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Amateur Radio

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

COMMUNICATIONS & TECHNOLOGY

JANUARY 2008

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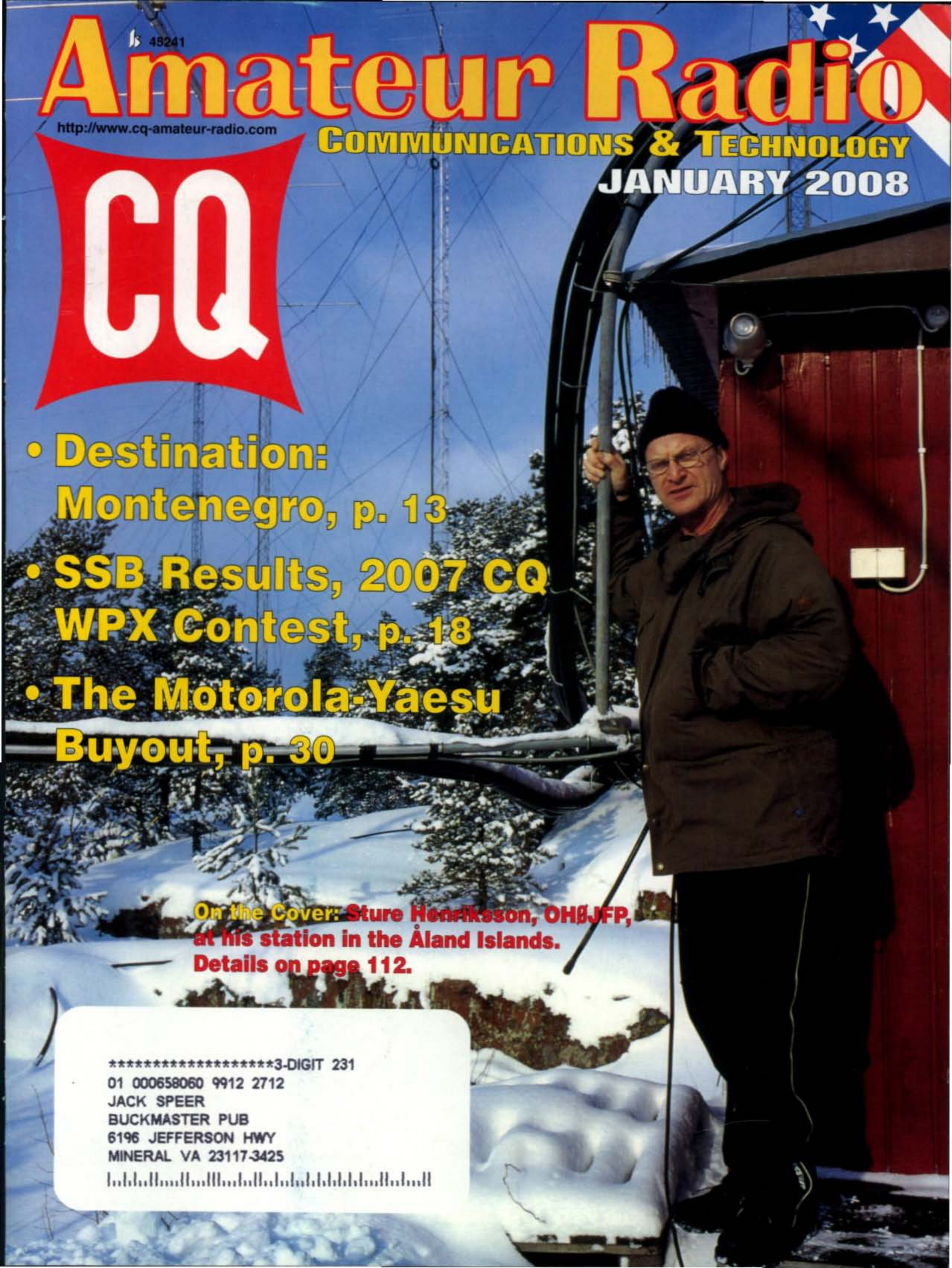

On the Cover: Sture Henriksson, OHØJFP, at his station in the Åland Islands. Details on page 112.

KENWOOD

Listen to the Future

New RC-D710

The RC-D710 is a standalone 1200/9600 bps TNC with APRS firmware

KENWOOD
Listen to the Future

www.kenwoodusa.com

TM-G707A

TM-V7A

TM-D700A

With the supplied accessories the RC-D710 is a full upgrade to the TM-V71A. The TM-V71A will have full functionality of the TM-D710A by exchanging the TM-V71A panel with the RC-D710.

This is where it gets interesting!

PG-5J connection kit makes the RC-D710 a complete standalone APRS/TNC for your current radio. This option allows connectivity with previous and current Kenwood models* as an external modem.

**Compatible models include: TM-D710A / TM-V71A / TM-D700A / TM-G707A / TM-V7A / TM-733A / TM-255A / TM-455A*

KENWOOD U.S.A. CORPORATION
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024
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P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
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JQA-1205 091-A
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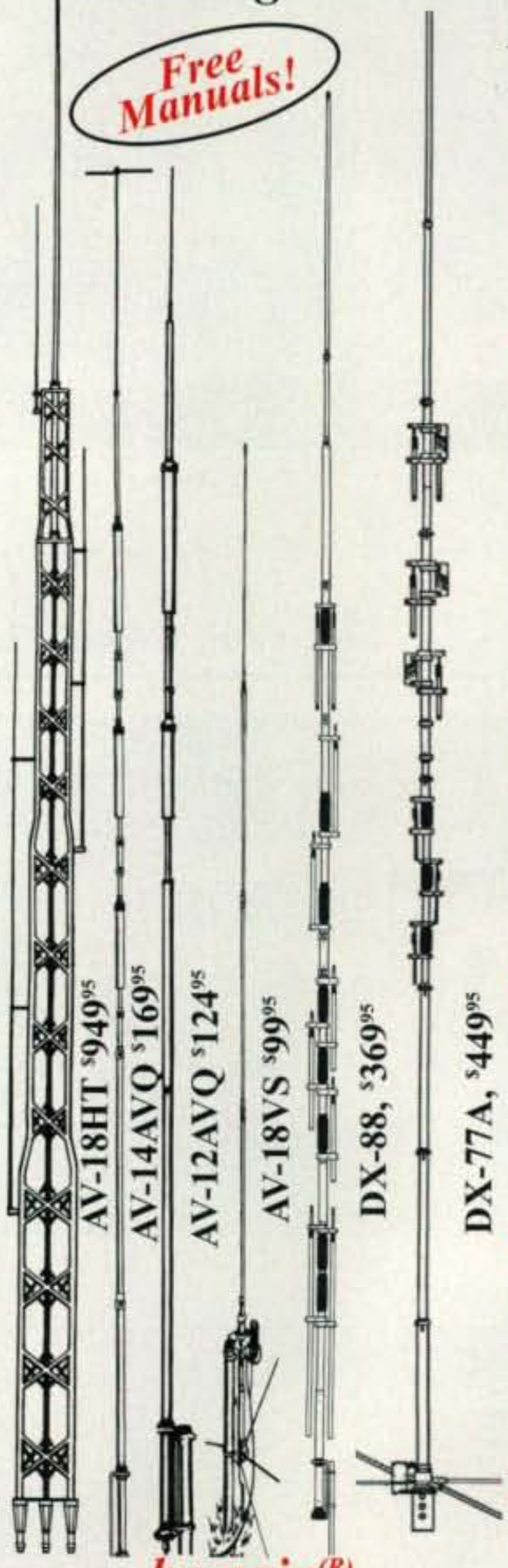
hy-gain® HF VERTICALS

Self-supporting -- no guys required . . . Remarkable DX performance -- low angle radiation, omnidirectional . . . Handles 1500 Watts . . . Low SWR . . . Automatic band switching . . . Aircraft quality aluminum tubing . . . Stainless steel hardware . . . Recessed SO-239 connector . . . Two year limited Warranty . . .



hy-gain(R)
Classics

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

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

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

Heavy duty, slotted, tapered swaged, aircraft quality aluminum tubing with full circumference compression clamps is used for radiators. Includes all stainless steel hardware. Recessed SO-239 prevents moisture damage. Hy-gain verticals go up easily with just hand tools and their cost is surprisingly low. Two year limited warranty.

AV-18HT, $949.95. (10,12,15,20,40,80 M, 160, 17 Meters optional). 53 ft., 114 lbs.

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

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

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

AV-18VS, $99.95. (10,12,15,17,20,30,40,80 Meters). 18 ft., 4 lbs. **High** quality construction and low cost make the AV-18VS an exceptional value. Easily tuned to any band by adjusting feed point at the base loading coil. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs.

All bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: 160 Meter add-on kit, KIT-160-88, $199.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

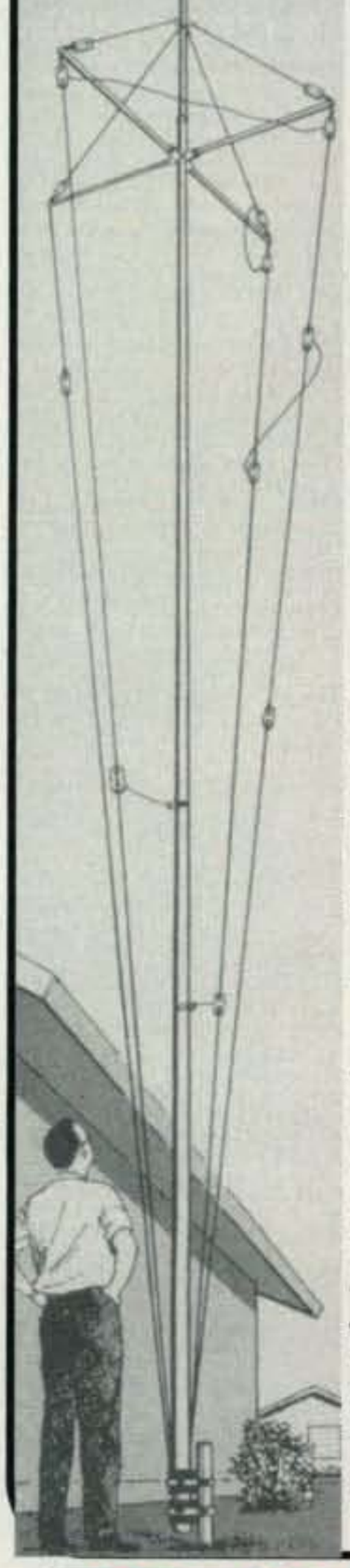
DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs.

No ground radials required! Off-center-fed Windom has 55% greater bandwidth than competitive verticals. Heavy-duty tiltable base. Each band independently tunable.

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$124.95	10,15,20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$99.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

Hy-Gain HyTower-Jr™

Stands 39 feet tall . . . Full 1/4 Wave on 40, 20, 15, 10 Meters . . . Cage loading on 80 Meters



AV-18HT-Jr. **$349.95**

Standing a tall 39 feet with *full-size* elements and rated at 5 KW, the AV-18JR *Hy-gain HyTower-Jr.*™ is the world's *second best** performing vertical!

Stub-decoupling is used to give *full-size* quarter wave radiators on 40, 20, 15, 10 Meters with super efficient cage loading on 80 Meters.

The *HyTower-Jr*™ has almost no losses -- your ground system determines your efficiency.

It is automatic bandswitching, fed with 50 Ohm coax and has low SWR over an exceptionally wide bandwidth. SWR is less than 1.2 at resonance on all bands.

The main radiator is aircraft high-strength, heavy walled, 2-inch aluminum tubing swedged at the top. Self-supporting in winds up to 40 MPH (use guy wires for higher winds). Mounts on 1¼ inch plumber's pipe. Heavy duty components will give you years of trouble-free operating pleasure. UPS Shippable.

Requires good ground system for optimum performance.

***The** famous 53 foot *Hy-gain HyTower*™ is legendary. It's the premier, best performing vertical in the world -- bar none! At less than half the price with nearly the *same* performance and based on the *same* principles, the *HyTower-Jr*™ is the poor man's version of its father *HyTower*. Of course, *Junior*™ doesn't have its father's rugged hot-dipped galvanized steel tower and construction!

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and Nearest Dealer . . . 800-973-6572
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http://www.hy-gain.com

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KENWOOD

Listen to the Future

All-Terrain Performance

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

144MHz FM TRANSCEIVER

TM-271A

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

KENWOOD U.S.A. CORPORATION
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024
Customer Support/Distribution
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ham radio news

Geostationary Ham Satellite on the Horizon?

AMSAT says it's working on a deal with Intelsat to put amateur radio transponders on a future commercial satellite in geosynchronous orbit (this means it orbits at the same speed as the Earth and always appears to be in the same spot overhead). According to the AMSAT News Service, AMSAT-NA President Rick Hambly, W2GPS, and Engineering Vice President Bob McGwier, N4HY, told attendees at the 2007 AMSAT Space Symposium that while arrangements are not yet complete, "there is enough in place at this time that AMSAT needs to begin planning engineering work" and possible construction of a ham payload for one of Intelsat's satellites. In addition to potentially providing audio, video, and digital messaging relays for hams on Earth, the payload under consideration could also be used to provide relays for school contacts in the Amateur Radio on the International Space Station (ARISS) program, potentially expanding the current 10-minute-per-pass contact limit with hours-long access that might permit student involvement with experiments aboard the space station.

ARRL, FCC, Spar in Federal Court

The U.S. Court of Appeals for the DC Circuit heard oral arguments in late October on the ARRL's appeal of the FCC's refusal to reconsider its 2004 Report and Order setting up rules for Broadband over Power Lines, or BPL. The ARRL has claimed consistently that certain BPL systems cause widespread interference across the HF and low VHF bands. According to the *ARRL Letter*, the League's main points dealt with the FCC's decision that interference to mobile stations could not be considered "harmful" because those stations could move away from the interference, and the fact that the Commission deleted several key portions of a technical study the ARRL had requested under the Freedom of Information Act. It will be several months before the court issues its decision.

Meanwhile, the FCC has "admonished" Ambient Corporation for exceeding radiated emission limits on its BPL system in Briarcliff Manor, New York. The system has been the source of a steady stream of interference complaints filed with the FCC by the ARRL and local amateurs since 2004. The FCC letter did not specifically address any of those complaints, nor did it make any finding about interference.

Iraq Hams May be Back on the Air

As we went to press, we were awaiting the lifting of the months-old ban on amateur radio operating from Iraq. On November 13, according to the *ARRL Letter*, Iraqi Amateur Radio Society President Diya Sayah, YI1DZ, announced that hams there would be allowed back on the air as of November 20. All ham radio operation there had been shut down in March 2007 for security reasons.

Motorola Set to Buy Vertex Standard

Motorola announced in early November that one of its subsidiaries, MI, Inc., was launching an effort to buy controlling interest in Vertex Standard, the parent company of Yaesu. If the $108 million bid is successful, Vertex Standard will become a subsidiary of Motorola, but will still be headquartered in Japan and day-to-day management is supposed to remain intact. For details and an interview with Vertex Standard's U.S. amateur sales chief, Dennis Motschenbacher, K7BV, see this month's "Washington Readout" column on page 30.

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.

Introducing the Yaesu FT-950 transceiver for DX enthusiasts
Superb receiver performance
Direct lineage from the legendary FT DX 9000 and FT-2000

HF/50 MHz 100 W Transceiver
FT-950

- Triple-conversion super-heterodyne receiver architecture, using 69.450 MHz 1st IF
- Eight narrow, band-pass filters in the RF stage eliminate out of band interference and protect the powerful 1st IF
- 1st IF 3 kHz Roofing filter included
- High-speed Direct Digital Synthesizer (DDS) and high-spec Digital PLL for outstanding Local Oscillator performance
- Original YAESU IF DSP advanced design, provides comfortable and effective reception. IF SHIFT / IF WIDTH / CONTOUR / NOTCH / DNR
- DSP enhancement of Transmit SSB/AM signal quality with Parametric Microphone Equalizer and Speech Processor
- Built-in high stability TCXO (±0.5 ppm after 1 minute@77° F)
- Built-in automatic antenna tuner ATU, with 100 memories
- Powerful CW operating capabilities for CW enthusiasts
- Five Voice Message memories, with the optional DVS-6 unit
- Large Multi-color VFD (Vacuum Fluorescent Display)
- Optional Data Management Unit (DMU-2000) permits display of various operating conditions, transceiver status and station logging.
- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

Optional, YAESU Exclusive, Fully-Automatic μ -Tuning Preselector System!

Fully automatic, Ultra-sharp, External μ -Tuning Preselector (optional) features a 1.1" (28 mm) Coil for High Q

On the lower Amateur bands, strong signal voltages impinge on a receiver and create noise and intermod that can cover up the weak signals you're trying to pull through. YAESU engineers developed the μ (Mu) Tuning system for the FT DX 9000/FT-2000, and it is now available as an option for the FT-950. Three modules are available (MTU-160, MTU-80/40, MTU-30/20); these may be connected externally with no internal modification required! When μ -Tuning is engaged, the VRF system is bypassed, but the fixed Bandpass Filters are still in the received signal path.

Optional External Data Management Unit (DMU-2000) Provides Many Display Capabilities

Enjoy the ultimate in operating ease by adding the DMU-2000! Enjoy the same displays available with the FT DX 9000 and FT-2000: Band Scope, Audio Scope, X-Y Oscilloscope, World Clock, Rotator Control, Extensive Transceiver Status Displays, and Station Logging Capability. These extensive functions are displayed on your user-supplied computer monitor.

Shown with after-market keyer paddle, keyboard, and monitor (not supplied).

DMU-2000
Data Management Unit (option)

YAESU
Choice of the World's top DX'ers™

Vertex Standard
US Headquarters
10900 Walker Street
Cypress, CA 90630 (714)827-7600

For the latest Yaesu news, visit us on the Internet:
http://www.vertexstandard.com

Specifications subject to change without notice. Some accessories and/or options may be standard in some areas. Frequency coverage may differ in some countries. Check with your local Yaesu dealer for specific details.

Yaesu - The Choice of the World's Top DXers ....on the VHF and UHF bands, too

HF/VHF/UHF Portable Operation Just Got a Lot More Powerful!

FT-897D TCXO DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

HF/VHF/UHF Multimode Mobile Transceiver, now Including Built-in DSP

FT-857D DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

Automatic Matching for FT-897/857 Series Transceivers

FC-40
Automatic-Matching 200-Memory Antenna Tuner
(160 m ~ 6 m Band)

WATERPROOF

Mobile Auto-Resonating 7~430 MHz for FT-897/857 Series Transceivers

ATAS-120A
Active Tuning Antenna System
(no separate tuner required)

VHF/UHF Base RadialKit ATBK-100 for ATAS-120A.

REAL PERFORMANCE, REALLY PORTABLE

FT-817ND
HF/50/144/430 MHz
5 W All Mode Transceiver
(AM 1.5 W)

60 m Band

ATAS-25
Manually-Tuned Portable Antenna

YAESU
Choice of the World's top DX'ers℠

Vertex Standard
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10900 Walker Street
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The radio... YAESU
Choice of the World's top DX'ers

Loaded with Leading-edge Performance Capabilities. . .
The First Triumph in the 2nd Generation of the FT DX 9000 Lineage:
The Powerful FT-2000!

HF/50 MHz Transceiver
FT-2000
100 W Version (Internal Power Supply)

DMU-2000
Data Management Unit

Photograph shows 100-Watt version. Computer display and keyboard are after-market items, not supplied with the FT-2000.

HF/50 MHz Transceiver
FT-2000D
200 W Version
(External Power Supply)

Options

SP-2000
External Speaker
with Audio filters

RF μ-Tune Kits

160m Band
RF μ-Tune Kits A

80/40m Band
RF μ-Tune Kits B

30/20m Band
RF μ-Tune Kits C

- Up to three μ-Tune Kits may be connected.
- μ-Tune Kit is included in purchase price of μ-Tune Unit.

For the latest Yaesu news, visit us on the Internet:
http://www.vertexstandard.com

Specifications subject to change without notice. Some accessories and/or options may be standard in some areas. Frequency coverage may differ in some countries. Check with your local Yaesu dealer for specific details.

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– a CQ editorial

zero bias

BY RICH MOSESON,* W2VU

Getting Technical

In my November editorial, I asked, "Where is Everybody?" referring to the many very quiet repeaters I encountered while driving to Maine and back on my summer vacation. Well, there are still plenty of quiet repeaters out there, but there are also some very active exceptions, which are generally attached to very active clubs. I'd like to highlight a couple of them in hopes that others can learn from their successes.

One common feature on these active repeaters, it seems, is a regularly-scheduled "tech net," in which any and every technical question is fair game. One of the most active repeaters in northern New Jersey, where I live, is the Bergen County FM Association's 146.79 "machine," which hosts many on-air activities of the Bergen Amateur Radio Association (BARA), a very active club that doesn't have its own repeater. One regular feature is BARA's Thursday night tech net, hosted by Gordon Beattie, W2TTT. The net's web page outlines the broad scope of such gatherings:

"Is there something in your shack or station that you do not understand fully and want explained? Have you heard a phrase or acronym that you don't understand? Is there a topic of potential interest that you would like explained? Is there a technical element of the hobby that annoys or mystifies you?" In other words, just about anything related to the technical side of ham radio is fair game ... and one key is for the net control to be willing to answer what may seem like the simplest of questions, or the most complicated (or to admit it's outside his/her area of expertise and see if anyone else on the net knows, or promise to dig up an answer by the next session). It's also important to make participants feel comfortable enough to ask virtually anything, and to know that they won't be ridiculed or criticized for asking what some might consider "stupid questions."

On the other side of New York City, the Long Island Mobile Amateur Radio Club (LIMARC) is one of the most active anywhere, and its 146.85 MHz 2-meter repeater is one of those on which you can nearly always find somebody to talk with. Every Sunday night, what you'll find there is a tech net, hosted by noted VHFer Dick Knadle, K2RIW. I was listening while driving last weekend, and Dick was talking about the Doppler effect (in which signals appear to change frequency if either the transmitting station or receiving station is in motion). This led to a story about airplane scatter on 2 meters—how, on a 900-mile path he regularly worked with another ham in North Carolina (yes, folks, on 2 meters!), airplanes at a certain altitude, at a certain point along the path, served as reflectors and briefly boosted signal levels by a significant amount. It was fascinating, covered a whole range of technical topics, and was told in such a way that it was hard to turn off the radio when I got home.

Then, this past week, I had to make a day trip to Boston. After making some contacts on a couple of the normally-active repeaters in the New York City area, I moved into a quiet zone that covered most of the state of Connecticut, and then I stumbled upon an active machine on 146.97 as I approached the Boston area. Turns out that this is the repeater of the Central Massachusetts Amateur Radio Association (CMARA), another very active club. I was invited, if I was still in the area that evening, to drop in on the club's weekly—you got it— tech net. It turns out that I was, and I did. Greg Algieri, WA1JXR, runs the club's "The Doctor is In" net (borrowing a column name from that other magazine). There were some three dozen check-ins the night I listened in, and the questions ranged from an explanation of "picket-fencing" on an FM signal to RF exposure concerns if one was to install a 450-watt amplifier in a mobile HF station, with the antenna five feet behind the driver, on the trunk lid. (After some discussion, the ham with the amp decided that discretion is the better part of valor, that his rig's basic 100 watts would probably be just fine, and that he'd probably be posting the amplifier on the club's next swap net.)

Not all of the questions were (or could be) answered definitively; other net participants offered ideas when there wasn't a clear-cut answer; and sometimes a questioner was sent off to try to gather more information about his question and come back the following week. Overall, though, the atmosphere was one of friendly explanations and discussions, with no question being too simple or too complex, and with any additional information or ideas being welcomed (even from a visitor who was just passing through).

This was all consistent with the venerable ham tradition of technical and scientific inquiry and, most importantly, of freely sharing knowledge and information with each other. It happens on the air, it happens at club meetings and at hamfest/convention forums. It is this tradition, and this spirit of openness and sharing, that helps keep ham radio vital.

I was in Boston with my wife, who was attending a professional conference for the day. Typically, in her field, you'd pay a couple of hundred dollars to hear a presentation on a given topic. I regularly receive flyers about conferences on various technical matters and the costs sometimes run upwards of $1,000, not including travel or other expenses. Within ham radio, though, the same levels of knowledge and expertise are often available to us for the minimal cost of a hamfest admission or a magazine subscription, or for free on your local repeater. I'm sure I've said this in the past, but it bears repeating: The most valuable resource we *have in* ham radio is ... hams. For the most part, we are bright, well-educated, enthusiastic people with knowledge across virtually all areas of endeavor, knowledge we are generally willing to share at little or no cost to other hams. It is an essential part of what makes us unique.

Another type of knowledge that we need to share more often and more widely is what successful clubs do that makes them successful. Why do some clubs have always-active repeaters and 50–100 people at club meetings, while others have nearly-silent repeaters and struggle to get a dozen people to a meeting? What is the formula for success for those groups that are "doing it right"? Tech nets are part of it, but certainly not all. Interesting meeting programs are part of it, but not all (CMARA's November meeting program, by the way, was on knot-tying for putting up wire and temporary antennas; BARA was having a member show-and-tell night; it also has a weekly kit night). If you're involved with a successful club or repeater, we'd like to hear from you. What is your secret formula? How can other clubs adapt what you're doing to build their own success? If we get enough input, we'll put together an article.

Again, best wishes to each of you from all of us here at *CQ* for a happy, healthy and prosperous new year.

73, W2VU

(Note: Due to space constraints, the CQ WW WPX Contest rules will appear next month. They will also be posted on our website by the time you see this.)

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

TOKYO HY-POWER

Complies with New FCC Rules.

Available Now with 12m and 10m Built-in!

HL-1.5KFX

HF/50MHz Linear Power Amplifier

Auto Band Set

This compact and lightweight 1kW desktop HF/50MHz linear power amplifier has a maximum input power of 1.75kW. Our solid-state broad-band power amp technology makes it **the smallest and lightest self-contained amplifier in the industry**.

Typical output power is 1kW PEP/SSB on HF and 650W on 6m band with the drive power of 85-90W. Bands set automatically with the **built-in band decoder**. You can forget about the band setting when the amplifier is connected to your modern radio through **supplied band data cables for ICOM CI-V, DC voltage (ICOM, Yaesu), and RS-232C (Kenwood)**. Manual band setting selectable as well.

All these data cables are included with the amplifier.

Features

- Lightest and most compact 1kW HF amplifier in the industry.
- The amplifier's decoder changes bands automatically with most ICOM, Kenwood, Yaesu.
- The amp utilizes an advanced 16 bit MPU (microprocessor) to run the various high speed protection circuits such as overdrive, high antenna SWR, DC overvoltage, band miss-set etc.
- Built in power supply.
- AC (200/220/235/240V) and (100/110/115/120V) selectable.
- Equipped with a control cable connection socket, for the HC-1.5KAT, auto antenna tuner by Tokyo Hy-Power Labs.
- Two antenna ports selectable from front panel.
- Great for desktop or DXpedition!

Specifications

Frequency:
1.8 – 28MHz all amateur bands including WARC bands and 50MHz

Mode:
SSB, CW, RTTY

RF Drive:
85W typ. (100W max.)

Output Power:
HF 1kW PEP max.
50MHz 650W PEP max.

Matching Transceivers for Auto Band Decoder:
Most modern ICOM, Yaesu, Kenwood

Drain Voltage:
53V (when no RF drive)

Drain Current:
40A max.

Input Impedance:
50 OHM (unbalanced)

Output Impedance:
50 OHM (unbalanced)

Final Transistor:
SD2933 x 4 (MOS FET by ST micro)

Circuit:
Class AB parallel push-pull

Cooling Method:
Forced Air Cooling

MPU:
PIC 18F452 x 2

Multi-Meter:
Output Power – Pf 1Kw
Drain Voltage – Vd 60V
Drain Current – Id 50A

Input/Output Connectors:
UHF SO-239

AC Power:
AC 240V default (200/220/235) – 10 A max.
AC 120V (100/110/115) – 20 A max.

AC Consumption:
1.9kVA max. when TX

Dimension:
10.7 x 5.6 x 14.3 inches (WxHxD)/272 x 142 x 363 mm

Weight:
Approx. 20kgs. or 45.5lbs.

Accessories Included:
AC Power Cord
Band Decoder Cables included for Kenwood, ICOM and Yaesu
Spare Fuses and Plugs
User Manual

Optional Items:
Auto Antenna Tuner (HC-1.5KAT)
External Cooling Fan (HXT-1.5KF for high duty cycle RTTY)

More Fine Products from TOKYO HY-POWER

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announcements

Ham Radio University – HRU 2008 will be held on January 13 at Briarcliffe College, Bethpage, Long Island, New York. It is also the ARRL NYC/LI Section Convention. Included will be forums, displays, presentations, operating events, and special events geared to ARES and EmComm. The keynote speaker will be Gordon West, WB6NOA. For more information, go to: <http://www.hamradiouniversity.org/>.

Southwest Ohio Digital & Technical Symposium – This technical conference/seminar is planned for January 12, sponsored by the Dial Radio Club, and will be held in Thesken Hall in the Middletown Campus of Miami University. For more information go to: <www.swohdigi.org>.

Special Event Station W3C – W3C, Washington Amateur Communications ARC, will be on the air from the annual Washington County, Pennsylvania, Sports Show from 1700Z January 31 to 2200 Z February 3 on SSB 14.250, 7.260 MHz. QSL with SASE to Ed Oelschlager, N3ZNI, 60 Carl Avenue B2, Eighty Four, PA 15330. <www.wacomarc.org>

The following hamfests, etc., are scheduled for Jan. & early Feb.:

Jan. 5, **West Allis RAC Hamfest/Swapfest**, Waukesha Co. Expo Center Forum, Waukesha, Wisconsin. Contact Phil, W9NAW, 414-425-3649; <www.warac.org>. (Exams 9–11:15 AM)

Jan. 5, **Morristown Hamfest**, Smoky Mountain Expo Center, White Pine, Tennessee. Contact June McClary, AI4SO, e-mail: <ladyinthemists@gmail.com>. (Talk-in 147.030+; exams 11 AM)

Jan. 12, **San Antonio Radio Club Amateur Radio Fiesta**, Schertz Knights of Columbus Hall, Schertz, Texas (NE side of San Antonio). Contact J.C. Smith, N5RXS, e-mail: <n5rxs@satx.rr.com>; <http://w5sc.org/>.

Jan. 12, **Northern Colorado ARC Winter Superfest**, Lincoln Center's Canyon West Room, Fort Collins, Colorado. Contact Matt, KGØW, e-mail: <kg0w@arrl.net>, phone 970-232-5215. (Exams 9:30 AM)

Jan. 27, **WCRA Mid-Winter Hamfest**, DuPage Expo, St. Charles, Illinois. Contact John Faber, WT9Y, e-mail: <info@w9ccu.org>, phone 630-604-0157; <http://www.w9ccu.org/>.

Feb. 2, **Charleston (SC) Hamfest & Computer Show & ARRL SC State Convention**, Exchange Park Fairgrounds, Ladson, South Carolina. Contact Jenny Myers, WA4NGV, e-mail: <brycemyers@aol.com>, phone 843-747-2324; <www.wa4usn.org>. (Talk-in 146.790–, 145.250– PL 123.0, 147.045+ PL 103.5; exams 1 PM, info KT4YW, e-mail: <kt4yw@sc.rr.com>, phone 843-871-4368)

Feb. 2, **Hiawatha Amateur Radio Swap & Shop**, Negaunee Township Hall, Negaunee, Michigan. Contact Robert Serfas, N8PKN, e-mail: <n8pkn@aol.com>, phone 906-225-6773; <www.qsl.net/k8lod/>.

our readers say

Lighthouse Clarification

Editor, *CQ*:

Congratulations on your article in August 2007 *CQ* magazine, "A First Time DX QSL Manager." Very well done and informative. I want to point out, however, two minor technicalities:

1. The caption to photo A says: "A station needs only to be within sight of a lighthouse to activate it."

As the creator of the "rules" for activating lighthouses, as well being the one who compiled and published the numerical system of identifying light beacons, I must point out that there are definite limitations to this "Visual Sight Rule." To quote from our "activations rulebook": "To be recognized as a valid lighthouse activation, physical presence on the property or within the light structure itself is preferred. ... [but] the ARLHS additionally recognizes stations operating under the '1000-Meter Rule.' Briefly stated, this rule says that any operation within a 1000 meter distance (1100 yards or 3300 feet) of the light is valid..., 'provided the operation qualifies under certain exceptions:'

"If operation within the 1000 meters would be (a) illegal, (b) ill-advised, (c) impossible, or (d) impractical, then the distance rule is suspended and the 'Visual Sight Rule' can be invoked and shall apply. Under the terms of the 'Visual Sight Rule,' an operation is valid if the station is within visual sight of the physical structure of the light during the day or the 'reach' of its light beacon at night. We find this to be consistent with our stated purpose of recognizing a light according to the geographic area served by it for mariners."

In other words, if the operation is not within 1000 meters, it must meet one of the four criteria cited above in order to be an authentic activation. Just because a light is visually in sight it is not automatically a valid activation.

2. Finally, the number given a lighthouse or beacon is not verified or authentic unless it is cited with the prefix "ARLHS" before the assigned number. In other words, the full and proper number for a light is ARLHS BAH-001 and not just BAH-001 or simply 001.

I hope this clarification will save a lot of our contest and event participants some embarrassment should they find their activity, award, or contest score declared invalid. For a full description of the rules and guidelines for activating lights, see our website pages, especially:

http://arlhs.com/page4.html (FAQs)
http://arlhs.com/page9.html (awards criteria)
http://arlhs.com/page3.html (contest rules and guidelines)

Jim, K2JXW, Founder & President
The Amateur Radio Lighthouse Society

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Wind Load (w/mast adapter)	**7.5 square feet**
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Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
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TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
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CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
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Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
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Wind Load (w/ mast adapter)	**not applicable**
Turning Power	5000 in.-lbs.
Brake Power	**7500 in.-lbs.**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
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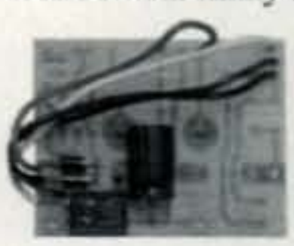

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The Radio Amateur Club of the Council of Europe, celebrating the Republic of Montenegro's new membership in the Council, mounted a DXpedition-style operation from contest superstation YT6A on October 17–20, 2007.

4OØCE DXpedition to Montenegro

BY FRANCIS KREMER,* F6FQK

Now that the Republic of Montenegro has joined the Council of Europe, the Council's radio club (CERAC/TP2CE) asked for permission to operate from the country with the callsign 4OØCE, as was done previously following the accession of the Principality of Monaco (3AØCE).

In response, the Press Service and the Public Relations divisions of the Council of Europe contacted the Telecommunications Agency in Montenegro in June. The authorization arrived in July, available for five months. We then needed to define an operating period, preferably not during large contests. We finally chose October, between the 17th and 21st. Then the only thing left to decide was our transmitting location.

We soon received a proposition from Ranko Boca, 4O3A, who suggested a place with installations and lodgings on the top of a hill along the bays of Kotor, and referred us to his website, <http://www.yt6a.com>. On visiting the site, we were surprised by the scale of the collection of antennas set up on three towers of 30 meters each (approximately 90 feet), as well as the different transceivers and amplifiers proposed; there was nothing for us to bring, as everything was in place.

We left Strasbourg, France (where the Council of Europe is headquartered) on October 16th at 2 PM in a hired (rented) vehicle and hoped to make the journey in 17 hours, driving through the night. However, we hadn't counted on the surprises that awaited us as we drove through Croatia. First, the splendid main road from Zagreb to Split was cut off in the middle and there were no diversion routes provided to join it later. Therefore, we were left to our own devices, and even our GPS unit was having trouble. As a result, we got to do a night "tour" around northwestern Croatia, finally arriving back "on track" as the new day was beginning. We continued down to the Adriatic coast, all the way to the seaside resort of Herceg Novi in Montenegro.

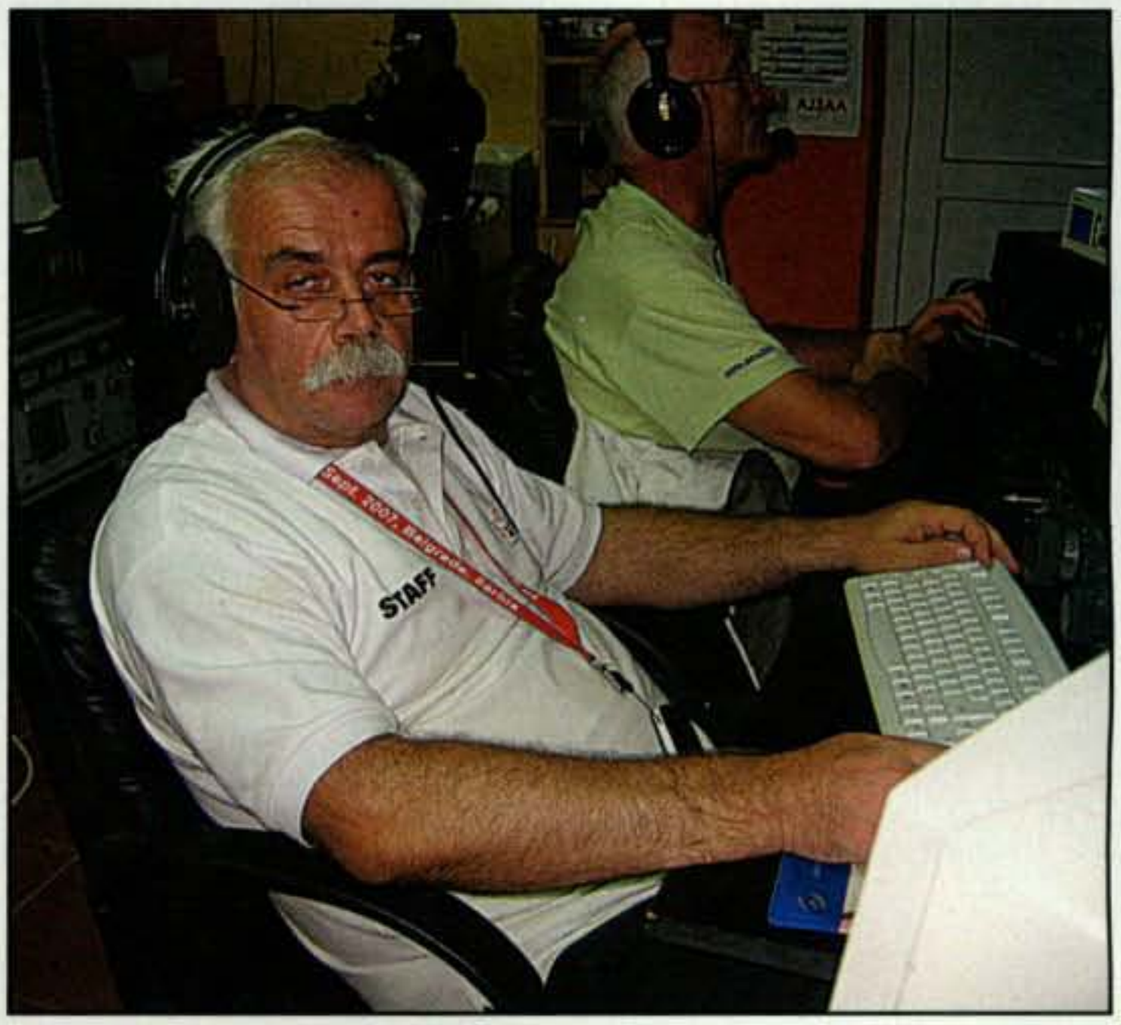
The four of us (FØEQE, F5LGF, F6FQK, and F5OCL) then took the ferry from Kamenari, avoiding the bays of Kotor. The landscape was stunning and still quite undeveloped, but no doubt soon will be snapped up by developers to put in hotels and other residences.

Ranko and Achim, YU1YV, were waiting for us where the ferry arrived in order to drive us to the station. We discovered that we hadn't had the last of our travel troubles, as the road conditions for the last four kilometers towards the top of the hill were appalling. We therefore had to leave our vehicle and borrow an ancient rattling Land Rover, which spluttered and used more oil than it did petrol—hi! It didn't matter, though, as after an hour of climbing we reached the top and our tiredness dissolved at the sight of the enormous antenna system, each tower containing several monobanders for the traditional HF bands; another tower supported a "full-size" antenna for 80 meters, as well as two Beverages for receiving. The station itself consisted of a Yaesu FT-1000 Mark V transmitter and two 3-KW amplifiers.

We weren't in such great shape after traveling for 25 hours, but a first team made up of Francis, F6FQK, and Christian, F5LGF, immediately got to work on 20 meters SSB and 40 meters CW. Given the advertising we'd posted

*Station Director, Council of Europe Radio Amateur Club, TP2CE
e-mail: <f6fqk@free.fr>

The original team 4O0CE (from left to right): Sergueï, F0EQE; Christian, F5LGF; Francis, F6FQK; and Jean Louis, F5OCL. (All photos courtesy of F6FQK)



Our local team member and "guard dog," Achim, YU1YV.

on the internet and the different commentaries, we knew that the wait for this event and above all, the prefix used, would be long, but we had never imagined just how long. We were no longer feeling tired, as the excitement had kicked in to such an extent that the second team (Sergueï, F0EQE, and Jean Louis, F5OCL) took over after three hours, as by then we were tired and in a bit of a daze. During the night our friend Achim, YU1YV, took over and sent everyone to bed after a quick bite to eat.

Achim had not been part of our original group, but he became a valued member of the team. We are particularly grateful to him for organizing the meals, general administration, and helping out the different teams, as this is what made the experience go so comfortably and smoothly.

During three days of operating, one pileup followed another, helped by propagation and a rising solar flux. Even the high bands (10, 15, and 20 meters) finally opened for DX (primarily to Japan, Southeast Asia, Australia, Indonesia, and the Americas), forcing us to work split (sometimes by as much as 15 kHz on SSB) or by number.

The only problem we encountered was on Saturday, before the end of the expedition, when we had to stop prematurely at 3 PM UTC due to a miscommunication. We learned that Ranko had invited a German ham to participate from the station in the Worked all Germany contest, which ran from 3 PM Saturday to 3 PM Sunday, whereas we had planned to be operating in DXpedition mode until Sunday night. In addition, the guest operator had apparently been told he would be able

The mountain scenery was made even more beautiful by the antennas on 30-meter (90-foot) high towers at the YT6A station site!

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"I can say that in my 30+ years of operating I've never enjoyed a rig more than the Omni-VII. The audio is superb as is the QSK, ergonomics, receiver characteristics and on and on." – W7TEA

"My Dad, KB2LAU, in Florida has become active again using my Omni-VII in Vermont. He is enjoying daily contacts [via Internet remote control]. Being a ham with limited to no antenna options, this has been a great opportunity." – W1ZN

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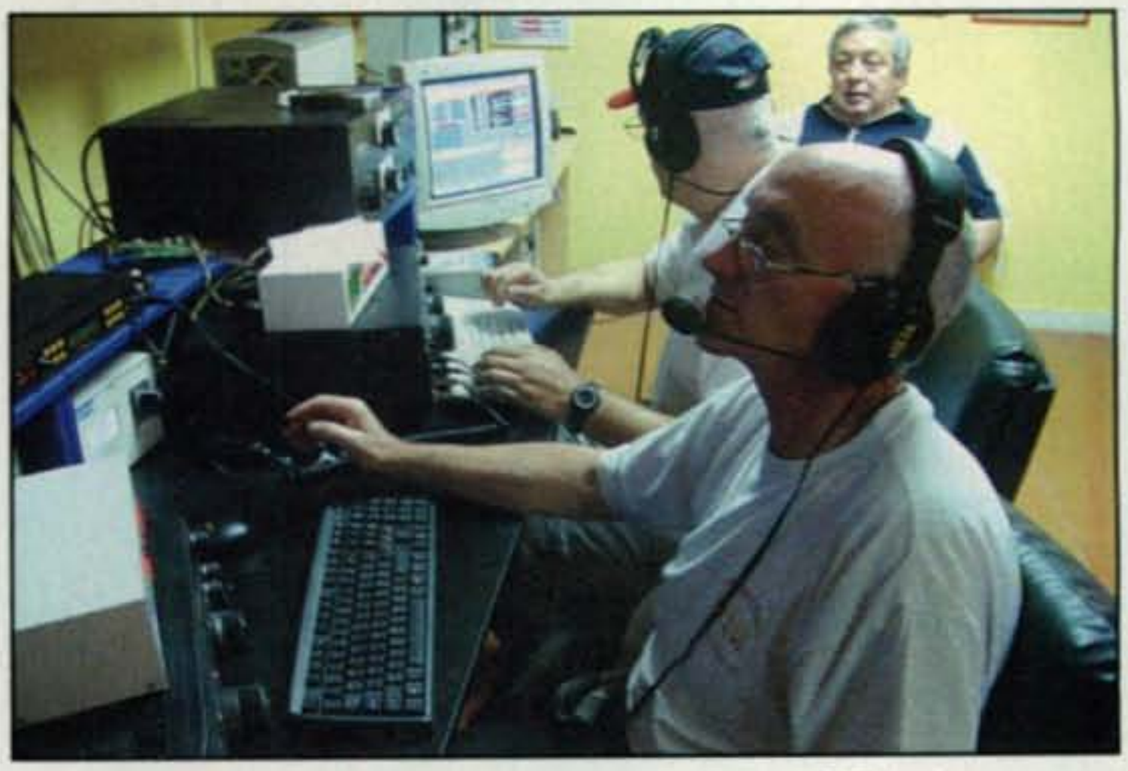
TEN-TEC

YT6A's full-size 80-meter beam made us very loud on 3.5 MHz!

Christian, F5LGF, and Francis, F6FQK, on the air from 4O0CE.

The YT6A contest station was fully equipped with everything we needed (except WARC-band antennas, since there's no contesting on those bands).



F6FQK and F5OCL operate while F5LGF looks on.

The 4O0CE QSL card features a photo of Milan Rocen (left), Montenegran Minister of Foreign Affairs, being welcomed to the Council of Europe by its Secretary General, Terry Davis. Montenegro became the Council's 47th member state on May 11, 2007.

to use the 4O0CE callsign. We explained that it had been assigned specifically to the Council of Europe for this special operation, which did not include participation in a single-country contest. He understood and operated using his personal callsign, but our operation was off the air on the traditional HF bands.

We considered switching to the WARC bands, but the station did not have any antennas for them. YU1YV tried to install a longwire for 30, 17, and 12 meters, but the SWR was high and the propagation was poor, so we decided to leave earlier than planned, which spoiled a bit of our fun.

Even though it was not our doing, we apologize to all those radio amateurs who were not able to contact us and who had hoped to do so on Saturday night or Sunday. Many consulted the packet cluster, hoping to find us there on one band or another. We would also like to apologize to those hams using VHF and satellites, as we had promised to operate on those bands and modes. Unfortunately we were not able to use the antennas we had planned for VHF work.

Nevertheless, over 63 hours of operating, we made a total of 9357 QSOs, 4534 of which were on CW, 4784 SSB, and 39 RTTY.

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Built in Texas

Made in the USA

FLEX-5000™

Family of ALL NEW HF-6m Software Defined Radios (SDR)

High-Performance Radio at its Best!

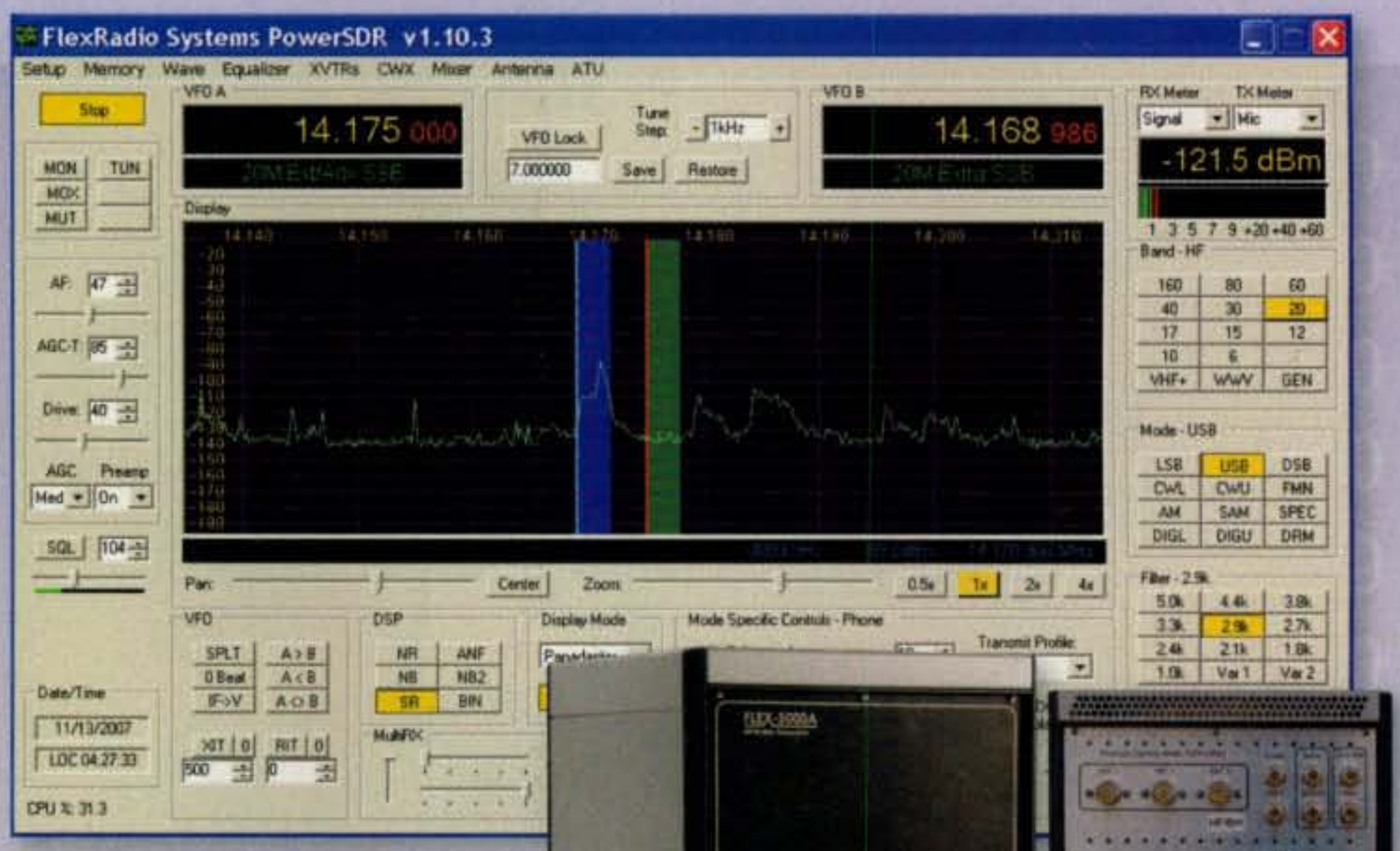
What Some of Our Customers Have to Say about FlexRadio:

Frank, GI4NKB – Comparing a FLEX-5000 to an analogue radio is akin to comparing a stone axe to a stealth fighter, I'm thrilled with mine and you will be too, sell whatever obsolete rig you're currently using, get one and remember, real radios don't need knobs!

Bob, W5RG – My new FLEX-5000A came yesterday and it was a snap to plug and play. I had it up and running in 20 min. just had to download the software and plug it in.

Paul, K3PZ – The FLEX-5000 is easily the best radio that I have ever owned.

Ken, K3YI –This is a very exciting radio to operate!



Exciting Leading Edge Technology with Traditional Solid Support and Reliability

Rear View

Just Some of the Highlights that Make FlexRadio THE World Class Performer

- PowerSDR™ - The open sourceDSP software that allows continuous evolution of unmatched radio performance and functionality. PowerSDR™ is the brains of the radio where the FLEX-5000™ is the brawn. You get a "new radio" every time you download the latest version.
- 192 KHz real-time, high resolution spectrum display/panadapter.
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- Spectrum display averaging resulting in lifting extremely weak signals out of the noise. You'll definitely see them before you hear them.
- No external sound cards required.
- Unparalleled support network; a company that cares and a support group ready to offer a hand whenever needed.

Just a Few of the Many NEW Features in the FLEX-5000™ Radio Family

FLEX-5000A™ – $2799

- >100 dB two-tone 3rd order dynamic range at 2 kHz spacing
- Frequency Stability: 0.5 ppm, TCXO equipped
- Individual optimized filters for all Ham Bands
- FlexWire™ interface for external control of rotator, antenna, and much more.
- 100 watts output 160-6 meters
- Optional full performance second receiver (MultiWatch is standard)
- Single cable connection to computer
- Fully automatic internal test/calibration. No external calibration equipment necessary
- Standard input/output jacks. Internal antenna switching for up to 3 antennas plus receive only antenna
- Balanced TRS line/microphone input
- Quiet high volume fan keeps unit cool
- General coverage receiver
- Full Duplex transverter ready
- QSK
- Optional full featured ATU 160-6m, $299

FLEX-5000C™ – $4799 – Same great features as the A model plus

- Integrated Intel Core2 Duo processor with 1 GB RAM, 160 GB hard drive
- Windows XP Pro operating system
- Internet connectivity standard
- Built-in 7 watt speaker
- Wireless Keyboard and mouse included
- No external computer is required
- SO2R ready with optional second receiver

Rear View

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Results of the 2007 CQ WW WPX SSB Contest

BY STEVE MERCHANT,* K6AW, AND RANDY THOMPSON,† K5ZD

Several days of the *K*-index at 0 or 1 leading up to the contest had contesters around the world dreaming of 10- and 15-meter band openings. When the clock rolled over to 0000Z on March 24, 2007, the bands magically exploded with activity and the 2007 CQ WPX SSB Contest was under way! Unfortunately, a solar disturbance impacted the bands just as the contest started. The *K*-index was 4 or higher for the first 12 hours.

In spite of the poor conditions, participants enjoyed high levels of activity and a seemingly unlimited number of exotic prefixes. When the log-submission robot and the post office were done, 3076 log entries had been received. Whether you were competing for a record score or just having fun, the 49th running of the WPX SSB Contest had something for everyone.

The ZY100S number one world Multi-Multi team (operators: PY5KD, AI6V, AI6YL, PY5CC, PY2NDX, PY2YU, PY5DC, PY5EG, and SMØCXU).

Single Operator All Band

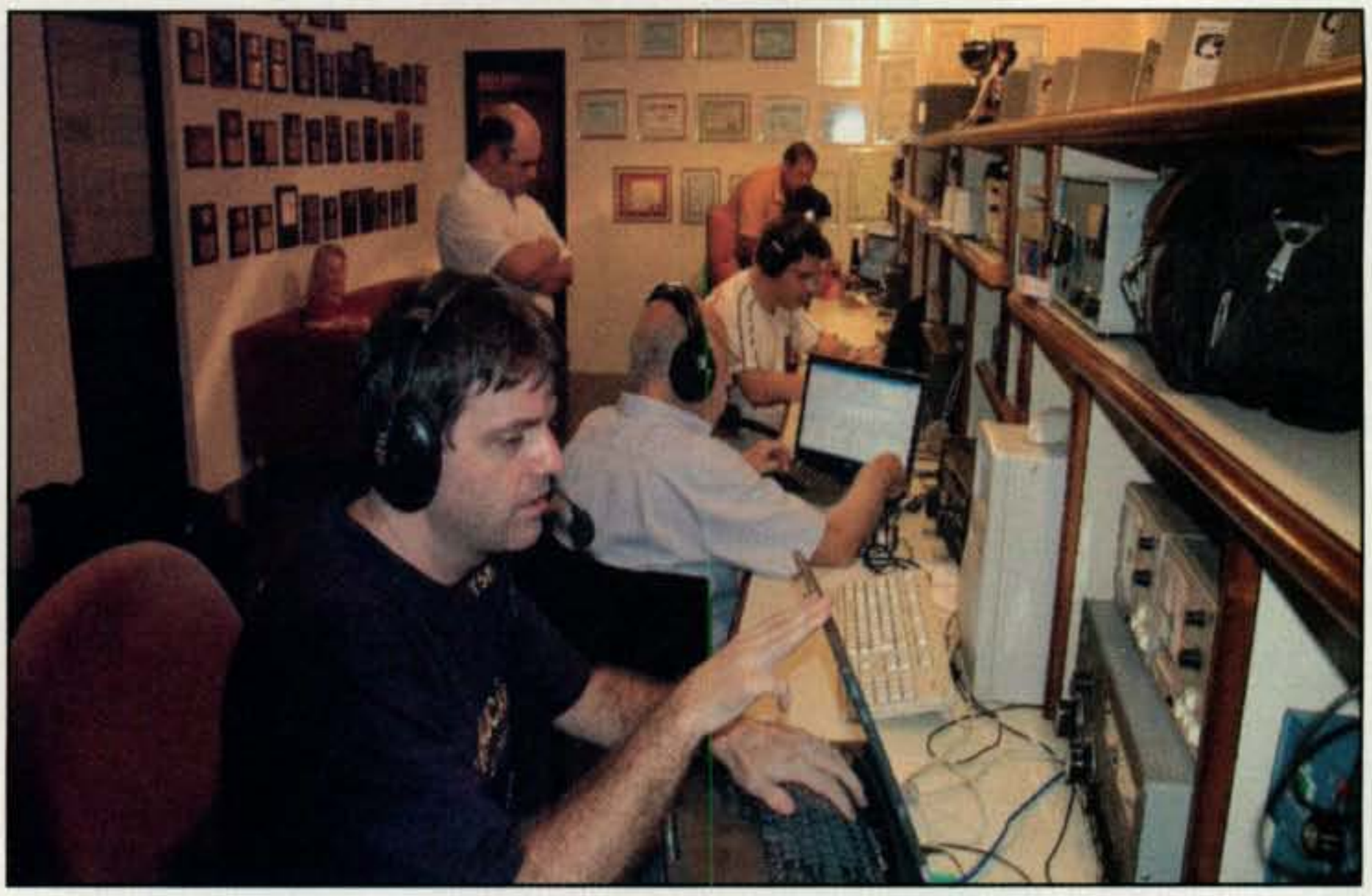
Repeating his victory of 2006, W2SC again operated from 8P1A in Barbados and blew away the competition for world high score in the SOAB category. Tom overcame broken radios and raging line noise on his way to over 5000 QSOs and 1100 multipliers. Second place was Hrane, YT1AD, operating from 3V8BB in Tunisia. Andy, AE6Y, traveled to P49Y in Aruba and also overcame line-noise problems to finish third. Wanderly, PY2MNL operating as ZX2B, finished just a few points ahead of RN9CWJ operated by Willy, UA9BA. Top North American scorer was VB3A operated by Ron, VE3AT.

It was an extremely close race for tops in the USA. NJ4M (Dan, K1TO op.), operating his first-ever full-time WPX SSB effort, beat WPX regular KC3R (Alex, LZ4AX op.) by only 18K points! Mitch, K7RL, operated using the call KW7Y to take third place with a great score from out west. Jerry, WB9Z, finished fourth with a fine showing from the middle of the country.

The best Europe scores seemed to come from the south, with 9A1A (Emil, 9A9A op.) taking the top spot, followed closely by IR4X (Matt, IZ3EYZ op.). Matt was handicapped by a broken 75-meter antenna. Third place was a fantastic effort by Pasi, OH6UM, operating from OH8X, who found a way to make a competitive score from near the Arctic Circle even with the poor conditions. Back to the south, UW2M (Roman, URØMC op.) came in at number four.

In the SOAB Assisted category, John, W2GD, made a last-minute trip to Aruba to help P49Y with antenna work, and then operated his own station to world high as P4ØW. Last year's winner, Jorge, EA9LZ, demonstrated the value of a North Africa location to take second. WY3P (Kamal, N3KS op.) topped the USA scores to finish third in the world. Jose, CT1CJJ, brought another continent into the mix by operating CT6A to fourth place and tops in Europe.

The competition for SOAB low power was a two-station race between Yasar, TC3D, in Turkey and ZPØR in Paraguay. Anibal at ZPØR had more multipliers, but it was not enough to overcome the TC3D advantage in QSOs. Ted, HI3TEJ, was a big "hit" with his HI3T call to finish third. Brazilians ZX7A (PS7TKS op.) and Vitor, PY2NY, finished fourth and fifth, respectively. Dainius, LY6M, took sixth and was the



Some of the ops of Multi-Multi station ZY100S working the contest.

