45241

Amateur Radio

http://www.cq-amateur-radio.com

CQ

SERVING AMATEUR RADIO SINCE 1945

SEPTEMBER 2000

In This Issue:

- **CQ WW DX SSB Contest 1999 Results, p. 13**
- **Uncle Sol's Magnificent Solar Wind–Part II, p. 30**
- **A Blueprint for Ham Radio in the 21st Century, p. 22**
- **Announcing the 2000 CQ WW DX Contest, p. 126**
- **Introducing our NEW Digital Wireless column, p. 78**

All Counties #1000—Jimmy Vandiver, , Indiana, is the one-thousandth ham ng distinction for confirmed contacts ies. Details on page 52 .

THE RADIO AMATEUR'S JOURNAL

U.S. $3

0 71896 45241 9

GET OUT. HAVE FUN.

ICOM MOBILES

Plenty of Power, PC Programmable, and Ready for FUN!

QST says:
"Those shopping for a wide variety of advanced features in an economically priced 2-meter mobile will find the ICOM IC-2100H worthy of serious consideration."
– QST, 1/99

IC-2100H ▶ 2 meters has never been easier or more fun! 55 watts of power; PC programmable*; 113 memory channels; die cast aluminum chassis; full control mic; CTCSS; highly intermod resistant; and a cool DUAL color display.

Only 4.3" Wide
The IC-207H's super compact remote head boasts a large display with soft key menu controls.*

Green or Amber
Select which color you want the display to show. The large alphanumerics and soft key controls are easy to see

◀ IC-207H The ultra-compact remote control* head of this 2 meter/440 MHz dual bander fits on just about any kind of dashboard. Also enjoy: CTCSS encode/decode; up to 9600 bps packet*; built-in duplexer; 182 memory channels; full control mic; auto repeater; and more.

Gordon West says:
"We are happy to report programming is a snap, and seeing the TFT color display on your dash is no problem during the day, and graphically, tantalizing at night!"
– Amateur Radio Trader, 9/99

IC-2800H ▶ Audio excellence, video excitement. 2M/440MHz dual bander with: remote control head; independent tuning & control knobs; cross band repeat; TFT color LCD display; NTSC video port; 118 - 174, 440 - 450 MHz wide band receive**; band scope; 9600 bps data port; CTCSS encode/decode; 232 memory channels; PC programmable*; die-cast aluminum chassis; full control mic; and MUCH more.

Optional Wireless Mic
Available for each mobile radio shown. Enjoy cable-free control and operation.

PC Ready!

*Optional equipment required.
Check with your authorized ICOM dealer.

ISO 9001

Get out and have MORE fun. Whatever your 2 meter or 440 MHz needs, ICOM has the rig for you. Contact your authorized ICOM dealer today or call for a free brochure, 24 hours a day: **425-450-6088**

ICOM®

www.icomamerica.com

The Dual Bander of Your DREAMS

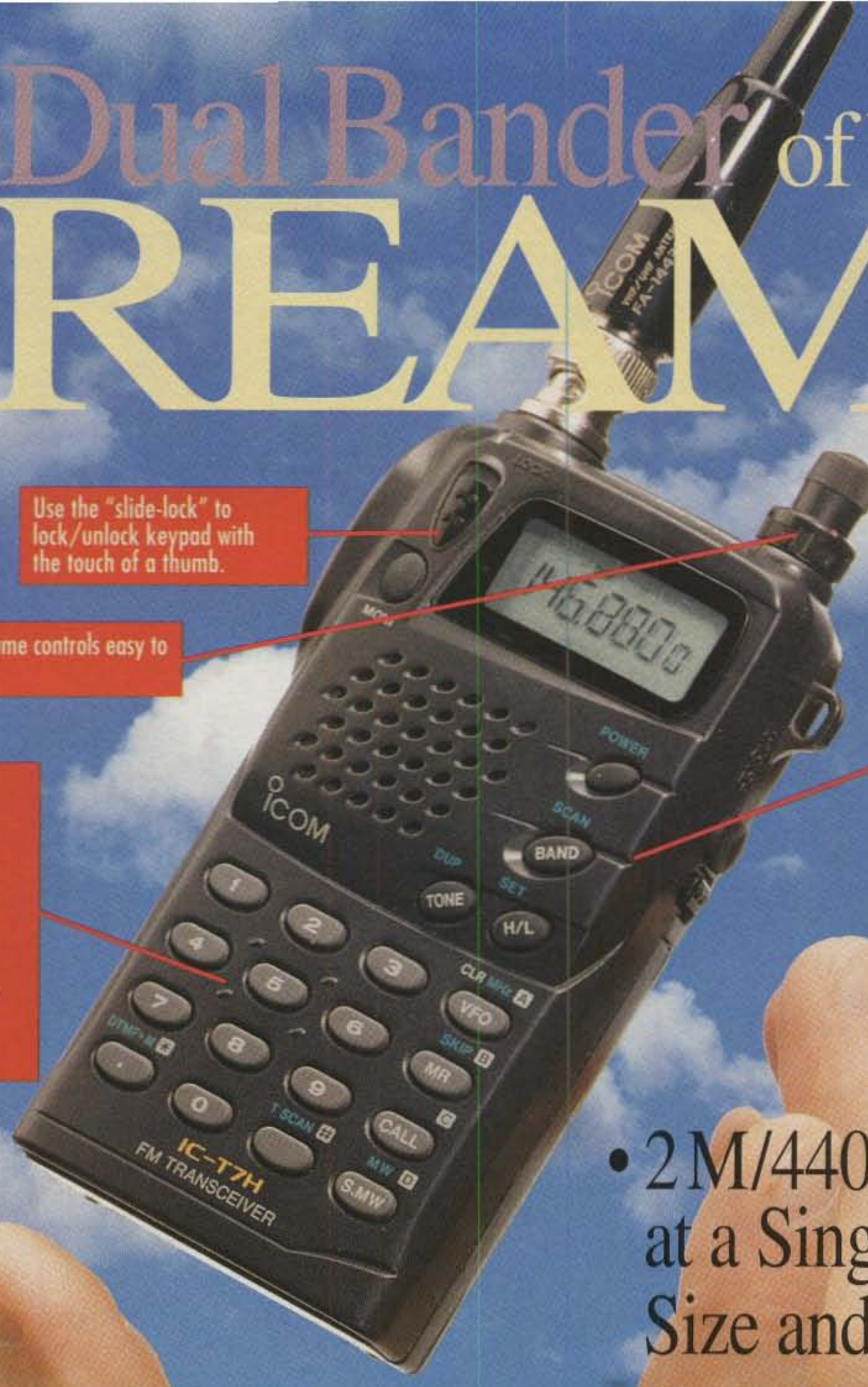
Use the "slide-lock" to lock/unlock keypad with the touch of a thumb.

Tuning and volume controls easy to locate on top.

Auto band selection.
Proper band is automatically selected when a frequency is entered.

One touch operation.
(No separate function switch.)

Simply press and release a key for its first function, press and hold for its second function.



Changing bands is as easy as entering the the desired frequency.

Actual Size
2 1/4(W) x 4 13/16(H) x 1 1/8(D)
(with optional BP-170, as shown)

- 2 M/440 MHz at a Single Bander Size and Price
- Extra Easy to Use

IC-T7H Dual Bander

ICOM'S IC-T7H: POWERFUL, DURABLE, COMPACT – Powerful output and clear audio in a compact, easy to carry, package • **PC PROGRAMMABLE** – Optional DOS or Windows® software available • **MEMORY ALLOCATION** – Store and scan VHF/UHF frequencies in any combination up to 70 channels • **"INTUITIVE" HELP FUNCTION** –Display instructs the user what to do when in the SET MODE • **6W VHF/UHF OUTPUT** – With 13.5 V DC (5W VHF/4W UHF with included 9.6V BP-173 Ni-Cd battery pack) • **ENCODE/DECODE** – With tone scan. **AND MORE:** 70 memories • 9 DTMF autodialing memories • Auto power save • Auto repeater offsets • Backlit display • MIL SPEC 810 C/D/E for shock & vibration.

WORK THE MAGIC ICOM

Call ICOM's brochure hotline: (425) 450-6088. Or contact ICOM Technical Support in the HamNet forum on CompuServe® @75540,525 (Internet: 75540.525@compuserve.com.)

ICOM
www.icomamerica.com

CQ Amateur Radio

SEPTEMBER 2000 VOL. 56, NO. 9

FEATURES

page 13

page 62

DEPARTMENTS

ON THE COVER: Jimmy Vandiver, N9CAR, of Summitville, Indiana, is the proud holder of USA-CA All Counties award #1000. Details on page 52. (Photo by Larry Mulvehill, WB2ZPI)

Quality and Reliability... Inside and Out

UBZ-AL14
FRS FreeTalk™

UBZ-LH14
FRS FreeTalk™

TH-22AT
2 meters

TH-G71A
2 meters
& 440 MHz

TH-D7A
2 meters &
440 MHz

TH-79AKSS
2 meters & 440 MHz

VC-H1
Visual
Communicator

TM-261A/461A
2 meters/440 MHz

TM-541A
1200 MHz

TM-331A
220 MHz

TM-742AD/642AD
2 meters & 440 MHz/2 meters & 220 MHz

TM-G707A
2 meters & 440 MHz

TM-V7A
2 meters & 440 MHz

NEW
Built-In TNC
and APRS™

TM-D700A
2 meters & 440 MHz

FREE
Operating Manuals
via the FTP site*

TS-50S
Compact HF All Mode

TS-570D/S(G) w/DSP
HF All Mode or HF + 6m All Mode

TS-870S w/DSP
HF All Mode

TS-950SDX w/DSP
HF All Mode

KENWOOD
Amateur Radio Products Group

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745
Customer Support/Brochures (310) 639-5300 Y2ARD-1974/D12100

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

INTERNET
Kenwood News & Products
http://www.kenwood.net
Kenwood Bulletins
*ftp://ftp.kenwood.net

Ham Radio News

From The CQ Newsroom

Light Speed Update

Last month we reported here that scientists had succeeded in transmitting a pulse of light through a tube of cesium at a speed considerably greater than the traditional "speed of light" of 300,000 meters/ second (186,000 miles/second). More details have become available with the publication of the scientists' paper in the journal *Nature*. Their explanation for the phenomenon is that light energy from the leading edge of the laser pulse is transferred to the cesium atoms, causing *them* to emit a *new* pulse of light which leaves the chamber before the original pulse has finished entering it. This raises fascinating questions about the nature of all electromagnetic energy transmitted through a fluid (including air), which we will try to look at more closely next month.

Next Step in Place for Space Station Amateur Radio

The successful July launch of the Zvezda service module of the International Space Station moves station construction and a renewed permanent ham presence in space a step closer to reality. The service module will house the crew members and eventually the space station's ham equipment. The initial ham gear will be set up in the "Functional Cargo Block" module, which is already in orbit, and is scheduled at this writing to be transported to the station by the space shuttle in early September. The first station crew is scheduled to go up in October.

P3D Launch Delayed Again

Speaking of October, it now looks likely that the Phase 3D amateur satellite will not be launched until mid-October at the earliest. *CQ* Satellite Editor Phil Chien, KC4YER, reports that Arianespace, which will be launching the satellite, wants to conduct further tests on a new upper stage of the Ariane 5 launcher before any additional flights. Chien says the delay is likely to be a matter of weeks, not months, from the previously announced timeframe of late September or early October.

ARRL to Promote Software Defined Radios

Declaring amateur radio to be "fertile testing ground" for Software Defined Radios (SDRs) now under development, the ARRL has promised to help promote amateur radio involvement in the new technology. The League's remarks come in comments filed with the FCC in response to the Commission's Notice of Inquiry about SDRs. (*For more on the concepts behind software-defined radio, see "Zero Bias" and "Washington Readout" in this issue—ed.*) According to the *ARRL Letter,* the League said that amateur radio's flexibility, shared allocations, and utilization of multiple modes makes it an ideal forum for developing SDR technology, and promised to promote its development in its technical magazine, *QEX.*

K1TO and N5TJ Take Top WRTC Honors

Defending champions Dan Street, K1TO, and Jeff Steinman, N5TJ, operating as S584M, retained their World Radiosport Team Championship (WRTC) title during the third running of the event this July in Slovenia. Finishing second in the 53-team field was S587N, operated by Russian contesters RA3AUU and RV1AW; followed by S582A, operated by Americans Doug Grant, K1DG, and *CQ* Contest Editor John Dorr, K1AR. All stations were provided with an "even playing field" of 100 watt transceivers and modest antennas. For details, see this month's "Contesting" column on p. 104.

Louis Varney, G5RV, SK

Antenna inventor Louis Varney, G5RV, died June 28 at age 89. According to the ARRL, Varney first described the antenna that bears his callsign as its name in the November 1966 issue of the Radio Society of Great Britain's *Bulletin.* The antenna, which uses a combination of dipole elements and a parallel wire feedline, coupled to coax, allows operation on 80–10 meters and is one of the most popular amateur wire antenna designs. Varney was active on the air until soon before his death. He is survived by his wife, Nelda.

Appeals Court Puts "Balance" Ahead of PRB-1

A federal appeals court in Florida has upheld a Seminole County ordinance limiting amateur radio towers to 35 feet without special permission, and ruled that the U.S. District Court that first heard the case had *not* erred by applying "a balancing test rather than the reasonable accommodation test required by PRB-1." The FCC, in a 1985 ruling known as PRB-1, said that municipal ordinances must "accommodate reasonably amateur communications" and "represent the minimum practicable regulation." But the Eleventh Circuit Court of Appeals, in an unpublished decision, said the county's denial of a request by Leonard Persin, WB4HZQ, to erect an 80 foot repeater tower in his side yard, was legal, as was the "balancing of interests" approach used by the district court.

The ARRL, which is funding Persin's appeals case, was disappointed in the outcome. Executive Vice President David Sumner, K1ZZ, said he belives the court's ruling "runs contrary to the clear and unambiguous meaning of the FCC's PRB-1 preemption decision." The only positive aspect of this ruling, according to the *ARRL Letter,* is that because the appeals court opinion was not published, it will *not* serve as a precedent in future cases.

FCC: No Change in VHF CW-Only Segments

The FCC has denied a petition by a group of hams in California to permit SSB voice and digital communications at the bottom ends of the 6 and 2 meter bands, in segments currently reserved exclusively for CW operation. The California Six Meter Club had argued that most weak-signal DX operation on the bands took place at the lower end of the voice segments, and that the CW-only areas were virtually unused, according to the ARRL. The FCC disagreed, saying such a change could have an adverse impact on operations by other licensees; that the proposal did not seem to have the support of the amateur community, and that it didn't see how opening the segments to voice operation would improve communications capabilities on the bands.

Don't Confuse the ULS!

ARRL/VEC Manager Bart Jahnke, W9JJ, reports that a software glitch in the FCC's Universal Licensing System (ULS) causes the system to throw out any applications with more than one action requested, such as an upgrade and a renewal, or an upgrade and an address change. The *ARRL Letter* says Jahnke advises filing two separate applications, and *waiting* until the first has been processed before filing the second. In addition, he says, people whose licenses are expired but within the two-year grace period who want to upgrade must file a renewal before filing their upgrade application, or the computer will spit it out. The system, it seems, can be very efficient ... as long as you don't ask it to do more than one thing at a time!

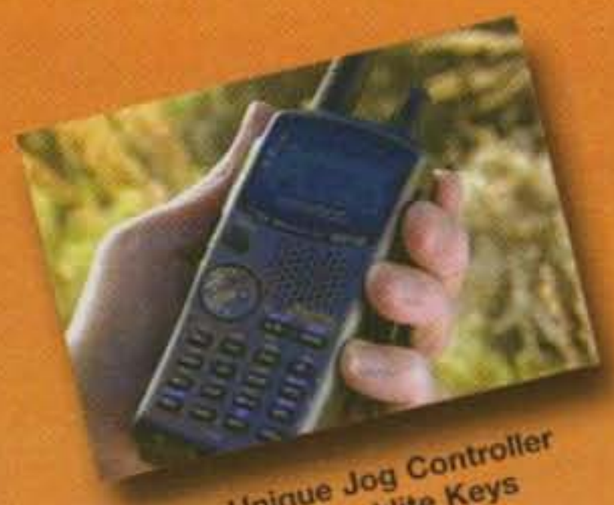
New DX "Top Ten" List

North Korea retains its #1 position as the most-wanted DXCC entity, according to the newly-published 1999 *ARRL DXCC Yearbook.* The other nine, according to the *ARRL Letter,* are: (2) BS7H, Scarborough Reef; (3) BV9P, Pratas Island; (4) A5, Bhutan (despite the success of the recent DXpedition there); (5) VU4, Andaman and Nicobar Islands; (6) 7O, Yemen; (7) E3, Eritrea; (8) 3Y, Bouvet Island; (9) FR/T, Tromelin Island; and (10) VU7, Lakshadweep Island.

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.

TH-D7A(G)
DATA COMMUNICATOR

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



Unique Jog Controller w/Backlite Keys

Emergency Communications and Position

Grid Square/Distance/Direction Information

Monitor DX Packet Clusters

Complete Line of Accessories

PC Connectivity Used For Programming APRS®/Packet

Advanced VC-H1 Controller

MIL-STD 810 C/D/E Water Resistance

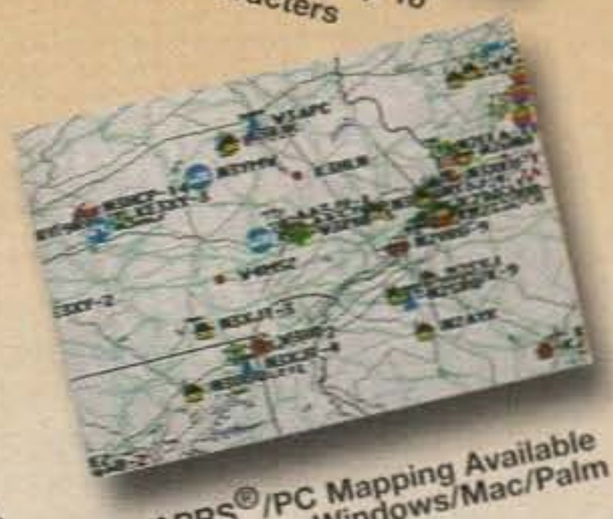
Weather Station & PHG Data Reception

APRS® Messaging Up To 45 Characters

Great Companion for the TH-D7A(G)

- FM dual-band (144MHz/440MHz) hand held
- 5.5 Watts @ 13.6 volts
- 200 memory channels w/8 alpha display
- Built-in 1200/9600bps TNC (AX.25 protocol)
- Built-in APRS® (Automatic Position Reporting System) software
- GPS interface for position/directional/ altitude data (NMEA-0813)
- Dual RX on the same band for voice and data (VHF only)
- PC Programmable for frequency and name (PG-4W required)
- 16-digit 10-channel DTMF memory
- Monitor DX Clusters
- DTMF remote control (TM-742A/TM-V7A)
- Dual receive on same band V+V/V+U
- AIP (intermod rejection)
- Selectable position memories
- Text message memories
- Position ambiguity
- Unique cursor key for easy menu navigation
- Manual input of latitude/longitude (No GPS required)
- Large 12 digit x3 line dot matrix display
- Free operation manual and color brochure at ftp://ftp.kenwood.net

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



APRS®/PC Mapping Available For Windows/Mac/Palm

KENWOOD
COMMUNICATIONS CORPORATION

3975 Johns Creek Court, Suwanee, GA 30024
P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745, U.S.A.
Customer Support: (310) 639-5300 Fax: (310) 537-8235 Y2ARD-2012 #071500

INTERNET
Kenwood News & Products
http://www.kenwood.net
Kenwood Bulletins
ftp://ftp.kenwood.net

Zero Bias

BY RICH MOSESON, W2VU

An Editorial

The Hatfield Imperative

Dale Hatfield isn't a household name to most hams. Those who contact him on the air know him just as Dale, WØIFO.This month you'll find his name sprinkled throughout *CQ*. That's because Dale Hatfield is the FCC's top technical honcho—Chief of the Office of Engineering and Technology (OET)—and when he made a speech last June about ham radio, it drew a lot of attention from hams, including "Washington Readout" editor Fred Maia, W5YI; "VHF-Plus" editor Joe Lynch, N6CL; and our new "Digital Wireless" editor, Steve Stroh, N8GNJ (more on Steve later). Fred has devoted all of this month's "Washington Readout" column to sharing the full text of Hatfield's speech with *CQ*'s readers, and I encourage you to read his remarks in full, beginning on page 22.

Keep this in mind when you're reading: Hatfield's office is, among other things, in charge of spectrum allocation in the United States. The future of our bands is largely in his hands, so when he talks about what hams need to do to protect their current allocations, and justify asking for more in the future, it's worth listening.

The main thrust of Hatfield's comments is that demand for spectrum use is growing exponentially, while the amount of available spectrum space, so far, is fixed and finite. Amateur frequencies will inevitably come under pressure from other spectrum users who feel they can make better use of "our" frequencies. The main thrust of his recommendations is that we hams need to prove our continuing need for large chunks of spectrum, and our continued relevance in a communications world going digital, by once again taking the lead in developing spectrum-efficient means of communicating, particularly using digital communications. He cites as a current example the growing popularity of digital modes such as PSK31, whose signals are only 31 Hz wide.

Hatfield sets out several recommendations for hams, but at the very top of his list is what we might call *The Hatfield Imperative*: "experimentation with digital techniques that are capable of squeezing more 'bits per second per Hertz of bandwidth' out of the increasingly valuable radio spectrum resource." He then goes on to describe, and to encourage hams to be part of, the FCC's recent initiative on so-called *Software Defined Radios*.

These "SDRs" were the topic of a posting to the *CQ* e-mail newsletter and our website news page back in March, when the FCC issued a Notice of Inquiry, but were squeezed out of the more limited space in the news section of the magazine itself. Let me take some space here to talk about them, even though the time for filing comments with the FCC has already expired.

The concept here is that virtually every parameter of a radio, including frequencies and modes, would be a function of software rather than hardware. Radios could be reprogrammed "on the fly" to perform different tasks, or to communicate with different groups. The FCC envisions this technology allowing wireless phone users to change providers without having to replace their phones; and permitting emergency communicators at disaster scenes to have their radios quickly reprogrammed for improved interagency communications (an area where, today, hams continue to provide a vital function). In addition, what it calls *smart SDRs* might be able temporarily to use vacant frequencies, perhaps automatically changing frequency if a primary user returns. Comments were due by early June. The complete Notice of Inquiry may be downloaded as a Word file at (take a deep breath) website: <http://www.fcc.gov/Daily_Releases/Daily_Business/2000/db0321/fcc00103.doc>. It is fascinating reading for anyone interested in seeing the future of radio communications.

In addition to spectrum allocation, one of the many functions of Hatfield's Office of Engineering and Technology is running the FCC's equipment authorization program (formerly known as type acceptance). One of the challenges facing the development of Software Defined Radios is that the current model of equipment authorization (approved for this use on this mode at this power level on this frequency) would be made obsolete by a radio that can change every parameter with a few clicks on a keyboard. But the Commission isn't sure what to use in its place, or how to authorize any Software Defined Radios that are produced.

One of the opportunities that we as hams have is that we don't need OET's okay to change things in our radios or to build something entirely new. In fact, we are the only service permitted—encouraged—to experiment, to tinker, to try new things with our radios. The primary technical standards to which we are subject under current FCC rules are bandwidth limitations and suppression of spurious emissions. As long as we don't occupy too much bandwidth (with exceptions for spread-spectrum) and don't interfere with other people, we can do pretty much anything we want, especially on the higher frequencies where there are few, if any, mode limitations.

There are hams right now who are working on the leading edge of this technology (I don't know specifically who they are, but I'm sure they're out there.), and ham groups—such as AMRAD, the Amateur Radio Research and Development Corporation, to whom Hatfield addressed his comments; TAPR (Tucson Amateur Packet Radio); AMSAT (Radio Amateur Satellite Corporation); and maybe even the ARRL—that must know how to access the knowledge behind the technology. The potential here is fantastic—radios that can be programmed to operate on any frequency in any mode and that do it all with spectrally-efficient streams of ones and zeros, supporting multiple contacts in multiple modes at the same time on the same frequency or frequencies. We hams have a unique opportunity to take the lead in what we have always done best, and that is take something that exists only in theory and turn it into something practical, showing the rest of the communications world how to use it most effectively and most efficiently. Plus, we've been invited to the party by the FCC's head man on new technology. Let's get to work!

CQ looks forward to the opportunity to chronicle the development of Software Defined Radios for amateur use, and we encourage anyone experimenting and progressing in this field to share what they've learned with our readers.

Introducing WW2CQ

Well, folks, we finally got "a round tuit." We put together a *CQ* staff radio club, and got a club license and a vanity callsign to go with it — WW2CQ (the WW is for World Wide). We put it on the air for the first time in July during the newly revived CQ World-Wide (See how that works?) VHF Contest and made about 40 contacts on 6 and 2 meters, including VP9ID in Bermuda on 6! Here in the northeast, the 6 meter openings were somewhat scarce, but folks in other parts of the country seemed to have had better luck. Thank you to all who participated and sent in logs. Most comments about the contest's new format seem to be positive. Listen for WW2CQ on a radio near you, especially during its namesake contests.

Speaking of which, I recently had the privilege of sharing lunch and a bag of "CQ Ion Salt" with Propagation Editor George Jacobs, W3ASK (along with Publisher Dick Ross, K2MGA, Managing Editor Gail Schieber, K2RED, and Contributing Edi-

Do the math!

2:1 Bandwidth (kHz)

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

6 10 12 15 17 20 30 40

Meter Vertical Antenna

Rig+Amplifier+Tuner+R8=Performance

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

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

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

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

The R8 = operating confidence, versatility and fun.

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

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

R8

CUSHCRAFT
COMMUNICATIONS ANTENNAS
48 PERIMETER ROAD, MANCHESTER, NH 03103 USA
(Tel.) 1-603-627-7877 • (Fax) 1-603-627-1764

tor Ken Neubeck, WB2AMU). As George explains in more detail in this month's "Propagation" column (page 109), it has been his tradition for many years to "salt the ionosphere" from various locations in advance of the CQ World-Wide DX Contest. His goal is to do whatever is possible to bring about good band conditions during the contest. It is hoped that this "full court press"—along with the puddle of water we were standing in (for better ground conductivity?)—will bring about the desired results. Rules for this year's running of the event are in this issue (page 126) and on our website.

Speaking of our website (<http://www.cq-amateur-radio.com>), we've decided to move our "Q&A" column from occasional appearances in the magazine to a permanent presence in the CQ Forums area. This way, it won't be squeezed out by space needs, and anyone with an answer to a posted question may reply. I hope you're checking into our website regularly. We keep adding and updating stuff, and always have something new in the works. Our goal is to make *CQ*'s website as indispensable to the active ham as *CQ* itself is!

Introducing N8GNJ

I was first introduced to Steve Stroh, N8GNJ, a little more than a year ago, when someone forwarded to me a copy of *Boardwatch* magazine with his "Wireless Data Developments" column, which that month was subtitled "Amateur Radio and the Future?" In it, Steve talked to his audience of commercial wireless data folks about not only the continued relevance of amateur radio as we enter the 21st century, but also its importance as an adjunct to formal technical training. "I've met an astonishing number of degreed Electrical Engineers who've never held a soldering iron," he wrote. "If you have a son or daughter who plans on a technical career, getting them involved in amateur radio will be a godsend."

Steve also had nice things to say about *CQ VHF* magazine, which I was editing at the time, so I dropped him an e-mail and we began to correspond occasionally by e-mail and phone. We had the opportunity to meet in person last year at the ARRL/TAPR Digital Communications Conference and talked about future trends in amateur digital wireless, as well as his burgeoning writing career.

Thus, after the departure a couple of months ago of long-time *CQ* Packet Editor Buck Rogers, K4ABT, Steve became an obvious choice to succeed him. N8GNJ is joining our staff as of this issue with a new column entitled "Digital Wireless." It will cover the full spectrum of amateur digital communications, with a particular focus on new and developing technology. Steve is chairman of the 2000 Digital Communications Conference, so he certainly has his finger squarely on the pulse of technical innovation within the amateur community. It is our privilege to be able to share his knowledge with you. Welcome aboard, Steve!

Remembering K2EEK

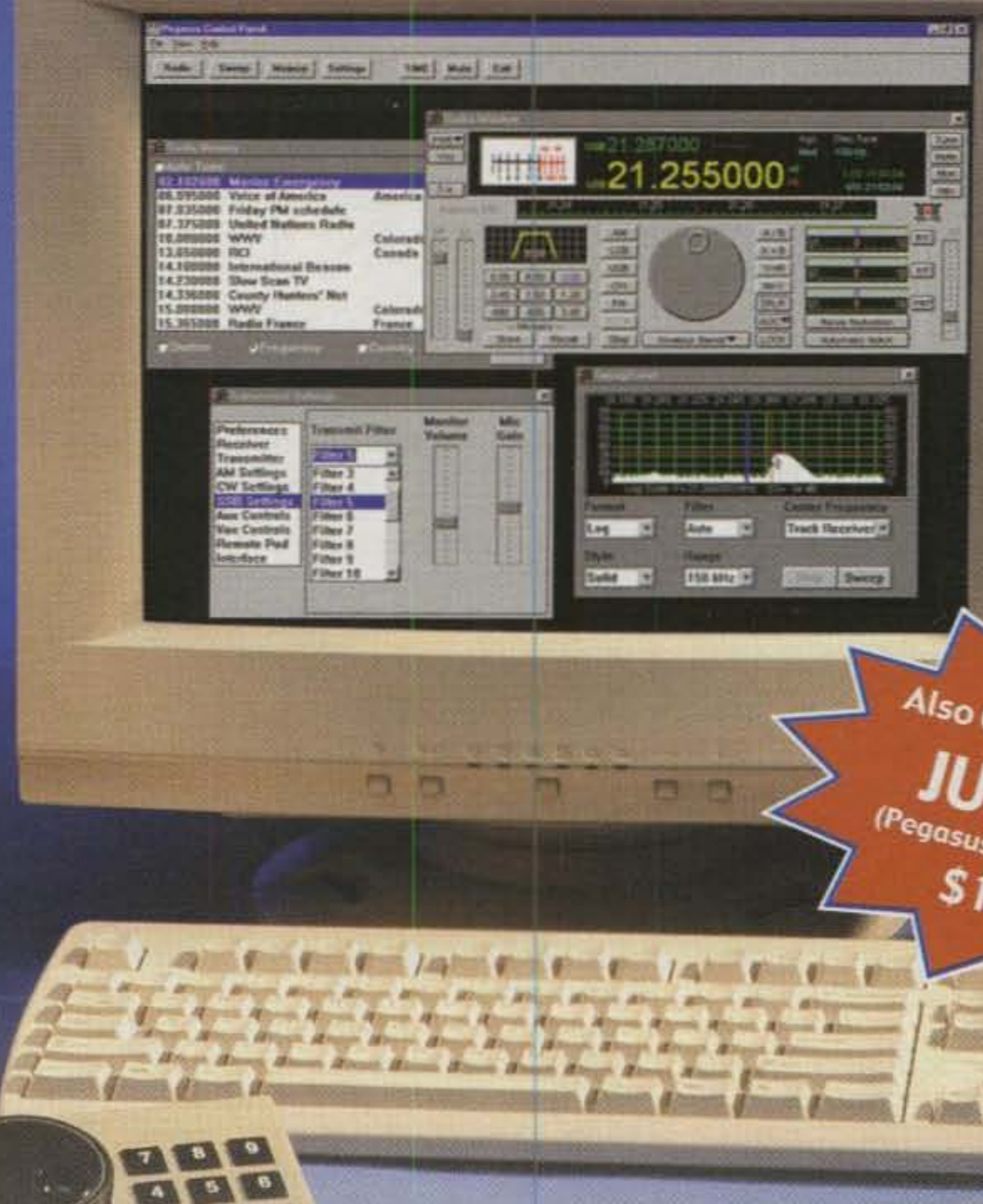
This issue goes to press on the one-year anniversary of the passing of my predecessor, Alan Dorhoffer, K2EEK. Hardly a day goes by that one of us doesn't say or do something, followed by a comment on how Al would have reacted to it. We miss you, OM.

It was in this space one year ago that *CQ* Publisher Dick Ross, K2MGA, notified the *CQ* readership of Al's passing and encouraged all of you to take seriously any signs from your body that something isn't right. We repeat that advice one year later. Early detection is crucial to stopping the progress of any life-threatening disease, be it cancer, heart disease, stroke, or whatever else is out to get you. Take care of yourself. Listen to your body. We want you to be with us for many more years to come.

73, Rich, W2VU

Everyone's Talking About PEGASUS

$895* Model 550



Also Coming Soon... JUPITER (Pegasus w/front panel) $1,189

$139* Model 302

Whether you're listening on the bands or reading the mail here at TEN-TEC, the message is the same - PEGASUS is the most intriguing new development in amateur radio. Combining the power of your own PC with cutting edge IF-DSP, TEN-TEC is the first to offer this HF innovation at such an affordable price. Take a look at what owners have to say:

"Love this radio...all reports great...."
- Brad Mackay, WE4DX

"Outperforming a recent HF transceiver from a competitor that costs three times as much."
- Dave Garner, WA4YRK

"This is an impressive product."
- Ted Mackinnon, NW8W

"Well designed and operator friendly."
- Richard Maxwell, K3BL

"It is a wonderful radio."
- Norm Creller, W8MPM

"The receiver is quiet with beautiful receive audio."
- Jim Cox, K4JAF

"It took less than 10 minutes to have my first QSO."
- Paul Christensen, W9AC

"Consider me delighted!"
- Karl Heimbach, W5QJ

"It's nice to have a large number of filters to choose from."
- Mark Aaker, K6UFO

"Congratulations on an outstanding accomplishment in quality and price."
- Harvey Solomon, KQ0A

"This is a winner!"
- Charles Scheid, W3OHV

"Reports on the air have been nothing short of fabulous."
- George Shapow, NY2O

Anyone running Windows 3.1, 95/98®, will have PEGASUS operational in minutes as there is no hardware to install inside your PC. Control any transceiver function with your mouse or PC keyboard. For armchair operation, add optional Remote Encoder Keypad, Model 302. Test drive the PEGASUS before you buy - download the actual software from our website (www.tentec.com).

For more information or to place an order:

1-800-833-7373

Monday - Friday 9:00 - 5:30 EST

You can reach us at:

1185 Dolly Parton Parkway
Sevierville, TN 37862

Office: (865) 453-7172
FAX: (865) 428-4483
Repair Dept.: (865) 428-0364 (8 - 4 EST)
Sales Dept. e-mail: sales@tentec.com
Visit our web site at www.tentec.com

* Model 550 - $895 plus $15 S/H in 48 states
* Model 302 - $139 (no added S/H if ordered with PEGASUS)
- We accept VISA, Mastercard, and Discover
- No-Risk 30-day Money-Back Guarantee. (Customer pays shipping both ways.)

...America's Best!

TEN TEC

MADE IN USA

Announcements

• **Microwave Update 2000** – Hosted by the Mt. Airy VHF Radio Club, this year's conference will be held September 29–30 at the Holiday Inn Select, Bucks County, just north of Philadelphia, Pennsylvania. For more info, contact <JohnKB3XG@aol.com>; web site: <http://www.ij.net/packrats/MUD_2000/mud.html>; or write to Microwave Update, P.O. Box 682, Hatboro, PA 19040. Also see the "VHF Plus" column in this issue of *CQ* for details.

• **Route 66 On the Air Special Event** – The song *Get Your Kicks on Route 66* names twelve cities and towns along this road. To offer hams a way to relive their memories of Route 66, amateur raddio clubs will be operating from each of these places from Sept. 9–17. Each special event club station will be using a unique 1×1 callsign (K6A through K6L), and they will be operating near the following frequencies: CW 3533, 7033, 14033, 21033, 28033, 50033; SSB 3866, 7266, 14266, 21366, 28466, 50166 kHz. A certificate will be available to any ham working at least one of these twelve Route 66 stations, with endorsements identifying all the special event stations worked. For more information check out the event website at: <www.qsl.net/nadxa/route66/rt66.htm>, or contact Jerry, Conover, NE7I, 2756 N. Mariah Way, Flagstaff, AZ 86004-7516 (<ne7i@arrl.net>).

• **The following Special Events are scheduled for September:**

N2UL, from "CQ Labor Day" honoring the nurses of the world; Robert D. Grant ARA; 1200Z Sept. 2 to 2400Z Sept. 4; on 28.420, 18.120, 21.375 MHz. For certificate send QSL to RDGULARA, P.O. Box 716, Nutley, NJ 07110-0716.

W3P, from USI expedition on Pea Patch Island, Delaware; Delaware County ARA; 1600Z Sept. 23 to 2100Z Sept. 24; on 14.260, 21.260, 28.460 MHz. For QSL send QSL and SASE to Dan Cashin, N3LMY, 1335 Harrington Rd., Havertown, PA 19083.

K5L, from Panhandle-South Plains Fair, Lubbock, Texas; Lubbock ARC; Sept. 22–30; on 17.265, 14.265, 21.365, 28.465 MHz. For QSL send QSL and SASE to Lubbock ARC, K5LIB, P.O. Box 16797, Lubbock, TX 79490.

W5SLA, from Ozone ARC celebrating 36 years of community service and ham radio fun, Lousiana; 1300–2200Z Sept. 16; on 14.250, 7.240 MHz ±QRM. For certificate send QSL and SASE to Michael White, 404 Holmes Dr., Slidell, LA 70460.

W6LY, from 36th anniversary of Leisure World, Laguna Woods, California; Leisure World ARC; 1400Z Sept. 9 to 2000Z Sept. 10; on 7.250, 14.250, 21.380, 28.380 MHz. QSL with SASE to Ernie Senser, KD6RIF, 3031 Calle Sonora Apt. B, Laguna Woods, CA 92653.

KB8UUZ, from National POW/MIA Week, Freedom Township, Ohio; 1600Z Sept. 11 to 0300Z Sept. 18; on 28.350, 21.350, 14.260, 7.260 MHz ±QRM. For 8 1/2 ×11 certificate send large SASE to Tom Parkinson, KB8UUZ, 9992 State Route 700, Mantua, OH 44255.

W8PIF, from 50th anniversary of ARRL charter; Marinette & Menominee ARC; 1700–2300Z Sept. 16; on 7.250, 14.250, 21.350, 28.450 MHz. For certificate and QSL send QSL and SASE to M&M ARC, P.O. Box 1082, Marinette, WI 54143.

W8YAF, from YAF Founder's Day, Yankee Air Museum, Belleville, Michigan; 1200–2000Z Sept. 17; on 7.270 ±QRM. For certificate send QSL and 9×12 SASE to Frank A. Nagy, N8BIB, 24315 Waltz Rd., New Boston, MI 48164-9167.

K9D, from McMaze Indiana, Cambridge City, Indiana; Whitewater Valley ARC; Sept. 23–24 on 7.265 MHz. Contact K9KL for info.

K9RAW, from "The Big Event," Winnibago, Wisconsin; Radio Amateurs of Wisconsin; 1400–2100Z Sept. 9; on 7.240, 14.240, 21.350, 28.350 MHz. For certificate send QSL and SASE to Mark Miller, N9WT, 336 W. 8th Ave., Oshkosh, WI 54902-5928.

K9S, from Platteville Sheepdog Trial, Platteville, Wisconsin; Hidden Valleys ARC; 1500–2200Z Sept. 2–3; on General class portions of phone and CW bands, plus VHF. For certificate QSL to HVARC, P.O. Box 112, Platteville, WI 53818-0112.

VE3MIS, from Halton Radial Railway Museum, Milton, ON, Canada; Mississauga ARC; 1400–2000Z Sept. 23 & 24; on 7.230, 14.240, 28.340 ±QRM. QSL info: MARC, c/o Michael Brickell, 2801 Bucklepost Crescent, Mississauga, ON, L5N 1X6 Canada *(Note: US postage stamps cannot be used to send mail from Canada to the US.)*; e-mail info: <ve3mis@rac.ca>; web: <www.marc.on.ca>.

• **The following hamfests, etc., are slated for September and late August:**

Aug. 27, **Lapeer Ham Swap & Computer Show**, Lapeer Center Building, Lapeer, Michigan. Call 1-888-705-8683 or 1-810-245-0347; e-mail: <w8lap@arrl.net; <http://www.lapeer.com/lcara>. Talk-in 146.620. (Exams)

Sept. 2, **Uniontown ARC Gabfest**, club grounds, Uniontown, Pennsylvania. Contact Carl, WA3HQK, or Joyce, KA3CUT, Chuprinko, 84 Heaven Hill Road, Morgantown, WV 26508 (304-594-3779).

Sept. 2, **Ottawa ARC Hamfest**, Carp Agricultural Fairgrounds, Carp, ON Canada. Contact Greg Danylchenko, VE3YTZ, 613-236-9291; e-mail: <fleamarket@oarc.net>; <http://oarc.net/fleamarket>.

Sept. 8–9, **Mena Hamfest**, Queen Wilhelmina State Park, near Mena, Arkansas. Contact KC5DOR, 1-870-642-7656; e-mail: <blee@ipa.net>. Talk-in 146.79, 146.49 simplex.

Sept. 9, **ARA of Hansen Hills Hamfest**, Grayling, Michigan. Contact Jon Schultz, N8YSS, 517-348-4966; e-mail: <jschultz@i2k.net>; web: <www.arahh.org/swapshop.html>.Talk-in 145.13 -600 offset. (Exams 10 AM, preregistration preferred, walk-ins okay)

Sept. 10, **SEMARA Hamfest**, Southeastern Massachusetts ARA Clubhouse, S. Dartmouth, Massachusetts. Contact Bill Miller, K1IBR, 508-996-2969; e-mail: <billmiller@netzero.net>. Talk-in 147.00/.60.

Sept. 10, **Long Island Hamfair**, Briarcliffe College, Bethpage, New York. LIMARC info-

(Continued on page 94)

A publication of

CQ Communications, Inc.
25 Newbridge Road
Hicksville, NY 11801 USA.

Offices: 25 Newbridge Road, Hicksville, New York 11801. Telephone: (516) 681-2922. FAX (516) 681-2926. E-mail cq@cq-amateur-radio.com. Website:http://www.cq-amateur-radio.com. CQ (ISSN 007-893X) is published monthly by CQ Communications Inc. Periodical postage paid at Hicksville, NY and additional offices. Subscription prices (all in U.S. dollars): Domestic—one year $27.95, two years $49.95, three years $71.95; Canada/ Mexico—one year $40.95, two years $75.95, three years $110.95; Foreign Air Post—one year $52.95, two years $99.95, three years $146.95. U.S. Government Agencies: Subscriptions to CQ are available to agencies of the United States government, including military services, only on a cash with order basis. Requests for quotations, bids, contracts, etc. will be refused and will not be returned or processed.

Printed in the United States of America.

Postmaster: Please send change of address to CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801.

Why buy any amplifier that you can't try in your own station risk-free?

Every new ALPHA is backed by ALPHA/POWER's 30-day money-back guarantee, 4-year factory limited warranty, and 30-year reputation.

ALPHA 87A... The finest maximum-legal-power hf amplifier you can buy is now fully automatic!

Hook up your new ***ALPHA 87A*** like an ordinary amplifier. Connect any suitable antenna. ***Then just transmit***. *Your **87A** automatically optimizes tuning and loading*. When frequency or load changes, the ***87A*** *automatically* re-optimizes tune-up... *all in seconds, while you transmit*.

ALPHA 87A even compensates *automatically* for drive level, insuring excellent efficiency and linearity at any power within its capability.

That's just one more important innovation from ***ALPHA/POWER*** that's *"not available elsewhere!"* Technological leadership is only one of many reasons why a 1999 poll of <contesting.com> participants revealed ***ALPHA*** as their *overwhelming* preference in hf power amplifiers.

ALPHA 87A ***special price of $5890*** has been extended but may terminate without notice. A chip set to retrofit *any* ***87A*** with fully automatic tune-up and *Windows*™-based remote control is only $99. *See WC1M's review of these new ALPHA 87A standard functions (called AlphaMax™ and AlphaRemote™, respectively) in* ***QST****, August 2000, pp.73-74.*

ALPHA 99... Solid, honest, brick-on-the-key ALPHA POWER at a "Brand X" price!

The rugged, maximum-legal-power, no-time-limit-all-modes, Colorado-built ***ALPHA 99*** *is* ***ALPHA*** *in every respect...* ***for just $2999!***

Like all new ***ALPHAs***, the ***99*** uses a robust *Peter Dahl* transformer, *Cardwell* variable capacitors, and durable ceramic tubes. Its moderately priced Gu74b/4CX800A grid-driven tetrodes are proven in extensive military and ***ALPHA 91B*** service. Specs, functions, performance, and self-protection are identical to the ***91B's***. In fact, ***99*** circuit boards are backward compatible with the ***91B***. We've already had to increase production capacity to meet demand for new ***ALPHA 99s***.

Order now and have your new ALPHA for great fall contesting!

ALPHA POWER

ALPHA/POWER, Inc.

14440 Mead Court • Longmont, CO 80504
(970) 535-4173 • FAX (970) 535-0281
www.alpha-power-inc.com

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

BURBANK, CA
2492 W. Victory Bl., 91506
(818) 842-1786
(800) 854-6046
Eric, KA6IHT, Mgr.
Victory Blvd. at Buena Vista
1 mi. west I-5
burbank@hamradio.com

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

SUNNYVALE, CA
510 Lawrence Exp. #102
94085
(408) 736-9496
(800) 854-6046
Ken, K1ZKM, Mgr.
So. from Hwy. 101
sunnyvale@hamradio.com

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Rick, K3TL, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Rich, KK7PL, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
Joe, KDØGA, Mgr.
John, N5EHP, Mgr.
denver@hamradio.com

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17
phoenix@hamradio.com

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi. no. of I-285
atlanta@hamradio.com

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Mike, N4MDK, Mgr.
Exit 161, I-95, So. to US 1
woodbridge@hamradio.com

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, KM4NZ, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

12 Store Buying Power!

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

Call For Summertime Specials!

YAESU

FT-840
- 100W • 12V DC • DDS
- Gen. Cov. Rx, 100 mem.
- Optional Ext. Auto • Tuners Available

Call Now For Our Low Pricing!

FT-1000MP HF Transceiver
- Enhanced Digital Signal Processing
- Dual RX
- Collins SSB filter built-in
- 100W, Power supply built-in

Call Now For Low Pricing!

FT-100 HF/6M/2M/70CM Transceiver
- Compact Transceiver w/detachable front panel
- Rx 100kHz to 970mHz (cell blocked)
- Tx 100W 160-6M, 50w 2M, 20W 70CM
- Built-in DSP, Vox, CW keyer
- 300 Memories

NEW!

Call Now For Low Pricing!

FT-2600M 2M Mobile
- Compact 2M 60W mobile • 12000/9600 baud
- 4 selectable power levels • Built-in CTCSS/DCS
- 175 mems, 8 character alpha-numeric display
- Low intermod Rx, Rugged

NEW!

Call Now For Low Pricing!

VR-500
Handheld Receiver
- 100kHz - 1300 mHz
- CW, LSB, USB, AM, FM (narrow and wide)
- Cell blocked in USA
- 1000 memory channels
- 8 character alpha-num display

NEW!

Great Sound, Call Today!

VX-5R
50/2M/440HT
- Wideband RX, 6M-2M-440TX
- 5W output
- 220 mems, opt. barometer unit
- Alpha Numeric Display
- CTCSS/DCS built-in
- Li-Ion Battery

Call For Low Price!

VX-1R
2M/440 Sub-Mini HT
- 290 Memory Channels
- .5W output
- Receives 76-999mHz plus AM BCB (Cell Band Blocked)
- Lithium Ion Battery

Call For Your Low Price!

FT-50RD
2M/440mHz Compact HT
- DVR, Decode, Paging Built-in
- Alpha numeric display
- Wide Band receive
- Battery Saver
- 112 Memories
- Mil-Spec
- HiSpeed scanning

Call For Your Low Price!

FT-847
Ultimate Base Station, HF, VHF, UHF
- 100w HF/6M, 50w 2M/430 mHz
- DSP • Full Duplex Cross-band
- 1200/9600 Baud Packet Ready

Call for Low Price!

FT-90R
2M/440 Mini Dualbander Transceiver
- 50w 2m, 40w 440mHz
- Wide Rx • Detachable Front Panel
- Packet Ready 1200/9600 Baud
- Built-in CTCSS/DCS Encoder/Decoder
- Less than 4" wide!

NEW!

Call for Your Low Price!

FT-920 HF+6M Transceiver
- 100w 160-6M, 12VDC
- Built-in DVR, CW Memory Keyer
- DSP, Auto-Notch • 99 Memories
- Computer controllable, CAT System

Call For Low Pricing!

FT-8100R 2M/440 Mobile
- Ultra Compact • 50w/35w 2m/440
- 110 memories • Wide Band RX
- Backlit mic • Remotable front panel w/op

NEW!

Call Now For Special Pricing

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

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

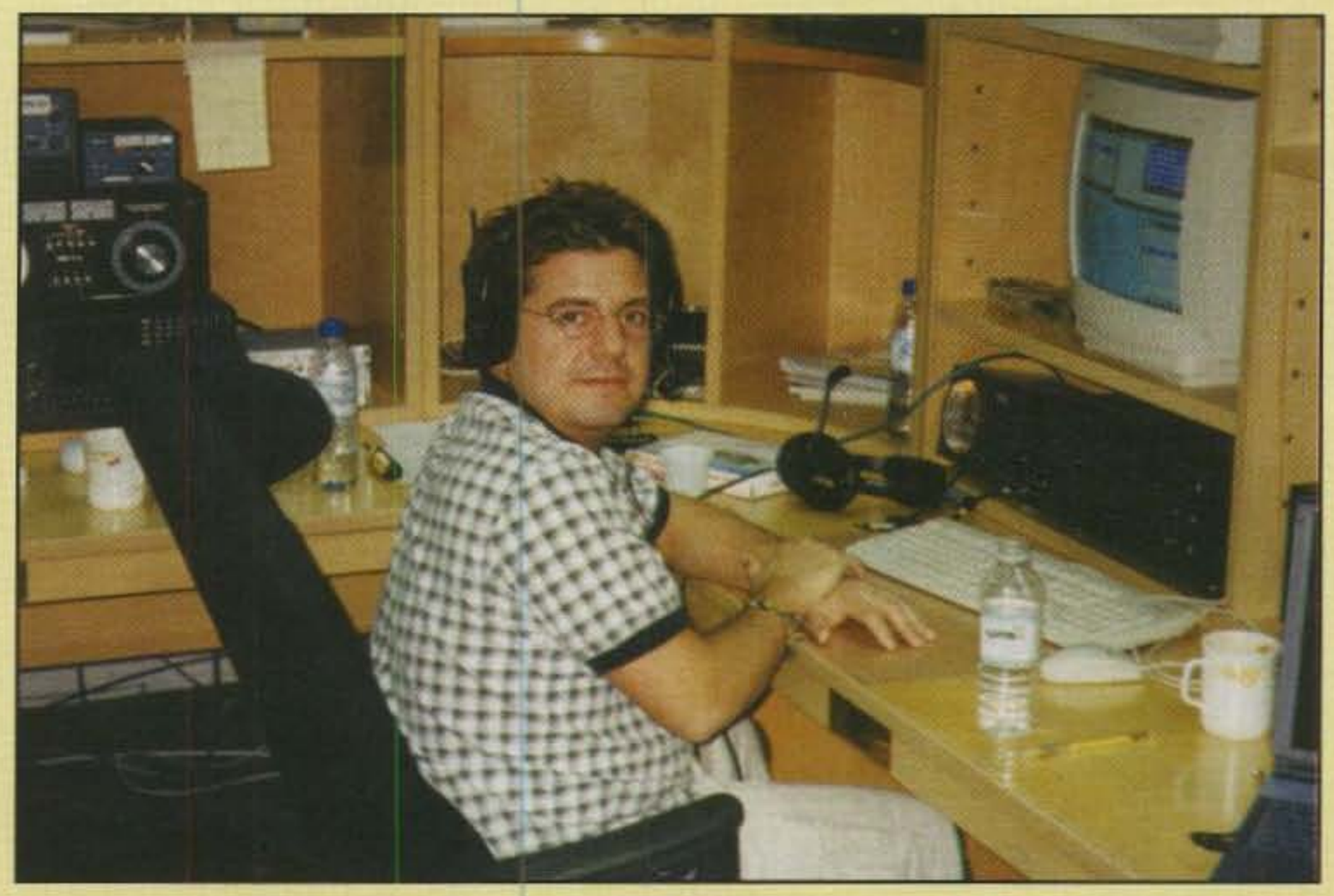
COAST TO COAST FREE SHIPPING
UPS - Most Items Over $100
Rapid Deliveries From The Store Nearest To You!

Results of the 1999 CQ WW DX SSB Contest

BY BOB COX,* K3EST

With solar conditions at a peak, contesters young and not so young from all over the world turned on their rigs. What did they find? *Ultima Thule.* Those words are the best way of describing the 1999 WW DX SSB Contest. Conditions were something beyond expectations. In 1998 the main band was 15 meters; in 1999 it was all the bands. If you listened on 10 meters, you found the band wall to wall with contesters from below 28.3 to above 29.2 MHz. It was a full megahertz of guys and gals having the time of their lives. With the solar flux hovering between 169 and 180, records fell across the board.

After months of planning, building, and practicing, thousands of contesters took full advantage of the smiling ionosphere. The number of logs received was 4025, the highest total for any CQ WW Contest in history. It was an increase of 500 logs over the prior year's record-breaking total. Reported here are the final results of the world's largest radio event. Read on to see how you and your friends ended up. Everyone who operated the CQ WW last year was a winner.



Frank, DL2CC, set a new Asian record from A61AJ.

High Power

I suppose you could say, "Wow!" That, however, would be an understatement. What Jeff, N5TJ, accomplished at EA8BH was contesting history. He broke the most coveted record in contesting by almost 10 million points. He is the first to make over 10K QSOs in any single operator category in the CQ WW. He had the highest multiplier total ever of any single-op. Place a great operator in an ideal QTH with great conditions and a new record is a strong possibility. Jeff's expectations were to try for 18 million or so points, but the QSOs just kept coming.

A continent away on the Galapagos Islands, Rich, N6KT, who has won the contest a half-dozen times, talked HC8A past the old world record only to find that he had secured second place. Third place in the world went to José, CT1BOH, operating at P4ØE. All three operators exemplify the ideal contester—motivated, completely alert, and a careful planner.

Not to be outdone, Robert, GIØKOW, put his station and QTH to good use by shattering the old European single operator record by 3.1 million points! That's not an easy task, considering the European record has edged upward very slowly. A jump of such large magnitude is truly unique. The battle for second place was very close. Not far to the east of Northern Ireland can be found Steve, GW4BLE, who pushed his station to new heights and claimed second place in Europe. Farther north, Jukka, OH2MAM, took the ferry over to OHØZ and wound up with third-place honors.

In the USA, John, K1AR, once again demonstrated why he is a great operator. John put the K1EA station through its paces to win the top USA spot. Conditions were so good that he felt as if he was in the Caribbean. Dave, NT1N, a sort of newcomer to New England radio life, found out why they call W1-land the anti-black-hole. Dave took the second-place position. Down in Washington, D.C., Fred, K3ZO, had one of his best finishes, coming in at number three in the USA.

The Top 10 World box has six continents represented. Take a close look at the outstanding efforts of 8P1A (W2SC), 3V8BB

JN1YUU—all ops are age 10 to 13 JA YLs!

*1816 Poplar Lane, Davis, CA 95616
e-mail: <k3est@cqww.com>

TROPHY WINNERS AND DONORS SSB

SINGLE OPERATOR

World All Band
EA8BH (Opr. Jeffrey Steinman, N5TJ)
Donor: Dave Rosen, K2GM – WA2RAU Memorial

World Low Power
Pedro Katz, HC1OT
Donor: Slovenian Contest Club

World QRP
Jacobo Oduber, P40B
Donor: Doc Sayre, W7EW

World Assisted
Malcolm Davenport, Jr., KI1G
Donor: Snake River Contest Club

U.S.A
John Dorr, K1AR
Donor: Potomac Valley R.C. – KC8C Memorial

U.S.A Low Power
Ann M. Santos, WA1S
Donor: North Coast Contesters

U.S.A. Zone 3
Robert Wruble, W7GG
Donor: Bill Fisher, W4AN

U.S.A. Zone 4
Jerry Rosalius, WB9Z
Donor: Bill Fisher, W4AN

Canada
Dave Dudley, VE3OI
Donor: Niagara Frontier Int'l DX Assn.
VE3WT Memorial

Caribbean/C.A.
8P1A (Opr. Tom Georgens, W2SC)
Donor: Alex M. Kasevich, VP2MM

Europe
Robert Cummings, GI0KOW
Donor: Potomac Valley R.C. – W4BVV Memorial

Europe Low Power
LY6M (Opr. Dainius Savicius, LY1DS)
Donor: Scott Jones, N3RA & Tim Duffy, K3LR

Africa
3V8BB (Opr. Hranislav Milosevic, YT1AD)
Donor: Gordon Marshall, W6RR

Asia
Hamad Al-Nusif, 9K2HN
Donor: 2 AM Dayton Pizza Gang

Japan
Satoshi Hara, JH5FXP
Donor: Japan Crazy Contesters Club

Oceania
9M8R (Opr. Jim Sullivan, W7EJ)
Donor: Northern California DX Club

South America
HC8A (Opr. Richard Smith, N6KT)
Donor: Yankee Clipper Contest Club

South America – Mainland
Horacio Botero, HK6KKK
Donor: Jose L. Bachmann, ZP6CC
& Cesar Ivaldi, ZP5K

SINGLE OPERATOR, SINGLE BAND

World – 28 MHz
ZD8Z (Opr. James Neiger, N6TJ)
Donor: Joel Chalmers, KG6DX

World – 21 MHz
9J2A (Opr. Akira Minagawa, JA0JHA)
Donor: Robert Naumann, N5NJ

World – 14 MHz
OE6Z (Opr. Michael Schwab, OE6MBG)
Donor: North Jersey DX Assn. – K2HLB Memorial

World – 7 MHz
P40R (Opr. Bob Allphin, K4UEE)
Donor: Fred Laun, K3ZO – K7ZZ Memorial

World – 3.7 MHz
VC1A (Opr. Yuri Blanarovich, K3BU)
Donor: Fred Capossela, K6SSS

World – 1.8 MHz
Jerzy Smoczyk, SP3GEM
Donor: Robert Wruble, W7GG

USA – 28 MHz
Bill Tippett, W4ZV
Donor: Donald Thomas, N6DT

USA – 21 MHz
Robert Shohet, KQ2M
Donor: World Radio

USA – 14 MHz
Walter P. Smith, K1DWQ
Donor: Southern California DX Club

USA – 7 MHz
Bill Kollenbaum, K4XS
Donor: Stanley Cohen, W8QDQ

USA – 3.7 MHz
Peter J. Dalton, W6KW
Donor: Arnold Tamchin, W2HCW

USA – 1.8 MHz
Larry L. Lindblom, W0ETC
Donor: World Radio

Carib./C.A. – 28 MHz
KP2A (Opr. Robert B. Hayes, KW8N)
Donor: Snake River Contest Club

Europe – 28 MHz
Zdravko Balen, 9A9A
Donor: CQ Magazine – VP2ML Memorial

Europe – 21 MHz
Vitomir Kregar, S56M
Donor: Tine Brajnik, S50A

Europe – 14 MHz
Wilfried Gottschald, DJ7AA
Donor: A. G. Anderson, GM3BCL

Europe – 7 MHz
Drago Turin, S59A
Donor: Roger Burt, N4ZC

Europe – 3.7 MHz
Emil Tafro, T99W
Donor: Marconi Contest Club – I3MAU Memorial

Europe – 1.8 MHz
Virgis Matizevicius, LY3BS
Donor: Robert Kasca, S53R

Oceania – 21 MHz
9M6NA (Opr. Saty Nakamura, JE1JKL)
Donor: Bruce D. Lee, KD6WW

Japan – 21 MHz
Kazunori Kuroki, JR6EZE
Donor: DX Family Foundation

Japan – 14 MHz
Toshihiro Ishibashi, 7M4BEN
Donor: Take Yokoyama, JL1BLW

MULTI-OPERATOR SINGLE TRANSMITTER

World
P3A (Oprs: RA9JX, 5B4LP, RZ3TX, UA9YAB, RV0AR, EU1AA)
Donor: Southern California DX Club
W6AM Memorial

U.S.A.
W2A (Oprs: W2XX, N2TX, KE2TR, N2DVQ, KD2TT, AA2MF)
Donor: Carolina DX Association

Carib./C.A.
VP5R (Oprs: N0AT, N0KK, N5QQ, W5WW)
Donor: Eric Scace, K3NA

Asia
UA7A (Oprs: RU9AN, RU9AZ, RW9MG, RZ9AZ, UA9AJ, UA9AR, UA9BA, UN4L)
Donor: Edward L. Campbell, NT4TT

Europe
TM2Y (Oprs: F6BEE, F6ARC, F6FGZ, F6FVY, F5NLY, F5SNJ, F5VCO)
Donor: Bob Cox, K3EST

Oceania
AH2R (Oprs: JG3RPL, JR3RVO, JI3ERV, KH2/JR8VSE, KH2/JR8PPG, JR7OMD)
Donor: Junichi Tanaka, JH4RHF

South America
PJ2C (Oprs:N4OKX, N6HR, W8KKF, WA8LOW, K8RF, W9EFL, W0CG)
Donor: Victor Burns, KI6IM

South America-Mainland
CE3F (Oprs: CE3FIP, CE8ABF, CE8SFG, SM3SGP)
Donor: Tomas Zappini, ZP5AZL &
Renato Bellucci, ZP5XF

MULTI-OPERATOR MULTI-TRANSMITTER

World
CN8WW (Oprs: DJ5IW, DK2OY, DK5WL, DK6WL, DK7YY, DL1MFL, DL2NBU, DL4MCF, DL6FBL, DL6RAI, DL8OH, DL8WPX, DL9NEI, OE2LCM, OE2MON, OE2VEL)
Donor: W6NL & K6BL

U.S.A.
KC1XX (Oprs: KC1XX, K1GQ, K1EA, KC1F, W1FV, AD1C, N1RR, DL7ALM, KB1AWE, KM3T, K6AW, Christine)
Donor: Paul Hellenberg, K4JA

Europe
M6T (Oprs: G4BAH, G4IFB, G3XTT, G3WGN, OH6YF, G4VMM, G0CYB, G4BUO, G4TSH, G4PIQ, G0MTN, G4BWP, G0KRL, G0AEV, G0WCW, G0AFH, G7OCD)
Donor: Finnish Amateur Radio League

Japan
JA5BJC (Oprs: JA5BJC, JA5FDJ, JA5JCC, JH5FXP, JH5RXS, JR5JAQ, JR5VHU, JM1UWB, JS1OYN)
Donor: Ryozo Goto, JH3JYS

CONTEST EXPEDITIONS

World Single Operator
XX9TRR (Pertti Simovaara, OH2PM)
Donor: National Capitol DX Assn.
Stuart Meyer, W2GHK Memorial

WORLD MULTI-SINGLE

T88WX (Ops: JA1WSX, JA7AYE, JH4OWG)
Donor: Tachio Yuasa, JA9VDA

WORLD MULTI-MULTI

R1MVZ (Ops: OH2BR, OH2KI, OH5BM, OH5NE, OH5SC, RA1ACJ, RA1ALY, RA3AUU, RU1AS, AB6BH, K6JL, N6AA, N6ZZ, W6NV)
Donor: Dieter Loffler, DK9KD
DJ3NG & DJ4EI Memorial

SPECIAL SINGLE OPERATOR AWARD

World-All Band Under 21 years old
Hamilton Oliveira Martins, PY2YU
Donor: Gene Zimmerman, W3ZZ

WORLD ALL BAND HIGH YL

Emily Thiel, P43E
Donor: Yutaka Tanaka, JH3DPB

Seiko, JJ6TYG.

(YT1AD), 6V6U (K3IPK), 9K2HN, 8R1K (OHØXX), and 9M8R (W7EJ).

Low Power

Pedro, HC1OT, repeated his world high victory of 1998. Taking time off from his photography business, he produced a new low power record. Far away in ancient Egypt, SU9ZZ edged out Dan, LY6M (LY1DS), and Emily, P43E, for second place. He sure made a lot of deserving contesters happy with the SU/34 multipliers. Dan, LY1DS, pushed LY6M to a first-place win in Europe over fellow countryman LY3BA. Third place in Europe went to DKØDO, DL1MGB operator.

Here in the US, Ann, WA1S, repeated as the #1 USA low power champion. She took away the USA trophy. Ann sure knows how to work the QSOs, and her accuracy is among the best. The battle for second place brought that honor to K1SD, with WT1O taking third.

Special mention must be made of the head-to-head competition between K6RO and K8PO/6 for the top West Coast score. K6RO prevailed in a close battle. It is not easy to make the Top 10 box, especially from Asia or the Indian Ocean. Three stations did it this year. The top Asian score was achieved by RSØF, with JL1ARF placing number one in Japan and Bruce, 3B8/KD6WW, taking Africa.

QRP

First you make the decision to try something a little different. Then you try something really difficult. Then you discover QRP in the CQ WW. With only a few watts output, the strategy you choose is almost always search & pounce (S&P). What a great way to learn very important contesting skills.

Jacobo, P4ØB (P43P), put his location and skill to full use to win the world QRP. He was able to run stations for a short time, but had to S&P most of the time. Jacobo's QTH is on the northwest coast of Aruba.

The next QRP champions were from Europe. YT7TY took top European honors, followed by F5MUX and I5NSR. The number one USA QRP scorer was KQ3V, followed by WT3W and WAØJYC. Special mention has to be made of the QRP Asian scores of RZØSR and JA6GCE. They are a long way from population centers.

Assisted

The year 1999 was the Assisted category's biggest. With over 300 entries, this category offers a way for DXers and contesters to contribute to their club. The category always attracts very good operators who want to try to maximize their multiplier effort. The secret to doing well in the Assisted category is to remember the QSOs are the name of the game—hard to do with so many juicy multipliers flying by on the screen every hour. The world top honor went to Rick, KI1G, who finished ahead of Dave, KH2/N2NL. Dave's score was quite a feat from the far Pacific. Third world high and first in Europe was John, ON4UN. Second place in the USA went to Charlie, K3WW, who sure knows how to operate this category. Third place went to Lou, KS1L. In Europe second place went to André, F6GYT, who used the contest call TM2V, and third place was won by Ozren, 9A7W, operating 9A5Y.

Multi-Single

Cyprus is fast becoming a popular location from which to mount a challenge for top honors. This year was no exception. P3A operated by a team of Russian, Cypriot, and Belarus contesters pushed their station to the clear number one spot. After several years of experience on the island, the P3A team has found the right QTH. Second world honors went to the Canadian team located at the VE3EJ QTH. You can see a photo of John's QTH on the cover of January 1996 *CQ Contest* magazine. Not very far behind was the French team of TM2Y. Located in northeastern France, they used their experience to take the highly fought over top European spot. Second in Europe was the IQ4A team. Having lost part of their land, they had to consolidate their antennas into a smaller area on top of Mt. Capra. The third-place European champion was CQ9K. Using a special callsign, W2A ran away with the top USA position—not an easy task! Second place went to the Frankford Radio Club power house, N2NU, and third went to the northern Ohio team of K8AZ. The multi-single category is great fun. If you get a chance to join a team, you will find it a real learning experience.

Multi-Multi

Zone 33 was clearly the place to be for the 1999 contest. Winning is one thing. Setting new standards while turning conventional wisdom on its head is another. The crew of CN8WW clearly did both. With a score which at first glance seems like a typo, they worked almost 23,000 QSOs and made 73+ million points! In one contest they made the job of beating the world record from zones 9 and 10 seem like a herculean task. Operating from northern Morocco from a beach front where all their antennas were located, the CN8WW crew clearly did their homework. Their submitted log was very clean.

Finishing in second place was the Italian crew of IG9A. Putting another zone 33 into the top box, this team set up their station on Lampadusa Island. They also broke the old multi-multi record set by the third-place finishers, PJ4B. All three top multi-multi scores beat the old world record—some more than others.

In the USA, the crew at KC1XX and K3LR

TEAM CONTESTING

1. Neiger's Tigers #1: 66,546,582. P4ØE(CT1BOH), HC8A(N6KT), EA8BH(N5TJ), GW4BLE.
2. CCF Unlimited: 27,609,020. XX9TRR (OH2PM), 8R1K (OHØXX), OH5LF, OH1VR, OHØZ (OH2MAM).
3. Team Nippon: 21,314,108. 9J2A (JAØJHA), 9M2TO (JAØDMV), 9M6NA (JE1JKL), JY9NX (JM1CAX), V8A (JO1RUR).
4. Neiger's Tigers #2: 18,653,550. ZX5J (PP5JR), UA9MA, W1WEF, W9RE.
5. Bavarian Chaos Crew: 12,719,201. DF4RD, DF7RX, DKØDO (DL1MGB), DL3NCI, DL4NAC.
6. CCF Max-3-Towers: 11,040,774. OH6RX, OH6NIO, OHØV (OH6LI), LU/OHØWW (OH1EB), OH8BQT.
7. Beverly Contest Group: 8,911,148. K1ZM (W1NT), W1ZT, K1EO, K1JE, W1TE.
8. Neiger's Tigers #3: 5,867,980. CT1ELP, ZD8Z (N6TJ).
9. Dream Team: 5,703,608. LY1FW, LY2OX, LY5W (LY1DR), LY6M (LY1DS).
10. CCF Singles: 3,094,674. OH8LQ, OH2RA, E44DX (OH1RY), OH1JD.
11. Novi Sad Contest Team: 1,125,169. YU7QL, YU7W, YU7WJ.
12. CCF Lounge Team: 238,215. OH9A (OH1EH), OH1BOI.
13. CCF Part-Timers: 173,032. W5/OH7WV, OH4A (OH4JLV).
14. Isla de la Torre Team: 166,535. EA1BAW, EA1AAW, EA1ATQ, EA1EB, EA1/YV5NIQ.

TOP SCORES

WORLD

All Band
EA8BH 25,646,796
HC8A 18,607,050
P4ØE 15,583,506
8P1A 11,013,948
3V8BB.....10,939,698
GIØKOW ...10,457,664
6V6U 9,562,950
9K2HN 9,330,834
8R1K 9,121,163
9M8R 8,662,544

28 MHz
ZD8Z.....3,794,280
ZX5J.....3,086,148
KP2A.....2,324,283
WP2Z.....2,297,199
9A9A 2,272,950
A61AJ 2,177,156

21 MHz
9J2A.....2,331,054
P43A 2,284,828
9Y4VU..... 2,013,050
YV5IVB 1,678,950
5NØW.....1,625,406
H2T 1,405,760

14 MHz
OE6Z.....1,878,569
DJ7AA.....1,822,464
OK1RI 1,431,846
9Y4NZ.....1,429,672
OH8LQ.....1,196,432
EA3ATM.....1,162,599

7 MHz
P4ØR.....500,000
S59A 484,050
HG9X 422,808
YT7A 416,139
S52O.....390,555
K4XS.....371,637

3.7 MHz
VC1A.....305,000
E44DX.....261,590
VE1JF 158,974
T99W 150,920
SP7VC 149,904
DL3LAB.....147,805

1.8 MHz
SP3GEM 86,516
LY3BS.....68,612
OK1DX.....62,530
OZ3SK 46,208
ZF2LA 40,545
7S6A 24,766

Low Power
All Band
HC1OT.....6,006,550
SU9ZZ.....4,823,882
LY6M 4,367,360
P43E 4,312,452
RSØF 3,393,404
WA1S 3,064,986
LY3BA.....3,044,888
JL1ARF 3,001,683
3B8/KD6WW
.....2,534,468
UP5P 2,499,800

28 MHz
KHØ/JF1RPZ
.....1,066,032
HC1JQ 994,224
PY1KS 962,822
LU3HIP 912,170
9A4KK.....843,447
VP2VF.....832,710

21 MHz
VC7A.....1,113,196
PY2P.....925,453
TA3D.....819,674
RU4PL 740,124
UAØFDX.....705,860
XE1CRO 545,860

14 MHz
HK3JJH.....822,822
RJ9J.....716,720
3E1DX.....673,608
TM9K 446,042
HAØIT.....425,712
LS9F 408,114

7 MHz
IR5T 172,909
YY5OIA 148,599
YV5NCK.....94,900
S54A 87,248
UA9ACJ 38,214
SP9ABU 32,178

3.7 MHz
TA3J.....178,128
9A2EU.....138,303
UA6LV.....63,140
LZ1UQ 63,084
S57CBS 55,029
4L2M 53,884

1.8 MHz
EU6EU 37,926
S57NMQ 26,488
DF9LJ 10,718
UT7UW 10,168
G3XWZ 8,427
VE7SV 6,289

QRP
All Band
P4ØB 2,018,688
YT7TY.....1,180,635
F5MUX.....1,060,878
I5NSR 844,512
KQ3V 843,720
RZØSR 834,750
LY2FE 823,970
WT3W 703,993
JA6GCE 618,094
YU1KN 535,150

Assisted
All Band
KI1G.....7,639,478
KH2/N2NL...7,619,776
OT9T.....7,048,074
K3WW.....6,310,200
KS1L 5,913,960
K2BU.....5,907,918
N3RR 5,901,750
TM2V 5,795,370
K2NG 5,440,030
W2RE.....5,298,144

Multi-Operator
Single Transmitter
P3A 17,321,994
VE3EJ 14,770,600
TM2Y 14,703,147
IQ4A.....13,688,588
VP5R.....13,492,710
6D2X 13,002,714

Multi-Operator
Multi-Transmitter
CN8WW 73,194,876
IG9A.....61,215,336
PJ4B 59,127,810
ZXØF 41,625,828
EA9EA 40,590,074
KH7R 33,588,440

USA

All Band
K1AR.....7,898,499
NT1N.....6,908,603
K3ZO.....6,171,165
K4ZW.....5,859,104
K3OO.....5,699,012
WB9Z.....5,503,582
K3CR 5,181,670
W1WEF.....5,079,638
N2IC/Ø.....5,074,398
W3BGN.....4,954,633

28 MHz
W4ZV.....1,400,870
K4EA.....1,308,736
N4UK 1,295,294
K5RX.....1,091,870
KZ5MM 1,059,377
WC4E.....963,333

21 MHz
K8DX.....1,235,388
W7WA.....1,004,988
N7DD 972,027
KØCL.....849,603
K3RV/4.....784,492
K4JNY.....537,900

14 MHz
K1DWQ.....321,945
W4RRR.....308,784
KGØZI 211,400
W5FO.....194,724
W7EB.....180,495
W8TWA.....168,192

7 MHz
K4XS.....371,637
K7EM 198,996
K7NV.....54,166
WØLSD 50,076
N5DO 42,770
KE4SCY 29,637

3.7 MHz
W6KW.....83,600
KE1Y.....69,192
WØCD/8 37,446
K7ZZZ.....22,140
WØAH 9,662
K2FF/5 9,072

1.8 MHz
WØETC 6,318
W2VO 2,993
K4TEA.....1,275

Low Power
All Band
WA1S.....3,064,986
K1SD.....2,101,764
WT1O.....1,979,649
N1HOQ 1,769,508
K6RO 1,708,938
K8PO/6 1,610,564
K1VUT 1,596,000
WD5K.....1,430,100
W2TZ 1,422,244
N1WR/3 1,368,075

28 MHz
KØKE.....438,075
KT3RR 390,260
K2MFY 303,524
K6KAY 294,630
W5ZO.....289,674
WJ7S 210,420

21 MHz
N4MO.....273,966
ND8DX.....242,959
NØNR 227,696
NI5M 209,000
NW7Q 189,596
NØRA 175,968

14 MHz
WA7BNM/6 136,708
KG7RZ.....65,535
W9HV.....55,500
W9JOO 54,099
AF8C.....47,634
KN5L.....41,610

7 MHz
WB2ZTH 20,676
KU6T.....6,059

3.7 MHz
No Entry .....

QRP
All Band
KQ3V 843,720
WT3W 703,993
WAØJYC 273,182
WA3NKO/4 160,962
N1TM 123,690
W9PNE 81,713
N8XA.....73,382
N6ZS.....58,968
NM1K.....57,534
NQ7X.....49,432

Assisted
All Band
KI1G.....7,639,478
K3WW.....6,310,200
K2BU.....5,907,918
N3RR 5,901,750
KS1L 5,895,897
K2NG 5,440,030
W2RE.....5,298,144
W2GD 5,001,930
W3EEE 4,997,877
N3AD 4,711,791

Multi-Operator
Single Transmitter
W2A 10,783,788
N2NU 8,760,304
K8AZ.....8,356,205
K8CC 7,161,844
K5MR 6,874,863
K4ISV 6,410,808

Multi-Operator
Multi-Transmitter
KC1XX 25,963,386
K3LR 25,709,664
N2RM.....24,430,230
W3LPL 21,168,659
K9NS.....15,380,904
N3RS 13,823,641

EUROPE

All Band
GIØKOW ...10,457,664
GW4BLE 6,657,018
OHØZ 6,620,832
S5ØA 6,504,693
4N9BW.....5,862,172
S57S 5,840,250
OH6RX.....5,365,115
RM4W.....5,197,066
SL3A 4,974,200
DJ4PT 4,586,742

28 MHz
9A9A 2,272,950
OK2RZ.....1,794,729
9HØA.....1,658,916
S53R.....1,568,392
CT1BOP.....1,499,532
S53T 1,315,310

21 MHz
S56M.....1,223,694
OK1RF 1,096,480
ERØF.....1,075,392
SP7GIQ.....1,056,396
S5ØU.....1,055,934
DL1IAO 1,023,975

14 MHz
OE6Z.....1,878,569
DJ7AA.....1,822,464
OK1RI 1,431,846
OH8LQ.....1,196,432
EA3ATM.....1,162,599
G3NLY 968,064

7 MHz
S59A 484,050
HG9X 422,808
YT7A 416,139
S52O.....390,555
IO4L 302,853
LZ2CJ 294,294

3.7 MHz
T99W 150,920
SP7VC 149,904
DL3LAB.....147,805
S57O.....138,993
EW1WZ.....126,276
YZ6A 118,678

1.8 MHz
SP3GEM 86,516
LY3BS.....68,612
OK1DX.....62,530
OZ3SK 46,208
7S6A 24,766
LY2OU 12,936

Low Power
All Band
LY6M.....4,367,360
LY3BA.....3,044,888
DKØDO 2,265,189
CT1ELP 2,073,700
DF7RX 2,073,500
S55A 1,884,450
S59AA.....1,825,140
HA1CW 1,662,966
DL7ANR.....1,569,584
GW3JXN 1,437,678

28 MHz
9A4KK.....843,447
Z31JA.....715,929
DL1LH.....715,007
F5BZB.....616,137
CT1ESO.....596,786
9A99F 589,260

21 MHz
RU4PL 740,124
S57IIO.....521,840
SP5ES 497,336
UA3ADN 475,794
UT9F 406,481
HA9MDP 402,371

14 MHz
TM9K 446,042
HAØIT.....425,712
EA2CJC 355,927
RA3WA 277,264
IT9ICS.....273,208
EA3KA 252,000

7 MHz
IR5T 172,909
S54A 87,248
SP9ABU 32,178
RW3DU 28,301
T91AAW.....25,853
OE3WMW 19,053

3.7 MHz
9A2EU.....138,303
UA6LV.....63,140
LZ1UQ 63,084
S57CBS 55,029
UR5QBB 52,388
YU1CC.....48,198

1.8 MHz
EU6EU 37,926
S57NMQ 26,488
DF9LJ 10,718
UT7UW 10,168
G3XWZ 8,427
IØKHP 4,840

QRP
All Band
YT7TY.....1,180,635
F5MUX.....1,060,878
I5NSR 844,512
LY2FE 823,970
YU1KN 535,150
EA3CKX.....448,818
EA1GT 373,730
YU1LM 371,995
UU4JO 336,679
HA7YS 310,753

Assisted
All Band
OT9T.....7,048,074
TM2V 5,795,370
9A5Y 4,827,020
F5RZJ 4,277,460
DJ2YA.....4,239,585
UTØU 4,219,046
DF4RD 3,530,555
OK2FD 3,348,360
EA7AGW.....3,071,410
OH6NIO 2,836,024

Multi-Operator
Single Transmitter
TM2Y 14,703,147
IQ4A.....13,688,588
CQ9K 12,440,610
SN2B.....12,294,892
DFØHQ.....11,384,976
TM1C 11,304,956

Multi-Operator
Multi-Transmitter
M6T.....29,338,624
RW2F.....23,815,161
OT9A.....22,481,380
OH2U 20,479,356
GM7V.....18,798,580
HG6N.....16,444,610

had a real fight. When the electrons settled down, it was Mat's team at KC1XX who prevailed and set a new USA multi-multi record. After a lot of work making even higher towers and bigger antennas, the KC1XX crew can now almost see Ireland from the top of the 300 foot, 80 meter quad tower. Not at all intimidated, Tim's crew at K3LR once again demonstrated their considerable skill by taking second place. Third place went to another East Coast powerhouse, N2RM.

Not to be denied, the European champion, M6T, rose to the occasion and set a new European multi-multi record. The M6T crew set up their station Field Day style on a farm. Second place in Europe went to the always present RW2F. The RW2F crew is to be congratulated for such a great score from so far north. The third position in Europe went to OT9A.

When you look at the top multi-multi scores, bear in mind many of them were DXpeditions with most of the stations being assembled where there were none before: CN8WW, IG9A, PJ4B, and M6T. Quite an effort.

Team Contesting

With only four out of five members submitting logs, Neiger's Tigers #1 talked their way to a new world team record! With 66.5 million points in their logs, they sure made it clear who was the king of the hill. The battle for second through third place was interesting. Taking second place was Contest Club Finland Unlimited (CCF). They edged out third-place Team Nippon. If you check the calls on these teams, you will find many a rare multiplier. Why not talk to your friends around the world and form a team of five? It's easy and fun, and you will develop team spirit. Look at the rules in this issue and on the CQWW web page <http://www.cqww.com> for all the necessary information.

Special Mention

Every year the CQWW attracts contesters who travel to distant QTHs. A special thanks to the following DXpeditions: ZF2NK, ZF2LA, TI5EBU, VP2MGL, VP2MBT, KP4/SM5AOE, V47KP, V47NS, PJ8/N7KG, KP2A, WP2Z, KP2/K1VW, KP2E, ZD8Z, XT2HP, EA8BH, 9E1C, 3B8/KD6WW, 6V6U, S79AU, 3V8BB, Z21KD, XX9TRR, E44DX, A61AJ, OHØZ, ZA/S51PF, ZB2/W8DO, ZB2/AA3SN, 9H3AAA, V8A, 9M8R, 9M6NA, 9M8YY, KHØ/JF1RPZ, KHØ/JE3WOM, T2DX, YJØDX, FW/JM3XAV, P4ØE, P4ØR, HC8A, 8R1X, PJ9/ON4CFD, 5B4AGD, OHØV, HI9/DK8YY, 6D2X, XE2/N7RK, VP2MCS, J6J, FS/K7ZUM, VP5R, VP5DX, NP2B, P3A, ZA/S57AW, T88WX, AH2R, PJ2C, V26B, J3A, J6R, VP5T, IG9A, IH9P, CN8WW, HBØ/HB9AON, R1MVZ, T33Y, ZXØF, and PJ4B.

The competition was fierce in many categories. Check out the scores to find them. For starters, look at the USA multi-multi battle for the top position, Europe 3.7 MHz, Z31JA vs DL3LAB, KP2A vs WP2Z, JH5FXP vs JH4UYB, V8A vs 9M8R, L99D vs LT7H, LTØH vs LU7YS, XR1X vs CE8EIO, S55A vs S59AA, and S58J vs S57J. There are many more such close races as well.

There were many outstanding efforts from propagationally challenged areas. The top USA score from west of the Mississippi was Steve, N2IC/Ø, followed by W7GG and WØEJ. Out in the Pacific, Jim, 9M8R (W7EJ), edged out V8A (JO1RUR), with Al, NH7A, third. KL7RA's effort in the multi-multi category was outstanding. W6KW finished first in the USA on 3.7 MHz, and WØETC was first on 1.8 MHz! The club station JN1YUU was operated by 10–13-year-old YLs, and UX8IXX was operated by young students. If you work those stations, be sure to give some encouragement to these youngsters.

New All Time SSB Records set:

World: AB EA8BH (N5TJ); 28 ZD8Z (N6TJ); L3.7 TA3J; Q28 KP4FP; Q14 KR2Q; A28 5X1T (ON6TT); A21 VA3MM; A14 RN3QO; A1.8 S57M; MM CN8WW.

Africa: AB EA8BH (N5TJ); 28 ZD8Z (N6TJ); A28 5X1T (ON6TT); MM CN8WW.

Asia: 28 A61AJ (DL2CC); 3.7 E44DX (OH1RY); L14 RJ9J (RA9JR); L3.7 TA3J; A1.8 EX8MBA; MS P3A.

Japan: QA JR4DAH; Q7 JA6GCE; Q3.7 JA1AA; MM JA5BJC.

Europe: AB GIØKOW; 28 9A9A; 14 OE6Z (OE6MBG); LA LY6M (LY1DS); L28 9A4KK; L21 RU4PL; 3.7 9A2EU; QA YT7TY; A28 SP3KEY; A21 OHØV (OH6LI); A14 RN3QO; A1.8 S57M; MM M6T.

North America: L21 VC7A (VE7AHA); L1.8 VE7SV; Q28 KP4FP; Q14 KR2Q; A28 KP4WW; A21 VA3MM.

USA: 28 W4ZV; 21 KQ2M; LA WA1S; Q14 KR2Q; AA KI1G; MM KC1XX.

Oceania: L28 KHØ/JF1RPZ; QA DU3RCM; Q28 NØKE/KH6; Q3.7 KH6SQ (W8QZA); AA KH2/N2NL.

South America: AB HC8A (N6KT); LA HC1OT; L14 HK3JJH; MM PJ4B.

Comments

The 1999 contest was definitely a great one. Beyond the great conditions, your help by submitting an electronic log made the contest the most thoroughly checked in history. We received over 3000 e-mails and disks. That was about 75% of the total logs received at *CQ* HQ. Your effort to submit an electronic log allows for a fairer adjudication process.

Submitting an electronic log is easy. Send your SSB log and summary to <ssb@cqww.com> by December 1, 2000. Please try to send your log in Cabrillo format. The Cabrillo format is now a standard submission with CT, TR, NA SuperDuper, and WriteLog. Please remember to name your file with your call with .cbr extension—e.g, PJ4B.cbr. If you have an older version of any standard logging software, send the following files: CT.all, TR.dat, NA.prn. Of course, include the .sum file if it is separate. If you are multi-single, please send your CT.bin file, because there are two .all files for the multi-single category. Please do *not* submit program-specific files such as spreadsheets—for example, Excel, Microsoft Word, or any other non-standard format. If you have any questions about the CQ WW please send them to: <questions@cqww.com>. You can see information concerning the CQ WW on our web page at: <http://www.cqww.com>.

Play by the Rules

One of the problems that has been around for years and years is bending the contest rules. Every year the CQ WW Contest Committee receives complaints about individuals who are thought to be cheating. The main method used in a tricky manner has two manifestations. One is a single operator entrant who has the help of several people to find QSOs or multipliers, for example. The Contesting Reflector has been replete with information concerning possible violators. The reflector is an ideal forum to air such complaints. Peer pressure is the best way to inform an errant contester to follow the rules. The winners on every level have in contesting want the assurance that their competition is playing fairly.

Brice, W9PNE, 81 years young.

Operating 14 MHz from Argentina was LU7YS.

The second method is the violation of the distance rule by multi-single and multi-multi teams. You are not allowed to have stations of any kind located all over a country, city, or island. We are aware of several such violators, and as we collect evidence in the future they will be disqualified.

Thanks!

Each year the results you finally see in this issue are the result of thousands of hours of work by the CQ WW Contest Committee. The log checkers were: N3ED, K1DG, KR2Q, N2NC, K6NA, W7EJ, N5TJ, and N9RV. Problem logs (decoding) were handled by W3ZZ, N5NJ, and JE1CKA. Converting paper logs to electronic form was handled by K3LR, K3ZO, and N2NC. Helping to proof-check the call database were K3LR and N5TJ. DX members of the committee helped obtain PTT databas-

BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

Number groups indicate: QSOs/Zones/Countries on each band

WORLD TOP SINGLE OPERATOR, ALL BAND

Station	160	80	40	20	15	10
EA8BH	150/13/54	547/18/80	682/27/97	2655/40/159	2071/39/148	4146/40/155
HC8A	229/14/30	569/25/79	924/29/102	1154/36/116	1848/37/135	3915/34/133
P40E	80/12/26	426/19/66	649/25/81	1392/36/118	1627/37/121	3642/37/121
8P1A	96/7/17	437/16/48	797/24/87	1471/31/98	2273/31/99	2778/31/104
3V8BB	213/6/47	430/15/65	339/21/84	1493/34/111	1195/35/116	2127/36/123
GIØKOW	134/6/45	373/15/71	600/24/85	1614/35/114	1765/38/130	1890/37/144
6V6U	9/7/9	83/10/25	388/20/64	1569/31/98	1571/31/107	2498/29/107
9K2HN	18/5/16	72/8/35	573/27/96	1503/39/121	1179/38/131	1674/39/132
8R1K	29/6/17	183/12/27	518/17/65	937/31/92	1575/33/116	2664/32/115
9M8R	11/4/7	114/20/40	436/35/89	1069/38/134	1134/38/108	2074/37/114

USA TOP SINGLE OPERATOR, ALL BAND

Station	160	80	40	20	15	10
K1AR	21/8/15	154/16/59	231/29/84	1145/38/142	1150/36/123	1392/33/128
NT1N	39/12/33	118/17/62	126/20/68	703/39/129	616/33/111	2026/35/140
K3ZO	11/5/10	78/14/39	122/17/58	966/34/113	1134/33/107	1433/33/122
K4ZW	33/11/21	154/15/64	139/26/71	704/31/117	749/31/117	1357/34/123
K3OO	20/7/14	120/14/58	135/21/65	723/34/126	612/30/110	1564/33/134
WB9Z	35/9/18	87/19/47	130/24/68	296/32/92	1054/36/119	1557/36/131
K3CR	31/9/15	147/14/54	121/20/59	751/35/110	865/33/104	1312/30/115
W1WEF	20/9/12	104/16/52	122/18/60	554/33/106	727/32/99	1589/32/124
N2IC/Ø	25/8/10	108/18/41	264/25/57	567/33/105	774/38/115	1282/35/133
W3BGN	34/12/18	127/17/59	148/23/74	618/37/113	762/32/100	1153/30/114

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

P3A	198/8/50	575/19/81	854/24/98	1964/37/142	1829/38/139	1829/38/165
VE3EJ	263/15/30	447/21/76	800/34/123	1478/40/173	1378/40/158	1825/37/173
TM2Y	93/8/56	447/21/90	587/35/116	912/39/161	1746/38/152	2601/40/177
IQ4A	59/7/59	87/18/83	422/29/111	1641/39/151	1566/40/143	591/40/155
VP5R	169/11/26	496/17/69	813/22/91	1786/33/122	2059/35/126	2918/33/141
6D2X	196/9/16	457/20/52	1283/31/112	1266/37/135	1382/37/142	2965/34/153

USA MULTI-OPERATOR SINGLE TRANSMITTER

W2A	15/9/14	198/17/76	295/27/102	1203/40/164	1623/38/153	1334/38/166
N2NU	33/15/31	196/17/77	364/29/109	813/40/153	999/39/146	1394/36/162
K8AZ	34/14/29	120/21/69	132/29/101	944/40/159	933/37/144	1519/36/166
K8CC	21/11/18	58/17/47	196/29/84	832/40/154	932/37/139	1458/36/161
K5MR	37/12/23	66/23/56	207/30/98	831/38/152	847/38/140	1219/37/160
K4ISV	29/13/26	84/23/64	306/31/108	366/38/137	1128/39/144	1245/37/171

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

CN8WW	1035/18/83	2220/25/118	2717/35/141	5900/40/186	4978/40/181	6112/40/191
IG9A	1190/17/86	2451/32/117	2988/39/139	5207/40/184	3937/40/182	4543/39/177
PJ4B	599/16/37	1175/21/103	2234/33/136	4699/39/180	5637/40/190	6273/39/188
ZXØF	249/16/54	766/26/94	1566/34/122	3894/40/167	4546/39/179	5241/40/185
EA9EA	44/3/17	977/23/92	2193/35/130	4234/40/173	4022/38/169	4260/40/178
KH7R	253/13/18	929/27/57	1920/37/96	3125/39/155	3616/39/149	4820/40/160

USA MULTI-OPERATOR MULTI-TRANSMITTER

KC1XX	197/16/36	699/24/102	746/31/119	2711/40/185	3245/40/170	2596/36/170
K3LR	259/16/40	697/26/94	893/34/126	2647/40/192	2827/40/169	2682/37/178
N2RM	175/17/43	652/27/110	730/34/122	2243/40/176	2919/40/173	2649/36/171
W3LPL	252/17/45	542/24/100	740/34/121	2471/40/182	2360/39/163	2148/37/175
K9NS	268/17/35	233/26/78	347/31/105	1613/40/171	2039/40/156	2212/37/166
N3RS	38/14/25	249/19/85	335/28/100	1298/40/160	2204/38/162	1779/35/165

es and provided help when entrant interface was necessary: F6BEE, JE1CKA, OH2MM, CT1BOH, OH2KI, ON6TT, G3SXW, I2UIY, EA3DU, OK2FD, S5ØA, DL6RAI, and VE3EJ. Special advisors were UA9BA, K3ZO, PY5EG, and VA7RR. The CQ WW log checking software is kept current through the efforts of N6TR. The CQ WW web site is made available by K2MM. All the SSB electronic logs were processed by N6TW before they were placed in the call database. Larry also updated the CQ WW web page with the UBN reports. Dick, N6AA, spent long hours RITing the call database into a usable form. The call database was over 3.5 million calls!

Thanks to all the entrants for their electronic submissions. Congratulations to all the entrants and winners! The 2000 CQ WW Contests should provide another fantastic experience. Join the SSB on October 28–29, 2000!

73, Bob, K3EST

DX QRM

Very good and numerous the participation. Excellent the opening on 10 meters, allowing to work totally. Very good it would be that to future, a space is assigned to operate with high power and for separate those of low power...***4B1BEF (XE1BEF).*** The rarest thing when contesting from 4U1VIC is time. Due to security reasons station and antennas can be put together not earlier than late Friday afternoon and everything has to packed up directly after the contest. Thank goodness that there is an "open-all-night" version of that famous burger restaurant next to the UN building. Thanks to JH4RHF and the rest of the VIARC. You have been great hosts...***4U1VIC.*** No cluster access, but a couple of people helped me working a multiplier, so guess that puts me in the Assisted class. This contest was at the peak of the 11-year cycle, at the yearly peak for 10m, and at a point with low indices. How much better could it get? 10m was open with massive signals 24 h/day. Pileups spread from 28,200 to 29,250.1 MHz full with contests. Never heard that before. It is always a yearly high to hear, as the starting time of the contest come closer, people setting up stations, coming on the air from rare places, and then actually warming up for the contest a few hours before. Like Formula 1 drivers blowing smoke while warming up. This was my last radio-weekend in 5X...***5X1T (ON6TT).***

Good conditions most of the time apart from dusk and sunset in E. Africa when conditions die. Lost electricity power (the usual thing in Mombasa) on two occasions and lost about 3 hrs in total. Although working single band, single operator, *many* stations repeatedly requesting me to QSY to other bands even before giving me my report. Why should I want to QSY having found a good spot on 28 MHhz and working a very large pileup!?...***5Z4IC.*** Good propagation on 80 meters, but lot of QRM in Europe and it was very difficult, from time to time almost impossible, to copy DX stations even if their signal was 59, because the QRM level was 59++most of the time... ***9A2EU***. First I have to thank Ralph, 9G1RQ, for his help with my license and equipment. This was my first contest from Africa. Great condx! Ten was open full 48 hours! Had some really nice runs with over 200 QSOs/hour. The "rate meter" (K1EA) showed over 400 couple of times. Pity I was so tired. Slept just 2 hours before the contest and was unable to stay on all the contest. I know I lost very much. Hope it will be much better in CW part. Congratulations to ZD8Z and ZX5J for outstanding results. Great job!...***9G5ZW.*** This is the first time to enjoy WW test outside from Japan. Enjoyed very much but it was tough to work US stations from here with wire ant. and 100W!...***9M2JI (JK1AJX).*** My first SSB effort from 9M6NA!...***9M6NA (JE1JKL).***

Great condx on 10 meters, station on condo lanai in Urban Honolulu. Note: *Not* KH7R...***AH7R.*** The last contest of the century is always a wonderful experience. 20 meters was poor propagation conditions in my country, 10 meters best band... ***CE3PA.*** This was another great contest! Although propagation wasn't good as I expected, I beat my previous record. Sad thing is "big gun station" behavior: Rules should say they could have at least 10 kHz just for them! Last, but certainly not least, I was very well surprised by a lot of young contesters (under 15). The highlight of this CQ WW was a QSO with a 10-year-old boy. That made my day!!! Please keep on the good work. CU next year!...***CT1EAT.*** It was my first CQ WW DX and tried only 10m, because very good propagation on this band. I used only 100W from my TS850S and a 5/8 vertical, but 20m high on a hill 930m. I'm surprised about so many countries I can work and cuagn in 2000...***DF2GN.*** Great conditions, as a handicapped operator I had my problems but fun. A lot of the MM or MS stations do not mention enough their call during the operation. I guess to give up the "separate Assisted class" would be a good idea. Cheating would be less and the whole contest would be more fun. Everyone has again the same chance... ***DJ6QT.*** Hope to get a new record in DL and Zone 14! First time I could easily work NA on 40m with my new antenna. Condx were great on the high bands. And hope to improve next year...***DKØDO (DL1MGB).***

The best contest result I have in my life. Nice condx to the West Coast on Sunday and great to work AH8A. Over 1172 QSOs with US, what a nice run! So I hope to have a good place and congrats to WP2Z for this nice result on 10m...***DL8UD.*** My first time to join the contest. Despite static and sometimes bad propagation, I had a great time as a single operator on 10m band...***DU1TJM.*** With MUF peaking at least to 44 MHz along the equator, 10 meters have been so good! Activity heard here from 28.230 (yes...) to 29.125. I had not made a contest QSO above 29 MHz since I had the bands restricted license (in early '80s). Something got me tired; almost half of North American STN took my call at first as EA3DUW, or said "EA3DU question mark, give me last letter." It looks many people using the same database trusted too much in it...***EA3DU.*** Normally, I work many hams from zone 29 and few from zone 2, but in this contest I worked a lot from zone 2 and not any from zone 29. All hams from zone 29 moved to zone 2?...***EA3EJI.*** Beautiful propagation, but the amplifier don't work okay and only put 400W on the air. Where was Thailand to complete the WAZ in two days?...***EA3QP.*** As it can be seen, I worked only a few "sessions" only to have a try at it and enjoyed it a lot. I was really amazed of the results with my President Lincoln monoband transceiver and CB GP 5/8-wave antenna. I would have been happier with more DX countries worked, but not bad for so few time and equipment conditions anyway. Until next year!...***EC5ACA.***

HF conditions fantastic with 10m open until late evening. It was difficult to find a clear QRG on 10m. All the illicit ops seemed to QRT for the weekend. Maybe we should have CQWW every weekend on 10m !...***EI4DW.*** What an incredible contest on 10m. DXCC in less than 8 hours on a single band, and that with the tower cranked down to 25 ft. due to gale force winds. Even Little Pistols got to feel like Big Guns in this year's contest...***EI6FR.*** Very thanks for the nice contest. See you next year... ***ERØF.*** Just on vacation. Huge cliffs behind the hotel, no Europe, no Asia, no Africa...***EA8/ES7RE.*** As usual a lot of fun. Thank you for the points, guys!...***EW1WZ.*** Blew one transceiver, one TV set, and had a lot of fun!...***F5KEM.*** Many thanks for fun during the contest. It was hard with 100W and a R5 antenna but the FT1000MP make a great job (thanks DSP...) and help me to work some *new one*...***F5NBK.*** Not much of a score but we beat last year's effort anyway. We'll be back for more. Don't forget it's just a hobby!...***FM5BH.*** Great condx on 10m. Worked A61AJ on the Saturday morning; didn't think he had my call, so didn't log him. Lesson learned; will know better next time. Thanks for the effort you guys are putting in doing the logs...***GØNWY.*** It's been five years since I tackled "The Big One" seriously and was delighted that I could still last the course. By the courtesy of G3VHB I had a tower/beam combination with real clout so that the likes of FO, FK, and T30 were calling me! A rare experience indeed!...***G3NLY.***

EUROPE TOP SINGLE OPERATOR, ALL BAND

Station	160	80	40	20	15	10
GIØKOW	134/6/45	373/15/71	600/24/85	1614/35/114	1765/38/130	1890/37/144
GW4BLE	62/4/34	206/14/56	431/19/71	873/30/95	1286/34/92	1748/35/109
OHØZ	134/5/38	423/13/62	424/24/82	1172/33/95	1181/35/97	1434/36/113
S50A	62/5/34	295/18/67	324/24/74	1034/36/112	1000/34/109	1419/35/115
4N9BW	178/7/56	425/15/69	539/31/102	742/35/123	1347/36/126	713/37/127
S57S	58/5/38	291/12/54	333/25/79	687/30/113	573/31/98	1806/37/128
OH6RX	53/6/33	95/11/52	153/22/65	1089/35/95	1440/35/102	969/33/107
RM4W	45/6/26	115/11/44	503/22/76	861/33/92	1203/34/106	1337/33/119
SL3A	149/6/44	208/14/56	493/24/82	1072/32/93	1245/33/96	865/33/103
DJ4PT	100/7/36	236/16/58	407/26/69	914/32/100	677/30/86	982/33/89

EUROPE MULTI-OPERATOR SINGLE TRANSMITTER

TM2Y	93/8/56	447/21/90	587/35/116	912/39/161	1746/38/152	2601/40/177
IQ4A	59/7/59	87/18/83	422/29/111	1641/39/151	1566/40/143	591/40/155
CQ9K	108/9/36	390/17/61	590/24/79	1911/36/115	1397/34/116	2184/35/125
SN2B	75/6/46	275/18/81	672/33/116	1175/39/143	1812/38/151	1990/40/169
DFØHQ	54/7/54	346/21/86	587/28/110	614/38/148	3538/40/152	2183/40/180
TM1C	48/8/48	523/20/73	698/27/99	1478/40/138	1846/39/133	1578/38/143

EUROPE MULTI-OPERATOR MULTI-TRANSMITTER

M6T	928/11/70	1768/24/107	1667/33/128	3202/40/172	3320/40/171	3770/40/188
RW2F	946/11/63	1445/24/103	2083/39/141	3008/40/164	2425/39/158	2536/39/178
OT9A	793/8/53	1219/14/74	2079/33/119	2967/40/177	2908/40/156	2556/39/181
OH2U	663/9/63	785/22/83	1304/38/135	3163/40/171	2585/40/158	2098/40/182
GM7V	452/8/53	638/13/80	1473/29/113	3344/40/167	3082/40/162	2323/35/155
HG6N	420/9/61	953/17/85	1112/35/120	2278/39/153	2718/39/143	2520/40/169

TOP SCORES IN VERY ACTIVE ZONES

ZONE 3

W7GG	2,653,855
W7AT	2,351,193
K6GX	2,322,978
AI6V	2,097,846
K4XU/7	1,918,728
KI6T	1,115,080
N6MI	957,689
W8AEF/7	853,842
KM7TM	763,074
W7CB/6	756,602

ZONE 4

VE3OI	6,273,328
WB9Z	5,503,582
N2IC/Ø	5,074,398
W9RE	4,811,092
VE3RM	4,016,105
K4AB	3,625,830
VE3AT	2,780,085
WØEJ	2,511,059
K9BGL	2,390,165
*VE3PN	2,305,394

ZONE 5

K1AR	7,898,499
NT1N	6,908,603
K3ZO	6,171,165
K4ZW	5,865,053
K3OO	5,699,012
K3CR	5,181,670
W1WEF	5,079,638
W3BGN	4,954,633
N8II	4,007,880
N2LT	3,952,148

ZONE 14

GIØKOW	10,457,664
GW4BLE	6,657,018
SL3A	4,974,200
DJ4PT	4,586,742
DJ6QT	3,751,704
M5D	3,625,020
DL4NAC	3,417,540
GMØF	3,347,180
SM5CEU	2,900,680
DL2DX	2,580,462

ZONE 15

OHØZ	6,620,832
S5ØA	6,504,693
4N9BW	5,862,172
S57S	5,840,250
OH6RX	5,365,115
*LY6M	4,367,360
OH5LF	4,098,125
OH1VR	3,327,876
*LY2BTA	3,238,040
LY3BA	3,044,888

ZONE 25

JH5FXP	6,195,458
JH4UYB	5,905,708
JS3CTQ	3,878,138
JA8RWU	3,844,800
JA1ELY	3,727,365
*JL1ARF	3,001,683
JM1XCW	2,457,048
JA2BNN	1,703,870
*JH8SLS	1,669,920
JJ1VRO	1,305,928

** Low Power*

Best propagation for years; all the work on the aerials paid off...***G3VAO.*** Very high levels of QRM/sideband splatter from Mid/East European stations that were running excessive power. Pity that most of them are contest groups that would not QSY! 15m was totally wiped out at times. Would suggest a lower power output level for contest groups...***G4WPD.*** Just managed to beat last year. An old-timer of 83 years, so my normal target is to beat last year. Had some problems on very loud stations on not tuning to the "beat" and kept getting reports of not being on their freq...***G6QQ.*** Wow: 3000-plus QSOs and three-band DXCC using just a small tribander at 30 ft! This is the first time the club station at RSGB Headquarters has put in an entry to CQWW. Operators were G4JVG (formerly P29DX and VK9YG); 2EØAPH, a Novice call belonging to the 16-year-old UK Young Amateur of the Year for 1999–2000; and GØWAT, who could only attend and operate overnight. We hope to be back with more operators next year...***GB3RS.*** Thanks for running the contest. Condx were as good as I have seen in a long time. Only wish I had an antenna on the top of this building instead of on my balcony. Still, we can't have everything!...***GM4HQF.*** Hard work with only 4W but fun. I was pleased to work CN8WW on 4 bands and break the pileup on 40m to work PJ4B...***GWØVSW.***

My big thanks to my wife for taking care of me during the contest despite being ready to give birth to our first child; and a big thanks also to my son for not spoiling his father's contest efforts by being a gentleman and coming to this world precisely on his due date, 1 Nov. 99, the Monday after the contest. On the radio side of things I really enjoyed 10m during this contest and I thought I had clinched the 10m Asian record, only to find out from the contest score rumors that A61AJ bettered the record by a wider margin than I did. Oh well. I wish for better luck in 10 year's time...***H22H (5B4MF).*** HG5T is the club call of foreign hams in Hungary, issued by HIF (Mr. Regaly). Conditions were great!...***HG5T (N9NC).*** Finally we got a great skip. I never heard 10 meters so full of stations. There wasn't a hole from 28.300–29.000. Too many stations, especially on the "western world," do not use the common standard phonetic code, so as a result it is very hard to understand their callsign. See you next year... ***IK4QJM.*** Fourteen hours active, fine pileup with USA on Sunday first evening more 120 QSOs in one hour...never been for me during a contest!...***IK4ZNH.*** Even the *best contest*, good propagation specially on 28...***IN3XUG.*** Beautiful propagation for all bands but spectacular during the second night on low bands with some pileup on 75m...***IO2L.***

I had a good time. I am looking for the next WW contest...***JAØQWO.*** Big opening of new Cycle 23 made our friendship so big fun. Every high band were busy from end to end. Our approach to WW came to an end. We will try to join to major club in test from 2000 on. Join together!...***JA6ZPR.*** Congrats on all the great scores! I broke the JA record and my last sunspot cycle record just a little, but did not reach a 4M barrier. As always enjoyed the biggest one and will try to do more progressive next year. Keep on challenging and trying to make a better situation...***JA8RWU.*** What a nice contest! Because many stations called me...***JF2FIU.*** Antenna height is about 20m from the ground. This contest is first time for me and I was excited. So we will join this contest for next time... ***JGØGGI.*** I enjoyed very good condition. I have never heard many Europe station on 10m band...***JG2VSF.*** I renewed my own contest record by help of good condition...***JH4ADK.*** I was so excited with the great open on 10m band and fully enjoyed the endless pileups from USA and EU...***JH4UYB.*** JJ3ZZE is a club station located on the top of the mountain. Elevation is about 810 meters above sea level. Excellent!...***JJ3ZZE (JF3PLF).*** I tried to join an SSB contest at this time. I usually attend CW contest. I felt regret for less time to attend in despite of a good condition...***JQ3UDL.*** I learned a bunch of things this time from my long callsign and first entry in WW contest from W7. I felt EU very far from W7 and realized bigness of W... ***W7/JR1NKN.*** Excellent condition on high bands. I got a lot of NA's through northeast (EU's) direction on 20m... ***JR4QZH.*** The maximum QSO I ever made. I need more multiplier and searching practice...***JY9NX (JM1CAX).***

Great conditions. Sunday much activity on 10m. Bad day for illegal and CB stations! See you next year, vacation days last three of October. Hi...***L6H (LU6HDV).*** First time as All Band; interesting moving multipliers between bands but without good antennas in low bands and with heavy thunderstorm during all the weekend is impossible to make a good score...***L99D (LU7DW).*** It's my first time effort from SA. Many TNX to Espora radio club for giving me an opportunity to use club equipment...***LR6D (JK3GAD).*** We had a great weekend by running this contest. Anyway, we lost a lot of possible QSOs, because our antennas for 40 and 160 were not okay. Also ON stations blocked the 160m with splitting (15 kHz up and down). Impossible to run there in the legal frequencies (for LX); that's also a reason for the only few QSOs on 160... ***LX9SW.*** Fantastic conditions, tons of multipliers, runs touching 200 an hour. Half expected to see palm trees and white sand out of the window instead of the rain sodden fields of eastern England...***M1P.*** This is the first time we used our new club call in the CQ WW contest. Had great fun especially on 10m, which was excellent during daylight hours. Next year we need to find more ops and

(Continued on page 114)

ZONE LEADERS SINGLE OPERATOR

Zone	Call	Score	Zone	Call	Score
1	KL7AC	981,843	21	9K2HN	9,330,834
2	VE2AE	1,895,703	22	VU2WAP	2,071,104
3	W7GG	2,653,855	23	JT1CO	4,715,064
4	VE3OI	6,273,328	24	XX9TRR	4,415,560
5	K1AR	7,898,499	25	JH5FXP	6,195,458
6	XE2DN	1,210,400	26	HSØ/SM3DYU	47,854
7	*3E1DX	673,608	27	4F4IX	1,506,886
8	8P1A	11,013,948	28	9M8R	8,662,544
9	P4ØE	15,583,506	29	*VK8DK	53,466
10	HC8A	18,607,050	30	VK5GN	3,709,900
11	ZX5J	3,086,148	31	NH7A	6,071,934
12	XR1X	1,956,385	32	ZL1ANJ	2,146,488
13	L99D	2,224,347	33	EA8BH	25,646,796
14	GIØKOW	10,457,664	34	*SU9ZZ	4,823,882
15	OHØZ	6,620,832	35	6V6U	9,562,950
16	RM4W	5,197,066	36	ZD8Z	3,794,280
17	UA9MA	5,692,200	37	5Z4IC	829,863
18	RVØAM	1,265,486	38	ZS6SA	4,528,840
19	*RSØF	3,393,404	39	*3B8/KD6WW	2,534,468
20	JY9NX	7,800,344	40	*OX3CO	276

**Low Power*

Raising The Standard for Toughness

Solid As A Rock

Actual Size

Yaesu's FT-1500M represents a technological breakthrough in radio transceiver design! New advances in power amplifier technology combine to provide you with 50 Watts of clean transmit power with enhanced current consumption efficiency. Yaesu's patent pending aluminum die-cast shell construction dissipates heat throughout the entire transceiver chassis and eliminates the need for a cooling fan. This allows the FT-1500 to fit in an incredibly small case size: less than 5 inches square X 1.4 inches high and offer superior operating specifications as well!

