	**134**	**0**	**134,940**
JA7MJ	259	697	61	108	18	130,339
JR3UIC	**256**	**728**	**49**	**102**	**20**	**128,763**
JH1EEB	245	682	45	101	19	112,530
K3JT	299	625	45	70	63	111,250
7S3A	217	547	44	105	50	108,853
N5PU	248	537	43	88	70	107,937
7S3C	233	551	53	138	0	105,241
KB9YOZ	230	478	52	86	65	97,034
GI4JTF	198	505	41	96	52	95,445
UA3UCD	251	581	42	119	0	93,541
W6JOX	212	443	54	76	77	91,701
DK8EY	223	536	43	92	34	90,584
JA6OLZ	**204**	**570**	**49**	**78**	**29**	**88,920**
K8FG	192	556	42	103	6	83,956
WA6BOB	246	414	48	51	94	79,902
N7MQ	205	493	38	77	46	79,373
UT5EPP	300	625	23	102	1	78,750
OK2PQS	**198**	**464**	**35**	**94**	**29**	**73,312**
UAØAZ	194	502	45	87	13	72,790
HB9CRV	**263**	**575**	**27**	**89**	**0**	**66,700**
W3FQE	170	438	34	85	28	64,386
YO7BGA	157	416	46	74	31	62,816
KF5ER	262	437	33	54	54	61,617
IZ5CCS	210	470	40	89	0	60,630
YL2LY	139	356	51	90	20	57,316
UA1AKE	132	331	52	113	6	56,601
N5DD	133	370	45	88	13	54,020
AA9NF	180	305	43	51	71	50,325
SM6E	164	371	40	92	0	48,972
G3SJX	128	314	46	84	18	46,472
DJ4PI	131	339	46	72	18	46,104
JR1VAY	137	350	42	69	20	45,850
K5ZD	140	358	30	73	23	45,108
N3NZ	141	296	34	59	45	40,848
JH4BTI	**128**	**357**	**37**	**69**	**3**	**38,913**
DL1DTC	125	325	37	62	14	36,725
YL2GD	124	305	30	61	22	34,465
JF1WQC	100	280	39	78	5	34,160
YO3III	127	293	35	67	13	33,695
K8RT	106	306	33	70	0	31,518
VK4WPX	100	287	32	45	22	28,413
JN1BMX	110	260	34	58	7	25,740
HL3GOB	114	284	30	41	7	22,152
SP9LJD	114	268	19	44	16	21,172
OK1HL	121	264	19	54	0	19,272
SM6WQB	194	395	7	36	1	17,380
K2NV	80	170	28	43	26	16,490
OE1TKW	70	173	34	49	11	16,262
VK7GN	73	213	21	35	10	14,058
WA3AAN	92	173	18	33	28	13,667
K2QPN	68	152	26	36	22	12,768
W7DPW	57	129	30	30	18	10,062
K9RT	44	105	24	28	12	6,720
YO6AJI	43	99	21	38	0	5,841
K9SG	39	64	16	17	25	3,712
K8AC	25	54	14	15	9	2,052

Ops: **D4B** (EY8MM), **KH7X** (KH6ND), **UP5P** (UN5PR), **WW7OR** (W7GG), **7S6N** (SM6CNN), DKØEE (DL4MDO), **UZ7U** (UT3UA), **RF4R** (UA4RC), **YBØZZ** (OK1JR), **LX9SW** (LX1RQ), **YR9P** (YO9HP), **LT1D** (LU4DJC), **7S3A** (SM3CER), **SM6E** (SM6FUD)

SINGLE OPERATOR ALL BAND LOW POWER

P43P	**2173**	**6460**	**88**	**253**	**193**	**3,449,640**
ZX2B	**1985**	**5877**	**95**	**265**	**176**	**3,150,072**
CN8KD	**1565**	**4687**	**73**	**249**	**167**	**2,291,943**
ON4ADZ	**1464**	**3609**	**114**	**295**	**145**	**1,999,386**
CQØT	**1363**	**3410**	**86**	**255**	**168**	**1,735,690**
WX4TM	1451	3336	86	245	171	1,674,672
ON4QX	**1208**	**3022**	**87**	**228**	**135**	**1,359,900**
UY8IF	**1225**	**2824**	**98**	**276**	**67**	**1,245,384**
YU7AM	**1011**	**2470**	**96**	**274**	**120**	**1,210,300**
UXØDL	1005	2545	95	262	118	1,208,875
RU3QW	**1084**	**2534**	**95**	**267**	**83**	**1,127,630**
UW5U	1133	2578	88	240	89	1,075,026
OK2PMS	**951**	**2294**	**88**	**239**	**106**	**993,302**
OK2RU	816	2043	98	257	107	943,866
W1ECT	**911**	**2260**	**74**	**210**	**127**	**928,860**
H2E	**1022**	**2901**	**63**	**225**	**31**	**925,419**
RU9DD	**1141**	**3143**	**63**	**212**	**19**	**924,042**
WA1EHK	**834**	**2028**	**88**	**234**	**132**	**920,712**
VE3XD	**885**	**2272**	**81**	**190**	**126**	**901,984**
W9HLY	**890**	**2065**	**80**	**197**	**143**	**867,300**
RX9SR	938	2618	67	224	27	832,524
GW4MVA	**913**	**2108**	**80**	**226**	**71**	**794,716**
YV5AAX	**738**	**2190**	**63**	**155**	**144**	**792,780**
OZ9GA	**869**	**2085**	**77**	**222**	**81**	**792,300**
G3XTT	**774**	**1897**	**83**	**227**	**96**	**770,182**
IO1DCI	**878**	**2177**	**67**	**168**	**115**	**761,950**
LZ9W	**999**	**2299**	**78**	**248**	**0**	**749,474**
GØMTN	809	1953	72	212	99	747,999
PS7TKS	**905**	**2669**	**61**	**216**	**0**	**739,313**
K8RS	**738**	**1821**	**81**	**210**	**114**	**737,505**
WA1Z	**800**	**1691**	**78**	**202**	**145**	**718,675**
DL2FAG	**722**	**1769**	**86**	**219**	**99**	**714,676**
UT9FJ	789	1818	92	250	51	714,474
F6AUS	**756**	**1911**	**74**	**187**	**103**	**695,604**
N4IG	**745**	**1706**	**85**	**189**	**132**	**692,636**
UA3SAQ	805	1842	81	232	48	664,962
DL7VOG	679	1659	87	222	79	643,692
RV9BB	759	2072	64	217	18	619,528
LU7FJ	**756**	**2223**	**53**	**120**	**99**	**604,656**
JI1RXQ	**702**	**1917**	**80**	**160**	**71**	**596,187**
DL9NEI	688	1660	73	188	91	584,320
UA3PW	758	1737	74	219	31	562,788
VE9DX	**589**	**1531**	**72**	**186**	**109**	**561,877**
GUØSUP	**615**	**1536**	**72**	**190**	**103**	**560,640**
W3MEL	**751**	**1763**	**58**	**146**	**111**	**555,345**
VE3GSI	599	1532	70	174	117	553,052
SV1CIB	**831**	**1881**	**64**	**156**	**74**	**553,014**
RV3FF	641	1536	86	208	66	552,960
RUØLL	745	1900	81	173	34	547,200
K4IK	579	1289	84	206	130	541,380
EA7AJR	**716**	**1727**	**51**	**148**	**112**	**537,097**
ON4CHT	615	1558	73	177	94	535,952
K3GP	**663**	**1428**	**70**	**175**	**124**	**526,932**
SN2E	**643**	**1522**	**68**	**191**	**78**	**512,914**
PA3BFH	**614**	**1447**	**74**	**216**	**54**	**497,768**
AC6JT	805	1448	71	108	159	489,424
HB9CAL	**642**	**1575**	**70**	**180**	**54**	**478,800**
IZ4DZD	591	1428	78	197	48	461,244
K4UTE	497	1308	88	202	59	456,492
N2FF	**535**	**1309**	**75**	**182**	**90**	**454,223**
IT9LGW	**593**	**1465**	**55**	**141**	**113**	**452,685**
N2DBI	565	1341	74	169	86	441,189
F6FTB	523	1284	73	183	79	430,140
OK2PBM	508	1247	77	195	72	428,968
RA9AU	716	2007	50	163	0	427,491
IZ8DVD	585	1360	69	200	45	427,040
TA2ZF	**601**	**1720**	**59**	**148**	**41**	**426,560**
OK2PEF	643	1444	60	195	23	401,432
N6PC	610	1150	69	118	161	400,200
OE2GEN	**526**	**1364**	**62**	**142**	**89**	**399,652**
ZL2BR	**488**	**1435**	**72**	**132**	**73**	**397,495**
4X6UU	**545**	**1547**	**55**	**183**	**18**	**396,032**
WW3S	567	1682	56	179	0	395,270
WA1LWS	522	1135	68	163	109	385,900
N1MGO	551	1153	67	149	118	385,102
OR3A	579	1381	60	155	61	381,156
SM7BJW	**465**	**1225**	**69**	**153**	**82**	**372,400**
DJ1OJ	468	1137	70	191	66	371,799
OK1FHI	486	1187	74	188	50	370,344
RX3DCN	580	1332	63	182	33	370,296
W1HY	478	1154	61	165	90	364,664
PA1CC	461	1178	68	151	89	362,824
UN5J	**517**	**1417**	**66**	**173**	**12**	**355,667**
N5KR	**581**	**1357**	**51**	**125**	**86**	**355,534**
SP6FJ	498	1209	71	163	58	353,028
RA9FRD	557	1504	56	164	8	342,912
HL2FDW	**539**	**1387**	**77**	**131**	**39**	**342,589**
HB9AWS	492	1178	63	161	64	339,264
SM5UFB	546	1274	53	153	59	337,610
DL1ARJ	457	1081	69	174	64	331,867
4X6UO	622	1790	34	102	47	327,570
NØAT	**517**	**1030**	**66**	**125**	**126**	**326,510**
WD4GBW	502	1291	45	141	66	325,332
RA4CTR	616	1382	53	172	10	324,770
KP4JRS	**479**	**1272**	**52**	**120**	**81**	**321,816**
HS1PDY	**579**	**1490**	**52**	**137**	**26**	**320,350**
W6FFH	525	1084	64	109	120	317,612
WG7Y	**547**	**1031**	**59**	**113**	**130**	**311,362**
KA3PVA	513	974	61	135	118	305,836
YB5QZ	**503**	**1490**	**54**	**133**	**18**	**305,450**
EW1CQ	**468**	**1112**	**65**	**170**	**36**	**301,352**
N9BX	397	969	72	161	71	294,576
KØCIE	507	991	57	120	115	289,372