*e-mail: <k6aw@cqwpx.com>
†e-mail: <k5zd@cqwpx.com>

The AO4R Multi-Multi team came in ninth in the world. Back row, left to right: EA4TD, UY7CW, Jeronimo, EC4DX, EA4ERJ, EC7AEJ, DH1TW. Front row, left to right: EA4ATA, EC1AGZ, EC7AKV, EA4CMD, EB1ISN, EA4DEC, EC4CBZ, EA4BBB.

top European score. In the USA, Ed, N1UR, again used the call NV1N for a dominating repeat victory.

With a commanding lead, the world high QRP score was set by Ymanol, YV5YMA, operating as 4M2L. Phil, NØKE, took up the challenge from TI5N to finish second. Chermen, UA3BL, pulled into the number three position to win Europe over Bob, M3RCV, and Antonin, OK7CM. Chris, KA1LMR, raced by Chas, K3WW, and Doug, N4IJ, to win top honors for the USA. All of the QRP entrants deserve special recognition for braving the QRM and poor conditions.

Single Operator Single Band

The lack of sunspots didn't mean 10 meters was completely dead. Juan, LU1HF, made over 1300 contacts to win his third consecutive 10-meter title with a big lead over the competition. The top eight scores all came from South America, with Marcos, PP5AMP, in second, leading L44DX and LW1HR. D69XC and 5R8FU battled it out forthe top Africa score. S57S beat RU6CQ for tops in Europe. K4WI operated NA4W and had the USA pretty much to himself.

The north-south path was almost the only game in town on 15 meters as well. Sergio, PP5JR, operated ZX5J for over 3500 contacts and 1130 prefixes to easily win world high. He also made the highest score of all single band entrants. Silvio, LS1D, battled it out with Jacques, FY1FL, for second place. Jaime, PP5JD, finished fourth overall despite running low power. LV5V (Jorge, LU5VV op.) took fifth to complete the South American sweep. YC3BDJ beat out NH6P for tops in Oceania. ST2T was best in Africa, followed closely by A45WD, who earned the top score for Asia. ZF1A (Joe, W6VNR op.) had the top score from North America. 9A5Y broke the 1-million point barrier to win Europe. In an extremely close race for top USA score, NQ4I (VE7ZO op.) passed KX7M by only 12,000 points!

With stations packing the band from top to bottom, 20 meters is a challenging place to spend the weekend, yet 349 stations submitted logs for this category. The road to victory traveled through Morocco for the second year in a row. This time it was Richard, W7ZR, operating as 5C5Z, who easily outdistanced the competition by a wide margin. Jiri, OK5R, and Kazik, SO2R, battled for second place and tops in Europe. Vakhtang, 4L8A, was close behind in winning Asia. Fifth place also came from Moroco with 5C8A (M'hamed, CN8NK op.) accomplishing this running low power! Twenty-meter master Dan, W7WA, took top North America and USA honors, just getting by Paul, VO1HE. Rodrigo, PP5NW, was the leader for South America. Kimo, KH7U, won for Oceania. Nobuo, JA6GCE, broke 2-million points for a very nice score from Japan.

The commercial-broadcast stations and split-frequency allocations are changing, but 40 meters remains a challenge. This is especially true with the MUF (maximum usable frequency) going below 7 MHz during the evening hours. Operating as far from the population centers as you can get, Dusko, ZL3WW, used the call ZM3WW to take world high. Less than 50K points behind was European winner Milovan, YT5A. T97M and DL3TD were separated by less than 10K points in their battle for third. WP3C had a nice score to win North America over XE2K. 4L4WW beat out EY8CQ for tops in Asia. PP5BZ was the winner for South America. The USA was a three-horse race among AK1W (K5ZD op.), KY5R, and K9NW.

Looking to escape the aurora and find an early spring, Martti, OH2BH, visited 4O3B for a single band 75-meter effort and was rewarded with the world high score and a new European record. Close behind in a tight race of their own was Petr, OK1BN, and CT1JLZ (Jiri, OK1RF op.). Europe dominated the top 10 scores in this category. Leading the rest of the world was RW9USA in eleventh place. Karl, ND8DX, made a great score from Ohio to win North America. AH6OZ raced with AH6JR for tops in Oceania.

As the days get longer and static levels increase, 160 meters can be a very lonely band

in WPX SSB. However, put a station on the door step to Europe and big scores are possible. Jim, W7EJ, operated CN2R in his continuing quest to own each of the single band records for the contest. He more than doubled the existing world record for 160 meters on his way to the victory. Visit <http://www.cn2r.net> for details on the CN2R station. SN3R and LY2IJ also broke the world record while battling for top score in Europe. H22H (5B4MF op.) took advantage of his proximity to Europe to win Asia. NT1E (K3BU op.) fell just short of the USA record in winning North America. Far from any population centers, Mike, KH6ND, in Hawaii only had nine contacts the first night.

Multi-Single

What can you do with a radio or two, some antennas, and a few friends? How about joining the 186 stations that entered Multi-Single category? Multi-operator stations are allowed to operate the full 48-hour contest period. Multi-single stations must follow a 10-minute rule for their run station, but have the extra flexibility of being able to work multipliers on a second band, so there is always plenty of operating action available.

This year's winner was the two-person team of IK2QEI and IK2SGC operating as 5D5A in Morocco. They made over 6000 QSOs to finish just short of the world record. The Russian team at 5B/AJ2O finished second. ZY7C came in third while winning South America. In seventh place, North American winner KP2TM had a great QSO and multiplier total, but couldn't overcome the point-per-QSO disadvantage of their location. Another two-operator team at 9M8Z finished 12th overall and first in Oceania.

Multi-Two

The Multi-Operator Two-Transmitters category was dominated by the team at AN8A. Their 48 million points is a new world record, just getting past the record set by HC8N last year. The next three scores all were within a million points of each other. OE4A beat TM6M in a photo finish for second place in the world and top score from Europe. LT1F was close behind to win South America. EKØB finished fourth to represent Asia among the top scores.

The gang at KD4D, operating from N3HBX's station, repeated their success as champion of the USA. WE3C moved up a place from last year into second. VE3SY just got by VE3RM for tops in Canada.

Multi-Multi

The Araucaria DX Group in Brazil used the special call ZY1ØØS to win the Multi-Operator Multi-Transmitter category. They had the top multi-

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

8P1A (W2SC)	17,726,454
3V8BB	14,123,540
P49Y (AE6Y)	13,408,078
ZX2B (PY2MNL)	10,202,364
RN9CWJ (UA9BA)	10,155,138
PY5HOT	10,002,030
UPØL (UN9LW)	9,364,500
VB3A (VE3AT)	8,844,880
*TC3D	8,526,440
9A1A (9A9A)	8,007,864
*ZPØR (ZP5AZL)	7,445,619
TO5A	7,402,446
IR4X (IZ3EYZ)	7,350,186
OH8X (OH6UM)	6,628,500
WP2Z (K8MJZ)	6,436,812
NJ4M (K1TO)	6,406,464
KC3R (LZ4AX)	6,388,668
A52AM (JAØJHA)	6,329,064
V31RG (K4VU)	6,097,132
UW2M (URØMC)	5,874,001

28 MHz

LU1HF	1,946,606
PP5AMP	831,444
*L44DX (LW1DTZ)	372,240
*LW1HR	193,856
*PY2CX	184,228
*LU8EOT	149,600
*CX4AAJ	103,935
*LU6FOV	92,106
*D69XC (UA9XC)	91,903
*YY1JGT	82,859

21 MHz

ZX5J (PP5JR)	11,767,820
LS1D (LW9EOC)	4,437,965
FY1FL	3,899,835
*PP5JD	3,505,950
LV5V (LU5VV)	2,459,344
*YC3BDJ	1,914,780
*PX2T (PY2DN)	1,818,725
*ST2T (S57CQ)	1,796,784
*YV1RDX	1,717,940
NH6P (W6YM)	1,405,740

14 MHz

5C5Z (W7ZR)	11,745,769
OK5R (OK1RI)	6,002,994
SO2R (SP2FAX)	5,277,888
4L8A	5,252,961
*5C8A (CN8NK)	4,609,346
YT2B (4N1JA)	4,198,050
TM1W (F1HAR)	4,056,164
RL3A (UA3ASZ)	3,999,303
W7WA	3,609,882
*4L2M	3,555,695

7 MHz

ZM3WW (ZL3WW)	5,130,345
YT5A	5,086,240
T97M	3,754,720
DL3TD	3,747,350
*WP3C	2,537,460
SO8A (SP8BRQ)	2,232,747
*4L4WW	2,027,935
YL6W (YL2GD)	1,920,270
XE2K	1,879,537
PP5BZ	1,593,648

3.7 MHz

4O3B (OH2BH)	2,734,722
OK1BN	2,052,028
CT1JLZ (OK1RF)	2,030,139
IV3OWC	1,780,616
HG8R	1,693,874
LN9Z (LA5KO)	1,642,336
YZ1U (YU1XA)	1,596,105
IR2C (IW2HAJ)	1,548,368
YT9X (YT1RX)	1,512,500
RL3FT	1,285,338

1.8 MHz

CN2R (W7EJ)	1,613,955
SN3R (SP6HEQ)	835,884
LY2IJ	784,800
DJ6QT	439,624
H22H (5B4MF)	333,564
NT1E (K3BU)	303,680
*VE3MGY	288,540
YT6Y	220,215
UX2X (UT2XQ)	207,974
DF2UU	197,286

SINGLE OPERATOR LOW POWER ALL BAND

TC3D	8,526,440
ZPØR (ZP5AZL)	7,445,619
HI3T (HI3TEJ)	5,227,712
ZX7A	3,579,840
PY2NY	2,865,888
LY6M	2,330,743
PY3DX	2,155,615
LU1HLH	2,045,736
EA8BTM	2,026,832
OM5CD	1,986,662
NV1N (N1UR)	1,941,450
UN9L	1,917,318
UZ7M (UT9MZ)	1,886,643
LY9A (LY3BA)	1,878,846
IZ2FOS	1,788,059
RL9A	1,694,834
HA3NU	1,686,650
3XM6JR	1,544,950
L5ØN	1,544,244
UA4FRL	1,412,760

28 MHz

L44DX (LW1DTZ)	372,240
LW1HR	193,856
PY2CX	184,228
LU8EOT	149,600
CX4AAJ	103,935
LU6FOV	92,106
D69XC (UA9XC)	91,903
YY1JGT	82,859
5R8FU	67,854
EA8AKN	46,973

21 MHz

PP5JD	3,505,950
YC3BDJ	1,914,780
PX2T (PY2DN)	1,818,725
ST2T (S57CQ)	1,796,784
YV1RDX	1,717,940
A45WD (YO9HP)	1,405,276
CX1AV	1,230,492
ED8D (EA8BHD)	1,118,852
YB4IR	1,099,350
LU3DX	964,886

14 MHz

5C8A (CN8NK)	4,609,346
4L2M	3,555,695
AO7R (EB7AEY)	2,753,478
ST2R (S57DX)	2,643,300
HH4/K4QD	1,933,342
6V7E (RW3TN)	1,365,552
TG9ANF	1,101,477
4N7N (YU7WW)	938,028
SO9L (SP9UML)	927,399
LZ9X	802,272

7 MHz

WP3C	2,537,460
4L4WW	2,027,935
SP4TKR	783,505
SN3X	683,640
EA1DR	487,553
LZ1RGM	472,236
RA9XY	276,012
SP3FYX	251,750
PR7DZ	244,024
II3L	226,632

3.7 MHz

S59N	744,408
HG9M (HA5MY)	708,080
F5BEG	651,550
T92D	543,874
YT8W (4N1KW)	505,274
IW3SSA	388,150
SP9XCN	288,899
SQ9GAI	200,540
OM7AB	192,768
SP4SHD	162,081

1.8 MHz

VE3MGY	288,540
OE3BCA	194,810
OL6P (OK2WTM)	54,978
GWØDCK/P (GØDCK)	54,384
OK1JOK	38,304
LY2OU	35,937
HA8BE	34,281
DL8CX	32,712
EA3AKA	31,524
UT4EK	29,160

TRIBANDER/SINGLE ELEMENT

ZX2B (PY2MNL)	A	10,202,364
V31RG (K4VU)	A	6,097,132
C52T (GØTSM)	A	4,559,620
C4M (5B4AGM)	A	4,086,459
WT4PF (N4PN)	A	2,716,912
NF4A	A	2,461,846
K4PV	A	2,058,381
*LU1HLH	A	2,045,736
K4BAI	A	2,026,141
*S51F	A	1,325,722
IZ8EDL	28	5,203
ZC4LI	21	593,280
JH7XMO	21	366,865
JG1ZUY	21	189,662
*YC6LAY	21	160,475
*IKØEIE	21	51,221
K4EU	14	739,297
*9Y4LDK	14	679,648
*NV8N	14	454,987
MØWLF	14	376,705
S57RTH	14	274,160
VK6DXI	7	503,174
WA3AAN	7	39,270
LY4Q	3.7	479,408
DL3BQA	3.7	312,634
*EA3AKA	1.8	31,524

ROOKIE

OT2A	A	2,675,460
XE2WWW	A	2,121,161
IZ1LBG	A	1,608,152
*RK9AJZ	A	1,068,923
*RN3AHL	A	939,575
*DQØT	A	529,720
*DB7TF	A	468,456
EC7ANC	A	467,168
*IZ3KKE	A	353,886
*AC4TT	A	307,695
*LW1HR	28	193,856
EA5GKC	28	20,625
*PY2ZK	28	14,625
*PX2T (PY2DN)	21	1,818,725
*YV1RDX	21	1,717,940
*ED8D (EA8BHD)	21	1,118,852
*EC7DND	14	420,740
AB1EP	14	100,746
*OH8GZN	14	31,302
*K9WBS	7	612
*IW3SSA	3.7	388,150
*SP5COF	3.7	132,978

QRP/p

4M2L (YV5YMA)	A	1,402,960
TI5N	A	803,348
UA3BL	A	684,428
M3RCV	A	523,611
OK7CM	A	387,361
YT7TY	A	321,356
KA1LMR	A	266,122
YO5OHY	A	201,168
K3WW	A	182,286
RW3AI	A	167,417
PW2C	28	25,872
JH7RTQ	21	87,192
YV5JF	21	31,240
RA3FO	14	236,664
RW3FY	14	113,520
YO2LYN	14	92,045
SP4GFG	7	83,936
HAØGK	7	15,416
HG6EU (HA6VA)	3.7	70,896
SQ2DYF	3.7	68,510
UA3OQ	1.8	8,220

SINGLE OPERATOR ASSISTED

P4ØW (W2GD)	A	15,837,235
EA9LZ	A	10,204,688
WY3P (N3KS)	A	5,569,500
CT6A (CT1CJJ)	A	4,881,240
OH4R (OH4JFN)	A	4,154,983
EM5U (UT5UDX)	A	4,018,664
RK4FD	A	3,805,144
W5WMU	A	3,341,979
LY8O	A	2,871,000
RXØAE	A	2,711,280
EA5EH	28	35,340
*LU3JVO	28	21,330
*9A2U (9A3ZA)	28	17,510
*ZP5MAL	21	5,028,127
9A2DQ	21	809,516
DP9Z (DF9ZP)	21	566,772
WW4LL	21	314,604
*UA3BS	21	231,256
HG3DX (HA3MY)	14	3,202,110
*YT5J (YU1JW)	14	2,696,898
RN3QO	14	2,345,571
UV8M (UX3MR)	14	2,151,282
YZ2A	14	1,788,696
SQ6Z	7	2,001,174
FM5FJ	7	1,014,750
ES5RW	7	903,548
OK1DQT	7	446,782
9A5CW	7	257,070
OK7M	3.7	1,099,683
HA1YI	3.7	968,485
4NØW (YT7AW)	3.7	840,315
ES2MC	3.7	720,776
*RA3XDX	1.8	402,690
YZ7A (YU7CM)	1.8	349,168
UXØLL	1.8	194,810

MULTI-OPERATOR SINGLE TRANSMITTER

5D5A	31,141,293
5B/AJ2O	23,822,253
ZY7C	19,181,715
D44AC	18,836,384
PJ2T	16,075,749
KP2TM	15,493,164
9K2HN	14,408,235
LR2F	14,123,456
OM8A	13,018,941
CN5W	12,972,960
9M8Z	12,387,300
LU7HN	11,605,360
CQ3T	11,485,149
EI7M	11,182,480
LP1H	9,593,760
HG1S	9,459,212
S5ØC	8,980,512
RT9W	8,944,155
HI3C	8,654,300
OLØW	8,161,771

MULTI-OPERATOR TWO TRANSMITTER

AN8A	47,019,528
OE4A	18,533,494
TM6M	18,056,756
LT1F	17,877,453
EKØB	16,957,584
UU7J	14,316,232
DL2ARD	12,012,880
4O1A	11,784,689
KD4D	11,031,244
C4I	10,148,864

MULTI-OPERATOR MULTI-TRANSMITTER

ZY1ØØS	33,805,464
CQ9K	29,665,356
DR1A	24,360,839
NP3U	21,936,992
OM7M	20,410,560
OT5A	16,465,752
YW4M	16,016,543
EC2DX	10,073,763
AO4R	8,447,004
LY7A	8,137,800

*Low Power

plier of any entry with 1452 prefixes. The Madera Contest Team operated CQ9K to second place. DR1A was third and took the top spot in Europe. NP3U finished fourth overall and first in North America. In the USA, NR6O (operating from N6RO) pulled out the victory over NE1C (operating from K1TTT).

Tribander/Single Element

The Tribander/Single Element category limits participants to a single tribander antenna for 10–20 meters and single element wires for the low bands. The purpose is to provide a competition class for the "average" station. Wanderly, PY2MNL, operating as ZX2B repeated as this category's winner with a score that was almost identical to his 2006 effort. Robin, K4VU, operated V31RG to second place. C52T (Darren, GØTSM) and C4M (Ben, 5B4AGM) battled it out for third and fourth.

The next two places were occupied by a close race for top USA honors. Paul, N4PN, using the unusual call WT4PF, just got by Charlie, NF4A, for the victory. Charlie had 62 more contacts, but Paul had more QSO points and 20 more multipliers. Close competition and finding a winning strategy are part of what makes WPX so much fun.

Rookie

The Rookie category is for operators who have been licensed amateur radio operators for less than three years. Patrick, OT2A, made an impressive 2.6-million points to win the category. Closed behind was Jorge, XE2WWW. In third was Roberto, PY2DN, operating as PX2T. It is encouraging for the future of ham radio and contesting that there were 140 entries recognized to be in the Rookie category.

Chasing Prefixes

Any winning strategy must balance QSO points with the need to find more prefixes. Leaders of the prefix hunt were ZY1ØØS with 1452 prefixes and DR1A finding 1451. We appreciate all the operators who go out of their way to obtain special callsigns or activate club stations in order to provide the rest of us with a new multiplier. Special thanks to these rare and unusual ones: 3XM6JR, 4D9RG, 4E1P, 5C5Z, 5C8A,

TROPHY WINNERS AND DONORS

WORLD: Stanley Cohen, W8QDQ Trophy. Won by: **8P1A operated by Tom Goergens, W2SC.**
World Low Power: Caribbean Contesting Consortium Trophy. Won by: **Yasar Gocet ,TC3D.**
World QRP/p: Phil Krichbaum, NØKE Trophy. Won by: **4M2L operated by Ymanol Caires Zubicaray, YV5YMA.**
USA: Atilano de Oms, PY5EG Trophy. Won by: **NJ4M operated by Dan Street, K1TO.**
USA Zone 4: Society of Midwest Contesters Trophy. Won by: **Jerry Rosalius, WB9Z.**
USA Low Power: Terry Zivney, N4TZ Trophy. Won by: **NV1N operated by Edward Sawyer, N1UR.**
USA Zone 4 Low Power: Society of Midwest Contesters Trophy. Won by: **Thomas Johnson, WD5K.**
CANADA Low Power: Contest Club Ontario Trophy. Won by: **Dennis Gasparotto, VE3JAQ.**
AFRICA: Peter Sprengel, PY5CC Trophy. Won by: **3V8BB operated by Dr. Hrane Milosevic, YT1AD.**
EUROPE: Jim Hoffman, NF5A Trophy. Won by: **9A1A operated by Zdravko "Emil" Balen 9A9A.**
SOUTH AMERICA: Ron Moorefield, W8ILC Trophy. Won by: **P49Y operated by Andy Faber, AE6Y.**
OCEANIA: Philip Frazier, K6ZM Memorial. Won by: **KH6WT operated by Louis B Cohen, K1YR.**
JAPAN: The DX Family Foundation Trophy. Won by: **Masaki Okano, JH4UYB.**
NORTH AMERICA QRP/p: Phil Krichbaum, NØKE Trophy. Won by: **TI5N operated by Phil Krichbaum, NØKE.**
USA QRP/p: Doug Zwiebel, KR2Q Trophy. Won by: **Christopher Merchant, KA1LMR.**

SINGLE OPERATOR, SINGLE BAND

WORLD: Steve Merchant, K6AW Trophy. Won by: **Sergio Lima de Almeida, ZX5J (21 MHz).**
WORLD 28 MHz: Alan Dorhoffer, K2EEK Memorial Trophy. Won by: **John Morandi, LU1HF.**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **ZM3WW operated by Dusko Dumanovic, ZL3WW.**
USA 3.7 MHz: Lance Johnson Engineering Trophy. Won by: **Karl H. Brandt, ND8DX.**
USA 14 MHz Low Power: Boomer Contest Club Trophy. Won by: **Dave Cockrum, N5DO.**
USA 21 MHz: Bernie Welch, W8IMZ Memorial. Won by: **NQ4I operated by James Roberts, VE7ZO.**

MULTI-OPERATOR, SINGLE TRANSMITTER

USA: Steve Bolia, N8BJQ Trophy. Won by: **WR3Z operated by WR3Z, W2CDO, N1SZ, W3IDT.**
USA Zone 4: Society of Midwest Contesters Trophy. Won by: **KM9P operated by K4JNY, KØEJ, W4NZ, KD4HIK, AB4GG, NA4K, KE4MBP.**
ASIA: W2MIG Memorial Trophy sponsored by Ed Campbell, NT4TT. Won by: **5B/AJ2O operated by RX3DCX, RX9TL, RW4WR, RA3AUU.**

MULTI-OPERATOR, TWO TRANSMITTER

WORLD: Doris Wong, AG1RL Trophy. Won by: **AN8A operated by OH1RY, OH2KI, OH2MM, OH1MA, ES5TV, EA8ZS, EA8CAC.**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Gail Schieber, K2RED Trophy. Won by: **ZY1ØØS operated by PY5EG, PY5CA, AI6V, AI6YL, PY5KD, PY5DC, PY5CC, PY2NDX, PY2YU, PY2BK, PU5RAS, SMØCXU.**
USA: Rick Dougherty, NQ4I Trophy. Won by: **NR6O operated by N6RO, K9YC, N6BV, WA6O, K6AW, K6RC.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **A52AM operated by Akira Minagawa, JAØJHA.**

5D5A, 6F75A, 8J100S, BV10TAR, DZ1BP, GC0EZQ, HF40PAZ, L81H, YU07HST, and ZY100S.

New Records

Records can be broken even during poor conditions. Congratulations to these new world record holders:

CN2R (W7EJ), 160meters, 1,613,955
5C5Z (W7ZR), 20 meters, 11,745,769
AN8A, Multi-Two 48,676,848

Final Thoughts

Many thanks to members of the CQ WW Contest Committee for helping with various log-handling issues. Thanks to Randy, K5ZD, for his help with redesigning and managing the CQ WPX website. Thanks as well to Trey, N5KO, and his robots; they are a huge help in the log-checking process. The biggest thanks go to Steve Bolia, N8BJQ, for his help and endless energy and enthusiasm.

Expanded results of the 2007 WPX SSB Contest, including the full QRM plus operators of the multi stations, can be found on the *CQ* website: <www.cq-amateur-radio.com>.

The 2008 WPX SSB Contest will be held on March 24 and 25. We should be past the bottom of the sunspot cycle by then, so please plan on joining the fun. Rules can be found elsewhere in this issue of *CQ*, on the *CQ* website, and on the CQ WPX Contest website (http://www.cqwpx.com). Logs are requested to be submitted by e-mail in Cabrillo format. Send WPX SSB logs to <ssb@cqwpx.com>. See you in the 2008 contest!

73, Steve, K6AW, and Randy, K5ZD

DX QRM

What's so hard to understand, 2E0!? So many people could not understand 2E0. Have they never hear one before?! Not complaining, nice rare mult! Due to antenna problems on 40m not too much was worked which meant a lower score (no USA hardly on Saturday night . . . **2E0CVN/p**. Unfortunately I had no microphone on Saturday and managed to get on the air only on Sunday afternoon. Tough to get attention when everybody is beaming elsewhere and propagation is not good . . . **5Z4/9A3A**. Highlight was Sunday night 7:00 PM local on 15m when everybody in western EU could hear my barefoot rig without repeats. It was magic. Beam direction: due north over the pole . . . **7J1AQH**. 8J1S is special amateur radio station to commemorate the centenary of the world Scout movement. Good Scouting to you . . . **8J1S**. It was very poor conditions, especially on Saturday. We used a TS870D (100w); 2-element quad on 10, 15, and, 20m; and a multi-dipole on 40, 80, and 160m. However it is great fun when the band is filled with activity. Our QTH was Skinnskatteberg (JO79UT) . . . **8S0C/5**. We got off to a slow start due to a very high SWR on the A4S on 20 and 15m. We tuned up on 10m and the SWR was near perfect . . . **9M6BRC**.

Joined contest in car with mobile antenna . . . **BD1DRJ**. This is the one of the most popular contests. It's time to join all together with pileups . . . **CT1EGW**. Some operators were deaf, but some had excellent ears! It's my first time participating in an SSB contest with QRP. Thank you great guys for your patience with my weak signals . . . **DJ0MY**. Please Mr. Murphy, next time go fishing, dancing, or diving . . . **DL6RBO**. A nice way to try out my newly installed Optibeam in my downtown apartment. Made a few 40 and 80m QSOs tuning up the beam! Relaxed atmosphere. Didn't worry about the generally poor propagation . . . **EA5ON**. I am 11 years old. It is my first contest! . . . **EY8CC**. This was just a casual entry to see if my new wire antenna works. It works fine! JA, ZL, and VR on 40, of all bands here in QRM alley proved it. Good sport. See you all next year . . . **G0RTN**. Great contest from the NW Haiti Christian Mission in spite of the band conditions. Rig was Kenwood TS-570. Antenna Mosley TA-33 at 60 feet. Operating time 24 hours . . . **HH4/K4QD**. Great contest from the NW Haiti Christian Mission in spite of the band conditions. Rig was Kenwood TS-570. Antenna Mosley TA-33 at 60 feet. Operating time 24 hours . . . **HH4/K4QD**. Only 4 hours of operation on 20m to test antenna and rig of the radio club. 200 QSOs and great fun! Next time all bands and multi-op . . . **IQ3VO**. Operating from the rain forest in Dominica was an experience! We don't know which was worse, the rain, the bats, the birds, the rain, the rats, the rain, the lizards, the rain, or the propagation. All our antennas were vertical dipoles in the trees . . . **J75RZ**.

Aloha and mahalo (tnx) to all and hope you enjoyed the CQ WPX 2007 contest. Had to break for our 56th wedding anniversary dinner but got back to the contest after several hours of a wonderful dinner. Mahalo to my wonderful XYL I got back to contesting . . . **KH6FKG**. Fantastic competition. Really enjoyed taking part and giving out a few points. Have annual leave booked for the full

USA TOP SCORES

SINGLE OPERATOR ALL BAND

NJ4M (K1TO)	6,406,464
KC3R (LZ4AX)	6,388,668
KW7Y (K7RL)	5,582,169
WB9Z	4,060,837
K5TR	3,896,706
WM5R	3,801,400
NC1I (K9PW)	2,984,474
WT4PF (N4PN)	2,716,912
NF4A	2,461,846
K4PV	2,058,381
K4BAI	2,026,141
AC0W	1,955,529
*NV1N (N1UR)	1,941,450
K0RH	1,720,652
AD4TR	1,495,821
N8BJQ	1,465,920
K5KG	1,301,481
W6TK	1,260,544
K4RO	1,252,550
*W3LL	1,227,340

28 MHz

*NA4W (K4WI)	31,302
*W5TD	3,842
*W7ISG	3,328
K4RDU	1,170
*W6GMT	290

21 MHz

NQ4I (VE7ZO)	380,304
KX7M	368,183
WN1GIV (N4BP)	232,060
NJ4U (K4EA)	220,844
KC7V	188,832
NX5M	141,693
*W7UPF	39,780
K7ZS	30,870
KV4T	26,362
*AJ5DX (W0VX)	21,315

14 MHz

W7WA	3,609,882
KU5B	2,282,211
KD2RD	1,859,920
NQ5K (W5ASP)	970,555
K6HNZ	862,576
K4EU	739,297
*N5DO	719,328
*NV8N	454,987
W6AFA	447,930
*AD7J	298,753

7 MHz

AK1W (K5ZD)	972,726
KY5R	816,992
K9NW	686,178
N4EEB	373,109
K4KZZ	313,456
*KI6LZ	148,114
W4SVO	127,100
KE3WM	75,000
*NR8U	42,333
WA3AAN	39,270

3.7 MHz

ND8DX	860,626
KU1CW	572,320
NT2A	336,076
K9ES	301,944
NA3M	235,538
*NS3T	102,249
KK9V	37,332
*KE0L	18,100
*N0YY	6,272
*K3SWZ	4,018

1.8 MHz

NT1E (K3BU)	303,680
W3GH	112,401
AA4MM	61,021
K1HAP	60,280
WJ9B	19,096

LOW POWER ALL BAND

NV1N (N1UR)	1,941,450
W3LL	1,227,340
WD5K	1,108,359
N2RRA	568,400
NX6T (K6AM)	558,215
WB8TLI	539,478
WZ8T	459,756
W4LT	457,026
AB4GG	451,043
KI3O	447,650

28 MHz

NA4W (K4WI)	31,302
W5TD	3,842
W7ISG	3,328
W6GMT	290

21 MHz

W7UPF	39,780
AJ5DX (W0VX)	21,315
K6JAT	20,898
W2AW (N2GM)	14,616
KA2ASU	4,141

14 MHz

N5DO	719,328
NV8N	454,987
AD7J	298,753
N4MO	243,105
KZ5OH	190,736
WB1HBB (W4WR)	163,688
K0PK	136,416
K7ACZ	71,000
KD2MU	37,572
KS2G	32,770

7 MHz

KI6LZ	148,114
NR8U	42,333
AB1FY	11,400
WA4VJC	3,483
N9HOE	2,380

3.7 MHz

NS3T	102,249
KE0L	18,100
N0YY	6,272
K3SWZ	4,018
AA4LR	217

1.8 MHz

N9TF	3,239

TRIBANDER/SINGLE ELEMENT

WT4PF (N4PN)	A	2,716,912
NF4A	A	2,461,846
K4PV	A	2,058,381
K4BAI	A	2,026,141
W6TK	A	1,260,544
*WD5K	A	1,108,359
K4SN	A	1,042,825
NJ2F	A	902,286
AB3CX	A	872,413
WN2O (N2GC)	A	833,958
*W7UPF	21	39,780
*AJ5DX (W0VX)	21	21,315
K4EU	14	739,297
*NV8N	14	454,987
*K0PK	14	136,416
*K7ACZ	14	71,000
*KD2MU	14	37,572
WA3AAN	7	39,270
*WA4VJC	7	3,483
KK9V	3.7	37,332
*KE0L	3.7	18,100

ROOKIE

*AC4TT	A	307,695
*KB3LIX	A	189,054
*KI4IMA	A	113,274
*N3XZ	A	97,128
*AD2H	A	42,210
AB1EP	14	100,746
*KI4KNS	14	17,487
*KI4MUG	14	3,854
*KB3NDS	14	1,430
*N9ABC	14	1,288
*K9WBS	7	612
*KC9GRD	7	108

QRP/p

KA1LMR	A	266,122
K3WW	A	182,286
N4IJ	A	161,935
KD1H	A	80,070
N8XA	A	74,061
WA8WV	A	73,790
WD9FTZ	A	47,730
NE1RD	A	34,727
K6TV	A	33,250
N6WG	A	21,216
W6QU (W8QZA)	28	1,564
KD2HE	21	4,257
K3TW	14	26,866
WB7OCV	14	11,169
W8QZA	3.7	4,320

SINGLE OP ASSISTED

WY3P (N3KS)	A	5,569,500
W5WMU	A	3,341,979
W6YI	A	2,593,584
AA3E (W3CF @ NE3F)	A	2,589,276
NZ1U (N2TTA)	A	2,453,360
W1CU	A	2,357,069
N2BJ	A	1,999,877
WN9O (W9IU)	A	1,901,732
NN4GG (N4GG)	A	1,739,584
WW5X ((@ W5TM)	A	1,464,006
WW4LL	21	314,604
K7RI	14	1,542,775
WR2G	14	411,774
KD7JGI	14	255,175
N0UU	7	36,676

MULTI-OPERATOR SINGLE TRANSMITTER

WR3Z	5,450,956
KM9P	4,847,360
WC6H	3,112,368
WA7XX	2,390,544
AJ9C	1,876,670
WX5S	1,642,901
NQ5D	1,518,237
W7EB	1,233,690
WF3C	1,062,404
KC9ARR	1,013,005

MULTI-OPERATOR TWO TRANSMITTER

KD4D	11,031,244
WE3C	9,589,086
N0NI	5,876,967
NG3U	2,421,955
W0EF	292,160

MULTI-OPERATOR MULTI-TRANSMITTER

NR6O	5,689,623
NE1C	5,047,455
WX3B	4,784,184
AG4RZ	2,731,662
W4V	2,567,204
K2AX	2,086,812

**Low Power*

CONTINENTAL LEADERS

AFRICA

1.8	CN2R	1,613,955
3.5	No Entry	
7	No Entry	
14	5C5Z	11,745,769
21	*ST2T	1,796,784
28	*D69XC	91,903
AB	3V8BB	14,123,540

ASIA

1.8	H22H	333,564
3.5	RW9USA	1,113,560
7	*4L4WW	2,027,935
14	4L8A	5,252,961
21	*A45WD	1,405,276
28	JA6WJL	27,412
AB	RN9CWJ	10,155,138

EUROPE

1.8	SN3R	835,884
3.5	4O3B	2,734,722
7	YT5A	5,086,240
14	OK5R	6,002,994
21	9A5Y	1,008,576
28	S57S	62,918
AB	9A1A	8,007,864

NORTH AMERICA

1.8	NT1E	303,680
3.5	ND8DX	860,626
7	*WP3C	2,537,460
14	W7WA	3,609,882
21	ZF1A	1,140,512
28	*NA4W	31,302
AB	8P1A	17,726,454

OCEANIA

1.8	KH6ND	26,432
3.5	AH6OZ	723,138
7	ZM3WW	5,130,345
14	KH7U	2,585,883
21	*YC3BDJ	1,914,780
28	*WK3D/NHØ	29,640
AB	KH6WT	5,459,815

SOUTH AMERICA

1.8	No Entry	
3.5	*PR7AR	13,064
7	PP5BZ	1,593,648
14	PP5NW	3,008,970
21	ZX5J	11,767,820
28	LU1HF	1,946,606
AB	P49Y	13,408,078

MULTI-OPERATOR SINGLE TRANSMITTER

AF	5D5A	31,141,293
AS	5B/AJ2O	13,174,324
EU	OM8A	13,018,941
NA	KP2TM	15,493,164
OC	9M8Z	12,387,300
SA	ZY7C	19,181,715

MULTI-OPERATOR TWO TRANSMITTER

AF	AN8A	47,019,528
AS	EKØB	16,957,584
EU	OE4A	18,533,494
NA	KD4D	11,031,244
OC	VK6ANC	4,526,434
SA	LT1F	17,877,453

MULTI-OPERATOR MULTI-TRANSMITTER

AF	CQ9K	29,665,356
AS	BVØL	1,415,440
EU	DR1A	24,360,839
NA	NP3U	21,936,992
OC	4E1P	138,444
SA	ZY1ØØS	33,805,464

**Low Power*

48 hr period for 2008 CQ WPX! . . . **MM3XXW**. Good activity but found few stations from Europe, Pacific, and South America. Most of the stations were from North America but overall had a nice time . . . **NP3CW**. Very bad propagation on Saturday and only 8 Q's on 10m! But only 27 hrs activity brought me better result than in 2006 . . . **OK1KT**. Once more a wonderful contest. See you in CW test . . . **PY2XC**. Excellent contest! I had a great chance to test my station and get back on the air after a very long time off because of hard wind troubles in my place. Nice to work so many friends from many places . . . **PY3DX**.

Thanks for the contest! Sorry no propagation on 10m and very bad on 15m. Anyway, much pleasure to meet old friends on the air . . . **RV4LC**. Nice to run SC5L (special callsign for the celebration of the 300 year of scientist Carl von Linnaeus and his work in Uppsala) and to give as many as possible a QSO with this callsign. Fun! (But only 100w and dipole.) . . . **SC5L**. Conditions were not very good but it was good enough for new African record . . . **ST2R**. With 100w and just a triple leg plus G5RV very hard to get through on 40/80/160 due to a lot of big guns in a very narrow QRG range. Anyway was fun. Just a few K's because of bad antenna location so a lot of mults missing . . . **TA1/DL7BC**. First WPX contest since 1995 as VO1SDF. Still lots of fun and got 3V8BB for new country! . . . **VA3XOV**. Training 5 new ops and they were hooked! Planning to learn CW and enter in WPX CW! . . . **VE3RM**. Had fun on the second morning S&P long path. WP2, NP4, and 8P1 then when calling being called by TT8HA; thanks, mate . . . **VK4NEF**. Conditions not as favorable obviously as in previous years. Thanks for all the Q's. Great giving out the first ever VP57 prefix . . . **VP57V**. Part-time effort with ICOM 746PRO, 100w, and Force12 Sigma 5 vertical. Interesting small packet run on 10m to Europe was a pleasant surprise. S8-9 QRN levels. Hope to have a better antenna system in future . . . **VU2PTT**. From paradise Menjangan is OC-022 with beautiful sea-garden fishing, hot spring and, contesting as well . . . **YB3MM/9**. There was something strange in EU. Wasn't able to break EU QRM with 350w. Only three EU QSOs. Thanks to OK1BN, CT1JLZ, and EI7M for the difficult QSOs . . . **ZL1KMN**.

USA QRM

Great contest as usual. Although conditions were about as bad as they can be I still had some good 15m time. I didn't hear a peep on 10, however. It is the one contest involving DX where an average U.S. ham can run a frequency . . . **AC9S**. Thirty years in a row for CQ WW SSB, ARRL Phone, and now CQ WPX SSB. It's been fun. Used calls of W7FP, AD7J, WA7AR, VP2MBA and one of three in 1980 CQ WW SSB at KHØAC. Thought Sunday much better than Saturday: . . . **AD7J**. CQ WPX is the best contest bar none. Would never miss it, ever. Sunday afternoon we had the big opening! Hurrah! . . . **K2HVE**. First contest in a long time; really enjoyed it . . . **K3GWK**. Because W3/E21EIC used my station for the first few hours of the contest the rules would not permit me to compete for score with my own call. but it was worth it to watch Champ enjoy operating from this side of the world . . . **K3ZO**. My first contest on my own! I couldn't spend a lot of time operating but really enjoyed the time I did spend. My first contact was also my first HF DX contact and my second HF contact since upgrading my license! . . . **K9WBS**. This contest was my first CQ WW WPX Contest and first HF contest. I had a great time working contacts and learning some operating skills . . . **KB5HPL**.

There are some guys out there with really good ears and plenty of patience. Thank you gentlemen! Again I was amazed what you can do with <100w and a wire antenna . . . **KCØDEB**. We had two new additions to our team: Miriam, K3MIM, and Mark, NA3D. Terrible conditions on 40 Saturday night. We went to 160! Thanks to John Evans, N3HBX, for letting us join him at the farm! . . . **KD4D**. This was the first time our new club's call was used on the air! We were surprised how often we were the first KD8 for someone. May this club participate in many more contests! (submitted by KC8RSA) . . . **KD8EUW**. Have 20m end fed Zepp. Works fantastic for first use on HF. Tried 40 and got one contact but SWR light came on and stayed on 20m. Passed General on March 5, 2007. Great introduction to HF. Thanks *CQ* . . . **N2TEV**. It was nice to hear the higher bands with more activity. The most persistent signals were from deep South America . . . **N8NA**. So this is the bottom of the cycle. I am not amused. Great to hear many new HF hams in the contest. Having a VK answer my 100w 40m signal and dipole long path in the afternoon was quite a surprise. Happy to be first U.S. station in the contest for many . . . **NV1N**. This was a great learning experience for our new hams! Lots of fun! . . . **W5UMS**. Vacuum tubes forever! HF = Collins . . . **W8JMF**.

Old-time contesting: one radio, one amp, one tower, two Yagis, a wire, an ancient computer, a broken-down OM contest has-been, and an up-and-coming YL contester! Cool time. We'll be back! . . . **WA7XX**. Had fun just looking for new countries/bands/modes . . . **WDØM**. Contesting ""old school"" with a Hallicrafters SR-2000 "Hurricane" . . . **WW5DX**. A favorite contest of WX3B! I must admit I envy all of you with large towers and stacked arrays onthe high bands. This year's effort was toned down (we took almost all of Saturday off, from 9:15 AM to 3:30 PM) and we featured several new WPX contesters . . . **WX3B**.

(Continued on page 105)

CQ WW WPX SSB CONTEST ALL-TIME RECORDS

The contest is held each year on the last full weekend of March. The All-Time Records will be updated and published annually. Data following the calls: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	CN2R('07)	1,613,955	399
3.5	CN2R('06)	11,849,076	894
7.0	CN2R('05)	14,724,696	931
14	5C5Z('07)	11,745,769	1009
21	ZD8Z('05)	17,129,112	1196
28	D44AC('02)	15,707,401	1123
AB	D4B('05)	26,871,482	1271
QRP/p	HC8A('94)	7,520,562	714

Multi-Operator Single Transmitter

D44TD('02)		33,443,856	1332

Multi-Operator Two Transmitter

AN8A('07)		47,019,528	1444

Multi-Operator Multi-Transmitter

HC8N ('03)		60,703,452	1476

U.S.A. RECORD HOLDERS

Single Operator

1.8	K1ZM('95)	327,712	308
3.5	WE3C('95)	1,519,300	475
7.0	KC7EM('95)	1,950,228	495
14	KK9A('00)	6,621,446	962
21	KX8R('00)	7,556,250	930
28	NY4A('00)	6,006,573	877
AB	KQ2M('00)	11,875,240	1066
QRPp	KR2Q('00)	2,688,158	649

Multi-Operator Single Transmitter

KM3T('99)		14,091,468	1077

Multi-Operator Two Transmitter

KD4D('06)		14,535,521	1183

Multi-Operator Multi-Transmitter

KM3T('00)		29,338,460	1355

CLUB RECORD

Contest Club Finland ('00) 250,320,141

QRPp RECORD

HC8A('94) 7,520,562

WPX (Prefix) RECORD

OTØA('00) 1528

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	CN2R('07)	1,613,955	399
3.5	CN2R('06)	11,849,076	894
7.0	CN2R('05)	14,724,696	931
14	5C5Z('07)	11,745,769	1009
21	ZD8Z('05)	17,129,112	1196
28	D44AC('02)	15,707,401	1123
AB	D4B('05)	26,871,482	1271

ASIA

1.8	*YMØT('05)	486,846	222
3.5	RW9USA('07)	1,113,560	388
7.0	H24LP('87)	5,348,975	503
14	H2A('91)	6,297,464	758
21	7L1GVE('92)	6,848,136	838
28	H22H('00)	9,092,146	931
AB	JY9NX('01)	15,463,485	1017

EUROPE

1.8	SN3R('07)	835,884	434
3.5	4O3B('07)	2,734,722	622
7.0	YT5A('07)	5,086,240	830
14	DJ7AA('00)	7,955,224	1052
21	CQ1BOP('00)	6,989,997	1029
28	GM7V('00)	8,305,756	982
AB	OK1RI('01)	10,844,592	1034

NORTH AMERICA

1.8	VA1A('99)	535,225	271
3.5	VE1BY('00)	2,226,300	492
7.0	TI4CF('05)	8,057,479	751
14	KP2A('95)	7,088,976	912
21	WP3R('98)	10,167,632	986
28	KP2A('00)	11,385,710	1046
AB	8P5A('06)	20,560,452	1199

OCEANIA

1.8	KH6ND('07)	26,432	59
3.5	WH7Z('03)	1,208,900	308
7.0	ZM3WW('07)	5,130,345	649
14	KH6ND('03)	6,493,727	887
21	AH7DX('00)	7,645,990	890
28	TXØDX('00)	12,049,422	847
AB	KH6ND('01)	15,498,798	1029

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	P4ØA('96)	1,715,076	426
7.0	ZX9A('97)	10,787,128	814
14	PYØFM('95)	9,660,432	939
21	PX5E('06)	14,179,990	1210
28	ZX5J('99)	14,405,820	1095
AB	HC8A('01)	25,180,199	1199

MULTI-OPERATOR SINGLE TRANSMITTER

AF	D44TD('02)	33,443,856	1332
AS	5B/AJ2O('05)	28,966,272	1252
EU	9A7A('02)	19,034,950	1306
NA	VP2EC('92)	24,409,580	1115
OC	T33RD('99)	17,778,372	998
SA	HC8A('93)	32,502,677	1107

MULTI-OPERATOR TWO TRANSMITTER

AF	AN8A('07)	47,019,528	1444
AS	A61AJ('04)	30,157,650	1255
EU	OE4A('07)	18,533,494	1337
NA	V47KP('03)	15,958,488	1092
OC	KH7X('05)	20,910,656	1066
SA	HC8N('06)	46,791,472	1456

MULTI-OPERATOR MULTI-TRANSMITTER

AF	CN8WW('99)	55,151,562	1334
AS	P3A('00)	53,554,592	1456
EU	9AY2K('00)	42,477,343	1493
NA	WL7E('00)	42,013,215	1395
OC	KH7R('02)	32,806,032	1304
SA	HC8N('03)	60,703,452	1476

If you're looking for an automatic antenna tuner that can handle a "full gallon," otherwise known as maximum legal power, the MFJ-998 should be on your "check it out" list.

CQ Reviews:

The MFJ-998 Legal Limit *Intellituner*™ Automatic Antenna Tuner

(With a Quick Look at the MFJ-925 as Well)

BY PHIL SALAS,* AD5X

I have to admit that I've become an auto-tuner junkie over the past few years. I use a full-featured auto-tuner with my IC-706MkIIG secondary station at home, a compact auto-tuner with the same transceiver when I operate portable, and a 600-watt auto-tuner with my solid-state HF amplifier. But how about an auto-tuner for legal-limit amplifiers? There are not many out there yet, but one worth looking at is the MFJ-998. This new *Intellituner*™ from MFJ has some unique new features that make using this auto-tuner with an amplifier a truly simple, user-friendly operation.

Photo A– The new MFJ-998 provides automatic antenna matching for QRP to full-legal-limit stations. (All photos by the author)

MFJ-998 Auto-Tuner Basics

The MFJ-998 *Intellituner*™ requires just 5 watts of transmit power for tuning and can match impedance ranges from 12–1600 ohms at up to 1500 watts CW and SSB, meaning you can use this auto-tuner from QRP to full-legal-limit power levels. Of course, like all relay-based auto-tuners, you should tune at a low power level (5–30 watts) with the amplifier off-line. Tuning is very fast, usually occurring in less than a second. Unlike the typical SWR search algorithms normally used, the MFJ-998 uses MFJ antenna-analyzer circuitry and firmware to actually measure the antenna system impedance and then calculate the L/C (inductance and capacitance) values needed for matching. The proper L/C values are then snapped in place and fine-tuned if necessary. Only if the antenna impedance is outside the analyzer measuring range will the tuner revert to an adaptive search algorithm, which requires a slightly longer tuning time.

Now for some of the MFJ-998 features: First, there are both analog and digital meters which give detailed power and SWR information and provide the means for setting a variety of parameters. The tuner also has manual tuning capability, A/B antenna switching, and separate coax and wire-output connectors. For an end-fed wire, a high-voltage ceramic feed-through connector is provided, which is connected in parallel with coax Antenna 1. This means you may pick either a long wire or a coax feedline (but not both) for Antenna 1. Antenna 2 is a coax port only. The two antenna ports have four memory banks with 2500 memories each (20,000 memories total), permitting the tuner to memorize up to four different antennas per antenna port. Thus, when you are in the auto-tune mode and you transmit on a frequency used previously, tuning is virtually instantaneous.

For tuning, you can set the target SWR (default is 1.5:1), select between semi-automatic and automatic tuning (default is automatic), and pick the auto-tuning start SWR (default is 2:1). The analog cross-needle power/SWR meter can be set to low power (300 watts forward/60 watts reverse power), high power (3000 watts forward/600 watts reverse power), or automatic ranging (default). The digital meter displays both forward and reverse power, frequency, and SWR. The digital meter can also display power and SWR on a bar-graph, display the inductance and capacitance values determined for matching (which you can use to make your own external fixed matching network), and also is used for setting the various menu items.

Besides the metering, there is also an audible indicator to let you know the approximate SWR with a series of beeps when tuning is complete—whether you need to increase tuning power (by beeping "QRO" in Morse code), that you are tuning with exces-

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Photo B– Forward and reflected power, SWR, and feature setups are handled by the integral digital meter and pushbutton controls.

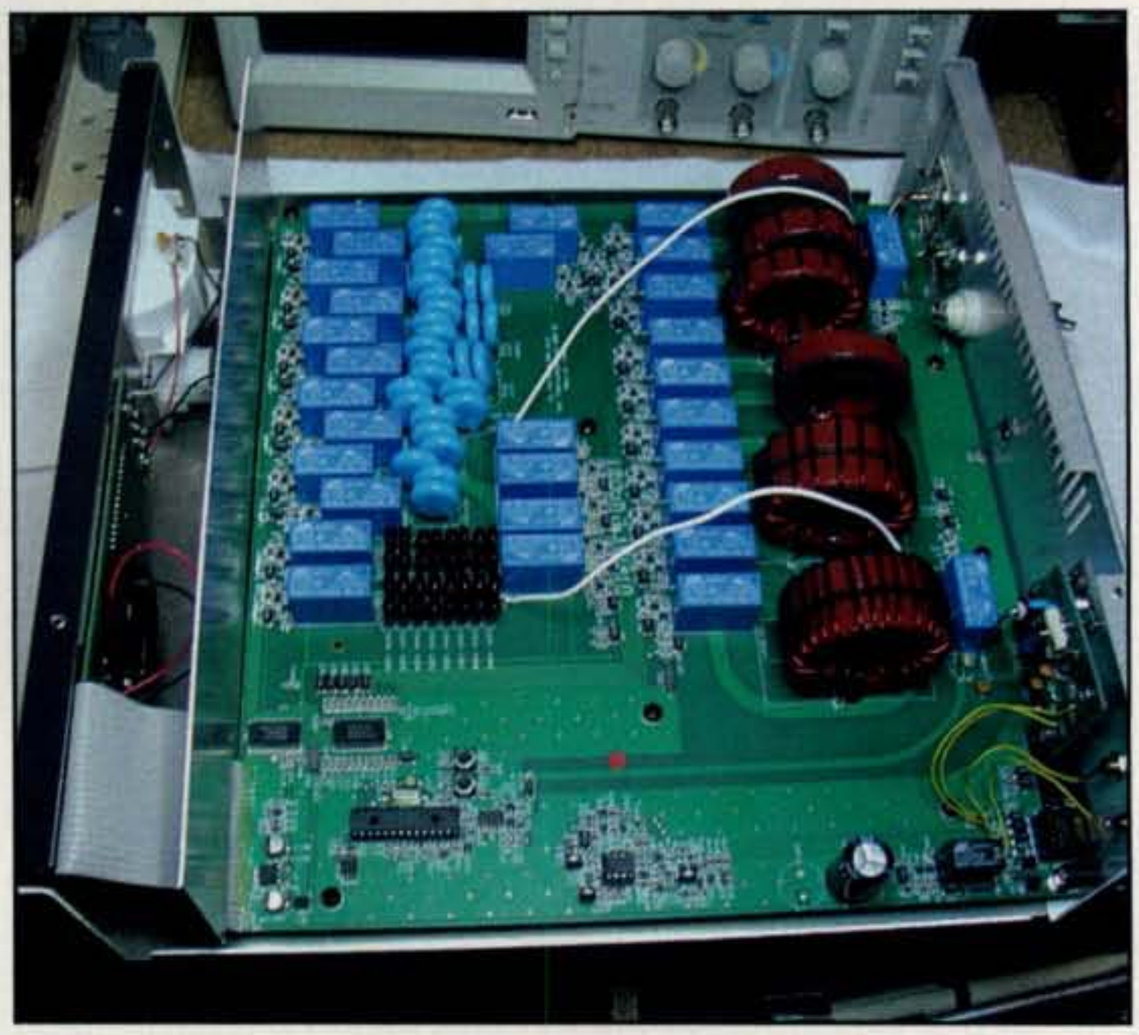

Photo C– Large toroids, RF capacitors, and 16-amp relays are the keys for high-power operation of the MFJ-998.

sive power (by beeping "QRP" in Morse code), or that you are transmitting with more than 1500 watts (by beeping "QRT" in Morse code). This same information is also displayed on the digital display, and the audible indication can be turned off if desired. If you try to tune with excessive power, tuning will be inhibited. Also, under the "greater than 1500 watt" transmitting condition, the MFJ-998 automatically bypasses itself.

The MFJ-998 really shines with a couple of well-thought-out amplifier interface features. First, you can (and should) feed your amplifier-enable keying signal through the MFJ-998 AMP ENABLE IN/OUT ports on the rear panel. This path is then interrupted whenever the MFJ-998 starts tuning, which automatically takes your amplifier off-line. At the same time, the tuner can control your transceiver through an optional transceiver interface cable, which puts your transceiver into a low-power CW tune mode. These features let you leave the MFJ-998 in the fully automatic mode, so it can start tuning whenever the SWR exceeds your programmed set-point without your having to do anything at all! The amplifier is automatically taken off-line, your transmitter outputs a low-power tuning signal, the MFJ-998 tunes, and then everything is all restored to normal operation —typically in a fraction of a second. The second amplifier interface feature is a programmable SWR set-point that disables the amplifier when the SWR exceeds a value that you consider safe for your amplifier regardless of whether tuning has occurred (default is 2:1).

Physical Characteristics

Being a full-legal-limit antenna tuner, the MFJ-998 is the largest in the MFJ auto-tuner line-up at $12\frac{3}{4}$"W × $14\frac{3}{4}$"D x 4"H, and weighing approximately 7 pounds. Photo A shows the front panel and photo B shows a close-up of the digital meter and pushbutton controls. Of course, I couldn't wait to take the cover off, so photo C shows an internal view of the MFJ-998. Note the large inductors, which are both soldered and tie-wrapped to the printed circuit board to stabilize them and protect the tuner from damage. The capacitors on the left are high-current, low-dissipation devices that are stacked to meet the worst-case voltage requirements of the tuner. Also note the aluminum shield between the main PC board and the digital/analog board. This shields the digital/analog board from the high RF fields possible on the main board, and shields the main board from digital "noise" that may be generated from the analog/digital board. The L/C relays are all highvoltage 16-amp relays.

On the rear of the MFJ-998 you'll find the expected RF connectors, and several non-RF connectors as shown in photo D. The non-RF connectors are on the left side of the photo and include DC input, the amp-enable feed-through ports previously discussed, an RJ-45 connector for connecting an optional transceiver interface cable between the tuner and most current HF radios, and an RS-232 port for downloading updated firmware from MFJ as features are added over time.

With a transceiver interface cable, the MFJ-998 "commands" your transceiver to output a low-power CW tune signal when tuning starts, and the tuning process is controlled by either the tuning control on the radio or the TUNE button on the MFJ-998 (depending on the transceiver), or automatically by the MFJ-998. You select the transceiver with which you are interfacing through the menu system.

While you can purchase the appropriate interface cable from MFJ, you also can easily build your own with the information provided in the MFJ-998 manual. In my case, I built the equivalent of the MFJ-5114Y3 interface cable for my Yaesu Ft-1000 MP MkV. Normally, all you need to do is take a short CAT5 cable and cut off the RJ-45 connector from one end. Then solder on the appropriate connector for your trans-

Photo D– Note the amplifier bypass connectors (labeled "Amp Enable"), as well as connectors for firmware upgrades and transceiver control.

The MFJ-925
The Other End of the Spectrum

The MFJ-998 occupies the high-end of the MFJ *Intellituner*™ line. At the bottom of the list is the compact, low-cost ($179.95 list) MFJ-925. Like its bigger brothers, the MFJ-925 has a very large matching range and uses MFJ antenna analyzer circuitry and software to determine matching components. It also has manual tune, auto-tune, and sticky-tune features, and audio SWR and warning indications. It even has a built-in software SWR/Power calibration routine. However, it has just one coax antenna port, although MFJ supplies a banana plug for connecting an end-fed wire to the coax output. Also, LEDs are used to provide information on the tuning status.

The MFJ-925 shares the same transceiver interface cables as the MFJ-998. It can be powered through this cable, an external DC source, or through a built-in bias-T which permits you to supply operating voltage on the center conductor of the input coax using an MFJ-4116 or MFJ-4117 bias-T voltage injector. This means you don't need to run separate DC power cables to a remotely located MFJ-925 (for remote operation you just leave the tuner set for auto-tune so that it tunes automatically whenever the SWR exceeds 2:1). Photo E shows the MFJ-925 with an IC-706MKIIG, and photo F shows the rear connections. Photo G shows an internal view of the MFJ-925.

If you don't need all the features of the higher-end auto-tuners, the low-cost MFJ-925 may be what you are looking for. While it is targeted for portable use, its 2-watt minimum tuning requirement and 200-watt SSB/CW power capability permit it to work well with virtually all transceivers in any home or portable setup.

Photo F– Transceiver interface and coax interconnections between the MFJ-925 and the IC-706MkIIG.

Photo E– The MFJ-925 with the author's IC-706MkIIG.

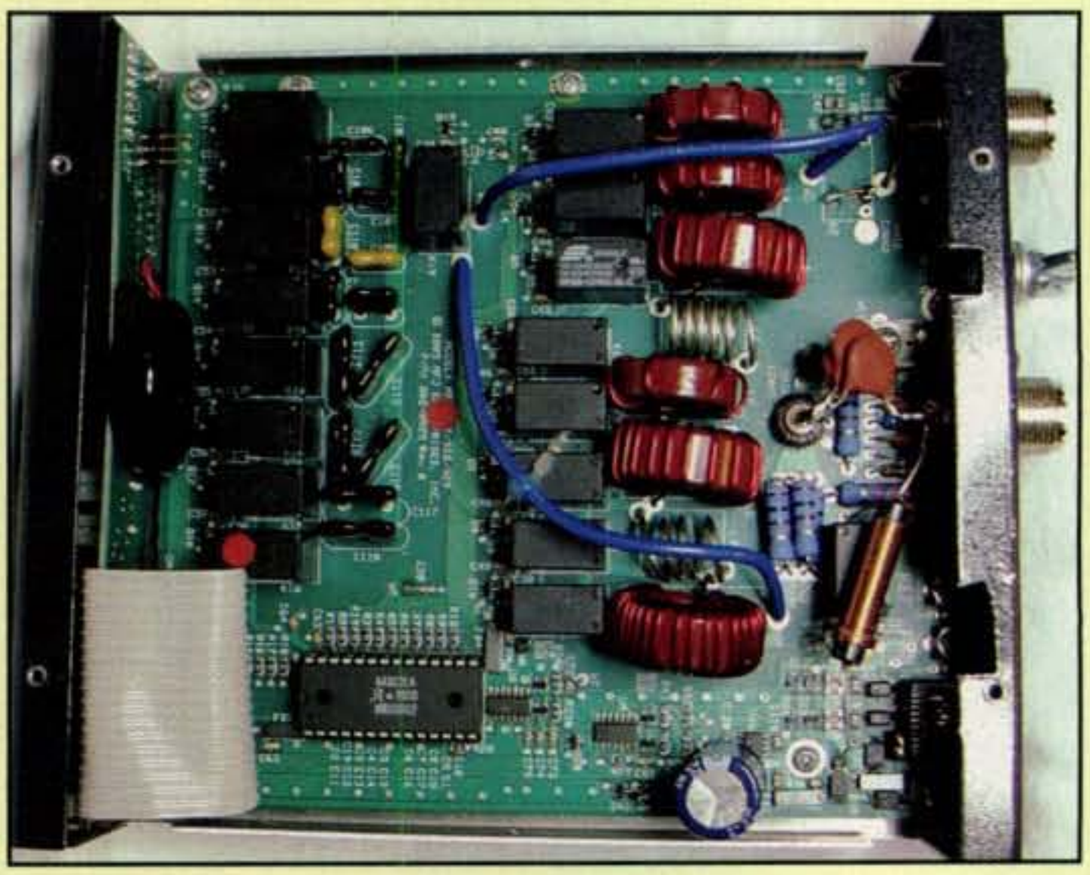

Photo G– Inside view of the MFJ-925. The inductor on the right-hand side is part of the internal bias-Tee, and the audio transducer is in the lower center. The author nibbled notches in the backside lip so he could more easily play with the calibration procedure.

ceiver, wiring it as shown in the manual. I'll bet I spent no more than 10 minutes making this cable.