FT-1500M

50 W 2-m FM Mobile Transceiver

YAESU

Choice of the World's top DX'ers℠

For the latest news, hottest products:
Visit us on the Internet! http://www.yaesu.com

VX-150
Compact yet incredibly rugged 2-meter handheld is designed to perform under the most difficult operating conditions. And it's packed with the leading-edge features you've come to expect from a Yaesu product. Five Watt power-output, 209 memories, DCS/CTCSS, 7 digit alphanumeric display, automatic repeater shift and much more.

FT-50RD
This durable, multi-featured
5 Watt Dual Bander is manufactured to rigid MIL-810 standards. Featuring wideband frequency coverage,* CTCSS/DCS operation, Dual Watch, 112 memory channels, and Digital Voice Storage.

FT23RMKII/FT33R
These ultra-compact, 5 Watt VHF FM Handhelds feature rugged die-cast aluminum cases, 10 memory channels, optional CTCSS, and multiple scan modes. The FT23RMKII (2M) and the FT-33R (222 MHz) are easy to operate, and give outstanding performance.

VX-110
This incredibly rugged 5 Watt VHF handheld features 209 memories, Smart Search,™ DCS/CTCSS, simple 8 key operation and Omni Glow™ display illumination for night time operation.

FT411MKII
The affordable FT411MKII is compact and durable. This 5 Watt VHF FM Handheld features a die-cast case, 40 memory channels, 10 DTMF memories, built-in VOX, and multiple scan modes.

VX-1R
The pocket-sized VX-1R is small in size only. Featuring Smart Search,™ DCS/CTCSS, Dual Watch, ARTS,™ wide-band coverage (76–999* MHz plus AM BC). The VX-1R provides 291 memory channels, and puts out ½ Watt (1 Watt w/optional E-DC-15 DC Adapter).

* Cellular Blocked

VR-500
This miniature Handheld Receiver provides FM, AM, SSB and CW reception on 100 kHz–1300 MHz, with 1091 memory channels, Smart Search,™ versatile Dot Matrix display, Band Scope, and Dual Watch.

VX-5R
Although Yaesu's newest Tri-Band Handheld Transceiver is the world's smallest, it offers the performance of a full-size unit. The VX-5R operates on the 50 MHz, 144 MHz and 430 MHz bands with 5 Watts of power output, along with ultra-wide receive coverage of the VHF and UHF spectrum, plus AM medium- and short-wave broadcast reception. The VX-5R is military rated, so its durable, lightweight design allows you to take it anywhere. It is equally suited to walking through the concrete jungle as it is to forging the raging rivers of a real one. Along with a temperature display, the optional barometer pressure sensor unit gives a read-out of barometric pressure and altitude.

TOUGH GUYS.

When you're small, you get picked on. Isn't that how it goes? Well not in Yaesu territory, because not only do we design compact handhelds for efficiency, but we give these clever little guys plenty of muscle. Yaesu handheld transceivers have earned the bragging rights for being the smallest handhelds with the most durable water resistant casings ever created. And packed inside the brawn are engineering accomplishments in performance that are unmatched in the industry. Our high-tech handheld transceivers provide clean power output on the VHF and UHF bands and offer revolutionary features that allows these tough guys to continually outperform the competition. Learn more about Yaesu products on the web at www.yaesu.com

YAESU ...leading the way.

Washington Readout

Regulatory News In The World Of Amateur Radio

BY FREDERICK O. MAIA, W5YI

The Role of Amateur Radio in the New Century

The following speech was delivered by Dale N. Hatfield, WØIFO, Chief of the FCC's Office of Engineering and Technology, at AMRAD's 25th anniversary dinner on June 17, 2000 in Falls Church, Virginia. Prior to assuming his current position, Hatfield was Chief Technologist at the agency. Before joining the FCC in December 1997, he was Chief Executive Officer of Hatfield Associates, Inc., a Boulder, Colorado-based multi-disciplinary telecommunications consulting firm. Prior to founding that firm in 1982, Hatfield was Deputy Assistant Secretary of Commerce for Communications and Information and Deputy Administrator of the National Telecommunications and Information Administration. Before moving to NTIA, Hatfield was Chief of the Office of Plans and Policy at the FCC. Hatfield was the founding director of Telecommunications Division at the University College at the University of Denver and has taught telecommunications policy and regulation courses at the University of Colorado at Boulder.

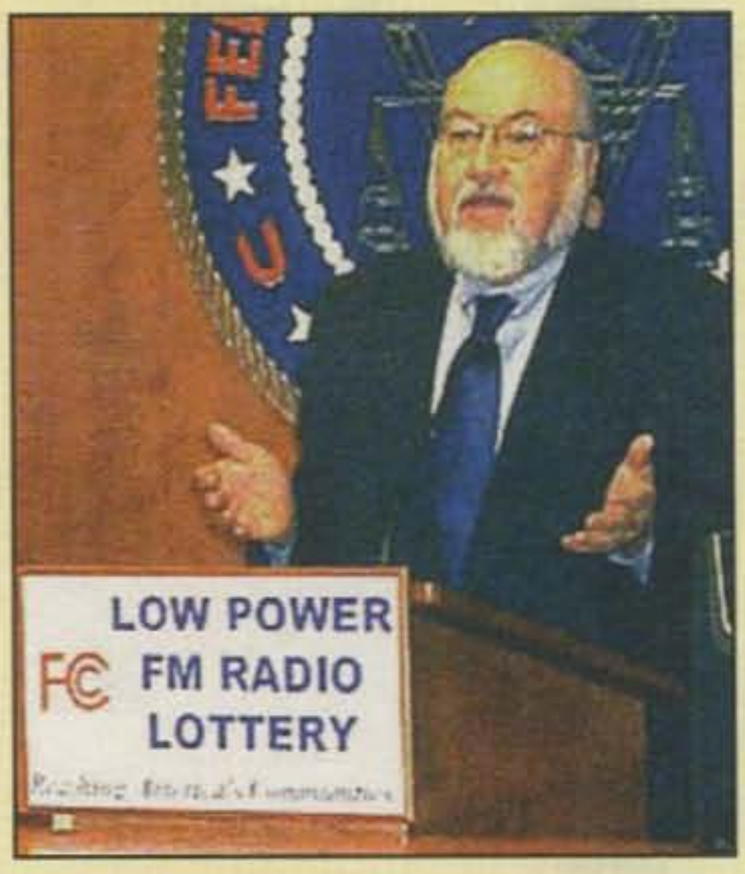
Hatfield's interest in communications began when he became an amateur radio operator in his early teens. He holds a BS in Electrical Engineering from Case Institute of Technology and an MS in Industrial Management from Purdue University.

AMRAD (Amateur Radio Research and Development Corporation) began as an informal group of technically oriented radio amateurs in 1972. It was incorporated in the Commonwealth of Virginia in 1975 as a nonprofit 501(c)(3) tax-exempt scientific and educational organization.

Both Hatfield's position at the FCC and his in-depth understanding of both amateur radio and emerging communications technology make it important to share his remarks with a broader ham radio audience.

I am very pleased to be able to speak to you this evening on the topic of the role of amateur radio in the new century. I am very pleased to be here for a number of reasons.

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (telephone 817-461-6443)
e-mail: <w5yi@cq-amateur-radio.com>



Dale Hatfield, WØIFO, Chief, Office of Engineering and Technology, FCC, spoke about the role of amateur radio in the new century at AMRAD's 25th anniversary dinner in June.

First, it is both your 25th anniversary and your first anniversary dinner held in the new century. That seems like a particularly good time to reflect on the future of the Amateur Radio Service, and I am flattered that you have asked me to do so.

Second, I have especially fond thoughts about the service because of the pivotal role that amateur radio, and individual amateur operators—hams—played in my own career. As I will explain in more detail in a moment, I would not be in my current position if it had not been for the help of some hams back when I was a teenager about 50 years ago.

Third, I regard it as a particular honor to be asked to address an amateur radio group that emphasizes experimentation and the more technical aspects of amateur radio. Again, as I will indicate in more detail in a few minutes, I believe that experimentation and contributions to the state of the art in the radio field are a major part of the justification for maintaining spectrum allocations for the service in the face of increased demands by commercial and other interests.

I would like to divide the remainder of my remarks into five parts:

First, I will briefly—very briefly—talk about my personal involvement in amateur radio.

Second, I will briefly describe the role of the Office of Engineering and Technology at the Federal Communications Commission so that you will have a better idea of the basis for my remarks.

Third, speaking from that perspective, I will talk about the growing scarcity, and hence economic value, of the radio spectrum and how that growing scarcity will inevitably put pressure on amateur allocations.

Fourth, I will talk about the important role that the Amateur Radio Service has played in the past and—going to the basic topic I have been asked to address—what the Amateur Service can do in the future to justify its spectrum allocations on both a national and international basis.

Fifth, and finally, I will talk about a proceeding we recently launched at the Commission, a proceeding dealing with Software Defined Radios.

Before I continue, I need to add the standard disclaimer that my remarks here this evening represent my own views and they may not necessarily reflect the views of the Commission, any individual Commissioner, or any other staff member.

Background in Amateur Radio

My own involvement in amateur radio began in my early teens, when my father bought me a used Hallicrafters S-38B shortwave receiver. He and his brother, my uncle, had tinkered with crystal sets when they were kids, and he somehow sensed that I might find radio interesting as well. I connected that receiver to a piece of antenna wire hung out of my bedroom window and soon I heard a ham radio operator in Morocco calling CQ on the 20 meter amateur band. From that moment I was hooked on radio communications.

Two local hams who lived near me—this was in Dayton, Ohio in the early 1950s—helped me get my first license (WN8NGG) and helped me build my first transmitter. These two hams were electrical engineers who were employed at Wright-Patterson Air Force Base near Dayton. It was their interest that led me into electrical engineering as a vocation and ultimately to a job at the government's old Central Radio Propagation Laboratory in Boulder, Colorado. I won't

bore you with the details, but that first, entry-level job eventually led me to the position I hold today. Accordingly, I will forever be in the debt of those two hams who so unselfishly supported my passion for radio.

Role of the Office of Engineering and Technology

As most of you may know, the FCC is organized into bureaus and offices. Generally speaking, the bureaus—the Common Carrier Bureau, the Wireless Telecommunications Bureau, the Mass Media Bureau, the Cable Services Bureau, and the International Bureau—have the "line," or operating responsibility, in terms of the Commission's regulation of particular segments of the telecommunications industry. For example, the Wireless Telecommunications Bureau, under the excellent leadership of my colleague, Tom Sugrue, has the responsibility for the Amateur Radio Service. The offices such as the Office of the General Counsel and the Office of Plans and Policy—provide support and advice to the operating bureaus and to the five-member Commission itself.

Reflecting that rough division, the office that I now head, the Office of Engineering and Technology, provides technical advice to other bureaus and offices and to the chairman and other commissioners. In addition, however, our office has the responsibility for administering specific parts of the Commission's rules—namely, Parts 2, 5, 15, and 18. Part 2 of the rules contains the Table of Frequency Allocations. That is, while the individual bureaus have primary responsibility for developing and recommending specific service rules, we, in OET, have the responsibility for general allocation matters. We also issue experimental licenses under Part 5 of the Commission's rules. In addition, we administer Part 15 of the Commission's rules dealing with unlicensed devices, as well as Part 18, which deals with certain industrial, scientific, and medical equipment. Finally, we are responsible for the Commission's equipment authorization program. Much of that work is done at our laboratory facilities in Laurel, Maryland.

Growing Demand For Spectrum

The management of the radio spectrum resource is an extremely important part of telecommunications policy and regulation. As you all know so well, radio spectrum is an increasingly scarce natural resource. We simply do not have enough spectrum to give everyone all they want. This increasing demand is being propelled by a host of developments:

- the growing shift of our economy towards the service sector,
- the increasing mobility of our work force,
- the convenience and increased efficiency produced by mobile/portable communications,
- the increasing performance and falling cost of wireless devices,
- the increasing requirements for public safety and for national defense systems, and
- the dramatically growing interest in accessing the Internet on a wireless basis.

Hence, the allocation of spectrum for particular uses and the development of specific technical and service rules governing those allocations is a crucial determinant of telecommunications industry structure and performance. Even more important, it is critical to the performance of our public institutions that

are devoted to certain scientific pursuits, such as radio astronomy, to the safety of life and property, and to the national defense.

As the office at the Commission that has primary responsibility for spectrum allocation matters, we, in OET, are in a particularly good spot to judge first hand the increasing demand for spectrum. Our office is generally the first place people stop when they are seeking new spectrum. Hardly a week goes by without someone stopping in my office or filing a petition asking that spectrum be allocated for some new service or that additional spectrum be allocated to an existing service. While increased efficiency in the use of spectrum—through the use of digital compression techniques, more efficient modulation, and greater frequency reuse, for example—can offset some of this increased demand, increased scarcity is a very real concern. This scarcity is exemplified by increasingly contentious debates over spectrum-sharing arrangements and by the amounts bid in auctions for radio licenses. The $35 *billion* bid in the recent Third Generation Cellular auctions in the United Kingdom provides very clear evidence of the increasing value of spectrum.

Our Chairman, FCC Chairman Bill Kennard, has recently called attention to the potential for a "spectrum drought," especially in the valuable range below about 3 GHz. Under the leadership of the chairman, and with solid support of Commissioner Susan Ness, who has always been intensely interested in spectrum issues, we have put forth a number of proposals and undertaken a number of initiatives that would allow more uses and users of this national and international resource. One of these initiatives relates to Software Defined Radios, a topic which I will return to briefly near the end of my remarks. The point that I want to emphasize here, however, is that in thinking about the role of amateur radio in the new century, we must think about it in the context of increasing pressure on the underlying spectrum resource.

Future of the Amateur Service

Turning now to the future, it seems to me that given the increased pressure on the underlying resource from commercial and other non-commercial uses, the key issue for the Amateur Service is maintaining access to an adequate amount of spectrum. Let me make it absolutely clear that in raising the spectrum issue, I am not suggesting that there is any immediate threat to existing amateur allocations. I am simply pointing out the reality of the situation. The rapidly growing demand for spectrum coupled with the increased visibility of its economic value due to auctions makes it almost inevitable that amateurs will be under a certain amount of pressure to justify their "free" use of this precious resource.

In the past, the Amateur Service has justified its spectrum allocations by, among other ways, (1) engaging in experimentation that has advanced the radio state of the art, (2) providing emergency communications in times of natural or manmade disasters, (3) providing trained radio operators in times of national emergencies, (4) encouraging international cooperation and goodwill by allowing direct communications be-

tween and among people on an international basis, and (5) as in my case, providing an important educational outlet for people interested in the more technical aspects of radio communications.

While the relative importance of some of these ways has obviously changed because of marketplace, technological, and other developments, they remain valid today. The important thing is that they actually be carried out. Or, to use a bit of slang, it seems to me that it will be even more important for all segments of the amateur community to "walk the walk," not just "talk the talk."

Another potentially important area deals with how efficiently one uses the spectrum. We could probably discuss at some length the proper measure of spectrum efficiency, but for our purposes here this evening it might be simply the number of simultaneous conversations that can be accommodated in a given amount of spectrum in a particular geographic area. In the commercial sectors, where organizations pay for their use of the spectrum, there is a significant economic incentive to use the resource efficiently—to spread costs over as many users as possible while maintaining good-quality service.

That is, there is a strong incentive to develop and adopt more spectrally efficient technology. For example, by adopting various digital techniques, commercial mobile radio service providers (e.g., cellular and PCS) have been able to dramatically increase their capacity compared to the original analog technology. Similarly, when the broadcast industry has completed its transition to digital television, we will be able to reclaim a substantial amount of spectrum for other uses.

I recognize that, in the past, hams have also adopted more spectrally efficient technologies—for example, by migrating from double-sideband amplitude modulation to single-sideband modulation and, more recently, by shifting to more efficient modulation for text (TTY) modes. I would urge you to continue shifting towards more spectrally efficient communications techniques, especially digital techniques. Such a shift has a number of benefits:

First of all, it demonstrates to policymakers and regulators that you are good stewards of the public's airwaves even without direct economic incentives.

Second, by using what you have efficiently, it strengthens your case when you need to ask for additional spectrum.

Third, by allowing more users to access the available allocations simultaneously, it improves the amateur experience and ultimately increases the attractiveness of the service to new and old users alike.

Fourth, it provides the opportunity or "headroom" for increases in data rates to more closely match those available on wireline networks and, in the future, on commercial wireless networks as well.

Fifth, as the rest of the telecommunications world makes the transition to digital techniques, and there are very few exceptions to that trend, the Amateur Service will look antiquated if it is not making progress in that direction as well.

So looking to the future of the Amateur Radio Service in the new century, I would urge you to continue your traditional role in public service by being prepared for and providing communications in times of emergencies, conducting experiments, providing training in radio communications, and encouraging international comity. But I would also urge you to focus particular attention, for the reasons I just mentioned, on experimentation with digital techniques that are capable of squeezing more "bits per second per Hertz of band-

width" out of the increasingly valuable radio spectrum resource.

Software Defined Radios

I am rapidly running out of time, but before I close I would like to talk about one additional topic that, as it turns out, may help enable some of the experimentation with digital techniques that I just advocated. The topic, as I mentioned at the outset of my remarks, is Software Defined Radios. Software Defined Radios, or software radios or software programmable radios as they are sometimes called, can be described as radios that are implemented in digital signal processors with functions defined in software. In other words, the signals are generated in, or converted to, the digital format and the necessary processing—for example, modulation and demodulation—is done in software on a common platform.

From what I have been told, such radios could have a host of advantages:

1. They would allow a common radio to accommodate a host of different standards and thereby help alleviate some of the problems that we have had with the creation of different standards in the wireless field.

2. They would facilitate inter-operability among different types of radio systems, when, for example, a large number of different emergency groups arrive at the scene of a major disaster.

3. They would allow a manufacturer to develop different radios but on a common hardware platform. In other words, rather than manufacture and carry in inventory several different radios, the manufacturer could achieve economies of scale in the production of a common hardware platform, but wait until the product is about to be shipped before loading the software to create a specific type of device.

4. They would allow the end user to update his or her radio simply by getting a software update, just like an end user gets updated software for a personal computer today. In fact, one could even envision a situation where one could get software updates right off the internet or over the air.

5. It is possible that a manufacturer could sell a bare-bones hardware platform to which third-party providers or end users, including hams, could supply software to create custom radio systems. Certainly we have seen similar developments in the computer field and in other sectors of the telecommunications industry.

6. It is even possible to imagine a radio that could adapt its characteristics to fit the interference environment and user needs on a more-or-less real-time basis. For example, the radio could maximize its use of bandwidth in areas where the spectrum is not congested while conserving bandwidth or going to more robust modulation in areas where interference is heavy and/or propagation conditions are particularly difficult.

Indeed, *if* we can solve some of the difficult regulatory issues involved, it is even possible to envision Software Defined Radios as a means of facilitating a new era of amateur experimentation. One intriguing possibility is that it could enable hams without skills and/or interest in hardware construction to build and experiment with new systems by writing new code.

It might also allow the rapid sharing of new modulation techniques and receiver designs through electronic publication of the implementing software. This could stimulate a whole new generation of amateur innovation that not only includes the more spectrally efficient systems I mentioned earlier, but also radios that could adapt to their environment as well.

In many ways, Software Defined Radios represent a final merger of the radio communications and computer fields. Viewed from that perspective, this technological development even has the potential of attracting back to the hobby some of the people who have shifted their interest to computer technology. Because of this potential to advance the service in fundamental ways, I would urge amateur groups to participate actively in our proceeding.

Concluding Thoughts

Let me conclude by saying that I believe that the future of the Amateur Service is a bright one. It is one where technological advances such as Software Defined Radios can enable the ham community to continue its proud tradition of innovation while demonstrating its commitment to the efficient use of the spectrum resource. Certainly your organization, AMRAD, is in a particularly good position to encourage the experimentation that will lead to such innovations and I strongly commend you for your leadership efforts in that direction in the past.

Now It's Up To Us

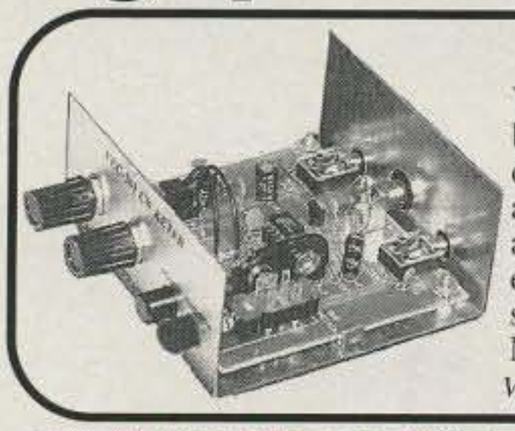
Well, there you have it, from the man with the primary responsibility for spectrum allocation in the United States—what we hams must do to protect the spectrum we already have and to support any future requests for additional spectrum. The leading edge of communications technology today is Software Defined Radios, and as Hatfield points out, the concept provides a tremendous opportunity for hams, both as participants in the FCC's proceeding on how to regulate these can-be-anything devices and as experimenters, designing, building, and using the radios.

The Amateur Service is the only one with the flexibility to build and use these radios right now. We don't need equipment authorization from Hatfield's office before we experiment with them on the air. We can be the leaders, designing, testing, refining these radios *in advance* of the FCC's decisions to authorize them for commercial use. We can also share what we learn with the Commission and the communications industry. This is our opportunity—in fact, a very specific invitation—to get in on the ground floor and to return to the forefront of leading-edge technology. Let's be sure to accept this invitation.

73, Fred, W5YI

VECTRONICS® kits

High-performance electronic kits . . . fun to build and use!



Full featured CW Keyer Kit, $24.95!

VEC-201K, the best electronic keyer bargain in ham radio! Send beautiful sounding Morse Code. Self-completing dot-dashes and dot-dash memory forgive timing errors -- makes sending CW easy and accurate. Front panel volume/speed (3-65 wpm) controls. Weight adjusts 25-75%. Sidetone (300 -1000Hz) has LM386 audio amp for external speaker/phones. Select Iambic A or B, fully automatic or semi-auto "bug" mode. Tune mode for tuning rig. RF proof. Sleep Mode battery saver. Use 9V battery. 1¾x4x3½ in. *Simple skill level.*

VEC-201K shown in optional case (vinyl cover top not shown), VEC-201KC, $14.95

Aircraft Receiver Kit tunes entire voice aircraft band 118-136 MHz. Picks up air traffic 100 miles away. Track progress of incoming/outgoing traffic in your area, gain advanced weather information, and discover how the National Air Traffic System really works. Great way to learn about aviation. Use 9V battery. Drives external speaker/phones. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-131K, $29.95.**

20/30/40/80 Meter Receiver Kits give high performance! Covers entire band or tailor to cover desired portion. Copy CW/SSB/AM. NE602/ 612 mixer-oscillator, LM386 high gain audio amplifier. 1¾x4¾x5¼ in. *Moderate skill level.* Order **VEC-1120K** (20 Meters),**VEC-1130K**(30 Meters),**VEC-1140K** (40 Meters), **VEC-1180K** (80 Meters), **$29.95 ea.**

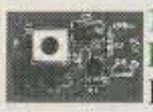
20/30/40/80 Meter QRP CW transmitter Kits have variable crystal oscillator tuning, front panel switch selects 1 of 2 crystals. 1 crystal included. Transmit and Receive switch. Connect receiver. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1220K** (20 Meters), **VEC-1230K** (30 Meters), **VEC-1240K** (40 Meters), **VEC-1280K** (80 Meters), **$29.95 ea.**

Tunable SSB/CW Audio Filter Kit has sharp *four* pole peak and notch filters. Zero in with frequency control & adjust bandwidth for best response. Tune frequency from 300-3000 Hz. Notch is an outstanding 50 dB. 1 Watt amplifier. Speaker/Phone jacks. 12 VDC at 300 mA. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-841K, $34.95.**

***Vectronics Comprehensive Soldering Course* and Kit** is the best home study soldering course available! Includes theory, quizzes, PC board, tools, safety, techniques and materials. Get professional soldering skills and a fun blinking LED project. Gets you ready for "through-hole" PC board assembly and repair. *Simple skill level.* Order **VEC-1500K, $29.95.** New!

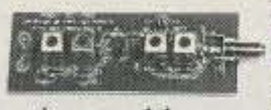
Super CW filter/amplifier Kit has powerful 1 watt audio amplifier to drive speaker. 8 poles active IC filtering uses cascaded low-Q stages. 3 bandwidths: 80,110, 180 Hz. Center frequency: 750 Hz. Up to 15 dB. Use 9-18VDC, 300 mA max. 1¾x4x3½ in. *Simple skill level.* Order **VEC-821K, $29.95.**

Super SSB Audio Filter Kit improves readability with 8 poles, optimizes audio bandwidth, reduces SSB splatter, low, hi-pitched interference, hiss, static crashes, background noise. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-830K, $19.95.**



144/220/440 MHz Low-Noise Preamp Kits soup up your antenna system. Helps pull in weak signals. Works wonders for scanner or ham-band receiver. Gives great low-noise performance and immunity from damaging electrostatic discharge. 1x1½ in. *Simple skill level.* Order **VEC-1402K** (144 MHz),**VEC-1422K** (220 MHz), **VEC-1444K** (440 MHz), **$17.95.**

CW Memory Keyer Kit stores 512 characters in four 128 character non-volatile EEPROM message memories. *Carry on entire QSOs by just pressing memory message buttons.* True sinewave sidetone with soft rise and fall time eliminates harsh keyclicks. Has all features of VEC-201K CW Keyer Kit. 1¾x 6¾x5¼ in. *Simple skill level.* Order **VEC-221K, $69.95.**



High-performance 2 Meter Preamp Kit pulls weak signals out of noise. Solves three reception problems -- boosts signals using a 1-dB noise figure microwave transistor, provides razor-sharp bandpass filtering, eliminates unwanted electrical noises with built-in balun. Uses 9-14 volts DC. Tiny 1½x3x1 in. fits in any size box. *Intermediate skill level.* Order **VEC-1402DK, $59.95.**

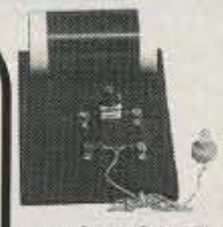
2/6/10 Meter FM Receiver Kits let you tune into the world of ham radio. Catch all the action! Each covers the entire FM sub-band and runs off your 9 volt battery. Plug in speaker or headphones for loud clear reception. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1002K** (2 Meters), **VEC-1006K** (6 Meters), **VEC-1010K** (10 Meters), **$34.95 each.**

2 Meter Monitor Kit receives 144-148 MHz. Low noise, high gain RF preamp gives you excellent 0.1 uV sensitivity. Air variable tuning capacitor has 8:1 reduction. Dual conversion superhet provides selectivity and stability. Automatically eliminates squelch tails. Built-in speaker, squelch, tone, volume controls. 19¼ in. telescopic whip. 9V battery. 2x4¼x4 in. *Intermediate skill level.* Order **VEC-104K, $79.95.**

5 Watt 2 Meter FM transmitter Kit lets you transmit voice and data -- AFSK data (up to 1200 baud) and FSK data (up to 9600 baud). Jumper select reactance or direct FM modulators. Reliable Motorola NBFM transmitter IC and PA transistor. Crystal controlled (x8 frequency multiplication). -60 dBc spurs and harmonics. Use 12-14 VDC, 1.5 amps. 5-pin DIN microphone jack. 1¾x4¾x5¼ in. *Difficult skill level.* Order **VEC-1202K, $99.95.**

Ni-Cad/Ni-MH Battery Charger Kit safely quick charges expensive batteries -- no overcharging -- many in less than an hour. HTs, cell phones, camcorders, lap top computers. Handles 1 to 12 cells. Charging status LEDs. Discharge before charge function reconditions batteries. Also removes memory effect. Runs on 12-15 VDC. 1¾x4¾x5¼ inches. *Moderate skill level.* Order **VEC-412K, $49.95.**

Shortwave Converter Kit converts AM or AM/FM radios to shortwave receivers at a push of a button. Choose two 1 MHz bands between 3 and 22 MHz. Popular 13, 16, 19, 25, 31, 41, 49 and 60 Meters international broadcast bands. On/off bypass, NE-602/612 mixer-oscillator IC and tuned input circuit. Use 9 V battery. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-101K, $27.95.**



Crystal radio set Kit lets you relive the experience of early radio pioneers. This baby really works! Wind your own inductor, wire up the earliest radio circuit without soldering a thing and listen to the magic of radio that needs no power. Put up an antenna, connect a ground. Stations come in amazingly loud and clear. Includes antenna wire, sensitive earphone. 1¾x5x6½ in. *Simple skill level.* Order **VEC-121K, $19.95.**

Shortwave Receiver Kit lets you listen to the world! Covers 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15 and 13 Meter bands. Explore AM, SSB, CW, WWV, RTTY and Packet signals. Vernier reduction drive, smooth regeneration control, RF stage. *Includes all metal cabinet.* 2 earphone jacks. Use 9V battery. 2½x7x6 in. *Intermediate skill level.* **VEC-102K, $59.95.**

QRP Transceiver Kits for 80/40/30/20 Meters

Great introduction to QRP, the hottest and fastest growing activities in ham radio. With this tiny *transceiver*, you'll discover what thousands of QRP enthusiasts already know -- you don't need a $1000 radio to get on the air and communicate worldwide. All it takes is some simple circuitry using less energy than a pen-light bulb! You get VXO frequency control, broad-banded transmitter circuitry, solid one Watt plus output, shaped keying, .3 uV sensitivity, direct conversion receiver. Includes crystal for popular QRP calling frequency. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-1380K** (80 Meters), **VEC-1340K** (40 Meters), **VEC-1330K** (30 Meters), **VEC-1320K** (20 Meters) **$59.95 each.**

Super CW Audio Filter Kit gives you three bandwidths: 80, 110, 180 Hz. Eight poles gives super steep skirts with no ringing. Pull CW QSOs out of terrible QRM! Plugs into phone jack to drive phones. QRM down 60 dB one octave from center frequency (750 Hz) for 80 Hz bandwidth. Improves S/N ratio 15 dB. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-820K, $19.95.**

AM Radio Transmitter Kit lets you set up your own AM station and broadcast crystal clear programming from your studio with *you* as the disc jockey or talk show host. Play music from CD player, tape deck or other source. Choose clear frequency from 530-1750 KHz. Standard line level or microphone input. Easy CD, tape deck or mike mixers connect. Audio level adjustment. 1¾x4x3½ inches. *Simple skill level.* Order **VEC-1290K, $29.95.**

The *GIANT* Book of Electronic Projects, Volume I.

Project book includes 19 exciting kits on this page. Has building tips, complete parts lists, parts placement and PC board layouts, test and alignment, operating instructions, in case of difficulty, theory and specs, schematics, cabinet layout and much, much more. Great school project book or gift for your favorite ham.

Order VEC-1901, $19.95.

Inspect and download our manuals from:

http://www.vectronics.com

Vectronics kits feature a professional quality epoxy glass PC board with solder mask and component legend, simple step-by-step instructions and highest quality components.

All metal cases for most kits, $14.95.
Add "C" for case to model #. Example: "VEC-201KC". Has knobs, hardware, rubber feet and brushed aluminum-looking front panel decal.

Order Toll-Free 800-363-2922

• **Fax**: (662) 323-6551 • **Tech**: (662) 323-5800
VECTRONICS, 300 Industrial Park Road, Starkville, MS 39759 USA • ***Add $6 s/h***

CIRCLE 136 ON READER SERVICE CARD

In this follow-up to his review of the Small Wonder Labs DSW transceivers last December, N7RR points out a problem he discovered regarding single sideband receive operation, and provides a fix.

Modifying Small Wonder Labs DSW Rigs to Receive SSB

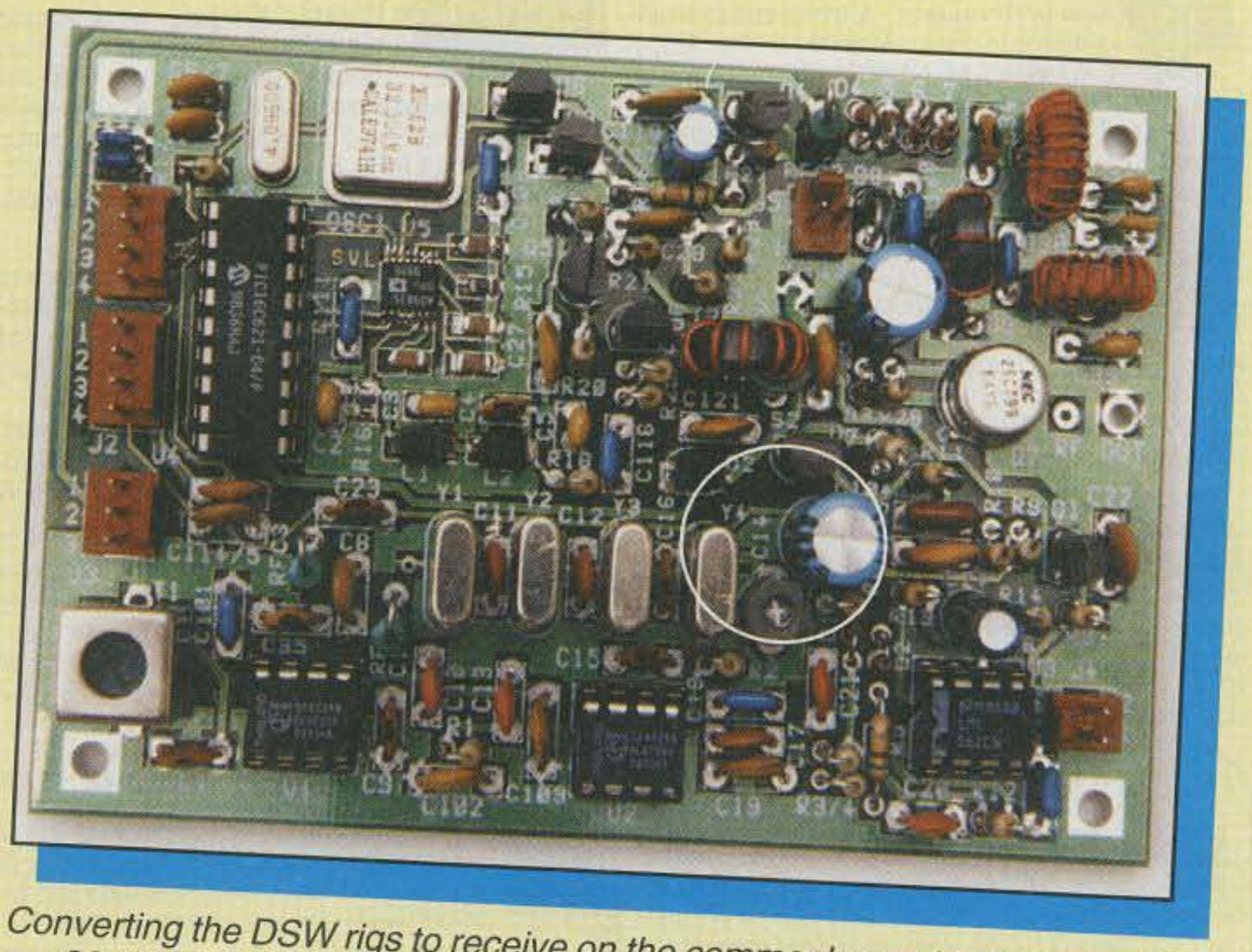
BY BRUCE PRIOR,* N7RR

I stated mistakenly in my review of the Small Wonder Labs DSW rigs (*CQ*, December 1999, p. 40), "The offset of all DSW rigs is set for receiving on lower sideband." In fact, only the DSW-20 and the DSW-30 receive on LSB. The 80 and 40 meter versions receive on upper sideband (USB). On the DSW-30, this feature makes no difference, since 30 meters is not a phone band. However, the design sideband for the 80, 40, and 20 meter DSW rigs is the reverse of customary sideband usage on those ham bands.

Changing Sidebands

After some experimentation and consultation with the DSW designer, Dave Benson, NN1G, I offer the following very simple modification which reverses the sideband on the DSW rigs. This potentially could be very important to a DSW owner in a remote area who needs to contact an SSB station in an emergency. As I noted in my review, the rigs cover all of their respective amateur bands and more, but if you can't understand the SSB stations on 80, 40, and 20 meters, the extra coverage is not very useful. What is needed is to convert the DSW-80 and DSW-40 to receive LSB and to convert the DSW-20 to receive USB. These conversions can be accomplished inexpensively by adding a single fixed inductor in parallel with trimmer capacitor C14.

Since the DSW-30 and DSW-40 both have an IF of 4 MHz, the modification is the same. Similarly, the DSW-20 and DSW-80 both have a 5182 kHz IF. However, the identical added inductor reverses the sideband of those rigs in opposite directions.



Converting the DSW rigs to receive on the commonly used sidebands (LSB on 80 and 40; USB on 20) requires adding an inductor in parallel with trimmer C14 (circled above), as explained in the text.

The only reason I can imagine that a DSW-40 owner might want to skip this modification is that the Canadian time-signal station CHU on 7335 kHz transmits its French and English voice signals on USB. WWV and WWVH on 10 and 15 MHz transmit on AM, so the modification will not change your ability to copy their signals on the DSW-30 and DSW-20. In addition, the modification broadens the audio bandpass a bit, so CW reception is slightly less selective. With the modification, SSB audio reception sounds somewhat pinched, but it is quite understandable.

Inductor Values

All DSW-40 and DSW-30 kits include a gray 70 pF trimmer for C14. Early model DSW-20 and DSW-80 kits have the same gray 70 pF trimmer. In current model DSW-20 and DSW-80 kits, how-

**853 Alder St., Blaine, WA 98230-8030*
e-mail: <n7rr@arrl.net>

ever, C14 is a black 90 pF C14 trimmer. Check the color before choosing your inductor. Here are the appropriate inductor values:

DSW-80 with a gray 70 pF trimmer capacitor C14: 8.2 µH

DSW-80 with a black 90 pF trimmer capacitor C14: 6.8 µH

DSW-40: 15 µH

DSW-30: 15 µH *(Note:* Since 30 meters is not a phone band, there's no point in modifying the DSW-30 for USB reception.)

DSW-20 with a gray 70 pF trimmer capacitor C14: 8.2 µH

DSW-20 with a black 90 pF trimmer capacitor C14: 6.8 µH

Modification Procedure

To install the inductor in parallel with C14, solder it to the two C14 pads on the bottom of the circuit board. The neatest way is to use a surface-mount inductor. I had a tubular inductor with axial leads available which I was able to bend around and tack onto the circuit board.

After soldering on the inductor, realign the offset pitch by adjusting C14 to match the sidetone. You obtain the offset pitch through your earphones by applying power while holding down the front-panel keyer button. Then depress your key or keyer paddle to give you the comparison sidetone pitch. This modification will change the 80 and 40 meter rigs to receive LSB and the 30 and 20 meter rigs to receive USB.

Inductor Sources

For the surface-mount option, the 70-UMC1812 inductors for the proper values from Mouser Electronics (958 N. Main St., Mansfield, TX 76063; phone 800-346-6873; fax 817-483-0931; e-mail: <sales@mouser.com>; web: <http://www.mouser.com>) would do fine. Dave Benson recommends the following Delevan surface-mount inductors, which are available from Digi-Key (701 Brooks Avenue S., Thief River Falls, MN 56701; phone 800-344-4539; fax 218-681-3380; web: <http://www.digikey.com>):

15 µH: DN12153JCT
8.2 µH: DN12822JCT
6.8 µH: DN12682JCT

The tubular axial-lead 70-IM2 inductors available from Mouser are bulkier and a bit trickier to solder beneath the circuit board.

Now you can use your DSW rig for cross-mode QSOs. Enjoy! ■

As the sunspot cycle reaches its likely peak, we continue our exploration of the intricate relationship among the solar wind, Earth's magnetic field, and radio communications.

Uncle Sol's Solar Wind and the Earth's Magnificent Magnetosphere — Part II

BY KARL T. THURBER, JR.,* W8FX

The Solar and Heliospheric Observatory (SOHO) helps us better understand the interactions between the Sun and the Earth's environment. A photo derived from the Extreme Ultraviolet Imaging Telescope (EIT), one of the major onboard instruments, is shown here. (Photo courtesy NASA)

Astronomers have been tracking the cycles of the Sun since 1755. The 23rd 11-year solar cycle since that time is most likely at or near its peak as this issue is published (we won't know for sure until after the fact). To help you make the most of this solar peak, we continue our exploration of the complex relationship between the Sun and the Earth, and its effects on radio communication.

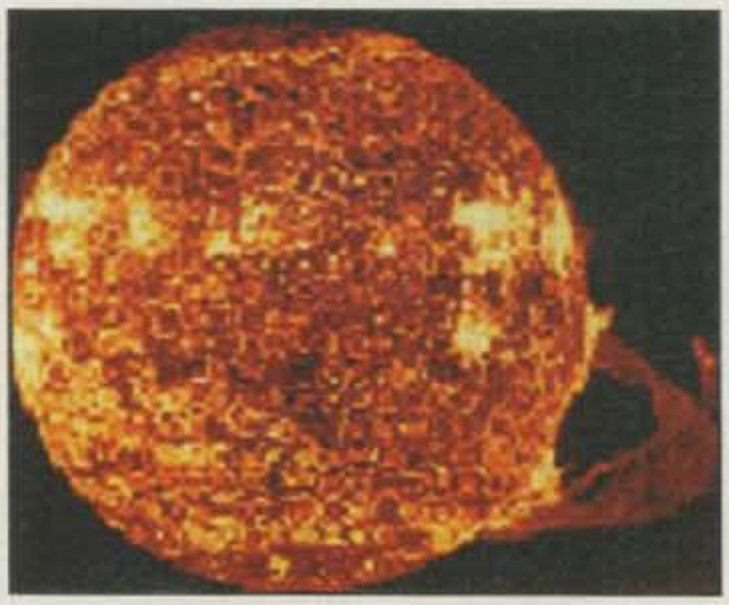
In Part I last month we learned about the composition of the Sun, how sunspots and solar flares are formed, and how gases from the Sun speed through space and interact with Earth's magnetosphere, a protective sheath that deflects the Sun's most harmful rays. We also learned about the effects of the solar wind on Earth's magnetic field and its atmosphere, including the radio-reflective ionosphere.

We continue now with an introduction to tracking and predicting solar activity, what to expect in terms of RF propagation, and the frontiers of new understanding being explored by the space-based SOHO observatory. We'll start by looking at the geomagnetic disturbances and storms that can result in the aftermath of a major surge in the solar wind.

Geomagnetic Storms and Disturbances

When a solar wind surge—often associated with sunspots and Coronal Mass Ejections (CMEs, see Part I) and touched off by solar flare eruptions—reaches the Earth, changes occur in the magnetosphere, and the Earth's geomagnetic field fluctuates wildly. Extended periods of geomagnetic activity known as geomagnetic storms (severe disturbances of the Earth's magnetic field) can last for days. The impact on radio propagation during the storm depends on the level of solar flux and the severity of the geomagnetic field disturbance.

Geomagnetic and Biological Effects. During such energetic storms, the high-altitude currents in the magnetosphere change rapidly in response



A large solar flare and an associated prominence. (Photo from the Australian government's IPS Radio & Space Services web site: <http://www.ips.gov.au>)

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

ICOM

FREE SHIPPING! via UPS Ground on Orders over $1,500

Super Deal!

IC-746 HF/VHF Transceiver

HF+6m/2m, 100w • IF-DSP, front panel adjust. • All-mode • Twin passband • HF + 6m auto ant. tuner • 11"w x 4½"h x 12½"d **FREE Logbook**,Limited Time .. © **$1349.99**

IC-756PRO HF/6M Transceiver

5-100w output–variable • All mode • 32-bit floating point DSP tech. • 24-bit AD/DA converters • DSP controlled AGC loop • 51 IF filters • Real-time spectral scope • Auto notch • Internal voice recorder • **FREE World Clock & CD-Rom service manual from Icom** thru 9/30/00..... **$2899.99**

NEW!

IC-718 HF Transceiver

.03-29.9MHz receive • Adjustable power 5-100w SSB, CW, RTTY, 2-40w AM • 10-button keypad - direct freq. input • Auto tuning steps • IF shift • VSWR • Digital S/RF meter..... © **$724.99**

IC-775DSP HF Transceiver

200w–all modes • IF-DSP • Auto IF Notch DSP noise reduction • Noise Blanker PSN modulation • Auto peak filter • Dual watch • CW pitch control • Electronic and memory keyer • Power MOS FET final • Built-in power supply .....**Special $3499.99**

HOT!

IC-706MKIIG Transceiver

HF+ 6m (100w); 2m (50w), 440 (20w) • 101 mem. • .03-200MHz broadband all mode • Cross band split • Noise blanker • IF shift • DSP • Auto repeater • Preamp/attenuator • CW keyer • Full break-in (QSK) • Speech processor • VOX/XFC • Tone encoder/decoder • 9½"w x 3¾"h x 9⅛"d, 9.1 lbs .....© **$1019.99**
IC-706MKIIG with AH4 .....© **$1309.98**
IC-706MKIIG with AT180 ....© **$1469.98**
IC-706MKII 6m (100w); 2m (20w) • Tone enc • **W/DSP** .....**Closeout $899.99**

IC-821H Transceiver

2m/440 MHz • Advanced satellite and digital base • All modes • 9600 full compatibility • Sub band transmit • 160 memories • Noise blanker • Adjust. transmit power • Satellite doppler correction .....**Closeout $1399.99**

R-75 Receiver

.03-60MHz • Triple conversion • Auto notch filter • Twin passband tuning (PBT) • Synchronous AM detection • Opt. DSP • Large front-mounted speaker • **FREE UT-106 DSP from Icom** thru 9/30/00.© **$699.99**

R-8500 Receiver

0.1-2GHz (cell blocked) • All mode • IF shift • Noise blanker • Auto peak filter • 1000 memory channels • PC controllable w/built-in CI-V and RS-232C port.....**Special $1499.99**

RECEIVER FOR PC

PCR-1000 .5-1300MHz PC-controlled • Power supply • AM/FM/SSB • Built-in speaker • Antenna • RS-232 cable and software • cell-blocked..... **Special © $349.99**
PCR-100-12 .01-1300MHz PC-controlled • AM/FM/WFM • CTCSS • Ant .....**Spec © $199.99**

Super LOW!

IC-2100H FM Transceiver

144MHz, 55w • FM switchable • PC ready • 14 channel DTMF • 113 memory channels • Selectable squelch delay • Optional HM-90A 5½"w x 1⅜"h x 7⅜"d **$179.99**

IC-207H Dual Band Mobile

2m/440MHz FM • 50w/35w • Wideband receive • 182 memory channels • 9600 baud capability – PC ready • 50 frequency en/decode • Backlit TTP mic **$299.99**

IC-2800H FM Mobile

50w/2m, 35w/440MHz • CTCSS enc/dec • S meter • Memory names • Simple band scope • 6 pin data port • External video input • Full function microphone • Independent band controls • Separate control head • 3" TFT color LCD screen **$539.99**

HANDHELD COMM. RECEIVERS

R-10-05* **(pictured)** Wideband coverage: 0.5-1300MHz (cell blkd) • FM/WFM/AM/USB/LSB/CW modes • 1000 memories • 8 character alphanumeric LCD • 7 scan modes with priority • Cloning .....**Special © $299.99**
R-2-06* .5-1300MHz • AM/FM/WFM • w/chgr/batt **Spec $179.99**
***FREE software from Icom** thru 9/30/00

PW-1 Amplifier

HF + 6m • 1KW PEP SSB and 1kw CW/RTTY output • Auto band change • Built-in auto antenna tuner • Wide ALC adjust. range • Full break-in CW operation • Built-in 110/220VAC • Auto input voltage selector • 14"w x 10⅝"h x 14⅝"d, 56 lbs .....**Special $4799.99**

HANDHELDS

IC-T22A IC-T2H IC-T8A/HP IC-Q7ABC IC-W32A

IC-T22A 2m • 3w (5w @ 13.5V) • Small, easy to use • Alphanumeric display • Air band rx • 80 memories; 40 with alpha-numeric display.....**Special $239.99**
IC-T2H 2m 6w • Wide band rcvr • 43 mem. • 8 program. keys • 8 AA batt**Spec $139.99**
IC-T7H 2m/440MHz • Dual bander at single bander size & price • Easy! Works one band at a time • 6w 2m/440MHz @ 13.5V • No function key and "intuitive" help function • Built-in CTCSS encode/decode.... **$199.99**
IC-Q7ABC 2m/440 • 300mw • rx: 30-1300MHz cell blkd • 200 mem..... **$134.99**
IC-W32A 2m/440MHz dual bander • 3w, 5w w/BP-173 • Independent band controls • Simultaneous receive of both bands • 200 mem. (100 per band) w/name capability • PC/radio-to-radio cloning capability • Built-in enc/dec • Auto repeater func. • Weather channel rcve capability..... **$269.99**
IC-T81A **Quad-band** HT • 5w 6m/2m/440 MHz, 1w 1.2 GHz **$299.99**

Other ICOMs not Pictured

A-22 5w Navicom Air HT **$499.99**
AH-4 80-6m/120w/auto wire tuner **319.99**
AT-180 Auto coax tuner HF + 6m **499.99**
IC-2GXAT/HP 7w 2m HT .....**Special 229.99**
IC-4008A Family radio service HT **79.99**
IC-M3A 5w VHF marine HT..... **159.99**
IC-M45AW 25w VHF marine xcvr **199.99**

© w/Instant Coupon, coupon expire 9/30/00
Prices subject to change without notice.

AMATEUR ELECTRONIC SUPPLY® LLC

5710 W. Good Hope Road Milwaukee, WI 53223 • 414-358-0333 • Fax 414-358-3337 • Service 414-358-4087

BRANCH STORES			STORE HOURS
28940 Euclid Ave Cleveland, OH 44092 440-585-7388 1-800-321-3594 Fax 440-585-1024 cleveland@aesham.com	621 Commonwealth Ave Orlando, FL 32803 407-894-3238 1-800-327-1917 Fax 407-894-7553 orlando@aesham.com	1072 N Rancho Dr Las Vegas, NV 89106 702-647-3114 1-800-634-6227 Fax 702-647-3412 lasvegas@aesham.com	Monday-Friday 9am to 5:30pm Saturday 9am to 3pm Over 43 Years in Amateur Radio

Internet **www.aesham.com** • E-mail **info@aesham.com** • Toll Free **1-800-558-0411**

ORDER TOLL FREE 1-800-558-0411

6:00 A.M. Pacific to 8:30 P.M. Eastern
Monday – Friday • Saturday to 6:00 P.M.

CIRCLE 106 ON READER SERVICE CARD

A colorful solar x-ray emission image. (Photo from the Australian government's IPS Radio &d Space Services web site: <http://www.ips.gov.au>)

to changes in the solar wind. These currents produce their own magnetic fields, which combine with the Earth's magnetic field to "geomagnetically induce" surge currents in the ground and in pipelines, electrical power transmission lines, and telephone lines. Effects may also be felt on wireless communication systems and satellites, which literally can become corroded by increased levels of solar-wind particles in space. There may be biological effects, too (a topic beyond the scope of this article), especially to exposed astronauts on space missions.

Because solar activity tends to drop off more slowly than it increases, the probability for severe geomagnetic storms and their associated terrestrial "fireworks" should run for several years, through about 2005.

Ionospheric Disruptions. Episodes of increased solar activity have many effects, and ionospheric propagation is susceptible to several kinds of short-term disturbances. During some geomagnetic storms, called *ionospheric storms*, worldwide disruptions of the ionosphere may occur, with a "mixed bag" of results possible. Shortwave (HF) radio propagation via the ionospheric *F* region (about 186 miles, or 300 km, high) is most likely to be affected. These disturbances upset the electron configuration in the ionosphere, and have the effect of weakening signal lev-

Selected Sources of Solar, Geomagnetic, and Propagation Indices and Data

Geophysical Alert Broadcasts on Stations WWV and WWVH

The NIST Stations. The National Institute of Standards and Technology (NIST) in Boulder, Colorado operates radio stations WWV in nearby Ft. Collins and WWVH in Kauai, Hawaii. Both broadcast continuously on 2.5, 5, 10, and 15 MHz; WWV also is on 20 MHz. Both stations offer voice and digital time, standard frequencies and time intervals, astronomical time corrections, geophysical (solar-terrestrial environment) alerts (Geoalerts), propagation information, marine storm warnings, and Global Positioning System (GPS) reports. Our main interest for this series of articles is the Geoalerts.

The Four-Part Geophysical Alerts. The Geoalerts are updated every three hours. They are broadcast in voice from WWV at 18 minutes after each hour and from WWVH at 45 minutes after each hour. These alerts consist of four parts:

Part 1: Solar-Terrestrial Indices. This contains various indices to estimate the current quality of ionospheric propagation, such as the 2800 MHz solar flux value, *K*-index, and *A*-index. The Boulder *K*-index, on a scale of 0 to 9, usually is derived from magnetometer measurements near Boulder and is reported every 3 hours. The Boulder *A*-index is a daily 24-hour measure of geomagnetic activity on a scale of 0 to 400, derived from the eight 3-hour *K*-indices recorded each day.

Part 2: Solar-Terrestrial Conditions for the Last 24 Hours. This part summarizes the intensity of solar activity and geomagnetic activity for the previous 24 hours, from very low to very high. Geomagnetic activity describes the state of the Earth's geomagnetic field; the various levels used in reporting geomagnetic activity are related to the *A*- and *K*-indices.

Part 3: Optional Information. This part reports on polar-cap absorption (PCA), major flares, satellite-observed "proton events," beginning and ending times of geomagnetic storms, "stratwarm" (stratospheric warming) alerts, and other very specialized information, mostly for professionals.

Part 4: Forecast of Solar-Terrestrial Conditions for the Next 24 Hours. The Part 4 forecast tells you whether to expect significant geomagnetic field activity as a result of flares or other causes. It uses the same terms as in Part 2 to forecast solar activity and geomagnetic activity for the next 24 hours.

Online Solar, Geomagnetic, and Ionospheric Web Sites

You'll find a great deal of solar, geomagnetic, ionospheric, and propagation data on the World Wide Web. Most web sites are sponsored by well-known academic, educational, and governmental research organizations. Here are some sites to check out:

1. The Space Environment Center (SEC) of the National Oceanic and Atmospheric Administration (NOAA), a part of the U.S. Department of Commerce, sponsors a very comprehensive and well-maintained site. It's at <http://www.sel.noaa.gov/sec_home.html>.

2. NOAA's National Geophysical Data Center (NGDC) distributes bulletins of solar and geomagnetic indices and offers excellent access to geophysical data and archival information. You'll find them at <http://www.ngdc.noaa.gov>.

3. The Solar Terrestrial Dispatch (STD) home page, operated by the University of Lethbridge in Alberta, Canada, provides abundant information regarding the Sun's state and its effects on the Earth. It's at <http://solar.uleth.ca/solar/main.html>.

4. The Australian government's IPS Radio and Space Services operates the Australian Space Forecast Center, which boasts a storehouse of online solar-terrestrial, space forecasting, and propagation information. It's at <http://www.ips.gov.au>.

5. The Aurora Page is sponsored by Michigan Technological University. It provides information, links, and images about the Northern Lights. It's at <http://www.geo.mtu.edu/weather/aurora>.

6. The Kangaroo Tabor Software web site is sponsored by Jim Tabor, KU5S, and features several software programs for those interested in current and future solar conditions and communications analysis predictions, including tools such as Active Beacon Wizard ++ and WinCAP Wizard 2. By all means check out the web site at <http://www.taborsoft.com>.

No Internet access? You can obtain solar flux, geomagnetic indices, and ionospheric reports by calling 303-497-3235 to hear a recorded WWV announcement, which is updated every three hours. Or, you may call the "on duty forecaster" at the Space Environment Center (SEC) for a live report at 303-497-3171.

Printed Sources of Information

Briggs, Roger P. and Robert J. Carlisle; edited by Barbara B. Poppe. *Solar Physics and Terrestrial Effects: A Curriculum Guide for Teachers, Grade 7-12*. Boulder, CO: Space Environment Laboratory, National Oceanic and Atmospheric Administration, December 1993. *[Note: This text was used as a reference for much of this article.]*

Davis, T. Neil, *The Aurora Watcher's Handbook*. Fairbanks, AK: University of Alaska Press, 1992.

Jacobs, George, W3ASK, Theodore J. Cohen, N4XX, and Robert B. Rose, K6GKU. *The NEW Shortwave Propagation Handbook*. Hicksville, NY: CQ Communications, 1995.

NOAA Technical Memorandum ERL SEL-80, "A Radio Frequency User's Guide to the Space Environment Services Center Geophysical Alert Broadcasts," Boulder, CO: Space Environment Laboratory, June 1990.

Oler, Cary. "Getting Primed for the Solar Maximum," *CQ* magazine, November 1998.

Thurber, Karl T., Jr., W8FX. "A Beginner's Guide to Radio Propagation," *Popular Electronics*, May 1998.

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's new adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them in the palm of your hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

MFJ's 25 Amp *MightyLite*™ weighs just 3.7 lbs. -- that's *5 times lighter* than an equivalent conventional power supply. MFJ's 45 Amp is even more dramatic -- *8 times lighter* and weighs just 5.5 pounds!

No RF hash!

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either!

Some competing switching power supplies generate objectionable RF hash in your transmitted and received signal.

These super clean MFJ *MightyLites*™ meet all FCC Class B regulations.

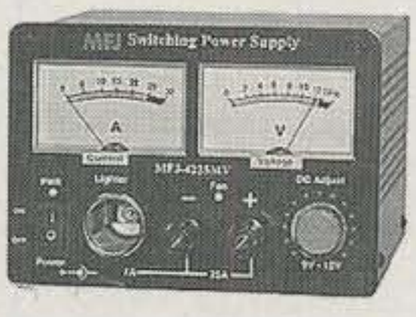
Low Ripple . . . Highly Regulated

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

Fully Protected

You won't burn up our power supplies!

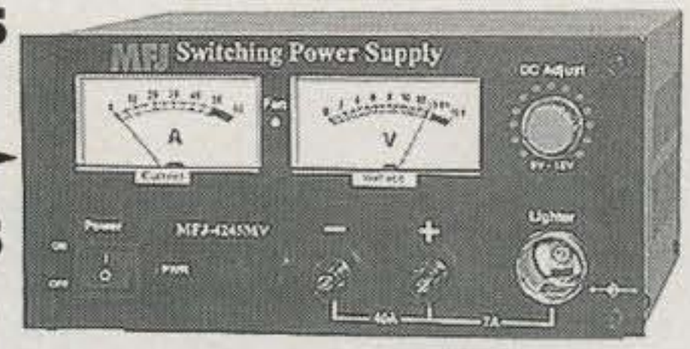
No RF Hash!



← MFJ-4225MV
25 Amp
$149.95
plus s&h

MFJ-4245MV →
45 Amp
$199.95
plus s&h

No RF Hash!



They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

MightyLites™ *. . . Mighty Features*

Front-panel control lets you vary output from 9 to 15 Volts DC.

Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

Brightly illuminated 3 inch meters let you monitor load voltage and current.

A whisper quiet internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D in.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¾Hx9D in.

NEW! 25 Amp *MightyLite*™

MFJ-4125
25 Amp
$109.95
plus s&h

Super light, super compact switching power supply delivers 25 Amps maximum/22 Amps continuous at 13.8 Volts DC. Low ripple, highly regulated. *No RF Hash!* Five-way binding posts for high current. Quick connects for accessories. Over voltage/current protection. 110 or 220 VAC operation. Meets FCC Class B regs. 3.5 lbs. 5½Wx2½Hx10¾D in.

MFJ 35/30 Amp Adjustable Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

MFJ-4035MV
$149.95
plus s&h

MFJ's heavy duty conventional power supply is excellent for powering HF or 2 Meter/440 MHz transceiver/accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for accessories and a covered cigarette lighter socket for mobile accessories.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾D inches.

MFJ *High Current* Multiple DC Power Outlets

Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

MFJ-1118
$74.95
plus s&h

MFJ-1116
$49.95
plus s&h

MFJ-1112
$34.95
plus s&h

New!
MFJ-1117
$44.95
plus s&h

MFJ-1118, $74.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet*. Lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC supply.

Two pairs of super heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total.Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator.

Built-in 0-25 VDC voltmeter. Six feet super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs. Heavy duty aluminum construction. 12½x2¾x2½ in.

MFJ-1116, $49.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $34.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

NEW! **MFJ-1117, $54.95.** For powering four HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. Tiny 8x2x3 inches.

Free MFJ Catalog
and Nearest Dealer . . . 800-647-1800

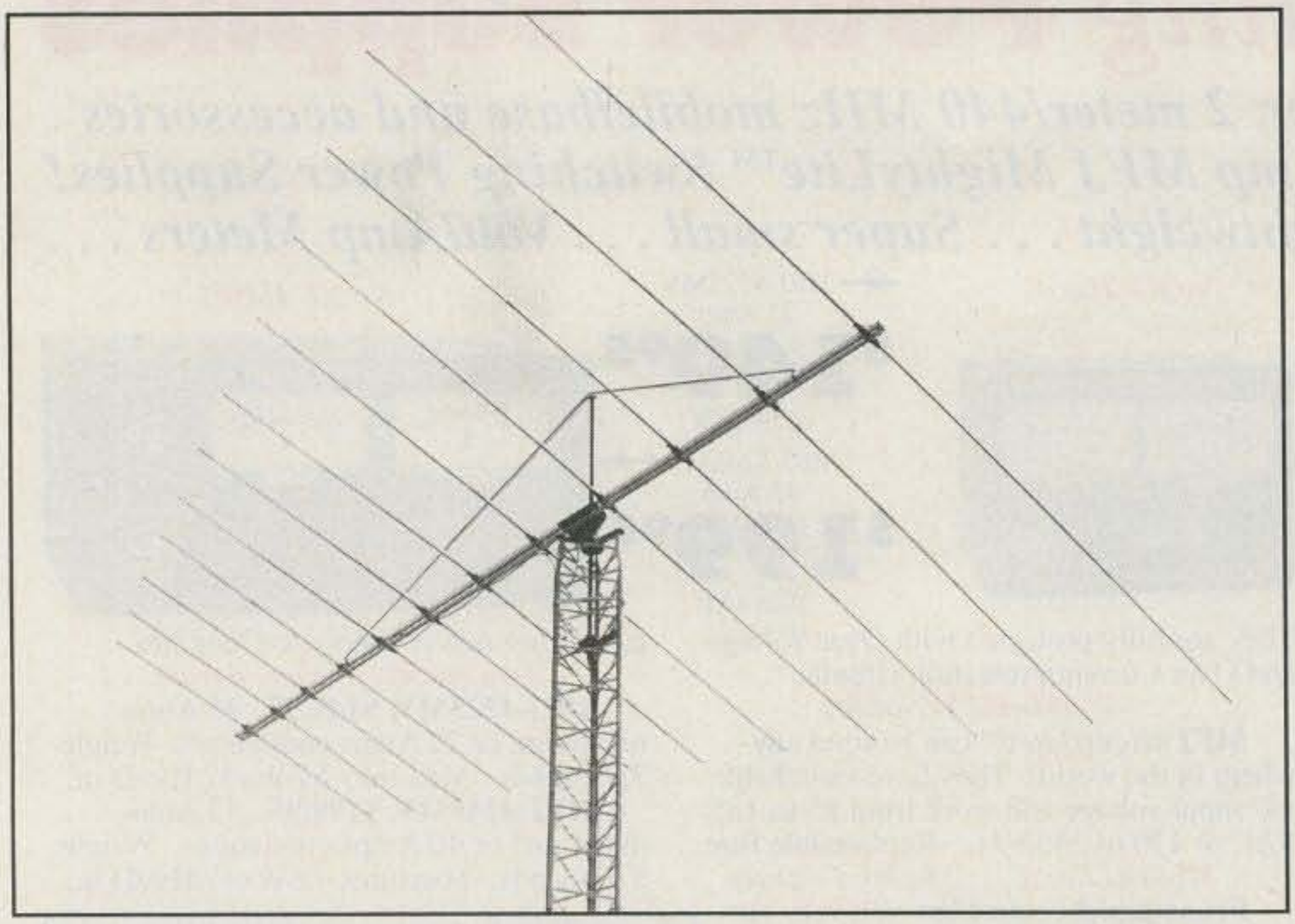
http://www.mfjenterprises.com

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(662) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (662) 323-6551; **Add s/h**
Tech Help: (662) 323-0549

All are protected by MFJ's famous No Matter What™ one year limited warranty.

CIRCLE 127 ON READER SERVICE CARD



Very wideband, frequency-agile antennas such as this commercial log-periodic type often are used in attempts to combat the ever-changing effects of geomagnetic storms, which can selectively disrupt long-distance HF communications frequencies using the ionosphere. The impact on radio propagation depends on the level of solar flux and the severity of the geomagnetic field disturbance. (Photo courtesy Hy-Gain Electronics)

els or even making them disappear entirely.

Shortwave radio users often find that high geomagnetic activity tends to degrade the quality of communications because geomagnetic field disturbances also diminish the capabilities of the ionosphere to propagate radio signals. During a solar x-ray outburst, the lower frequencies are the first to suffer, and signals crossing daylight paths will be the most affected.

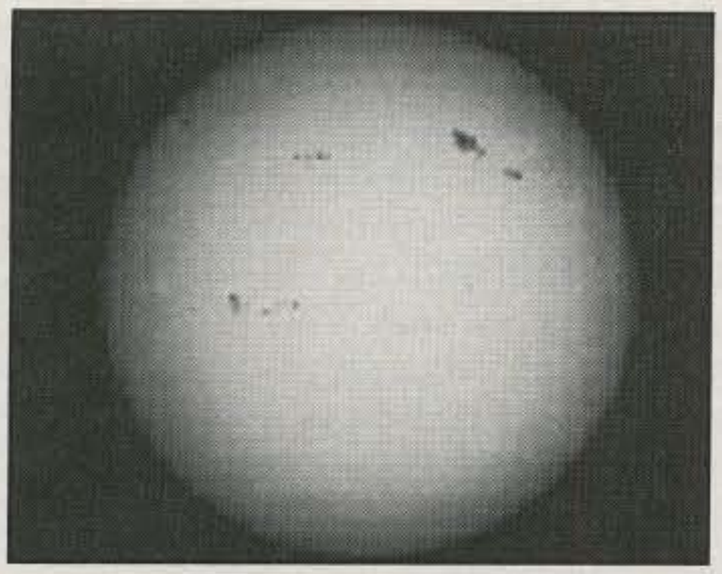
In some circumstances, however, higher solar activity actually can *improve* HF communications. As a rule, the higher the solar activity, the better the conditions on the higher HF amateur bands, such as those above 14 MHz, and on the lower VHF bands. If you hear announcements of a solar disturbance on National Institute of Standards and Technology (NIST) stations WWV or WWVH, try tuning to a higher frequency. Higher frequencies are also the first to recover after a storm, the opposite of disturbances indirectly caused by geomagnetic storms.

Auroral (Au) Propagation

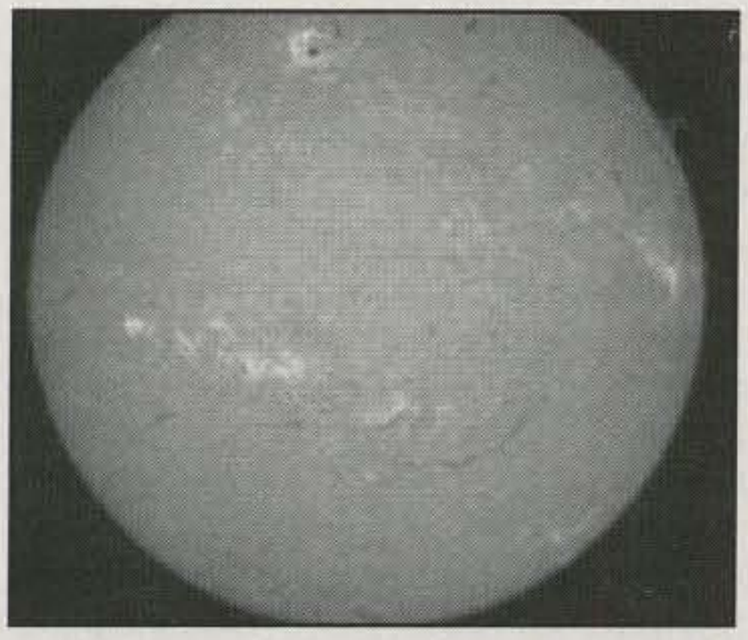
Geomagnetic disturbances that result in aurora may actually improve propagation on high HF and VHF bands. Besides the visible auroral display, there also may be a *radio aurora.* This is a sort of fluorescence of the ionospheric *E*-layer, which tends to reflect radio signals above about 20 MHz. Radio amateurs and other HF and VHF spectrum users are particularly interested in auroral (Au) effects that temporarily can enhance propagation. Auroral *E*-layer propagation is noticeable on the amateur 28, 50, and (sometimes) 144 MHz bands. It's common across the northern third of the US and southern Canada at about the same time as auroral activity is diminishing. Signals behave much like sporadic-*E,* but sometimes have a "hollow" sound. Effects are mostly on east-west paths over distances to about 1400 miles (2253 km). Auroral *E* "openings" typically last for an hour or two.

Tracking and Forecasting Solar Dynamics

Astronomers have been tracking solar activity for nearly 250 years. Today the key measures are *sunspot number* and *solar flux.* Since the earliest days of observing solar activity, activity has been based on counting sunspots. It has also been known for many years



A black-and-white solar image showing significant sunspot activity. (Photo from the Australian government's IPS Radio & Space Services web site: <http://www.ips.gov.au>)



A black-and-white solar image taken in Hydrogen Alpha light (6653 Angstroms), from the National Solar Observatory at Sacramento Peak, New Mexico. (Photo from the government-funded National Solar Observatory Sacramento Peak web site at <http://www.sunspot.noao.edu>)

that radio propagation conditions vary with sunspot number and size, with Maximum Usable Frequency (MUF) and signal absorption both increasing as ionizing radiation increases. The sunspot number and solar flux are used as indirect measures of this radiation.

We use the *International Sunspot Number* (ISN) as an approximation of general solar activity. The ISN involves a complex formula that takes into account other factors such as sunspot grouping and size. The ISN varies from near zero at sunspot minima to well over 200 at the solar cycle peak. Most propagation models require you to specify the sunspot number to be used; some let you use solar flux (see sidebar).

We generally consider the 2800 MHz (10.7 cm) *solar noise flux* (or simply "solar flux") to be a more dependable (yet still indirect) measure of radio noise coming from the Sun. The solar flux varies from about 60 to 300.

Correlating Sunspot Numbers and Solar Flux Values. Although we use both sunspot number and solar flux as activity measures, there isn't an exact mathematical relationship, especially if we only examine daily data. However, there is a fairly close correlation between the two if we use a 12-month running average (the *smoothed sunspot number*, or SSN) for both sunspots and solar flux. (For a comparative perspective, a solar flux of 100 equates to an SSN of about 48; an SSN of 200 represents a solar flux of about 242.)

Why We Want to Know. So far we've discussed the sunspot and solar flux nuts and bolts. It's also quite important to be able to predict solar activity and its effects on the Earth. Unfortunately, doing so still is far from being an exact

science. (*W3ASK's predictions in* CQ *over the past 49 1/2 years are about as accurate as they come.—ed.*)

Research to improve solar forecasting is occurring in two major areas. The first is the correlation of phenomena with effects on Earth; we do this already, but our correlations so far are coarse and in need of refinement. The second, and most ambitious, area of work is that of constructing a comprehensive model for the solar-terrestrial environment that encompasses the incredibly complex interactions of *magnetohydrodynamics* (MHD) and the equally complex domains of the Sun, the interplanetary medium, and the Earth's magnetosphere. No simple task, indeed!

Ionospheric Storm Prediction. Ionospheric storms are caused by a variety of solar phenomena, such as solar flares, coronal holes, and CMEs. The storms last from a few hours to several days, and they sometimes recur with the Sun's own 27.5-day rotation.

Although ionospheric storms are difficult to predict, they occur in conjunction with geomagnetic storms, so geomagnetic field disturbances are an indicator of ionospheric disturbances. Severity is indicated by the *A* and *K* indices included in the geophysical alert (Geoalert) broadcasts from WWV and WWVH (see sidebar). In general, the MUF decreases and absorption increases as geomagnetic field activity increases. Ionospheric and magnetic disturbances may be accompanied by visible auroras.

The *K*-index. The *K*-index is the result of a three-hourly magnetometer measurement comparing the current geomagnetic field orientation and intensity to what it would have been under geomagnetically "quiet" conditions. *K*-index measurements are made at sites throughout the globe, and each is carefully adjusted for the geomagnetic characteristics of its locality. The Boulder *K*-index is on a scale of 0 to 9.

The *A*-index. The *A*-index is an averaged measure of geomagnetic activity derived from a series of physical measurements. The *A*-index provides a longer-term picture of geomagnetic activity. It ranges in value from 0 to 400 and is derived from *K*-indices. (*Stay tuned for an article by WB2AMU on interpreting and using these K- and A-index numbers.—ed.*)

Solar Cycle Predictions

Long-term predictions, such as deciding when a solar cycle has ended and another has begun, or even forecasting next year's conditions, is problematic. Making predictions is a complex endeavor that involves a variety of sophisticated techniques. All of these are beyond the scope of this article, but are discussed in some detail in *The NEW Shortwave Propagation Handbook* (Jacobs, Cohen, and Rose, CQ Communications, 1995).

As we have seen, high levels of geomagnetic activity generally degrade the ability of the ionosphere to propagate HF radio signals. Therefore, they are of interest to users of that portion of the RF spectrum.

Many government agencies, foreign governments, universities, and others are involved in predicting the solar cycle and monitoring solar activity. The National Oceanic and Atmospheric Administration (NOAA) and the United States Air Force (USAF) jointly operate the Space Weather Operations Facility, located in Boulder, Colorado (which is also home of the National Institute of Standards and Technology). It issues forecasts and warnings of impending solar disturbances, much like terrestrial weather forecasts.

Learning More from SOHO

The Solar and Heliospheric Observatory (SOHO) is a joint undertaking of the European Space Agency (ESA) and NOAA. This spacecraft is one of our most ambitious projects, giving us what amounts to an uninterrupted view of the Sun. The project helps us better understand the interactions between the Sun and the Earth's environment, including the solar wind.

The exceptional view of the Sun itself and its heliosphere (the region in space over which the Sun's gases and magnetic field extend) is achieved by operating the SOHO spacecraft from a permanent vantage point. This point lies 1.5 million kilometers (900,000 miles) ahead of the Earth in a special halo orbit around what scientists call the "L1 Lagrangian Point." This is one of five special points in the Earth's orbit where a body can revolve without being disturbed by the Earth's gravitation. All previous solar observatories simply have orbited the Earth, where their observations were periodically interrupted as our planet "eclipsed" the Sun. This won't occur with SOHO.

With its battery of onboard instruments, SOHO is helping scientists to solve some of the most perplexing riddles about the structure of the Sun, involving the heating of the solar corona, the acceleration of the solar wind, and the physical conditions of the solar interior. Constructed at a cost of $1 billion, the satellite has surveyed the Sun since 1996 with spectacular results, beaming back hundreds of thousands of remarkable images of solar eruptions and making dozens of important discoveries. It also has improved the ability of astronomers to predict and spot powerful solar storms.

A Very Close Call. There was a hold-your-breath scare on June 24, 1998 when SOHO fell silent and appeared lost to further observations. However, contact was reestablished with the satellite by searching for it in space with a powerful HF radio beam from the 1,000 ft. dish of the world's largest radiotelescope at Arecibo, Puerto Rico. Following a several-months-long evaluation, SOHO was back in commission—and with good measure. Already SOHO has dramatically expanded our knowledge of solar physics, including the discovery and mapping of rivers of plasma on the Sun, flare-induced "sunquakes," CMEs, and over 50 sungrazing comets. Also, SOHO recently helped to further pinpoint patches at the edges of honeycomb-shaped magnetic regions in the Sun's atmosphere from which the solar wind originates, helping with a search some have compared with the legendary terrestrial search for the source of the River Nile.

Summary

This article touched on space physics and solar-terrestrial dynamics, a timely inquiry as we approach the peak of the 11-year solar cycle. It focused on the solar wind, which streams from the Sun and bombards the Earth with high-speed, electrically charged particles. The article also discussed electromagnetic (EM) radiation and the EM spectrum, the Sun's complex structure, the Earth's magnetosphere and lower atmosphere, the Van Allen Radiation Belts and the aurora, geomagnetic storms and disturbances, tracking and forecasting solar dynamics, and the Solar and Heliospheric Observatory (SOHO). We will conclude with a companion piece by WB2AMU on making practical use of the solar activity data provided by the National Institute of Standards and Technology.

This series should help you make the most of the current peak of Solar Cycle 23. Good DX! ■

MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C
$359.95

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¾Wx4½Hx15D in).

MFJ AirCore™ Roller Inductor gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive *Self-Resonance Killer*™ keeps damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

MFJ *No Matter What*™ Warranty

MFJ will repair or replace your MFJ-989C (at our option) *no matter what* for one year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™

MFJ-986
$329.95

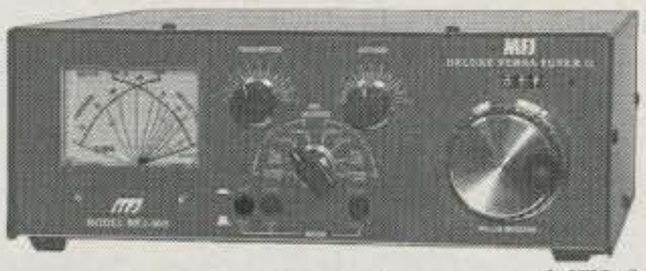
Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10¾Wx4½Hx15 in.

MFJ-962D *compact* Tuner for Amps

MFJ-962D
$269.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10¾x4½x10⅞ in.

MFJ-969 300W *Roller Inductor* Tuner



MFJ-969
$199.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. 3½Hx10½Wx9½D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E
$149.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, 48 position *Precision48*™ inductor, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. 3½Hx10⅝Wx7D inches. **MFJ-948, $129.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E
$129.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek 10½Wx2½Hx7D in.

MFJ-945E HF+6 Meter *mobile* Tuner

MFJ-945E
$119.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $4.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971
$99.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x6½x2½ inches.

MFJ-901B *smallest* Versa Tuner

MFJ-901B
$79.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-16010 *random* wire Tuner

MFJ-16010
$49.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906
$79.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $49.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921 or MFJ-924
$69.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 inches. Simple 2-knob tuning for mobile or base.

MFJ-922 *144/440 MHz* Tuner

MFJ-922
$79.95

Ultra tiny 4x2½x1¼ inch tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

MFJ-931 *artificial* RF Ground

MFJ-931
$89.95

Creates artificial RF ground. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire. Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. **MFJ-934, $169.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

Free MFJ Catalog
and Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

1 Year *No Matter What*™ warranty 30 day money back guarantee (less s/h) on orders from MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(662) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (662) 323-6551; **Add s/h**
Tech Help: (662) 323-0549

CIRCLE 137 ON READER SERVICE CARD

Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

A 1 KW Optical Transmitter Follow-up

Whenever I write an April column I try to choose a subject that is just on the border between reality and "science fiction." In this way the reader has to really think to determine how much (if any) of the subject matter is really practical or not.

This year in my April column I described a 1 KW optical transmitter more for your amusement than necessarily as the forerunner of a construction project—or so I thought at the time! The response has been such, however, that I felt a follow-up was in order, as many readers took me far more seriously than I could have imagined. There was a good deal of truth in that column, however, and I would like to expand my views on the matter this month.

Before I begin, I would like to thank in particular Henry, AA9XW, and Bruce, KG4HLZ, both of whom took the time to outline their thoughts in detail. I would also like to acknowledge a number of amateurs I know personally, as well as those who have also commented on the subject via e-mail. Now let's see what can be done seriously with such an endeavor.

c/o CQ magazine

Those of you who read the April column will recognize fig. 1, the original diagram. The optical path described is basically correct, and if you were to use the normal projection lamp and optical train from an old slide projector instead of the telescope, you would be able to project a rather strong beam forward. This is pretty obvious to anyone who has used such a projector.

The projection lamps used in these projectors have a parabolic rear reflector which reflects most of the visible light produced by the lamp in the forward direction. The reflector also has a wavelength-selective coating which allows much of the heat produced to pass through the coating to the rear so that it is removed from the forward beam. In this way the slide is not burned up and everything works fine.

As a light source, this arrangement works pretty well, and if you take such a projector outdoors at night, you can sometimes even bounce light off low clouds, depending on the adjustment range of the particular lens you have. As an alternate, a high-powered "million candlepower" searchlight can also be used and will produce an even tighter beam. Try both; you'll see what I mean.

Now comes the hard part—modulating the light beam. The nickel modulator, although correct in principle, will not produce enough movement of the slit to significantly vary the intensity of the beam. Another method has to be used.

A common question asked by several amateurs was why not modulate the light source directly and eliminate the need for any external modulator? In other words, put the lamp in series with a transformer (or something like that) and then feed it with audio as shown in fig. 2. You can try this, but the speed of response of lamps, particularly high-power lamps, is much too slow to properly pass audio frequencies. Remember, we want a fairly large modulation depth, for it is the amount of variation in the brightness of the lamp that will be recovered as audio in the receiver, not the absolute brightness level.

Unfortunately, the largest incandescent lamp that will give fair results with audio is a #222 flashlight bulb, and its output is far too low for this type of project. The larger the bulb, the slower it gets, and the more the high frequencies in the audio are attenuated. An LED could be used, or even a high-brightness device such as those used in auto-

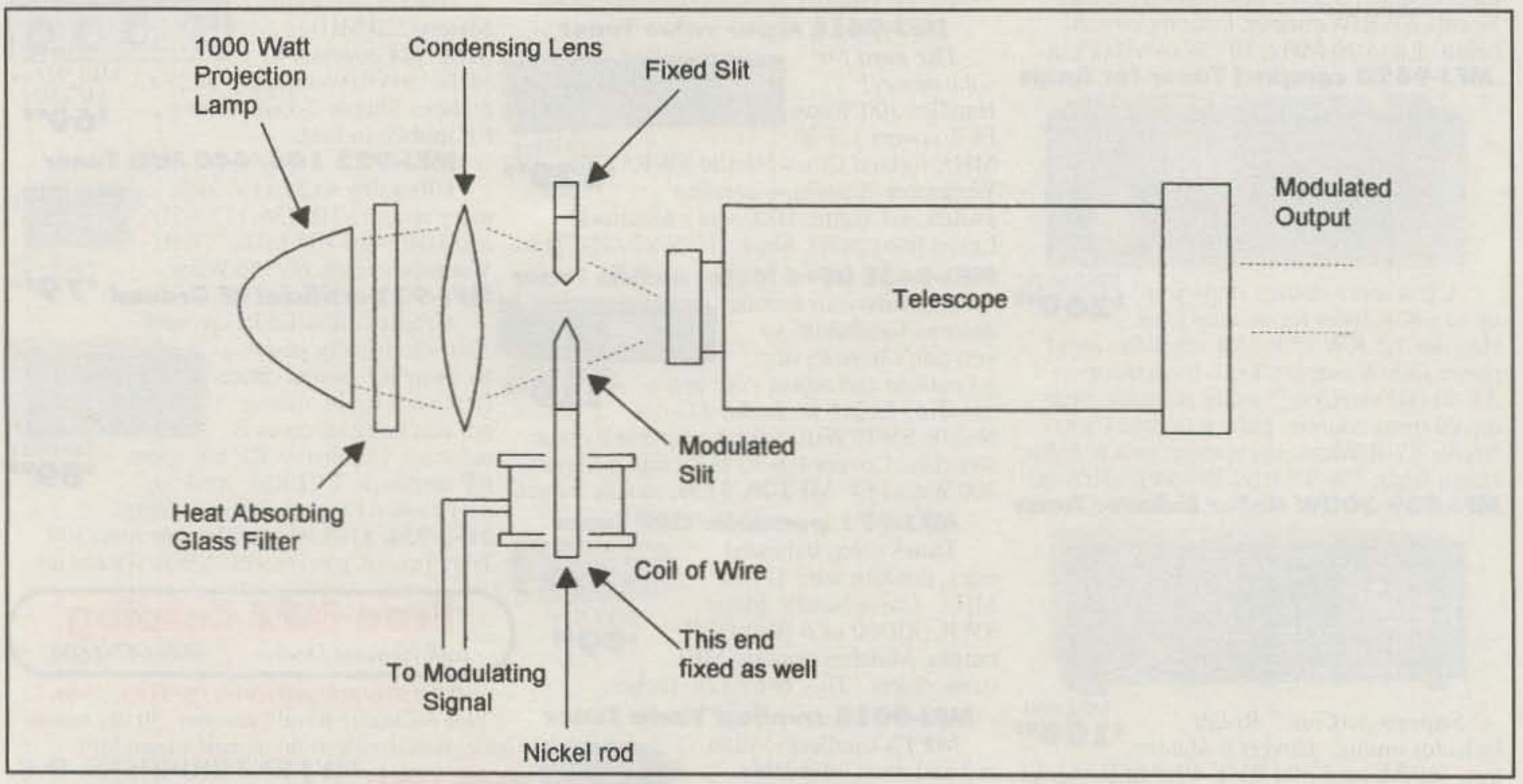


Fig. 1– Operating diagram of a 1 KW optical transmitter.

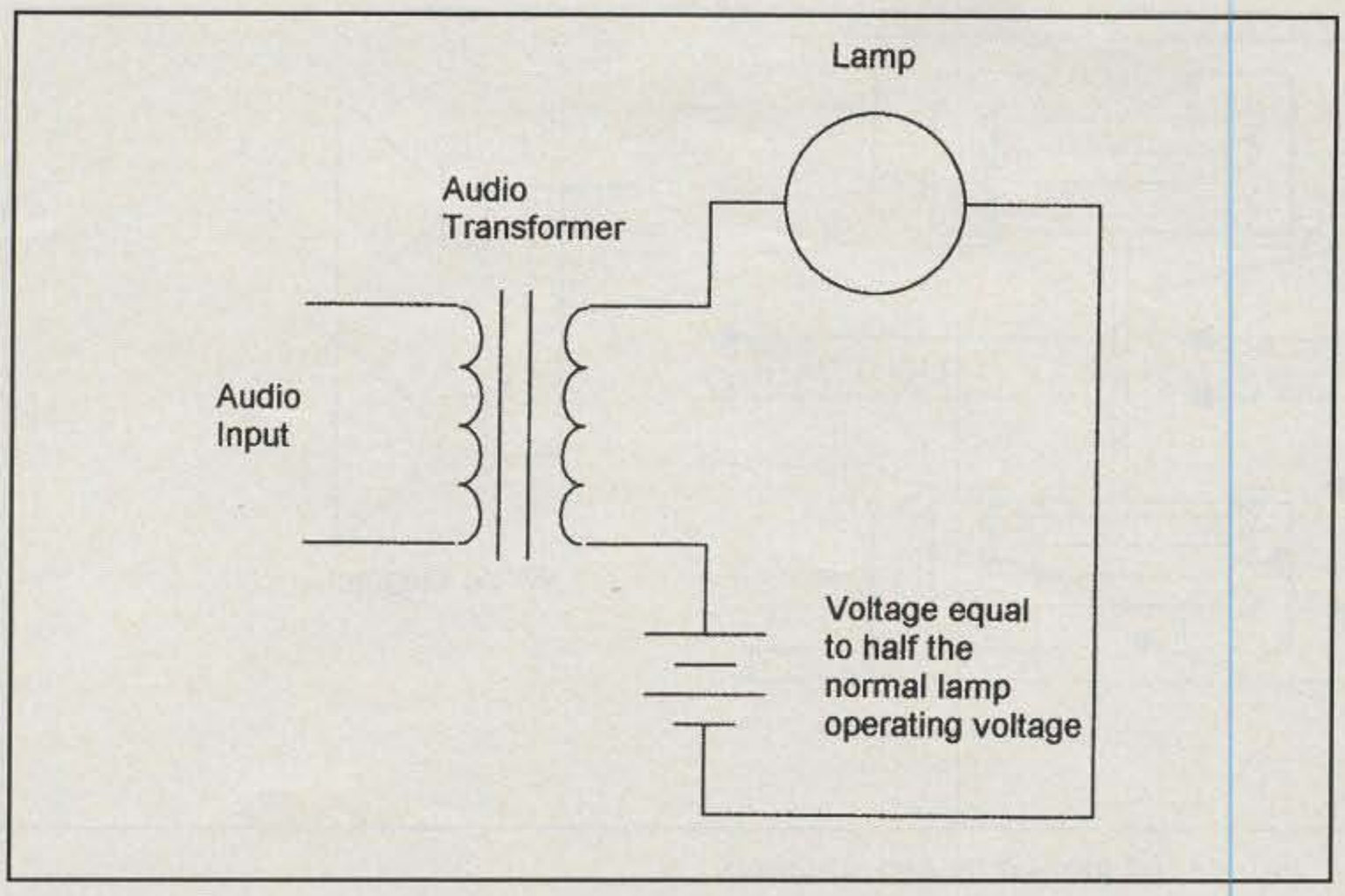


Fig. 2– A simple incandescent lamp modulator.

mobile tail lights, but the output will still fall far from a 1 KW source. The speed of modulation of an LED, however, can easily reach the microsecond region, so it can be a good candidate for short-range applications and will work with video. A laser could also be used, but then cost is an issue, not to mention the safety aspect. I think the best bet, for the beginner anyway, is to stick with the lamp approach. Besides, a KW transmitter sounds awesome!

The easiest signal to accommodate is CW. Here all we have to do is turn the light on and off. This can be done with a simple, lightweight metal shutter con-

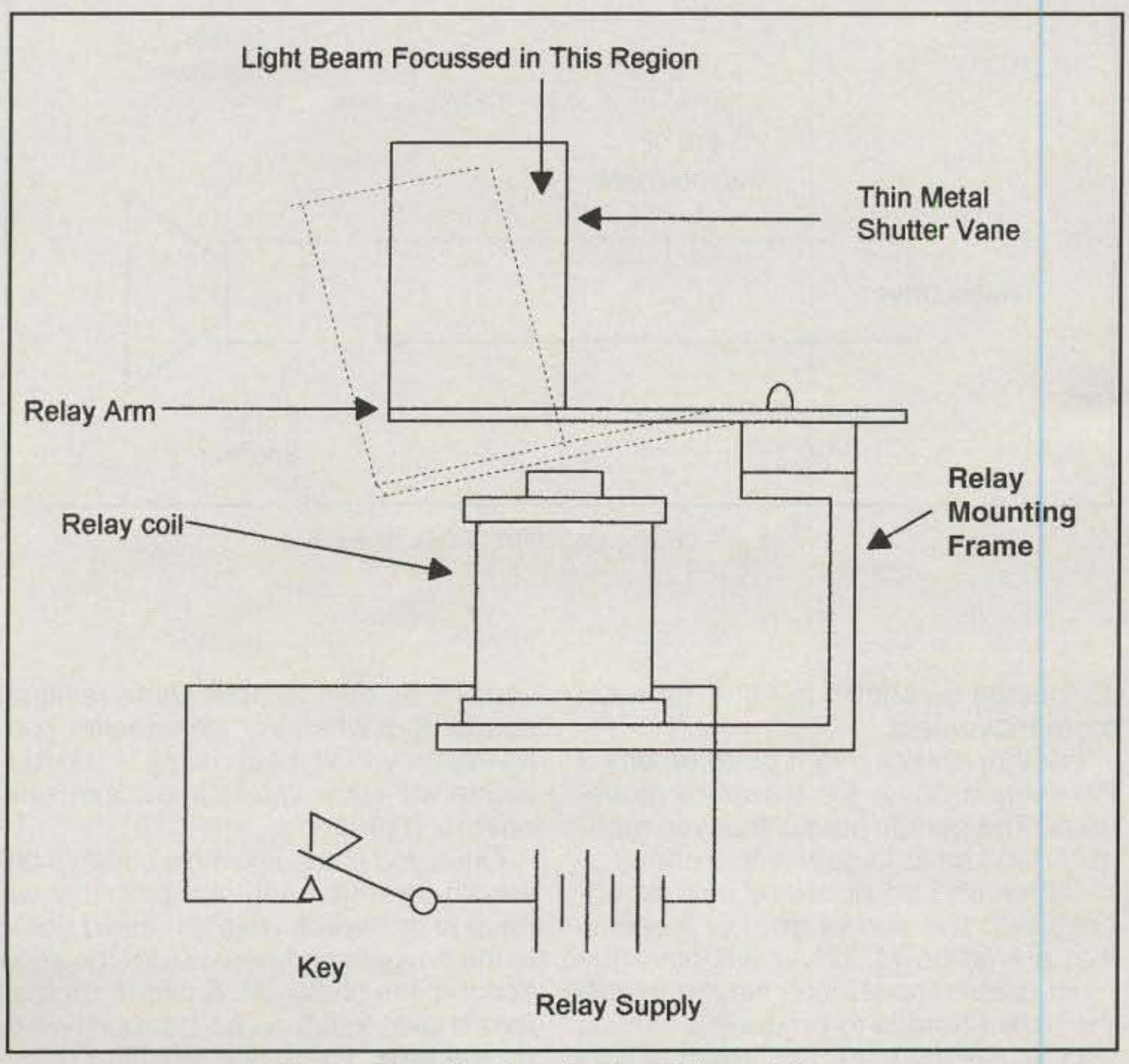


Fig. 3– Details of a simple CW modulator.

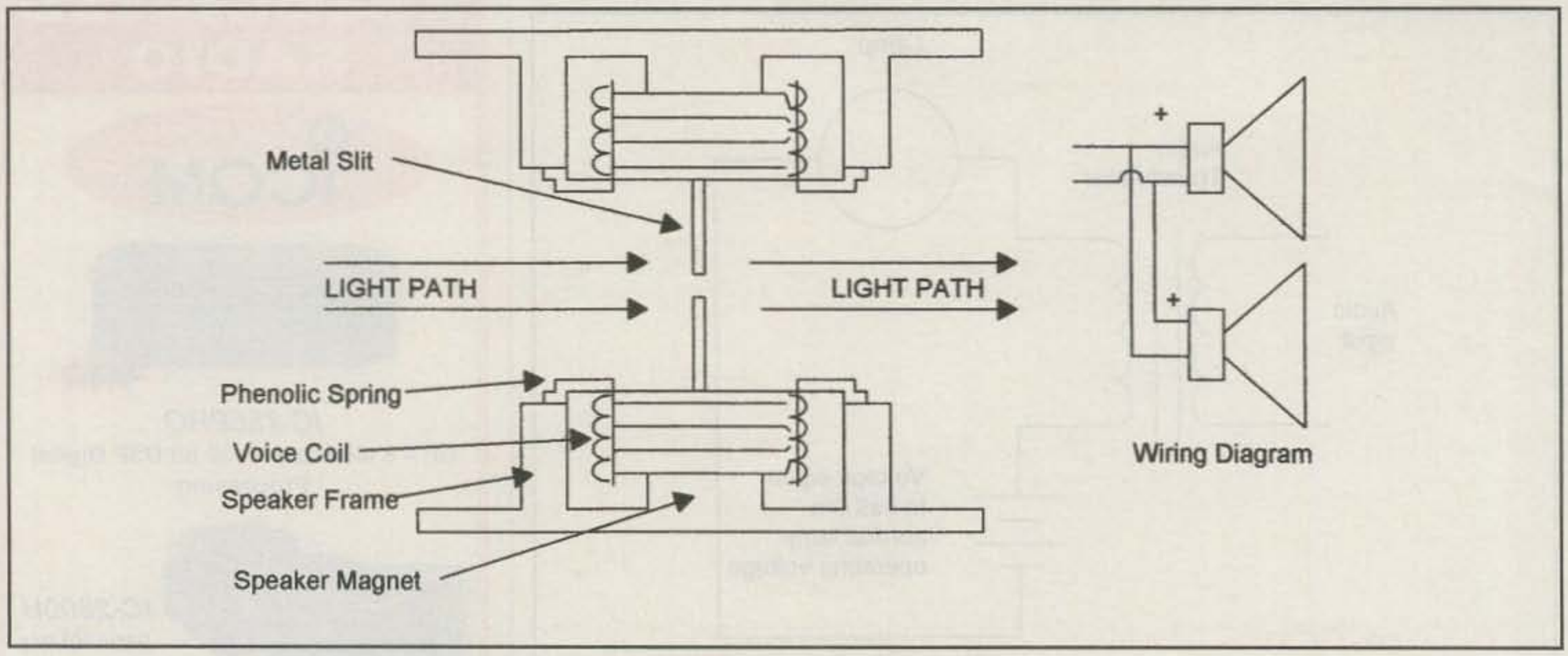


Fig. 4– Slit formed by two speakers.

nected to a relay as shown in fig. 3. The metal used can be shim stock or thin aluminum. The lighter the better. If you choose the relay carefully, you can achieve fairly high speeds. Remember, in the "old days" telegraph operators could achieve speeds of greater than 25 words per minute with mechanical sounders. The only problem you will have with such a shutter is getting enough movement to totally block the beam. The longer the swing of the relay arm, the slower the unit will be. You might even try making a key that moves the metal plate that blocks the beam directly and eliminate the need for additional electrical circuitry also. Some experimentation is definitely in order here. Even using a mirror connected to the relay arm to deflect the beam may work. Whatever method you finally come up with, the ideal situation is to achieve as close to total on-off control of the beam as possible.

For audio we must return to the speaker approach. Those of you who have any experience at all with loudspeakers are aware that the voice coil of a speaker moves a paper or mylar cone, which in turn moves air to produce the sound. Some speakers have fairly large degrees of movement easily seen particularly with rock music, while some do not appear to move at all. As a rule, the larger the unit, the more the movement. I would try to find as large a speaker as you can—maybe even a 15 inch woofer. I would also try to find one where the voice coil is supported by a phenolic spring in addition to the cone. Then carefully remove the cone, mount a thin metal plate to the voice coil, and use that as the movable portion of the slit in fig. 1. You could try a second speaker/plate assembly oriented and connected as shown in fig. 4 for even more movement.

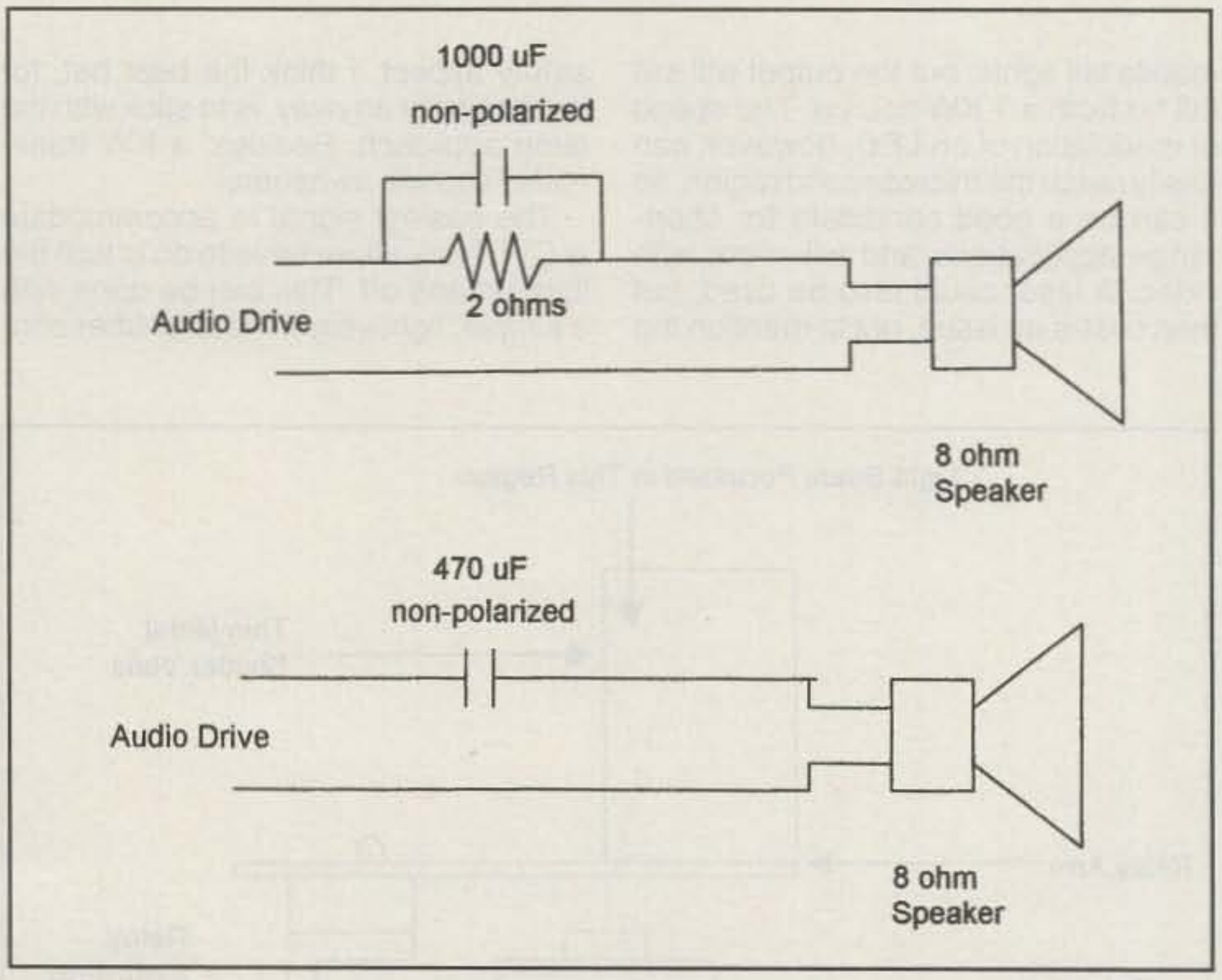


Fig. 5– High-pass filter possibilities.

Another choice might be to modify a PA system driver for still more movement. The benefit here is that you probably don't have to deal with a cone.

Although I do not have any experience with this sort of device, it seems that a high-power driver will have the most usable movement. Nevertheless, the object here is to produce a varying slit that will modulate the beam of light from about 10% to 90%. The fact that you will be able to hear some residual sound from whatever the speaker configuration you wind up using is a benefit that will allow you to know that all is operating properly.

Once you come up with a suitable driver/slit arrangement, you probably will have to pre-emphasize the audio going to the driver to compensate for the additional mass of the slit. A circuit such as that shown in fig. 5 can be modified to do the trick. The high-pass filter hopefully will produce clear audio, but re-

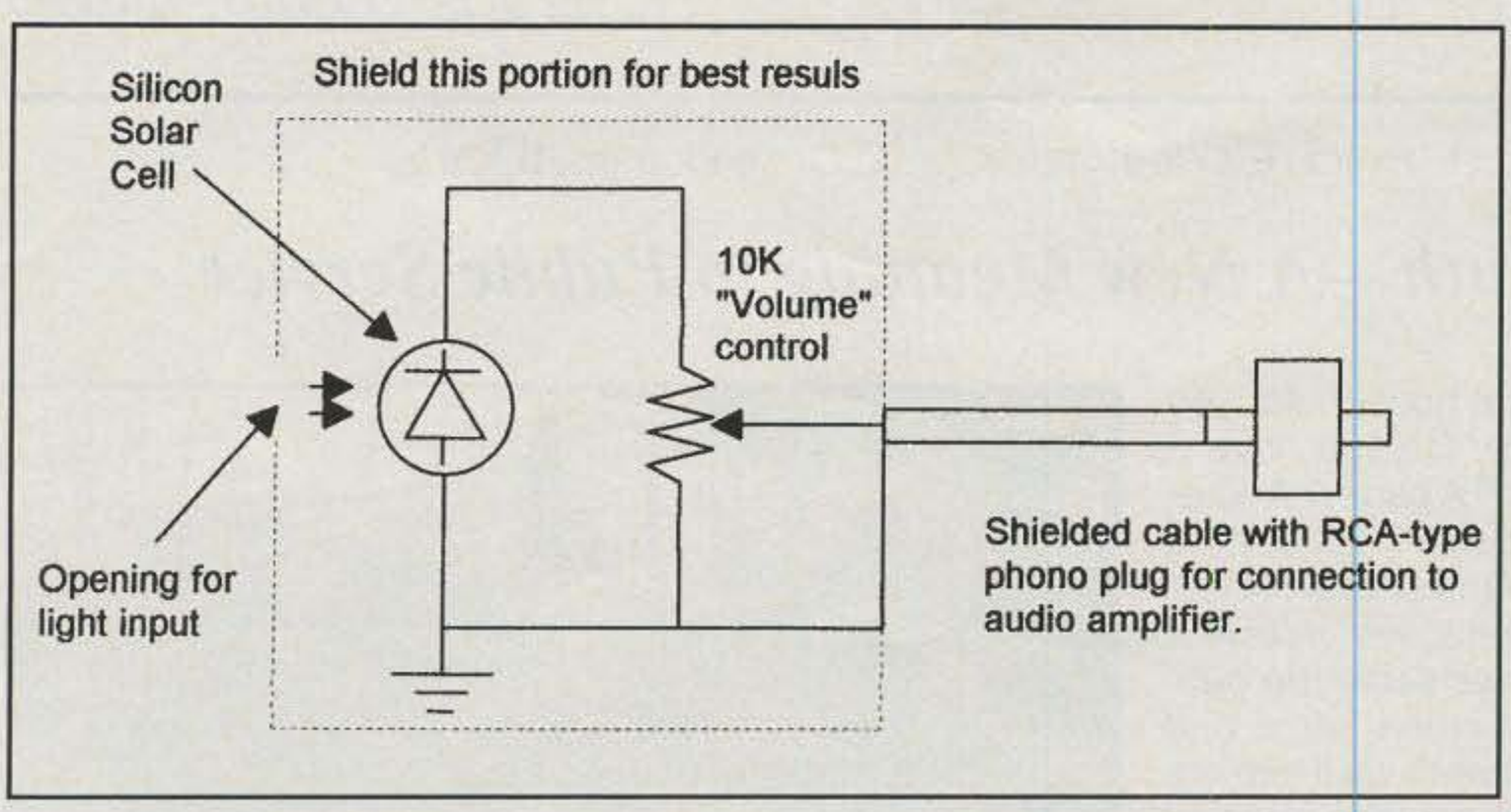


Fig. 6– Simple optical receiver for "tune-up" purposes.

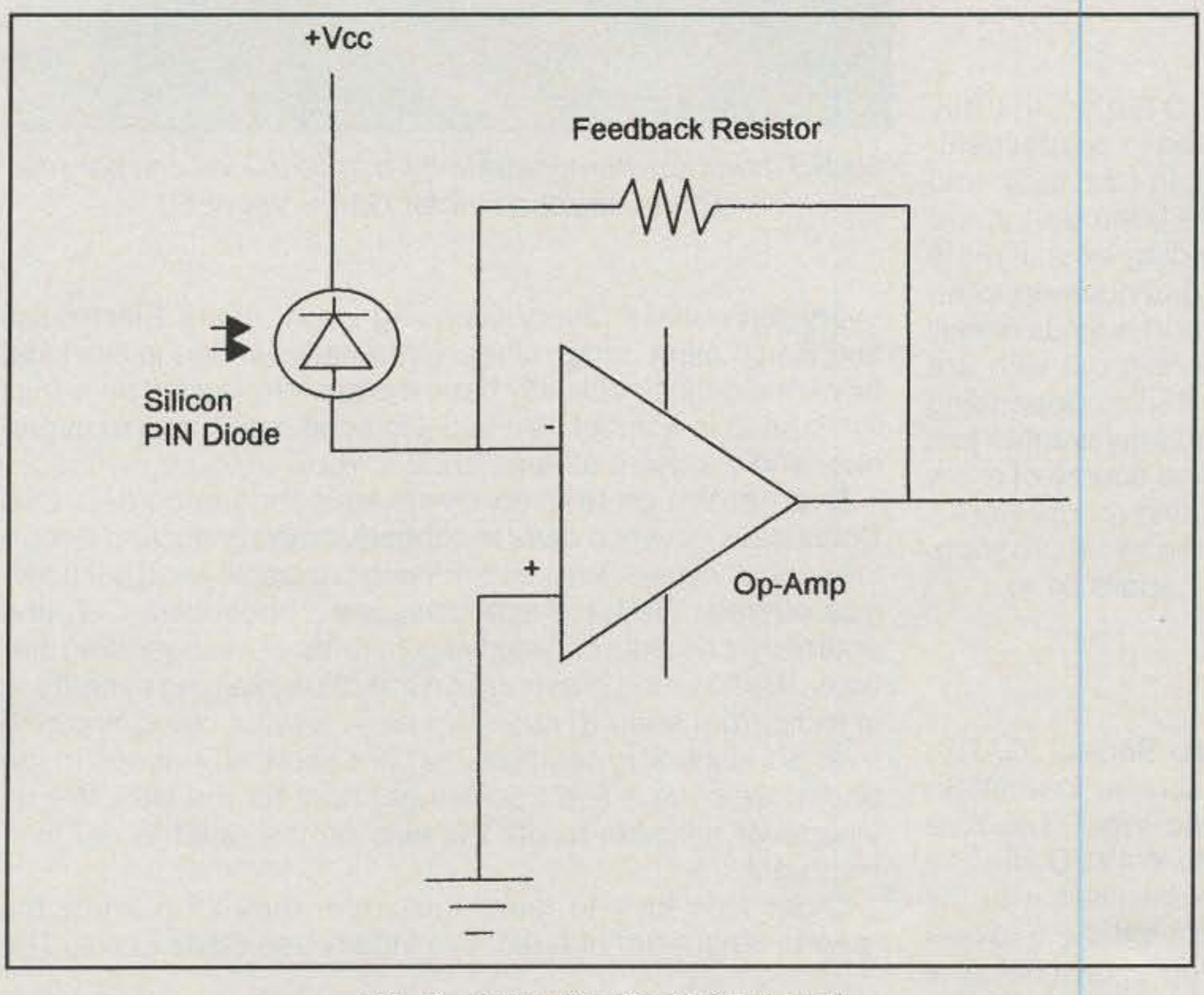


Fig. 7– A "real" optical front-end.

member, you don't have to be very elaborate; you only have to produce communications-quality sound.

For the receiving end of such a system, sensitivity is the name of the game, as is the case for RF transmission as well. The problem is the wide range of possible interfering sources. Neon lights, reflections from all sorts of things, and the sun itself all contribute to background QRM which can easily swamp the signal you are looking for. One possibility is to use color filters on both the transmitter and receiver to filter out unwanted signals. Again, there is a wide range of experiments that can be carried out in this area.

To start, a simple, inexpensive silicon solar cell at the focus of a 3 to 4 inch magnifying glass can be connected to a common audio amplifier as shown in fig. 6. This will produce enough signal for you to "tune up" everything. The use of a shielded enclosure for the photocell and "volume" control is suggested for minimization of hum and extraneous nose pickup. Once you have everything working properly, you can progress to a "real" optical receiver and use a silicon PIN diode followed by a transimpedance amplifier for the front end, as shown in fig. 7. As I have covered these types of circuits in the past, I will not do so now. However, if there is enough interest, perhaps we can come up with a complete "starter" receiver.

I sincerely hope this column will spark interest in the experimenters among us and that you will let me know how you progress. By the way, just so you have a feel for things, the equivalent electromagnetic frequencies for the light you are using can be determined by the following formula: frequency (in Hz) = speed of light (in meters per second) ÷ optical wavelength (in meters). Thus, for red light, at approximately 630 nanometers the frequency would be 299,792.5 meters per second (speed of light a bit more exact than you might be aware of) ÷ 630 × 10E9, which equals 475.86 THz (that's terahertz, folks).

White light, from 400 to 700 nanometers, contains an incredible amount of bandwidth (over 300 THz), so what you are doing when you use a projection lamp is modulating all of that spectrum—not too far removed from the early spark transmitters, which did the same thing, but many magnitudes lower. It is interesting how the state of optical transmission today is roughly at the same point that conventional RF transmission was in the spark era 90 years ago. Keep experimenting. The best is yet to come!

73, Irwin, WA2NDM

Public Service

BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Teaching Our Youth—A New Meaning to Public Service

Look around you. If you're in a typical household, you have many wireless devices nearby. Do you have a cordless telephone? A cellular phone? A pager? A wireless internet device? A garage-door opener? Each item involves communications between a transmitter and receiver. As hams in traditional public-service rolls, we provide a pool of trained communicators. How can we serve the public to help prepare today's youth for jobs in the future and show that it's fun at the same time? This month we'll explore one method of introducing youth to the fascinating world of communications and how we can provide a service to members of our community.