SP3BJK	453	1095	63	153	43	283,605
RA9XF	552	1477	45	143	0	277,676
XE2ML	**442**	**1057**	**54**	**90**	**118**	**276,934**
JA7EMH	**384**	**1032**	**73**	**150**	**35**	**266,256**
JH8KYU/1	**424**	**1055**	**76**	**136**	**40**	**265,860**
VA3PL	406	1202	57	164	0	265,642
UA9OJG	519	1343	54	142	0	263,228
UA9CR	447	1180	56	158	8	261,960
VA3XRZ	380	895	61	117	114	261,340
JA1BHK	430	1098	70	124	44	261,324
UU9JQ	514	1139	59	166	0	256,275
NM1W	392	852	64	133	96	249,636
VA6MM	**402**	**997**	**56**	**99**	**92**	**246,259**
UAØCW	373	965	75	130	43	239,320
DL4JYT	444	1010	82	152	0	236,340
SV1CER	491	1066	50	148	22	234,520
N8ME	384	829	62	124	96	233,778
W4LC	403	1037	49	127	49	233,325
DK4IO	380	930	61	137	52	233,250
DK7FP	367	895	52	122	83	230,015
OZØF	461	1040	53	152	16	229,840
UA9LAU	458	1206	51	124	13	226,728
F8BNN	394	943	54	127	50	217,833
VE5SF	**401**	**1001**	**43**	**97**	**77**	**217,217**
WY4Y	395	780	59	118	101	216,840
DL6ZNG	350	860	61	144	47	216,720
SQ7B	424	960	58	164	0	213,120
F5TNI	424	965	59	160	0	211,335
UA6YGJ	453	959	51	153	16	210,980
UT5UKY	349	829	67	161	25	209,737
EA4DQX	472	1031	44	158	0	208,262
AH6OZ	**364**	**1080**	**46**	**62**	**84**	**207,360**
SP6BEN	336	819	59	151	43	207,207
PAØWRS	354	871	70	167	0	206,427
G3KMQ	325	797	59	142	58	206,423
JH7QXJ	**337**	**928**	**66**	**114**	**42**	**206,016**
SM3ETC	484	1061	42	127	25	205,834
UT5UML	393	912	54	152	19	205,200
EA6LP	**323**	**802**	**57**	**133**	**65**	**204,510**
KH6GMP	395	1168	41	39	95	204,400
UA1AIR	378	897	58	145	19	199,134
YU1LM	401	914	49	138	30	198,338
SP3BAY	319	839	59	124	52	197,165
RX9FG	394	1096	37	130	12	196,184
RV6FG	394	903	51	125	40	195,048
EA3EYD	327	808	53	132	56	194,728
W8KX	294	712	67	142	64	194,376
N5IJE	387	704	61	102	108	190,784
PA3EBP	372	879	48	129	40	190,743
UAØSMF	534	1322	41	103	0	190,368
RU6LA	352	810	62	155	18	190,350
RV3DND	443	968	44	151	0	188,760
SP9FT	354	846	53	138	32	188,658
EA3AGZ	331	824	53	116	57	186,224
N1NB	340	767	45	120	71	181,012
HA3NU	**268**	**695**	**73**	**146**	**38**	**178,615**
RA9DA	379	1017	42	133	0	177,975
AE4Y	328	661	63	111	95	177,809
DL4RCK	307	732	58	137	47	177,144
K5CM	382	755	59	83	92	176,670
DK3WN	345	794	52	135	35	176,268
F5RD	359	812	47	140	30	176,204
W4TIJ	358	732	52	99	89	175,680
W6ZL	345	711	62	84	98	173,484
NL7AU/4	**307**	**737**	**54**	**94**	**87**	**173,195**
RA6DE	372	847	49	141	14	172,788
DF7ZS	308	767	52	114	58	171,808
KSØM	291	636	68	125	77	171,720
RA3BB	359	852	54	112	34	170,400
WB1EDI	289	651	61	128	69	167,958
K7RE	389	729	49	83	95	165,483
SP4CJA	386	898	48	133	0	162,538
DK3WJ	270	682	64	126	44	159,588
OK2TCW	300	766	44	114	47	157,030
OH2LO	**343**	**803**	**54**	**129**	**11**	**155,782**
N3KAE	288	627	57	111	76	152,988
AG4SV	295	632	50	110	82	152,944
K6TA	319	717	57	77	78	152,004
ER3ZZ	**384**	**885**	**39**	**132**	**0**	**151,335**
W2WB	279	605	62	113	75	151,250
SV1BDO	304	709	52	132	27	149,599
UA9FFV	370	1010	36	112	0	149,480
DK3VN	298	758	47	94	54	147,810
WN1OTV	310	625	47	110	79	147,500
VE2OWL	**261**	**608**	**53**	**90**	**93**	**143,488**
UA9FM	296	832	41	115	16	143,104
PA3CDN	283	678	47	130	34	143,058
SP8FHJ	298	697	50	133	20	141,491
MØCOP	263	674	48	106	55	140,866
KE4DX	292	664	49	92	68	138,776
JA7KM	282	773	51	92	36	138,367
LA/DL1ZBO	**335**	**745**	**42**	**113**	**28**	**136,701**
UK/JI2MED	**368**	**976**	**40**	**100**	**0**	**136,640**
SM6NET	272	678	51	112	38	136,278
OH2LZI	344	773	41	126	8	135,275
KE1FO	275	620	51	100	66	134,540
K6UM	260	574	62	94	76	133,168
SP6OPY	258	628	53	129	30	133,136
DL3JPN	255	626	56	113	39	130,208
M5AEX	285	655	43	125	30	129,690
RK3DH	233	582	61	132	28	128,622
RU3XB	322	729	43	130	3	128,304
SP6CYV	244	601	55	119	38	127,412
DL2YED	286	639	45	120	33	126,522
HF8KAF	356	796	40	104	13	124,972
AA5AM	286	517	57	80	102	123,563
NØIBT	271	576	48	83	81	122,112
W5BBR	240	517	52	98	83	120,461
IKØWRB	257	617	51	119	25	120,315
JA1XRH	244	617	65	107	22	119,698
HAØGK	293	675	44	118	14	118,800
K4JAF	221	547	55	114	44	116,511
OM5NA	**247**	**635**	**45**	**94**	**44**	**116,205**
JA2CXF	**229**	**643**	**59**	**108**	**13**	**115,740**
KT1I	237	543	52	100	59	114,573
DL6UHD	247	590	53	111	30	114,460
N7DB	270	529	52	77	87	114,264
OZ5MJ	202	531	57	102	56	114,165
RX3PN	285	644	40	125	11	113,344
K3SV	230	534	53	104	55	113,208
UAØWL	342	936	30	89	0	111,384
XE2AUB	246	572	46	59	89	110,968
IV3HAX	278	696	31	75	51	109,272
JA1XUY	232	608	59	100	20	108,832
NI5F	243	515	55	89	64	107,536
N3XLS	264	516	43	92	71	106,296
ON6OM	253	598	47	105	25	105,846
N9CK	226	523	48	96	54	103,554
JA2KCY	209	556	62	101	23	103,416
AAØCY/3	227	528	35	101	58	102,432
IV3KSE	205	521	48	99	47	101,074
SV9FBK	**275**	**584**	**33**	**132**	**7**	**100,448**
JA2BQX	263	667	45	74	30	99,383
K6BIR	254	477	53	65	90	99,216
LA7CL	252	597	39	95	32	99,102
KB6WKT	254	508	42	75	77	98,552
VA7ST	**243**	**575**	**46**	**62**	**62**	**97,750**
OK2BMC	238	559	45	112	14	95,589
ES7FU	**226**	**511**	**44**	**124**	**11**	**91,469**
UT4ZX	208	492	47	109	26	89,544
K6EID	216	625	30	99	11	87,500
RV3LQ	260	568	35	111	7	86,904
N4PSE	227	479	38	70	72	86,220
DJ3JD	228	535	43	116	0	85,065
DK3WI	241	549	38	99	17	84,546
WD9GMK	236	436	47	78	68	84,148
EA/DH8WR/P	270	611	28	85	23	83,096
SN5J	264	581	35	102	6	83,083
N9LYE	218	416	51	78	69	82,368
G3URA	233	555	38	86	24	82,140
KC6G	232	499	39	63	61	81,337
W4BCG	213	439	46	80	59	81,215
K2MK	193	471	42	93	37	81,012
K6HGF	224	415	46	61	85	79,680
JA1EMQ	182	520	45	78	28	78,520
DL1EL	184	446	49	99	26	77,604
DL4HTK	256	543	33	109	0	77,106
YO7ARY	**196**	**485**	**40**	**84**	**33**	**76,145**
AG4TJ	192	464	38	75	45	73,312
G3LHJ	177	453	40	84	36	72,480
W6ZZZ	225	383	46	46	97	72,387
ON4MGY	174	411	47	109	19	71,925
LW5DR	175	489	47	100	0	71,883
GØTOC	218	502	32	82	29	71,786
7N2UQC	184	501	47	79	17	71,643
LU1BJW	178	511	40	81	19	71,540
EA1AHA	183	449	37	84	37	70,942
RK3BX	218	498	33	89	18	69,720
JA1PUK	165	470	40	84	21	68,150
EA4BT	244	521	31	99	0	67,730
N9CIQ	187	433	37	69	50	67,548
K6OWL	203	403	42	49	76	67,301
IV3WMS	171	431	38	73	45	67,236
KJ7NO	213	369	42	53	86	66,789
OH7JJT	195	461	38	99	6	65,923
OM5XX	224	524	33	74	18	65,500
VE4YU	**170**	**402**	**47**	**54**	**61**	**65,124**
IØYQV	158	412	38	69	51	65,096
OK2SPD	213	524	34	80	9	64,452
JA8AGI/1	166	439	51	79	16	64,094
DF1GW	160	411	41	75	37	62,883
XE1XOE	156	368	44	57	68	62,192
DJ6TK	157	418	42	70	36	61,864
DL6RBH	164	397	42	83	28	61,353
7XØAD	**181**	**541**	**29**	**84**	**0**	**61,133**
9A3ZI	**194**	**429**	**41**	**101**	**0**	**60,918**
N7UVH	179	467	40	61	27	59,776
UA1ACC	199	446	32	98	3	59,318
AH6HH	156	453	43	45	42	58,890
NT3R/0	183	333	46	64	66	58,608
UY5OQ	211	468	29	87	9	58,500
DF6DBF	170	393	42	106	0	58,164
JL3SBE	**156**	**421**	**47**	**90**	**0**	**57,677**
PAØLSK	187	440	41	89	0	57,200
N2LK	157	335	41	70	59	56,950
WB6BWZ	189	324	40	52	77	54,756
TF3KX	**155**	**386**	**34**	**70**	**36**	**54,040**
WØSM	215	477	25	45	43	53,901
DH9SB	150	398	37	66	31	53,332
IK8SCR	141	372	31	59	51	52,452
DF2AP	172	383	35	82	14	50,173
DL3FCG	158	377	34	77	22	50,141
VK3DBQ	**163**	**471**	**34**	**72**	**0**	**49,926**
VE7HBS	161	339	36	33	77	49,494
HB9HQX	188	399	29	90	5	49,476
K7ZOO	155	316	39	58	57	48,664
IK2WFN	155	368	38	69	23	47,840
JR3NDM	142	365	48	74	9	47,815
RA6XE	215	477	26	68	5	47,223
K9WX	141	291	47	64	51	47,142
DL9ST	145	345	38	78	20	46,920
JA1AZS	134	361	42	65	20	45,847
JA1IZZ	133	355	43	67	19	45,795
UA4WLI	175	388	31	83	3	45,396
W5RW	160	292	42	53	59	44,968
DH2PL	154	360	38	72	14	44,640
KO2FB	134	287	39	64	49	43,624
RW6AH	171	365	31	88	0	43,435
IK2WYI	122	362	29	36	54	43,078
OK2SWD	155	367	28	69	20	42,939
IK2YSJ	141	335	39	71	17	42,545
K1DW/5	141	281	40	59	52	42,431
W6RLL	174	278	39	40	73	42,256
KØXU	140	296	42	52	47	41,736
DF6ZY	153	359	31	72	13	41,644
HB9VID	120	291	39	92	12	41,613
RW4HM	110	286	49	85	11	41,470
SM6CRM	131	321	38	82	7	40,767
RN4SS	167	371	30	76	0	39,326
MWØGMB	131	295	34	79	17	38,350
ON5SPA	134	318	29	64	27	38,160
ON4CIN	147	341	32	65	14	37,851
RA4AFZ	172	390	23	74	0	37,830
2E1OKT	162	367	24	66	10	36,700
VE3BDN	118	325	29	63	20	36,400
WN3C	121	282	32	66	31	36,378
WD9EWK/7	134	253	39	48	54	35,673
JO1VRK	118	334	36	59	9	34,736
7Z1SJ	**158**	**465**	**17**	**57**	**0**	**34,410**
IZ7CDB	129	301	27	66	20	34,013
DS5KJR	155	365	38	47	8	33,945
USØOYA	107	289	38	64	15	33,813
YO4CVV	159	354	21	71	3	33,630
UA9OSV	147	372	29	61	0	33,480
RU9CY	112	300	35	68	8	33,300
WO4O	101	276	39	68	12	32,844
SQ9ANS	134	308	33	73	0	32,648
RN1AO	140	326	32	64	4	32,600
AA8EN	126	264	31	52	40	32,472
VK5LA	112	319	35	42	19	30,624
7L3IUE	116	317	31	48	17	30,432
SP3DOF	133	314	29	67	0	30,144
SP8NFF	128	294	9	66	30	30,870
S21YY	**184**	**424**	**26**	**42**	**0**	**28,832**
JA1IZ	97	274	37	46	22	28,770
CX5UR	**142**	**413**	**20**	**49**	**0**	**28,497**
W1LZ	97	279	29	65	7	28,179
YL2KF	**139**	**304**	**27**	**62**	**3**	**27,968**
SP6M	89	251	29	41	40	27,610
EA4AWM	118	278	21	55	22	27,244
JI1FLB	107	276	33	59	6	27,048
DL8HCO	119	296	30	49	11	26,640
IZØEHL	114	261	31	58	13	26,622
G6OKU	107	261	26	59	17	26,622
N8RMF	123	204	31	41	58	26,520
KD7RX	159	233	29	34	50	26,329
AE8U	111	224	32	41	41	25,536
HB9CZF	112	259	27	55	15	25,123
JA3MIB	103	264	37	53	5	25,080
RZ9IB	121	307	23	56	2	24,867
WB4PLA	95	278	23	66	0	24,742
K4SAC	117	205	37	43	40	24,600
PA2ALF	99	255	23	48	22	23,715
IT9ORA	124	265	21	67	1	23,585
UAØLD/P	114	292	28	51	0	23,068
K6SRZ	81	221	39	56	8	22,763
IK2LOL	95	237	29	48	19	22,752
DH9FAJ	102	254	27	45	17	22,606
RK2FXG	99	220	30	71	1	22,440
IK2NCF	91	215	30	52	18	21,500
SM7ATL	96	219	28	67	0	20,805
KØCF	87	198	32	46	27	20,790