Using the MFJ-998

The MFJ-998 manual has a "Fast Start" section so you can start using the tuner without getting into the nitty-gritty details of the manual. A simple, yet detailed drawing shows how to connect your rig, antenna, and DC power. Then you simply transmit a 5–30-watt constant carrier signal. If the SWR is greater than the default 2:1 "start-tuning" value, the MFJ-998 will auto-tune to an SWR less than 1.5:1, or you can push the TUNE button while transmitting and the MFJ-998 will auto-tune to less than 1.5:1 regardless of the SWR. However, *read the manual!* There are a ton of parameters that you may want to consider changing based on your particular requirements. Also, you will need to "tell" the MFJ-998 which type of transceiver you have if a transceiver interface cable is used.

Now on to the testing. The first thing I wanted to do was check the accuracy of the digital power meter. For this I used my new Tektronix TDS-2022B 2 GB/s digital oscilloscope which was calibrated with NIST-traceable test equipment. As you can see in Table I, the worst-case measurement discrepancy between the MFJ-998 power meter and the TDS-2022B oscilloscope was 6%, with most measurements well within 4%.

Incidentally, should you ever want to recalibrate the SWR circuitry for any reason, the MFJ-998 has an excellent built-in software-based calibration procedure. You just call up the internal SWR cal procedure, transmit into a dummy load at 100 watts, and adjust the FWD trim pot for 100 watts forward power as indicated on the analog and digital meters. You then reverse the transmitter and dummy load, transmit in the reverse direction through the MFJ-998, and adjust the REV trim pot for 100 watts reverse power indicated on both the analog and digital meters.

Band	Low Power 2022B	Low Power 998	Nominal Power 2022B	Nominal Power 998	Med Power 2022B	Med Power 998	High Power 2022B	High Power 998
160m	31.1	33.0	82.4	82.7	272	268	592	574
80m	30.8	33.3	81.0	83.3	293	293	452	440
40m	29.8	33.0	77.5	81.3	220	228	481	482
30m	29.3	32.7	75.4	79.3	—	—	—	—
20m	31.0	34.0	78.7	82.7	212	222	523	527
17m	32.4	35.0	80.3	83	242	244	515	511
15m	28.7	30.7	71.3	72.7	266	269	522	522
12m	28.6	29.7	70.2	70.0	245	239	487	475
10m	25.8	26.5	65.8	64.5	264	249	500	480

Table I– Tektronix TDS-2022B Oscilloscope vs. MFJ-998 Power Meter. Values are in watts. Low power is the low-power CW tune output of my MkV, about 30 watts; nominal power is the drive power, about 80 watts, for my Ameritron ALS-600 amplifier; medium power is the output of the amplifier when driven with the 30-watt tune power as its input; and high power is the amp output with 80 watts of drive power (I generally run the amp at less than full power).

Now it was time to see how the MFJ-998 could tune my home station antennas. My Butternut vertical has very narrow bandwidths on 160 and 80 meters since the antenna is electrically short on these bands. My 160-meter resonance point is 1817 kHz, and the SWR rises to 20:1 at 1856 kHz. I set my FT-1000 to 1856 kHz and pushed the TUNE button, and in less than a half-second I had an SWR of 1.2:1. I also have a 41-foot vertical fed with a 4:1 balun and a short piece of LMR-400 coax. The SWR on this antenna was greater than 25:1. Tuning on this antenna took about 5 seconds and resulted in an SWR of 1.5:1.

Next I went to 80 meters, where my Butternut resonates at 3560 kHz. The SWR was 20:1 *(yes, that's twenty to one!—ed.)* at 3960 kHz. After I enabled tuning, the SWR dropped to 1.4:1 in a fraction of a second. On 40 meters I switched to my MFJ-1775 rotatable dipole. This is a short, loaded multiband dipole resonant at 7.04 MHz. At the top of the 40-meter band the SWR is 5:1. Again, no problem auto-tuning to a 1.5:1 SWR in a fraction of a second. Finally, I went to 20 meters where the MFJ-1775 antenna is resonant on 14.02 MHz. At the top end of 20 meters the SWR rises to 3:1. The MFJ-998 auto-tuned this impedance almost instantly to less than a 1.5:1 SWR.

My normal operation is a snap. I leave the MFJ-998 in the automatic mode and just transmit when and where I want to without thinking about anything. Also, when my amplifier is on, I know it is fully protected from both high SWR and tuning damage at high power.

Summary

If you are thinking about an auto-tuner for your high-power station, the MFJ-998 *Intellituner*™ should be one of the considerations in your decision-making process. Its unique amplifier-interfacing features, wide matching range, wide selection in transceiver interface cables, accurate digital metering, upgradeable firmware, and low tuning power requirement make this a very flexible auto-tuner for most any station.

List price of the MFJ-998 is $699.95. For more information, contact MFJ Enterprises, 300 Industrial Park Rd., Starkville, MS 39759; phone 662-323-5869 or 800-647-1800; on the web: <http://www.mfjenterprises.com>.

BY FREDERICK O. MAIA,* W5YI

Motorola Seeks to Acquire Parent of Yaesu; Yaesu Exec. VP K7BV Explains Impact on Hams

On Monday, November 5th, Motorola distributed a press release stating that one of its subsidiaries, MI, Inc., intends to acquire a controlling interest in Vertex Standard "...a provider of two-way radio communication solutions." One of Vertex's subsidiaries is Yaesu, a prominent manufacturer of amateur radio transceivers.

If the tender offer is successful, Motorola will own 80 percent of Vertex Standard, forming a joint venture with Toko Giken, a privately-held Japanese company controlled by Vertex Standard's current president and chief executive, Jun Hasegawa. Toko Giken will own the remaining 20 percent. The joint venture will become a subsidiary of Motorola, but will continue to be headquartered in Japan.

Motorola...

... is a very large publicly-held global telecommunications company with some 66,000 employees. It is headquartered in Schaumburg, Illinois. The brand was born when Chicago's Galvin brothers introduced the world's first car radio in 1930. Galvin Manufacturing Corp. made battery eliminators that enabled home radios to operate on household electric current. Its engineering team then developed a way for radios to operate in moving automobiles.

Paul Galvin called his radios "Motorola," a name he coined from "motor" and "Victrola," meaning "sound in motion." In the late-1930s, Galvin/Motorola introduced its two-way "Police Cruiser" mobile radios. The company made military walkie talkies in the 1940s, and was renamed Motorola in 1947.

Motorola developed and began selling the world's first commercial portable cellular phone in 1984 (see photo). It weighed nearly two pounds. Now, weighing just a few ounces, mobile handsets account for two-thirds of Motorola's $43-billion annual sales revenue. Currently the world's third-largest mobile handset maker (Nokia is the largest with a 40 percent market share), Motorola has been under intense competition from Korea's Samsung Electronics, which recently took over the number two slot.

One-fourth of Motorola's sales come from analog and digital two-way communications—including land mobile—equipment. A third division distributes cable TV set-top boxes and internet-access products. Motorola does not market any amateur radio products, a concern of many who felt the Yaesu division might be sold or closed down, since the amateur radio equipment market is small.

The first commercial "handheld" cell phone, introduced by Motorola in 1984, weighed nearly 2 pounds.

Recently, Motorola's earnings and profit margins have fallen short of forecasts, a source of concern to the investing public. Motorola CEO Ed Zander has been under pressure from large investors such as multi-billionaire financier Carl Icahn to return the wireless giant to its former leadership position in the communications industry.

Yaesu...

... got its start in 1956 when a young Japanese electronics engineer and radio amateur, Sako Hasegawa, JA1MP, founded the General Television Service Co., Ltd. in Tokyo. Back then, tube-type TV sets needed a lot of maintenance. He later began developing and marketing two-way communications equipment. Hasegawa's goal was to design and manufacture modern HF single-sideband equipment for the amateur radio market. His first amateur radio product was a crystal-controlled 40-watt 40-meter monoband transmitter.

In 1964 Sako moved his headquarters to the Yaesu district in Tokyo and (in 1973) changed the name to Yaesu Musen Co., Ltd. After moving his headquarters again, he opened the Yaesu USA office in Los Angeles.

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e-mail: <w5yi@cq-amateur-radio.com>
(This material also appeared on the W5YI.org website.)

Sako died in 1993 at the age of 64 and the company is now managed by his son, Jun Hasegawa. In the mid-1990s, the firm expanded into maritime, aeronautical, data transmission, and other wireless-communication products, which are sold worldwide. In 1998 it acquired Standard Communications Company from Marantz Japan. In 2000 the company name was again changed, to Vertex-Standard. The firm now has about 700 employees with offices in Europe (Amsterdam), the United Kingdom, Australia, the USA, and Hong Kong.

The Joint Venture...

... will give Vertex Standard "access to Motorola's global distribution channels, presenting considerable opportunities for Vertex Standard to drive growth. With Motorola, Vertex Standard will be stronger and better positioned to deliver new and innovative two-way radio solutions for professionals and consumers around the world," Jun Hasegawa said. "As a leading provider and pioneer in two-way radio communication solutions, Motorola is an excellent strategic partner for our business."

Hasegawa added that Yaesu, "...will continue to be focused both on leading DXpedition events as the 'Choice of the World's Top DXers' and on world championships in radio contesting."

Motorola commercial products Vice President Mark Moon said in a statement, "We are extremely pleased to announce this transaction, which will improve our ability to address the growing needs of our two-way radio customers worldwide. We look forward to the continued leadership of Jun Hasegawa and making this new joint venture a success."

The total purchase price for 80 percent of the outstanding shares will be approximately $108 million. The joint-venture company will be called Vertex Standard and will become a subsidiary of Motorola, with headquarters in Tokyo.

The board of directors of Vertex Standard has expressed its support of the tender offer. Japanese law requires that Motorola complete the sale within 60 working days. The deal is expected to close in early January 2008.

Conversation with Yaesu's Sales Manager

To learn more, we spoke with Dennis R. Motschenbacher, K7BV, Executive Vice President of Yaesu's amateur radio sales.

CQ: Can you tell me how this all started? Did Motorola contact Vertex? What is the background of this tender offer?

K7BV: Since those discussions took place at the very highest level of our senior management, I am sorry but I do not have those details. Frankly, due to the potential impact those talks would have on the two-way radio marketplace, it is no surprise to me that both companies took every possible precaution to ensure that the discussions were kept secret until both firms were sufficiently comfortable with the outcome and able to make their intentions public.

CQ: I note that Motorola's Mark Moon (a Senior Vice President) talks about the joint venture enabling Motorola and Vertex Standard "to deliver an enhanced combined product offering to new regions and customers worldwide." That sort of hints that Motorola will be involved in product development. Just what is Motorola's interest? Are they interested in ham radio as well as land mobile equipment?

K7BV: I am confident that Motorola is well aware that Vertex Standard

makes every possible effort to develop technology and product designs that can be used by all communications services served by our company. Because of that fact, amateur radio operators today are using technology to chase DX and enjoy QRM-free QSOs that might not have been available if our company had not been able to spread out R&D cost between the various divisions at Vertex Standard. So, while the Amateur Division has benefited from work over on the Land Mobile side of the company, so too has that successful division benefited from technology lessons learned by the Yaesu Division.

It is my understanding that Motorola respects the engineering capabilities of our company and is quite eager to gain access to the talents of the Vertex Standard product development team. I expect to see plenty of joint work on future product development projects—work that will enhance product performance across all Vertex Standard and Motorola two-way radio divisions, Yaesu products most definitely included. I do not expect to see Yaesu products beginning to take on the look of Motorola commercial radios and vice versa.

Expect Yaesu amateur radio products to have full benefit of any new technology and products that result from the combined efforts of the Motorola and Vertex Standard development teams working together. I look forward to witnessing Yaesu bringing some truly innovative Yaesu radios to the amateur radio market in the not too distant future.

Let me point out an often-overlooked fact about our company. Certainly, throughout amateur radio circles around the world, Mr. Sako Hasegawa, JA1MP, is recognized for founding and building Yaesu as a leading-edge amateur radio focused company that introduced advancements in rig performance that have totally revolutionized the hobby.

What is not commonly known is the fact that the amateur community can thank his son, Mr. Jun Hasegawa, for dramatically expanding the company to now also be a major player in the commercial two-way radio industry. All of that Vertex Standard commercial radio business provides hugely beneficial economies of scale that keep the costs of our Yaesu operations down while providing plenty of R&D funding to keep us at the top of the game, which means appropriately priced leading-edge radios for us hams. Jun Hasegawa is not going to let his father's legacy and all of the work he personally has put into continuing the power of that legacy disappear—you can bet on that, period.

CQ: How will a smaller company like Vertex Standard adjust to now being owned by a huge corporation with large investors who are primarily interested in profits? Will Motorola be exerting influence over the future direction of Yaesu?

K7BV: While it is true that our company originally was privately held, it actually has been traded for some time now on the Jasdaq Securities Exchange in Japan. It has been made abundantly clear to me from the day I joined the company reporting directly to Mr. Jun Hasegawa that we have shareholders looking over our shoulders, too.

The other managers at Vertex Standard I have met from our operations around the world perform just like me—with a close eye on profitability, because we all know we are accountable to those individuals who have invested in the company that pays our salary. We will not have any trouble acclimating ourselves to the needs of the Motorola investors.

I believe that both companies share a number of key similarities in their respective business models, including developing and producing quality products, providing good customer service,

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and making a reasonable profit while doing that. There is sufficient similarity in business models to promise a future for all of the Vertex Standard operations, Yaesu included.

Let's not forget what the secret talks discussed above did *not* generate. Most important to radio amateurs is the talks did *not* include an intent to reduce, close, or spin off Yaesu. It appears to me that Motorola wanted the total success formula of Vertex Standard, and that formula could not be complete without the technology, sales revenue, and profit contribution that continue to flow from a robust and growing Yaesu operation.

Since the announcement on Monday, Mr. Hasegawa has made it clear to all of us involved in Yaesu operations that business will continue as it has in the past under his direct management. The amateur radio community can expect that Mr. Hasegawa will continue to push us to be the best in the business, now utilizing the additional strength brought to that goal through access to the huge financial and people assets at Motorola.

By the way, Fred, I see some attempts are being made by individuals and/or companies in the amateur radio community to suggest that Yaesu would be weakened or worse, destroyed, because of the Motorola move. Those are pretty shortsighted views from my insider perspective. If there might be a need to worry about the health of any amateur radio equipment manufacturer because of the Vertex Standard/Motorola joint venture, I might suggest that concern would be better spent contemplating the long-term viability of companies that must now compete with a new Yaesu that will be stronger than it has ever been before because of our access to financial, marketing, and competition strategic planning talent unequalled in the industry. I expect our loyal customers to come to the same logical conclusion after they have sufficient facts and time to properly consider this situation.

CQ: What are the long-range plans for Yaesu transceivers? Are we going to continually see new Yaesu products being developed? What changes can the amateur radio community expect in Yaesu marketing, pricing, customer service, etc.?

K7BV: Clearly, Yaesu has introduced more new amateur radio products in the last 12 months than any of our competitors. Included in those introductions are some incredibly exciting innovations such as our first-in-the-amateur-radio community Bluetooth-equipped FTM-10R/E radio. Mr. Hasegawa assures me that we have no intention whatsoever of letting up on the steady flow of new amateur HF, VHF, and UHF home, portable, mobile, and hand-held radios.

A quick look at some of the Motorola websites to view the company's products likely will send any active ham's mind spinning with thoughts about all the neat Motorola technology that might find its way into our radios in the future. The challenge that will be created for others in the amateur radio transceiver manufacturing industry cannot be anything but healthy.

Your question about Yaesu marketing, pricing, customer service, etc., pretty much summarizes the biggest concerns of our dealers and our loyal Yaesu radio users. I want everyone to know

WRC 2007 Under Way in Geneva

As we went to press, representatives of nearly 200 nations were gathered in Geneva, Switzerland, finishing up a four-week World Radiocommunication Conference, known as WRC-07. Amateur radio was represented at the conference by a team from the International Amateur Radio Union (IARU). Two items on the agenda were of specific interest to radio amateurs:

WRC-07 Agenda Item 1.13 covers a review of the allocations to all services in the HF bands between 4 MHz and 10 MHz excluding those allocations to services in the frequency range 7000 to 7200 kHz, which includes most of our amateur 40-meter band. Those frequencies were resolved at the last conference (see below). This could, however, present a threat to 7200–7300 kHz and 60 meters in ITU Region 2 (our hemisphere), or it could provide an opportunity for further realignment.

There are several ITU proposals on this item. Among them:

1. to provide a primary allocation at 7.200 to 7.300 MHz in Regions 1 and 3 "...to globally harmonize the Amateur Service allocations" and

2. to provide a worldwide secondary amateur allocation of 5.260 to 5.410 MHz "...to allow communications at times when propagation conditions do not permit the use of the presently allocated bands at 3.5 and 7 MHz."

The last conference, WRC-03, agreed to shift HF broadcasting stations in ITU Regions 1 and 3 out of the 7100—7200 kHz band and to reallocate the band to the amateur service in those two regions. (Region 1 includes Europe and Africa; Region 3 includes the Middle East. Asia, the South Pacific, and Australia.) It marked the first time that an HF broadcasting band has been relocated to accommodate the needs of another service.

The allocation in Region 2 (North, Central, and South America) of 7000–7300 kHz remains exclusively amateur. The HF broadcasting band in Regions 1 and 3 will become 7200–7450 kHz and in Region 2, 7300–7400 kHz. The change will take effect on March 29, 2009. In Regions 1 and 3 the 7100–7200 kHz band will become exclusively amateur on that date.

WRC-07 Agenda Item 1.15 will consider a secondary allocation to the amateur service in the frequency band 135.7 to 137.8 kHz in all three ITU Regions. Such a low-frequency allocation is already available in many European countries, and Canada has been pressing for such an allocation in the international table. This band is currently allocated to the maritime mobile and fixed services. (136 kHz is in the 2200-meter band, a wavelength of nearly 1.4 miles!)

In addition, IARU President Larry Price, W4RA, writing in the issue of the *ITU News Magazine* made available to conference delegates, set out the amateur radio community's goals for the next WRC, in 2011. They include:

- Allocating the 6-meter band (50–54 MHz) to amateur radio in Region 1, providing a single worldwide allocation;
- Creating a small, low-frequency amateur band at 495–510 kHz, either on a primary or secondary basis, to permit development of "reliable groundwave systems for disaster relief and providing spectrum for digital signal processing experimentation;"
- Making sure hams continue to have access to frequencies "at regular intervals" above 275 GHz as allocations are made to other services. One option suggested is to provide hams with narrow primary allocations adjacent to wider, secondary bands; and
- To consider—in any review of HF allocations—expanding the 30-, 20-, and 17-meter amateur bands in order to better accommodate increased activity.

The conference ended November 16. See this issue's "Ham Radio News" page for relevant highlights. If decisions warrant it, we will have expanded coverage in next month's "Washington Readout."

that within mere hours of the public announcement of Motorola's intentions, Mr. Hasegawa had instructed me to do everything I could to ensure our dealers and Yaesu owners that there would be no changes in pricing, warranty, customer service, or other important policies because of the pending offer by Motorola.

All of Mr. Hasegawa's general internal announcements as well as our private communications clearly indicate to me that the question of Yaesu's future was a far more important topic of discussion at the negotiation table than many who would love to cast a cloud of doubt about the new joint venture want the general public to believe.

In summary, let me say that I believe that amateur radio as a whole and Yaesu customers specifically are going to have an enriched enjoyment of the Amateur Radio Service as a result of Motorola's involvement with Vertex Standard and Yaesu.

Dennis also sent me a list that he had prepared to respond to inquiries about the merger. This is what it said:

• Vertex Standard (meaning Yaesu to us in the amateur radio hobby) will remain a separate, global organization with distinct resources governed by the Board of Directors comprised of four Motorola representatives and one Toko Giken representative. Toko Giken is a privately held Japanese company, controlled by the founder's family. It currently holds 29.2% shares of Vertex Standard.

• Mr. Jun Hasegawa (my boss), son of Sato Hasegawa, JA1MP, the founder of Yaesu, will continue to take part in the management of Vertex Standard in his capacity as the Representative Director, President, and CEO of Vertex Standard after the tender offer. The day-to-day management of the joint venture will be the responsibility of Mr. Hasegawa and his senior leadership team, who are also expected to continue. Count me as one of those who will continue with Yaesu.

• Our business will continue to be operated as is, and we will continue to actively develop new products and operate the business as a leading manufacturer of amateur radio, marine, land mobile, and airband radios.

• The Vertex Standard brand of equipment (Standard brand in Japan) will continue to exist. The current Vertex Standard brand strategies are highly respected by Motorola and will be continued. Since Motorola appreciates our Yaesu brand strategy, there will be no change to it.

• There will not be a Motorola brand of amateur radio equipment replacing or competing with Yaesu. There is absolutely no reason to have the slightest concern about equipment warranties and the continuation of support for our products.

• Yaesu customers can expect to see positive benefit from the fact that:

(1) Vertex Standard has an experienced engineering team that, combined with Motorola's extensive engineering talent, will develop new, innovative products. Personally, I cannot wait to see what this joint engineering effort will bring to amateur radio!

(2) Cost synergies will be realized through the use of Motorola's buying power to reduce the joint venture's costs for raw materials. Hams are known to enjoy seeking out the best buy for their hard-earned money; expect to see Yaesu products remain highly competitive and provideg excellent value for your investment.

• Because Mr. Hasegawa will continue to manage the day-to-day operations of Vertex Standard, we do not expect to see changes in the existing Yaesu dealership, pricing, and rebate philosophies as a result of the joint venture.

Finally, Dennis added, "These are historic exciting times for Yaesu, our customers, and amateur radio. The future is bright and the potential for incredible technological advancements for amateur radio is immense. We are glad you will be there with us as the positive effects of the Vertex Standard/Motorola joint venture unfold."

73, Fred, W5YI

Announcing:

The 2008 CQ World-Wide RTTY WPX Contest

February 9–10, 2008

Starts: 0000 GMT Saturday Ends: 2400 GMT Sunday

Logs are due no later than March 7, 2008

I. Period of Operation: Single Operator stations may operate only 30 hours of the 48-hour contest period. Off time periods must be a minimum of 60 minutes in length and must be clearly marked on the Summary Sheet. Multi-Operator stations may operate the entire 48-hour contest period.

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

III. Bands: The 3.5, 7, 14, 21, and 28 MHz bands may be used. No 1.8 MHz or WARC bands. *Observance of established band plans is strongly encouraged.*

IV. Terms of Competition (for all categories): All entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score. Transmitters and receivers must be located within a 500-meter diameter circle or within the property limits of the station licensee, whichever is greater. All antennas must be physically connected by wires to the transmitters and receivers used by the entrant. All high power categories must not exceed 1500 watts total output power on any band. Only the entrant's callsign can be used to aid the entrant's score. RTTY (Baudot) mode only. No unattended operation or contacts through gateways or digipeaters are permitted.

Any form of DX alerting assistance is permitted in ALL categories.

V. Categories:

1. Single Operator (Single Band and All Band)

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

(b) Low Power: Same as 1(a) except that (i) output power is 150 watts or less and (ii) only All Band entrants may enter the Low Power category. Stations in this category compete with other Low Power stations only.

(c) Rookie: An entrant in this category shall, at the time of the contest, have been licensed as a radio amateur for three years or less. If you are entering this category, please indicate on your Summary Sheet.

2. Multi-Operator (All band operation only)

(a) Single-Transmitter: Only one transmitted signal at any time. Limited to 6 band changes in any clock hour (0 through 59 minutes.) For example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes. Violation of the 6-band change rule will result in reclassification to the Multi-Multi category.

(b) Multi-Two: A maximum of two transmitted signals are allowed as long as each transmitter is on a different band. Each of the two transmitters is limited to 6 band changes in any clock hour (0 through 59 minutes.) For example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes. Violation of the 6-band change rule will result in reclassification of the entry to the Multi-Multi category. Each transmitter must keep a chronological log containing its own serial numbers and unique transmitter identifier (0 or 1 in the Cabrillo format).

(c) Multi-Transmitter: No limit to transmitters, but only one signal and running station allowed per band.

3. SWL: SWL's are required to log the callsigns of both the heard and correspondent station. Scores are based only upon the heard station, using the same rules as transmitting stations. Correspondent callsigns may not appear more than three times per band in your log.

VI. Exchange: RS(T) report plus a progressive contact three-digit serial number starting with 001 for the first contact. (Continue to four digits if past 999.) Your log *must* show the correct serial number sent and received for each contact.

VII. Serial Numbers and Identification of Transmitters: Single Operator log entries must contain a progressive three (or four) digit serial number sequence starting with 001 for the first contact. Multi-Two log entries must follow the same serial number scheme for each transmitter separately, and identify the transmitter (0 or 1) that makes each QSO. Multi-Transmitter (Multi-Multi) log entries must follow the same serial scheme as Single Operator log entries, but use separate serial numbers for each band. *Multi-Multi logs need not identify the transmitter that makes each QSO.*

VIII. QSO Points:

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

2. Contacts between stations on the same continent but in different countries, and contacts with maritime mobile stations are worth two (2) points on 28, 21, and 14 MHz and four (4) points on 7 and 3.5 MHz.

3. Contacts between stations in the same country are worth one (1) point on 28, 21, and 14 MHz, and two (2) points on 7 and 3.5 MHz.

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

1. A prefix is the letter/numeral combination which forms the first part of the amateur call. Examples: N8, W8, AB8, DL5, DJ2, HG1, WD200, WF96, 3DAØ, GB75, ZS66, U3, etc. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix. A station operating from a DXCC country different from that indicated by its callsign is required to sign portable. The portable prefix must be an authorized prefix of the country/call area of operation. In cases of portable operation the portable designator will then become the prefix. Example: AB5KD operating from Wake Island would sign AB5KD/KH9 or AB5KD/NH9. American DX (KL7, KH6, KP2, KH3, etc.) operating within the 48 states must sign with a full designator of their choice. KH6XXX operating from Ohio must use an authorized prefix for the U.S. 8th district (W8, K8, etc.) United States portable stations are not permitted to select a portable prefix designation. For example, WS7I/2 is permitted, but WS7I/WY2 or WS7I/KZ2 is not. Portable designators without numbers will be assigned a zero (Ø) after the second letter of the portable designator to form a prefix. Example: N8BJQ/PA would become PAØ. All calls without numbers will be assigned a zero (0) after the first two letters to form the prefix. Example: XEFTJW would count as XEØ. Maritime mobile, mobile, /A, /E, /J, /P, or interim license class identifiers do not count as prefixes.

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

X. Scoring:

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

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

3. A station may be worked once on each band for QSO point credit.

XI. Awards: First place certificates will be awarded in each category listed under Section V in every participating country and in each call area of the United States, Canada, Australia, and Japan. All scores will be published. To be eligible for an award a Single Operator station must operate at least 12 hours. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award only. (Single band entrants who also operate on other bands are encouraged to submit their logs to aid in the log checking process. *Note:* Logs

containing more than one band will be judged as all-band entries unless they are submitted in Cabrillo format and the single band entry is specified in the Cabrillo header.) All certificates and plaques will be issued to the licensee of the station used. To the extent sponsors or winners purchase plaques through the Contest Director, plaques will be awarded in the following geographical areas for each of the Categories listed in Rule V: World, North America, USA, Canada, South America, Africa, Europe, Asia, and Oceania.

XII. Club Competition. A plaque will be awarded each year to the club that has the highest aggregate scores from logs submitted by members. The club must be a local group and not a national organization. Participation is limited to members operating within a local geographical area defined as within a 275-km radius from center of club area (exception: Dxpeditions specially organized for operation in the contest and manned by club members; club contributions of Dxpedition scores are proportioned to the number of club members on the Dxpedition). Indicate your club affiliation in the Cabrillo file. To be eligible for an award, a minimum of three logs must be received from a club, and if requested by the Contest Director a club officer must verify a list of participating club members.

XIII. Instructions for Preparation of Logs:

1. All logs should be submitted in Cabrillo format via e-mail to <wpxrtty@kkn.net>. Logs must be submitted no later than March 7, 2008. **In the "Subject:" line of your e-mail message please include your callsign**. Logs should be sent as an e-mail attachment, not in the text of the e-mail, and the filename for the log should be *yourcall.log*. Receipt of all e-mailed logs will be confirmed via return e-mail. To view a sample Cabrillo QSO template for this contest, go to <www.kkn.net/~trey/cabrillo/wpx-rtty.txt>.

2. Entries from Multi-Two and Multi-Multi stations must be merged into a single chorono-logical log. In the case of Multi-Two stations, the log must also indicate clearly which station (shown as 0 or 1 in column 81 of the Cabrillo log) made each contact.

3. If the Cabrillo format is unavailable, contact the Log Checker, Paolo Cortese, I2UIY at <i2uiy@cqww.com>.

4. Other questions pertaining to the CQ WPX RTTY Contest may be sent to the WPX RTTY Contest Director, Glenn Vinson, W6OTC, 488 Locust Street, #401, San Francisco, CA 94118 USA, e-mail: <w6otc@garlic.com>.

XIV. 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 QSO's or multipliers will be deemed sufficient cause for disqualification. An entrant whose log is deemed by the WPX RTTY Contest Committee to contain a large number of discrepancies may be disqualified as a participant operator or station for a period of one year. If within a five-year period the operator is disqualified a second time, he will be ineligible for any CQ contest awards for three years.

XV. Deadline: All entries must be submitted NO LATER than **March 7, 2008.** E-mail logs are subject to the same deadline. Logs postmarked after the deadline may be listed in the results but will be ineligible for any awards.

math's notes

BY IRWIN MATH,* WA2NDM

Low-Cost Test Equipment

First I would like to wish a very happy and healthy New Year to all of my loyal readers. I sincerely hope that this is the year when all of those dreams and wishes you have had for so long really do come true. Always remember, you never know what a new year (or tomorrow, for that matter) will bring!

In the August 2007 issue we described some low-cost test equipment that the experimenter on a tight budget could build. The response was good, so we thought we'd continue the trend this month.

A Simple Zener Diode Tester

Our first offering is a simple Zener diode tester that will enable you to easily check the operating voltage and quality of those unmarked regulator diodes you may have in the junk box. Looking at fig. 1, the circuit consists of a 555-based astable oscillator operating at a frequency of about 1 kHz. The nearly square wave produced is then applied to a small audio step-up transformer (Mouser 42TM117-RC), where it is boosted to about 100 volts or so. The two 1N4004 diodes are arranged in a simple voltage doubler and rectify the AC, producing DC across the two series-connected 4.7-µF capacitors. Note that these capacitors must be high-voltage devices (Mouser 647-UVR2A4R7MOD or similar). A dropping resistor (R_d) is then connected from the high-voltage DC point to the Zener diode to be tested and the resulting Zener voltage read on a common DVM. The value of high voltage you obtain across the 4.7-µF capacitor will determine the maximum Zener voltage you can measure, and the R_d resistor should be chosen to allow roughly 1 ma to flow through the Zener.

You can determine the approximate value of this resistor by dividing the high voltage you actually get by .001 (1 ma) or by temporarily connecting a current meter in series with the resistor. A milliampere or so should be adequate for most measurements, however, and will not load the high-voltage portion of the circuit too much. Should you wish more current, you can always decrease the value of R_d, but if you do, be sure to not load the HV supply. Finally, a push-button is included so that current is only drawn from the battery when making an actual measurement.

Crystal Activity Checker

Fig. 2 is a schematic of a simple crystal activity checker. This device is primarily intended to deter-

*c/o CQ magazine

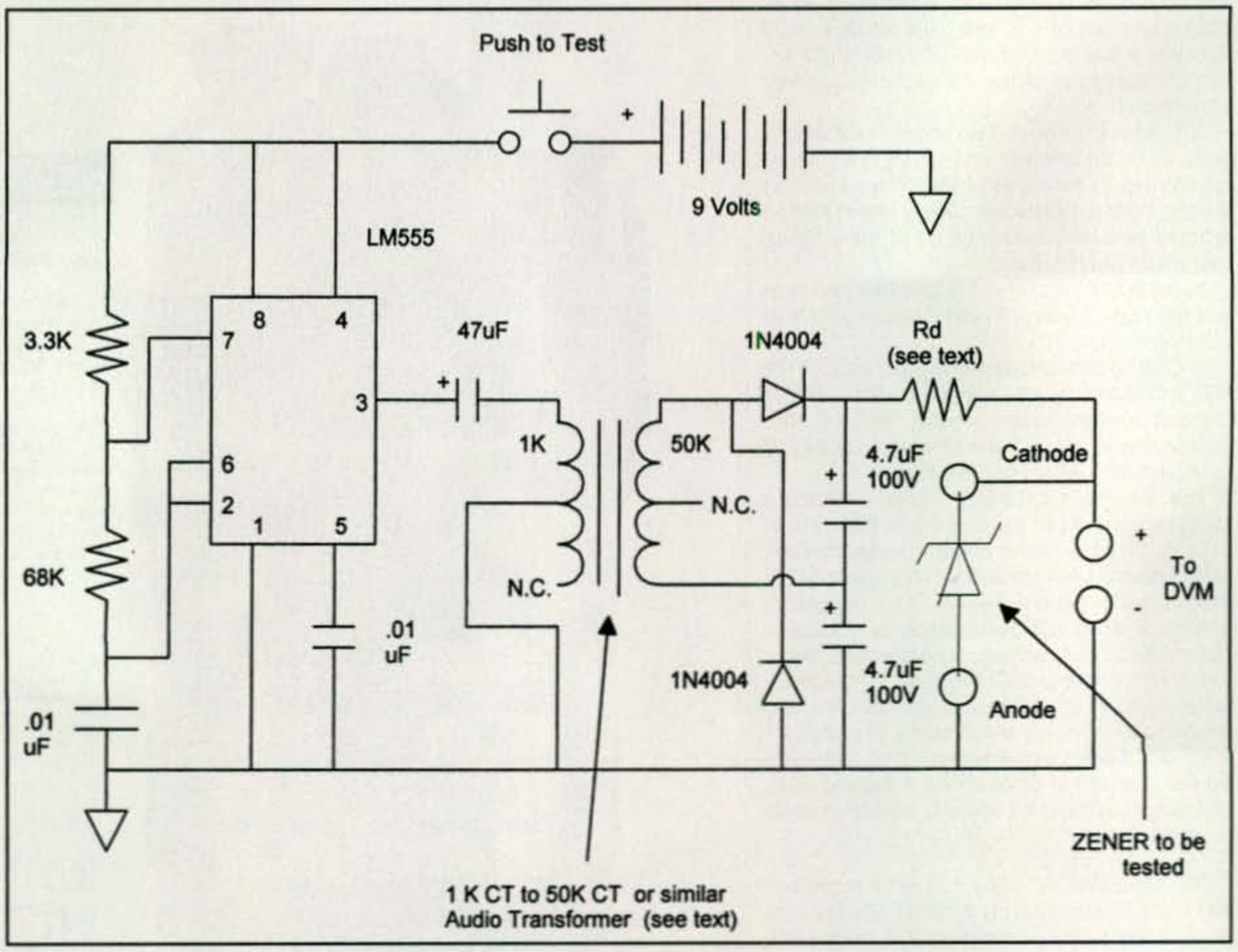

Fig. 1– A simple zener diode tester.

mine if a crystal in the range of approximately 1 MHz to 20 MHz is good or not and roughly how active it is. Note that it will not check the actual frequency, only that the crystal will (or will not) oscillate. A receiver or frequency counter is then needed to find out the exact frequency. The circuit is a common untuned Colpitts oscillator. Output from the oscillator is rectified by a voltage doubler made up of a couple of 1N4148 silicon diodes and then applied to an inexpensive microampere meter. The meter can be any inexpensive surplus device, as it is uncalibrated. The amount of deflection is simply a function of how much RF is produced. As in the first case, a push button is provided to conserve battery life.

In building this device, you may have to experiment with the value of the two 270-pF capacitors to get it to oscillate reliably, so it would be a good idea to have at least one good crystal available for initial testing. This is a great device to bring to a flea market for a quick check on "bargain" crystals. For frequency determination there is usually enough output to drive a nearby receiver.

A Setup for SSB Measurements

Those of you who use SSB will easily be able to approximate the peak power output of your rig by the simple scheme described next. You will need a basic oscilloscope that covers your operating frequency. Most inexpensive "modern" scopes will easily allow operation up to 20 meters, and even the old-fashioned ones with uncalibrated time bases will do. Many of the old-fashioned ones only had bandwidths of 5 or 10 MHz, but since the technique described here can be done at 80 or 40 meters as well, almost any scope will do. You will also need a 50-ohm dummy load. This can be made simply by connecting twenty 1K 1-watt carbon-composition resistors in parallel.

To make the measurement, first connect everything as per fig. 3. Next set the transmitter to CW and quickly tune it up into the dummy load. If you have a 100-watt transmitter, the dummy load (only rated at 20 watts) will heat up rather quickly, but you should be able to adjust everything rapidly enough before it gets too hot. Wait for everything to cool down and then again key the transmitter (in CW), this time adjusting the scope's vertical gain for full-screen deflection. This will be your reference. Keep in mind that if your transmitter produces 100 watts RMS, 70.7 volts (RMS) will be present across the 50-ohm load, so be sure to use a

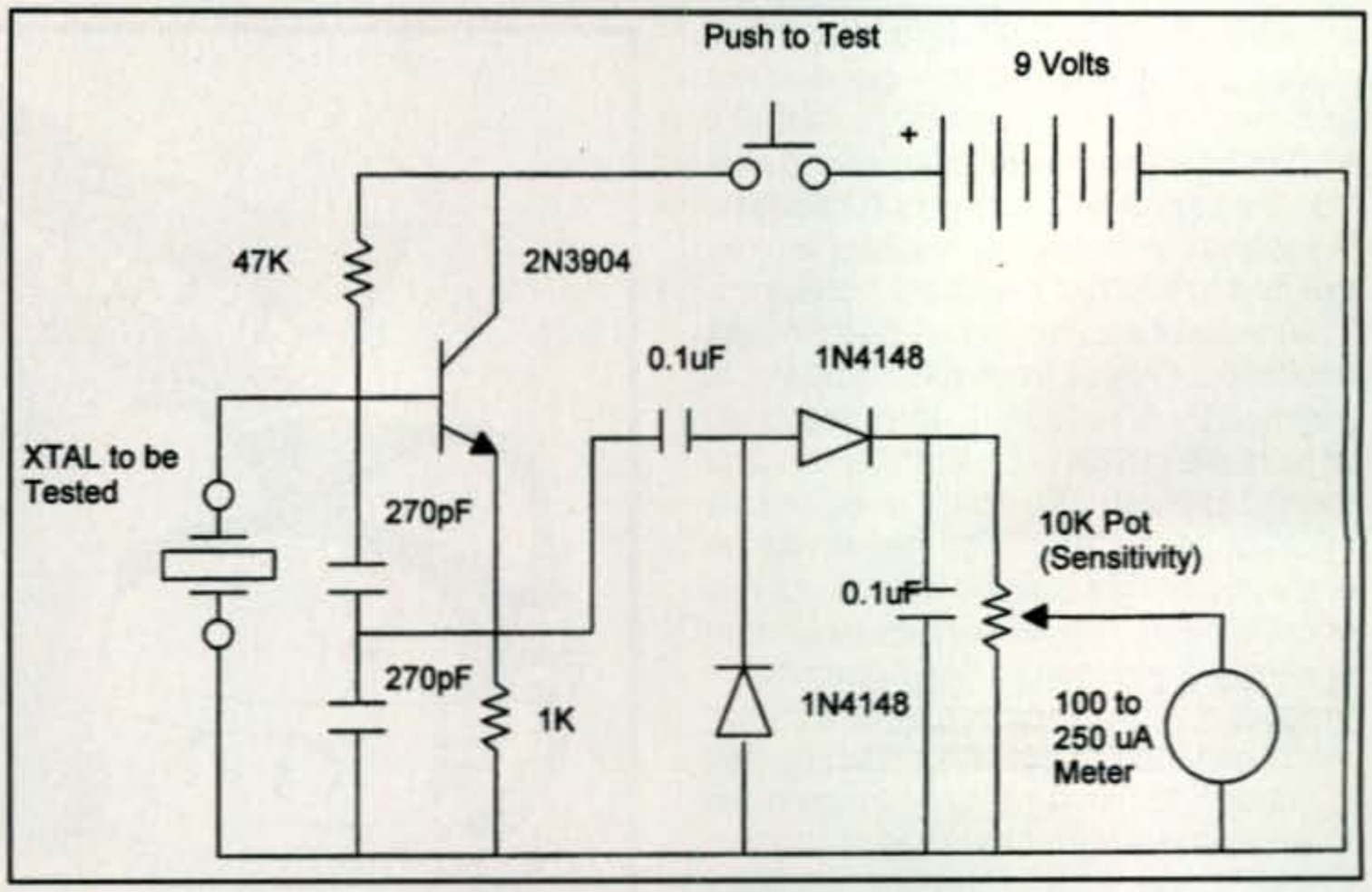

Fig. 2– A crystal activity checker.

scope or scope probe that can safely handle this voltage.

Now set the horizontal axis (time base) of the scope so that you see a wide band of light, not the individual RF cycles. A setting of 1 to 10 ms/division (or 50 to 100 Hz for older scopes) is fine. Again, be sure not to overheat the dummy load. You have now set the vertical axis to equal the CW output level (or envelope power) of your transmitter (100 watts RMS in our example). Note that if specsmanship is your game, this is also equal to 141.4 watts peak, or 282.8 watts peak-to-peak. By measuring this voltage (with the scope) you can also calculate the actual power ($P = E^2/50$).

Now set the transmitter to SSB and speak into the microphone in a normal manner. Adjust the time base if necessary to see the audio peaks. Note the level of these peaks on the scope. Using the reference point you previously "calibrated," you can easily determine the peak SSB output of your transmitter by noticing how close the voice peaks come to the reference value. If all is correct, these points should just about equal the peak CW level. If they exceed this level, or if the tops of the wave shape appear clipped (as compared to rounded edges), distortion will surely occur. Note that if the deflection only reaches half scale, the output is just equal to 1/4 the level it should be (remember $P = E^2/R$). If this is the case, either turn up the microphone gain, speak louder, or determine if there is an actual problem with the transmitter! Commercial measurements usually use a two-tone signal to make such measurements, but normal speech can give you a fairly good idea of how much sideband power you really have.

I hope these devices and techniques spark some interest, and if you want more, please let me know.

73, Irwin, WA2NDM

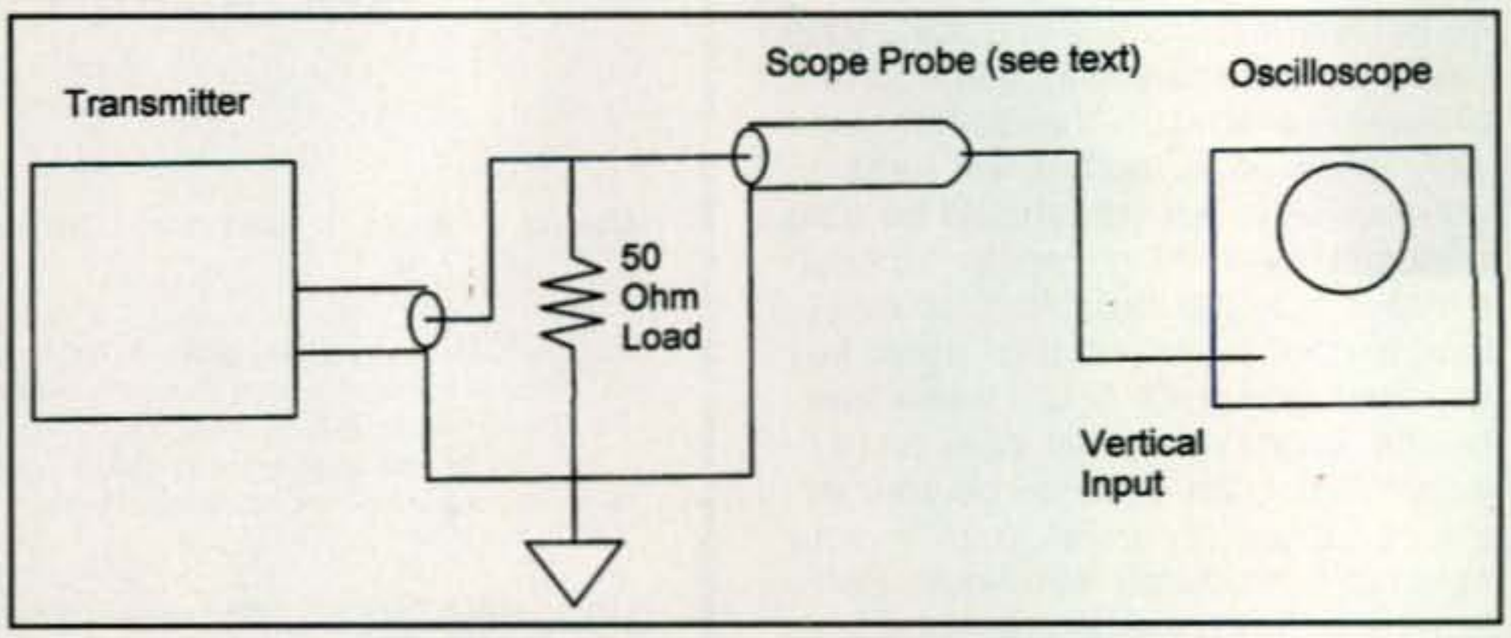

Fig. 3– Setup for SSB measurements.

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BY BOB JOSUWEIT,* WA3PZO

Firestorm! Hams Fill Various Roles in Southern California Wildfires

At least 12 major fires burned in southern California in late October. Fueled by Santa Ana winds, which reached hurricane strength, the fires burned over 518,000 acres; destroyed over 3100 structures, including 2200 homes; and killed at least seven people. More than 120 firefighters and 25 civilians were injured in the fires. Two of the fires are being blamed on arson, and at least five—including the Witch fire, which burned nearly 200,000 acres—are being blamed on electrical power lines. Investigators say high-voltage lines can start fires when they cross or touch tree branches or hit the ground, causing the electrical current to arc in explosions of sparks. The high winds blew branches and tree limbs into the power lines, causing the fires to ignite. The fires affected areas of San Diego, Orange, Los Angeles, San Bernardino, and Ventura counties. More than 500,000 people were evacuated from their homes, a greater number than were evacuated along the U.S. Gulf Coast during Hurricane Katrina.

Red Flag Patrols

Volunteers in the California Volunteers in Prevention "Red Flag Patrol" provide California Fire with additional eyes and ears that can report fires in their early stages, identify and report situations that may cause fires, and serve as a deterrent to arsonists. The patrol is made up of people in radio equipped mobile units assigned to designated routes in San Diego County. Organizations providing patrol members are CAL FIRE, the United States Forest Service, the Amateur Radio Emergency Service (ARES), and REACT.

The patrols are highly organized to travel predetermined routes. The decision to activate is made by CAL FIRE based on weather conditions. The participants are considered volunteer state employees and are reimbursed for vehicle mileage. They are also covered by workers' compensation.

Hams Respond

On Sunday, October 21, ARRL San Diego Section Emergency Coordinator Jim Cammarano, KG6R, conferred with Red Flag Coordinator Richard Beisigl, N6NKJ, and was told that ARES volunteers were not needed at that time. Cammarano continued to periodically check with the Red Flag Coordinator and was assured that they would call immediately if they required help from the San Diego Amateur Radio Emergency Service. According to Cammarano, "We have been used for Red Flag patrols, but with the Santa Ana winds blowing, the fires had rapidly advanced far beyond the point where volunteer radio operators would be safe in performing such a role."

Governor Arnold Schwarzenegger echoed how dangerous it was fighting the fires. "Any commander in a war would tell you that ... fighting a war on two fronts is very difficult. It is not different with a fire," Schwarzenegger said. "And in these fires that are burning across the state, there are multiple fronts. With the changing of the winds that we've all seen in the last day or two, it has put our

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

Within three hours, high winds spread fires across southern California. The left-hand image shows several fires giving off small plumes of smoke. The image below shows large amounts of smoke pouring from blazes northwest of Los Angeles. Actively burning fires are outlined in red. In the second image plumes of smoke can be seen blowing off the coast, indicating the intensity of the winds and the presence of additional fires farther south. (Courtesy of NASA/MODIS Rapid Response)

The Harris wildfire threatened thousands of homes, forcing an evacuation larger than Hurricane Katrina. (Photo courtesy of Mark Williams)

firefighters in precarious positions, because they are now uncertain about the predictability of where that fire is going to spread."

No Background Check, No Deployment

Several amateur radio operators provided communications for the American Red Cross and the Salvation Army. The Red Cross policy on requiring background checks was in place and enforced. Although additional hams were needed and available to support Red Cross operations, the Red Cross stood firm and said it would not accept help from volunteers who had not completed a background check.

Proper training was also an issue, as some hams apparently didn't understand how they fit into the larger picture. Cammarano recommends taking the Federal Emergency Management Agency's Incident Command System (ICS) courses ICS-100, 200, 700, and 800. These, he says, will give you an understanding of working with other emergency responders.

As the fires spread, San Diego ARES ran an information net and hams checked in with information about road closures, traffic congestion, and reports on the locations of the fires. Once activated, the ARES group provided the only backup emergency communications for the County Emergency Medical Services. According to Cammarano, there is no other emcomm group who can perform this critical role. He stayed in contact with the Incident Commander at the Medical Operations Center. He said plans were followed during the activation process. They received notification, were placed on standby, and finally deployed. Once they were told to deploy by the San Diego County EMS, Cammarano initiated a web-based automated callout system which made over 400 calls in less than five minutes.

Cammarano continued the story: "I asked Teri Rowe, KI6FKD, RN, Assistant Section Emergency Coordinator for Emergency Medical Service, to be the Incident Command nurse for the duration of the disaster. She provided a supply of responders available for initial deployment and replacement personnel. She compiled manpower reports and lined up personnel well in advance of the order to deploy. On Sunday evening she manned three phones and two PCs monitoring the County WebEOC online message boards (and) keeping us updated with road closures, patient transports, hospital evacuations. She answered questions, reviewed the Incident Command System (ICS) forms and called each hospital Incident Command registered nurse or officer to coordinate deployment of the responders. She was able to do all this and monitor the fire status in Poway so she could evacuate when necessary. Poway was eventually evacuated, but she decided to stay."

While San Diego ARES members were reporting to their assigned positions, other nets took over gathering information about the fire location, wind direction, shelter locations, and initial evacuations. According to Howard White, KY6LA, hams provided eyes and ears on the ground as to where the danger was. He said that as the fire raged out of control, the town of Ramona was evacuating. Tom Ryan, KD6TR, pro-

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"With 8,000 memories in LDG's exclusive "3-D Memory" array, the Z-11Pro uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. All cables included. **Suggested Price $179**

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New!

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Friends help each other search for belongings in this Rancho Bernardo home destroyed by the San Diego wildfires. (FEMA Photo by Andrea Booher)

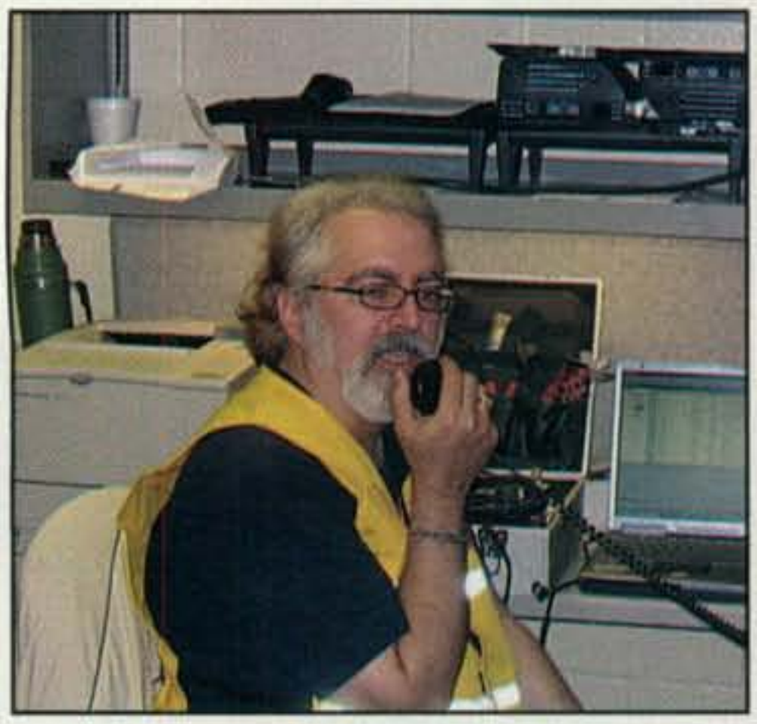
vided on-the-spot information from Ramona that proved vital to evacuees in getting through traffic jams and out of harm's way. Terry Runyon, K3PXX, drove his animal rescue trailer through fire and smoke up to the Ramona Fire House to rescue animals before flames finally forced him to evacuate as well.

Hospitals Staffed

Approximately 22 hospitals were staffed by hams in case telephone service was lost. Robert Palle, KC2CHN, of Valley Center, CA staffed the Palomar Hospital Emergency Room. He worked with the Incident Command Officer to get nursing staff through various road barricades to the hospital. The Medical Operations Center (MOC) was staffed by Martin Offenhauer, N6QIR, Andre Hansen, K6AH, Chuck Hempel, K6HW, and Cammarano. They were able to operate on six VHF/UHF voice frequencies, and monitor fire radio and the local AM broadcast stations. The group received hourly updates from the Incident Commander. This information was forwarded via voice and Winlink to the hams responding in the field. Winlink proved to be a valuable asset, since many phone lines were down and consequently internet service was not available.

Hams spent the night with the Emergency Room (ER) staff at Scripps Memorial Hospital in La Jolla. Dee Osargent, the Disaster Preparedness/Scripps Systemwide Emergency Radios Coordinator, said, "ARES support at this facility is vital. There is always excellent communication from the traffic ARES receives to the ER Charge Nurse up the chain to our Command Center."

Osargent said that during the firestorm the "hospital depended heavily on the ARES support, for there was a concern that the repeaters on Mt. Woodson would go down, and our radio link with the ambulances would fail. ARES is not only an outstanding radio backup but also is helping us pass/receive important information back and forth." She continued by saying that "ARES is a vital part of our communications team, and (we) look forward to always being very fortunate in having these radio operators with us in times of disaster."



Jim Cammarano, San Diego ARES Section Emergency Coordinator, provides communications to area hospitals from the San Diego Medical Operations Center. (Photo courtesy of Martin Offenhauer, N6QIR)

San Diego ARES members Jim Eller, KD6OZL, Colleen Mathieson, KI6MAT, and Gene Swiech, WB9COY, provide communications using Winlink at the Dulzura Community Center. ARES members were active for five days in early November supplying communications until the Dulzura wildfire was contained. (Photo courtesy of Michael Panger, KG6JCW)

Other ARES members volunteered at Qualcomm Stadium, which became the largest temporary shelter in the county. Several more contributed to the Fire Watch Net on 146.730, as well as Winlink.

Neighbors Helping Neighbors

While ARES members were busy supporting hospital communications, a FireNet was established on the Palomar Amateur Radio Club's 146.73-MHz repeater. According to White, many questions came up as residents, including hams, attempted to evacuate ahead of the approaching fire. White said some of the questions that were being asked included: "Is the fire near us? Where is the head of the fire? What directions are the heads going? What are the winds doing? Should we evacuate? What roads are closed? What about our animals? Where should we go? What should we take? What is the route to avoid the flames? Can you help us find missing people or pets? Can you help us get barrels of water for animals? Can you help us find food and water? Can you get the police to deal with looters?"

"Unlike Katrina, the questions and answers did not abate at night," said White. "It was non-stop. Terry, K3PXX, needed routing around the fires to evacuate his animal trailer. In turn, Terry reported on fires as he drove through Poway and back to the San Marcos Emergency Operations Center."

Members of the Ramona Outback Amateur Radio Society (ROARS) had to evacuate the town of Ramona. They were on the 147.03-MHz repeater looking for help to be routed safely out of the area. White continued, "Fires broke out in Coronado Hills in San Marcos. People needed to be evacuated. Brian Comer, KF6C, asked where to evacuate his four children. San Marcos EOC needed to be activated and FireNet held the fort for them until they could get there and became operational to evacuate San Marcos. George Gross, KG6IDE, tried to drive up to Ramona to evacuate elderly parents but we (had to) turn him back to avoid the flames."

Rice Fire

Eight ARES members responded to the Fallbrook Fire Department and the Fallbrook Hospital. Each member responded knowing that his/her own home could be in danger of being destroyed by fire. As the fire moved, a decision was made to evacuate the hospital. Bigs Parker, KG6GIU, stayed with the Fallbrook Hospital evacuation until it was completed. Once the hospital was closed, the ARES members reported to the EOC. Cammarano said the situation in Fallbrook was dire and the hams operated under very difficult circumstances. In fact, Parker and his wife evacuated and learned later that their home had been destroyed by the fire.

Members of the Fallbrook Amateur Radio Club supplied information of local interest in addition to maintaining contact with other amateur groups outside the Fallbrook area and relaying information to and from them as needed. N6FQ is the club station of the Fallbrook Amateur Radio Club and is co-located with the North County Fire Protection District (NCFPD) EOC. It was also the Incident Command Post for the Rice Canyon Fire. "All of our equipment is supplied and maintained by the NCFPD and we obviously have a great relationship with them," said Kenneth Dickson, W6MF. "Our operations are fully encouraged and supported by NCFPD. N6FQ disseminated updates and important information to all stations listening as the information became available," said Dickson. "Many of the off-site and evacuated stations provided information to groups where they were located in refugee locations. At one of these locations two daily briefings were done with the refugees. In between the briefings at this site, which had over 100 refugees and employees at one point, written postings were made as information was received from N6FQ. The calming effect to these refugees was remarkable, because they knew that they were receiving timely, and more importantly, accurate information." Dickson explained that the television station information rarely dealt with the Rice Canyon Fire and much of the "news" was outdated and reported incorrect information. He said, "The TV and radio stations were turned off and N6FQ became the sole source of information. N6FQ became the 'voice' of Fallbrook." He continued, "Due to our communications with our ICP we easily and readily confirmed media reports as we became aware of them and then tried to correct them if necessary through contacts with ama-

When All Else Fails ...

ARRL San Diego Section Emergency Coordinator Jim Cammarano, KG6R, received the following letter after the fires from Campo, California, Fire and Rescue Public Affairs Officer Craig Williams, W6CAW:

Jim,

Your team did a great job today. I am assuming that, as I never listened to the radio! Messages were passed between the field and IC (*Incident Command—ed.*) quickly and accurately so they were completely transparent to me.

Wish I could take credit. I order them and ARES sends them out.

Today I listened to the radio once. I just send and receive paper messages off to this ham operator at my elbow and they magically appear at a remote, burned out, location.

And every agency at the IC from local to state to federal got a real lesson, (reinforced) by me, that when all else fails, there is HAM radio!

teurs all around the area who monitored the N6FQ operation."

Positive PR

"In the past our print media in Fallbrook, 'The Village News,' has printed stories related to amateur radio in the area," said Dickson. He continued, "A couple of stories have been printed in the past where we've suggested that residents obtain scanners so they can listen to our 146.175-MHz frequency in case of an emergency. We know from telephone calls that were received during this emergency (that) several people did pick up the information from their scanners. Hopefully we can get this information put forth to the community again soon, because amateur radio is very much a part of the community in which we live. Many of (our) amateur radio operators give many hours of their time to local activities conducted by our city, Chamber of Commerce, and Fire Protection District all without any expectation of compensation or recognition. Time and personal equipment are donated for the purpose of supporting the community and people ... where we reside."

Repeaters Lost

Despite backup batteries and generators, many repeaters were lost because of fire damage, batteries being drained, or generators running out of fuel. The Red Cross utilized the 147.13 machine on an informal basis until it failed and then switched over to the 147.075 repeater. The San Diego ARES net on the East County Repeater Association 147.03-MHz repeater failed, and the ARES EMS Net moved its operation to the 147.075 repeater, which was already busy. According to Steve Early, AD6VI, "this was a very good example of the amateur radio community working together."