GARS members demonstrate ham radio to kids and parents. (Photo courtesy Victor Gann, W4VEG)

Scouting

As chartered by the Congress of the United States, the Boy Scouts of America is a movement dedicated to supplementing and expanding the education of youth. In fact, radio and the "secret" language of Morse code have been part of the program for years. One method of providing education is through the merit-badge program, which provides opportunities for youth to explore more than a hundred fields of skill and knowledge. Four badges hams can help out with are Computers, Electricity, Electronics, and Radio. Depending on how much time you have available, you may want to just offer to teach the Radio merit badge over the course of a few nights or help start an amateur radio scouting group. Here's a look at how two groups became part of the scout program, and how you might be able to help in your spare time.

Crew 73

Members of the Gwinnett Amateur Radio Society (GARS) in Georgia got involved in Scouting in response to amateur radio operators' children asking, "Can I do this?" The club formed a board and chose Victor Gann, W4VEG, as the group's advisor. The club decided to get involved with the Venture program in scouting. Venture replaced the Explorer Post program. An advisor is the Venturing equivalent of a Scoutmaster.

Forming a Scout group doesn't just happen. GARS spent nearly a year getting the required paperwork approved. Crew 73 was official. W4VEG shares his experience of getting Crew 73 started:

Why did we choose Venturing? Well, it's for boys and girls ages 14 to 20. The Crew members themselves run the Crew. This means the adults fill advisory roles only. When this works, it's great. The Crew members like being in charge and making decisions; the adults like watching and coaching. With the BSA behind us, there are enormous resources for the High Adventure part of Venturing, including liability insurance and great training available for adults.

Setting up the Crew on paper, getting adult advisors, and registering aren't everything. You have to have participants! We began to promote the Crew everywhere we went—at every radio class, every licensing class, every Electronics and Radio merit badge class. Eventually, we found five kids, boys and girls, to officially have a crew. We started an e-mail list to keep in contact. We use it to send one e-mail to everyone, and we use it at least once a week.

Events: We go to every event we can: camporees, Cub Scout days, science days in schools, day camps, and Scouting special events. We keep refining our display and our activities offered. We have mini-classes on phonetics, CW, and operating procedures, and we give tours of the operating stations. We have ten presentation boards explaining everything in radio from soup to nuts. We have a parts board showing over 50 electronic components. We show *CQ* videos in the booth, we have a radio scavenger hunt for the kids. We try whenever possible to get the kids on the radio to get over mic fright.

Older kids love to learn the code; they then know the "secret language" of radio. We mostly use *Code Quick*. The

Crew 73 members learn all about mobile operation. (Photo courtesy Victor Gann, W4VEG)

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

Radio Merit-Badge Requirements

1. Explain what radio is. Include in your explanation: the differences between broadcast radio and hobby radio, and the differences between broadcasting and two-way communicating. Also discuss broadcast radio, amateur radio callsigns, and using phonetics.

2. Sketch a diagram showing how radio waves travel locally and around the world. How do the broadcast radio stations, WWV and WWVH, help determine what you will hear when you listen to a radio?

3. Do the following:

a. Draw a chart of the electromagnetic spectrum covering 100 kilohertz (kHz) to 1000 megahertz (MHz).

b. Label the LF, MF, HF, VHF, UHF, and microwave portions of the spectrum on your diagram.

c. Locate on your chart at least eight radio services, such as AM and FM commercial broadcast, CB, television, amateur radio (at least four ham radio bands), and police.

d. Discuss why some radio stations are called DX and others are called local. Explain what the FCC and the ITU are.

4. Explain how radio waves carry information. Include in your explanation transceiver, transmitter, amplifier, and antenna.

5. Learn the safety precautions for working with radio gear, particularly DC and RF grounding.

6. Do the following:

a. Explain the differences between a block diagram and a schematic diagram.

b. Draw a block diagram that includes a transceiver, amplifier, microphone, antenna, and feedline.

c. Explain the differences among an open circuit, a closed circuit, and a short circuit.

d. Draw ten schematic symbols. Explain what three of the represented parts do. Find three electrical components to match to three of these symbols.

7. Do *one* of the following:

a. Amateur radio

1. Describe some of the activities that amateur radio operators can do on the air, once they have earned an amateur radio license.

2. Carry on a 10-minute real or simulated ham radio contact using voice or Morse code; use proper calsigns, Q signals, and abbreviations. (Licensed ham radio operators may substitute five QSL cards as evidence of contacts with amateur radio operators from at least three different call districts.)

3. With the help of a local amateur radio operator, talk to and properly log at least two Morse code radio contacts. Record signal reports. Explain how often amateur radio operators must give their callsigns during a radio contact.

4. Explain at least five Q signals or amateur radio terms you hear while listening.

5. Explain some differences between the Novice Class license and the Technician Class license requirements and privileges. Explain who gives amateur radio exams.

6. Explain how you would make an emergency call on voice or Morse code. Tell why the FCC has an Amateur Radio Service.

7. Explain handheld transceivers vs home "base" stations. Explain about mobile amateur radios and amateur radio repeaters.

8. Visit a radio installation approved in advance by your counselor (ham radio station, broadcast station, or public service communications center, for example). Discuss what types of equipment you saw in use, how it was used, what types of licenses are required to operate and maintain the equipment, and the purpose of the station.

Rick Blank, WB3BSA, explains to students at SPARK Lodge how to "listen" before you "speak." (All photos of the SPARK activities were taken by Ted Fleury of Post 123 and are the property of the SPARK Lodge ARC)

Frank Martin, N3NMP, explains some of the finer points of circuit theory to Scouts at SPARK Lodge.

Scouts log shortwave stations as part of the Radio merit-badge requirements.

kids just don't respond well to dah-dah-dah and di-di-dit. But use the *Code Quick* sound alikes, and we've taught the entire alphabet in an hour! Yes, more practice is needed to pass a 5 wpm test, but the kids are hooked and take over study on their own.

One of the big mistakes hams make is going too big, too far, and too technical for kids. Kids don't know and don't care what gain your 17-element Yagi has. The want to talk to someone "out there," and anyone will do. To them DX is anything not in the same room. So don't set up an antenna to work DXCC when a simple vertical on 20 meters will get some kind of traffic 24-7. Keep your rig simple, too. When parents see a Yaesu 1000MP with a tuner, speaker, linear amplifier, desk mic, antenna switches, and a giant Yagi, they don't think fun, they think *money!* Even though an HT is less than karate lessons, the visual display is very strong. We use a FT-100 and a power supply with the simplest antenna possible for the location. Non-threatening is the best idea for parents.

Another thing we stress is what you can *do* with amateur radio. When you are inside the ham community, you can easily take for granted everyday ham activities of which other people are completely unaware. Talk about an autopatch, DXing, helping with a parade, or helping with an emergency or disaster. Eyes light up when you can show a QSL card from the space shuttle. "And they send you a card, too?!" If you think about it, there are probably over a hundred things you could bring up between HTs, mobiles, and HF rigs that the general public doesn't know about. We look for their hot buttons on that list.

Next we emphasize the radio-related careers you can get into: engineers to broadcast journalism, electronic repair to radio dispatchers. And please don't say anything about there being more professionals in electronics than there are professional sports, or you'll never have enough meeting space! Parents and kids alike relate to careers, and radio can spawn a lot of them. Throw in cultural relations, and there's a spectrum wide enough for anyone.

Practical Advice. Get adults who are "kid friendly" involved—that is, patient and good teachers. The motto of some hams around here is "no kids, no lids, no space cadets." Well, that pretty well describes most of the people coming to our booth! Getting "kid and lid" friendly hams will keep the kids coming and keep the future of amateur radio alive.

Make sure the meetings are *fun* and punctual. Start on time. Finish on time. Don't let anyone go to sleep in between. We have meetings that address administration, adventure, and amateur radio in 90 minutes. That way the outdoor interests are addressed with the technical desires. We meet once a month and have one activity a month. We hope to operate a Crew net by year end. We encourage all the Crew to attend our local ARES at least once a quarter.

Refine your display as much as possible. Don't just put up a table and a radio. We have a 10' × 20' shelter that is filled with tables of demos, presentation boards explaining concepts, and lots of literature. I suppose we have three-quarter of the Technician class concepts in our booth. The booth can also double as a portable shack for our outings. You can put a lot of radios in a space that size.

Successes. At Gold Rush, a BSA event held in North Georgia every two years, we saw over 1000 Scouts, talked

to 40 countries, and got two new Crew members. Cub Scout Day saw 150 kids, most of whom had never seen a radio before. For Field Day 2000, our Crew basically took over the 15 meter phone station. One of our crew was at her first radio event ever. She personally made nearly 200 contacts!

Our sponsor has approved a fund raiser for the club—selling batteries! If the Council approves, we will be suppliers to the county of high-capacity private-label batteries. This fits so well with radio, and since it is an ongoing fundraiser, we hope it will help us purchase equipment, as well as finance our future plans.

Future Plans. Upcoming events through Christmas for the Crew include rock climbing, white-water rafting, and DX backpacking. The crew will DX on all the campouts. We have already reserved the spot for JOTA, and are planning a code class and a Tech class. Next spring we are going to have a "Pixie Party," where we assemble a pixie radio and test it in one weekend. The adults are saving Altoids boxes already. The long-term goals are a DX trip to Pennsylvania in 2001 as practice for a trip to Belize in 2002.

SPARK Lodge

Another group in southeastern Pennsylvania provides a service for Scouts of all ages. President Frank Martin, N3NMP, of the SPARK Lodge Amateur Radio Club, K3BSA, sponsors a Crew. The club has a building at a local scout camp. The 20' × 30' building is divided into a classroom and a shack. They offer activities for all Scouts at the camp. This includes anywhere from a short one-hour program for the younger Scouts, to weekends where they will teach the Radio, Computer, or Electricity and Electronics merit badges. On other weekends they may be participating in contests or other operating events. The building's size limits the number of students to 15 at a time. When the merit badge courses get announced they are generally filled in two to three weeks. The SPARK Lodge and its volunteers graduate about 150 students per year.

Martin sees the Lodge as an opportunity for kids. Since it is located at a Boy Scout Camp, parents see safety at camp for their kids. They work with a lot of kids under the age of 16. As Martin put it, they want to work with kids before the "fumes" set in. The "fumes" to which he's referring are gasoline fumes with a car and the perfume of the gals.

What If I Don't Have A Scout Camp Nearby?

CQ asked Martin how a ham club could offer to teach a Radio merit badge course if they don't know where to begin. Use the Boy Scout web site to location a local Council or office. Each Council is divided into Districts. The District generally holds a Roundtable meeting of all of the Scouting units in its coverage area. Here's a good spot to introduce yourself and your club to all of the Scout leaders and offer to teach a merit-badge course. By doing this the Scouting units can coordinate registration, perhaps provide a meeting location, and take all of the phone calls from parents.

SPARK charges $3.00 for a merit- badge course. The money is used as an attendance commitment from the Scout. At the same time it provides funds for the station and teaching materials. They have been so successful that they were able to buy two new computers to create a small network for the Computer merit badge.

Kids Get Psyched!

Remember, kids can get psyched by talking to anyone who is not in the same room with them. At the 10/70 Repeater Association Field Day in northern New Jersey, kids were everywhere, including on the air. The 15 meter phone tent turned into Kid Central with the adults providing the supervision. In October you can help Scouts meet young people from around the United States and around the world as more than 400,000 Scouts and Guides "get together" on the radio for the annual Jamboree-on-the-Air (JOTA). JOTA is held October 21–22 from Saturday at 0001 hours local time to Sunday 2359 hours local time.

Here's an Opportunity!

Here's your chance to introduce kids to amateur radio. Remember, not all Scouts will be interested enough to get a ham license, but those who are will become active amateurs in their community and hopefully in your club as well. Following JOTA, you can offer to teach a license class. What a great way to build momentum in the club! In this column check out the requirements for the Radio merit badge and look at the list below of resources available to help make your Scouting program a success. Until next time . . .

73, Bob, WA3PZO

Web Resources

GARS: <www.gars.org>
SPARC: <www.k3bsa.org>
BSA: <www.bsa.scouting.org>
Merit Badges: <www.meritbadge.com>
ARRL Scout info/JOTA: <www.arrl.org/ead/#scouts>
Radio Merit Badge course help: <www.qsl.net/aa6j/radiomb>
Trooper Batteries: <www.trooperbatteries.com>
CQ Videos: <www.cq-amateur-radio.com>
Code Quick 2000: <www.cq2k.com>

Looking Ahead in CQ

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

- "Measuring Geomagnetic 'Weather,'" by WB2AMU
- "Antenna in the Sky . . . and Power from It," by K8WPI
- "A 'Flying Solo' Cable Tester," by KB2YTN
- "Looking into the Crystal Ball," by WA6ITF

Plus:

- "A Skeleton-Fed Monopole," by K6MHE
- "Low-Impedance, Parallel, Square-Conductor Transmission Lines," by VE3ERP
- Weathernode Paging," by KC5RTH

Do *you* have a ham radio story to tell? See our writer's guidelines on the *CQ* website.

Our Readers Say

Thank You, N2OZ

The following letter was sent to CQ's Lew Ozimek, N2OZ:

Hello, Lew: I just read your column regarding the Transtronics SW Receiver kit (April issue), and was delighted to find your attitude in helping younger people get into radio. I am a "mere" 32 years old, still a kid to some folks, and have only been at the radio hobby for about five years now. It has been folks like you who sparked my interest and kept it alive, and continue to help me learn. I am not a licensed amateur, not yet, as most of my interests lean toward the monitoring side, not the transmitting side! But SW and particularly kit-building/homebrew projects have become my passion, and like you, I have found that showing kids the magic of the medium *with a responsible hands-on approach*, such as you describe in your recent article, is paramount to the success and longevity of the field.

I subscribed to *CQ* for a trial run (my niece had a school magazine drive!) and don't know if I'll renew my subscription, since again, I am not looking to obtain my ham license, but I must applaud your column this month. To get kids involved in *some* kind of meaningful relationship with the magic of radio is wonderful enough; to express to *others* how important it can be is very needed, and refreshing indeed. I am glad to hear of your moderate success with your relatives, particularly the youngest ones. It keeps the hope alive that this hobby will not go the way of the dinosaur (not that I believe it ever truly will, but with all the other distractions of youthful fancy these days . . .)

So I wanted to toss you a note to say thank you for the great read, the expression of a *very* important and sorely needed attitude toward our younger people, and the intelligence to bring it off without sounding either elitist, as some amateurs seem to do, or dumbing down, which the *rest* of the amateurs seem to do! Kudos, Mr. Ozimek!

Michael Cathcart,
Branson, Missouri

N2OZ Responds:

Michael: Thank you for the very kind words you expressed in your e-mail concerning my article in CQ. Your comments are very welcome indeed and greatly appreciated. I was sorry to hear that you are not a licensed amateur. Your interest alone would be a great basis for creating an active role in our hobby.

I am also sorry to think that you perceive of too many amateurs as sounding elitist or of dumbing down to those not in the "clan." The amateur fraternity has prided itself on giving newcomers a helping hand whenever and wherever it is needed. This action on the part of amateurs has been give the title of being an "Elmer." It is a proud title and one that is enjoyed by many, many hams.

My ham club in New York holds classes for those interested in getting a license and these are given to youngsters in grammar school up to the "ancient mariners." I know for a fact that we are not alone in these pursuits. If you were here I would make sure that you entered one of those classes. Please do yourself a favor and don't let your interest slip away! Years from now you may be very sorry that you did not give yourself an opportunity to expand your abilities and your pleasures. Keep your subscription going so that you can be exposed to all of the many aspects of this hobby.

Amateur radio is a lot more than just pushing a button down on a microphone and talking. Look for ham radio clubs in your area, I am willing to bet that they have some sort of training course open to the public. At the very least see if you can find an "Elmer" in your area who can help you get started. It may be the best decision you ever made.

Reader Feedback

GNU, GPL, and "Copyleft"

Reader Nate Bargmann, NØNB, writes:

First, allow me to congratulate and thank Buck Rogers, K4ABT, for his series of articles on the technical and operational side of packet radio. I have had the pleasure of using Buck's drawings and articles to further my understanding and they've helped me perform mods for packet. His contributions will be missed.

With all this in mind, I regret the need to correct a slight misunderstanding I found on page 76 of the July issue of *CQ*. In the middle column regarding the mention of WinPSK, Buck says in part, "...fully GPLed..., which means the source is available for free for non-commercial use."

I did check the web page, which has moved to <http://www.qsl.net/ae4jy>, and looked at the WinPSK page as well as the binary and source archives available there. The relevant portion of the web page is as follows: "The Visual C++ 6.0 project source code for WinPSK here(73K) WinPSKsrc205.zip. This code is now released as public domain software with absolutely no support or warranty of any kind." No mention of the GPL is made, neither on the page nor in the source code archive.

I feel the need to bring this up, as it is a subtle and important issue for many of us using and championing Free Software based systems such as Linux. The GPL, GNU Public License is a way for software authors to release their source code with the assurance that some entity will not be able to legally use the author's work in a proprietary work. The GPL uses current copyright law to protect the freedom of authors to share their work with like-minded authors in a twist called "copyleft." Copyleft is a play on the copyright term to mean that the code in question may be freely copied and modified by others as long as the changes are made available to others under the same circumstances the original author made the code available.

The GPL does *not* restrict commercial use of the code, nor does it prevent commercial entities from bundling GPL code together and selling it for profit. In fact, companies such as Red Hat, Caldera, S.u.S.E., Corel, and others have done this for years. In addition, placing a restrictive clause on code such as "for licensed radio amateurs only," causes that code to *not* be compatible with the GPL. The end result is that such code may not be used in a work covered by the GPL and if that work contains GPL code, then the restricted work is in violation of the GPL and the original author's copyright unless a special waiver has been granted by the author(s).

More information on the GPL may be found at <http://www.gnu.org> and more information on Linux may be found starting at <http://www.linux. org>. There are other Free Software licenses besides the GPL, such as the BSD and artistic licenses. Each of these fulfills a specific need, and it is up to the software author as to which license to use.

Once again, my personal thanks to Buck for all his efforts and I wish him well in his future endeavors. —*NØNB*

Reader Survey
September 2000

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

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

This month, we'd like to know about your access to, and use of, the internet.

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

1. ... whether you have a computer in your home
- Yes, more than one 138
- Yes, one only 139
- No 140

2. ... whether you have a computer in your ham shack
- Yes, more than one 141
- Yes, one only 142
- No 143

3. ... whether you have internet access
- Yes, home and work 144
- Yes, work only 145
- Yes, home only 146
- No 147

4. ... if you answered yes to Question 2, whether your ham shack computer is connected to the internet
- Yes 148
- No 149

5. ... if you answered yes to Question 3, whether you use the internet for ham-radio-related activities
- Yes 150
- No 151

6. ... if you answered yes to Question 5, please indicate all ham-related activities for which you use the internet
- Callsign databases 152
- Communicating with other hams (e-mail/newsgroups/reflectors) 153
- Communicating with the FCC (e.g., filing comments) 154
- Contest/QSL information 155
- Direct ham links (e.g., APRS via I-gates) 156
- Equipment research (visiting manufacturers' websites) 157
- Ham radio news 158
- Manufacturer/dealer customer service 159
- Online ordering of ham equipment 160
- Propagation/sunspot data 161
- Other 162

7. ... your view of the internet and ham radio
- The internet will destroy ham radio 163
- The internet can hurt or help ham radio, depending on how we use it 164
- The internet will help ham radio 165
- The internet won't impact ham radio one way or the other 166
- No opinion 167

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

What You've Told Us...

Our survey questions in June asked you how active you are in ham radio, and about your favorite ham activities, both on and off the air. The results were astounding, to say the least. Seventy-nine percent of you described yourselves as "very active," being on the air at least once a week; another 12% said "moderately active," operating at least once a month; followed by 5% "somewhat active" (less than once a month), 2% inactive, and 1% "active off the air but not on the air." That's 96% of *CQ* readers who are at least somewhat active, and 91% who are on the air a minimum of once a month!

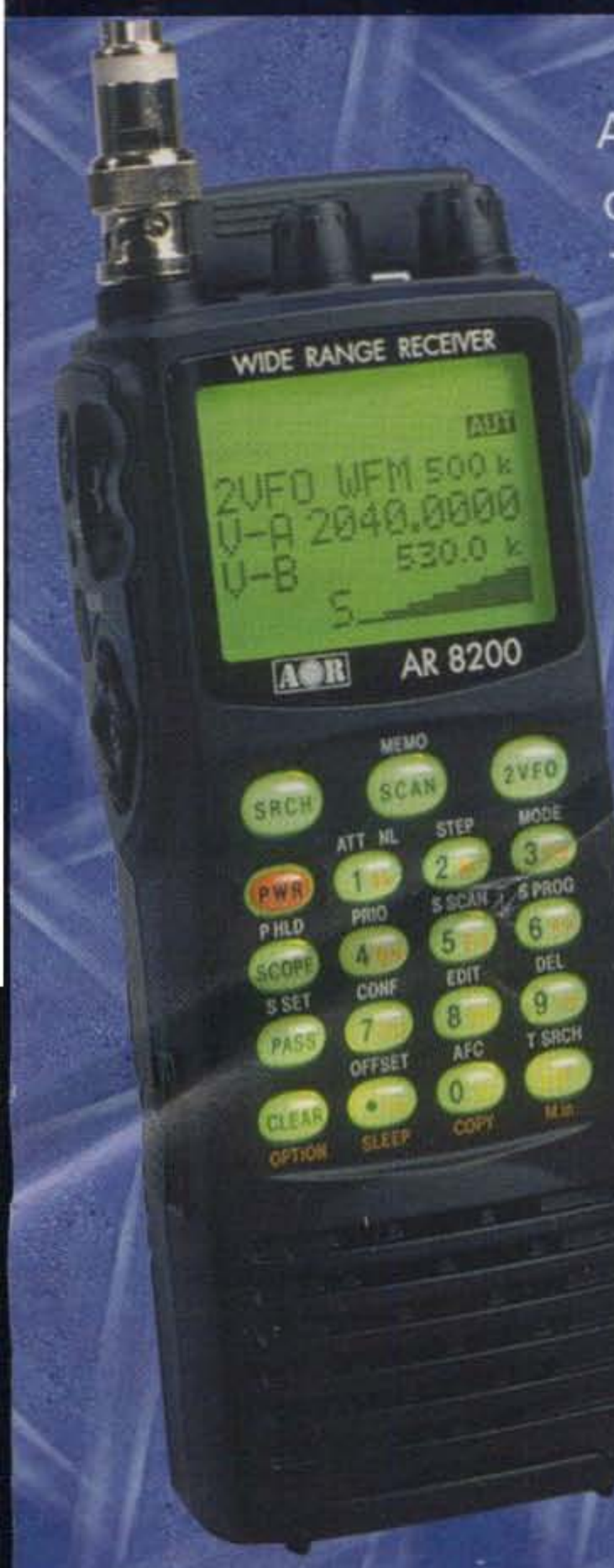
Among those readers who are active on the air, the most popular activity is DXing (63%), followed by rag-chewing (62%), VHF mobile operating (56%), and repeater operating (48%). The next level of activity includes HF contesting (38%), public service and traffic handling (28%), HF mobile operating (also 28%), QRP (25%), and award-chasing (24%). Down below 20% but still significant are HF and VHF digital modes (16% each), VHF contesting and VHF/UHF weak-signal (15% each), "other" (14%), on-the-air experimentation (13%), and satellite operating (12%). Finally, we had EME (moonbounce) and slow-scan TV (3% each), with fast-scan ATV enjoyed by only 2%.

Ham-related off-the-air activities include reading ham magazines (84%), attending club meetings and activities (57%), building/designing/modifying antennas (56%), helping other hams or potential hams (41%), building/designing/modifying equipment (31%), giving license exams (23%), research and experimentation (22%), and teaching licensing courses (13%).

We finally have an answer to the gnawing question of "Where have all the 'Elmers,' builders, and experimenters in ham radio gone?" Nowhere! They—you—are right here, reading *CQ*!

Our free subscription winner this month is Jim Walroth of Ocean Springs, Mississippi.

The Best Just Got Better!



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

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

When you're ready to own the best, you're ready for AOR.

AOR™

NEW! AR8200 Mark II B

- **New TCXO for greater stability – performance not found in most desktop units!**
- **Brighter backlit display for easy use anytime**
- **New telescopic antenna included for better reception**
- **New keyboard layout for easier operation**
- **Attractive new black case**
- **Now includes 1100 mAh high capacity Ni-Cd batteries**
- 500 KHz ~ 2040 MHz * coverage
- 1,000 memory channels (20 banks)
- Computer control and programming. *(requires optional connection cable)*
- Download free control software from AOR web site!
- "All Mode" reception includes "super narrow" FM plus wide and narrow AM in addition to USB, LSB, CW and standard AM and FM modes
- True carrier reinsertion in USB and LSB modes.
- Includes 3 KHz SSB filter!
- Detachable MW antenna
- Optional internal slot cards expand the AR8200 MarkII B capabilities. Choose from Memory Expansion (up to 4,000 memories), CTCSS Squelch & Search, Tone Eliminator, Voice Inverter and Record Audio (saves up to 20 seconds of audio)
- Tuning steps programmable in multiples of 50 Hz in all modes
- 8.33 KHz airband step is correctly supported
- Noise limiter and attenuator
- Band activity"scope" display with "save trace" capability
- Four-way side panel rocker switch allows one-hand operation
- Large display includes A and B VFO frequencies and signal strength meter
- Battery Save function with Low Battery indicator
- Operates on 12 VDC external power
- 4 AA Ni-Cd batteries supplied, also uses standard AA dry cells
- BNC antenna connector
- Wide choice of accessories
- Patented design (U.S. Pat. No. 6,002,924)

AOR™

AOR U.S.A., Inc.
20655 S. Western Ave.
Suite 112 Torrance, CA 90501
310-787-8615 Phone • 310-787-8619 Fax
www.aorusa.com

CIRCLE 15 ON READER SERVICE CARD

Cellular frequencies blocked in compliance with USA regulations.* ***Continuous coverage models available for authorized users/agencies; documentation required.*
AOR engages in ongoing efforts to improve its products. As such, design and performance parameters may change without notice or obligation on the part of the manufacturer and/or distributor(s).

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

USA-CA All Counties #1000!

The following is from Jim Vandiver, N9CAR, who has the distinction of being awarded USA-CA #1000 (see the front cover of this issue). Also in this column is a sidebar with some of the history of the USA-CA counties award. First we hear from Jim.

Finally!! I had just finished working KØARS in Price County, Wisconsin on 40 meters for my last for the "whole ball of wax." After congratulations from the several hams on the frequency, I shut off my rig and didn't turn it on again for two days. I needed a well-deserved rest from all the power-line noise and interference I have to put up with at my home, and also after 20 years of working for that last one. This was on April 10, 2000. It took a while to get the cards checked by K9MI and KA9ZWH, to get the last few cards, and then to tidy up everything and send it to Ted, K1BV, for the final approval.

I went to the Dayton Hamvention on Friday, May 19th, and met a few of the county hunters near the *CQ* booth. I told them I was waiting for my number. When I got home that night, there was an e-mail from Ted telling me he had been away on business and had just gotten back. He had processed my application and had awarded me USA-CA #1000!

Whom to thank? First, the other 999 recipients before me—what a nice group to be a part of. And of course, I have to thank the net controls and all the mobile operators, without whom this would have been almost impossible. KB7QO deserves special mention because he gave me more counties than anyone else—a very big help. I must, of course, also thank my wife Sue, KA9WMH, for doing most of the logging on our trips and basically for just putting up with me all the years I have been a county hunter! (I have not yet told her I started working them for the second time around.)

I got my license in January 1979, but did not get into county hunting seriously until 1987, when Dennis, NQ9E, and I took a trip out west. We had a blast putting out the counties in 14 different states! It was like being rare DX for a couple of guys from the unimportant-for-anything state of Indiana—hi, hi! After that I was hooked big time! Dennis was also, but he has slowed down due to other things, as happens in real life.

I am not sure how many years it took me to get to the #1000 award, but I am now wondering how long it will take for the #2000 award. I hope I'm here to see it. And as slow as I am, I probably will still be working on my second-time award! Again, many thanks to all of you. *—Jim, N9CAR, USA-CA #1000*

65 Glebe Road, Spofford, NH 03462-4411
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Esther Imsande, KB6HW
USA-CA All Counties #1002
June 10, 2000

Merle Olmsted, AA4QE
USA-CA All Counties #1003
June 24, 2000

USA-CA Honor Roll

500
AA4QE 3122

1000
DJ5GG 1548
AA4QE 1549

1500
AA4QE 1290

2000
VK6NZ 1190
AA4QE 1191

2500
AA4QE 1115

3000
DL3DD 1020
JH8GWW 1021
AA4QE 1022

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

Interesting Tidbits

From the e-mail and snail-mail award correspondence I receive come the following tidbits:

AB7PX, whose biographical sketch ran in the "Awards" column in the June issue, is a YL, not an OM. The introductory paragraph referred to Terrie as "him." Not so! Terrie invites other YLs to join the fun on 14336. County hunting has pile-ups, but much more gentle ones than the infamous DX pile-ups.

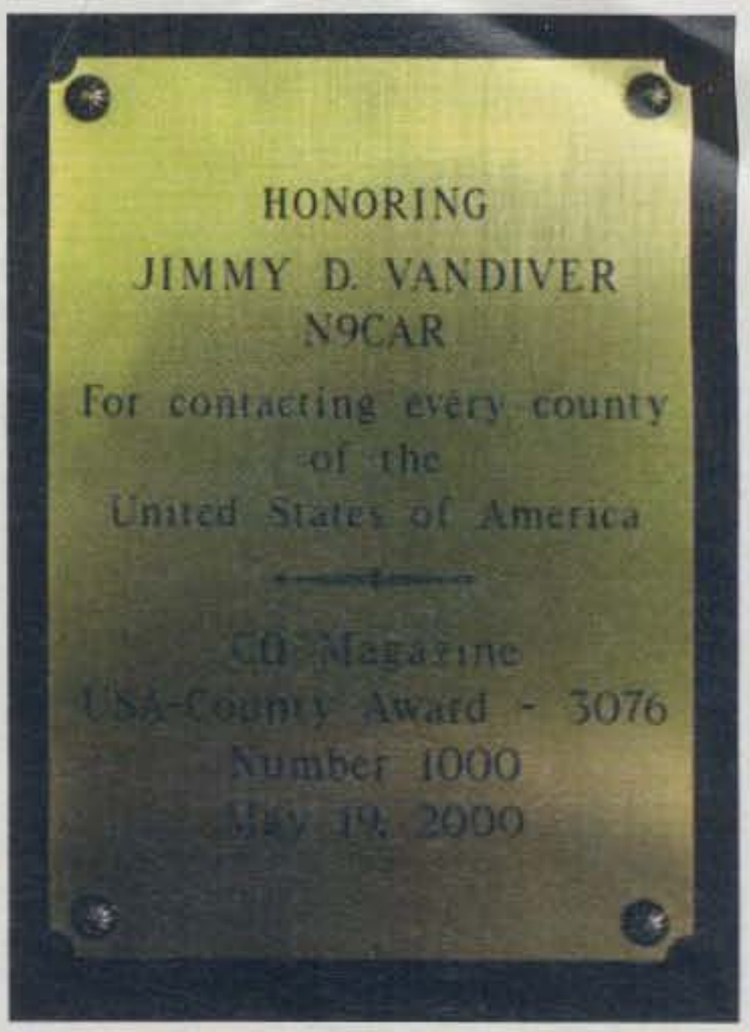
USA-CA and Signal Reports: The official USA-CA rules don't make reference to signal reports. By custom and tradition, it has become accepted that the minimum readability and strength is a 22. The description of the RST system shows that 22 is the absolute lowest threshold of any kind of information or intelligence being passed. If you are using cards from QSO parties or contests and the RS/T is not shown, but some kind of a serial number *is* shown, it is assumed that the report will be considered at least a 22.

The question "May I submit for USA-CA a second time, all CW or all SSB?" has come up. The USA-CA is a "one-time" award. The award, as issued, will be based on the band/mode combination you initially selected. There is one exception: If you have a lower level of the certificate (for example 1000 counties) and wish to make the award all CW or all SSB, etc., you may, at the next application, submit a revised list of contacts that match the specific criteria. Your final award will be recorded on the new criteria if all subsequent endorsements support it.

JH8GWW is shown in this month's Honor Roll earning the 3000 level. Yas notes that he earned the 2500 seal in September 1988. A transfer to JA5 and the end of the last sunspot cycle slowed things down. He also earned a higher class JA license, allowing 200 watts on 20 meters. Yas would like to thank the following stations for assisting him in recent years: W7LQT, KZ2P, KA1JPR, N7BKW, KL1V, VK4AAR, NU9M, KCØJG, K5CWR, and many others.

DX Awards

Germany, CW-QRP-C Award. The Deutscher Telegrafie Club issues this



Jim, N9CAR, was awarded CQ's USA-CA All Counties #1000. (Photo by WB2ZPI)

CQ's USA-CA Award—A Bit of History

By Arnie Trossman, W2DTJ

In 1959 I found myself working with the late Ken Grayson, W2HDM, who at the time was contributing a monthly column on war surplus conversions to *CQ*. Back then we all were veterans working at a now defunct company on a top secret project for the Air Force, which I believe to this day has never been made public. Walt Gordon, W2KAH, was there, too. Walt is now N6FBG residing in northern California and is one of the leading QRM generators out on the West Coast.

After the war, going to Cortland Street in downtown New York and buying a piece of equipment for $10 that cost the government $20,000 made ham radio an exciting time indeed. Ken's conversions were very popular at that time. Also, Ken was instrumental in suggesting my name to Barry Briskman, K2IEG, for Assistant Editor of *CQ*. The rest, as they say, is history. *(Arnie, W2DTJ, was Editor of CQ from November 1960 to June 1964.—ed.)*

The story behind the beginning of the *CQ* USA-CA program is really quite simple. On a trip to the Dayton Hamvention in 1960, I arranged to meet Clif Evans, K6BX, at the North Jersey DX Association's hospitality suite. Urb Lejuene, W2DEC, who was writing the DX column for *CQ* at the time, was a member of the NJDXA. There were dozens of famous DXers present. If I started to name them, I'd get into trouble, because I would be sure to leave someone out.

Clif was very busy privately publishing a "Directory of Certificates" from his home in Bonita, California. Rewards for special feats of on-the-air operating were becoming very popular. The majority came in the form of paper certificates one could frame and hang on the wall. They came from all over the world; some were easy to obtain, while others were not. Most were serious; some were humorous.

Explaining and organizing these certificates was a job Clif relished, and since he had a penchant for writing (I think he invented the word "hamdom."), he was hoping to get national exposure by writing about "Certificate Hunting" on the pages of *CQ*. I was troubled, however, that Clif did not want to cease publication of his directory if he received an offer to write for *CQ*.

In order to keep the "Certificate Hunting" unique and to avoid a conflict with Clif's directory, we came up with a program I thought might be both popular and unique to *CQ*—United States Counties. Each county has a geopolitical boundary, a county seat, law enforcement; some are tiny and others are huge. Everyone resides in a county. What could be better?

There we sat on the edge of a bed in one of the bedrooms at Dayton. Hams were coming and going, shaking hands and hugging one another, many meeting one another for the first time. I asked Clif if he knew how many counties there were. I'll never forget his reply: "I'll bet there's nearly a thousand!"

When we left Dayton, Clif went home and I went back to New York with an idea that needed to be worked out.

In my private library I had a small book entitled *The Style Manual*, published by the US Government Printing Office. I referred to it quite a bit for abbreviations, hyphenation, and grammar. (Computers take care of all of that now.) It was a kind of almanac book also, and it happened to have a list of every county, arranged alphabetically by state. Since many counties have peculiar names and some sound the same but are not spelled the same, this manual was a great help. I asked my secretary to add up the counties and give me a total. When she returned and handed me the tape from the adding machine, I almost keeled over—3000-plus! Perhaps I had bitten off more than I could chew. The only way to keep track of a monster list such as that was to come up with some kind of record-keeping book that would make it easy and *fun* to track progress.

The only company I could find that had individual maps of each state with counties shown was a relatively small company only a few miles away in New York City. The maps primarily were used by business people to track sales and service. I remember the company wanting an outrageous royalty just to copy the maps, so I left the negotiations to someone else.

Graphics of every page and the cost of additional typesetting were beginning to add up. *CQ*'s accountant at the time, Harry Turock, was giving me the evil eye over the eyeglasses he constantly wore down on the end of his nose. If it weren't for Dick Cowan, WA2LRO, who was General Manager and the eldest son of *CQ*'s publisher, USA-CA would never have happened. Despite the soaring costs, Dick allowed me to continue the project.

The crown of the USA-CA program has to be the certificate itself. To this day, it is a large certificate in full color, with the US flag in the center and the state flags creating a border. A very nice gentleman by the name of Dave Saltzman, who did a lot of freelance graphic- arts work for the printing industry, said he knew of a very good artist who would do the layout and color-plate separations. He could tell this project was very important to me, and he assured me I would be satisfied with the results. After picking out all the typefaces and giving him the copy and general layout, I sat back and waited.

Meanwhile, the California end of USA-CA was getting *very* antsy. Clif wanted exact dates of delivery and the status of every item in the plan. You could tell he was a retired Navy man. You also could tell he relied very little on anyone else to get things done. To him USA-CA was top dog, while to me it had to take a back seat. I had other important things to do, too.

After a few corrections and modifications the artwork was complete and the final go-ahead was given. Although I only wanted a hundred certificates (I figured that was enough for the next hundred years.), the printer insisted the minimum was 250 copies. Clif was elated at the outcome and was proud to finally lend his name to the program.

Never in my wildest dreams did I ever think that a program as complicated as USA-CA would become as popular as it has. *CQ*'s Editor, W2VU, asked me to jog my memory and write this piece, and frankly there are a lot of things I *don't* remember.

It's very hard for me to believe that 1000 nutty hams have now worked someone in *every* county of the United States. I thought it would take 40 years for just the first one to achieve that goal! "Hamdom" should be very proud.

award to promote CQ QRP activity on the amateur radio bands. It is available in three classes: Class III requires 100 QRP QSOs, Class II 200, and Class I 300. QRP requires no more than 5 watts output. Mode must be CW. All contacts must have been made during one calendar year. Non-members of this group should apply with a copy of their log (GCR), while members' word of honor will be sufficient. Send list/certification and fee of DM5 or $US4 to: Raimund Misch, DG9YFB, Marderweg 8, D-48157 Muenster, Germany.

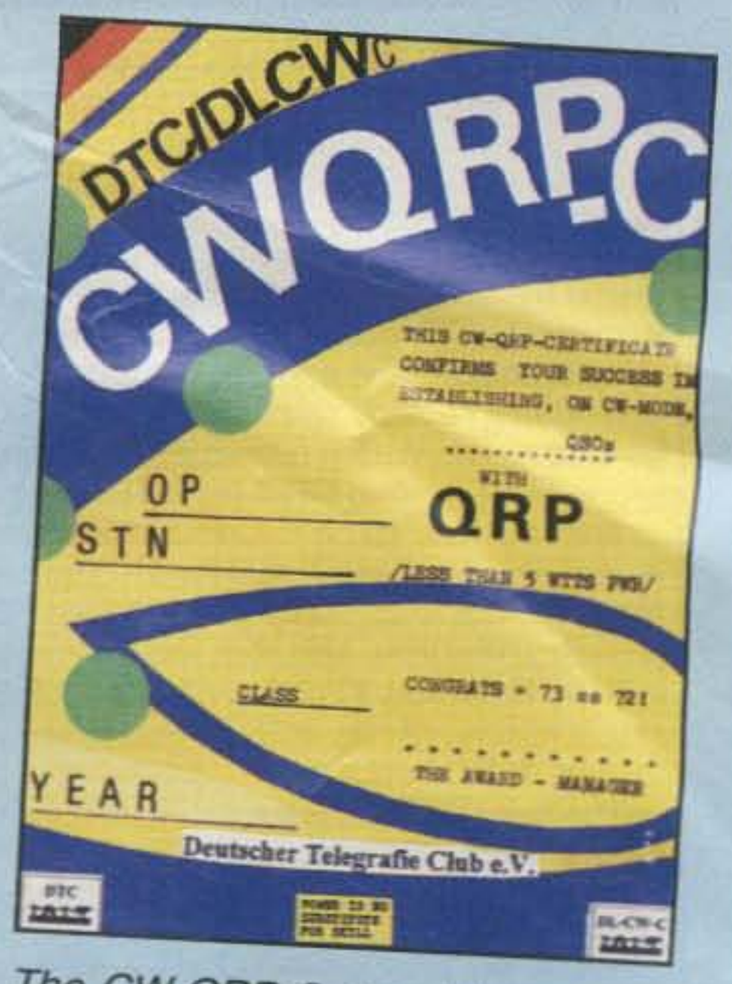
The Netherlands, Kanaalstreek R27 Award. Contact Dutch stations located in Region 27 since 1 January 1990. SWL okay. All modes okay. Class VHF/UHF—inside The Netherlands earn 5 points; outside earn 3 points. Class HF—earn a total of 3 points. Each QSO with a R27 station = 1 point. Contacts with club station PI4KST or PI50KST = 2 points. No repeater QSOs. Send GCR list and fee of fl7,50, $US10, or 10 IRCs or the equivalent to: Ruud Rozema, PA3ECZ, Middenweg 75, 9645 BC Veendam, The Netherlands (e-mail: <rozema@dds.nl>).

The Portuguese Islands Plaque. This award is sponsored by the Oeste DX Gang and issued to any station providing proof of having contacted or heard a minimum of 25 stations on different Portuguese (CT), Azores (CU), and Madiera (CT3) islands. Contacts must have been made on or after 1 January 1985. The Portuguese Islands are in six different groupings as follows: NT – islands North of Tejo, TJ – island of Tejo, ST – islands South of Tejo, AC – islands of the Azores, MD – islands of Madeira, and XX – islands of Macau (valid only prior to 20 December 1999). Endorsements for each group of ten additional islands are free, although an IRC/SASE is requested. Stations operating from any valid island will receive credit without having to work the island themselves. Send GCR list and fee of 3000 Escudos for Portugal, Azores, and Madeira, 3.000 PTAs for Spain, 16 Euros/$US16 for Europe, and 20 Euros/$US20 for rest of world. The award is an aluminum plate mounted on a base of wood measuring 15 × 20 cm. Apply to: PIP Manager, Jorge Santos, CT1FMX, P.O. Box 189, P-2564-911 Torres Vedras, Portugal. (For a list of islands, go to <dxawards.com>, or it is available from the sponsor for an SASE.)

Yas, JH8GWW, has reached the 3000 level on the USA-CA Honor Roll.

Romania, Timisoara Award. This beautiful, multi-color award is offered to all licensed radio amateurs and SWLs by the Radioclub of Timisoara City in Romania for contacts after 16 December 1989. Submit verified evidence of contacts with at least five stations from the YO2 District/Timis County, including two stations from Timisoara City. There are no band or mode limitations. The same station may be worked on different bands. Send GCR list and fee of $US5 or 7 IRCs. Apply to: Radioclub of Timisoara YO2KAB, P.O. Box 100, RO-1900 Timisoara, Romania.

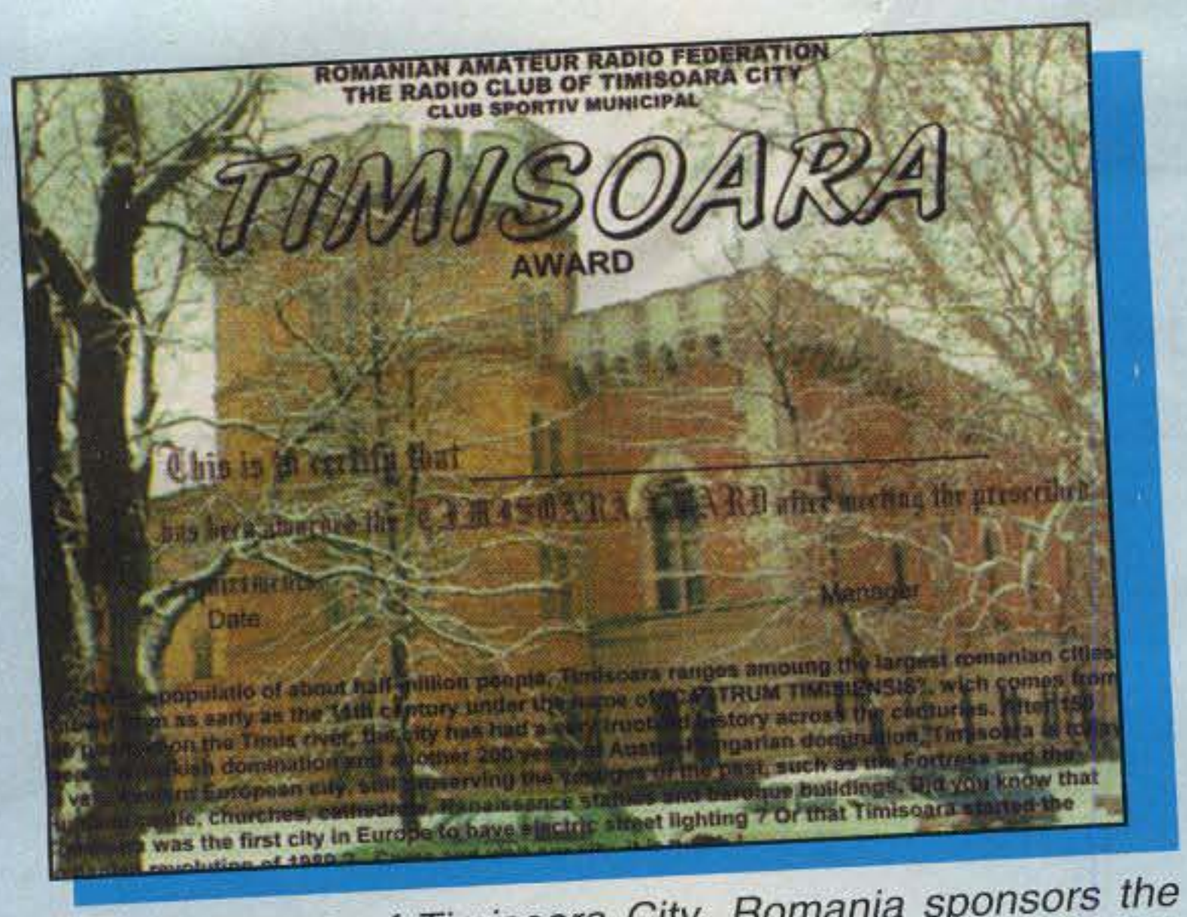
Russia, Ural Award. The Ural Award is issued by the Radio Sports Section of Ekaterinburg and is available to all amateurs and SWLs for contacts/heard of different amateur radio stations locat-



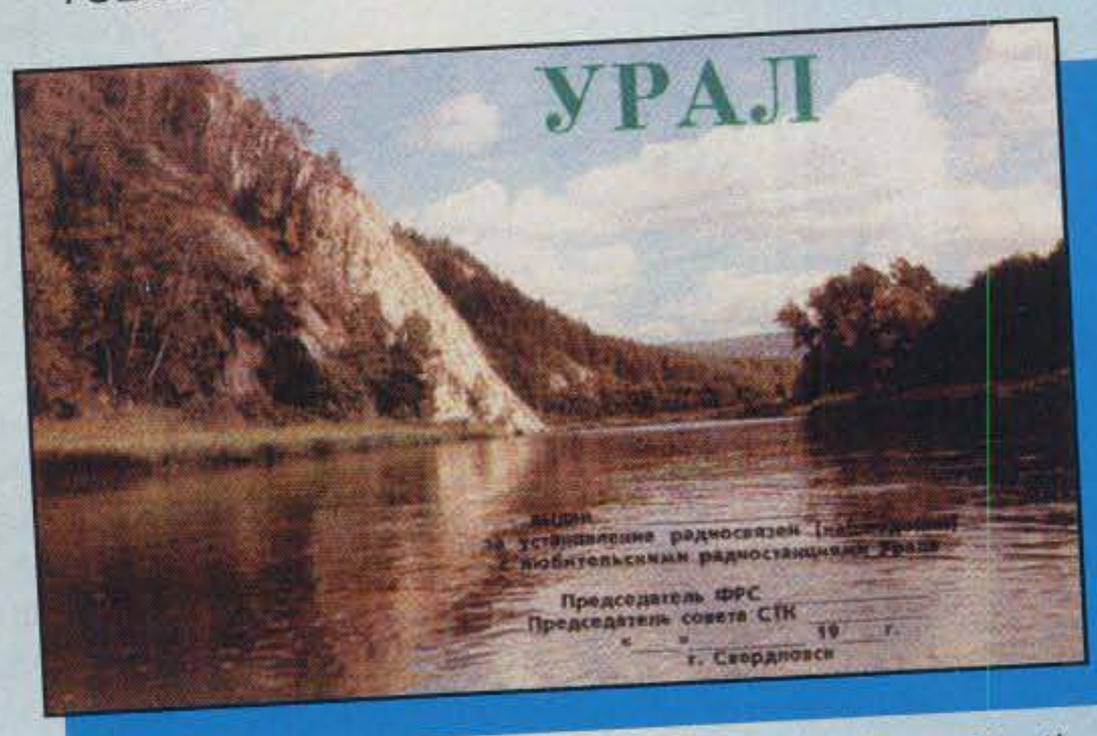
The CW-QRP-C award issued by the Deutscher Telegrafie Club.

The Kanaalstreek R27 Award is offered for contacting Dutch amateur radio stations in Region 27.

Sponsored by the Oeste DX Gang, the Portuguese Islands Plaque is available for contacting a minimum of 25 stations on different Portuguese (CT), Azores (CU), and Madiera (CT3) islands.



The Radioclub of Timisoara City, Romania sponsors the Timisoara Award for contacting at least five stations from the YO2 District/Timis County.



The Ural Award is issued by the Radio Sports Section of Ekaterinberg for contacts with stations in the Ural Mountains area of Russia.

ed in the Ural Mountains area of Russia on or after 1 January 1957. Applicants outside Russia (Europe and Asia) using traditional modes (CW, SSB, AM, FM) on all HF bands should have 20 contacts with the area. Applicants elsewhere outside Russia need 10 QSOs. Applicants outside Russia using non-traditional modes (RTTY, SSTV, AMTOR, PSK31, etc.) or operating via satellites, or on VHF bands (144 MHz and above), or mobile (/M, /MM, /AM, /S) need 5 such QSOs. The following oblasts count for the award:

Udmurt (UD): RA–RZ4W; UA–UI4W
Cheliabinskaya (CB): RA–RZ9A, B; UA–UI9A, B
Sverdlovskaya (SV): RA–RZ9C, D, UA–UI9C, D
Permskaya (PM): RA–RZ9F, UA–UI9F
Kurganskaya (KN): RA–RZ9Q, R, UA–UI9Q, R
Orenburgskaya (OB): RA–RZ9S, T, UA–UI9S, T
Bashkir (BA): RA–RZ9W, UA–UI9W

Send log extract and fee of 10 IRCs to: Serge V. Stikhin, Box 1035, Ekaterinburg, 620063 Russia.

Internet Site of the Month

Many awards make use of a set of rules plus a list of eligible counties, states, club members, islands, castles, or even fortresses! The lists are absolutely necessary for determining whether or not the contact you made is good for that award. It's nice when the QSL card lists all affiliations or geographical status, but it doesn't always work out. I've collected a large batch of such lists and have started to place them on my web site. Right now, there are about 80 lists published there, with more to be added. About half of the lists are links to the organizations that created them. The other half are ones I've keyed in. Check it out at: <http://www.dxawards.com>.

73, Ted, K1BV

Antennas

BY ARNIE CORO, CO2KK

Connecting Your Station To The World

Slopers—The Lowest Cost Directional Antennas? Part I

Sloping antennas provide gain and directivity at the lowest possible cost. There perhaps is no better way to make optimum use of a single support structure than by installing a "sloper" system. Believe it or not, when properly set up, a sloping antenna can very closely match the performance of a small beam antenna.

Sloper Saves Contest Station

The contest is just a few minutes away and a summer thunderstorm hovers over our multi-single station site. Heavy rain and high-speed winds hit us with brutal force, and the 3-element beam starts vibrating at the top of its mast. Despite the guy wires and well set anchor posts, the tribander hits the ground and, as may be expected, is damaged beyond any possible field repairs.

Weeks of careful preparation now seem lost. Suddenly, however, one of the operators on our team brings all of us back into contest tempo. "Arnie," he shouts in the middle of the rain shower, "let's start making *slopers!*"

Thanks to our well-organized efforts and teamwork, plus wire and coax taken to the contest site as we always do "just in case," less than an hour after the disastrous end of the tribander we have two slopers up and running, one for 40 and the other for 20, which are followed by two more for 15 and 10 meters.

While some team members operate and keep the logs, the rest of us continue to work at a fast pace with the big roll of wire that was left after we made the 160 and 80 meter dipoles.

Quarter-wave and half-wave slopers for Top band and 80 soon are also up and running, the two coming down from a water tower, giving the station not only a viable alternative to our damaged beam, but also a set of very effective skywires that worked very well throughout the contest.

The results? Absolutely amazing! Our sloping wire antennas make themselves heard even on the most difficult pile-ups, and from that day on, although our contest stations still use single-band Yagi-type beams, slopers are now an essential part of our contest package.

c/o CQ magazine
e-mail: <co2kk@cq-amateur-radio.com

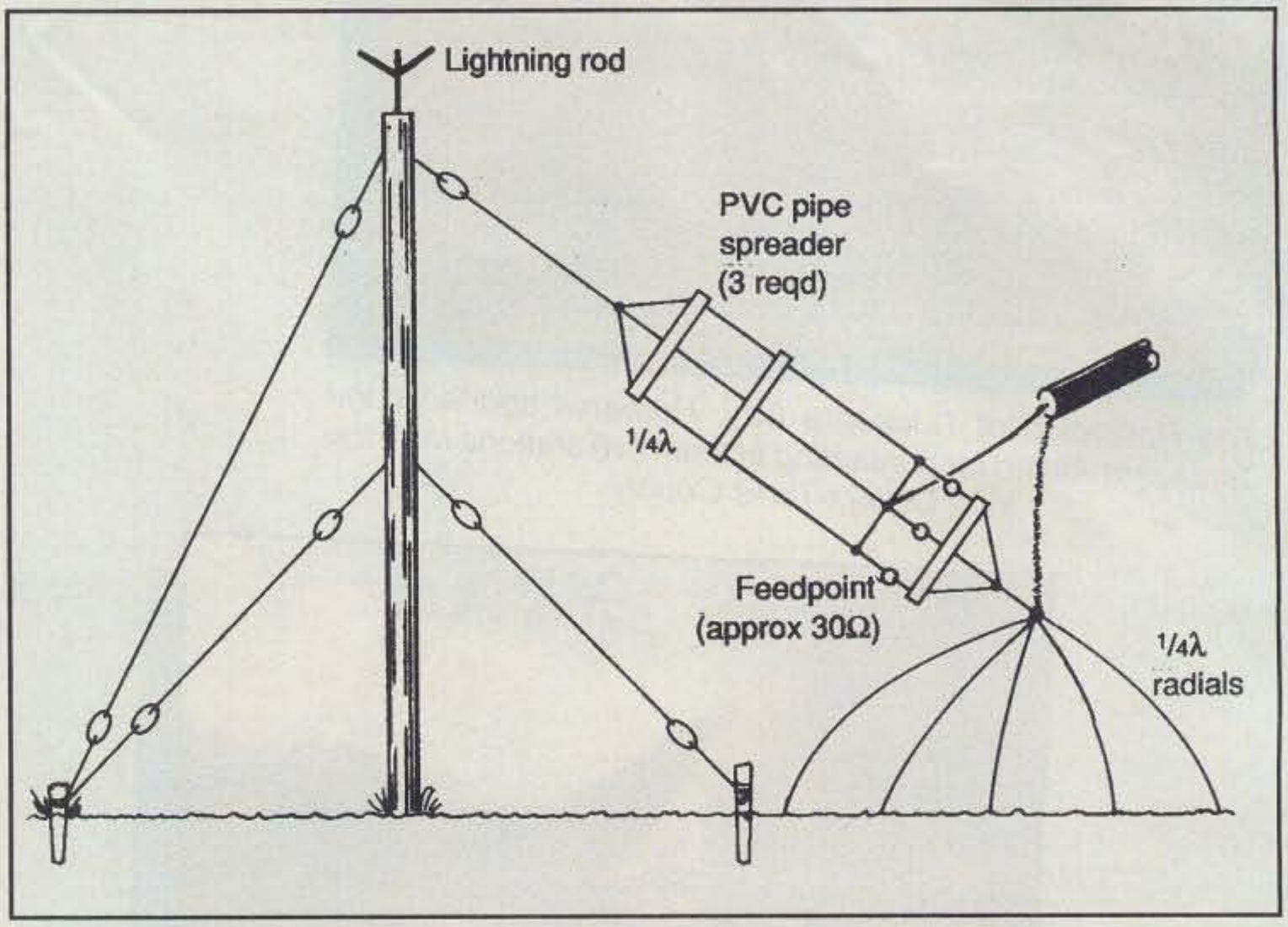


Fig. 1– Of the many possible and effective configurations for sloper antennas, the broadband, bottom-fed three-wire system is one of my favorites. Making the wires 1/4 wave for the 40 meter band, the antenna also works very well as a 3/4-wave sloper system on 15 meters. There must be at least 4 radials (minimum; 12 or more is better) located at the feedpoint. I use a combination of interleaved radials for 40 and 15 meters, which works very well. The antenna feedpoint impedance is very dependent on the specific installation conditions, and that's why I recommend using a remotely switchable two-band tuning unit.

For permanent installations, sloping wire antennas in many cases are able to provide the only viable alternative for HF operation from locations that allow the installation of a single support or can make use of an existing structure.

Although some amateurs may advocate the installation of a delta loop when only a single mast is available, slopers not only provide a low TOA (take-off angle), they can also be oriented to favor a particular area, or they may be moved around maypole fashion to target different azimuths.

Facts About Slopers

Here are some facts about slopers:

1. You can make good use of 0.25, 0.5, and 0.75 wavelength slopers.

2. The quarter-wave sloper *does require* a ground system (more about this topic later).

3. Optimum sloping angle is 45 degrees, but you can use any angle from 30 to 60 degrees with good results.

4. Decoupling the transmission line from the sloping antenna is essential in order to achieve the low take-off angle you want for working DX.

5. Adding a ground counterpoise system at the low side of the antenna will improve the low-angle radiation of the three most popular sloper types—the 1/4-, 1/2-, and 3/4-wavelength antennas.

6. Conductive or nonconductive masts or supports? A good question which I'll try to answer later.

Before we start with the practical side of this month's column, let's add that the controversial TTFD (Tilted Terminated Folded Dipole) is certainly a very special case of sloping antenna *that is almost non directional,* making the exception to the rule of sloping antennas.

Practical Sloping Antennas For Radio Amateurs

I have tested slopers from 1.8 MHz all the way up to 50 MHz, and my findings show that even under nonideal installa-

YAESU

FT-1000D Transceiver

tx: 160–10m **rx**: 100kHz-30MHz • 200w • 100 mem. • Dual receive • Antenna tuner • Dual bandpass filter • Temp. compensated crystal oscillator • 2.4kHz & 2kHz SSB filters, 500Hz CW crystal filter 6"h x 16"w x 15"d, 58 lbs.....**Special $3999.99**

FT-1000MP Advanced features • EDSP Collins mech. filter.....**Closeout $2399.99**

FT-1000MP MK V IDBT • VRF • Class A PA operation • 200W MOSFET final amp • Integrated shuttle jog control **$3399.99**

FT-847 All Mode Transceiver

Ideal for HF & satellite • 100w HF/6m • 50w 2m/430MHz • Crossband full duplex • Reg/reverse tracking • Satellite memory • DSP filters • Low noise VHF/UHF • Built-in preamp • 0.1Hz tuning step • Shuttle jog • CW sidetone pitch control • CTCSS/DCS encode/decode • Direct keypad entry • 1200/9600 bps .....**Special © $1419.99**

FT-920 HF Transceiver

6m • 50MHz w/100w • AF-DSP • Auto antenna tuner • 127 memories • FET RF amp • Digital voice memory system • Dual display • Keyer • **FREE FM-1 FM unit for a LIMITED TIME**.....**Special $1389.99**

Affordable Beginner's Radio!

FT-840 HF Transceiver

transmit: 160 to 10m, **receive:** 100kHz to 30MHz • 100 memories • 100 watts • Twin VFOs • Optional FM • Repeater offset • CTCSS encode • 13.8V DC @ 20A • 10"w x 3⅜"h x 9½"d,18 lbs.....**Special $699.99**

Quadra System HF/6M Amplifier

Amateur coverage: 160–15 & 6m • 1000w • 220V AC 500w power out on 6m • Built-in high-speed ant. tnr • 2 RF inputs • 4 RF outputs • Auto band switching w/FT-1000D, FT-1000MP, FT-920 & FT-900 • Separate amp & PS units • 16¼" x 5¾" x 16¼" • (amp) 33 lbs; (pwr sply) 26 lbs.....**$3999.99**

FT-100 Mini HF Transceiver

160-6m mobile xcvr + 2m and 430-450MHz rx: 100kHz-30MHz, 30-970MHz (cell blocked) • 100/50/20w • DSP • SSB/CW/AM/FM/AFSK/Packet oper. • Built-in CTCSS/DCS • 300 memories. • IF Shift • IF noise blanker • VOX • Dual VFOs • Electronic memory keyer • Speech processor ..**Closeout *© $969.99**

FT-100D Same as FT-100 with 500Hz, 8-pole crystal filter • High stability reference oscillator • FTS-27 CTCSS decoder • New high quality speaker..... **$1299.99**

NEW!

FT-90R Micro 2M/440 Transceiver

50/35w 2m/440 micro FM • Built-in CTCSS/DCS enc/dec • Select. TX power • 186 mem. • Direct keypad freq. entry • DTMF autodialer • ADMS PC program. • Auto repeater shift • RF-lavel squelch • Program. front panel/mic key func. • 1200/9600 bps compat. • 3.9"w x 1.2"h x 5.4"d .....**Special $379.99**

FT-8100R Dual Band Transceiver

2m 144–148MHz tx, 110–550 & 750-1300 MHz (cell blkd) rx • **70cm** 430–450MHz tx/rx • 208 mem. • 50-35/3/5w • CTCCSS encode • 5½"w x 1⅞"h x 6¼"d .....**Special $439.99**

FT-3000M 2m FM Transceiver

70w • 110 to 180MHz, 300 to 520, 800 to 999MHz receive (cell blocked) • 81 memmories • 1200/9600b comp. • 5½"w x 1⅝" x 6¼"d, 2¼ lbs.....**Special $389.99**

© with Instant Coupon, coupons expire 9/30/00

***© Coupon good until stock is gone**

FREE SHIPPING! via UPS Ground on Orders over $1,500

FT-2600M 2m FM Transceiver

60w • 134-174MHz rcvr • 175 mem. • Built-in CTCSS/DCS enc/dec • Smart Search™ • Auto repeater shift • S-Meter squelch • Extensive menu • Key freq. entry from mic • 1200/9600 bps packet • Compact .....**Special $219.99**

NEW!

FT-1500M 2m FM Mobile

144-148MHz transmit/137-174MHz rec • 50w • 1200/9600bps packet compatible • CTCSS enc/decode • 130 mem. • 10 weather channels • Windows programm..**Special $179.99**

VHF/UHF Repeaters

25w • 8 channels • PLL synthesized • Fully programmable • CTCSS encode/decode • Time out & hang timers • Wall/ rack mt. • 13.8V @ 6A • 14¾" x 1¾" x 4¾", 25 lbs

VXR-5000VADC 135–175MHz **$1199.99**
VXR-5000UCDC 400–512MHz **1199.99**
VXR-5000V/TA 2m rptr w/PS..... **1399.99**
VXR-5000U/TC 440 rptr w/PS..... **1399.99**
VXD-40UB 440 Duplexer..... **199.99**

FRG-100B Receiver

50kHz-30MHz, SSB/CW/AM modes, FM opt. • 50 mem. • Select. bandwidths • Dual ant. inputs • 9¼"w x 3⅜"h x 9⅝"d ..**Spec $569.99**

Antenna Rotators

Light, medium, heavy & extra heavy-duty models, plus elevation & azimuth – elevation.

G-450A Lt/medium, 10 sq. ft **$259.99**
G-550 Elevation 12 sq ft **299.99**
G-800SA Medium, 17 sq. ft **339.99**
G-800DXA Same, w/presets..... **429.99**
G-1000DXA 23 sq. ft. w/presets **519.99**
G-2800SDX Extra HD, 23 sq. ft..... **1139.99**
G-5500 Azimuth/elevation 11 sq ft ... **629.99**

Handhelds

FT-23MKII/12 5w 2m HT..... **$159.99**
FT-33R 5w 220 MHz FM HT **Special 249.99**
FT-50RD/41B 5w 2m/440.....**Special 249.99**
FT-411MKII/12 5w 2m HT..... **179.99**
VR-500 100kHz - 1300MHz AM/FM/SSB handheld receiver....**Special 319.99**
VX-150 5w 2m FM HT.....**Special 149.99**
VX-1R 500mw 2m/440 HT...**Special 169.99**
EDC-15 DC adapt.; VX-1R/FRS**Special 19.99**
VX-5R 5w 6m/2m/440 HT....**Special 319.99**
VXA-100-16/41B 5w air HT w/VOR .. **499.99**
VXA-120 4w air HT.....**Special 299.99**
VXF-10 FRS HT with WX..... **79.99**

POWER SUPPLIES

FP-712 10A switching ps.....**Closeout $79.99**
FP-1023 23A switching ps w/fan..... **159.99**
FP-1030A 25A ps w/meters..... **249.99**

MISCELLANEOUS CLOSEOUTS

CA-8 Chrg sleeves; NC-50/416/530..... **$1.99**
CSC-24S Case; FT-23/33/73R/FNB12S **99¢**
CSC-35 Case; FT-411E w/FNB-17 ..... **99¢**
CSC-50 Case; 415/416/FNB-25..... **1.99**
CT-20 Mic cable for use w/MD-1C8 ..... **4.99**
FNB-40 650MA 6V battery..... **29.99**
FNB-49 600MA 6V battery **9.99**
FRC-4 Pager unit; 5200/6200..... **2.99**
FRC-6 Pager unit; 2500M/7400H **4.99**
FTS-6 Encoder/decoder; 09 series **4.99**
FTT-12 16# keypad/dec/dvrs; FT-50R.. **19.99**
FTT-4 TTP unit; FT-23R/33R/73R..... **4.99**
FX-1 Xcvr-fax interface/controller **4.99**
MW-2 Remote control wireless mic **29.99**

Prices subject to change without notice.

AMATEUR ELECTRONIC SUPPLY® LLC

5710 W. Good Hope Road Milwaukee, WI 53223 • 414-358-0333 • Fax 414-358-3337 • Service 414-358-4087

BRANCH STORES

28940 Euclid Ave
Cleveland, OH 44092
440-585-7388
1-800-321-3594
Fax 440-585-1024
cleveland@aesham.com

621 Commonwealth Ave
Orlando, FL 32803
407-894-3238
1-800-327-1917
Fax 407-894-7553
orlando@aesham.com

1072 N Rancho Dr
Las Vegas, NV 89106
702-647-3114
1-800-634-6227
Fax 702-647-3412
lasvegas@aesham.com

STORE HOURS

Monday-Friday
9am to 5:30pm
Saturday
9am to 3pm
Over 43 Years in Amateur Radio

Internet **www.aesham.com** • E-mail **info@aesham.com** • Toll Free **1-800-558-0411**

ORDER TOLL FREE 1-800-558-0411

6:00 A.M. Pacific to 8:30 P.M. Eastern
Monday – Friday • Saturday to 6:00 P.M.

CIRCLE 105 ON READER SERVICE CARD

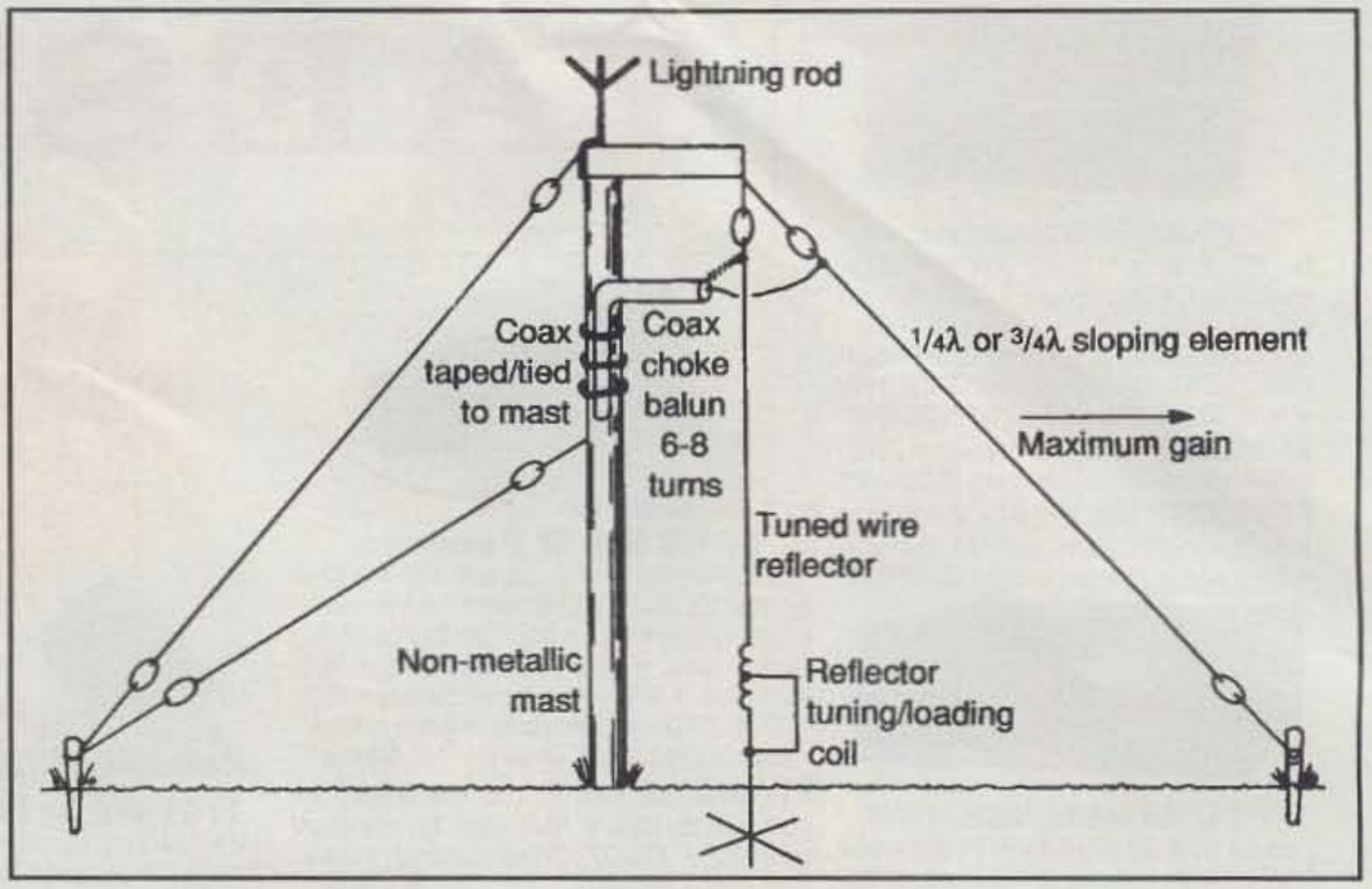


Fig. 2– The "Tuned Reflector Sloper." A nonconductive mast requires using a 0.25 wavelength counterpoise (which is actually a tuned reflector) optimized by tuning it to resonate –5% lower in frequency from the 1/4- or 3/4-wave sloping radiator. Otherwise, the sloper won't work properly and the antenna pattern will not be the desired one. Adding a coaxial cable choke at the feedpoint is essential to keep the coax braid from radiating and distorting the antenna's vertical pattern. A metal mast can also be made to resonate, and the coaxial cable will be decoupled properly by sending it down via a hole in the mast's wall; it exits through a similar hole near ground. In this case you can do without the coaxial choke.

tion situations these systems give at least some gain and directivity, *always in the direction in which the antenna is sloping!*

Let's start with the 0.25 wavelength long antennas. The 1/4-wavelength slopers are usually the most popular ones for 160 and 80 meters for obvious reasons. Top feeding them places the *high current section* at the maximum height available. However, many installations fail to take into consideration the characteristics of the support structure and the real possibility of the coaxial feedline becoming another radiator, which will distort the radiation pattern due to improper decoupling.

Let's build a quarter-wave sloper system for 40 meter DXing. First things first: How high should the mast be? Elementary trigonometry tells us that if we need to use the minimum possible mast height (for the 30 degree angle antenna), the mast should be no less than 8 meters (or some 26 feet) high, considering that the closer-to-ground antenna end should be no less than 0.1 wavelength above average terrain, which is roughly 4 meters (or about 13 feet) in round numbers. Take a look at fig.1 and you will realize why this antenna system is so forgiving from the supporting-structure standpoint.

The height necessary for the "ideal" 45 degree tilt, again with the minimum 0.1 wavelength separation from ground, is 12 meters (or nearly 40 feet), so your design margin goes all the way from 6 meters (20 feet) for 20 degree tilt, to 12 meters (40 feet) for the 45 degree version, and you can even try a 60 degree tilt angle successfully.

Slopers are "hands on" antennas, and they do require a good amount of cut and try before you can consider them working optimally. The fact is, however, that suboptimum (but rather nice) results can be obtained without much effort.

Our first example design for the 45 degree tilt quarter-wave antenna for 40 meters is shown in fig. 2. Notice that we are considering a *nonconductive* mast! That's the reason for using a 0.25 wavelength counterpoise, coming from the top of the mast all the way down to ground. The "vertical radial" running close to the nonconducting mast is connected to the coaxial cable braid, and the coax itself *must be coiled* to form an RF choke at the feedpoint. This will discourage the so-called "antenna currents" from flowing down the coax shield, radiating from there and thus distorting the antenna's vertical radiation pattern.

If you use a *metal supporting structure*, such as a steel or aluminum mast

or a tower, the coaxial cable may be routed through a hole at the top of the mast, exiting at the bottom through another properly placed hole, thus effectively decoupling the cable from the radiating element.

In the case of a tower, the cable can be placed in close contact with one of the tower's legs, achieving somewhat similar but not as good results as when the cable travels inside a metal mast in the effort to decouple the downlead from the antenna.

Start with a little more than 0.25 wavelength. (I prefer to make the radiator of the quarter-wave sloper 0.28 wavelength long in order to raise the theoretical feedpoint impedance to near 50 ohms, and although the extra length of wire will introduce a reactive component, this can easily be tuned with a series capacitor).

Use wire of no less than 14 gauge (which, by the way, is considered universally by electrical safety codes as the minimum diameter for external antennas) and feed it at the top with 50 ohm coaxial cable (RG58-U or similar for short runs; RG213, RG8-U, or similar for longer runs).

Use two insulators at both ends of the sloping wire, separated by a 15 cm or 6 inch length of Dacron® rope or similar insulating cord. (This will improve the antenna's performance under rainy conditions.)

Remember to *decouple* the feedline from the antenna by making a coil of about 20 cm (or 10 inches) diameter right next to the feedpoint. The coaxial cable choke should have no less than 6 to 8 turns, and it can be kept in shape using plastic cable ties. Don't forget to use this transmission-line decoupler or coaxial choke! It makes a *lot* of difference in the performance of these antennas!

One Important "Add On"

Quarter-wave slopers with added radials located at the lower end of the system—and with either a tall enough conductive mast or a nonconductive mast with a vertical wire acting as counterpoise—provide anywhere from 2 to 3 dB gain. This depends on how you measure it and the actual TOA of the antenna's main lobe, which in turn gives the angle of incidence on the ionospheric layer we want to use to communicate.

That's why I take sides with the concept of *apparent antenna gain*, a phrase you are going to see used from now on here in *CQ*'s "Antennas" column. The 0.25 or 0.28 wavelength systems will require tuning for a reasonable SWR at

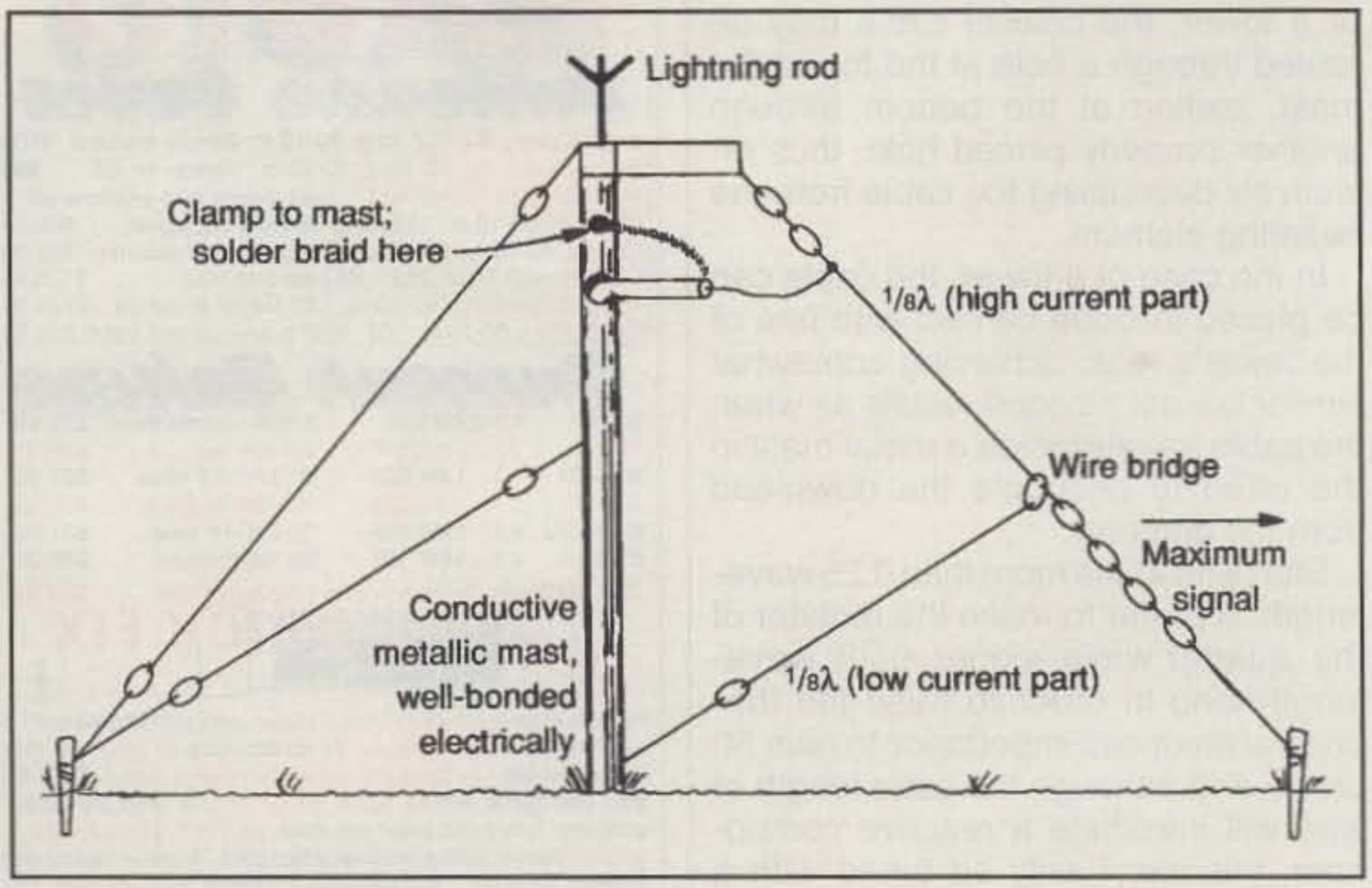


Fig. 3– A bent sloper is a practical approach for the lower bands when space is limited. It requires using insulated ropes to keep the antenna in place. Efficiency, while not as high as the fully extended sloper, is good enough to make its installation worthwhile, especially on 160, 80, and 40 meters.

the center operating frequency, but keep in mind that it is *always* a good idea to use an antenna tuner at the transmitter for many valid reasons. If your 0.25- or 0.28-wave sloper system shows a 1.5 or 1.7 to 1 SWR at the planned operating frequency, you certainly can try to optimize it by carefully cutting or adding length to the radiator, but let me tell you that I seldom spend time trying to push the SWR at the center operating frequency down once I reach 1.4 or even 1.5 to 1. I simply rely on the nice antenna tuner right close to the transmitter and disregard the very small losses caused by the SWR on the coaxial cable.

This is especially true when you are running transmitters in the QRP to about 250 watt range; and even when operating kilowatt rigs, an SWR figure of about 1.5 to 1 is perfectly admissible without any signs of overheating of the coaxial transmission line or its connectors (more about connector losses in an upcoming column).

Quarter-wave slopers for 160 and 80 meters, and of course for 40 meters too, can be installed in a very special way to save space, while at the same time keeping the advantages of horizontal directivity and low take-off angle. The method (see fig. 3) is simply *bending the sloper,* leaving the high-current top section sloping at a 45 degree angle and the rest of the antenna folding back into the supporting structure.

Tests run at CO2KK on the 40 meter band showed that the "bent" or "zigzag" sloper shows both gain and directivity comparable to the "full-size" version of the antenna. This "bent" sloper requires the use of Dacron® or similar insulating material rope used as "long insulators," and tuning is rather more critical than with the "full-size" antenna. The "bent sloper" is really a full-size system, with its high-current part sloping in the desired direction. I also found that adding two full-length radials at the base of the mast did improve the SWR bandwidth of the "bent sloper" for 40 meters.

Start Planning Your Quarter-Wave Sloper!

Now is a good time to test drive one of these simple, but good wire antennas. In our next column we will bring you details about the ever-popular *half-wave sloping dipole,* some very interesting results obtained by providing a better ground system to that antenna, and references on how to install a three- or four-sloper system with a simplified switching arrangement. Part II will also present a full description and illustration of CO2KK's ASCD (Asymmetrical Sloping Counterpoised Dipole) 6 meter sloper, which has proven very valuable for field work, as the antenna can be transported in a very compact form.

Send your antenna related questions to: <co2kk@cq-amateur-radio.com>.

73, Arnie, CO2KK

World Of Ideas

BY DAVE INGRAM, K4TWJ

A Look At The World Around Us

Resurrecting Simple, Fun Rigs from the 1950s

Have you noticed how golden-oldie gear has exploded in popularity, friends? It's true. Just listen to some of the special-interests groups and vintage rig nets meeting on 20 meters or tune the classic AM range of 29 MHz on 10 meters to confirm that fact for yourself. Vacuum-tube-type receivers and transmitters from eras past—and the 1950s in particular—are being restored and returned to the airwaves in record numbers. What is the attraction? Everyone has his or her own opinion here, but most folks agree the soft glow of amber dials and full-bodied sounds from tube gear have a special charm and personality unequaled by modern rigs. Yes, and just like classic cars, original "muscle gear" from yesteryear can also be a mite pricey at the present time.

There is, however, a low-cost "fun for everyone" side to this story, and that's the focus of this year's nostalgia special column(s): restoring or replicating simple '50s-type gear for use on the air today. We have some very exciting ground to cover and captivating rigs lined up to spotlight, so let's get started!

A popular trend of the fabulous '50s was buying a good commercially made receiver and then home-assembling a mating transmitter from a kit or "from scratch" to get maximum performance at minimum cost. The "big guns" used National NC-300s, Hammarlund HQ-180s, and Collins 75A-4s, while "small pistols" used NC-88s, HQ-110s, and Hallicrafters S-38s. Mated low-budget transmitters ranged from Heathkit AT-1s and Johnson Adventurers to homebrewed one-tube 6L6 and 6AG7 wonders.

We may not have worked the world with those bare-bones rigs, but that situation surely would have been different if we knew then what we know now, right? You bet, and getting back on the air with such a "first rig" today truly proves the operator rather than the gear makes the difference! Ready to set up your own golden-oldie station, are you? That's the spirit! Go for it!

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

Digging for Gold

One of the most convenient and direct routes to getting on the air with your own '50s-style rig is by seeking out and restoring equipment from an estate sale or hamfest fleamarket. Large, full-featured gear can require a fair amount of money and time to fix up, but watch for smaller and more affordable items under display tables or in partially covered boxes. You may be pleasantly surprised to find a special gem (or two) at a low price. That fact is especially true if you concentrate on a CW setup rather than putting together an SSB or AM station. Top it off with a simple '50s-style wire antenna, a neat little key or bug, plus a VXO circuit for warping the transmitter's crystal, and you have a vintage rig that is blowout fun to operate!

Rescued-from-extinction gear is usually in less-than-ideal condition, but that's when your appreciation for old-time ham equipment really shines. Where do you start? Some folks strip rigs all the way down to a bare chassis (which they clean to like-new condition), then rebuild with as many new components as possible. Others go for a mild cleaning, partial or full tube replacement, maybe a quick realignment, and then put the rig back in service. The choice depends on your finances and spare time.

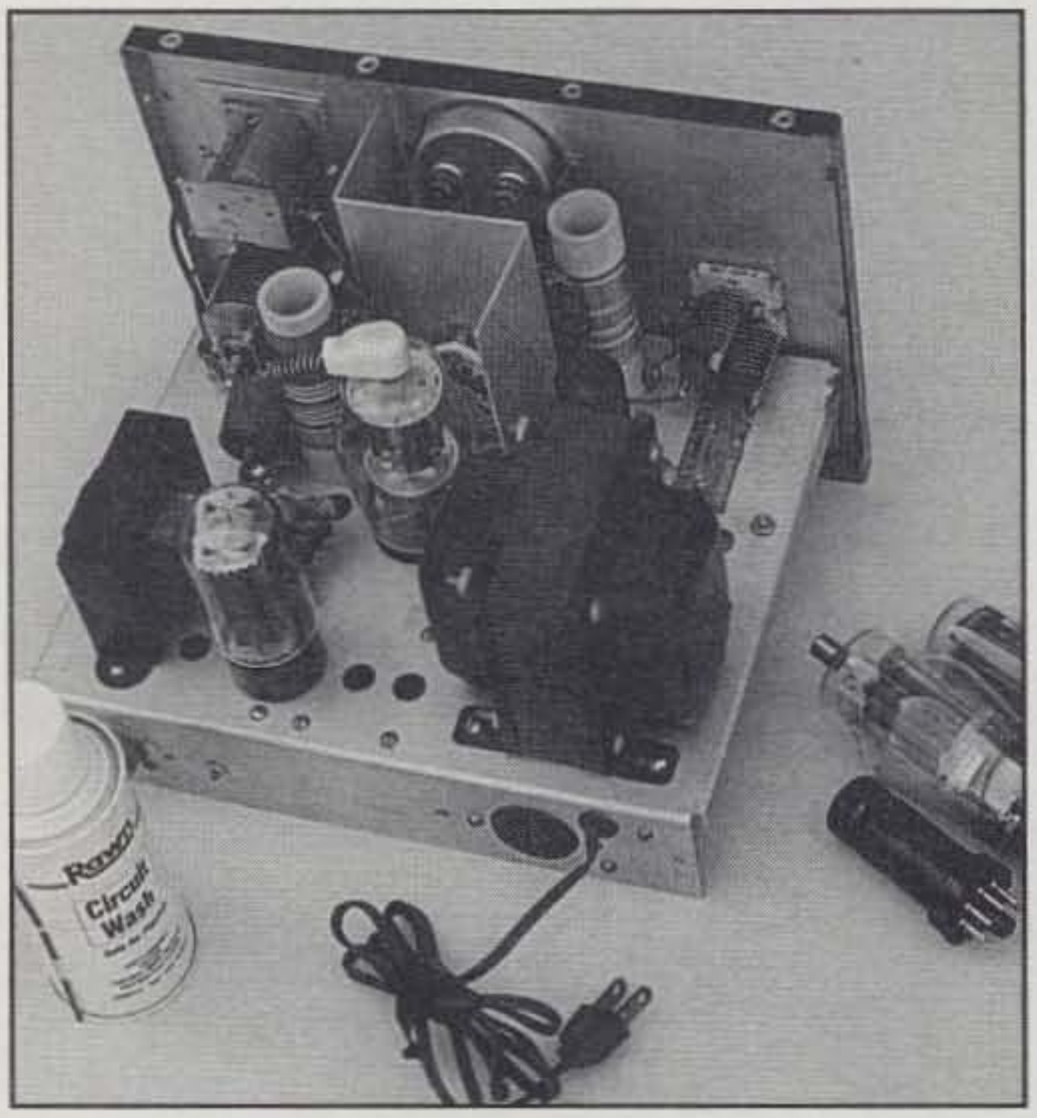


Photo A– Our quick and easy restoration of a small '50s-style transmitter begins with a brief cleaning and a round of new tubes. This simple step resulted in smoother tuning and more output power from the little Johnson Adventurer shown here.

The Restoration Process

If you find some good gear at a hamfest fleamarket, remember to look around for a test table and vintage-parts supplier. You may be able to quickly check a transmitter or receiver's operation and even buy basic "fix up" items such as tubes and power-supply capacitors right on the spot (one-stop shopping!). Once again, opting for small, simple gear proves attractive here, as a small sack of parts is much more affordable than a big box of tubes and other components. Yes, the gear may (hopefully does!) work okay with its existing tubes and filter capacitors, and yes, some folks brag about using original tubes indefinitely, but that does not mean the performance is up to par. Retubing and replacing filter capacitors is a simple step that makes a big difference (photo A). This is also the best time to remove dust and clean switches and/or tube sockets. A spray contact cleaner works great here. Need I remind you to be sure any piece of equipment you service is unplugged from an AC outlet and its filter capacitors discharged beforehand? You may be an old pro and know exactly what you are doing, but a hand or finger can

slip or a chassis can shift from its prop and kazam! Instant defibrillation! Always respect both high and low voltage. Don't take chances.

Finding exact replacement or same- size filter capacitors for older gear can be quite challenging, but most rigs have plenty of "under chassis" room for larger substitutes. You will do fine here if you just remember more (in microfarads and voltage ratings) is always better than less. That was the case with my little Johnson Adventurer (photo B). It received "overkill" capacitors because they were on sale at an irresistible price, and as a result, it has a beautiful, clean CW note.

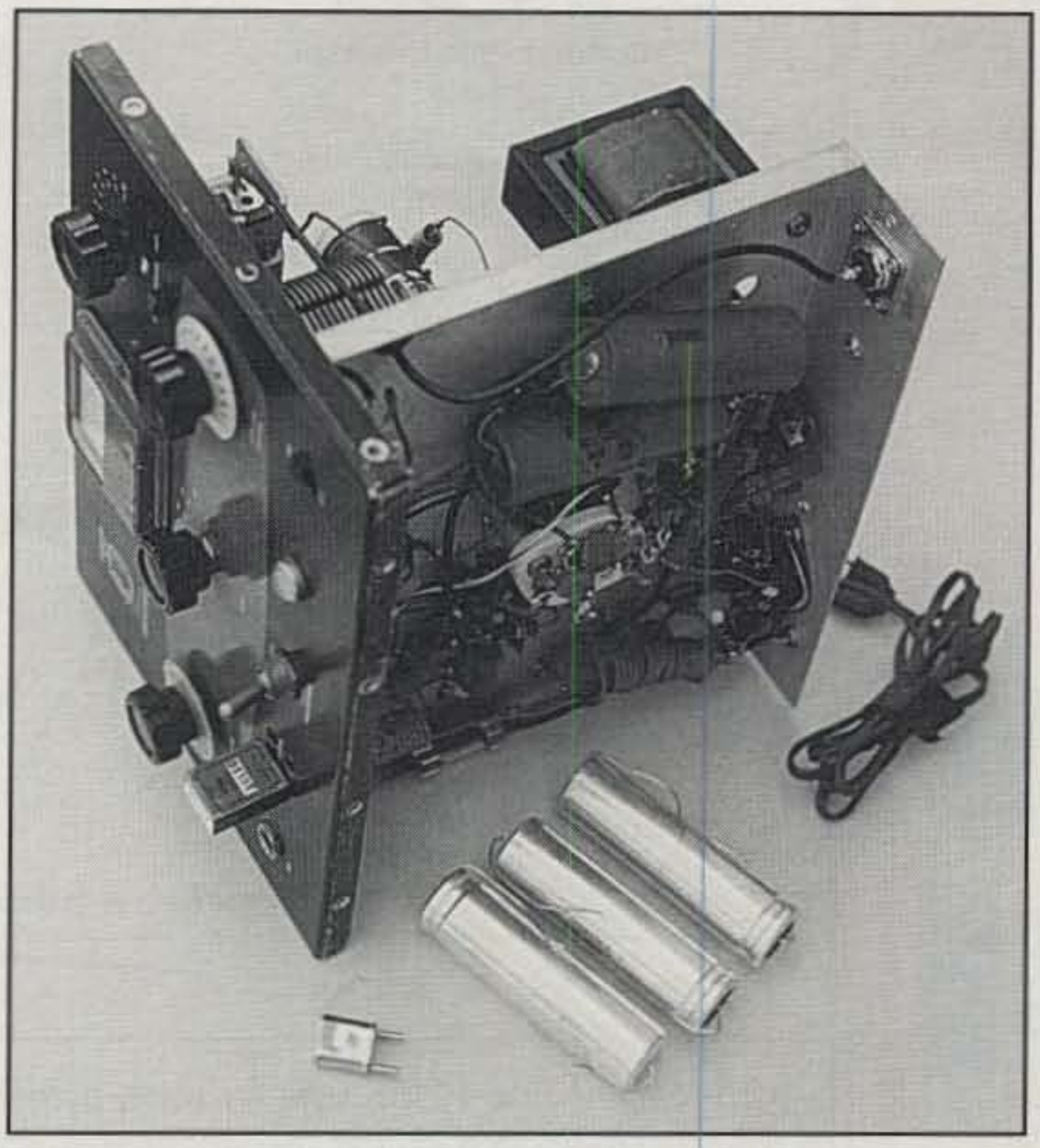


Photo B– Under chassis, the Adventurer gets a new line of power-supply filter capacitors to ensure a clean signal without AC hum. A VXO circuit was also added for warping the crystal's frequency.

Where's the Manual?

Additional steps associated with restoring a transmitter or receiver mainly will depend on you and your particular equipment. These steps may include replacing faded bypass capacitors, realigning a receiver, replacing a dial cord, or other measures requiring instruction manual details or guidance. Say you did not get a manual with your golden-oldie rig? Don't feel short-changed, as they tend to become separated from each other over the years.

Reproduced manuals for over 5500 models of old-time receivers, transmitters, amplifiers, test gear, and more are available from W7FG Manuals, 402731 W. 2155 Dr., Bartlesville, OK 74006 (photo C). The toll-free telephone number, 1-800-807-6146, even rings with authentic-era nostalgia! W7FG has an incredibly wide array of manuals on everything from Ameco and Galaxy to Utica and Zenith. Give him a call when you need a manual quickly.

A Cool '50s Antenna

Another neat treat available from W7FG Manuals is genuine 600 ohm ladder line—the same type of open feedline used in multiband doublets of the 1950s (photo D). You can purchase it in 50 and/or 100 foot lengths, with or without wire for the horizontal ("flat top") section, and in pre-assembled or kit form (you stretch out

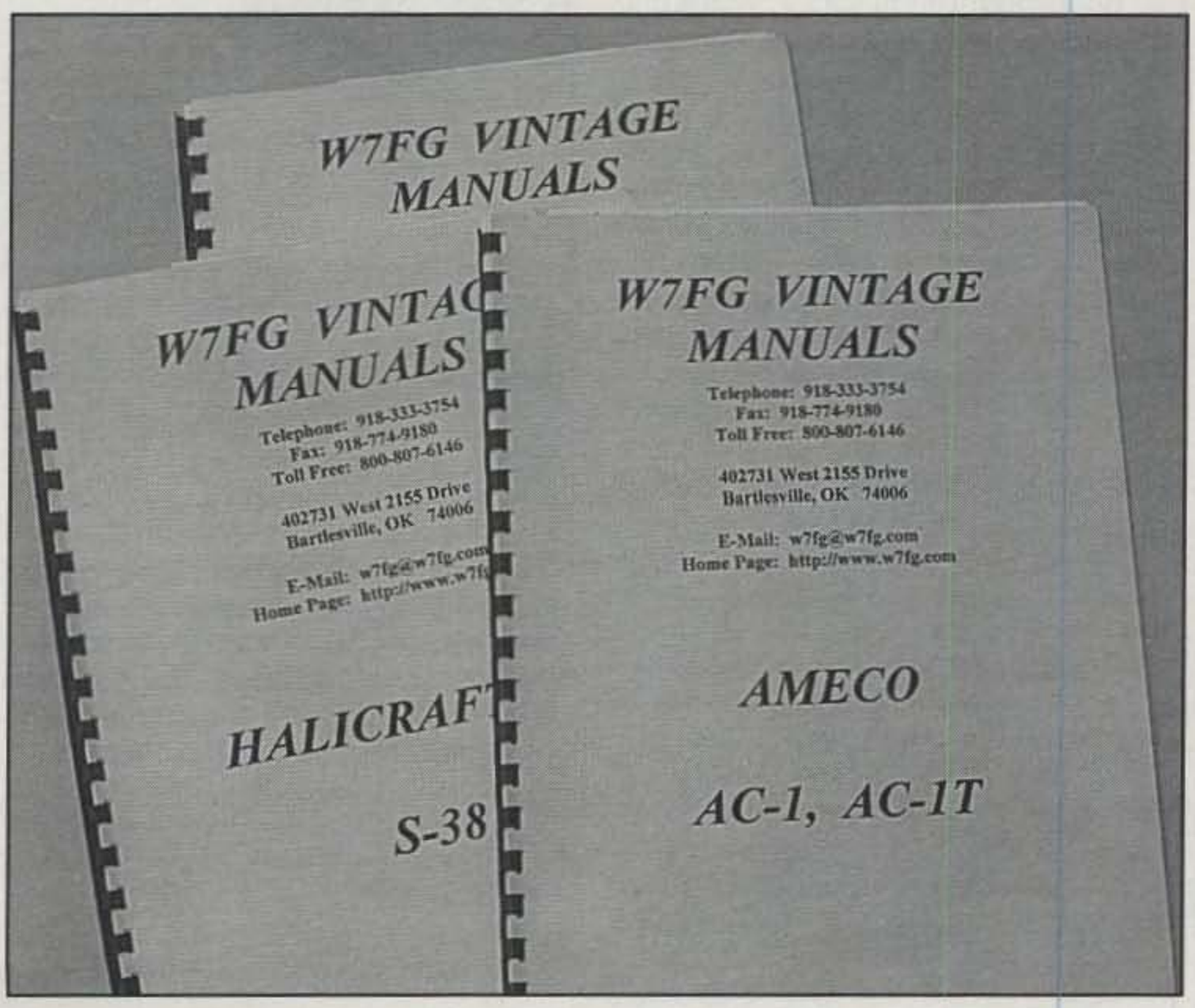


Photo C– Instruction-manual guidance is vital for in-depth restoration of vintage gear, and an excellent source of reproduced manuals is W7FG Vintage Manuals in Bartlesville, Oklahoma. (Details in text)

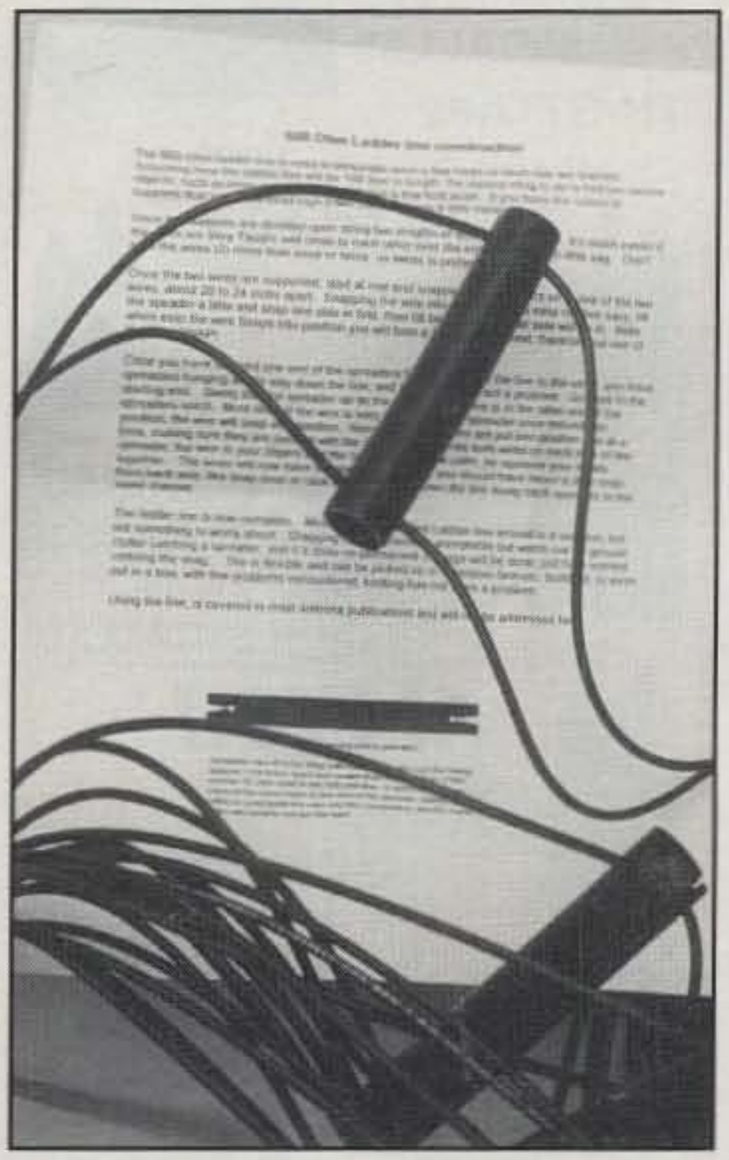


Photo D– Multiband doublet antennas and 600 ohm ladder line work just as well today as they did in the 1950s. Both items are available at reasonable cost from W7FG. (Discussion in text)

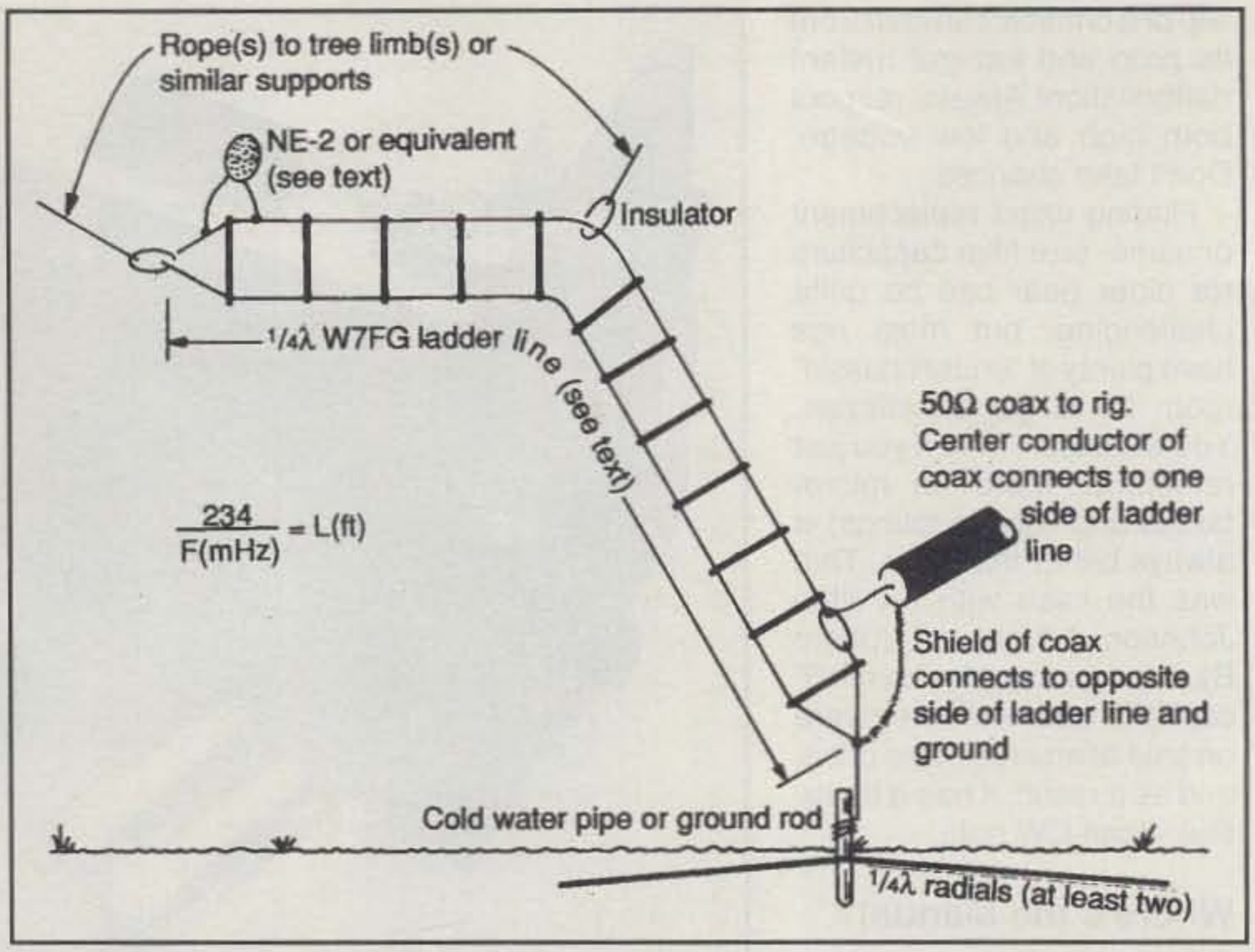


Fig. 1– Outline of a 1950s-style 1/4-wave antenna called the "El Toro." Antenna is a perfect mate for a simple '50s-style setup, as its monoband design minimizes radiation of harmonics. Open-air ladder line to make it is available from W7FG.

the wire and snap on the spacers). The spacers are heavy-duty, semi-rigid plastic, the wire is well insulated, and overall quality is superb.

Doublets were popular wire antennas of the 1950s, and guess what? They are still good performers today. Mate one with a balanced-output antenna tuner, and you have a dandy low-cost skywire. Install a W7FG doublet amidst a stand of trees, and its black insulation blends with foliage to produce an almost invisible antenna (that's why I used a sketch rather than a photo in the column.

After checking out W7FG's ladder line, I remembered a clever little wire antenna of the 1950s called the "El Toro." As I recall, it was a "trapped" three- or four-band version of a Twin-lead Marconi, and it could be installed vertically, sloping or bent into an "L" to fit available space and supports. I used some of the ladder line to make a modern-day monoband equivalent, and it works great. If you would like to include a genuine '50s antenna in your vintage station, the El Toro is perfect. *Olé!*

A sketch of the El Toro is shown in fig. 1. Basically, it is a Twinlead Marconi cut to 1/4 wavelength for your desired band of operation and RF-fed with 50 ohm coax cable. Like the original, it can be installed vertically, sloped or bent. I prefer a monoband version because it is easier to make, more foolproof to set up, and minimizes radiation of harmonics (and vintage gear is well-known for its generation of harmonics). Overall length of the antenna is determined by the formula:

length (feet) = 234/frequency (MHz)

Using 40 meters as an example, 234/7.050 MHz = 33.19 feet. One end of the antenna (the end nearest ground)

Fig. 2– Original-era advertisement of the Ameco AC-1. This little delight was built on an open chassis and is easy to reproduce today. It's the ultimate complement to a golden oldie.

is RF-fed with 50 ohm coax, and the two twinlead wires on the other (far) end are soldered together. Overall length can be trimmed for lowest SWR. It is that simple, but do not sell short El Toro's performance. One wire of this little tiger serves as a built-in radial and thus makes it more efficient than a regular inverted-L or random wire. Try one. You will like it.

As a special nostalgic treat, add a little NE2 neon-glow lamp to the antenna's far end (a '50s "fun topping"). It will blink along with your transmitted CW, produce a tiny light show at night, and can even serve as a tune-up aid or RF output indicator for your transmitter. No, it will not usurp power from your signal. Can't find an NE2? Try substituting a small neon-glow night light.

Replicating the Ameco AC-1

Call me a hopeless nostalgia buff if you wish, but I cannot resist looking through ham magazines of the 1950s at every available opportunity. Ads and articles highlighting those warm little one- and two-tube transmitter kits from companies such as Ameco, Philmore, and WRL always capture my attention (genuine open-air, glow-in-the-dark rigs!). Unfortunately, however, the little tikes can no longer be mail-ordered (I tried!), and they seem never to surface at hamfests (Didn't anyone save those rinky-dink Novice rigs?). The good news, though, is you can build an exact replica right in your own home in only a weekend, and at low cost!

Consider, for example, the unforgettable Ameco AC-1 illustrated in figs. 2 and 3. It is built on an approximately $2^1/_2$" × 8" × 10" chassis with four tube sockets and a small power transformer mounted on the top. (Drag out those drill bits and Greenlee punches! This is going to be fun!) Two of the tube sockets are used for the 6V6 and 6X5, one is used for supporting the plug-in pi-net tank coil, and the fourth is employed as a combination crystal and key socket. Tuning capacitors and other high-voltage-associated components are mounted below chassis for safety. The front panel (which is only the chassis front lip) is hammertone gray with white lettering (two 0–100 dials plus label "Ameco Transmitter Model AC-1"). Two red pointer knobs round out the cosmetics.

Are those creative ideas flowing yet, friends? Chassis, lettering kits, red knobs, tubes, sockets, and coil forms all are available right now from Antique Electronic Supply (6221 S. Maple Ave., Tempe, AZ 85283; telephone 602-820-5411), Mouser Electronics (958 N.

Powerful. Small. Quiet.

www.ALINCO.com

Visit our website for product information and links to many of these fine dealers.

Alinco amateur radio products are available at the following dealers:

Advanced Specialties
Lodi, NJ.
800-926-9426

AES
Las Vegas, NV
800-634-6227

AES
Milwaukee, WI
800-558-0411

AES
Orlando, FL
800-327-1917

AES
Wickliffe, OH
800-321-3594

Alabama Radio
Anniston, AL
888-613-8061

Alaska Ham Radio Supply
Chugiak, AK
907-688-4267

All Com
Mesquite, TX
887-426-7883

ALQ Electronics
Woodstock, NB
506-328-1115

Am-Com, Inc.
Lakeside, MT
406-844-3252

Anvil Electronics
Nome, AK
907-443-5304

Associated Radio
Overland Park, KS
800-497-1457

Austin Amateur Radio
Austin, TX
800-423-2604

BamCom
Raceland, LA
800-283-8696

Barry Electronics
New York, NY
212-925-7000

Brownville Sales, Inc.
Stanley, WI
800-646-RICH

Burnaby Radio
Burnaby, BC
604-298-5444

Burghardt Amateur
Watertown, SD
800-927-4261

ComDaC
St. Joseph, MI
800-382-2562

Com-West Radio Systems, Ltd.
Vancouver, BC
604-321-3200

Communications City
Miami, FL
305-579-9709

CT Morgan
Chattanooga, TN
800-251-1373

Dentronics, Inc.
Flushing, MI
810-659-1776

Durham Radio Sales & Service
Whitby, ON
888-426-1688

East Coast Amateur Radio
N. Tonawanda, NY
800-995-1787

Gateway Electronics
St. Louis, MO
800-669-5810

Grove Enterprises
Brasstown, NC
828-837-9200

Ham Central
Poughkeepsie, NY
800-721-4426

Ham and Electronics
Veradale, WA
509-928-4387

Honolulu Electronics
Honolulu, HI
808-593-8777

Hooper Electronics Supply
Biloxi, MS
228-432-0584

Houston Amateur Radio
Spring, TX
800-471-7373

Ham Radio Outlet
Anaheim, CA
800-854-6046

Ham Radio Outlet
Atlanta, GA
800-444-7927

Ham Radio Outlet
Burbank, CA
800-854-6046

Ham Radio Outlet
New Castle, DE
800-644-4476

Ham Radio Outlet
Denver, CO
800-444-9476

Ham Radio Outlet
Salem, NH
800-444-0047

Ham Radio Outlet
Oakland, CA
800-854-6046

Ham Radio Outlet
Phoenix, AZ
800-444-9476

Ham Radio Outlet
Portland, OR
800-854-6046

Ham Radio Outlet
San Diego, CA
800-854-6046

Ham Radio Outlet
Sunnyvale, CA
800-854-6046

Ham Radio Outlet
Woodbridge, VA
800-444-4799

IRI Amateur Electronics
Jamestown, NC
336-454-2012

Jun's Electronics
Culver City, CA
800-882-1343

Kcomm
San Antonio, TX
800-344-3144

Lentini Communications
Newington, CT
800-666-0908

MacFarlane Electronics Ltd
Battersea, ON
613-353-2800

Memphis Amateur
Memphis, TN
800-238-6168

NSI Communications
Federal Way, WA
800-977-0448

NTF Communications, Inc.
Calgary, AB
403-219-0555

R & L Electronics
Hamilton, OH
800-221-7735

Rad Comm Radio
Lubbock, TX
800-588-2426

Radio City, Inc.
Mounds View, MN
800-426-2891

Radio Depot
Seattle, WA
800-291-9067

Radio Place
Sacramento, CA
916-387-0730

Radio World
Boulder City, NV
702-294-2666

RadioWorld Inc. of Canada
Toronto, ON
416-667-1000

RLS Electronics
Morrilton, AR
888-315-7388

Rogus Electronics, Inc.
Southington, CT
860-621-2252

Ross Distribution co.
Preston, ID
208-852-0830

RT Systems*
Huntsville, AL
256-880-2497

Soundnorth
International Falls, MN
218-283-9290

That Radio Place, Inc.
Oxford, PA
610-932-3300

Texas 2 Way
San Juan, TX
888-289-9752

Universal Radio, Inc.
Reynoldsburgh, OH
800-431-3939

Virginia Ham Radio
Christiansburgh, VA
800-298-6153

YV-5 Communications
Miami, FL
305-577-9960

also available at Fry's Electronics stores and radioshack.com stores

Simple ■ Clean ■ Dependable

ALINCO®

AMATEUR RADIO'S VALUE LEADER™

U.S.A. Alinco Branch: 438 Amapola Ave.
Suite 130 • Torrance, CA 90501
Phone: (310) 618-8616 • Fax: (310) 618-8758
Internet: http: //www.alinco.com

Specifications subject to change without notice or obligation. Performance specifications apply only to Amateur bands. Permit required for MARS/CAP use. Products intended for use only by properly licensed Amateur Radio operators.