OH5KFP	121	260	23	55	1	20,540
DL5JWL	94	237	26	47	13	20,382
SM4RLD	102	221	26	62	4	20,332
K9MI	94	187	30	41	36	20,009
G7TMU	119	263	19	48	9	19,988
UA1OMS	83	206	30	60	6	19,776
PY2NB	109	309	19	44	0	19,467
G4EMT	103	233	25	57	0	19,106
RV3UG	99	219	23	60	0	18,177
PY7IQ	72	201	30	39	20	17,889
EA3KN	74	188	32	63	0	17,860
W7GTO	76	222	34	43	0	17,094
SP3RBG	66	189	34	40	14	16,632
JQ1AHZ/2	84	224	28	40	6	16,576
SO1JBW	88	193	24	61	0	16,405
JA1IE	67	174	37	46	7	15,660
W3GCW	71	174	24	46	18	15,312
F6DZD	81	180	20	55	10	15,300
JA1XPU	75	209	30	30	13	15,257
SP6NVK	78	199	25	38	12	14,925
UT1UA	95	218	22	45	0	14,606
KZ8E	69	152	31	40	25	14,592
DS1CCU	81	219	26	40	0	14,454
TA1BM	65	162	31	57	0	14,256
KA5EYH	83	138	29	30	44	14,214
RAØAN	75	211	22	44	1	14,137
SM7BGE	96	203	17	52	0	14,007
WB9BSH	75	152	27	37	28	13,984
SP6BSL	67	180	29	37	10	13,680
DL3SCN	86	187	22	45	4	13,277
7S3F	92	212	18	40	2	12,720
N3RW	64	183	19	42	5	12,078
SO1CE	91	192	16	46	0	11,904
N2UM	67	145	24	35	22	11,745
W9THD	59	148	26	39	12	11,396
JR1NKN	58	158	22	34	9	10,270
US7IB	78	164	16	46	0	10,168
JJ2PUG	56	143	29	36	5	10,010
MØAFZ	72	154	13	44	4	9,394
G8XDX	82	172	12	41	0	9,116
IK2REA	73	156	18	39	0	8,892
UA3QIX	83	176	11	39	0	8,800
PA3HGF	52	128	19	31	16	8,448
KB1CJ	55	123	16	32	18	8,118
S53ZO	56	126	22	36	4	7,812
SQ8LEC	164	388	18	12	0	7,760
M3DXL	59	127	16	44	1	7,747
JA2QVP	48	127	22	26	11	7,493
M3MLR	66	132	14	41	0	7,260
SP7AWG	43	126	25	32	0	7,182
RA3YO	57	125	16	40	0	7,000
K4G	52	106	18	28	20	6,996
LZ1ZM	62	132	15	35	1	6,732
EW6BI	52	114	17	38	2	6,498
ER1MF	55	119	17	36	1	6,426
JG5DHX/5	49	127	16	32	2	6,350
PT2FM	59	151	12	27	0	5,889
UN8PO	53	135	14	27	2	5,805
AG4WH	36	81	23	25	13	4,941
HA3OU	37	111	8	5	30	4,773
RU4SS	49	111	12	31	0	4,773
K6MI	34	78	19	21	11	3,978
RA4LE	39	92	12	30	0	3,864
EA1FAE	25	68	16	24	0	2,720
JH1TUX	29	64	20	21	1	2,688
GMØAXY	28	62	13	24	0	2,294
KJ1J	22	65	13	21	1	2,275
EA3EZD	23	55	15	17	5	2,035
SQ4NR	28	67	10	18	0	1,876
K9BJM	21	62	12	18	0	1,860
AK6DV	23	47	13	13	9	1,645
LU1AEE	18	48	11	10	8	1,392
IK7WPD	23	49	9	16	0	1,225
EA5AEB	17	41	10	15	3	1,148
JE8KKX	15	42	10	10	4	1,008
KE4QDM	21	35	8	8	11	945
DL6UAM	16	30	5	14	0	570
WA8OQZ	16	20	8	5	13	520
SM4XIH	12	27	6	12	0	486
RA2FW	10	17	7	9	2	306
RA6XB	8	21	7	7	0	294
PY7ZY	7	20	5	7	0	240
UT5HA	3	7	3	3	0	42