The Poomacha fire was active on Palomar Mountain. The fire came within a few hundred yards of the repeater site. The site lost commercial power in the early morning of Monday, October 23rd. The repeater system switched over to the battery backup automatically, as expected. Early said, "Mike Doyle, AB6QT, was able to make one visit to the site on Monday evening to provide a partial charge to the battery system. Soon afterward he, along with all other residents of the mountain, were evacuated. The site continued to operate on 40-year-old batteries for a few days, but age took its toll." Several repeaters on the mountain succumbed to low voltage. The last was the 147.075, which was reported to have given up early Thursday morning. Two days later a work party was able to get two repeaters back on the air using emergency power. Early said that to keep the repeaters operational, the sites would have to be visited almost daily for two weeks.

Emergency Plans Work

"We worked seamlessly through our emergency communications plan even though we had to shift frequencies as five repeaters failed," said Cammarano. "We always had a backup frequency prepared for a repeater failure. We also used every tool we had to an advantage. Cell phones, fax machines, e-mail, the web EOC, FM, and Winlink were pressed into service. HF was part of a backup plan that never had to be used."

He said that hospitals asked the hams to help get their staffs deployed to the hospitals to relieve their overworked personnel. "At one point a trauma center was in danger of losing a communications tower. Numerous hospitals were evacuated and patients were transported." Cammarano said San Diego ARES was there as backup if the critical communications links were broken. "As the order to change our status from deployment to standby came, many responders were asked for their contact information in case they were needed again." He said many stations did not pass emergency traffic, but were able to provide critical information regarding the status of other hospitals to the various Incident Commanders. He said the hospitals were thankful for the support because many feared that the fire might force the repeaters on Mt. Woodson off the air, causing the hospitals' regional radio link to ambulances to fail, resulting in a serious impact on the hospitals' ability to prepare for arrival of critical cases or transports to other vital trauma centers in the county.

In Closing

The October firestorm that swept southern California was one of the worst in recent memory. Yet amateur radio was there to provide backup communications to served agencies and immediate assistance to those who were being evacuated. The Red Cross enforced its background check policy: All volunteers must have had a background check. If not, they'll do without their help. We would like to thank Jim, KG6R, Howard, KY6LA, Ken, W6MF, and Steve, AD6VI, for supplying information for this story.

73, Bob, WA3PZO

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Shows radiated antenna relative field strength. Determine radiation pattern. **MFJ-802** has huge 3 inch meter. Telescoping dipole reduces influence of surrounding objects and is more reliable, repeatable than monopole. Sensitivity control. Jack for remote sensor, MFJ-802R, $29.95.

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MFJ-801 has 1¾ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

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MFJ-886 covers 1 MHz to 3 GHz with 300 MHz direct count, 0.1 Hz resolution. 4 gate times. 10-digit high-contrast 3/4 inch LCD display. Lock display button. Bargraph shows RF field strength. Includes rechargeable Ni-Cad batteries, charger, telescopic antenna. Black anodized aluminum. 2¾x2¼x1¼ in.

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MFJ-888, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/period, has 50/1M Ohm input, auto hold, LED backlight, beeper. 2¾x4¼x1¼ in.

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BY DAVE INGRAM,* K4TWJ

Thinking Outside the Box

Thanks, Friends!

This year marks a very special occasion in my life and I wish to share the good time with you, my friends, fans, and supporters near and far. As of 2008, I have been a continuously active radio amateur for 50 years, an amateur radio writer for 35 years, and a *CQ* columnist for 25 years. I have also written 1,000 columns and articles, plus 26 full-length books on amateur radio.

In addition to writing three columns here in *CQ* (World of Ideas, How It Works, and QRP), I presently write a series of "Ham Pride" articles appearing in amateur radio magazines throughout the world—from the United Kingdom and South Africa to South America, Thailand, Sweden, and more.

I did not plan to be a long-term writer. I simply became involved with several areas of new technologies and answered various requests to share my insight with others through written words. Although it wasn't in my original plans, I have become one of the most published authors in amateur radio history, and you, dear friends, helped make it happen. Thanks! And may the force of good signals always be with you.—*Dave, K4TWJ*

Amateur radio and electronics technology overall have experienced some remarkable advancements during the past 100 years, and a number of even more remarkable advancements promise to evolve during the next 100 years. This month I would like to share with you some intriguing views on what I consider tomorrow's amateur radio world. The future probably will not evolve precisely as depicted here, but I am sure you will agree this "electronic science fiction" is good food for thought—and it also reflects this column's purpose of sharing a "World of Ideas."

Ever since the early days of wireless telegraphy, radio amateurs have been actively involved in pioneering communications frontiers. For example, during the early days of spark when frequencies below one megahertz were considered prize spectrum, we proved short waves rather than long waves could cover the greatest distance by bouncing or reflecting off the Earth's ionosphere. During the 1920s and 1930s, we were right in the middle of mechanical scanning disk-type television experiments. As time progressed, we pioneered amateur Fast Scan TV on the UHF bands and single sideband plus multi-format Slow Scan TV concepts on the HF bands. We also were forerunners of the evolution of cell phones with autopatching repeaters and touchtone pads added to our handheld FM transceivers (1960s), e-mail and wireless internet concepts with packet radio setups (1970s), internet-linked VHF communications with IRLP, and more. Little did we realize the far-reaching impact our pursuits would have on future communications concepts. We were simply having fun doing what we do best. A justifiably proud lot? You bet we are, and indeed the best may be yet to come.

Overview

Possibly I am off-base, but I visualize a series of small and closely- related steps connecting our past, present, and future. The steps began with telegraphy, spark gap, and radio. They expanded into mechanical scanning disk "televisor" setups and electronically scanned TV, and continued on to color TV, digital, and standard- and high-definition TV. Proceeding along that line, I expect future "stepping stones" to include evolutions such as laser-projected video, holographic video, amateur radio communications with space-exploration bases planned for the moon and Mars, and more. Look toward the far horizon with me and you may also foresee electronic transporters and forward time travel.

Farfetched? Not when you consider that traveling to the moon, an orbiting space station, sheep

*3994 Long Leaf Drive, Gardendale, AL 35071
e-mail: <k4twj@cq-amateur-radio.com>

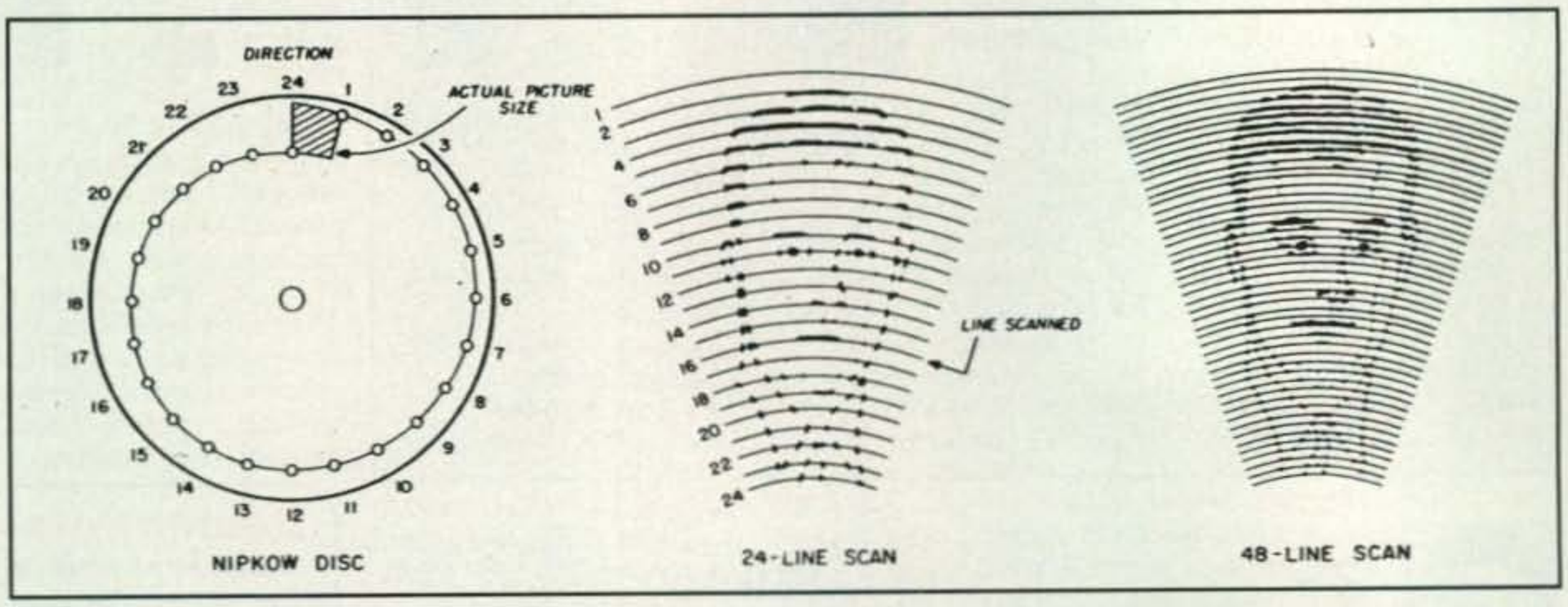

Fig. 1– Outline of how a mechanical scanning disk, invented by Paul Nipkow during the late 1800s, was used to transmit and receive simple 24- and 48-line pictures during the 1930s. A neon tube connected in lieu of a receiver's speaker was placed behind the shaded upper viewing area, and speed of the receiving disk's motor was varied until it synchronized with the speed of the transmitting disk motor. This first step into television was quite crude, but it launched a concept and an era that continues to expand today.

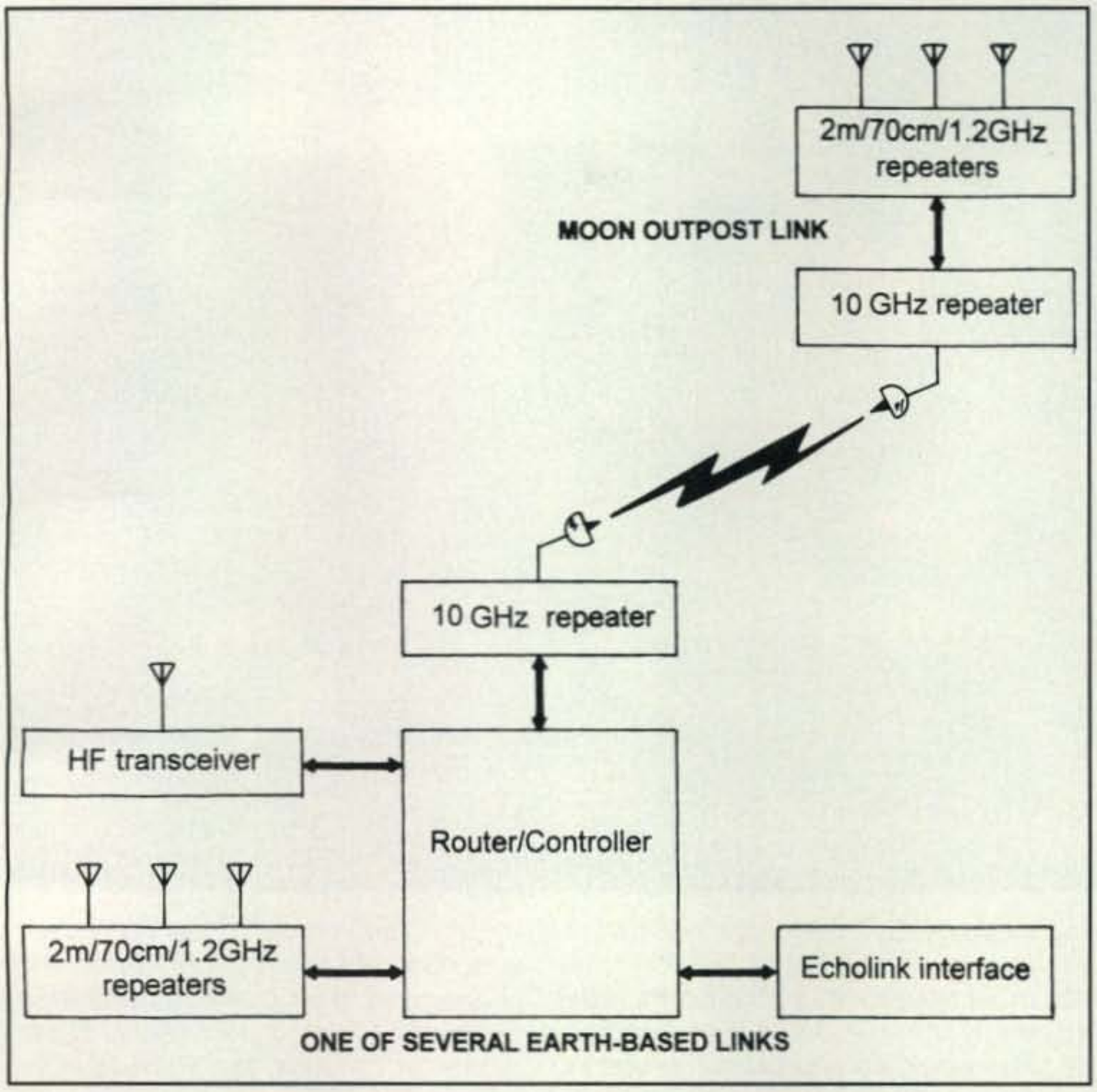

Fig. 2– Outline of an Earth/moon-linked VHF/UHF/microwave repeater system as discussed in the text.

cloning, etc., were mere fantasies 100 or 200 years ago. If we had told someone in the mid-1800s that pictures could be electrically separated into tiny pieces or elements, scanned, and sent through the air from one place to another—instantly—they would have laughed us out of town. Tiny pieces? Scanning? Even with a steady wind, pictures could not fly. The idea was ridiculous. They were looking through 1850s' eyes, however, and their views were limited by 1850s' technology. Looking back from today's viewpoint, we understand how pictures are scanned, their voltage equivalents transmitted as RF signals, and those signals converted to variations of light and dark for reproduction on a screen. If we use that same logic to shift our thinking forward 100 or 200 years, visualizing future evolution also becomes feasible. It is simply a matter of time and perspective, and a brief study of the past and the present prove helpful here.

Background

The first hint of television dates back to the late 1800s when a German scientist named Paul Nipkow invented a mechanical scanning disk. The disk contained a series of small holes spiraling inward, each corresponding to one line of a scanned picture (fig. 1). Images were reproduced when each hole passed between a neon lamp and a small (two or three inch) viewing area near the disk's top. Each hole produced a streak of light or strip of darkness immediately below the previous streak, and a viewer's persistence of vision combined all streaks to produce a crude picture of essentially pure white and pure black areas (no gray scale).

Nipkow's invention received limited recognition until the 1930s, when John Baird of England and Francis Jenkins of the U.S. initiated test transmissions using an adjustable-speed DC motor rotating a Nipkow disk with a neon-gas-discharge tube behind it connected in lieu of a radio receiver's dynamic speaker. The tests were transmitted on the AM broadcast band (550–1750 KHz) after midnight, and details on home-assembling a setup for viewing the images were included in *QST* magazine in 1929 and 1930. The challenge was actually receiving a discernible image,

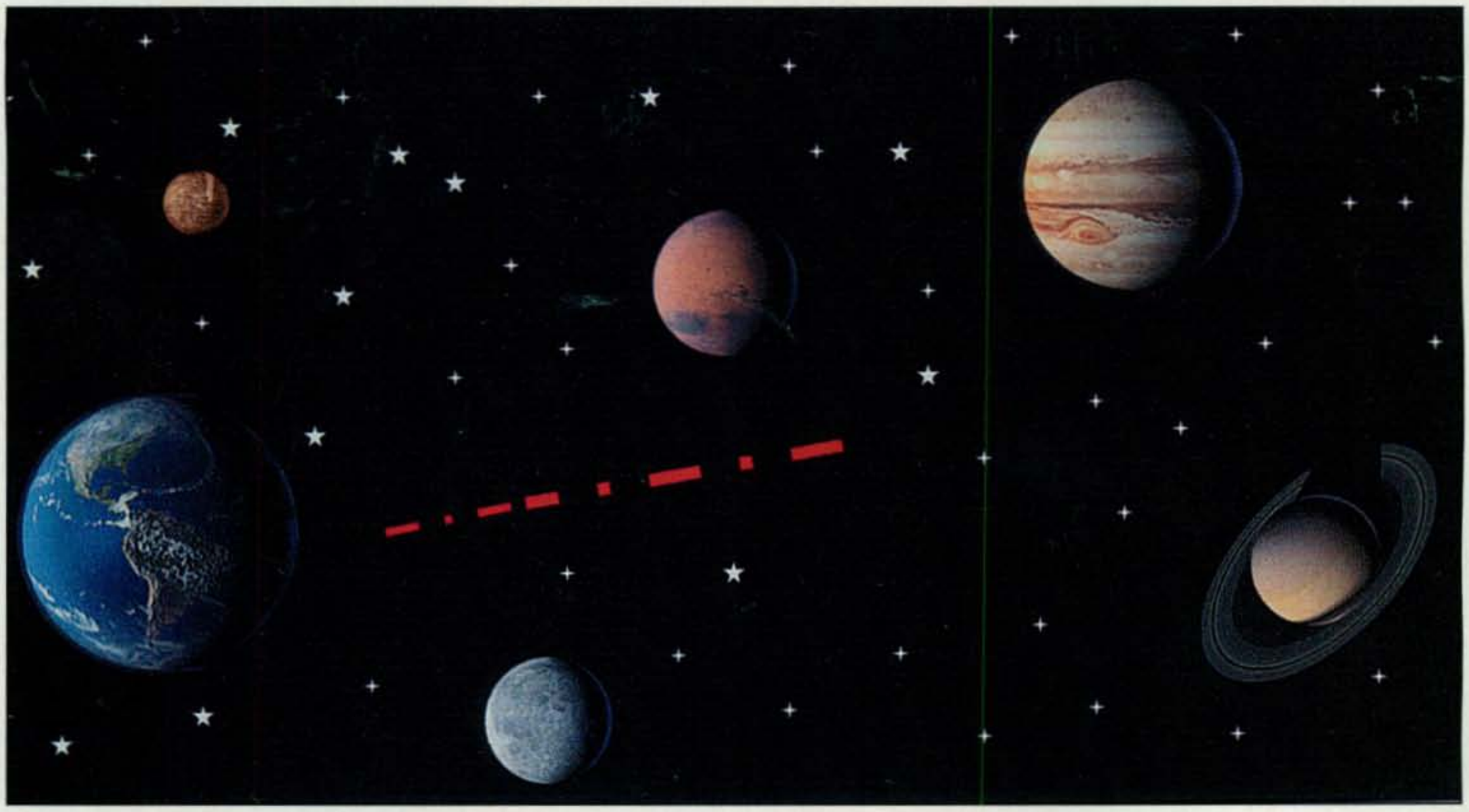

Fig. 3– How long is a CQ? At 22 wpm it is approximately 372,000 miles in length, with a distinct beginning/front and end/rear (read it from right to left), as it travels through space at a speed of 186,000 miles per second. As points of reference, the moon is 250,000 miles from Earth and Mars is 50 million miles from Earth. If the CQ is sent by laser beam rather than a radio signal as shown here, it can also be seen by the naked eye. Location of planets in this sketch is necessarily not to scale; otherwise, the distance from Earth to Mars would be approximately one inch, to Jupiter 8 inches, to Saturn 18 inches, and Earth to Pluto approximately 72 inches. (Artwork by Sandy Ingram, WB4OEE)

which required the receiving operator to adjust the speed of his disk to match that of the transmitting station. The process was crude and simple, and was probably considered "dinking," but amateurs of the day had a ball doing it.

During the 1940s, the invention of the cathode-ray tube and the evolution of electronic scanning overshadowed mechanical scanning and took video communications to the next level. Soon afterwards, radio amateurs began experimenting with amateur television (ATV) on the VHF/UHF bands. During the early 1950s, commercial experiments in color TV began, and a modified form of Nipkow scanning disk known as the CBS color wheel was again called into use. It, too, was plagued by the same pitfall as original disk-scanned images—difficulty maintaining synchronization with the transmitting disk. A number of additional techniques were considered. The most unusual involved using four full TV channels for transmitted color—one carrying red video, one carrying blue video, one carrying green video, and the fourth carrying brightness information (the standard black-and-white picture). Eventually all the separate systems were replaced by a compatible-with-all system employing a full-resolution black-and-white signal plus a pair of limited-resolution color signals conveyed by orthogonally modulated or quadrature sidebands. This system—dubbed NTSC, for the National Television Standards Committee which developed it—will continue in operation until early 2009, when all commercial TV broadcast stations in the U.S. must discontinue their analog transmissions and utilize a streaming digital video format transmitted using a modified form of PSK (phase shift keying) modulation. All stations will then be given (basically) free rein to transmit one HDTV/High Definition, two MDTV/Medium Definition, or several lower definition digital pictures simultaneously within an allocated (6-MHz wide) channel on new UHF frequency allocations.

Does this ensure that your fancy new HDTV with both NTSC and ATSC (Advanced Television Systems Committee) tuners will then receive all TV channels and programs in HD? Not necessarily. It depends on whether the stations/channels you select (and your cable company, if you subscribe to cable) transmit in HD; and stations have the option of changing between HD, MD, or LD as easily as they change hourly programs (you probably have noticed "this program in HD" designation on football games, newscasts, etc., at the present time).

Looking Ahead

Consider them pipe dreams if you wish, but I foresee some interesting and radical developments evolving in our future. As I mentioned earlier, my views probably will not evolve exactly as described on the following pages, but they do spin off some intriguing possibilities.

Watch for new-style TV screens and handheld/cell-phone laser projection systems to soon upstage digital and high-definition TV systems. This is a natural evolution, as a laser beam can be concentrated for pinpoint accuracy and it can also be swept horizontally and vertically while being modulated in intensity. Further refinements surely will result in laser-projected images of all types and new developments in holography. As you probably know, holograms are three-dimensional images that appear to actually exist—except that you can move a hand or arm right through them.

The next step, remote scanning and transmission of views acquired through laser-projected images, requires some imaginative (sci-fi?) thinking, but it is well within the possibilities of future electronic evolution. In fact, there is no reason to rule out additional development of matter transducers, ultra-wideband transmitters, receivers, and electronic transporters. In the same way that I hinted at terrorist attacks from Al Qaida plus weapons of mass destruction in my 1996 book *Guide to Survival Communications,* and described the concept of wireless internet and the resultant need for higher and higher speed links in my 1985 *Microwave Communications Handbook,* I am convinced that such evolutions are not a matter of "if," but simply a matter of "when."

Let's now shift *focus* slightly to bring in some additional developments I feel are destined to occur in the future.

Space Communications

As you probably have heard or read, manned space exploration is expected to become a foremost scientific interest starting in the next few years and continuing indefinitely.

Several moon-based outposts planned for later this century are on the NASA drawing board. One or two outposts will study the feasibility of mining ice deposits for Earth's booming population, plus manufacturing items in a high-vacuum environment. The other outposts will set up long-range optical telescopes and radio astronomy equipment for direct transmission of views back to Earth. Lacking a view-clouding atmosphere, moon-based stations will give us never-before-obtainable views of deep space, especially those set up, as planned, on the dark side of the moon. A series of VHF/UHF/microwave repeaters are projected to link each

moon-based outpost, and we can also logically surmise amateur radio links back to Earth will be included with the repeaters (fig. 2) so amateurs can communicate with friends back home during "off time." *(In fact, when CQ interviewed NASA Administrator Michael Griffin, NR3A, last year and asked about ham radio on future moon bases, he replied, "Well, you're way ahead of us, but I would be surprised if it didn't show up ... We're unlikely to tell people, 'No, you can't bring a ham radio along.'")*

Does this hold merit? Sure. The moon, Mars, Saturn, etc., are straight line-of-sight from Earth. Unlike moonbounce, where reflected-back signals suffer extreme loss/attenuation, signals traveling one way through pure space experience minuscule attenuation. The only credible interference results from cosmic sources such as the sun and the Milky Way, and that can be minimized by clever choice of daily operating times. Can you imagine that, friends? Monthly propagation reports for galactic DXing? Wow!

As we continue discussing tomorrow's world of electronic fantasy, visualize transporting an ultra-wideband repeater to a point in space a few billion miles from Earth—and as a means of reference, dwarf planet Pluto is approximately 3.6 billion miles, or 39 Astronomical Units (AU), from Earth. Also as a reference, an Astronomical Unit is 500 light seconds long and radio signals travel at the speed of light (186,000 miles per second), so a laser light or a radio "CQ" sent in Morse code at 22 words per minute would be approximately 372,000 miles long and travel approximately 325 minutes, or 5.4 hours, one way, between Earth and Pluto (see fig. 3).

Follow that by transporting a second ultra-wideband repeater to another point in space several hundred Astronomical Units distant from the first repeater. Then transmit a test signal and electronic transported object to be relayed back and forth between the repeaters "X number" of times before returning to Earth. If the test signal and test object return safely, a more important object or even a person might then be transmitted and relayed "X times" between the galactic repeaters and return to Earth later in time.

How much later? There are several variables in that answer, but over one or two years, the signal or object would have aged only slightly while Earth and its population would have aged quite noticeably. The time traveler could hypothetically return to meet his/her descendants.

The thoughts I have presented truly tax one's imagination and may border on electronic science fiction, so once again I emphasize that you must look back from 200 years in the future to grasp their full potential. Trying to visualize the future through 2008 eyes is analogous to settlers of the early 1800s trying to visualize our present day/2008 world. Radio, television, radar, cell phones, computers, etc., were beyond their comprehension. Yes, and even if my views seem far out, you must agree that they energize your creative thinking—and radio amateurs have always been recognized for their ability to "think outside the box."

Amateur Radio's Golden Age Lives Today!

In looking both backward and forward in time, we realize we are living in an era of unequaled charm, beauty, fun, and excitement. As modern radio amateurs, we still enjoy the fun, exhilaration, and classic thrills of riding the waves of (HF) ether and exchanging greetings with our radio friends worldwide by voice, telegraphy, and data modes. The sheer glamour of this magic moment in time may not last forever, but we are sure our proud legacies and traditions—the traits that situate us 10 dB above the crowd—will live on indefinitely!

73, Dave, K4TWJ

Oops...

You may have noticed that fig. 1 of November's "World of Ideas" column was a block diagram that had nothing to do with one-tube transmitters, rather than a schematic of a push-pull 6L6 transmitter. Obviously, we didn't notice that until readers started pointing out that they couldn't find RFC2, which was referenced in the caption but nowhere to be found in the diagram (which was actually fig. 1 for November's "How it Works" column). In any event, our apologies for the oversight. Here is the correct fig. 1 for November "World of Ideas"—*the editors*

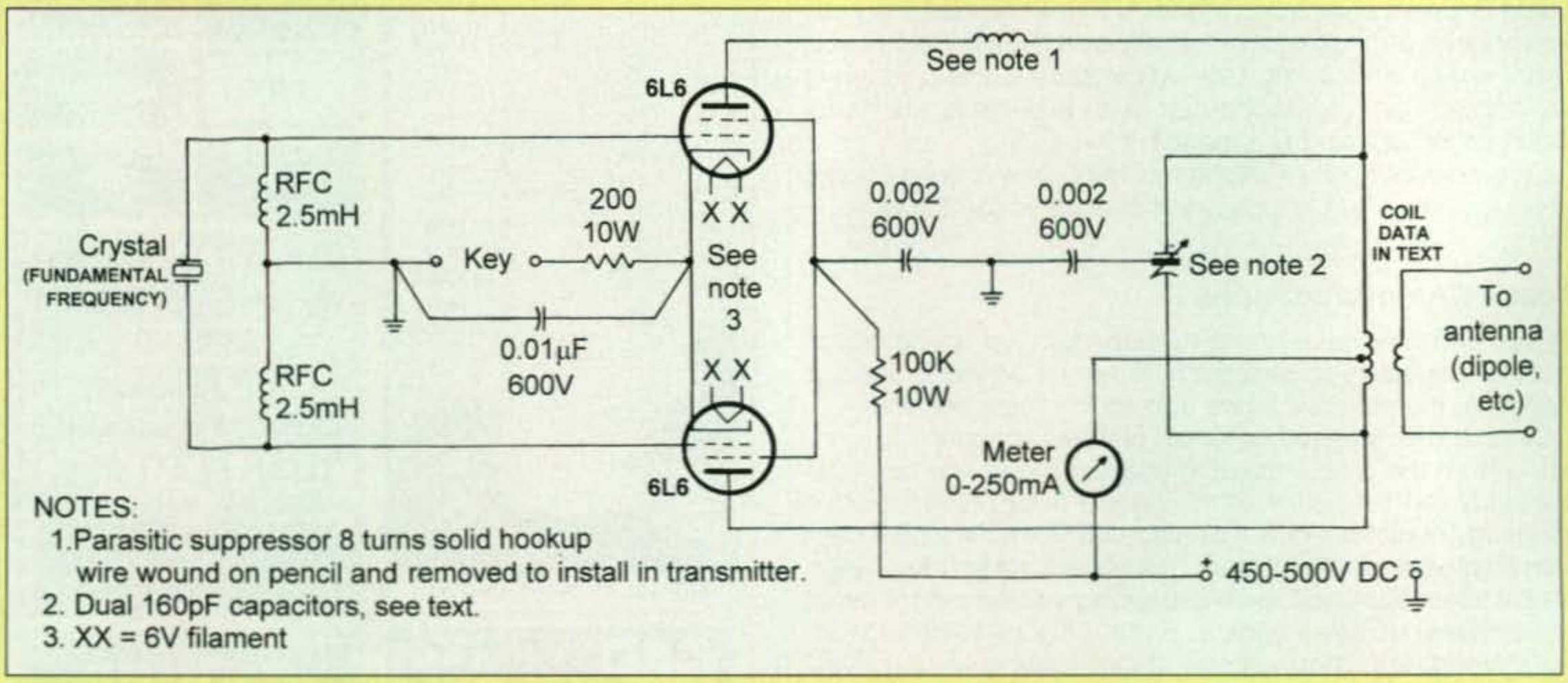

Fig. 1– Circuit diagram of the push-pull 6L6 transmitter. RFC2 is included in the plate line of the top tube (only) to eliminate any UHF parasitic oscillation. It is visible between the front tube and the skirted knob in photo A.

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You get 850 Watts output on CW, 500 Watts output on RTTY, an extra heavy duty power supply, genuine 3-500G tube, nearly 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, multi-voltage transformer, dual Cross-Needle meters, QSK compatability, two-year warranty, plus much, much more! Made in U.S.A.

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HF Amps with Eimac 3CX800A7

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$1995
Suggested Retail
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AL-800H
$2995
Suggested Retail
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These HF linears with *Eimac*® 3CX800A7 tubes cover 160-15 Meters including WARC bands. Adjustable slug tuned input circuit, grid protection, front panel ALC control, vernier reduction drives, heavy duty 32 lb. grain oriented silicone steel core transformer, high capacitance computer grade filter capacitors. Multi-voltage operation, dual lighted cross-needle meters.

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AL-1200
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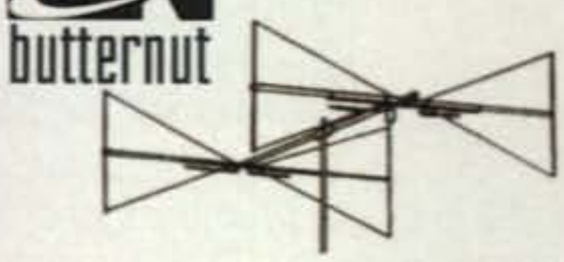

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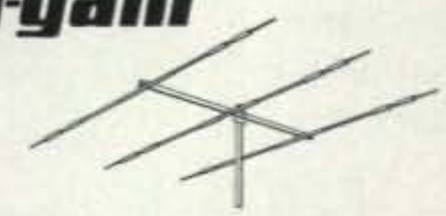

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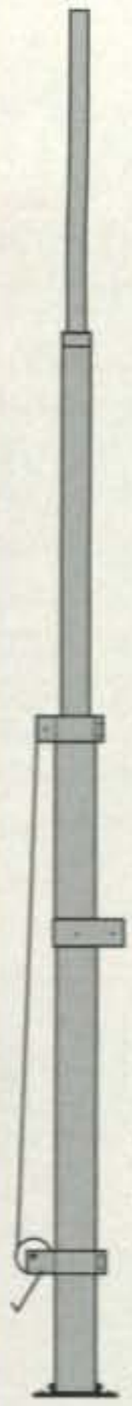

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magic in the sky

BY JEFF REINHARDT,* AA6JR

A Radio is Born

Take a look at your radio. It doesn't matter if it's a small hand-held, a full-featured HF desktop model, or a compact mobile. Behind that attractive display, the rows of buttons and the sturdy case, did you ever wonder how, and maybe where, your radio became a radio? It's a pretty amazing journey from design concepts and raw materials to the finished product that can send your voice sailing over distances and pull a contact, intended for you, out of the invisible electrom agnetic spectrum that surrounds us. As amateur radio aficionados, I hope we never lose our sense of awe and wonder at the miracle of modern communications.

Let's take a journey and see how a radio is "born" and also take a look at how it came to arrive at your home.

Design engineers collaborate in integrating product features and problem solving. (All photos by the author)

Full Disclosure

Part of the way I make a living is through my role as a marketing consultant. I have served clients in a number of trades and professions, including bulk building materials, law, office products, professional sports, financial services, and yes, communications. For over a decade I have been a consultant to a few electronics manufacturers. I have been careful not to promote their products in my *CQ* columns ("Magic in the Sky" and "Mobiling"), because I believe you want and expect unbiased information on these pages. I feel the same way. Therefore, please regard the information in this column as just that: It's information, education, and entertainment. It's not a review or endorsement of any particular product; rather, it's a glimpse behind the scenes at how a given product is made.

The processes covered here apply to a particular manufacturer, but with a few variations, they are widely used in the ham radio and electronics industry. The journey described in this column was largely funded by a manufacturer for which I consult. In the magazine business, it's not unheard of to write about a travel experience funded by an outside business entity, but not all writers disclose their subsidized travels. It's important to me that this information is shared with you, and I'll summarize it in this way: My services as a consultant are rendered for the benefit of my clients, but no matter what the circumstances, my integrity is a quality that's never "for sale."

This is where ideas for new radios come to life.

Let's Go to Japan

For more than a couple of decades, Japan has been the center of the radio universe, and not just ham radio, either. It extends from the post-war ascent of Sony and its breakthrough transistor radio to others, including Panasonic, JVC, NEC, Sanyo, Hitachi, Samsung, and brand names recognized by hams, such as Kenwood, Yaesu, ICOM, Alinco, Japan Radio, and others. It is rec-

Just part of a very artistic dinner. Attention to detail is a wonderful element found in the Japanese culture.

*5904 Lake Lindero Drive, Agoura Hills, CA 91301
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ognized that there are quality manufacturers in the U.S. and elsewhere, but Japan's impact on the electronics industry is undeniable, and I'm betting you don't have to go very far in your daily travels before you see or use an electronic product that originated there. AOR is a company at the periphery of ham radio; its primary business is the design and manufacture of high-end receivers. They are used by some hams, but the product lines and pricing structure are geared more toward monitoring professionals. The folks at AOR invited me to visit their corporate headquarters, design studios, and manufacturing facilities.

The departure of the long-anticipated, non-stop flight from Los Angeles to Tokyo's Narita Airport was delayed a few hours, an experience that's not unusual these days, but it caused concern for maintaining a very tight travel itinerary spread over the next ten days. This was to be my second trip to Japan, and I knew what to expect in terms of the disorientation that can occur when moving ahead 14 hours in time and losing a day by crossing the international date line. Happily, I arrived with the ability to maintain my many hotel reservations. Prior to departure, passes were purchased for the complex Japan Rail system, an amazing creation with a reputation for quality service.

A visit to AOR corporate headquarters in Tokyo is always an adventure. The city is alive with millions of people who know how to maximize the use of space. A small, multi-story office building houses the headquarters facility where I met with the president and senior managers to discuss many topics, including new product development and the challenges of the marketplace.

I'll now share some other impressions of Tokyo. I stayed in the city for a few days, and in all that time I heard just one siren, and it was an ambulance. I recall having seen only one police car. I took subways and trains, often arriving back

This machine places components on circuit boards. The tapes contain components that are placed on the boards with great precision and speed.

The factory is a clean, dust-free environment.

Some of the quality-control personnel who inspect circuit boards using microscopes.

at the hotel late at night, sometimes carrying bags. At no time did I feel that I was not safe. There's no tipping for services in Japan, and the prices in the stores include any applicable taxes, so the price you see is the price you pay.

Throughout Japan I encountered a society that is extremely polite. No one talks on cell phones on commuter trains; they text message instead. If you're traveling on a long-distance train and you receive a call, you're expected to move into the unoccupied area between rail cars and conduct your conversation there. Japan is geographically about the size of California with a population about five times as large. Civility and an orderly transportation structure are two key elements in making it all work.

The Design Team

No matter what, from architecture to mechanical items, from art to civil works projects, I've always been fascinated with the design process. It requires great imagination, technical ability, a thorough working knowledge of what the desired outcome may be, and a strong historical perspective that provides a foundation for the project at hand. I've seen design studios that range from lavish, spacious surroundings to a Dilbert-like cubicle.

The facility I visited in Nagasaki could be described as "utilitarian." It was functional, but it was anything but lavish (see photos). Nevertheless, the design and engineering teams work very well together. Perhaps it's the close quarters in Spartan surroundings that facilitate easy communications and a group approach to problem-solving. When you're in arm's reach of a co-worker, there's no reason to waste a half day exchanging e-mails with a person on the other side of a cubicle wall!

I saw teamwork, camaraderie, and a focus on the job at hand, but embedded in the culture is an atmosphere of formality. There is no separate office for the manager; he's there working alongside the rest of the group. We met in a small conference room and discussed products in development, some obstacles in need of solutions, the timelines for product introduction, and how the many different applications found in a specific product may fit the needs of potential customers.

Nagasaki is a beautiful city with rivers, parks, and surrounding mountains. It's alive with activity, but not so much that it's an intrusion or oppressive. There is a museum and memorial park dedicated to the atomic bomb experience that occurred in August 1945. The museum acknowledges all the factors that led to the war, but the focus is placed on what happened at that location on that particular day. Taking photos was not allowed inside the museum, but it was a very educational, and at times moving, experience.

The evening of my visit to Nagasaki, I enjoyed a most wonderful dining experience with the design team at a restaurant where the food was excellent, not only for the unique Japanese cuisine, but also its artistry (see photo). It was a most pleasant experience, and as the evening unfolded, the conversation migrated from business to more personal discussions about families, educations, backgrounds, and some of the amusing cultural differences we experience. Only two of the engineers had visited the U.S., so it was enjoyable to relate some of the experiences of growing up and living in the U.S. I also learned a great deal from them, and I hope to visit again at some future time.

How They're Built

It was a long train ride to the manufacturing facility near Aizu-Wakamatsu City, but riding the Japan Rail "bullet

Final inspection and assembly.

Actual Size

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- **DJ-V27T** 222 MHz HT
- **DJ-V47T** 440 MHz HT

These powerful HTs make perfect companions for outdoor activities like fishing, camping or snow-sports.

The rugged polycarbonate materials are compatible to IPX7 so these HTs are submersible 1m/3ft. for 30 minutes! And unlike water-resistant radios you may have looked at before, the DJ-V17, DJ-V27 and DJ-V47 all have a large 40mm internal speaker so the audio is clean and crisp, not muffled. You can enjoy 500mW max audio-output, new two-touch repeater access, and over 200 memories. A special battery-drain function helps avoid battery memory-effect. Other features include an ergonomic design, ultra-flexible antenna with SMA connector, 39 CTCSS settings, split function, two-level attenuator and more. Whatever your idea of outdoor fun, Alinco's DJ-V17, DJ-V27 and DJ-V47 are ready to take on the challenges of rain, dirt and dust and come back for more.

- New, two-touch repeater access
- High grade waterproof materials compatible to IPX7 (submersible 1m/3ft. for 30 min.)
- Rugged polycarbonate body resists dirt, dust and moisture
- Large 40mm internal speaker for great audio!
- Highly visible backlit alphanumeric display
- Direct frequency input through illuminated keypad
- 200 Memories, plus one call channel and one repeater access parameter memory
- VFO, Memory and Scan modes
- Ultra-flexible antenna with SMA connector avoids breakage
- 39 CTCSS tone squelch (encode+decode) settings
- Tone burst function (1,000, 1450, 1750 and 2100Hz)
- Battery-drain function avoids memory-effect
- Cloning feature
- Ni-MH standard also uses optional Lithium-ion and NiMH battery packs or AA dry cell case
- SMA antenna port
- 2-level attenuator
- Waterproof single mic/speaker jack

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Tokyo's Electronics Marketplace is packed with dealers. This store's specialty is ham gear, but there are hundreds of stores with very specific specialties. It's a great place to shop for hard-to-find components.

trains," officially known as *shinkansen,* is a pleasurable experience. You can place a glass of water on the windowsill while you are sitting at the station, accelerate to 160 mph (verified by my GPS), and stop at the next station without worrying that even a drop will spill. To reach my final destination, I had to transfer to a local train. It was slower but allowed a more relaxed view of the rural scenery that was in an early-autumn splendor. A taxi took me several kilometers from the station to the manufacturing facility that was the subject of the day's visit.

The business of building high-tech devices is a constant battle to apply state-of-the-art technology to cutting-edge products with the highest degree of reliability built into the finished item. There's no room for error. The manufacturing facility I visited is run by a contractor who serves many companies. In this facility I saw products being made for a number of brands you would easily recognize: high-end telephoto lenses for cameras, cellular telephones, and yes, radio receivers, among other items. Quality and reliability are the key elements. A good portion of the staff members I observed were engaged in quality control and inspection.

Why is a contractor used instead of a manufacturing facility that is entirely owned by a given company? The volume of any given product run is a key element. I was amazed to learn the life-cycle of a cellular-telephone design in today's world may be as short as 90 days. Ham radios typically are not high-volume items. They are produced in "runs" of several hundred or a few thousand units at a given time. The manufacturing industry has responded by diversifying its facilities while adding the ability to quickly respond to changes in products. For low-volume product lines, contracted construction helps reduce costs.

It was interesting to learn the challenges many Japanese manufacturers face today. They are striking in their similarity to the challenges U.S. industries faced in the 1970s. Lower cost labor is now found in China, India, Thailand, and elsewhere. In some of those locations skilled labor may be in limited supply, but that too is changing through education and the quicker lines of communication made possible by the internet. Some countries have lower environmental protection standards. While acknowledging these challenges, the manager of the facility took great pride in the quality of the items produced there and the skills found in his personnel, as most of them have many years of experience. Another obstacle on the horizon is that Japan is a country experiencing negative population growth. There is concern as to who will comprise the next generation of skilled and semi-skilled workers.

I donned a dust-free jacket; I had already shed my street footwear at the entrance to the building and put "booties" on my feet. A cap is also worn to keep dust and other contaminants at a minimum. I was escorted through the air-tight doors into the area where circuit boards are cut and placed in units where robotic devices apply components at lightning speed. The tiny surface-mount devices are on tape feeds that supply a stream of resistors, capacitors, and other items that are then soldered in place. Because of the variety of products being made for different companies, the opportunity to take photos was understandably limited, but I was able to capture a few "generic" photos of the equipment and staff who work in quality control.

It's a pleasure to say the client I work for is a stickler for quality. Most companies with a good reputation feel the same way, but some companies may tolerate a certain percentage of "failure rate" in their equipment or inspect only a certain number of items. The goal at this firm is zero errors, and every unit is tested to meet its performance specs—not just some of them, all of them. If it doesn't meet the specs, it doesn't go out the door.

A few years ago, the manufacturer was puzzled by a run of radios that did not meet the published specifications. Research showed a parts supplier had substituted a specified component. Rather than try to implement a work-around, the entire run of rather expensive radios was ordered destroyed by the company president. He simply would not have those units go out the door with his company's name on them.

Value

In today's terms, the cost of a radio shows a very strong value ratio. Quality and features are up; costs are down. Compare today's mobile transceivers to those of the late 1980s or early 1990s and prices are substantially lower, yet the radios have more in the way of features, such as the amount of memory, CTCSS, DSQ, DTMF microphones, and more. Integrated design and manufacturing techniques, advancements in technology, and even the international monetary exchange rates all play a role.

When you consider your next radio purchase, think about some of the elements in this story. Your primary reason for buying is probably linked to the functions you have in mind, but your decision also helps drive the *many* elements that will result in even better products tomorrow.

I hope you've enjoyed this inside look at the industry that makes contemporary radio equipment possible. I want to thank Taka Nakayama, KW6I, for his assistance in making this "behind the scenes" tour a reality. As a reader of this magazine, I believe you share an interest in and even a fascination with the technology that makes electronic communications the magnificent miracle we enjoy in everyday life. And while the equipment is a thrill unto itself, remember that you are the ones who place the "Magic in the Sky."

73, Jeff, AA6JR

MFJ tiny Travel Tuner

Tiny 4½x2¼x3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything!

MFJ brings you the *world's smallest* full power 150 Watt 80-10 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna.

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Operate anywhere, anytime with a quick easy set-up! Tune out SWR on your mobile whip from inside your car. Operate in your apartment with a wall-to-wall antenna or from a motel room with a wire dropped from a window or from a mountain top with a wire over a tree limb. Great for DXpeditions or field day. Be prepared for emergencies.

MFJ-902 is so small and handy, you'll rely on it wherever you go! It's easy to pack away in your briefcase, suitcase, backpack, glove compartment or desk drawer. It's tiny enough to slide in your back hip pocket! 4½Wx2¼Hx3D inches.

MFJ-902
$99.95

Tiny Travel Tuner with 4:1 Balun

MFJ-902H
$119.95

MFJ-902H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun* for balanced lines and 5-way binding posts for balanced lines and random wire. 5¾Wx2¼Hx 2¾D in.

Tiny Travel Tuner with Cross-Needle SWR/Wattmeter

MFJ-904
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MFJ-904, same as MFJ-902 *Tiny Travel Tuner* but has *Cross-Needle SWR/Wattmeter.* Read SWR, forward and re-flected power all at a glance in 300/60 and 30/6 Watt ranges. 7¼Hx2¼Hx2¾D inches.

ALL-in-one Tiny Travel Tuner with 4:1 Balun *and* SWR/Wattmeter

MFJ-904H
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ALL-in-one! MFJ-904H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun for balanced lines* and Cross-Needle SWR Wattmeter. Read SWR, forward and reflected power all at a glance in 300/60 and 30/6 Watt ranges. Has 5-way binding posts for balanced lines and random wire. 7¼Hx2¼Hx2¾D inches.

Long 10/12 foot Telescoping Whips

MFJ-1954
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10 Feet

MFJ-1956
$34.95
12 Feet

10 foot extended, 19 inches collapsed, MFJ-1954, $22.95. 12 foot extended, 22.5 inches collapsed. MFJ-1956, $29.95. Standard 3/8 inch by 24 threaded stud for use with all standard mounts. Durable 1/2 inch diameter plated brass. Telescopes for full 1/4 wave operation 2 to 12/15 Meters. Cover 17, 20, 30, 40, 60, 80, 160 Meters with loading coil. Use two for multi-band dipoles. Replace screwdriver antenna whip for highly efficient *fixed* mobile operation.

MFJ RF Isolator

MFJ-915 *RF Isolator*

MFJ-915
$29.95

prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. *Don't operate without one!* 5x1½ inches. For 1.8 to 30 MHz.

Portable Collapsible Antenna Tri-Pod

MFJ-1918
$49.95

Holds 66 pounds of antenna steady. Black *steel* base forms strong braced equilateral triangle 40 inches on a side. Non-skid feet. One inch diameter steel mast extends height to six feet. Strong base and mast locks. Easily add antenna mount or mast extension for greater heights. Collapses to 38 inches by 4 inch diameter. 6¾ pounds.

40-10M G5RV Junior
MFJ-1778M, $39.95.
Half-size 52 foot *G5RV Jr*
40-10 Meters, 1500 Watts.

1500 Watt Lightning Surge Protector

MFJ-272
$39.95

Protect your expensive transceiver from static electricity and lightning induced surges with an ultra-fast gas discharge tube. Plug between rig and antenna, attach ground. DC to 1000 MHz. SO-239s.

All-Band G5RV Antenna

MFJ-1778
$44.95

Cover all bands, 160-10M with tuner. 102 ft. long, 1.5kW. Custom fiberglass insulator stress relieves 450 Ohm ladder line. Use horizontally, as inverted vee or sloper. Marconi on 160M.

Glazed Ceramic Antenna Insulator

MFJ-16C06
6-Pack
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(79 cents each)

Authentic *glazed ceramic* antenna insulator. Extra-strong -- will not break with long antennas and will not arc over or melt even under full legal power. Molded ridges give extra-long high voltage path to prevent high-voltage breakdown. Smooth wire holes prevent wire damage. Use as center or end insulator for dipoles, doublets, G5RVs, guy wires and others.

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MFJ-918
$24.95

True *1:1 Current Balun/Center Insulator* forces equal currents into dipole halves to reduce coax feedline radiation and field pattern distortion. Reduces TVI, RFI and RF hot spots in your shack. 50 ferrite beads on *Teflon*(R) coax. 1.5kW, 1.8-30 MHz. Stainless steel hardware. *Direct* antenna connection. 5x1½ in.

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the weekender

BY PHIL SALAS,* AD5X

Automatic Antenna Grounding System for Multiple Feeds and Multiple Receivers

I've been using an MFJ-4726 antenna switch for about a year now (see the review of the MFJ-4726 in the February 2007 issue of *CQ*). As I have multiple radios and multiple antennas, this lets me switch any radio to any antenna. However, recently I've become interested in being able to connect multiple radios to multiple antennas simultaneously. As an example, while operating on 40, 30, or 20 meters with my Yaesu MkV, I also like to monitor 17 meters with my Drake 2B receiver (a 14.1 MHz crystal in the Band C position permits tuning 30 and 17 meters) and 6 meters with my IC-706MKIIG. To do this, I need to bypass the MFJ-4726 for my Drake and ICOM radios. Now while I do use ICE surge arrestors on all my feedlines before they enter the house, I also like the peace of mind of physically grounding the antenna feeds as well. Hence, this month's project.

My first version of this device began as in-line individual coax automatic grounding switches. I just used a relay to simultaneously open the RF feed and ground the transceiver/receiver input when the master power was turned off. However, after thinking about this for awhile, I decided to add some simple circuitry to protect the secondary receivers from overload when transmitting with my main transmitter. This is because my antennas are located fairly close together. Also, I could even put the secondary receivers on the same band so I could simultaneously listen to two frequencies in the same band, or even gain the advantage of diversity reception. To provide this capability, I use the amp-enable output of my Yaesu MkV as a key-

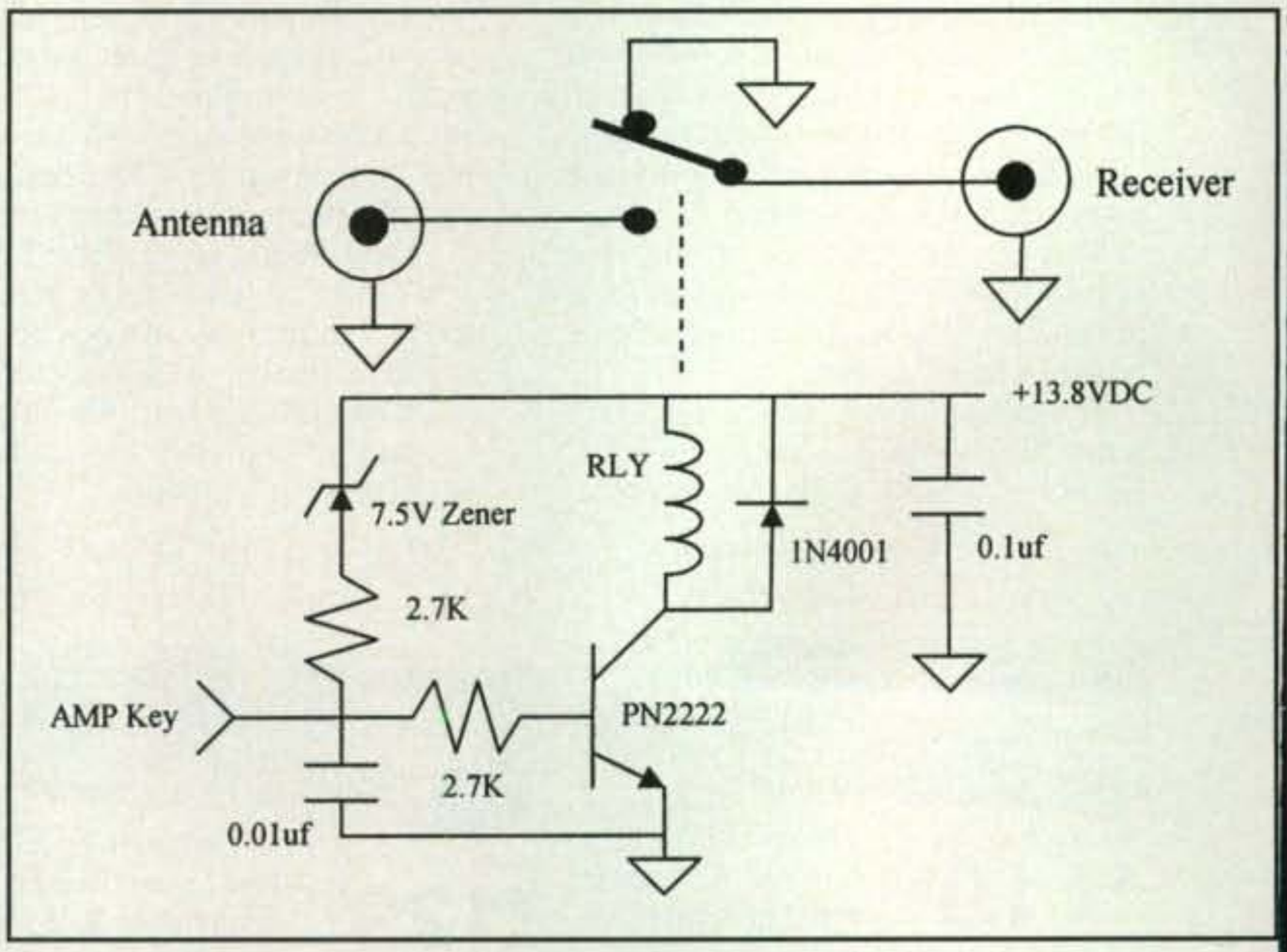

Fig. 1– Schematic of the final design.

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e-mail: <ad5x@cq-amateur-radio.com>

← *Photo A– Internal view of the grounding box.*

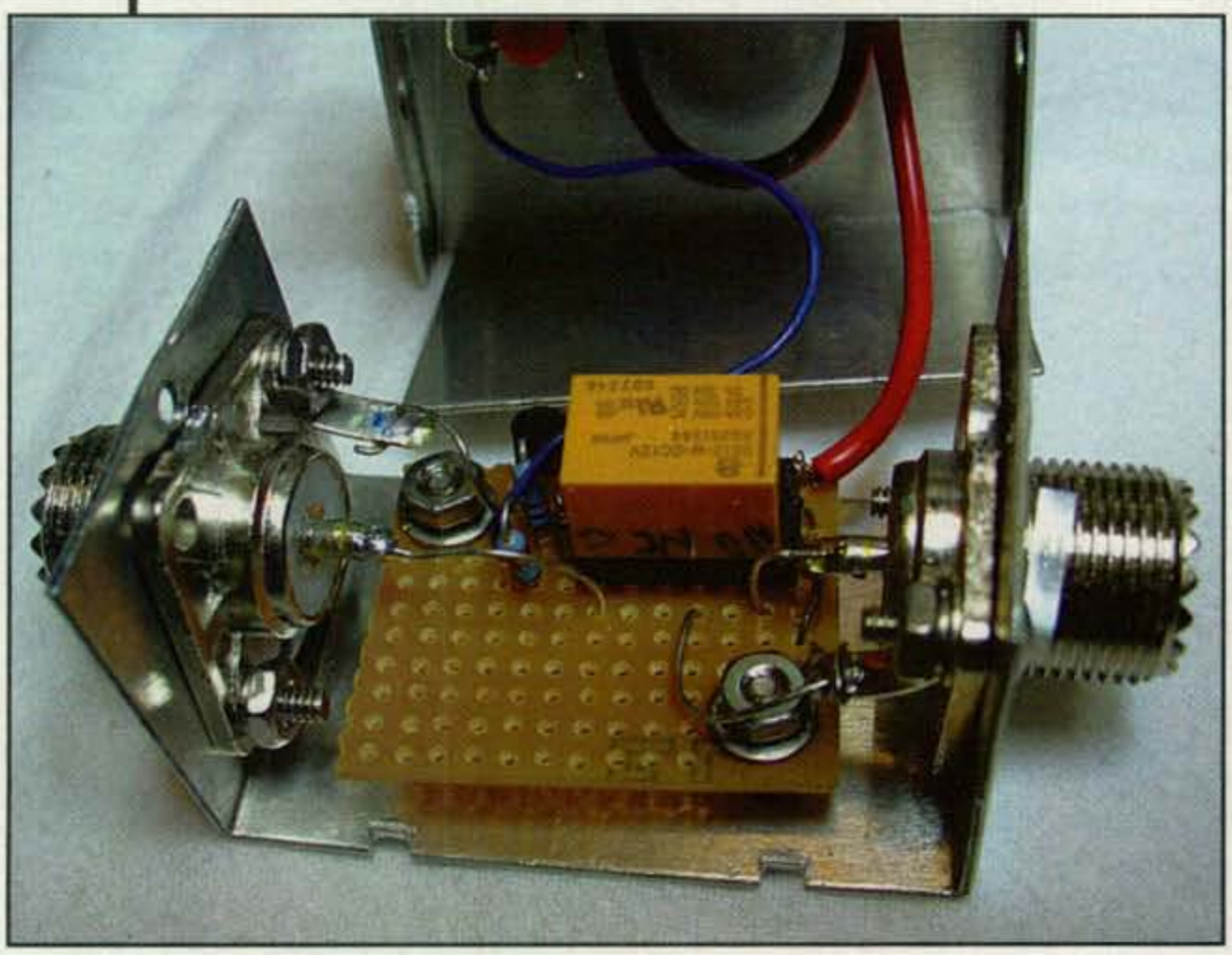

Photo B– External view of the grounding box. ↓

Qty.	Description	Source/Part No.	Price each
1	SPDT signal relay	Mouser 653-G5E-134PL-DC12	$3.74
1	2.25" × 1.5" × 1.38" AL box	Mouser 537-M00-P	$3.99
2	SO-239 connectors	All Electronics SO-239	$1.00
2	2.7K ohm resistor	All Electronics 2.7K-1/4	10/$0.50
1	1N4001 diode	All Electronics 1N4001	15/$1.00
1	PN2222 transistor	All Electronics PN2222	5/$0.80
1	14-pin IC socket	All Electronics HRICS-14	$0.50
1	7.5V Zener diode	All Electronics 1N4737	4/$1.00
1	0.01 µF capacitor	All Electronics 103D50	10/$0.60
1	0.10 µF capacitor	All Electronics AM-104	10/$0.90
1	Perf board	All Electronics PC-1	$0.75

Mouser: <www.mouser.com>
All Electronics: <www.allelectronics.com>

Table I– Parts list for each unit.

ing input on the RF switch box so that the unit operates whenever the main transceiver is keyed.

Fig. 1 is a schematic of my final design. The miniature signal relay operates in less than 5 milliseconds, so it switches faster than the RF becoming available for virtually any transceiver. The Amp-Key input is designed to handle the keying output of any transceiver, including the low current output of IC-706MKIIG and IC-7000 transceivers. It is not necessary to connect the AMP-Key input to your main transceiver unless you are worried about damage to your secondary receivers or transceivers due to close proximity of the main transceiver antenna. Refer to photos A and B for internal and external views of the grounding box.

This unit works great, and the relay is fast enough so that you can operate full QSK without worrying about damage to a receiver that is even on the same frequency on which you are transmitting. Spend part of your weekend and a few dollars and build this inexpensive coax grounding unit. It will give you a little extra peace of mind when using separate radios on separate antenna feeds.

That'll do it for this month.