*Software inquiries only

CIRCLE 119 ON READER SERVICE CARD

Alinco DJ-X2T

World's Smallest Scanning Receiver?

- "Credit Card" size
- 522 KHz ~ 1 GHz tuning range*
- 700 memory channels (70 channels X 10 banks)
- AM, FM, WFM modes
- Internal Lithium-ion battery PLUS snap-on-dry-cell power pack
- Effective RF "sniffer" feature detects hidden transmitters (patent pending)
- SMA antenna connector
- Three different antenna modes including internal AM ferrite bar
- Easy and Expert user operating profiles
- Attenuator
- Clone function
- Preset, memory and VFO operating modes
- Illuminated display

www.ALINCO.com

U.S.A. Alinco Branch: 438 Amapola Ave. • Suite 130 • Torrance, CA 90501
Specifications subject to change without notice or obligation. **cellular excluded*

CIRCLE 112 ON READER SERVICE CARD

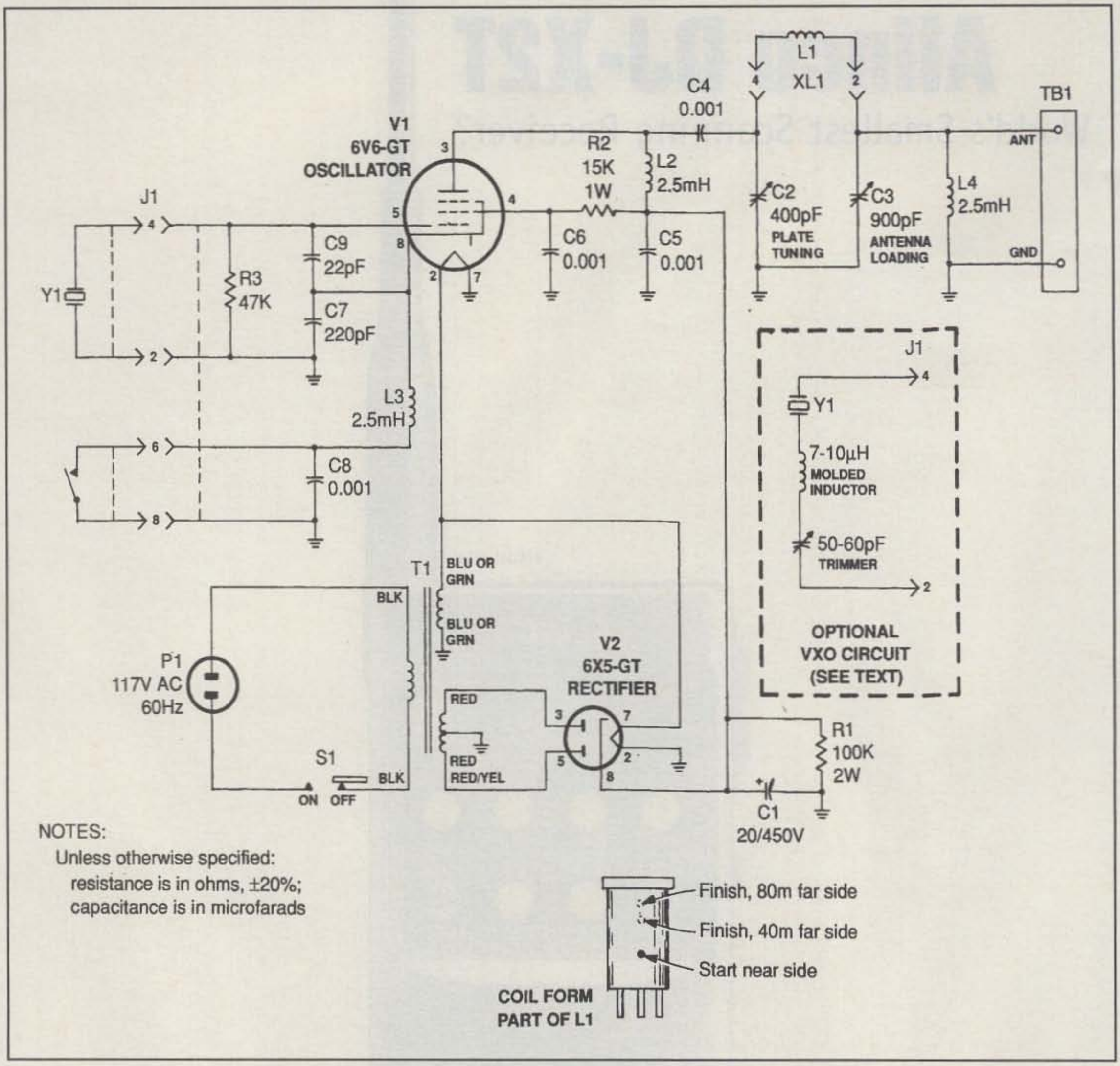


Fig. 3– Circuit diagram of the Ameco AC-1, with inset of optional crystal warping "mod."

Main, Mansfield, TX 76063-4827; telephone 1-800-346-6873), and various other parts suppliers.

A power transformer may be slightly more difficult to find, so remember to check older TV and sound-system repair shops for substitute candidates. Anything in the 300 to 350 volt range capable of delivering 100 or 200 ma and with a 6 volt filament winding should work fine. Why use a 100 or 200 ma transformer when we only need around 40 ma for 15 watts input? Because we want a steady output voltage that does not change with keying and cause a chirpy signal. Likewise, including a 40 mFd or larger power-supply capacitor is also a good idea. Still can't find a power transformer? Consider wiring two 115–6 volt transformers "back to back" and possibly including a voltage doubler circuit as illustrated in fig. 4. Use solid-state diodes, but leave the 6×5's filament connected for glamour (image is everything here!).

Space is now running low, but a few more notes on the AC-1 still warrant mention. First, the plate/p-net coil is wound close-spaced style with number 22 or 24 enamel-coated copper wire on a regular 1 1/2 inch diameter plug-in form. The original form was clear plastic. Substitutes naturally are acceptable. The coil consists of 28 1/2 turns for 80 meters or 15 1/2 turns for 40 meters. After some dinking, I also found a 9-turn coil works well for 30 meters. Although the circuit diagram shows 400 pF and 900 pF tuning and loading capacitors, they look like single- and double-section 365 pFd capacitors in the photos in the original manual (AC-1 manuals are available from W7FG (1-800-807-6146). The AC-1's tuning range with these capacitors is very broad; it will

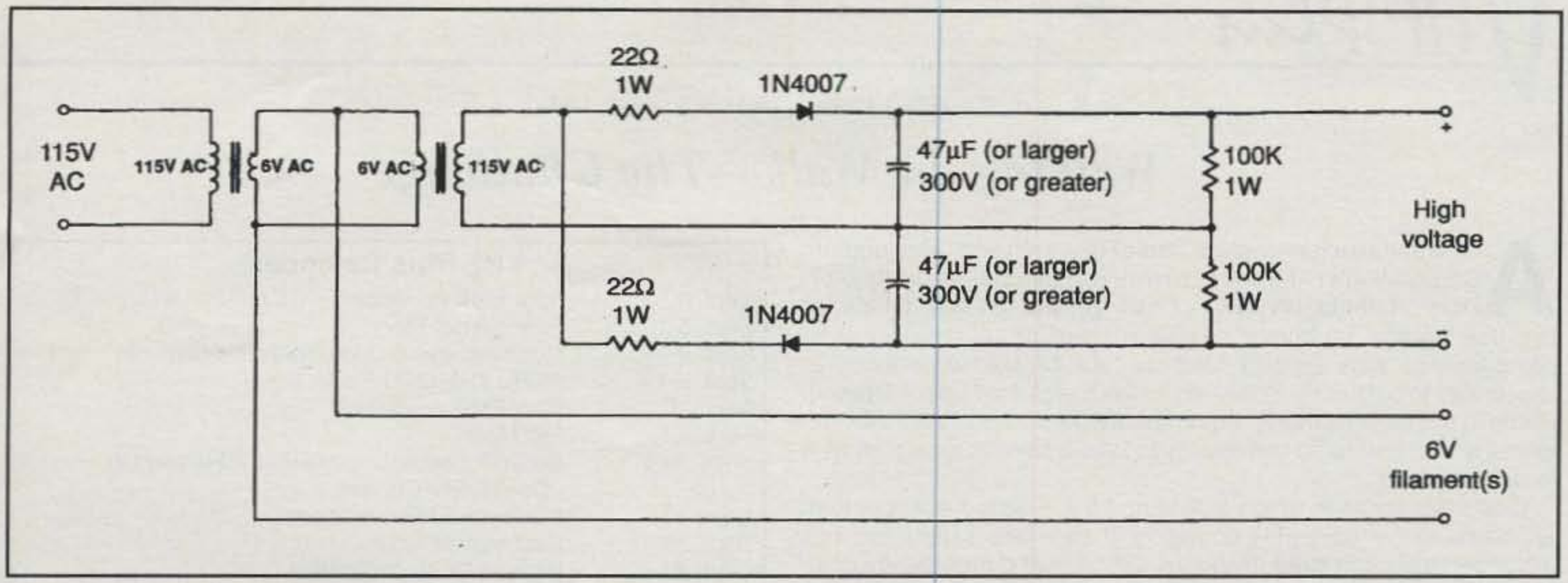


Fig. 4– Circuit diagram of a substitute power supply for the Ameco AC-1. (Explanation in text)

load everything from dipoles to half-wave wires. A meter for tune-up is not included, so use your existing in-line wattmeter, SWR bridge, or an antenna-clipped NE2 neon lamp as an indicator and tune for maximum output. You can double-check input power by connecting a 100 or 200 ma meter in series with the key. Approximately 50 ma will indicate approximately 15 watts.

Once your "retro AC-1" is working properly, you might add a VXO circuit to it for shifting the transmit frequency a few kHz. As shown in the inset in fig. 3, a molded 7 or 10 µH inductor and a miniature 50 or 60 pF capacitor will work fine (if we had only known that trick years ago!). Now team your AC-1 with an S-38, SW-54, or HQ-100 and an El Toro antenna and hit the bands in style. Happy days are here again!

Stay tuned for more nostalgia fun next month, and listen for me "nostalgia style" on 30 meters!

73, Dave, K4TWJ

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

Walking the Walk—The Challenge

As the speaker for Amateur Radio Research and Development Corporation's (AMRAD) 25th Anniversary Dinner on June 17, Dale Hatfield, WØIFO, Chief of the FCC's Office of Engineering and Technology, challenged all of the amateur radio community to "walk the walk," not just "talk the talk" when it comes to activities in our hobby. Speaking on the topic "The Role of Amateur Radio in the New Century," he urged the members of AMRAD and all of the amateur radio community to take a serious look at what is to be our future.

Citing five areas in which amateurs have justified our spectrum allocation in the past—(1) engaging in experimentation that has advanced the radio state-of-the-art, (2) providing emergency communications in times of natural or manmade disasters, (3) providing trained radio operators in times of national emergencies, (4) encouraging international cooperation and goodwill by allowing direct communications between and among people on an international basis, and (5) providing an important educational outlet for people interested in the more technical aspects of radio communications— Hatfield stated in essence that we cannot now sit on our laurels and expect to be unaffected by the coming changes in wireless communications.

The entire text of Hatfield's speech is in this month's "Washington Readout" column. You might want to read it first before reading my comments on the speech.

VHF Plus Calendar

Sept. 3	Poor EME conditions
Sept. 5	First quarter Moon
Sept. 8	Moon apogee and lowest declination
Sept. 9-11	ARRL VHF QSO Party
Sept. 10	Poor EME conditions
Sept. 13	Full Moon
Sept. 16-17	Second weekend of ARRL10 GHz and Up Cumulative Contest
Sept. 17	Moderate EME conditions
Sept. 20	Last quarter Moon
Sept. 22	Highest Moon declination
Sept. 23	Moon perigee. Pacific Northwest VHF/UHF Conference *(See text.)*
Sept. 24	Excellent EME conditions
Sept. 27	New Moon
Sept. 29-Oct. 1	Microwave Update 2000 *(See text for details.)*

**EME conditions courtesy W5LUU.*

Walking the Walk—in Practice

Certainly challenging, Hatfield has caused us to give some serious introspective thought to our future as a viable hobby. Because so much of the five areas cited by Hatfield in which amateurs have justified our spectrum allocation in the past involve the VHF spectrum, I want to take this month's column space to perform some of the self-examination that his speech challenges us to do.

First, in the area of "engaging in experimentation that has advanced the radio state-of-the-art," we in the weak-signal community have been on the forefront of such experimentation. By our keeping of records of firsts and increased distances in communications over various VHF-plus ham bands, we continue to demonstrate that we push the envelope of communications by having the equipment and being available to complete each new DX contact. Furthermore, through AMSAT, and more specifically the Phase 3D program, we expect to venture into new arenas of propagation once the satellite is launched, hopefully this month or next. In particular, among the many features of the satellite, the onboard 24 GHz beacon will provide us opportunities for the first time to examine long-distance space propagation of signals in that band.

In the coming years, once the International Space Station is underway, it will present other opportunities for frequency spectrum experimentation via the ARISS program. I cited such experimentation in my February column concerning the development of a wide-band transponder as proposed by Matthew Ettus, N2MJI, at last year's TAPR Digital Communications Conference.

While in private e-mail to me, Bill Tynan, W3XO, raised legitimate concerns about the proposal as I outlined, I believe that these concerns can be addressed in a way that would make that or similar experiments possible. Furthermore, other creative uses of the ARISS program that also will examine efficient use of our frequency spectrum can be put forth.

Concerning terrestrial communications, recent software advances have made it possible for more of us to experiment with high-speed meteor-scatter communications (HSMS). Additionally, advances in digital signal processing (DSP) have opened up more opportunities to use computers to aid in detecting weak signals both terrestrially and via EME communications. It is this improvement in detection that has enabled an increasing number of operators with heretofore marginal stations to complete EME contacts. While we have benefited from the natural cyclical improvement of EME conditions in the last year or so, I believe that the principal factor causing the increased success has been the improved technology.

In the area of "providing emergency communications in times of natural or manmade disasters," we amateurs continue to perform exemplary duty. When telephone systems (including cell-phone systems) fail, regular communications channels become overloaded, or an emergency occurs outside the range of commercial networks, only hams have the flexibility, frequency agility, and knowledge to set up and maintain alternate communications networks.

Most recently, here in the Tulsa, Oklahoma area, during the early morning hours of 20 June almost all phone service in the metropolitan area was disrupted when a battery backup system at the local telephone company was depleted. The disruption prevented almost anyone in the metro area from being able to call 911. Being out of the loop of the official communications, a few amateurs discovered the emergency while monitoring scanner radios. An impromptu net was formed on a local repeater. Via that net amateurs were dispatched to critical locations. In all, 20 amateurs were sent to sites such as the Tulsa EOC and area hospitals during the crisis, which ended at around 7:30 AM.

Coy Day, N5OK, ARRL West Gulf Division Director, writing in the "West Gulf Quarterly Newsletter," observed: "A very important lesson was learned from this incident. A telephone alert system isn't much good when all the phones are out. They had to go knock on doors to get folks out to help. This incident was a good PR event for amateur radio and made the Tulsa papers."

The resulting PR also extended to electronic media. In particular, Dave Ratliff, W5ATV, the president of the Tulsa Amateur Radio Club, appeared on an early morning local television news program. Via his apearance, Dave was able to explain amateur radio's role in the emergency and promote the club's forthcoming high-profile Field Day activities at a local park.

Amateurs in the New Braunfels, Texas and the southern Oregon areas also provided necessary communications during phone outages in those communities during the month of June.

While occasionally not recognized by local officials until well into an emergency (such as was the case with the Tulsa telephone outage), amateur radio operators continue to make themselves available for such backup communications.

P.O. Box 73, Oklahoma City, OK 73101
(phone 918-627-6625; fax 918-835-9785)
e-mail: <n6cl@cq-amateur-radio.com>

In a passive role, fast- scan amateur television operators often provide real-time rebroadcasting of the National Weather Service's weather maps via one of the 70 cm frequencies that can be received over the air on one of the cable channels on a cable-ready television. Such live broadcasts provide not only amateur radio operators with these maps, but also anyone in the public sector who wishes to tune in to the proper channel.

In the area of "providing trained radio operators in times of national emergencies," hams continue to gain valuable training via local net participation and contest activities such as Field Day. Even so, a growing number of hams do recognize the need for more training. The ARRL has been receiving input to its new Certification Program via forums on its home page. Coming to the forefront of the demands for such certification has been the area of emergency communications. According to the League, "Member interest has been particularly high in the Emergency Communications forum led by Pat Lambert, WØIPL. Lambert has already developed a tentative outline with the aid of other forum participants."

In addition to nets and contests, local clubs often sponsor storm-spotting seminars that provide amateur radio operators with the information needed to provide extra ears and eyes to the National Weather Service during times of severe weather.

In the area of "encouraging international cooperation and goodwill by allowing direct communications between and among people on an international basis," organizations such as the Six Meters International Radio Klub (SMIRK) and AMSAT have encouraged development of weak-signal and satellite communications in developing countries. Additionally, SAREX and the Russian Mir programs have fostered communications between astronauts and cosmonauts and school children in various countries throughout the world.

Furthermore, through extending invitations to international ham radio operators—Arnie Coro, CO2KK, for example—organizations such as the Central States VHF Society have encouraged communications between peoples of countries of diverse political views. Such people-to-people contacts prove that regardless of political persuasion, we all are members of the human family.

Members of the EME community are working hard to encourage development of EME activity in countries that previously have not had such activity. Via equipment loans and grants, EME operations have taken place in heretofore inactive countries. Additionally, via technical exchanges taking place on the Internet, operators from developing countries benefit from shared technology alongside their brothers and sisters of more advanced countries.

Finally, in the area of "providing an important educational outlet for people interested in the more technical aspects of radio communications," serious weak-signal experimenters have the opportunity to attend one or more of at least a half dozen forums spread across the country, two of which are announced in this month's column. Moreover, technically oriented packet and satellite operators also have forums available to them. Almost all these forums publish "Proceedings" usually handled via the ARRL. Such forums provide for intense times of exchanges of ideas and instruction in the technical aspect of specialty communications.

As has been the case down through the decades, amateur radio has inspired many a ham to make a career choice related in one way or another to the hobby. Your editor's initial career and subsequent choices have been laced with influence by ham radio. Furthermore, it is because of a deep passion for the hobby that I continue to write this column after entering a career that is pretty much unconnected with electronics, although, one may be surprised as to just how much electronics is making an inroad in the religious communities. It certainly pays to know what I'm doing when I try to fix our church's soundboard!

Amateur radio has opened many doors in my new career. For example, sometime in 1998, *Leadership Journal* ran a cartoon showing a little boy confronting the neighborhood pastor at the door of the boy's home with the statement, "My dad says you can come in, but you can't talk to him about church until after you fix our television." I cut out that cartoon and hung it on my office door with the following modifications: I labeled the pastor as "Pastor Joe Lynch" and added a thought circle above the pastor's head which read, "Boy, is he in for a surprise."

Ham radio operators have been among the cutting-edge users of spin-off technolo-

gy. For example, hams who like to launch weather balloons sometimes include a GPS receiver to keep track of the balloon's location. In addition, weak-signal operators use the maps transmitted from weather satellites to forecast tropospheric propagation. Weak-signal operators also use information transmitted by NASA's ACE spacecraft to predict aurora propagation.

All of the positive statements above are not to say that everything is all peaches and cream. Far from it! Two areas of concern are our use of antiquated forms of communication, in particular our VHF FM repeater system, and our being so very territorial concerning our specialty frequency spectrum.

In the area of repeaters, frankly we haven't advanced much past the original

Huge Solar Flare Causes Widespread 2 meter Aurora Communications

Thanks to a huge X-class flare that erupted on 14 July at 1003 UTC, amateurs in Europe and North America experienced several hours of aurora-induced communications. The flare, which was measured to be 5.7, caused proton ejections. The outburst occurred in a region (9077) that was almost directly facing Earth. The resultant coronal mass ejection (CME) triggered a severe G5 category geomagnetic storm, which pushed the *K*-index to 9 for approximately nine hours.

The *K*-index rose to 5 at around 0600 UTC on 15 July, rose to 6 at around 1200 UTC, and then pegged at 9 at 1500 UTC. It fell off to 8 at 0000 UTC on 16 July, and remained there for an additional three hours, falling to 6 for around three more hours before going below 5 at around 0600 UTC on 16 July. (Data courtesy the NOAA URL: <http://www.sec.noaa.gov/rt_plots/kp_3d.cgi>).

According to the National Oceanographic and Atmospheric Administration (NOAA), "*K*-indices of 5 or greater indicate storm-level geomagnetic activity. Geomagnetic storms have been associated with satellite surface charging and increased atmospheric drag." According to SpaceWeather.com, "Bright Northern Lights were spotted as far south as 40 degrees latitude in Asia, Europe, and eastern North America. U.S. sightings included reports from Virginia, Missouri, Washington, Illinois, and Michigan."

This rare (usually no more than twice in a solar cycle of 11 years) event allowed amateurs to experience aurora-stimulated propagation in diverse, rare places such as Colorado, south Texas, and Florida. In Europe, widespread propagation enabled stations as far south as Germany and the Balkans to work into Scandinavia. **Joe, PAØJMV**, reported, "We enjoyed auroral-*E* openings (3×) to northern Scandinavia, and I was able to work 23 European DXCC countries via one of the strongest auroras I've ever heard. Aurora started about 1400 UTC on 15 July and ended just before 0200 UTC on 16 July. QSOs were made as far south as I4, S5, and YO6." Stations throughout Europe also experienced ionospheric scatter communications in the run-up to the aurora propagation.

Here in the U.S., **Herb Krumich, WA2FGK**, in FN21, reported, "Got home when the aurora was in full swing. During the intense period my antenna was almost west for the southern grids. I worked nine new grids to bring me up to 178 on 144 MHz, including 68 stations in 47 grids. I worked many South Carolina stations and Georgia, the farthest south station. The farthest west station that I worked was in EN00."

Ken Reecy, AC4TO, reported, "I am in EM70 Tallahassee, Florida, and am pretty new to 2 meter all-mode operating. I was thrilled to work Au as far northeast as K1TEO (FN31), and northwest to W9FX (EM57), and several others on 2 -meter Au. I have never experienced it before and it was fun! It was open here for 3 hours with Au. I heard stations as far west as WØVD in EM27, but he couldn't hear me. Many loud stations couldn't hear me. I kept getting beat out by W1s, etc."

John Godwin, K5IUA, in EL29, reported, "While I only made seven contacts, I heard a lot more folks. Most of them I could work via tropo using CW on a daily basis. I moved the antenna from west to east and found that for the duration of the opening the ideal heading was at 30 degrees. I made my first contact at 2023 UTC and the last Au signal was heard at about 2353. For what it's worth, these were my first contacts via Au (licensed since 1989), and no new grids, calls, states, etc., were heard or worked that I had not worked previously via other terrestrial modes of propagation." John's QSOs included: K5CM, EM25; K4QI, FM06; WØVD, EM27; KØETC, EM27; KØGU, DN70; AG4V, EM55; and W4MYA, FM07. Grids heard via Au but not worked included: EL09, EM04, 12, 15, 35, 36, 90, DM98, and FM16.

Sam Whitley, K5SW, in EM25, reported, "Got home from the movies at 2120 UTC and found the Au in progress. I started out on 222 MHz. There I worked NØLL, EM09 and W9UD, EN41. I went to 144 MHz, where I worked 37 stations in 19 states, with K1TEO in FN31 as the best DX (about 1240 miles). I worked as far south as SC, TN, LA (EM40), and TX (EM21), and to the west only as far as KØGU (DN70) and WØAH DM78, both in CO. My best time frame was 2120–2200 UTC and my last QSO was at 0118 UTC." Sam also reported hearing the following stations making contacts: WØVD, KØETC, WØJRP, WB5YWI, K5YT, K5YY, W7FG, N5OSK, WA4HFN, and KM5ES.

Dave Teague, K5MQ, in EM31, reported: "I made six QSOs on 2 meters during the Au opening. I have been on 2 meters weak signal for about ten years and this was the first Au opening I ever worked in central LA. My station here is 400W and 17-ele M^2 Yagi." Dave's stations worked included: KØETC, EM27; KØGU, DN70; NØKE, DM69; NØIT, EM48; W8WN, EM77; and NØPB, EM39.

If warranted, more Au reports will appear in next month's column. Congratulations to all who were able to participate in this rare event!

repeater operations that took place on the old 5 meter band, where an operator patched various receivers into a transmitter, thereby retransmitting a distant station's signal. While our system of remote receivers and automatic voting protocol is superior to the old 5 meter days in that it eliminates the human operator, it pales by comparison to what our commercial brethren are using for cellular telephone systems. As Hatfield pointed out in his speech, driven by the cost factor, commercial interests have made technological advances that put amateur radio operations far behind the curve in efficient use of spectrum.

One of the main reasons why we stay where we are in our technological development is territorialism. There is no reason why each club or special-interest group needs its own repeater. Through the proper use of spread-spectrum technology, all of the repeaters in a metropolitan area can be consolidated into one area of the band. I know this is controversial, but we must change.

With the growing use of cell phones, for the most part amateur radio repeaters have been passed by in their day-to-day usefulness. Exceptions do exist, such as reported in the July 2000 Palomar Amateur Radio Club, Inc. newsletter "Scope," which concerned the coverage of their repeater verses cell-phone coverage. Editor Stan Rohrer, W9FQN, states having heard autopatch QSOs from as far away as Catalina Island (50–60 miles off the San Diego County coast) and Palm Springs. Stan is justifiably proud of the coverage furnished by the Palomar repeaters, as opposed to the lack of cell-phone coverage.

Emergency communications does justify the use of repeaters. However, oftentimes a portable repeater at the site of the emergency can handle such communications. Also, coordination for a specific frequency pair for such repeaters can be handled via local or regional coordinating committees. Such is what we learned in the Oklahoma City bombing five years ago. We were very grateful for the use of the Oklahoma City Autopatch Association's 146.82 MHz machine. Despite its age and need for maintenance, it performed flawlessly as long as it was in service. However, the communications needs of those of us working the disaster could have been met just as easily by having a portable repeater located downtown either near or inside the disaster area. This is precisely what the cell-phone people did to provide cell-phone communications inside the perimeter of the disaster: They set up one of their portable repeaters.

Another aspect of territorialism has to do with use of the frequency spectrum by different special-interest groups. Constantly there is tension when someone using FM wants to foray into an area of the band reserved for weak-signal work. Other areas of contention also arise as various special interests vie for limited frequency spectrum. Why is it limited? Because of inefficient use of the spectrum.

It's not just special-interest groups that are concerned with frequency management. Determining who gets to talk to whom on what segment of 6 meters continues to be a problem years after the establishment of specific calling frequencies and a DX window. During a recent posting on the VHF reflector, Ken Neubeck, WB2AMU, pointed out that discussion concerning moving the 6 meter calling frequency and associated DX window has been going on for four years. Even so, as he observed, "It is very hard to legislate or mandate behavior by a band plan, particularly at this time after many have gotten on the band and especially since each ham has his own opinion on this issue."

As Hatfield point out in his speech, change we must, for in changing, we demonstrate we are good stewards of what we have and in not changing we demonstrate that we cannot justify our existence. If we will not change, we show the rest of the world that we really don't care to know how to manage the frequency spectrum we have.

For the most part, the threats to our spectrum are at bay at the moment. However, there are conferences coming up that can change that picture overnight. Unless we do something now, we will be unprepared to defend ourselves when it becomes absolutely critical.

On the Air

All of the June contests reaped good to excellent propagation. In particular, the June VHF QSO Party saw 6 meter propagation for the better part of the contest period. Field Day saw excellent 6 meter propagation throughout the contest period. I made several contacts in both contests using the club call WRØVER. I hope you were one of them.

In an e-mail I received, Gene Mitchell, NØDQS (EN22gd), reports the following: "Just wanted to report a couple of sporadic-*E* openings I experienced recently. On June 26, at 0256 worked W6TOD in DM15 at 1273 miles and then K7ICW, NW7O, KT6KT all in DM26 at about 1136 miles.

"Then on July 5, while delivering my son to his grandparents and working a schedule on 2 and 432 with KAØPQW and others in EN33 and EN34 and EN35, from EN20mx I worked sporadic-*E* to K9KNW in EL95 at 1283 miles and KF4YOX in EL96 and WA4DOS EL86 at about 1200 miles. This was done with 150 watts and a pair of M^2 stacked loops and an FT-100. These have been by far my best mobile contacts on 2 and I have had some over 400 miles.

"Then on July 11 at 0325 worked K7MAC, W7ID, WA7GSK all in DN13 and W7EW in CN84 at 1387 miles. The June contacts and July 11 contacts were done from the home QTH in EN22gd with 160 watts and a pair of 19-element 32-19's. Nice sporadic-*E* openings and from the mobile on July 5. I could hear W7XU in South Dakota and WYØV also working the same Florida stations.

The following report is via e-mail from **Howard Sine, WB4WXE** (EM74): "One CQ at 1945 UTC on 10 July got return of EI5FK (IO51), G4HBA (IO80), G1YPD (IO70), G1HHO, G7SVF, G8BCG/P, DL5RBW (new country), ON4KST (new country), G4SMV GØRUZ (IO93), G1BRE (IO83), G6YIN, and PA7MM (JO23). Also heard a GW at 50.210. DX was well spread out. Many other G's were heard but not worked."

Sam Whitley, K5SW, reports the following: "Well July 10 just wasn't a good day for our area. On 50 MHz Europe was worked into MN, IA, SD, and NM (nothing here with a lot of listening). On 144 MHz sporadic-*E* was reported in areas just east of EM25. Stations were working out west. For example, K5YY (EM26) worked DN70 in CO; KØETC (EM27) worked WA (DN96); N5FAC (EM35) worked DN70 and others. KØGU (DN70) worked EM24, EM26, and EM35. I could hear KU4WW in AL working west over us. We just missed it by a little. Great to see it happen for these guys even if we missed it here."

Laser Field Day QSO

While not unique, the following from the July 7 *ARRL Letter* represents an innovative use of technology: "Participants at the Palomar Amateur Radio Club ARRL Field Day site in Valley Center (in north San Diego County), California this year completed a two-way voice contact via laser beam. In typical ham radio tradition, communicating over the nearly 13-mile path on a beam of light involved minimal cost and readily available parts.

"'The first step in establishing a laser QSO is determining that a clear optical path exists,' says Bob Gonsett, W6VR, one of those involved in the experiment. Stan Rohrer, W9FQN, at the PARC Field Day site simply 'transmitted' a mirror flash to Gonsett, who was on Boucher Hill, Palomar Mountain.

"'Flashing this 12.7 mile optical path confirmed that there were no trees, bushes, or buildings in the way—constant problems in optical work,' Gonsett said. Hams have conducted laser communication over paths of 100 miles or so, he noted, so the distance was not record-breaking. The PARC experiment showed laser communication can be accomplished with simple, inexpensive gear.

"Equipment involved two full-duplex voice-modulated laser units constructed by Kerry Banke, N6IZW, and Chuck Houghton, WB6IGP, using PVC pipe housings. Each uses an ordinary 0.5 mW red 'pointer' laser costing less than $3 apiece as a transmitter. The lasers were mounted outside the PVC tubes. 'Because a laser beam is very narrow, the apparatus is aimed with the aid of a rifle telescope,' Gonsett explained. Precise positioning was accomplished using two micrometers salvaged from microwave tubes.

"At the transmitting end, a 'stock' pointer laser is powered by a 35 kHz oscillator. A microphone frequency modulates the 35 kHz oscillator at 5 kHz deviation. At the receiving end, the incoming red laser light hits a plastic Fresnel lens that focuses the light onto a photo detector. Out of the photo detector comes the 35 kHz FM signal. That signal is mixed with a 145.000 MHz local oscillator, producing a signal on 145.035 MHz. That signal is run through coax to a ham radio HT tuned to 145.035 MHz—the H-T serving as the FM demodulator/receiver. The system is full-duplex.

"Gonsett said observers at the PARC Field Day site were 'blown away' by the brilliance of the one-half milliwatt red laser beam coming from the distant mountain. 'While the beam shimmered with atmospheric turbulence, voice communications were clear and steady with only a hint of rumble, thanks to the use of FM,' he reports."

Following Field Day, the PARC presented a laser technical talk at their July 5 meeting, thereby giving all of those who wish to know more about laser communications a hands-on experience.

Current Conferences

As I mentioned above, we in the weak-signal community have many opportunities to get together and share our technological knowledge. Two such opportunities exist this month: the Pacific Northwest VHF/UHF Conference and Microwave Update 2000. Below are their announcements:

Pacific Northwest VHF/UHF Confer-

AMERITRON True Legal Limit™ Tuner

Easily handles 1500 Watts continuous carrier even on 160 Meters . . . High-current edge-wound silver plated Roller Inductor . . . Two 500 pf high capacitance tuning capacitors with 6:1 vernier reduction drives . . . 3 core choke balun . . . Six position antenna switch . . . True peak reading Cross-Needle SWR/Wattmeter . . .

Call your dealer for your best price!

AMERITRON ATR-30

$599

Suggested Retail

- *Handles 1500 Watts carrier*
- *Super High Current edge-wound silver plated Roller Inductor*
- *500 pf tuning capacitors with 6:1 vernier reduction drives*
- *3 core choke balun*
- *6 position antenna switch*
- *True peak reading meter*

AMERITRON's ATR-30 *True Legal Limit*™ roller inductor antenna tuner is ham radio's toughest! It'll handle 1500 Watts *continuous carrier output* on *all* modes and *all* HF bands into most antennas -- even on 160 Meters where most antenna tuners fail.

It's perfect for Ameritron's most powerful amplifiers where the ATR-30 just loafs.

All band coverage lets you operate 1.8-30 MHz including all MARS and WARC bands.

Super High Current Roller Inductor

You'll see Ameritron's new *super high current* air core roller inductor. It's *edge wound* from a thick solid copper strip and silver plated. This produces a large surface area and a massive conductor. It can carry huge circulating RF currents and withstand tremendous heat that'll melt or burn ordinary roller inductors.

A gear driven turns counter and crank knob gives you precise inductance control.

Two 500 pf Tuning Capacitors

Two 500 pf -- *the highest of any antenna tuner* -- variable transmitting capacitors give you no-arc wide range impedance matching for true high power performance.

6:1 vernier reduction drives makes capacitor tuning smooth and easy.

Super Balun, 6 position Antenna Switch

Super heavy duty three core choke balun lets you match virtually any balanced feedline antenna without core saturation.

A 6 position antenna switch lets you select your desired operating antenna.

Read *true* Peak Power

Ameritron's active electronic *true* peak reading meter accurately reads forward and reflected power and SWR *simultaneously* on a lighted Cross-Needle meter.

Roomy Cabinet maintains High-Q

Roomy extra-strong .080 inch thick aluminum cabinet gives highest efficiency and lowest loss. 13¼Wx5⅝Hx17½D inches.

AMERITRON ATR-15 Antenna Tuner

ATR-20, $459. Handles a full 1.2 kW SSB and 600 Watts CW. It's designed to safely handle the full SSB power of Ameritron's AL-811/811H/80B, ALS-500M/600 and other 1.2 kW SSB amplifiers. Compact all metal cabinet.

Ameritron has the best selection of *TrueLegalLimit*™ HF Amplifiers

AMERITRON's legal limit amplifiers use Peter Dahl super heavy duty Hypersil power transformer capable of 2500 Watts!

Ameritron's most powerful Amp

with Eimac® 8877 ceramic tube

AL-1500

$2845

Suggested Retail *TrueLegalLimit*™

Ameritron's *most powerful* amplifier uses the herculean Eimac® 8877 ceramic tube. It's so powerful that 65 Watts drive gives you the full output power -- and it's just loafing because the power supply is capable of 2500 Watts PEP. All HF bands, all modes. 77 pounds, 18½Dx17Wx10H in.

Ameritron's toughest Amp

with Eimac® 3CX1200A7 tube

AL-1200

$2395

Suggested Retail *TrueLegalLimit*™

Get ham radio's *toughest* tube with AL-1200. The Eimac® 3CX1200A7 has a 50 Watt control grid dissipation and the lowest history of field replacement of any modern transmitting tube that we use. 90 Watts in gives you full power out. All HF bands, all modes. 76 pounds, 18½Dx17Wx10H in.

Ameritron's classic Amp

with 2 graphite plate Amperex® 3-500ZG tubes

AL-82

$2295

Suggested Retail *TrueLegalLimit*™

Most linears using 3-500s can't give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential. AL-82 is ham radio's *only* super 3-500 amp! 100 Watts in gives you full power out. All HF bands, all modes. Hefty 76 pounds, 18½Dx17Wx10H inches.

1.5 *plus* kW SSB HF Amp

with 2 Eimac® 3CX800A7 tubes

AL-800H, $2395 suggested retail. Two Eimac® 3CX800A7 tubes produces 1500 *plus* Watts SSB PEP with 55 Watts drive. 52 lbs., 8½Hx16½Dx14¼W in. **AL-800, $1695** suggested retail, single 3CX800A7, 1250 Watts out with 70 Watts drive.

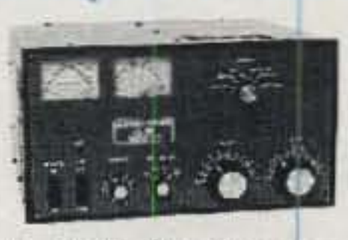
NearLegalLimit™ Amp

with four Svetlana® 572B tubes

AL-572, $1395 suggested retail. New class of *Near Legal Limit*™ amplifier gives you 1300 Watts SSB PEP power output (70 Watts drive) for 65% of price of full legal limit amps! Instant 3-second warm-up. 40 lbs. 8½Hx15½Dx14½W inches.

1 kW Desktop HF Amp

with Amperex® 3-500ZG tube



AL-80B, $1299 suggested retail. Gives you full kilowatt SSB PEP output (85 Watts in) from a whisper quiet compact desk- top linear. 8½x14x15½ in. Plugs into 120 VAC outlet. Graphite plate *Amperex®* 3-500ZG tube. Nearly 70% efficiency. Weighs 48 lbs.

Precision SWR/Wattmeter

AWM-30, $149 suggested retail. Active circuit gives *true* peak/average readings on lighted Cross-Needle meter. 3000/300 Watt ranges. Remote sensor.

Call your dealer for your best price!

Free Catalog: 800-713-3550

AMERITRON®

. . . the world's high power leader!

116 Willow Road, Starkville, MS 39759

TECH (662) 323-8211 • **FAX** (662) 323-6551

8 a.m. - 4:30 p.m. CST Monday - Friday

For power amplifier components call (662) 323-8211

http://www.ameritron.com

Prices and specifications subject to change without notice. ©2000 Ameritron

CIRCLE 115 ON READER SERVICE CARD

ence. This conference will be held September 23 in St. Helen, Oregon at the Village Inn. As of press time, the agenda as yet to be determined. For more information, contact Arnie Jensen, W7DSA, at <n7yag@columbia-center.org>. The Village Inn can be reached at 503-397-1490. It is located at 535 South Hiway, St. Helen, OR 97051.

Microwave Update 2000: This event will be held September 29–30 at the Holiday Inn Select, Bucks County, just north of Philadelphia, Pennsylvania. This year, the Mt. Airy VHF Radio Club, Inc will be the host ("The Pack Rats"). The hotel will provide accommodations for the event, which will have full use of the conference center Friday and Saturday. Two smaller meeting rooms will be available for the evening fleamarket(s). Hotel information: Holiday Inn Select, Bucks County, 4700 Street Road, Trevose, PA 19053 (215-364-2000, 800-HOLIDAY, <www.basshotels.com/holiday-inn>).

Also planned are some extracurricular activities for family members and the traditional surplus tour, plus Hamarama on Sunday. Noise-figure testing will be provided as well as an equipment tune-up clinic.

Advance Registration is $40.00 with forms available at the web site below. Send registration to Microwave Update, P.O. Box 682, Hatboro, PA 19040. For more info, contact John Sortor, KB3XG, via <JohnKB3XG@aol.com> and visit the Packrats web page for the latest on Microwave Update 2000 at <http://www.ij.net/packrats/MUD_2000/mud.htm>.

Current Contests

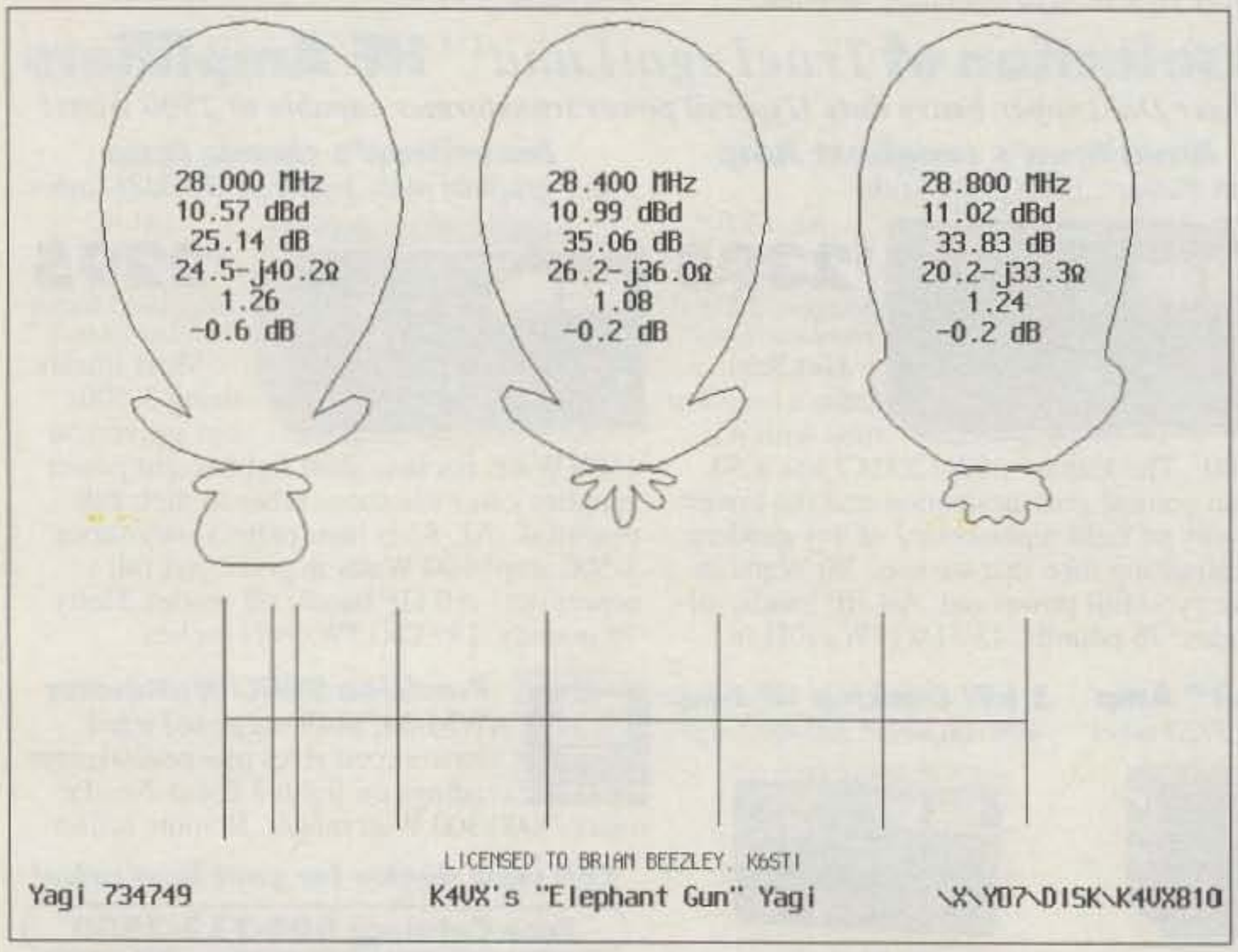
Another couple of opportunities to hone and practice our skills are the September VHF QSO Party and the ARRL 10 GHz and Up Cumulative Contest. The September VHF QSO Party is just like the June VHF QSO Party except that it is held in September. This year's contest will be held September 9–11. Full details can be found on the ARRL web site or in August *QST*. The second weekend of the 10 GHz and Up Cumulative contest is September 16–17.

Current Meteor Showers

Two minor showers, the *Piscids* (two peaks, September 8 and 21) and the *Aurigids* (September 30) can be seen this month. However, their activity has not been much above what is considered sporadic activity.

Oops...

The antenna shown in fig. 4 of K6STI's July article, "Global Optimization of Yagi Designs," somehow lost two of its elements (we still haven't figured out how). The correct figure is presented here. In addition, all of the diagrams lost some clarity in the translation from Brian's originals to our page layout software. There are no breaks in any of the antenna patterns.



Also, reader KD7HHD points out an error in the web address we gave in the "Ham Radio News" section of the July 2000 issue, and in the supporting story on the *CQ* website, regarding UO-36 hosting the first Space Internet node. The correct address (which has already been fixed on the website link) is <http://www.spacedaily.com/news/internet-00l.html>, with the figures before the html suffix reading zero-zero-the letter "l", rather than zero-zero-one.

Walking the Walk With a Hobby Hero

As you may have figured out by now, this column has been devoted to the challenge that Dale Hatfield, WØIFO, has made to us concerning walking the walk in our hobby. As part of his speech Dale told the story of his Elmers, two local hams in the Dayton area, who helped him get his first ham license, how they helped him build his first transmitter, and how their being electrical engineers influenced his career choice. As Dale illustrated in his speech, an essential part of walking the walk is to have had Elmers leading the way on the journey. These Elmers often turn out to be personal heroes of our hobby.

I want to devote the rest of this column to telling the story of one of my heroes in the hobby and how he has given me an example of walking the walk during the years I have known him.

It was January 3, 1961. I had just gotten home from school and in the mail was a document that I will never forget receiving—my Novice license. I ripped open the envelope and saw my new callsign, WV6PDE. Excitedly, I picked up the telephone and called my new friend, Frank Adams, WV6OAC. I could hardly talk, I was so excited. Frank knew why I called. He only had to ask my callsign, which I told him. He in turn wrote it down inside of the top of a checkers box, the only paper he could find to write on near the phone at the time.

Calming me down a bit, Frank invited me over to his house so that I could show off my new license. Upon arriving (it took about 15 minutes by bicycle, peddling as fast as I could from one end of Bonita, California to the other), I learned that he had arranged for me to make my first contact with a friend of his, Hap, WA6OTC. Frank told me to go into his bedroom and call Hap, as he was standing by to work me. Frank would wait for me in the living room so as not to increase my nervousness.

I was trapped. I wanted to cancel the QSO. The only way I could do so would be to call Hap on the phone. However, Hap lived in El Cajon, which was a long-distance telephone call. I couldn't use Frank's phone to make the call, as that would have been impolite, and I also couldn't peddle home and call Hap from my home, as that would have been rude. Besides, without asking Frank, I didn't know Hap's phone number.

There I was, staring down at Frank's homebrew equipment. Nervously, I started tapping out Hap's call and my own on Frank's straight key, all the while watching the arm of the meter on the transmitter going up and down with each keystroke. Then I turned it over to Hap, who came right back to me. My first QSO was underway, thanks to my best ham radio junior high school friend.

As you may have figured out by the similarity of our callsigns, Frank had received his license just a couple of months before I did. Somehow he learned about my having taken my Novice exam and contacted me. We met in the halls of our junior high school and became instant pals. Thus, it was perfectly nat-

l for me to let Frank know first about my *w* license.

When Frank got his license, with his dad, Bert, being K6BTO, there were then two hams in the same house. As a result, there was a division of territory at the Adams' home. The division took place across the property and across the frequency spectrum. As anything below 6 meters was DC for Bert, that left the HF bands for Frank to control—until he got his Tech license five months after getting his Novice. When he did, he cannibalized an old television that he bought for one dollar from the Value Village Thrift Store and used the parts and chassis to build a 6 meter rig. This was Frank's first foray onto the VHF ham bands. Hhis first love was HF, however, and that generally is where he stayed. Even so, he couldn't leave the VHF ham bands entirely alone. None of us who were pals then could. We found ourselves making equipment and trying it out, tearing it apart and trying again. We still experiment today.

During those junior high and high school days there were four of us teenagers who were pals. Tom Nielssen, WV6PIB, who is now W6HZ, and Doug Decker, WA6TAD, joined Frank and me to make up the foursome. Among us we figured out how to keep the National City area of the VHF ham bands pretty active.

In those days repeaters were just coming into use in southern California, and Doug, with Frank's assistance, was one of the early experimenters in that arena. Unfortunately, Doug became a silent key back in the '70s as a result of an automobile accident.

One time Tom built his own version of the Heath Sixer. Together, Tom and I lugged it up Mt. San Miguel to work some 6 meter DX one weekend. The best DX we got was Frank—about four miles away via line of site! Even so, the fun was in the effort of getting up the mountain.

Within the year of his having obtained his initial license, Frank upgraded to General. Eventually he got his Extra and quite some time later broke down and changed his call to an Extra class callsign, AE6L.

One of the most important of Frank's attributes is kindness. If ever there was someone who exemplified that ancient saying of loving your neighbor as yourself, Frank is it. I remember one Saturday when we were just walking around. Frank knew a ham who had a heart condition. He talked me into going over to this ham's house to visit him just to be company. As weak as he was, the ham was so delighted to see us that he decided to muster all of his strength and take us for a ride in his pickup truck. After we visited the better part of the day, the ham took us back to Frank's house. Dropping us off, he thanked us for giving him the best day he had had in a very long time.

The lesson I learned is that we need to be considerate of others. If I had talked myself out of going with Frank, I would never had been part of bringing sheer joy to another human being—something that was and continues to be just a natural for Frank.

When Frank found out that I had met the person who would eventually become my wife (Carol, W6CL) on the air and that I was taking more than a passing-fancy interest in her, he coined the phrase "Love at first dit." To this day, when I tell people how Carol and I met on the air and add that it was "Love at first dit," Carol playfully counters, "Don't flatter yourself." Carol and I both have something to remember Frank by.

Since moving to Oklahoma in 1984 it has been more difficult to keep up with Frank. We have kept spotty communication going, though. Partially I have kept in touch with Frank in order to keep up with his dad, who is an anchor point for my VHF- plus experiences. Those of you who have read my book *The VHF "How To" Book* will remember Frank's dad. Bert was my inspiration to get on the VHF-plus ham bands. It was the sound of the radar buzz and the smell of cooking capacitors in the APX-6 in Bert's shack that romanced me into the throes of the weak-signal world.

In recent years, as members of the San Diego Microwave Society, Frank and his dad have experimented with homebrew 10 GHz rigs. While not making a mark on any ham radio records, Frank has been a steady user of the VHF plus ham bands off and on all of his life.

My friendship with Frank has lasted a lifetime—a lifetime that is now rapidly coming to an end for Frank. Frank has melanoma. As I write this, he has been given two months, maybe three, to live. Frank is one of those cool-as-a-cucumber type of guys. Nothing really fazes him, not even having only two months to live. The Christian faith of he and his wife Sherri is playing an important role for them. There is no denying that. Even so, I have never known Frank to be upset about much of anything.

As long as I have been in the ministry (which is not very long), I have wondered why we should wait to say nice things about our friends until after they are Silent Keys. Therefore, I am publishing my "nice things" about Frank now. I do so for two reasons: First, I am saluting one of my best friends and heroes in the hobby. Second, I want to urge all of us to take a moment to think about our best friends and heroes in the hobby and reminisce about what that friendship has meant to us. Then I urge us to use that reminiscing to challenge ourselves to think about what we can do to make this hobby of ours just a little bit better for all of us and for the next generation following in our footsteps. In so doing, we too will be walking the walk that Dale Hatfield, WØIFO, is exhorting us to take in this journey through our wonderful hobby of amateur radio.

And Finally . . .

This month I concentrated on a theme of walking the walk because I believe that Dale has a very important message for us to hear. Time is running out to make the necessary changes for our hobby to continue in the new century. If you have creative ideas that you would like to share in this column, please let me hear from you. Until next month...

73, Joe, N6CL

Digital Wireless

BY STEVE STROH, N8G

Packet Radio and Beyond

Meet The New Guy

Welcome to *CQ*'s new "Digital Wireless" column. My name is Steve Stroh, N8GNJ, and I'm the "new guy." This column is a successor to Buck Rogers' "Packet User's Notebook," but it's also different, with a broader focus on everything digital in amateur radio. I want to use this first column to introduce myself and to try to explain what you can expect from the column in the coming months.

First, I feel thrilled and privileged, and more than a bit awed, to have been offered this assignment. A quote from Sir Isaac Newton applies to my writing here: "If I have seen further it is by standing on ye shoulders of Giants." One of the first of my "Giants" was Bdale Garbee, N3EUA, for his beloved "Bits In The Basement" column which ran in TAPR's "Packet Status Register" newsletter a number of years ago. Bdale truly did see further, and by his writing about leading-edge topics, inspired many, many hams who wondered "... is this *all* there is? Bdale's answer was a profound *no*—there are many more interesting things out there.

Greg Jones, WD5IVD, the immediate past-President of TAPR (Tucson Amateur Packet Radio), personally encouraged me to write more about leading-edge wireless technology (about which I was writing professionally already) in amateur radio venues such as "Packet Status Register" and *CQ*. Don Rotolo, N2IRZ's, column in *CQ VHF* was consistently great and interesting, and I always learned something new from Don's column. Dewayne Hendricks, WA8DZP, shook up my life late one Saturday night in 1996, when I helped host the 1996 Digital Communications Conference in Seattle, and I've never been quite the same since. Dewayne's insights on where wireless technology was headed inspired me to begin my writing career (this was *interesting* stuff), and now that has come full circle.

Last, for now, two hams in the Cleveland, Ohio area—the late Maynard Weston, W8MW, and Tom Kryza, KB8CI, with whom I've regretfully lost touch—helped get me started in packet radio. Thanks *very* much, Maynard and Tom!

P.O. Box 2406, Woodinville, WA 98072
e-mail: <n8gnj@cq-amateur-radio.com>

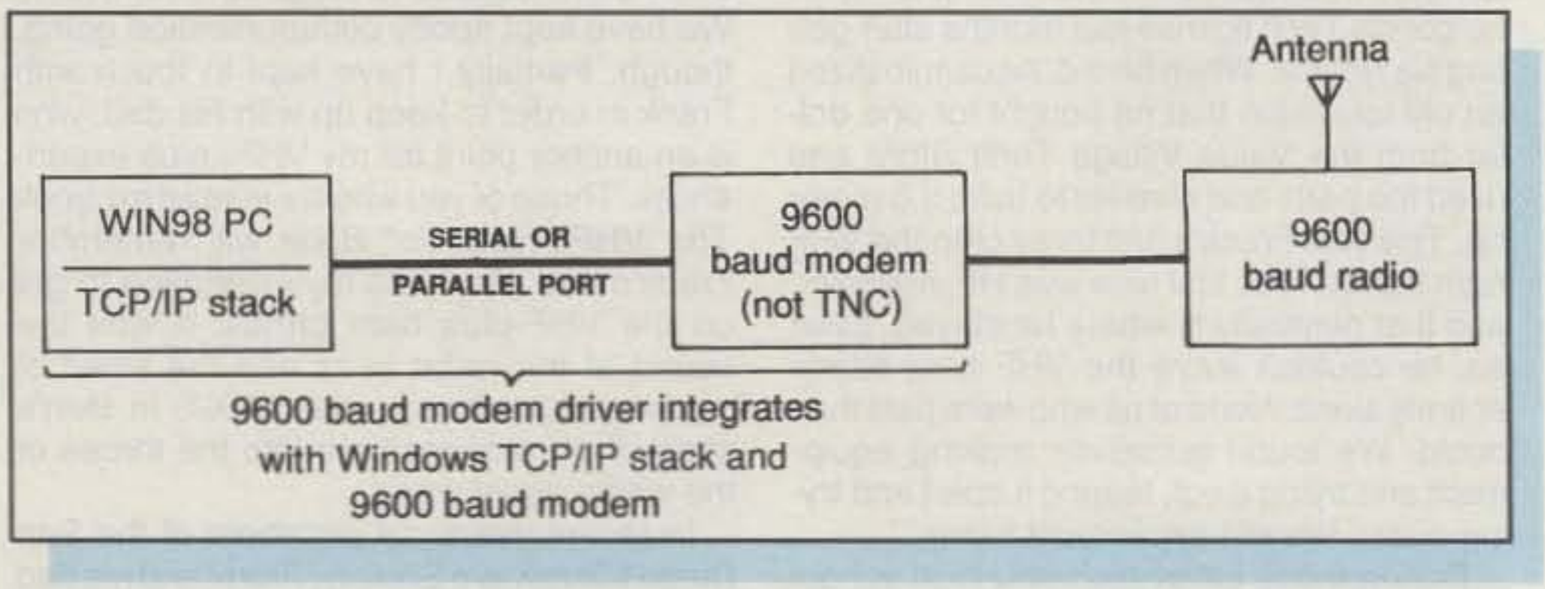


Fig. 1– Block diagram of a no-TNC, 9600 baud packet station, as described in the text.

I've been licensed since the mid-1980s. My primary interest in amateur radio all along (including the years of interest prior to obtaining my license) has been focused on digital communications, and much of how I view the hobby is filtered through that lens. For example, my (latent, at the moment) interest in HF and satellites is digital communications.

Since late 1987 I have lived in the Seattle, Washington area. When I moved here from Ohio, I fell in with a crowd of techies then called NAPRA, Northwest Amateur Packet Radio Association, which had a digipeater network (on nice high mountaintops) of a sort that was in the very early stages of getting organized in Ohio. I've continued my involvement with this same group for more than ten years now, and I'm lucky to have them as a resource in writing this column.

The Puget Sound Amateur Radio TCP/IP Group and Network (a name I have created, as the informal name doesn't "convey" its purpose very well) is one of the more impressive amateur packet radio networks in the country. Currently we have six 9600 baud bit-regenerative repeaters in the Seattle area on various bands (including one portable repeater at my home on 222 MHz, which was elegantly built into an ammo can by Dennis Rosenauer, AC7FT/VE7BPE) with as many as three more under construction. All of them have Linux-based routers and access to the Internet, and are used primarily for TCP/IP. The main purpose of this network is training, experimentation, and *fun!* You'll hear a lot more about what we're doing in the Pacific Northwest in the future.

Since the mid-1990s I've been involved with TAPR, which I consider one of amateur radio's true gems. I think it is vastly under-appreciated for *all* that it does. Currently I am Coordinator of TAPR's Networking Special Interest Group (NetSIG) and Coordinator of the 2000 ARRL and TAPR Digital Communications Conference to be held in Orlando, Florida on September 22–24, 2000. For a time I was Secretary of TAPR, and this allowed me to get to know the organization from the inside, and to acquaint myself with many of the current members of the Board of Directors. I frequently will write about TAPR and its projects in this column.

Earlier this year, my close association with TAPR led directly to a major "upgrade" in my career. I am now a full-time independent technical writer, columnist, speaker, and consultant, focusing on wireless internet access. I currently write three other columns, all on that topic—wireless internet access—and contribute feature articles in addition to the columns. I'm also working on a book on wireless internet access which is almost complete and will be published later this year. Prior to my career change, I was a self-taught System Administrator for a major company. I feel blessed and honored to have been able to develop enough writing work in my

Books, Videos, Cards, Pins!

Playing Cards

Top quality, plastic coated playing cards.

~~$9.95~~

Now only $4.95 per deck

CQ Award Pins

If you've earned any of CQ's Awards, you can also display the corresponding CQ Award pin. Available for WAZ, 5 Band WAZ, 160 Meter WAZ, CQ DX, CQ DX Honor Roll, WPX, WPX Honor Roll, and USA-CA awards. **ONLY $5.00 EACH.**

Visit Our Web Site www.cq-amateur-radio.com

Getting Started Videos - "How-To," Tips, Techniques & More!

Ham Radio Horizons: The Video .....*Order No. VHOR*

Getting Started in VHF .....*Order No. VVHF*

Getting Started in Ham Radio .....*Order No. VHR*

Getting Started in DXing .....*Order No. VDX*

Getting Started in Packet Radio .....*Order No. VPAC*

Getting Started in Amateur Satellites .....*Order No. VSAT*

Getting Started in Contesting .....*Order No. VCON*

Video Special

~~$19.95~~ **ea.**

NOW $12.95 ea.

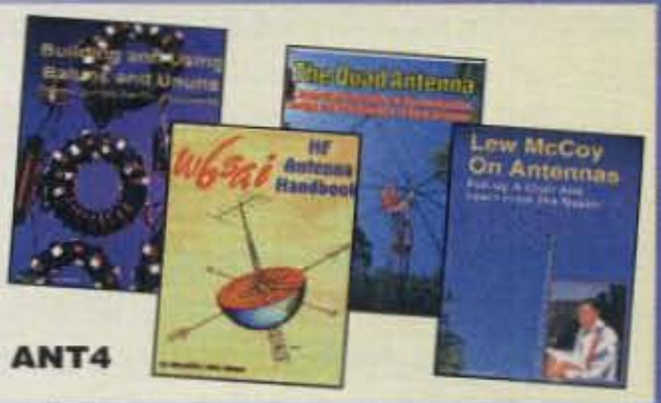
Buy all 7 for your Club for only $69.95

Antenna Book Special!

4-great books for only $54.95!

- **W6SAI HF Antenna Handbook**
- **McCoy on Antennas**
- **Building and Using Baluns and Ununs**
- **The Quad Antenna**

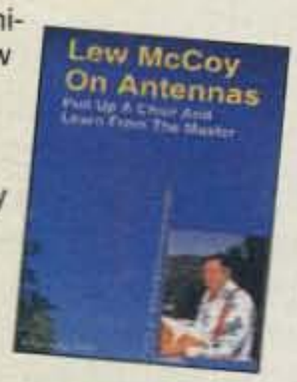
.....Order No. ANT4



McCoy on Antennas

by Lew McCoy, W1ICP

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

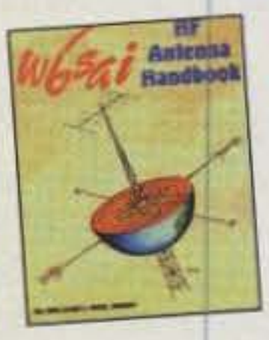


Order No.MCCOY

.....$15.95

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

Fax us at 516-681-2926

Call us toll free at 1-800-853-9797

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~~

ONLY $5.95

The Quad Antenna

by Bob Haviland, W4MB

Second Printing

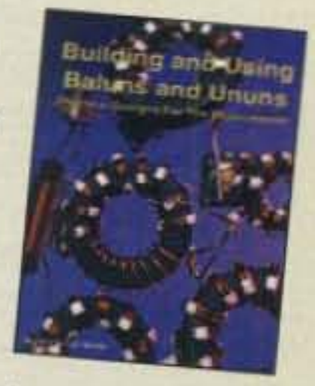
An authoritative book on the design, construction, characteristics and applications of quad antennas.

Order No. QUAD $15.95

Building and Using Baluns and Ununs

by Jerry Sevick, W2FMI

This volume is the source for the latest information and designs on transmission line transformer theory. Discover new applications for dipoles, yagis, log periodics, beverages, antenna tuners, and countless other examples.



Order No. BALUN.....$19.95

33 Simple Weekend Projects

by Dave Ingram, K4TWJ

Do-it-yourself electronics projects from the most basic to the fairly sophisticated. You'll find: station accessories for VHF FMing, working OSCAR satellites, fun on HF, trying CW, building simple antennas, even a complete working HF station you can build for $100. Also includes practical tips and techniques on how to create your own electronic projects.

Order No. 33PROJ.....~~$15.95~~

ONLY $9.95

Amateur Radio Equipment Buyer's Guide

This 144-page book is your single source for detailed information on practically every piece of Amateur Radio equipment and accessory item currently offered for sale in the USA complete with specs and prices. Also includes the most comprehensive directory of Ham product manufacturers and dealers in the USA.

Order No. EBG.....~~$15.95~~

NOW ONLY $9.95

The NEW Shortwave Propagation Handbook

by W3ASK, N4XX & K6GKU

A comprehensive source of HF propagation principles, sunspots, ionospheric predictions, with photography, charts and tables galore!

Order No. SWP

.....$19.95

Name _____ **Callsign** _____

Street Address _____

City _____ **State** _____ **Zip** _____

Qty	Item #	Description	Price	Total Price
U.S. and possessions - add $4 shipping/handling. Foreign - shipping/handling charges are calculated by order weight & destination.			Shipping/Handling	
			Total	

Method of payment ☐ **Check** ☐ **Money Order** ☐ **Visa** ☐ **MasterCard** ☐ **Discover** ☐ **American Express**

Credit Card No. _____ **Expiration date** _____

CQ Communications Inc., 25 Newbridge Rd., Hicksville, NY 11801/516-681-2922; Fax 516-681-2926

chosen field to comprise a full-time job. My "core knowledge" of wireless came from my experiences as a ham, and that part of my career will often cross over into my writing about amateur radio.

IP Everywhere

I'm an advocate of IP *everywhere*. It's a core belief of mine that IP (Internet Protocol) is "good enough" for many, many functions in telecommunications, including wireless. For example, Voice Over IP (VOIP), sometimes called Voice Over Internet (VOI), is becoming the most cost-effective way of handling voice calls. I hasten to emphasize that I'm not saying that TCP/IP is ideal. However, the profound thing about TCP/IP is that (1) it is flexible and works *well enough*, (2) it is by far the best supported networking protocol on the planet, and (3) it is extensible and can grow to support new requirements, as has happened with IP version 6.

Please don't make the mistake, as *so* many have, of equating the utility and usability of TCP/IP based on *particular* implementations of TCP/IP for amateur radio. An equivalent of this would to be say that SSB doesn't work well at all, when in fact the radio you used was defective. I'll explore IP Everywhere in depth in future columns

Closely related is my belief in, and advocacy of, Spread Spectrum and related communications technologies (such as Ultra Wideband). Spread Spectrum allows far, far more efficient use of wireless spectrum. It seems to me the very worst type of abuse for a service that has as two of its "missions" advancement of the radio art and experimentation is to be so rigid in spectrum allocations that "... Sorry, no more room for your new system; go elsewhere if you want to try something new" is the most typical response to someone wanting to put a new system on the air.

My wake-up call about how badly we are abusing our "gift of spectrum" came during a speech given by Lyle Johnson, WA7GXD, at the 1996 Digital Communications Conference (see <http://www.tapr.org/tapr/html/lyle.banquet.html>). Very recently, Dale Hatfield, WØIFO, Chief of the Office of Engineering and Technology of the FCC, basically told amateur radio that it's doing a poor job of deploying new technology, particularly spectrally-efficient technology, and the countdown clock is ticking (see this month's "Washington Readout" or <http://www.fcc.gov/Speeches/misc/dnh061700.html>).

The recent amateur radio rules changes regarding Spread Spectrum were a start, but only just that—a start. We need to go further.

One example of how capable Spread Spectrum technology is came from an amateur who had built his own spread spectrum system. As a test, his system is frequency-hopped specifically on the *input* channels of a large number of southern California amateur radio repeaters, with no one noticing, largely because the dwell time on-channel was a barely perceptible fraction of a second (*nonetheless, this is* not *a recommended practice—ed.*).

TAPR is developing a Spread Spectrum radio that hopefully will become available in 2001. This is a unique design specifically for the needs and requirements of amateur radio operators. It has the potential to begin the Spread Spectrum revolution in amateur radio, as the TNC-1 and TNC-2 did for amateur packet radio. I'll cover the SSR project extensively in this column.

In the interest of full disclosure, I am one of those "evil" folks who advocate the *selective* (not wholesale and indiscriminate) interconnection of amateur radio networks with the internet. There. I've said it, and hopefully you'll actually read these words in print. One of my absolute favorite examples of just such an "internet interconnect" that makes sense is the rapid emergence of *Igates* used in APRS (Automatic Position Reporting System) networks. Igates allow an APRS user to exchange short text messages with any other APRS user, knowing only another person's callsign. The Igate network will "route" the message from source to destination, making effective use of the internet for the backbone message transport, and using radio for what it does best. This topic requires extensive discussion and more than a bit of education in the future. It follows, then, that I'm not wholly supportive of a complete ham radio parallel to the internet, as Buck Rogers, K4ABT, proposed in his column in the June 2000 issue of *CQ*. Many of Buck's ideas have merit, but I disagree with others, and I'll state my case about AmNet in detail in a future column.

In my career as a writer, I live on the internet for much of my work day. One convention I have, which may take a bit of getting used to, is that I will quote a web address for almost any topic, manufacturer, etc., that I write about. I'll write about what I consider the high points, novelties, and subtleties of the news, product, etc. With the web address, *you* have the ability to do your own follow-up if you're seriously interested. As far as I'm concerned, internet access is as necessary for business, personal life, and being an involved citizen as the telephone was to earlier generations.

I'm also a fan (mostly passive, at this moment) of using the Linux operating system in amateur radio. I'm in awe of the incredible capabilities of Linux and some of the things it makes possible. Linux has finally "met me halfway" with distributions that feature a reasonably friendly Graphical User Interface. My anticipated usage of Linux is mostly utilitarian; Linux and a cheap (older) PC make a great router and "black box" device that costs so little and does so much that it's worth dedicating an entire PC to the task. Becoming comfortable and effective with Linux is a skill of the present, not the distant future. Since I'll be learning Linux as I go, I'll keep you posted on the high points of that adventure.

2000 Digital Communications Conference in September

As I mentioned earlier in the column, the 2000 ARRL and TAPR Digital Communications Conference (<http://www.tapr.org/dcc>) is being held September 22–24at the Orlando Airport Marriott Hotel (7499 Augusta Drive, Orlando, FL 32822; Marriott phone number 407-851-9000, fax 407-857-6211). I *highly* recommend attending the DCC if any of what I wrote above resonated with you as an interest of yours. I call the DCC "Amateur Radio's Research and Development Conference." As always, there will be plenty of opportunities to learn from others who are doing interesting things, including internationally. Co-sponsors of the DCC this year include Packet Radio User's Group of Japan, Lake Monroe Amateur Radio Society, Orange County (FL) ARES/RACES, Seminole County (FL) ARES/RACES, and the Orlando Amateur Radio Club. Reservations for the DCC (only; call the Marriott to reserve a room) should be made by contacting the TAPR office at 940-383-0000 or e-mail <tapr@tapr.org>, or fax 940-566-2544.

High-Speed Wireless

One of the joys of the internet is a fast connection to the internet. Prices of Digital Subscriber Line (DSL) service are becoming quite reasonable, and it makes an absolute world of difference in your online experience to have a fast connection to the internet. My home is currently out of range for "conventional" DSL, so I opted for a DSL variant called IDSL—ISDN (Integrated Services Digital Network) DSL—which provides me with a 144 Kbps connection.

For now this is fast enough, and the fact that it's on all the time (as opposed to dial-up connections) makes even more of a difference.

I've experimented briefly with using my laptop and a long Ethernet cable to allow me to do some writing from my deck in the warm Seattle-area sunshine. That was nice, but ultimately it was unworkable because of the requirements to keep doors closed, etc. What did work well was the use of an "802.11" Wireless Local Area Network card and an "access point" attached to my household Ethernet network. The combination makes a startling difference, and it's delightful to be able to take the laptop anywhere around the house and still be in full contact with the internet, able to print, access the other PCs on the LAN, etc. Prices on 802.11 equipment are falling rapidly, with PC cards for laptops costing as little as $150.

A quick note: If you are buying new, make sure you get 802.11**B**, which operates at 11 Mbps, instead of the older 802.11, which operates at only 2 Mbps. If you see a product marked as having been tested to WiFi specifications, it is 802.11B.

TCP/IP and 9600 Baud—Painlessly!

I hinted above that many current TCP/IP implementations in amateur radio are "less than optimum" and have given many a "bad taste" of TCP/IP. What would be ideal is a "clean" way to implement "Amateur Radio TCP/IP" with a Windows system, and have it work well. If there was a relatively simple, reasonably inexpensive way to do Amateur Radio TCP/IP on a Windows 98 system, then TCP/IP might well become much more popular.

In the ongoing quest to have new members join our hobby, it's a theory of mine that amateur radio is a lot more interesting when it's explained in the context of something already understood. For the majority of computer users, that's Microsoft Windows, with its reasonable built-in internet capabilities such as Internet Explorer and Outlook Express for e-mail, and an adequate Telnet client.

For several years now it's been possible to put together such a system, and best of all, one which does not require the use of a TNC and its awkward KISS mode. Instead, a simple 9600 baud modem is used. While a TNC is often referred to as a "modem for radio," in reality it is much, much more than a modem. Therein lies the problem with TCP/IP, which works best if it is able to do more of the "work" of packet communications than the TNC "allows."

The final link of the system is the radio, and there are far, far more choices for 9600 baud radios than there have ever been. Excellent, inexpensive data-only radios are available from Tekk and MFJ, with commercial data-only radios potentially being available from Maxon and Motorola.

The "glue" that holds such a system together is driver software that connects the "simple 9600 baud modem" into the TCP/IP communications "stack" of Windows 98. The combination works well, and "notifies" Windows that the connection is a slow one. Windows then adjusts timing settings in the TCP/IP stack accordingly.

All the pieces have been available for some time, but to my knowledge there hasn't been anyone who has "put them all together" and written a paper or article, etc., that thoroughly documents this project. A friend of mine has gone much further than I have in this project to date, and will be releasing the info on his personal web page and even support it with a mailing list. However, he's not quite ready to go "live" with this project, so more details will have to wait for a future column. To answer a likely question... no, this idea doesn't have much overlap with Windows-based TCP/IP systems mentioned in recent issues of *CQ*.

Write To Me!

Please do write to me; e-mail is strongly preferred. Let me know what you think, let me know what you'd like to read more about, and most of all, let me know what's going on with you and your circle of digital hams.

73, Steve, N8GNJ

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

The Art of the QSL

Somebody once said that business is only a game and making money is just the scorecard you use to keep track of how the game is going. I suppose that Donald Trump is good at that game. "Making money" is against the ham rules—at least doing it on the air is. There then has to be some other medium for keeping score. For most hams, a QSL card is that scoring device, as are the awards derived from having the right number of QSL cards from the right places.

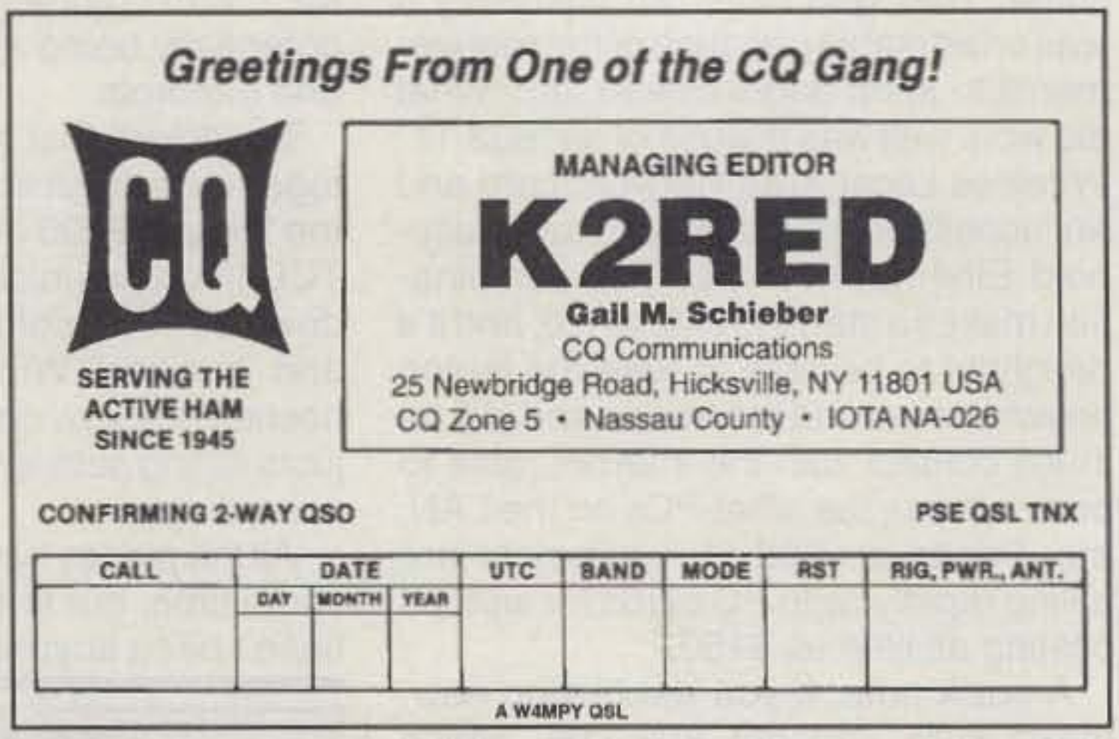
The QSL card is a written confirmation that a contact took place between two specific stations on a certain date, time, and frequency. The tradition of exchanging QSLs dates back to the very beginnings of our hobby. In the early days of spark gap, 20 miles was a long-distance contact. As contacts over longer and longer distances became the norm, there was a lot of competition to increase the distance. Unfortunately, there are always those willing to boost their ego by faking some accomplishment or another, and ham radio, like any other activity, has had its share of liars and cheaters over the years (and it still does). The QSL card keeps things honest, more or less, and some of the conventions surrounding QSLs arose from the desire to weed out the cheaters.

Certain information is considered necessary for each and every QSL card if it is to be considered "valid" for most awards. First of all, you must have the date, time, frequency/band, and mode of operation, and of course the callsign of the station worked as well as that of the station sending the card. Finally, there has to be a signature or some other marking to positively identify the card as valid. Recently, some DXpeditions and QSL managers have taken to using specially designed rubber stamps to authenticate their cards in place of signing them. This makes sense when you realize that they may have upward of 25,000 cards to distribute. Just think about signing your name 25,000 times.

Creating or Picking Out Your QSL Card

Before we get to the details of filling out and sending off your cards, we need to look at the question of how you get your cards to begin with. Do you buy them or make them yourself? With today's technology, you have a real choice in what to do about QSLs.

Several years ago I received a card from a teenager in Alaska. The card was totally hand drawn. Maybe there wasn't much else to do on those *looong* Alaska nights. One step above that is to design a card on your computer and print your own with a laser or ink- jet printer. You'll need a page-layout program or a versatile word processor. Just divide a standard 8.5" × 11" sheet into four equal boxes, design your card in one of the boxes, and then copy it to the other three. Once you have this process in hand, you can run off as many copies as you like, using card stock if at all possible or heavyweight paper at the very least (your local office-supply superstore should carry both). Incidentally, this size is not exactly that of a typical US postcard, but it is close enough. The acceptable standard in terms of size for QSL cards is a height range of $2^3/_4$ to $4^1/_4$ inches and a width range of $4^3/_4$ to $6^1/_4$ inches.



This type of card has all the information on one side, increasing the chances of getting a QSL in return, especially when the recipient has thousands of cards to deal with. (Card printed by W4MPY)

If you are going the home-computer route for your cards, you can become quite creative, particularly if you will be printing them on a color printer. Of course, the cost per card can quickly become quite high. Such an approach is practical only for relatively small runs. If you are "serious" about DXing, contesting, or chasing paper (collecting awards such as *CQ*'s Worked All Zones [WAZ] and the ARRL's Worked All States [WAS]), you probably are going to want to look at some other approaches.

One possibility in between cards totally generated on a home computer and purchasing printed cards (which we'll get to soon) is to buy clear labels and run those through your laser printer, or you can order clear return address labels from the companies that advertised in the Sunday newspapers. There are also companies that sell rubber stamps in the form of the QSL report. All you have to do then is find a suitable picture postcard and add the labels to it for an attractive QSL. If you can find out who the postcard distributor is and buy in bulk, you'll save a lot of money instead of paying 10–75 cents per each card. If you can find a cheap source of attractive postcards, then you can print and add the stickers as you need them. *(Just be sure you can write on the stickers if you'll be adding QSO information on them.—ed.)*

Most hams who are planning to send out more than, say, 100 cards per year probably will find it most cost-effective to get their cards printed commercially. Printed QSL cards are going to range in cost from about $20 (100 simple one-color cards) to maybe $250–300 for a thousand "picture" cards. If you bypass the ego boost of putting your picture on the card, you can keep the price range down to under $100 per thousand, and still have an attractive card. It is mostly a matter of personal taste.

*123 NW 13th Street, Suite 313, Boca Raton, FL 33432
e-mail: <wb2d@cq-amateur-radio.com>

The next question you may want to ask yourself is this: Am I really going to use 1000 cards? Before I move? Before I change my callsign? Ever? It really depends on how active you are, what your interests are, and how deep your pockets are. We'll get to this last consideration later, when we talk about methods of sending cards. If you are a contester, you easily can burn through 1000 cards in one good weekend, assuming you are going to QSL all the contacts. If you are a rag chewer, though, how long is it going to take you to make a thousand contacts? Say each QSO lasts 30 minutes. How many can you make in a day or week? Keep in mind, we are a mobile society. We move; we upgrade; we get vanity calls. All these things can tend to limit the life span of our cards. This is the voice of experience speaking on this one. I don't want to think about the stacks of unused QSLs I've tossed out over the years.

Finally, if you are going to buy cards, where do you go? Start with the advertisers in this magazine. They produce some of the finest cards going at reasonable prices. You will do best to use a printer who specializes in QSL cards, as "the printer down the street" will probably have to special-order the card stock you'll need, and specially set up his press to accommodate our slightly unusual card size. All this adds up to extra bucks.

If you want to expand your search further, check out the web sites in the URLs box elsewhere in this column. Take a little time, write for samples, and compare prices. You'll find a card that you like at a reasonable price.

Designing Your Card

Whether you buy your cards commercially, use a rubber stamp on a postcard, or create custom cards on your computer, the first question you need to ask yourself is "What do I put on the card?" (The commercial folks make this easy for you, offering a choice of standardized designs and information layouts.)

If you're designing the card yourself, here are the basics. For starters, you are going to want to put your callsign in large letters. Beyond that, you need places for the standard information: date, time, frequency/band, mode, and, of course the callsign of the other station. You may also want to add information about your station, such as equipment, antennas, power level, and so forth. You might want to add relevant information about yourself—for instance, any awards you hold, such as WAZ or WAS. You definitely are going to want to put your location on the card. If it is a US address, you should have your town and state as a minimum (some hams prefer to use a post office box instead of their actual street address), but you might also consider adding your county, since there are a number of hams interested in "county hunting," and your grid square, especially if you operate VHF or UHF. Finally, you may be a member of some ham-related organizations such as 10-10, ARRL, or FISTs. At some point, though, you draw the line. Most hams do not want their QSL to look like a photocopied page of classified ads.

There is one further thought on design that we can talk about here, although it mostly bears on increasing the chance of getting a QSL back (generally your goal, of course). Your callsign and address should always be on the *same side* of the card as your signal-

ARRL Incoming DX QSL Bureau Addresses

First Call Area: All calls
W1 QSL Bureau
Y.C.C.C.
P.O. Box 80216
Springfield, MA 01138-0216

Second Call Area: All calls
ARRL 2nd District QSL
Bureau
N.J.D.X.A.
P.O. Box 599
Morris Plains, NJ 07950.

Third Call Area: All calls
Pennsylvania DX Association
P.O. Box 100
York Haven, PA 17370-0100

Fourth Call Area: All single-letter prefixes (K4, N4, W4)
Mecklenburg Amateur Radio Club
P.O. Box DX
Charlotte, NC 28220

Fourth Call Area: All two-letter prefixes (AA4, KB4, NC4, WD4, etc.)
Sterling Park ARC
Call Box 599
Sterling, VA 20167

Fifth Call Area: All calls
ARRL W5 Incoming QSL Bureau
Magnolia DX Assn.
P.O. Box 999
Wiggins, MS 39577-0999

Sixth Call Area: All calls
ARRL Sixth (6th) District DX QSL Bureau
P.O. Box 1460
Sun Valley, CA 91352

Seventh Call Area: All calls
Willamette Valley DXC Inc.
P.O. Box 555
Portland, OR 97207

Eighth Call Area: All calls
8th Area QSL Bureau
P.O. Box 182165
Columbus, OH 43218-2165

Ninth Call Area: All calls
Northern Illinois DX Assn.
W9 Incoming QSl Bureau
P.O. Box 273
Glenview, IL, 60025-0273

Zero Call Area: All calls
WØ QSL Bureau
P.O. Box 4798
Overland Park, KS 66204

Puerto Rico: All calls
Puerto Rico QSL Bureau
P.O. Box 9021061
San Juan, PR 00902-1061

U.S. Virgin Islands: All calls
Virgin Islands ARC
GPO Box 11360
Charlotte, Amalie
Virgin Islands 00801

Hawaiian Islands: All calls
Wayne Jones, NH6GJ
P.O. Box 860788
Wahiawa, HI 96786

Alaska: All calls
Alaska QSL Bureau
P.O. Box 520343
Big Lake, AK 99652

SWL:
Mike Witkowski, WDX9JFT
4206 Nebel St.
Stevens Point, WI 54481

QSL cards for Canada may be sent to:
RAC Incoming QSL Bureau
Box 51
St. John, NB E2L 3X1

QSL cards for Canada may also be sent to the individual bureaus:

VE1, VEØ
Brit Fader Memorial QSL Bureau
Box 8895
Halifax, NS B3K 5M5

VE2
Jacques Dube, VE2QK
875 St. Severe St.
Trois-Rivieres, QC G9A 4G4

VE3
The Ontario Trilliums
Box 157
Downsview, ON M3M 3A3

VE4
Adam Romanchuk, VE4SN
26 Morrison St.
Winnipeg, MB R2V 3B4

VE5
Bjarne Madsen, VE5FX
739 Washington Dr.
Weyburn, SK S4H 2S4

VE6
Neil Jensen, VE6NRJ
E.P.O. Box 57205
Sherwood Park, AB T8A 5L7

VE7
Dennis Livesey, VE7DK
8309 112th St.
Delta, BC V4C 4W7

VE8
Rolf Ziemann, VE8RZ
2 Taylor Road
Yellowknife, NWT X1A 2K9

VE9, VY2
VE9, VY2 QSL Bureau
Box 12-255
1633 Mountain Road
Moncton, NB E1G 1A5

VO1, VO2
Rick Burke, VO1SA
Box 23099
St. John's, NF, A1B 4J9

VY1
Hugh Henderson, VY1HH
P.O. 33062
Whitehorse, YT Y1A 5Y5

report information. There is nothing that says it can't be on both sides, but having everything on one side of the card will increase your chances of getting a return QSL. Why? Simple. Think of the other ham or QSL manager having to flip back and forth between the two sides of the card. If there is only one card to deal with, it might not be that big a deal. However, if there are dozens or hundreds or thousands, it is going to be an annoyance and slow things down. Then maybe it just gets put it in a pile of "problem" cards to do later—much later, like maybe never. It happens.

Sending Cards

Sending QSL cards can be pretty straightforward. The most obvious approach is to put an address on them and drop them in the mail. If it is a ragchew, then the operator easily can give you his or her address. If it is some sort of short contact, then you may have to find the address on your own. That falls into the domain of looking it up on a CD-ROM or doing a search on one of the web sites that provide ham addresses. This is especially true of domestic contacts. If you (a US station) work another US station, then you send a card in the mail, and that station sends one back to you—maybe.

Suppose you are located in one of the smaller states (ham population wise), say Rhode Island or Utah. Suppose you are on the air a lot, and you end up working a lot of stations in California, New York, and Florida. How many QSL cards from those states do you need? Not many. But how many of those stations need your card? Most of them. Here's the deal. Many operators in the rarer states only QSL when you send an SASE (self-addressed, stamped envelope) along with your card. It is not bad manners; it is just simple economics. The rule of thumb, therefore, is this: If you want a return card, put your QSL in an envelope along with an SASE. That is the courteous thing to do, and it goes a long way towards ensuring that the other operator will QSL.

DX contacts are a whole different matter. First of all, unless you go to a stamp dealer (there are some around who cater to DXers), you cannot send an SASE to a foreign ham simply because US postage is valid only in the

Important QSL URLs

www.cq-amateur-radio.com *CQ*'s web site. Check out the Advertiser's Page for several QSL shops.

www.k1dwu.net/ham-links/qsl.cards.phtml This is K1DWU's listing of over 20 sites related to QSLs and QSLing.

www.cpcug.org/user/wfeidt/index.html NG3K's DX/Contest oriented page.

www.qsl.net/wf5e "Private" DX QSL service.

www.buck.com/haminfo.html Buckmaster's online address lookup for domestic addresses and some DX.

US. Second, there are some countries where using US-size envelopes is a problem, too; they may violate size standards of the local post office. There is an international alternative to the SASE, which we'll get to in a moment. But first...

The least expensive way of handling international QSLing is by using the ARRL Outgoing QSL Bureau. Here, the cost is $6 per pound of QSLs that you send out. There are some rules about using the bureau that you have to be aware of. First and foremost, you have to be a member of the League to use the bureau. If you are an active DXer or contester, this cost savings alone will pay for an ARRL membership in short order. Also, there are a number of countries where there is no service, or it is limited to hams who belong to the local equivalent of the ARRL. This list changes from time to time, so you have to keep up to date by checking with the League (e-mail <mcook@arrl.org> for the latest information on the bureau and its services). Basically, the bureau collects all the outbound cards from the US, sorts them by destination country, and ships by bulk mail to the membership society of that country. Each country's society then gets the cards out to the local hams. It is inexpensive, but the price you pay is in speed. Expect a six-month to two-year delay between sending your card and getting one back.

There are also private bureaus that will send your cards directly to the DX stations for a small fee. These private bureaus cost considerably more than $6/lb, but the turnaround time on the card will be a lot faster and they are still considerably cheaper than going direct.

If you go direct, be prepared to assist the DX station in the cost of sending a card back to you. You can buy local postage from a dealer and include that with your card, or send IRCs (International Reply Coupons), which you purchase from your local post office (you'll need two for an airmail return). Then, of course, there is the venerable tradition of sending "green stamps" (dollar bills). None of these absolutely assures you that your card will come back via airmail, but they up the chances considerably. There are those unscrupulous foreign hams who pocket your money/IRCs and send your card back via the bureau... if at all. Nice.

Finally, there is the QSL manager. Some DX stations and almost all DXpeditions have a QSL manager. This is a person who has access to the logs of the operator(s) and is responsible for taking care of the QSLs. If a DX station tells you he has a QSL manager, then send the card to the manager. Period.

One major caveat: Keep your logs in UTC (Coordinated Universal Time). *QSL in UTC*. One of the easiest ways to almost guarantee that you will *never* get your QSL is to send someone a card where you've recorded the contact in Mountain Standard Time. Sure. I'm dealing with logs that have over 2000 contacts in them, and some idiot wants me to convert Outer Mongolia time to Mountain Standard Time. Right.

Receiving Cards

The *incoming* QSL bureaus are based on the district your callsign is from. For instance, I live in Florida but my callsign is from 2-land. My cards are handled by the 2-land bureau. We've included a current list of all the bureaus. To receive your cards through the bureau, you have to follow their rules and procedures. By the way, the bureaus are all run by volunteers. They are doing you an enormous favor, so cooperate with them and follow the guidelines they give you. Basically, you will either supply them with SASEs of a particular size or money with which they will buy envelopes and stamps. Contact your bureau to find out what they want you to do.

When the cards come in from the foreign bureaus, volunteers sort them down to the individual ham level. Picture the work involved. Enough said.

Speaking of "enough said," I'm about out of space for this month's column. Remember the essential information that needs to be on every QSL card, your choices in designing and obtaining them, and the different options you have in exchanging them with other hams. Then get on the air, make contacts, send out cards, sign up with your incoming bureau, and wait for that first package of cards from the bureau to arrive in the mail. Enough said.

73, Pete, WB2D

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

Computers and Internet

BY DON ROTOLO, N2IRZ

Ham Radio's Online Connection

Is the Internet Our Enemy—or Just a Tool?

The internet is our enemy. After all, it is so much better (and less expensive) than anything as quaint and old-fashioned as (gasp!) *radio.* Clearly it spells the doom of amateur radio as we know it. Believe it?

Sorry, I just don't buy into that idea, but you'd be surprised how many hams feel that way. They see the internet as amateur radio's competition, a faster/ better/cheaper messaging system that anyone with a little bit of equipment—no test required—can use. The reality is, the internet is nothing more than a tool. Like all tools, the results one gets depend upon knowing the tool's capabilities and how to use them.

This month we're going to take a look at the internet from the point of view of it being a tool, and have a look at some of the ways we can use it to enhance our amateur radio operating.

Lots of Pluses

As a guess, I estimate that over 90% of you who are reading these words own a computer capable of connecting to the internet. For the other 10%, you need to know that a 100 MHz Pentium PC can be had for nearly free these days, and you can get an awful lot of connect time for well under $20 per month. The point is, if you can figure out how to program the memory in your new HT, or know how to neutralize a pair of 6146s, then you need not be afraid of using the internet. Just like a typewriter, it is another tool, and a very useful and inexpensive one at that.

I received an e-mail message from Peter Dillon, JY9NE/N3FNE, giving a few examples of how he uses the internet. Living in Amman, Jordan, he finds that he is a little bit "off the beaten path" when it comes to hamming. He subscribes to a number of e-mail reflectors to set schedules, post his operating times, ask questions about equipment, and discuss operating procedures. He is an active member of 10-10 International and the 6 meter club, and uses their reflectors to keep in touch with other club members. For example, he often posts a quick message to the reflector just before he goes on the air, allowing others to work a JY station. Peter also finds that he saves a small fortune in postage by making use of e-mail and web sites to apply for certificates and contest awards, renew memberships, and verify QSL information with other stations.

DX is a popular pastime for Peter, so he subscribes to the ARRL DX List and 425DX News to keep up to date on DX operations, DXpeditions, and QSL routes. He also makes considerable use of the various callsign servers, his favorite being KD4UJK's DX Info page, which carries a variety of foreign callbooks in addition to the online versions of the Buckmaster and QRZ callbooks. Since Jordan has no packet network, Peter uses the DX Summit web page to see DX spots. Of course, on-line propagation forecasts are quite useful, too.

Ham-related software abounds on the internet, and Peter makes good use of what's out there: Azimuth software, grid generators, grid maps, and 10-10 logging software, not to mention the PSK31 software. It also gives him a chance to download other shareware utilities, try them out, and even send in his registration fee using a credit card.

545 Baylor Ave., River Vale, NJ 07675
e-mail: <n2irz@cq-amateur-radio.com>

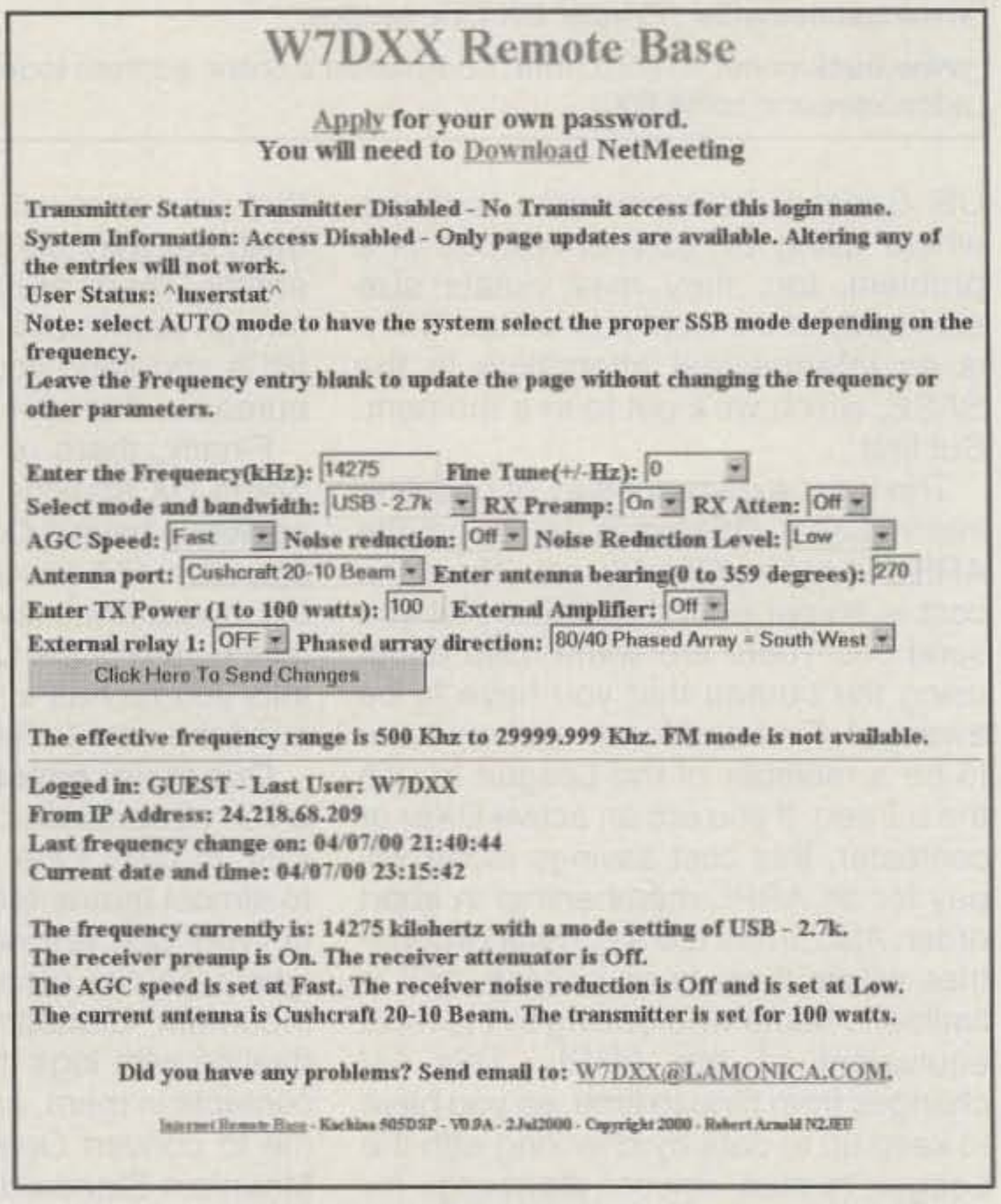


Fig. 1– The W7DXX Remote Base control panel. This is what you see as you operate the remote base, with the ability to control all aspects of the Kachina 505DSP radio, as well as the ACOM2000 amplifier and the rotator for the Cushcraft beam.

The big buzzword these days is *e-commerce.* This is a catch-all phrase for doing business over the internet. A quick look at the display ads in *CQ* shows that nearly 90% of the companies have a web site. These sites range from a few simple pages of information to a complete catalog and on-line ordering system. For example, after reading the excellent article in the July 2000 issue of *CQ* "Identify that Unknown Feedline," by Benson Smith, KA4LBE, I decided it would be nice to have an antenna analyzer. After visiting a few sites, I ended up at the MFJ Enterprises web site, where I found the MFJ-259B. I read all about it, looked at the other models available, and decided it was just what I wanted. I haven't bought it yet, but once I'm ready, I'll probably go somewhere such as Ham Radio Outlet's web site.

By the way, a new feature at *CQ*'s web site is a table of links to advertisers' web sites. This handy new feature will help you get the information and equipment you want—fast.

While I live near New York City, where we have a few ham radio stores, there are plenty of folks who live at least a few hours' drive from anything bigger than a RadioShack. For these folks, mail-order has become a way of life. Well, the web has taken mail order to a new and better level, with so much information available that the biggest problem is finding it. (By the way, the RadioShack Unlimited catalog service has really expanded the range of items you can get from RadioShack. If you have not looked through their RSU catalog lately, you will be very surprised at what they sell—everything from Rohn towers to Belden coax.)

On the topic of finding things, I have found that the various search engines each tend to find different things, so it is well worth your while to perform a search using as many search engines as you can. While you'll tend to find popular subjects (such as coaxial cable) fairly easily, some of the more obscure topics (tube neutralization techniques) might take a little searching. For a neat experiment, try searching for your own callsign on at least a half-dozen search engines. I found a FlexNet article I had written years ago, translated into Russian!

As a homebrewer and experimenter, I used to be a catalog junkie, saving every catalog I could get my hands on. Whether for equipment, retail outlets, or components, my catalog collection served as a ready reference for specifications, ideas, and prices. Not too long ago, I recycled most of my collection after coming to the realization that it's all posted on the web somewhere. For instance, when I needed the exact dimensions of a right-angle 9-pin sub-D connector for a PC board I was designing, I used to turn to my trusty Digi-Key catalog. Now I find it more convenient to just log onto their web site and view the appropriate catalog page. I get my information without having to search through the basement for the catalog and then (finding it) sneeze as my dust allergies kick in.

Late last year I heard about a new way to operate HF—via the internet. Keith Lamonica, W7DXX, managed to connect a Kachina 505DSP transceiver to the web, letting anyone with a license operate from Keith's Boston QTH. The software for this ambitious project was written by Bob Arnold, N2JEU.

After logging on to the W7DXX Remote web site, the operator can select the frequency, mode, power level, and even switch in the ACOM2000 amplifier and rotate the Cushcraft beam. For

Fig. 2– A NASA web page featuring the International Space Station, soon to be the highest shack in the sky.

those who just want to listen, in real time, what conditions sound like up in Boston, there is a RealAudio feed. If you want to transmit, you first need to get a password via the automated password server and then log in to the remote base via Microsoft NetMeeting. This system helps ensure that only one person is operating the remote at any given moment. With over 300 remote operators from over 65 countries registered with the system, access needs to be tightly controlled.

One fun use for this system is listening to your own station. The RealAudio feed serves as a great way to really hear what your signal sounds like from afar. Two hams from JA can work each other and have it really be a DX contact!

For the future, Keith has plans for a second remote base, this one on 2 meters. This should prove interesting, as there is a lot of activity on this band in New England.

It's All Out There

Last year, I wrote a column for *CQ VHF* magazine about the volume and depth of information available through the Special Interest Groups (SIGs) at Tucson Amateur Packet Radio (TAPR). These SIGs consist of e-mail reflectors, message archives, and software libraries, mostly having to do with packet and other data modes. Of course, TAPR doesn't have a monopoly on these kinds of resources; for example, check out the extensive list of mailing lists on QTH.net for topics as varied as amateur radio itself. Similar in operation are the Newsgroups, best described as a BBS (Bulletin Board Service) devoted to fairly narrow subject areas. These are accessed through your e-mail program by first subscribing to the newsgroups that interest you (there are tens of thousands) and then browsing the recently posted messages every so often.

No matter what kind of information you seek—equipment and component specifications and prices, facts about a place or person, folks with similar interests, clubs, contests, DX spots, even a study guide for the new Extra class exam—you will find that the internet is as varied as the entire planet. Since hams tend to be "early adopters" of technology, a greater percentage of the stuff out there is of interest to hams.

What *Can't* You Do?

What can you do on the internet to enhance your amateur operations? Although I've only barely touched on the possibilities, the question really should be, what can't you do? Well, emergency traffic when the phone lines are down, and real-time random QSOs are two things you generally cannot do on the internet, but hey, that's what radios are for, right?

I have to admit that I'm not a contester, but after my recent upgrade to a 5 wpm General (and proud of it!), I decided that I should perhaps give it a try. It quickly became apparent that I needed some logging software. I asked around, and found that contesters tend to feel very strongly about their logging software. For the last column of the year, I plan on taking a look at what's available out there, and let you draw your own conclusions. Until then . . .

73, Don, N2IRZ

Internet Resources

This is a list of web sites used in the preparation of this column. Also look in the Advertiser's Index at the back of this issue of *CQ*, and on the *CQ* web site, for the sites of our advertisers and other useful links.

CQ magazine: <http://www.cq-amateur-radio.com>
425DX News: <http://www.425dxn.org>
ACOM: <http://www.hfpower.com>
Alinco Electronics: <http://www.alinco.com>
American Radio Relay League: <http://www.arrl.com>
Buckmaster Publishing: <http://buck.com>
Cushcraft: <http://www.cushcraft.com>
Digi-Key: <http://www.digikey.com>
DX Summit web page: <http://oh2aq.kolumbus.com/dxs>
Ham Radio Outlet: <http://www.hamradio.com>
ICOM America: <http://www.icomamerica.com>
Kachina Communications: <http://www.kachina-az.com>
KD4UJK's DX Info page: <http://users.southeast.net/~kd4ujk1/dxqslge.htm>
Kenwood USA: <http://www.kenwood.net>
MFJ Enterprises: <http://www.mfjenterprises.com>
PSK31: <http://www.kender.es/~edu/psk31.html>
QTH.Net: <http://www.qth.net>
QRZ Callbook server: <http://www.qrz.com>
Radio Shack: <http://www.radioshack.com>
Six meter club: <http://www.6mt.com>
Ten-Ten International Home Page: <http://www.lehigh.edu/lists/tenten-l/index.html>
Timewave/AEA: <http://www.timewave.com>
Tucson Amateur Packet Radio: <http://www.tapr.org>
UK 6 metre group: <http://www.uksmg.org>
W7DXX Remote Base: <http://www.lamonica.com>
Win1010 log software: <http://www.hds.net>
Yaesu Electronics: <http://www.yaesu.com>

How It Works

BY DAVE INGRAM, K4TWJ

Theory 'n Practice

A Closer Look at AF and RF Amplifiers

Ask five electronic technicians or engineers what they consider the single most important piece of equipment or circuit in radio communications, and at least four of them will say amplifiers. Indeed, amplifiers are used to boost the strength of our transmitted and received signals, increase speaker and microphone levels, and much more. Understanding the operational concepts of both AF and RF amplifiers is thus beneficial to all radio amateurs. Explaining all the pertinent details of their operation also calls for sharing more information than we could squeeze into our previous "How It Works" column. More ground-floor details on amplifiers are thus coming your way again this time. Overall, this double-barreled study should give you a good general knowledge of what amplifiers do and how they function.

Once again, we must jump right into the discussion and move forward at a brisk pace to cover a large amount of ground. Let's start with an overview of main amplifying devices and progress from there.

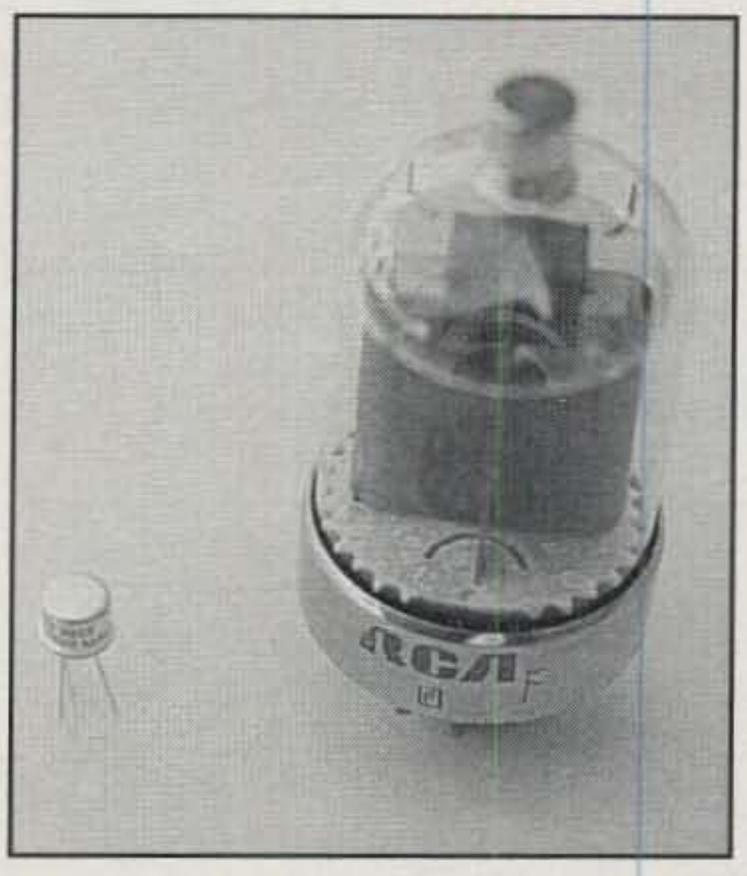


Photo A– Whether large or small, a tube or transistor is the key component in amplifiers of all classes and configurations. Representing those items is the ever-popular 75 watt 6146 tube and a 2 watt 2N3553 bipolar-type transistor shown here.

Popular Amplifying Devices

Generally speaking, one of four types of electronic devices or "main components" form the heart of any AF or RF amplifier: vacuum tubes, transistors, ICs, and/or power modules. Samples of these devices are shown in photos A and B, and they all operate on the same principle: A small change in their input voltage or current will produce a large change in their output voltage or current. That is the most condensed, yet accurate technical description of amplification you will ever hear.

Vacuum tubes are typically used in large, high-power amplifiers (both AF and RF types), where the main considerations are stouthearted reliability and economical cost. Our British friends refer to vacuum tubes as "electron valves" because of their current-controlling action; as we will discuss later, the analogy is both clever and logical. I might also point out that dedicated audio enthusiasts have a great appreciation for vacuum tubes, as they produce a special "full bodied" sound that is unequaled by solid-state devices. When you demand "stand above the crowd" audio, vacuum tubes are the answer!

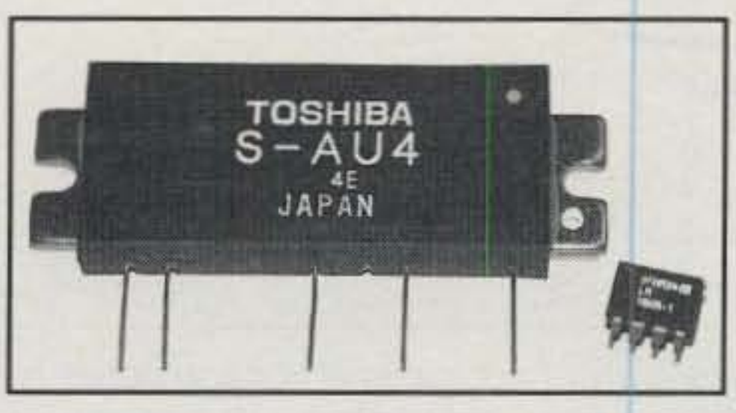


Photo B– The large, high-power Toshiba module used in RF amplifiers for 2 meters is flanked by a small audio IC used to boost a receiver's volume from earphone to speaker level. Both items contain several transistors and other components in their multi-pin packages. (Photo courtesy Richard Stubbs of MFJ Enterprises)

Transistors are generally more sensitive or fragile than vacuum tubes. If they are operated within "comfortable" and "conservative" limits, however, they can outlast and provide more carefree operation than tubes. A filament or heater element in a tube's center wears slightly every time the tube is switched on and used, for example, whereas transistors thrive on such brief periods of use. An interesting variation of the conventional bipolar (PNP or NPN type) transistor with a most promising future also warrants mention here: It is the MOSFET, or metal oxide semiconductor field effect transistor. This device looks like a power transistor; it is able to withstand voltage and current levels high enough to destroy regular transistors, and it also delivers surprisingly high output power as a result. Another unique aspect of MOSFETs used in RF amplifier stages is they are "transparent" to received signals. In other words, you can "hear through" a MOSFET amplifier stage and T/R switching is not necessary (ideal for external amplifiers).