Ops: ZX2B (PY2MNL), CQØT (CT1ILT), **UW5U** (UY2UA), **IO1DCI** (IK1GPG), **SN2E** (SP2EWQ), **OR3A** (ON4IG), **WY4Y** (N4EIL), **HF8KAF** (SQ8GHY), **VE3BDN** (VA3BDN), **PY7IQ** (PY2IQ), **7S3F** (SM3AF), **K4G** (K4HV)

SINGLE OPERATOR 10 METERS

LU1HF	**1266**	**3754**	**26**	**82**	**55**	**611,902**
LW7EIC	706	2079	24	73	50	305,613
HC1JQ	**551**	**1618**	**23**	**69**	**53**	**234,610**
LU9EV	**504**	**1473**	**18**	**62**	**53**	**195,909**
K4EA	**414**	**1082**	**23**	**74**	**27**	**134,168**
DL1LH	**286**	**766**	**26**	**67**	**40**	**101,878**
LW4EU	313	922	18	54	31	94,966
LW1HDJ	201	570	23	60	28	63,270
J42A	**201**	**546**	**20**	**56**	**31**	**58,422**
UX1IL	**205**	**512**	**24**	**63**	**14**	**51,712**
JA6WJL	**194**	**508**	**29**	**57**	**9**	**48,260**
CT2GRF	**152**	**375**	**14**	**42**	**19**	**28,125**
YBØWWW	**159**	**473**	**12**	**44**	**0**	**26,488**
SQ9UM	**116**	**327**	**19**	**36**	**21**	**24,852**
OHØHEY	114	307	18	42	20	24,560
CE8DGQ	**135**	**378**	**11**	**42**	**0**	**20,034**
4Z5LZ	**112**	**326**	**15**	**38**	**8**	**19,886**
K9JS	**99**	**285**	**11**	**34**	**3**	**13,680**
PY4PW	**74**	**199**	**14**	**32**	**15**	**12,139**
EA4DBS	77	193	15	31	10	10,808
LU2FDN	76	222	13	31	0	9,768
SQ6ELV	58	168	15	24	14	8,904
ES4MM	45	121	10	21	6	4,477
LU/VE2DWA	40	118	9	9	16	4,012
UR6INL	18	47	10	11	2	1,081
JE2SOY	21	55	9	10	0	1,045
KA8SEP	13	37	4	6	0	370

Ops: LU9EV (LW9DMM), **J42A** (SV2AEL)