73, Phil, AD5X

how it works

BY DAVE INGRAM,* K4TWJ

Times, Seasons, and Communications

UTC, GMT, EST, EDST, World Time, 24-Hour Time, Military Time . . . It is confusing enough to drive new amateurs crazy! Factor in time differences between various world areas, the sun effects on heating and cooling of the ionosphere, spring and fall equinox, Northern and Southern Hemispheres, and the game gets twice as perplexing, especially when sending QSL cards. What time reference generally is used for amateur radio? How do you visualize times between world areas, and what are the resultant benefits? That is the focus of this column, and we will strive for simplicity in explaining the terms. Let's begin with some easy-to-comprehend explanations of "time terms."

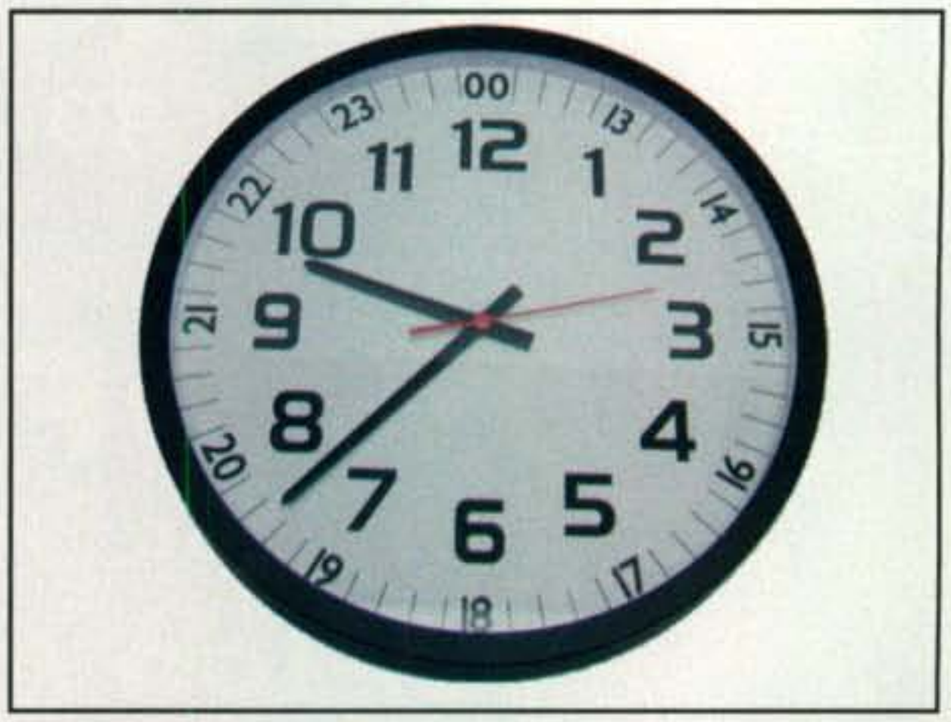

Photo A– Do you find converting between your regular AM/PM time and 24-hour UTC time confusing? This 12-inch diameter MFJ-126 clock solves the dilemma by indicating both. It sports three hands and indicates 12-hour time on its inner dial while simultaneously showing 24-hour time on its outer dial. (Photo courtesy of MFJ Enterprises, Inc.)

Photo B– Notice the bezel around this MFJ-115 wall clock. It is marked with major cities in each of the world's 24 time zones and makes quickly determining local time anywhere on Earth a cinch. You just find a city in a selected time zone, then count the hours "ahead" or "behind" your local time, and use that "correction factor" to establish time. (Photo courtesy of MFJ)

General Explanations

I personally consider UTC, or Coordinated Universal Time , as a modern ("updated") nomenclature for GMT, or Greenwich Mean Time. Both UTC and GMT are identical in their stated time, which is also considered a standard reference (because for global contacts, radio amateurs typically convert their local time to UTC for logging and QSLs). Greenwich, incidentally, is a suburban area of Greater London, England and home of the Royal Observatory. Greenwich Time or Coordinated Universal Time is five hours ahead of EST (Eastern Standard Time), six hours ahead of CST (Central Standard Time), seven hours ahead of MST (Mountain Standard Time), and eight hours ahead of PST (Pacific Standard Time).

Since Coordinated Universal Time is a world standard, it remains fixed when other areas (such as the U.S.) "spring forward" an hour in spring and "fall back" an hour in fall for Daylight Savings Time. As a result, while EST is five hours behind UTC, EDST is four hours behind UTC. Likewise, CDST is UTC minus five hours, MDST is UTC minus six hours, and PDST is UTC minus seven hours. I encourage you to reread this paragraph and the one prior to it (possibly writing some time zone comparisons as you go) for greater understanding.

A common entanglement in visualizing times of different zones is differentiating between AM and PM. The use of 24-hour time (which some refer to as World Time or Military Time) simplifies this dilemma. How does it work? The first 12 hours of a day (from one minute past midnight until 12 noon) are stated as 0001 to 1259 and without an AM designation. The second 12 hours, or PM, are then stated as 1300 to 2359 (without a PM designation). Stated another way, 1:00 PM is 1300 hours, 3:00 PM is 1500 hours, and 7:00 PM is 1900 hours. In rereading the previous sentences you might question if the minutes following 2359 would be stated as 2400, 2415, etc., until reaching 0100. No, the minute following 2359 (which coincides with 11:59 PM) begins the next day—time 0000—and that first hour following midnight is 0001 until 0059, followed by 0100, 0115, etc. Are you still with us? Congratulations! You just completed timekeeping 101.

Visualizing Times Around the World

As we learned during early childhood, the Earth's orbit around the sun causes the sun to rise (dawn) in the eastern sky and set (dusk) in the western sky. Related to our U.S. QTH, that means when dawn or sunrise is occurring in the mid U.S. (typically 0600–0700), it is already noon in Europe, and it is still dark in areas to our west (Hawaii, Japan, Australia, etc.). Likewise, noon in the U.S. coincides with dusk or evening in Europe and the approach of dawn in Japan and Australia. Looking farther at the world's 24-hour time zones (which often are found on world globes and many specialized clocks

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅝	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	2⅞ x 7 x 9⅝	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 9⅝	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅝	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	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 9⅝	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

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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

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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

Photo C– During Christmas 2006, Colorado, located in the Northern Hemisphere, was hit with freezing cold temperatures and a winter blizzard that dumped over 24 inches of snow. Brrrrr!!

Photo D– Also at Christmas 2006, Rio de Janeiro and its world-famous Ipanema Beach, located in the Southern Hemisphere, experienced a heat wave with temperatures about 30°C, or 100°F. (Photo courtesy of our good friend and QRP aficionado Alex Grimberg, PY1AHD)

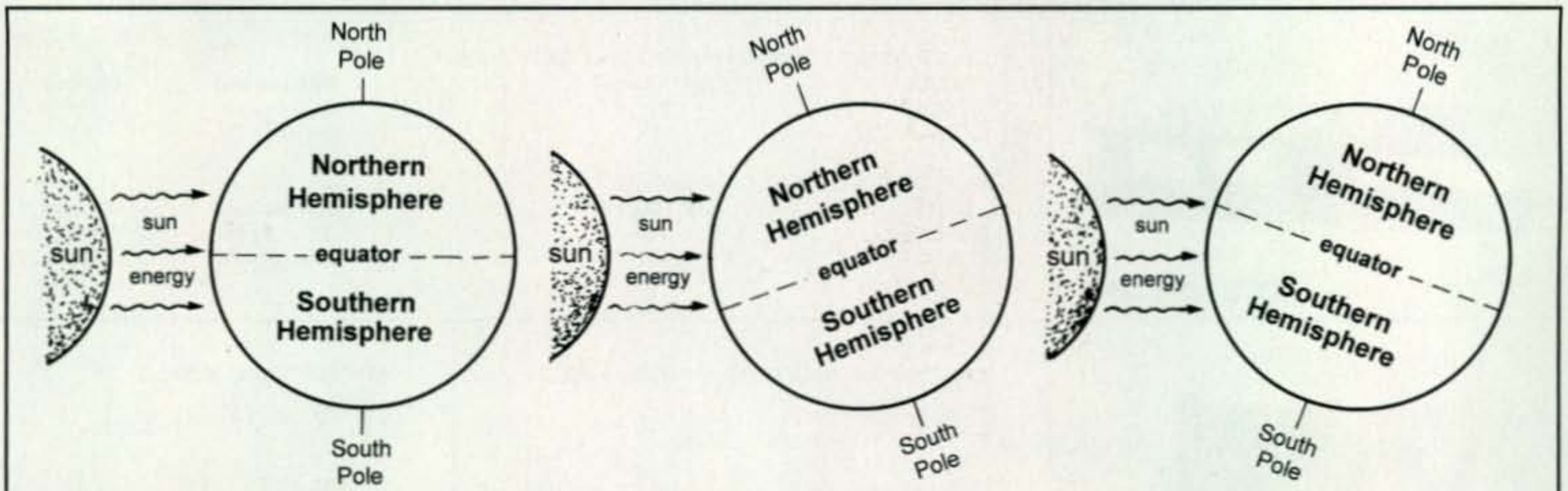
or watches), we find Brazil is three hours ahead of the mid U.S., South Africa is eight hours ahead, and Australia is 16 hours ahead.

How do the previously discussed facts related to amateur radio? Simply described, ultraviolet and solar energy from the sun directly influence the ionosphere's ability to reflect or "skip" HF signals long distances. Some real-life examples best relate that fact. When the time is 0900 in the mid U.S., the time is 1500 in the U.K. and the sun is over the Atlantic, midway between the two continents. Assuming sufficient UV and solar energy from the sun, upper HF bands such as 15, 17, and 20 meters will be "open" to Europe around this time, and the greater the sunspot activity, the higher bands such as 15, 12, and 10 meters will support U.S. to Europe communications. Similarly, warm summer months enhance upper band communications more than cold winter months.

When we look at the "flip side" of that situation, the lower bands of 30, 40, 80, and 160 meters provide an interesting study. When the time is 6:00 AM in the mid U.S., it is 2200 in Australia and the darkest hours of night are roughly midway on that path (near Hawaii). The cool ionosphere then supports HF communications on the lower HF bands, such as 40, 80, and 160 meters. Once again (in reverse), the cooler the ionosphere (winter as opposed to summer, for example), the better the openings on nighttime bands such as 40, 80, and 160. The 20-meter middle HF band, incidentally, is influenced by both a warm and cool ionosphere and is typically "open" to one area or another of the world during most hours of the day or night (it is the ultimate DX band!).

The Equator and the Seasons

As we learned in grade school, the world is comprised of an upper, or northern, hemisphere and a lower, or southern, hemisphere, and the two are defined (separated) by the equator. When



A: spring/fall. Equal amounts of sun energy in northern and southern hemispheres.

B: summer. Maximum sun in northern hemisphere. **winter.** Minimum sun in southern hemisphere.

C: winter. Minimum sun in northern hemisphere. **summer.** Maximum sun in southern hemisphere.

Fig. 1– Seasons in the sun . . . Due to the fact that the Earth is tilted on its axis, different regions receive more direct sunlight over the course of our planet's year-long trip around the sun. In the March–May and September–November timeframes (A), both the Northern and Southern Hemispheres receive relatively equal amounts of sunlight; the Northern Hemisphere gets more in June/July/August, while the Southern Hemisphere gets more during the northern winter months of December, January, and February. (And no, the Earth does not actually rock back and forth by 45 degrees between winter and summer; we've just made it look that way for purposes of illustration.)

studying the planets and our solar system, we also learned that because the Earth is tilted on its axis, different regions receive more direct sunlight at different times of the year.

Those changes cause seasonal variations we know as winter, spring, summer, and fall. In looking closer, we see that when the sun appears most directly over the Southern Hemisphere, its solar heating effects produce warm summer weather in South America, Africa, and Oceania. Simultaneously, reduced solar heating of the Northern Hemisphere results in cooler temperatures and winter weather in North America, Europe, and Asia. Approximately six months later, the sun appears over the Northern Hemisphere and the situation is reversed. South America, Africa, and Oceania then experience winter weather, and North America, Europe, and Asia experience summer weather. We also see that during spring and fall the sun appears directly over the equator and near-equal amounts of its solar energy produce close-to-equal heating of both the Northern and Southern Hemispheres. It is difficult for some of us to visualize hot summer weather at Christmas and biting cold days in July, but that is because we live in the Northern Hemisphere. Those who live in the Southern Hemisphere probably experience difficulty visualizing our cold weather in December and warm weather in July.

Once again, let's consider how the previous facts relate to HF radio communications. Let's begin by reiterating the familiar "propagation statement" of a cool ionosphere enhancing long-range communications on lower HF bands, while a warm ionosphere supports long-range communications on upper HF bands. Ah, but there is a hitch: The ionosphere's temperature is not equal the world over.

When it is winter in North America, Europe, and Asia and summer in South America, Africa, and Oceania, stations in the U.S. normally can receive 40-, 80-, and 160-meter signals from stations in both the Northern and Southern Hemispheres better than Southern-Hemisphere-based stations can copy U.S. stations on 40, 80, and 160 meters. We may thus find working Northern Hemisphere areas with a simple antenna and low power fruitful, but need a mild-mannered (500-watt) linear amplifier to be heard above static and band noise in Southern Hemisphere areas. During that same time period (winter north, summer south), stations in South America, Africa, and Oceania can receive 15-, 12-, and 10-meter signals from stations in both Southern and Northern Hemisphere areas better than we (in the U.S.) can receive them on 15, 12, and 10 meters. Then they need more power or we need a higher gain antenna (such as a beam).

When seasons reverse, the previously described scenario also reverses. During summer in North America, stations in the Southern Hemisphere (which are then in winter) can receive us better than we can receive them on lower HF bands—and we can copy them better than they can copy us on upper HF bands. Confusing? Just remember cool times (nights and winters) enhance conditions on the lower HF bands and warm times (daylight hours and summer) enhance good conditions on upper bands. How does the mid-HF band 20 meters (and, to a mild extent, its adjacent bands of 17 and 30 meters) fit in the previous study? Signals in that range tend to reflect or skip off the ionosphere quite effectively during many hours of the day (or night) and various seasons of the year. They are all-season favorites.

A magical time for long-range HF communications on almost all HF bands, incidentally, occurs twice a year when the sun is directly over the equator (the first day of spring and the first day of fall). These times are known as equinoxes and the hours of daylight and darkness are equal the world over (12 hours each). The sun's effects on ionospheric heating are also equal, and HF propagation between the Northern and Southern Hemispheres is also close to equal. Check contest calendars and you will notice that the major DX contests are held around the equinoxes. A coincidence? No, it is the best time of the year to chase DX on any and all HF bands, and all world areas are on "equal ground." Like DXing? Watch for an equinox!

Conclusion

This time we discussed how times and seasons around the world influence general HF signal propagation. We also presented several ideas and items you can use for determining times in various areas of the world. You can expand on our views in many ways. Our goal was simply getting your creative thinking started. Future columns will look at more exotic forms of signal propagation. Meanwhile, remember the real fun of radio communications is getting on the air and enjoying HF communications via ionospheric skip. We will be listening for you on 30 meters one weeknight soon.

73, Dave, K4TWJ

Oops...

Well, it was inevitable ... In sharing the experiences of so many hams relating to the launch of Sputnik-1 50 years ago (October and November issues), we were bound to mess up at least one callsign. So far, we've only heard about one: Spence Miner let us know that his correct call is K4KEP, not K4PEP as we'd printed, or as Spence put it in his e-mail, "K 4 KEEP EATING PEACHES, not POSSUMS EAT PERSIMMONS." We apologize for the error. And we'll try not to let the possums eat the peaches!

You can put a dish in California, another one near Seattle, another near Boston, and finally one in my backyard in Texas. By synchronizing the signals received by all four antennas looking at the same star at the same time, you can obtain virtually the angular resolution of a dish antenna the size of the United States!

But why stop there? Let's equally space dish antennas around the world as best we can (oceans often get in the way) and now simulate a dish antenna the size of our planet!

But why stop there? Perhaps hypothetically we could synchronize with one of those hypothetical CIA birds in orbit to listen to the stars instead of cell phones in Colombia. Now we are talking about simulating a 25,000-mile-wide dish antenna. Of course we can't simply connect coax between all of these antennas as the same time, but by recording the signals along with GPS-derived time stamps, it is possible to combine data from all the antennas at a later time and plot the results. The use of commonly available VCR recorders allows several MHz of bandwidth to be recorded for several hours. Thus, fine resolution of radio sources is well within the reach of the amateur community.

Other planned projects include a 2.695-GHz *solar radiometer.* There is a very high correlation between the 2.695-GHz noise levels and sunspot activity. In simpler terms, a higher solar noise level on 2.695 GHz means there is a good chance that 15 and 10 meters will be open worldwide in a few hours.

Letters, Letters, We Get Letters

From Matt in Amarillo, Texas we received several questions prompted by the last column on mobile antennas about loading inductors and the "Q" of a coil.

The "Q," or *quality factor,* of an antenna loading coil is important, yet difficult to measure. Mathematically, Q is the inductive reactance of a coil divided by its resistance. Let's say a coil has 1000 ohms of reactance on 75 meters and has 1 ohm of DC resistance. Then the Q would be 1000/1, or 1000. (Yes, I know there are no real-world antennas with a Q of 1000, but the numbers make the math easy.)

Another way is to measure the bandwidth of the antenna. If a 20-meter antenna has a usable bandwidth of 100 kHz, then the Q is 14.1/.1, for a Q of about 140. However, this is the Q of the entire antenna, not just the loading coil.

At the same time, two wires close to each other form a capacitor. Thus, while you are winding an inductor, at the same time you are making a capacitor in parallel to the inductor. Use big, low-resistance wire and the capacitor has a higher value. Use thin wire and the capacitance is low, but then the resistance in the Q becomes a problem. Next, DC resistance is not exactly the true resistance of the coil. RF travels on the outside of the wire, not the inside. This makes your #10 wire look more like #16 wire to the RF currents. I feel a column topic coming on!

A well-designed loading coil will use a moderate, not too big, not too small diameter wire spaced close enough for good inductance between loops, but not so close as to make interwinding capacitance an issue. The coil will be just a little longer than it is wide—that is, almost square, but not so big that catching birds and bugs becomes an issue.

You often see CB antennas with big coils on trucks. This is more a "Mine is Bigger than Yours" than a functional antenna coil. It looks like I need to cover this topic more thoroughly when I get back to the U.S. Plus, I will try to get back to explaining how to read those antenna pattern charts you often see in advertising. Cheers and 73, 2EØVJB

radio classics

BY JOE VERAS,* K9OCO

Boatanchor Heresy

Vintage-radio enthusiasts tend to think in terms of equipment old enough to exhibit the glow of vacuum tubes. It may seem heretical to describe solid-state ham gear as vintage or classic. The transistor was invented 60 years ago this month by Bell Laboratories' William Shockley, John Bardeen, and Walter Brattain. The first transistorized amateur product reached the market more than half a century ago. Even though most of the early solid-state gear is neither large nor heavy enough to be called true boatanchors, their age qualifies them as vintage in my view.

Amateur radio periodicals took note of the transistor in 1948, and construction projects using the new device began appearing in ham magazines as early as 1953. The first commercial product was introduced in 1956. It was a marvel.

Regency

Regency, a division of I.D.E.A., Incorporated, ushered in the amateur solid-state era with its ATC-1 converter (photo A). The tiny unit ($4^3/4$" × $3^1/4$" × $4^1/16$") weighed but 30 ounces and was powered by three penlight cells. It covered 80 through 10 meters and received CW and SSB as well as AM. The rotary-drum dial featured linear band-spread calibration. A Q-multiplier aided selectivity. Only two external connections were necessary: one to the ham-band antenna and another to the host broadcast-band receiver's antenna input. The converter's 1230-kHz output frequency was chosen to keep harmonics of the broadcast receiver's oscillator from falling within any of the ham bands. Pushing in the tuning knob turned on the ATC-1's dial lamp. The dial lamp drew more current than the rest of the converter, so this use-it-when-needed feature helped minimize battery drain. The circuit used two transistors: one as an oscillator/mixer, while the other functioned as a Q-multiplier that doubled as a BFO for CW and SSB reception. Credit for the ATC-1's design goes to James Towler, W9MNY.[1]

Much of my information on the ATC-1, as well as other radios in this column, came from Jim Garland, W8ZR. Jim was generous with his time and gave me his first-hand impressions of the gear. He has an inside-outside knowledge of the equipment. Any factual errors in this article are mine alone. Readers may wish to visit the vintage section of Jim's website, <http://www.w8zr.net/vintage/index.htm>, for a detailed look at these radios.

In the summer of 1958, sixteen-year-old Jim (then WØZKE) toured Europe with his family in a Volkswagen micro-bus. He had an ATC-1 mounted on the dash, playing through the VW's car radio. When they stopped at hotels, he took the Regency converter in with him and listened to the European ham scene using a portable GE transistor radio as the ATC-1's back end.

Regency made a broadcast-band radio to pair with the ATC-1. The TCR-2 completed the IF and audio stages. This accessory is rarely seen today. It is pictured alongside the converter in photo A.

Another good ATC-1 webpage is located at <http://users.arczip.com/rmcgarra2/regencyAT1.html>. It is the work of Bob McGarrah, KB9CPH, and is well illustrated and full of information about the early solid-state era. It also includes a reprint of the *Popular Electronics* article noted at the end of the column.

Hallicrafters

Hallicrafters announced an astonishing new radio in the summer of 1957. The FPM-200 (photo B) was a full-featured transmitter/receiver for the 80- through 10-meter amateur bands on CW, AM, and SSB. The receiver section and low-level transmitter stages were solid state. Its 6146 finals, their 12BY7 driver, and a pair of OB2 voltage regulators were the only tubes used.

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website: <www.k9oco.com>

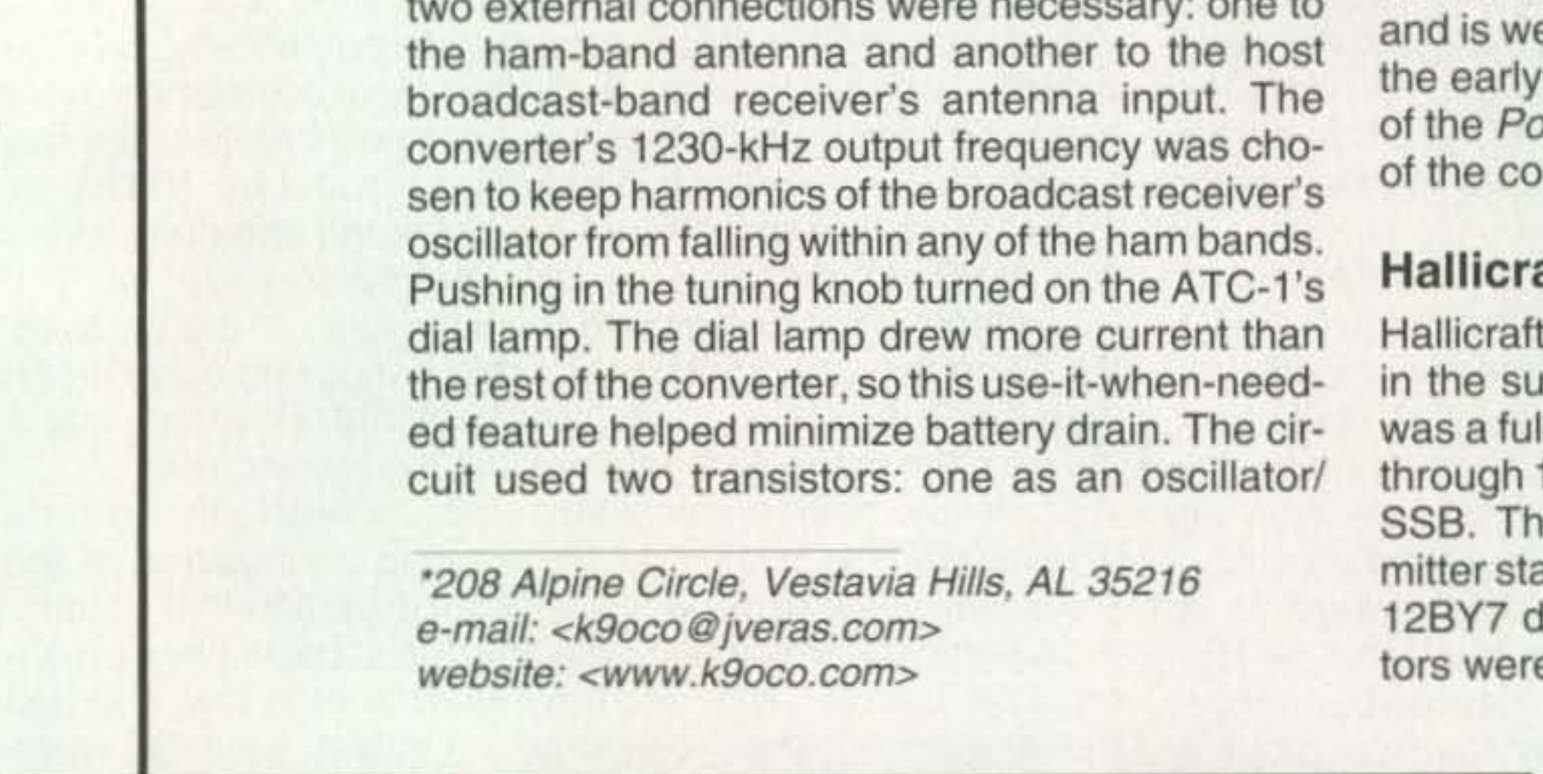

Photo A– The Regency ATC-1 converter was the first transistorized product to reach the ham market. It sold for $79.50 when introduced in 1956. Also pictured (left) is Regency's TCR-2 companion broadcast-band receiver which served as the converter's IF and audio stages for portable operation. (Photos © Joe Veras, 2008, all rights reserved)

Photo B– Hallicrafters' FPM-200 transmitter/receiver was all solid state except for its 6146 finals, their 12BY7 driver, and a pair of OB-2 VR tubes.

The FPM-200's dual PTOs provided linear tuning with calibration in 1-kHz increments. A front-panel switch enabled transceive operation with either PTO, as well as separate trans*mit and receive* functions using them both. The radio ran directly off 12 VDC. Active devices in the receiver section and low-level transmitter stages required 12 volts or less. A solid-state multi-vibrator supplied higher voltages for the tubes. The companion speaker/power-supply console for fixed-station use converted the AC mains voltage to 12 VDC and furnished power to the FPM-200's internal DC supply, which then converted it to the necessary high voltages.

Despite the ground-breaking innovations packed into its handsome case, the FPM-200 suffered performance *maladies* common to pioneering solid-state equipment. The transistors of the day were ill-equipped to handle strong signals. The gain distribution of the receiver's RF chain added to the problem. Another of the FPM-200's problems was the trouble Hallicrafters had getting it into production and the length of time it took to do so. In fact, there is disagreement about whether it ever became a real production item at all.

In August 1957, Hallicrafters first presented the FPM-200 in the advertising pages of amateur radio periodicals. The full-page ads were illustrated with drawings of the proposed rig but carried no actual photographs. The drawings showed a piece of equipment in the HT-32/SX-101 style, although it was smaller than either of those two boxes and certainly much lighter. The FPM-200 that eventually appeared had a control layout similar to the 1957 drawings, but the overall style was much different.

A series of ads in the following months dropped hints about the coming FPM-200, described some of its birth pangs, and predicted that "fully-transistorized ham receivers equal in performance to tube sets" would soon appear.

In May 1958, Hallicrafters announced that the FPM-200 would be first prize in the company's SSB-VHF contest. The contest required entrants to visit a Hallicrafters dealer and fill out a short "Why I like Hallicrafters equipment" statement. The grand prize was presented to W8BCK (SK) at the 1959 Dayton Hamvention®. Today that very same FPM-200 belongs to Jim, W8ZR.

Meanwhile, back at Hallicrafters' Chicago plant, the drama surrounding the FPM-200 went on. A May 1959 ad reported on the technology being developed for the new rig, saying it was "being readied for fall production." However, as the leaves began to turn in northern Illinois, the company ran another ad entitled "Where is the FPM-200?" Hallicrafters answered the rhetorical question by saying that extensive field tests had been conducted using five hand-built engineering prototypes. Fifty more would be built using production people, parts, and tools. These were to undergo further field tests, and production of customer sets was scheduled for the end of 1959.

In April of 1960, Hallicrafters announced that subassemblies for the 50 field test units had been completed and they were in the final assembly stages. The company called the development of a "totally new product concept" an "exacting, time-consuming, and costly process."

Some units eventually reached customers' hands, although even a ballpark number is difficult to determine. Estimates range from a total of about 50 to nearly 200. Either number includes all the engineering samples and prototypes, as well as those more closely resembling a finished product.

The FPM-200's 1960 price tag of $2660 represents more than $18,000 in today's money. The median (1960s dollars) income of American families that year was about $5300.[2] Even if it had reached the market sooner and in larger numbers, that price alone may have kept it from commercial success. On the other hand, at about the same time Hallicrafters was working to get the FPM-200 out the door, the price for the Collins 75A-4/KWS-1 combination had risen to nearly $2800 and the company sold plenty of those.

I have been fortunate to visit with Don Buska, N9OO, at his Kenosha, Wiscon-

sin QTH and photograph some of his collection. Don's website, <http://home.wi.rr.com/n9oo/fpm200/fpm200.htm>, gives a good covers-off look at the FPM-200.

National

The National HRO-500 (photo C) was the penultimate model in the long-running HRO series and the last one to use the company's trademark PW dial. When introduced in late 1964, it broke the mold in a significant way: It was fully solid state and synthesized. It covered all the radio spectrum between 5 kHz and 30 MHz in a total of sixty 500-kHz bands with the same tuning rate and calibration accuracy in every range. The receiver could operate directly from 11–16 VDC and also had an internal 117/234-VAC supply.

Jim, W8ZR, enjoys his HRO-500 and is thoroughly familiar with its inner workings. One challenge in keeping such equipment going is finding substitutes for no-longer-available solid-state devices. Ironically, finding tubes for boatanchor gear much older than the 500 is often an easier task. Jim gives the HRO-500's AM audio high marks and praises the pass-band tuning as well. "My biggest gripe," he says, "is the sound of CW notes, which have significant distortion. They sound almost like harmonica notes, and the SSB audio isn't much better." He attributes the problem to the distortion caused by the IF's 50-kHz pot core resonators.

My friend Niel Wiegand, WØVLZ, is expert on National products, and information on the HRO-500 can be found on his site <http://www.io.com/~nielw/nat_list/hro500.htm>. Point your web browser at <http://home.netcom.com/~lardiere/id4.html> for Rocco Lardiere, N6KN's detailed report on his restoration and trouble shooting of the HRO-500.

The final National receiver to bear the HRO name was the HRO-600. The last of the long-running line, it was the first in the series without the PW dial of its ancestors.

Photo C– The solid-state, synthesized National HRO-500 retained the classic PW dial of its predecessors but did away with the plug-in coils that had defined the HRO series.

Davco

One of the jewels of early solid-state ham gear was an innovative receiver that had its roots in the Asheville, North Carolina area. Everest McDade, W4DYW, and James Lovette, K4BXO, both were members of the Asheville Symphony Orchestra (Lovette played flute and piccolo), but their most interesting duet was a receiver design they collaborated on in the early 1960s.

The Davco DR-30 (photo D) grew out of work the two men did in the basement of Lovette's parents' house. By the time there was an actual Davco company and production facility, the business had been moved to Tallahassee, Florida, where Lovette headed up the operation and was the driving force behind getting the DR-30 into production. The Davco name sprang from the radio's North Carolina home, however. James Lovette was a graduate of **Dav**idson **Co**llege and contracted the name of his alma mater to christen the receiver. Following Davco's move to Florida in 1964, the receiver was well-advertised in ham magazines and had favorable reviews, but the company struggled along before failing in 1968.

Three ceramic filters in the DR-30's 455-kHz IF provided the basic 5-kHz selectivity. Further selectivity was achieved by inserting a 2.1-kHz Collins mechanical filter in the IF circuit using diode switches. A series 455-kHz crystal, also diode switched, followed the

Photo D– The Davco DR-30, shown here with its DR-30S power supply/speaker, housed solid-state circuitry, a Collins mechanical filter, and advanced construction techniques in a compact enclosure.

mechanical filter to narrow the passband to 500 Hz for CW. An effective notch filter, tunable with a front-panel control, gave the DR-30 another tool to dodge QRM. Early versions of the DR-30 design used bipolar transistors in the front end, causing it to suffer the predictable strong-signal problems. FETs were substituted in the production version, decreasing the receiver's tendency to overload. The DR-30 covered 80–10 meters and the 50–50.5 MHz portion of the 6-meter amateur band. It also included a position for monitoring 10-MHz WWV. Two additional 540-kHz ranges were available, their frequencies determined by optional crystals.

The receiver's innovative circuitry was complemented by its sturdy mechanical design. An extruded aluminum chassis provided a solid mounting platform for the printed-circuit boards and other components. The internals were wrapped in a handsome panel/cabinet, and the whole package was a compact 4" H × 7 1/8" W × 6" D. Power requirements were 300 ma at 11.5–16 VDC with the panel lamps switched on. The current draw dropped to half that with the lamps off. The DR-30S speaker/regulated power supply furnished the necessary power from a 110/220-VAC mains source and also had space for nine D-cell batteries for portable use. The DR-30 sold for $389.50 in 1967; the DR-30S for $39.50. A companion transmitter, the DT-20, was planned but the project never proceeded beyond a prototype or two.

McDade did much of the design work on the solid-state Hammarlund HQ-215 when he worked at the company's Mars Hill, North Carolina plant in the mid-1960s. His interests also ranged beyond the world of electronics. He grew orchids and held a patent for cloning the plants. He was a flutist in the symphony and played the French horn as well.

The saga of the McDade family is a story all by itself. The house rule was that every family member must have a ham license, even those who married into it! Mrs. Edith McDade, to whom I am indebted for much of the Davco information, is WA4SRD. She names CW as her favorite mode and was once very active on North Carolina traffic nets. Son Evan is WA4AAK. He recalls seeing one of the prototype DT-20 transmitters mounted alongside a DR-30 in Lovette's sports car. The McDade daughters were licensed as teenagers. Elissa is now WA4BVF and held the call DJØYL while living in Germany. Emily and Ellen are WA4BSJ and WA4BQY, respectively.

Thanks to John Travis, W4QCF, and Carl Smith, N4AA, for helping establish contact with Mrs. McDade. Thanks also to Hobart Whitman, W4WES, for additional information on Lovette, McDade, and Davco's early years.The equipment in the photos is from the collection of Herman Cone, N4CH. Thanks again, Herman!

December 2007 marked my 50th year in ham radio. Writing this column has enabled me to revisit old friends (the radios) and make many new ones (fellow boatanchor enthusiasts and collectors). It's been an exciting journey and it goes on. The column I will write in another 50 years might be about that great vintage classic the ICOM IC-7800, or some such. I wish you all a wonderful 2008. 73, Joe, K9OCO

Notes

1. *Popular Electronics*, September 1956, p. 30.
2. U.S. Department of Commerce, Current Population Reports, Income of Families and Persons.

beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

The Basics of Making Low-Band Contacts: An Introduction

If you have any HF (the "low bands" from 160 to 10 meters) capability at all in your station setup, you will notice several things almost immediately. At least one of them is the ability to make contacts over long distances ("working DX") without the assistance of repeaters, as compared to VHF (the frequencies of 6 meters and up).

Many operators get a real "kick" out of contacting faraway stations using their ham stations. Even today with the internet and cellular phones capable of instant global communications, DXing with your own equipment at your home station can be thrilling and satisfying. Many countries have ham radio organizations and awards programs such as the CQ DX, WAZ, and WPX awards sponsored by CQ. Take a look at the awards programs from all over the world in K1BV's "Awards" column in this magazine, too.

For some inspiration, obtain some ham radio maps, both of your country and of the world. Here in the U.S., ham radio maps are available from the ARRL (American Radio Relay League) and from some radio manufacturers at hamfests. There are also some very nice ham radio maps on the internet (see the References and Resources section for the URLs).

Generally speaking, propagation is very different on the HF bands, the low bands, and the VHF and above bands. The lower bands enable local to global communications when the conditions are right. These radio conditions also change throughout the day and seasons of the year. On the other hand, VHF and above propagation is generally characterized by local, but reliable, short-range communications. The major exception to this general rule is 6 meters (50 MHz). This band is also known as the "Magic Band," because it has a strange and wonderful mix of propagation characteristics. Radio-wave propagation is the reason why even modest stations can establish (or not establish) contacts many hundreds or even thousands of miles away.

Let's see what can be done with a dipole or similar wire antenna and a 100-watt transceiver. There are thousands of stations in the "small station category" all over the world. With this sort of equipment, there are some stations that can make amazing contacts and some that cannot. The difference between the successful and the not-so-successful stations can largely be attributed to an operator's skill. This is sort of similar to NASCAR racing, in which strict equipment rules limit vehicle capabilities to some extent, and driver skill becomes a major factor in winning the race.

Sure, if one were to invest in building a most impressive ham station, with the latest and greatest radio equipment and the biggest and highest tower-mounted antennas available, chances are more than good that contacts will be successful. However, chances are equally good that not every contact attempted will result in a contact being completed.

Thus, let's get back to something more practical and talk about the hints and techniques that you can use to increase the "skill factor" to maximize small-station performance.

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A good set of headphones is an excellent accessory to work the weak stations. Newer designs include a noise-cancelling feature, such as these "earphones" made by Panasonic. However, you may want to get a pair of 'phones specifically for radio communications, such as the units made by Heil Sound.

Setting Expectations

Before we get too far, understand that simple antennas usually mean simple contacts. I mean to say that although ham radio lore is filled with some amazing tales of DX contacts made with a bed-spring antenna, or even a "wet noodle," it does not make sense to expect that you will be able to establish contact with 100 percent of the stations you can hear. However, it is reasonable that you can expect to talk to stations that deflect the rig's signal-strength meter (S-meter) way to the right (S-5 or above, and maybe less).

Another thing to remember is that your station location will contribute to the contacts your station is capable of working. For example, when I lived in the New England area, I was amazed at the number of European stations I could hear and actually work. I was also disappointed to learn that 40 meters was sometimes very difficult due to the shortwave broadcast stations booming in from Europe. On the West Coast, where I live now, stations in the Pacific Ocean area and Asia are fair-

ly easy to work. I have made hundreds of contacts with Japan using 100 watts and a 40-meter inverted-Vee antenna on 15 meters CW and SSB, for example. (The 40-meter, or 7-MHz, antenna is being used on its third harmonic, 15 meters, or 21 MHz.)

Speaking of antennas, a great example of a very strange antenna system is described by Patty Winter, N6BIS. Patty has used something she calls an "awntenna" and has made hundreds of DX contacts with it. In fact, she has the ARRL's operating award "DXCC," which means that Patty has submitted proof of making contact with at least 100 different ham radio entities (listed in the ARRL's DXCC list). More details on Patty's awntenna, and other interesting things, are on her website (see the References section for the URL).

Turn On the Radio and Listen

By the way, I plugged "How to work DX" in the Google search engine just now. There are over 2-million resources on this topic on the World Wide Web, so if you want to learn how to work DX, take a look on the internet. Of course, sitting in front of your computer is not going to help you make contacts. Likewise, a radio on receive does nothing to make contact with others. So let's get on the air and "just do it."

First things first: The ability to listen is the number one skill to hone. This brings us to another necessary ingredient for success in making contacts—patience. Then add concentration, since the loud and clear signals are easy to contact, but the weak and noisy ones are harder to understand and yet end up being the most gratifying to complete, since it often takes more effort to make that difficult contact.

While I did not read all 2-million pages about working DX, I did notice a common theme in most of these entries, and this bit of advice withstands the test of time: You must listen, listen, and listen more. A popular saying goes something like this: "You can't work 'em if you can't hear 'em." Remember, you are trying to establish contact with another station, and you must be able to listen to instructions and follow them, since the station on the other side is "instructing" you (and others on the frequency) what to do in order to make contact with him or her.

You must also listen to what else is going on on the frequency. Are other stations also trying to contact the same station? Is there interference from your next-door neighbor's electric weed-

References and Resources

Amateur Radio Maps, Online:

DX Zone: <http://www.dxzone.com/catalog/Operating_Aids/Maps/>
DX Atlas, by Alex Shovkoplyas, VE3NEA, Afreet Software, Inc.: <http://www.dxatlas.com/>
Amateur Radio Maps, ARRL: <http://www.arrl.org/catalog>

Awards Programs:

The CQ Awards Programs: <http://www.cq-amateur-radio.com>
The ARRL Awards Programs: <http://www.arrl.org/awards/>

Reading Material:

Locher, Bob, W9KNI, *The Complete DXer,* published by Idiom Press, ISBN: 0-9617577-0-1. This book is in its third edition, and is one of the most inspiring ham radio books I have ever read. You can order direct from Idiom Press (http://www.idiompress.com/index.htm), or from the CQ Bookstore (see contact info elsewhere in this issue).

Silver, H. Ward, NØAX, *Ham Radio for Dummies,* published by by John Wiley & Sons, Inc., ISBN: 0-7645-5987-7.

Winter, Patty, N6BIS, "Space Shuttles, Amateur Radio and Astronomy" web page: <http://www.wintertime.com/OH/hobby.html>

Headphones:

Noise cancelling headphones from Heil Sound, QuietPhone: <http://www.heilsound.com/>

whacker? Is the baby crying in the room next to your ham shack? All these "interference factors" must be overcome in order to hear what the other station is saying.

One station accessory that will help your concentration is a good pair of headphones. Check your favorite ham radio store and ask your friends for some advice on what to purchase. Using headphones will not only improve your ability to hear, they also will help keep the radio noise out of the earshot of others in your house. Heil Sound makes several types of headphones specifically for ham radio use, as well as headsets that include microphones. Check the Heil Sound website for more information on its line of ham-radio-specific audio accessories (see the References section).

I recently purchased an "active noise cancelling" set of earphones at a stereo shop, mainly for use when I am traveling on airplanes. However, I will also use these for my ham radio operations (see photo).

Know Your Equipment

Part of your radio skill set must be your ability to manipulate the controls to maximize your receive and transmit performance. Interference-fighting controls on the receiver such as pass-band tuning, IF shift, and even digital signal processing are available on many modern ham radio sets. On older equipment, crystal or mechanical filters can be switched in and out so you can compare what you hear. The controls are there for you to use, so do not be afraid to tweak the knobs. Accessory filters are available to further minimize interference that impedes reception. Know when just enough knob-turning optimizes the signal. Experiment and play, as this is all part of increasing your skill!

Not Yet . . .

I know this seems like a lot of work, and we have not yet even pushed the microphone button to transmit. One of the things that can be very frustrating is once you are all set to work a faraway station, you may call several times but the operator on the other side seems to be ignoring you. The feeling gets worse as the station seems to easily be talking to dozens of other stations, and yet you still sit there trying to get his or her attention. Remember, working the challenging stations takes a lot of patience, and this is where you get to test this skill.

Timing is Everything

Okay, now that I have drilled into your mind that the most important thing to remember when operating the radio is listening, it is time to transmit. However, hang on, as you must wait until the time is right.

Almost all ham radio operations on the low bands are done in "simplex" rather than "duplex" mode, which means that the station that is transmitting (talking) cannot hear anything. This is very different from using a telephone to communicate, since telephones are "full-duplex," and talking and listening can be done at the same time. Many contacts are "lost" simply because the operator seeking a contact talks when the sending station is talking at the same time, and the sending station does not hear the operator seeking the contact although hundreds or thousands of other "listening" stations do! This is called "doubling."

You must wait until the other station stops talking and starts listening. Most of the time, the station you are trying to contact will tell you when he is listening: "WA6NIA from JA1IST in Tokyo, over."

I must add one other element to this skill set, and that is luck. My high school algebra teacher used to tell me, "Every once in a while even a blind squirrel can find an acorn—sometimes." The same is true when "working DX."

This article only scratches the surface of operating the HF bands. As always, join a good ham radio club (or find an Elmer) and seek the advice of the experienced DXers.

73, Wayne, KH6WZ

Announcing:

2008 Nominations Open for the *CQ* Amateur Radio Hall of Fame

*Amateur radio operators have been responsible for many advances in communications technology, and entire industries have been built on the foundation of amateur radio experimentation and activity. In an effort to recognize outstanding amateurs and their achievements, and help the public appreciate the far-reaching and long-standing value of amateur radio in our society, we have established the *CQ* Amateur Radio Hall of Fame. Nominations for the 2008 "class" are now open. Members of the 2007 "class" were announced last May and appeared in the July issue of *CQ*.

The CQ Amateur Radio Hall of Fame honors those whose technical or other accomplishments have helped propel amateur radio forward, or whose achievements in other areas of life have helped improve ham radio's reputation simply through association. Nominees for the *CQ* Amateur Radio Hall of Fame will be judged on the basis of qualifying in one of two broad areas: those individuals—whether licensed amateurs or not—who have made significant contributions to the amateur radio hobby; and those radio amateurs who have made significant contributions to society in general. Nominees must have made *significant* contributions of nationwide or worldwide impact.

Nomination Period Closes March 31

Between now and March 31, 2008, we will be accepting nominations for the 2008 "class" of the Amateur Radio Hall of Fame. Nominations received after that date will be considered for future selection. You may either use the form on our website, or simply write us a letter stating your candidate's name, where to contact him/her if still living, for which category you are nominating him/her, and a brief one- to two-paragraph description of this person's accomplishments. Please include your name and contact information as well. E-mail to <hall-of-fame@cq-amateur-radio.com> or mail to *CQ* Amateur Radio Hall of Fame, 25 Newbridge Rd., Hicksville, NY 11801. If you feel someone has earned this recognition, please submit a nomination. Please *don't* assume that someone else will nominate the person you may have in mind.

We'll be making up our own candidate list at the same time, and will announce this year's selections at the Dayton Hamvention in May 2008. Please help us recognize these "ham radio heroes" whose contributions have helped shape our hobby, our nation, or our world.

(The official nomination form is on the CQ website.)

CQ DX and Contest Halls of Fame

Deadline March 1st

Nominations are also open for the **CQ DX Hall of Fame** and the **CQ Contest Hall of Fame**, which recognize those amateurs who have made major contributions to DXing and contesting, respectively. The activities and accomplishments that qualify one for membership in these elite groups involve considerable personal sacrifice and can usually be described by the phrase "above and beyond the call of duty."

Nominations for the Contest and DX Halls of Fame are made by **contesting or DX clubs or national organizations,** and must be submitted by **March 1** of each year to be considered. Nominations for the CQ Contest and DX Halls of Fame should be directed to Bob Cox, K3EST, c/o CQ Communications Inc., 25 Newbridge Rd., Hicksville, NY 11801; or via e-mail to <k3est@cqww.com>.

what's new

BY ANTHONY A. LUSCRE,* K8ZT

HF Transceiver Kit, Lightweight Antenna, Automatic Antenna Switcher, and more

This month's items include a new HF transceiver kit and a very reasonably priced light weight, portable antenna. We open the books for a peek at a waterproof logbook and a series of mini manuals. Then you can sit back, pop in a DVD and enjoy one of three new amateur radio videos. Stay in your seat as we let an automatic antenna switch do its thing. Finally we visit the "Amateur Radio Website of the Month."

DZKit HF Transceiver

Over the last half-dozen years there has been a large increase in the number of ham radio kits available, putting to rest the notion that hams no long build things. The latest entry into the full-featured HF transceiver kit market is from the DZ Company.

The base Sienna HF Kit starts out as a CW/SSB/AM/FM 10-watt transceiver kit (photo A). "This is not an SDR or PC-controlled radio, but a tried and true analog design," says the manufacturer. You can then add features including an internal battery or a 100-watt Power Amplifier Kit, Antenna Tuner Kit, and a variety of filters. Finally, there is an option that sets the Sienna apart from other kits—a complete PCM-9386 Embedded PC that installs in the case. The PC runs Windows® XP or Linux, allowing it to run digital modes, log on to the web directly, transfer files to a home computer via USB flash drive or LAN, and run popular rig control or logging programs right on the rig. The computer also processes received audio (via SiliconPixels ChromaSound DSP), enhances receive audio with a 10-band graphic equalizer (built into the onboard sound card), and controls a secondary receiver/ spectrum analyzer such as the ICOM PCR-1500. Back-panel computer ports include LAN, PS-2, VGA, COM1 (RS-232), and USB. The O/S resides on a removable 4-gig compact flash card.

A triple-conversion general-coverage receiver with a 4-kHz roofing filter provides excellent dynamic range with no shortwave "dead spots."

*5441 Park Vista Court, Stow, OH 44224-1663
e-mail: <k8zt@cq-amateur-radio.com>

The kit consists of a 10-piece aluminum and steel chassis, mostly pre-assembled cables, three preassembled and tested boards, six complete kit boards, and two partially assembled kit boards (SMT components are pre-loaded on receiver and transmitter boards). Weight is 10 lbs. without the PC, battery, or amplifier options. Dimensions are 3.5"H × 14.0"W × 16.0"D.

Inquiries should be directed to DZKit, 710 Grove Ct., Loveland, CO 80537; phone 970-667-7382; e-mail <sales@dzkit.com>, or on the web <www.dzkit.com>.

KL7IPV's Lightweight Antenna To Go

Frank, KL7IPV set out "to make an antenna that did not cost an arm and a leg and also did not need a handbook on how to make it work." His antennas are made from simple materials that require little or no maintenance and are lightweight (photo B). The antennas can be adapted for portable use and can quickly be put into service and then removed when done. This can also allow operations from locations where there are restrictions on permanent antenna installations.

The multiple-band antenna uses an alligator clip to choose the band you wish to work. The overall height of the antenna when in use is approximately 7 feet. At the top of the antenna there is a 3/8" × 24 thread allowing use of longer or shorter whips. For transporting the antenna, the whip simply unscrews from the top and the antenna is ready to go. The overall length of the main antenna body without the mast is less than 4 feet. To order or for more information, visit <www.antenna-to-go.com>.

ASA, Inc.'s Waterproof Logbook

When operating in the field, rain can definitely put a damper on your day. With the All Weather Amateur Radio Logbooks from ASA, Inc. you can keep written entries from smudging or even write in the rain (photo C). Ideal for maritime use, they even float. The logbooks are very portable at 3" × 5". Special synthetic paper accepts pencil, non-water-soluble inks, permanent markers, and normal ballpoint-pen ink. Two formats are available—traditional entry or expanded comment fields—

Photo A– Front panel display of the Sienna HF transceiver kit. (Photo courtesy of DZ Company)

Photo B– From Frank, KL7IPV, here are three examples of mounting the lightweight antennas that are simple to install, move, and use. (Photo courtesy of KL7IPV)

Photo C– A dip in a coffee mug demonstrates the all-weather durability of Amateur Radio Logbooks from ASA, Inc. (Photo courtesy of ASA, Inc.)

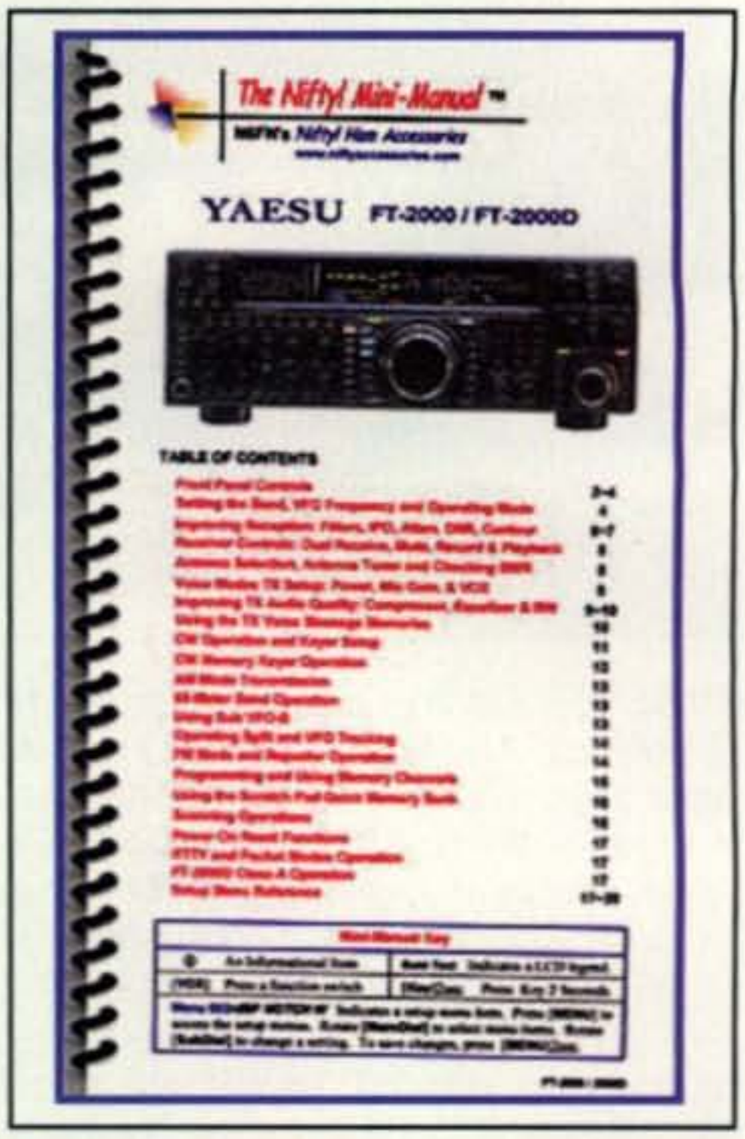


Photo D – Mini-Manuals are fully laminated and spiral-bound booklets, 4.25" × 8", providing simplified step-by-step instructions for all of your radio's features. They are easy to read and color-coded to quickly find the information you need. (Photo courtesy of Nifty Accessories)

and both are bond with rustproof spiral bindings and have flexible covers. Price is $10.50 plus shipping. Details and ordering information can be found at <www.waterprooflogbooks.com>.

Nifty Accessories Mini-Manuals

To learn how to use all the features of your new ham rig you may need to spend hours with the manufacturer's manual. However, even after reading the manual it is nice to have a small, convenient list of key features and commands at your fingertips in your shack, on the road, or in other portable operations. Mini-Manuals are fully laminated and spiral-bound booklets, 4.25" × 8", providing simplified, step-by-step instructions for all your radio's features (photo D). Easy to read and color-coded to quickly find the information you need. they are available for a large variety of radios from all the popular manufacturers.

In addition, Mini-Manuals are also available for scanners and test equipment. Nifty Mini-Field Guides are available for the HF/VHF/UHF bands, operating, and DXing. These guides gives quick resources such as DX prefixes, CQ Zone and ITU maps, band plans, and other helpful hints for operating. For a complete list of available Mini-Manuals and ordering information, visit <www. niftyaccessories.com>.

KN4AQ/ARVN Ham Radio DVDs

Have you never been able to make it to the Dayton Hamvention®? Would you like a fun guided tour of it? Gary, KN4AQ, and ARVN (Amateur Radio Video News) want to take you there with their DVD (photo E). The (unofficial) ARVN 2007

Photo E– Starting with an almost empty Hara Arena, the (unofficial) ARVN 2007 Dayton Hamvention® Tour can take your or your radio club members on a tour of the sites and sounds of the Hamvention®. Gary, KN4AQ, includes interviews and play-by-play and color commentary. (Photo courtesy of KN4AQ and ARVN)

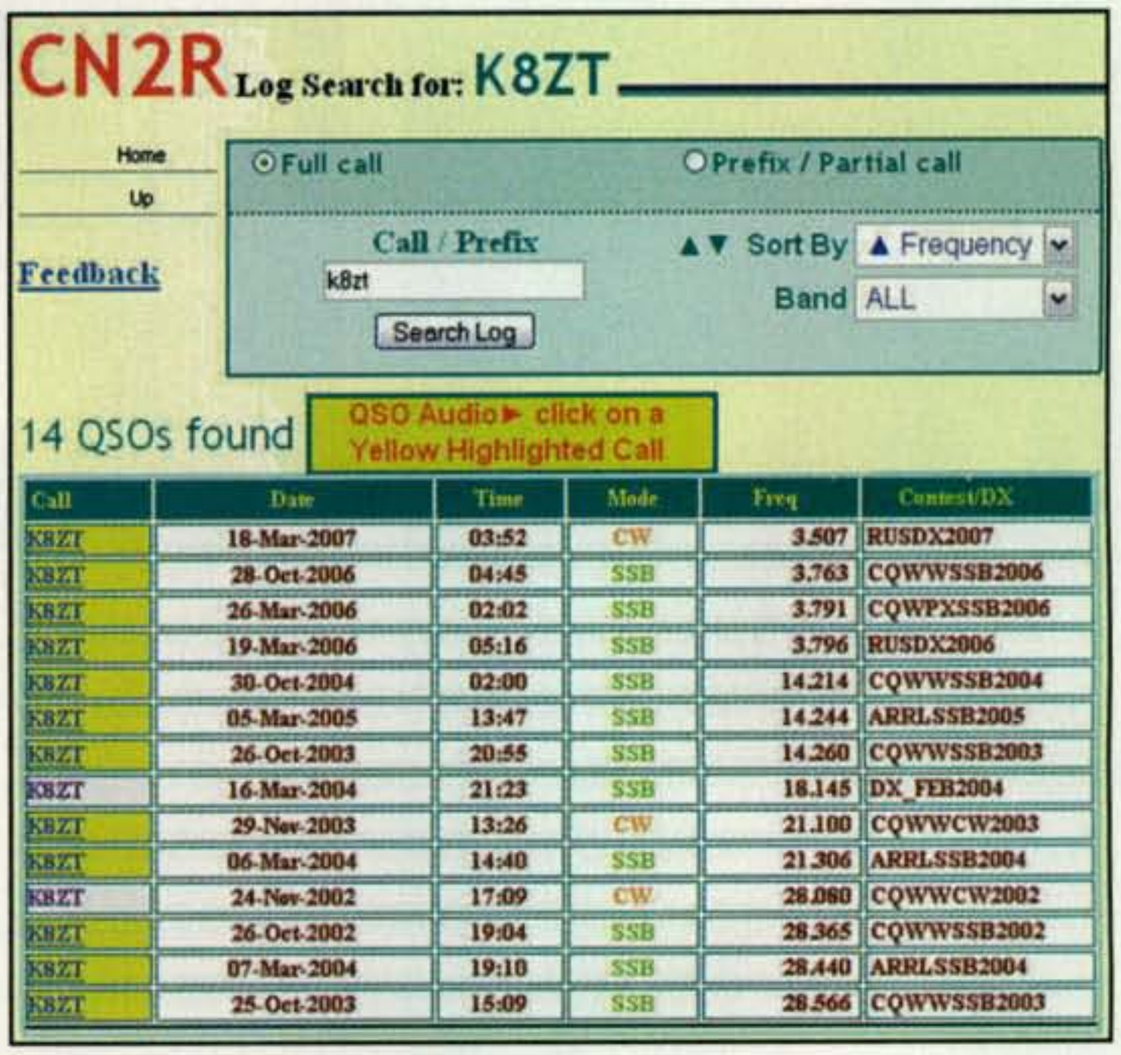
Dayton Hamvention® Tour is one of three new DVDs. Other titles include FCC Forum at the Dayton Hamvention and 2006 ARDF (Amateur Radio Direction Finding) USA Championship. According to Gary, the target audience is radio club meetings. For details or to order, visit <www.ARVNVidNews.com>.

MFJ Automatic Antenna Switch

Many hams face a dilemma on the lower frequency bands. Their rigs have only one antenna connection, but they have two antennas for a single band—one with good transmit ability and another that is better for receiving. With the new MFJ-1707 it is very easy to use both automatically (photo F). You connect the MFJ-1707 Automatic Antenna Switch between your radio's coax and the feed lines from your two antennas. As soon as you key your rig, the RF sensing circuitry instantly switches your rig from the receiving antenna to the transmitting antenna. You can use the amplifier control output of your transceiver to also automatically switch antennas. An adjustable delay prevents the transmit antenna from instantly switching to receive. There is also an auxiliary contact closure to ground during receive. For details, visit MFJ's website: <www.mfjenterprises.com>.

The Amateur Radio Website of the Month

This month's site is such a good idea that by the time you read this column many similar sites will probably be on the web. The sponsor of this month's site is the CN2R contest super station in Casablanca, Morocco, North Africa (fig. 1). Sure there are the typical items found on most contesting groups' websites— pictures of very impressive towers and antenna arrays, photos of the operators, details on the station layout, and even a count-down clock to the next contest date. What makes this site special is the Log Lookup. It is not simply a way to see if you have worked CN2R and which bands and modes you have worked them on. Many other sites also have these abilities. However, the CN2R site actually lets you hear recorded audio of your contact from their side of the QSO! It was amazing to hear how even my tiny QRP signal sounded at their end. Listening to the pileups, it is amazing that they can actually pick out and work individual stations. Visit the site at <www.cn2r.net>, check the log for your callsign, and then turn up your computer's speakers and listen.