ICs, or integrated circuits, are "all in one" packages of transistors and other components such as resistors and capacitors which function like a complete stage or circuit in a single multi-pin device. ICs are often used as audio amplifiers, for example, with externally connected components used, establishing overall gain, frequency response, etc. Due to their small size, ICs usually handle power levels below 10 watts.

Power modules are the equivalent of ICs for RF applications. These "full-size" devices include in their casings RF power transistors or MOSFETs plus resistors, capacitors, and small-value inductors. They can handle 100 watts or more of power, depending on their size and mating heat sink. Additional details on each of the previously mentioned amplifying devices could easily overfill a thick notebook, but let's keep this discussion simple and continue on to other basic facts regarding amplifiers.

Classes of Operation

As previously discussed, amplifiers work on the principle of using a small input signal to vary the internal resistance of a vacuum tube or transistor. Those variations, in turn, cause a change in voltage dropped across the tube or transistor's load impedance and that change is ultimately output as the amplified signal. Now let's look closer

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

Class A, B, C, and D Amplifiers

Class of Amplifier Operation	Bias Point	Overall Efficiency	Time of Plate Current Flow
A	Midway between cutoff and saturation/in linear portion of Ip/Eg curve	30–40%	All the time, during 360 degrees of input signal
B	At cutoff	45–65%	During 180 degrees of input signal
C	2 to 3 times cutoff	65–75%	Less than 180 degrees of input signal
D	9 to 10 times cutoff	Up to 90%	Only during positive peaks of input signal

Fig. 1– Main factors and parameters associated with class A, B, C, and D amplifiers. As discussed in the text, each class has its own special advantages and disadvantages.

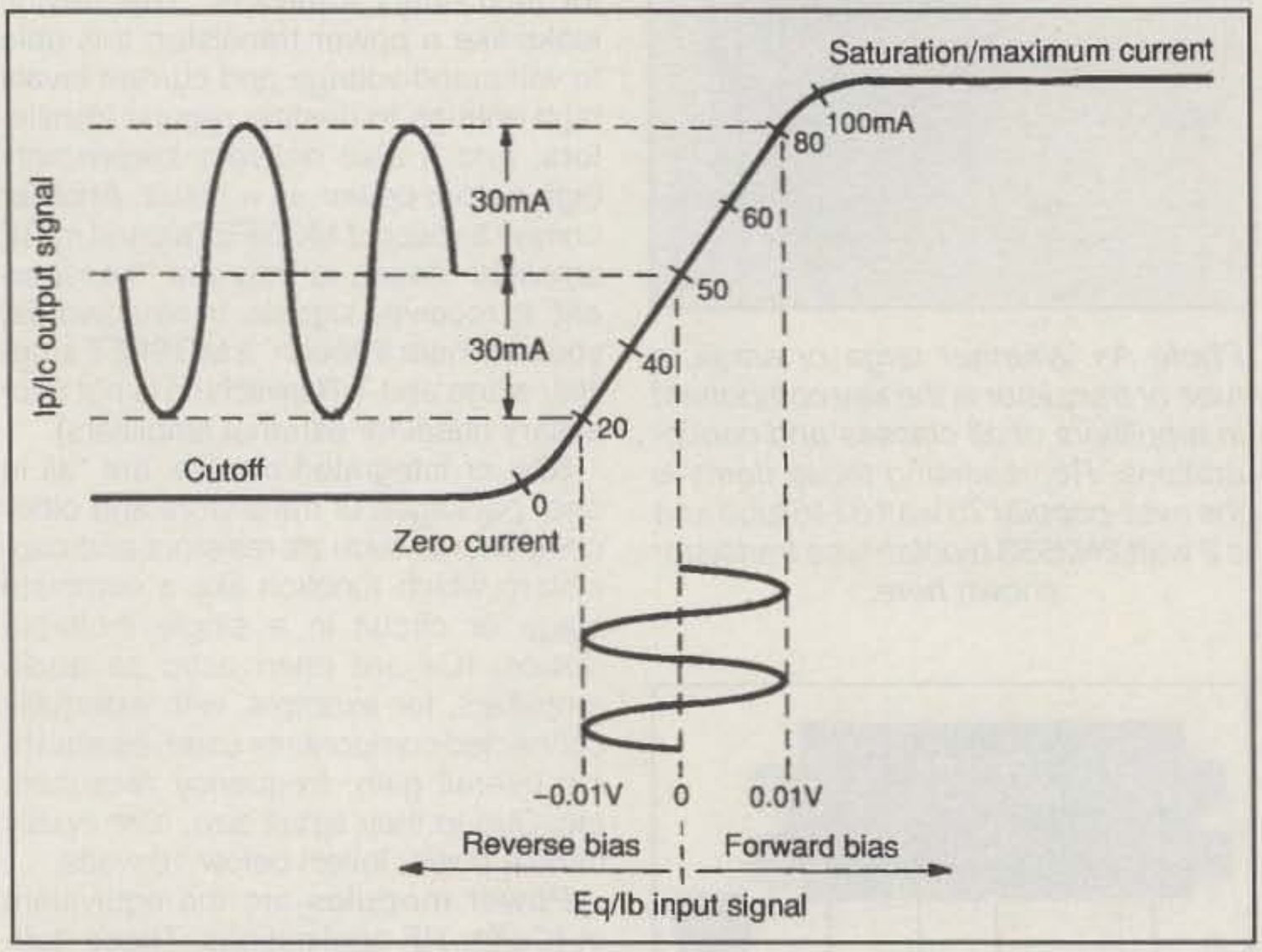


Fig. 2– "Lunch-time napkin sketch" of plate current versus grid voltage curve for a class A amplifier. Notice the bias point is midway between cutoff and saturation, or in the linear portion of the curve. (Discussion in text)

and consider how effectively an amplifier performs its assigned task of amplifying and reproducing its input signal. Here we find amplifiers are divided into three main classes of operation (A, B, and C), and each has its own special advantages and disadvantages.

An amplifier operating **class A** delivers the most accurate and great-sounding reproduction of its input signal, but it is also the least efficient (30 to 40 percent, typically). A class A amplifier is thus ideal for AF applications, but a mite extravagant for RF applications. As an example, let's say we have a single 3-500Z RF amplifier operating class A with 2500 volts at 400 ma of plate current (1000 watts input). At 35 percent efficiency, the amplifier's output would be 350 watts (and 650 watts would be dissipated as heat). In order to get 700 watts output like a regularly advertised single 3-500Z amplifier, we would need to add a second parallel-connected 3-500Z and increase plate current to 800 ma (2000 watts input). There is another hitch: We are overtaxing the 3-500Zs beyond their maximum plate dissipation of 500 watts. We actually should reduce their power even more and add extra cooling fans. Oh, but a class A amplifier would sound marvelous in a home Hi-Fi or a classic AM setup!

Am amplifier operating **class B** will not produce the super-great-sounding audio quality of a class A amplifier, but it is the next best choice, and it exhibits a higher efficiency (45 to 65 percent, typically). A class B amplifier can be operated in push-push or push-pull circuit configurations, and it is equally suited for AF or RF applications. In fact, most of today's popular "linear amplifiers" operate class B. Using the previous single 3-500Z example again, let's say we have 2500 volts at 400 ma of plate current for 1000 watts input. At 55 percent efficiency, the amplifier's output would be 550 watts with 450 watts dissipated as heat. How is that possible? Because plate current now flows during only part of the input signal's sine wave rather than continuously (continue reading; I will explain that further with upcoming Ip/Eg curves). Notice, too, 450 watts is now below the 3-500Z's maximum plate dissipation rating of 500 watts. The tube not only delivers more output power, it also runs cooler. Now we are hamming!

An amplifier operating **class C** will not produce an acceptable-for-audio reproduction of its input signal, but it exhibits great efficiency (65 to 75 percent, typically). Use of class C amplifiers today thus is limited to CW and FM applications. Again, referring to our previous single 3-500Z with 2500 volts at 400ma/1000 watt input example, and assuming 70 percent efficiency, a class C amp's output would be 700 watts with only 300 watts of plate heat dissipation. If you are thinking plate current must flow for even less of an input signal's sine wave, you are absolutely correct. Congratulations on your logic! You say you can understand limiting class C to CW, but wonder why it is acceptable for FM? Because audio/intelligence on FM is conveyed as frequency shifts, not amplitude variations. We do not "listen to the carrier wave"; we just analyze or detect its movement.

One final note: Recently a **class D** operation has evolved. It embraces yet shorter time of plate current flow and its tank circuit "rings" to yield up to 90 percent efficiency (at only 10 percent plate dissipation to boot—cool!). This type of amplifier is useful for CW or pulsed modulation, and it has a most promising future. We'll have more details in a future column, but right now let's forge ahead. A quick summary of our previously discussed amplifier classes and their parameters, incidentally, is included in fig. 1.

Biasing

At this point, you probably are asking what determines whether an amplifier's

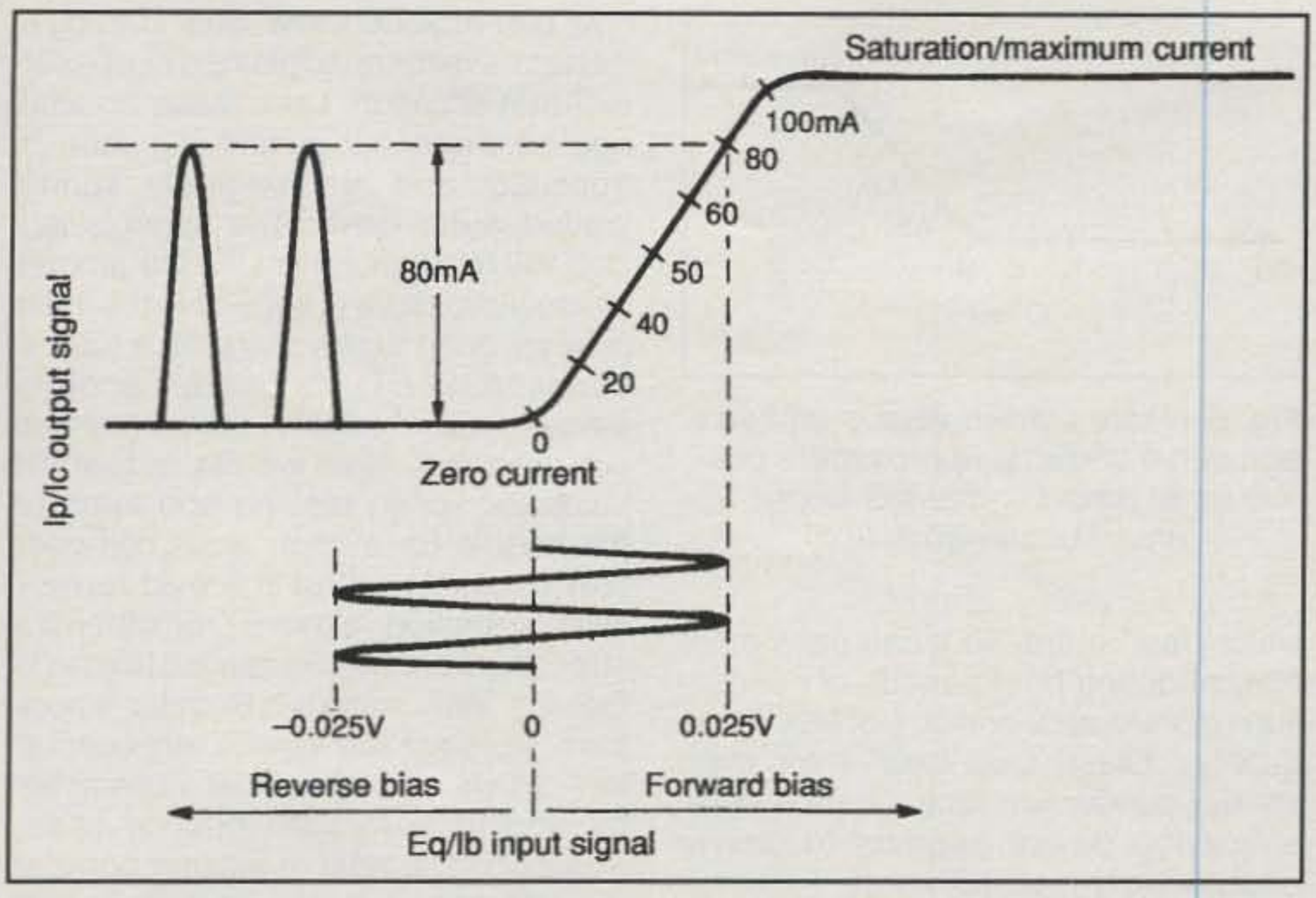


Fig. 3– Sketch of plate current versus grid voltage curve for a class B amplifier. Notice bias has been shifted to the point of plate-current cutoff. (Discussion in text)

class of operation is A, B, or C. Basically, it is established by the amplifier's point of biasing and the amplitude of its input signal. This concept is best explained with some Ip/Eg or Ic/Ib curves as shown in figs. 2, 3, and 4. What kind of curves? They are pronounced "ice of p versus ece of g" for tubes, or "ice of c versus ice of b" for transistors. They are expanded output-signal versus input-signal curves with tube plate current (Ip) or transistor collector current (Ic) plotted vertically and tube grid voltage (Eg) or transistor base current (Ib) plotted horizontally. These curves are found in technical papers of amplifying devices; my "lunch-time napkin sketches" of them in figs. 2, 3, and 4 are just simplified for easy understanding.

Fig. 2 symbolizes class A operation, with biasing set so plate or collector current is midway between cutoff (zero)

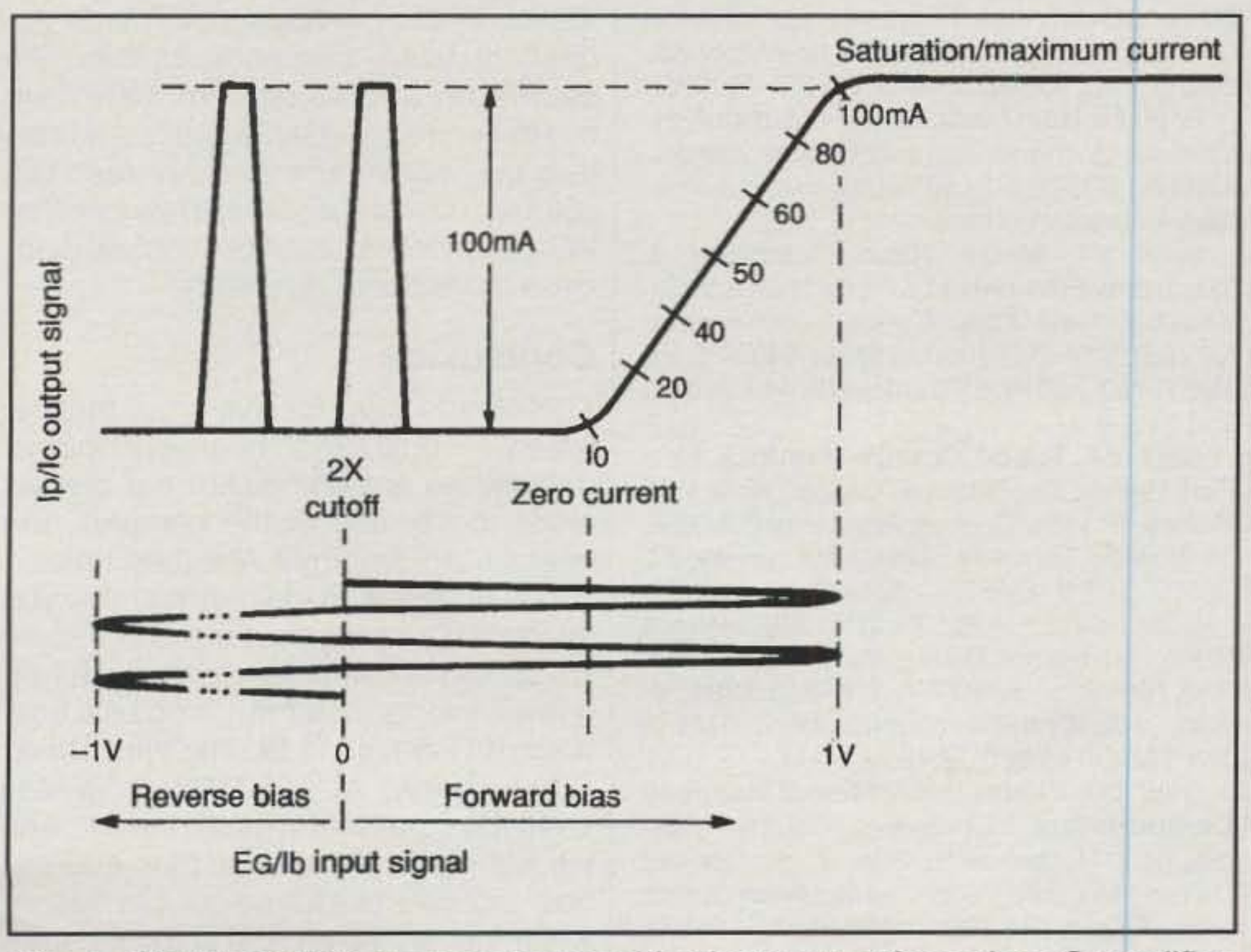


Fig. 4– Sketch of plate current versus grid voltage curve for a class C amplifier. Here bias is set between two and three times cutoff. (Discussion in text)

and saturation (maximum). Using hypothetical values (and a low-power amplifier as an example), 50 ma of current flows through the (small) tube or transistor all the time—even when there is no input signal. When a weak (.01 volt) signal is applied to the grid or base, output current will swing ±30 ma and amplification occurs. Now notice these fine points. If the input signal's amplitude is increased, output current will reach cutoff and/or saturation. In this case, the output signal will flatten or square off its top and bottom curves, and the result will be poor sound quality. If we have a larger input signal and/or need more output, we must switch to a larger amplifying device.

Fig. 3 depicts class B operation. Biasing is now set right at the point of plate- or collector-current cutoff. In other words, zero current flows until a positive alternation of the input signal drives the grid or base into conduction. Look carefully and you will notice both input and output signals are now larger in amplitude (more output power!). Notice, too, all negative alternations of the input signal are clipped off (a drop in signal quality).

Fig. 4 is an example of class C operation. Here bias is set between two and three times cutoff, and plate or collector current only flows during positive peaks of the input sine wave. This shorter conduction time lets the tube/transistor "rest" more, so it can pass more current during brief periods of conduction (more output power, but less audio quality). Class D is biased for even shorter conduction times; thus a small amplifying device appears to deliver exceptionally high efficiency.

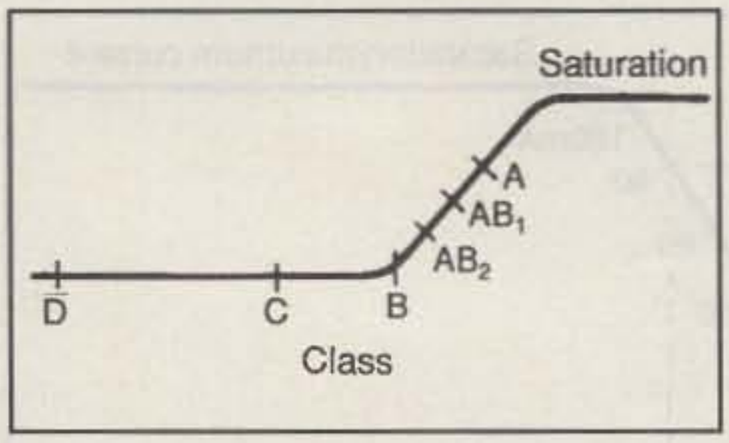


Fig. 5– Plate current versus grid voltage curve showing approximate position of all amplifier classes in one figure. (Discussion in text)

Fig. 5 is our final sketch. It shows the bias points of the previously discussed amplifier classes on one Ip/Eg curve. I also added in classes AB1 and AB2, which are incorporated in many modern amplifiers. class AB1 is closer in quality to class A; class AB2 is closer to class B. It's that simple.

More on Biasing

We have been referring to biasing as if everyone magically understands it, but how can anyone know what biasing is if it has never been explained? Let's correct that situation. Let's make an analogy between our amplifying tube or transistor and an imaginary spring-loaded water valve. The spring's tension will represent bias. If a fair amount of water pressure is applied to the valve (like applying high voltage to a tube or power MOSFET), its control handle or element will just flop to full on (saturated) condition. Now we can adjust the holdback spring tension and force on the handle for a continuous half-open flow (class A), off until a mild forward twist is applied (class B), or off until a strong forward twist is applied (class C). Get the idea, friends? Regular bipolar transistors are low-power semiconductors, so we must help their valve action by adding a forward biasing spring (resistor). The ratio of tension between forward and reverse bias springs sets the point/class of operation. Are spring-loaded tubes and transistors real? Of course not, but I will bet you will remember our analogy for many years!

Now think about that bias adjusting control on the back of your rig for a minute. When you adjust it for more (no input signal) idling current, you actually are decreasing bias voltage and increasing the level of plate-current flow. In other words, you are moving the class of operation closer to class A. When you set the bias control for less idling current, you are increasing bias and moving operation closer to class B.

There is a wealth of additional information in the previous statements (indeed in every sentence of this mini course on amplifiers). We also have overflowed all available space and can thus only encourage you to re-read this column, now and again in a few months. With each rereading, I bet you will learn even more about amplifiers!

Conclusion

That wraps it up for this time, friends. Now we would like to hear your opinion on how we are doing. Are our discussions too simple or too complex, too brief or too lengthy? Are they helping you to understand electronics? Are you interested in a particular area or topic we should consider featuring in a future "How It Works" column? Drop us a brief note (K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210) or e-mail <k4twj@cq-amateur-radio.com>, and we will report the results plus address your inquiries in a future column. Meanwhile, get on the air and enjoy the endless thrills of amateur radio!

73, Dave, K4TWJ

Announcements

(from page 10)

line 516-520-9311; e-mail: <hamfest@limarc.org>; <http://www.limarc.org>. Talk-in 146.85 (136.5 PL). (Exams 10 AM)

Sept. 16, **Grand Rapids ARA Super Swap**, 9757 Duncan Lake Ave., Caledonia, Michigan. Contact Tom <n8dgd@home.com>. Talk-in 147.260/R, CTCSS 94.8 Hz.

Sept. 16, **Sonoma County RA Hamfest**, Lewis Adult Education Center, Santa Rosa, California. Call Rick Reiner, K6ZWB, 707-575-4455; web: <http://www.cds1.net/scra>. (Exams 9 AM to noon)

Sept. 16, **Eastern PA ARA Hamfest,** Monroe County Vo-Tech, Bartonsville, Pennsylvania. Contact Tim Campson, N3TIM, 570-839-3083. Talk-in 147.045 PL –131.8, 146.535 simplex. (Exams)

Sept. 16, **Delaware Lehigh ARC 2000 Hamfest**, Schnecksville Fire Deptartment, Schnecksville, Pennsylvania. Call 610-261-0403; e-mail: <aa3ix@arrl.net>; <http:// www.kutztown.edu/faculty/chuk/dlarc/>. Talk-in on 146.79 (PL 151.4)/R, 444.90 (PL151.4)/R.

Sept. 17, **Greater Cincinnati ARA Communications Expo 2000**, Kolping Center north of Cincinnati, Ohio. Contact Jim Weaver, K8JE, 513-459-0142, e-mail: <k8je@arrl.net>; web: <http://w3.one.net/~rkuns/expo2000/>. Talk-in 146.88-. (Exams contact W8GS, 513-683-7373, <w8gs@arrl.net>)

Sept. 21, **Western Connecticut Hamfest**, Edmond Town Hall, Newtown, Connecticut. Contact Seab Lyon, AA1MY, 12 Willow St., Beacon, NY 12508. Talk-in 146.67- PL100.

Sept. 24, **Ham Radio Bar-B-Q & Hamfest**, Ventura, California. Contact George Kreider, KN6LA, 805-388-2488; <http://www.jetlink.net/~ko6oy/barbq.html>.

Sept. 24, **Metro 70cm Computer & Electronic Fleamarket**, Lincoln High School, Yonkers, New York. Contact Carl Everts, N2VQP, 914-969-1053. Talk-in 440.425 PL 156.7, 223.760 PL 67.0, 146.910, 443.350 PL 156.7.

Sept. 24, **Pasco County Hamfest**, New Port Richey Recreational Center, New Port Richey, Florida. Contact Ron Wright, N9EE, 8849 Gum Tree Ave., New Port Richey, FL 34653 (727-376-6575; <n9ee@akos.net>).

Sept. 24, **F.A.R. Fest 2000**, Prince Georges Stadium, Bowie, Maryland. Contact Dan Blasberg, KA8YPY, 301-345-7381; e-mail: <blasberg@bellatlantic.net>. Talk-in 147.105+, 146.520. (Exams 9 AM)

Sept. 30, **Elmira International Hamfest/ Computerfest**, Chemung County Fairgrounds, Horseheads, New York. Contact Dave, 607-589-7636; <http://www.arast.org>. Talk-in 146.700- (alternate 147.360+). (Exams beginning at 9 AM; contact John, 607-565-4020)

What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

Super September Stuff

This month in your "What's New" column we'll focus on radio gear, accessories for the shack, antennas and antenna accessories, software and computers, and books for your bookshelf. Ready? Let's begin.

The Ten-Tec RX-340 DSP-Based receiver.

Radio Gear

The Ten-Tec RX-340 DSP-Based Receiver. Recently, Ten-Tec introduced a new general-coverage synthesized receiver using extensive, sophisticated Digital Signal Processing (DSP) technology. The new receiver is the RX-340, which tunes 5 kHz to 30 MHz in tuning steps and resolution of 1 Hz. The receiver's displays are vacuum fluorescent for unparalleled contrast and readability.

Ten-Tec has been a supplier of commercial- and government-grade receivers for some years now. DSP-based technology in a radio tends to bring the performance of expensive military-grade receivers down into the price range of top-end commercial receivers. The RX-340's DSP-based design uses fewer analog circuits than traditional receivers, with specialized DSP microprocessors replacing many conventional discrete circuits with intensive software containing over 60,000 lines of code.

Memory and scan features of the RX-340 include a scratchpad, 100 memories, memory scan, and F1 to F2 scan. Receiver stability is rated at ±1 parts-per-million across the entire operating range of 0 to 50 degrees Centigrade. The receiver mounts in a standard 19 inch rack and weighs 12.5 pounds.

For more information and pricing, contact Ten-Tec, Inc., 1185 Dolly Parton Parkway, Sevierville, TN 37862 (1-800-833-7373; e-mail: <sales@tentec.com>;. web: <www.tentec.com>).

AOR on the Web. Recently, AOR U.S.A., Inc., well known for its rapidly expanding line of high-quality portable and fixed-station receivers, has developed a major internet presence with an attractive website at <http://www.aorusa.com>.

AOR is a leading communications equipment manufacturer headquartered in Tokyo. It was founded in 1977 by Shigeru Takano, JA1AOR ("Authority on Radio Communications"), and Jun Oshima, JA1EXM. Besides radio amateurs, AOR serves monitoring enthusiasts, communication professionals, shortwave listeners (SWLs), and others in electronics. The firm long has been at the forefront of radio communications technology, with its first real breakthrough coming in 1984 with the introduction of a continuous-coverage, wideband monitor receiver, the now-classic AR2001.

Today AOR's wide-ranging, "hi-tech" communications products include the AR8200 Mark II B Handheld Receiver; AR7030 Plus Communications Receiver; DDS-2A Local Generator Unit for Collins® radios; SDU-5500 Spectrum Display Unit; and many others.

For free product flyers, contact AOR U.S.A., Inc., 20655 S. Western Ave., Suite 112, Torrance, CA 90501 (310-787-8615; e-mail: <info@aorusa.com>; web: <http:// www.aorusa.com>).

One very popular Heil Sound mic is the Goldline Studio Microphone. It is specifically for full-range, smooth, articulate SSB audio, with a 60 Hz to 15 kHz response. The microphone, available with your choice of mic elements, has a significant peak at 2 kHz for excellent voice articulation. It also has a "big bottom" low end that's important for producing a well-balanced, studio-quality SSB signal. (Photo via the Heil Sound website.)

Heil Sound offers much more than just microphones. The firm also offers the popular ProSet series of lightweight amateur radio headsets, sometimes known as "boomsets." These units were designed with the most critical multi-op contester and DX chaser in mind. (Photo via the Heil Sound website)

Accessories for the Shack

Heil Amateur Audio Accessories. Bob Heil, K9EID, is a very capable sound engineer, one deeply involved with the intricacies of sophisticated "sound reinforcement" of live concert sound for touring acts, club bands, and concert stars. He's the founder and president of Heil Sound, Ltd., and he

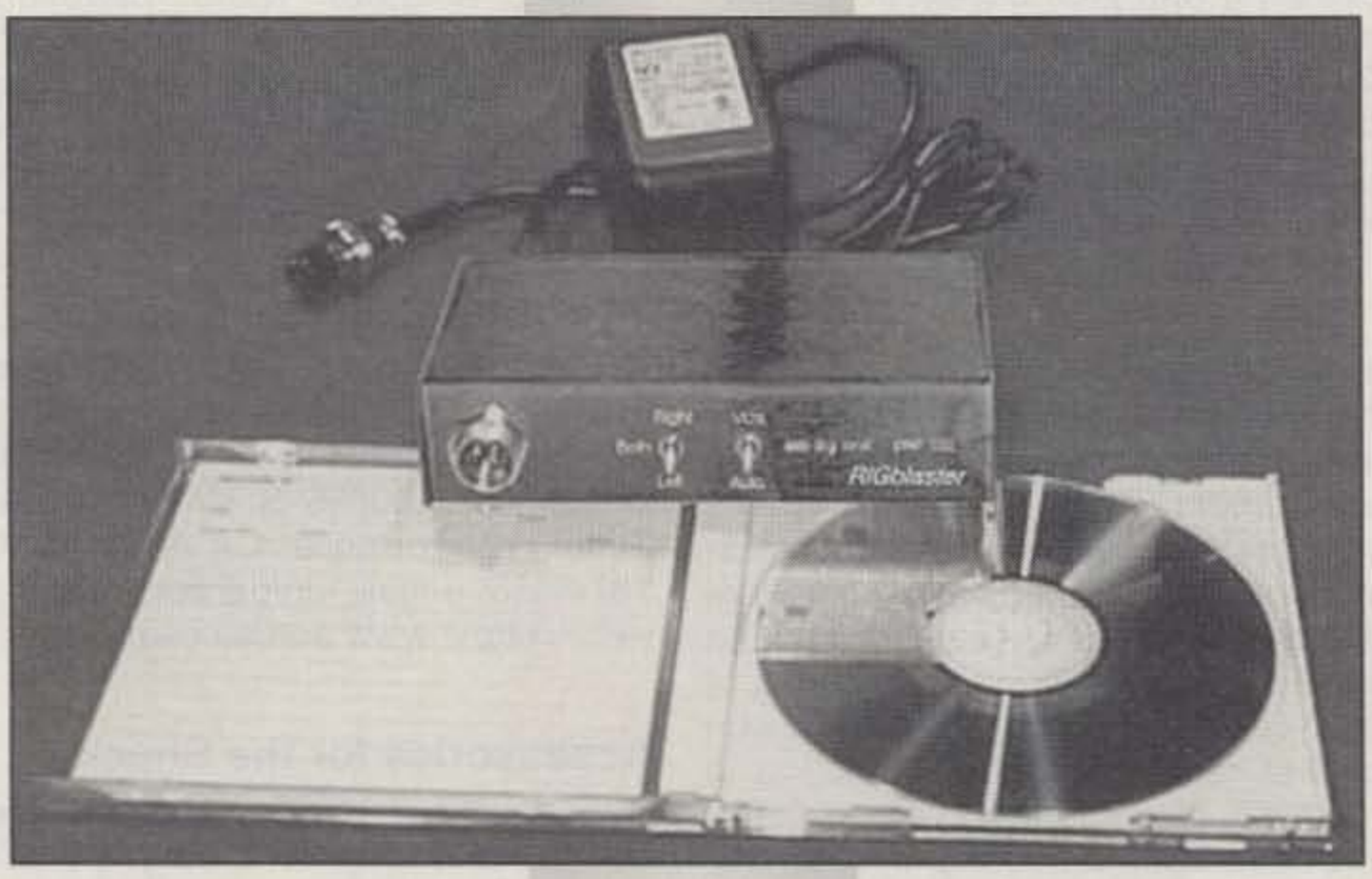
*289 Poplar Dr., Millbrook, AL 35054-1674
e-mail: <w8fx@cq-amateur-radio.com>

Bruce Clark, K1FZ's series of transformers is specially designed for optimum use of Beverages. The "classic" K1FZ units are the KB-1 and KB-2, pictured here, which give tailored, broadband SWR results from 1.8 to 7.3 MHz. Housed in attractive, rugged plastic project-type boxes, the units are of similar construction, but the KB-1 is for single-wire Beverages, whereas the KB-2 is for two-wire, two-direction skywires. (Photo via the K1FZ website)

now specializes in top-quality "home theater" design and installation.

Bob offers a variety of microphones, headsets and boomsets (especially popular with multi-op contesters and DXers), and accessories (stands, switches, cables, transformers, and the like). Many of these are attractive for general amateur use.

One very popular microphone Heil Sound offers is the Goldline Studio Microphone. It's created specifically for full-range, smooth, and articulate SSB audio, with a 60 Hz to 15 kHz response. The mic has a +4 dB peak at 2 kHz for excellent voice articulation. It also has a "big bottom" low end that's important for producing a well-balanced, studio-quality SSB signal. The Goldline microphone models GM-4 and GM-5 are available for $139.99 (choice of mic element). The GM-V "Vintage Goldline," with built-in matching transformer for use with older hi-Z "boatanchor" inputs is $159.95 *(for a review of the GM-V, see the May issue of* CQ*, p. 52—ed.).*



Del Schier, K1UHF's RIGblaster connects your radio to your computer's sound card to let you get on the air with a variety of modes, including PSK31, SSTV, RTTY, AMTOR, packet, CW, contest voice keying, HSCW meteor scatter, and other new modes. In effect, the RIGblaster and your PC take the place of older, expensive adapters and terminal node controllers. (Photo via the West Mountain Radio website)

Heil Sound also offers the popular ProSet series of lightweight amateur radio headsets, sometimes known as "boomsets." These hands-free units are designed to please the most critical multi-op contester and DX chaser.

For more information, contact Heil Sound, Ltd., 5800 North Illinois, Fairview Heights, IL 62208 (618-257-3000; e-mail: <info@heilsound.com>; web: <http://heilsound.com>).

W2IHY 8-Band Audio Equalizer and Noise Gate. While we're on the subject of audio products for amateur radio, we also should mention another popular accessory, the W2IHY 8-Band Audio Equalizer and Noise Gate ($229.99 assembled). Designed with twin goals—to "make your mic sound really good" and to "have audio that stands out from the crowd"—the unit is compatible with ICOM, Yaesu, Kenwood, and other radios.

The noise-gate feature eliminates fan and other ambient noise. Designed to connect to two radios, the unit also features outstanding immunity to RF, and it includes a built-in headphone monitor. Also available is a similar dual-band equalizer, the W2IHY Audio Equalizer and Noise Gate. The latter unit is $99.99 kit or $129.99 assembled.

For more information, contact Julius D. Jones, W2IHY, 19 Vanessa Lane, Staatsburg, NY 12580 (914-889-4933, or 914- 889-4253 after 7 PM eastern time; e-mail: <w2ihy@prodigy.net>; web: <http://www.w2ihy.com>).

Antennas and Accessories

K1FZ Beverage Antenna Transformers. Beverage antennas are especially popular as receiving antennas on the MF and lower HF bands. Often, though, the results achieved with such antennas are unimpressive, and much of this disappointment can be traced to improper antenna impedance matching. Enter the K1FZ Beverage Antenna Transformers.

Bruce Clark, K1FZ's transformer series is specially designed for optimum use of Beverages. The units feature high-efficiency, wound ferrite toroid transformers with isolated 50 ohm windings for minimum noise transfer. Each unit is individually calibrated to eliminate the variations often found in mass-production units.

The "classic" K1FZ units are the KB-1 ($59.95 plus s/h) and KB-2 ($119.95), which give tailored, broadband SWR results into resistive loads from 1.8 to 7.3 MHz. They're housed in attractive, rugged plastic project-type boxes. The devices have color-coded binding posts

for Beverage wire(s) and ground connections. The units are of basically similar design and construction, but the KB-1 is for single-wire Beverages, whereas the KB-2 is for two-wire, two-direction Beverages.

Recently, Bruce added several new transformers to his product line. One is the KB-3 End Termination Transformer ($79.95); it's for all two-wire Beverages, allowing both wires on the far end of the two-wire Beverage to be insulated from ground. The other is the innovative KB-4 50 Ohm Distribution Transformer. This unit, which varies in price according to the user's requirements, is designed to feed a single receiving antenna to a contest multi-operator, multi-band 80–160 meter system; it has one 50 ohm input and two outputs.

For more details, contact Bruce at Clark Electronics, RR2, Box 2025, Belfast, ME 04915 (207-338-0474; e-mail: <k1fz@agate.net>; web: <http://www.qsl.net/k1fz/index.html>).

Software and Computers

The WinCw Morse Code Program. Stephen Stuntz, NØBF, is no stranger to our column. Several years ago we profiled his HTMORSE Morse Code practice program, designed to help no-code Technicians to learn Morse by using their handheld transceivers (HTs). Before that, we profiled Stephen's YT-1 Yaesu FT-990 Control Program, which controls the Yaesu FT-990 transceiver when used in conjunction with the Yaesu FIF-232c interface.

Recently Stephen introduced his Windows™-based Morse Code program, WinCw, which works under Windows 3.1, 95, and 98. Making use of the RS-232 serial interface, the program offers advanced features such as a large, type-ahead buffer with visual display; ten preprogrammable F-key memories capable of storing up to 100 characters; a repeat message function with timer setting; adjustable sending speed from 5–99 wpm; and more.

When operating, you can program in various messages such as exchanges or responses, and you also can program messages to repeat at timed intervals. The type-ahead buffer offers a visual display of the text you have typed; if you recognize an error, you can backspace and correct mistyped characters before transmission. The price, including software on disk and a wired interface cable, is $25 on a money-back satisfaction basis.

Contact Stephen at Electrosoft, P.O. Box 1462, Loveland, CO 80539 (970-593-0722; e-mail: <nØ0bf@juno.com>).

HAMCALC now on CD-ROM. In several columns we have profiled the ongoing updates to George "Murph" Murphy, VE3ERP's excellent, free, DOS-based HAMCALC math and design programs. As you may recall, Murph defines his very comprehensive software as providing "painless calculations for amateur radio operators."

According to Murph, the HAMCALC freeware package has indeed prospered since its introduction as a reference and learning tool in 1993. The current version includes over 250 math and design programs and program upgrades. Included are calculation routines of interest not only to radio amateurs but to professional engineers and university faculties alike.

Well, Murph finally did it. After about seven years of distributing HAMCALC on a 3.5 inch diskette, the program finally grew too big for its boots. The result: It's now offered on CD-ROM, which also allows for future program growth.

The program collection still is essentially free, but Murph asks that you send $7 check or money order (U.S. funds; no stamps or IRCs, please) to cover the cost of materials and airmail worldwide. Remit to George Murphy, VE3ERP, 77 McKenzie St., Orillia, ON L3V 6A6, Canada (e-mail: <ve3erp@encode.com>).

RIGblaster. Del Schier, K1UHF, has developed an innovative new product for amateur use. RIGblaster, a radio-to-sound-card interface, connects your radio to your computer's sound card to let you easily get on the air with a variety of modes, including SSTV, RTTY, PSK-31 (phase-shift keying, an increasingly popular HF mode), AMTOR, packet, CW, contest voice keying,

HSCW (high-speed CW for meteor-scatter operation), and other ways hams have of communicating. In effect, the RIGblaster and your PC take the place of older, expensive adapters and terminal node controllers (TNCs).

The RIGblaster eliminates ground loops, matches the sound card audio, and provides fully automatic audio and push-to-talk (PTT) control. RIGblaster lets you enjoy completely normal station operation without unplugging or manual switching. The interface is available in several different microphone connector configurations at $79.95 plus s/h. A 12 volt wall power supply, 36 inch radio microphone cable, and free CD-ROM of amateur sound card software all are included.

Contact West Mountain Radio, 18 Sheehan Avenue, Norwalk, CT 06854 (phone 203-853-8080; e-mail: <k1uhf@westmountainradio.com>; on web: <http://www.westmountainradio.com>).

KM5KG RF Network Designer Program for Windows 98. Grant Bingeman, P.E., KM5KG, now offers the KM5KG RF Network Designer Program for Windows 98. Grant's new program provides a large number of practical network design solutions integrated into a common package, as can be seen by examining the main screen as shown in fig. 1. This illustration gives an idea of some of the design subjects covered in the program. User-definable curve plotting, graphic screen capture and screen printing, file import and export, and extensive online help text are available. With the program, impedance matching of nonresonant loads is accommodated for L-, Tee-, and Pi-networks. Many of the program screens include frequency sweep and sensitivity analysis capabilities. The program even features stress analysis for CW, SSB, and AM on all components.

The KM5KG RF Network Designer Program for Windows 98 is $49. You also can download a 500KB demo file from "Dr. Bingo's Amateur Radio Web Site," either at <http://www.qsl.net/km5kg> or <http://website.mciworld.com/~drbingo@mciworld.com>.

Contact Networks, 1908 Paris Ave., Plano, TX 75025 (e-mail: <DrBingo@compuserve.com>; web listed above).

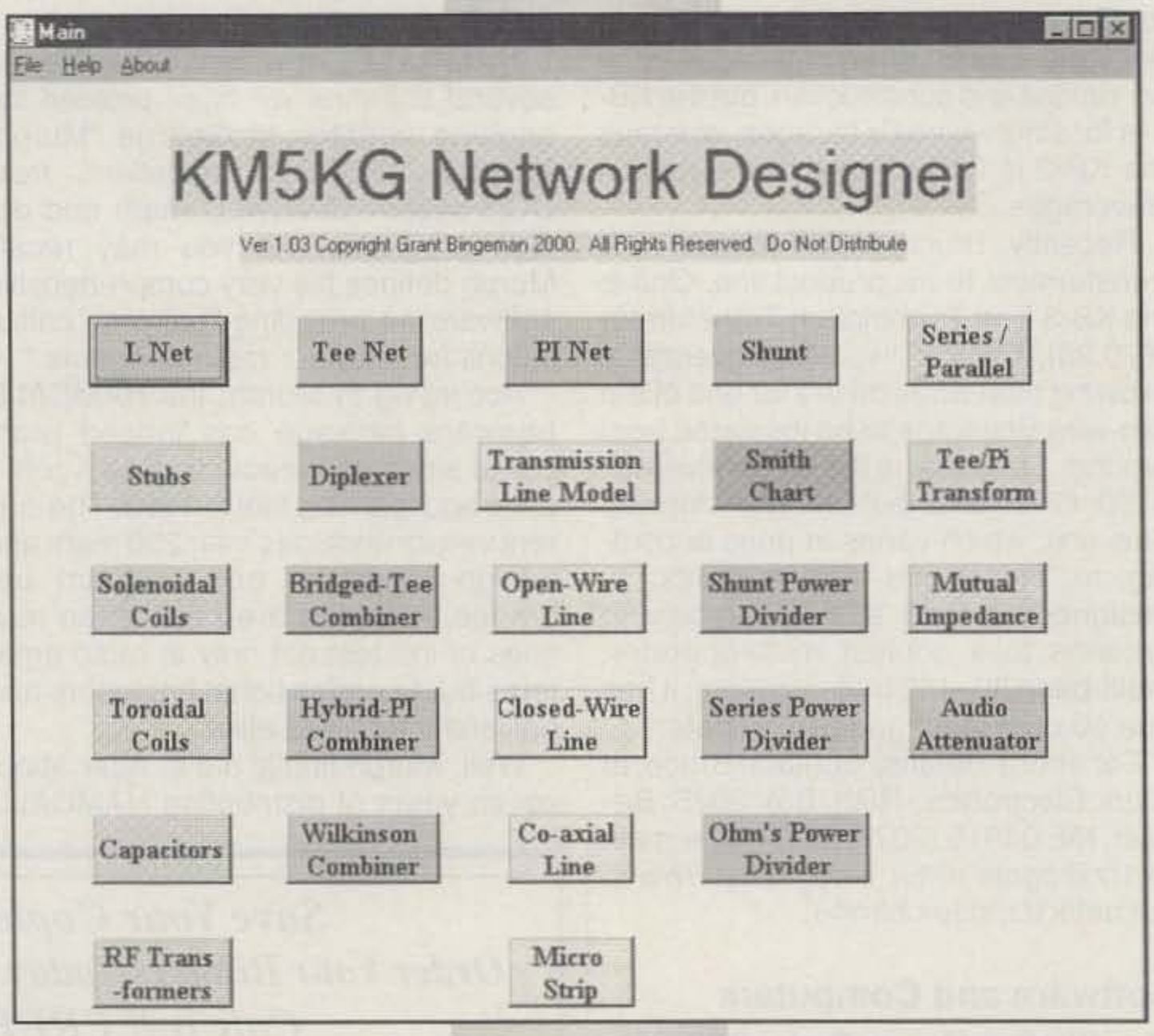


Fig. 1– Grant Bingeman, P.E., KM5KG, offers the KM5KG RF Network Designer Program for Windows 98. Grant's program provides a large number of practical network design solutions integrated into a common package, as can be seen in the program's main screen. With the program, impedance matching of nonresonant loads is allowed for L-, Tee-, and Pi-networks. See the text of this month's column for details. (Graphic illustration downloaded from the "Dr. Bingo" website)

From the Bookshelf

Communication Concepts Catalog. Communication Concepts, Inc., offers a wide range of high-quality products and components for the radio amateur. The firm's marketing emphasis is on the individual who wants to construct his/her own gear, as well as the electronics professional who wants to save money and time in prototyping circuit designs.

Some of the many products offered by Communication Concepts include ATV downconverters, filters, HF amplifiers, HF transformers, splitters and combiners, and VHF amplifiers. Also offered are many hard-to-find, specialized components, including capacitors, chokes, coaxial cable, diodes, heatsinks, transistors, integrated circuits, RF modules, mixers, toroid cores and assemblies, relays, connectors, and much more.

For a free catalog, contact Communication Concepts, Inc., 508 Millstone Drive, Beavercreek, OH 45434-5840 (phone 937-426-8600; e-mail: <cci.dayton@pobox.com>; on the web: <http://www.communicationconcepts.com>). You can order the catalog online if you like.

Universal Radio Communications Catalog. Regular as clockwork, Universal Radio has issued a periodic update to its well-illustrated, large-format communications catalog. The new, 104-page 2000 Communications Catalog is an excellent ordering and reference resource that covers equipment for the amateur radio, shortwave, and scanner buff. An impressive selection of antennas, headphones, books, and accessories also is featured.

Some spiffy gear covered in the new catalog includes the Ten-Tec RX-340 Communications Receiver; Palstar R30 Communications Receiver; Grundig Satellite 800 Portable Receiver; Kenwood TM-D700A 2-meter/440 MHz Mobile Transceiver; ICOM 756 Pro HF Amateur Transceiver; and many new accessories.

For a copy of the catalog, contact Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068-4113 (phone 1-800-431-3939; e-mail: <dx@universal-radio.com>; on web: <http://www.universal-radio.com>). The catalog is free on request by fourth-class mail, or $3 by priority mail. Outside North America, send five IRCs postage.

Wrap-Up

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

Overheard: Although I'm personally not inclined to work this way (doing so makes me nervous!), few things can make you as productive as waiting to do something until the very last minute!

73, Karl, W8FX

DX

BY CARL SMITH, N4AA

News Of Communication Around The World

Here and There

It was a relatively quiet start to the summer, DX-wise anyway. The major operation from Tromelin will have come and gone by now with the rather lengthy callsign FR/F6KDF/T; the operation from Lesotho (7P8AA) by a German group is well underway as I write this (worked them on 40 meters CW with an honest S-9 signal); CY9 from St Paul is just starting a five-day run after solving the problems associated with new restrictions on access to the island; Monaco (3A) got a lot of attention with a group of eight to ten in early July; and there was a week of activity by 1AØKM from the Sovereign Military Order of Malta by an Italian group.

Coming up in September we'll have another operation from Bhutan, this time by a French group, and Bob, G3ZEM, will be operating from Tristan da Cunha (ZD9) for about three weeks this month.

October will see operations from Agalega (3B6), another "guest operator" is scheduled to be active from East Timor (4W), and don't forget that Monk Apollo will be using the special callsign SY2A from October through December.

No doubt there will be other activity announced after this column is written, so pay attention to the DX bulletins and your packet clusters for current updates on what is going on in the DX world.

With all of the major DXpeditions earlier this year, the stories of these trips have started appearing in the various magazines. These stories are all different, obviously, as each represents a totally different set of circumstances. I encourage you to locate these stories and read them to give you better insight into the trials and tribulations associated with bringing these "new ones" to you. Most of us can't even imagine the effort that is required in planning and actually making these operations happen.

Trey, 4W/N5KO, operating from the station of Jose, 4W6EB, last spring. (Photo via José, 4W6EB/CT1EEB)

Trey, 4W/N5KO (left), and José, 4W6EB (right), have a rare moment of rest from the pile-ups and hard work. (Photo via José, 4W6EB/CT1EEB)

Books of Interest

Speaking of stories, a friend recently loaned me copies of two books that I had never had the pleasure of reading. One is called *The Complete DX'er*, written by Bob Locher, W9KNI. The one I read was the second edition, copyright 1989. Although this book, and the material, is over ten years old now, I found it interesting to re-visit the basics of DXing presented by Bob. It reminded me so much of my learning years.

In my early days of DXing (the mid-1950s) I was fortunate to have Clyde Fritz, WØDXE, as an Elmer. With a call like that you know he had to be a DXer. Clyde taught this naïve teenager the

P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

The WPX Program

CW

3040	UA3AP	3042	CE8NKR
3041	AB7ZL		

SSB

2746	UA3AP	2750	WZ3AR
2747	CT1ZS	2751	W8TTS
2748	VK2CA	2752	8P6EX
2749	RW9RF		

Mixed

1859 ..... K1JN

Award of Excellence 160M Bar: RW9SG

CW: 350 UA3AP. 400 UA3AP. 450 UA3AP. 500 UA3AP. 550 UA3AP. 600 UA3AP. 1400 W9IL. 1450 W9IL. 1500 W9IL. 1550 W9IL. 1800 IK3GER. 3550 N4NO. 4400 WA2HZR. 4450 WA2HZR.

SSB: 350 UA3AP, CT1ZS, RW9RF, CE8NKR. 400 UA3AP, CT1ZS, W8TTS. 500 UA3AP, CT1ZS, W8TTS. 550 UA3AP, CT1ZS. 600 UA3AP, CT1ZS. 650 CT1ZS. 700 CT1ZS. 750 CT1ZS. 800 CT1ZS. 850 CT1ZS. 900 CT1ZS. 1550 W9IL. 1600 W9IL. 1650 W9IL. 1700 W9IL. 1750 W9IL. 3000 N4NO. 3050 N4NO.

MIXED: 450 K1JN. 500 K1JN. 550 K1JN. 600 K1JN. 650 UA3AP, W9BOK, K1JN. 700 UA3AP, W9BOK, K1JN. 750 UA3AP, K1JN. 800 UA3AP, K1JN. 850 UA3AP, K1JN. 900 UA3AP, K1JN. 950 UA3AP. 1000 UA3AP. 1350 KWØU. 1400 KWØU. 2450 W9IL. 2500 W9IL. 3100 IK2ILH. 3150 IK2ILH. 4050 N4NO. 4300 ZL3NS. 4350 ZL3NS. 4400 F2YT.

20 meters: WA7OBH
40 meters: AA1KS

Asia: WA7OBH
N. America: UA3AP, WZ3AR
S. America: AA1KS

Award of Excellence Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH,, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KB0G, NB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA.

Award of Excellence with 160 meter Endorsement: K6JG, N4MM, W4CR2, N5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDE1, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA.

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

The WAZ Program

Single Band WAZ

10 Meter SSB

501 .....K2SY
502 .....SM5BMB
503 .....JL1MVM
504 .....K9RR
505 .....LU2NI

12 Meter SSB

16 .....EA5BRE
17 .....EA5GPQ
18 .....LU2NI

15 Meter SSB

533 .....K2SY
534 .....W6IS
535 .....EA6LP
536 .....EA5GPQ
537 .....JJ3MCZ
538 .....JS3IKM
539 .....LU2NI

17 Meter SSB

17 .....EA5BRE
18 .....EA5GPQ
19 .....LU2NI

20 Meter SSB

1060 .....EA6LP
1061 .....W1TE
1062 .....DF7HX
1063 .....LU2NI

40 Meter SSB

93 .....KF2O
94 .....LU2NI

80 Meter SSB

75 .....K2SY
76 .....LU2NI

10 Meter CW

155 .....K5MC

12 Meter CW

18 .....F3TH

15 Meter CW

280 .....W5ODD

20 Meter CW

507 .....W1TE
508 .....K4VNY

30 Meter CW

36 .....N2QT

40 Meter CW

208 .....N2QT
209 .....W7RR
210 .....WØSF

17 Meter Mixed

34 .....W2YC

160 Meters

153 ...RK9CWA (32 zones)
154 .....RV1CC (31 zones)
155 .....N5UL (32 zones)
156 .....KG7H (31 zones)
92 .....N4CH (35 zones, endorsement)

All Band WAZ

RTTY

121 .....GUØSUP

All CW

171 .....K7JI
172 .....AB7ZL
173 .....EA1EZZ
174 .....W7CT
175 .....WZ4P
176 .....GI4SNC
177 .....W1TE
178 .....WAØQMP
179 .....N5UL
180 .....PY8JA
181 .....WØSF

SSB

4556 .....K6IRA
4557 .....DL5RC
4558 .....WDØEIL
4559 .....WA3GNW
4560 .....W6BCZ
4561 .....ZP6CC
4562 .....KU4FP
4563 .....W4KS
4564 .....JA1BBA
4565 .....K3HT
4566 .....W4TMM
4567 .....WB2KHO
4568 .....N2LEB
4569 .....HL5FXP

Mixed

7944 .....K7JI
7945 .....W4OSE (phone)
7946 .....N5MV
7947 .....W6FU
7948 .....WZ4P
7949 .....AI9L
7950 .....WO6M
7951 .....DL5MHQ
7952 .....DL4OCM
7953 .....HL5CL
7954 .....JK2DKW
7955 .....JE2PCY
7956 .....WB9M
7957 .....AA5CK
7958 .....KF2TI
7959 .....W7CT
7960 .....K4GHS
7961 .....W7IG
7962 .....JH1CHU
7963 .....YU1XW
7964 .....JI1CYX
7965 .....UU5JR

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, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

5 Band WAZ

As of May 31, 2000, 530 stations have attained the 200 zone level and 1142 stations have attained the 150 zone level.

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

K1UO LU2NI KG7H CT3DZ N2UN

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

N4WW, 199 (26)
W4LI (AA4KY), 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
ABØP, 199 (23)
KL7Y, 199 (34)
NN7X, 199 (34)
OE6MKG, 199 (31)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
W6SR, 199 (37)
W3UR, 199 (23)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W3NO, 199 (26)
K4UTE, 199 (18)
K4PI, 199 (23)
HB9DDZ, 199 (31)
N3UN, 199 (18)
NØTN, 199 (6 on 40)
K4IQJ, 199 (23)
K3NW, 199 (23)
UA3AP, 199 (6)
EA5BCK, 198 (27,39)
G3KDB, 198 (1,12)
KG9N, 198 (18,22)
KØSR, 198 (22,23)
UA4PO, 198 (1,2)
JA1DM, 198 (2,40)
9A5I, 198 (1,16)
K4ZW, 198 (18,23)
LA7FD, 198 (3,4)
K5PC, 198 (18,23)
NT5C, 198 (18)
VE3XO, 198 (23,23 on40)
K4CN, 198 (23,26)
KF2O, 198 (24,26)
OH2VZ, 198 (31,18 on10)
K9YY, 198 (18, 18on 10)
W6BCQ, 198 (37,34on40)
G3KMQ, 198 (1, 27)
DL3JJ, 198 (19&31 on 10)

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

W1TE (167 zones)
WØSF (184 zones)

Endorsements:
AB5C (190 zones)
RAØFA (200 zones)
OK1DWC (196 zones)
UA3AGW (200 zones)
UA3AP (199 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, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached at e-mail: <k5rt@cq-amateur-radio.com>.

Roger, DU1KT, visited in April and did a bit of operating at VA3JS. He visited the US as well. Roger is an active DXer deeply involved in the Asian DXing scene (DX1S, the Filipinas DX Society etc.). He is shown here seated, while John, VA3JS, looks on. (Photo courtesy John, VA3JS/VE3IPR)

Kadek, YC9BU, at his operating position in Bali, Indonesia. (Photo courtesy Bill, W8ZNH)

"tricks of the trade" in those early years. DXing was quite different back then, but the basics of the chase have not changed for decades. We didn't have nearly as many signals to contend with back then, but when a "rare one" did show up there was plenty of QRM. It wasn't the kind of unnecessary QRM we hear today. It was just plenty of big signals, each trying to be heard over the others, pretty much the same as it is today, just a lot less of them.

Clyde taught me the "secrets" of listen—listen—listen; how to call; when to call; where to call; and "tail-ending" was not a dirty word. He always had the best gear (Collins 75A3 and 75A4 receivers and Collins transmitters followed by the Hallicrafters HT-32 for SSB, then the old

ASTRON CORPORATION
9 Autry Irvine, CA 92618
(949) 458-7277 • (949) 458-0826

www.astroncorp.com

E151765 E151765

...POWER ON WITH ASTRON

SWITCHING POWER SUPPLIES...

MODEL SS-10TK

MODEL SS-12IF

SPECIAL FEATURES:

- HIGH EFFICIENCY SWITCHING TECHNOLOGY SPECIFICALLY FILTERED FOR USE WITH COMMUNICATIONS EQUIPMENT, FOR ALL FREQUENCIES INCLUDING HF
- HEAVY DUTY DESIGN
- LOW PROFILE, LIGHT WEIGHT PACKAGE
- EMI FILTER
- MEETS FCC CLASS B

PROTECTION FEATURES:

- CURRENT LIMITING
- OVERVOLTAGE PROTECTION
- FUSE PROTECTION.
- OVER TEMPERATURE SHUTDOWN

SPECIFICATIONS:

INPUT VOLTAGE: 115 VAC 50/60HZ OR 220 VAC 50/60HZ SWITCH SELECTABLE

OUTPUT VOLTAGE: 13.8VDC

AVAILABLE WITH THE FOLLOWING APPROVALS: UL, CUL, CE, TUV.

MODEL SS-18

DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅛ x 6 x 9	3.4
SS-18	15	18	1⅛ x 6 x 9	3.6
SS-25	20	25	2⅛ x 7 x 9⅜	4.2
SS-30	25	30	3¼ x 7 x 9⅝	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	2⅛ x 7 x 9⅜	4.2
SS-30M*	25	30	3¼ x 7 x 9⅝	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 9⅜	6.5
SRM-30	25	30	3½ x 19 x 9⅜	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅜	6.5
SRM-30M	25	30	3½ x 19 x 9⅜	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 9⅜	10.5
SRM-30-2	25	30	3½ x 19 x 9⅜	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅜	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

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 331 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement sticker s is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K2TQC 331	W2FXA 331	W4OEL 329	I1JQJ 327	I5XIM 325	I2EOW 324	YU1AB 317	OZ5UR 311	N7WO 285
K2FL 331	N4MM 331	K2JLA 329	I4LCK 327	WA8DXA 325	N4AH 324	G3KMQ 317	HB9DDZ 307	EA3BHK 282
K6JG 331	PT2TF 331	K4CN 329	N5FG 327	N5FW 325	W6SR 323	K7JS 317	WG5G/QRPp 307	F5OIU 282
N4JF 331	W2UE 330	K6GJ 329	I4EAT 327	IK2ILH 325	K7LAY 323	K4JLD 316	W6YQ 305	YC2OK 282
K9BWQ 331	W6DN 330	W7CNL 329	DL8CM 327	9A2AA 325	9A2AJ 323	YU1TR 316	W7IIT 305	KD8IW 279
K2ENT 331	G4BWP 330	K9IW 329	SM6CST 327	OK1MP 325	LA7JO 323	K8JJC 315	KE5PO 304	XE1MD 278
K6LEB 331	EA2IA 330	WB5MTV 329	N4KG 327	W4LI 325	KU0S 322	IK0ADY 315	LU3DSI 302	EA2CIN 278
N7FU 331	W7OM 330	IT9QDS 329	W0JLC 327	K3JGJ 325	HA5DA 321	N1HN 313	PY4WS 302	I3ZSX 276
K3UA 331	W0HZ 330	K4IQJ 328	NC9T 326	K1HDO 325	K6CU 321	CT1YH 313	YU7FW 301	G3DPX 275
YU1HA 331	W8XD 330	W1WAI 328	IT9TQH 326	K5UO 325	N5HB 321	W4UW 313	KH6CF 300	W9IL 275
K9MM 331	F3TH 330	PA0XPQ 328	4N7ZZ 326	DL3DXX 324	VE7DX 320	K9FYZ 313	K9HQW 299	
WA4IUM 331	N7RO 330	DJ2PJ 328	VE7CNE 326	N4CH 324	HA5NK 319	K9DDO 312	KF8UN 299	
K2OWE 331	KZ4V 329	K8PV 327	K2JF 326	WB4UBD 324	N0FW 317	W3II 312	F6HMJ 296	
F3AT 331	K4CEB 329	W4QB 327	KA7T 326	K8LJG 324	SM5HV/HK7 317	K1FK 311	WG7A 295	

SSB

K4MZU 331	DU9RG 331	W0YDB 330	W3AZD 329	I1EEW 327	KC4MJ 325	EA1JG 320	N1ALR 305	VE7HAM 285
K2TQC 331	VE3XN 331	WA4IUM 330	PA0XPQ 328	I1ZV 327	K3JGJ 324	F6BFI 319	XE1MDX 305	F5RRS 284
K2FL 331	K9MM 331	YV1KZ 330	VE2WY 328	SV1ADG 327	I0SGF 324	N6RJY 319	EA5OL 305	CT1CFH 284
EA2IA 331	W4UNP 331	YV1AJ 330	VE2PJ 328	DL8CM 327	AC7DX 324	CT1EEN 319	WB2AQC 305	W0IKD 283
W6EUF 331	PY4OY 331	W4NKI 330	W2JZK 328	KE4VU 327	K0HQW 324	WA4DAN 319	K6CF 304	EA3CYM 283
K2JLA 331	N7BK 331	I4LCK 330	YV1JV 328	I1JQJ 327	VE4ROY 324	PY2DBU 319	KC4FW 304	K7ZM 282
K6JG 331	N7RO 331	4N7ZZ 330	KZ4V 328	XE1MD 327	K6BZ 324	CE1YI 318	EA5GMB 304	WN6J 281
K6GJ 331	ZL3NS 331	W4UW 330	WD0BNC 328	VE2GHZ 327	W2FKF 324	ZL1BOQ 318	YC2OK 303	CP2DL 281
K2ENT 331	I8LEL 331	YV1CLM 330	K1HDO 328	KF8UN 327	EA3BKI 323	W9IL 317	WB2NQT 303	YU1TR 280
N4JF 331	OE3WWB 331	K8CSG 330	VE4ACY 328	W2CC 327	I8KCI 323	WS9V 316	VK3IR 303	KK5UY 280
VE1YX 331	IK8CNT 331	W2FXA 330	K5UO 328	W5RUK 327	K4JDJ 323	CT1AHU 316	W5GZI 302	EA3CWT 278
K5TVC 331	DL9OH 331	W8ZET 330	N5ZM 328	W4QB 326	WW1N 322	N5HSF 316	N5QDE 302	N1KC 278
K6YRA 331	N4MM 331	VE7WJ 330	W6SHY 328	K8PV 326	F6BFI 322	K6RO 316	KD4YT 302	9A9R 277
YU1AB 331	EA4DO 331	LA7JO 330	K9PP 328	W6SR 326	LU7HJM 322	K7TCL 315	SV3AQR 302	VE2DR 277
W7OM 331	K9FYZ 331	W9SS 330	K9HQM 328	W4LI 326	K5NP 322	WB8ZRV 314	LU3HBO 301	SV2CWY 276
K4MQG 331	PT2TF 331	WS9V 329	I4EAT 327	OE7SEL 326	NI5D 322	K9YY 313	YT7TY 300	W6UPI 276
VE3MR 331	W6DN 330	W7FP 329	CT1EEB 327	DL6KG 326	YZ7AA 321	N0MI 313	K3LC 300	KE4SCY 275
K7LAY 331	XE1L 330	N5FG 329	W9OKL 327	N4KG 326	W8AXI 321	KD5ZD 312	WA4ZZ 300	VE2AJT 275
IK1GPG 331	ZL3NS 330	OE2EGL 329	F9RM 327	KD8IW 326	CT1EEN 321	VE3CKP 311	LU5DV 300	Z31JA 275
K5OVC 331	XE1VIC 330	K4JLD 329	AA6BB 327	WA4WTG 325	EA8TE 321	CT1YH 311	SV2CWY 300	KA5OER 275
DJ9ZB 331	XE1AE 330	I2EOW 329	SM6CST 327	KE5PO 325	XE1CI 321	W5OXA 311	K6GFJ 299	
N0FW 331	VK4LC 330	K2JF 329	W3GG 327	N2VW 325	W6MFC 321	HA6NF 310	SV1RK 295	
KZ2P 331	WB4UBD 330	WB3DNA 329	OZ3SK 327	IK0IOL 325	K0FP 320	K3LC 310	4X6DK 295	
K1UO 331	K3UA 330	ZL1AGO 329	CX4HS 327	YV5AIP 325	N4CSF 320	W4WX 310	YT1AT 294	
OZ5EV 331	K9BWQ 330	I8KCI 329	KX5V 327	K9IW 325	N4HK 320	WR5Y 310	OA4EI 292	
W6BCQ 331	VE3MRS 330	4Z4DX 329	IT9TQH 327	WA4JTI 325	DL3DXX 320	K7HG 309	K0OZ 291	
YV5IVB 331	N4CH 330	VE7DX 329	IT9TGO 327	W8KS 325	AE5DX 320	EA3BHK 307	EA5GMB 287	
K7JS 331	K0KG 330	K4CN 329	WD8MGQ 327	VE3GMT 325	KB1HC 320	WZ3E 306	KK4TR 286	

RTTY

K2ENT 327	W2JGR 316	NI4H 305	G4BWP 287	W4EEU 284	YC2OK 280	I2EOW 278	KE5PO 274	PA0XPQ 272
WB4UBD 320	K3UA 312	I1JQJ 289	EA5FKI 284	W4QB 280				

KWS-1 by Collins), but his only antenna was a *big* 4-element monoband Yagi on a 90 foot crank-up tower. To a 15-year-old kid, this was the best of the best. All I had at that time was a 50 watt CW transmitter and an old National NC-100 receiver with almost no bandspread, along with a couple of wire antennas hung in the 30 foot trees.

I spent a lot of time at Clyde's house. We worked DX, operated the contests, and built amplifiers. I will never forget the time when Clyde decided he needed an antenna for 40 meters. He got 30 feet of Rohn 25G tower, a roof mount, and a Mosley 2-element Yagi for 40 meters. One weekend he put together a crew of five or six locals to put this whole thing on his rooftop. The tower went up without much difficulty. Then came the task of getting that monster antenna up to the top of the tower. Around midnight it got done. I'll never know how. There it was above the treetops and it was time to try it out.

Clyde was like a kid with a new toy. The rest of the crew was totally exhausted and went home, while Clyde and I spent the rest of the night chasing DX on 40 meters. It was a most memorable event in my early DXing days.

We spent the next few years working DX and contesting until I entered the USAF in 1958. Unfortunately for me, Clyde was killed in an airplane accident in early 1959. I have fond memories of our time together and I thank Clyde for teaching me all of the valuable DXing basics that have served me well for over 40 years.

If you have not seen/read the book by Bob Locher, you might ask around and see if you can borrow one. Sure it's ten years old, but DXing *basics* are kind of like Ohm's Law: It never changes.

Although I had heard about the book *Where Do We Go NEXT?* by Martti Laine, OH2BH, I had not had the opportunity to read it until John, W7KCN, offered to let me read his copy. This book, also some ten years old, is hard to put down. I found myself reading and reading and reading until I had finished it, in just a few days. Although much of the book is written by Martti himself, numerous chapters are written by well-known DXers such as Dave Heil, K8MN/9L1US/A22MN/5H3US); Chip Margelli, K7JA; Pete Grillo, AH3C; Steve Wright, VE7CT; Wayne Mills, N7NG; and Jim Maxwell, W6CF. There is also a chapter by Hugh Cassidy, WA6AUD. Many DXpeditions of the 1980s are highlighted in this book and provide the reader with knowledge and entertainment as the authors tell of their ordeals in those early days of DXpeditioning to some of the most interesting places on Earth.

If you can borrow a copy of this book, I think you will find it well worth your time to read it. You may discover why Martti

QSL INFORMATION

9E1C to IV3OWC, Claudio Fabbro, Via Casale Coloset 3, I-33030 Moruzzo, Ital
9G5ZW to OM3LZ, Miroslav Ivan, Bodvianska 11, 82107 Bratislava, Slovakia
9J2FR to IK2RZQ, Claudio Mondini, via Clerici 93, 21040 Gerenzano (VA), Italy
9K2SS to KB2MS, Mark S Sherman, 3 Wendover Rd., Denville, NJ 0783, USA
9M2TO to JAØDMV, Tex Izumo, Bukit Dumbar APR 9-4, 97 Jalan Thomas 11700, Gelugor Penang, Malaysia
9M2XA to JF4WPQ, Kodama Shin'ichi, 35-8-2, Villa Mutiara Apt, JLN Bagan, Jermal, 10250 Penang, Malaysia
9M6CT to G4JMB, Philip Weaver, P.O. Box 7, Bangkok 10506, Thailand
9N1VJ to JA9VJ, Hajime Mouri, 10-28-1402 Takakura, Nagoya, 456-0015 Japan
9N7IP to JG5CIP, Shigeko Suzuki, 87-3 Kitabun, Kozaki, Ichiba 771-1622 Japan
9N7VN to K3VN Callbook address
9V1XE to DL4DBR, Thaddaeus Barczyk, Pappelstr. 34, D-58099 Hagen, Germany
A35MQ to DL8NBE, Hans Ingenhaag, Grabiger Weg 8, D-97618 Unsleben, Germany
A45ZN to GØDBX, Kenwood London Road, Louth, Lincolnshire, LN11 8QH, UK
A52A to WØGJ Callbook address
AJ2U/VP9 to KQ3F, Joseph M. Stepansky, 7648 Patterson Dr., Harrisburg, PA 17112, USA; Bureau okay
BTØQGL to KQ6PS Callbook address
BV9G to BV8BC, Sky Chen, Box 222, Taitung, Taiwan
BX4AL to W3HC Callbook address
C6AKA to DL7VOG, Gerd Uhlig, P.O. Box 700 332, D-10323 Berlin, Germany
CO8LY to EA7ADH, Francisco de la Serna Martinez, Cristobal Colon, 28A Utrera, Sevilla 41710, Spain
CO8TW to EA3FQV, Antonio J Bueno Sanchez, Apartado 36075, 08080 Barcelona, Spain
CT3KN to CS3MAD, A.R.R.M., P.O. Box 4694, 9058 Funchal Codex, Madeira Isl., Portugal
CT9KN to CT3KN Callbook address
CV7V to CX4ACR, Ricardo Casal, P.O. Box 17057, 12500 Montevideo, Uruguay
CX1JJ to CX2AM, Gustavo A Frontini Acosta, Casilla de Correos 6000, 11000 Montevideo, Uruguay
CX1JK to CX2AM Callbook address
ED5SJF to EA5URL, Seccion URE, Box 112, 03850 Alcoy, Alicante, Spain
EO55HK to UT1HT, George Ignatov, P.O. Box 87, Kremenchug-21, 39621, Ukraine
EO55IX to UR6IM, P.O. Box 91, Konstantinovka-14, 85114, Donetskaya obl, Ukraine
EO55ZN to UYØZG, Nick Gubenko, Box 309, Nikolaev 34, 54034 Ukraine
EP1DX to DL1EL Callbook address
EP2AC to RV6AB, Victor A. Babenko, Box 33352900, Armavir, Russian Fed.
EP2FM to EP2FM, Abdollah Sadjadian, *(reg. mail)* P.O. Box 16765-1187, Tehran, Iran
ER6A to ER1LW, P.O. Box 112, Chisinau, MD-2012, Moldova
EY/ON6TT to ON5NT Callbook address
EY8MM to K1BV, Ted Melinosky, Jr, 65 Glebe Rd., Spofford, NH 03462 USA
FO5PS to FO5PS, Serge Poitevineau, P.O. Box 2970, CP 98713 Pspeete, France
P5DX to TK5NN, Pat Bittinger, P.O. Box 227F, 20179 Ajaccio, Cedex, France
FR5ZQ/G to FR5ZQ, Henri Namtameco, Rampe de Saint-Francois 5052 Tour La Chaumiere, F.97400 Saint-Denis, France
FY5KE to F6BEE, Jacques Saget, 34 Rue Maurice Ravel, F-78690 Les Essarts le Roi, France

Kadek, YC9BU, and his wife dressed in traditional Balinese style. (Photo courtesy Bill, W8ZNH)

(IREF), 118 Oak Ridge Dr., New Braunfels, TX 78132 for $28 plus $3 postage.

I hope you all had an enjoyable summer and got those "big" antennas put up on the "tall towers." It's time to settle down for the fall and winter DXing season. Until next month . . . Good Hunting.

73, Carl, N4AA

has been honored by the CQ DX Hall of Fame, the CQ Contest Hall of Fame, and most recently the Dayton Hamvention Radio Amateur of the Year for 2000, and is considered amateur radio's number one ambassador of international goodwill.

CADXA 25th Anniversary Year

The Central Arizona DX Association is celebrating its 25th anniversary year. In celebration, each monthly meeting of the CADXA will devote time to a historic-information presentation by Bob Davies, K7BHM, the CADXA Historian. Included will be early days organization; first members review (including NN6R, W7XA, KD6VS, N6NR, N7RP N7RR [SK], and about ten others); CADXA QSLs; the CADXA logo, and various DXpeditions sponsored by CADXA.

The highlight of the anniversary year's activities will be a 25th Anniversary Reunion for members from 1975, 1976, and early 1977. It will be held in Tempe at the PERA Club in conjunction with the September 7th business meeting.

Further information can be obtained by contacting Bob, K7BHM, at <bdavies@sfamipec.com> or by phone at 480-839-3728.

IOTA Directory 2000

IOTA Directory 2000 was published by the RSGB on June 19th. If you are an active IOTA participant or just a "closet" island chaser, you will need a copy, as the island listings have undergone a complete revision. The changes are sufficiently significant such that without the new directory, you will be at a real disadvantage. Manually updating an earlier version will not be a feasible option either. DXpeditioners, in particular, need to get a copy, as there are rules changes as well as island listing changes which may affect their expedition plans, including the IOTA Contest.

Copies are available from: RSGB IOTA Programme, P.O. Box 9, Potters Bar, Herts EN6 3RH, England. For information on prices, etc., check the RSGB website at <http://www.rsgb.org.uk> (click "Browse Our Book Catalogue" and then "Awards" in "Catalogue Contents") or e-mail <sales@rsgb.org.uk>. The directory is available in the US from the Island Radio Expedition Foundation

CQ DX Awards Program

SSB

2310 .....F5JSK 2312 .....CT1CFH
2311 .....OK1ZSV

CW

1010 .....RW3AX

SSB Endorsements

320 .....W9SS/330
320.....LA7JO/330
320.....K9HQM/328
320 .....W2FKF/324
310.....W5OXA/311
310 .....WR5Y/310
275 .....CT1CFH/284
275.....EA3CYM/283
200.....EA1IF/202

CW Endorsements

320 .....LA7JO/323
250 .....UA9SG/255
150 .....K6UXO/188
3.5/7 MHz.....UA9SG

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. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 331 active countries. Please make all checks payable to the award manager.

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

WRTC 2000—An Incredible Experience!

September's Contest Tip

If you're operating as a multi-op and only have the luxury of one computer, try adding an additional keyboard (and perhaps monitor if using a laptop) to the second operating position. You'll be amazed at how significant this "poor man's" computer setup can be to increasing your scores in the next contest.

When typing the words "World Radio Team Championship 2000," I'm left with the difficult task of trying to describe the most incredible ham radio event ever experienced by this contester. When you consider the opportunities I've had over the years to operate from some of the best stations and meet some of the coolest people, that's quite a statement indeed.

For you history buffs, the WRTC is a concept that largely was conceived by Danny Eskenazi, K7SS, in the late 1980s as a way of creating an equalized contesting event and social extravaganza for contesters to experience on the world stage. It was an overwhelming success, as competitors from dozens of countries around the world converged on Seattle, Washington to join in the festivities of the first WRTC.

Benefiting from the success of those early days in WRTC history, the Northern California Contest Club sponsored the second WRTC in 1996, centered on the San Francisco Bay area. Not unlike its predecessor, WRTC 1996 was a huge success as well.

As the festivities of the 1996 WRTC week began to unwind, I remember sitting at a table with K3EST, S50A, W6OAT, and several others, all of us experiencing a common feeling. The concept of WRTC is so unique, so incredible that we just couldn't let it fade away. It was then that Tine, S50A, first suggested WRTC 2000 be held in Slovenia.

Many of you are probably reading this and saying, "Okay, so a bunch of hams got together and enjoyed a week of operating and parties. What's the big deal?" The big deal, if you will, is that the concept of WRTC is not just about contest operating. It's about the gathering of like-minded hams who have more passion for the sport of contesting than you can imagine and thoroughly enjoy sharing their enthusiasm with others. I, for one, am in that lot and am dedicating the rest of this month's column to the nearly impossible task of telling you something about the experience of WRTC 2000.

I remember when I first told my wife that it was likely that I would be heading off to Slovenia this summer. Her first reaction was "Where's that?" When I told her, she realized that I was a man on a mission. To say that incredible preparation went into the planning of WRTC 2000 by the Slovenians is like saying it takes some work to coordination the production of the Superbowl. The task of establishing effective logistics and coordination around the world for over 100 competitors and 500 other guests was a massive one, and to say that the Slovenian hams achieved anything but miraculous results is a huge misstatement.

Let's walk through a chronicle of events so that I can perhaps begin to tell you just how amazing WRTC 2000 really was.

Days 1 and 2, July 3–4: Traveling to Slovenia. In keeping with something that works and after having been fortunate enough to be selected as a USA Wildcard Team participant, I picked Doug, K1DG, as my partner. Doug is my brother-in-law and we live in the same town. Doug had no small part in this effort, both operating and elsewhere, as you'll learn later. With three WRTCs under our belts, I guess we're stuck with each other! Life could be much worse.

Early on we decided to live the good life by cashing in a few frequent-flyer miles and traveling business class on Swiss Air to Slovenia. That proved to be a good strategy, as we arrived relatively refreshed and raring to go. As an early indicator of what was to come for the week, we were surprised to see a convoy of fully staffed army vehicles awaiting our arrival for transport to the hotel. Only the Slovenians could have pulled that one off, as we had some initial concern about how we were going to get all of our luggage and radios into a "car."

Upon arriving at our ultimate destination of Bled, the scope of preparation that S50A and his team had completed was very apparent. It started with a huge banner as we entered the city welcoming all WRTC participants. Everywhere we turned there were WRTC 2000 posters. Signs indicating official WRTC venues were displayed on every corner. It was amazing! The Slovenian gov-

Calendar of Events

Aug. 26-27	Ohio QSO Party
Aug. 27	Colorado QRP Club Summer QSO Party
Sept. 2-3	All Asian SSB Contest
Sept. 3	North American CW Sprint
Sept. 9	SOC Marathon Sprint
Sept. 9-10	Worked All Europe SSB Contest
Sept. 10	North American SSB Sprint
Sept. 9-11	ARRL Sept. VHF QSO Party
Sept. 16-17	Scandinavian Activity CW
Sept. 16-17	Washington State Salmon Run
Sept. 16-17	QCWA QSO Party
Sept. 17-18	Tennessee QSO Party
Sept. 23	Panama Radio Club Contest
Sept. 23-24	**CQ WW RTTY Contest**
Sept. 23-24	Scandinavian Activity SSB
Sept. 30	Louisiana QSO Party
Sep.30-Oc.1	Texas QSO Party
Oct. 7-8	California QSO Party
Oct. 14-15	Pennsylvania QSO Party
Oct. 28-29	**CQ WW DX SSB Contest**
Nov. 4-6	ARRL CW Sweepstakes
Nov. 10-12	Japan Int'l SSB DX Contest
Nov. 11-12	Worked All Europe RTTY Contest
Nov. 11-12	OK/OM DX Contest
Nov. 18-19	LZ DX Contest
Nov. 18-20	ARRL SSB Sweepstakes
Nov. 25-26	**CQ WW DX CW Contest**

Contesters from around the world gathered for WRTC 2000 in Slovenia this past July.

2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

It's a herd of CQ Contest Hall of Famers! Left to right: G3SXW, N6AA, PY5EG, DJ6QT, S5ØA, N2AA, K3EST, K1AR, non-member Milan, K6NA, ON4UN, and AI6V.

What a QTH! This was the view from the ground at S582A.

ernment had even printed an official WRTC 2000 postage stamp in honor of the event!

As we got out of the army vehicle at the Hotel Astoria, we were immediately escorted to the WRTC office to check in. Again, to our amazement there were name tags ready for us, a bag filled with Slovenian/WRTC information and gifts, as well as an official WRTC 2000 coat and competitor's polo shirt. If we wanted, we could start using one of the several available PCs that were connected to the internet through four ISDN lines that the committee had installed for our use. Frankly, internet use in Slovenia was faster and more convenient than in my own home!

Day 3, July 5: WRTC Office Opens. Day 3 was kind of a lazy day as we settled into our new lifestyle in Slovenia. Doug and I planned on an extra day in our itinerary to allow for adjustment to jet-lag problems, so after some well-deserved sleep, we spent part of the day poking around the town of Bled and talking with many of the other competitors and attendees. You just can't measure the value we derived from all of these conversations, as we renewed friendships with folks from years past and made many new friends going forward.

The day ended with a brief introductory meeting and one of many fine Slovenian meals at the local Ice House (home of hockey games, skating competitions, etc.).

Day 4, July 6: Pile-up Tape Competition/Opening Ceremonies. Day 4 was where the action really started to heat up for WRTC 2000. At the bright and early hour of 9 AM competitors, judges, and the WRTC Contest Committee met to review the rules and answer questions. Two hours later we were still meeting. It wasn't that the rules were unclear, as much as the pressure of the pending competition was becoming clear and everyone had questions. As you might expect, though, S50A and S53R handled the task with grace, and everyone left the hall ready to "win it all."

One of the criteria for selecting the winners of WRTC 2000 was a new competitive element—pile-up tapes. The idea is to flood your brain with a multi-minute pile-up, with the goal being to copy as many correct callsigns as possible—one period on SSB and the other on CW. Given that K1DG had shown good results at the Kansas City DX Suite in Dayton for this sort of thing, I passed the team's torch to him. This also gave me more time to shop for souvenirs—hi. If you want to give the recordings a try yourself, download them at <http://wrtc2000.bit.si/>.

As the day progressed, everyone's focus turned towards the opening ceremonies. By this time we were starting to get used to the overwhelming hospitality of the Slovenians and were not disappointed when we arrived in the center of Bled for the opening festivities. Not only was there a local musical ensemble there to play, we were entertained by several local dancing groups and given a personal welcome by the mayor of Bled. All of the teams marched into the square carrying signs displaying each country name. Also, flags could be found above the venue representing each participating country. It was a sight to behold and one that I'll never forget. All of this took place and we hadn't even operated the contest yet!

Day 5, July 7: Drawing Contest Calls and Pre-contest Parties. The tension was building in a big way during Day 5 as the WRTC competition neared. We had been told that our location (all locations were selected randomly for the teams) was very good. The only missing piece was which contest callsign we would have (five minutes before the contest began we learned it was S582A). Callsigns were distributed to each team's judge in ceremonial style during the morning, and then in army vehicles we headed for the mountains to our contest location.

It has been said that there are locations and then there are locations. Our QTH was truly spectacular and proved for perhaps the thousandth time that the Slovenians had done an incredible job of putting together all of the locations, antennas installed (similar throughout) and ready to go. We had the additional good fortune of drawing a great friend for our referee, Oms, PY5EG. While he was a good friend going into WRTC 2000, we left as brothers, yielding a friendship that will last a lifetime. No one could have had a better referee!

After spending a few hours setting up the stations and testing everything, K1DG and I split up and headed to various cookouts and parties into the evening. I was treated to a very special evening and dinner for CQ Contest Hall of Fame members, where we witnessed what was perhaps the largest gathering of Hall of Famers that had ever been assembled anywhere! What followed was nearly nine hours of sleep, as the contest start time loomed ahead of us.

Days 6 and 7, July 8–9: The Contest. One of the good things about operating in Europe is that a contest (in this case, the IARU HF Championship) that starts at 1200Z begins at 2 PM local time. That gave us plenty of opportunity to check out conditions in the morning as well as have a nice meal with our gracious host,Sasha, at the local eatery. I suspect they don't get a lot of Americans pulling into their parking lot, so we were a big hit with the staff.

It's a K1AR/K1DG tradition that we flip a coin before the contest to see who starts. Our operating plan (such as it was) was to alternate hours of operation. For the third time running (sorry, Doug) I won the toss and started the contest. We elected to operate on 15 meters at the beginning, which later proved to be a good choice. In our case the beginning of the contest was amazing, with rates over 150/hour. Not bad for 100 watts and a tribander! The remainder of the contest focussed on balancing QSO rate, with mode choices and our need for multipliers—all criteria for calculating the final WRTC

WRTC 2000 Results

Op-1	Op-2	Call	Score
K1TO	N5TJ	S584M	965.31
RA3AUU	RV1AW	S587N	910.86
K1DG	K1AR	S582A	867.15
DL1IAO	DL2MEH	S517W	866.10
OH1EH	OH1NOA	S537L	846.15
DL6FBL	DL1MFL	S511E*	845.19
UT4UZ	RW1AC	S523W	837.19
9A9A	9A3GW	S573O	825.02
KQ2M	W7WA	S519I	820.29
DL6RAI	OE2VEL	S533G	813.16
VE7ZO	VE3EJ	S581I	812.11
K6LA	K5ZD	S518N	808.71
K1ZM	N2NT	S531R	804.89
LY1DS	LY4AA	S524G	793.93
LY3BA	LY2BM	S512T	789.31
UT5UGR	UU2JZ	S548X	782.03
RZ9UA	UA3DPX	S549L	780.90
HA3OV	HA3NU	S536P	770.73
ON4WW	ON6TT	S539D	762.44
IK2QEI	I2VXJ	S562P	759.55
EA3NY	EA3KU	S567F	755.26
OM3BH	OM3GI	S528D	753.65
K8NZ	W2GD	S526O	751.33
G3SXW	G4BUO	S568Y	745.19
YT1AD	YU7NU	S544Z	741.77
UA9BA	RN9AO	S577V	738.10
K4UEE	N6IG	S546Q	733.57
LW9EUJ	LU7DW	S522R	726.77
K9TM	N2IC	S574V	719.80
9A3A	9A2AJ	S542B	714.54
DL2CC	DL5XL	S583D	712.67
WC4E	WØUA	S588S	709.69
ZS6EZ	ZS4TX	S572L	705.67
K4BAI	K6LL	S534J	703.51
5B4WN	5B4LP	S529A	697.96
S59A	S58A	S541F	694.05
K3NA	N6TV	S571W	691.31
PP5JR	PY2NY	S532N	689.28
VE7SV	VA7RR	S521H	683.68
OK1QM	OL5Y	S586U	679.75
JM1CAX	JO1RUR	S514U	667.35
K9ZO	K7BV	S566Z	661.86
PY5CC	PY1KN	S578R	653.71
S50U	S51TA	S538F	644.92
VE3BMV	VE3KZ	S561C	644.16
F6BEE	F6FGZ	S543C	642.02
SP8NR	SP9HWN	S547B	638.69
JH4NMT	JK3GAD	S527K	618.51
JA8RWU	JH4RHF	S513A	617.99
EA7GTF	EA7KW	S516M	582.68
N3AD	N3BB	S563X	567.29
VK4EMM	VK4XY	S564Q	511.92
I5NSR	I5JHW	S576K	431.76

Notes:
**S511E score based on submission of truncated log, missing approximately one hour of operation*
Refer to <http://wrtc2000.bit.si>.

score. We also had to manage the need to take four hours of off-time in a contest where the rate was high throughout, making this decision very critical. The good news is that during those off-times we were able to sample another Slovenian surprise—local pizza. I wonder if they deliver to the US?

What amazed me about operating in Eastern Europe is how loud the other Europeans were, especially on the low bands. Also, I now understand why it can be hard to get a run going on 20 meters in the early morning. It's not uncommon to hear other European stations that are 30-40 dB over 9, making it hard for a USA station to break through.

At the end of the contest we suspected that we had done reasonably well, although I knew in my heart that we didn't have a winning score. However, to say that the contest was anything less than spectacular would be an understatement.

Day 8, July 10: Excursions and Closing Award Ceremonies. As we entered into the final day, the tension of log checking and final scores was apparent on many of the competitors' faces. We were easily distracted, though, as the organizing committee put together another amazing experience for many of us: We were escorted to the caves of Slovenia for a tour. Following that incredible visit, we then moved on to a local ham distributor (the eating type), where we sampled the local goods and got a tour of one of Slovenia's more unique "ham shacks."

After traveling back to Bled, we assembled in the town square for the closing award ceremonies. Keep in mind that at this point no one—except a very small group of judges and scorekeepers led by K1ZZ and N6AA—knew the final rankings of the competitors. The tension built as rumors began to spread about who ended up in various positions.

Throughout the ceremonies I was truly touched by the generosity of the Slovenians and the commitment that they had made to WRTC 2000. The fact that K1DG and I ended up in third place was a wonderful feeling, but not as wonderful as the feeling we gained from our week in Bled. As you might imagine too, the Slovenians delivered a closing presentation with the style and grace that we were slowly becoming accustomed to witnessing. Put simply, it was just great!

Day 9, July 11: Back to New Hampshire. WRTC 2000 was finally winding down. The reality of our week-long adventure said that we had to pack up and head home. However, we didn't leave without many hugs and a few tears shed as we realized, yet again, why contesting is so much more that just exchanging numbers and callsigns.

Some Final Thoughts

What else can I say except to proclaim my sincere and deep admiration for my friends in Slovenia and to everyone who had a hand in making WRTC 2000 such a huge success. There were so many people involved in making this event happen, but let me acknowledge the key players: Tine Brajnik, S50A, Committee President; Leopold Kobal, S57U, Vice President; Leon Sporcic, S59L, Secretary General; Robert Kasca, S53R, Director of Competition; Franci Gricar, S51F, Marketing; Franc Bogataj, S59AA, Technical Director; Robert Bajuk, S57AW, worldwide web (plus); Marijan Miletic, S56A, Data Processing.

It's amazing that just when I think I've experienced the greatest event of my life in ham radio, a WRTC 2000 comes along. While there's talk that the next WRTC might originate in either Finland or my own backyard (W1-land), it's my hope that one aspect of WRTC is maintained throughout—the growth of camaraderie among contesters throughout the world. WRTC 2000 proved to

me again that we enjoy an aspect of our hobby that goes way beyond what we do on the radio. It's about a passion for excellence and a desire to share an amazing level of enthusiasm with others. Isn't that what ham radio itself is all about?

To my Slovenia friends...my hats off to you. You have my eternal respect and thanks. To my fellow competitors...you are the world's best. I look forward to the next WRTC where we can pick up where we left off. In three words...thank you all!

In Closing . . .

It's hard to believe that summer is almost over. When I last looked, it was just starting! Hopefully, your antenna projects have gone well this season. As a reminder, there's still time to submit your 2000 CQ Contest Survey. Check out the "easy to complete" form at <http://hamgallery.com/survey.htm> for all the details.

One last thought: You'll be reading the long-awaited results of the 1999 CQ WW DX SSB Contest in this issue (CW next month). The amount of work it takes to put these words and numbers to paper is staggering, and it happens entirely due to the efforts of a small group of volunteers and dedicated *CQ* personnel. If you have the occasion to run into a CQ Contest Committee member (e.g., in person, on the air, via e-mail, etc.), let him know how much you appreciate the effort. I, for one, pass along my kudos for a job well done!

As always, please remember to send your contest calendar submissions to me for the December issue no later than October 1st.

73, John, K1AR

ARRL September VHF QSO Party

1800Z Sat., to 0300Z Mon., Sept. 9–11

All bands, 50 MHz and up can be used for this one. Details can be found on the ARRL web site at <www.arrl.org>. It is recommended that you send for official summary and log sheets. A large SASE will get you a supply. Address your request to the ARRL VHF Party, 225 Main St., Newington, CT 06111.

Scandinavian Activity Contest

CW: Sept. 16–17 Phone: Sept. 23–24
1200Z Saturday to 1200Z Sunday

It's the world working in this 42nd Scandinavian Activity Contest (SAC). The same station may be worked on each band for QSO and multiplier credit. The prefixes used in Scandinavia are: LA, LB, LG, LJ (Norway); JW (Svalbard & Bear Is); JX (Jan Mayen); OF, OG, OH, OI (Finland), OFØ, OGØ, OHØ (Aland Is.); OJØ (Market Reef); OX (Greenland); OY (Faroe Is.); OZ (Denmark); SJ, SK, SL, SM, 7S, 8S (Sweden); and TF (Iceland).

Classes: Single operator and multi-operator single transmitter, all band only. Multi-operator must remain on the same band for at least 10 minutes (exception: A station may be worked on another band if it is a new multiplier, only). Also, QRP single operator (maximum of 10 watts output) and SWL (only SAC stations may be logged).

Bands: 3.5, 7, 14, 21, 28 MHz according to IARU band plans; 3560–3600, 3650–3700, 14060–14125, and 14300–14350 kHz should be kept free of contest activity.

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

Scoring: European stations score one point for each SAC contact. Non-Europeans score one point on 14, 21, and 28 MHz, and three points on 3.5 and 7 MHz.

Multiplier: Each call area in the above list of SAC countries worked on each band (call areas, not prefixes).

Final Score: The sum of QSO points from all bands times the sum of the multipliers worked on each band. Scoring for SWLs same as above.

Awards: Certificates to the winning station in each class, both CW and phone, in each country and each U.S.A. call area. QRP stations will be listed in one common list. The non-SAC SWL winner will be awarded a certificate. Plaques will be awarded to the top-scoring station in each continent. Depending on the number of participants, the contest committee may consider additional awards.

The usual disqualification criteria will be observed. Include a summary sheet and a dupe sheet for logs with more than 200 QSOs, and a signed declaration. Logs may also be submitted on MS-DOS diskettes in either ASCII format or the accepted ARRL contest log standard. If you send your log on disk, paper logs are not required. The summary sheet must be on paper. All disks must be clearly labeled with call, contest name, class, and date of the contest. CW and SSB portion can be on same disk. Send an SASE if you want your disk returned.

Mailing deadline for all logs is no later than October 31st. Send all entries to: SAC Contest Manager, SM3CER, Jan-Eric Rehn, Lisataet 18, SE-863 32 Sundsbruk, Sweden. E-mail logs go to: <sac@contesting.com>.

Washington State Salmon Run

1600Z Sat., to 0700Z Sun., Sept. 16–17
1600Z to 2400Z Sun., Sept. 17

This popular state QSO party is sponsored by the Western Washington DX Club and is open to amateurs worldwide on SSB and CW.

Classes: Single or Multi operator, Single transmitter. Also, entrants may operate QRP, low power (200 watts or less), or in the open category on SSB, CW, or mixed modes, and Mobile, Washington County DXpedition, and SWL. There will be a special competition among Washington State clubs in the Multi-Single category.

Exchange: RS(T) and QTH (state/province/DXCC country or Washington state county).

Scoring: Count 2 points for SSB and 4 points for CW. The multipliers are Washington counties (maximum 39) or state/provinces/DXCC countries for Washington state stations. Credit multipliers only once per mode on multiple bands. Final score is total QSO points times multiplier. A QSO with W7DX will add a 500 point bonus for each mode. A total of 1000 points may be earned in this manner.

Frequencies: CW 1850, 3550, 7045, 14050, 21050, and 28050. SSB 1850, 3925, 7260, 14280, 21380, and 28380. Mobile frequencies are 5 kHz below these recommended targets. Try CW on the half-hour; 160 meters at 0500Z; 80/75 meters at 0300Z and 0600Z.

Awards: The highest scorers in each US call area will receive a package of Pacific Northwest smoked salmon. Certificates will be available for other category winners. A participation certifi-

cate will be awarded to each log submitted (50 QSOs [US], 25 QSOs [DX], 100 QSOs [Washington State] minimum). A special award will be awarded to the highest Washington club score.

The mailing deadline for logs is October 31st. Logs can be sent to: W7DX Western Washington DX Club, P.O. Box 395, Mercer Island, WA 98040 or via e-mail to <salmonrun@wwdxc.org>. Complete rules are available at <www.wwdxc.org/salmonrun>.

Tennessee QSO Party

1800Z Sun., to 0100Z Mon., Sept. 17–18

This is a rejuvenated event sponsored by the Tennessee Contest Group. You are encouraged to give it a try. Tennessee stations may work anyone; those outside Tennessee work only Tennessee stations. Stations may be worked once per band/mode. Mobiles may be worked again if they change counties. No repeater contacts (or contacts on repeater frequencies) are allowed. Data- mode QSOs must have a licensed operator present at both stations (i.e., no "robots").

Exchange: RS(T) and Tennessee county/state/province/DXCC country.

Scoring: One point per QSO on HF phone; two on HF CW or digital modes. Two points on VHF/UHF phone and digital; four on VHF/UHF CW. Multipliers are Tennessee counties (95 maximum). Stations in Tennessee may also add US states, Canadian provinces/territories, and DXCC countries. Don't forget to count US, Canada, Alaska, and Hawaii as countries, and Tennessee, Alaska, and Hawaii as states.

Bonus points: All entrants may claim 100 bonus points for each QSO with TCG headquarters station K4TCG. Tennessee mobile operators may claim 500 bonus points for each Tennessee county from which they complete at least 10 QSOs. All bonus points are added after the geographic multiplier.

Frequencies: CW 1815, 3540, 7040, 14040, 21040, 28040. SSB 1855, 3900, 7240, 14280, 21390, 28390. Novice/Tech 3700, 7130, 21140, 28140, 28390. RTTY 3620, 7080, 14080. VHF/UHF 50.195, 144.195, 146.55, 223.50, 446.0.

Awards: Certificates will be awarded to the five highest scoring Tennessee stations in each category. Certificates will also be awarded to the highest scoring station in each US state, Canadian call area, and DXCC country. A certificate will be awarded to the first-place team entry. (The certificate will be sent to the leading entrant on the team.) TCG Headquarters Station K4TCG and the TCG itself are not eligible for awards.

Teams: A team consists of between two and five stations, with any number of operators. Teams do not need to be registered in advance, and team members do not need to be members of any radio club. Team members must indicate the name of their team on their entry. There is a separate competition for teams whose members are in Tennessee and for teams whose members are outside the state. Multi-operator stations may participate in team competition. If more than five stations in a club would like to participate in team competition, they may form more than one team. ("Podunk Radio Club Team #1," "Podunk Radio Club Team #2," etc.)

Computer logs on MS-DOS formatted floppy disks or via e-mail are encouraged. Logs must be in ASCII text format. Please be sure your callsign and mailing address are on your entry. Template files for the TRLog and NA contest programs are posted on the TCG Home Page at <http://www.k4ro.net/tcg.html>. If you don't have internet access, mail your log (or inquiries) to: Tennessee QSO Party, c/o Douglas Smith, W9WI, 1385 Old Clarksville Pike, Pleasant View, TN 37146-8098. Logs must be postmarked before November 12. Enclose a business-size SASE for results, or watch the TCG Home Page at the address above.

Panama Anniversary Contest

1200Z to 2359Z Saturday, Sept. 23

The Panama Radio Club invites all radio amateurs of the world to participate in the XXIX Anniversary Contest.

Classes: Single Operator, All Band, SSB only, 40 and 20 meters.

Exchange: RS and serial number (e.g., 59001).

Scoring: HP club members are 2 points; all other stations are 1 point. The multiplier is the total number of DXCC countries worked on all bands. Final score is total QSO points times multiplier.

Awards: A certificate of participation will be sent to all amateurs who work three or more HP stations. A plaque will be awarded to the station with the high score from each continent.

Logs must be postmarked by November 27th and sent to: Radio Club Panama, Anniversary Contest, P.O. Box 10745, Panama 4, Republic of Panama.

CQ WW RTTY Contest

0000Z Sat. to 2400Z Sun., Sept. 23–24

This is the 13th annual running of the CQ/RJ WW RTTY Contest.

Bands: All five bands, 10 through 80 meters.

Classes: Single Operator, Single and All Band, and Single-Op Assisted All Band only. Multi-Operator, Single Transmitter, all band only. There is also a High and a Low Power category. Competitors in all categories may operate the entire 48-hour contest period.

Exchange: RST, state or VE area, and *CQ* zone for stations within the 48 continental US states and 13 Canadian areas. All others send RST and *CQ* zone.

Points: One point for contacts within own country; two points for contacts outside own country but same continent; three points for contacts outside own continent.

Multiplier: One for each state (48) and VE area (13); one for each DX country (ARRL and WAE list); one for each *CQ* zone (40). All of the above on each band.

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

Awards: Plaque to the first-place winner in each operator class. Certificate to second and third place. Certificate to the first-place finisher in each DX country.

Complete rules were published in the July issue of *CQ*. The standard *CQ* log and summary sheets are recommended. Sample forms are available from CQ. Include a SASE (or IRC) with your request. All entries must be postmarked no later than December 1st. An extension may be given upon a written request. All logs should be mailed to: CQ/RJ RTTY DX Contest, 25 Newbridge Road, Hicksville, NY 11801 USA or via e-mail at <cqwwrtty@kkn.net>. Check *CQ*'s web site at <http://www.cq-amateur-radio.com/rtty.html> for more info.

Louisiana QSO Party

0000Z to 2400Z Sat., Sept. 30

This one, sponsored by the Twin City Hams ARC, will coincide with the Texas QSO Party to increase participation from operators around the world. Louisiana stations may work anyone; those outside Louisiana may work only other Louisiana stations. Stations may be worked once per band/mode. Mobiles may be worked again if they change counties.

Classes: Single Operator (QRP, low power, high power) Mixed mode, Phone only, CW only; Multi-Single (QRP, low power, high power).

Exchange: RS(T) and Louisiana parish/ARRL section/DX.

Scoring: Two points per QSO on HF phone; three on HF CW or digital modes. Multipliers are Louisiana parishes (64 maximum). Stations in Louisana credit ARRL sections as multipliers.

Frequencies: CW 50 kHz up from band edge. SSB 3960, 7260, 14260, 21360, 28360 kHz.

Computer logs are encouraged, on MS-DOS formatted floppy disks or via e-mail to <laqp@tchams.org>. Please be sure your callsign and mailing address are on your entry. If you don't have internet access, mail your log (or inquiries) to: TCHC Contest Committee, P.O. Box 1871, West Monroe, LA 71294 no later than October 31st. For more information, check out the TCHC web site at <www.tcharms.org>.

Texas QSO Party

1400Z Sat. to 0500Z Sun., Sept. 30 – Oct. 1
1400Z to 2000Z Sun., Oct. 1

This one is now sponsored by the Northwest Amateur Radio Society (NARS) and has always been a popular QSO Party. Texas stations may work anyone; those outside Texas work only other Texas stations. Stations may be worked once per band/mode. Mobiles may be worked again if they change counties. No repeater contacts (or contacts on repeater frequencies) are allowed.

Classes: Novice/Technician, Single and Multi-Op (Multi-Single and Multi-Multi), Texas Mobile Single and Multi-Op, QRP Single and Multi-Xmtr, CW only, and Club Aggregate.

Exchange: RS(T) and Texas county/state/province/DXCC country.

Scoring: Two points per QSO on HF phone; three on HF CW or digital modes. Multipliers are Texas counties (254 maximum). Stations in Texas may also add US states, Canadian provinces/territories, and DXCC countries. Don't forget to count USA, Canada, Alaska, and Hawaii as countries, and Tennessee, Alaska, and Hawaii as states.

Bonus points: All entrants may claim 100 bonus points for every 10 Texas mobiles worked per band/mode. Texas mobiles add 5000 points per every five counties covered with at least five QSOs.

Frequencies: CW—40–60 kHz up from band edge. SSB—25 kHz up from General class segments.

Computer logs are encouraged on MS-DOS formatted floppy disks or via e-mail to <K5VUU@arrl.net>. Please be sure your callsign and mailing address are on your entry. If you don't have internet access, mail your log (or inquiries) to: NARS Texas QSO Party Committee, P.O. Box 690342, Houston, TX 77269-0342 no later than October 31st. For more information, check out the NARS web site at <www.flash.net/~nars> or send an SASE to NARS directly.

Propagation

BY GEORGE JACOBS, W3ASK

The Science Of Predicting Radio Conditions

Ionosphere Salted!

For the past dozen years or so I have been carrying around my mythical bag of "*CQ* Ion Salt" to various parts of the world either historically or geographically associated with radio. The purpose of these travels has been to symbolically "salt" the ionosphere in the hopes of inducing Mother Nature to produce good DX propagation conditions during the annual CQ World-Wide DX Contest weekends each October and November.

Every year that we have "salted" the ionosphere resulted in improved propagation conditions during the WW contest periods. Even during the barren years of low sunspot count, conditions perked up during the contests. I would be the first to admit that there is no scientific reasoning to explain these coincidences, but they have happened. Perhaps Mother Nature appreciates the symbolic tribute that we pay to her!

This Year? CQ HQ!

In discussing possible places to salt the ionosphere this year, an anonymous caller suggested the *CQ* headquarters in Hicksville, New York. Who is the most responsible for the CQ WW DX Contests? And the center of *CQ*'s "power" is Hicksville. Wasn't this therefore the most logical place to pay symbolic tribute to Mother Nature this year?

The *CQ* staff thought for a few brief seconds, and we responded in unison—by gosh, he's right!

I carried my bag of mythical "*CQ* Ion Salt from Silver Spring, Maryland to *CQ* headquarters in Hicksville with the help of the US Air Shuttle. Precisely at noon on a weekday near the end of June, members of the *CQ* editorial staff and I made the perilous climb to the roof of 25 Newbridge Road. Rich, W2VU, and I unleashed the salt into the hazy atmosphere above us. The ritual has been duly recorded on film, a picture of which appears elsewhere in this column. We thus have especially high hopes for conditions for the CQ WW DX Contest this October and November!

11307 Clara Street, Silver Spring, MD 20902
e-mail: <george@gjainc.com>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for September 2000

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 7, 9, 19-20	A	A	B	C
High Normal: 4, 8, 10, 18	A	B	C	C-D
Low Normal: 3, 5-6, 13, 16-17 21-22, 24, 27-28	B	C-B	C-D	D-E
Below Normal: 1, 11-12, 15, 23, 25, 30	C	C-D	D-E	E
Disturbed: 2, 14, 26, 29	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be fair-to-poor (C-D) on Sept. 1st, poor (D) on the 2nd, fair-to-good (C-B) on the 3rd, good (B) on the 4th, fair-to-good (C-B) on the 5th and 6th, etc.

CQ WW DX Contest 2000

This year's CQ WW DX Contest will be held on the following dates:

SSB section—October 28–29
CW section—November 25–26

In this column's tradition for the past 39 years, next month's Propagation column will be devoted to a special, comprehensive forecast focusing on both weekends of the 2000 contest. Besides the usual worldwide band-opening predictions and propagation forecasts, tips also will be included for efficient operation and for maximizing scores during the contest periods. URL web addresses will also be updated for making the most of the very valuable, useful propagation data available on the internet.

We look forward to this year's mythical salting of the ionosphere to again influence Mother Nature to cast her brilliance for a strong ionosphere during the 2000 CQ WW DX Contest.

This year W3ASK (left) arrived at CQ headquarters in Hicksville, New York to "salt the ionosphere" for the CQ WW DX Contest this fall. Shown helping him with his duties in Rich, W2VU, Editor of CQ. (Photo by K2MGA)

Progress of Sunspot Cycle 23

The Royal Observatory of Belgium reports a mean sunspot number of 121 for May 2000. The daily sunspot count reached a high of 205 on May 15th. This is the second highest daily count recorded to date during Cycle 23, the highest being a count of 206 on November 10, 1999. A daily low of 50

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	10	10	10	9	8*	9	8	8	8	9**	10	10
1997	11	11	14	17	18	20	23	25	29	32	35	39
1998	44	49	53	57	59	62	65	68	70	71	73	78
1999	83	85	84	86	91	93	94	98	102	108	111	*113*
2000	*114*	*115*	*116*	*116*	*116*	*116*	*117*	*117*	*116*	*116*	*115*	*114*
2001	*114*	*114*	*113*	*113*	*112*	*112*	*111*	*110*	*109*	*108*	*107*	*106*

Predicted values appear in italics.
** May 1996 marks Cycle 23's mathematical beginning.*
*** October 1996 marks the beginning of Cycle 23 according to a consensus of scientists, which NGDC is now using. Standard deviations are not shown.*

Table I– Smoothed sunspot numbers observed for Cycle 23 from its beginning through November 1999, as well as predictions made by the National Geophysical Data Center through 2001.

was recorded on May 6th. The mean value for May results in a 12-month running smoothed sunspot number of 111 centered on November 1999. This is an increase of three from last month's smoothed number. A peak smoothed sunspot count of 116 is forecast for September 2000.

A corresponding increase was reported in the 10.7 cm solar flux level. Canada's Dominion Radio Astrophysical Observatory in Penticton, B.C., reports a monthly mean of 195 for May 2000. This results in a smoothed value of 174 centered on November 1999. A smoothed level on the order of 176 is expected during September 2000.

Cycle 23 is now believed to be at or very near to its expected peak sunspot count.

Table I is a listing of smoothed sunspot numbers observed for Cycle 23 from its beginning through November 1999, as well as predictions made by the National Geophysical Data Center, Boulder, Colorado, through 2001.

September Conditions

September and early October represent a time of transition for HF propagation conditions. On some days conditions will seem to be much the same as during the summer months, and on other days the first signs of wintertime conditions should be noticeable. For this reason this month's column contains both Short-Skip and DX Propagation Charts. The Short-Skip Charts are valid for the entire months of September and October, while the DX Charts are valid from mid-September through mid-October.

By mid-September days should be getting noticeably shorter and nights longer in the northern hemisphere. Static levels should be considerably lower and daytime absorption reduced from summer levels. This should result in a greater number of DX openings on 10, 12, 15, 17, and 20 meters during the hours of daylight, with somewhat stronger signals. Improved nighttime DX propagation conditions are expected for the 30, 40, 80, and 160 meter bands, with considerably lower static levels. A seasonal decline should be noticeable on 20 meters during the hours of darkness, but this is expected to remain a very good band for DX almost around the clock.

Another solar phenomenon that will have considerable influence on propagation conditions during this period is the autumnal, or fall, equinox. This will occur on September 22nd as the sun crosses the plane of the equator on its apparent travel from northern to southern skies. On this day the hours of daylight and darkness are equal in length throughout the world.

The effect of the autumnal equinox will be felt on HF propagation conditions from about mid-September through early October. During this period the characteristics of the ionosphere are similar over large areas of the world, and this is usually the best season for DX openings between the temperate regions of both the northern and southern hemispheres. A similar period occurs during the spring equinox, which is centered on March 21st. Equinoctial propagation conditions should produce a considerable improvement in interhemispheric DX openings, for example, from the USA to South America, to the South Pacific area and Australia, to southern Asia, and to southern Africa and Antarctica. This improvement should be noticeable on all bands 10 through 160 meters.