SINGLE OPERATOR 15 METERS

9A5W	**1303**	**3486**	**36**	**105**	**56**	**686,742**
EO6F	**1085**	**2792**	**33**	**92**	**56**	**505,352**
S51FB	**971**	**2590**	**33**	**91**	**56**	**466,200**
S57IIO	949	2536	32	92	55	453,944
IK4MHB	**887**	**2395**	**33**	**96**	**55**	**440,680**
4X6ZK	**959**	**2758**	**26**	**87**	**37**	**413,700**
SP5GRM	**814**	**2232**	**34**	**92**	**57**	**408,456**
DH6LS	**793**	**2184**	**34**	**90**	**56**	**393,120**
YI9X	**1023**	**2913**	**20**	**68**	**45**	**387,429**
UT5UGR	745	1933	35	100	51	359,538
L44DX	**771**	**2282**	**28**	**76**	**53**	**358,274**
JM1LPN	**641**	**1749**	**31**	**87**	**48**	**290,334**
YO3JF	**662**	**1747**	**30**	**83**	**49**	**283,014**
CX7BY	**592**	**1755**	**28**	**76**	**53**	**275,535**
UAØCA	**651**	**1763**	**28**	**73**	**49**	**264,450**
5B4AHA	**686**	**1977**	**23**	**74**	**31**	**253,056**
9J2KC	**622**	**1860**	**22**	**63**	**45**	**241,800**
AB8K	**624**	**1638**	**29**	**84**	**34**	**240,786**
HA3OV	**551**	**1475**	**32**	**81**	**49**	**238,950**
JR3RIY	**503**	**1394**	**31**	**77**	**44**	**211,888**
JH4IFF	**481**	**1341**	**33**	**86**	**36**	**207,855**
KE6YTT	**545**	**1205**	**26**	**68**	**52**	**175,930**
YFØANA	**420**	**1250**	**29**	**76**	**20**	**156,250**
LR1F	389	1153	21	51	50	140,666
EU1DX	**462**	**1157**	**30**	**91**	**0**	**139,997**
LU7DW	353	1031	26	59	46	135,061
YB2DGR	404	1199	27	66	16	130,691
LW9ETQ	366	1078	24	46	47	126,126
N5JR	**354**	**887**	**23**	**69**	**36**	**113,536**
W6IWO	343	831	27	64	41	109,692
I7PXV	330	838	24	67	39	108,940
M2Z	**373**	**945**	**17**	**55**	**42**	**107,730**
K5IC	357	848	21	64	35	101,760
S51J	343	911	19	50	42	101,121
JA2BY	**285**	**810**	**24**	**57**	**37**	**95,580**
HA3JB	290	780	26	65	37	99,840
CT1AGF	**532**	**1133**	**19**	**67**	**0**	**97,438**
JA2BY	285	810	24	57	37	95,580
DL9NDS	279	753	24	60	41	94,125
K4MM	**306**	**721**	**22**	**74**	**34**	**93,730**
UN4PD	**315**	**854**	**24**	**69**	**3**	**81,984**
AG4W	255	648	25	64	30	77,112
JG1GGU	234	625	28	57	32	73,125
CT3IA	**194**	**578**	**22**	**70**	**11**	**59,534**
SP3PL	174	489	26	56	36	57,702
SM7GXR	**179**	**502**	**21**	**47**	**35**	**51,706**
RX9JM	237	635	19	59	0	49,530
4N1N	**250**	**582**	**18**	**59**	**0**	**44,814**
ON4VV	**171**	**447**	**20**	**49**	**30**	**44,253**
SP4NKJ	158	425	23	53	25	42,925
SP9KJ	141	378	25	55	24	39,312
SP9TCC	126	349	24	46	30	34,900
W9ILY	**162**	**409**	**19**	**49**	**15**	**33,947**
EC1AKI	**155**	**378**	**13**	**42**	**30**	**32,130**
K7ZO	**173**	**463**	**14**	**38**	**16**	**31,484**
4L1DA	**214**	**612**	**11**	**40**	**0**	**31,212**
LY1FW	**132**	**350**	**23**	**43**	**23**	**31,150**
JH2BTM	105	289	23	44	19	24,854
EC4ABL	168	362	13	43	10	23,892
JE1RRK	104	271	25	41	11	20,867
J45XB	**140**	**339**	**15**	**42**	**0**	**19,323**
JA1BUI	82	228	19	28	20	15,276
LZ1MC	80	212	19	35	18	15,264
E21EIC	90	252	18	37	5	15,120
LA5TFA	**162**	**349**	**10**	**31**	**0**	**14,309**
YL2GUI	82	212	13	30	21	13,568
DJ4IC	79	207	19	32	6	11,799

YC3MM/5	80	237	15	34	0	11,613
VE3RCN	70	177	14	26	13	9,381
JH9BWC	64	175	12	27	0	6,825
RK4CWA	65	156	11	24	0	5,460
OH3BU	45	107	13	26	5	4,708
PT2OO	26	75	10	23	0	2,475
OM8HG	28	80	11	12	2	2,000
PR7AYE	24	68	7	14	7	1,904
EA4ZB	14	33	6	14	0	660
RW4LQ	12	33	8	10	0	594
UT5UGQ	5	13	5	5	1	143

Ops: EO6F (UXØFF), **YI9X** (OM2DX), **L44DX** (LW1DTZ), **9J2KC** (JL1NKC), **LR1F** (LU5FD), **M2Z** (M5RIC), **4N1N** (4N1JA), **J45XB** (DJ9XB), **RK4CWA** (RK4CR)

SINGLE OPERATOR 20 METERS

9A2DQ	**1126**	**2770**	**32**	**94**	**53**	**495,830**
IT9BLB	**982**	**2383**	**31**	**89**	**49**	**402,727**
YU7NW	**788**	**1896**	**29**	**87**	**39**	**293,880**
SP4TXI	**717**	**1764**	**30**	**87**	**44**	**284,004**
VE2RYY	**669**	**1797**	**29**	**82**	**46**	**282,129**
SP6AXW	690	1716	30	90	42	277,992
UW8M	**775**	**1795**	**29**	**85**	**35**	**267,455**
OK2ZC	**655**	**1620**	**29**	**89**	**37**	**251,100**
YU7AE	680	1597	30	81	35	233,162
YU1NR	633	1515	27	83	33	216,645
CE8SFG	**496**	**1462**	**23**	**62**	**50**	**197,370**
OK1KSL	554	1330	28	80	37	192,850
OHØXY	**627**	**1429**	**28**	**79**	**25**	**188,628**
UN7JX	**496**	**1346**	**30**	**77**	**33**	**188,440**
VE2SB	539	1275	21	63	53	174,675
WØYR/4	**501**	**1101**	**27**	**72**	**51**	**165,150**
IT9STX	566	1319	21	63	37	159,599
SQ5IRO/7	496	1219	25	68	29	148,718
WØLSD	**504**	**997**	**27**	**67**	**51**	**144,565**
SN5N	428	1034	27	71	32	134,420
UR5ZMK	532	1210	22	65	21	130,680
F6FJE	**418**	**990**	**25**	**71**	**34**	**128,700**
UT2AU	499	1130	26	69	15	124,300
RW4WZ	**427**	**974**	**26**	**80**	**16**	**118,828**
CX4AAJ	**398**	**1168**	**26**	**74**	**0**	**116,800**
LX7I	**384**	**952**	**22**	**60**	**36**	**112,336**
KU1CW	**390**	**801**	**27**	**68**	**44**	**111,339**
S5ØR	**366**	**900**	**23**	**66**	**31**	**108,000**
YBØECT	**334**	**992**	**25**	**63**	**20**	**107,136**
UN4PG	389	1052	22	67	12	106,252
UR5WCQ	439	1022	26	76	0	104,244
RU3DNN	445	969	23	68	11	98,838
UWØF	393	899	23	64	11	88,102
RZ6AUL	433	920	20	67	5	84,640
7K4QOK	**225**	**616**	**25**	**67**	**8**	**61,600**
DJ2XC	**260**	**602**	**23**	**65**	**13**	**60,802**
RK6BZ	313	685	19	66	0	58,225
G/YO3VU	**304**	**670**	**18**	**52**	**13**	**55,610**
UA6LO	247	560	25	65	9	55,440
ON4APU	**252**	**576**	**18**	**59**	**16**	**53,568**
UA4FCO	271	614	19	67	0	52,804
IK1HGI	**231**	**531**	**20**	**63**	**15**	**52,038**
UX3MR	212	522	22	49	26	50,634
UZ7HO	235	545	20	57	15	50,140
EA4EJP	**337**	**714**	**14**	**53**	**2**	**49,266**
IZ3ESV	278	607	16	49	14	47,953
KF2XF	**205**	**372**	**21**	**53**	**43**	**43,524**
PA1RBZ	**266**	**587**	**13**	**46**	**12**	**41,677**
UA9FGJ	**196**	**540**	**14**	**50**	**11**	**40,500**
DL9MBZ	209	472	17	51	15	39,176
SP1DTG	164	400	24	65	7	38,400
PR7AR	**138**	**400**	**18**	**46**	**29**	**37,200**
EX8MII	**208**	**561**	**15**	**50**	**0**	**36,465**
OK1DCP	225	509	16	52	0	34,612
RX6AOB	213	452	14	53	7	33,448
OK1AOV	139	347	20	56	19	32,965
FO5PS	**142**	**414**	**19**	**28**	**32**	**32,706**
NP3D	**126**	**304**	**19**	**45**	**32**	**29,184**
UT7FP	208	468	12	42	8	29,016
UA9XKB	132	371	14	43	13	25,970
M5CSM	169	381	14	38	15	25,527
TA1DX/P	**179**	**400**	**11**	**42**	**4**	**22,800**
I4DOO	135	322	13	38	14	20,930
KØCOP	99	229	16	39	28	19,007
W5TZN	**228**	**278**	**7**	**12**	**47**	**18,348**
DK1RF	127	288	15	33	14	17,856
DL1DTL	125	284	13	40	5	16,472
RK6CM	140	322	11	40	0	16,422
RV3IC	139	315	12	38	0	15,750
OM4TC	**116**	**263**	**15**	**40**	**0**	**14,465**
GW8DNH	93	213	12	38	12	13,206
SP2HXY	120	273	40	0	0	10,920
K7WD/KH6	74	150	19	27	22	10,200
EU1CC	83	183	11	30	6	8,601
HP1KZ	66	144	12	16	30	8,352
W4XDX	76	135	14	23	23	8,100
RA3TT	75	183	11	32	1	8,052
EA3ALV	60	137	11	32	9	7,124
HI8ROX	43	107	15	23	14	5,564
EA5ME	47	116	11	22	11	5,104
G4KXG	33	78	9	19	6	2,652
NØRUT	33	61	12	12	12	2,196
AA3TL	22	63	12	20	0	2,016
UA3UBT	29	65	9	20	0	1,885
SP2DVH	26	63	8	15	0	1,449
ES4RD	22	51	6	15	0	1,071
BW2/ JH0KHR	18	37	2	3	0	185
RV6ASU	3	8	2	2	0	32
KC2FJS	3	5	2	2	2	30