Call	Date	Time	Mode	Freq	Contest/DX
K8ZT	18-Mar-2007	03:52	CW	3.507	RUSDX2007
K8ZT	28-Oct-2006	04:45	SSB	3.763	CQWWSSB2006
K8ZT	26-Mar-2006	02:02	SSB	3.791	CQWPXSSB2006
K8ZT	19-Mar-2006	05:16	SSB	3.796	RUSDX2006
K8ZT	30-Oct-2004	02:00	SSB	14.214	CQWWSSB2004
K8ZT	05-Mar-2005	13:47	SSB	14.244	ARRLSSB2005
K8ZT	26-Oct-2003	20:55	SSB	14.260	CQWWSSB2003
K8ZT	16-Mar-2004	21:23	SSB	18.145	DX_FEB2004
K8ZT	29-Nov-2003	13:26	CW	21.100	CQWWCW2003
K8ZT	06-Mar-2004	14:40	SSB	21.306	ARRLSSB2004
K8ZT	24-Nov-2002	17:09	CW	28.060	CQWWCW2002
K8ZT	26-Oct-2002	19:04	SSB	28.365	CQWWSSB2002
K8ZT	07-Mar-2004	19:10	SSB	28.440	ARRLSSB2004
K8ZT	25-Oct-2003	15:09	SSB	28.566	CQWWSSB2003

Fig. 1– Screen shot of this month's Amateur Radio Website of the Month. The CN2R site lets you not only check their log for contacts, but it also allows you to hear your station from their side of the QSO. (Image from <www.cn2r.net>)

Wrap-up

That's all for this month's column. Thanks for the feedback e-mails from last month's column and remember, I welcome your feedback, questions, and/or comments. Please send me news of your new products so we can preview them here in this column. Also, you can drop me note with candidates for future Amateur Radio Websites of the Month. Please feel free to use my e-mail or snail-mail address on the first page of this column.

Until next time . . . 73, Anthony, K8ZT

Photo F – Do you have two antennas and one rig? Then the MFJ-1707 can be a quick, convenient, and automatic way to switch between your transmit and receive antennas. (Photo courtesy of MFJ Enterprises)

***Note:** Listings in "What's New" are not product reviews and do not constitute a product endorsement by CQ or the column editor. Information in this column is primarily provided by manufacturers/vendors and has not necessarily been independently verified. The purpose of this column is to inform readers about new products in the marketplace. We encourage you to do additional research on products of interest to you.*

BY JOE LYNCH,* N6CL

The Launch and Recovery of Oklahoma State University's ASTRO 7 Balloon

It was a foggy Saturday morning, November 10, 2007, on the north edge of the Oklahoma State University campus in Stillwater, Oklahoma. Despite the fog, Dr. Andy Arena, the Chair of the School of Mechanical and Aerospace Engineering, led several of the students in his Introduction to Aerospace Engineering class in the launching of ASTRO 7, a helium-filled balloon that carried multiple payloads aloft for a 1 1/2-hour flight across central Oklahoma.

The students in Dr. Arena's class are divided into teams of four and each team builds a satellite. The Data Team's satellite records temperature, pressure, and humidity with altitude. The Image Team's satellite takes pictures. Each of the teams solders its electronic kits together and builds the satellites.

The purpose of the class is to introduce students to the Aerospace Engineering field with a fun project in which they can learn a lot through hands-on experience. There are 48 students in two classes, and they built a total of 12 satellites.

This particular Saturday morning's launch took place within a few minutes of the scheduled 9 AM time. However, the low ceiling caused by the fog meant that sight of the balloon was lost very shortly after the launch. After a 1-hour 35-minute flight in which the balloon reached an altitude of 102,165 feet, it burst. The payloads floated down to Earth, landing in a tree near the Keystone Dam in Keystone State Park. Chase teams came from Tulsa, as well as from the OSU campus. Thos from Tulsa included Harry Mueller, KC5TRB, as well as your editor and my wife, Carol, W6CL.

Dr. Arena, KE5CAB, wrote:

At the recovery site were Joe Conner, W2OSU, and me, from OSU; Harry Mueller, KC5TRB, of Oklahoma

*e-mail: <n6cl@sbcglobal.net>

VHF Plus Calendar

January 3	Moon Apogee
January 4	*Quadrantids* meteor shower peak
January 6	Very poor EME conditions
January 8	New Moon
January 13	Good EME conditions
January 15	First Quarter Moon
January 19	Moon Perigee
January 19–20	ARRL VHF Sweepstakes Contest (See text for details)
January 20	Poor EME conditions
January 22	Full Moon
January 27	Moderate EME conditions
January 30	Last Quarter Moon
January 31	Moon Apogee

—EME conditions courtesy W5LUU.

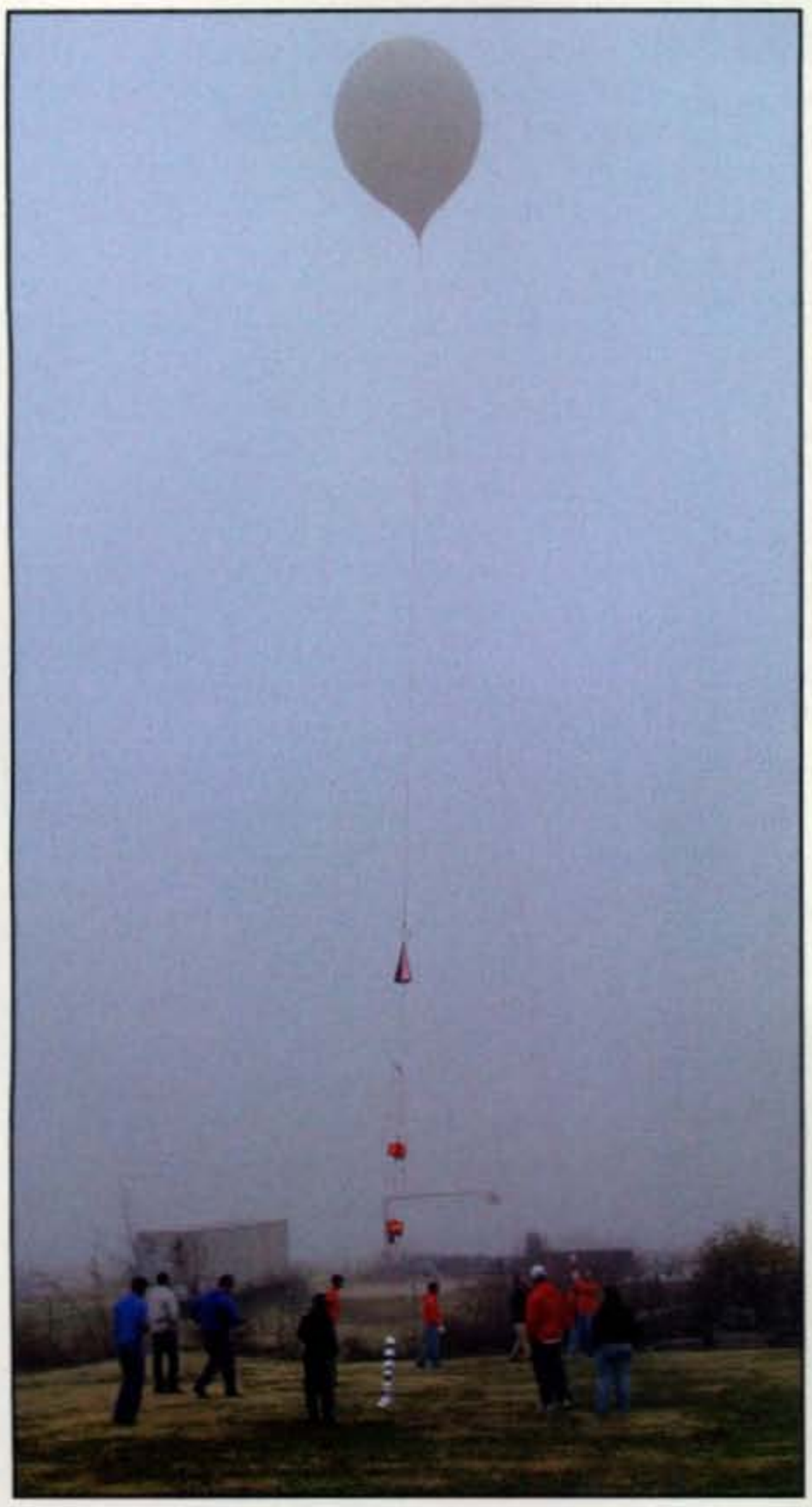


Photo A– At the very last moment before the launch of ASTRO 7, Dr. Arena (to the right with his hands fully extended upward) is holding the balloon in place so that all of the payloads, including the 12 student-constructed payloads (the shiny cubesats at the bottom of the payload line), are untangled and ready for the launch. (N6CL photo)

Photo B– A photo of the sun during the flight of ASTRO 7 as taken by Team IR3's camera. (Oklahoma State University photo)

Photo C– This photo from the satellite constructed by Team IR3 shows the tangled mess of the payloads after they landed in a tree. In the foreground of the photo is one of the dozen student-constructed satellites that flew on ASTRO 7. (Oklahoma State University photo)

Photo D– Barely visible in the tree is Alex Jech, KD5PFF, using Harry Mueller, KC5TRB's tree saw to clear away branches that were blocking the recovery of the payloads. (Oklahoma State University photo by KE5CAB)

Research Balloons; Alex Jech, KD5PFF; Scott Haley, KD5NJR; and Scott McInnis, KE5HQP. The landing was high in a tree at the side of a steep hill right by the railroad tracks. You can see that in the pictures. I stayed down on the tracks to take pictures, and everyone else made the difficult trek up the hill to retrieve the payloads. Alex climbed half way up the tree, and the only way to get the payloads down was to use Harry's portable tree saw to cut down a limb. You can see Harry in the yellow shirt in the pictures and Alex in the tree with the saw.

More information on the ASTRO 7 launch and recovery can be found at the ASTRO website: <http://astro.okstate.edu/ASTRO_07/ASTRO_0x.htm>. Oklahoma State University is an affiliate member of the Oklahoma Space Grant Consortium, one of NASA's 52 space-grant consortia around the country. The ASTRO program is supported by OSU and the Oklahoma Space Grant Consortium. Dr. Arena is Deputy Director of the Oklahoma Space Grant Consortium.

Strange Space Weather Over Africa

For propagation aficionados, here is a report condensed from the Science@NASA website information of November 13, 2007 (http://science.nasa.gov/headlines/y2007/13nov_africa.htm?list90677) on a recently discovered space-weather phenomenon that seems to be centered in Africa.

This past mid-November a group of scientists gathered in Addis Ababa, Ethiopia at the Africa Space Weather Workshop to discuss the phenomenon. The workshop began on November 12 with nearly 100 scientists and students in attendance. Among the participants were representatives from NASA, NOAA, the National Science Foundation, the European Office of Aerospace Research and Development (EOARD), the International Center for Theoretical Physics (ICTP), and many others.

Photo E– The recovery team after removing the payloads from the tree. From left to right, standing are: Scott McInnis, KE5HQP, Alex Jech, KD5PFF, Joe Conner, W2OSU, and Scott Haley, KD5NJR. Kneeling is Harry Mueller, KC5TRB, of Oklahoma Research Balloons. (Oklahoma State University photo by KE5CAB)

What got these people together is an ion plume that researchers are comparing to a factory smokestack. What is different between factory smokestacks and this ion plume is that the plume contains electrified gas and comes in contact with space itself.

According to the workshop co-organizer, Tim Fuller-Rowell, "The plumes appear during geomagnetic storms and they can interfere with satellite transmissions, airline navigation, and radio communications." It was their effects on GPS signals over North America that led to the initial discovery a few years ago.

These ion plumes reside in a layer of Earth's atmosphere called the *ionosphere*. The ionosphere is a broad region 85 km to 600 km above ground level where ultraviolet radiation from the sun displaces electrons from atoms and molecules, creating a layer of ionized gas or plasma surrounding the planet. As we amateur radio operators have known for more than 100 years, the ionosphere can bend, distort, reflect, and even absorb radio waves. Plumes amplify these effects.

A typical example of this phenomenon is the plume of November 20, 2003 that is displayed in fig. 1. Two days before this map was made, an explosion on the sun hurled a cloud of magnetized gas—a coronal mass ejection, or CME—toward Earth. The plume formed when the CME hit Earth, thereby triggering a strong geomagnetic storm. The plume consisted of ionized air at high altitude moving from Florida to Canada at a speed of 1 km/s (2200 mph).

In looking for the inevitable smokestack, researchers headed for central Africa. "Many believe the source of the plumes is near Earth's magnetic equator," explained NASA heliophysicist Lika Guhathakurta, who attended the workshop. "Africa is a great place to check this possibility, because the magnetic equator passes directly over the sub-Sahara."

The major obstacle confronting the scientists' ongoing research is the lack of dual-frequency GPS receivers, the sensor of choice for their research. According to Fuller-Rowell, "There aren't enough sensors in Africa to study the phenomenon. North America has an abundance of dual-frequency GPS receivers—thousands of them in a network we use to monitor North American

plumes. But Africa has only a few dozen." Added Guhathakurta, "It's widely understood that Africa is key to the puzzle."

Currently, only North America has a well-mapped ionosphere. NOAA posts new images every 15 minutes at this website: <http://www.swpc.noaa.gov/ustec>. "Five years from now," said Fuller-Rowell, "we hope to be making realtime maps of the ionosphere over Africa, too."

The workshop was organized under the auspices of the 2007 International Heliophysical Year (IHY), continuing the tradition of international research and cooperation that began during the International Geophysical Year (IGY) of 1957. To learn more about the IHY on the web, visit <http://ihy2007.org/>.

My thanks go to Shelby Ennis, W8WN, who alerted me to this story.

Possible AMSAT Comm Package Onboard a Future IntelSat Bird

The following comes from the AMSAT ANS website: <http://www.amsat.org/amsat-new/index.php>:

One of the more exciting announcements during the 2007 AMSAT Symposium in Pittsburgh was that of talks between AMSAT-NA and Intelsat to place a communications package and antennas aboard an Intelsat geostationary satellite. Thanks to Rick Hambly, W2GPS, AMSAT President, Lee McLamb, AMSAT EVP, and Bob McGwier, AMSAT VP Engineering, for identifying and pursuing this opportunity. More information will be published in a future issue of the *AMSAT Journal*.

ARISS Achieves a Double-Double Set of Contacts

On October 29 and 31, 2007 the ARISS program achieved a double-double set of contacts when on these two days European Space Agency astronaut Paolo Nespoli, IZØJPA, made contact with Italian schools. The following is excerpted from two web accounts by Francesco De Paolis, IKØWGF, ARISS mentor for the double-double QSOs. Here is his report:

On Monday October 29, 2007 at 0823 UTC—i.e., 09:23 local time—the IIS Deambrosis-Natta school, located in Sestri Levante, near Genoa, and the Engineering Faculty of the University of L'Aquila established a radio contact with ESA astronaut Paolo Nespoli, IZØJPA, onboard the International Space Station. A second contact between the schools and Nespoli took place during the following pass, at 09:59 UTC.The IIS Deambrosis-Natta school has 900 students and 140 teachers. Deambrosis-Natta is a high school specializing in scientific and technological subjects. The school is a member of the national network "Radio at school" and "Radio transmission experiments for educational purposes."

The Engineering Faculty of the University of L'Aquila was founded in 1964 and offers more than two dozen undergraduate and graduate-level programs in engineering fields. The facility is located on the hilltop of Roio a few km from the city of L'Aquila. Presently there are 5000 students enrolled.

At each location the questions were read by the students. The audience in the shack room included about 200 persons in Sestri Levante and more than 350 students, guests, and media operators in L'Aquila. In Sestri Levante were present ESA Educational and ASI representatives.

At 08:23 UTC contact with IZØJPA was established and Paolo Nespoli first introduced Pamela A. Melroy, STS 120 Commander, who sent greetings to the students and then answered three questions.

At 09:59 UTC a second contact with IZØJPA was established and Paolo Nespoli answered 10 more questions. The signals and audio from the ISS were excellent. Many TV stations, radio stations, and newspapers covered the event.

This is from Francesco's second account:

On Wednesday October 31, 2007 at 0733 UTC—i.e., 08:33 local time—the high school Galileo Galilei, located in Civitavecchia, near Rome, and the ITI - LST Mottura of Caltan-

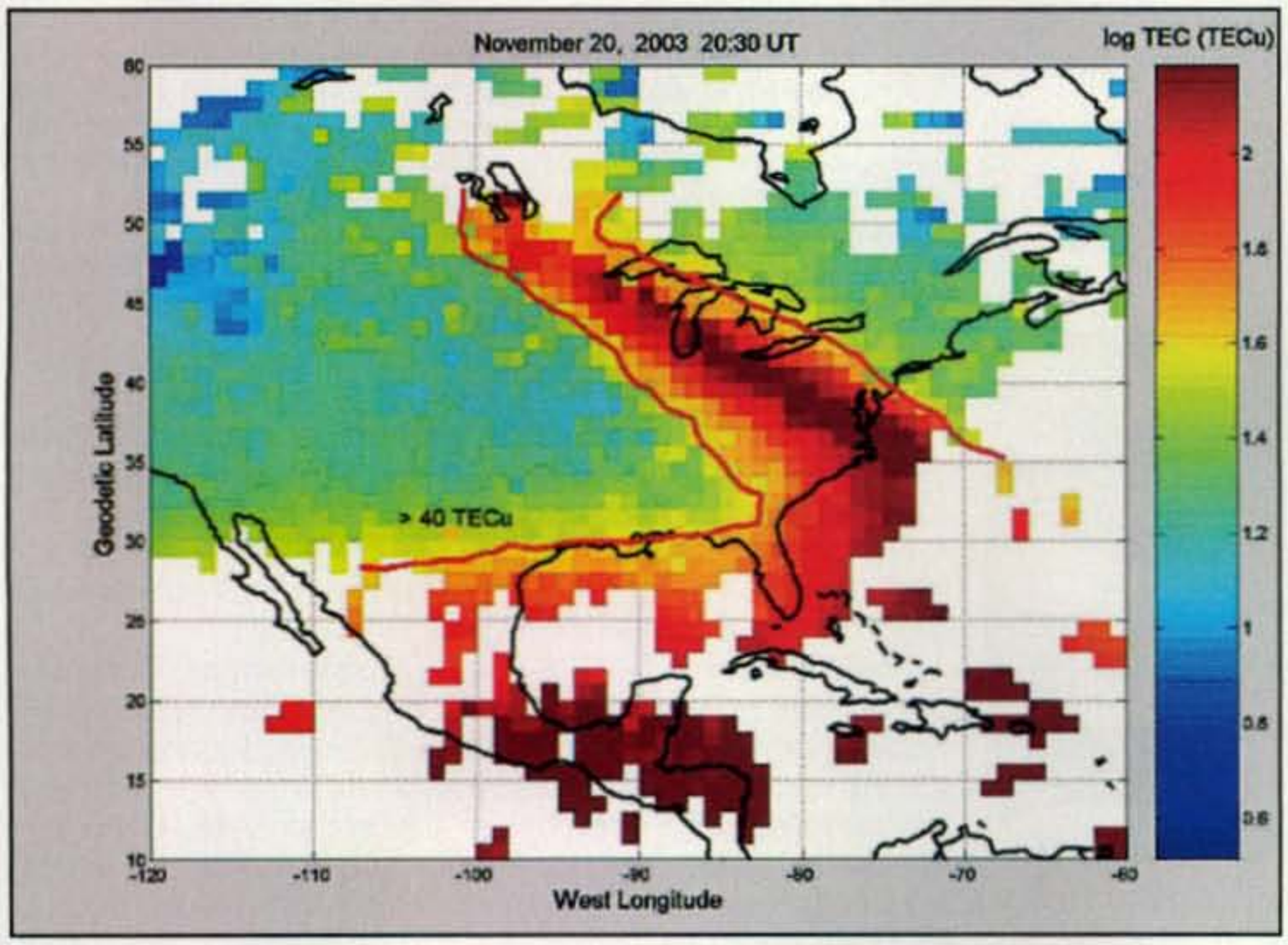


Fig. 1– A plume of excess electron density over North America on November 20, 2003. The plume was discovered and mapped by its effect on GPS signals. (Courtesy of Anthea Coster and John Foster of MIT)

Photo F– Faculty and students of the Engineering Faculty of the University of L'Aquila observe the activities taking place in association with their October 29, 2007 double ARISS QSO. (Photo courtesy of IKØWGF)

isetta (Sicilia) established a radio contact with ESA astronaut Paolo Nespoli, IZØJPA, onboard the International Space Station.

Galileo Galilei is a high school in Civitavecchia with a scientific focus. The school has 650 students from 14 to 19 years old. Civitavecchia is the most important harbor in Italy. Here Guglielmo Marconi conducted experiments with microwaves, RADAR, radio mobile telephone, and the use of the moon as a natural satellite. He sent waves to the moon and received the reflections.

ITI - LST Mottura in Caltanisetta is the oldest mining school in Italy, founded in 1862. It offers three different specialized courses which are scientific and technological orientation, electrical engineering and automation, and a geo-environmental course.

Once again, the questions were read by the students. The audience in the shack room included about 200 persons in Civitavecchia and more than 300 students, guests, and media people in Caltanisetta.

The audio was forwarded to EchoLink and IRLP by SkyPE. Thanks to Dieter Schliemann, KX4Y, who fed the signals of the ARISS contact into EchoLink.

ESA Educational and ASI representatives participated to the event in Civitavecchia.

At 07:33 UTC, contact with IZØJPA was established and Paolo Nespoli answered 10 questions. The signal and the audio from the ISS were excellent. Many TV stations, radio stations, and newspapers covered the event.

Photo G– Faculty and students of high school Galileo Galilei observe an unidentified person asking a question of European Space Agency astronaut Paolo Nespoli, IZØJPA, during their October 31, 2007 double ARISS QSO. (Photo courtesy IKØWGF)

Malaysian School Contacts

Malaysia's Dr. Sheikh Muszaphar Shukor, 9W2MUS, participated in the Amateur Radio on the International Space Station program while on board the ISS in mid-October. The following is a summary of her QSOs from the AMSATwebsite:

Five different groups of Malaysian school children gathered at the National Planetarium in Kuala Lumpur and spoke with Shukor, directly via 9M2RPN. All five of the successful contacts took place over the week of October 14, 2007. Approximately 90 people attended each of the 1st and 3rd through 5th sessions; the second contact had an audience of 50 students, teachers, and others. The National Planetarium provided the youth with shows related to space exploration during their visits and each student was issued a QSL (postcard) to commemorate the event. NASA astronaut Robert "Hoot" Gibson was present during the final session and gave talks about space. Three television stations, one radio station, and five newspapers covered these events.

First Reverse VUCC Award Issued

The following is from Joe Goggin, K9KNW, and was forwarded to me by Brad Pioveson, W9FX:

I'm happy to announce that the first 2-meter VUCC/Reverse award, number 144-001, has been issued to K9KNW. This award is issued by the Central States VHF Society and requires the operator to provide proof of 100 confirmed contacts, the contacts having been made while the station was operated from within the confines of 100 different grid squares. In other words, it's VUCC in reverse.

The VUCC/R award is not mode specific, but in this case, the 100 grids from which K9KNW operated were all meteor-scatter QSOs, and all were completed using FSK441, one of the modes included in the WSJT software suite. In that regard, I owe a special thank you to Joe, K1JT. Also, a vote of thanks goes to NØPB for helping to keep me organized and for all the encouragement Phil provided during thousands of miles of travel. Check NØPB's website for a map of grids from which K9KNW operated at <http://n0pb.mystarband.net/k9knw.html>.

To answer the inevitable question, I drove about 20,000 miles in RVs, one summer's trip alone having seen 10,000 miles roll over the odometer. In addition, about 2,500 miles of sea travel were involved, all aboard my (now a memory, thanks to Hurricane Wilma) fishing boat, the *Island Gypsy*, with QSOs having been made from water grids between the continental U.S. and the Bahamas.

Thanks to all of you who were (and are!) operating 144-MHz meteor scatter. Thanks for the activity and QSOs, but most of all, thanks for the fun!

73 de Joe Goggin, K9KNW

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings*, or both. For more information, contact the person listed with the announcement. The following organizations and/ or conference organizers have announced calls for papers:

Southeastern VHF Society Conference: Technical papers are solicited for the 12th annual Southeastern VHF Society Conference to be held in Orlando, Florida on April 25–26, 2008. Papers and presentations are solicited on both the technical and operational aspects of VHF, UHF, and Microwave weak-signal amateur radio. In general, papers and presentations on non-weak-signal related topics such as FM repeaters and packet will not be accepted, but exceptions may be made if the topic *is* related to weak signal. For example, a paper or presentation on the use of APRS to track rovers during contests would be considered.

The deadline for the submission of papers and presentations is February 29, 2008. All submissions should be in Microsoft Word (.doc) or Adobe Acrobat (.pdf) files. Pages should be 8 1/2 by 11 inches with a 1-inch margin on the bottom and 3/4-inch margin on the other three sides. All text, drawings, photos, etc., should be black and white only. Indicate when you submit your paper or presentation if you plan to attend the conference and present there or if you are submitting just for publication. Papers and presentations will be published in the conference *Proceedings* by the ARRL. Send all questions, comments, and submissions to Program Chair Steve Kostro, N2CEI, <svhfs2008@downeastmicrowave.com>. For further information about the conference go to <http://www.svhfs.org> and/or <http:// www.flwss.net>.

Central States VHF Society Conference: Technical papers are solicited for the 42nd annual Central States VHF Society Conference to be held in Wichita, Kansas on July 24–27, 2008. Papers, presentations, and posters on all aspects of weak-signal VHF and above amateur radio are requested. You do not need to attend the conference, nor present your paper, to have it published in the *Proceedings*. Posters will be displayed during the two days of the conference.

Non-weak signal topics such as FM, repeaters, packet radio, etc., are generally not considered acceptable. Contact the folks below if you have any questions about the suitability of a topic. Preference will be given to papers that are written and formatted specifically for publication, rather than as visual presentation aids.

Deadline for submissions: for the *Proceedings*, June 2, 2008; for presentations delivered at the conference, June 30, 2008; and for notifying us that you will have a poster to be displayed at the conference also June 30, 2008. Please bring your poster with you on July 25, 2008. Contact information: Mel Graves, WRØI, via e-mail: <wr0i@sgdrugfree.com>, or snail mail at: Melvin Graves, WRØI, P.O. Box 273, Wichita, KS 67201-0273.

Submissions can be made via the following: electronic formats (preferred); via e-mail; upload to a website for subsequent downloading; on media (3.5-inch floppy, CD, USB stick/thumb drive).

Current Contest

The ARRL VHF Sweepstakes is scheduled for the weekend of January 19–20. For the contest rules, see the December 2007 issue of *QST* or the League's URL: <http://www.arrl.org>.

Current Meteor Shower

The *Quadrantids*, or *Quads*, is a brief, but very active meteor shower. The expected peak is around 0640 UTC on 4 January. The actual peak can occur three hours before or after the predicted peak. The best paths are north-south. Long-duration meteors can be expected about one hour after the predicted peak. For more information on the above meteor-shower prediction, please see Tomas Hood, NW7US's "Propagation" column elsewhere in this issue. Also visit the International Meteor Organization's website: <http://www.imo.net>.

And Finally . . .

When we begin a new year, many times we tend to think about New Year's resolutions. By way of the following story, which is courtesy of the Upper Room daily e-mail (http://www.upperroom.org) I receive, is a suggestion for you to consider for your New Year's resolution:

Bruce Blumer, of South Dakota, was on his way home from his travels when he stopped in a small town long enough to attend a minor league baseball game. For any of you who have ever attended a minor league baseball game, you know about the drawings for prizes for fans that take place during the game. During the course of this game, not once but three times Bruce won a prize. In the third inning he won a free oil change at a local garage. In the sixth inning everyone seated in his section won a coupon for appetizers at a local restaurant. Finally, in the eighth inning he won a coupon good for dinner for two at a local restaurant. Bruce reported that because he was from out of town and had no plans to ever return to that town, he gave each prize away to someone else.

Bruce's experience caused me to think about each new day as being a gift. Because from a timeline perspective we are never again going to pass through each new day, we also should consider giving away the gift of that new day to someone else. This then is my idea for a New Year's resolution: to consider each day as a gift to be given away.

If you have decided to give away a few gifts and these gifts have a tie-in to the VHF-plus frequencies, please let me know so that I can publicize it here in this column and/or in the pages of *CQ VHF* magazine. Until next month...

73 de Joe, N6CL

awards

BY TED MELINOSKY,* K1BV

A Success Story and DX Awards

The March 2007 column featured awards offered by the Japan Amateur Radio League (JARL). Bob Balzarini, WA2CKP, organized the cards necessary to earn the Asian DX Award and applied—30 Asian countries worked with vertical antennas, I might add. Three months later, Bob was able to frame the handsome certificate he was awarded.

Bob Balzarini, WA2CKP, organized the cards necessary to earn the Asian DX Award, working 30 Asian countries with vertical antennas.

The purpose of this column is to present the fascinating array of awards available, inspire you to set a goal and work to achieve that goal, and then for you to receive a reward for that achievement. In this sense, Bob followed through and got his reward. Each reader of this column can work toward the the thrill of opening a big envelope with an award. Remember, if you already have a good collection of QSLs to work with, propagation conditions probably won't matter.

DX Awards

England's BARTG PSK31 – 40 Award. The marriage of the computer and the radio transmitter is most apparent in the digital modes. PSK enthusiasts have carved out their narrow domains on most HF bands, and their warbling signals are almost always heard, even when the bands are "not working" for CW or SSB. The British Amateur Radio Teledata Group offers a series of awards, the most recent of which is the BARTG PSK31 – 40 Award.

Hear or work 40 different countries using only PSK31 on any band; contacts beginning January 1, 1999 count for the award. Endorsements are available for mixed band, single band, mixed data modes, or single data mode. You may send the actual cards or photocopies (which must show a data mode), GCR list certified by a national society or two officers of a club or society, or your claim based on any BARTG HF contest. The ARRL country list must be observed.

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

USA-CA Special Honor Roll

Stephen Morton, AA8HH
USA-CA All Counties #1161
October 4, 2007

Bill Barr, N4NX
USA-CA All Counties #1162
October 9, 2007

USA-CA Honor Roll

500
DK6WA....3419
AA8HH.....3420
DL2DXA...3421
DL3DXX...3422
F5MSB.....3423

1000
AA8HH.....1744
DL2DXA...1745
DL3DXX...1746

1500
AA8HH.....1463

2000
AA8HH.....1354
N4NX 1355

2500
AA8HH.....1275
N4NX 1276

3000
AA8HH.....1185
N4NX 1186

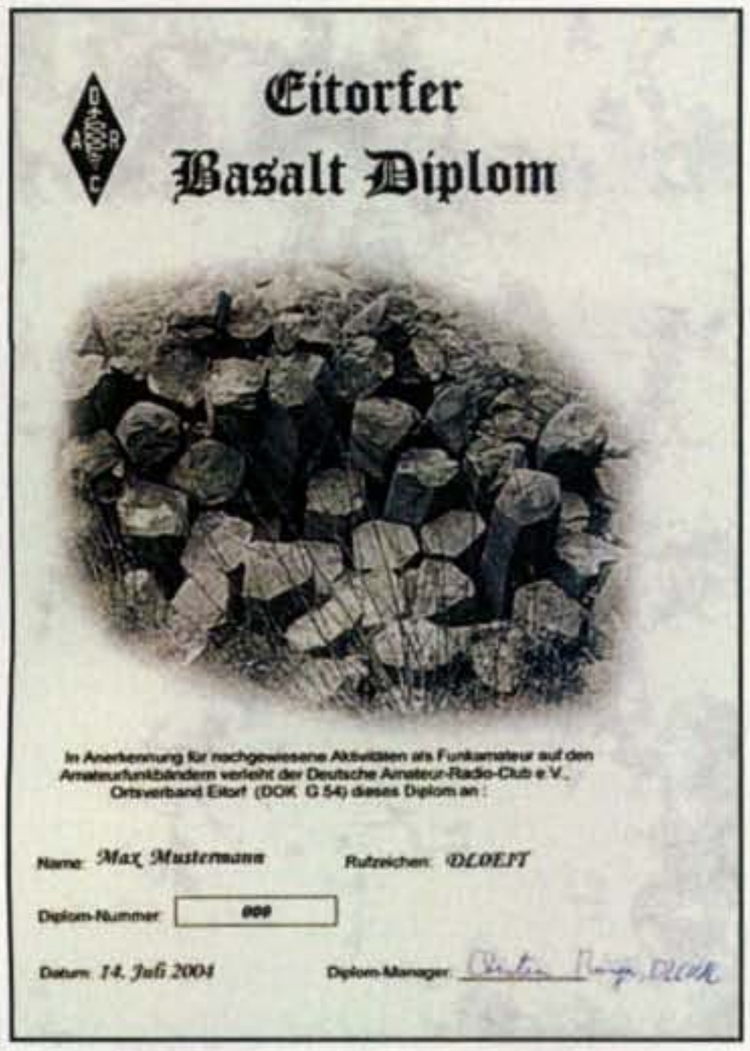
The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

To earn the BARTG PSK31 – 40 Award, hear or work 40 different countries using only PSK31 on any band.

Cost of the award is UK6£, $US10, 10 Euros, or 30 IRCs. Apply to Phil Cooper, GUØSUP, 1 Clos au Pre, La Hougue du Pommier, Castel, Guernsey GY5 7FQ, UK. E-mail: <pcooper@guernsey. net> or <awards@bartg.co.uk>. Internet: <http:// bartg.co.uk/>.

Germany's Eitorfer Basalt Diplom. Basalt is an igneous rock created by volcanic activity. It is fairly common around the world. It is often used in the construction of road and rail beds, since it is relatively hard, inexpensive, and can be crushed to desired size. Under certain conditions, however, when basalt is cooled slowly, this rock forms huge hexagonal crystals ,each one of which may be one to two feet in diameter.

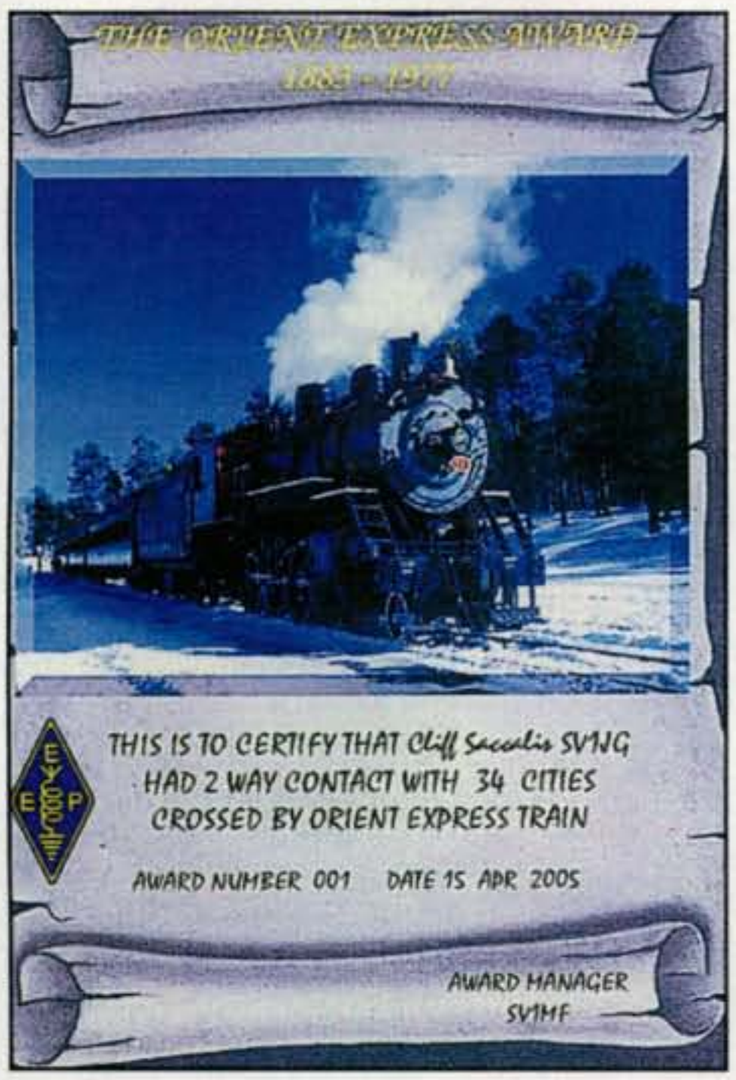
The German radio club in Eitorf is in located in one of the areas where these giant crystals have formed. A striking image of these large crystals is prominent on the certificate.



The Eitorfer Basalt Diplom is sponsored by the Ortsverband Eitorf (DOK G54) of Germany.

The award is sponsored by the Ortsverband Eitorf (DOK G54) for contacts after January 1, 2004. SWL okay. Earn 150 points with at least 50 points from G54 stations. Each contact with stations in DOK G54 = 10 points. Club stations DFØHC and DLØEIT = 20 points. Contacts with stations in the district Köln-Aachen (all G DOKs) and VFDB-DOKs Z12, Z32, and Z37 count 2 points. Each contact with a G DOK (G11, G24, etc.) counts just one time for 5 points. All bands and modes accepted except packet. Each station may be worked only once.

Send GCR list and fee of 5 Euros for DL stations, all others 10 Euros or $US10 to: Christian Bünger, DL6KAC, Im Schiefengarten 3, D-53639 Königswinter, Germany. Internet: <http://www.darc.de/distrikte/g/54/index.html>.



Greece's Orient Express Award is issued to radio amateurs or SWLs who have contacted stations in European cities through which the Orient Express passed.

Greece's Orient Express Award. The Orient Express was the name of a popular railroad service that crossed all of Europe and ended in Turkey. It used a variety of routes during its active existence, starting in 1883 and ending by 1977. Portions of the route continue to be run by trains still using the world-famous name. The Greek national amateur radio society offers this award honoring the glory days when the name *Orient Express* became synonymous with intrigue and luxury travel.

The award is issued to radio amateurs or SWLs who have had contacts with stations in European cities through which the Orient Express passed. There are 34: Athens (SV1), Basel (HB9), Belgrade (YU), Berlin (DL), Brussels (ON), Bucharest (YO), Budapest (HA), Calais (F), Chur (HB9), Cologne (DL), Istanbul(TA2), Dijon (F), Frankfurt (DL), Giurgiu (LZ), Innsbruck (HB9), Lausanne (HB9), London (G), Milan (I), Munich (DL), Nis (F), Oostende (ON), Paris (F), Plovdiv (LZ), Prague (OK), Ruse (LZ), Sofia (LZ), Strasburg (ON), Trieste (I), Thessalonica (SV2), Varna (LZ), Venice (I), Vienna OE), Zagreb (YU), and Zurich (HB9). An initial award is available for contacts with 16 of the listed cities. Category 1 of the award is issued for contacts with all 34 cities. These are separate certificates. Contacts on or after January 1, 1958 count for the award. All modes may be used.

Send a list certified by either the award manager of a national society or two licensed amateurs and fee of 10 IRCs or 10 Euros to: RAAG, Award Manager, P.O. Box 3564, 102 10 Athens, Greece.

Italy's WAP ASEA (Antarctic Special Event Award). Many of Italy's amateur radio operators seem to have a fascination with the polar regions. Each year during the last week in February they encourage that the use of special commemorative prefixes/suffixes be made available from countries that have stations or facilities in the Antarctic. (During this period, look for unique calls coming mostly from Europe, such as TM8ANT, IO2ANT, etc.) The sponsor of this award is ARI, CR Lazio, Section of Casino, and its website offers several incredibly researched pdf documents which have a great collection of Antarctic maps and lists of callsigns from stations that have operated from the South Pole at the many scientific and exploration sites over the years.

Italy's WAP ASEA (Antarctic Special Event Award) is issued for contacts made during Antarctic Activity Week, which is held the last week of February each year.

The award is issued for contacts made during Antarctic Activity Week, which is held the last week of February each year. It is available to all amateurs and SWLs for contacts made on or after January 1, 2006. Contact at least five of these special-prefix commemorative stations—as listed in the official directory under "Antarctic Event Stations"—in countries that have stations or facilities in the Antarctic. Note that the valid stations for the award are *not* located in the Antarctic, but are from the home countries of supported bases, generally using a special prefix. The complete and official listing of eligible stations can be found on the special internet site: <http://www.ddxc.net/wap>. (Stations of Argentina's Armada's Auxiliar Service, which manages supply shipments to the Antarctic, are also valid for the award.) All bands and modes accepted. Endorsements are available in groups of each additional five event stations. Fee for an endorsement is 5 Euros or $US5. For the award send a GCR list showing the usual contact information plus WAP reference number and fee of 10 Euros or $US15 to Nuccio Meoli, IØYKN, Via Conte Bassavilla 1 - I-03030 Rocca d' Arce (FR), Italy.

We're always interested in hearing from clubs, special interest groups, or individuals who sponsor an award. Please contact me at the e-mail or snail-mail address shown on the first page of this column.

73, Ted, K1BV

dx

BY CARL SMITH,* N4AA

DX for the New Year and "Making Lemonade"

I trust you all had a great holiday season and are looking forward to the coming year. I know I'm ready for some real propagation. Go Sunspots! Oh, oh . . . maybe I shouldn't say that. Here in November as I write this, I have no idea what kind of propagation we will have in January, February, or any other month in 2008 for that matter. I did see something about *one* sunspot showing up after some 29 days of *zero* sunspots. I sure hope that means something, but I'll be doggoned if I know what. I think I'll just turn on the radio and see what I can hear, besides white noise.

DX Activity

The first quarter of 2008 is going to be a busy one for DXers. The schedule shows the following:

J5C from Guinea Bissau, January 11–21 (http://www.j5c.eu)

VP6DX from Ducie in February (http://www.vp6dx.com)

TI9K from Cocos Island, February 6–16 (http://www.ti9.eu.com)

TX5C from Clipperton, March 4–18 (http://www.clipperton2008.org)

These operations should prove to be very popular. Here is where they ranked in the 2006 Most Wanted Survey: Guinea Bissau was #85, Ducie was #38, Cocos Island was #87, and Clipperton was 35.

Since the BS7H operation in 2007 gave a lot of folks that coveted #1 Honor Roll spot, many DXers kind of backed off for a while. I know I did. However, after going over their list of band/mode "holes," they started thinking again. Remember the DXpedition that gave us the on-line "greenies"? Well, folks now are searching their old logs to try and fill in their own "greenies" for bands and modes. It's interesting that I have been getting requests for cards for the few DX stations for which I handle cards, dating back into the 1990s. I even recently got a request for the original 5A1A DXpedition card from back in 1995. That DXer was lucky, as he was in the log and got the card.

Also, have you listened to any of the RTTY frequencies lately? There sure are a lot of signals on the bands that were not there a year or so ago.

We still have at least a couple of years at the bottom part of the solar cycle, and that means the low bands will still be providing us with plenty of opportunity to get more "greenies" on 160, 80, and 40 meters. Bigger, better antennas for those bands will be needed to snag the last ones while we still have time. *What did I do with that antenna wire? There was a beverage balun lying around here somewhere!*

*P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

In addition, for decades contests have provided a great opportunity to add countries to our worked lists. The CQWW seems to be more popular than the ARRL contests for DXpeditions to needed places, but you'll find lots to choose from in any contest. We have a number of contests coming up in the next few months, so check your lists and like the Boy Scouts—Be Prepared!

The 2007 Most Wanted Survey

It's still too early to give you any hints on the Most Wanted Survey for 2007. I do think there will be little surprise that most of those at the top for 2006 will still be there for 2007, such as KP1 and KP5. If you are interested in the survey results, you can check the website <http://www.dxpub.com> around mid-January and see the overall results posted there.

Reversing a Trend

It's a new year and time for a few of those New Year's Resolutions. We keep talking about our numbers shrinking with more Silent Keys and fewer newbies to replace them. Well, several groups are taking action to reverse that trend. One of them is the Magnolia DX Association in Mississippi. The following article written by Wes Lamboley, W3WL, it speaks for itself, and perhaps will spark some interest for other groups.

When Life Gives You a Bunch of Lemons, Make Lemonade

By Wes Lamboley, W3WL

The removal of Morse code as a requirement for any class of ham radio license looks like it is turning out to *have one* of the most positive impacts on ham radio since the advent of Heathkit! Okay, there are those who disagree, but many

The Magnolia DX Association getting folks interested and involved in amateur radio. (Photo courtesy of W3WL)

The WAZ Program

6 Meters

83 .....I5KG (29 zones)

20 Meter SSB

1169 .....IZ3GST

15 Meter CW

330 .....KØGM

80 Meter CW

74 .....W6OAT

160 Meters

253 .....UA2FX (38 zones) 254 ...HB9BIN (38 zones)

All Band WAZ

Mixed

8480 .....N9EN
8481 .....K5MDX
8482 .....RN6BY
8483 .....IT9TWC
8484 .....KK9H
8485 .....JAØBMS
8486 .....RV3ID
8487 .....G3VKW

SSB

5052 .....IZ3GST

CW

528 .....JQ6RUP 529.....HA2EQD

RTTY

180 .....I5KG

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

new people are now being attracted to our hobby for a variety of reasons, and it gives all of us DXers an opportunity to expose the newcomers to our exciting aspect of the hobby. The Northern California DX group will continue the theme at Visalia "Elmering New DXers is Job #1," and many clubs throughout the country, including our own SouthEast DXC, are sponsoring "DX-101" programs and scheduling events to generate interest in the DX chase. My presentation of DX-101 at the recent ARRL Convention at the Huntsville Hamfest in August was standing room only and garnered many good questions from the attendees. However, a club in southern Mississippi, the Magnolia DX Association, deserves the greatest admiration and provided me with the inspiration for writing this article.

Hurricane Katrina wreaked havoc with most of the MDXA group. The eye of the storm passed directly over the

Roger, G3SXW, and John, G4IRN, recently spent a fun weekend in Iceland. Roger says these weekend "DXpeditions" are great fun and don't cost very much. (Photo courtesy of Roger, G3SXW, and John, G4IRN)

*Javier, HR2J/HR4, works 40 meters SSB on an IOTA *(Islands On The Air) trip. (Photo courtesy of Andrei, NP3D/EW1AR/HQ4R)*

QTHs of many the members and several were stripped of everything they owned and cherished. They lost homes, cars, ham gear, and all manner of personal property. Many of the losses were uninsured (for one of the MDXA member's story see the September 2006 issue of *CQ* magazine). The one thing they did not lose, however, was the friendships generated through ham radio. Ham friends donated cars, towers, antennas, radios, generators, and other much-needed items.

Many people in the area affected by Katrina, especially those associated with emergency services, realized how vulnerable normal communications are in a disaster and found themselves being helped out by hams and their communications abilities. After Katrina, members of the MDXA, led by Ed, KA5VFU, and his wife, Betty Jo, KB5CSQ, recognized an opportunity and set up amateur radio classes for those who wanted to find out what ham radio is all about. They started in January 2007 and had 16 people in the first class. The Technician class consisted of school teachers, students, fire department members, power company workers, and friends. On testing day, they had 15 of the 16 pass, and they ranged from 11 to 82 years of age. Out of this group many have since joined the MDXA and are now helping with classes and antenna parties and are ready to help in time of need. Out of this group three upgraded to General class.

The MDXA invited the new radio operators to the annual March picnic this year. The new operators wanted to know when the next class would start! They joined a class already in session, and by the time the class was completed a total of 11 more passed the Technician test, 2 upgraded to General, and 8 upgraded to Extra. Then other members of the MDXA, including Floyd, N5FG *(CQ's WAZ Award Manager—ed.)*, and Vic, N5YY, got started with some serious DX Elmering. The newcomers were introduced to the FCC (First Contact Club), whereby they were helped in making their first real DX contact, sometimes through a pileup! There were visits to DXers shacks, a DX-101 course, antenna parties, a course in QSLing, and all-around help just for the asking.

The MDXA group realized that when a lot of them started DXing they did it on 2 meters. Hearing the spots from your friends come over 2 meters added to the excitement! George, K5JZ, and Ed, KA5VFU, started to look for a place to put up a new 2-meter repeater so all could enjoy the old way of DXing. MDXA now has a repeater up at 800 feet which covers about 70 miles state line to state line for DX. They have had donations come in for the repeater from a lot of the new and old members of the MDXA. The new Technician can now hear what is going on with DX spots, and this generates the enthusiasm and desire to upgrade! Vic, N5YY, started a class to help those who wanted to upgrade to Extra, and then he started a second class. He is running a 100% completion rate. He takes the time to explain about the right and wrong way to DX. He has done an excellent job with his graduating classes.

The next big event the MDXA had was Field Day in June. They invited all of the new licensees and had the largest group of people ever show up (over

The WPX Program

CW

3190 .....HA8TI 3192 .....EA4WD

SSB

2987 .....JR3KAH 2989 .....IWØHOU

Mixed

1994 .....ZS2DL 1998 .....YI1OM
1995 .....DH5MM 1999 .....PY2IQ
1997 .....IW9GUR

CW: 700 HA8TI. 2250 W9IL. 2350 IK3GER.
SSB: 450 JR3KAH. 800 7N1NXF. 850 K6TV. 900 JA1FJJ. 2250 W9IL.
Mixed: 600 ZS2DL. 3100 W9IL. 3950 WB2YQH. 4200 HA5DA..

20 meters: KZ8E

Asia: JA1FJJ
Europe: KZ8E, JA1FJJ
Oceania: JA1FJJ
N. America: KZ8E, JA1FJJ

Award of Excellence: N8BJQ, UA3BS, UA9FGR
160 Meter bar: N8BJQ, UA3BS, UA9FGR

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MDD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GO, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, WB8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8UB, HA6XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IK4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBF, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, I7PXV, S53EO, DF7GK, S57J, EA5BM, DL1EY, DJ1YH, KUØA, VE2UW, 9A9R, UAØFZ, DJ3JSW, OE6CLE, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX, WB9IHH, CT1EEN, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, KT2C, UA9CGL, AE5B, KØDEQ, DKØPM, SV1EOS, UAØFAI, N4GG, UA4RZ, 7K3QPL, EW1CQ., UA4LY, RZ3DX, UA3AIO, UA4RC.

160 Meter Endorsements: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8ILC, K9BG, W1CU, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, DJ1YH, KUØA, VR2UW, UAØFZ, DJ3JSW, OE6CLD, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, CT4NH, EA7TV, LY3BA, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, DL6ATM, W2OO, RU3DX, WB9IHH, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, UA9CGL, SM6DHU, KØDEQ, DKØPM, SV1EOS, N4GG, UA4RZ, 7K3QPL, EW1CQ, UA4LY, RZ3DX, UA3AIO., UA4RC

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 355, New Carlisle, OH 45344 USA. Note: WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.
*Please Note: The price of the 160 meter bar for the Award of Excellence is $6.50.

5 Band WAZ

As of November 1, 2007, 740 stations have attained the 200 zone level and 1571 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
UA2FX N9EN W6OAT

The top contenders for 5 Band WAZ (zones needed, 80 or 40 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
W2YY, 199 (26)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
IK1AOD, 199 (1)
DF3CB, 199 (1)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W3NO, 199 (26)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
N3UN, 199 (18)
OH2VZ, 199 (31)
W1JZ, 199 (24)
W1FZ, 199 (26)
SM7BIP, 199 (31)
SP5DVP, 199 (31 on 40)
N4NX, 199 (26)
N4MM, 199 (26)
EA7GF, 199 (1)
N6HR/7, 199 (37)
JA5IU, 199 (2)
NØIJ, 199 (21)
RU3DX, 199 (6)
N4XR, 199 (27)
WØPGI, 199 (26)
HA5AGS, 199 (1)
EA8AYV, 199 (27)
VE3XN, 199 (26)
YU7GMN, 199 (10)
K7LJ, 199 (37)
RA6AX, 199 (6 on 10m)
RX4HZ, 199 (13 on 80m)
KG9N, 199 (18)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K4CN, 198 (23, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
F5NBU, 198 (19, 31)
OE2LCM, 198 (1, 31)
HA1RW, 198 (1, 31)
WK3N, 198 (23, 24)
W9XY, 198 (22, 26)
KZ2I, 198 (24, 26)
W7VJ, 198 (34, 37)
K9MIE (18, 21)
W9RN (26, 19 on 40)
W5CWQ (17, 18)

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

RN6BY (171 zones) K8YC (170 zones)
HB9BIN (198 zones)

5 Band WAZ updates:

WØCP (199 zones) K8YC (178 zones)
WC5N (160 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $100 ($120 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

CQ DX Awards Program

SSB

None

CW

1084 .....HA5LQ 1085 .....N2VW

SSB Endorsements

330 .....W9SS/337
330 .....KZ2P/337
330 .....K9HQM/337
330 .....EA2IA/337
330 .....VE3MR/337
330 .....VE3MRS/337
330 .....N2VW/335
320 .....KD5ZD/325
320 .....VE7SMP/321
250 .....IK8OZP/252

CW Endorsements

330 .....W4OEL/336
330 .....WØJLC/336
330 .....EA2IA/336
320 .....K1FK/328
275 .....N2VW/282

RTTY Endorsements

330 .....NI4H/334

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 337 active countries. Please make all checks payable to the award manager.

100!). What brought out all the people is listed below:

• Randy, W5UE (Field Day chairman), set a schedule and list of equipment needed, and the club members stepped up and filled his requests with antennas, radios, food, and operators.

• Chuck, WS1L, set up a demonstration on how to install a vertical antenna.

• Cecil, K5DL, did a demonstration on how to network computers for logging.

• Betty Jo, KB5CSQ, set up the GOTA station for all new and non-hams to operate.

• Larry, WB5HVX, set up slow-scan TV.

• Jimmy, KB5FSV, did the demonstration on satellite transmission.

• Jerry, N5UCF, Gene, KE5MVZ, and Justin, KE5MWA, did some fantastic cooking for the group.

Some MDXA members traveled 600 miles to be part of the 2007 Field Day! Besides all the usual camaraderie that comes with Field Day, there was another spin-off. The seasoned YLs insisted that the new YLs operate the GOTA station. What came from that experience was more enthusiasm, and there are now four new Generals, three Extras, and three soon-to-be Extra class YLs. The YLs now have their own net night once a week (they had 93 check-ins last month!), a dinner meeting once a month, and are doing a fund raiser to help support the repeater.

MDXA set up for the ARRL Kids Day and had 15 kids participate. Try to think of what you felt like and how sweaty your hands were as you made your first call on HF. Some of the MDXAers had to laugh when they thought about what they must have looked like during their first HF contact many years ago. If you have never done Kids Day, you need to think about it for next year and enjoy supporting ham radio for the future.

The club has a breakfast on the second Saturday of each month and that includes a program on some type of DX-related subject. They have speakers talk about RTTY, CW, how to get connected to the DX node to see what DX is coming in, how to fill out QSL cards, how the outgoing and incoming bureaus work, and DX films of rare expeditions around the world. They also have door prizes to give away.

MDXA has a lot of people with different talents, and they work together to help solve problems the members have. They have a website that is run by John,

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 337 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the *CQ DX* Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K9BWQ 336	WB4UBD 336	K4CEB 335	PA5PQ 334	K5UO 333	W4UW 330	W4LI 325	PY4WS 320	RA1AOB 300
N7FU 336	K9MM 336	PY2YP 335	K3UA 334	KA7T 333	G3KMQ 329	N4OT 325	OZ5UR 320	VE7KDU 300
N4JF 336	N5FG 336	N6AW 335	DL3DXX 334	K8LJG 332	N5HB 329	N7WO 325	CT1YH 320	KT2C 300
K4IQJ 336	K4CN 336	K4JLD 335	K2ENT 334	K5RT 332	K1HDO 329	YV5ANT 324	YT1AT 317	K4IE 291
K2TQC 336	W7CNL 336	K9OW 335	NC9T 334	YU1AB 332	K7JS 329	KE3A 323	W6YQ 315	G3DPX 284
K2FL 336	W8XD 336	N4AH 335	W2VJN 334	HB9DDZ 332	W6OUL 329	KF8UN 323	UA9SG 310	KØKG 283
N4MM 336	W4OEL 336	K9IW 335	G4BWP 334	K3JGJ 332	W7IIT 328	F6HMJ 323	W9IL 309	N2VW 282
K4MQG 336	WØJLC 336	K5UO 335	W1JR 334	VE3XN 331	KA3S 328	IKØTUG 321	EA3ALV 309	DJ1YH 281
N7RO 336	EA2IA 336	N5ZM 335	I4LCK 334	K2JF 331	K1FK 328	W3II 320	WA4DOU 309	XE1MD 280
W7OM 336	F3TH 335	K2JLA 334	K7LAY 334	WA8DXA 331	K6LEB 328	IKØADY 320	YU7FW 306	WD9DZV 277
K2OWE 336	N4CH 335	F3AT 334	WØHZ 333	K8SIX 331	SM5HV/HK7 327	WG5G/QRPp 320	LU3DSI 302	W2JLK 277
NØFW 336	OK1MP 335	WA4IUM 334	W4MPY 333	W2UE 330	K6CU 326	F5OIU 320	N1KC 302	

SSB

K6YRA 337	XE1AE 337	KE5K 336	K1UO 335	VE7WJ 334	YV1JV 331	CP2DL 327	N8SHZ 316	N5WYR 300
IK1GPG 337	N5FG 337	K3JGJ 336	I8KCI 335	YZ7AA 334	K3JGJ 331	NI5D 327	XE2NLD 315	K4IE 300
K5TVC 337	DU9RG 337	W4UNP 336	I8LEL 335	CT3BM 334	N5ORT 331	K7TCL 326	IZ6CST 314	RA1AOB 300
NØFW 337	PY2YP 337	N5ZM 336	DU9RG 335	WS9V 334	CT1AHU 331	HB9DDZ 326	W6NW 314	K7SAM 300
KZ2P 337	N6AW 337	K8SIX 336	DU1KT 335	WA4WTG 334	EA3JL 331	YV4VN 326	WØROB 313	YC9WZJ 300
K4MZU 337	OZ5EV 337	K4CN 336	CT1EEB 335	4N7ZZ 333	K1HDO 331	WR5Y 325	EA3ALV 313	WA1ECF 295
N4JF 337	K9BWQ 337	KØKG 336	W1JR 335	VE1YX 333	K7HG 331	KC4MJ 325	W7GAX 312	KW1DX 295
W4WX 337	WB4UBD 337	W4UW 336	I4LCK 335	W2JZK 333	K3LC 331	PY2DBU 325	KA1LMR 312	W4EJG 295
K2TQC 337	W8AXI 337	W2FKF 336	ZL1HY 335	K8LJG 333	AE5DX 330	YT1AT 325	WA5MLT 310	XE1MW 293
K5OVC 337	VE2PJ 337	W7FP 336	VE2GHZ 335	VE4ACY 333	KB2MY 330	KE4SCY 325	RW9SG 310	K1RB 292
W6BCQ 337	K9HQM 337	K2JLA 335	AB4IQ 335	VE2WY 333	K3PT 330	KD5ZD 325	XE1RBV 310	W9ACE 291
DJ9ZB 337	W9SS 337	IK8CNT 335	W7BJN 335	WB3DNA 333	WS9V 329	K6GFJ 324	IØYKN 310	W5PVE 288
W6EUF 337	KE5K 337	OE7SEL 335	W2CC 335	K9PP 333	W9OKL 329	W6WI 323	AA1VX 308	KKØDX 285
K4MQG 337	VK4LC 337	ZL3NS 335	K9IW 335	DL3DXX 333	W2FGY 329	EA3CYM 323	KK4TR 306	VE7HAM 285
N7BK 337	VE3MR 337	K7JS 335	N2VW 335	EA3EQT 333	CT1CFH 329	WA4ZZ 322	WB2AQC 305	N8LIQ 284
N4MM 337	VE3MRS 337	YU1AB 335	WDØBNC 334	YV1KZ 333	EA1JG 329	WN9NBT 322	K3BYV 303	WØIKD 283
XE1L 337	EA2IA 337	PY4OY 335	WØYDB 334	KE3A 333	W9IL 329	W6OUL 322	JR4NUN 303	KBØRNC 282
4Z4DX 337	AA4S 337	VE3XN 335	W4NKI 334	ZL1BOQ 333	F6HMJ 329	CT1ESO 321	YV2FEQ 303	XE1MEX 282
W6DPD 337	K4JLD 337	IØZV 335	OE2EGL 334	YV1AJ 332	KF8UN 328	KD2GC 321	KU4BP 303	IK8TMI 281
N4CH 337	OZ3SK 337	IN3DEI 335	WA4IUM 334	KSØZ 332	WØULU 328	SV3AQR 321	VE7KDU 302	F5INJ 279
N7RO 337	K9BWQ 336	EA4DO 335	K5RT 334	LU4DXU 332	K1EY 328	VE7SMP 321	W5GZI 302	WD9DZV 278
K7LAY 337	WB4UBD 336	PA5PQ 335	W6SHY 334	VE4ROY 332	K4DXA 328	N1KC 320	W4PGC 302	W5GT 276
W7OM 337	K2FL 336	XE1VIC 335	W5RUK 334	CT1EEN 332	LU5DV 328	W5GZI 320	N2LM 302	HSØ/EA4BKA 276
OE3WWB 337	W3AZD 336	K2ENT 335	EA3KB 334	K5UO 332	N1ALR 328	KD2GC 320	AC6WO 301	K9DXR 275
K9OW 337	OK1MP 336	IK6GPZ 335	AA4S 334	N7WR 332	XE1MD 327	LU3HBO 317	4X6DK 301	AD7J 275
K9MM 337	EA3BMT 336	NC9T 335	CT3DL 334	DL9OH 331	DK5WQ 327	WB4GMR 317	4Z5FL/M 301	

RTTY

WB4UBD 335	K2ENT 333	N5FG 331	G4BWP 325	EA5FKI 320	PA5PQ 311	K8SIX 300	W4EEU 297	K4CN 283
NI4H 334	K3UA 332	N5ZM 326	OK1MP 323					

KC5LK, at <www.mdxa.org>. The website is loaded with all kinds of useful information for the DXer, including a link to the MDXA DX node run by George, K5JZ, that is accessible via the internet (K5MDX AR Cluster). For more information on the MDXA, please go to the website and look at all that has gone on and what is on the calendar.