The best times for equinoctial-type DX openings should be the twilight periods around local sunrise and sunset, but they will occur at other times as well. Many of these interhemispheric openings may follow either the long or the short great circle path, or both, so be sure to check both directions.

VHF Ionospheric Openings

6 meters: The combination of peak solar activity, seasonally higher daytime usable frequencies, and equinoctial propagation conditions should maximize *F2*-layer DX openings on 6 meters. Openings towards the northeast and south are most likely to take place between 9 AM and noon local daytime time. From noon to approximately 4 PM expect 6 meter conditions to peak towards the Caribbean, Central America, and South America. Look for openings to the south and southwest for an hour or two before sunset. Interhemispheric openings between North America and South America, southern Africa, Australia and the southern Pacific area, and southern Asia are likely to occur as a result of equinoctial propagation conditions. The best times for such openings are when 10 meter openings are shown in the DX Propagation Charts with a rating of (4).

The summertime peak in sporadic-*E* ionization is expected to wane considerable during September. Occasional E_S ionization may still occur, permitting some short-skip openings on 6 meters between approximately 1000 and 1300 miles. Although sporadic-*E* propagation can occur at any time, the best times to check are before noon and again during the early morning.

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

September 15 - October 15, 2000
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1) 10-11 (2) 11-13 (3) 13-15 (2) 15-16 (1)	08-09 (1) 09-11 (2) 11-14 (4) 14-15 (3) 15-17 (2) 17-19 (1)	02-04 (1) 04-06 (2) 06-10 (3) 10-12 (2) 12-15 (3) 15-17 (4) 17-21 (3) 21-02 (2)	18-19 (1) 19-21 (2) 21-23 (3) 23-02 (4) 02-03 (3) 03-04 (2) 04-05 (1) 20-22 (1)* 22-01 (2)* 01-04 (1)*
Northern Europe & European CIS	09-10 (1) 10-13 (2) 13-14 (1)	08-09 (1) 09-10 (2) 10-13 (3) 13-14 (2) 14-16 (1)	03-06 (1) 06-08 (2) 08-11 (3) 11-13 (2) 13-17 (3) 17-19 (2) 19-21 (1)	18-20 (1) 20-04 (2) 04-06 (1) 21-04 (1)*
Eastern Mediter-ranean & Middle East	09-10 (1) 10-12 (2) 12-14 (1)	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (2) 16-18 (1)	07-09 (2) 09-15 (1) 15-17 (2) 17-21 (3) 21-23 (2) 23-01 (3) 01-03 (2) 03-07 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	09-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-21 (4) 21-00 (3) 00-03 (2) 03-05 (1)	20-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
Eastern & Central Africa	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2)	08-10 (1) 10-13 (2) 13-14 (3) 14-16 (4)	12-14 (1) 14-17 (2) 17-22 (3) 22-02 (2)	20-02 (1) 00-01 (1)*
Southern Africa	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 14-15 (1)	08-11 (1) 11-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (2) 08-15 (1) 15-16 (2) 16-19 (3) 19-00 (2) 00-03 (3) 03-04 (2) 04-06 (1)	19-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	09-11 (1) 19-22 (1)	08-09 (1) 09-12 (2) 12-13 (1) 20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	05-07 (1) 20-23 (1)
Southeast Asia	11-14 (1) 18-21 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-10 (2) 10-12 (1) 15-18 (1) 20-21 (1) 21-00 (2) 00-02 (1)	06-08 (1)
Far East	09-11 (1) 18-20 (1)	08-09 (1) 09-11 (2) 11-13 (1) 16-18 (1) 18-20 (2) 20-22 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-14 (1) 18-20 (1) 20-22 (2) 22-00 (1) 00-03 (2) 03-04 (1)	05-08 (1) 18-19 (1) 05-07 (1)*
South Pacific & New Zealand	09-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	08-09 (1) 09-11 (2) 11-14 (1) 14-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	12-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3) 04-08 (2) 08-10 (3) 10-12 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	10-12 (1) 14-16 (2) 17-18 (3) 18-19 (2) 19-21 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-17 (1) 17-18 (2) 18-20 (4) 20-21 (2) 21-23 (1)	07-09 (2) 09-11 (3) 11-13 (2) 13-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-02 (3) 02-04 (2) 04-07 (1)	02-04 (1) 04-06 (2) 06-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-11 (4) 11-13 (3) 13-18 (4) 18-20 (3) 20-21 (2) 21-22 (1)	03-05 (2) 05-07 (3) 07-10 (4) 10-14 (2) 14-16 (3) 16-23 (4) 23-03 (3)	19-20 (1) 20-21 (2) 21-04 (4) 04-06 (3) 06-07 (2) 07-08 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-11 (3) 11-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	10-16 (1) 16-17 (2) 17-18 (3) 18-00 (4) 00-03 (3) 03-05 (2) 05-07 (3) 07-10 (2)	21-00 (1) 00-04 (2) 04-06 (1) 01-05 (1)*
McMurdo Sound, Antarctica	15-19 (1)	11-15 (1) 15-17 (2) 17-21 (3) 21-22 (2) 22-23 (1)	16-17 (1) 17-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 07-09 (2) 09-10 (1)	23-01 (1) 01-05 (2) 05-07 (1) 04-06 (1)*

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-11 (1) 11-13 (2) 13-14 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-18 (3)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)*
Northern & Central Europe & European CIS	09-13 (1)	08-09 (1) 09-11 (2) 11-12 (3) 12-13 (2) 13-15 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-17 (3) 17-19 (2) 19-21 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-01 (1)
Eastern Mediter-ranean & Middle East	10-13 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-20 (3) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1)	20-23 (1) 21-23 (1)*
Western Africa	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-19 (3) 21-23 (3) 23-02 (2) 02-05 (1)	20-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Eastern & Central Africa	11-13 (1) 13-16 (2) 16-17 (1)	09-10 (1) 10-13 (2) 13-17 (3) 17-18 (2) 18-19 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-23 (2) 23-00 (1) 07-09 (1)	21-00 (1)
Southern Africa	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 13-15 (1)	07-09 (1) 09-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (2) 08-14 (1) 14-16 (2) 16-19 (3) 19-22 (2) 22-01 (3) 01-05 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)*
Central & South Asia	09-11 (1) 19-21 (1)	09-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	06-08 (1) 19-21 (1)
Southeast Asia	10-12 (1) 12-13 (2) 13-15 (1) 17-18 (1) 18-19 (2) 19-20 (1)	09-11 (1) 11-13 (2) 13-15 (1) 18-19 (1) 19-20 (2) 20-22 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-13 (1) 16-20 (1) 20-23 (2) 23-02 (1)	05-09 (1)
Far East	15-17 (1) 17-19 (2) 19-20 (1)	10-16 (1) 16-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-16 (1) 16-19 (2) 19-21 (1) 21-23 (2) 23-00 (3) 00-01 (2) 01-03 (1)	03-05 (1) 05-08 (2) 08-09 (1) 06-08 (1)
South Pacific & New Zealand	11-13 (1) 13-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	08-09 (1) 09-15 (2) 15-17 (3) 17-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	04-08 (2) 08-11 (3) 11-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-02 (4) 02-04 (3)	00-01 (1) 01-06 (3) 06-08 (4) 08-09 (2) 09-10 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Australasia	09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	08-09 (1) 09-11 (2) 11-15 (1) 15-16 (2) 16-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	06-08 (2) 08-11 (3) 11-13 (2) 13-16 (1) 16-18 (2) 18-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3)	02-03 (1) 01-06 (3) 05-07 (3) 07-08 (2) 08-09 (1) 05-06 (1)* 06-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-12 (3) 12-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-09 (2) 09-11 (4) 11-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-10 (4) 10-12 (3) 12-14 (2) 14-16 (3) 16-23 (4) 23-03 (3) 03-05 (2) 05-07 (3)	19-20 (1) 20-21 (2) 21-22 (3) 22-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 20-23 (1)* 23-05 (2)* 05-07 (1)*
Peru, Bolivia,	08-09 (1) 09-12 (2)	07-08 (1) 08-09 (2)	11-16 (1) 16-17 (2)	21-00 (1) 00-05 (2)

Paraguay, Brazil, Chile, Argentina, & Uruguay	12-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (2) 19-20 (1)	09-11 (3) 11-15 (2) 15-16 (3) 16-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	17-20 (3) 20-01 (4) 01-04 (3) 04-06 (2) 06-08 (3) 08-11 (2)	05-07 (1) 01-06 (1)*
McMurdo Sound, Antarctica	16-19 (1)	12-15 (1) 15-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	16-18 (1) 18-22 (2) 22-01 (3) 01-04 (2) 04-08 (1) 08-10 (2) 10-11 (1)	23-01 (1) 01-05 (2) 05-07 (1) 05-07 (1)*

Time Zone: PDT (24-Hour Time)
WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-12 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-15 (1) 22-00 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1) 23-01 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European CIS	09-11 (1)	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-17 (2) 17-18 (1) 21-23 (1)	20-21 (1) 21-22 (2) 22-23 (1) 21-22 (1)*
Eastern Mediter-ranean & Middle East	09-11 (1)	08-09 (1) 09-10 (2) 10-11 (3) 11-12 (2)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (3)	20-23 (1)

East		12-13 (1) 20-22 (1)	16-20 (1) 20-23 (2) 23-01 (1)	
Western & Central Africa	09-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	08-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	01-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-20 (4) 20-23 (3) 23-01 (2)	21-00 (1)
Eastern Africa	11-13 (1) 13-15 (2) 15-16 (1)	09-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-23 (1)	20-23 (1)
Southern Africa	09-10 (1) 10-12 (2) 12-14 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-16 (2) 16-17 (1)	01-07 (1) 07-09 (2) 09-10 (1) 12-16 (2) 16-20 (3) 20-01 (2)	19-22 (1)
Central & South Asia	09-11 (1) 17-19 (1)	08-11 (1) 16-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	02-08 (2) 08-10 (3) 10-12 (2) 12-17 (1) 17-21 (2) 21-02 (1)	06-08 (1) 19-21 (1)
Southeast Asia	09-10 (1) 10-11 (2) 11-12 (1) 16-17 (1) 17-18 (2) 18-19 (1)	07-10 (1) 10-13 (2) 13-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	03-07 (2) 07-09 (3) 09-12 (2) 12-13 (1) 21-22 (1) 22-01 (2) 01-03 (3)	01-03 (1) 03-06 (2) 06-08 (1)
Far East	15-16 (1) 16-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	09-11 (1) 14-15 (1) 15-18 (2) 18-19 (3) 19-20 (4) 20-21 (2) 21-22 (1)	04-07 (2) 07-10 (4) 10-13 (3) 13-15 (2) 15-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3)	01-03 (1) 03-07 (2) 07-08 (3) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
South Pacific & New Zealand	10-12 (1) 12-13 (2) 13-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-16 (3) 16-21 (4) 21-23 (3) 23-01 (2) 01-02 (1)	14-17 (1) 17-19 (2) 19-21 (3) 21-02 (4) 02-04 (3) 04-08 (2) 08-09 (3) 09-11 (4) 11-12 (3) 12-14 (2)	21-22 (1) 22-23 (2) 23-00 (3) 00-05 (4) 05-07 (3) 07-08 (2) 08-09 (1) 23-02 (1)* 02-06 (2)* 06-07 (1)*
Australasia	09-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-21 (2) 21-22 (1)	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-17 (3) 17-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	08-10 (4) 10-12 (3) 12-13 (2) 13-15 (1) 15-18 (2) 18-20 (1) 20-22 (2) 22-23 (3) 23-02 (4) 02-04 (3) 04-08 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-12 (3) 12-15 (4) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-09 (3) 09-11 (4) 11-13 (3) 13-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	06-07 (3) 07-09 (4) 09-11 (3) 11-14 (2) 14-16 (3) 16-23 (4) 23-02 (3) 02-06 (2)	19-20 (1) 20-21 (2) 21-22 (3) 22-04 (4) 04-05 (3) 05-06 (2) 06-08 (1) 20-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	07-08 (1) 08-09 (2) 09-12 (3) 12-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-23 (1)	09-15 (1) 15-17 (2) 17-18 (3) 18-23 (4) 23-03 (3) 03-05 (2) 05-07 (3) 07-09 (1)	21-23 (1) 23-03 (2) 03-05 (1) 00-03 (1)*
McMurdo Sound, Antarctica	14-16 (1) 16-18 (2) 18-19 (1)	10-14 (1) 14-16 (2) 16-20 (3) 20-21 (2) 21-23 (1)	08-10 (1) 15-17 (1) 17-19 (2) 19-22 (3) 22-00 (4) 00-03 (3) 03-08 (2)	22-00 (1) 00-05 (2) 05-06 (1) 03-05 (1)*

During the evening hours there are increasing possibilities for trans-equatorial (TE) type openings on 6 meters between southern locations in the US and South America. TE conditions usually peak during late September and early October, and the best time to look for such openings is between 8 and 11 PM local daylight time. While *F2* 6 meter DX openings are generally steady and quite strong, TE openings are usually weak and often are accompanied by flutter fading.

Meteors: No major meteor showers are expected during September, but three minor ones may produce sufficient ionization when they peak. They are the *delta-Aurigids,* which should peak at about 01 UT on September 1st; the *Piscids* on September 20th, and the *Sexantids* at approximately 20 UT on the 27th.

Aurora: Auroral activity often peaks during the equinoctial period. An increase in solar-flare activity during the peak of a sunspot cycle also results in an increase in radio storminess and auroral activity. The combination of peak solar activity and equinoctial conditions expected during September considerably increases the likelihood of auroral propagation on the VHF bands. VHF signals can be propagated for distances of up to 1200 miles or so by reflection from ionized patches produced by auroral activity. Aurora displays are most likely to occur during September when conditions are Below Normal or Disturbed on the HF bands. Check the Last-Minute Forecast at the beginning of this column for those days that are expected to be in these categories during the month. Check the website <http://www.spaceweather.com> for real-time Aurora Watch and Alert and Solar Flare Watch and Alert information.

73, George, W3ASK

CQ Short-Skip Propagation Chart September & October 2000 Local Daylight Savings Time At Path Mid-Point (24-Hour Time)

Band	*Distance Between Stations (miles)*			
(meters)	*50-250*	*250-750*	*750-1300*	*1300-2300*
10	Nil	10-19 (0-1)	08-10 (1)	08-09 (1-2)
			10-12 (1-2)	09-10 (1-3)
			12-14 (1-3)	10-12 (2-4)
			14-15 (1-4)	12-14 (3-4)
			15-17 (1-3)	14-15 (4)
			17-19 (1-2)	15-17 (3)
			19-22 (0-1)	17-19 (2)
				19-20 (1-2)
				20-22 (1)
15	Nil	08-10 (0-1)	08-10 (1-2)	08-09 (2)
		10-14 (0-2)	10-14 (2-4)	09-10 (2-3)
		14-15 (-03)	14-15 (3-4)	10-17 (4)
		15-17 (0-2)	15-17 (2-4)	17-20 (3)
		17-21 (0-1)	17-20 (1-3)	20-22 (2-3)
			20-22 (1-2)	22-23 (1-2)
			22-08 (0-1)	23-01 (1)
				01-08 (1-0)
20		12-14 (0-1)	08-10 (0-3)	06-08 (1-2)	06-08 (2)
		14-17 (0-2)	10-12 (0-4)	08-10 (3-4)	08-10 (4)
		17-22 (0-1)	12-14 (1-4)	10-18 (4)	10-14 (4-2)
			14-17 (2-4)	18-22 (3-4)	14-16 (4-3)
			17-18 (1-4)	22-01 (2-3)	16-22 (4)
			18-22 (1-3)	01-03 (2)	22-00 (3-4)
			22-03 (0-2)	03-06 (1)	00-01 (3)
			03-08 (0-1)		01-03 (2)
					03-06 (1-2)
40		08-10 (2-3)	08-10 (3-4)	08-10 (4-2)	08-10 (2-1)
		10-12 (3-4)	10-12 (4-3)	10-12 (3-1)	10-16 (1-0)
		12-18 (4)	12-16 (4-2)	12-16 (2-1)	16-18 (2-1)
		18-20 (3-4)	16-18 (4-3)	16-18 (3-2)	18-20 (3-2)
		20-23 (1-2)	18-20 (4)	18-20 (4-3)	20-04 (4)
		23-06 (0-1)	20-23 (2-4)	20-01 (4)	04-06 (3-4)
		06-08 (1-2)	23-01 (1-4)	01-04 (3-4)	06-08 (4-3)
			01-06 (1-3)	04-06 (3)	
			06-08 (2-3)	06-08 (3-4)	
80		07-09 (3-4)	07-09 (4-2)	07-09 (2-1)	07-09 (1-0)
		09-11 (4)	09-11 (4-1)	09-17 (1-0)	09-17 (0)
		11-19 (4-3)	11-17 (3-1)	17-19 (2-1)	17-19 (1)
		19-00 (4)	17-19 (3-2)	19-21 (3-2)	19-21 (2)
		00-05 (3-4)	19-21 (4-3)	21-22 (4-3)	21-22 (3-2)
		05-07 (2-4)	21-07 (4)	22-06 (4)	22-04 (4-3)
				06-07 (4-3)	04-06 (4-2)
					06-07 (3-1)
160		17-19 (1-0)	18-20 (1-0)	20-21 (1-0)	21-23 (1-0)
		19-21 (2-1)	20-21 (1)	21-23 (3-1)	23-03 (3-2)
		21-06 (4)	21-03 (4-3)	23-03 (3)	03-06 (1)
		06-08 (3-2)	03-06 (3-2)	03-06 (2-1)	06-08 (1-0)
		08-10 (2-1)	06-08 (2-1)	06-08 (1)	
		10-12 (1-0)	08-10 (1-0)		

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.

HAWAII September & October 2000 Openings Given in Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	06-08 (1)	05-06 (1)	11-14 (1)	18-20 (1)
	08-12 (2)	06-08 (2)	14-16 (2)	20-23 (2)
	12-14 (3)	08-12 (1)	16-18 (3)	23-00 (3)
	14-16 (2)	12-16 (2)	18-21 (4)	00-01 (2)
	16-17 (1)	16-18 (3)	21-00 (3)	01-02 (1)
		18-20 (2)	00-04 (2)	20-22 (1)*
		20-22 (1)	04-06 (3)	22-00 (2)*
			06-07 (2)	00-01 (1)*
			07-08 (1)	
Central USA	06-08 (1)	05-06 (1)	09-14 (1)	18-20 (1)
	08-11 (2)	06-08 (2)	14-16 (2)	20-22 (2)
	11-14 (4)	08-10 (1)	16-18 (3)	22-01 (3)
	14-16 (2)	10-12 (2)	18-22 (4)	01-03 (2)
	16-17 (1)	12-14 (3)	22-00 (3)	03-04 (1)
		14-16 (4)	00-04 (2)	21-22 (1)*
		16-18 (3)	04-06 (3)	22-00 (2)*
		18-20 (2)	06-09 (2)	00-02 (1)*
		20-22 (1)		
Western USA	07-09 (1)	06-07 (1)	10-15 (2)	18-19 (1)
	09-11 (2)	07-09 (2)	15-17 (3)	19-20 (2)
	11-14 (4)	09-14 (3)	17-19 (4)	20-02 (4)
	14-16 (3)	14-17 (4)	19-00 (3)	02-04 (3)
	16-18 (2)	17-19 (3)	00-02 (2)	04-05 (2)
	18-19 (1)	19-22 (2)	02-04 (1)	05-06 (1)
		22-00 (1)	04-06 (2)	21-22 (1)*
			06-08 (4)	22-23 (2)*
			08-10 (3)	23-02 (3)*
				02-03 (2)*
				03-04 (1)*

ALASKA September & October 2000 Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	18-20 (1)	16-18 (1)	14-16 (1)	08-12 (1)
	20-23 (2)	18-22 (2)	21-23 (1)	
	23-00 (1)	22-01 (3)	23-00 (2)	
		01-02 (2)	00-02 (3)	
		02-03 (1)	02-03 (2)	
			03-04 (1)	
Central USA	19-21 (1)	17-19 (1)	15-17 (1)	08-11 (1)
	21-00 (2)	19-22 (2)	21-23 (1)	11-13 (2)
	00-02 (1)	22-00 (3)	23-00 (2)	13-14 (1)
		00-02 (4)	00-04 (3)	
		02-03 (2)	04-05 (2)	
		03-04 (1)	05-07 (1)	
Western USA	20-22 (1)	18-21 (1)	16-18 (1)	08-11 (1)
	22-00 (2)	21-23 (2)	18-20 (3)	11-14 (2)
	00-02 (3)	23-02 (4)	20-00 (2)	14-16 (1)
	02-03 (2)	02-03 (3)	00-02 (3)	11-14 (1)*
	03-04 (1)	03-05 (2)	02-04 (4)	
		05-06 (1)	04-05 (3)	
			05-06 (2)	
			06-10 (1)	

See explanation in "How To Use Short-Skip Charts."

* Indicates best time for 80 meter openings. Openings on 160 mMeters 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 20 and 40 meter openings.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

a better antenna system for 40, 80, 160...***M2H.*** Wonderful fun and a great way to work new countries. Gales snapped the mast in half Sunday morning but managed to soldier on. Thanks for a great contest!... ***MMØBQI.***

Comparing our approx. 4.2 million points to the last year's score, we increased our score by 300%! Our Q's increased by 180%! Adding up 10, 15, and 20m Q's clearly shows that 70% of this year's contacts were made on the high bands, a trend that I am sure will be present in all other logs too. How good actual 10m condx were you can derive from our 10m Q's, which by the way made 35% of our this year's total Q's. To top it off we achieved DXCC on three bands, another first time record for us! To sum it up: Condx were ultra-fine-business—sunspots *are* back. Our mini-team converted the fine condx into our best score ever!!...***OE5T.*** Great contest. Got really carried away when condx turned out to be so good! Got the stack working just a few hours before the contest started (last-minute job, as usual) and it seems to have made a difference... ***OE6Z (OE6MBG).*** Absolutely great conditions. Having set a 1700 q, 120 c, and 35 z target I got a lot more than that with much more sleep involved!...***OH2RA.*** This was the best concert Paksalo Philharmonics (a.k.a. OH2U) has ever held. Huge and active audience made it a thrill our orchestra will remember for long. Not to mention the excellent acoustic environment in our global concert hall. What a blast. And just to emphasize the fact that we take live music seriously we now and then break records. This time it was a 30-year-old piece composed by OH5SM. A song that was just being played for too long. A big "thank you" to all for QSOs. P.S.: Despite the fact that encore was only demanded by ourselves we'll do it!...***OH2U.***

Conditions were very good on higher bands. The aurora was quite strong during second night. Lower bands suffered quite a lot of this phenomena. My target was to break old OH-record from 1980 (4.6M). I almost reached my target score (5M) and almost number of QSOs (3500). But I failed some multipliers. After contest I felt having made a good job. But compared conditions my target was perhaps too low. Anyway it was great fun and my first CQWW all band operation as single operator...***OH5LF.*** I've never heard so many stations on 10m! Good prop, nice contest! ...***OK1KT.*** This year Murphy was not visiting, he was almost staying with me. During the contest, or before, I have lost the following: (1) My car—broken bottom of the engine and lost all oil, etc., stuck in the remote location of our station after the contest. (2) Power supply for our old amplifier (working without hitch since 1984)—lost it in flames! (3) Control box from the low antenna, rotating by pressing the conductors with screwdriver—trying to repair but... (4) Top antenna—not repaired until 8 hours before end. (5) Bottom antenna—not repaired until 4-1/4 hours before end— i.e., *end* of contest. Concerning all the above I am happy with the result. I believe that even if everything would be okay Will DJ7AA would beat me anyway... ***OK1RI.*** Anyone complaining about sunspots should have listened to 10m during this CQ WW SSB test. PSE don't forget the QSL chore guys!...***ON4CAS.*** My very first CQWW DX SOAB. Happy for my result for 34 hrs operation. 10m was fantastic. 160m was too difficult because of the Belgian regulations (20 kHz band with 10W only)... ***ON4LCE.***

Great contest, great condx. Missed zone 26 for a sweep, but wkd zone 1 (KL7Y) thru the US pile. Amazing! ...***ON7NQ.*** Great contest! We set up more operator positions so band changes were a lot easier. However, linking the stations in a network was now a problem! Too many operators for a M/S operation, but not enough for M/M so a lot of supporters around all the time! Thanks again for a fantastic weekend! Who else can bring such an event on the air than *CQ*!...***OT9L.*** Millionaire! The story of PA1TT during the CQ WW SSB contest 1999. Starting this contest I never had the feeling that I would get more than a million points this contest. Like every year the biggest fun would be joining and giving some points away. Since the Netherlands are very crowded, it is quite a problem to gain a house with a large garden, so the lower bands are a problem and 160m is not possible at my house. In order to have some activity on 40m and 80(75)m I made some sloper antennas, which were optimized with an analyzer...***PA1TT.*** Keeping PY2NY (my husband) away from radio during best time on 10m was hard! Would like to listen more YL in contests!...***PU2VYT.*** This contest was big! Too many station in action in same time! I never see it before...***PY5TJ.*** Very best conditions! Many stations from W/VE. My personal record in CQ WW...***RA3DNC.*** This is my first CQ WW after 5 years. Many thanks to Karl and his wife Zvonka for hospitality on S52O contest location...***S52O (S52RU).***

Band was awesome the first afternoon. Had an average rate of 200-plus QSOs over the period of 6 consecutive hours. Not bad for S5 with another 20 or so countryman on the same band...***S53R.*** Great condition this year. I wish I had some monoband antenna for high bands. It was nice to run US in "Caribbean " mode...***S57S.*** Great contest and UFB propagation on 28 MHz, but it was painful to be there with only 100W because the band was crowded!...***S58J.*** I'm sorry for very short time operation but it was not a contest expedition since I was in Seychelles from 21 Oct. 1999 to 04 Nov. 1999 with my wife on honeymoon vacation. Anyway there was also a very peculiar propagation very hard to be heard with only a vertical and 60–80 watts out also with granitic hills toward north, north west. QTH at time of contest was Hotel Coco de Mer, Praslin Is. (AF-024 IOTA ref.), Seychelles...***S79AU.*** Being 17 years old, licensed since 1997, it's a really nice experience to work from a station like SK3LH. It was a wonderful contest and in a few years I hope that I will be more experienced and get even higher scores! I sure hope that the CW contest will have the same propagation!...***SK3LH (SM3WMV).*** Yes, we like M/M. We're not aiming at the king's throne. We just like to have as much fun as possible! Fellow hams believe we are crazy going M/M with two ops..hi. Skill and fun: That's ham radio...***SK6D.*** My first CQ WW. Great fun!...***SP5AWY.***

Linear failed 3 hours prior the contest started. Thank you, Mr. Murphy. I usually run 10m HP and at 23:40 UTC I decided to run in SOAB LP category with simple top band antennas. I achieved first goal—1000 QSO and second—1 meg. points. That was my great time. Once again, thank you, Mr. Murphy for the great fun!...***SP5DDJ.*** Congratulations to 9A4KK and 9A99F who also did better than old zone 15 record. At least I have T9 record...***T93Y@ T91ENS.*** We are pleased to achieve this score and we reached over previous best score for TM1C station. The young team is also pleased to reduce the difference between TM2Y and TM1C (TM2Y has only experienced contesters and DXers)...***TM1C.*** Conditions were very nice. 15m band was used from 21.100! up to 21.451+! It was very hard to have good runs in so good conditions and with such an activity. Everyone wants to be on. CQ WW contest is suffering from its success...***TM4T (F6HLC).*** This was my first semi-serious effort from new antenna farm. So it's far away from what I hope to build, enjoyed the contest very much. Local packet cluster failed to work, so used sporadic telnet sessions...***UA3AB.*** Excellent contest, super propagation on 10 meters. Pity I could not work full time because of XYL and family duties. The setup included IC751, homebrew linear—400W and A3S 3-el tribander. The best hour for me was 184 contacts. I hope CW part is going to be as good...***UA9CDC.***

I'm happy! Very good activity on 10m. Tnx for FB contest...***US8U.*** It was great! Sorry but I can't operate full time of the contest. Thanks to everyone who call me and give some points. Hope to participate in CQ WW CW soon... ***UU2JZ.*** Big thanks to contest committee for the contest. In this WW contest took part many young operators of our club station. It is first WW for all. These school boys and girls are very glad and look with big eyes to the worldwide map. All our equipment made in home and always present bad surprise for operators: UW3DI (on electronic valves, made in 1967). I think if we shall have better transceiver (TS-450, for example) then children can be QRV on all bands in all times and grow results in contests. If contest committee or anybody have an old transceiver, *Please help* school club station, young operators (champions of WW contest in future, with your help)...***UX8IXX*** *(If you can help, contact <questions@cqww.com>.—ed.).* Problems with antennas, 4 square was omnidirectional, condx were poor, worked hardly any Eus the first night. Still had more fun than on 160...***VC1A(K3BU@VE1ZZ)).*** Best conditions on 15m in MANY MANY years. What a hoot!...***VC7A(VE7SV).*** Some great runs!! Finally was able to connect with the DX Cluster thru the Telnet...***VE2CSI.***

I was very disappointed in the stations I heard asking people to spot them on DX Clusters. This is against the rules, and the CQ WW Committee should crack down on this nonsense...***VE2ZP*** *(It is against the rules of the CQ WW to spot yourself in ANY way—ed.).* FUN in a big way! Nice to have HF antennas back up. Will be interesting to see the UBN...***VE3PN.*** Superb conditions and a real thrill to work country #309 (5R8FU) barefoot with a dipole!... ***VE3ZZ.*** CQ WW DX an event you just can't miss...***VE6SV.*** Ran 100 watts and so the neighbors are still talking to me! I had a great time on 10m.Tremendous band conditions! Thanks to my wife for keeping my 1-1/2year old and 4 year old busy during the contest...***VE7GFS.*** Talk about surfing the net...try surfing 10 meters...dead calm one moment, Bonzia Pipeline the next...***VK4ICU.*** What fantastic conditions. My goals were to beat my previous best of 3.4M in 1982 and try to get over 4M! 3.99 doesn't count. I'll have to try harder next year. Hi...***VK5GN.*** First time contesting and a great experience! Thanks to *CQ* for having this kind of event...***XE2Q.*** This is our first DX international event (multi-multi) with many new members (newbies). Surely will be back next year!...***YBØZDC.*** I "hit and bounced" for few hours only, but enjoyed giving points to the others... ***YO9HP.*** I enjoy the contest but in the night the mosquitoes pileup enjoy *me*...***YV5IVB.***

I am extremely pleased to have carried out my first contest after several years as amateur radio operator, and I would like to thank YV5LIX for motivating me to participate, even though he knew how difficult it was going to be due to my working conditions, a CB radio that I modified to work on 28 MHz at 5 W, and my less than optimal antenna system. Also I would like to thank all the hams around the world that with great patience and sportsmanship made the effort to listen to my QRP signal...***YV5LVT.*** I operated from the QTH of YV5LIX, Jose; and I would like to thank him for lending me his fine contest station. This is my first contest and I am looking forward for the next year one...***YV5OHW.*** Long time didn't hear so big activity on 10m. Very good condition without QRM in the mountain as I have at the home. I like to apologize to many hams who asked me to move on other bands, which was impossible because I have antenna only for 10m...***Z31JA.***

USA QRM

It was nice to work some DX on some of the lower bands, 80 meters. Had a lot of fun and look forward to doing it again next year. I finally put up my ARRL map of the world during this contest, so I got to see where some of the rare DX was really operating from...***AA1SU.*** It was a lot of fun, but I just *have* to get the tribander back up in the air!... ***AA2AD.*** This is only our third contest. Our goal will be 2.5–3 million. We worked so hard to get ready for the contest that we both crashed and burned the second night. We completed remodeling the office/radio room just before the contest. We also worked hard to get new 40m and 80m antennas up for this year. Conditions were a lot different this year such that 40/80 were not as important as last year. The 40m wire beam was very effective. Broke lots of pileups with the C31-XR. Super antenna. Unfortunately, we only have one. We feed it with three separate feed lines so the run station and the multiplier station can share it. We haven't really got that working well just yet. All in all, a blast...***AE2F.*** Finally moved up to a real computer. TR makes it *too easy!* Thanks for a great contest...***AI2C/4.*** Only a part-time effort but still had fun. Great conditions. How do you guys do tha??...***KØEJ.*** Band conditions made this one of the most fun contests in a long time...***KØGQ.***

Who says ham radio and contesting are dying? Only open spot on 10 was 29.010 Sunday AM!... ***KØLIR.*** Working ZXØF on all bands especially on 160 where I had only six stations worked. Worked (finally) VK9LX at 2359Z Sunday for my last contact and multiplier. Turned on the radio Sunday morning after 3 hours sleep and discovered that I could not change bands with the homebrew interface I was using so I stayed on 20 until I decided to get the CT manual out to see if I could solve the problem. Blamed it on the change to EST by the computer (Hi Hi). Lesson learned: If all else fails read the "blankety blank" manual *first*. This is only the second time working a contest and getting a little better at it and liking it more. Having an understanding wife, who is also a ham, helps considerably...***K1BD.*** Since joining the fun in CQ WW SSB in 1996, I have doubled my score every year. I think it will start to get harder now to keep doing that. This year was fabulous...***K1TW.*** Nice to have 10m open once again. There was even activity above 29.100! 15m was wall-to-wall with stations...***K3IXD.*** Murphy struck as usual: Rotator on quad froze Saturday evening, and other commitments slowed down things on Sunday. Nice to see the great conditions on 10m...***K4LQ.*** Very good conditions on 10 and 15m. 10m was full of contest stations from 28.3 to 29 MHz...***K4LTA.*** Great contest. Four of our five operators were licensed together as Novices in 1969. This was our first time to finally get to operate together as a team. Two of the operators had not seen each other for 30 years! What a thrill to team up again during a contest with great propagation. Thanks for all the QSOs...***K5MR & crew.***

Very hard to leave 100+ per hour runs to search for mults...***K5RX.*** Over 600 kHz of wall-to-wall RF on 10m. It's been a long time since I've heard that much SSB operation above 29 MHz...***K5VG.*** Wow! As N5KO says, "There's no meters like 10 meters!" I installed a new Tri-Ex 54 foot crankup this summer. I had no idea how much better it would be than my old 30-footer! (You mean my new tower wasn't 100 percent responsible for the improved conditions?!) I was unable to establish any sort of a run on any band, but I was very effective at S&P, so that's what I did. 40m was very tough, and I couldn't hear anything on 80. I know what my next antenna project will be—80! The good news is that once again, nothing broke!... ***K6GT.*** Biggest thrill: working A61AJ at 0300Z. Fairly good conditions but from the NW one wouldn't know it...***K7QQ.*** This contest was a lot of fun. The first CQ WW for my friend, N6ENU, who was celebrating his new KT34XA. We can conclusively say that it works now, although the rotor may be a little tired!...***K7ZL.*** My first CQ WW. Never knew there were so many countries out there. Had a blast. Will be back next year for sure!...***KBØWHY.*** Breaking a pileup to contact South Africa late on the second day! Also, the great presence of so many DX countries!...

KCØFUD. Incredible condx on 15 and 10m! It's a lot of fun having a great team assembled for the CQ WW contests...***KC1XX.***

Extremely dry WX condx meant a high QRN level on 15m. It never dropped below S5 on my meter. How much more fun I would have had with a low noise level! Great openings into EU but never could get a JA run going... ***KC6X.*** 42 Zones, 54 DXCC entities, 123 contacts with 100W into a dipole. The bands were good. Also worked on WAS contacts...***KC7WUE.*** Surpassed my personal goals for the contest and had fun in the process. Was pleased with the conditions on 40. Howeve, the JA's seemed to be weaker this year. I wish that the EU's would listen up more often into the US band...***KD4RH.*** Can it get much better?! All contacts made in S&P mode...***KF8K.*** Our operating team keeps getting better. Very pleased with our improvements over last year's efforts...***KG6OK.*** Only casual entry. Mostly looking for new countries, of which I found about 10. Spent Sunday morning putting up a TA-33 Jr tribander. Beats the pants off my G5RV dipole at the same height, especially on 10m! Thanks to all who put up with my weak signals...***KIØLO.*** My 45 ft. vertical ant. fell down in a storm about 0400 of the first day—bummer. My wife and I got it back up about 15 hours later. I still managed to get 16 zones!...***KI5YP.*** 10m was awesome! How long has it been since one had to look above 29 MHz for a clear spot to call CQ?...***KKØSS.***

Very close race here on 10m in North America. Got the antennas up with just a couple hours before the start. Good to get KP2A back on the air again...***KP2A (KW8N).*** Needed more rest before the contest; low band mults suffered as I slept. Many things left to learn and improve but overall a very satisfying experience. Thanks to N4AF for the use of a fine station...***KS4XG@N4AF.*** My first phone contest and I loved every minute of it. I will be in a lot more contests from now on. Turned out 10m was the place to be. I should have stayed there longer. It was open to the world...***KW4DA.*** Great contest!! Really enjoy the new (shorter) callsign. I was very excited to hit the 100 country mark for the first time. Thanks DX ops...***NØRA.*** My 2W on 10m to the HB x-beam was enough to have loads of fun. I do not usually run SSB but this was a blast...***N2VPK.*** My best rate was CQing on 28.992!...***N4GN.*** I don't think I have ever heard 15m in better shape than it was on Sunday. During the 23 hr in the final minutes of the test you could hear the world!...***N4MO.*** Great conditions. Next year will have another operator, or two, and improve the LF antennas, especially the 80m 4-square which did not perform as well as it did last year...***N4TO.*** Ten being wide open to Europe and JA sure makes it more fun for a "little pistol" like me! 98% of QSOs were S&P. Almost swallowed the mic when 5X1T answered one of my rare CQs!...***N5AW.***

Thanks to all the stations who worked us in the contest. We really had a ball. Conditions were great most of the weekend. The three tribander stack was great for mults!...***N5YA.*** In memory of Bill Adams, W6BA, who became a Silent Key one hour before the contest started...***N6AW@W6KP.*** What a trip! Comments from: R1MVZ – "QRP is not allowed in this contest! 3V8BB – "You're actually moving my S-meter!" CN8WW – "Great signal for QRP; S8 on the meter!" Jim (N6IG) at PJ4B said, "You must be a masochist!" Whatever! I can't wait 'til the CW portion! The good news is that the pace was slow enough that I filled out all my QSL cards between contacts!...***N6ZS (QRP).*** No equipment failures! But we blew the primary-side fuse for the power transformer on the power pole outside the house! Off the air for about an hour on Saturday afternoon while the electric co-op replaced it. Ten meter condx will be remembered a long time...***N8NR.*** More than doubled my previous high number of contacts (all S&P). Had so much fun, decided to submit my log (first time)... ***N9QQK.*** While my score will not impress the "big guys", it is a personal best for me and the first time I have achieved the million point level. Ten meters was awesome, and it was also my first time working over 100 countries on a single band. About 99% was search and pounce. Above all, it was great fun!...***NT4D.***

Great band conditions. We were a limited multi-multi using mainly three stations most of the time with a fourth available for 40m. A thunderstorm took us off the air for a while on Saturday. We also had an electrical problem which knocked power out twice. Best food of the weekend was the BBQ ribs prepared by N5XJ...***NX5M.*** Unbelievable propo on all bands...reminiscent of late '70's. Noisy Friday night with thunderstorm moving through ...hurt on 40 and 80, but can't complain. 160m antenna evolved into great dummy load hrs into contest. Enjoyed the courtesy and fun everyone seemed to be enjoying. Worked into a personal best!...***NY5B.*** When EA8BH answered my CQ on 160, he was so loud I swore he was a bootlegger. Do only crazy people like me do a single band 160 effort in this one?...***WØETC.*** Ten meters was fantastic! The entire phone segment of the band was covered with contesters. Had to go above 29.0 MHz to find a clear spot...***W4JH.***

Lots of fun. Great conditions. After winning the USA M/S category in the ARRL DX Phone contest this year, we decided to try our first M/S in the CQ WW. It was definitely a learning experience: (1) The first lesson learned was that you need a *lot* more operators to do this category seriously. We had only one full-time op (KI7WX wins the Iron Man award) and three part timers. (2) Lesson two was that four guys connected to a local Packetcluster doesn't cut it! Why do the packet links always go down when you need them the most? (3) You must link both stations' computers together, and this always takes n+1 COM ports, where n = the number of COM ports your computer has installed. We got in 41 hours, and were actually sorry to see it end, unlike a lot of recent low rate marathons. Nothing blew up and fun was had by all, so I guess it was a success...***W4MR.*** The European QRM was so bad that I had to use the "search and pounce" method all weekend because I could not find a clear frequency!...***W4RRR.*** Nothing above 40'! We beat our W4NC score from last year by 1 M Pts! Finally, had solid runs on 10 and 15. 10 was amazing. Its operators are skilled folks and not always lots of money dumped into hardware. Congrats to W2A and nice to see W4MR jump in. Tks for the post contest cookout by my XYL, Julie...***W4WS@N4VHK.***

This was a fun contest. I worked some all- time new countries. The best part of the contest was working the station with the coolest call in the world, DX1DX!... ***W5CTV.*** Had a good time and beat last year's score. What more can you ask for? Maybe a couple of new countries next time! Thanks to all the stations that stuck with me to complete the contact. I'm antenna challenged with my multi-wire dipole hidden up on the condo roof. Most of the signal goes into the roof. It's still better than loading up the flashing on the peak of the roof. That was too scary with wood shake shingles...***W6SA.*** This was the year to see records broken on 10m. It was pure delight to hear so many parts of the world, even though nothing was heard from zones 17, 22, and 34. My rotator quit the last 1.5 hours of the contest; fortunately the antenna was pointed toward JA...***W6YA.*** Great contest! Great conditions! I purchased the Force 12 C4S in June and finally erected it the day before CQ WW. Wow! wWhat a difference a Yagi makes. DX actually returned my calls! I doubled last year's score! My highlight was breaking a pileup on HZ1AB with 40 minutes left in the contest and watching CT roll up my score (new country and new zone). It's more fun than a pin-ball machine...***W8VE.*** Couldn't generate any significant runs on 20m, but I worked a lot of countries and zones that I've never worked in this contest before. I thought I had a chance to work 39 zones (34 doesn't exist from my point of view), but could never find zones 23 and 24 on 20m...***WA7BNM/6.*** Quiet bands and good propagation helped me snag my first China contest QSO!... ***WS1A.*** Started this year's contest with the modest goal of making more than last year's 68 QSOs. Wound up with 306 and score close to 200,000; great conditions on all bands...***WT2JG.***

Station Operators
Multi-Op Single Transmitter

4K7Z: 4K5CW, 4J9RI, 4K5D. **4T4WW:** OA4AHW, OA4BHY, OA4CVT, OA4DJW, DL6NBC. **4U1VIC:** JH4RHF, OH2TA, DF6VP, DL1EFD, DL2MEH, DL2OBF, DL3KDV, DL4OCL, DL6BCF, DL9YAJ. **5H3US:** K8LEE, WD8SDL, K8MN. **5R8FU &** SMØDJZ. **6D2X:** K5TSQ, K5TR, N5KO, N5TR, W5VX, XE2XDX, XE2YNE, XE2YNS. **7AØK:** YBØAI, YBØAZ, YBØDX, YBØHD, YBØNU, YBØAVK, YBØCBI, YBØECT, YBØFMT, YBØLUC, YCØLBK, YCØLDA, YCØONE, YCØYAD, YDØFIM. **8S2F:** SM2ODB, SM2HWG, SM2LIY, SM2NOG. **9A1CMS:** 9A5TR, 9A5AVW, 9A5AHD, DAMJAN. **9A1O:** 9A2OM, 9A2TN, 9A3IQ. **9A4U:** 9A2AJ, 9A4MF. **9A7A:** 9A7V, 9A8A, 9A3TR, 9A4PA, 9A4RX, 9A6DM. **AA1ON &** W1RH. **AA5NT &** N5TVL, WJ1U, NOØT, AD4PU, KE4RHU, KC5LBE, W5GN, WD5FLK, N5NJ. **AB7RW &** KC7KQ. **AD4ES &** K9ES. **AE2F &** WR2I. **AH2R:** JG3RPL/N1BJ, JR3RVO/WX8M, JI3ERV/NH2C, KH2/JR8VSE, KH2/JR8PPG, JR7OMD/WI3O. **B4R:** BA4RC, BA4RD, BA4RE, BA4RF, BA4RX, BD5RV, BG4RUC. **B9G:** Club. **BV2B:** BV2PU, BV2NT, BV2KS, BV2KI, BV2CE, BV2WA, BV2/N2IT, BV2/JP1RIW. **BY1PK:** BA1AB, BA1OK, BA1RB, BZ1AL, BZ7SGH. **BY2JCY:** Club. **CE3AA:** Club. **CE3F:** CE3FIP, CE8ABF, CE8SFG, SM3SGP. **CE3PA:** CE3TLH, CE3PCN, CE3SOC, CE3WMS, CE3RR, CE3KW, CE3HDI, CE3TQU, CE3WDV, CE3EDW, CE3HFD, CE3JSX, CE3WE, CE3LCF, CE3CTF, CE3CB, CE3OMN. **CE4TA:** Club. **CQ9K:** CT3BD, CT3BM, CT3CD, CT3DL, CT3HF, CT3IA, CT3KN, CT3HK. **CS1A:** CT1DXQ, CT1FAC, CT2FUN, CT2FVL, CT2GDF, CT5GOJ. **CS9Z:** CT3CK, CT3EX, CT3FJ, CT3FQ, CT3HV, CT3KY. **CT1EGF &** Others.

DFØHQ: DL1AUZ, DL2SAX, DL3DXX, DL3TD, DL4ALB, DL5ANT, DL5YY, DL7VOA. **DF3CB &** DL3LBA, DL7AOS. **DHØDX:** DF8AE, DK5QN, DL1YAW. **DH1TW &** DH1SGS. **DJ2OOO:** DH6WS, DH9DP, DH2CHD. **DKØMM:** Club. **DLØBKR:** DK1WV, DH2PK, DL5WJ, DJ1ER, DJ3PY, DL6EN, DK9WQ. **DLØGL:** DL3QQ, DL2VB, DL6YFB, DF8QJ, DL1YTM, DJØRU. **DLØHNF:** DL2YEY, DL6QN. **DL6PK &** DH8PK, DJ1YH, DK5WQ, DL3SR, DL8WO. **DL8EAD &** DL9LR, DL6ECA. **DN1MA:** Marcus, Robert. **DX1DX:** DU1SAN, DU1TW, DU1AHS, DU1IHU. **DX1RN:** DU1LER, DU1PBM, DU1TLD, DU1OPV, DY1MDU, DY1PMK, DY1GSK, DY1ZXW, DY1RPS, DY1HJJ. **EA1COZ &** EA1EAG, EA1AS. **EA1EEY &** EA1DZW, EA1CS, EA1CUB, EA1BXW, EA1BVP. **EA1RCT:** EA1DLD, EA1APM, EA1AUN. **EA1URO:** Club. **EA2AAE &** EA2AWF, EA3BO, EC2AEU. **EA3AR &** EA3BHB. **EA3RKG:** EA3BOW,

EA3BOX, EA3DGQ, EA3EIO. **EA4RKU:** RCUA Contest Group. **EA4ST &** EA4ATI. **EA5AFH &** EA5FFC, EA5GMO, EA5ZI. **EA5FKX:** Others. **EA5RKL:** EA5ANQ, EA5GCT. **EA5URP:** EA5ON, EA5CLH, EA5DFV, EC5CPL. **EA8URL:** EA8BIK, EA8BVH, EA8DP, EC8APU, EA8BVX, EA8AKN, EA8NL, EC8ABT, EA8RA, EA8AQE, EA8AVR, EA8AKQ, EA8BPC. **ED1BD:** Others. **ED1CL:** EA1ACP, EA1BFZ, EA1FEL, EC1DMF. **ED1EB:** EC1ANC, EA1AAW, EA1BAW. **ED2RCA:** EA2CBY, EA2ARW, EC2AFA, EA1OZ. **ED2WW:** EA2AZ, EA2MQ, EA2SG, EA2CND, EA2CCG, EA2ATU, EC2AHS. **ED3MM:** EA3WC, EA3AJW, EA3GEP, EA3GGO, EA3GIP. **ED5WEB:** EA5WI, EA5DYY, EA5ASF. **EM4E:** UR3EZ, UR5ECW, UR5EDX, UR5EFJ, USE-699. **EN5J:** UU1JA, UU2JQ, UU4JDX, UUØJX. **ES2X:** ES2RJ, ES2QH, ES2FM, ES1MW, ES1TFT, ES2NA. **ES5Q:** ES5MC, ES5MG, ES5QA, ES5QX, ES5RN, ES5RW, ES5RY, ES5TV, ES5RAH. **EW1WC:** EU1EU, EW2DD, EW1SK. **EX9A:** EX2M, EXØM, EX8MDA.

F5KDC: F6BIF, F8CFO, F5IXG, F5OKD, F5RVV. **F5KEM:** F6JSZ, F5ICC, F-16353 + SWL Staphane. **F6KDF:** F5NOD, F5PXT, F5SIH, F6JJX, F5PYI. **F6KHK:** F5USK, F5LTT, F6HIZ, F5IUU, F5REH. **FM5BH &** FM5DN, FM5DS, FM5FJ, FM5GU. **FS/K7ZUM &** KD7BSW, KC7TWZ. **GØEYO:** MØCOK, MØCOP. **GØRAF:** G3VAC, MØCES. **G1Y:** MØAYQ KU4CG, MØCQS/NØKV, M/WAØQII. **G3B:** G4LOO, M1ACI, G4OXD, G3OLY, G8ATD, GØBVW, G4YRF, MØBIK, G4YRS, G1GSN, G4VXT, MØAJF, G8BEG, MØCKA. **G4WAC:** MØCOK, G7HOC. **GB3RS:** G4JVG, 2EØAPH, GØWAT. **HB9H:** HB9CIP, HB9BLQ, HB9FBH, HB9FAP, HB9CAT, HB9CXZ, HB9FBG. **HB9OK:** HB9FBS, HB9ODM, HB9FBL, HB9ALM, HB9DHG, HB9FAQ, HB9AGC, HB9DOS, HB9FBG, HB9PHA, HB9FBM, HB9OBI. **HB9RL:** HB9AUS, HB9BYT, HB9BYU, HB9DCM, HB9DPD, HB9FAW, HB9FBO, HB9OBQ, HB9YC, HE9EEX. **HI9/DK8YY &** Others. **HSØAC:** HSØ/G3NOM, HS1CKC, HSØGBI, HS6NDK, HSØ/JA4RWN, E21EIC, E21CJN, E2ØNVH, E2ØREX, JAØQZ. **II1R:** I1NVU, IK1CLP, IK1LWL, IK1QBT. **II2Y:** IK2OWX, IK2PTR, IK2PIH, IK4MED, IK4GRF, I2MWZ. **II4I:** IK4CIE, IK4CNO, IK4HAL, IK4MTK, IK4QJF, IK4XQM. **IK1SLE &** IZ1BPR, IK1RLI. **IK1SLP &** IK1YLL. **IO2A:** IK2HKT, I2IFT, IK2CIO, IK2ANI, IK2RZP, IK2XRW, IK2XSL, IK2YCN, IK2WZV. **IO2L:** I2OKW, IZ2ACZ, IK2YXP, IK2YYE, IK2XYU/KF6EEZ, IW2HAJ. **IO8O:** Club. **IQ2X:** IK2GZU, IK2GSN, IK2SAU, IK2CZQ, IK2BCP, IK2EAD, IW2LLH. **IQ4A:** I4EAT, I4EWH, I4IKW, I4IND, I4TJE, IK4DCT, IK4EWK, IK4MGP, IK4SDY, IK4XQH, IZ4BOY. **IQ5B:** I5JVA, I5VXG. **IQ9K:** IT9KWF, IT9EWG, IT9CYH, IT9CUP. **IR2S:** IZ1ASN, IK1IXF, IK1UVQ, IZ1BZV, I1ANP, IK1LRX, IK1LBW, IW1PDP. **IR3P:** IV3TDM, IV3JVJ, IV3BVK, IV3SCR, IV3FHH, IV3BKC, IV3ZAC, IV3MUC, IV3ORB, IV3WWF, IV3WZG, IV3IHF. **IT9FXY &** IT9GNG, IT9HBT, IT9WKH, IT9ECQ. **IU2C:** Club. **IZØBEE &** IZØCGP, IZØCSO, IKØZYI, IKØZYJ. **J6J:** J68WX/W4WX, J68WB/N2WB, J68AZ/W9AAZ. **JA1YFG:** JQ1BRW, 7M4DPF. **JA3YPL/2:** JA3ESQ, JJ3TBB.

JA6ZLI: JG6POJ, JI6XJG, JO6JRP, JJ6WYS. **JA7YAA:** Takeuchi, Nakagawa, 7M1JAS, JM1QPR, JG7PSJ, JHØNZN, JHØORW, JE7HLZ. **JA8YBY:** LZ2SAF, 7K2CWQ. **JA9YBA:** H.Nada, JR9QNJ, JFØEGG, N.Sugimoto. **JE4VVM &** JG4CLV, JN4FEU. **JE6ZIH:** JR6GKT, JF6DEA, JI6BRB. **JF6ZPH:** JG6KZH, JH6QIL, JK6SEW, JM6CIP, JP6EGZ. **JH7PKU &** JA9SSY, JF2IWL, JO1BMV, JR5KDR. **JI2ZEY:** JA2BY, JA2BIV, JA2BIL, JM2CCL, JQ2BBC. **JI2ZJS:** JA2AXB, JA2JSF, JA2XCR, JE2HCJ, JG2TSL, JH2MYN, JH2UVL, JR2XOM, JM2RUV. **JJ3YBB:** JA3PJL, JA3FHL, JJ3FQF, JA3OOK, JF3MOK, JF3RLG, JS3VEX. **JM1ZTI:** JJ1SDF, JA7FYF. **JW5E:** JW5NM, LA7FD, LA7QIA. **KØGQ:** KØOU, KBØRTH. **KØLIR:** KI9A, KIØMB. **K1GW &** KB1T. **K1NU &** K1OA. **K1YR &** K1RU. **K1ZO &** N1KWF, WA1ZYX, WK1P. **K2OWE &** KG2MY. **K2SB &** W2OF. **K2UA &** N2MG, K2AXX, KB2VGH. **K2XR &** AB2BK, K2OWR, N2YFH, VE3XAP. **K3BSA:** K3JLK, WB3BSA. **K3DI &** W3ICM. **K4HA &** NX9T. **K4ISV &** K4CMS, K4UVH, K4CM, NN4T, K4CN. **K4RC:** K4MU, W4MGL, KA4VGF, W4NYY. **K5MR &** N5RZ, K5NZ, K6NR, K5OT. **K6KR/7 &** K7LXC. **K6LY &** N6CY, WC6DX, K7KX. **K6ZM:** K6WG, WA6O. **K7ZL &** N6ENU. **K8AZ &** K8NZ, W8BIN, W8KIC, W8WWV, WB8K, WT8C, W1MD. **K8CC &** K8GT, N8VW, W8MJ, WD8S. **K9IU:** N9NI, KA9OKT, N2VQD. **K9NR:** Others. **KCØCWU &** KIØMI, KCØCZG, KCØCZH, KBØHNR. **KC7V &** AA7A, KN7Y, K7XN, K7SP. **KD8SQ &** KA8YNW, KC8MRP. **KD9ST &** KA9SQR, KA9SQS, KB9EXE. **KE2HG &** N3QDC, KB2DDM. **KG4CM:** N1WON, KG4AU/WV3N. **KG6OK &** N6PEQ, N6HC, W1HIJ, AA6PW, KQ6ES, KJ6ZH, KI6X. **KKØSS &** KCØDQ, NØNB. **KK5CA &** KD5GUY. **KL7Y &** WA2GO, WL7E, KL9A, KL7FH, AL7PJ. **KP2D:** NP2Q, NP2DJ. **KR4TG &** KF4DZV, KF4SMT. **KU4RG &** KF4OKG.

LA8W: LA4DCA, LA5KO, LA8SDA, LA9EEA, LA9HW, LA9SEA. **LT5Y:** LU1YAG, LU1YU, LU2YAX. **LU1NF:** LU1NDC, LU8NA, LU1NAF, LU7NN, LU4NAZ, Otto, Tom. **LX2LX &** LX1NO. **LX9SW:** Others. **LY2OM &** LY2BUU. **LY2ZZ:** LY3MM, LY3BY, LY2PAJ. **LY3MR:** LY2BIL, LY2BKF, LY3NFW. **LZ2K:** LZ2JE, LZ2MP, LZ2NP, LZ2VL, LZ2YO, LZ4AE, LZ4UG. **M1P:** G3GAF, G3UHU, G4PWA, G4TNB. **M2G:** GØUZF, GØUCS, GØLRE, G1AHM, GØWTD, G4TZR, G3ZRE. **M2H:** G3MXH, GØREP, MØAIZ. **M4T:** GØVQR, GØLHZ, G4ELY, GØOPB, MØCRK, 2U1EJF, G7UET, G7WGE. **M5W:** G7UGC, G8WJY, MØCOP. **MUØBKA:** K4ZLE/MUØBKA, 5B4WN/GØWWW, G4ZFE. **NØIJ &** AAØBY, AF9T, WJØM, WØTVD. **N1AO &** KT1O, W1SDR. **N1AU &** WC1D. **N1LN/5 &** K7LEX, K5UO, WDØBCE, WA5MLT. **N1WK &** N1RSX. **N2LBR &** WA1KKM. **N2NU &** K2WI, AA5B, W2REH, WW2Y, N3RU. **N2SS &** N2MT. **N4TO &** K1TO, K1KNQ. **N5KB &** KK7JS. **N5YA &** K8IT, N5KR, N5JB, N5WD, NN5T, K5WO, W5KNE, KM5UB, WB5TVI, W5IUA, KB5SSV. **N8NR &** N8BJQ, N9AG, NR8Z, WB9CIF. **NE3F &** K3ATO, KS3F, NT3V. **NK1K/9 &** KX9X, NO9Z. **NK7U &** K7ZO, KK7A, W7ZRC, K7MK, WS7I, N7BZ. **NP2B &** W4OV, KU4GY, WD4JNS. **OE1W:** OE1AKB, OE1JJB, OE1SHS, OE1TOS, OE1WIU, OE3KCC, OE4JHW, OE4MXB. **OE5T:** OE5OHO, OE3GEA, OE5MKM, OE5VBL, OE5MRP. **OH1F:** OH1EH, OH1MDR, OH1MM, OH1NOA. **OH2BA:** OH3RM, OH3WW. **OH6KSR &** ex-ON6NU. **OH7M:** OH4KBC, OH4XX, OH6LNI, OH7KD, OH7KIR, OH7MHL, OH7MS. **OK1KIR:** OK1AWH, OK1FED, OK1IMC, OK1IPN, OK1PG. **OK5W:** OK1AEZ, OK1CF, OK1WF, OK1FKD, OK1DDO, OK1JR, OK1TA, OK1TN, OK1JKT. **OL2A:** OK2PDK, OK2HBY, OK2PEM. **OL5Q:** OK1HRA, OK1FLC, OK1FFU, OK1INC, OK1VSL, OK1XDF. **OM3A:** OM3DX, OM3CGN, OM8AM, OM8AU, OM8AW, OM8DM, OMØWR. **OM5M:** OM1KM, OM2KI, OM2KW, OM3BH, OM3EI, OM3RG, OM6NM. **OM7M:** OM3PA, OM5RW, OM5RM, OM5ZW. **OM8A:** OM2RA, OM2VL, OM3CW, OM3EA, OM3GI, OM3JW, OM3NA, OM3LU, OM3RM. **ON6DP &** ON4KGP, ON4LFB, ON5PO, ON7RN, ON1LMR, ON1MFA, ON1MFC.

OR5EU: DF3TJ, ON5GA. **OT9C:** ON4ACA, ON4AJZ, ON4ALT, ON4AMI, ON6MR, ON7UN, Dirk. **OT9K:** ON4ON, ON4BCJ, ON4CBV, ON6CX, ON6HH, ON1DI, ON9CCB, ONL-39Ø8, ONL-4531. **OT9L:** ON4AEK, ON4AHF, ON4AKL, ON4ATW, ON4BR, ON4CAF, ON4CEP, ON4CJH, ON4CFZ, ON5UM, ON6NL, ON6ZX, ON1AFN, ON1DLL, ON1DMO, ON1DNN. **OZ9KY:** OZ1AA, OZ9AAR, OZ1EEZ. **P3A:** RA9JX, 5B4LP, RZ3TX, UA9YAB, RVØAR, EU1AA. **P39P:** Constantinos Neophytou, Constantinos Demetriades, Vassilis Erotokritou, Demetris Spanias, Antonis Karaolis, Christakis Zapitis, George Georgiades, Michalis Kapsos. **PA7MM &** PA1XA, PA3AAV, PA7MH, PAØCOR, PE9DX. **PI4CC:** PA3ALK, PA3BAG, PA3BSQ, PA3EPD, PA4LA, PBØAIU, Gerard. **PI4TIL:** Club. **PI4WAL:** Club. **PI4ZLD:** PA5KT, NL8884. **PJ2C:** N4OKX, N6HR, W8KKF, WA8LOW, K8RF, W9EFL, WØCG. **PT2CM:** PT2BAT, PT2QX, PT2LEL, PU2AOV, Nell, Vivian, Paulo, Lulu. **PW5D:** PY5AWB, PY5DZ, PY5ROS. **RA3AA &** RA3AA/W3UA, RN3AC. **RF9C:** RZ9CO, RA9CMO, RA9CKQ, UA9FQY. **RK3AWB:** RW6HJV/3, Anna Radina, Wlad Sinitzyn. **RK3AWE:** RA3FF, RA3DKE, RU3DGD, RK3FM, RK3FT. **RK3QWM:** RA3QH, RA3OU, UA3QJJ. **RK3YYM:** RW3YW, UA3YFA, RA3YK. **RK4FWX:** RK4FB, RW4FO, UA4FAR, UA4FCV, UA4FMV, UA4FPS. **RK4HWZ:** RA4HBC, UA4HAD, RW4HBZ. **RK4HYT:** RA4HBS, RX4HB, RA4HTN, RW4HMI. **RK4WWA:** UA4WA, RW4WA, UA4WAN, UA4WKK. **RK9CYA:** RK9CR, RV9CPQ. **RK9CZO:** RX9CAZ, RZ9CX, RA9CDH, Rjamov K. **RK9JWJ:** UA9JMA, UA9JPK, UA9JLZ. **RK9JWV:** RA9JP, RV9JK, RA9JM, RV9JC, UA9JEP. **RK9TWA:** RV9SV, RW9TA. **RM6A:** RN6BN, RA6CM, RA6CO, RA6AX, RX6BA, RU6CZ, UA6AAY, RA6YY, RU6AB. **RU1A:** RV1AW, RW1AC, RA1ARJ, UA1ACC. **RW4LYL:** Club. **RX3RXX:** UA3RAR, UA3RJ, UA3RA, RA3RFA, UA3RV. **RZ1AWO:** Mikhail Fedorov (R1A-15), Vitaly Vasil'ev (R1A-14). **RZ4PZL:** UA4PMG, UA4PNP, UA4PNT.

S51NM & S52OP, S52SK, S57XZ, S51MA, S53DS. **S59SLO:** S51PP, S57ODX. **SK3W:** LY2IJ, SM3EVR, SM5IMO, SMØOEK, SMØRUX. **SK7AX:** SM7HCW, SM7TOG, SM7TZK. **SL7BZ:** SM7TUG, SM7TKL, SM7VHS. **SNØKAO:** SP9LAS, SQ9FCH, SQ9FCQ. **SN2B:** SOØWDX, SP2FAX, SP2JKC, SP2WKB, SP5DRH, SP8RX/ DJØIF. **SN6U:** SP6NVK, SP6OPE. **SP3KPN:** SP3SFN, SQ3EPX, SQ3GOU. **SP9KDU:** SP9AVZ, SQ9DXO, SQ9FMU. **SP9KGG:** SP9IKN, SQ9DDH. **SP9KJU:** SP9MDY, SP67510. **SP9PRO:** SP9IJU, SP9PT, SP9QMP, SP9QZT, SP9-3021. **SV1AFA:** SV1CIB, SV1CDN, SV1DPJ, SV1DPI, SV1DPX, SV1CID, SV1DPL, SV1ETM, SV1ETN, SV1SN, SV1UK, SV1CIF, SV1DPF, SV1ETK, SV1CQR, SV1CIE, SV1ETL, SV1DPP, SV1CQK, SV1CQY, SV1DHU. **T88WX:** JA1WSX, JA7AYE, JH4OWG. **T91CMN:** T94NR, T95MEH, T95MEQ, T95DXT. **TA2KB:** TA2DS, TA2YA, TA2BB, TA2BV, TA2NC, TA2ND, TA2CFO. **TF3IRA:** TF3AO, TF3GB, TF3HP, TF3MLT, TF3RJT, TF3WOT, TF3VGT. **TI5EBU:** TI5KD, JA6WFM, JM6EBU, JM6UAA. **TM1T:** F6CQU, F8BPN, F6HKA, F5PSA, F6BHI, F5PHV, F1MCO, F5NBX, F1OKU, F1EZC. **TM1C:** F5ITK, F5LND, F5NGA, F5PSG, F6CTT, F8AKS. **TM1V:** FB1BON, F5TRO, F5SVO, F6CCH, F4BHZ, F4CIY. **TM1W:** Club. **TM2Y:** F6BEE, F6ARC, F6FGZ, F6FVY, F5NLY, F5SNJ, F5VCO. **TM5KP:** Pigouche, Baude. **TM5LO:** F8CMZ, F8BXI, F5CCX. **TM8A:** F5RXL, F5OZF, F6EXV, F5SSG, F2VX. **TM8F:** F6BNH, F6BGC, F8CMF, F6FNL, F5UAM, F4BGO, F4CFR, F1ADG, F5DJL, F5BPQ. **UA7A:** RU9AN, RU9AZ, RW9MG, RZ9AZ, UA9AJ, UA9AR, UA9BA, UN4L. **UN5G:** UA3AWG, WØAIH. **UPØL:** UN9LW, UN7LAN, UN9LO. **UR4MWU:** URØMM, UR4MEU, UR4MT. **US8U:** UT5UUF, UT5UDG, UT5UPN, US-U-Ø94. **UT3IZZ:** US3IRX, US3IVN, US-i-375. **UT4UWL:** Club. **UT7Z:** UR5ZMH, UR7GG, UR7ZZ, UTØZZ, UT4ZO, UYØZG. **UU7J:** UU4JMG, UU8JK, UU4JDD, UUØJM, UUØJX, ANDY STRAKHOV. **UX8IXX:** UX8IX, US8IBS, US8ICA, US-I-696, Lina, Sergey, Ivan, Alex, Wasily, Nasty.

V73AX: V73A, V73AT, V73BN, V73CW, V73TV, V73UX, V73ZZ. **VA2RHJ:** VE3RHJ, VA3RHJ. **VA3SK &** VE3ZN, VA3MW, VA3PC, VA3JAK. **VE2CMH:** VE2TPE, VE2FAL, VE2KV, VA2MP. **VE2CQ:** VE2NZR, VE2GDA, VE3KDC, VE2KCB, VE2SVP, VE2TDX, VE2ETR, VE2MIG, VA2DAX. **VE2CSI:** K1EU, K1JB, K1MV. **VE3DC:** VE3SS, VE3BK, VE3OCY, VE3VMO, VE3AHQ, VE3OZO, VE3OCD, VE3FBO. **VE3EJ &** VA3UZ, VE3XN, VE7ZO. **VE3HG &** VA3GGF, VE3HKC. **VE5DX &** VE5CPU, VE5TP, VE5SF, VE5RC, VE5ZG, VE5SJA. **VE5RI:** VE5CMA, VE5FD, VE5FF, VE5FN, VE5WI, VE6BBP, VE6EZ, VE6FW VE6REE. **VE6AO:** VE6BIR, VE6NJK, VE6TC, VE6WSI, VE6KC, VE6RSX, VE6UUG, VE6WTD. **VE6JY &** VE6WQ, VE2QV, VE6FU, VE6JO, VE6SLV, VE6MAA. **VE6SV &** VE6AKY, VE6BAB, VE6EPK, VE6MRT, VE6NAP, VE6VW, VE7NS, VO1CV. **VK4IU &** VK4MZ. **VK4UC &** VK4EMM. **VK6ANC:** VK6APK, VK6NE, VK6NU. **VO2CQ:** VO1MP, VE3FU, VO1MX. **VP2MCS:** DL5NAM, DL9NDS, DL7NFK. **VP5DX:** N4KE, K4EB, NU4Y. **VP5R:** NØAT, NØKK, N5QQ, W5WW. **VU2PAI &** VU3DMP. **W1BK &** W1NR. **W1CC &** N1BSO.

W2A: W2XX, N2TX, KE2TR, N2DVQ, KD2TT, AA2MF. **W2CG &** W2NO, K2WJ. **W2GSB:** N2UHR, KC2FBV. **W2LC &** K1PY. **W2RD &** N2VM. **W2UP/3 &** KC3NE. **W3DXR:** K3UOC, K3USC, Molly the Pumpkin. **W3MF &** K3PH. **W4CAT:** W9WI, W4KH, K4BEV, K1KY, N4PQV, KQ6ID, KD4VVA, KF4PPA, KF4OAH, KE4JUH, KØEDG. **W4MR:** AA4NC, KI7WX, N4CW, K4MA. **W4PRO &** KO4MR. **W4WS:** N4VHK, NØKTY, WA4IAM, WB4MSG, WB4KQN, KD4RGB, KT4KV, K4HQ, KC4WSK, K4BLR. **W5YM:** KB5WPM, KB5ZYC, KC5LDC, KD5GNB, AH2AK, N5DX, AC5RR. **W6EEN &** K6XC, K6LA, W6ORD. **W6II &** KR6RR, AA6W. **W6XR/2 &** N2AU, KC2EAL. **W6YX:** N6DE, W6KNS, W6LD, N7MH. **W7IG &** KA7AGH, W7BJB, N7HA, N7LF, KC7Q, W7SIR, N7TL. **W7JQ:** N7HT, KC7BBO, W6QJI. **W7PXL:** Club. **W9UR &** K4WW, K4YAT, KD4ULW. **WA1RR:** KB1LN, KA1VMG, N1HRA. **WB2KHO &** KB2NOW. **WU3M &** N3MKZ. **XE1X:** XE1NVX, XE1D, XE1AE. **XE2/N7RK &** N7IX, N7MB, NE9Z, NA7DB. **YL4U:** YL2KL, YL3DW. **YN2EJG:** W5GCX, K5LBU. **YO9KPD:** YO9GJX, YO9JIM. **YP3A:** YO3ND, YO3GJC, YO3FWC. **YU7AJM:** Stan, Ivan, YT7XT, YU7YZ, 4N7TA, 4N7NN. **YZ7A:** YU7KC, 4N7CC, Fero, Lacy, Tibi, Zola, Zoltan, Ace, Pete. **YZ9M:** YU7KW, YU7NU. **ZA/S57AW &** S51F. **ZC4ATC:** ZC4GB, ZC4AW, ZC4MP, ZC4OS, ZC4FL, ZC4CM. **ZL6QH:** ZL2AOV, ZL2UO, ZL2TT. ZL2AMI, ZL2CA, ZL2BBJ, ZL1ZXG. **ZV5V:** PP5VB, PP5LL.

Station Operators Multi-Op Multi-Transmitter

AB2DE: N2KPB, KB2YJT, KC2DZY, N2ZAS, KC2AVE, KB2IZB, KC2DLD. **B1Z:** BA1DU, BA1GYS, BA1HAM, BA1KA, BA1MK, BA1MT, BA1TU, BD1CC, BD1CU. **CN8WW:** DJ5IW, DK2OY, DK5WL, DK6WL, DK7YY, DL1MFL, DL2NBU, DL4MCF, DL6FBL, DL6RAI, DL8OH, DL8WPX, DL9NEI, OE2LCM, OE2MON, OE2VEL. **CV1T:** CX2TG, CX2TL, CX1TM, CX2TG, CX7TK, CX5TV, CX3TI, CX1TU, CX2TQ, CX3TQ, CX1VF. **DX1DBT:** DU1MHX, DU1JXP, DU1RYN, DU1RYJ, DU1RYK, DU1RYL, Arem, Chrisitan, Carlo, Sean, Cholo, Joel, Dervin, Opel, Biboy, Paolo, Angelo, JC, Ton. **EA4ML:** EA2TV, EA4CT, EA4ET, EA4TX, EA5RM, EA5OW ,EA5XX, EA7JB, EA4KA, EB4EPJ, EB4AKI. **EA9EA:** EA1AK, EA2CLU, EA4KD, EA4KK, EA4KR, EA7GTF, EA7KW, EA7TL, EA9AI, EA9AZ, EA9KB. **ED7VG:** EA7HY, EA7ATX ,EA7CCA, EA7EZQ, EA7GNC, EA7CCN. **GM7V:** GM3WOJ, GM4YXI, GMØNAI, GMØGAV, GWØGEI. **HBØ/DK7ZL &** DF7EME, DL2FP, DH1MFF, DL1TS, DF7ZS. **HBØ/HB9AON:** DF1JC, DF5UL, DJ2YE (HB9AON), DL8DAW, DL8EAQ. **HG6N:** HA3OV, HA3NU, HA6DX, HA6OY, HA6OB, HA6OI, HA6ND, HA6NF, HA6NL, HA6NY, HA6PX, YO5BRZ. **IG9A:** I4UFH, IV3TAN, I2EOW, IK4UPB, I4AVG, IT9EQO, 9A6A, I4JMY, I2VXJ, IK4MTF, IK2QEI, IT9GSF, IV3TRK, IK2SGC, IK2SFZ, I4VEQ, IK2JUB, IK2NCJ, IT9STG, IV3YYK, SV8CS, I4KLY, IT9LFR, IT9QQP, IT9SGN. **IH9P:** IT9BLB, IT9VDQ, IT9ZGY, IT9WPO, I8QLS, IK8ETA, W1NA, K7FL, KR7X, WA7EQW, OK1FUA, ZS6EZ, ZS6NW. **IK3OII &** IK3ORD. **IQ3X:** IV3SKB, IV3HAX.

J3A: DL8OBQ, K1FTA, K1EP, K2BHX, K2DO, K2KQ, N2GA, N9KAU/2, W1WFZ, WO9Z. **J6R:** K3LP, K3UG, K7KL, N3NT, J69AZ. **JA1YPA:** JA1PEJ, JF1KOB, JH1AZO, JH1FDP, JH6VLF, JI1XVE, JM1NKT, JO1CRA, JP1OGL. **JA3ZOH:** JH3PRR, JE3MAS, JG3KIV, JI3OPA, JH4NMT, JF4FUF, JR4ISF. **JA5BJC &** JA5FDJ, JA5JCC, JH5FXP, JH5RXS, JR5JAQ, JR5VHU, JM1UWB, JS1OYN. **JA6ZPR:** JH6JSR, JH6SQI, JR6CKX, JR6HVE, JE6EKC, JI6MYW. **JA7YFB:** Takuma Ishii,Shinntarou Hase,Yoshiyuki Okada. **JA7YRR:** JA7AUM, JATCXV, JA7FDY, JA7MQM, JA7MSQ, JA7OZW, JH7MEX, JH7VHZ, JR7BPM, JR7LVA, JI7HAV, JM7VFK, JJ1XGF, JQ1NBV. **JN1YUU:** Saori Shizu, Chisa Nanbu, Shizuka Hirashima, Ayumi Miyazaki, Chie Hirose, Yuki Mutou, Mayumi Kikuchi, Mami Hirose, Tomoyo Okami, Youki Inokura, Haruna Tabuse *(All YLs age 11-13!—ed.)*. **KØUE &** KEØMF, KBØNUY. **K1KI &** KM1P, N1IXF, W1RM. **K1RX &** K1EPJ, KF1V, WC1M, KR1G, W3SM, AA1SI, KA1UQ, WB1GEX. **K1TTT &** K1MK, NJ1F, KB1W, K2WR, KC2FEE/RA9USU. **K1XM &** W1KM, NB1B, N1TB, N1ZE, K1HI, WA1QGC, AA1IZ. **K2RD/1 &** W1CU, WA1FCN, K2SX. **K3ANS &** W3ZL, WB2K, K3YD, KC2ZA, KC3WX, N3VJA, K3ZTJ. **K3II &** K3TEJ. **K3LR &** N3RA, KØRF, ND8L, K8GL, K9VV, W8JV, N9RV, W4AN, NI3S, K3UA, WØUA, KA3JWJ, XE2AC. **K4WPM &** K4WZ, AK5E, K4QFF, KS4CG. **K5KG &** NA2U. **K9NS:** AA9D, K9DX, K9GS, K9HMB, K9JY, K9PW, K9RS, KS9U, KS9W, W9RM, W9XT, WV9T. **KB1H &** AA1CE, KB1DFB, N1XS, NB1U, WM1K, K1EBY, N1LYA, N1BU. **KB1SO &** W1GQ, K1ZR, KW1DX, K2TE. **KB1ZQ/1 &** N1LPN, N5VWF. **KB8QO &** KC8JMX, KC8LBH. **KC1XX &** K1GQ, K1EA, KC1F, W1FV, AD1C, N1RR, DL7ALM, KB1AWE, KM3T, K6AW, Christine. **KH7R &** KH6ND, AH6OZ, K9PG, WE9V, K9NW, KA9FOX, K9QQ, KH7U, NH6XO, ND3A, NL7Z. **KL7RA &** AL7AF, AL7IF, AL7MU, KL7TC, KL7XD, NL7V, NL7Y. **KV1W &** W1CSM, N6RFM, K1MBO, K1HT.

LU4FM: LU1FAM, LU1FGE, LU1FGZ, LU1FI, LU1FZR, LU2FA, LU2FFD, LU2FT, LU2FYU, LU2JCW, LU3FCK, LU3FP, LU3FR, LU4FA, LU4FAC, LU4FPZ, LU5FA, LU5FGG, LU6FA, LU6FEC, LU6FFQ, LU6FUQ, LU6FWM, LU8FCM, LU8FPT, LU8FQQ. **LX/DF6QC &** DL1ELY, DL4ABR, DL5XAT, DL5XL. **LY7A:** LY2BMX, LY2BUE, LY2KZ, LY2NK, LY2OC, LY2UF, LY3DA, LY3HD, LY3IT, LY3RJ, LY4AA, LYB26, LYR346, LYR728, A.Toleikis. **M6T:** G4BAH, G4IFB, G3XTT, G3WGN, OH6YF, G4VMM, GØCYB, G4BUO, G4TSH, G4PIQ, GØMTN, G4BWP, GØKRL, GØAEV, GØWCW, GØAFH, G7OCD. **NØAX/7 &** KD7BUQ, KD7DQO, KD7FWQ, KD7FYX. **N2BIM &** K2BM. **N2MM &** KD2P, K2UT, N3EA, NO2R, K2PS. **N2RM &** K2TW, K2WK, K4WMS, N2AA, N2NC, N2NT, N7BG, W2RQ, WM2H. **N3RS &** N3RD, N2SR, N3ZS. **N6AW &** W6KP, AD6DO, N6RT, W6KK, K6HMS, K6AM, W6HT, N6WS, W6TK, N6KI, W6RW. **NM4T &** K4NO, KA9EKJ, W4HFZ. **NQ4I &** K4KYO, N1CC, K4BAI, KS4Q, WA4ILO, W4DD, K4SB, AA4LR, W4WA, AA4GA, NA8V, K4PI, AC4S. **NX5M &** K8EP, N5XJ, N4GCA, W5MN, AC5GH, KS5J, KM5ET. **OH2U:** OH2LUR/ES2RR, OH2XX, OH4YR, OH4JFN, OH6CT, OH6EI, OH7BX, OH7JR, OH8KXK. **OK1KQH:** Club. **OL7W:** OK1DUT, OK1FDR, OK1HPW, OK1VBA, OK1FUT. **OT9A:** DF3TJ, DJ4AX, DJ7EO, OH2JA, ON1AEI, ON1AWB, ON1CIM, ON1CKE, ON1DEL, ON1DIB, ON1DJU, ON1DLJ, ON1DQK, ON1DQZ, ON1DRA, ON1GL, ON2BIL, ON4ALW, ON4AMX, ON4ASW, ON4AVM, ON4AWH, ON4AWJ, ON4AWU, ON4BAG, ON4BCB, ON4CAT, ON4CCE, ON4CCL, ON4CDC, ON4CDE, ON4CGJ, ON4CGP, ON4CGS, ON4CHO, ON4CJN, ON4CJQ, ON4CKH, ON4DB, ON4FG, ON4FI, ON5AI, ON5CD, ON5DH, ON5OT, ON5RW, ON5WL, ON6HP, ON6HZ, ON6PU, ON6RW, ON7HV, ON7NB, ON7VU, ON7YZ, ON8IC, ON9CFB, ONL1Ø116, ONL1Ø277, ONL8764, PA3EZL, PA3GEO, PA7BT, Linda, Nathalie. **OZ5WQ &** OZ1ETA, OZ1MAT, OZ3ZW.

PJ4B: K1DG, K1XX, K2SS, K3EST, KL2A, N3ED, N6IG, N7ZZ, W3UM, W3ZZ, WA3LRO. **PY3MHZ:** HC1NG, PU3AGP, PU3CWD, PU3GIB (in memorium), PU3GUI, PY3AFS, PY3ADY, PY3BM, PY3BZA, PY3FOX, PY3GYM, PY3MRZ, PY3PAZ, PY3SGO, PY3TMR. **R1MVZ:** OH2BR, OH2KI, OH5BM, OH5NE, OH5SC, RA1ACJ, RA1ALY, RA3AUU, RU1AS, AB6BH, K6JL, N6AA, N6ZZ, W6NV. **RW2F:** RA2FA, RA2FBC, RN2FA, UA2FB, UA2FC,U A2FF, UA2FJ, UA2FP, UA2FX, UA2FZ. **RW3WWW:** Club. **SK6D:** SM6FUD, SM6WQB. **SP5ZDH:** SQ5HAR, SQ5MBL, Maciej Dymkowski, SP5IKC, SQ5HAT(YL). **SP9KDA:** SP6GCU, UR5WDQ, SP6-8522, SP6MQO, SP9LJE, SP9UO, SQ9CWO. **SV1DKR &** OK1YM/SV, SV1DNW. **T33Y:** DL2NWK, DL2RUM, DL7DF, DL7UFR. **V26B:** N2TK, WXØB, W2YR, N3OC, DL6LAU, N3BNA, W3CF, W2UDT, KA2AEV, K3SW, WT3Q. **VE3BUC &** VE3SY. **VE6FI &** VE6AQ, VE6LB, VE6PY, VE6NA, VE6NWG, VE6JAG, VE6EM, VE6IG. **VP5T:** K2WB, N2VW, WA2VYA. **VY2SS &** Others. **WØAIH/9:** WRØDK, AAØZZ, KBØVRV. **W1QK &** N1GS. **W2AX &** K2LE, N2UN, N2FF, K2UU, N2QW, W1MA, VE1XT. **W3LPL &** K1HTV, K1RA, K1RZ, W2GG, ND3F, W3KX, AI3M, K3MM, K3MQH, K3NA, KE3Q, K3RA, W4XP, N5OKR, NH6C, K9GY. **W3MM &** W3FV. **W3PP &** AA1K, N3KW, NW3Y, N6ZO, N3HUV, KD3UC, W3OR, K3FT, NX3A, KB3DTT. **W4D:** KD5CQT, KK5EW, N5FG, W5FI, N4HPL, KB5IXI, WQ5L, W5OXA, W4PGC, N5UE, W5UE, K4VW, K5YG, N5ZJ, N5ZX. **W4MYA &** AC4OB, N4EHJ, K4BAM, K4WMA, KB4DI, KF4QQY, W4DR, W4HJ, W4HZ, WA4QDM, WK4Y, WU4G, WX3B, Lilly. **W8ZA &** K3DNE, K8OQL, WD3A. **XE2DV &** K7JJ, W7SE, N7XK. **YBØZDC:** YGØDIO, YDØJXI, YDØJTN, YDØIR, YCØLOW, YCØJPS, YCØIFJ, YCØHYH, YCØEHN, YBØTOY, YBØDO. **ZP6T:** ZP5MAL, ZP5AZL, ZP5WBM, ZP5VAY. **ZXØF:** PY5EG, PY5CC, PY5ZBU, PY5GU, PY2KC, K1CC, K1LZ, K1ZM, K2DM, N5FA, LZ1JK, LZ1JY. ■

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zones, and Countries. An asterisk (*) before a call indicates low power. Certificate winners are listed in bold. (All country terminology reflects the DXCC list at the time of the contest.)

SSB RESULTS
SINGLE OPERATOR
NORTH AMERICA
UNITED STATES

K1AR	**A**	**7,898,499**	**4094**	**160**	**551**
NT1N	**"**	**6,908,603**	**3630**	**156**	**533**
W1WEF	**"**	**5,079,638**	**3117**	**140**	**453**
K5ZD/1	*	3,345,918	2039	129	453
K1ZM	*	2,801,890	2369	108	347
			(Op.: W1NT)		
K1IR	*	2,225,356	1534	113	419
K1MY	*	2,085,321	1551	123	376
W1TE	*	2,018,285	1420	117	398
W1ZK	*	1,687,567	1264	120	371
K1NO	*	1,665,180	1263	122	373
			(Op.: K5FUV)		
W1AO	*	1,573,656	1295	99	357
W1KT	*	1,505,200	1038	121	409
W1KRS	*	1,409,900	1068	105	355
W1ZT	*	1,334,897	1082	108	349
K1CN	*	1,188,759	975	104	325
W1US	*	1,099,542	973	105	352
			(Op.: K1LOM)		
AK1N	*	991,209	893	110	307
W1RY	*	966,339	968	90	297
N1API	*	961,848	954	81	285
K1HD	*	662,662	895	73	213
K1BD	*	582,757	618	84	259
W1ZZ	*	579,143	599	93	254
WQ1H	*	516,672	585	89	262
N1SOH	*	492,533	591	72	221
			(Op.: W1FM)		
K1BV	*	410,176	501	55	177
NØICI/1	*	347,680	504	67	198
WB1GEX	*	319,965	503	65	192
W1OHM	*	255,645	398	63	184
K1RM	*	250,767	588	35	118
W1BIH	*	238,833	289	95	262
W1MK	*	169,569	313	68	159
K1DWI	*	73,200	376	58	165
W1LRY	*	58,375	170	35	90
W1AZ	*	43,848	127	32	94
KK1L	*	43,800	131	53	93
WC1M	*	6,903	63	13	26
KE1GQ	*	5,512	39	18	34
NY1E	**28**	**786,019**	**1683**	**31**	**138**
W1ON	*	272,085	625	34	131
K1DC	*	10,250	74	17	33
WR1P	*	1,071	21	8	13
K1DWQ	**14**	**321,945**	**727**	**38**	**131**
WA1MKS	*	37,648	190	25	79
KE1Y	**3.7**	**69,192**	**394**	**17**	**76**
***WA1S**	**A**	**3,064,986**	**2015**	**132**	**406**
***K1SD**	**"**	**2,101,764**	**1506**	**126**	**398**
***WT1O**	**"**	**1,979,649**	**1539**	**110**	**359**
***N1HOQ**	**"**	**1,769,508**	**1365**	**110**	**358**
***K1VUT**	**"**	**1,596,000**	**1224**	**111**	**369**
*KS1J	*	1,332,800	1139	100	325
*WS1A	*	1,231,315	1002	109	336
*N1PGA	*	1,074,048	1034	86	298
*AE1B	*	1,074,029	1004	88	301
*AA1SU	*	633,248	803	78	230
*KU4BP/1	*	528,864	610	85	251
*N3KCJ/1	*	492,240	591	71	222
*W1ZS	*	492,100	704	56	210
*K1RO	*	476,561	612	71	218
*KD1SG	*	460,092	698	65	211
*W1XF	*	407,077	599	59	194
*WØMHK/1	*	383,775	335	104	321
*K1TEX	*	364,230	535	64	206
*KA1UQ	*	355,590	498	69	201
*K1VSJ	*	354,008	479	73	201
*WR1X	*	282,000	437	58	182
*N1SR	*	210,055	377	56	159
*K1HT	*	209,214	375	55	142
*N1DS	*	206,147	410	56	155
*K1GU	*	182,699	358	47	140
*K1WCC	*	178,400	346	48	152
*W3TB/1	*	102,900	219	51	124
*W6FC/1	*	66,675	140	51	124
*K2MN/1	*	60,192	157	32	100
*KQ1F	*	25,025	109	17	60
*W1DEO	*	24,180	86	51	73
*W1/JR7GDU	*	11,926	68	36	53
*N1NVX	*	10,286	61	27	47
***KE1AK**	**28**	**178,470**	**502**	**28**	**107**
***W3EP/1**	**"**	**174,816**	**496**	**31**	**113**
*KA1RLI	*	101,269	319	24	95
*N1FUS	*	86,961	304	20	81
*N1BCL	*	11,100	88	16	44
*K1LD	*	8,047	51	21	36
*W1DYJ	*	722	16	9	10
*KB1DFG	*	171	8	4	5
***NS1Z**	**14**	**29,889**	**173**	**20**	**61**
N2LT	**A**	**3,952,148**	**2616**	**136**	**402**
N7UN/2	**"**	**1,726,280**	**1249**	**125**	**390**
W2LU	**"**	**1,608,006**	**1257**	**128**	**374**
N2MR	"	1,356,192	1215	96	312
WA2NHA	*	1,225,390	1089	106	327
N2CU	*	1,089,246	1026	88	291
K2CS	*	969,077	916	101	296
KB2NMV	*	916,700	821	107	338
KG2BN	*	501,424	624	82	226
K2FR	*	496,155	622	68	223
WB2QLP	*	443,615	579	78	229
KG2DB	*	391,306	760	75	214
W2YK	*	340,362	481	76	221
WR2V	*	306,176	473	64	192
AA2WN	*	295,664	459	77	195
N2MUN	*	222,488	456	56	176
WF2Y	*	221,256	303	59	193
W2ZU	*	173,020	296	52	153
WB2KLD	*	164,971	301	56	143
W2RW	*	118,846	246	54	128
KG2BI	*	86,154	219	50	123
WF2B	*	60,489	188	43	100
W2OP	*	52,398	149	40	102
K2YLH	*	41,772	175	36	82
W2OAE	*	40,713	125	38	85
N2SCJ	*	15,910	93	28	58
K2YR	*	12,558	62	30	48
K2ZJ	**28**	**542,301**	**1174**	**34**	**129**
NA2AA	*	193,600	448	32	128
WA2BKN	*	39,440	162	21	64
KQ2M	**21**	**1,327,139**	**2624**	**39**	**148**
NG2P	*	57,434	211	22	72
K2MGA	**14**	**142,800**	**380**	**35**	**115**
KC2Q	*	81,351	223	31	100
KB2MN	*	12,716	93	20	48
NA2M	*	1,425	20	8	17
WQ2M	**7**	**21,625**	**304**	**33**	**92**
W2VO	**1.8**	**2,993**	**51**	**14**	**27**
***W2TZ**	**A**	**1,422,244**	**1247**	**108**	**320**
***K2AZ**	**"**	**1,211,158**	**1033**	**112**	**369**
*K2SIG	*	1,060,696	967	94	309
*KA2NDX	*	613,930	722	69	221
*K2GKM	*	291,840	426	66	174
*KM2L	*	253,572	443	52	152
*W3EH/2	*	245,058	392	61	176
*W2SF	*	206,628	359	51	150
*W2MKW	*	204,750	366	64	161
*W2CVW	*	192,276	319	54	164
*K2SZ	*	183,904	331	59	165
*WT2JG	*	176,000	300	61	159
*WA2NZA	*	171,672	361	39	145
*N2LQQ	*	129,528	276	43	125
*K2UF	*	105,468	224	54	133
*K2JF	*	103,592	301	46	138
*AA2TM	*	100,776	232	40	116
*KB2EOQ	*	94,285	226	52	121
*KG2FH	*	76,456	214	41	111
*W2FUI	*	69,860	171	43	97
*K2HT	*	66,341	167	59	104
*N2LEB	*	53,152	143	45	106
*KC2AZU	*	33,602	115	31	75
*WA2CNV	*	31,734	111	45	78
*K2CF	*	29,165	119	27	68
*WB2AIV	*	26,910	117	23	67
*AA2AD	*	22,950	108	33	69
*W2ENY	*	22,116	90	25	72
*W2VU	*	15,656	81	23	53
*N2LK	*	14,707	79	20	57
*N2UM	*	11,715	59	27	44
*N2CK	*	7,242	55	19	32
*KG2NO	*	5,757	45	21	36
***K2MFY**	**28**	**303,524**	**691**	**33**	**136**
*K2BQW	*	114,712	400	23	81
*N2DEM	*	106,536	319	31	107
*WA2ASQ	*	73,188	230	25	89
*NG2C	*	66,082	245	25	69
*K2KJ	*	42,656	180	21	65
*N2LSJ	*	20,264	105	18	50
*KA2SLC	*	17,952	101	19	47
*W1NXB/2	*	3,655	85	17	26
*KA2D	*	2,059	34	11	18
***WB2ZTH**	**7**	**20,676**	**125**	**17**	**49**
K3ZO	**A**	**6,171,165**	**3744**	**136**	**449**
K3OO	**"**	**5,699,012**	**3175**	**139**	**507**
K3CR	**"**	**5,181,670**	**3227**	**141**	**457**
			(Op.: KB3AFT)		
W3BGN	**"**	**4,954,633**	**2842**	**151**	**478**
KQ3F	*	2,903,532	2029	133	383
K3JT	*	2,300,475	1495	139	416
W3MR	*	1,929,906	1462	118	368
K2PLF/3	*	1,614,450	1300	116	354
K3NW	*	1,481,850	1002	131	424
W3AP	*	1,155,277	1000	115	334
AJ3M	*	851,424	818	102	290
K4JLD/3	*	842,501	748	106	295
W3OU	*	623,398	694	92	261
W3KV	*	437,664	525	76	215
N3RC	*	428,329	717	62	191
KF3BE	*	427,710	525	81	237
N3PUR	*	365,715	419	82	233
AD3Z	*	337,940	394	74	231
W3BYX	*	323,850	449	62	193
AA3TT	*	301,227	514	60	177
N3KR	*	250,920	367	64	182
AA3LX	*	216,619	339	73	174
NY3C	*	204,525	351	60	165
N3RJ	*	195,348	392	58	161
WA3DMH	*	175,330	343	52	145
N3YUG	*	156,306	293	56	162
K3SX	*	145,420	259	74	146
WA3SES	*	143,104	264	62	146
W3JRY	*	100,817	202	52	129
K3ZA	*	95,228	226	60	119
KA3ZIP	*	52,822	173	50	104
N3HXQ	*	45,110	140	37	93
N9GG/3	*	100	7	6	7
WR3L	**28**	**416,340**	**821**	**35**	**145**
W3AZ	*	98,280	373	28	92
W3GN	*	1,856	47	10	19
KO3Q	*	6	1	1	1
N3HBX	**21**	**525,262**	**1107**	**38**	**143**
W3KHQ	*	299,792	671	37	127
K3IC	*	88,146	274	29	89
WY3T	**14**	**126,840**	**374**	**34**	**106**
***N1WR/3**	**A**	**1,368,075**	**1129**	**108**	**327**
***W3UJ**	**"**	**653,196**	**774**	**90**	**258**
*N3II	*	579,040	552	93	292
*WF3M	*	508,285	630	69	226
*NV3V	*	480,816	582	84	234
*KB3MM	*	362,600	458	68	228
*K1EFI/3	*	299,897	479	48	173
*KC3AJ	*	178,476	397	57	157
*W3PO	*	126,672	296	38	130
*W3CP	*	124,074	276	51	132
*KC3TL	*	120,716	233	62	144
*W3INK	*	111,112	320	37	115
*K3DSP	*	102,706	235	51	127
*W3BEN	*	92,254	225	53	140
*N3TG	*	90,093	203	59	118
*K3GYS	*	56,668	169	32	92
*K3CKO	*	43,164	152	36	96
*N3OUC	*	39,520	196	45	107
*W3FQE	*	33,852	124	30	93
*W3XG	*	28,270	105	36	74
*N3QYE	*	18,091	92	30	49
*WA3YTI	*	10,270	62	29	36
*N3ZRW	*	6,510	52	25	37
***KT3RR**	**28**	**390,260**	**937**	**34**	**124**
*N3RW	*	96,860	309	28	88
*KA3RZE	*	67,367	250	23	78
*N3EYB	*	23,316	132	16	51
*N3JIX	*	6,750	57	16	29
K4ZW	**A**	**5,865,053**	**3139**	**148**	**513**
K4AB	**"**	**3,625,830**	**2265**	**146**	**439**
N6AR/4	**"**	**2,985,948**	**1963**	**133**	**441**
KS4XG	*	2,429,752	1853	115	373
K1PT/4	*	2,171,092	1571	128	404
AI2C/4	*	1,966,520	1542	120	346
KØEJ/4	*	1,713,636	1304	133	359
WA4TII	*	1,572,592	1079	133	399
N4GU	*	1,493,400	1190	110	346
AG4W	*	1,313,598	1093	106	323
N4MM	*	1,289,982	930	123	366
N4GN	*	1,065,936	895	115	309
K4LTA	*	1,022,444	997	116	327
W4OX	*	1,022,424	1129	90	249
W4KJ	*	839,592	877	108	306
K4BAI	*	773,110	878	80	233
W3VT/4	*	763,560	717	102	276
W4YE	*	735,048	785	81	247
KF4ZR	*	709,104	706	98	276
N4AA	*	693,263	667	89	278
K4LQ	*	665,270	698	84	271
KR4QI	*	625,716	624	93	271
K4LM	*	622,500	639	102	273
K2OY/4	*	505,400	560	105	275
W4NTI	*	497,080	575	94	250
W4LC	*	427,533	537	79	224
NC4NC	*	408,332	487	100	256
AA4V	*	349,431	504	63	206
K4PHE	*	292,888	430	63	185
N4DW	*	289,044	418	86	193
W4ATL	*	260,022	400	68	178
W4FDA	*	258,116	288	96	250
KB4MIL	*	247,338	384	63	171
NN4K	*	220,980	383	63	191
W4ASM	*	220,418	424	61	172
W4WNT	*	216,752	351	62	186
W4NF	*	187,616	411	38	126
W4SI	*	184,254	365	64	150
W4SJ	*	181,023	338	70	179
K4IU	*	161,570	296	59	155
KX4WW	*	152,680	254	52	168
KQ4QM	*	124,852	254	55	127
W4UEA	*	120,065	233	53	132
W4YDY	*	118,728	280	60	134
K4MGN	*	117,852	264	46	137
W4UFO	*	101,994	207	61	117
N2FY/4	*	93,942	225	45	108
N4XM	*	87,906	245	42	96
N4EK	*	80,325	213	33	102
N4CW	*	77,433	174	47	112
W4IF	*	72,450	219	51	124
NZ4DX	*	67,580	213	40	115
W4VC	*	61,070	213	41	114
WX4DX	*	57,750	206	58	117
W4OGG	*	34,040	111	40	75
W4GD	*	26,208	273	25	71
W4ZYT	*	24,864	115	17	57
W4XXX	*	15,272	95	24	59
W4ZV	**28**	**1,400,870**	**2566**	**36**	**154**
K4EA	**"**	**1,308,736**	**2260**	**37**	**171**
N4UK	**"**	**1,295,294**	**2596**	**36**	**146**
WC4E	**"**	**963,333**	**1888**	**35**	**154**
N4BP	*	745,336	1737	33	118
W4/5B4AFM	*	394,613	1004	34	139
W3NC/4	*	264,528	592	34	133
WB4NRI	*	58,695	218	30	61
K3RV/4	**21**	**784,492**	**1700**	**36**	**136**
K4JNY	**"**	**537,900**	**1252**	**37**	**128**
N8PR/4	*	345,667	864	34	127
W4RRR	**14**	**308,784**	**655**	**37**	**131**
K4XS	**7**	**371,637**	**889**	**35**	**118**
KE4SCY	*	29,637	141	22	67
K4TEA	1.8	1,275	25	9	16
***WO4O**	**A**	**1,265,382**	**1105**	**114**	**324**
***N4IG**	**"**	**1,232,572**	**1035**	**104**	**332**
*N4DL	*	1,088,640	993	96	309
*N4UH	*	1,081,898	1017	100	301
*K4IE	*	994,290	945	100	293
*NA4K	*	815,388	838	92	265
*NY4T	*	717,024	804	93	259
*KB4CG	*	457,905	547	90	253
*WD4CNZ	*	412,500	593	55	195
*K5DXR/4	*	377,575	504	65	210
*K4FYM	*	357,004	487	88	210
*KS4YX	*	343,995	572	56	199
*KT4FD	*	330,644	488	66	196
*KW4DA	*	260,392	410	76	193
*K1DCB/4	*	237,776	435	49	144
*N4EL	*	169,740	307	50	155
*W4AMP	*	157,080	318	64	156
*WB9IHH/4	*	151,156	260	57	212
*W4JH	*	141,570	314	40	125
*W4SD	*	121,329	239	51	132
*KU4FP	*	118,846	246	51	131
*N4KU	*	115,440	227	60	135
*NA4MA	*	76,588	314	22	60
*N3ZYU/4	*	74,624	210	35	93
*AA4KD	*	68,697	175	45	108
*AF4CD	*	66,420	190	53	111
*KU4WA	*	64,320	189	47	113
*KC4B	*	35,148	121	29	72
*AJ4F	*	29,970	122	42	69
*KS4JB	*	19,788	103	28	40
*K4PR	*	4,386	39	14	29
*KØCOP/4	*	4,230	50	15	30
***N4TZ**	**28**	**132,096**	**384**	**29**	**99**
***KF4KSN**	**"**	**104,236**	**400**	**28**	**75**
*K4DET	*	68,694	245	23	84
*KD4RHT	*	39,560	181	20	66
*K4MTS	*	37,926	172	20	66
*KE4MVK	*	25,680	140	22	58
*KB4VIR	*	25,668	119	25	68
*K4EP	*	24,552	127	19	53
*WD4AHZ	*	23,141	122	20	53
*KQ4QR	*	18,960	108	17	43
*KG4CHX	*	12,282	96	24	45
*KE4HRH	*	5,712	40	21	35
*KF4TJE	*	3,894	50	9	24
***N4MO**	**21**	**273,966**	**653**	**34**	**120**
N5JR	**A**	**2,207,646**	**1805**	**115**	**326**
W5WMU	**"**	**2,010,876**	**1571**	**136**	**382**
KZ5D	**"**	**1,343,286**	**1410**	**114**	**327**
KR5V	*	1,278,285	1565	125	340
K5UA	*	1,096,520	1038	103	292
K5ZO/5	*	1,050,025	1006	108	325
N5ZK	*	967,758	1056	80	261
			(Op.: W5ASP)		
N5QDE	*	715,502	708	92	269
AB5C	*	529,931	591	92	239
N5EPU	*	466,004	635	89	219
N5DD	*	358,708	466	88	234
WA5SOG	*	276,048	439	63	180
KY5N	*	220,277	443	52	129
KG5NE	*	142,504	286	53	135
KM5QG	*	130,824	255	52	132
WM9M/5	*	106,222	220	52	121
K1DW/5	*	97,280	238	47	113
N1QXV/5	*	78,600	310	46	104
K5VG	*	76,608	184	57	114
KD5CAS	*	72,501	201	59	110
KM5VI	*	40,560	137	45	75
W5HUQ	*	10,998	64	30	48
K5RX	**28**	**1,091,870**	**2137**	**36**	**149**
KZ5MM	**"**	**1,059,377**	**2084**	**37**	**156**
W5KFT	*	708,354	1535	34	140
W5OB	*	662,641	1452	36	145
K5AM	*	438,501	1056	30	127
W5FL	*	22,204	93	26	65
K5JMR	*	21,996	151	23	55
K5NA	**21**	**524,784**	**1319**	**35**	**121**
W6PU/5	*	268,974	701	36	117
N5MV	*	210,728	933	34	108
N5ZC	*	87,884	285	34	93
W5/OH7WV	*	288	10	7	9
W5FO	**14**	**194,724**	**489**	**38**	**124**
NA5B	*	146,328	555	32	102
			(Op.: W5AO)		
W5JRP	*	45,990	177	27	63
K2BA/5	*	37,966	204	23	59
N5DO	**7**	**42,770**	**174**	**28**	**66**
K2FF/5	**3.7**	**9,072**	**75**	**13**	**43**
KI5YP	*	2,905	40	15	20
***WD5K**	**A**	**1,430,100**	**1139**	**114**	**340**
***W5PS**	**"**	**873,936**	**980**	**103**	**254**
*N5AW	*	685,560	741	90	258
*W5CWQ	*	571,516	622	99	242
*K5OE	*	493,920	585	90	225
*N5RXF	*	431,158	654	84	215
*W5RZ	*	289,140	432	70	174
*N5XT	*	201,576	326	66	156
*W5GZ	*	192,266	319	90	161
*WK5K	*	131,430	261	61	134
*KM5CF	*	20,910	110	34	51
*KY5S	*	14,364	76	34	50
***W5ZO**	**28**	**289,674**	**669**	**34**	**137**
*W5NO	*	85,305	369	28	93
*KD5FVZ	*	57,530	193	26	84
*W5CTV	*	51,680	205	25	70
*KC5RPF	*	40,044	220	23	71
*KØCIE/5	*	14,560	122	17	39
*KD5AIA	*	7,952	96	20	36
***NI5M**	**21**	**209,000**	**525**	**34**	**118**
*KN5L	14	41,610	171	25	70
K6GX	**A**	**2,322,978**	**1680**	**140**	**357**
AI6V	**"**	**2,097,846**	**1673**	**129**	**348**
KI6T	**"**	**1,115,080**	**922**	**127**	**330**
N6MI	*	957,689	1120	110	243
W7CB/6	*	756,602	817	116	258
NN6XX	*	745,920	797	99	261
K6GT	*	667,029	770	94	225
KF6A	*	607,662	764	89	208
KG6AO	*	518,677	606	106	225
AK6R	*	422,237	795	97	216
N6VH	*	297,432	444	84	159
W6KNB	*	265,154	433	71	162
N6TW	*	219,880	382	75	155
N6ATD	*	199,956	316	80	148
K6UO	*	152,975	259	68	143
W6UJ	*	149,695	317	90	145
K6HRT	*	139,776	281	64	118
AJ6V	*	116,808	243	70	116
W6JZE	*	94,088	242	50	102
N6TNX	*	87,416	180	66	130
K6III	*	86,925	204	69	114
W6RKC	*	63,244	225	43	54
W6MFC	*	61,994	166	54	85
W6ISO	*	61,596	146	63	114
N6IJ	*	60,270	285	34	48
			(Op.: AEØM)		
W6KQI	*	58,200	172	35	85
K6VNX	*	26,220	97	29	63
W6TE	*	18,900	121	31	53
N6IFW	*	10,804	70	29	44
K6DB	*	10,064	56	30	44
W6YA	**28**	**708,474**	**1416**	**37**	**149**
W6AFA	*	338,664	937	31	106
NJ6P	*	277,764	616	35	123
K6YRA	*	79,120	161	34	138
W6ZL	*	3,572	43	16	22
N6TNW	*	1,196	22	10	16
K6HNZ	**21**	**472,160**	**1149**	**38**	**122**
KC6X	*	149,193	417	33	104
W6RCL	7	11,868	73	24	45
W6KW	**3.7**	**83,600**	**377**	**31**	**69**
***K6RO**	**A**	**1,708,938**	**1353**	**128**	**334**
***K8PO/6**	**"**	**1,610,564**	**1414**	**129**	**299**
*WN6K	*	756,679	852	106	235
*KQ6QW	*	374,115	649	75	170
*K6UM	*	350,190	464	81	189
*WB6NFO	*	237,750	358	87	163
*KC6AWX	*	170,940	412	52	96
*W6SA	*	155,665	333	76	115
*N6NF	*	136,890	313	55	107
*AA6EE	*	121,800	270	63	112
*K6CSL	*	33,028	134	43	49
*AD6G	*	27,348	152	37	49
*W6PLJ	*	25,466	107	54	65
*KB6OQJ	*	21,340	90	39	58
*KI6PG	*	18,768	79	37	55
*W6RFF	*	16,575	96	32	53
*KF6PKG	*	14,446	86	29	33
*N2ALE/6	*	1,125	20	13	12
***K6KAY**	**28**	**294,630**	**839**	**34**	**104**
*W6/NP4IW	*	71,246	295	26	72
*N6NG	*	38,640	175	25	59
*W6ZQ	*	28,424	133	23	53
*KB6LEA	*	3,120	31	15	24
***W6EUF**	**21**	**141,622**	**401**	**37**	**97**
*WA6FGV	*	88,830	308	28	77
***WA7BNM/6**	**14**	**136,708**	**346**	**37**	**106**
*K6CEO	*	100	24	15	17
*KU6T	7	6,059	58	15	30
W7GG	**A**	**2,653,855**	**2068**	**139**	**352**
W7AT	**"**	**2,351,193**	**1832**	**147**	**354**
K4XU/7	**"**	**1,918,728**	**1540**	**143**	**343**
W8AEF/7	*	853,842	867	105	269
KM7TM	*	763,074	809	119	232
WA7LNW	*	722,623	839	119	248
WN7J	*	692,198	735	97	240
KI7M	*	637,632	863	103	225
W7LGG	*	527,520	627	89	225
W7TSQ	*	515,145	654	99	206
KS7T	*	463,496	653	70	183
K7LY	*	360,111	526	100	207
W7QN	*	355,656	461	86	206
K6TIM/7	*	326,688	427	94	238
NF7E	*	265,902	432	91	182
AD7U	*	200,564	369	78	125
W7YS	*	92,736	272	40	86
N7JXS	*	91,840	237	54	86
N7JT	*	75,900	204	55	77
K7PVT	*	75,240	229	52	128
K7WP	*	55,278	188	40	71
K7RAT	*	36,735	164	36	43
KAØWBP/7	*	5,336	59	26	32
W7ZMD	*	3,240	37	17	28
K7QQ	**28**	**486,475**	**1352**	**31**	**114**
NX7K	*	141,253	471	27	92
W7AYY	*	85,056	312	24	72
W9FI/7	*	72,013	283	27	74
W7WA	**21**	**1,004,988**	**2027**	**39**	**139**
N7DD	**"**	**972,027**	**1963**	**40**	**149**
W7FP	*	421,820	952	37	124
W7CL	*	411,968	1071	37	120
W7UPF	*	149,330	390	35	102
WG7A	*	119,603	322	35	96
W7WW	*	46,284	158	32	84
W7EB	**14**	**180,495**	**582**	**34**	**101**
K7EM	**7**	**198,996**	**532**	**32**	**106**
K7NV	*	54,166	192	29	77
KK7DP	*	18,252	106	25	53
KJ7TH	*	12,095	80	21	38
K7ZZZ	**3.7**	**22,140**	**183**	**21**	**39**