Ops: VE2RYY (NØEL), **UW8M** (UR5MID), **OK1KSL** (OK1AHG), **LX7I** (LX2AJ), **7K4QOK** (JR2BNF), **K7WD/KH6** (JH7IMX), **W4XDX** (W1KCD)

SINGLE OPERATOR 40 METERS

S5ØA	**865**	**2078**	**30**	**83**	**48**	**334,558**
OL5Q	**767**	**1785**	**25**	**77**	**37**	**248,115**
S51DX	**690**	**1635**	**26**	**77**	**43**	**238,710**
HA1A	**749**	**1710**	**22**	**73**	**37**	**225,720**
V8A	**586**	**1742**	**28**	**66**	**23**	**203,814**
US9QA	**670**	**1510**	**23**	**72**	**33**	**193,280**
M4K	**700**	**1510**	**23**	**70**	**31**	**187,240**
F5CVI	**561**	**1265**	**22**	**66**	**35**	**155,595**
N2WK	**494**	**1038**	**24**	**66**	**49**	**144,282**
DF8QB	**534**	**1127**	**21**	**72**	**29**	**137,494**
4Z8EE	**456**	**1336**	**17**	**57**	**21**	**126,920**
OK2CLW	474	1066	22	69	25	123,656
W1US	**429**	**928**	**22**	**59**	**48**	**119,712**
WØGJ	**401**	**845**	**24**	**61**	**49**	**113,230**
IK1HSR	**480**	**1031**	**18**	**60**	**29**	**110,317**
EU1SA	**425**	**953**	**22**	**68**	**17**	**101,971**
YO4DFT	**468**	**1035**	**15**	**62**	**19**	**99,360**
SP5OXJ	**421**	**904**	**21**	**66**	**17**	**94,016**
N7GYD	**304**	**627**	**22**	**57**	**47**	**79,002**
T94DO	**322**	**701**	**17**	**58**	**15**	**63,090**
SO6A	274	612	20	57	19	58,752
JR5JAQ	**232**	**618**	**20**	**51**	**12**	**51,294**
DL7CX	249	538	20	61	11	49,496
UW2F	273	586	15	54	8	45,122
SV1XV	**243**	**527**	**15**	**53**	**13**	**42,687**
UT2UZ	195	457	18	51	23	42,044
DL1SWB	259	526	14	54	10	41,028
NA5Q	**181**	**348**	**19**	**44**	**38**	**35,148**
LA2IJ	**192**	**415**	**18**	**56**	**8**	**34,030**
SP6EIY	198	430	18	53	3	31,820
9A2DI	**235**	**499**	**14**	**47**	**0**	**30,439**
SP9CQ	193	417	15	52	5	30,024
7L4IOU	**162**	**385**	**20**	**44**	**8**	**27,720**
SP3CCT	160	363	16	47	13	27,588
W8WEJ	**152**	**286**	**14**	**43**	**37**	**26,884**
4K6DI	**125**	**351**	**15**	**47**	**3**	**22,815**
JH1APZ	**108**	**302**	**19**	**41**	**9**	**20,838**
SV1FJN	145	296	8	36	3	13,912
OH7KUD	**109**	**235**	**10**	**35**	**1**	**10,810**
SP3POZ	117	243	7	35	0	10,206
JA5ATN	63	172	16	28	4	8,256
YU7HC	**101**	**213**	**8**	**27**	**0**	**7,455**
EA4WC	62	138	10	34	6	6,900
ES4MF	50	104	6	26	2	3,536
UAØFDX	58	122	9	13	0	2,684
PV8IG	26	69	11	21	0	2,208
SP7FBQ	20	37	3	11	0	518

Ops: OL5Q (OK1HRA), **V8A** (JO1RUR), **M4K** (MØBEW), **4Z8EE** (OK1EE), **W1US** (K6ND), **SO6A** (SP6IHE), **UW2F** (UTØFT)

SINGLE OPERATOR 80 METERS

S54E	**503**	**1081**	**16**	**62**	**19**	**104,857**
NB1B	**295**	**627**	**14**	**52**	**46**	**70,224**
9A7R	**429**	**886**	**13**	**55**	**7**	**66,450**
HA8BE	**447**	**922**	**12**	**54**	**6**	**66,384**
EU1AZ	**424**	**875**	**9**	**53**	**2**	**56,000**
DL6JZ	**404**	**776**	**10**	**53**	**5**	**52,768**
F6IRF	**268**	**552**	**12**	**52**	**8**	**39,744**
UTØH	**249**	**507**	**11**	**47**	**2**	**30,420**
S57UYX	**271**	**548**	**7**	**44**	**1**	**28,496**
OK2SG	**205**	**411**	**8**	**45**	**2**	**22,605**
OM1II	**218**	**440**	**7**	**43**	**1**	**22,440**
LY2SA	**167**	**347**	**7**	**39**	**0**	**15,962**
LY2FN	159	322	7	34	0	13,202
OM1AVK	128	254	4	32	0	9,144
OK2ZJ	106	211	4	29	0	6,963
KØHW	91	99	4	3	33	3,960
JE2OTM	35	46	6	6	2	644

SINGLE OPERATOR ASSISTED

JH4UYB	**1860**	**5142**	**121**	**284**	**120**	**2,699,550**
DL5AXX	**1745**	**4462**	**116**	**304**	**181**	**2,681,662**
AA5AU	**1774**	**3680**	**112**	**297**	**224**	**2,329,440**
DK3GI	**1379**	**3546**	**124**	**316**	**175**	**2,180,790**
JY9QJ	**1643**	**4759**	**88**	**271**	**87**	**2,122,514**
JS3CTQ	**1546**	**4229**	**119**	**260**	**110**	**2,067,981**
IV3TMV	**1298**	**3287**	**103**	**302**	**159**	**1,853,868**
LTØH	**1338**	**3944**	**86**	**196**	**163**	**1,755,080**
LU1NDC	1273	3751	79	187	153	1,571,669
NO2T	**1239**	**2934**	**91**	**245**	**152**	**1,431,792**
UAØAGI	**1224**	**3323**	**92**	**260**	**29**	**1,266,063**
K4WW	**1133**	**2620**	**84**	**221**	**172**	**1,249,740**
ND5S	**994**	**2261**	**101**	**242**	**163**	**1,144,066**
AY8A	897	2607	87	210	116	1,076,691
SM7BHM	**879**	**2239**	**91**	**238**	**126**	**1,018,745**
NT1Y	978	2466	74	216	118	1,006,128
W4PK	938	2488	77	227	95	992,712
LU8EKC	886	2563	75	186	122	981,629
JA1BWA	**891**	**2426**	**102**	**217**	**74**	**953,418**
KI1G	**722**	**1723**	**85**	**215**	**120**	**723,660**
IKØYVV	652	1711	83	206	113	687,822
UAØJQ	935	2323	84	204	0	669,024
VE4COZ	**725**	**1740**	**77**	**164**	**136**	**655,980**
BD5RI	**917**	**2304**	**73**	**170**	**38**	**647,424**
VK1AA/4	**728**	**2146**	**76**	**140**	**85**	**645,946**
XE2AC	**721**	**1713**	**75**	**138**	**142**	**608,115**
W9OL	**626**	**1433**	**86**	**203**	**114**	**577,499**
N9QQK	666	1497	82	185	101	550,896
IK1SPR	567	1436	77	183	101	518,396
LZ2K	**722**	**1754**	**57**	**154**	**77**	**505,152**
LZ2BE	601	1459	72	191	43	446,454
VA7SW	**623**	**1445**	**65**	**90**	**150**	**440,725**
DL8NFU	492	1216	70	181	73	393,984
N2BJ	536	1109	64	135	108	340,463
NN6XX	**455**	**1073**	**77**	**135**	**87**	**320,827**
KA2D	432	1173	66	166	40	319,056
K3UW	**478**	**1017**	**55**	**147**	**111**	**318,321**
EA5YJ	**533**	**1271**	**48**	**132**	**64**	**310,124**
UA4HJ	**455**	**1013**	**54**	**173**	**18**	**248,185**
N6TQS	432	842	68	105	121	247,548
KF8HR	396	978	52	132	62	240,588
AA9RR	352	826	69	140	80	238,714
OE8YDQ	**481**	**1125**	**50**	**120**	**41**	**237,375**
DP1POL	483	1415	37	97	28	229,230
SV1DPI	**465**	**1042**	**57**	**134**	**28**	**228,198**
K6UFO	292	702	75	147	72	206,388
SM6BSK	345	814	51	145	28	182,336
DL2KUW	270	642	71	151	30	161,784
JF2SKV	**318**	**785**	**70**	**118**	**17**	**160,925**
LU2BA	255	707	68	137	0	144,935
KA8PTT	243	614	53	120	49	136,308
OE8CIQ	348	768	37	106	19	124,416
OM7PY	**241**	**601**	**56**	**114**	**28**	**118,998**
JR1BAS	212	590	60	106	23	111,510
SP3IQ	**243**	**588**	**57**	**109**	**16**	**107,562**
G3UHU	**251**	**567**	**45**	**129**	**14**	**106,596**
W3WKR	232	521	46	96	60	105,242
MMØBQI	**222**	**513**	**50**	**123**	**29**	**103,626**
JA8JCR	**239**	**580**	**56**	**99**	**20**	**101,500**
JR1KSK	212	589	56	92	20	98,952
K5HDU	**220**	**478**	**47**	**81**	**68**	**93,688**
UAØFZ	218	589	44	109	0	90,117
DJ9RR	187	465	53	102	30	86,025
JA3PYC	181	506	56	88	20	82,984
YLØA	**203**	**494**	**43**	**105**	**16**	**81,016**
NI6T	207	462	54	62	52	77,616
W3NR	176	412	48	94	45	77,044
K5DU	170	447	50	92	24	74,202
RV3BQ	221	485	38	106	4	71,780
RU3AT	142	362	61	108	17	67,332
W3OA/4	155	395	41	97	26	64,780
K5WW	219	354	40	45	87	60,888
WA9ALS	199	488	28	57	33	57,584
PR7FN	**261**	**757**	**13**	**53**	**0**	**49,962**
N3JIX	135	292	48	72	37	45,844
WAØSXV	**175**	**356**	**40**	**42**	**45**	**45,212**
KC7V	**139**	**373**	**24**	**48**	**21**	**34,689**
PY8AZT	113	321	27	56	23	34,026
RUØAT	189	507	14	43	9	33,462
N4XMX	97	283	38	76	2	32,828
SP6GNJ	87	235	20	34	23	18,095
KB9KEG	86	168	33	38	35	17,808
PY2RH	42	106	13	12	17	4,452