The Magnolia DX Association took a devastating situation (Hurricane Katrina) and turned it into an opportunity to showcase amateur radio and expand its membership. The activities outlined above have generated a very positive outcome for ham radio, emergency preparedness, and the art and thrill of DXing. My hope is that this article might inspire others to take advantage of the new opportunities now out there since the code requirement has been dropped. My offer is to put together a compendium of ideas for all of us to use in generating enthusiasm for our hobby, and that includes promoting CW for those who are interested. Carl, N4AA, has promised to publish something on the subject in the future. Please send me any ideas you use or can think of to help get new "blood" into our passion for DX! I can be reached via e-mail at <blamboley@aol.com>.

Need anything more be said? Until next time, enjoy the chase and Have Fun!

73, Carl, N4AA

QSL Information

V63J via K9AJ
V63MB via UA4WHX
V63RE via IT9YRE
V63WN via I1SNW
V73VV via UA4WHX
V8BDS via V8BDS
VA7EWK via WD9EWK
VK1YT via K4YT
VK8AA via VK6NE
VK9LI via K6VNX
VK9LO via K6VNX
VK9LR via K6VNX
VP2E via UA3DPX
VR2/K9EL via K9EL
VS6BX via K9EL
VS6EC via K4YT
VU2CP via DJ9ZB
VU2FC via DJ9ZB
W9K via WD9EWK
WD9EWK/VE7 via WD9EWK
XEØIEC via K4YT
XE2/WD9EWK via WD9EWK
XE2BOA via WD9EWK
XE2BSS via WD9EWK
XE2MX via K6VNX
XE2S via WD9EWK
XE2SI via K6VNX
XE2TG via WD9EWK
XE2TPJ via WD9EWK
XE2VAS via WD9EWK
XE7X via K6VNX
XU7ADG via K4YT
XW1A via E21EIC
YBØGJS via NI5DX
YB1GJS via NI5DX
YI9YT via K4YT
YJØAUS via DJ9ZB
YJØVB via UA4WHX
YK1AA via DJ9ZB
YK1AN via DJ9ZB
YK1BA via N5FF
YL/ES4Q via ES5RY
YL1A/A via ES5RY
YS1/AC4LN via UA4WHX
YS1JR via DJ9ZB
YS1X via DJ9ZB
Z2/UA4WHX via UA4WHX
Z21BA via NI5DX
ZB2DZ via K4YT
ZC4DX via DJ9ZB
ZD7JP via NI5DX
ZK1/AC4LN via UA4WHX
ZK1XD via DJ9ZB
ZK2VB via UA4WHX
ZK4AB via UA4WHX

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

Interpreting Contest Rules the Right Way

BY JOHN DORR,* K1AR

January's Contest Tip

Make sure you work dupes! Does that sound like strange advice? If someone calls you and appears to be a dupe, it is generally advisable to simply work the person rather than take the time to negotiate the merits of a second QSO. Also be sure you log the contact. Sometimes a station is "duping" you because the first QSO *never* really happened. It would be a shame to create an unnecessary "not in log" error simply because you didn't want to use a few more bytes of RAM in your computer.

I'm learning that there are certain subjects in contesting that require reinforcement on a semi-regular basis. The way we interpret contest rules happens to be one of those topics. Even though I covered this subject in some depth a few years ago, I feel compelled to do it again as we enter a new calendar year. The truth be told, there will be sunspots again and less time to think about the way we view each other as peers. Thus, now is the time to be introspective about our behavior and ways we play this game called "contesting."

Over the years, contest adjudicators have done a skillful job of defining contest rules in a way that leaves little to the imagination. We're fortunate that this is the case, as I don't *think very* many of us are ready to hire a lawyer before submitting our next contest score. Of course, there have been a number of mid-course corrections over the years, many of which evolved with the advancement of technology and other factors. Some of you may recall an addition to the CQ WW rules that specifically precludes the use of non-amateur-radio communications during a contest to solicit QSOs. This was in response to an infamous multi-op entry that used the telephone to arrange schedules and QSOs, which at the time was not expressly prohibited. It's exactly situations such as these that are in the spirit of what we will discuss this month.

When it comes to staying on the proper side of contest rules interpretation, most of us subscribe to what our "guts" tells us. In reality, it's really not more complicated than that. Most of you have heard the *old* cliché that being honest in life allows one to sleep soundly at night. To set the record straight, we're not going to have a discussion this month about the ethics of contest operators. That subject will have to be reserved for another time. The issue at hand actually has nothing to do with cheating *per se*, but with the legitimate interpretation of contest rules and how they are implemented in the heat of battle.

Several years ago, George Fremin, K5TR, outlined several examples of where he chooses not to cross the gray line of rules interpretation. His personal rule book avoids the following:

- Making skeds before a contest.
- Sending e-mail messages "reminding" people to work him in a contest.
- Warming up a frequency 30 minutes before a contest. (I will get on and tune around a bit and work some guys to find out if my station *is still* working.)
- Using other bands in the 10-meter contest or in a single-band effort to find stations and move them to the band I am on for the weekend.
- Using databases of past exchanges (e.g., super-super check-partial).
- Using the packet cluster to fill up the band maps before the contest starts and then turning it off as the contest begins while operating as a single operator.
- Running my amp when I am low power in an effort to get to the 150- or 200-watt limit.
- Having my friends feed me callsigns that no one else will work.

In addition to George's view of the world, there are other factors to consider, especially as they pertain to the single-operator class, as follows:

- Asking for on-the-air intelligence of needed multipliers.
- The legitimacy of having access to real-time internet-fed propagation data.
- Establishing instant-messaging connections with other stations (not to obtain operating intelligence, but simply to chat).
- Utilizing a packet connection for the express purpose of outbound spots only.
- Having access to logistic support during a contest, ranging from food being served for you to the host operator fixing things on your behalf during the contest (e.g., equipment, antennas, computers, etc.).

As you can quickly see from the lists above, there are no clear answers to managing these issues (at least some of them). When considering K5TR's list,

Calendar of Events

All year	**CQ DX Marathon**
Dec. 29	RAC Winter Contest
Dec. 29–30	Stew Perry Topband Challenge
Jan. 1	ARRL Straight Key Night
Jan. 5–6	ARRL RTTY Round-up
Jan. 6	ARRL Kid's Day
Jan. 12–13	Hunting Lions on the Air Contest
Jan. 12–13	North American CW QSO Party
Jan. 19	LZ DX Contest
Jan. 19–20	UK RTTY DX Contest
Jan. 19–20	HA DX Contest
Jan. 19–20	North American SSB QSO Party
Jan. 26–27	**CQ WW 160 Meter CW Contest**
Jan. 26–27	REF CW Contest
Jan. 26–27	YLISSB SSB QSO Party
Jan. 26–27	BARTG RTTY Contest
Jan. 26–27	UBA SSB DX Contest
Feb. 2	Minnesota QSO Party
Feb. 2–3	Vermont QSO Party
Feb. 2–3	YLISSB CW QSO Party
Feb. 2–3	Delaware QSO Party
Feb. 3	North American CW Sprint
Feb. 23–24	**CQ WW 160 Meter SSB Contest**

*2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

2008 CQ Contest Dates

Jan. 26–27	CQ WW 160 M CW Contest
Feb. 9–10	CQ WW WPX RTTY Contest
Feb. 23–2	CQ WW 160 M SSB Contest
Mar. 29–30	CQ WW WPX SSB Contest
May 10–11	CQ WW Foxhunting Weekend
May 24–25	CQ WW WPX CW Contest
July 19–20	CQ WW VHF Contest
Sept. 27–28	CQ WW RTTY DX Contest
Oct. 25–26	CQ WW DX SSB Contest
Nov. 29–30	CQ WW DX CW Contest

I personally agree that "spamming" the contest world with e-mails about your pending operation is not in the spirit of the rules. That said, I don't believe that establishing a run frequency before a contest begins is crossing any ethical lines. Nor do I agree that the use of super-check partial tools is violating any interpretation of the rules, provided you continue to actually copy and log what you hear (check partials that include exchanges is another matter, however). An interesting sidebar to this subject is the way the interpretation of contest rules bleeds into some of the ugly habits that we now experience in contesting. For example, using a check-partial tool is not a rule violation, but it has fostered a shift from good, old-fashioned on-the-air data capture to dependency on what the computer tells you. The same problem exists for packet spotting. Let's allow the tool to give us the answer at the expense of getting it right ourselves. If these behavioral trends continue, one has to wonder why anyone would bother to operate a contest anymore. Let's just let the computers duke it out and may the best network win! The fact is that most of this nonsense actually hurts your score by generating bad data. The old-fashioned technique of actually copying stations "on the air" mercifully continues to prevail. It's a rare occurrence indeed when someone's log is more accurate by depending heavily on external/software tools versus using the best tool of all—the one between your ears!

Given that so many of you have already expressed opinions on this month's subject demonstrates to me that the desire to do the right thing is what is really on most of your minds. Also, to a certain extent there is a fair measure of polarization. The extreme right would suggest that a contest starts at 0000Z and that's when the operator should sit down in the chair and begin the contest. There will be no pre-contest tuning, checking propagation on the various bands, running strings of stations, etc. That's like starting a running race without the customary stretching of your leg muscles. The other extreme is endless pre-contest publicity (disguised under the auspices of ensuring that everyone is aware of the "rare one" that's about to come on), pre-contest skeds, "thanks for calling and please stay here for the next 20 minutes and work us in the contest," and on it goes.

At the end of the day, most of us know how to do the right thing when figuring out the limits of contest operating and the rules that guide us. It comes down to one simple question you need to ask yourself: "Are the actions I'm taking outside of the spirit of what was intended and do they provide me with an unfair competitive advantage?"

The other challenge I offer is for you not to fall into the trap of convincing yourself that because you have big antennas, fast computers, and strong ergonomic station design you are entitled to other advantages as well. Reality teaches us that not all station "enhancements" are created equal in the eyes of the adjudicators. Having the ability to own the band edge for hours at a time is not the same as asking a friend to hold it for you while you take five minutes to execute a "bio break." Being a system administrator for a packet node is not the same as feeding yourself with tons of internet-generated automated information that you did not discover on your own "single op" time.

I realize that in writing this month's column I sound like I'm lecturing a bit. To be honest, I've struggled with some of these issues myself and where to draw the line. The important thing is for all of us to consider the issues often and be open-minded to other opinions. Peer pressure is one of our sport's greatest assets. If you feel comfortable sharing your rulemaking interpretations with the masses, then you're likely to be doing the right thing. If public opinion says you should change a particular behavior, then do it! That's just one of many factors that make competent contest competitors into great ones.

Final Comments

Let me conclude by wishing all of you a Happy New Year. With 2008 under way, we hopefully are going to learn that the bottom of the sunspot cycle is upon us and we are now looking forward to better conditions in the near future. Given some of the contest scores we've seen this past fall, it boggles the mind to consider what will be possible in just a few short years.

On that note, see you in the next contest, and in the spirit of this month's discussion, you'll just have to tune around to find me, hi! 73, John, K1AR

Electromagnetic (EM) Force – Part I

BY TOMAS HOOD,* NW7US

A Quick Look at Current Cycle 23 Conditions
(Data rounded to nearest whole number)

Sunspots
Observed Monthly, October 2007: 1
Twelve-month smoothed, April 2007: 10

10.7 cm Flux
Observed Monthly, October 2007: 66
Twelve-month smoothed, April 2007: 75

***Ap* Index**
Observed Monthly, October 2007: 9
Twelve-month smoothed, April 2007: 9

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for January 2008

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 11-7, 11-14, 18, 21-23	A	A	B	C
High Normal: 8, 10, 16-17, 19-20	A	B	C	C-D
Low Normal: 9, 15	B	C-B	C-D	D-E
Below Normal: N/A	C	C-D	D-E	E
Disturbed: N/A	C-D	D	E	E

Where expected signal quality is:
A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing in *The New Shortwave Propagation Handbook* by George Jacobs, W3ASK; Theodore J. Cohen, N4XX; and Robert B. Rose, K6GKU.

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 2 will be good (B) on January 1st through the 7th, fair (C) on the 8th, then fair to poor (C-D) on the 9th, etc.

3. As an alternative, the Last-Minute Forecast may be used as a general guide to space weather and geomagnetic conditions through the month. When conditions are Above Normal, for example, the geomagnetic field should be quiet and space weather should be mild. On the other hand, days marked as Disturbed will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the path is ionospherically supported.

What inspires you about amateur radio? Is it the lure of working with electronic components? Or perhaps the idea that you can play with the building blocks of a modern circuit and develop a better way to accomplish some task by using these electronic parts in a new design? Maybe you just enjoy the social aspect of the hobby. Perhaps while enjoying the social ham radio scene, you find yourself amazed that your voice can be propagated over great distances. Is it the dazzle of the sun and the talk of giant solar flares and the way solar plasma can trigger aurora, and how you can reflect your radio signal off the aurora so that another amateur radio operator can hear you and respond from a home two states away?

The Amateur Radio Service was created many years ago, in part for scientific exploration. Initially, in 1912, licenses were granted "to stations actually engaged in conducting experiments for the development of the science of radio communication, or the apparatus pertaining thereto, to carry on special tests, using any amount of power or any wave lengths, at such hours and under such conditions as will ensure the least interference with the sending or receipt of commercial or Government radiograms, of distress signals and radiograms, or with the work of other stations." *(An Act To regulate radio communication, approved August 13, 1912.)*. Today, the focus seems to be more on the use of amateur radio as an emergency radio service than on experimentation and science. While emergency communications became a key part of the Amateur Service as early as 1915, perhaps today we are ignoring a very important and potentially world-changing component of amateur radio—scientific experimentation and development of new communications technology.

I applaud the growing QRP movement among the ranks of amateur radio enthusiasts. Among these passionate hobbyists are those who delve deep into circuit theories and radio principles, and combine modern components with innovative building techniques. This spirit of experimentation is breathing new life into our hobby and has the potential of bringing about significant discoveries in the world of radio communications.

Another area of scientific enquiry is growing in our ranks, as well. With groups such as the PropNet folks <http://www.propnet.org/> working hard on developing an active research network around the world, new discoveries about the way radio waves propagate from one area to another are possible. Reports of new modes of propagation have already been made. This can only happen if more amateur radio operators join these experimenters and researchers.

The spirit of enquiry is fundamental to the forward progress of our hobby. If we lose this element of our service, then we become nothing more than an appliance service, providing what any other service could provide. We would then relegate our position as innovators and pioneers to those who sit in the halls of academia.

History tells us that it is the amateur scientist who contradicts the established line of reason coming from the halls of academia. Great examples include Michael Faraday, Thomas Edison, and our forefather, Guglielmo Marconi.

Michael Faraday

Born on September 22, 1791 in England, Michael Faraday started work at the age of 13 as an errand boy for a bookseller. After a year of running

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errands, the bookseller took Faraday on as an apprentice bookbinder. With this connection, Faraday worked the rest of his childhood years in the bookbinding business. Throughout these seven years, Faraday consumed the thoughts and knowledge in every interesting book he could find. Specifically, he was drawn to the books about science that came through his workplace.

In 1813, he was hired by Humphry Davy—who had been Faraday's hero since he attended his chemistry lectures—as an assistant and secretary. While in this employ, Faraday came into direct contact and had conversations with prominent scientists of the day. This provided a foundation that moved Faraday toward a significant moment in science. In 1820 several scientists in Paris, including Arago and Ampère, made significant advances in establishing a relation between electricity and magnetism. Davy became interested and allowed Faraday the opportunity to work on the topic. Faraday published "On some new electro-magnetical motions, and on the theory of magnetism" in the *Quarterly Journal of Science* in October 1821. This was hailed as the first conversion of electrical into mechanical energy and the first notion of the "line of force."

Faraday, in no sense a mathematician but in every sense a self-made amateur scientist, continued his work on electricity and in 1831 made what is arguably his most important discovery, namely that of electro-magnetic induction. This discovery, that a magnet could induce an electrical current in a wire, showed that mechanical energy could be converted into electrical energy. This discovery of the first dynamo was the opposite of the discovery he had made ten years earlier. However, Faraday again made lines of force central to his thinking.

During the rest of the 1830s Faraday discovered other critical aspects of electrochemistry, and by 1838 he brought all of these discoveries together into a coherent theory of electricity. Great mathematicians of the day took up Faraday's theories and began to work on formulas that would prove these theories.

James Clerk Maxwell

Enter James Clerk Maxwell. A Scottish physicist and mathematician born on November 13, 1831, Maxwell contributed to the scientific work a large body of revolutionary work in electromagnetism and the kinetic theory of gases. "Maxwell's importance in the history of scientific thought is comparable to Einstein's (whom he inspired) and to Newton's (whose influence he curtailed)," Ivan Tolstoy, biographer of Maxwell, wrote. Maxwell wrote in 1864 that "We have strong reason to conclude that light itself—including radiant heat and other radiation, if any—is an electromagnetic disturbance in the form of waves propagated through the electromagnetic field according to electromagnetic laws." This was hailed as one of the greatest leaps ever achieved in human thought.

Maxwell's most important achievement was his extension and mathematical formulation of Michael Faraday's theories of electricity and magnetic "line of force." Maxwell expressed the behavior of electric and magnetic fields and how an oscillating electric charge produces an electromagnetic field in four partial differential equations. These are now known as *Maxwell's equations*.

Maxwell also calculated that the speed of propagation of an electromagnetic field is approximately that of the speed of light. He proposed that the phenomenon of light is therefore an electromagnetic phenomenon. Because charges can oscillate with any frequency, Maxwell concluded that visible light forms only a small part of the entire spectrum of possible electromagnetic radiation.

Maxwell used the later-abandoned concept of the ether to explain that electromagnetic radiation did not involve action at a distance. He proposed that electromagnetic-radiation waves were carried by the ether and that magnetic lines of force were disturbances of the ether. Heinrich Hertz discovered such waves in 1888.

Heinrich Hertz

Hertz noticed that a charged object loses its charge more readily when illuminated by ultraviolet light. In 1887, he made observations of the photoelectric effect and of the production and reception of electromagnetic (EM) waves. He had built an apparatus consisting of a coil with a spark gap. Experimenting with a dynamo, he discovered that a spark would be seen in the gap when creating electrical energy in the dynamo placed nearby. He placed the apparatus in a darkened box in order to see the spark better. However, he observed that the maximum spark length was reduced when the loop and spark gap were placed in the box. He concluded that the glass panel placed between the source of EM waves and the receiver absorbed ultraviolet radiation that assisted the electrons in jumping across the gap. If he removed the glass, the length of the spark would increase. When he replaced the glass with quartz, he observed no difference in the length of the spark. This has been explained by the way glass absorbs UV radiation while quartz does not.

Earlier in 1886, Hertz developed the Hertz antenna receiver, a set of terminals that is not electrically grounded for its operation. He also developed a center-fed driven dipole element for transmission of UHF radio waves. Hertz also altered Maxwell's equations to take into account new discoveries for electromagnetism.

Guglielmo Marconi

When Hertz died in 1894, a large amount of his work was published. A young Guglielmo Marconi took up interest in this electromagnetic radiation and the "Hertzian wave." Marconi was a true amateur radio scientist. He built his crude devices and tested his theories in his home garden. By doing so, he changed the world when he gave birth to the world of radio.

Hear the Call

Are you deeply interested in some aspect of radio science? Space weather, ionospheric propagation of radio waves, meteor plasma trails, and ionized gas propagation . . . do these spark a passion in you? New antenna design, creative circuit construction techniques . . . do these inspire you to stay up past bedtime in pursuit of the next new idea? I hope that you do hear this call, and follow it wherever it may lead you. Our hobby must have this as part of our survival as a hobby and as a service in the public's interest. We are more than communicators; we are innovators and pioneers.

During 2008 this column will explore some key concepts of radio-wave propagation. We want to begin at the very beginning, with the concepts discovered by these pioneers. It is my hope that you will gain a greater love for radio and the science of radio-wave propagation through this column. Perhaps, too, you will hear the call to scientific investigation. Perhaps you will become one of the new radio pioneers.

Now that I have whetted your appetite for scientific inquiry, return next month for our promised dive into the facts of electromagnetic radiation, a self-prop-

agating wave in space that is composed of both an electric and magnetic components. I promised that we would explore EM radiation in this month's column, but our space is limited. I feel very passionate that we must inspire more scientific exploration in our hobby, and launched into a short historical perspective before digging into the meat of the topic. Now that I have your attention, we are ready for next month's second part on this, the backbone of our radio hobby.

Good Conditions for 2008

Here is an overview of expected propagation conditions for each amateur band from 6 to 160 meters for 2008.

6 Meters: About the only real action on 6 meters will be during the summer season's troposcatter and sporadic-*E* activity. Aurora will play a minor role during spring and fall. Meteor-scatter propagation might offer an occasional peak in activity, as well.

10 and 12 Meters: These bands will be fair to poor, except during times of sporadic-*E* activity. Expect most DX openings to be mostly on north and south paths. Most of the time the solar activity will not support propagation on the higher bands, except for possible openings on paths between lower latitudes and locations on the other side of the equator (north/south paths).

15 Meters: This band will be fair to poor during the first part of the year, with occasional worldwide openings during the daylight hours of all seasons. Most openings, if present, will be short, except for the strong and frequent north/south path openings. Through most of 2008, we will see a slight increase in solar activity as the new cycle, solar Cycle 24, is expected to begin.

17 Meters: Seventeen meters should behave much like 15 meters, but you will find it open more often, with it remaining open for DX an hour or two longer than 15.

20 Meters: This band is going to be the main player during this year of low to moderate solar activity. Expect fair conditions during the daylight hours, with DX openings possible to limited areas throughout the year. DX conditions on this band tend to peak for a few hours after local sunrise and again during the sunset period.

30 Meters: Thirty meters will offer moderate openings, especially from a few hours before sunset until a few hours after sunrise. In 2008, 30 meters will be an exciting band for those low-power digital signals. Winter brings longer nights, providing the right mix for exceptional worldwide DX.

40, 60, 80, and 160 Meters: These are nighttime DX bands. Great worldwide DX should continue on 40 meters from about two hours before sunset to approximately two hours after sunrise during all seasons. Expect coast-to-coast DX on 60 meters. DX openings on 80 and 160 should peak during the early spring, late fall, and winter months. Expect somewhat stronger signals than those of last year.

January Propagation

It should be a toss-up between 17 and 20 meters for some great DX propagation openings during the daylight hours. These bands should open to most areas of the world, often with very strong signals. Seventeen meters may have a slight edge before noon, with 20 meters taking the lead after noon and becoming an optimum DX band during the late afternoon hours. Short-skip openings between distances of about 1200 and 2300 miles should be excellent during the daylight hours. Excellent short-skip openings are expected on 15 and 17 meters from shortly after sunrise through the early evening hours for distances between 1000 and 2300 miles. Twenty meters is expected to be a solid band with openings for both DX and short-skip. DX conditions should peak during a window of an hour or so right after sunrise and again during the late afternoon and early evening hours. Short-skip openings between approximately 1300 and 2300 miles should be possible from just after sunrise to as late as midnight. Shorter distance openings should also be possible from mid-morning to mid-afternoon.

The optimum band for DX conditions during the hours of darkness should be 40 meters. Expect openings to most areas of the world from shortly before sundown, through the hours of darkness, and until shortly after sunrise. Signal levels may be exceptionally strong at times. During the daylight hours, short-skip conditions should be optimal for openings between approximately 100 and 600 miles. Skip will

lengthen during the late afternoon, and by nightfall short-skip conditions should be optimal for openings between 800 and 2300 miles.

Expect 60 meters to play a significant role in nightly DX across the United States. With very low noise levels this month, the weaker signals of 60 meters will be easy to copy.

Because atmospheric noise levels will be at seasonally minimum levels in the Northern Hemisphere during January, 80 and 160 meter bands should also be hot. Expect some good openings to many parts of the world on 80 meters during the hours of darkness and the sunrise period. Short-skip openings between distances of 50 and 250 miles should be optimal on 80 meters during the daylight hours. During the later afternoon and early evening hours short-skip openings should increase to between 250 and 1500 miles, and by nightfall openings up to and beyond 2300 miles should be possible.

Expect some DX openings on the 160-meter band during the hours of darkness. Openings towards Europe and the east should peak at about midnight. Openings towards the South Pacific and in a generally southerly direction may be possible just before daybreak, as well as openings into Asia and the North Pacific. Short-skip openings up to 1300 miles should be possible during the hours of darkness, and frequently the skip will extend out as far as 2300 miles. During the daylight hours intense ionospheric absorption will severely limit openings, although at times some may be possible up to 150 miles or so.

VHF Conditions

Look for the *Quadrantids* meteor shower, the major meteor shower for January. It typically starts sometime around January 1 and lasts through January 5. The maximum should occur at 0640 UTC on January 4. This shower can be quite intense, so it may be a good idea to set up some 2- and 6-meter schedules. Morning meteor openings may be the best bet during this month. The hourly rate can be as high as 200 this year, although the expected average is about 120.

Check out <http://www.imo.net/calendar/> for a complete calendar of meteor showers in 2008. Have you worked any of these meteors? Please drop me a note and let me know. I'll construct a summary from your reports for this column's readers to enjoy.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for October 2007 is 0.9, the lowest recorded during Cycle 23. The lowest daily sunspot value of zero (0) was recorded for October 1–5 and October 9–31. The highest daily sunspot count was 11 on October 6. The 12-month running smoothed sunspot number centered on April 2007 is 9.9. A forecast for 2008 has not yet been published, but I will venture a forecast calling for a smoothed sunspot count of 22, give or take about 12 points lower to 12 points higher, for January 2008.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 65.5 for October 2007. The 12-month smoothed 10.7-cm flux centered on April 2007 is 75.2. No prediction is yet available for 2008, but my predicted smoothed 10.7-cm solar flux for January 2008 is 80, give or take about 14 points.

The observed monthly mean planetary *A*-index (*Ap*) for September 2007 is adjusted to 9, and for October is 9. The 12-month smoothed *Ap*-index centered on April 2007 is 8.5. Expect the overall geomagnetic activity to vary greatly between quiet to active during most days in January. Refer to the Last-Minute Forecast at the beginning of this column for the outlook on conditions during January.

I invite you to visit my online propagation resource at <http://propagation.hfradio.org/>, where you can get the latest space data, forecasts, and more, all in an organized manner. If you have a cell phone with internet capabilities, try <http://wap.hfradio.org/>.

Drop me an e-mail or send me a letter if you have questions or topics you would like to see me explore in this column. Also, I'd love to hear any feedback you might have on what I have written. Until next month . . .

73, de Tomas, NW7US

Looking Ahead in CQ

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

- "CQ Interviews: Vice Admiral Scott Redd (Ret.), KØDQ," by W2VU
- "CQ Market Survey: HF Transceivers," by WB6NOA
- "Jeff's Walk," by WV5J
- "Six Meters at Last," by W4YO

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

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

2007 WPX SSB RESULTS

QRP/p

4M2L	**A**	**1,402,960**	**1096**	**380**
			(Op: YV5YMA)	
TI5N	**A**	**803,348**	**807**	**364**
UA3BL	**A**	**684,428**	**805**	**431**
M3RCV	**A**	**523,611**	**638**	**387**
OK7CM	**A**	**387,361**	**534**	**359**
YT7TY	**A**	**321,356**	**431**	**322**
KA1LMR	**A**	**266,122**	**392**	**271**
YO5OHY	**A**	**201,168**	**365**	**264**
K3WW	**A**	**182,286**	**303**	**247**
RW3AI	*	167,417	358	251
N4IJ	**A**	**161,935**	**308**	**233**
UX1UX	**A**	**161,364**	**335**	**238**
RX1CQ	*	156,695	388	259
SV1NK	**A**	**137,904**	**286**	**221**
SP9RQH	**A**	**125,191**	**277**	**209**
IZ1ANK	**A**	**124,740**	**280**	**220**
UX8ZA	*	119,793	304	219
LU1VK	**A**	**94,978**	**267**	**169**
RZ6MP	*	92,130	261	185
KD1H	*	80,070	191	157
N8XA	**A**	**74,061**	**140**	**117**
WA8WV	*	73,790	200	157
VE3SHL	**A**	**67,080**	**186**	**120**
SP2DNI	*	62,484	202	164
PE2KP	**A**	**55,264**	**208**	**176**
YO4AAC	*	48,106	171	134
WD9FTZ	*	47,730	188	129
RK9DO	**A**	**46,345**	**155**	**115**
EA1TI	**A**	**44,800**	**156**	**140**
HA5BA	**A**	**34,986**	**148**	**119**
NE1RD	*	34,727	150	121
K5TV	**A**	**33,250**	**141**	**125**
VE3CW	*	27,632	114	88
N6WG	*	21,216	143	96
VE6EX	**A**	**20,750**	**109**	**83**
UT5UKY	*	20,076	104	84
S59TI	**A**	**18,270**	**99**	**87**
S56G	*	18,216	95	88
N4ZAK	*	17,480	106	92
IZ5GSV	*	17,424	96	88
AD0NW	*	13,938	81	69
PY2VM	**A**	**9,009**	**71**	**63**
DF1RK	**A**	**6,555**	**61**	**57**
EA5BJI	**A**	**6,210**	**69**	**54**
NA4BW	*	5,684	71	58
KV6T	*	5,428	60	46
			(Op: K6MI)	
DL2YOU	*	4,750	53	50
EC7ANB	*	4,232	48	46
YY6JAG	**A**	**3,526**	**41**	**41**
US0YA	*	3,128	38	34
JE2HCJ	**A**	**1,633**	**30**	**23**
IK0XBX	*	1,625	25	25
IU9A	**A**	**1,495**	**27**	**23**
PA1W	*	1,485	36	33
ON3ICK	**A**	**1,100**	**25**	**25**
PE2WG	*	990	23	22
DF7LS	*	966	25	23
VA3RKM	*	940	21	20
HS2JFW	**A**	**616**	**17**	**14**
OK1JDC	*	540	16	15
DL9NDV	*	350	14	14
LZ3FN	**A**	**252**	**12**	**12**
			(Op: LZ2ITU)	
K6MI	*	171	14	9
JK1TCV	*	171	9	9
PW2C	**28**	**25,872**	**132**	**98**
			(Op: PY2WC)	
I5KAP/QRP	**28**	**2,828**	**35**	**28**
W6QU	**28**	**1,564**	**26**	**23**
			(Op: W8QZA)	
JA2MWV	**28**	**72**	**6**	**6**
WB8IWG	**28**	**27**	**3**	**3**
JH7RTQ	**21**	**87,192**	**220**	**173**
YV5JF	**21**	**31,240**	**130**	**110**
JR1NKN	*	10,458	74	63
KD2HE	**21**	**4,257**	**44**	**43**
SQ9AOR/QRP	**21**	**2,368**	**34**	**32**
SQ6ELV	*	2,291	31	29
XX9LQ	**21**	**720**	**18**	**15**
JQ6PAQ	*	714	20	17
KK6TV	*	160	8	8
JA1KPF	*	126	8	7
XX9KX	*	12	2	2
UA9XTX	**21**	**6**	**3**	**2**
RA3FO	**14**	**236,664**	**520**	**342**
RW3FY	*	113,520	311	240
YO2LYN	**14**	**92,045**	**269**	**205**
DJ0MY	**14**	**62,807**	**209**	**181**
K3TW	**14**	**26,866**	**109**	**101**
SP1DTE/4	**14**	**22,550**	**125**	**110**
EC5APA	**14**	**16,362**	**123**	**100**
I1BAY	**14**	**16,198**	**106**	**89**
RZ9IB	**14**	**15,246**	**80**	**77**
JA4DQ	**14**	**14,925**	**91**	**75**
JA4DQX	*	14,726	91	74
YU8ALR	**14**	**12,496**	**98**	**88**
WB7DCV	**14**	**11,169**	**77**	**73**
VE3IAE	**14**	**9,540**	**71**	**60**
WN4DX	**14**	**9,504**	**75**	**66**
NP3D/NY2	*	6,944	68	56
			(Op: EW1AR)	
KC9AMM	**14**	**2,948**	**52**	**44**
G4GSA	*	1,870	35	34
M5AAV/P	*	1,056	24	24
K4RKZ	*	4	2	2
SP4GFG	**7**	**83,936**	**194**	**172**
HA8GK	**7**	**15,416**	**86**	**82**
LY2TS	**7**	**10,854**	**67**	**67**
EA3FF	**7**	**10,416**	**57**	**56**
BA3CE	**7**	**56**	**5**	**4**
HG6EU	**3.7**	**70,896**	**198**	**168**
			(Op: HA6VA)	
SQ2DYF	**3.7**	**68,510**	**206**	**170**
SQ4LP	*	19,760	105	95
W8QZA	**3.7**	**4,320**	**57**	**48**
UA3OQ	**1.8**	**8,220**	**63**	**60**
DJ3GE	**1.8**	**493**	**17**	**17**
YO3III	**1.8**	**240**	**10**	**10**

SINGLE OPERATOR

UNITED STATES

NC1I	**A**	**2,984,474**	**1764**	**751**
			(Op: K9PW)	
K1SND	**A**	**492,822**	**655**	**393**
ND1X	**A**	**414,800**	**580**	**340**
NN1N	*	342,888	440	314
AE1P	*	228,475	404	247
KC1ME	*	142,606	314	226
			(Op: K1JB)	
AB1BW	*	67,940	201	158
K5ZD	*	36,300	122	110
W1YRC	*	35,700	117	105
N1MGO	*	2,706	35	33
KB1ILH	*	1,302	23	21
AB1EP	**14**	**100,746**	**224**	**193**
W1OHM	*	5,880	59	56
AK1W	**7**	**972,726**	**952**	**446**
			(Op: K5ZD)	
K1HAP	**1.8**	**60,280**	**222**	**137**
***NV1N**	**A**	**1,941,450**	**1373**	**645**
			(Op: N1UR)	
***NA1QP**	**A**	**202,500**	**366**	**225**
***KA1C**	**A**	**111,940**	**263**	**193**
*K1JMD	*	51,786	166	137
*W1CRK	*	51,606	183	141
*K1VU	*	46,992	170	132
*KB1FRK	*	41,088	151	128
*AA1O	*	36,270	139	117
*KA1EKR	*	34,093	118	103
*W1HBR	*	33,276	151	118
*N1ORK	*	31,301	133	113
*KB1FCB	*	10,048	72	64
*KA1VMG	*	8,732	75	59
*KB1CJ	*	8,624	63	56
***AB1FY**	**7**	**11,400**	**65**	**60**
***W1BJ**	**14**	**126**	**7**	**7**
AB3CX	*	872,413	894	457
WN2O	*	833,958	821	433
(Op: N2GC)				
WA2JQK	*	687,200	689	400
NA2NA	*	274,000	386	
2I4GDJ				
NJ1F	*	204,726	391	229
K2XA	*	124,995	249	195
K3QDV	*	98,747	242	191
AA2NA	*	90,210	238	186
K2PS	*	86,013	206	171
N2BZP	*	60,261	176	159
W2FUI	*	46,008	123	108
KB2DE	*	19,092	99	86
KD2RD	**14**	**1,859,920**	**1256**	**670**
N2UN	*	201,721	323	263
N2DWS	*	129,115	231	217
N2NS	*	26,565	152	115
NT2A	**3.7**	**336,876**	**453**	**299**
***W2CCC**	**A**	**214,249**	**391**	**241**
			(Op: K2CS)	
***WA2MCR**	**A**	**213,360**	**381**	**240**
***K2RET**	**A**	**211,696**	**351**	**252**
*KV2M	*	143,510	304	226
*KM2O	*	100,833	274	183
*AB2TC	*	82,867	218	173
*K2YSY	*	79,713	177	153
*N2OBY	*	66,097	214	157
*KG2NI	*	55,350	182	150
*N2MTG	*	54,000	198	135
*KA2D	*	53,466	154	134
*K2YLH	*	42,229	169	121
*N2MRI	*	28,944	146	108
*N2WLS	*	27,956	141	116
*W2ARP	*	21,805	96	89
*K2RNY	*	20,972	107	98
*KD2MX	*	12,089	88	77
*W2ANQ	*	10,656	81	72
*WA2IAU	*	6,204	51	47
*N2TEV	*	5,562	55	54
*NV2G	*	5,096	60	56
			(Op: N2ZN)	
N2NFU	*	3,116	50	41
*KA2FHN	*	2,482	37	34
*KC2OGR	*	408	17	17
*KG2V	*	40	5	5
***W2AW**	**21**	**14,616**	**80**	**72**
			(Op: N2GM)	
*KA2ASU	*	4,141	42	41
*W2IX	*	4,068	41	36
***KD2MU**	**14**	**37,572**	**144**	**124**
*KS2G	*	32,770	126	113
*K2HVE	*	17,313	95	87
*K2RED	*	6,552	56	56
*KC2JRQ	*	3	1	1
KC3R	**A**	**6,388,668**	**2635**	**949**
			(Op: LZ4AX)	
N3UM	**A**	**773,190**	**724**	**426**
NY3A	**A**	**289,842**	**490**	**309**
W3/E21EIC	*	206,414	334	221
WR3H	*	120,593	238	209
W6AAN	*	112,320	218	195
W0BR	*	72,618	229	147
W3GNQ	*	35,742	118	111
K3FIT	*	11,418	72	66
K3VDR	*	8,450	77	65
N3NZ	*	2,660	35	35
W2BZR	**14**	**65,440**	**180**	**160**
KE3WM	**7**	**75,000**	**200**	**150**
WA3AAN	*	39,270	143	110
NA3M	**3.7**	**235,538**	**435**	**262**
W3GH	**1.8**	**112,401**	**362**	**181**
***W3LL**	**A**	**1,227,340**	**1086**	**545**
***N2RRA**	**A**	**568,400**	**693**	**406**
***KB3LIX**	**A**	**189,054**	**358**	**243**
*N3ALN	*	138,846	317	219
*N8NA	*	123,516	271	188
*KA3FZN	*	114,449	250	193
*N3XZ	*	97,128	262	171
*KB3EXB	*	56,580	160	123
NJ4M	**A**	**6,406,464**	**3047**	**976**
			(Op: K1TO)	
WT4PF	**A**	**2,716,912**	**1910**	**718**
			(Op: N4PN)	
NF4A	**A**	**2,461,846**	**1972**	**698**
K4PV	*	2,058,381	1728	657
K4BAI	*	2,026,141	1815	631
AD4TR	*	1,495,821	1428	591
K5KG	*	1,301,481	1428	531
K4RO	*	1,252,550	1400	533
K4SN	*	1,042,825	1087	505
NJ2F	*	902,286	866	462
K4VV	*	676,962	667	429
WB2QLP	*	501,534	694	374
KU8E	*	498,201	633	341
NX9T	*	354,765	556	335
N4ZZ	*	308,070	553	315
K4LQ	*	297,126	370	306
N4MM	*	288,288	377	273
NE4M	*	251,691	424	263
N4VZ	*	193,732	376	238
N6AR	*	186,030	303	234
WA4ASJ	*	185,164	342	238
K4OH	*	153,920	282	208
WK4Y	*	144,976	339	208
N4CU	*	143,640	269	210
WA3OFC	*	115,776	251	201
N4BCB	*	108,116	233	179
K4PHE	*	106,720	215	184
N4JDB	*	88,110	227	178
K4WX	*	85,738	202	163
AE4EC	*	69,611	186	151
AI4QB	*	38,316	161	124
NJ4F	*	30,210	113	106
N4UH	*	29,900	107	92
NZ5N	*	28,400	117	100
N4WO	*	27,772	131	106
KI4EUP	*	26,936	105	104
N4LZ	*	26,670	126	105
*N3FNE	*	40,716	163	117
*N3VMD	*	25,452	123	101
*AH0AH/W3	*	21,060	106	90
*K2LNS	*	15,936	105	83
*K3RMB	*	12,936	83	77
*KB3LHT	*	11,808	88	72
*WR3F	*	11,431	81	71
*N3TEE	*	10,695	82	69
*KB3KRW	*	7,564	75	61
*KB3IBT	*	5,808	50	44
*N3FJP	*	3,564	48	44
*N3KHK	*	1,755	28	27
*N3JON	*	1,276	22	22
*N3KGC	*	825	29	25
*K3CAR	*	576	17	16
*N3TXH	*	189	12	9
*N3GE	*	6	3	2
***K3LAB**	**14**	**5,247**	**59**	**53**
*KB3JGU	*	3,784	50	43
*KB3NDS	*	1,430	26	26
***NS3T**	**3.7**	**102,249**	**374**	**189**
*K3SWZ	*	4,018	45	41
N4CW	*	24,304	100	98
W4ATL	*	2,418	32	31
W4RK	*	1,350	26	25
KI4EEQ	*	714	18	17
K4RDU	**28**	**1,170**	**22**	**18**
NQ4I	**21**	**380,304**	**550**	**342**
			(Op: VE7ZO)	
WN1GIV	*	232,060	423	283
			(Op: N4BP)	
NJ4U	*	220,844	389	274
			(Op: K4EA)	
KV4T	*	26,362	121	98
K4EU	**14**	**739,297**	**795**	**481**
WO4O	*	118,791	265	201
KY5R	**7**	**816,992**	**1114**	**422**
N4EEB	*	373,109	736	317
K4KZZ	*	313,456	508	286
W4SVO	*	127,100	380	205
K9ES	**3.7**	**301,944**	***384***	***276***
K1GU	*	9	3	3
AA4MM	**1.8**	**61,021**	**238**	**139**
WJ9B	*	19,096	118	88
K4ADR	*	3,397	47	43
***W4LT**	**A**	**457,026**	**669**	**361**
***AB4GG**	**A**	**451,043**	**720**	**367**
***KI3O**	**A**	**447,650**	**586**	**350**
*N4IG	*	420,021	494	339
*W4TMN	*	333,940	466	295
*AC4TT	*	307,695	495	281
*W4EEH	*	263,351	416	269
*N4JF	*	234,500	431	268
*N2ESP	*	195,580	369	254
*KI4IMA	*	113,274	266	203
*AA4FU	*	99,138	251	186
*AC5ZS	*	62,240	185	160
*W4LOS	*	62,016	178	152
*KT4PD	*	58,220	189	142
*KG4EFR	*	57,456	215	144
*W5BXQ	*	48,339	171	131
*AD2H	*	42,210	163	126
*AI4GR	*	40,920	171	120
*N3UC	*	37,884	143	123
*WA4OSD	*	37,760	165	128
*N3UA	*	36,300	123	110
*K4MIL	*	34,553	143	109
*KF4GTA	*	33,264	164	126
*K4WES	*	31,578	124	114
*KD6AKC	*	29,430	114	109
*NU4I	*	28,560	123	102
*N3CZ	*	28,365	109	93
*W4PFM	*	26,214	112	102
*AI4DB	*	25,317	117	97
*K4FTO	*	23,700	116	100
*WB5NMZ	*	21,182	105	89
*N4SCS	*	17,680	104	85
*K4JAF	*	11,084	73	68
*N3AO	*	11,060	80	70
*AI4ME	*	9,455	71	61
*W4WNT	*	9,272	69	61
*KG4EXA	*	6,962	65	59
*NN4RH	*	5,936	58	53
*K3MZ	*	5,043	46	41
*K4GOP	*	4,176	54	48
*K1KEY	*	4,032	52	48
*NZ1D	*	3,872	50	44
*AG4YQ	*	3,526	48	43
*N4DXI	*	3,478	38	37
*N4IOZ	*	3,268	40	38
*W4NSC	*	3,196	35	34
*KI4NEC	*	2,849	41	37
*W4AMP	*	2,607	37	33
*K4JHK	*	2,268	41	36
*N4JN	*	2,139	35	31
*K1TC	*	1,829	32	31
*WW6O/4	*	1,012	22	22
*N5SPX	*	864	18	18
*KD4WUO	*	696	25	24
*KX4O	*	540	18	18
*K1CEC	*	507	15	13
*KO4OL	*	378	15	14
*KG4WQN	*	280	14	14
*KG4NET	*	130	10	10
*KF4MJJ	*	60	5	5
*N4KTM	*	0	0	0
***NA4W**	**28**	**31,302**	**139**	**94**
			(Op: K4WI)	
***N4MO**	**14**	**243,105**	**333**	**285**
*KZ5OH	*	190,736	327	262
*WB1HBB	*	163,688	338	259
			(Op: W4WR)	
*KI4KNS	*	17,487	96	87
*K1HG	*	9,800	71	70
*NX9O	*	5,992	58	56
*KU4FP	*	5,984	50	44
*KI4MUG	*	3,854	50	47
*K2EKM	*	1,794	27	26
*K4BP	*	1,416	25	24
***WA4VJC**	**7**	**3,483**	**47**	**43**
***AA4LR**	**3.7**	**217**	**8**	**7**
K5TR	**A**	**3,896,706**	**3176**	**782**
WM5R	**A**	**3,801,400**	**2768**	**830**
K5ER	**A**	**1,067,710**	**1290**	**490**
WA5ZUP	*	146,258	394	217
WW5DX	*	99,369	260	181
WD5JNC	*	83,660	236	178
N5XZ	*	78,077	190	163
KD5JAA	*	48,552	174	136
KC5TA	*	21,890	112	110
W5IBM	*	19,380	127	102
			(Op: K5PI)	
NX5M	**21**	**141,693**	**298**	**219**
KU5B	**14**	**2,282,211**	**2152**	**717**
NQ5K	*	970,555	1373	499
			(Op: W5ASP)	
N5JR	*	80,640	193	180
N5VYS	*	17,900	144	100
***WD5K**	**A**	**1,108,359**	**1058**	**511**
***KE5OG**	**A**	**98,784**	**333**	**196**
***KE5LQ**	**A**	**76,820**	**235**	**167**
*KD5J	*	57,660	269	155
*K5BZH	*	46,644	189	138
*AB5XZ	*	44,890	189	134
*KE5DHY	*	33,516	151	114
*K5PI	*	23,856	137	112
*WA5OK	*	23,618	117	98
*KB5DRJ	*	22,578	153	106
*W5REO	*	21,146	122	97
*K5LAN	*	19,475	105	95
*KB5HPL	*	19,392	125	101
*N5KLE	*	18,228	97	84

*KE5AQD	*	17,708	95	76
*WA5AAA	*	14,118	124	78
*N4CYV	*	10,863	89	71
*N5DTT	*	10,725	85	75
*K5KA	*	10,430	103	70
*KD5IKG	*	8,896	74	64
*W5BKT	*	7,847	66	59
*N5HYP	*	5,781	57	47
*N5ZC	*	5,670	66	54
*KC0LFQ	*	1,920	35	30
*KE5KWD	*	455	15	13
*KC5QNK	*	30	5	5
***W5TD**	**28**	**3,842**	**44**	**34**
***AJ5DX**	**21**	**21,315**	**103**	**87**
			(Op: W0VX)	
***N5DO**	**14**	**719,328**	**1004**	**472**
*WA5SWN	*	20,604	123	101
*K5PX	*	3,192	51	42
W6TK	**A**	**1,260,544**	**1373**	**512**
NF6A	**A**	**1,051,378**	**952**	**521**
		(Op: K6XX @K6XX)		
WT6TT	**A**	**969,487**	**959**	**433**
(Op: N6NZ)				
N6AA	*	454,080	615	330
N6NF	*	349,596	800	324
WB6JJJ	*	247,345	438	259
K6NA	*	241,776	357	219
KY6LA	*	239,056	367	223
KJ6RA	*	194,103	327	237
NT6K	*	55,386	251	153
W7CB	*	50,310	156	129
K6QK	*	40,052	200	124
K2RD	*	38,850	159	111
KG6ZHC	*	32,686	149	118
KY0W	*	2,016	34	28
			(Op: W0YK)	
NK6A	*	1,824	34	32
KX7M	**21**	**368,183**	**527**	**283**
K6HNZ	**14**	**862,576**	**1082**	**464**
W6AFA	*	447,930	675	378
*NX6T	*	558,215	824	389
			(Op: K6AM)	
***WN6K**	**A**	**198,290**	**451**	**251**
***N6EM**	**A**	**94,656**	**265**	**174**
***KE6SHL**	**A**	**81,965**	**296**	**169**
*AA6K	*	68,544	194	168
*KD4HXT	*	63,910	301	166
*AA6EE	*	47,676	194	137
*K6DEX	*	46,644	174	138
*N6OU	*	33,988	144	116
*W6RTW	*	13,280	98	80
*KD6X	*	11,880	77	66
*KB6MTH	*	8,791	60	59
*W6FB	*	4,140	54	45
*W6ELJ	*	3,978	58	51
*K6CSL	*	2,775	39	37
*K6BIR	*	1,683	38	33
*AF6DD	*	1,508	27	26
*WB6KDH	*	312	13	13
*NC6P	*	285	15	15
*N6YMK	*	16	4	4
***K6JAT**	**21**	**20,898**	**94**	**86**
***KC6ZZT**	**14**	**63**	**7**	**7**
*KE6GFI	*	8	2	2
***KI6LZ**	**7**	**148,114**	**310**	**206**
KW7Y	**A**	**5,582,169**	**2724**	**909**
			(Op: K7RL)	
NB7V	**A**	**656,854**	**994**	**409**
W7JY	**A**	**247,473**	**401**	**279**
K7ZZ	*	241,302	486	262
NN7ZZ	*	178,365	361	235
			(Op: N5LZ)	
WR5G	*	174,930	342	238
N7BF	*	139,638	336	222
K7ABV	*	127,200	249	212
W7TTE	*	107,439	213	177
KI7AO	*	97,664	218	218
KG7P	*	60,897	222	159
KV7DX	*	34,560	158	120
			(Op: KN5H)	
K7EG	*	30,058	120	113
NF7E	*	29,868	142	114
W7TAX	*	8,024	68	59
KC7V	**21**	**188,832**	**342**	**224**
K7ZS	*	30,870	126	98
W7WA	**14**	**3,609,882**	**2334**	**846**
W6AEA	*	295,480	373	332
WG7X	*	14,616	102	87
N7XY	*	5,000	52	50
***N4LS**	**A**	**160,474**	**329**	**206**
***NA7RF**	**A**	**100,956**	**303**	**188**
***K7JE**	**A**	**69,293**	**186**	**133**
*W7QN	*	65,440	212	160
*N7IR	*	64,296	190	141
*W7TSQ	*	54,950	172	157
*W7RV	*	44,912	145	112
*KD7MSC	*	41,184	210	132
*NQ7R	*	41,022	173	129
*N7NJO	*	40,870	153	122
*W4LSC	*	28,050	129	102
*W7JU	*	26,884	122	94
*WB7DE	*	21,828	148	102
*N7VPN	*	21,658	129	98
*W7ASF	*	21,008	127	104
*KF0X	*	19,251	122	93
*K6UM	*	19,184	110	88
*AD7KG	*	18,834	126	86
*KN7T	*	13,689	103	81
*N7IZ	*	13,272	113	79
*K7TR	*	12,950	75	70
*WI7F	*	10,725	96	75
*KI7Y	*	9,660	82	70
*W7YVK	*	8,960	69	64
*K7LMM	*	7,688	76	62
*NG7Z	*	6,160	62	55
*AD7LJ	*	5,684	66	58
*KD7YFG	*	5,376	65	56
*WA5MAH	*	4,998	59	51
*AD7KI	*	1,554	21	21
*WA7YUL	*	1,484	29	28
*W8TK	*	14	3	2
*K8LJK	*	6	2	1
***W7ISG**	**28**	**3,328**	**37**	**32**
***W7UPF**	**21**	**39,780**	**129**	**117**
***AD7J**	**14**	**298,753**	**478**	**343**
*K7ACZ	*	71,000	170	142
*K7MY	*	20,304	110	94
*W7KAM	*	14,151	105	89
N6BJQ	**A**	**1,465,920**	**1154**	**576**
K8VUS	**A**	**100,992**	**228**	**192**
W8JMF	**A**	**65,395**	**181**	**145**
N8ILU	*	27,072	118	94
K8MR	*	14,140	74	70
ND8DX	**3.7**	**860,626**	**984**	**419**
NT1E	**1.8**	**303,680**	**580**	**260**
			(Op: K3BU)	
***WB8TLI**	**A**	**539,478**	**603**	**369**
***WZ8T**	**A**	**459,756**	**608**	**387**
***WN8R**	**A**	**286,878**	**482**	**274**
*WB8JUI	*	246,820	400	287
*N8WK	*	186,714	338	253
*KD5LNO	*	175,904	398	239
*W8AKS	*	159,183	332	207
*N8IE	*	118,420	298	191
*NO8R	*	95,892	251	183
*N8HC	*	66,171	220	161
*W8IDM	*	38,688	157	124
*W9KB	*	31,527	160	113
*NF8M	*	27,772	132	106
*W8KNO	*	26,001	136	107
*K8BSG	*	24,823	124	103
*AF8C	*	20,928	106	96
*WF8P	*	16,770	100	86
*K8DXR	*	14,877	102	87
*KE8FD	*	14,432	100	82
*WA8YVF	*	13,430	96	85
*K8CR	*	10,354	75	62
*KE8UM	*	6,426	61	51
*W8GHZ	*	1,175	29	25
***NV8N**	**14**	**454,987**	**601**	**403**
***NR8U**	**7**	**42,333**	**194**	**137**
WB9Z	**A**	**4,060,837**	**2225**	**869**
W9JA	**A**	**548,632**	**607**	**388**
AC9S	**A**	**448,324**	**598**	**347**
AK9I	*	103,944	315	183
K9IDQ	*	92,799	232	189
WA9IVH	*	92,394	206	174
K9JIG	*	65,312	212	157
N9WKW	*	63,918	222	159
AF9J	*	5,040	64	56
KG9N	**14**	**167,913**	**424**	**243**
KD9MS	*	145,518	323	237
K9ON	*	100,188	228	198
W9IL	*	9,860	59	58
K9NW	**7**	**686,178**	**999**	**393**
KK9V	**3.7**	**37,332**	**158**	**122**
***K9OM**	**A**	**121,200**	**283**	**200**
***K9SQL**	**A**	**104,652**	**272**	**171**
***NG9C**	**A**	**95,760**	**282**	**190**
		(Op: W9EYE@NG9C)		
*K9JE	*	95,749	257	181
*N9LYE	*	89,091	284	171
*N9NG	*	44,286	130	121
*KB9YGD	*	22,260	154	105
*KA9VHG	*	20,758	130	97
*N9TTX	*	19,184	112	88
*N9UPU	*	14,964	102	87
*AK9F	*	12,388	114	76
*W9WY	*	7,137	69	61
*K9TCD	*	6,930	70	66
*N9MFK	*	4,998	58	51
*KW9L	*	3,478	51	47
*KC9HJO	*	3,243	49	47
*K9AIH	*	2,700	47	36
*KC9FQV	*	486	20	18
*WQ9T	*	176	11	11
***WD9DJD**	**14**	**16,192**	**98**	**88**
*N9ABC	*	1,288	23	23
*KX9R	*	840	22	21
***K9WBS**	**7**	**612**	**20**	**18**
*KC9GRD	*	108	9	9
***N9TF**	**1.8**	**3,239**	**52**	**41**
AC0W	**A**	**1,955,529**	**1764**	**621**
K0RH	**A**	**1,720,652**	**1810**	**596**
K00U	**A**	**1,113,330**	**1208**	**510**
			(Op: K0OU)	
KT0R	*	865,332	1106	468
K0DEQ	*	485,904	632	382
K0GAS	*	326,370	677	330
WK0P	*	181,920	467	240
WB0N	*	164,735	393	235
KV6O	*	132,804	413	217
NY0T	*	115,960	251	223
WA0HLJ	*	75,342	200	174
K0BUD	*	60,759	202	157
K0AD	*	27,500	173	110
WD0M	*	24,475	96	89
W0BH	*	15,714	97	81
WB0GAG	*	1,104	27	24
K0LMD	**14**	**70,990**	**172**	**155**
W0PPF	*	29,402	125	122
KU1CW	**3.7**	**572,320**	**759**	**365**
***W0ETT**	**A**	**202,500**	**408**	**250**
***AA0NK**	**A**	**191,730**	**370**	**249**
***WB0TSR**	**A**	**130,390**	**316**	**221**
*NT0F	*	69,966	233	169
*K4JNB	*	41,832	153	126
*WT0N	*	36,841	199	133
*KC0DEB	*	35,919	143	117
*K0ERE	*	25,422	161	114
*N9CI	*	25,168	145	104
*N0CQI	*	22,407	125	97
*KC0RQH	*	19,701	116	99
*WZ7S	*	18,281	122	101
			(Op: K7YJ)	
*WY7AA	*	15,925	117	91
			(Op: N0HF)	
*KA0EIC	*	13,120	105	82
*KA4CKR	*	13,040	99	80
*W0PSS	*	12,516	109	84
*K0MPH	*	8,883	77	63
*N0EOP	*	7,392	79	66
*NA0BR	*	5,472	60	57
*NC6T	*	5,432	67	56
*WB0QIR	*	4,644	44	43
*WA0IAF	*	4,067	57	49
*KB0PPM	*	1,200	27	24
***W6GMT**	**28**	**290**	**10**	**10**
***K0PK**	**14**	**136,415**	**271**	**232**
*KC0SZU	*	1,276	33	29
***N9HOE**	**7**	**2,380**	**41**	**35**
***KE0L**	**3.7**	**18,100**	**127**	**100**
*N0YY	*	6,272	53	49

NORTH AMERICA

BARBADOS

8P1A	**A**	**17,726,454**	**5119**	**1182**
			(Op: W2SC)	
8P6EX	**A**	**1,118,944**	**913**	**479**

MARTINIQUE

TO5A	**A**	**7,402,446**	**2770**	**867**
FM5AN	*	92,110	184	151
***FM1HN**	**21**	**84,640**	**234**	**160**

HAITI

***HH4/K4QD**	**14**	**1,933,342**	**1558**	**563**

DOMINICAN REPUBLIC

***HI3T**	**A**	**5,227,712**	**2358**	**784**
			(Op: HI3TEJ)	

PANAMA

HP1WW	**A**	**2,768,256**	**1588**	**576**
***HP3FTD**	**A**	**214,936**	**317**	**268**

HONDURAS

***HR1AAB**	**A**	**585,816**	**931**	**308**
*HR1RTF	*	111,054	262	166

GRENADA

J37T	**A**	**3,861**	**44**	**39**
			(Op: VE3EBN)	

ALASKA

AL1G	**A**	**25,840**	**123**	**85**
KL7RA	**3.7**	**88,122**	**186**	**114**
***KL1SF**	**A**	**5,874**	**46**	**43**

VIRGIN IS.