***WW7Q**	**A**	**516,241**	**602**	**90**	**237**
***N7IR**	**"**	**455,304**	**524**	**92**	**219**
***N7RQ**	**"**	**417,690**	**594**	**77**	**178**
*K7TR	"	254,358	453	69	165
*N7FL	"	224,136	335	64	200
*KW7N	"	124,256	278	64	112
*KI7Y	"	119,228	274	57	107
*KE7RT	"	107,088	290	46	92
*KC7UP	"	85,330	196	46	115
*KX7J	"	67,680	161	47	97
*W7HS	"	59,976	168	53	83
*KD7DOK	"	51,858	206	49	85
*KC5AC/7	"	44,980	139	69	61
*WA2OCG/7	"	32,700	148	32	68
*W7IIT	"	27,937	109	34	57
*KC7WUE	"	26,550	120	37	53
*W7YR	"	5,390	34	22	33
*W7GTO	"	595	14	8	9
***WJ7S**	**28**	**210,420**	**620**	**31**	**95**
*W7USA	"	130,134	364	28	95
*W7YAQ	"	40,068	172	25	59
*KI7XA	"	20,167	127	24	43
*W7AVA	"	11,718	69	21	42
*W7YU	"	962	25	13	24
***NW7Q**	**21**	**189,596**	**497**	**33**	**106**
*WS7V	"	165,105	445	34	101
***KG7RZ**	**14**	**65,535**	**217**	**32**	**84**
N8II	**A**	**4,007,880**	**2665**	**127**	**413**
KE8GG	**"**	**1,236,038**	**1062**	**114**	**308**
K2UOP/8	**"**	**1,151,648**	**942**	**115**	**349**
WB8TLI	"	1,124,591	1030	98	279
K8LN	"	1,022,120	951	108	296
K8FC	"	856,324	667	123	391
W8JY	"	822,016	858	79	259
W8KEN	"	672,237	749	84	255
W8UPH	"	604,160	759	72	223
NC8V	"	587,079	729	87	246
K6VWE/8	"	570,064	683	74	242
KC8KE	"	432,617	565	86	245
W8KX	"	318,636	368	73	245
K8MR	"	305,347	448	63	178
N8KOJ	"	302,775	455	68	207
N8KR	"	286,720	371	90	190
WD8JLM	"	285,821	438	82	207
AA8PA	"	239,316	404	63	159
NS8O	"	218,488	391	67	181
KT8X	"	176,774	393	50	119
			(Op.: JE2LUN)		
AD8J	"	166,872	312	61	143
KB3X/8	"	159,174	277	80	142
W8WWC	"	80,800	201	54	146
WA8RSA	"	53,946	198	45	117
W8MHV	"	42,681	169	38	85
WT8E	"	8,211	69	29	40
KC8IUM	"	4,128	44	19	29
K3ZJ/8	**28**	**389,222**	**972**	**31**	**111**
WA8TNO	"	126,314	344	29	108
NA8W	"	25,488	132	14	58
K8DX	**21**	**1,235,388**	**2416**	**38**	**153**
W8UD	"	267,696	637	36	120
W8TWA	**14**	**168,192**	**412**	**35**	**111**
WØCD/8	**3.7**	**37,446**	**270**	**19**	**60**
			(Op.: W8UVZ)		
***KF8K**	**A**	**1,145,772**	**991**	**105**	**307**
***KI8CS**	**"**	**817,336**	**797**	**100**	**277**
*N8CN	"	611,830	765	79	216
*WA8WV	"	534,625	620	85	240
*KG8ZD	"	289,907	486	66	173
*W8VE	"	252,720	420	67	176
*KA8PTT	"	145,320	263	56	154
*W8IDM	"	141,696	277	48	144
*KE8PX	"	109,518	1361	74	189
*N8UBK	"	98,532	234	41	112
*K8CV	"	91,960	220	46	106
*N8AA	"	86,064	197	47	116
*N8FWA	"	77,910	238	45	102
*KC8HWV	"	66,080	187	42	98
*K8VUS	"	63,742	178	47	110
*KC8IOR	"	63,591	193	46	95
*AB8DE	"	62,640	192	50	85
*K8BKM	"	57,876	151	53	106
*K8LY	"	54,171	161	37	80
*AA8SN	"	16,577	137	44	77
***K8IR**	**28**	**205,719**	**523**	**28**	**113**
*N4SEA/8	"	184,752	450	32	112
*KA8NRC	"	62,239	237	26	83
*K8RWL	"	46,500	158	30	70
*N8XWO	"	35,588	190	19	63
*W8UMR	"	27,378	131	22	59
*KC8TL	"	10,360	70	17	39
*KC8LTL	"	7,956	67	16	36
***ND8DX**	**21**	**242,959**	**592**	**34**	**117**
*NG3Q/8	"	132,310	341	31	100
*N8EXS	"	8,950	71	12	38
*WT8P	"	7,497	88	13	36
***AF8C**	**14**	**47,634**	**224**	**27**	**75**
WB9Z	**A**	**5,503,582**	**3160**	**156**	**475**
W9RE	**"**	**4,811,092**	**2749**	**156**	**491**
K9BGL	**"**	**2,390,165**	**1771**	**131**	**374**
KB9MDL	"	1,298,108	946	126	392
K9ZO	"	1,121,876	1079	106	283
N9UA	"	1,061,346	942	107	322
N9QQK	"	642,147	740	78	241
W9RN	"	620,574	629	102	251
K9UQN	"	333,935	494	67	168
WA9CCQ	"	212,160	385	45	147
N9WKW	"	180,048	288	78	186
K9CS	"	115,596	222	76	152
KF9YR	"	113,643	255	54	129
K9HUH	"	68,684	175	54	100
NI9C	"	52,065	165	40	77
WD9FEN	"	34,850	167	27	58
KB9CYL	"	14,784	83	25	41
WA9TPQ	**28**	**329,439**	**839**	**31**	**118**
K9IG	**"**	**327,780**	**667**	**34**	**146**
W9OP	"	281,344	653	31	126
N9PQU	"	227,952	606	29	115
W9OF	**21**	**289,083**	**588**	**36**	**137**
WI9WI	"	99,327	351	30	83
K9CAN	**14**	**116,886**	**334**	**35**	**103**
K9YNF	**"**	**115,443**	**334**	**31**	**96**
N9HCA	"	68,580	262	30	78
AA9VR	"	10,716	75	16	41
K9CJ	**7**	**4,095**	**38**	**11**	**28**
***K9XD**	**A**	**1,235,832**	**1019**	**120**	**346**
			(Op.: N9VVV)		
***WO9S**	**"**	**1,134,326**	**1086**	**99**	**295**
*K9JE	"	595,876	674	83	228
*W9GG	"	572,520	710	80	232
*K9YA	"	563,220	674	81	234
*K9QVB	"	547,616	691	82	232
*KG9AV	"	516,672	684	85	214
*K9OP	"	445,887	529	90	219
*WT9U	"	413,192	570	70	204
*NG9L	"	265,232	429	61	181
*N9XX	"	204,720	321	78	162
*KA9FAJ	"	172,900	358	51	131
*K9XJ	"	153,881	233	74	173
*WB9LRK	"	150,535	292	49	138
*W9LYN	"	139,416	247	72	150
*N9LYE	"	128,095	276	59	128
*W9ILY	"	85,968	232	39	105
*WA9Z	"	85,960	270	38	102
*KF9VJ	"	31,324	137	23	59
*KJ9C	"	29,812	96	44	72
***KB9JIF**	**28**	**86,219**	**300**	**29**	**80**
*W9GIL	"	71,577	254	17	82
*KA9JAC	"	60,894	234	24	78
*N9GUN	"	52,452	213	22	71
*K9KR	"	29,550	394	22	53
*W9IXX	"	21,606	111	20	58
*W9NHX	"	7,584	71	18	30
***K9AB**	**21**	**62,726**	**219**	**0**	**78**
*N9HDE	"	16,860	100	17	43
***W9HV**	**14**	**55,500**	**253**	**23**	**77**
*W9JOO	"	54,099	201	26	83
N2IC/Ø	**A**	**5,074,398**	**3020**	**157**	**461**
WØEJ	**"**	**2,511,059**	**2083**	**125**	**342**
NØAV	**"**	**2,063,205**	**1636**	**120**	**345**
NØAH	"	1,697,955	1496	136	335
WØGG	"	1,411,200	1202	119	322
NØDY	"	1,102,218	1193	92	246
KØCAT	"	1,095,854	1166	81	253
			(Op.: K9WIE)		
KØGAS	"	646,204	809	87	202
K9MWM/Ø	"	456,924	686	98	250
KEØUI	"	330,250	525	68	182
NØZM	"	166,537	246	80	179
K1LR/Ø	"	165,400	302	52	148
WØPPF	"	153,408	294	61	127
KØDAT	"	143,850	249	58	152
WØOSK	"	140,448	289	67	142
KBØTFT	"	132,848	343	45	107
KØFG	"	121,260	248	52	163
K4VX/Ø	"	117,961	239	54	125
WBØIEL	"	115,940	240	51	119
WØTT	"	108,096	210	71	121
WXØU	"	59,778	168	58	104
KIØF	"	53,460	175	46	86
KI7WO/Ø	"	53,132	149	52	96
WØMW	"	52,096	152	46	82
WMØG	"	50,828	149	42	89
WØNF	"	21,534	81	37	60
WDØBWM	"	10,212	83	24	45
KVØQ	**28**	**891,616**	**1769**	**38**	**149**
N7DR/Ø	**"**	**575,003**	**1449**	**33**	**110**
KØUK	"	309,894	842	30	107
WØART	"	146,280	374	32	106
KBØMZG	"	131,318	404	29	98
ABØIO	"	30,780	148	23	58
KØCL	**21**	**849,603**	**1807**	**37**	**136**
KGØUA	"	48,048	197	24	67
KGØZI	**14**	**211,400**	**726**	**35**	**105**
WØLSD	**7**	**50,076**	**200**	**28**	**89**
WØAH	**3.7**	**9,662**	**75**	**19**	**41**
WØETC	**1.8**	**6,318**	**193**	**14**	**25**
***ACØW**	**A**	**907,542**	**859**	**106**	**291**
***KØGT**	**"**	**288,684**	**363**	**99**	**198**
*WØETT	"	282,729	496	65	154
*KØVSV	"	204,895	371	67	148
*WAØDCB	"	150,549	320	65	136
*KØSZ	"	134,524	338	49	120
*KØFJ	"	121,396	280	57	121
*KBØWPY	"	97,148	222	56	107
*KIØLF	"	39,644	138	35	71
*KBØWHY	"	38,850	151	39	72
*KCØFUD	"	17,496	83	32	49
*WØOF	"	7,548	50	21	30
*NØRIA	"	5,550	69	29	30
***KØKE**	**28**	**438,075**	**950**	**34**	**131**
*KAØDX	"	138,556	360	30	104
*NØYKN	"	10,887	82	17	40
*KØLLS	"	3,290	35	14	21
***NØNR**	**21**	**227,696**	**562**	**35**	**117**
***NØRA**	**"**	**175,968**	**453**	**34**	**107**
*NØUU	"	113,652	330	33	93
*KDØNB	"	68,556	264	30	86
*AAØAI	"	67,084	242	33	91
*WDØGQA	14	16,008	125	22	65

ALASKA

KL7AC	**A**	**981,843**	**1368**	**83**	**210**
***KL1R**	**A**	**323,900**	**655**	**65**	**140**
***KL7FAP**	**21**	**133,532**	**738**	**26**	**50**

ANGUILLA

VP2E	**28**	**2,106,016**	**5012**	**35**	**141**
			(Op.: WØGJ)		

BARBADOS

8P1A	**A**	**11,013,948**	**7852**	**140**	**454**
			(Op.: W2SC)		
***8P6EX**	**A**	**142,600**	**300**	**56**	**144**

BRITISH VIRGIN ISLANDS

***VP2VF**	**28**	**832,710**	**2935**	**29**	**94**

CANADA

VE9FX	**A**	**628,895**	**790**	**86**	**279**
VY1JA	"	142,164	328	73	125
XJ1JF	**28**	**762,783**	**2061**	**31**	**116**
VC1A	**3.7**	**305,000**	**1260**	**26**	**99**
			(Op.: K3BU)		
VE1JF	"	158,974	766	21	80
			(Op.: W5AJ)		
***VE1JS**	**A**	**978,711**	**1104**	**80**	**247**
*VO1HE	"	153,340	284	60	145
VE2ZP	**A**	**2,125,354**	**1682**	**121**	**397**
VE2AE	**"**	**1,895,703**	**2406**	**84**	**242**
VE2AYU	"	1,863,115	1850	96	295
VA2AM	"	80,892	214	53	136
VA2BY	**3.7**	**81,249**	**903**	**16**	**37**
***VE2GSO**	**A**	**1,030,029**	**1555**	**74**	**199**
*VE2AWR	"	808,633	945	88	261
*VE2GWL	"	256,074	501	54	147
*VE2ZDR	"	15,400	113	28	60
***VE2GSX**	**28**	**145,148**	**373**	**28**	**103**
*VE2PIJ	"	14,991	98	16	41
***VA2SRE**	**21**	**159,959**	**643**	**25**	**78**
***VA2KCE**	**14**	**244,800**	**1215**	**23**	**77**
*VE2MAQ	"	21,318	183	14	37
*VA2DXE	1.8	570	69	3	2
VE3OI	**A**	**6,273,328**	**4076**	**137**	**447**
VE3RM	**"**	**4,016,105**	**2879**	**127**	**418**
VE3AT	"	2,780,085	2437	102	313
VE3KPU	"	1,726,280	1665	106	306
VE3KZ	**28**	**1,002,925**	**2142**	**35**	**140**
VA3RU	"	899,836	1763	36	160
***VE3PN**	**A**	**2,305,394**	**1884**	**122**	**356**
*VE3OTL	"	1,114,947	1135	101	286
*VE3STT	"	901,901	902	87	284
*VA3JFF	"	589,440	728	77	230
*VA3SWG	"	579,762	988	72	207
*VE3ZZ	"	576,688	727	76	228
*VE3ST	"	333,166	490	59	180
*VE3LBQ	"	33,396	118	40	92
*VE3SYB	"	7,107	53	27	42
*VA3PL	"	468	10	8	10
***VE3ZT**	**28**	**491,722**	**1188**	**30**	**124**
*VE3TLT	"	2,631	50	11	20
***W8IQ/VE3**	**21**	**154,559**	**438**	**29**	**98**
*VE3DO	1.8	2,530	55	10	13
VE4GV	**A**	**521,472**	**847**	**68**	**188**
VE4IM	"	476,424	602	87	225
VE4RA	"	38,352	126	47	89
*VE4YU	A	14,516	75	24	52
***VE4VV**	**28**	**562,839**	**1387**	**30**	**133**
VE5AAD	**21**	**84,600**	**348**	**23**	**77**
*VE5MX	A	73,556	205	61	87
***VE6ZT**	**A**	**486,024**	**807**	**72**	**192**
***VE6BMX**	**28**	**192,368**	**1065**	**27**	**61**
VE7SCC	**A**	**358,053**	**971**	**72**	**141**
VE7XF	"	318,562	411	99	199
VE7XO	"	224,541	424	63	120
VE7IN	**28**	**310,002**	**1109**	**31**	**90**
VE7NNN	"	140,679	635	24	75
VE7VF	"	115,100	418	27	73
VC7C	**21**	**1,395,072**	**3298**	**35**	**138**
			(Op.: VE7AHA)		
VE7NKI	"	598,644	1810	33	105
VE7GL	"	485,214	1441	36	106
VE7XR	**14**	**644,894**	**1386**	**38**	**140**
VE7AV	"	132,360	402	30	90
***VE7CV**	**A**	**442,510**	**614**	**84**	**190**
***VE7UQ**	**"**	**390,104**	**620**	**77**	**165**
*VE7TLK	"	376,896	935	74	134
*VE7CVM	"	355,866	572	94	165
*VE7VR	"	208,527	365	73	140
*VE7XB	"	204,498	438	62	127
*VE7HA	"	20,034	134	29	34
***VE7GFS**	**28**	**447,501**	**1549**	**30**	**99**
***VC7A**	**21**	**1,113,196**	**2628**	**35**	**131**
			(Op.: VE7SV)		
***VE7SV**	**1.8**	**6,289**	**185**	**10**	**9**

CAYMAN ISLANDS

ZF2MK	**28**	**1,635,097**	**3980**	**35**	**132**
			(Op.: K9MK)		
ZF2LA	**1.8**	**40,545**	**483**	**12**	**33**
			(Op.: K9LA)		

COSTA RICA

TI7DBS	**21**	**425,752**	**1291**	**35**	**117**

CUBA

CO9BKK	**A**	**525,515**	**771**	**81**	**224**
			(Op.: CO2JA)		
CO2WF	**7**	**129,360**	**719**	**22**	**66**
***CO8DC**	**A**	**1,212,132**	**1613**	**87**	**245**
***CO8LY**	**"**	**1,101,507**	**1554**	**80**	**239**
*CM2TK	"	60,928	258	39	89
***CO8DM**	**14**	**53,756**	**269**	**23**	**66**

DOMINICAN REPUBLIC

HI8ROX	**28**	**229,274**	**834**	**28**	**90**

GREENLAND

*OX3CO	21	276	9	5	7

GUADELOUPE

FG5BG	**A**	**7,413,678**	**4950**	**146**	**493**

MEXICO

XE1OBD	A	9,447	154	20	27
XE1VV	28	54,450	200	26	73
***XE2DN**	**A**	**1,210,400**	**1360**	**121**	**235**
***XE2Q**	**"**	**666,573**	**1341**	**83**	**166**
*XE2AUB	"	336,482	921	51	115
*XE2MX	"	287,560	471	79	181
*XE1GR	"	149,464	851	39	80
*XE1RGL	"	54,625	196	42	73
***XE1JEO**	**28**	**694,560**	**1779**	**32**	**128**
*4B1BEF	"	104,386	602	26	56
*XE3WAO	"	88,940	594	21	44
*XE1DNF	"	37,920	391	26	71
***XE1CRO**	**21**	**545,860**	**1735**	**35**	**105**

MONTSERRAT

VP2MGL	**A**	**1,165,220**	**2137**	**70**	**175**
			(Op.: EA3WL)		
***VP2MBT**	**A**	**674,336**	**1566**	**58**	**150**
			(Op.: EA3BT)		

PANAMA

***HO3A**	**A**	**274,626**	**555**	**66**	**153**
*HP1HEW	"	46,096	200	36	50
***3E1DX**	**14**	**673,608**	**1921**	**32**	**124**
			(Op.: HP1XVH)		

PUERTO RICO

KP4 /SM5AOE	**A**	**554,876**	**843**	**68**	**198**
KP4KOE	"	38,372	300	15	41
***WP4LNY**	**A**	**251,136**	**868**	**44**	**100**

ST. KITTS & NEVIS

V47KP	**A**	**5,051,475**	**4082**	**117**	**378**
			(Op.: W2OX)		
V47NS	**28**	**1,072,530**	**2635**	**34**	**119**
			(Op.: W9NY)		
V44NK	21	30,767	564	24	71

ST. MAARTEN

PJ8/N7KG	**A**	**7,662,684**	**6053**	**127**	**421**

U.S. VIRGIN ISLANDS

KP2A	**28**	**2,324,283**	**5230**	**37**	**146**
			(Op.: KW8N)		
WP2Z	**"**	**2,297,199**	**5126**	**37**	**146**
			(Op.: N5RP)		
KP2/K1VW	**7**	**167,960**	**794**	**21**	**83**
***KP2E**	**21**	**230,826**	**1039**	**23**	**79**
			(Op.: N4FD)		

AFRICA

ALGERIA

***7X2RO**	**A**	**56,854**	**248**	**33**	**98**

ASCENSION ISLAND

ZD8Z	**28**	**3,794,280**	**6247**	**40**	**170**
			(Op.: N6TJ)		

BURKINA FASO

XT2HP	**A**	**74,693**	**229**	**35**	**78**
			(Op.: JA1OEM)		

CANARY ISLANDS

EA8BH	**A**	**25,646,796**	**10253**	**176**	**692**
			(Op.: N5TJ)		
EA8AD	"	361,179	1142	44	73
EA8BAY	3.7	8,160	71	9	31
***EA8IK**	**A**	**108,438**	**243**	**50**	**136**
***EA8AEI**	**28**	**119,357**	**394**	**26**	**93**
*EA8/ES7RE	"	100,891	506	21	50

CEUTA & MELILLA

***EA9AR**	**A**	**674,366**	**792**	**68**	**234**
***EA9IB**	**28**	**471,582**	**1119**	**30**	**112**

DJIBOUTI

J28NH	A	53,328	175	39	93

EGYPT

***SU9ZZ**	**A**	**4,823,882**	**3410**	**106**	**391**

ETHIOPIA

***9E1C**	**14**	**188,806**	**568**	**32**	**102**
			(Op.: IV3OWC)		

GHANA

9G1MR	**A**	**198,186**	**689**	**29**	**73**
9G5ZW	**28**	**2,060,289**	**3805**	**38**	**151**

KENYA

5Z4IC	**28**	**829,863**	**1806**	**36**	**135**

LIBERIA

EL2WW	**A**	**1,767,817**	**1699**	**96**	**265**
			(Op.: ON4WW)		

LIBYA

***5A1A**	**14**	**165,996**	**530**	**23**	**85**

MADEIRA ISLANDS

*CT3GV	28	58,401	434	21	60

MALI

TZ6DX	**28**	**465,080**	**1447**	**22**	**88**
			(Op.: K4RB)		

MAURITIUS

***3B8 /KD6WW**	**A**	**2,534,468**	**2057**	**114**	**322**

NIGERIA

5NØW	**21**	**1,625,406**	**3139**	**38**	**145**

SENEGAL

6V6U	**A**	**9,562,950**	**6118**	**128**	**410**
			(Op.: K3IPK)		

SEYCHELLES

*S79AU	A	4,386	47	22	29
			(Op.: IK4AUY)		

SOUTH AFRICA

ZS6SA	**A**	**4,528,840**	**4138**	**115**	**289**
ZS5NK	"	373,550	596	78	163
ZS4I	"	187,960	370	60	125
ZSØE	"	80,340	236	51	105
ZS6HO	"	16,200	93	22	38
ZS6IR	**28**	**199,472**	**519**	**30**	**107**
ZS6H	14	77,926	270	28	66
*ZS4NS	A	2,640	40	17	23
***ZS1ESC**	**28**	**265,360**	**840**	**29**	**78**

TUNISIA

3V8BB	**A**	**10,939,698**	**5796**	**147**	**546**
			(Op.: YT1AD)		

ZAMBIA

9J2FR	**A**	**1,443,295**	**1628**	**90**	**211**
9J2A	**21**	**2,331,054**	**4162**	**38**	**160**
			(Op.: JAØJHA)		

ZIMBABWE

Z21KD	**28**	**454,572**	**1377**	**31**	**91**
			(Op.: DK4XJ)		

ASIA

ARMENIA

***EK6TA**	**A**	**1,755,015**	**1817**	**81**	**264**
***EK6CC**	**14**	**387,587**	**1114**	**35**	**114**

ASIATIC RUSSIA

UA9MA	**A**	**5,692,200**	**3385**	**141**	**495**
UA9AM	**"**	**1,578,042**	**1558**	**107**	**352**
RA9DZ	**"**	**1,156,800**	**1236**	**96**	**304**
UA9LAC	"	782,400	971	76	244
RK9CWG	"	759,486	949	78	243
			(Op.: RA9CGK)		
RA9DA	"	459,510	571	78	240
UA9OS	"	416,160	611	79	210
RA9AN	"	242,351	365	67	190
RA9AC	"	139,810	270	49	156
UA9KM	"	129,904	314	58	126
UA9XEN	"	66,246	150	60	123
RW9DX	"	59,869	185	39	98
RX9FG	"	43,845	159	31	80
RW9HA	**28**	**677,188**	**2029**	**34**	**124**
UA9CDC	"	455,215	959	33	148
UA9CAW	"	125,160	409	27	93
RZ9UA	**14**	**1,063,950**	**2360**	**37**	**136**
***RZ9WZ**	**A**	**1,887,349**	**1654**	**103**	**328**
***UA9JDP**	**"**	**1,002,588**	**1590**	**65**	**203**
*RW9QA	"	901,945	1018	76	265
*RK9SWF	"	807,598	850	81	273
			(Op.: RA9-167-69)		
*RK9AD	"	434,534	562	86	248
*UA9CR	"	313,900	424	77	215
*RA9XF	"	284,540	541	51	154
*UA9ZBN	"	192,096	348	66	166
*UA9ORQ	"	168,340	357	58	132
*RW9RF	"	111,048	269	45	123
*UA9JMS	"	92,637	299	37	104
*RZ9OU	"	91,936	213	53	116
*RA9CZ	"	10,920	95	19	59
***RX9SR**	**28**	**339,012**	**922**	**31**	**115**
***RA9AE**	**"**	**237,120**	**678**	**33**	**119**
*UA9JMB	"	223,000	900	20	80
*RV9BB	"	196,520	558	32	104
*UA9CES	"	110,210	415	26	81
*UA9AAP	"	88,023	284	26	85
*RA9FF	"	34,578	133	26	76
***RK9KWB**	**21**	**277,712**	**802**	**33**	**103**
*RA9AUH	"	73,010	287	23	75
***RJ9J**	**14**	**716,720**	**1846**	**37**	**133**
			(Op.: RA9JR)		
*RK9LWA	"	143,990	507	30	91
			(Op.: Krainov)		
*UA9BS	"	130,750	409	31	94
*RK9AC	"	120,086	497	25	72
***UA9ACJ**	**7**	**38,214**	**218**	**15**	**60**
RVØAM	**A**	**1,265,486**	**1751**	**95**	**227**
RAØAM	**"**	**867,350**	**1319**	**110**	**308**
RVØAX	"	735,264	1102	76	212
UAØJDD	"	162,155	427	74	131
RWØBG	"	120,184	322	55	126
UAØSR	"	24,444	204	37	60
UAØLS	"	8,832	85	24	45
UAØCW	**21**	**349,752**	**1041**	**36**	**116**
RAØCG	**3.7**	**74,617**	**473**	**27**	**56**
UAØWY	"	45,653	297	16	55

*RSØF	A	3,393,404	2925	135	341	
						(Op.: UAØFZ)
*UAØANW	"	728,750	1120	75	200	
*UAØYAY	*	332,640	476	76	212	
*RAØLU	*	123,877	294	51	118	
*UAØAGI	*	84,000	192	70	140	
*UAØAPP	*	9,576	60	23	40	
*RAØFW	28	286,085	788	37	108	
*RUØSU	*	119,527	555	18	61	
*UAØFDX	21	705,860	2166	36	109	
*RZØCQ	*	54,188	239	25	67	
*UAØSJ	*	27,255	148	21	58	
*RAØCL	*	12,324	113	18	34	
*UAØSAD	7	23,322	150	19	50	
*RAØFF	3.7	13,376	188	19	25	

ASIATIC TURKEY

*TA3BN	A	1,009,665	1300	69	208
*TA4ED	28	435,490	1432	31	79
*TA3YJ	*	2,160	39	4	16
*TA3D	21	819,674	1839	38	135
*TA3J	3.7	178,128	893	10	62

CHINA

*BA4DW	28	348,530	988	33	97
*BD4ED	21	510,440	2127	36	104
*BA4EG	14	7,905	285	12	19

CYPRUS

H22H	28	1,831,500	4020	39	141
					(Op.: 5B4MF)
H2T	21	1,405,760	2854	38	146
					(Op.: 5B4XF)

GEORGIA

*4L1W	21	70,810	372	16	57
*4L7AA	7	10,440	70	21	37
*4L2M	3.7	53,884	282	14	72

HONG KONG

VR2BG	14	304,854	1016	38	111

INDIA

VU2WAP	A	2,071,104	1834	115	354
ATØVLH	7	181,591	782	26	87

ISRAEL

4X4DZ	28	1,413,720	3257	37	133
4X1GA	*	21,797	157	21	50
4X6ZK	21	959,977	2053	38	135
*4XØF	A	259,187	472	56	135
					(Op.: 4Z5FL)
*4Z5CP	*	14,925	81	28	47
*4X6TT	28	379,332	889	37	127
*4X/OK1CW	*	334,336	1003	30	98
*4Z5FW	*	33,174	200	15	42

JAPAN

JA1ELY	A	3,727,365	2456	161	412
JM1XCW	"	2,457,048	2288	122	288
JF1OPL	*	784,896	1038	96	196
JF1SEK	*	633,888	820	83	205
JR1GMK	*	614,835	1114	64	131
JF1EQA	*	485,342	656	89	197
JR1LEV	*	314,266	496	84	164
JA1HP	*	252,046	466	73	148
JH1WOW	*	203,732	364	70	142
JR1LZK	*	186,576	357	69	139
JA1KAL	*	91,938	267	55	99
JR1JCB	*	15,008	96	33	34
JH1RFM	*	6,322	53	25	33
JH1FSF	28	534,404	1137	38	134
JE1CKA	"	309,632	986	32	86
JA1BK	*	233,404	528	38	134
JR1BTG	*	218,730	711	33	82
JJ1RDX	*	205,058	538	36	115
JH1UUT	*	103,634	396	28	73
JA1ANA	*	20,230	98	26	53
JQ1LPT	*	15,629	80	26	54
7J1ABD	*	12,934	84	17	41
					(Op.: WA6URY)
JA1AAT	*	10,755	70	19	44
JJ1JRH	*	5,651	81	12	14
JH1EAQ	21	575,384	1529	34	108
JE1LFX	"	487,611	1225	36	117
JR1MQT	*	330,253	1099	33	81
JA1XEM	*	1,568	29	10	12
7M4BEN	14	721,875	1543	39	136
*JL1ARF	A	3,001,683	2298	138	333
*JJ1VRO	"	1,305,928	1280	106	271
*7K4GUR	"	733,036	882	97	224
*JA1BUI	*	467,166	639	96	198
*JG1TVK	*	254,255	410	88	165
*JG1OWV	*	225,389	344	96	161
*JR1MRG	*	222,406	434	76	138
*JE1UFF	*	163,659	350	69	120
*JA1XUY	*	143,460	307	63	117
*JJ1QJP	*	125,064	306	54	108
*JR1VAY	*	120,370	238	71	135
*JA1XRH	*	118,252	256	70	118
*JA1AB	*	100,674	288	50	88
*JA1HFY	*	97,881	262	58	98
*JH1EVD	*	92,083	231	55	105
*JH1FNU	*	69,023	212	51	84
*JG3NKP/1	*	65,760	175	49	88
*JH1OLB	*	48,360	186	36	68
*JA1XPU	*	42,738	158	40	62
*JP1SPV	*	39,585	151	32	59
*JH1RMH	*	20,101	100	30	51
*JN1WTQ	*	12,540	83	33	43
*JH1RDU	*	4,244	33	22	31
*JP1POD	*	2,374	24	18	20
*JH1PXY	*	1,785	29	13	13
*JR4PMX/1	28	745,850	1520	37	138
*JA1YBK	"	525,532	1433	34	103
					(Op.: JL1WFD)
*JK1OXU	*	285,240	889	33	91
*JF1RWZ	*	100,144	439	25	63
*JS1KQQ	*	80,978	299	30	77
*JA1MYW	*	77,519	324	27	62
*7N2UQC	*	71,877	279	28	69
*JH1CML	*	55,510	231	30	65
*JF1SXL	*	52,740	223	27	63
*JA1VVH	*	34,482	174	22	57
*JA1EEG	*	25,133	141	22	46
*JE1HJV	*	9,353	77	18	29
*JA7GG/1	*	6,232	60	18	23
*JE1REU	*	2,924	37	11	23
*7K2PBB	*	1,127	22	9	12
*JA1AAV	*	871	15	10	12
*JH1TUX	*	675	27	12	15
*JG1ZUY	21	537,624	1523	37	115
					(Op.: JM1LPN)
*JA9SCB/1	"	241,956	720	33	99
*JF1SQC	*	173,382	548	32	79
*JAØBMS/1	*	134,841	469	32	81
*JQ1BNL	*	67,359	263	31	73
*JA1BBA	*	43,516	203	28	58
*JA1KK	*	34,144	168	28	52
*JH1FOP	*	27,430	188	24	49
*JQ1AHZ	*	22,496	123	24	53
*JG1QNV	*	14,340	96	20	40
*7K4XVK	*	9,498	86	19	24
*JO1RGV	*	8,136	77	18	25
*JM3UAO/1	*	7,248	113	27	44
*JH1KZQ/1	*	5,864	53	18	40
*JA1JLP	*	5,655	50	17	25
*JO1TLP	*	5,562	51	17	26
*JR1LQK	*	4,692	48	17	29
*JK1BII	*	3,912	45	16	23
*JG1GCO	*	2,598	27	16	25
*JE1PJR	*	2,550	47	10	11
*JR1UMO	*	1,288	17	11	17
*JR1BSV	*	813	19	8	13
*JK7SDX/1	*	168	8	4	3
*7M3RMD	*	86	8	4	7
*JH4ARK/1	*	66	5	3	2
*JE1GZB	14	16,720	92	26	50
*JG1FGL	*	79	6	5	4
*JH1AIL	7	2,248	36	16	19
*JE1SPY	3.7	539	16	8	9
JA2BNN	A	1,703,870	1875	114	232
JA2FSM	"	1,184,880	1337	110	232
JF2FIU	*	341,250	664	72	123
JH2AQI	*	183,784	308	75	167
JA2ZJW	28	374,904	1097	33	90
					(Op.: JH2CMI)
JA2CWU	21	72,592	304	26	67
JF2PTA	*	13,105	107	27	30
JA2DLM	3.7	4,154	46	16	24
*JK2VOC	A	186,776	404	83	144
*JF2SKV	*	168,439	388	67	112
*JA2OJ	*	157,664	333	66	122
*JP2XYT	*	133,760	289	64	126
*JA2GHP	*	128,304	345	50	100
*JA2BQX	*	124,317	317	63	108
*JH1ABP/2	*	113,527	287	57	119
*JH2WHS	*	83,279	245	47	88
*JA2BEY	*	55,588	198	56	85
*JG2REJ	*	41,992	171	34	65
*JA2BLJ	*	22,706	129	33	64
*JA2TKO	*	20,562	156	39	73
*JJ2TKX	*	13,752	80	27	45
*JI2VLM	*	11,917	87	27	34
*JL2HUJ	*	6,928	86	28	36
*JN2EIU	*	6,888	45	23	33
*JF2VAX	28	371,712	1054	32	96
*JA2KKA	*	59,765	275	23	62
*JG2VSF	*	44,160	206	23	57
*JA2GAL	*	28,831	163	22	45
*JN2QYN	*	647	16	9	7
*JR2LIS	21	246,050	709	35	98
*JH2BTM	*	17,797	116	23	41
*JA2IZA	*	4,213	43	12	26
*JL2LSA	*	3,519	52	14	17
*JF2FKJ	*	2,169	34	12	17
*JE2OTM	7	3,712	44	16	21
JS3CTQ	A	3,878,138	3237	120	311
JE3HDD	"	1,071,318	1038	104	289
JG3WCZ	*	607,011	739	108	213
JF3MKC	*	45,978	174	37	60
JA3ARM	*	29,103	111	38	68
JA3XOG	28	164,905	491	32	96
JR3NZC	21	657,122	1626	35	123
JE3BMU	*	57,082	197	30	84
JA3CE	7	2,140	23	17	21
*JH3CUL	A	664,734	700	103	254
*JI3BFC	*	346,466	538	86	177
*JA3UWB	*	96,897	252	50	104
*JH3TXP	*	62,304	200	43	77
*JJ3APB	*	42,837	156	52	77
*JL3IVX	*	14,669	83	34	45
*JJ3TBB	*	7,318	50	27	36
*JN3BMB	*	6,496	56	24	34
*JM3HYL	*	333	11	6	8
*JG3MMD	28	15,680	106	19	37
*JA3AA	*	10,987	84	15	40
*JH3AKD	*	2,750	32	14	23
*JR3RIY	21	441,294	1112	35	112
*JL3VUL/3	*	429,987	1185	35	107
*JK3DGX/3	*	267,600	664	36	114
*JA3LEZ	*	111,531	347	29	84
*JA3VXH	*	61,389	220	33	76
*JA3TC	*	49,041	232	27	59
*JL3RDC	*	19,747	131	24	44
*JR3CVJ	*	16,152	93	25	44
*JA3BBG	*	12,490	88	21	36
*JR3CVO	*	9,647	73	22	32
*JG3EHD	14	1,053	20	8	13
JH4UYB	A	5,905,708	3753	155	431
JH4ADK	"	1,066,716	1084	116	262
JA4DPL	*	468,860	787	76	162
JA4ESR	*	136,444	319	68	107
JA4DHN	*	31,955	92	49	87
JL4DJM	28	131,104	361	36	100
JA4XRN	*	2,112	24	13	19
JH4JNG	21	629,668	1494	38	126
JH4CPC	3.7	769	17	11	12
JA4YPE	*	48	3	3	3
					(Op.: JF3EBO)
*JR4GPA	A	529,074	812	67	167
*JE4MHL	"	311,491	458	81	170
*JA4AQR	*	90,997	231	44	105
*JA4EBU	*	4,366	44	11	30
*JM4WUZ	28	233,033	691	33	97
*JA4KTE	*	221,647	645	36	100
*JE4BTE	*	90,614	301	33	88
*JA4CTL	*	49,338	199	30	67
*JA4ETH	*	44,486	199	27	62
*JN4GHQ	*	40	3	1	3
*JA4BAA	21	29,638	152	23	57
*JA4JJI	*	23,348	146	23	44
*JA4TWZ	*	8,848	69	23	33
*JA4KDD	*	422	6	6	5
JH5FXP	A	6,195,458	4290	138	385
JA5IP	*	92,602	218	59	111
JH5FIS	*	14,792	74	35	51
JA5ATN	28	37,921	221	19	44
*JA5EO	A	399,636	791	65	131
*JH5OXF	*	125,913	319	50	91
*JA5NSN	28	84,410	303	32	78
*JF5FGY	*	15,433	81	27	52
*JG5VIA	*	10,808	63	28	41
*JR5HXU	*	1,975	23	13	21
*JE5MCV	21	486,999	1161	38	115
JQ6NAW	A	1,221,035	1273	111	263
JA6WW	28	97,232	323	31	87
JJ6DGP	*	77,024	275	29	80
JA6AV	*	38,016	153	31	68
JA6BCU	*	11,456	100	6	40
JR6EZE	21	802,402	1851	37	130
JH6EJG	7	51,639	215	27	74
*JA6EML	A	738,110	888	92	218
*JH6OPP	"	737,154	926	89	217
*JH6FTJ	*	236,027	495	56	130
*JA6QDU	*	39,171	146	42	62
*JH6AUS	28	646,462	1389	38	141
*JA6EFT	*	125,070	393	36	89
*JN6GBB	*	65,018	264	28	66
*JH6TYD	*	48,555	237	21	55
*JA6CBW	*	33,787	173	56	23
*JA6BIF	21	6,815	83	14	18
JA7JHT	A	270,600	394	88	176
JJ7SRA	*	38,836	136	42	76
JH7XGN	28	965,960	2117	36	128
JH7DNO	"	835,604	2294	36	118
JA7WME	"	511,210	1605	35	99
JH7BZR	"	172,353	848	21	52
JA7ERJ	"	103,105	383	32	75
JH7NPF	21	236,347	830	29	83
JH7LRS	14	603,943	1332	37	136
*JA7NVF	A	811,462	1136	86	190
*JH7CJM	*	47,045	118	57	108
*JA7ARW	*	8,828	67	24	33
*JF7GDF	*	5,227	49	20	25
*JRØEFE/7	*	4,472	41	26	26
*JA7BEW	28	472,940	1240	37	110
*7J7ACV	*	155,409	480	34	95
*7J7ACZ	*	149,846	454	31	98
*JE7DOT	*	77,271	306	28	70
*JA7COI	*	53,206	260	23	51
*JR7CJO	*	44,965	207	26	59
*JA7CUK	*	25,225	155	22	43
*JK7QYZ	*	11,682	104	16	29
*JH7FUI	21	61,100	230	28	66
*JM7EPG	*	25,788	142	22	52
*JR7LVK	*	13,314	173	25	60
*JA7ADV	*	7,029	70	18	31
*JR7XGL	*	4,879	50	18	24
*JN7LDV	*	4,330	46	17	23
*JR7LAQ	*	3,323	45	15	17
*JL7IFR	*	1,943	29	14	15
*JA7BJS	14	216,300	606	33	107
JA8RWU	A	3,844,800	2886	139	341
JA8TEZ	*	92,523	273	55	85
JH8UQJ	28	149,435	484	31	90
*JH8SLS	A	1,669,920	1489	115	305
*JE8NYY	*	47,234	177	38	75
*JH8HEO	*	25,578	135	33	54
*JA8GTO	*	5,692	41	31	35
*JK8HOS	*	4,615	43	21	25
*JH8DHV	28	78,617	328	29	68
*JH8QBY	21	28,417	142	23	55
*JI8GZS	*	11,537	81	23	34
*JK8TOE	*	3,783	63	16	23
*JK8FRL	*	79	6	5	4
JA9DDF	A	76,560	210	56	89
JA9IKL	28	16,703	115	21	36
*JA9KUG	A	62,542	188	50	93
*JE9UUY	*	21,067	116	26	44
*JH9VSF/9	28	646,152	1725	35	121
*JA9TQY	*	87,683	318	28	77
*JA1ALX/9	*	59,499	260	28	63
*JA9QOY	*	57,239	252	29	63
*JH9URT	21	223,091	672	32	94
JRØWZR	A	1,164,377	1083	116	310
JHØGHZ	"	646,961	692	107	266
JHØRNN	*	130,560	257	53	139
JAØHYU	*	63,541	166	53	105
JAØQWO	*	32,712	100	44	72
JAØRCK	21	27,832	105	27	71
JAØQNJ	7	210,630	736	33	85
*JAØTEN	A	39,265	145	43	64
*JAØGEY	*	16,434	102	36	47
*JGØGGI	*	8,442	49	28	39
*JEØVFV	*	4,266	39	20	28
*JGØIPW	*	1,378	20	14	13
*JAØGZ	*	1,295	22	14	18
*JHØFUW	28	408,204	963	36	117
*JH1BXH/Ø	"	399,785	1036	34	115
*JRØEQQ	*	73,431	260	34	89
*JHØEPI	14	159,269	491	34	95
*JEØRHE	*	57,582	189	36	90
*JAØVHI	3.7	111	8	3	3

JORDAN

JY9NX	A	7,800,344	4912	126	442
					(Op.: JM1CAX)
*JY9NE	A	53,360	178	30	85
					(Op.: N3FNE)

KAZAKHSTAN

UP4L	A	3,582,072	2729	121	395
					(Op.: UN7LZ)
UP6F	*	615,285	684	94	269
					(Op.: UN7FZ)
UN7TO	*	99,792	228	48	114
UN7JX	28	281,050	871	32	122
*UP5P	A	2,499,800	2584	139	441
					(Op.: UN5PR)
*UN8GU	*	401,706	668	70	188
*UN9FD	*	36,600	146	44	78

KOREA

HLØO	A	93,978	443	66	141
*HLØHQ	A	129,050	539	57	88
					(Op.: DS1HAL)

KUWAIT

9K2HN	A	9,330,834	5019	156	531

KYRGYZSTAN

EX8W	14	913,616	2224	38	141
*EX2T	A	1,265,962	1322	89	284
*EX8MIO	28	36,491	161	23	68
*EXØY	21	287,420	909	33	107

LEBANON

OD5NJ	A	6,550,950	4707	116	394
OD5					
/OK1MU	14	977,394	2106	38	139

MACAO

XX9TRR	A	4,415,560	3535	154	436
					(Op.: OH2PM)
*XX9SC	21	33,062	342	28	53
*XX9AU	*	15,000	200	22	28

MONGOLIA

JT1CO	A	4,715,064	4718	125	373
*JT1CJ	A	237,241	826	40	91
*JT1JA	"	194,127	546	66	127
					(Op.: JT1BG)
*JT1BV	28	175,905	696	28	93

OGASAWARA ISLANDS

*JD1BIA	A	161,390	1088	47	60

PALESTINE

E41					
/OK1DT	21	1,105,920	2575	37	123
E44DX	3.7	261,590	1017	20	81
					(Op.: OH1RY)

SAUDI ARABIA

HZ1AB	A	7,862,400	5179	122	418
					(Op.: DF1IK)

SINGAPORE

9V1RH	A	81,500	243	58	105
*9V1BG	A	431,756	782	97	202
*9V1XE	28	32,682	278	26	52
					(Op.: VK3DXI)

SRI LANKA

4S7EVG	A	113,306	332	59	122

TAIWAN

BV7FF	21	120,600	810	29	71
*BV3FQ	28	14,941	83	23	44

TAJIKISTAN

EY8MM	A	3,939,948	2835	127	446

THAILAND

HSØ					
/SM3DYU	A	47,854	145	55	87

TURKMENISTAN

*EZ8CW	A	26,796	122	33	54

UNITED ARAB EMIRATES

A61AJ	28	2,177,156	3974	40	162
					(Op.: DL2CC)

UZBEKISTAN

UK9AA	A	3,919,255	2815	128	419
*UK8IG	A	253,725	510	52	147

WEST MALAYSIA

9M2TO	A	1,802,808	1945	120	321
*9M2JI	A	60,393	290	48	75
					(Op.: JK1AJX)

EUROPE

ALAND ISLANDS

OHØZ	A	6,620,832	4765	146	486
					(Op.: OH2MAM)

ALBANIA

*ZA/S51PF	A	2,156	34	17	32

AUSTRIA

OE1EMS	A	2,880,598	2494	132	449
OE8CIQ	*	485,760	900	76	244
OE1TKW	*	7,104	69	23	51
OE3I	28	569,800	1361	38	147
					(Op.: OE1JNB)
OE6Z	14	1,878,569	4150	40	177
					(Op.: OE6MBG)
*OE7AJT	A	235,466	490	66	212
*OE1BKA	*	34,452	148	35	81
*OE2S	28	105,925	506	26	69
					(Op.: OE2GEN)
*OE3WMW	7	19,053	227	14	59

AZORES

*CU3AV	A	106,049	370	42	131

BALEARIC ISLANDS

EA6AEQ	A	759,150	1037	84	266
EA6ZS	*	81,503	299	40	109
*EA6LP	A	371,840	639	85	247
*EA6ZZ	*	116,012	311	58	136
*EA6YW	*	26,112	105	44	58
*EA6VQ	28	69,930	439	17	46
*EA6XQ	*	37,296	278	22	50
*EA6TC	*	33,726	244	21	56

BELARUS

EU1KR	A	135,240	420	51	159
EU1PA	*	118,656	429	56	150
					(Op.: EU1KR)
EW3LN	*	5,959	65	16	43
EU6TV	28	2,170	29	14	21
EW6GB	21	23,828	196	18	56
EW3EW	14	142,480	522	38	99
EU1CC	*	46,560	372	23	74
EW6AF	*	43,710	321	23	70
EU5A	7	153,472	987	28	100
EW1WZ	3.7	126,276	1202	20	82
EU4EU	*	26,488	468	7	49
EW6TU	*	17,898	416	10	47
EW7DX	*	13,250	205	9	44
*EU1SA	A	619,920	843	93	276
*EW1NA	"	237,120	487	71	214
*EW6DF	*	223,416	546	53	161
*EW8OD	*	85,324	260	47	119
*EU6AR	*	71,094	338	38	85
*EV5M	*	30,030	183	39	91
*EW6BI	*	3,080	44	14	30
*EW6AL	28	122,012	413	28	90
*EU6DX	*	52,400	238	27	73
*EW1NY	21	40,416	286	24	72
*EW8DA	*	28,476	153	22	62
*EW6AW	*	25,276	178	21	68
*EU6TT	3.7	15,433	223	11	50
*EU6EU	1.8	37,926	601	8	55

BELGIUM

OT9P	A	1,007,736	1263	94	304
					(Op.: ON6AH)
*ON5GQ	A	1,342,742	1383	115	394
*ON4AOI	*	820,050	1017	93	257
*ON5CZ	*	19,110	108	28	50
*ON4KMB	*	11,926	100	25	42
*ON7SS	*	3,600	39	18	27
*ON4TO	28	273,942	730	37	134

BOSNIA-HERZEGOVINA

T94MZ	21	271,123	1209	34	103
T94LW	*	214,953	895	34	103
T95A	7	4,633	91	8	33
T99W	3.7	150,920	1218	22	88
*T93R	A	57,276	240	33	78
*T97M	*	37,448	111	46	78
*T98W	*	32,818	155	42	80
*T93Y	28	427,450	1235	36	130
*T92M	*	60,864	277	26	70
*T95MMX	21	1,326	23	8	18
*T94DO	14	92,230	561	25	90
*T91AAW	7	25,853	239	20	83
*T97Y	*	6,650	104	9	41

BULGARIA

LZ5QZ	A	1,206,771	1805	97	336
LZ1ZD	"	1,033,389	1653	99	324
LZ6A	*	906,105	1305	102	333
					(Op.: LZ2EG)
LZ1BJ	*	861,105	1356	98	319
LZ1QV	*	40,703	203	32	69
LZ1BG	*	23,205	88	41	64

LZ1QZ	"	748	12	11	11
LZ1NG	**28**	**697,000**	**2005**	**38**	**162**
LZ6W	**14**	**115,994**	**409**	**30**	**88**
					(Op.: LZ2PEP)
LZ2CJ	**7**	**292,530**	**1323**	**34**	**113**
***LZ2NB**	**A**	**482,460**	**802**	**86**	**254**
*LZ3YY	"	226,709	641	58	175
*LZ2DB	"	142,830	366	54	153
*LZ3TL	"	74,725	322	45	130
*LZ1CW	"	68,013	384	25	74
*LZ5AZ	"	67,450	272	40	102
*LZ1AQ	"	55,263	170	48	121
*LZ4BU	"	13,446	65	36	45
*LZ2MP	"	11,360	62	29	51
*LZ4HM	"	2,288	31	17	27
***LZ2HM**	**28**	**309,450**	**1193**	**35**	**115**
*LZ1HB	"	111,435	660	27	58
*LZ2GS	"	91,396	257	31	115
*LZ2GTR	21	51,110	268	24	71
***LZ1UO**	**14**	**114,192**	**541**	**30**	**87**
*LZ2ZY	"	90,732	217	20	58
***LZ1UQ**	**3.7**	**63,084**	**695**	**15**	**69**
*LZ1DM	"	44,436	433	13	71

CROATIA

9A8M	**A**	**1,922,564**	**2004**	**133**	**444**
9A9A	**28**	**2,272,950**	**4071**	**40**	**185**
9A3TN	"	60,900	253	27	73
9A2R	**21**	**447,744**	**1202**	**38**	**138**
***9A3IJ**	**A**	**1,036,512**	**1196**	**101**	**371**
***9A2YC**	**"**	**881,144**	**1121**	**104**	**314**
*9A4SS	"	655,814	734	98	288
*9A2NO	"	603,908	674	102	326
*9A6ACY	"	251,600	746	42	158
*9A3SM	"	162,564	428	60	168
*9A5Z	"	110,622	326	59	120
*9A3CY	"	74,691	385	36	93
*9A5BB	"	28,615	135	25	72
***9A4KK**	**28**	**843,447**	**1743**	**37**	**146**
*9A99F	"	589,260	1367	38	145
					(Op.: 9A3AG)
*9A3GW	"	492,100	1101	39	146
*9A9R	"	378,675	969	38	127
*9A2RD	"	305,466	884	35	112
*9A5ST	"	255,753	783	38	119
*9A2TX	"	21,592	145	15	36
*9A4ML	"	16,933	128	23	36
***9A2L**	**21**	**344,871**	**1227**	**37**	**122**
					(Op.: 9A2VJ)
***9A4RV**	**14**	**65,945**	**410**	**26**	**83**
***9A2EU**	**3.7**	**138,303**	**1092**	**16**	**83**
*9A4W	"	21,645	311	11	54
*9A5AVW	"	9,593	197	6	47

CZECH REPUBLIC

OK1EP	**A**	**1,980,630**	**1961**	**117**	**414**
OK1DWC	**"**	**822,519**	**966**	**130**	**401**
OK2ABU	"	346,464	634	76	212
OK1DVM	"	235,759	456	69	212
OK2ZO	"	39,102	297	21	36
OK2RZ	**28**	**1,794,729**	**3623**	**39**	**162**
OK1AXB	"	355,260	828	38	153
OK1ARI	"	295,075	780	35	110
OK1KT	"	142,000	448	35	107
OK1QM	"	110,280	390	34	86
OK1RF	**21**	**1,096,480**	**2491**	**40**	**136**
OK2SAT	"	182,700	643	34	116
OK1XC	"	48,312	234	23	76
OK2OP	"	9,520	168	17	51
OK1RI	**14**	**1,431,846**	**3334**	**40**	**171**
OK1FCJ	"	536,040	1809	40	140
OK1FC	**7**	**39,678**	**282**	**22**	**80**
OK1DX	**1.8**	**62,530**	**855**	**10**	**64**
OK1DJ	"	1,395	41	5	26
OK1DWJ	"	196	10	4	10
***OK2VWB**	**A**	**1,301,956**	**1316**	**106**	**357**
***OK1DSZ**	**"**	**902,805**	**1204**	**88**	**329**
*OK1DUO	"	737,087	1061	90	313
*OK1MQY	"	498,780	900	69	257
*OK2SGY	"	407,175	865	76	229
*OK1JOC	"	386,884	743	73	238
*OK2PMS	"	384,622	871	72	259
*OK1SI	"	361,494	716	76	226
*OK2HI	"	313,564	618	71	206
*OK1AJY	"	305,280	592	69	196
*OK2QX	"	201,356	459	63	221
*OK2TBC	"	178,672	424	65	143
*OK1KZ	"	167,400	469	58	167
*OK1AUP	"	155,520	453	55	185
*OK2SWD	"	51,136	256	30	106
*OK1FDY	"	42,296	173	45	91
*OK2VP	"	23,016	107	36	48
*OK2EC	"	15,860	104	25	40
*OK1AOU	"	11,804	161	43	115
*OK1DDV	"	5,733	81	13	36
*OK2BHE	"	4,400	49	14	30
*OK2PSA	"	1,989	49	11	28
***OK1KCI**	**28**	**194,700**	**636**	**32**	**100**
					(Op.: OK1CDJ)
*OK1JN	"	137,500	478	32	93
*OK1DOL	"	123,299	442	33	88
*OK2ZJ	"	107,880	392	29	91
*OK1IE	"	85,445	272	32	83
*OK1ACF	"	76,024	280	31	73
*OK2PCL	"	58,194	183	32	74
*OK2PBG	"	30,030	178	20	46
*OK1HRR	"	25,756	227	15	32
***OK1FKM**	**21**	**188,917**	**591**	**37**	**126**
*OK2DU	"	90,272	543	28	84
*OK1LL	"	64,375	353	26	77
*OK1ILM	"	35,441	254	20	63
*OK1CZ	"	27,404	201	20	48
*OK1MMN	"	12,540	153	17	40
***OK1AKF**	**14**	**29,241**	**240**	**17**	**64**
*OK1DXR	"	24,734	229	21	62
*OK1FWW	"	5,080	95	10	30
*OK1DVK	"	714	26	6	15
*OK2PPM	7	6,678	111	8	45
*OK8PPA	3.7	460	25	5	18

DENMARK

OZ1HXQ	**A**	**1,863,869**	**2003**	**97**	**316**
OZ5EV	"	971,774	915	116	362
OZ9Y	"	238,663	895	32	69
OZ6PI	"	65,992	209	43	103
OZ5MJ	"	55,424	220	48	80
OZ3SK	**1.8**	**46,208**	**725**	**8**	**56**
***OZ1ACB**	**A**	**441,408**	**752**	**71**	**233**
*OZ8NJ	"	357,760	867	67	253
*OZ4NA	"	179,646	430	58	179
***OZ5DX**	**28**	**11,900**	**88**	**17**	**33**
*OZ7AEI	"	2,838	50	13	20
***OZ3ZK**	**7**	**15,330**	**66**	**7**	**30**

DODECANESE

J45P	**28**	**220,234**	**1475**	**28**	**78**
					(Op.: SV5AZP)

ENGLAND

M5D	**A**	**3,625,020**	**3285**	**132**	**408**
G3UFY	"	277,984	486	64	174
G4KIU	"	48,880	304	30	100
G4OJH	**28**	**490,620**	**1381**	**37**	**119**
M4R	**21**	**319,431**	**1065**	**33**	**114**
					(Op.: G4AXX)
G4WPD	"	180,918	667	32	106
G3NLY	**14**	**968,064**	**2640**	**39**	**153**
G3TVU/M	"	42,622	248	25	76
***G3VAO**	**A**	**1,015,644**	**1230**	**100**	**352**
***G4IIY**	**"**	**707,940**	**677**	**100**	**337**
*G3LOJ	"	205,646	495	57	202
*GØVBD	"	189,392	451	49	129
*G6QQ	"	173,019	480	56	175
*G4NXG/M	"	122,070	296	62	133
*G3JKY	"	114,848	379	47	147
*MØBWY	"	89,920	318	43	117
*G3RSD	"	37,180	188	32	98
***GØKDS**	**28**	**179,928**	**639**	**31**	**105**
***G4PCI**	**"**	**170,856**	**577**	**27**	**99**
*GØNWY	"	146,673	498	28	101
*GØKXL	"	29,484	147	27	90
***MØBJL**	**21**	**199,206**	**764**	**33**	**120**
*GØATG	"	49,622	327	23	63
*GØVQR	"	10,150	107	14	44
*GØJJQ	14	16,958	212	12	49
*G3XWZ	1.8	8,427	37	4	21

ESTONIA

ES1OX	**A**	**180,792**	**411**	**71**	**208**
ES1QD	"	120,982	199	79	162
ES1RA	"	44,744	140	58	130
ES1BH	**14**	**93,338**	**686**	**26**	**87**
***ES6PZ**	**A**	**802,072**	**1089**	**94**	**334**
*ES4RD	"	370,622	613	82	240
*ES4BG	"	170,681	438	61	198
*ES1QX	"	89,562	314	43	134
*ES7FU	"	27,550	239	21	74
***ES1ABR**	**28**	**167,240**	**509**	**34**	**114**
*ES6CO	"	79,704	293	33	90
*ES5RIM	"	58,712	337	20	62
*ES6DO	"	42,837	165	32	99
*ES1MM	"	6,440	43	24	32
***ES3BM**	**21**	**88,143**	**404**	**32**	**90**
*ES1CN	"	69,892	372	24	77
*ES6RHB	"	43,359	233	23	74
*ES1RG	"	15,120	142	17	46
*ES5CX	"	10,340	128	14	33

EUROPEAN RUSSIA

RM4W	**A**	**5,197,066**	**4064**	**139**	**463**
					(Op.: RW4WR)
RW4AA	**"**	**3,536,068**	**3317**	**135**	**461**
RM3C	**"**	**2,628,444**	**2498**	**131**	**478**
					(Op.: RA3CW)
RN6BY	"	2,334,120	2283	130	400
UF3CWR	"	2,217,039	2692	127	402
					(Op.: RV3BR)
RW1ZA	"	1,874,400	2021	124	404
RU3QW	"	1,823,164	2030	120	412
UA3BL	"	1,489,011	1855	113	406
UA1OMS	"	1,165,104	1344	116	380
RX3RC	"	1,100,320	1545	105	355
UA4LY	"	771,060	1182	88	338
RA3ANI	"	503,025	882	75	278
RA3LBW	"	390,945	729	81	254
RK3DK	"	360,267	780	70	233
UA3AGS	"	318,091	582	80	251
RU3FF	"	294,250	507	60	190
RU3DX	"	276,822	518	93	245
RA3XO	"	255,498	468	75	216
RN3FA	"	232,674	498	74	173
RK3AD	"	214,240	542	61	199
RK6BZ	"	196,900	574	65	210
RA1QX	"	183,651	468	51	170
RZ1AZ	"	169,276	330	55	147
RV3DAR	"	161,330	311	60	161
RW6BN	"	120,156	353	49	155
RW3QF	"	92,984	240	63	134
RX3RZ	"	58,338	307	27	99
RA4UAT	"	9,246	79	21	48
RU6LA	**28**	**644,436**	**1570**	**39**	**165**
RN3QY	"	428,526	1282	40	131
RA4CC	"	400,920	1333	36	120
RV6LJK	"	158,382	860	31	95
RN6HE	"	156,584	515	33	115
RV6LOB	"	113,832	430	34	119
RX3ABI	"	2,294	33	13	18
UA3EJU	**14**	**40,375**	**310**	**21**	**64**
RA1ABU	"	5,963	99	17	50
RW4PL	**3.7**	**95,312**	**607**	**24**	**88**
RK4FD	"	50,286	516	14	73
RA3XA	"	23,115	289	11	56
***UA3BZ**	**A**	**587,776**	**989**	**79**	**249**
***UA3LHL**	**"**	**529,617**	**796**	**87**	**276**
***RU3DVR**	**"**	**453,152**	**672**	**92**	**300**
*RA1AW	"	429,490	797	71	219
*RZ3FR	"	289,501	583	72	235
*UA1AJW	"	278,164	386	85	268
*RA1AKE	"	274,890	694	56	199
*RA3SL	"	245,875	582	70	211
*U1BA	"	213,044	509	58	183
*RA3NZ	"	193,680	472	69	200
*UA9QCP/3	"	176,928	390	44	150
*UA3SAQ	"	160,545	419	62	169
*RX3DBG	"	149,612	400	55	171
*UA4HAK	"	135,160	408	56	162
*UA4ACP	"	124,200	407	48	136
*RU4WE	"	116,842	391	58	168
*RA3QOC	"	114,240	389	42	162
*UA4FER	"	112,749	377	42	135
*RX1CQ/1	"	109,806	636	64	163
*RV3YR	"	100,584	340	45	153
*RX3AEX	"	91,800	339	48	152
*UA1AKE	"	71,780	156	62	132
*UA6XT	"	59,479	202	58	145
*RW1QF	"	57,682	153	50	141
*UA3ZU	"	50,864	401	27	109
*RK3BR	"	45,453	173	45	94
*UA1AQF	"	41,374	220	35	116
*UA1OAM	"	37,490	145	54	109
*RAØCCV/3	"	31,248	180	11	37
*UA1ZKF	"	25,389	239	57	116
*RN1AR	"	24,900	113	32	51
*UA3YCX	"	9,849	97	14	53
*RA1TV	"	6,675	76	19	56
*UA3XAC	"	6,300	63	25	45
***UA4LCQ**	**28**	**532,449**	**1632**	**38**	**163**
***RA4HT**	**"**	**307,116**	**996**	**36**	**135**
*RU3WR	"	102,942	471	29	85
*UA3VCS	"	99,876	411	28	95
*RW4WM	"	95,496	396	29	109
*RA6AMA	"	92,920	457	30	85
*RV3AH	"	77,490	419	26	79
*UA4PAN	"	76,600	533	23	77
*UA4LBK	"	52,767	277	24	75
*RA3OU	"	15,120	102	26	58
*RW3DLX	"	11,990	128	16	39
*RU3DD	"	10,686	141	5	21
*UA3QJJ	"	5,775	82	26	49
*UA6ACK	"	391	10	7	10
***RU4PL**	**21**	**740,124**	**2084**	**38**	**140**
***UA3ADN**	**"**	**475,794**	**1633**	**34**	**128**
*RW3GB	"	389,298	1177	35	126
*RZ6FA	"	387,200	1156	40	136
*RV3ACA	"	250,033	898	37	124
*RA3DNC	"	215,605	790	36	119
*RU3WT	"	73,124	306	25	76
*RN3FT	"	59,470	353	22	73
*RW6AH	"	45,291	273	27	66
*UA3UMT	"	9,381	114	10	43
***RA3WA**	**14**	**277,264**	**881**	**36**	**136**
*UA3IKO	"	148,452	653	34	105
*UA1ANA	"	146,652	690	32	100
*RW1ON	"	49,572	315	26	76
*UA3XBB	"	6,213	84	13	44
***RW3DU**	**7**	**28,301**	**216**	**19**	**72**
*UA3RCM	"	1,728	44	7	25
***UA6LV**	**3.7**	**63,140**	**426**	**24**	**86**
*UA3SGA	"	532	36	4	10

EUROPEAN TURKEY

***TA1FA**	**A**	**391,745**	**1200**	**51**	**84**
***TA1BM**	**28**	**107,217**	**717**	**24**	**75**

FINLAND

OH6RX	**A**	**5,365,115**	**3804**	**142**	**453**
OH5LF	**"**	**4,098,125**	**3278**	**149**	**476**
OH1VR	"	3,327,876	2611	144	438
OH8BQT	"	1,011,593	1122	105	346
OH1JD	"	971,658	1005	111	303
OH1BV	"	814,500	1223	84	291
OH3JR	"	340,338	400	97	336
OH1BOI	"	234,240	446	59	197
OH1TV	"	101,981	283	44	83
OH9A	"	3,975	43	20	33
					(Op.: OH1EH)
OH4MDY	**28**	**643,188**	**1909**	**36**	**146**
OH3RR	"	188,500	597	34	111
OH2KQ	"	13,851	61	25	56
OH8OB	"	12,152	120	18	44
OH2RA	**21**	**664,994**	**1958**	**40**	**127**
OH5NQ	"	470,415	1467	38	127
					(Op.: OH5JOC)
OH2BCD	"	96,000	583	31	89
OH8LQ	**14**	**1,196,432**	**3137**	**40**	**148**
OH6ZH	7	1,815	25	10	23
OH3UU	**3.7**	**59,224**	**649**	**17**	**71**
OH2BYS	"	58,206	597	16	73
OH7A	**1.8**	**5,390**	**203**	**6**	**43**
					(Op.: OH7UE)
***OH2LYP**	**A**	**434,160**	**825**	**72**	**252**
*OH2BPA	"	234,156	448	73	243
*OH1HJO	"	102,185	323	44	147
*OH2NN	"	88,433	221	50	141
*OH1TD	"	72,854	191	50	96
*OH3JKV	"	16,384	99	21	43
***OH4A**	**28**	**172,744**	**610**	**34**	**109**
					(Op.: OH4JLV)
*OH2LU	"	136,752	438	27	105
*OH4YT	"	81,534	380	26	81
*OH2BNX	"	56,832	221	25	86
*OH5PA	"	54,208	176	20	101
*OH2MO	"	24,534	188	21	66
*OH6RC	"	5,238	46	17	37
*OH1WR	"	682	13	9	13
***OH8NLC**	**21**	**66,960**	**319**	**24**	**84**

FRANCE

F5LBL	**A**	**2,135,424**	**2367**	**112**	**386**
F5AMH	**"**	**1,627,200**	**1962**	**100**	**350**
F5BBD	"	977,152	1415	86	266
F6CXJ	"	258,359	513	61	178
F5RAB	"	193,548	354	73	181
F5SUL	"	107,672	301	47	125
F5KDQ	**28**	**245,077**	**715**	**35**	**122**
					(Op.: F5MVB)
F6CLM	"	5,633	63	8	35
TM9T	**21**	**919,620**	**2656**	**37**	**119**
					(Op.: F6HMQ)
TM4T	"	874,057	2111	40	139
***F5ASD**	**A**	**823,549**	**1303**	**79**	**274**
***F8BJI**	**"**	**594,540**	**790**	**76**	**248**
***F5DRD**	**"**	**569,470**	**913**	**79**	**255**
*F6FTB	"	551,777	825	83	248
*F5SUY	"	312,312	597	71	241
*F5TVG	"	257,957	383	85	216
*F8BQQ	"	213,624	425	59	217
*F8AKC	"	163,268	346	61	177
*F5OHH	"	140,182	414	54	163
*F5NBK	"	128,466	295	57	126
*F5JBR	"	81,832	267	47	146
*F5RPB	"	62,495	182	47	98
*F5MLJ	"	61,787	244	39	98
*F6DZD	"	56,848	200	42	110
*F8AMV	"	42,673	137	42	97
*F5JSK	"	37,500	200	36	60
*F5DXN	"	26,287	163	30	67
***F5BZB**	**28**	**616,137**	**1500**	**36**	**141**
*F5TDK	"	398,938	1018	35	138
*F5CWU	"	167,640	621	28	92
***F5JY**	**21**	**78,807**	**358**	**23**	**86**
***TM9K**	**14**	**446,042**	**1505**	**37**	**129**
					(Op.: F5BEG)
*F5HWB	7	6,811	80	10	39
***F2EE**	**3.7**	**47,920**	**519**	**14**	**66**
*F5JDG	"	27,150	165	22	53

GERMANY

DJ4PT	**A**	**4,586,742**	**3317**	**144**	**438**
DJ6QT	**"**	**3,751,704**	**2869**	**141**	**453**
DL4NAC	**"**	**3,417,540**	**2498**	**141**	**477**
DL2DX	**"**	**2,580,462**	**2060**	**132**	**397**
DF6QV	"	2,349,315	1891	120	435
DL8PC	"	1,592,532	2127	83	196
DL1NEO	"	972,334	996	95	363
DL1AZZ	"	956,592	1222	105	333
DJ8UV/P	"	605,880	1184	80	260
DF1DV	"	550,020	889	80	276
DK8EY	"	543,326	794	91	303
DM3HZN	"	519,840	806	69	235
DK6CQ	"	495,516	706	79	268
DL6UNF	"	466,281	701	69	240
DF6JC	"	377,134	704	59	143
DL1TC	"	368,736	450	85	249
DF9RD	"	324,373	655	70	241
DL8YR	"	309,333	546	69	222
DJ4QO	"	294,021	521	68	205
DK6QW	"	238,238	483	58	180
DF3JO	"	237,144	425	69	172
DL3ZI	"	226,642	509	73	226
DL4DCC	"	182,280	421	57	188
DL8NBE	"	178,976	385	69	203
DL6AG	"	176,955	334	67	168
DK6HH	"	169,684	319	62	174
DHØSP	"	148,088	332	54	160
DJ2IA	"	130,800	300	63	155
DL6KVB/P	"	126,812	424	53	143
DL6AX	"	108,367	409	38	99
DL3ARK	"	102,508	278	54	142
DL4DRA	"	98,325	310	49	122
DL5RBR	"	90,508	264	50	137
DL5JMN	"	90,000	302	39	86
DH9KR	"	85,960	323	37	103
DL6DVU	"	76,825	300	41	134
DL7YS	"	72,580	218	54	137
DL2MFP	"	40,720	180	20	60
DK4QT	"	35,650	121	37	78
DL5RMH	"	24,521	156	34	79
DL2AYL	"	19,602	95	36	63
DL5ZV	"	15,510	94	19	36
DL1ARK	"	10,260	58	39	56
DL2DSA	"	4,032	33	38	73
DL9XW	"	2,730	37	13	26
DF8XC	**28**	**754,572**	**2010**	**39**	**143**
DLØSG	**"**	**501,354**	**1409**	**35**	**126**
DJ5JH	"	430,359	1047	36	131
DL2KUW	"	140,504	342	39	143
DL2QT	"	131,200	442	30	98
DK7AN	"	87,740	337	28	79
DJ6GK	"	59,670	236	35	100
DL1IAO	**21**	**1,023,975**	**2226**	**39**	**146**
DK9WI	"	83,210	358	27	79
DJ7AA	**14**	**1,822,464**	**3692**	**40**	**186**
DF7YU	"	304,854	961	40	146
DF4IAR	"	208,500	915	32	93
DL4NN	**7**	**34,202**	**269**	**21**	**77**
DL3LAB	**3.7**	**147,805**	**1204**	**21**	**82**
***DKØDO**	**A**	**2,265,189**	**1983**	**120**	**449**
					(Op.: DL1MGB)
***DF7RX**	**"**	**2,073,500**	**1857**	**124**	**456**
***DL7ANR**	**"**	**1,569,584**	**1413**	**117**	**409**
*DL3NCI	"	1,411,038	1397	118	436
*DJ3HJ	"	1,214,370	1431	93	316
*DL4FAY	"	767,864	949	89	335
*DF3QG	"	754,152	766	117	352
*DLØMFL	"	719,775	1078	76	239
					(Op.: DL2JRM)
*DK7ZH	"	710,850	993	79	271
*DF2FM	"	688,800	866	85	265
*DJ4JF	"	673,872	686	111	306
*DF6LQ	"	639,963	941	75	262
*DL3ZAI	"	565,547	898	85	282
*DF1ZN	"	499,525	707	79	246
*DL5ASE	"	496,105	862	76	241
*DJ1OJ	"	487,306	720	84	250
*DL2KK	"	482,560	806	72	248
*DL8SDC	"	480,352	795	71	201
*DL4ZBC/P	"	421,470	778	68	247
*DL3NBL	"	371,196	635	92	286
*DL1LSZ	"	364,480	818	57	215
*DL2HX	"	359,988	543	104	289
*DL6JFR	"	334,506	519	73	210
*DJ2OR	"	301,675	565	73	202
*DK5DS	"	298,496	602	72	184
*DF1QQ	"	297,568	550	69	203
*DH2PL	"	285,136	623	64	220
*DL1FZZ	"	272,640	514	61	195
*DL7UXG	"	272,583	627	62	217
*DF5EN	"	243,522	503	58	191
*DL8ULO	"	233,548	602	57	209
*DL2JAA	"	219,564	499	57	157
*DL8HCO	"	216,905	479	58	177
*DL2AL	"	213,672	506	58	174
*DL2YAK	"	212,880	512	57	183
*DF2KD	"	208,472	400	64	120
*DK5AN	"	175,351	442	51	158
*DL5WS	"	171,336	369	59	118
*DL1MDH	"	162,176	394	63	161
*DL1AOB	"	160,524	395	58	194
*DL1DQY	"	155,946	443	59	178
*DL4FDM	"	149,350	282	64	142
*DL4GBA	"	149,325	323	67	208
*DL6AKK	"	147,368	425	54	164
*DJ2UB	"	127,281	372	54	149
*DJ3GE	"	118,482	335	49	137
*DL1AQY	"	109,335	265	56	141
*DL6ZNG	"	90,128	260	56	116
*DL3DBY	"	80,852	271	43	121
*DJ1AD	"	79,838	288	48	143
*DK7FP	"	74,899	248	38	83
*DL1EHR	"	68,704	283	40	112
*DK4DS	"	60,858	196	49	112
*DL1DCJ	"	49,248	210	35	79
*DK1EAW	"	46,368	195	43	83
*DL5ANS	"	36,920	164	44	86
*DL2FAR	"	32,960	107	16	38
*DL9FV	"	22,824	146	25	47
*DL3KDC	"	21,939	213	25	78
*DM5OH	"	21,840	67	30	40
*DL2RTJ	"	20,544	155	28	79
*DL2MIH	"	19,404	73	38	60
*DL1HSR	"	11,834	70	24	37
*DL4AUE	"	10,318	85	26	51
*DF5AU	"	6,405	45	22	39
*DF5RF	"	5,917	42	25	36
*DJ2QV	"	4,128	30	21	27
*DL9JW	"	1,920	47	8	32
*DL6OZ	"	1,855	38	12	23
*DL3JRA	"	1,215	25	11	16
***DL1LH**	**28**	**715,007**	**1578**	**39**	**160**
***DJ7LX**	**"**	**280,440**	**828**	**37**	**127**
*DL4YAO	"	192,049	527	34	109
*DJ9RX	"	125,744	390	29	87
*DF9CY	"	102,250	315	35	90
*DJ2XC	"	101,626	329	29	90
*DF2GN	"	96,728	373	28	85
*DH5WB	"	72,981	395	24	57
*DL6EG	"	41,688	238	21	51
*DL6UAM	"	41,028	201	21	57
*DL3AG	"	34,142	139	26	60
*DM3XI	"	19,760	93	28	48
*DJØBX	"	12,876	124	15	22
*DL3WB	"	10,251	82	17	34
*DL6KBG	"	2,112	37	9	15
***DJØMCZ**	**21**	**234,284**	**764**	**34**	**114**
*DL3BRA	"	49,234	233	28	75
*DL4XS	"	15,410	124	17	50
*DL2RZG	"	12,636	104	18	36
*DL5CX	"	135	5	4	5
***DF2EY**	**14**	**5,720**	**54**	**15**	**37**
*DK1HO	"	2,520	26	16	24
*DL8AKA	7	4,590	79	10	41
***DF9LJ**	**1.8**	**10,718**	**178**	**7**	**53**

GIBRALTAR

*ZB2/W8DO	A	2,050	158	23	59
***ZB2/AA3SN**	**21**	**134,640**	**1385**	**21**	**78**

GREECE

SV1DZB	**A**	**481,068**	**1181**	**89**	**233**
***SV1DKL**	**A**	**687,420**	**1195**	**91**	**289**

*SV1CID	"	172,056	350	74	194
*SV4FGT	"	16,256	154	16	48
*SW2A	28	550,293	1634	35	142
					(Op.: SV2AEL)
*SV1CQN	21	175,275	938	29	94
*J42T	"	74,750	390	27	88
					(Op.: SV2BFN)
*SV2BBD	14	1,271	29	9	22

HUNGARY

HG5T	A	2,685,956	2439	131	480
					(Op.: N9NC)
HA3MN	"	1,328,613	1286	113	376
HA8ZO	"	383,032	602	75	179
HAØDU	21	598,596	1673	38	128
HA5CQ	14	57,677	230	33	104
HA3UU	"	27,846	278	18	45
HG9X	7	422,808	1789	35	123
					(Op.: HA9PP)
HA7JTR	3.7	62,568	786	13	66
*HA1CW	A	1,662,966	1878	108	431
*HA/WØYR	"	440,748	1078	56	133
*HA8IH	"	262,856	519	69	163
*HA8AT	"	117,952	274	59	135
*HA8A	28	296,257	729	37	132
*HG9VHF	"	176,859	543	33	96
					(Op.: HG9MET)
*HA3FT	"	135,423	466	30	93
*HA9MDP	21	402,371	1367	33	107
*HA5COK	"	57,672	227	27	81
*HAØIT	14	425,712	1566	38	130

IRELAND

EI8IC	A	1,515,746	1803	85	312
EI4DW	"	1,233,728	1687	72	224
*EI4CF	A	345,402	561	73	206

ITALY

II4A	A	1,978,399	2250	106	357
					(Op.: IK4ADE)
IK8NWK	"	1,864,560	2775	100	308
IZ8CGS	"	1,551,744	1672	100	284
IZ4COW	"	1,379,853	1658	102	315
IK6JNH	"	937,984	1070	109	349
IK4ZHH	"	512,278	714	91	232
IK4QJM	"	437,760	768	74	214
IK4MHB	"	345,552	839	47	137
IZ2BVL	"	228,987	372	71	226
IK2YVI	"	143,220	319	59	158
IZ5AXA	"	137,386	377	46	100
IV3GCH	"	107,640	357	42	142
IK7UKF	"	78,209	281	54	143
IZØBPI	"	76,638	247	45	114
IK7WUE	"	55,314	241	40	86
I2/NH7DX	"	29,735	244	28	67
					(Op.: I2UIY)
IR1A	"	2,145	25	15	24
IR4W	28	1,095,780	2306	40	170
I8KPV	"	662,279	1604	37	144
I8UZA	"	473,480	1235	38	140
IK2YSA	"	391,401	1018	38	119
IK2EGL	"	150,259	456	31	108
IV3BMV	"	105,250	418	35	90
IK7QHS	"	96,683	411	30	79
IO5A	21	716,562	2230	37	117
					(Op.: IK5ZTW)
IU2P	"	699,600	1836	36	129
					(Op.: I2PJA)
IO4L	7	302,853	1383	35	122
					(Op.: I4LCK)
IR4R	"	190,000	946	26	99
					(Op.: IK4ALM)
IR8B	"	14,003	238	13	54
*IK2VFW	A	787,632	1055	82	284
*IK1RQQ	"	692,229	828	97	311
*IN3XUG	"	636,030	836	93	289
*IK2SAI	"	520,960	820	73	223
*IK6OIN	"	436,240	622	96	232
*IK3PQG	"	272,238	539	82	232
*IK2RPK	"	261,105	504	64	131
*II3L	"	216,576	729	58	198
					(Op.: IV3KAS)
*IK8DUI	"	203,580	568	57	177
*IK1YEE	"	200,704	452	61	163
*IK2YSJ	"	172,508	490	51	151
*IK7RVY	"	170,984	590	44	90
*IK6UBY	"	166,124	452	55	183
*IZ4DJZ	"	166,044	382	59	143
*IZ2BKA	"	150,552	332	59	145
*IK3CXG	"	148,654	429	54	179
*IK8JRD	"	145,044	431	58	146
*IK2WZQ	"	144,935	291	65	140
*IZ2ABN	"	135,366	257	76	155
*IK3SCB	"	131,626	341	56	137
*IK5NTF	"	130,414	334	49	148
*IK2RPE	"	128,945	385	54	131
*IZ6CUS	"	116,590	360	49	129
*IK2WYI	"	110,825	394	36	107
*IK8WEI	"	110,372	355	48	116
*IZ8DBJ	"	104,430	314	56	121
*IZ2BHQ	"	103,602	231	61	125
*IK1DFH	"	94,380	242	48	117
*IK8IFW	"	90,153	345	44	115
*I8TWB	"	85,744	307	51	133
*IK3XTY	"	82,040	293	50	90
*IK4THF	"	75,604	258	53	111
*IK8YFU	"	71,064	241	47	121
*IKØSTM	"	66,120	167	56	134
*IZ1AWD	"	57,447	188	45	72
*IK1ZOE	"	56,581	273	40	97
*IK7WPD	"	53,721	173	46	95
*IZ2DAY	"	48,618	230	38	108
*IK7YZI	"	48,024	148	51	87
*IK3ZBM	"	35,332	133	43	78
*IK2OLJ	"	32,912	171	39	82
*IV3RLB	"	32,841	110	48	75
*IK8YFW	"	31,808	155	36	76
*IV3KSE	"	30,624	151	34	82
*IK2VUC	"	29,502	132	38	61
*I2WIJ	"	26,568	120	34	74
*IZ2ACG	"	23,865	127	41	70
*IK5ZTT	"	23,067	191	22	77
*IZØBXT	"	22,932	104	38	88
*IK4WLP	"	20,300	114	37	79
*IK3UMT	"	13,708	61	34	58
*IK7YZF	"	12,993	101	23	38
*IK2ZJN	"	12,300	65	30	45
*IK4CBM	"	11,310	113	16	49
*IØ/YO6FUP	"	11,200	112	20	77
*IK1VGG	"	11,092	108	26	68
*IK2XYI	"	3,200	33	17	23
*IZ1CQZ	"	2,813	33	14	15
*IK2EBP	"	2,738	36	16	21
*IK8NRW	"	1,989	34	15	24
*IZ3ALS	"	975	13	12	13
*IK2ZJJ	"	630	16	8	13
*IK8TEO	28	310,416	772	34	140
*IQØA	"	199,120	586	31	121
					(Op.: IKØXBX)
*I2ARC	"	87,255	340	28	77
*IK5EKB	"	85,342	282	35	107
*IK6VXO	"	73,138	350	26	71
*IV3ZUU	"	53,580	296	26	69
*IZ7CDB	"	48,000	230	27	69
*IK5YJK	"	17,875	144	18	37
*IR5T	7	172,909	1112	26	95
					(Op.: IK5ORP)
*IK3SSJ	3.7	14,160	233	9	50
*IØKHP	1.8	4,840	47	4	25

JERSEY

*GJØNYG/P	28	340,900	1078	31	109

KALININGRAD

*UA2CZ	A	93,018	299	56	166

LATVIA

YL2GM	A	2,332,624	2472	110	362
YL2KO	"	2,153,382	2274	117	408
YL3CW	"	1,023,708	2294	39	157
YL2MR	"	439,920	976	76	236
YL2IP	"	157,200	276	75	165
YL2LW	"	13,120	144	21	61
YL2GD	7	32,752	272	17	72
*YL2KA	A	776,902	1085	88	334
*YL2SW	"	313,172	741	63	173
*YL2NS	"	188,851	528	48	151
*YL2GQT	28	143,500	566	29	96
*YL2EC	"	342	11	7	11
*YL2BJ	21	48,216	260	24	74
*YL2PP	"	46,354	273	23	75
*YL3BZ	"	23,192	223	24	80
*YL3FW	14	70,192	513	26	81

LITHUANIA

LY2BTA	A	3,238,040	2872	153	523
LY1CX	"	1,544,480	1630	110	380
LY5W	"	1,161,356	1563	91	322
					(Op.: LY1DR)
LY2MM	"	828,936	1073	92	305
LY2DX	"	437,898	791	78	276
LY3CW	"	322,518	764	67	227
LY2OX	"	114,057	314	48	123
LY1TR	"	56,772	159	59	112
LY2BET	"	12,480	84	21	44
LY3ZM	"	3,480	71	9	31
LY2GF	28	569,850	1510	38	136
LY3IW	21	9,016	76	14	35
LY2CX	14	85,724	513	27	89
LY3BX	7	111,027	835	26	93
LY3BS	1.8	68,612	965	8	60
LY2OU	"	12,936	303	7	49
*LY6M	A	4,367,360	3162	134	506
					(Op.: LY1DS)
*LY3BA	"	3,044,888	2486	131	485
*LY2PW	"	980,001	1204	117	404
*LY1DD	"	447,180	895	61	196
*LY2LA	"	386,560	784	76	226
*LY2FN	"	355,812	743	68	230
*LY3CY	"	346,346	731	59	227
*LY1BW	"	225,594	612	53	196
*LY1DT	"	163,900	676	49	171
*LY2PBM	"	72,000	405	30	120
*LY2AE	"	70,956	238	42	120
*LY1FW	"	58,275	246	40	135
*LY3KB	"	36,309	175	36	97
*LY2OW	"	15,456	174	21	75
*LY2AT	28	57,785	282	29	62
*LY2GV	"	15,180	100	22	44
*LY3NRO	21	18,615	189	18	55
*LY2TZ	14	58,446	420	23	79
*LY2CU	"	14,768	249	14	57
*LY3NRP	3.7	1,632	61	5	27

LUXEMBOURG

LX1TI	A	1,163,170	1760	95	315
LX2AJ	"	1,090,674	1195	116	415
LX1EP	"	771,060	1734	74	288
LX2SM	21	280,779	889	38	135
*LX1JH	A	528,556	830	84	217
*LX1FC	14	51,992	382	23	74

MACEDONIA

Z31GX	A	1,252,098	1843	94	299
Z37FCA	"	621	13	10	13
*Z31JA	28	715,929	2232	37	130
*Z31BU	21	235,170	1002	30	105
*Z32KV	3.7	1,080	37	5	19

MALTA

9HØA	28	1,658,916	4119	40	163
*9H3AAA	A	323,120	528	69	211
					(Op.: OE3JIS/1)
*9H4GRS	28	10,065	94	22	39
					(Op.: 9H5JO)

MOLDOVA

ER1IM	A	343,577	531	59	110
ER3HW	28	105,264	265	31	105
ERØF	21	1,075,392	3136	40	152
					(Op.: UXØFF)
ERØN	14	561,756	1837	35	134
					(Op.: UT7ND)
*ER2GR	28	15,744	108	18	46
*ER1LW	3.7	23,528	300	10	58

MONACO

*3A/K3TW	21	7,685	103	9	44

NETHERLANDS

PAØIJM	A	1,107,410	2016	80	290
PAØADP	"	36,480	153	35	79
PA3BWD	14	44,298	149	34	104
PA1AW	"	34,500	221	19	41
PA4WM	3.7	116,100	1084	16	74
*PA1TT	A	944,632	1134	92	311
*PAØMIR	"	693,668	879	94	310
*PAØKHS	"	683,337	1051	81	298
*PA3ELD	"	320,850	503	87	223
*PAØRBS	"	255,580	591	63	197
*PA2SWL	"	231,660	425	73	224
*PA1BX	"	105,225	306	50	133
*PAØJR	"	104,076	330	54	142
*PA3GZC	"	101,150	352	46	129
*PAØJNH	28	40,770	219	24	66
*PA3HCF	"	19,093	187	17	44
*PA3EMN	21	151,470	588	31	104
*PAØRRS	"	53,000	241	22	84
*PA3CAL	14	40,326	281	22	72

NORTHERN IRELAND

GIØKOW	A	10,457,664	6375	155	589
*GIØKVQ	A	297,075	651	58	175
*GIØOUM	"	121,680	416	49	146

NORWAY

LA7CL	A	120,960	363	51	129
LA4EU	"	100,155	312	49	116
LA9JDA	"	99,750	332	44	146
LA6VDA	"	80,800	264	50	150
LA9AU	"	23,861	139	34	73
LA8GK	"	11,392	57	39	50
LA6YEA	28	955,200	2005	39	160
LA2MJA	"	158,067	605	28	89
LA5YV	"	16,472	101	17	54
LA2IR	14	97,695	425	26	91
LA5QFA	3.7	72,357	782	15	74
LA6EIA	"	47,872	479	14	74
LA6WEA	1.8	12,444	227	12	49
*LA5JX	A	319,023	679	75	147
*LA2HFA	"	286,416	617	66	206
*LA1PHA	"	250,690	516	60	205
*LA2EIA	"	206,397	578	52	161
*LA9GY	"	117,810	431	49	161
*LA7TN	"	102,486	397	45	141
*LA2JR	"	15,176	106	23	33
*LA2DKA	"	15,015	142	22	69
*LA3TR	"	1,232	24	10	12
*LA4LG	28	20,808	140	21	47
*LA1VKA	"	1,540	26	10	25
*LA8WG	21	30,420	214	18	60

POLAND

SP9WZJ	A	1,548,004	1774	93	392
SP6AZT	"	1,348,872	1551	123	395
SP1CHV	"	956,734	1129	94	289
SP6CZ	"	871,060	907	127	358
SP3BNC	"	424,960	668	85	235
SP1AEN	"	134,075	364	36	119
SP9HZW	"	101,887	275	46	93
3ZØZAR	"	86,975	296	44	131
SP9DAE	"	83,768	375	32	116
SP9MAX	"	75,180	238	53	126
SP2ATF	"	47,144	203	45	97
SP1MHV	"	40,004	123	52	85
SP9VRY	"	30,537	100	48	69
SQ9FCH	"	10,947	90	29	60
SP9LDI	"	6,336	120	10	23
SP6NVK	"	4,784	40	20	32
SP6AYP	"	2,232	25	15	21
SP7HQ	"	1,820	21	16	19
SP2QVI	28	833,454	2085	39	132
SP3KFH	"	778,300	1820	36	136
					(Op.: SP3JZR)
SP5CPR	"	369,848	914	38	128
SP5EWX	"	251,100	697	36	119
SP5LKM	"	214,776	617	36	116
SP4WRF	"	5,280	70	12	18
SP9LAS	"	2,808	30	12	24
SP9CCA	"	1,425	27	8	11
SP7GIO	21	1,056,396	2864	34	125
SN8V	14	719,992	2206	39	145
					(Op.: SP8GQU)
SP9OYK	"	66,312	394	25	83
SP7FDV	"	38,496	288	24	72
SP5AWY	"	418	11	8	11
SP7VC	3.7	149,904	1103	24	84
SP3GEM	1.8	86,516	1004	14	72
*SP5DDJ	A	1,015,452	1213	100	321
*SP7LZD	"	703,452	1194	79	293
*SP9XWD	"	690,426	1018	81	282
*SP5ULD/8	"	499,010	608	100	259
*SP5IKC	"	342,820	589	70	211
*SP6KFA	"	342,798	782	70	221
					(Op.: SP6MLG)
*SP9UOG	"	300,160	508	78	190
*SP6GNJ	"	263,588	506	69	205
*SP5ICS	"	254,492	521	61	183
*SP1PLA	"	231,975	514	61	164
*SP5BB	"	211,992	485	66	198
*SP3NUN	"	204,127	419	66	175
*SP6AXW	"	183,642	344	73	168
*SP9NSJ	"	160,489	360	61	166
*SP9HZF	"	139,300	272	68	131
*SP9HQC	"	139,240	291	61	175
*SP1DID	"	131,196	443	56	100
*SP9WUM	"	123,256	374	63	154
*SP6OJJ	"	111,397	174	105	142
*SP8BVN	"	101,548	291	55	157
*SP9IIL	"	90,036	292	51	132
*SQ5RTV	"	68,076	157	59	124
*SP8OON	"	65,790	261	46	107
*SP9XUE	"	60,590	162	48	98
*SP6OPY	"	59,428	221	47	119
*SP3XR	"	42,692	427	46	137
*SP9ELM	"	41,409	125	50	79
*SP7A	"	34,662	163	35	71
					(Op.: SP7FQI)
*SP6CXH	"	33,269	163	35	68
*SQ9FQY	"	24,096	152	29	67
*SP8TDE	"	23,520	93	42	78
*SP1MVG	"	19,557	82	40	119
*SP6DHH	"	16,885	212	17	64
*SP3MEP	"	12,172	71	31	37
*SP4MPA	"	7,316	57	23	36
*SP9LCW	"	5,893	92	25	40
*SP3EJL	"	4,698	37	21	33
*SP9MAT	"	3,744	31	19	29
*SP9IKN	"	3,140	65	10	21
*SP6OPE	"	2,205	23	13	22
*SP9W	28	607,547	1439	39	160
					(Op.: SP9HWN)
*SP6NIC	"	300,909	792	35	126
*SP5IVC	"	179,333	569	32	105
*SQ9HYM	"	153,282	540	29	89
*SP5LCC	"	89,548	280	31	91
*SPØAAZ	"	48,918	206	25	68
*SQ8AMD	"	46,310	169	29	81
*SP5ALP	"	25,020	135	30	50
*SQ4CUX	"	21,375	161	17	40
*SP8OOB	"	9,494	103	16	31
*SP3EAX	"	8,978	134	23	44
*SP3VZY	"	2,475	25	14	19
*SP9PTG	"	598	28	10	13
					(Op.: SQ9IAJ)
*SP5ES	21	497,336	1312	37	129
*SP9BBH	"	195,818	711	32	110
*SQ5FWS	"	113,206	478	28	79
*SP7SEW	14	183,168	929	29	99
*SP9EWO	"	170,644	662	36	112
*SP4SHD	"	37,400	312	18	67
*SP8MI	"	24,960	169	22	74
*SP6RGC	"	10,948	155	15	53
*SQ9BDV	"	7,748	58	18	58
*SP2GNB	"	7,598	100	13	45
*SP9WUN	"	1,980	56	5	31
*SP6PAX	"	1,820	50	8	27
*SP9ABU	7	32,178	272	17	77
*SQ4CTS	3.7	19,250	156	8	47
*SQ8GBN	"	12,650	242	7	43

PORTUGAL

CT1GPQ	A	1,181,029	1937	79	228
CT1DYV	"	145,080	329	53	127
CT1ELF	"	48,087	189	38	99
CT1BOP	28	1,499,532	3561	37	149
*CT1ELP	A	2,073,700	2177	105	361
*CT1EWA	"	193,802	460	57	161
*CT2GWZ	"	77,805	370	47	86
*CT2GRV	"	41,246	203	24	58
*CT1ESO	28	596,786	1690	37	142
*CT1EAT	"	410,826	1481	33	105
*CT1AHU	"	308,992	1013	29	107
*CT1GFK	"	189,551	1151	26	83
*CQ4GTP	"	120,408	545	29	87
*CT7GXJ	"	74,736	347	27	81
*CT4MS	"	60,808	468	24	64
*CT2GZT	"	39,786	269	19	38
*CT1FLD	"	33,520	220	20	60
*CS1A	"	28,221	285	17	52
*CT1FNT	"	11,990	140	20	35
*CT2GVG	"	126	10	3	8
*CT1ETX	21	51,400	226	20	80
*CT1AGS	"	32,960	152	24	79
*CT2DJK	7	360	55	6	30

ROMANIA

YO8BPK	A	193,160	389	63	157
YO8DHD	"	19,068	142	25	59
YO7GNF	"	15,120	131	28	77
YO8GF	"	6,270	42	22	33
YO7GGT	"	100	8	6	8
YO4HW	28	54,534	397	31	91
YO3FF	"	5,610	54	19	32
YO4NF	21	677,102	2365	39	124
*YO3APJ	A	704,370	776	103	340
*YO5CYG	"	671,930	1035	86	320
*YO2DFA	"	406,560	772	81	271
*YO9GJY	"	207,045	563	61	154
*YO4BSM	"	24,240	124	39	62
*YO4AYE	"	19,344	140	27	130
*YO8MI	"	18,905	95	25	70
*YO6OEK	"	2,945	73	31	45
*YO4CIS	28	203,756	791	33	100
*YO6BHN	"	124,740	380	31	104
*YO2LDE	"	50,373	251	24	63
*YO3JF	"	37,740	324	23	51
*YO6AVB	"	27,324	110	29	63
*YO8RNP	"	24,288	199	20	46
*YO7AQF	"	21,320	172	22	43
*YO9HP	"	18,056	133	24	50
*YO9FDN	"	1,232	33	11	17
*YO9FJW	"	752	17	8	8
*YO5AJR	21	67,663	329	26	84
*YO3AIL	"	65,992	344	28	85
*YO9IF	"	2,460	61	13	28
*YO4US	7	13,926	154	12	54
*YO6BZL	3.7	34,090	486	10	60
*YO2LIF	"	21,770	434	10	60
*YO2CJX	"	14,924	280	7	45
*YO5OHO	"	4,522	107	6	32
*YO8BGD	"	2,070	60	6	24

SARDINIA

ISØLLJ	A	144,837	395	54	155
ISØKEB	28	504,828	1321	32	116
*ISØIGV	A	278,610	574	56	166
*ISØHQJ	"	154,912	343	66	140
*ISØLDT	"	48,300	200	41	109
*ISØSLR	"	2,574	99	15	36
*ISØ/I2ADN	28	241,680	984	28	86

SCOTLAND

GMØF	A	3,347,180	3145	127	453
					(Op.: GM4AFF)
GM3BCL	"	931,952	1240	81	233
GM3RTJ	"	78,240	246	46	117
GMØEGI	21	255,204	1000	29	110
*GMØFET	A	595,800	1001	70	230
*MMØBQI	"	321,433	587	72	257
*GM4HQF	"	297,088	693	51	160
*GMØFQV	28	360,472	979	35	129

SICILY

IT9STX	14	837,802	2462	37	129
*IT9CCU	A	61,632	207	47	97
*IT9ICS	14	273,208	1174	32	110

SLOVAK REPUBLIC

OM4JD	A	145,420	250	75	145
OM7IR	21	58,485	280	24	81
*OM4KK	A	509,232	957	78	261
*OM8DD	"	486,496	969	80	288
*OM8FF	"	249,600	612	56	200
*OM7AG	"	186,720	568	50	190
*OM3YK	"	184,800	466	50	181
*OM6TX	"	105,777	345	48	159
*OM4DN	"	103,412	358	46	160
*OM7VF	"	17,702	123	28	106
*OM7YC	28	34,854	184	26	48
*OM3CDZ	14	19,392	200	13	51
*OM7RC	3.7	34,408	469	10	58
*OM7AB	"	30,080	499	9	55

SLOVENIA

S5ØA	A	6,504,693	4134	152	511
S57S	"	5,840,250	3748	140	510
S53R	28	1,568,392	3166	39	157
S53T	"	1,315,310	2675	40	166
					(Op.: S57DX)
S5ØK	"	1,120,038	2718	36	138
S51AY	"	902,844	1920	39	147
S58D	"	897,298	2021	38	140
S5ØQ	"	789,136	1965	38	134
S53O	"	594,542	1590	36	133
S56M	21	1,223,694	2942	40	146
S5ØU	"	1,055,934	2272	40	158
S5ØL	"	1,006,953	2487	37	140
					(Op.: S53EA)
S51SL	"	146,168	704	29	92
S53M	14	824,180	2108	39	157
					(Op.: S53ZO)
S51CK	"	544,086	1664	39	142
S59A	7	484,050	1764	39	136
S52O	"	390,555	1793	31	104
					(Op.: S52RU)
S57AL	"	87,450	520	23	83
S57O	3.7	138,993	1152	22	85
S52ZW	"	111,922	978	19	88
*S55A	A	1,884,450	1800	121	389
*S59AA	"	1,825,140	1573	124	446
*S54AA	"	1,191,444	1124	113	403
*S57U	"	1,020,830	1091	102	343
*S51WA	"	561,353	673	93	284
*S57UYX	"	298,800	870	50	130
*S59X	"	128,908	359	47	101
*S53DX	"	105,099	393	43	116
*S51MG	"	97,644	349	41	117
*S52GP	"	21,588	121	34	50
*S58J	28	373,107	960	37	126
*S57J	"	363,952	852	37	135
*S52OT	"	350,892	980	34	128
*S58DX	"	192,150	572	36	114
*S54E	"	149,942	445	36	110
*S59KW	"	119,310	460	33	90

*S57IIO	21	521,840	1313	38	138
*S51RJ	"	169,200	570	36	108
*S57KAA	"	151,200	606	31	95
*S57MSU	"	108,360	457	33	96
*S54A	7	87,248	480	29	104
*S53T	"	100	807	23	86
					(Op.: S57CQ)
*S57CBS	3.7	55,029	610	13	70
*S53F	"	44,304	545	12	66
*S57NPR	"	11,662	252	5	44
*S57NMQ	1.8	26,488	503	5	51

SPAIN

EA3BCP	A	1,704,048	1619	122	402
EA1UX	"	1,465,466	2446	83	230
EA3GBU	"	1,401,400	1612	92	348
EA3GHQ	"	1,307,496	1538	90	257
EA1BLX	"	1,059,247	1291	88	301
EA7DHP	"	1,019,879	1422	92	279
EA1DAX	"	940,680	1313	80	280
EA3SD	"	373,152	812	73	239
EA1FBU	"	315,612	777	49	149
EA1URG	"	307,275	576	65	190
EA1OS	"	254,204	563	59	147
EA1FCR	"	249,561	597	60	183
EA3NB	"	141,930	319	59	131
EA1BZN	"	122,752	303	57	167
EA5DCL	"	115,444	291	57	160
EA1HV	"	105,492	381	41	108
EA3MR	"	85,974	428	41	137
EA5GMA	"	69,003	224	60	127
EA5EG	"	32,256	160	38	90
EA5TD	"	9,017	58	25	46
EA1QA	"	8,787	76	30	57
EA4FW	"	6,890	41	26	39
EA1DFP	"	1,736	24	10	16
EA5GOR	"	840	23	10	20
EA4EAP	28	981,522	2228	39	147
EA5YJ	"	440,594	1224	32	122
EA1BLA	"	94,848	261	34	118
EA3CCN	"	82,594	348	31	91
EA3DU	"	44,405	233	25	58
EA7BJV	"	31,995	197	21	60
EA3DNC	"	10,614	70	22	36
EA1ASC	"	6,419	65	19	30
EA7CRL	21	665,356	1858	38	143
EA3QP	"	649,166	1761	39	139
EA4OI	"	126,862	537	31	106
EA1JO	"	99,138	403	30	93
EA4BT	"	74,360	398	23	87
EA5EU	"	7,020	61	19	35
EA3ATM	14	1,162,599	2844	38	145
*EA3GHZ	A	1,182,954	1320	101	305
*EA3GEG	"	1,081,080	1225	88	302
*EA7RU	"	937,334	1232	95	279
*EA1AJV	"	868,480	1280	82	238
*EA3ELZ	"	807,640	1072	79	252
*EA5EOR	"	740,124	1011	88	290
*EA3FF	"	665,812	875	85	231
*EA1EYG	"	553,857	743	80	273
*EA1CP	"	461,748	782	68	208
*EA3ASX	"	435,750	562	83	267
*EA1EVR	"	383,075	673	62	213
*EA1BPO	"	376,970	770	66	187
*EA3ASS	"	362,406	510	83	240
*EA5EYJ	"	336,336	515	87	225
*EA3AQQ	"	327,570	670	83	283
*EA1COE	"	325,080	647	71	244
*EA7AJR	"	302,512	603	62	197
*EA1IF	"	293,940	715	65	211
*EA1CCM	"	278,108	607	68	183
*EC3AGC	"	274,625	765	41	128
*EA3AGB	"	273,798	430	68	178
*EA1YR	"	272,600	497	62	170
*EA7HCU	"	270,354	536	61	226
*EA1BLI	"	243,712	633	58	180
*EA2BNU	"	235,144	519	62	176
*EA1YB	"	233,220	461	66	164
*EA3OP	"	227,682	449	61	173
*EA7AFM	"	219,825	680	58	167
*EA5AJX	"	200,778	451	56	162
*EA1AE	"	189,216	481	55	161
*EA2BEY	"	175,436	345	61	183
*EA2RW	"	171,550	311	66	169
*EA1FFC	"	164,970	396	54	180
*EA2AP	"	157,796	337	54	152
*EA3EVR	"	148,332	274	75	113
*EA4BSC	"	143,500	292	69	181
*EA1ET	"	141,375	339	56	139
*EA1AW	"	138,572	359	53	143
*EA5GMB	"	134,067	350	61	140
*EA1CDH	"	109,000	287	55	145
*EA3NA	"	106,343	233	65	128
*EA7BDL	"	99,600	330	54	146
*EA3AMV/5	"	95,175	283	35	100
*EA7GXX	"	92,261	257	51	100
*EA1GL	"	90,768	252	60	126
*EA5AQP	"	90,420	400	34	103
*EA2CMW	"	80,325	208	52	123
*EA4CER	"	77,280	238	50	110
*EA5BAO	"	70,196	231	45	116
*EA1/YV5NI	"	69,630	219	45	120
*EA7CWV	"	66,624	154	49	143
*EA1EB	"	65,824	232	40	96
*EA1APS	"	64,855	244	34	85
*EA1JW	"	60,929	211	53	138
*EA1TU	"	60,588	219	38	70
*EA5AOM	"	53,627	147	56	107
*EC1ASE	"	51,765	239	42	103
*EA3EAN	"	50,072	182	40	84
*EC7DYH	"	48,364	230	30	77
*EC1COU	"	45,064	222	35	96
*EA3DWU	"	45,064	213	36	95
*EA5CRU	"	44,799	176	37	100
*EA2AVM	"	44,157	199	39	84
*EA3AAW	"	41,640	195	37	83
*EA3ESZ	"	41,022	381	53	156
*EA7DWJ	"	40,365	168	42	75
*EA3TA	"	36,000	174	34	86
*EA3AQL	"	34,800	148	46	99
*EA1FBJ	"	34,277	236	37	114
*EA1AAW	"	28,585	153	33	96
*EA7TG	"	28,512	84	50	82
*EA3DOR	"	24,750	99	25	65
*EA3FAJ	"	23,283	77	44	73
*EA1ACQ	"	22,374	111	33	66
*EA5FGK	"	21,112	129	32	84
*EC1ALY	"	19,126	120	18	55
*EA2BT	"	18,450	103	30	52
*EC1ANZ	"	17,982	218	27	84
*EA1EDF	"	10,323	93	19	18
*EA2ANF	"	8,712	68	25	47
*EC5AIP	"	7,740	140	27	59
*EA1EQ	"	7,622	69	25	49
*EC3CEC	"	7,370	137	18	49
*EA5CZL	"	6,076	62	18	31
*EA4DKS	"	3,285	52	13	32
*EA1ATQ	"	1,748	23	16	22
*EA3GIP	"	768	12	12	12
*EA1BAW	"	748	12	10	12
*EA7FTR	28	454,408	1416	38	120
*EA1FDI	"	382,766	1154	34	123
*EA1GA	"	354,756	1113	32	116
*EA3FCQ	"	282,154	841	33	109
*EA1CBX	"	210,500	844	27	98
*EA7AKJ	"	130,500	558	26	90
*EA1HF	"	114,804	490	23	85
*EA5AAJ	"	99,000	382	28	82
*EA7ASZ	"	79,386	397	24	77
*EA7IA	"	76,627	318	27	82
*EA1DFZ	"	64,047	258	25	86
*EA5CHT	"	63,840	362	21	63
*EA1BIM	"	63,638	345	23	71
*EA1CJH	"	53,928	244	28	79
*EA1ZH	"	38,724	239	23	61
*EA1DZL	"	28,689	203	20	53
*EA2AJX	"	25,760	167	22	48
*EA5CGU	"	21,804	88	30	62
*EA4CBH	"	11,252	109	19	39
*EA4AAA	"	6,050	51	18	37
*EA1CVY	21	209,433	744	32	110
*EA3KT	"	85,044	365	22	92
*EC3AJW	"	75,030	323	33	90
*EA1AUM	"	49,938	320	22	65
*EC4DFA	"	35,640	347	20	61
*EA4AFA	"	32,756	283	18	58
*EF1ANC	"	23,680	195	21	59
*EC2BAA	"	12,975	126	19	56
*EC5JJ	"	8,507	170	9	38
*EC1DNE	"	7,198	64	20	39
*EC3AMA	"	5,880	74	13	36
*EC4AIV	"	4,277	60	11	36
*EC2ADR	"	360	11	5	10
*EA2CJC	14	355,927	1457	30	101
*EA3KA	"	252,000	1236	30	96
*EA1AUT	"	198,720	872	34	110
*EA5WX	"	140,958	579	29	94
*EA3CM	"	119,700	375	33	100
*EA5AWI	"	34,470	239	18	72
*EA3CT	"	34,290	251	20	70
*EA5DHK	"	15,440	193	23	57
*EA4AZJ	"	6,370	59	20	45
*EA2CRG	3.7	34,707	309	12	57
*EA1DVY	1.8	1,591	57	7	30

SWEDEN

SL3A	A	4,974,200	4031	142	474
					(Op.: SM3JLA)
SM5CEU	"	2,900,680	2510	135	436
8S7A	"	1,025,325	1528	102	339
					(Op.: SM7CRW)
7S2A	"	707,217	1330	83	274
SM3BIZ	"	612,540	853	96	314
SM7BJW	"	386,835	685	70	185
SM7CWI	"	100	3	3	3
7S5S	28	118,542	381	31	107
					(Op.: SM5CSS)
SMØKV	21	287,407	907	38	129
7S2E	14	900,950	2817	40	145
					(Op.: SM2DMU)
7S3X	"	4,305	50	13	28
					(Op.: SM3DMP)
7S6W	7	68,709	469	21	90
					(Op.: SM6DER)
7S6A	1.8	24,766	590	7	51
					(Op.: SM6DOI)
*SM4AIO	A	708,849	1146	82	257
*SM2KAL	"	325,796	621	79	237
*SKØHS/Ø	"	318,600	585	73	227
					(Op.: SMØJT)
*SMØBDS	"	122,838	331	51	126
*SM5G	"	110,880	311	48	117
					(Op.: SM5JBM)
*SM6WXO	"	101,304	329	41	127
*8S4BX	"	86,856	250	52	136
					(Op.: SM4WGB)
*SM5BDA	"	42,976	123	54	82
*SMØTRT	"	14,430	79	24	50
*SM5UFB	"	9,167	78	27	62
*SM3X	28	70,035	312	24	81
					(Op.: SM3CVM)
*SM6GUL	"	59,897	283	25	64
*SM7FTG	"	41,934	232	23	64
*SM4HEJ	7	3,504	67	7	41
*SK4UW	3.7	3,255	91	5	30
					(Op.: SM4JHK)

SWITZERLAND

HB9BTI	A	420,900	795	66	210
HB9AAA	"	370,656	504	20	45
HB9NN	28	44,793	203	23	56
*HB9AA	A	600,288	1005	79	259
					(Op.: HB9ARF)
*HB9AYZ	"	51,090	211	38	92
*HB9HQX	"	24,476	171	24	92

UKRAINE

UY5ZZ	A	1,566,464	2358	102	320
UX1UA	"	835,822	1092	102	340
EM8I	"	811,300	1301	89	291
					(Op.: UT8IM)
UR6IJ	"	347,480	589	87	253
UT6EE	"	283,424	613	65	207
UT4EK	"	201,096	435	68	184
UY2RO	"	108,648	337	56	160
UU4JQE	"	52,104	177	42	114
UT7MD	"	35,376	159	32	100
UX1HV	"	23,800	120	29	71
UU2JQ	"	8,568	54	26	42
US6L	28	724,224	1739	39	153
					(Op.: UR4LUG)
URØD	"	520,459	1239	35	128
					(Op.: UR5DDZ)
UT2ID	"	334,958	1387	38	131
EO1I	"	231,994	959	35	111
EN5E	"	201,356	1188	34	108
UT4EO	"	57,694	350	22	69
UT5RQ	21	215,561	742	37	120
UR6MX	"	158,625	727	36	99
UR5WAN	"	120,764	437	33	100
UX7MM	"	85,680	584	25	80
UX3HA	"	32,802	258	20	57
UU2JZ	14	542,605	1581	40	145
UX3MR	"	83,566	465	32	95
UT4UO	7	239,838	1002	33	109
UT6Y	"	171,240	1012	27	93
					(Op.: US2YW)
US2IR	"	150,420	818	33	105
UX2MM	"	93,960	672	25	95
UT5UGR	3.7	87,305	927	19	76
UT7CC	"	21,756	262	15	59
*UR7M	A	720,241	1294	90	299
					(Op.: UT5MB)
*UR5YAL	"	432,693	858	84	283
*US3IZ	"	395,766	693	78	271
*UT5EFV	"	177,708	484	62	189
*UY5TE	"	157,050	471	49	176
*UT1II	"	107,260	292	51	122
*UT5UML	"	79,492	242	50	117
*UT8IT	"	44,902	201	36	107
*UR3QCW	"	27,306	141	35	88
*UT5ECZ	"	18,624	133	26	70
*UU5JSP	"	9,520	99	22	63
*UT4MW	"	6,090	65	16	42
*UR5UAC	"	551	21	9	20
*UT7QL	28	145,124	502	35	111
*US3WO	"	144,392	440	34	104
*UX5UO	"	77,682	278	30	91
*UR4QSG	"	46,593	322	25	68
*UR5QRB	"	36,814	334	21	58
*UT5JDS	"	7,504	76	18	49
*US5WDL	"	1,278	34	6	12
*UT9F	21	406,481	1388	40	138
					(Op.: UR5FEL)
*UR5WIF	14	42,224	284	17	74
*UR5QBB	3.7	52,388	579	14	68
*UT1T	"	39,957	502	14	59
					(Op.: UR7TZ)
*UX3M	"	18,590	243	10	55
*UT7UW	1.8	10,168	189	8	45