Ops: LTØH (LU3HY), **LZ2K** (LZ4AE), **DP1POL** (DL5XL), **YLØA** (YL2KA)

MULTI-OPERATOR TWO-TRANSMITTER

HC8N	**4189**	**12446**	**128**	**357**	**261**	**9,284,716**
RU1A	**2957**	**7153**	**128**	**381**	**179**	**4,921,264**
RM6A	2531	5887	132	384	154	3,944,290
9H3M	**2766**	**6410**	**97**	**313**	**134**	**3,487,040**
PI4COM	**2115**	**5362**	**126**	**347**	**176**	**3,479,938**
PI4CC	2052	5086	116	333	167	3,132,976
YT6A	**2190**	**5414**	**102**	**296**	**171**	**3,080,566**
RKØAXX	**2214**	**6004**	**105**	**284**	**59**	**2,689,792**
K7WM	**2005**	**4011**	**110**	**233**	**230**	**2,298,303**

VE5RI	**1531**	**3808**	**88**	**197**	**174**	**1,747,872**
JA6ZPR	**1415**	**3968**	**84**	**204**	**94**	**1,515,776**
YV4A	**947**	**2781**	**73**	**235**	**0**	**856,548**
XE3RCC	811	1991	72	161	141	744,634
RKØAZC	**817**	**2109**	**78**	**204**	**7**	**609,501**

Ops: HC8N (N5KO, W6OTC, N6OJ), **RU1A** (RA1ACJ, UA1AKC, RW1AC, RA1ARJ, RN1AM, RU1AA, UA1ARX, UA1ANX), **RM6A** (RN6BN, RA6CM, RA6CO, RU6CQ, RN6AA), **9H3M** (YL2KL, YL2MD, YL2GQT), **PI4COM** (PA3EWP, PA3BWD, PA7UL, PC1A), **PI4CC** (DH5HV, PAØVHA, PA2A, PA4LA, PA5NIQ, PA7KG, PB7CW, PC2A), **YT6A** (S56A, YT6A, 4N3NET, YU6ESC, YZ3CAO), **RKØAXX** (RAØALM, RVØAX, RUØAM, RUØAB, RAØAHC, RUØAAB, RAØAM), **K7WM** (AE6KR, KE6ONS, K7WM, KX7LDS, W7WW), **VE5RI** (VA6ZZZ, VE5CMA, VE5FN, VE5WI, VE6EZ, VE6FN), **JA6ZPR** (JH6JSR, JR6CKX), **YV4A** (YV4GME, YV5AMH, YV5KAJ), **XE3RCC** (XE3OYJ, XE2YVN, XE2NN), **RKØAZC** (RUØAIG, RX0AE,RUØAKA, RUØAKB)

MULTI-OPERATOR SINGLE TRANSMITTER HIGH POWER

P3A	**3242**	**9397**	**124**	**392**	**189**	**6,624,885**
HG1S	**2102**	**5436**	**128**	**364**	**207**	**3,799,764**
OM5M	**1976**	**5113**	**126**	**369**	**191**	**3,507,518**
RL3A	**2223**	**5301**	**125**	**372**	**144**	**3,397,941**
OH1F	**1990**	**4855**	**122**	**365**	**156**	**3,121,765**
Z37M	**1953**	**4661**	**108**	**311**	**159**	**2,694,058**
RO4M	**1976**	**4559**	**113**	**344**	**87**	**2,480,096**
OH5CX	**1565**	**3825**	**111**	**323**	**116**	**2,103,750**
JE1ZWT	**1674**	**4582**	**103**	**228**	**116**	**2,048,154**
YZ9A	**1400**	**3585**	**88**	**263**	**145**	**1,778,160**
K4PX	**1384**	**3124**	**100**	**264**	**178**	**1,693,208**
S53S	**1295**	**3285**	**101**	**254**	**147**	**1,649,070**
UZ4E	**1366**	**3243**	**100**	**278**	**103**	**1,559,883**
RD3R	1591	3634	83	253	64	1,453,600
DLØTTY	**1319**	**3098**	**91**	**253**	**113**	**1,415,786**
KJ7TH	**1296**	**2602**	**91**	**200**	**187**	**1,243,756**
OH2AG	1067	2544	87	266	91	1,129,536
DLØOV	984	2369	96	250	121	1,106,323
VE3NZ	**924**	**2378**	**81**	**215**	**140**	**1,036,808**
KE7AJ	953	2012	100	218	160	961,736
AB5K	**1029**	**2040**	**76**	**163**	**150**	**793,560**
4U1VIC	**670**	**1722**	**67**	**155**	**80**	**520,044**
AL1G	**690**	**1691**	**55**	**101**	**116**	**459,952**
DB6OA	566	1345	66	174	59	402,155
GØBRC/P	**575**	**1318**	**60**	**157**	**74**	**383,538**
RK9AZZ	**372**	**1006**	**39**	**122**	**0**	**161,966**
W3DSX	**225**	**503**	**42**	**95**	**56**	**97,079**
TF3W	35	78	8	21	2	2,418

Ops: P3A (RA9JX, RW9CF, UA9CDV, UA9CGA), **HG1S** (HA1TJ, HA1DAE, HA1DAC, HA1DAI, HA3UU, HA3LN, HA1SN, HA1AV, HA1AR, HA1SD), **OM5M** (OM3RG, OM2RA, OM2KW, OM4DW), **RL3A** (RK3BX, RV3BA, RW3FO, RX3DCX, RZ3AJD, UA3ASZ), **OH1F** (OH1MDR, OH1MM, OH1NOA), **Z37M** (Z31GX, Z32PT, Z36W, IGOR, GORAN), **RO4M** (RA4LW, RA4LZ, RA4HCN, RN4LP, RU4HP, RU4HP, RU4LM, RV4HL, RW4LE), **OH5CX** (OH5CX, OH5CW), **JE1ZWT** (JK1IQK, JS1OYN, JN1MSO), **YZ9A** (YU1KT, YU1RH, YU1AU), **K4PX** (K4PX, AF4Z, K4QD, KT4FY, NR4E, KC4HW, WO4D, KE4MMI, W2DTJ, AB4ET, KD4HHF, WB4EQS), **S53S** (S57NDT, S50M, S57LWE, S57VAH, IV3IPS, IV3EPO), **UZ4E** (UR7EU, US-E-601, SERGEJ, NICK), **RD3R** (RN3RC, RU3RQ, RK3RX), **DLØTTY** (DJ3NG, DL2YCA, DH1NFL, DL2MDZ, DL4NEI, DL3NEA, DL8NBJ), **KJ7TH** (KJ7TH, KW7N), **OH2AG** (OH2GI, OH2LU, OH2SS, OH2BR), **DLØOV** (DL2KQ, DL3PS, DG3KAF, DL7KCM, DD2CM, DH1KBM, DL2KCD, DL3KMS, DF4KV), **VE3NZ** (VE3DZ, VE3NE, VE3NZ), **AB5K** (AB5K, N5UXT), **4U1VIC** (JH4RHF, VE3IEY), **AL1G** (AL1G, KL7FH), **DB6OA** (DB6OA, DL8OBQ), **GØBRC/P** (MØFSH, G4VSZ, G7MMF, M3MDY, G6YLW, M3EJL), **RK9AZZ** (RN9AS, RZ9AP, RX9AOG), **W3DSX** (W3DSX, K3CHB)