WALES

GW4BLE	A	6,657,018	4608	136	457
GWØRYT	"	377,720	769	63	203
*GW3JXN	A	1,437,678	1721	97	314
*GW3NJW	"	279,972	517	63	189
*GW3KJN	"	22,330	124	27	50

YUGOSLAVIA

4N9BW	A	5,862,172	3944	161	603
					(Op.: YU7BW)
YU1QU	"	117,629	530	39	112
YU7AV	28	1,155,549	2512	40	161
YT1AD	"	1,008,370	2149	40	166
					(Op.: Z32ZM)
YZ1U	"	793,251	2203	39	120
					(Op.: YU1WS)
YU1RE	"	313,998	798	36	141
YZ9W	21	887,684	2181	40	156
					(Op.: YZ1AU)
YU1KX	"	692,106	2021	40	146
YT7KF	"	623,700	1907	39	123
YZ9A	"	614,592	1834	38	138
					(Op.: YU1NW)
YU7KWX	"	258,432	1178	29	99
					(Op.: YU7SK)
YU1JW	14	915,705	3018	40	149
YT7A	7	416,139	1741	36	127
					(Op.: 4N7DW)
YZ6A	3.7	118,678	1135	20	78
*YU7QL	A	406,164	670	87	275
*YU7WJ	"	367,752	674	80	220
*YUØC	"	179,772	502	60	153
					(Op.: 4N7CA)
*YU1OJ	28	566,300	1517	36	139
*YU7W	"	351,615	996	35	130
*4N1N	"	193,304	745	35	111
*YU7KM	"	75,210	274	29	80
*YU7SF	"	24,500	150	20	50
*YTØC	21	233,100	875	35	115
*YU1HFG	14	215,883	1084	33	120
*YZ1V	"	100,660	596	34	106
*YU1CC	3.7	48,198	485	15	72
*YU1AST	1.8	4,361	108	5	37

OCEANIA

AMERICAN SAMOA

AH8A	28	1,415,260	3230	38	116
*AH8LG	A	11,280	53	33	47

AUSTRALIA

VK5GN	A	3,709,900	2928	127	333
VK3IO	"	53,795	133	58	87
VK4ADC	"	52,125	202	49	90
VK2BCQ	"	8,804	54	25	46
VK2XN	28	387,208	1245	29	87
VK2KKD	"	45,600	241	23	57
*VK5EMI	A	8,560	64	36	44
*VK4EJ	28	452,234	1455	31	74
*VK2ARJ	"	372,100	1267	31	69
*VK4JSR	"	101,010	414	27	64
*VK8DK	"	53,466	379	24	43
*VK4ICU	"	19,162	112	23	44
*VK2HV	"	17,955	105	19	38
*VK1MOJ	21	112,665	491	33	72
*VK3WWW	7	1,178	26	9	10
*VK3TZ	3.7	105	8	4	3

BRUNEI

V8A	A	7,592,229	4861	150	401
					(Op.: JO1RUR)

EAST MALAYSIA

9M8R	A	8,662,544	4840	172	492
					(Op.: W7EJ)
9M6NA	28	1,787,673	3479	36	143
					(Op.: JE1JKL)
9M8YY	21	127,300	476	31	64
					(Op.: JR3WXA)

HAWAII

NH7A	A	6,071,934	4719	140	327
KH6FKG	7	187,796	843	27	49
KH6CC	1.8	8,802	204	9	9
*WH6DGA	28	75,190	267	32	71
*AH7R	"	484	24	10	12
*KH6GMP	21	215,523	754	29	70
*KH6/SM6FJ	"	9,027	60	21	30

INDONESIA

YB8BHC	A	271,406	574	64	130
YB5QZ	28	574,980	1421	37	111
YB2ERL	21	234,090	676	32	103
*YBØUNC	A	339,556	492	97	171
*YC8TXW	"	169,482	626	39	55
*YC5VYH	"	129,492	496	36	73
*YC6JKV	"	42,372	165	30	77
*YB8BRI	"	31,301	125	41	90
*YC6PLG	"	30,992	152	37	67
*YC5SKR	28	44,436	322	26	43
*YC3IZK	"	14,805	119	24	39
*YC8RBC	21	29,039	152	25	46
*YC6LAY	"	13,786	80	20	41
*YB2LAB	14	35,568	193	18	60

MIDWAY ISLAND

*KH4/W4ZYV	A	246,935	694	55	76

NEW CALEDONIA

*FK8GM	A	1,408,431	1680	103	214
*FK8GT	14	106,000	365	30	76

NEW ZEALAND

ZL1ANJ	A	2,146,488	1910	120	288
*ZL3JT	A	103,731	195	68	145

NORTHERN MARIANAS

WHØV	3.7	20,941	197	16	27
*KHØ /JF1RPZ	28	1,066,032	2656	37	107
*KHØ /JE3WOM	21	179,400	1151	25	35

PHILIPPINES

DU3NXE	A	20,010	139	26	32
DU1ODD	28	159,396	540	32	79
DU1SAN	"	59,384	404	22	30
DU1COO	21	302,162	981	34	79
*4F4IX	A	1,506,886	1757	105	209
*DU1TJM	28	21,797	140	23	48
*DU1LKY	21	45,600	456	23	37
*DU67IHU	"	34,818	367	18	24
*4F5CM	"	29,784	138	25	48
*DU67FZB	"	29,087	228	20	39
*DU1LHU	7	2,080	56	11	21

TUVALU

*T2DX	A	228,939	425	64	137
					(Op.: W4WET)

VANUATU

YJØDX	28	707,130	2045	33	102
					(Op.: VK4BKM)

WALLIS & FUTUNA ISLANDS

*FW/JM3XAV	21	2,992	64	8	9

SOUTH AMERICA

ANTARCTICA

R1AND	A	672,980	1031	80	173
					(Op.: RW1AI)

ARGENTINA

L99D	A	2,224,347	2113	106	295
					(Op.: LU7DW)
LT7H	"	1,995,099	1823	118	313
LU1BR	"	725,654	953	96	218
LU/OHØWW	"	569,485	809	72	193
					(Op.: OH1EB)
LU1VM	"	308,952	762	59	109
LU4MCS	"	177,744	434	49	112
LU5FF	"	43,456	173	45	67
L2F	28	1,365,835	3616	36	137
					(Op.: LU9FDG)
LU1HF	"	1,170,150	2619	36	138
LT1F	"	889,042	2699	35	126
LR6D	"	510,051	1364	31	106
					(Op.: JK3GAD)
LU8VCC	"	395,125	1141	32	113
LU6ETB	21	1,034,604	2141	38	136
LO7H	"	513,756	1454	36	106
LU4HH	"	374,850	977	34	113
AY1I	"	358,644	1161	34	98
					(Op.: LW9EUJ)
LU7H	"	188,902	504	29	102
					(Op.: LU2HAO)
LU9MBY	"	178,866	542	31	83
LU8XW	"	53,856	295	28	71
LU1ELY	"	11,573	107	20	51
LTØH	14	684,111	1754	37	126
					(Op.: LU3HY)
LU7YS	"	679,712	1439	39	137
LU6FFL	3.7	10,812	119	19	34
*AYØN	A	1,587,519	1421	125	298
					(Op.: LU2NI)
*LU9HO	"	1,150,496	1388	86	228
*L6H	"	635,000	940	79	175
					(Op.: LU6HDV)
*L2ØF	"	399,996	731	84	187
					(Op.: LU4FCZ)
*LU3HIP	28	912,170	1977	34	132
*LU4DX	"	737,429	1705	33	124
*LU7VCH	"	634,893	1644	31	116
*LV4V	"	467,968	1452	27	101
*LU3VAO	"	442,611	1326	27	90
*LU1DWR	"	425,467	1459	30	103
*LU1VEW	"	393,450	1198	28	94
*LU5WF	"	388,227	1084	32	107
*LW5HBR	"	375,390	1215	28	101
*LU7PT	"	302,875	990	29	96
*LW5DX	"	299,208	865	33	104
*LU2EC	"	294,627	998	26	83
*LW7EIC	"	284,589	1066	25	78
*LW8DXJ	"	278,931	1098	28	81
*LW1EGD	"	250,684	897	26	72
*LU4FQZ	"	197,112	550	35	94
*LU1MD	"	165,101	588	29	78
*LU5EVK	"	147,384	626	29	60
*LU6YAR	"	93,600	375	22	74
*LU7VFJ	"	80,878	360	27	82
*LW7EGO	"	78,570	309	23	67
*LU3YBI	"	52,392	278	21	53
*LW9DAH	"	50,052	213	28	69
*LU4HKL	"	33,220	216	16	39
*LU4HUG	"	6,063	93	17	26
*LW8EXF	"	5,244	62	17	29
*LU9YAS	"	4,505	87	17	36
*LU2BA	21	469,200	1242	35	115
*LU3ES	"	52,065	278	26	63
*LU3DL	"	37,500	284	19	56
*LS9F	14	408,114	1251	37	121
					(Op.: LU5FCI)
*AY5E	"	90,402	351	30	84
					(Op.: LU5DV)

ARUBA

P4ØE	A	15,583,506	7816	166	533
					(Op.: CT1BOH)
P43T	"	4,510,596	3644	110	334
P43A	21	2,284,828	4378	38	144
P4ØR	7	500,000	1415	26	99
					(Op.: K4UEE)
*P43E	A	4,312,452	3228	111	363
*P43DJ	28	435,240	1385	29	91

BOLIVIA

CP6XE	28	241,040	1071	29	86

BRAZIL

PT7BZ	A	2,988,085	2181	118	387
ZX1Z	"	1,604,688	1938	89	214
					(Op.: PY1LVF)
ZV3K	"	1,463,280	2137	79	194
PS8DX	"	528,840	2260	63	171
PY5HSD	"	521,640	769	80	190
PT2TF	"	521,235	670	88	209
PP8KWA	"	176,715	338	68	187
PS7SAS	"	166,025	411	40	105
PR2G	"	120,750	295	65	145
ZW2A	"	84,396	216	52	104
PT2CMN	"	25,500	134	57	113
PY2OZF	"	11,277	71	25	38
PT2OI	"	6,557	52	32	47
PT2PC	"	506	13	9	13

ZX5J	28	3,086,148	5278	39	180
(Op.: PP5JR)					
PW2A	"	1,665,252	3099	39	165
(Op.: PY2ZP)					
ZX4Y	"	1,337,472	2958	33	139
(Op.: PY4OY)					
PY2SBY	"	420,048	1185	33	111
PY2AXZ	"	118,236	532	31	87
PY2FUS	"	81,200	216	34	111
PS2WW	"	66,200	336	25	75
PU2MZI	"	56,856	248	29	74
PY3CGP	"	50,778	216	28	63
PY4OD	"	23,016	104	26	58
PY5JO	"	13,797	113	23	40
PP5UA	21	796,700	2306	36	119
PQ5W	14	633,250	1799	37	133
(Op.: PP5WG)					
PT2HO	"	141,570	471	31	79
PP5AIM	"	15,732	150	25	51
PP5UB	7	41,652	239	22	56
*PY2MNL	A	2,477,020	2443	92	272
*PY2YU	"	1,573,311	1413	111	286
*PY2NY	"	656,230	904	83	191
*PT2AW	"	642,864	1002	60	176
*PU2A	"	584,078	807	84	194
(Op.: PY2ZX)					
*PY2KQ	"	507,180	857	70	167
*PY2APQ	"	193,965	413	64	129
*PY2DJ	"	185,440	420	59	131
*PY7YL	"	180,910	350	68	161
*PR7FMT	"	161,634	464	51	107
*PP5TE	"	152,626	452	38	96
*PY2RAF	"	140,964	375	67	137
*ZZ7Z	"	126,063	321	60	129
(Op.: PR7AR)					
*PP5MQ	"	123,590	292	53	117
*PP8EB	"	91,105	273	43	90
*PY2TNT	"	83,664	400	40	86
*PY3FBI	"	63,500	306	48	79
*PY6WO	"	56,224	197	52	60
*PR7SM	"	50,344	231	34	82
*PY1ON	"	45,878	181	35	78
*PY7IQ	"	41,262	136	47	91
*PY4LH	"	40,530	166	41	64
*PY5DC	"	35,840	157	44	68
*PY7BEL	"	25,543	156	25	64
*PY3CQ	"	20,698	139	24	55
*PY2AER	"	17,885	85	29	44
*PY2DBU	"	16,317	84	36	63
*PY1AFS	"	12,640	100	30	49
*PV8IG	"	11,571	69	36	51
*PY2SRL	"	10,988	82	22	45
*PY2QI	"	10,150	101	19	31
*PY1ZT	"	7,527	150	20	47
*PY7BR	"	783	28	9	18
*PR7SD	"	100	62	24	36
*PY1KS	28	962,822	1866	39	155
*ZY4K	"	628,370	1459	35	120
(Op.: PY4BK)					
*PY2NW	"	397,528	1092	31	105
*PU2YDX	"	383,380	1097	31	114
*PY2NKY	"	200,799	738	28	83
*ZV2VT	"	169,065	703	31	86
(Op.: PY2WVT)					
*PY2ELG	"	152,988	537	27	87
*PU2LQD	"	111,549	448	26	77
*PP5CN	"	110,889	397	25	86
*PY2EDY	"	104,636	433	24	77
*PU2MXU	"	67,771	403	26	75
*PY5BF	"	65,520	226	27	85
*PY2DDK	"	57,510	304	25	65
*PY5TJ	"	52,894	232	25	81
*PY5ZT	"	48,364	256	28	79
*PY2LED	"	47,975	290	25	70
*PY2TST	"	42,964	213	25	67
*PU2TES	"	42,768	185	25	63
*PU2WIF	"	18,615	112	24	49
*PU2PDH	"	17,052	100	29	58
*PY5AG	"	14,091	94	25	52
*PY4XYZ	"	13,179	80	24	45
*ZW8K	"	11,700	57	21	57
(Op.: PS8ET)					
*PY2MOS	"	8,112	208	21	57
*PU7ENW	"	7,670	87	20	45
*PU2TVQ	"	6,789	176	19	54
*ZY7W	"	5,150	73	13	37
(Op.: PR7FN)					
*PR7HT	"	3,096	41	15	28
*PU7EEL	"	1,400	22	11	17
*PU8PYK	"	950	15	10	15
*PY2SOM	"	817	21	10	9
*PY2DVD	"	616	54	11	17
*PY2EPC	"	608	65	11	21
*PR7QI	"	540	60	20	34
*PU7EUA	"	408	19	7	10
*PY2P	21	925,453	1907	39	142
(Op.: PY2RIK)					
*PY3AJB	"	9,073	79	19	24
*PS8HF	"	6,256	69	14	32
*PS8NF	14	17,987	117	19	51
*PY2ESZ	"	17,472	108	20	44
*PR7AYE	"	6,384	52	13	35
*PY2TI	7	216	12	5	7
*PY3CEJ	1.8	70	10	2	5

CHILE

XR1X	A	1,956,385	2072	104	269
(Op.: XQ1IDM)					
CE8EIO	"	1,885,500	2400	85	215
CE6ABC	21	253,764	855	32	94
*CE8DGQ	28	137,410	666	23	68

COLOMBIA

HK6KKK	A	5,773,040	4036	137	423
HK6MKK	"	108,261	257	58	149
HK3TAS	28	988,518	2707	31	103
*HK3JBR	A	1,730,438	1784	100	286
(Op.: F2JD)					
*HK6PSG	"	345,300	484	79	221
*HK6BRK	"	10,318	48	27	40
*HJ3PXA	28	756,897	1816	31	126
*HK3JJH	14	822,822	2170	30	113

ECUADOR

*HC1OT	A	6,006,550	3994	128	422
*HC1JQ	28	994,224	2059	35	141

FALKLAND ISLANDS

*VP8ON	A	17,550	103	30	45

GALAPAGOS ISLANDS

HC8A	A	18,607,050	8638	175	595
(Op.: N6KT)					

GUYANA

8R1K	A	9,121,163	5906	131	432
(Op.: OHØXX)					

NETHERLANDS ANTILLES

PJ9/ON4CFD	28	1,191,702	2843	36	113

PARAGUAY

ZP6S	7	24,960	179	24	56
(Op.: ZP5SAT)					

TRINIDAD & TOBAGO

9Y4VU	21	2,013,050	3740	39	151
9Y4NZ	14	1,429,672	2946	38	135

URUGUAY

CW3C	28	483,072	1321	31	105
CX3AT	"	53,284	254	21	56
*CX9AU	A	647,088	941	93	179
*CX8BAE	28	174,734	727	26	72

VENEZUELA

YV5BY	28	513,636	1538	30	108
YV5IVB	21	1,678,950	3424	38	144
YV6DBX	"	109,710	587	22	68
YY5OIG	"	23,733	176	25	56
YW1A	14	977,906	2552	37	129
(Op.: YV1AVO)					
YV5USB	"	46,252	283	15	47
YV5AMH	3.7	94,462	483	17	56
*YV5JBI	A	291,164	371	95	237
*YW3B	"	143,088	420	52	124
(Op.: YV3BKC)					
*YV5NWG	"	770	13	9	13
*YV7QP	"	100	159	46	100
*YV2FEQ	28	201,500	775	30	100
*4M5I	"	125,640	632	19	53
(Op.: YV5EMI)					
*YY4GMB	"	66,483	310	23	60
*YV5EIL	21	100	80	18	36
*YV5OHW	14	255,132	1055	25	89
*YY5OIA	7	148,599	747	20	59
*YV5NCK	"	94,900	465	16	57
*YV5DZQ	"	23,256	136	18	58

QRP

P4ØB	A	2,018,688	1942	101	283
(Op.: P43P)					
YT7TY	"	1,180,635	1320	109	356
F5MUX	"	1,060,878	959	99	370
I5NSR	"	844,512	890	115	348
KQ3V	"	843,720	776	105	290
RZØSR	"	834,750	1082	80	238
LY2FE	"	823,970	1199	81	314
WT3W	"	703,993	746	90	247
JA6GCE	"	618,094	736	101	245
YU1KN	"	535,150	921	91	294
JR4DAH	"	503,316	702	86	193
EA3CKX	"	448,818	596	90	291
LU1VK	"	413,130	586	82	200
EA1GT	"	373,730	778	63	203
YU1LM	"	371,995	879	66	229
UU4JO	"	336,679	644	82	245
DU3RCM	"	325,128	622	68	116
HA7YS	"	310,753	710	71	225
US6EX	"	301,396	696	63	239
SP5FKW	"	297,480	400	78	190
WAØJYC	"	273,182	504	80	167
UA4YJ	"	266,409	533	65	232
VE6BF	"	232,675	397	69	158
S59D	"	226,806	549	74	235
WA3NKO/4	"	160,962	311	46	147
N1TM	"	123,690	240	54	136
I3MDU	"	116,088	330	42	126
UA1OZ	"	113,190	370	61	170
DF2WF	"	103,208	327	44	89
N8XA	"	74,382	338	69	176
W9PNE	"	81,713	211	48	111
OK2PP	"	81,106	315	58	156
UAØKCL	"	71,504	250	49	60
NM1K	"	65,380	171	45	95
N6ZS	"	58,968	137	51	111
4X6DK	"	58,938	177	34	80
DH2UL	"	49,764	189	39	93
NQ7X	"	49,432	163	56	92
LU1HN	"	47,847	189	47	76
JRØBQD	"	42,837	149	52	70
K5DKH	"	37,169	137	36	73
OK2PLK	"	35,235	211	30	105
GM4ELV	"	35,072	246	33	104
ON7CC	"	34,125	192	34	91
UA9AX	"	32,007	112	49	92
UT5UUF	"	30,723	97	57	90
YO4AAC	"	30,360	190	30	80
I1PLX	"	22,008	102	32	99
JN2FSE	"	20,544	89	36	60
VE6GK	"	18,615	111	39	46
YL2MF	"	17,301	109	22	51
GWØVSW	"	14,065	105	27	70
YL2TW	"	13,572	82	29	58
AF9J	"	13,260	80	27	41
UAØSE	"	12,948	118	18	44
WØHEP	"	12,104	70	27	41
RV6AF	"	9,017	92	16	55
UU9JQ	"	7,575	88	17	58
K6MI	"	4,059	43	17	24
UA3AD	"	3,984	47	15	33
PAØRBO	"	3,526	53	14	29
XE1HKR	"	1,820	32	13	13
YCØLOW	"	16	2	2	2
KP4FP	28	574,788	2240	26	88
JA5GPJ	"	180,463	612	29	83
SP3LWP	"	171,879	511	35	106
NØKE/KH6	"	146,854	541	32	69
KA1PRD	"	104,638	354	24	89
LW3DX	"	98,430	441	25	77
YT1CS	"	89,300	435	24	76
JA3LFK	"	84,818	348	28	68
N4IJ	"	77,400	297	24	76
YV5LVT	"	66,038	366	24	65
LY2HM	"	54,202	327	20	62
4NØX	"	49,230	263	28	62
(Op.: YZ7DM)					
SKØMT	"	49,215	257	21	64
(Op.: SM5CCT)					
LU2HNP	"	48,861	217	26	63
OH5NHI	"	46,463	247	22	75
WH6O	"	38,216	200	26	42
W6YJ	"	34,800	178	24	56
CX/ZP5XF	"	31,734	188	21	61
JN6VBX	"	25,312	149	22	46
JA2LRD	"	24,106	135	21	48
EX8MFW	"	22,338	159	12	39
YU7AEC	"	20,176	170	17	35
N2JNZ	"	20,040	114	13	47
LW7DQW	"	19,096	151	16	46
EU6FF	"	18,600	127	17	43
2UØARE	"	17,024	135	16	48
HAØGK	"	16,646	172	15	26
SQ9IET	"	16,600	165	13	27
SP6BBE	"	12,100	108	19	31
CT1GFQ	"	10,584	111	20	36
EW6DX	"	8,850	89	15	44
IK5RUN	"	8,060	58	21	44
OM7PY	"	6,500	44	18	32
ES5TX	"	5,096	46	16	33
YO3III	"	4,592	70	14	27
EC5ACA	"	2,037	40	9	12
N2VPK	"	1,568	30	9	19
YO8BGE	"	1,564	67	11	23
SP2UUU	"	1,216	26	6	10
DL2YET	"	242	17	4	7
ES7GT	"	192	14	4	12
NA4CW	21	150,066	422	30	96
I4AFQ	"	119,680	434	31	105
N7VY	"	93,129	316	32	79
OH7FF	"	74,679	439	22	71
OK1GW	"	68,907	300	24	79
KH6/W8QZA	"	63,058	286	28	54
EA2CAR	"	53,429	356	23	78
7K4QOK	"	50,670	226	27	63
UA3DJY	"	30,959	248	19	64
UY1M	"	27,097	263	15	64
JH3DMQ	"	20,895	127	23	41
IK5WGK	"	9,860	78	17	41
EC4CUV	"	9,638	64	15	46
W7/JR1NKN	"	3,456	57	12	15
KJ5CI	"	608	14	4	12
KR2Q	14	225,835	509	36	119
W6CN	"	40,512	157	27	69
DL4RCK	"	30,616	275	18	68
SQ7BCG	"	7,192	94	11	43
LZ3GM	"	6,400	97	12	38
DL1BWM	"	5,060	92	10	36
KH6/KØEC	"	4,410	39	19	26
(Op.: NØKE)					
SP9EH	"	3,534	45	12	26
DJ1VQ	"	2,412	46	7	29
N4EUK	"	2,220	31	11	19
JHØNEC	"	425	16	6	11
OK2PCN	7	6,360	122	8	45
IK8HOE	"	1,457	50	5	26
DAØFF	"	84	11	3	9
(Op.: DF2FM)					
YTØT	3.7	13,688	211	11	48
(Op.: YU1YV)					
SP4GFG	"	12,648	231	7	44
SP3J	"	3,960	122	4	29
(Op.: SP3NGB)					
SQ5ABG	"	1,620	53	5	25
OK1IWN	"	714	62	5	29
KH6SQ	"	594	23	5	4
(Op.: W8QZA)					
OM6ACW	"	494	27	4	15
SM5CCT	"	323	21	3	16
YL2GUV	1.8	3,360	108	3	29
YU1UA	"	420	33	5	15
EX8MBA	"	81	5	4	5
VE1/W5AJ	"	12	7	1	2

ASSISTED

NORTH AMERICA

UNITED STATES

KI1G	A	7,639,478	3403	169	622
KS1L	"	5,913,960	3154	150	519
K1VR	"	3,718,435	2077	145	510
N1CX	"	3,205,182	1906	134	485
K5MA/1	"	2,765,048	1761	137	435
AA1QD	"	2,305,626	1854	106	341
W1RZF	"	2,173,914	1523	122	409
KZ1M	"	2,167,368	1474	121	411
W1NG	"	2,128,758	1168	151	518
N1DG	"	2,099,160	1353	136	452
K1JN	"	2,041,848	1366	131	417
N8RA/1	"	1,712,750	1204	122	405
K1JE	"	1,562,224	1150	112	390
N1DD	"	1,523,240	1005	130	435
AA1V	"	1,467,568	880	133	459
K1UO	"	1,432,867	906	142	445
NZ1Q	"	1,393,711	1072	114	379
N1NQD	"	1,310,976	855	139	430
WF1B	"	1,291,722	1007	104	357
K1VV	"	1,242,054	1030	110	341
K1RV	"	1,237,584	1008	104	333
K1EO	"	1,193,852	979	113	360
N1JP	"	1,128,160	943	101	339
KK1DX	"	1,109,660	804	118	373
K1AE	"	1,079,075	935	104	321
WO1N	"	1,046,808	896	98	336
W1YK	"	1,045,917	843	107	356
(Op.: N2YHK)					
N1RLI	"	989,573	830	103	364
W1LLU	"	959,880	830	108	348
N1IUN	"	818,854	799	87	296
W1LP	"	708,448	634	100	316
K8CH/1	"	680,497	617	92	309
K1ST	"	648,824	601	92	312
W1HR	"	620,100	513	110	340
K1OZ	"	601,758	655	73	258
K1TH	"	570,688	709	73	223
NQ1K	"	541,098	506	102	312
KG1D	"	446,152	421	103	331
KV1J	"	414,668	471	89	243
KD1KI	"	400,400	576	60	215
KE1KD	"	379,440	404	102	258
N4XR/1	"	363,168	387	110	306
KE1IH	"	330,337	501	69	218
W1JK	"	198,099	248	68	229
W1JR	"	191,252	262	86	188
K1KU	"	173,382	314	56	157
W1SRG	"	126,735	239	63	150
(Op.: N1XYR)					
W1AY	"	114,810	281	46	132
WA1ZYX	"	105,600	234	32	128
WV1M	"	69,600	172	60	114
KA1GJ	"	61,845	179	39	94
WW1E	"	42,721	129	28	91
K2BU	A	5,907,918	2926	154	559
K2NG	"	5,440,030	2416	174	649
W2RE	"	5,298,144	2855	159	564
W2GD	"	5,001,930	2539	160	586
W1GD/2	"	4,243,960	2284	148	511
K2XA	"	4,015,305	1982	167	568
N1EU/2	"	3,259,485	1840	142	499
N2ED	"	3,255,245	1982	138	457
K2TR	"	2,065,975	1340	135	440
W2TV	"	2,008,714	1246	134	453
W2YC	"	1,747,164	1200	127	455
K2ONP	"	1,490,975	964	138	437
W2GDJ	"	1,457,000	1119	115	355
K2BX	"	1,404,464	1031	107	381
WB2WPM	"	1,173,392	923	106	346
KF2O	"	974,400	655	136	424
K2LS	"	961,704	824	110	346
K2EP	"	900,102	772	94	312
KQ2O	"	893,761	978	81	260
K2AJY	"	889,812	794	106	356
K2XF	"	843,410	717	105	332
KD2KS	"	836,640	763	107	313
W9NGA/2	"	818,764	744	101	327
W2HCA	"	625,086	632	93	270
AA2DY	"	566,060	620	78	254
W4EN/2	"	548,977	613	85	264
K2QMF	"	518,964	539	85	269
NO2R	"	510,342	465	109	310
W2YG	"	370,036	395	92	224
K2ZP	"	341,310	447	72	238
N2WKS	"	340,544	418	76	237
N2TTT	"	324,996	446	76	242
N2WK	"	288,306	378	79	202
N2KJM	"	282,388	450	50	177
W2LK	"	236,014	425	50	149
AA2D	"	216,006	324	76	202
W2ASS	"	129,426	329	67	155
WK2H	"	66,304	194	27	101
N2VM	"	19,992	88	34	68
NA2X	28	91,601	232	30	09
K3WW	A	6,310,200	3013	168	612
N3RR	"	5,901,750	2863	161	589
W3EEE	"	4,997,877	2845	136	505
N3AD	"	4,711,791	2414	163	560
AA3B	"	3,623,368	2045	137	486
K3PP	"	3,443,162	1777	160	546
K3NZ	"	3,204,855	1712	156	531
WR3Z	"	3,137,868	1848	145	461
W3GM	"	2,492,949	1475	144	463
N3AM	"	2,309,720	1484	132	433
N3DL	"	2,235,391	1318	133	484
KE3VN	"	2,137,848	1416	129	433
NN3Q	"	2,057,582	1302	137	440
N3MV	"	1,911,800	1223	140	410
W3CC	"	1,709,787	1123	137	442
WA2C/3	"	1,705,620	1453	117	348
N3ZA	"	1,671,810	1071	136	434
KB3TS	"	1,501,482	1097	114	388
K3CT	"	1,462,844	1037	126	388
N3NA	"	1,390,488	1006	122	384
W3IZ	"	1,310,428	1007	111	365
K3CP	"	1,285,676	944	123	388
K3AR	"	1,217,202	847	117	394
W3HVQ	"	1,086,995	889	111	344
WT3P	"	883,220	810	94	301
W3OV	"	866,700	771	101	327
K3SA	"	628,419	560	99	318
K3SV	"	545,761	534	105	296
K3IXD	"	401,882	471	93	245
WA3RHW	"	390,456	498	80	226
N3GPU	"	376,929	512	74	205
KU3X	"	313,730	423	70	204
N3UN	"	311,691	401	89	232
W3EKT	"	310,794	403	72	205
W3UL	"	231,285	372	73	182
K3TG	"	213,344	357	67	159
WA3KF	"	212,459	298	70	207
N3HTZ	"	70,720	198	34	102
KT4W	A	3,823,235	2187	156	499
W4JVN	"	1,518,457	1105	125	374
K3KO/4	"	1,110,600	924	117	333
NT4D	"	1,089,675	818	126	375
N4QQ	"	449,228	571	88	238
KT3T/4	"	385,200	486	96	225
WF3J/4	"	385,050	537	74	228
N8WRL/4	"	300,027	452	72	201
K4BS	"	203,574	296	73	186
AA4GA	"	87,817	239	41	96
W4ZW	"	71,576	188	68	116
KO4MR	28	104,404	216	34	138
N4NX	7	55,460	172	29	89
KD4RH	"	51,198	197	27	79
N2BT/4	3.7	11,222	70	14	48
NR5M	A	1,410,981	1198	134	373
NA4M/5	"	1,352,190	1119	120	350
N5TY	"	648,324	585	105	309
K4NR/5	"	229,333	307	86	213
W9DX/5	21	205,375	485	35	120
N6CCL	A	810,135	639	125	334
N6IC	"	779,405	725	114	269
AB6WM	"	594,776	670	103	241
K6XX	"	370,920	511	89	175
WA5VGI/6	"	311,080	401	93	187
WA6TLA	"	156,773	275	65	146
W6OAT	"	141,219	243	75	146
KF6BIR	"	105,120	278	53	91
K6ACZ	"	91,102	179	73	129
K6JG	"	88,880	158	63	139
K6JAT	"	61,752	199	66	100
KA6BIM	28	383,895	876	36	135
W6ISQ	"	58,764	202	45	112
N6DHZ	"	26,197	140	21	46
W7OM	A	1,022,420	959	122	314
K7BTW	"	986,513	1099	104	237
K7GJ	"	622,125	696	110	265
K7ABV	"	414,966	509	81	210
N7UJJ	"	331,134	533	68	161
K6LL/7	"	328,878	642	54	144
K7TD	28	108,069	275	34	129
K7ED	21	167,495	443	34	105
(Op.: WAØRJY)					
W7CT	"	153,267	398	35	106
N8TR	A	4,086,628	2022	159	562
ND5S/8	"	1,680,585	1003	149	470
KB3AUG/8	"	1,342,310	978	116	383
KD8FS	"	552,979	547	105	296
K8CX	"	490,468	602	84	230
N8SHZ	"	431,460	520	92	248
N4ZR/8	"	128,520	220	66	144
KA8FSM	"	28,336	104	37	75
AA8U	21	897,432	1803	38	145
WN9O	A	1,443,316	1032	136	396
(Op.: W9IU)					
KB9BUM	"	919,485	812	101	316
W9GIG	"	485,078	507	91	283
KG9N	"	75,654	186	60	102
NRØX	A	1,871,907	1166	140	439
N5IN/Ø	"	1,743,500	1257	132	418
WØTM	"	1,663,086	1387	117	321
KØKX	"	1,307,948	1321	104	284
KTØR	"	767,404	674	120	308
WB8ZRL/Ø	"	762,192	585	122	352
KØOB	"	666,050	743	95	251
KØIW	"	485,440	554	90	230
KZØC	"	423,738	494	101	241
KØIL	"	337,269	455	81	210
KIØLO	"	69,368	150	58	126
KGØUS	"	59,664	173	44	88
KKØDX	"	58,282	140	54	107
KBØVVT	"	41,724	147	40	74
KØINR	"	18,304	92	36	68
KGØUT	"	7,308	48	24	39
WØCP	28	79,050	279	29	73

BARBADOS

8P2K	A	3,250,497	2685	115	404	(Op.: 8P6SH)

CANADA

VE5CB	A	749,340	1238	92	184	
VA3MM	21	1,285,766	2381	39	154	
VE1RX	"	141,564	561	22	72	

PUERTO RICO

KP4WW	28	1,174,986	3237	34	128	

AFRICA

UGANDA

5X1T	28	2,812,630	4517	40	175	(Op.: ON6TT)

ASIA

JAPAN

JJ3ZZE	A	2,206,555	1992	120	289	(Op.: JF3PLF)
JQ1BVI	"	1,914,660	2108	116	280	
JA9XBW	"	856,516	838	120	294	
JR4QZH	"	854,784	926	93	243	
7L4IOU	"	371,091	497	99	188	
JJ3VPY	"	327,075	464	85	182	
JJ6TYG	"	44,275	117	53	99	
JA7OWD	28	885,720	2018	38	127	
JR8OGB	"	286,713	865	31	92	
JHØALB	"	55,834	252	27	61	
JA6AVT	"	35,864	208	21	44	
JA8JCR	"	33,028	146	28	64	
JQ3UDL	"	10,856	80	17	42	
JN3DRB/3	21	159,240	518	34	86	
JR9NVB	"	92,638	300	31	90	
JG1JQJ	"	52,020	249	25	65	
JA1KVT	7	19,276	114	24	50	
JL7BRH	"	18,251	111	20	48	
JA3LDH	"	16,756	105	25	46	
JG3DOR/2	"	2	1	1	1	

JORDAN

JY9QJ	A	2,299,374	1781	122	340	

KAZAKHSTAN

UPØF	A	986,748	1176	95	262	(Op.: UN7FK)

EUROPE

ALAND ISLANDS

OHØV	21	1,251,328	3134	39	149	(Op.: OH6LI)

AUSTRIA

OE1WEU	A	645,192	884	92	320	
OE2CZN	"	235,115	439	77	218	

BELGIUM

OT9T	A	7,048,074	3862	159	600	(Op.: ON4UN)
ON4LCE	"	896,730	1079	97	329	
ON4BBW	"	198,440	424	69	173	
ON4CAS	28	101,310	351	28	82	

BULGARIA

LZ9F	21	85,760	385	33	101	

CROATIA

9A5Y	A	4,827,020	3432	161	579	(Op.: 9A7W)
9A4KA	3.7	8,635	138	7	48	
9A2U	1.8	27,654	473	7	59	(Op.: 9A3ZA)

CZECH REPUBLIC

OK2FD	A	3,348,360	2108	149	561	
OK2ZI	"	1,539,145	1400	128	441	
OK1DG	"	563,616	789	77	211	
OK1AVY	28	64,719	188	34	107	
OK1DIG	1.8	50,960	818	7	58	

DENMARK

OZ1FAO	A	88,068	222	46	110	

ENGLAND

G3TMA	A	1,029,990	1072	97	320	

EUROPEAN RUSSIA

UA4HTT	A	2,834,610	2942	126	444	
RA3AJ	"	1,956,456	2118	121	401	
UA3AB	"	1,846,800	1958	109	323	
RZ3AA	"	1,210,650	1521	111	414	
UA1QV	"	886,950	1316	99	339	
RA3AUM	"	809,840	1235	90	292	
UA3AP	"	236,622	490	70	156	
RU6LC	"	89,082	261	60	142	
UA4RF	"	78,585	292	52	143	
UA4LDP	"	36,322	152	37	90	
UA6LP	"	15,960	81	34	50	
RN3QO	14	675,260	1900	40	150	

FINLAND

OH6NIO	A	2,836,024	2252	127	441	
OH3BU	28	497,448	1333	38	151	
OH2VB	"	87,240	202	37	133	
OH2BO	1.8	6,860	130	6	43	

FRANCE

TM2V	A	5,795,370	3693	140	490	(Op.: F6GYT)
F5RZJ	"	4,277,460	2865	143	517	
F8CIO	"	500,950	645	105	325	

GERMANY

DJ2YA	A	4,239,585	2658	140	505	
DF4RD	"	3,530,555	2083	148	597	
DL7ON	"	1,610,180	1332	131	441	
DF6QN	"	1,171,296	1103	105	393	
DK9IP	"	1,142,784	984	118	378	
DJ5BV	"	1,124,026	980	124	433	
DJ9MH	"	881,280	865	122	422	
DK3GI	"	862,750	748	129	364	
DL1YFF	"	785,583	960	108	349	
DL8AAM	"	757,712	1185	82	286	
DJ1TU	"	749,662	880	95	284	
DL8NFU	"	739,908	962	96	346	
DLØEK	"	688,176	819	97	335	(Op.: DL1GST)
DL4DXF	"	584,412	737	96	276	
DL1QW	"	474,376	656	90	304	
DF5ZV	"	439,310	611	96	298	
DL4RDJ	"	361,504	634	69	217	
DL9NDV	"	356,590	521	81	257	
DK4VW	"	260,392	395	79	190	
DF2UU	"	154,660	300	61	129	
DF2IAX	"	119,145	378	56	179	
DL5ZB	"	57,682	145	66	125	
DK7ZT	"	19,712	97	36	76	
DF9ZP	28	1,278,963	2728	39	162	
DL8UD	"	1,033,344	2073	39	168	
DL2DBH	"	866,436	1741	39	167	
DL5IC	"	663,168	1467	39	153	
DF2LH	"	200,430	519	34	119	
DJ8FR	"	55,062	190	27	99	
DL5PW	"	18,018	129	20	46	

IRELAND

EI8IR	A	2,365,090	2623	112	343	
EI8GS	"	2,064,230	2349	85	285	
EI6FR	28	332,424	994	33	129	

ITALY

IQ2A	A	778,488	1014	86	240	(Op.: I2UIY)
IK4WMH	"	445,203	664	78	219	
IK3RIZ	"	428,180	543	81	235	
IY4W	28	574,692	1426	37	129	
IN3ZNR	21	708,624	1832	36	132	
I8NHJ	14	319,185	1006	39	134	
IC8WIC	3.7	38,304	581	11	61	

NETHERLANDS

PA3FNE	A	1,112,412	1379	105	387	
PA3EWP	28	1,126,170	2101	39	176	

POLAND

SP3KEY	28	1,840,811	3484	40	177	(Op.: SP3RBR)
SP4XQN	3.7	6,627	200	6	41	

SLOVAK REPUBLIC

OM5A	A	1,901,718	1849	123	436	(Op.: OM3LA)
OM3IAG	"	1,058,376	1598	100	322	

SLOVENIA

S56A	A	1,946,005	1499	135	520	
S59L	"	327,810	537	79	215	
S50R	28	764,001	1730	38	143	
S51TA	21	1,000,073	2472	40	139	
S5ØS	"	556,512	1656	39	137	
S57M	1.8	66,576	827	11	65	

SPAIN

EA7AGW	A	3,071,410	2809	120	385	
EA5BM	"	2,470,736	2092	140	474	
EA5FID	"	204,512	335	88	220	
EA3EJI	21	202,377	623	36	125	
EA3IN	14	295,596	970	35	126	
EA3ALV	7	32,476	277	18	74	

SWEDEN

SK3LH	A	2,425,151	2311	122	401	(Op.: SM3WMV)
8S5A	"	1,391,720	1678	101	339	(Op.: SM5AJV)

UKRAINE

UTØU	A	4,219,046	3516	130	487	(Op.: UT5UDX)

YUGOSLAVIA

4N1A	3.7	55,352	701	11	63	(Op.: YT1WA)

OCEANIA

GUAM

KH2/N2NL	A	7,619,776	5156	151	385	

SOUTH AMERICA

ARGENTINA

LU6QI	A	7,875	51	29	46	

BRAZIL

PS2E	A	917,007	1261	83	190	(Op.: PY2EX)
PP5JD	28	979,020	2087	36	149	
ZZ2Z	21	410,010	931	36	122	(Op.: PY2YP)

URUGUAY

CX5X	21	1,151,884	2309	39	142	

MULTI-OPERATOR SINGLE TRANSMITTER

NORTH AMERICA

UNITED STATES

K1YR	5,470,850	2820	151	574	
AA1ON	4,085,406	2149	154	557	
K1ZO	2,652,903	1583	146	487	
N1AO	2,216,780	1531	124	418	
K1GW	2,139,864	1569	126	421	
K1NU	2,035,192	1342	118	418	
N1AU	1,838,609	1260	117	404	
N1WK	912,939	844	99	294	
WA1RR	746,916	897	104	298	
W1BK	609,336	511	94	340	
W1CC	46,228	190	17	74	
W2A	10,793,916	4669	169	675	
N2NU	8,760,304	3802	177	679	
K2UA	5,214,342	2665	157	557	
W6XR/2	4,712,520	2784	154	527	
K2XR	4,163,544	2284	154	539	
W2CG	3,373,488	1898	141	507	
W2LC	2,205,144	1711	119	379	
K2OWE	2,117,808	1344	143	473	
N2SS	1,955,850	1376	119	391	
AE2F	1,599,612	1185	127	421	
N2LBR	1,067,652	915	101	322	
W2RD	806,538	672	118	340	
WB2KHO	608,069	631	92	279	
KE2HG	589,778	563	94	315	
K2SB	567,567	609	107	334	
W2GSB	714	20	8	13	
NE3F	4,099,268	2464	151	523	
W2UP/3	3,937,080	2393	136	466	
WU3M	3,277,365	1993	141	496	
W3MF	3,027,310	1731	144	494	
W3DXR	1,466,976	1188	111	333	
K3DI	932,514	823	97	329	
K3BSA	740,316	744	92	290	
K4ISV	6,410,808	3206	179	628	
N4TO	6,261,284	3049	162	604	
W4MR	4,621,248	2667	145	494	
W4WS	2,464,020	1684	132	453	
K4HA	1,610,077	1243	118	351	
W4CAT	1,470,840	1149	128	382	
K4RC	968,691	997	100	317	
KR4TG	495,600	537	93	257	
AD4ES	323,876	521	76	193	
KU4RG	287,574	397	77	210	
W4PRO	141,282	294	59	108	
K5MR	6,874,863	3157	181	650	
AA5NT	3,714,855	2312	151	530	
N5YA	2,172,870	1476	148	482	
N1LN/5	1,835,350	1378	133	417	
W5YM	1,341,400	1116	123	352	
N5KB	925,932	809	107	331	
KK5CA	27,225	113	33	66	
W6EEN	3,303,720	2163	157	464	
KG6OK	2,708,630	1817	155	462	
K6ZM	2,445,786	1931	148	383	
W6YX	1,885,590	1460	134	377	
K6LY	1,474,070	1230	139	354	
W6II	262,340	407	76	184	
NK7U	4,743,804	2892	167	480	
KC7V	2,845,800	1940	149	463	
K6KR/7	915,860	764	125	335	
W7IG	697,656	916	99	229	
K7ZL	630,819	731	96	227	
AB7RW	150,722	323	63	124	
W7JQ	91,784	224	53	96	
W7PXL	81,696	210	50	98	
K8AZ	8,356,205	3684	177	668	
K8CC	7,161,844	3496	170	602	
N8NR	5,672,494	2719	168	593	
KD8SQ	369,622	516	85	232	
NK1K/9	4,916,067	2709	161	538	
KD9ST	1,781,229	1240	137	400	
W9UR	1,140,156	1162	104	287	
K9NR	1,060,900	1035	93	319	
K9IU	449,084	557	81	230	
NØIJ	2,374,344	1592	141	447	
KØLIR	1,742,250	1402	130	375	
KKØSS	1,532,214	1488	111	303	
KØGQ	1,333,848	1205	122	325	
KCØCWU	374,010	574	76	197	

ALASKA

KL7Y	9,549,554	6075	166	492	

CANADA

VE3EJ	14,770,600	6198	187	733	
VO2CQ	9,785,300	5455	147	553	
VE6JY	7,825,662	4855	159	530	
VE6SV	5,668,750	3874	155	470	
VA3SK	5,194,044	3379	145	476	
VE5DX	5,175,456	4788	137	391	
VE2CSI	5,057,600	3996	129	416	
VE6AO	2,384,181	2954	116	273	
VE5RI	1,927,752	2390	107	269	
VE3DC	700,138	887	110	284	
VE3HG	510,040	738	79	232	
VE2CMH	190,440	406	50	157	
VE2CQ	69,806	233	46	121	
VA2RHJ	29,610	367	13	32	

COSTA RICA

TI5EBU	8,879,619	6038	150	473	

DOMINICAN REPUBLIC

HI9/DK8YY	8,712,900	7007	124	416	

GUANTANAMO BAY

KG4CM	2,509,033	2815	103	280	

MARTINIQUE

FM5BH	9,754,160	6471	148	516	

MEXICO

6D2X	13,002,714	7549	168	610	
XE1X	2,450,736	2760	94	272	
XE2/N7RK	1,945,600	2473	120	280	

MONTSERRAT

VP2MCS	7,078,230	5557	128	430	

NICARAGUA

YN2EJG	1,408,440	1833	89	241	

ST. LUCIA

J6J	5,204,892	4231	121	395	

SAINT MARTIN

FS/K7ZUM	4,242,700	4766	102	304	

TURKS & CAICOS ISLANDS

VP5R	13,492,710	8241	151	575	
VP5DX	11,411,148	6918	161	571	

U.S. VIRGIN ISLANDS

NP2B	4,946,762	4514	127	366	
KP2D	1,288,127	3085	63	136	

AFRICA

CANARY ISLANDS

EA8URL	1,713,753	1827	93	298	

MADAGASCAR

5R8FU	1,677,336	1582	107	269	

MADEIRA ISLANDS

CQ9K	12,440,610	6579	155	531	
CS9Z	1,416,987	1773	70	227	

TANZANIA

5H3US	6,777,528	4617	133	401	

ASIA

ASIATIC RUSSIA

UA7A	9,318,515	4764	169	604	
RF9C	8,675,844	4091	165	624	
RK9JWV	2,842,020	2436	128	385	
RK9CZO	1,461,571	1122	118	381	
RK9TWA	949,586	1078	85	289	
RK9JWJ	571,200	807	77	223	
RK9CYA	8,496	75	16	43	

ASIATIC TURKEY

TA2KB	1,927,125	2011	70	305	

AZERBAIJAN

4K7Z	982,488	1201	65	247	

CHINA

B4R	1,187,082	2254	102	249	
BY1PK	349,058	1385	56	122	
B9G	211,008	818	73	119	
BY2JCY	46,566	551	44	73	

CYPRUS

P3A	17,321,994	7913	164	675	
P39P	3,830,310	3499	101	337	

INDIA

VU2PAI	3,164,106	2261	134	439	

JAPAN

JH7PKU	6,651,928	3828	165	469	
JE4VVM	6,113,926	3621	152	485	
JA7YAA	5,311,368	3195	158	481	
JI2ZJS	4,648,889	3333	148	429	
JJ3YBB	4,021,524	3512	137	370	
JE6ZIH	3,644,073	2723	141	402	
JA9YBA	2,642,052	2111	133	364	
JF6ZPH	2,117,503	1910	123	308	
JI2ZEY	1,891,305	1681	133	344	
JA6ZLI	1,761,315	1522	123	312	
JA1YFG	987,690	1182	98	232	
JA8YBY	669,260	946	99	208	
JM1ZTI	3,315	51	32	33	
JA3YPL/2	1,533	30	10	16	

KAZAKHSTAN

UPØL	8,101,951	4726	148	541	
UN5G	1,656,192	1770	100	284	

KYRGYZSTAN

EX9A	4,059,328	3624	108	368	

TAIWAN

BV2B	592,626	1735	81	177	

THAILAND

HSØAC	1,998,547	2784	123	308	

UK BASES ON CYPRUS

ZC4ATC	6,174,560	3941	127	469	

EUROPE

4U-VIENNA

4U1VIC	9,078,627	6095	163	634	

ALBANIA

ZA/S57AW	4,416,875	4116	130	495	

AUSTRIA

OE5T	4,201,782	3290	132	486	
OE1W	231,840	579	64	216	

BELARUS

EW1WC	646,760	1695	66	230	

BELGIUM

OT9L	8,378,370	4562	167	670	
OT9C	6,511,455	4614	142	553	
ON6DP	4,243,818	3117	129	477	
OT9K	3,610,289	2903	125	452	
OR5EU	429,368	1152	56	135	

BOSNIA-HERZEGOVINA

T91CMN	301,637	861	66	221	

BULGARIA

LZ2K	1,535,144	1972	113	396	

CROATIA

9A7A	7,707,948	4673	170	634	
9A1O	2,437,800	2687	111	367	
9A4U	1,344,607	1767	113	374	
9A1CMS	398,145	803	60	225	

CZECH REPUBLIC

OK5W	9,041,883	4749	178	729	
OL5Q	3,481,842	2957	141	496	
OL2A	1,090,560	1375	103	323	
OK1KIR	920,010	1305	102	353	

DENMARK

OZ9KY	4,094,912	3507	140	447	

ENGLAND

M1P	8,106,700	4715	148	592	
GB3RS	3,450,664	2945	130	472	
G3B	2,455,225	2088	117	428	
G1Y	2,066,134	2206	90	316	
M2H	1,558,152	2238	76	230	
M2G	1,120,290	1664	78	243	
G4WAC	121,794	373	48	111	
M5W	49,742	235	32	87	
GØEYO	33,988	171	32	84	
M4T	13,446	132	25	58	
GØRAF	8,232	110	14	42	

ESTONIA

ES5Q	7,691,600	4825	170	650	
ES2X	1,901,744	2102	114	419	

EUROPEAN RUSSIA

RU1A	9,530,016	4997	182	706	
RM6A	8,007,125	4890	177	698	
RW4LYL	5,042,448	4201	156	566	
RK3AWE	3,564,000	3678	128	422	
RX3RXX	2,402,490	3101	125	405	
RK3AWV	2,294,064	2587	125	409	
RK4WWA	2,003,431	2444	131	456	
RK4HYT	1,151,646	1470	114	409	
RK4FWX	916,160	1439	91	318	
RK3QWM	840,608	1407	103	379	
RA3AA	653,844	1309	78	231	
RK3YYM	400,000	941	67	253	
RZ1AWO	389,400	1098	62	238	
RZ4PZL	261,126	557	70	197	
RK3AWB	126,480	412	51	153	
RK4HWZ	125,664	437	51	180	

FINLAND

OH1F	9,574,620	4956	179	711	
OH7M	8,069,039	4688	170	657	
OH2BA	2,498,985	2383	121	414	
OH6KSR	843,827	854	123	446	

FRANCE

TM2Y	14,703,147	6386	181	752	
TM1C	11,304,956	6171	172	634	
TM1T	6,570,808	5113	135	487	
TM1W	5,128,000	3550	141	500	
F6KDF	4,577,466	3665	139	544	
TM8A	4,191,876	3580	135	501	
TM8F	3,921,509	3063	128	465	
TM1V	3,528,315	3609	107	376	
F5KDC	1,366,154	1773	90	301	
F6KHK	875,425	820	121	354	
TM5KP	685,440	1285	75	240	
TM5LO	420,420	983	64	209	
F5KEM	203,682	478	63	186	

GERMANY

DFØHQ	11,384,976	5333	174	730	
DHØDX	5,523,768	3483	143	574	
DF3CB	5,076,016	2965	156	608	
DLØGL	1,391,250	2155	91	284	
DKØMM	1,361,772	1376	108	378	
DH1TW	1,312,610	1581	103	336	
DL6PK	989,312	1073	109	415	
DN1MA	511,231	672	87	280	
DL8EAD	246,206	581	64	193	

DLØBKR	136,136	422	37	117
DJ2OO	57,720	260	40	80
DLØHNF	46,464	257	37	95

GREECE

SV1AFA	**666,864**	**1295**	**94**	**302**

GUERNSEY

MUØBKA	**5,370,750**	**4105**	**143**	**539**

ICELAND

TF3IRA	**2,112,175**	**3415**	**76**	**259**

ITALY

IQ4A	**13,688,588**	**6365**	**173**	**701**
IQ2X	**6,736,472**	**3995**	**157**	**615**
IO2A	**6,634,410**	**3877**	**156**	**631**
IK1SLE	3,194,269	2800	122	411
IO2L	2,448,004	2370	111	415
II2Y	2,444,904	2254	120	384
IO8O	2,418,768	2313	133	461
IQ5B	1,484,610	1849	107	319
II1R	1,453,760	1641	93	347
IR3P	1,141,672	1289	121	430
II4I	744,276	1047	80	258
IK1SLP	611,550	852	100	305
IU2C	490,710	1685	38	127
IR1S	369,512	973	61	148
IZØBEE	231,594	432	75	288

LATVIA

YL4U	**5,637,757**	**3913**	**163**	**588**

LITHUANIA

LY2ZZ	**5,621,538**	**3767**	**160**	**583**
LY3MR	3,983,966	3022	158	585
LY2OM	1,708,022	1850	108	406

LUXEMBOURG

LX2LX	**3,781,140**	**3830**	**114**	**396**
LX9SW	2,620,392	2835	109	383

NETHERLANDS

PA7MM	**5,724,432**	**3805**	**150**	**606**
PI4CC	**4,236,876**	**3085**	**141**	**503**
PI4ZLD	1,037,120	1195	101	362
PI4TIL	351,624	706	76	236
PI4WAL	201,586	374	68	170

NORWAY

LA8W	**7,516,704**	**4805**	**154**	**587**

POLAND

SN2B	**12,294,892**	**5999**	**174**	**709**
SP9PRO	**2,954,061**	**2576**	**125**	**438**
SP9KDU	262,614	647	64	189
SP3KPN	187,850	543	50	171
SN6U	138,736	415	48	160
SNØKAO	75,665	278	53	132
SP9KGG	73,139	291	39	70
SP9KJU	13,280	68	33	50

PORTUGAL

CS1A	**2,199,744**	**2740**	**103**	**329**
CT1EGF	416,835	765	72	223

ROMANIA

YP3A	**1,739,450**	**2946**	**114**	**361**
YO9KPD	88,550	570	27	88

SICILY

IQ9K	**1,929,098**	**2832**	**82**	**280**
IT9FXY	**1,702,835**	**1831**	**111**	**374**

SLOVAK REPUBLIC

OM8A	**11,005,979**	**5981**	**161**	**662**
OM5M	**9,239,280**	**5181**	**166**	**677**
OM3A	7,539,000	4430	169	671
OM7M	3,042,900	3067	113	377

SLOVENIA

S51NM	**3,828,624**	**2787**	**140**	**524**
S59SLO	282,924	792	67	204

SPAIN

EA1EEY	**5,691,504**	**3901**	**129**	**495**
EA5URP	**5,478,343**	**3871**	**131**	**486**
ED3MM	**2,607,720**	**2605**	**127**	**493**
EA5FKX	2,312,112	2294	115	413
EA4ST	**2,283,270**	**3022**	**91**	**279**
EA4RKU	2,266,320	2399	93	333
ED1BD	1,916,784	2353	97	311
EA1COZ	1,861,617	2123	98	321
EA3AR	1,738,064	2045	99	269
EA2AAE	**1,648,920**	**2049**	**125**	**395**
EA3RKG	1,626,400	2015	100	300
ED1CL	1,410,084	1616	92	322
EA5AFH	933,324	1486	80	207
ED2WW	708,474	1197	76	217
ED2RCA	568,733	941	79	268
EA1URO	469,092	923	74	217
EA1RCT	310,926	804	57	174
ED5WEB	251,328	561	65	207
EA5RKL	94,300	319	68	162
ED1EB	27,729	126	32	47

SVALBARD

JW5E	**1,961,290**	**2175**	**108**	**307**

SWEDEN

SK3W	**7,131,680**	**3987**	**172**	**676**
SL7BZ	921,639	1680	85	296
SK7AX	285,075	447	78	237
8S2F	41,553	435	14	67

SWITZERLAND

HB9H	**6,263,568**	**4092**	**146**	**583**
HB9RL	**5,208,060**	**3692**	**141**	**519**
HB9OK	1,143,933	1804	80	319

UKRAINE

UT7Z	**8,521,481**	**5565**	**166**	**613**
UU7J	**3,462,627**	**3556**	**163**	**586**
EN5J	2,367,900	2351	121	419
EM4E	2,085,135	2685	120	435
US8U	1,018,710	1509	97	365
UX8IXX	330,064	1845	83	309
UT3IZZ	186,208	534	52	201
UR4MWU	166,772	508	49	192
UT4UWL	35,235	223	32	113

YUGOSLAVIA

YZ9M	**2,506,565**	**1970**	**143**	**486**
YZ7A	901,470	1273	100	353
YU7AJM	393,700	696	71	239

OCEANIA

AUSTRALIA

VK4UC	**4,961,152**	**3938**	**125**	**323**
VK6ANC	896,442	1026	91	227
VK4IU	715,065	978	90	195

BELAU

T88WX	**6,671,714**	**5343**	**126**	**320**

GUAM

AH2R	**9,616,144**	**5977**	**148**	**436**

INDONESIA

7AØK	**2,671,326**	**2743**	**106**	**276**

MARSHALL ISLANDS

V73AX	**3,990,510**	**3298**	**133**	**306**

NEW ZEALAND

ZL6QH	118,248	603	25	53

PHILIPPINES

DX1DX	**743,274**	**1151**	**80**	**158**
DX1RN	130,650	434	52	78

SOUTH AMERICA

ARGENTINA

LU1NF	**3,466,080**	**2958**	**121**	**343**
LT5Y	1,075,824	1527	76	172

BRAZIL

PT2CM	**1,573,600**	**1946**	**94**	**256**
ZV5V	122,550	354	64	126
PW5D	11,988	69	33	48

CHILE

CE3F	**8,995,350**	**5309**	**156**	**494**
CE4TA	1,749,622	2353	96	233
CE3AA	888,468	1211	90	204
CE3PA	702,477	1220	77	190

NETHERLANDS ANTILLES

PJ2C	**9,885,330**	**5700**	**147**	**492**

PERU

4T4WW	**1,559,280**	**1790**	**111**	**245**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES

KC1XX	**25,963,386**	**10194**	**187**	**782**
K3LR	**25,709,664**	**10011**	**193**	**799**
N2RM	**24,430,230**	**9380**	**194**	**796**
W3LPL	**21,168,659**	**8512**	**191**	**786**
K9NS	**15,380,904**	**6712**	**191**	**711**
N3RS	**13,823,641**	**5903**	**174**	**697**
K1XM	**12,561,696**	**5509**	**178**	**690**
W3PP	11,287,672	5485	171	665
NQ4I	**11,088,792**	**5238**	**183**	**675**
K1TTT	10,655,400	4915	173	667
KB1SO	10,297,485	5538	162	619
W2AX	**10,035,800**	**4936**	**162**	**598**
K1RX	9,926,430	4514	170	648
W4MYA	**9,460,550**	**4439**	**175**	**660**
KV1W	8,755,476	4090	163	608
K1KI	8,514,336	4295	157	587
N6AW	**8,298,150**	**4479**	**166**	**569**
KB1H	8,181,852	3962	158	613
K2RD/1	7,338,956	3529	162	596
N2MM	6,571,927	3422	158	581
NX5M	**5,703,733**	**3603**	**156**	**527**
W8ZA	**4,956,216**	**2627**	**157**	**539**
K3ANS	4,893,696	2447	164	604
K5KG/2	4,842,915	2373	160	575
W3MM	4,579,785	2273	159	576
K3II	3,947,284	2391	142	492
NM4T	2,984,130	1909	151	488
N2BIM	2,429,843	1456	139	462
W1QK	1,881,516	1295	122	424
WØAIH	1,049,220	1006	96	306
AB2DE	790,372	841	117	367
KØUE	766,736	872	98	248
KB8QQ	597,474	803	93	249
W4D	539,414	656	97	249
K4WPM	309,618	518	78	231
NØAX/7	248,670	375	85	185
KB1ZQ/5	62,729	169	53	96

ALASKA

KL7RA	**13,326,144**	**9279**	**156**	**452**

ANTIGUA

V26B	**32,750,664**	**15188**	**180**	**736**

CANADA

VY2SS	**22,538,819**	**11246**	**167**	**686**
VE6FI	7,737,660	5913	153	470
VE3BUC	2,171,868	1834	116	358

GRENADA

J3A	**23,073,536**	**13482**	**158**	**614**

MEXICO

XE2DV	**5,877,560**	**5230**	**145**	**375**

ST. LUCIA

J6R	**9,260,394**	**7082**	**129**	**430**

TURKS & CAICOS ISLANDS

VP5T	**15,735,408**	**10291**	**140**	**484**

AFRICA

AFRICAN ITALY

IG9A	**61,215,336**	**20314**	**207**	**885**
IH9P	**32,535,454**	**12700**	**181**	**730**

CEUTA & MELILLA

EA9EA	**40,590,074**	**15731**	**179**	**759**

MOROCCO

CN8WW	**73,194,876**	**22960**	**198**	**900**

ASIA

CHINA

B1Z	212,745	1017	80	115

CYPRUS

5B4AGD	8,073,660	5084	147	511

JAPAN

JA5BJC	**15,917,102**	**7581**	**178**	**600**
JA3ZOH	**13,081,175**	**6731**	**168**	**557**
JA1YPA	**8,147,420**	**5055**	**156**	**464**
JA7YRR	**6,429,456**	**4217**	**153**	**441**
JA6ZPR	**3,384,937**	**3511**	**143**	**378**
JN1YUU	46,203	188	42	69
JA7YFB	14,790	129	34	53

EUROPE

BELGIUM

OT9A	**22,481,380**	**12521**	**174**	**760**

CZECH REPUBLIC

OL5T	**4,931,388**	**3303**	**150**	**606**
OL7W	**3,867,399**	**3207**	**134**	**497**
OK1KQH	1,191,680	1346	103	387

DENMARK

OZ5WQ	**1,713,204**	**1920**	**113**	**409**

ENGLAND

M6T	**29,338,624**	**14655**	**188**	**836**

EUROPEAN RUSSIA

RW3WWW	**590,238**	**1300**	**78**	**285**

FINLAND

OH2U	**20,479,356**	**10599**	**189**	**792**

GERMANY

DF6QC	**1,738,964**	**2213**	**100**	**378**

GREECE

SV1DKR	**2,424,908**	**3208**	**122**	**420**

HUNGARY

HG6N	**16,444,610**	**10001**	**179**	**731**

ITALY

IK3OII	**1,225,424**	**1269**	**112**	**352**
IQ3X	743,020	976	91	297

KALININGRAD

RW2F	**23,815,161**	**12441**	**192**	**807**

LIECHTENSTEIN

HBØ /HB9AON	**6,193,272**	**5570**	**129**	**504**
HBØ/DK7ZL	2,478,978	3513	104	418

LITHUANIA

LY7A	**10,579,495**	**7880**	**170**	**641**

MALYJ VYSOTSKIJ ISLAND

R1MVZ	**14,151,288**	**10253**	**175**	**621**

POLAND

SP9KDA	**1,007,019**	**1629**	**100**	**353**
SP5ZDH	56,952	234	39	87

SCOTLAND

GM7V	**18,798,580**	**11309**	**165**	**730**

SPAIN

EA4ML	**10,436,044**	**7109**	**162**	**656**
ED7VG	2,667,126	3424	115	387

SWEDEN

SK6D	**1,173,012**	**1489**	**101**	**377**

OCEANIA

BANABA

T33Y	**2,359,840**	**3084**	**114**	**187**

HAWAII

KH7R	**33,588,440**	**14691**	**195**	**635**

INDONESIA

YBØZDC	191,206	413	90	158

PHILIPPINES

DX1DBT	**1,135,775**	**1920**	**89**	**162**

SOUTH AMERICA

ARGENTINA

LU4FM	**11,240,704**	**8107**	**154**	**454**

BRAZIL

PY3MHZ	**1,200,320**	**1621**	**85**	**235**

FERNANDO DE NORONHA

ZXØF	**41,625,828**	**16263**	**195**	**801**

NETHERLANDS ANTILLES

PJ4B	**59,127,810**	**20618**	**188**	**834**

PARAGUAY

ZP6T	**4,158,441**	**4457**	**115**	**332**

URUGUAY

CV1T	**4,401,019**	**4217**	**128**	**359**

CHECK LOGS

Our thanks to the following stations who sent in check logs.

3Z4X, 4X1IM, 4Z5DW, AA9IV, AL7CC, CT1DJE, DK2QL, DK5OS, DL1EJG, DL5DWW, DL5NA, EA1CXY, EA1DDU, EA1DKF, EA1EBJ, EA1FAE, EA2ABQ, EA2CHL, EA3AYQ, EA3BJM, EA4AFI, EA4CEN, EA5AVD, EA5FSC, EA5FXS, EA5LV, EA5UW, EA6GP, EA7ARD, EA7BBB, EA7GBD, EA7GSU, EA7GVW, EA7HE, EA8BYL, EA8ZZ, EA9BO, EC4AJL, EC8AQQ, EW3LB, EW8CM, HA5AEX, HA5AF, HA5WG, IC8SCI, IKØJMS, KØMLH, K6FM, KF6SIL, LA1FW, LA3VJA, LA4LN, LA4OGA, LA5LT, LA5RIA, LA7FJA, LA7GM, LA8CD, LA9NM, LA9TJA, LY2BAG, LZ3AB, OH2PR, OH3R, OH3WR, OK2BCJ, OK2EQ, OK6L, OZ1JMO, OZ2MD, OZ7BW, OZ8RN, PAØRBA, PAØUKC, PA3AAV, PA3EXI, PA3FOZ, PA3GVI, PA3HGF, PA9OK, PT7WA, PY2EJN, PY3CEM, PY3TD, RAØFA, RA1AVP, RA1ZM, RA4LC, RV6AB, RW6AML, RZØSB, RZ1AR, SMØBNK, SM2UJW, SM3CBR, SM5CVC, SM6RTM, SP1DMD, SP1JON, SP2JLR, SP2QCR, SP3NX, SP4CGJ, SP4SAF, SP4TVO, SP5CEQ, SP5CGN, SP5OXJ, SP6BEN, SP6CIK, SP6FIB, SP6KEP, SP6LUV, SP6OJG, SP6ORR, SP7ICE, SP8BWR, SP8HKT, SP8JMA, SP8KBZ, SP8SRS, SP9CLO, SP9CQ, SP9DEE, SP9GFI, SP9GNM, SP9MCU, SP9MDY, SP9ODY, SQ5AAS, SQ5TT, SQ9CAQ, UAØCA, UAØJD, UA3PB, UA3UBT, UA4CDV, UA4PKN, UN6T, UY9IM, W7LBN, YL2AZ, YO3ABL, YO3BWK, YO3CTK, YO3GDA, YO4ATW, YO5BIM, YO8AII, YO8BNG, YO8OH, YO8ROO, YO9AHX, YU1AXY, YV6DBW, Z32AF.

Disqualified: HG1S (HA1TJ) single op with multiple signals & multiple time modifications.

Announcing:

The 2000 CQ WW DX Contest

Phone: October 28–29 CW: November 25–26
Starts 0000 GMT Saturday Ends 2400 GMT Sunday

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many zones and countries as possible.

II. BANDS: All bands, 1.8 through 28 MHz, except for WARC bands.

III. TYPE OF COMPETITION (choose only one):

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

A. Single Operator Categories: Single band or all band; only one signal allowed at any one time; the operator can change bands at any time.

1. Single Operator High: Those stations at which one person performs all of the operating, logging, and spotting functions. The use of DX alerting assistance of any kind places the station in the Single Operator Assisted category.

2. Single Operator Low: Same as III A 1 except that the output power shall not exceed 100 watts (see rule XI. 11).

3. QRPp: Same as III A 1, except that the power output must not exceed 5 watts (see rule XI.11).

B. Single Operator Assisted: Same as III A 1 except the passive (self-spotting not allowed) use of DX spotting nets is allowed.

C. Multi-Operator (all band operation only):

1. Single Transmitter: Only one transmitter and one band permitted during any 10-minute period, defined as starting with the first logged QSO on a band. Exception: One—and only one—other band may be used during any 10-minute period if—and only if—the station worked is a new multiplier. Logs found in violation of the 10-minute rule will be automatically reclassified as multi-multi.

2. Multi-Transmitter: No limit to transmitters, but only one signal and running station allowed per band.

D. Team Contesting: A team consists of any five radio amateurs operating in the single operator category. A person can be on only one team per mode. Competing on a team will not prevent any team member from submitting his personal score for a radio club. A team score will be the sum of all the team member scores. SSB and CW teams are totally separate. That is, a member of an SSB team can be on a totally different CW team. A list of a team's members must be received at *CQ* Headquarters by the time the contest begins. Mail or FAX the list to *CQ*, Att: Team Contest, 25 Newbridge Road, Hicksville, NY 11801 U.S.A.; FAX 516-681-2926. Awards will be given to the top teams on each mode.

IV. NUMBER EXCHANGE: Phone: RS report plus zone (i.e., 5705). CW: RST report plus zone (i.e., 57905).

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The *CQ* Zone Map, DXCC country list, WAE country list, and WAC boundaries are standards. Maritime mobile stations count only for a zone multiplier.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. *Exception:* For North American stations *only*, contacts between stations within the North American boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: the final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VIII. AWARDS: First-place certificates will be awarded in each category listed under Sec.III in every participating country and in each call area of the United States, Canada, European Russia, Spain, and Japan.

All scores will be published. To be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only*. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates/plaques will be issued to the licensee of the station used.

IX. TROPHIES & PLAQUES (Donors)

PHONE

Single Operator, All Band

World: Dave Rosen, K2GM – WA2RAU Memorial
World Low Power: Slovenia Contest Club
World QRP: Lew Sayre, W7EW
World Assisted: Snake River Contest Club
U.S.A: Potomac Valley R.C. – KC8C Memorial
U.S.A. Low Power: North Coast Contesters
U.S.A. Zone 3: Bill Fisher, W4AN
U.S.A. Zone 4: Bill Fisher, W4AN
Canada: Niagara Frontier Int'l DX Assn. – VE3WT Memorial
Caribbean/C.A.: Alex M. Kasevich, VP2MM
Europe: Potomac Valley R.C. – W4BVV Memorial
Europe Low Power: Scott Jones, N3RA & Tim Duffy, K3LR
Africa: Gordon Marshall, W6RR
Asia: 2 AM Dayton Pizza Gang
Japan: Japan Crazy Contesters Club
Oceania: Northern California DX Club
S. America: Yankee Clipper Contest Club
S. America, Mainland: Jose Bachmann, ZP6CC, & Cesar Ivaldi, ZP5K

Single Operator, Single Band

World—28 MHz: Joel Chalmers, KG6DX
World—21 MHz: Robert Naumann, N5NJ
World—14 MHz: North Jersey DX Assn. – K2HLB Memorial
World—7 MHz: Fred Laun, K3ZO – K7ZZ Memorial
World—3.8 MHz: Fred Capossela, K6SSS
World—1.8 MHz: Bob Wruble, W7GG
USA—28 MHz: Donald Thomas, N6DT
USA—21 MHz: World Radio
USA—14 MHz: Southern California DX Club
USA—7 MHz: Stanley Cohen, W8QDQ
USA—3.8 MHz: Arnold Tamchin, W2HCW
USA—1.8 MHz: World Radio
Carib./C.A.: Snake River Contest Club
Europe—28 MHz: CQ Magazine – VP2ML Memorial
Europe—21 MHz: Tine Brajnik, S50A
Europe—14 MHz: A.G. Anderson, GM3BCL
Europe—7 MHz: Roger Burt, N4ZC
Europe—3.8 MHz: Marconi Contest Club – I3MAU Memorial
Europe—1.8 MHz: Robert Kasca, S53R
Oceania: Bruce D. Lee, KD6WW
Japan—21 MHz: DX Family Foundation
Japan—14 MHz: Take Yokoyama, JL1BLW

Multi-Operator, Single Transmitter

World: Southern Calif. DX Club – W6AM Memorial
U.S.A.: Carolina DX Association
Europe: Bob Cox, K3EST
Carib./C.A.: Eric Scace, K3NA
Oceania: Junichi Tanaka, JH4RHF
Africa: *CQ* Magazine
S. America: Victor Burns, KI6IM
S. America, Mainland: T. Zappini, ZP5AZL, & R. Bellucci, ZP5XF
Asia: Edward Campbell, AH2BE

Multi-Operator, Multi-Transmitter

World: Dave & Barb Lesson, W6NL & K6BL
U.S.A.: Paul Hellenberg, K4JA
Europe: Finnish Amateur Radio League
Japan: Ryozo Goto, JH3JYS

Contest Expeditions

World-Single Operator: National Capitol DXA – W2GHK Memorial
World Multi-Single: Dieter Loffler, DK9KD – DJ3NG & DJ4EI Memorial
World Multi-Multi: Tachio Yuasa, JA9VDA

Special-Single Operator Award

World-All Band Under 21 years old: Gene Zimmerman, W3ZZ
World-All Band YL: Yutaka Tanaka, JH3DPB – KA6V Memorial

CW

Single Operator, All Band
World: Albert Kahn, K4FW – W9IOP Memorial
World Low Power: Slovenia Contest Club
World Assisted – Snake River Contest Club
World QRPp: Gene Walsh, N2AA
U.S.A: Frankford Radio Club
U.S.A. Low Power: North Coast Contesters
U.S.A. Zone 4: Bill Fisher, W4AN
U.S.A. Zone 3: Bill Fisher, W4AN
Canada: Jim Fisher, Jr., VE1JF
Caribbean/C.A.: Chuck Shinn, W7MAP
Europe: Edward Bissell, W3AU
Europe Low Power: Scott Jones, WR3G & Tim Duffy, K3LR
Scandinavia: Charles Weir Jr., W6UM – Charles Weir, Sr., W3FYS Mem.
Africa: Gordon Marshall, W6RR
Asia: Chuck Shinn, W7MAP
Japan: Japan Crazy Contesters Club
Japan Low Power: Western Washington DX Club
Oceania: Peahi Contest Club
S. America: Venezuela DX Club

Single Operator, Single Band
World—28 MHz: Joel Chalmers, KG6DX
World—21 MHz: Don Busick, K5AAD – N5JJ Memorial
World—14 MHz: North Jersey DX Assn. – W2JT Memorial
World—7 MHz: Alex M. Kasevich, VP2MM
World—3.8 MHz: Fred Capossela, K6SSS
World—1.8 MHz: Kenneth Byers, Jr., K4TEA
USA—28 MHz: Wireless Institute of the Northeast
USA—21 MHz: Wayne Carroll, W4MPY
USA—14 MHz: Northern Illinois DX Association
USA—7 MHz: Jan Perkins, N6AW – W6AM Memorial
USA—3.5 MHz: Bill Feidt, NG3K
USA—1.8 MHz: World Radio
Canada: Radio Amateurs of Canada
Carib./C.A.: Snake River Contest Club
Europe—28 MHz: Jay Pryor, K4OGG
Europe—21 MHz: Robert Naumann, N5NJ
Europe—14 MHz: Maud Slater – G3FXB Memorial
Europe—7 MHz: Ivo Pezer, 9A3A/5B4ADA
Europe—3.5 MHz: Frankford Radio Club – K3VW Memorial
Europe—1.8 MHz: Pat Barkey, N9RV & Terry Zivney, N4TZ
Japan—21 MHz: DX Family Foundation
Japan—14 MHz: Mitsuhiro Nishimura, JA7WME

Multi-Operator, Single Transmitter
World: Anthony Susen, W3AOH
U.S.A.: Douglas Zwiebel, KR2Q
Canada: Eastern Canadian DX Assn.
Carib./C.A.: Octorino G. Villa, PY2KC
Africa: Harry Booklan, RA3AUU
Europe: Bob Cox, K3EST
Oceania & Asiatic Pacific Rim: Junichi Tanaka, JH4RHF
S. America: *CQ* Magazine
Asia: Steve Merchant, K6AW

Multi-Operator, Multi-Transmitter
World: Douglas Zwiebel, KR2Q – Hazard Reeves, K2GL Memorial
World SSB/CW Combined: Alpha/Power, Inc.
U.S.A.: Bob Ferrero, W6RJ – N6RJ Memorial
Europe: Finnish Amateur Radio League
Japan: Ryozo Goto, JH3JYS

Contest Expeditions
World Single-Operator: Yankee Clipper Contest Club
World Multi-Single: Carl Cook, AI6V
World Multi-Multi: Bill Schneider, K2TT

Special-Single Operator Award
World SSB/CW Combined: Hrane Milosevic, YT1AD
World All Band Under 21 years old: Chuck Shinn, W7MAP

Club
World SSB/CW: *CQ* Magazine – W1WY Memorial
Non-USA SSB/CW: N. California Contest Club – N6AUV Memorial

A station winning a World trophy will not be considered for a sub-area award. The trophy will be awarded to the runner-up in that area.

X. CLUB COMPETITION:
1. The club must be a local group and not a national organization.
2. Participation is limited to members operating within a local geographic area defined as within a 275 km radius from center of club area (except for DXpeditions especially organized for operation in the contest; club contributions of DXpedition scores are percentaged to the number of club members on the DXpedition).
3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and CW.

XI. LOG INSTRUCTIONS:
1. All times must be in GMT.
2. All sent and received exchanges are to be logged.
3. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.
4. Logs must be checked for duplicate contacts, correct QSO points and multipliers. Submitted logs must have duplicate contacts clearly shown.
5. We want an electronic log. The Committee requires an electronic log for any possible high score.

E-MAIL Required Content: We strongly recommend you submit the Cabrillo file created by all major logging programs. If Cabrillo is unavailable, then: (1) A SUMMARY sheet in plain-text ASCII, and (2) your LOG in plain-text ASCII. These files may be sent in either one message or in separate messages. Be sure to put the **STATION CALLSIGN** and the **MODE** in the "Subject:" line of each message.

Your log should be sent in plain-text ASCII format. Every logging program has the option of producing an ASCII text log. Examples of the ASCII log file names of the three most common logging programs are the following: **CT = YOURCALL.ALL**, **NA = YOURCALL.PRN**, and **TR = YOURCALL.DAT**. Acceptable submissions can also include all other fixed-column ASCII formats. If you must send a binary file, it will have to be encoded. All popular encoding schemes are acceptable, including UUencode, Base64, and BinHex. Your software may automatically encode your log as an attachment.

Your e-mail log will automatically be acknowledged by the server. You will also receive a personal access code from the server. Use this code to view your log for completeness and later to retrieve your computer analysis. If we have trouble reading your file, we may ask you to send a disk. Submit your CQ WW SSB log to **<ssb@cqww.com>** and your CQ WW CW log to **<cw@cqww.com>**.

DISKS: If you use a computer, please send your IBM, MS-DOS compatible computer disk. A disk containing your files may be submitted in lieu of a paper log. All disks MUST be accompanied by a PAPER summary sheet satisfying all logging instructions. Label your disk clearly with YOUR CALL, files included, the mode (SSB or CW), and your category. The format we require for the most common logging programs is your CT.all file (e.g. HSØAC.all), N6TR. DAT, or NA.QDF files. Name your file correctly (for example, HSØAC.all).
6. Use a separate sheet for each band.
7. Each entry must be accompanied by a summary sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS, and a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.
8. Sample log and summary sheets and zone maps are available from *CQ*. A large self-addressed envelope with sufficient postage or IRCs must accompany your request. If official forms are not available, make up your own 80 contacts to the page on $8^1/2" \times 11"$ paper.
9. All entrants are required to submit cross-check sheets (an alphabetical list of calls worked) for each band on which 200 or more QSOs were made. All other entrants are encouraged to submit cross-check sheets.
10. Duplicate contacts and broken QSOs penalty: three (3) additional contacts removed.
11. QRPp and low power stations must indicate same on their summary sheets and state the actual maximum power output used, with a signed declaration.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest; unsportsmanlike conduct; taking credit for excessive duplicate contacts; unverifiable QSOs; or unverifiable multipliers will be deemed sufficient cause for disqualification. Incorrectly logged calls will be counted as unverifiable contacts.

An entrant whose log is deemed by the Committee to contain a large number of discrepancies may be disqualified from eligibility for an award, both as a participant operator or station, for one year. If an operator is disqualified a second time within 5 years, he will be ineligible for any *CQ* contest awards for 3 years.

The use by an entrant of any non-amateur means such as telephones, telegrams, internet, or the use of packet to SOLICIT contacts during the contest is unsportsmanlike and the entry is subject to disqualification. Action and decisions of the *CQ* Contest Committee are official and final.

XIII. DEADLINE:
1. All entries must be postmarked NO LATER than December 1, 2000 for the SSB section and January 15, 2001 for the CW section. **Indicate SSB or CW on the envelope, disk, or e-mail.**
2. An extension of up to one month may be given if requested by letter or other means. The granted extension must be confirmed by letter sent to the contest director, must state a legitimate reason, and the request must be received before the log mailing deadline. Logs postmarked after the extension deadline may be listed in the results but will be declared ineligible for an award.

Both Phone and CW logs should be sent to *CQ* Magazine, 25 Newbridge Road, Hicksville, NY 11801.

Ham Shop

Advertising Rates: Non-commercial ads are 20 cents per word including abbreviations and addresses. Commercial and organization ads are $1.00 per word. Boldface words are $1.50 each (specify which words). Minimum charge $2.00. No ad will be printed unless accompanied by full remittance. All ads must be typewritten double-spaced.
Closing Date: The 10th day in the third month preceding date of publication (example: Jan. 10th for the March issue). Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of *CQ* cannot vouch for the merchandise listed therein. The publisher reserves the right to reject any advertisement. Direct all correspondence and ad copy to: CQ Ham Shop, 25 Newbridge Road, Hicksville, NY 11801.

CB-TO-10M CONVERSIONS: Frequency modifications, FM, books, plans, kits, high-performance CB accessories. Catalog $3. CBCI, Box 1898A, Monterey, CA 93942. <www.cbcintl.com>

FOREIGN AIRMAIL POSTAGE for successful QSLing! Many countries, monthly bargains, plus **EUROPEAN NESTING AIRMAIL ENVELOPES!** We offer **QSLs, EYEBALL CARDS, QSL ALBUMS, WALLHANGERS.** Bill Plum, 12 Glenn Road, Flemington, NJ 08822-3322 (weekdays: 908-788-1020; fax: 908-782-2612).

QSLs FOR DX STATIONS: Our new "International Division" was established to handle QSL needs of DX hams. We understand the problems of packaging, shipping, and dealing with the customs problems. You can trust us to deliver a quality QSL, usually much cheaper than you can find locally. Write, call, or FAX for free samples and ordering information. "The QSL Man—W4MPY," 682 Mount Pleasant Road, Monetta, SC 29105 USA. Phone or FAX 803-685-7117.

"QRZ DX"—since 1979: Available as an **Adobe PDF file** each Wednesday or by regular mail. Your best source for weekly DX information. Send #10 SASE for sample/rates. **"The DX Magazine"—since 1989:** Bimonthly – Full of DXpedition reports, QSL Information, Awards, DX news, technical articles, and more. Send $2.00 for sample/rates. DX Publishing, Inc., P.O. Box DX, Leicester, NC 28748-0249. Phone/Fax: 704-683-0709; e-mail: <DX@dxpub.com>; WEB PAGE: <http://www.dxpub.com>.

WANTED TO COMPLETE PHOTOGRAPHY FOR BOOK: Ham transmitters manufactured prior to World War II and receivers from the same era by companies other than Hallicrafters, Hammarlund, or National. I will travel to your location to do photography. Please contact Joe Veras, N4QB. Telephone: 205-967-2384; e-mail: <n4qb@cq-amateur-radio.com>; or P.O. Box 1041, Birmingham, AL 35201.

CALLBOOK S.E. CD-ROM: $38.95. **<AA6EE@amsat.org> <http://www.radiodan.com/aa6ee/>.**

CERTIFICATE for proven contacts with all ten American districts. SASE to W6DDB, 45527 Third Street East, Lancaster, CA 93535-1802.

TOWER HARDWARE, SAFETY EQUIPMENT, weatherproofing, T-shirts, and **MORE**. Champion Radio Products, telephone 888-833-3104, or <www.championradio.com>.

ALUMINUM CHASSIS-CABINET KITS, UHF and VHF Antenna Parts. K3IWK, 5120 Harmony Grove Rd, Dover, PA 17315-3016; <www.flash.net/~k3iwk>.

HALLICRAFTERS Service Manuals. Amateur and SWL Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. C, Berwyn, IL 60402.

FREE!!! Ham Radio and other CD-ROMs and software disk catalog. **MOM 'N POP'S SOFTWARE**, P.O. Box 15003-HE, Springhill, FL 34604-0111 (phone 1-352-688-9108; e-mail: <momnpop@gate.net>; website: <http://www.momnpopsware.com>).

TRYLON SELF-SUPPORTING TOWERS: Steel towers available up to 96 ft. Terrific value and reliability. The popular T-500 72-footer will take 45 square feet of antennas at 70 mph and is only $1825.00. <www.championradio.com> or 888-833-3104 for more info.

STRAT (Magazine of G-QRP-Club) issues 1–100 on CD-ROM. $25.00 including s&h. Member price $20.00 only! Pay by MC, VISA, Amex, cash or check. FUNKAMATEUR, Box 73, 10122 Berlin, Germany; fax ++49-30-44669469; <www.qsl-shop.com>.

ESCAPE from the HORDES! Phone bands unbearable? Move up to CW with **CW MENTAL BLOCKBUSTER III**. Completely redesigned for Generals, Advanceds, and Extras who once knew enough code to pass the exams. **FREE INFO**. 1-800-425-2552. WWW.SUCCESS-IS-EASY.COM.

<www.recycledradio.com>

NEW CD-ROM release for 1999, for the PC with the PicturePacket (LITE) program ready to install on your Windows 95, 98, or NT based PC. The CD also contains many of K4ABT's articles, PacketRadio Handbooks, and hundreds of TNC to transceiver drawings, transceiver modifications (both 9600 baud and some commercial radio conversions), TNC to node conversions, and text file radio modifications. Some documents are in MSWord format. Here is a library of files and drawings from 15 years of the "Packet User's Notebook." Most drawings are in GIF and JPG formats. All orders are shipped PRIORITY, FIRST-CLASS MAIL within 24 hours of received order. Send check or MO ($20.00 US) payable to Buck Rogers, K4ABT, 115 Luenburg Drive, Evington, VA 24550.

KNOW FIRST! Ham radio fanatics—you need THE W5YI REPORT, a twice-monthly award-winning Hot Insider Newsletter Acclaimed best! Confidential facts, ideas, insights, nationwide news, technology, predictions, alerts. Quoted coast-to-coast! We print what you don't get elsewhere! $19.50 annually to new subscribers! Money-back guarantee! FREE sample for SASE (two stamps). W5YI, P.O. Box 565101, Dallas, Texas 75356.

<www.seaqmaui.com>

W7FG Vintage Manuals and Ladder Line: Most manuals in stock. SASE for catalog. 600 ohm Ladder Line. Visa/MasterCard accepted. **402731 W. 2155 Dr.**, Bartlesville, OK 74006 (918-333-3754 or 800-807-6146) **<http://www.w7fg.com>**

FREE Ham Gospel Tracts, SASE. KW3A, 265 West Ave., Springfield, PA 19064.

ANTENNA HARDWARE – S.S. "U" bolts, Aluminum Saddles, Element and Boom Plates, S.S. Hose Clamps. Write for list to HARBACH ELECTRONICS – WA4DRU, 2318 S. Country Club Road, Melbourne, FL 32901-5809 (http://www.harbach.com).

WANTED: Older model bugs, unusual bugs, and miniature hand keys. State price, condition. Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210.

Advertiser's Index

now including websites

ADI/Premier Communications	8	www.adi-radio.com
Advanced Specialties, Inc.	89	home.att.net/~advancedspec/
AEA	41	www.aea-wireless.com
Alinco Electronics	66,67	www.alinco.com
Alpha/Power	11	www.alpha-power-inc.com
Alternative Energy Engineering	107	alt-energy.com
Aluma Towers	112	www.alumatower.com
Amateur Electronic Supply	31,57	www.aesham.com
Ameritron	75	www.ameritron.com
Antique Electronic Supply	128	www.aesham.com
Antique Radio Classified	112	www.antiqueradio.com
AOR, Inc.	51	www.aorusa.com
Associated Radio	39	www.associatedradio.com
Astron Corp	101	www.astroncorp.com
Atomic Time, Inc.	29	www.atomictime.com
Batteries America/E.H.Yost	131	www.batteriesamerica.com
Bilal Co./Isotron Ants	112	www.catalogcity.com
Buckmaster Publishing	128	www.buck.com
Burghardt Amateur Center	87	www.burghardt-amateur.com
C & S Sales	25	www.cs-sales.com
CQ Merchandise	79	www.cq-amateur-radio.com
CBC International	130	www.cbcintl.com
Champion Radio Products	130	www.championradio.com
Comet Antennas	61	www.cometantennas.com
Command Productions	54	
Command Technologies	130	www.command1.com
Communication Concepts Inc	97	www.communication-concepts.com
Communications Specialists	73	www.com-spec.com
Creative Services Software	107	www.cssincorp.com
CTI Com Tec, Inc	112	www.CTIComTec.com
Cubex Quad Antennas	112	www.cubex.com
Cushcraft	7	www.cushcraft.com
Cutting Edge Enterprises	125	
Davis RF	128	www.davisrf.com
Denver Amateur Radio Supply	55	www.denverradio.com
Directive Systems	112	www.directivesystems.com
DX4WIN(Rapidan Data Systems)	93	www.erols.com/pvander
EQF Software	60	www.itis.net/eqf
First Call Communications	34,35	www.firstcallcom.net
Funk	128	www.qslshop.com
G4ZPY Paddle Keys	128	website.lineone.net/~g4zpy/index.htm
Gateway Electronics	29	www.gatewayelex.com
Geo Tool	112	www.geotool.com
Giovannini Antenna Systems	73	www.antenna.it
Glen Martin Engineering, Inc	71	www.glenmartin.com
Hal Communications	45	www.halcomm.com
Ham Radio Outlet	12	www.hamradio.com
Ham Radio Insurance Assoc.	77	www.hamradioinsurance.com
High Sierra Antennas	115	www.hsantennas.com/info
ICOM America, Inc ... Cov. II,Cov.IV,1		www.icomamerica.com
Jan Crystals	106	
Jensen Tools	97	www.jensontools.com
Juns Electronics	64	www.jun's.com
K1EA Software	60	www.k1ea.com

FOR SALE: CQ/Ham Radio/QST/73 magazines and binders. SASE brings data sheet. W6DDB, 45527 Third Street East, Lancaster, CA 93535-1802.

FREE HAM RADIO GOSPEL TRACTS: Christian youth leaders needed for out-reach areas. Membership is free. Send #10 SASE with call letters for details. Ray Bohmer, W1REZ, P.O. Box 8, Harmony, ME 04942.

P49V's ARUBA COTTAGE FOR RENT with 2 bedrooms, rig, and antennas. For info write Carl Cook, 2191 Empire Ave., Brentwood, CA 94513.

IMRA-International Mission Radio Assn. helps missioners—equipment loaned; weekday net, 14.280 MHz, 1:00–3:00 PM Eastern. Sr. Noreen Perelli, KE2LT, 2755 Woodhull Ave., Bronx, NY 10469.

WANTED: HAM EQUIPMENT AND RELATED ITEMS. Donate your excess gear—new, old, in any condition—to the Radio Club of Junior High School 22, the Nation's only full time non-profit organization working to get Ham Radio into schools around the country as a teaching tool using our EDUCOM—Education Thru Communication—program. Send your radio to school. Your donated material will be picked up ANYWHERE or shipping arranged, and this means a tax deduction to the full extent of the law for you as we are an IRS 501(c)(3) charity in our 18th year of service. It is always easier to donate and usually more financially rewarding, BUT MOST IMPORTANT your gift will mean a whole new world of educational opportunity for children nationwide. Radios you can write off; kids you can't. Make 2000 the year to help a child and yourself. Write, phone, or FAX the WB2JKJ "22 Crew" today: The RC of JHS 22, P.O. Box 1052, New York, NY 10002. Twenty-four hours call 516-674-4072; fax 516-674-9600; or e-mail <wb2jkj@juno. com>. Join us on the WB2JKJ Classroom Net, 7.238 MHz, 1200–1330 UTC daily and 21.395 MHz from 1400 to 2000 UTC.

ANSWER THE DOOR FROM ANY PHONE—ONLY $140.00 (US): SIMPLE TO USE, EASY TO INSTALL, 2-wire design allows easy retrofit to door chime wire. When a visitor presses the door button, all your phones ring. Pick up any phone to connect to the door. VISCOUNT 1-800-476-3774 <www.enterphonesolo.com>

ASTRON Power Supply, brand new w/warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249. Call for other models, AVT 626-286-0118 <www.aventrade.com>.

ATTENTION SB-200 & SB-220 OWNERS: Restore and up-grade your tired old amplifier with our parts and kits. Power supply boards, soft keys, soft starts, new fans & motors, many more items. Write for details—**Please specify the model**. Harbach Electronics—WA4DRU, 2318 S. Country Club Rd., Melbourne, FL 32901-5809 (http://www.harbach.com).

VP5 – Be DX: Newly constructed 2BR/2BA villa with rig and antennas overlooking north coast of beautiful Middle Caicos. Telephone 904-282-0158, or e-mail <islands@southeast.net>.

COMMUNICATIONS EXPO 2000 Hamfest and Electronics Show, September 17, 2000: The Greater Cincinnati ARA Communications Expo 2000 hamfest/electronics show is September 17: Kolping Center, north of Cincinnati, OH. Show open 8 AM through 4 PM. Commercial exhibitors indoors, flea market, radio-controlled race car races, ARRL officials, good food, free parking, excellent prizes, hidden transmitter hunts, interesting forums, VE exams, ladies' program, great atmosphere. Admission: $5/SASE by September 10; $8 at gate; 12 and under free. The Kolping Center is at 10235 Mill Rd. five minutes south of exit 36 of Interstate 275 in northern Hamilton County. Talk-in: 146.88–. See <http://w3.one.net/~rkuns/expo2000/>. Indoor exhibit chairman Gary Osborne, W8XS, <osborne@fuse.net>, 513-474-0287; fleamarket/advance ticket chairman Tom Denham, K8VOE, <tdenham@cos.net>, 513-779-3951; VE exams Scott Henninger, W8GS, <w8gs@arrl.net>, 513-683-7373; General Chairman Jim Weaver, K8JE, <k8je@arrl.net>, or 513-459-0142.

FREE GUIDE "THE TEN MOST COMMON TOWER BUILDING MISTAKES": Written by well-known tower expert Steve Morris, K7LXC, this guide will help you avoid dangerous mistakes. TOWER TECH, Box 572, Woodinville, WA 98072; e-mail <UpTheTower@aol.com> or call 800-TOWERS8 or on the web: <www.championradio.com>.

QSL CARDS: Many styles. Top Quality. Order Risk Free. Plastic cardholders, T-shirts, Personalized caps, mugs, badges, jackets. Suppliers of QSL cards and ham shack accessories since 1956. Free call, Free samples. **Rusprint 1-800-962-5783**/1-913-491-6689, fax 1-913-491-3732 or web **<http://www.rusprint.com>**

CASH FOR COLLINS: Buy any Collins Equipment. Leo, KJ6HI, phone/fax 310-670-6969; <radioleo@earthlink.net>

RAINBOW AMATEUR RADIO Association, the gay/lesbian club. Active weekly HF nets, monthly newsletter, e-mail reflector, web page: <www.rara.org>. Chat room. Privacy respected. E-mail: <rara@qsl.net>, or P.O. Box 191, Chesterland, OH 44026-0191.

KK7TV COMMUNICATIONS: *See our display ad.*

GREAT CIRCLE MAPS computer generated for your exact QTH, $20 ppd worldwide. Printouts $12 ppd. SASE for info. Bill Johnston, K5ZI, Box 640, Organ, NM 88052 (505-382-7804).

PACKET RADIO AND MORE! Join TAPR, connect with the largest amateur radio digital group in the U.S. Creators of the TNC-2 standard, working on Spread Spectrum technology. Benefits: newsletter, software, discounts on kits and publications. For membership prices contact TAPR, 8987-309 E. Tanque Verde Road, #337, Tucson, AZ 85749-9399 (phone 940-383-0000; fax 940-566-2544; internet <tapr@tapr.org>; web: <http://www.tapr.org>).

200+ PROJECTS. Secure WEB ordering @ <www.matcopublishing.com/plans1.htm> or send $1.00 (refundable) Matco-5E, P.O. Box 509, Roseville, MI 48066-0509 USA.

TUBES f/s – M/p of ge 6jb6a or 6146w & driver $38.00. M/p 6js6c & driver $70.00. Other amateur-related tubes are available. Website <http://www.internetbci.net/tubes>. E-mail: <tubes@internetbci.net>. Bob Bieker 219-924-0945.

OLD-TIME RADIO PROGRAMS: Over 100 thirty-minute programs per computer CD (in MP3 or Real Audio). WWW.SCANCAT.COM 1-888-722-6228

TRIBANDER COMPARISON REPORT: Find out the real lowdown on HF antenna performance. K7LXC and NØAX test the KT34XA, TH7, TH11, C-3, Skyhawk, and more. Over 60 pages. $15 plus $3.00 s/h. <www.championradio.com> or 888-833-3104.

PHASED ARRAY NETWORKS by COMTEK SYSTEMS deliver gain and front to back. Call 704-542-4808; fax 704-542-9652. COMTEK SYSTEMS, P.O. Box 470565, Charlotte, NC 28247.

COUNTY HUNTERS: Worked All Texas Award. Beautiful Certificate. Temple Amateur Radio Club, P.O. Box 616, Temple, TX 76503 <www.tarc.org>

FOR SALE: Tristao Tower, Model TWS-72, four-section free-standing tower. Includes BTS base, with anchor bolts, template, and mounting hardware. Tower on the ground. Purchase price for pickup $3000, or shipping price $3500. SASE with 33 cents postage for manula copies or 55 cents, which includes Civil Engineer's report, to WN5N at CBA.

OVER 2500 DIFFERENT DX AWARDS from 122 DXCC countries listed. K1BV DX Awards Directory. Put your QSLs to work for you! $21 postpaid. Ted Melinosky, 65 Glebe Road, Spofford, NH 03462-4411. <http://top.monad.net/~k1bv>.

WANTED: Instruction manuals for Ameco TX-86; Globe HG-303, DB-68; Heath TX-1 (Apache), KL-1, AR-1, FMO-1, HA-14, HX-20, HW-22A, HW-10, HW-99, IM-12; B&W 5100, 5100B; National NC-303, NC-188, NC-140; Knight T-175, R-55, R-55A; Collins 75A-3, 30S-1; Millen 90711, 90801; Hallicrafters S-107, SR-75, SX-73, SX-130, HT-9, HT-19; Hammarlund HQ-100A, HQ-180A, Comet Pro; Lafayette HA-225, HA-226, HA-230, KT-200 (construction manual), HE-80; Johnson Valiant II, Invader, Invader 2000, "Kilowatt," Viking Mobile; Drake TR-6; Lysco 600; Lakeshore Phasemaster. Al Bernard, NI4Q, P.O. Box 690098, Orlando, FL 32869-0098 (407-351-5536).

SELL: Yaesu 1000MP with matching SP-8 speaker. Near new, $1800. Bill Lyons, KO6CS, 310-320-7435 evenings.

Advertiser's Index

now including websites

K2AW's "Silicon Alley"	128	
Kenwood, USA	3,5	www.kenwood.net
KK7TV Communications	129	www.kk7tv.com
LDG Electronics	71	www.ldgelectronics.com
Lewallen, Roy, W7EL	60	
M2 Antennas	43	www.m2inc.com
M&S Computer	128	www.mscomputer.com
MFJ Enterprises	33,37	www.mfjenterprises.com
Max Research	106	
Nemal Electronics	47	www.nemal.com
Palomar Engineers	93	www.palomar-engineers.com
Personal Database Applic.	130	www.hosenose.com
Peter Dahl Co.	81	www.pwdahl.com
QRO Technologies, Inc.	87	www.qrotec.com
QSLs by W4MPY	106	www.w4mpy.com
QSLs by WX9X	107	www.qth.com/wx9x
RF Applications	65	www.rfapps.com
RF Connection	77	www.therfc.com
Radio Club of JHS 22	72	www.wb2jkj.org
Radio Depot	93	www.hammall.com
Radio Engineers	77	
Radiohaus	74	www.radiohaus.com.br
Radio Works	59	www.radioworks.com
Raibeam Antennas	81,89	www.raibeam.com
Ross Distributing	74	www.rossdist.com
SGC	23	www.sgcworld.com
Spectrum International	46	
Surplus Sales of Nebraska	65	www.surplussales.com
Synthetic Textiles	115	www.synthetictextilesinc.com
Ten Tec	9	www.tentec.com
Tennadyne Corporation	85	www.tennadyne.com
Timewave Technology	129	www.timewave.com
T.G.M. Communications	106	www3.sympatico.ca/t.g.m./index.html
The Wireman	77	www.thewireman.com
Traffie Technology	74	www.hexbeam.com
Universal Radio	58	www.universal-radio.com
Vectronics	27	www.vectronics.com
Vibroplex	47	www.vibroplex.com
Virginia Beach Hamfest	59	www.vahamfest.com
W2IHY, Julius Jones	74	pages.prodigy.net/w2ihy
W5YI Marketing	58,74,77,115	www.w5yi.org
W9INN Antennas	74	
W & W Associates	24	www.wwassociates.com
Warren Gregoire & Assoc.	129	www.warrengregoire.com
West Mountain Radio	89	www.westmountainradio.com
WXOB Array Solutions	26	www.arraysolutions.com
Yaesu Electronics	CovIII,20,21,132	www.yaesu.com

It's easy to advertise in CQ.
Let me know what I can do to help.
Jon Kummer, WA2OJK
(516) 681-2922 or FAX (516) 681-2926
e-mail:jkummer@cq-amateur-radio.com

MOBILE DX MASTER

Since its introduction over a year ago, Yaesu's FT-100 HF/VHF/UHF Transceiver has been widely acclaimed for its outstanding performance and flexibility. Now the FT-100D builds on this success story, adding the convenience of factory-installed modules for today's Ham on the go!

FT-100D HIGHLIGHTS

The FT-100D is a high-performance, ultra-compact transceiver operating on the 160-10 meter HF bands, plus the 50, 144, and 430 MHz VHF/UHF bands. Known for its outstanding receiver performance, the FT-100D's easy-to-access DSP system is the cornerstone of the outstanding receiver capability. Providing Noise Reduction, Auto-Notch, and Narrow-Bandwidth Filter selection, the DSP system also includes a Microphone Equalizer for the transmit side.

The new and enlarged speaker of the FT-100D (ϕ66 mm) provides spectacularly clean audio output, to help you dig out those weak signals.

Whether at home or away, the fantastic new FT-100D is The Choice of the World's Top DX'ers. Step up to the FT-100D, and enjoy the thrill of the sunspot peak in style!

MICRO MOBILE

FT-100D

Ultra-Compact HF/VHF/UHF Transceiver

YAESU
Choice of the World's top DX'ers

For the latest news, hottest products:
Visit us on the Internet! http://www.yaesu.com

"Brick-Wall" Selectivity

Today's elite-class operators demand the best RF weaponry available. Yaesu's exciting new MARK-V FT-1000MP answers the call, with an expanded array of receiver filtering, 200 Watts of power output, and Class-A SSB operation capability for the cleanest signal on the band. Enhanced front-panel ergonomics save you seconds in a pile-up or a contest "run," and Yaesu's HF design and manufacturing know-how ensures that no short-cuts have been taken in our effort to bring you the best HF transceiver money can buy. For more QSOs in your log, and more awards on your wall, there is only one choice: the MARK-V FT-1000MP from Yaesu!

I. IDBT: Interlocked Digital Bandwidth Tracking System

The IDBT feature greatly simplifies operation by matching the bandwidth of the DSP (Digital Signal Processing) system to the net bandwidth of the 8.2 MHz and 455 kHz IF stages. The IDBT system accounts for the settings of the IF WIDTH and SHIFT controls, and automatically sets a DSP bandwidth which matches the analog IF bandwidth.

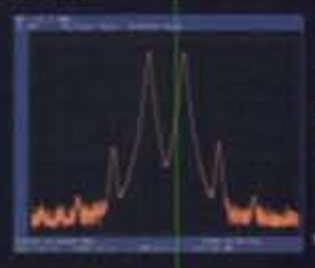
IDBT: A Breakthrough in Selectivity!

II. VRF: Variable RF Front-End Filter

Protecting the MARK-V's receiver components from strong out-of-band signals, the VRF system acts as a high-Q "Preselector," located between the antenna and the main bandpass filter networks, providing additional RF selectivity on the 160-20 meter Amateur bands for multi-operator contest teams, DX-peditions, or for operation near MW/SW broadcast stations.

III. 200 Watts of Transmitter Power Output

Utilizing two Philips® BLF147 Power MOSFETs in a 30-Volt, push-pull configuration, the MARK-V's transmitter puts out up to 200 Watts of clean output power, thanks to the conservative design of the PA section.



Class A 75 W PEP IMD

IV. Class-A SSB Operation

Exclusively available on the MARK-V FT-1000MP , a press of a front-panel button engages Class-A SSB operation of the transmitter, at a power output level of 75 Watts. Class-A operation produces incredibly clean signal quality, with 3rd- order IMD suppressed 50 dB or more, and 5th- and higher-order products typically down 80 dB or more!

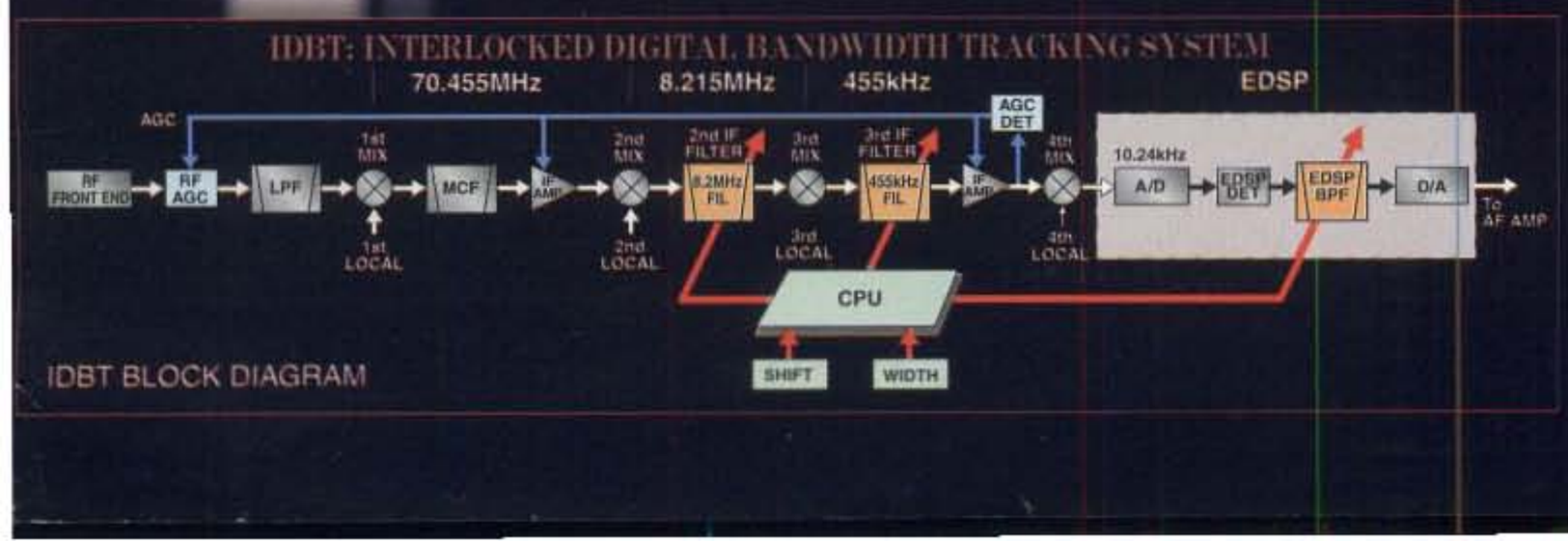
V. Multi-Function Shuttle Jog Tuning/ Control Ring

The immensely-popular Shuttle Jog tuning ring, which is concentric with the Main Tuning Knob, has a new look in the MARK-V: it now includes the activation switches for the VRF (left side) and IDBT (right side) features, so you don't have to move your hand position to activate these important circuits during contest or pile-up situations!

Photo shows optional MD-100A8x Deluxe Desk Microphone

HF 200 W All-Mode Transceiver

MARK-V FT-1000MP



IDBT BLOCK DIAGRAM

YAESU

Choice of the World's Top DX'ers™

For the latest news, hottest products:
Visit us on the Internet! http://www.yaesu.com

Makes Getting into HF a Piece of Cake.

> ...the IC-718 was very easy to operate with a minimum of "manual" intervention.
> *QST, July 00*

> The ICOM IC-718 offers a nice collection of the more desirable features that are typically absent from transceivers in its price class.
> *QST, July 00*

The New, Easy to Use IC-718

Whether you're new to HF or just looking for a capable second rig, the IC-718 is for you. It's simple. Buttons for the functions you use the most are prominent and easy to access. Selecting a frequency is as easy as punching in the numbers on the large, well spaced, keypad. And you can quickly tune up or down a band with the auto tuning step feature. It even has a band stacking register to "remember" your last used frequency. It's superior. The '718 features a continually adjustable noise blanker - a feature some high-end rigs don't even have. The IF shift helps reject nearby interference. And with the optional UT-106 installed, you can enhance the superior receiver performance with Digital Signal Processing (DSP). The Auto Notch Filter minimizes noise without compromising receive audio. A full 100 watts (40w AM) of adjustable power keeps you on the air for extended periods. Talk hands-free with the VOX feature. And a built-in keyer for CW enthusiasts. All this and more in a compact, easy to carry little package. Simple. Superior. Piece of cake.

Optional DSP capability. With the optional UT-106 installed, you can enhance the superior receiver performance with Digital Signal Processing (DSP). The IC-718 is the only rig in its price range to offer you the choice!

IC-718 features

- Simple Operation
  - One Touch Band Switching
  - Direct Frequency Input via 10 Button Keypad
  - Auto Tuning Steps (TS). Senses the rate the knob is turned
- Easy to Use Front Panel Controls
- Microphone Compressor
- IF Shift
- 100w of Output Power (40w on AM)
- Meter Functions (Output Power, ALC, VSWR)
- Built-in Keyer with CW reverse
- VOX
- Large Front Firing Speaker
- Optional FSK Operation
- Adjustable Noise Blanker
- Latest RF & Digital Technology
- Optional DSP with Auto Notch
- Optional Voice Synthesizer

Contact your authorized ICOM dealer today, or call for a free brochure: 425-450-6088

Ready for HF?

ICOM®

www.icomamerica.com

WORK THE MAGIC ICOM

There's something magical about amateur radio. The fact that you can speak into a little box and communicate with someone else on the other side of town, or even on the other side of the world, with nothing between you and that person but thin air...what an incredible, powerful feeling. It feels like magic. Work the magic.