MULTI-OPERATOR SINGLE TRANSMITTER LOW POWER

K1TTT	**1664**	**4009**	**110**	**338**	**192**	**2,565,760**
PJ2P	**1408**	**4151**	**99**	**241**	**213**	**2,295,503**
KP2D	**1405**	**3489**	**92**	**245**	**207**	**1,898,016**
FG/EA2RY	**1419**	**3748**	**76**	**225**	**164**	**1,742,820**
DL2DBH	**1139**	**2769**	**98**	**274**	**124**	**1,374,912**
YU7AL	**1065**	**2560**	**97**	**272**	**102**	**1,205,760**
LZ9R	**1119**	**2555**	**88**	**266**	**80**	**1,108,870**
9A7T	**877**	**2245**	**83**	**230**	**136**	**1,008,005**
N4DSL	**955**	**2112**	**75**	**191**	**144**	**865,920**
ES5KJ	**662**	**1616**	**82**	**228**	**65**	**606,000**
VE3FJB	**592**	**1592**	**65**	**162**	**78**	**485,560**
SP4PBI	**425**	**1070**	**77**	**163**	**67**	**328,490**
SP3KFH	429	1032	68	179	0	254,904
DL9AS	442	983	66	191	0	252,631
OM3RJB	**383**	**928**	**62**	**137**	**49**	**230,144**
N4CW/1	**332**	**795**	**52**	**137**	**56**	**194,775**
LZ1KSC	**453**	**964**	**39**	**145**	**0**	**177,376**
F8KGH	**212**	**520**	**48**	**99**	**37**	**95,680**
UR4EYA	**267**	**594**	**42**	**114**	**0**	**92,664**
F8KFN	**233**	**529**	**36**	**111**	**17**	**86,756**
OK1KDO	**122**	**285**	**24**	**68**	**0**	**26,220**
YU7AJM	39	86	13	29	0	3,612

Ops: K1TTT (K1TTT, K1MK, N1MM, N1XS, N2AMG, WØBR, W1TO), **PJ2P** (NH7C, DL6LAU, KD4FRP, KG6ITP), **KP2D** (KP2N, NP2M, NP2W, NP2DJ, NP2DZ), **FG/EA2RY** (EA2RU, EA2RY), **DL2DBH** (DL2DBH, DJ9DZ), **YU7AL** (YU7AL, YZ7EM, YT7AW), **LZ9R** (LZ3YY, LZ1ZM), **9A7T** (9A2EU, 9A5MR, 9A4JK), **N4DSL** (N4DSL, K4DJG, K4RMY, KD4UPL), **ES5KJ** (ES5RY, ES5RAH), **VE3FJB** (VE3FJB, VE3IJM, VA3DG), **SP4PBI** (SP4Z, SP4-17-001-SWL, SP4-17-002-SWL), **SP3KFH** (SP3GKH, SP3TD, SP3JHY), **DL9AS** (DK6WX, DL4PAC, DL9AS), **OM3RJB** (OM5MB, OM5CW), **N4CW/1** (N4CW/1, KD1EA), **LZ1KSC** (LZ5AZ, LZ5KC, LZ3HI, LZ1EV, LZ3DB), **F8KGH** (F8KGH, F6OBD), **UR4EYA** (UR7EW, UR5ECE, UR5ECW), **F8KFN** (F5TEF, F5GKW, F8DJU, F8DPP, F8CHR), **OK1KDO** (OK1WN, OK1-35783), **YU7AJM** (4N7TA, YT7XT)

MULTI-OPERATOR MULTI-TRANSMITTER

LY5A	**3360**	**8311**	**137**	**407**	**182**	**6,033,786**
K9NS	**3372**	**7826**	**122**	**364**	**252**	**5,775,588**
RK2FWA	**3262**	**8078**	**129**	**392**	**186**	**5,711,146**
KA4RRU	**2470**	**5654**	**107**	**304**	**209**	**3,505,480**
OL7R	**2177**	**5468**	**116**	**330**	**181**	**3,428,436**
DL6FBL	**2133**	**5276**	**116**	**329**	**191**	**3,355,536**
RW9OW	**117**	**303**	**18**	**38**	**0**	**16,968**

Ops: LY5A (LY2PAJ, LY2IJ, LY1BA, LY2KW, LY3MM, LY2BIG), **K9NS** (K9DX, K9HMB, K9PW, K9RO, KG9X, KS9W, N9BR, N9NCX, W9MU), **RK2FWA** (RA2FA, RN2FA, RV2FW, UA2FB, UA2FF, UA2FM, UA2FX), **KA4RRU** (KA4RRU, N4DXS, K5VG, KE4BUS, K5OF, KT4AD, W4MGM, W4DAV, WA4TK, K4RSU, KD6AKC, N8CSI, N8CIA, KR4KF, W4DC, WB4ZNH), **OL7R** (OK1XUV, OK1WMV, OK1VWK), **DL6FBL** (DL6FBL, DJ9MH, DK1MM, DL4NER), **RW9OW** (RW9OW, RA9YDR, UA9KGQ)

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Dual Band with Attitude!

IC-208H

Think of it as the '2720H's kid brother - with attitude!

• 2M/70CM • 55W VHF/50W UHF • 500 Alphanumeric Memories • CTCSS/DTCS Encode/Decode w/ Tone Scan • Wide Band RX† 118-999.990 MHz • Remote Control Mic • DMS • DTMF Encode • 10dB Attenuator

Fast>Digital>Now!

ID-1

Amateur radio will never be the same!

• 1.2GHz • 10W/1W Selectable • 105 Alphanumeric Memories • CTCSS Encode/Decode w/Tone Scan • FM (Analog Voice)/GMSK (Digital Voice/Data) • 128K Data • USB Contol Interface • 10 BASE-T Ethernet Port • AMBE 2.4kbps • PC Control

Ultimate QRP!

IC-703

The legacy of the 706MKIIG...now in QRP configuration!

• HF/6M • 10W~0.1W@13.5V SSB, CW, RTTY, FM / 4W ~ 0.1W @ 13.5V AM • Newly Designed PA Unit • Internal Antenna Tuner • Detachable, Remotable Control Panel • DSP with Auto Notch Filter & Noise Reduction • Automatic Battery Save Mode • Automatic Power Scale Meter • Low Current Mode • High Sensitivity

Proven Performer!

IC-706MKIIG

Built-in DSP and 100W of output power, yet no bigger than most mobiles!

• 160-10M/6M/2M/70CM • HF/6M @ 100W, 2M @ 50W, 70CM @ 20W • 107 Alphanumeric Memories • CTCSS Encode/Decode w/Tone Scan • AM, FM, WFM, SSB, CW, RTTY; w/DSP • Auto Repeater • Plug-n-Play Filters • Backlit Function Keys • Built-in Keyer • IF-Shift • Tone Squelch • Remote Head Operation with Optional Equipment

V/V, U/U, V/U Operation!

IC-2720H

Large display and simple, independent controls on each band make for true dual band fun!

• 2M/70CM • 50W VHF/35W UHF Output • 212 Memories • CTCSS & DTCS Encode/Decode w/Tone Scan • DMS • Remote Control Mic • Wide Band RX† 118-549, 810-999 MHz • Auto Repeater

High Power 2M!

IC-U8000

75W output for power when you need it! Let your signal be heard!

• 2M • 75W Output • 207 Alphanumeric Memories • CTCSS & DTCS Encode/Decode w/Tone Scan • DMS • Remote Control Mic • FM Narrow Mode • Weather Alert & Channel Scan

2M On a Budget!

IC-2100H 25th

Commercial grade rugged and simple to use! With superior receive IMD and performance!

• 2M • 50W Output • 113 Alphanumeric Memories • CTCSS Encode/Decode w/Tone Scan • Remote Control Mic • MIL STD • Auto Repeater • Large Keys and Knobs

†Cellular frequencies blocked. Unblocked versions available to FCC approved users.

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