WP2Z	**A**	**6,436,812**	**3201**	**834**
			(Op: K8MJZ)	
***KP2BH**	**A**	**899,679**	**904**	**411**

PUERTO RICO

***NP3CW**	**A**	**448,630**	**692**	**290**
*WP3GW	*	63,700	164	130
***WP3C**	**7**	**2,537,460**	**1127**	**508**

GUATEMALA

***TG9ANF**	**14**	**1,101,477**	**1073**	**463**

COSTA RICA

***TI2JCY**	**21**	**70,030**	**209**	**149**

ANTIGUA

***V25WY**	**7**	**29,232**	**74**	**72**

BELIZE

V31RG	**A**	**6,097,132**	**3174**	**761**
			(Op: K4VU)	

CANADA

VB3A	**A**	**8,844,880**	**2853**	**1012**
			(Op: VE3AT)	
VO1MP	**A**	**4,087,693**	**1718**	**751**
VE3EJ	*	3,961,752	1631	766
VE3CX	*	2,177,144	1227	568
VA3CCO	*	2,002,062	1081	573
			(Op: VE3KZ)	
VE3CR	*	1,202,769	783	479
VO1TA	*	992,297	701	421
VC5X	**A**	**698,625**	**826**	**375**
			(Op: VE5UF)	
VE1MC	**A**	**562,487**	**520**	**347**
VY2LI	**A**	**343,671**	**388**	**291**
VE7VR	**A**	**171,453**	**294**	**201**
VY1CQ	**A**	**23,312**	**105**	**94**
VE5CPU	*	2,325	32	31
VO1HE	**14**	**3,326,738**	**1675**	**766**
VA7JW	**14**	**50,661**	**216**	**117**
VE5FX	**14**	**49,504**	**149**	**136**
VE6JY	**14**	**37,855**	**134**	**113**
VE3TAZ	**14**	**4,200**	**47**	**42**
VA3XH	**7**	**326,144**	**335**	**224**
***VE3JAQ**	**A**	**1,058,536**	**761**	**431**
***VE2XAA**	**A**	**640,461**	**580**	**381**
*VE3KPP	*	495,872	509	298
*VA3SWG	*	493,884	509	306
*VA3DX	*	332,880	399	292
***VE6CNU**	**A**	**329,908**	**454**	**268**
*VE3OX	*	298,095	392	255
***VE1JS**	**A**	**292,998**	**345**	**282**
***VO1KVT**	**A**	**272,089**	**372**	**241**
*VE3CGE	*	243,225	352	207
***VE4EAR**	**A**	**228,636**	**363**	**219**
*VE3RCN	*	215,340	314	222
*VE3TW	*	178,277	288	209
*VA2SG	*	168,682	293	193
*VE3FH	*	167,079	273	183
*VO1TX	*	146,870	258	190
*VA3OX	*	95,485	203	169
***VA7BEC**	**A**	**77,532**	**190**	**142**
*VE3XAT	*	75,558	178	147
***VE4YU**	**A**	**71,645**	**182**	**161**
*VE3GLO	*	56,373	162	129
*VE7BSM	*	45,980	157	121
*VO1DJT	*	45,628	140	122
*VE2AWR	*	45,540	137	110
*VE3NCQ	*	44,096	131	104
*VA3ZWT	*	35,815	136	95
*VA3VO	*	32,130	103	90
*VE7FCO	*	30,765	121	105
*VA2WDQ	*	27,846	120	102
*VE4DET	*	26,772	119	92
*VA3XOV	*	21,600	93	90
*VA3TPS	*	12,672	73	66
*VE3ZIN	*	10,192	66	56
*VA2RIO	*	9,843	63	51
*VA1XBN	*	8,990	61	58
*VE7HL	*	6,968	57	52
*VE6RLB	*	4,712	47	38
*VE3LXL	*	2,610	31	30
*VE2ARR	*	1,750	28	25
*VE2GLA	*	1,701	23	21
***VY1EI**	**A**	**1,219**	**25**	**23**
*VA4TV	*	552	15	12
*VE3QEE	*	224	8	8
*VE7BGP	*	180	9	9
*VE6MRX	*	55	5	5
***VE3XD**	**14**	**540,484**	**553**	**398**
***VA7ALK**	**14**	**13,651**	**90**	**73**
***VE9DXR**	**14**	**2,880**	**38**	**36**
***VE5BCS**	**14**	**1,908**	**45**	**36**
*VA3HUN	*	120	8	8
***VA7PX**	**7**	**10**	**2**	**2**
***VE3MGY**	**1.8**	**288,540**	**383**	**229**

TURKS AND CAICOS

VP5/V	**A**	**5,566,615**	**2798**	**755**
			(Op: W5CW)	

BERMUDA

***VP9/K0ARY**	**14**	**271,949**	**391**	**289**

MEXICO

XE2WWW	**A**	**2,121,161**	**1549**	**511**
6H1ZVO	*	12,716	71	68
			(Op: XE1ZVO)	
6I2YBG	*	10,679	71	59
XE2S	**14**	**463,360**	**682**	**320**
XE2K	**7**	**1,879,537**	**935**	**391**
***6I2MX**	**A**	**414,410**	**516**	**290**
			(Op: XE2MX)	
*6H1ZTW	*	35,700	136	102
			(Op: XE1ZTW)	
*6I2HUM	*	8,470	65	55

CAYMAN IS

ZF1A	**21**	**1,140,512**	**1079**	**464**
			(Op: W6VNR)	

AFRICA

TUNISIA

3V8BB	**A**	**14,123,540**	**3448**	**1094**

GUINEA

***3XM6JR**	**A**	**1,544,950**	**969**	**530**

MADAGASCAR

***5R8FU**	**28**	**67,854**	**180**	**129**

KENYA

***5Z4/9A3A**	**A**	**29,925**	**187**	**95**

SENEGAL

***6V7E**	**14**	**1,365,552**	**882**	**522**
			(Op: RW3TN)	

GHANA

***9G5ZS**	**A**	**51,250**	**141**	**125**

GAMBIA

C52T	**A**	**4,559,620**	**2121**	**710**
			(Op: GBTSM)	

MOROCCO

5C5Z	**14**	**11,745,769**	**3895**	**1009**
			(Op: W7ZR)	
CN2R	**1.8**	**1,613,955**	**686**	**399**
			(Op: W7EJ)	
***5C8A**	**14**	**4,609,346**	**2064**	**749**
			(Op: CN8NK)	

COMOROS

***D69XC**	**28**	**91,903**	**237**	**133**
			(Op: UA9XC)	

CANARY IS

EA8MQ	**A**	**363,118**	**412**	**259**
EA8KL	*	51,040	133	116
EA8LS	**21**	**171,360**	**284**	**204**
EF8A	**14**	**422,304**	**446**	**318**
			(Op: EA8AUW)	
***EA8BTM**	**A**	**2,026,832**	**1179**	**524**
***EA8/DL3KVR**	**A**	**728,037**	**665**	**369**
***EA8OM**	**A**	**540,459**	**523**	**333**
*EC8AFM	*	169,990	248	178
*EA8BUR	*	127,328	240	184
*EA8AJC	*	99,358	206	151
*EC8ADS	*	37,932	128	109
*EA8AD	*	7,852	53	52
***EA8AKN**	**28**	**46,973**	**149**	**107**
***ED8D**	**21**	**1,118,852**	**874**	**434**
			(Op: EA8BHD)	
*EC8ADW	*	704,224	640	373
*EA8CCB	*	132,818	250	179
***EA8ARG**	**14**	**27,264**	**100**	**96**
*EA8BEX	*	23,460	94	85

SUDAN

***ST2T**	**21**	**1,796,784**	**1147**	**528**
			(Op: S57CQ)	
***ST2R**	**14**	**2,643,300**	**1353**	**660**
			(Op: S57DX)	

CHAGOS

VQ9LA	**A**	**1,937,824**	**1101**	**574**

REPUBLIC OF SOUTH AFRICA

ZS5NK	**A**	**701,679**	**657**	**363**
***ZS6CCW/P**	**21**	**27,072**	**100**	**94**

ASIA

AZERBAIJAN

***4K9W**	**A**	**177,184**	**281**	**224**

GEORGIA

4L8A	**14**	**5,252,961**	**2203**	**861**
4L4CC	**3.7**	**439,999**	**331**	**239**
***4L2M**	**14**	**3,555,695**	**1727**	**715**
*4L1AE	*	101,616	228	174
***4L4WW**	**7**	**2,027,935**	**816**	**455**

ISRAEL

4Z5ML	**14**	**898,710**	**712**	**435**
***4Z5QQ**	**A**	**453,222**	**495**	**297**
***4X6DK**	**A**	**205,792**	**276**	**218**
*4Z5MV	*	90,915	214	165
*4Z5PJ	*	6,850	53	50
***4X1VF**	**21**	**201,324**	**341**	**228**

CYPRUS

C4M	**A**	**4,086,459**	**1702**	**689**
			(Op: 5B4AGM)	
H22H	**1.8**	**333,564**	**278**	**209**
			(Op: 5B4MF)	

WEST MALAYSIA

9M2/JH3GCN	**21**	**47,399**	**193**	**139**
9M2MT	**14**	**100,416**	**265**	**192**

SINGAPORE

9V1YC	**A**	**533,973**	**769**	**363**
9V1UV	*	32,635	137	107

OMAN

A41MX	**A**	**1,511,955**	**1085**	**455**
***A45WD**	**21**	**1,485,276**	**992**	**514**
			(Op: YO9HP)	

BHUTAN

A52AM	**A**	**6,329,064**	**3047**	**707**
			(Op: JA0JHA)	

BAHRAIN

***A92GR**	**A**	**99,932**	**212**	**166**

TAIWAN

BX6AP	**A**	**1,282,068**	**1414**	**486**

CHINA

BD3APX	**A**	**157,617**	**374**	**211**
***BG7MVZ**	**A**	**80,190**	**249**	**165**
***BG1QMU**	**A**	**56,502**	**207**	**146**
*BD5HAM	*	44,735	163	115
*BD4IXA	*	34,047	188	117
*B4R	*	27,878	197	106
			(Op: DL2JRM)	
*BD4SX	*	6,150	64	50
*BG1LKK/4	*	3,600	43	36
*BG3BXH	*	2,146	33	29
*BD6AHP	*	1,400	30	28
*BG3GDB	*	858	30	26
***BD3AIE**	**21**	**20,148**	**123**	**92**
*BD7IBN	*	16,704	92	87
*BD7KLO	*	13,774	78	71
***BA6QD**	**14**	**60,750**	**195**	**162**
*BD2BT	*	40,905	201	135
*BD1DRJ	*	8,832	92	64
*BG6AIF	*	30	5	5

PHILIPPINES

***DU4JT**	**14**	**5,952**	**50**	**48**

KYRGYZSTAN

EX2T	**A**	**360,566**	**515**	**278**
EX8MAT	*	116,472	184	138
***EX2X**	**21**	**853,368**	**822**	**444**
*EX7ML	*	134,714	316	193

TAJIKISTAN

EY8DQ	**14**	**28,608**	**110**	**96**
EY8CQ	**7**	**1,088,217**	**619**	**393**
***EY8CC**	**21**	**57,260**	**161**	**140**

SOUTH KOREA

***HL2SQQ**	**14**	**60**	**6**	**5**

THAILAND

HSBZDR	**21**	**2,108**	**32**	**31**
***HS1CKC**	**A**	**323,186**	**551**	**283**
***E21YDP**	**A**	**302,211**	**451**	**273**
*HS0GBI	*	78,387	227	159
*E20YLM	*	3,045	39	35

SAUDIA ARABIA

HZ1GW	**A**	**280,374**	**315**	**249**

JAPAN

JH4UYB	**A**	**3,993,258**	**1832**	**698**
JA2PAC	**A**	**1,183,054**	**883**	**457**
JR7WAB	**A**	**594,055**	**629**	**385**
JE1LFX	*	522,546	576	327
JA7COI	*	498,370	598	305
JA2BNN	*	469,050	566	318
JH7QXJ	*	397,824	500	296
JA5FBZ	*	191,274	327	213
JR3NZC	*	163,976	295	206
JA7BME	*	156,716	271	203
JG4AKL	*	127,982	250	178
JA3LEZ	*	102,170	213	170
JA7ZP	*	99,408	220	152
JF2FIU	*	38,114	153	118
JR1LEV	*	36,865	131	101
7J1ABD	*	21,746	99	83
JA7JH	*	21,406	81	77
JA4EZP	*	18,320	97	80
JA5GSG	*	5,280	52	48
JA6WJL	**28**	**27,412**	**142**	**89**
JA6BGA	*	864	20	16
JA7NVF	**21**	**462,672**	**592**	**324**
JH7XMO	**21**	**366,865**	**503**	**307**
JG1ZUY	*	189,662	364	233
			(Op: JA6-9330)	
JH2BTM	*	240	10	10
JA6GCE	**14**	**2,070,400**	**1213**	**640**
JH1ACA	**14**	**412,764**	**476**	**354**
JA5APU	*	230,212	353	268
JM4WUZ	*	147,606	306	219
JE7YSS	*	17,459	91	79
			(Op: 7N4TEN)	
JA1YPA	**7**	**47,502**	**106**	**91**
			(Op: JA1PEJ)	
JI1ALP	*	4,740	33	30
***JH7CUO**	**A**	**311,080**	**434**	**280**
***7J1AQH**	**A**	**228,004**	**383**	**238**
***JA7LMZ**	**A**	**143,376**	**290**	**206**
*JA2PFO	*	140,790	279	190
*JH6OPP	*	121,146	254	183
*JA1GLE	*	105,950	236	163
*JA1XPU	*	80,784	229	144
*JA4AQR	*	53,317	169	131
*JA1HFY	*	44,660	160	110
*JH1FNU	*	39,663	153	117
*JA1KK	*	33,695	146	115
*JF9KVT	*	32,235	143	105
*JJ1MZH	*	26,850	121	75
*JH0NEC	*	26,730	117	90
*JA2GHP	*	26,675	137	97
*JA2DLM	*	21,243	79	73
*JL8MBF	*	20,510	97	70
*JA0BMS	*	19,840	113	80
*JO1SIM	*	19,007	125	83
*JF4GWA	*	16,576	100	74
*JA1BPN	*	12,350	73	65
*JE1HMC	*	12,200	74	61
*JK1NSR	*	10,974	80	59
*JH3PTC	*	10,395	78	55
*JA1HNW/1	*	7,755	65	55
*JA1AAT	*	7,200	56	50
*JA1OQ	*	6,500	60	50
*JA0TEA	*	3,360	41	35
*JO1AHZ/6	*	3,030	41	30
*JA1HG	*	2,706	40	33
*JA3KDJ	*	1,750	34	25
*JO2OUL	*	1,178	24	19
*JH1HYC	*	1,040	22	20
*JA5ND	*	531	26	9
*JN1DNV	*	512	16	16
*JJ1WWL/1	*	253	11	11
*JA2VSU/3	*	91	7	7

*JA9EJG	*	84	6	6
*JR1UMO	*	21	3	3
*JL3MCM	28	22,161	119	83
*8N3HK/3	21	247,689	425	261
			(Op: JR3RIY)	
*JF3BFS	21	202,662	354	243
*7K3OWM	21	133,263	289	201
*JA1RYC	*	20,856	101	88
*JA1RQT	*	14,112	78	72
*JHØSGG	*	7,290	57	54
*JA3PYH/1	*	6,625	67	53
*JA1MVK	*	6,110	50	47
*JL3RDC	*	6,018	54	51
*JA1DBG	*	4,884	47	44
*JR3KAH	*	3,774	46	37
*JE1JAC	*	3,648	44	38
*JE8KKX	*	3,256	40	37
*JA3BBG	*	1,792	32	28
*JR6VIX/6	*	1,288	24	23
*JE1REU	*	1,060	23	20
*7K1EQG	*	680	20	17
*JK1BII	*	260	10	10
*JI8BUR	*	176	10	8
*JM3HYL	*	85	7	5
*JM1DSC	*	84	6	6
*JA1LBZ	*	4	2	2
*JG2KKG	14	404,940	481	340
*JI1FDF	14	237,226	370	263
*JA6WFM	14	232,925	357	275
*JR4FLW/4	*	95,400	222	180
*JH6QFJ	*	50,806	160	133
*JHØEPI	*	19,754	96	83
*JH1UUT	*	11,084	79	68
*JE1GZB	*	4,796	49	44
*JG1GCO	*	2,144	35	32
*JO3FUO	*	171	9	9
			(Op: JJ1BDX)	
*JR4URW	7	27,784	115	92
*JH9AMJ	*	15,104	67	59
*JL6IPK	*	4,551	41	37
*JH1RDU	*	2,394	21	21
*JE1SPY	3.7	8,055	59	45
*JH9URT	*	1,606	23	22

OGASAWARA

*JD1BIA	A	5,166	53	42

MONGOLIA

*JU1T	A	66,728	263	152
			(Op: JT1CJ)	

TURKEY

*TC3D	A	8,526,440	2714	863
*TA2IB	21	10,200	66	60

ASIATIC RUSSIA

RN9CWJ	A	10,155,138	2921	903
			(Op: UA9BA)	
UA9JDP	A	2,558,016	1367	576
UA9ZZ	A	2,501,859	1378	579
RU9CK	*	1,865,782	1054	563
RU9TO	*	1,836,453	990	503
RW9OW	*	558,756	494	332
UA9SP	*	552,640	450	320
UA9BS	*	535,944	502	326
RX9JD	*	349,980	419	285
RK9KWI	*	185,505	321	249
			(Op: UT7CR)	
RV9LM	*	41,106	121	102
RA9UAD	*	25,839	103	99
RX9FW	*	23,306	96	86
RV9JE	*	15,309	99	81
RA9SG	*	3,115	35	35
UA9SAW	*	720	16	15
RK9WZZ	*	126	8	7
			(Op: R9W-449)	
UA9UR	28	1,029	25	21
RV9JD	21	342,240	436	310
UA9QA	*	219,373	347	259
UA9SCX	*	122,958	258	207
RA9JM	14	560,564	564	397
UA9HR	*	264,702	374	281
RZ9UI	7	292,896	337	226
RW9USA	3.7	1,113,560	567	388
RV9SV	3.7	511,007	375	259
RA9SAS	*	2,640	23	22
*RL9A	A	1,694,834	999	542
*RK9AJZ	A	1,068,923	781	457
*UA9AL	A	968,816	707	401
*RW9MD	*	873,134	696	461
*UA9ACJ	*	528,496	499	268
*RZ9OW	*	515,151	595	357
*RK9CR	*	414,115	448	277
*UA9TF	*	404,790	415	309
*RX9CCJ	*	337,412	404	268
*RA9CB	*	328,874	384	278
*RX9FR	*	317,262	390	253
*RZ9HG	*	190,588	328	212
*RV9UF	*	182,248	324	218
*RX9JP	*	172,140	310	228
*RX9WN	*	152,711	263	221
*RX9DJ	*	125,796	261	181
*RA9DZ	*	95,220	218	180
*UA9AGX	*	63,360	166	128
*RA9AE	*	61,746	161	123
*UA9QCZ	*	26,180	90	77
*RW9MZ	*	23,310	107	90
*RU9WZ	*	11,850	86	75
*RZ9OJ	*	10,854	72	67
*RW9RA	*	10,385	77	67
*UA9YJI	*	10,332	66	63
*RU9UE	*	3,375	33	27
*RA9MX	21	169,448	300	236
*UA9FGJ	*	25,245	103	99
*RK9UAC	*	23,925	97	87
*RA9FEL	*	21,755	111	95
*UA9QF	*	11,868	80	69
*RW9QA	*	3,999	45	43
*RA9KM	*	2,376	36	36
*UA9MAZ	14	783,543	683	417
*RA9JR	14	496,164	510	346
*UA9JMB	*	290,127	375	291
*RA9UN	*	217,115	357	251
*RX9FG	*	133,328	249	208
*RW9TP	*	90,862	202	181
*RA9YA	*	47,616	148	128
*RZ9OQ	*	3,040	33	32
*RA9XY	7	276,012	268	204
*RA9SPF	*	84,942	151	121
*UA9WIK	3.7	38,394	97	79
RZØSR	A	2,101,316	1517	604
RVØAL	A	1,224,960	894	528
RWØUU	A	677,799	882	381
UAØSE	*	578,018	685	371
UAØACG	*	402,675	497	295
RUØAW	*	310,208	397	262
RZØAO	*	153,090	306	189
UAØSC	*	128,472	300	202
RAØAM	*	96,403	184	149
RZØAK	*	44,064	164	108
RAØQD	*	37,177	119	113
RWØUM	*	31,248	158	112
UAVCW	*	9,331	53	43
RAØBA	21	353,038	431	302
UAØSR	*	109,220	284	215
RKØAB	14	1,406,160	983	560
UAØAGI	*	326,859	488	289
RAØAA	*	184,908	315	228
RKØUT	*	9,920	70	64
*UAØSJ	A	634,678	657	374
*UAØCNX	A	318,570	552	287
*RAØLE	A	84,409	245	151
*RWVCV	*	150,656	342	214
*RNØSA	*	121,808	313	184
*UAØUV	*	73,120	209	160
*UAØDAM	*	19,360	112	88
*RAØAY	*	16,350	92	75
*UAØOD	*	1,944	28	27
*UAVAPV	*	280	10	10
*UAØSAD	28	35	7	5
*RWØCF	21	3,094	40	34
*UAØIBX	14	126,564	273	212
*RUØAT	*	19,152	88	84
*RKØUN	*	48	4	4

KAZAKHSTAN

UPØL	A	9,364,500	2850	900
			(Op: UN9LW)	
UN5J	*	135,660	260	204
UN7MMM	14	2,629,296	1364	684
UN7QF	*	554,880	604	340
UN6LN	*	335,088	414	312
*UN9L	A	1,917,318	1044	523
*UN7FW	*	279,790	358	245
*UN8AA	21	507,749	547	341
*UN6G	*	121,404	300	201
*UN4PG	*	117,728	254	208

HONG KONG

VR2XMT	21	803,730	989	438
*VR2YYW	A	10	3	2

INDIA

*VU2NKS	A	133,056	239	198

MACAU

*XX9AU	21	16,660	132	85

UK BASES ON CYPRUS

ZC4LI	21	593,280	623	384

EUROPE

SICILY

IT9ESW	A	646,696	774	458
IT9YVO	28	9,256	64	52
IT9STX	14	1,567,485	1319	683
IT9RBW	14	1,327,829	1279	673
*IT9RJE	A	214,704	387	284
*IR9P	*	71,445	209	165
			(Op: IW9HMQ)	
*IW9HIK	*	27,136	140	128
*IT9AJP	*	26,656	122	112
*IT9LNH	*	16,974	100	82
*IT9ORA	21	784	17	16
*IT9HUV	14	28,125	171	125

TURKEY (EUROPE)

*TA1/DL7BC	A	752,719	912	451
*TA1BM	*	19,320	87	84
*TA1EJ	*	4	2	2
*TA1CM	1.8	26,866	120	101

MONTENEGRO

4O3B	3.7	2,734,722	1550	662
			(Op: OH2BH)	

CROATIA

9A1A	A	8,007,864	2986	1068
			(Op: 9A9A)	
9A3ST	*	1,680	26	24
9A5Y	21	1,008,576	840	544
			(Op: 9A5CM)	
9A5W	14	3,463,339	2031	803
*9A2YC	A	388,653	483	353
*9A2EY	A	75,690	230	174
*9A4VM	*	68,160	206	160
*9A3QB	*	30,300	108	100
*9A8A	*	23,520	107	96
*9A4VV	*	11,715	73	71
*9A5AQA	*	1,541	23	23
*9A5YY	*	464	16	16
*9A5KV	28	1,998	30	27
*9A5MT	21	36,462	127	118

PORTUGAL

CT1AOZ	21	49,780	140	131
CT1BNW	14	66,750	197	178
CT1JLZ	3.7	2,030,139	1070	573
			(Op: OK1RF)	
*CT1FMS	A	255,732	428	303
*CT4GO	*	1,525	25	25
*CT1DKS	*	795	16	15
*CT1EGW	14	158,819	301	241
*CT2GSN	7	50,000	128	125
*CT2HZU	*	8,700	59	58

AZORES

CU2CR	14	1,473,696	1204	612
CU2AF	1.8	117,114	195	149
*CU3AL	A	286,258	386	254
*CU3FT	*	15,920	85	80

GERMANY

DL4MCF	A	3,625,935	1917	815
DL2MWB	A	2,666,367	1476	759
DO5FZ	A	2,531,900	1592	700
DF3GY	*	1,065,260	866	490
DJØUD	*	880,946	873	506
			(Op: DK5JM)	
DL5MEV	*	475,392	534	384
DL9GWD	*	418,834	534	362
DL9DYL	*	311,748	420	313
DL9ABF	*	305,175	485	313
DRØR	*	242,870	439	298
			(Op: DK2DQ)	
DK7CH	*	241,310	406	295
DH2RTW	*	239,700	389	282
DJ9HX	*	230,394	336	258
DL6RBO	*	191,784	364	262
DF5BX	*	174,216	364	244
DK6CQ	*	157,542	295	231
DL1PT	*	109,752	254	204
DG5MKU	*	25,896	108	78
DL1YFF	*	4,158	45	42
DL5SVB	*	2,880	34	32
DK9IP	*	935	17	17
DL1NEO	*	532	14	14
DO5JE	*	12	2	2
DK3GG	21	57,772	166	143
DL3KZA	14	209,152	372	304
DLØAZ	14	186,975	379	277
DP3D	*	129,712	298	242
			(Op: DK3KD)	
DK4IO	*	20,200	108	101
DL3TD	7	3,747,350	1624	745
DG4R	*	187,000	296	250
			(Op: DL1RG)	
DL8EAQ	*	49,731	149	137
DL9AWI	*	2,772	32	28
DL3BQA	3.7	312,634	493	326
DJ6QT	1.8	439,624	650	358
DF2UU	1.8	197,286	392	262
*DD5M	A	738,030	741	438
			(Op: DJØZY)	
*DR4G	A	666,636	684	438
			(Op: DJØGM)	
*DQØT	A	529,720	713	410
			(Op: DC7NF)	
*DJ8UV	*	519,021	684	409
*DB7TF	*	468,456	582	393
*DL7VDX	*	262,605	428	287
*DL3BRA	*	253,800	438	300
*DGØCC	*	199,920	365	280
*DC8SG	*	153,186	306	242
*DL1EHR	*	133,950	297	235
*DJ9MH	*	129,498	287	226
*DL2YED	*	122,807	294	227
*DM3HZN	*	121,520	267	217
*DL6RBH	*	118,002	301	213
*DF3IS	*	117,810	259	210
*DG3DAT	*	107,214	285	214
*DK6AY	*	101,504	257	208
*DL8YR	*	100,386	256	198
*DM3BJ	*	95,728	245	193
*DL6LB	*	94,354	229	191
*DL4CW	*	93,122	250	202
*DF2PH	*	92,466	242	198
*DM2AWM	*	82,280	231	187
*DL6NAL	*	74,096	218	176
*DL9ZWG	*	66,552	205	177
*DH2DAM	*	65,968	182	152
*DL1ARJ	*	65,527	207	161
*DG6OAG	*	65,037	206	163
*DK2FG	*	60,140	185	155
*DK1KC	*	59,906	168	154
*DF1MM	*	54,978	193	154
*DF6WE	*	44,756	172	134
*DB4SP	*	40,460	164	140
*DL1TS	*	37,791	131	117
*DA3T	*	35,687	149	127
*DL7UIO	*	34,185	138	129
*DL6DVU	*	33,000	144	120
*DK1AUP	*	31,000	146	125
*DL6UYA	*	29,524	135	121
*DJ4TS	*	28,438	129	118
*DK7MCX	*	28,336	131	112
*DO1BEN	*	28,024	135	113
*DG6TOM	*	26,070	139	110
*DJ5KW	*	25,422	136	114
*DH2PL	*	24,402	114	98
*DF2FM	*	23,052	116	102
*DO9ST	*	21,420	111	102
*DG7RO	*	18,909	113	99
*DK0W	*	17,160	103	88
*DJ6UP	*	14,256	93	88
*DL8UAA	*	13,114	85	83
*DD7BW	*	10,434	81	74
*DM2AJK	*	9,864	83	72
*DL5MK	*	9,760	70	61
*DLØBRA	*	9,472	79	74
*DH2PG	*	7,370	72	67
*DL2MIH	*	6,608	56	56
*DK7AN	*	6,572	54	53
*DL2DVL	*	6,554	61	58
*DG6DAF	*	5,559	53	51
*DO7GG	*	5,220	51	45
*DM9JM	*	4,968	49	46
*DM4DX	*	4,800	46	40
*DC9AM	*	4,784	55	52
*DGØLFG	*	4,752	50	48
*DL9LF	*	4,324	47	47
*DL8ZVG	*	4,032	44	42
*DC2ZL	*	3,608	41	41
*DC2IP	*	3,243	49	47
*DM5WF	*	1,740	30	30
*DB1CH	*	836	22	22
*DM5JBN	*	660	16	15
*DL7CU	*	336	14	14
*DL7BA	*	70	5	5
*DO4DXA	28	1,200	26	25
*DO4ZN	21	38,985	135	115
*DG5OBB	*	17,892	93	84
*DH8BQA/M	*	10,626	75	69
*DJ6TK	*	4,851	53	49
*DL3ZAI	*	2,542	34	31
*DL5KUD	*	360	12	12
*DF1IAQ	14	380,439	523	369
*DH2UHF	14	209,155	387	295
*DF7GG	*	91,372	261	212
*DL4GBA	*	52,812	186	163
*DG3NEC	*	15,486	90	89
*DLØSM	*	325	13	13
			(Op: DG3NEC)	
*DL1SBF	7	4,982	48	47
*DLØMFS	*	2,555	36	35
			(Op: DJ6TK)	
*DH5AO	3.7	134,640	344	220
*DL3KDC	*	4,475	51	47
*DL8CX	1.8	32,712	126	116
*DL2VSF	*	10,143	81	69

SPAIN

EA4KR	A	5,150,880	2229	876
AO4K	A	3,553,420	1840	790
			(Op: EA4KD)	
EA5DFV	A	1,550,217	1181	633
AM3R	*	886,968	804	508
EA5ON	*	579,012	679	452
ED7TV	*	578,460	863	465
EC7ANC	*	467,168	604	416
EA7GBD	*	20,880	94	87
EA1MR	*	15,010	88	79
EA5VK	*	4,089	47	47
EA5GKC	28	20,625	103	75
EA1FDI	21	121,746	271	206
EA7HF	*	58,519	165	139
EA2CNU	*	7,802	56	47
AM1JJ	14	1,003,590	968	567
EC5ANF	*	15,477	84	77
EA3ALV	7	87,548	191	172
EB1BOA	1.8	33,899	139	109
*EA7AA	A	524,524	573	364
*AN1A	A	442,232	561	371
			(Op: EA1AST)	
*ED7R	A	432,120	578	390
*EA1EWC	*	166,254	297	229
*EA1JO	*	161,172	305	242
*EB5KAU	*	155,736	305	252
*EC2AWD	*	153,500	319	250
*EA5QB	*	148,694	321	247
*AN2R	*	147,322	309	238
			(Op: EA2TO)	
*EA1GAR	*	128,352	293	224
*EA3EIQ	*	127,012	257	226
*EA5IY	*	123,013	275	211
*EA3NP	*	119,161	261	203
*EA7CWA	*	111,305	261	197
*EA5BWR	*	101,146	243	206
*EA3NA	*	71,668	199	164
*EA3CEC	*	57,960	162	140
*EA1AJV	*	52,800	172	150
*EB5CNK	*	51,051	181	143
*EA3FHP	*	48,411	192	163
*EB5AN	*	45,612	161	126
*EA1FEJ	*	44,488	162	134
*EA7FRX	*	42,636	137	114
*AO4T	*	39,680	159	128
			(Op: EA4TV)	
*EA5BAH	*	38,497	153	137
			(Op: OH2BAH)	
*EA5AVW	*	35,136	138	122
*EA1AQN	*	35,090	140	110
*EA1UY	*	33,899	127	109
*EA3FAR	*	33,087	144	123
*EB2CYQ	*	24,696	116	98
*EA2CE	*	24,200	114	100
*EA5EFU	*	23,660	115	91
*EC4ACS	*	22,816	100	92
*EB5ALB	*	21,462	109	98
*EC3DEL	*	21,160	111	92
*EA1CYX	*	19,572	99	84
*EA1AY	*	11,745	97	87
*EA1VM	*	11,109	80	69
*EA1AQE	*	7,772	62	58
*EA1AOH	*	4,720	42	40
*EA7EYQ	*	2,670	31	30
*EA1TCR	*	1,612	26	26
*EA3OH	*	1,102	20	19
*EB1EVX	*	990	22	22
*AN7NW	*	920	24	23
*EA1CRL	*	893	20	19
*EA3KN	*	520	16	13
*EC2ADT	*	432	12	12
*EA5GSY	*	429	13	13
*EA3CHZ	*	225	9	9
*EA3AGB	*	180	6	6
*EA7FIQ	*	108	6	6
*EA4AAZ	*	50	5	5
*EH7T	21	113,905	267	209
			(Op: EA7HBP)	
*EA1YB	*	32,239	111	103
*EA1ASG	*	19,836	91	76
*EC7DZL	*	2,296	28	28
*AO7R	14	2,753,478	2284	819
			(Op: EB7AEY)	
*EC7DND	14	420,740	641	436
*AM7KJ	*	355,718	701	418
*EA4YK	*	46,512	160	153
*EA2CHL	*	23,530	70	65
*EA5GFK	*	17,010	91	90
*EA5TN	*	3,375	46	45
*EA1DR	7	487,553	442	349
*EA7HE	*	2,040	30	30
*EA3DUM	3.7	33,277	113	107
*EA3AKA	1.8	31,524	124	111

BALEARIC IS.

*EC6UD	21	9,295	59	55

IRELAND

EI4DW	A	1,154,104	943	557
EI9HX	14	1,649,680	1332	680
*EI/W5GN	A	417,960	519	360
*EI9FVB	*	71,232	200	159
*EI4GAB	*	21,944	111	104
*EI4CF	21	74,304	226	172

MOLDOVA

*ER5DX	A	193,041	299	241
*ER3CT	*	70,356	206	164
*ER3HW	1.8	1,856	30	29

ESTONIA

ES5RR	A	1,771,200	1286	615
			(Op: ES2RR)	
ES5MG	14	444,507	577	427
ES5QX	1.8	48,361	156	137
*ES8DH	A	55,096	174	142
*ES5RIM	14	23,310	133	126
*ES1LS	7	89,712	201	178
*ES6PA	3.7	54,612	169	148
*ES6KW	1.8	9,849	68	67

BELARUS

EW2EO	A	39,900	162	133
EW3LN	*	20,468	96	86
EU4LY	*	8,379	68	63
EW8CY	7	23,674	93	89
*EW4AB	A	349,163	539	323
*EW6MM	*	5,460	56	52
*EW6GL	*	1,885	31	29
*EW6CU	21	6,396	59	52
*EU2MM	14	314,979	515	371
*EW6DX	*	20,520	108	90
*EW8OM	*	11,410	81	70
*EU6NN	7	9,086	61	59
*EU1DZ	3.7	110,911	243	197

FRANCE

F5BBD	A	655,941	700	429
F4CPF	*	35,875	127	125
TM1W	14	4,056,164	2033	868
			(Op: F1HAR)	
F1JKJ	14	1,110,148	996	571
*F4EGZ	A	1,346,970	980	590
*F6KZC	A	1,147,225	924	545
			(Op: F8AOF)	
*F6HKA	A	325,819	403	353
*F5LIW	*	253,728	383	288
*F6DRP	*	253,722	388	294
*F4DLL	*	226,586	389	277
*F4FDA	*	136,927	289	217
*F5LCU	*	119,892	272	206
*F1FPL	*	113,905	245	209
*F8DVD	*	101,875	217	163
*F5IYQ	*	88,749	211	173
*F6CNM	*	70,437	188	159
*F4FFH	*	64,834	196	154
*F8EZE	*	51,649	186	137
*F5CQ	*	39,536	131	112
*F4CUI	*	35,754	142	118
*F2RO	*	30,090	129	118
*F1IWH	*	17,574	102	87
*F4EMN	*	12,717	87	81
*F8KCF	*	9,000	77	72
*F4CGJ	*	7,625	64	61
*F5MLJ	*	1,342	22	22
*F1ADG	*	91	7	7
*F1OK	*	6	2	2
*F5SDD	21	3,605	35	35
*F4DOG	*	3	1	1
*F5ODA	14	252,720	448	324
*F5MPN	*	12,150	93	90
*F5BEG	3.7	651,550	698	415
*F6CIU	1.8	1,081	23	23

ENGLAND

GØMTN	A	579,800	645	446
MØZLB	*	26,536	120	107
G4HSU	*	19,570	107	95
MØWLF	14	376,705	467	329
G3TXF	3.7	8,526	59	58
*2EØCVN/P	A	913,959	967	519
*G4DBW	A	220,176	416	278
*2EØPLA	A	124,020	287	234
*G8ZRE	*	53,138	212	163
*G4WGE	*	45,760	171	143
*G6CSY	*	39,852	149	123
*GØUGO	*	36,180	166	135
*G6UBM	*	26,880	125	112
*G4NXG/M	*	21,620	102	92
*2EØSJC	*	18,042	101	93
*M1ACB	*	17,922	103	87
*MØWWA	*	15,834	88	78
*G3RSD	*	15,480	98	90
*G7RTI	*	6,254	61	53
*G3OXL	*	6,204	67	66
*M1MAJ	*	1,980	37	36
*MØEZP	1.8	2,244	34	33

ISLE OF MAN

MDØCCE	A	102,676	245	193

NORTHERN IRELAND

*GI4AAM	A	107,532	268	206
*MI3OZX	*	5,670	54	54

SCOTLAND

GMØNTL	A	84,889	218	181
*GM7TUD	A	143,264	296	242
*GMØFGI	*	95,790	273	206
*GM/SQ4MP	*	32,574	154	122
*MM3XXW	*	10,010	87	77
*MMØGOR	*	3,984	49	48
*GM4UYZ	*	1,908	36	36

GUERNSEY

MUØFAL	A	113,708	260	217
*MUØGSY	A	202,920	350	267

WALES

GW4BLE	A	379,704	488	312
GW3JXN	*	174,956	297	229
*GW8NBI	*	57,986	205	158
*MW1MDH	A	57,400	203	164
*GWØTKX	*	49,086	179	162
*GW3YVC	*	5,085	48	45
*GWØDCK/P	1.8	54,384	199	132
			(Op: GØDCK)	

HUNGARY

HA5NB	A	62,208	192	162
HA3FT	28	1,134	22	21
HG9R	14	331,232	569	352
HG8R	3.7	1,693,874	1263	574
HA1AD	*	329,208	465	319
*HA3NU	A	1,686,650	1241	610
*HA8CQ	*	84,667	236	179
*HA5YG	*	24,453	116	99
*HA3LN	*	990	23	22
*HA2MN	28	133	7	7
*HA8TP	21	38,744	130	116
*HA6D	*	9,396	60	58
			(Op: HA6-345)	
*HA6IAM	14	295,152	486	344
*HA6ZO	7	7,000	50	50
*HG9M	3.7	708,080	772	424
			(Op: HA5MY)	
*HA6IGM	*	72,144	204	167
*HA8BE	1.8	34,281	144	117

SWITZERLAND

HB9FBS	A	1,148,576	948	502
HB9AUS	*	119,892	246	206
*HB9TSA	A	26,145	115	105
*HB9RNK	*	7,808	67	61
*HB9JAQ	14	1,537	31	29

ITALY

IR4X	A	7,350,186	2629	993
			(Op: IZ3EYZ)	

IR3V	A	2,040,135	1301	645
(Op: IN3VVK)				
IZ1LBG	A	1,608,152	1155	611
IZ7CDB	*	1,009,800	885	510
IK0FMB	*	932,418	875	557
II1M	*	546,270	606	417
(Op: IK1SOW)				
IK1YED	*	497,448	605	376
IV3VBM	*	403,744	548	352
IZ3ENH	*	333,560	481	310
IW0HOU	*	291,247	430	319
IZ0KBR	*	220,590	373	258
IK8SEU	*	218,960	353	280
IZ8EEL	*	209,013	383	269
IR2W	*	158,926	304	229
IQ4RA	*	45,540	160	138
IW4EIQ	*	23,220	104	90
IZ2ABI	*	13,509	86	79
IZ0NNT	*	10,508	84	74
IV3JCC	*	6,875	59	55
IZ1CQZ	*	5,940	46	45
I1YGQ	*	5,200	57	52
IZ8GNH	*	2,320	31	29
IZ8EDL	28	5,203	51	43
IU3X	14	2,477,223	1521	771
(Op: IV3NDC)				
IR2M	14	1,723,608	1186	666
(Op: IZ2FDU)				
IQ2CJ	*	948,155	881	503
(Op: IK2NCJ)				
IQ3VO	*	69,972	196	147
(Op: I3EJ)				
I1NHR	*	13,260	92	85
IV3OWC	3.7	1,780,616	1216	584
IR2C	3.7	1,548,368	1086	568
(Op: IW2HAJ)				
*IZ2FOS	A	1,788,059	1248	637
*IZ3KKE	A	353,886	440	338
*IZ7GXB	A	246,950	398	275
*IZ8FFA	*	225,924	344	281
*IZ3GNG	*	162,855	304	235
*IZ0EHL	*	107,250	250	195
*IK2YSJ	*	96,432	238	196
*IK7RVY	*	91,584	236	192
*IZ2EAS	*	76,995	225	177
*IW0HLZ	*	75,480	205	170
*IZ0GYP	*	61,851	183	159
*IW0BCF/6	*	55,900	169	130
*IZ8GBH	*	53,568	191	144
*IZ2ABN	*	53,460	154	135
*IZ8FQJ	*	51,512	166	137
*IR4E	*	46,930	159	130
*IZ4DIG	*	44,022	153	138
*IZ8JFL	*	32,754	139	106
*IZ2GTO	*	31,244	126	107
*IZ3EAX	*	27,225	126	121
*IZ1KGY	*	23,760	126	110
*IR3R	*	23,085	102	95
(Op: IK3STG)				
*IW0GYC	*	22,050	104	90
*IZ5ILK	*	21,896	105	92
*I3LTT	*	18,291	97	91
*IZ8GUH	*	16,660	94	85
*IK2WFN	*	15,939	93	77
*IQ3ME	*	15,600	88	78
(Op: I3VAD)				
*IZ0KBW	*	14,250	84	75
*IK3ZFZ	*	11,280	69	60
*IW7EFJ	*	11,242	80	77
*IZ8FTW	*	9,734	71	62
*IW2ENA	*	9,675	77	75
*IW2BZY	*	8,723	65	61
*IV3PGQ	*	6,156	59	57
*IZ2HAN	*	5,808	50	48
*IK8MIG	*	5,500	56	50
*IK2VUC	*	4,928	46	44
*IW2NSE	*	4,896	49	48
*IZ6ERS	*	4,292	40	37
*IK2AIT	*	3,807	50	47
*IW3SRZ	*	3,280	42	41
*IK0UXO	*	2,958	34	34
*IZ0GXM	*	2,001	30	29
*IZ2GNQ	*	1,680	26	24
*IZ5HQB	*	688	17	16
*IW0HBY	28	22,230	107	78
*IW4EGX	*	1,323	23	21
*IK0EIE	21	51,221	145	131
*IK5YJK	*	5,192	46	44
*IK8NBE	*	2,436	30	29
*IQ8EB	14	141,900	348	275
(Op: IZ8GNR)				
*IZ8EFD	*	52,808	184	161
*IK1PMR	*	22,360	108	104
*IZ5IMD	*	1,650	31	30
*IZ1GJK	*	1,148	29	28
*II3L	7	226,632	377	266
*IW3SSA	3.7	388,150	519	350
*IZ1GQI	*	48,620	174	143
*IW5EIJ	*	13,300	83	76
*IZ1DGG	*	312	14	13

SARDINIA

IS0/WH0Q	14	1,187,746	1161	602
(Op: IN3ZNR)				
*IS0AFM	A	177,216	314	284
*IS0LLJ	*	88,360	232	188
*IS0OFC	14	9,920	86	80

NORWAY

LA6UL	A	12,402	91	78
LN9Z	3.7	1,642,336	1379	544
(Op: LA5KO)				
LA2XPA	*	11,808	77	72
*LA5HPA	A	27,798	147	123
*LB9LE	*	11,745	96	87
*LA3HPA	14	4,756	64	58

LUXEMBOURG

LX1NO	21	34,776	122	108
LX7I	14	508,468	608	401
LX4A	*	38,080	204	136
LX5T	7	148,390	286	209
LX/OK1NY	3.7	384,780	508	330

LITHUANIA

LY9Y	A	3,708,018	2142	846
(Op: LY2CY)				
LY4CW	A	1,104,676	1011	554
LY2FN	A	550,418	667	394
LY2OO	*	24,444	116	97
LY2VA	*	3,081	40	39
LY2IC	7	223,224	362	262
LY4Q	3.7	479,408	617	361
LY2K	*	24,800	117	100
LY2IJ	1.8	784,800	914	400
*LY6M	A	2,330,743	1620	691
*LY9A	A	1,878,846	1462	643
(Op: LY3BA)				
*LY2BET	A	447,744	610	384
*LY2AE	*	358,176	515	336
*LY2BBF	21	5,115	59	55
*LY3QT	*	3,680	46	40
*LY2T	14	389,574	693	414
*LY3SL	*	61,576	198	179
*LY2LF	*	1,450	30	29
*LY2MM	7	133,352	248	211
*LY1C	*	30,171	122	113
*LY2OU	1.8	35,937	136	121

BULGARIA

LZ129LO	A	2,523,840	1977	717
LZ2ZG	21	44,409	157	131
LZ1PM	*	432	12	12
*LZ2DF	A	243,672	399	264
*LZ2ZY	A	166,355	334	245
*LZ2UZ	A	49,446	159	123
*LZ1KP	*	45,250	151	125
*LZ1AQ	*	22,360	120	104
*LZ1IKY	*	16,848	89	81
*LZ1ONK	*	10,586	84	67
*LZ1MC	*	1,925	31	25
*LZ5XQ	*	1,407	24	21
*LZ1JZ	*	1,026	19	18
*LZ4TX	*	80	8	8
*LZ9Z	28	574	15	14
*LZ1HB	21	99,731	225	181
*LZ9X	14	802,272	1000	548
*LZ5PL	*	10,710	97	90
*LZ2CE	*	5,115	59	55
*LZ1RGM	7	472,236	487	354
*LZ2JA	3.7	130,820	269	211

AUSTRIA

OE2S	14	148,941	309	201
(Op: OE2VEL)				
*OE2IJL	A	21,293	119	107
*OE3BCA	1.8	194,810	392	242

FINLAND

OH8X	*	6,628,500	2694	982
(Op: OH6UM)				
OF3F	A	2,066,496	1457	687
OH1RX	A	1,279,308	1081	543
OH1EB	*	113,484	259	196
OH1N	*	4,922	50	46
(Op: OH1BOI)				
OH8L	14	3,308,928	1961	896
*OH6GFI	A	486	19	18
*OH8T	14	41,760	178	145
(Op: OH8GZQ)				
*OH8GZN	*	31,302	162	141
*OH6JYH	3.7	2	1	1

ALAND IS.

OH0R	A	5,160,912	2604	948
(Op: OH2PM)				
OH0JFP	14	2,461,760	1948	785
(Op: SM0TQX)				

CZECH REPUBLIC

OK5R	14	6,002,994	2613	1046
(Op: OK1RI)				
OK1BN	3.7	2,052,028	1465	626
*OK6Y	A	818,651	805	467
(Op: OK2PTZ)				
*OK1AY	A	289,221	446	321
*OK2ZIL	A	265,060	444	290
*OK1LO	*	192,850	373	266
*OK2BRX	*	192,192	377	273
*OK1MKU	*	184,450	316	238
*OK1HEH	*	171,094	370	242
*OK2ZDL	*	159,512	315	254
*OL2T	*	122,807	302	227
(Op: OK2TC)				
*OK2WYK	*	117,312	272	208
*OK2BEN	*	106,964	241	187
*OK5XX	*	101,167	258	187
*OK1TFH	*	91,680	243	191
*OK2PBG	*	85,746	240	186
*OK6AB	*	76,650	232	175
*OK1BLU	*	43,492	171	131
*OK5OK	*	34,848	149	132
*OK5ZH	*	30,866	139	122
*OK1AMF	*	26,208	105	91
*OK1UDJ	*	24,975	122	111
*OK1DOZ	*	21,733	120	103
*OK2KFK	*	12,640	91	80
(Op: OK2ABU)				
*OL5Y	*	7,535	61	55
*OK4AZ	*	3,200	43	40
*OK1ULE	*	629	18	17
*OK2ABU	21	16	4	4
*OK1BA	14	142,250	317	250
*OK1RW	*	35,466	153	138
*OK1UG	7	64,092	154	147
*OK1TRA	3.7	33,396	143	121
*OL6P	1.8	54,978	200	147
(Op: OK2WTM)				
*OK1JOK	*	38,304	153	126
*OK1KZ	*	5,253	56	51
*OK5AD	*	3,560	50	40

SLOVAKIA

OM4EX	A	1,065,717	836	531
OM0WR	21	533,358	611	378
OM3RRC	14	9,782	78	73
(Op: OM4TQ)				
*OM5CD	A	1,986,662	1367	662
*OM7DX	A	760,189	783	461
*OM4DN	A	440,910	609	345
*OM6AL	*	242,802	409	287
*OM7AMP	*	221,184	401	256
*OM5UM	*	93,060	250	188
*OM3TLE	*	16,008	111	87
*OM1TD	*	2,448	37	36
*OM1NW	*	1,352	27	26
*OM5CW	21	14,413	75	71
*OM7YC	14	44,251	155	137
*OM1AVK	*	24,420	128	111
*OM2AW	*	16,200	116	100
*OM7AB	3.7	192,768	364	251
*OM3R	3.7	83,304	224	178
(Op: OM3CFR)				
*OM6TX	*	44,712	160	138
*OM50KHE	*	11,242	76	73
(Op: OM6AZ)				

BELGIUM

OT2A	A	2,675,460	1670	732
OQ7T	A	426,240	535	360
ON4BHQ	*	42,699	147	129
ON8PH	*	16,965	100	87
OR4A	7	452,256	489	336
OR4T	7	396,552	478	328
*OO7W	A	61,088	198	166
*ON3AR	*	55,645	189	155
*ON5WL	*	4,140	50	45
*ON7BBR	14	13,689	85	81
*OO0A	*	308	14	14
*OO6U	3.7	123,552	291	208
(Op: ON6UU)				

FAROE IS.

*OY9R	A	49,077	197	171

DENMARK

OZ7AM	A	657,900	694	425
OZ5EV	A	593,630	596	445
OZ1ADL	7	1,050,700	957	475
*OZ1ACB	A	297,850	465	322
*OZ4RT	A	50,700	164	156
*OZ1DC	*	23,520	114	105
*OZ1DGQ	*	2,440	41	40

THE NETHERLANDS

PA9DD	A	223,944	349	248
PA0LOU	A	177,099	340	247
PA4A	A	123,888	284	232
PA1TX	*	81,345	249	187
PA3GCV	*	68,850	177	150
PA0JNH	*	35,154	133	126
PA5TT	*	22,990	104	95
PA3AAV	*	4,900	50	49
PA1BDO	14	458,211	591	379
PA0IJM	3.7	661,776	775	408
*PA1CM	A	261,657	396	297
*PE1MMZ	A	197,626	338	286
*PA8KW	A	196,176	356	268
*PA0AGA	*	169,920	353	236
*PF9A	*	135,840	294	240
*PE2JMR	*	77,256	222	174
*PA0DVD	*	59,235	193	165
*PD0AT	*	47,716	184	151
*PD5LO	*	41,004	160	134
*PH3BDJ	*	33,210	145	123
*PA1WLB	*	31,089	149	129
*PA0KDM	*	22,660	113	103
*PA4CHE	*	13,122	91	81
*PA2CVD	*	11,583	90	81
*PD0JAC	*	11,340	95	84
*PA3DBS	*	7,812	67	63
*PA3HGF	*	5,106	48	46
*PA0ADP	*	1,175	26	25
*PA3CEB	*	136	11	8
*PG2AA	14	24,075	129	107
*PA3ARM	*	16,199	109	97

SLOVENIA

S51DX	A	86,376	235	183
S53XX	*	66,015	188	163
S57S	28	62,918	222	163
S51FB	21	676,006	691	454
S57RTH	14	274,160	484	298
S57J	3.7	660,660	691	420
*S51F	A	1,325,722	1031	554
*S53QD	A	204,978	339	269
*S58RU	*	152,985	305	235
*S57YX	*	117,605	263	215
*S57U	*	6,384	60	57
*S56ZZZ	14	30,866	169	122
*S59N	3.7	744,408	813	422

SWEDEN

SM3R	A	29,512	129	119
(Op: SM3CBR)				
SE0W	*	2,916	32	27
(Op: SM0NJO)				
SM5U	14	210,023	447	313
(Op: SM5UGC)				
SI3A	*	60,375	203	175
(Op: SM3LIV)				
SD3A	*	54,549	203	171
(Op: SM3FJF)				
SM6BGG	3.7	263,439	401	297
*SI0E	A	60,502	206	169
(Op: SM0EPO)				
*SE6C	A	36,378	163	129
(Op: SM6CDN)				
*SA0AQT	*	20,748	130	114
*SA7AOI	*	15,570	99	90
*SM7YGZ	*	10,512	79	72
*SA7AOM	*	8,174	64	61
*SM7BJW	*	6,215	62	55
*SE2T	*	5,406	56	53
*SM0FM	*	1,984	32	31
*SM5OSZ	*	1,881	33	33
*SF3E	14	10,935	89	81
(Op: SM3EAE)				
*SM2IEN	*	594	23	22

POLAND

SN7Q	A	4,230,012	2049	822
SP8TJU	A	585,144	673	387
SQ5MX	A	246,942	392	269
SP6IEQ	*	62,752	195	148
SP5GMM	*	33,384	123	107
SP8HXN	*	29,795	113	101
SP5ELA	*	19,176	80	68
SP60SEP	*	15,036	91	84
SP2FAP	*	8,584	64	58
SP9W	*	5,520	51	48
SP3GXH	*	12,740	70	65
SO2R	14	5,277,888	2462	952
(Op: SP2FAX)				
SQ9UM	14	1,632,833	1209	691
SP4XQN	14	1,179,762	1071	618
SP4D	*	128,760	281	232
SP2FTL	*	57,782	188	173
SO8A	7	2,232,747	1129	627
(Op: SP8BRQ)				
SP4JTJ	*	5,934	47	46
SN4R	3.7	886,704	834	464
(Op: SP4DEU)				
SP3LPG	3.7	579,555	657	405
SN0MAT	*	48,096	159	144
SN3R	1.8	835,884	860	434
(Op: SP6HEQ)				
*SP3J	A	455,244	594	354
*SP5X	A	326,368	487	329
*SP9NWN	A	240,240	397	286
*SP5ATO	*	222,154	364	277
*SQ8LSC	*	188,730	302	270
*SP6MLX	*	163,248	319	228
*SQ7B	*	161,000	332	250
*SP2GJI	*	159,820	332	244
*SP6DMI	*	149,695	323	245
*SP1MVG	*	103,530	206	174
*SP8ONB	*	102,836	251	188
*SQ6NES	*	97,536	247	192
*SP4AAZ	*	85,500	225	180
*SP8LNE	*	78,044	237	179
*SP9EWO	*	74,710	205	155
*SP9FRZ	*	70,473	203	169
*SQ2EAN	*	69,628	226	169
*SP4ICD	*	60,300	195	150
*SQ9FCH	*	60,258	188	166
*SQ9DXT	*	53,576	191	148
*SQ9ANS	*	46,332	176	143
*SP6NVK	*	38,920	172	140
*SQ9IWT	*	36,456	140	124
*SP9MAN	*	36,096	147	128
*3Z8Z	*	30,210	114	106
(Op: SP8AJC)				
*SQ1EIC	*	29,524	143	121
*SP1O	*	27,141	96	83
*SP4DDS	*	25,422	133	114
*SP4AVG	*	12,638	97	89
*SN5K	*	12,561	89	79
(Op: SQ5NF)				
*SP9IBJ	*	12,384	90	86
*SP4DZT	*	7,515	54	45
*SP9CLU	*	4,949	51	49
*SQ5NBK	*	4,386	53	51
*SP6GNJ	*	3,220	39	35
*SP9DEM	*	3,204	37	36
*SP0PZK	*	2,800	43	40
(Op: SP2UKB)				
*SP1MWF	*	2,304	28	24
*SP9IHP	*	1,848	27	24
*SP1DTG	*	784	15	14
*SP3LWP	*	384	12	12
*SP1YGL	*	150	7	6
*SP9UOP	28	297	11	11
*SP2EXN	21	46,500	148	125
*SP2AVE	*	26,765	112	101
*SO9L	14	927,399	869	537
(Op: SP9UML)				
*SP9BMH	*	34,701	159	129
*SN9N	*	14,352	104	92
*SN9U	*	8,305	57	55
(Op: SP9UMJ)				
*SP3YM	*	1,152	24	24
*SP4TKR	*	783,505	715	449
*SN3X	7	683,640	685	422
*SP3FYX	7	251,750	394	265
*SP8LZC	*	83,248	186	172
*SP2GCE	*	66,010	184	161
*SP4LVK	*	58,102	151	139
*SP3FLQ	*	7,695	59	57
*SP8KEA	*	3,960	36	36
*SP9XCN	3.7	288,890	441	313
*SQ9GAI	3.7	200,540	347	271
*SP4SHD	*	162,081	308	243
*SP5COF	*	132,978	288	222
*SQ2DYL	*	8,514	67	66

GREECE

*SV1GRD	A	41,409	154	129
*SV1JG	14	74,672	275	208

CRETE

SV9GPV	A	1,545,878	1620	646
SV9COL	*	276,066	481	313

SAN MARINO

T70A	21	473,024	610	389
(Op: I4FYF)				

BOSNIA-HERZEGOVINA

T97M	7	3,754,720	1597	757
*T94LW	A	679,044	759	426
*T92D	3.7	543,874	608	386

ICELAND

TF3WX	A	51,681	216	161
TF3AM	*	1,260	30	30

EUROPEAN RUSSIA

RG3K	A	3,778,613	2353	841
(Op: UA3QDX)				
RS3A	A	3,220,824	1988	804
(Op: RA3CW)				
RM3F	A	2,358,425	1530	725
(Op: UA3DPX)				
RU6DZ	*	2,255,421	1767	687
RN4WA	*	1,954,788	1793	649
RN3ZC	*	1,413,159	1253	561
RA1AGL	*	1,341,438	1305	574
RX3FS	*	1,290,600	1162	540
RK3QWW	*	1,241,967	1083	519
(Op: RK3QS)				
RM4HZ	*	489,678	654	393
RW4PL	*	446,688	543	396
RZ3TZZ	*	386,460	520	342
RU3DX	*	349,020	493	315
RK3GWW	*	278,967	444	311
RV3NA	*	268,800	481	336
UA6UDV	*	257,100	443	300
RM4HW	*	207,554	419	314
RA3NC	*	203,544	370	257
UA3TCJ	*	191,016	275	168
RA3RK	*	186,967	355	253
RV4HC	*	177,525	384	263
RW6FO	*	147,030	279	195
RV1CC	*	141,648	303	208
RA3TT	*	130,298	291	227
UA4NC	*	64,116	189	137
RD4WZ	*	49,364	185	164
RX3AEX	*	44,928	164	128
RV3BQ	*	34,713	157	133
RA3NZ	*	34,177	151	143
UA4RZ	*	34,026	129	106
RN3GM	*	29,925	126	105
RW3DD	*	10,845	61	45
RN6DR/6	*	9,180	60	51
RA1OD	*	5,977	47	43
RU1AB	*	4,522	41	38
RA3UT	*	3,193	35	31
RA3LAL	*	546	14	14
RU6CQ	28	30,672	134	108
UA4HOX	21	386,024	516	292
UA4LU	21	384,680	485	326
RW6AN	*	100,939	237	193
RA6AFB	*	90,100	230	170
RA3XO	*	363	11	11
RL3A	14	3,999,303	2361	957
(Op: UA3ASZ)				
RZ1ZZ	14	1,116,180	1161	636
RA1ACY	14	1,065,344	1130	574
RW6ATJ	*	501,837	733	483
RL3AW	*	258,862	376	373
RT3T	*	205,200	387	304
(Op: UA3TU)				
RK6CM	*	133,552	379	272
RU4CO	*	112,840	347	248
RA4HTX	*	94,146	278	213
RA6EE	*	75,850	246	205
RA4LBS	*	54,912	192	156
RU4WE	*	14,400	98	90
RZ1AWT	7	940,655	841	449
(Op: UA1ARX)				
UA6YN	*	316,744	428	289
RL3FT	3.7	1,285,338	1003	534
UA6AKD	*	28,325	121	103
UA3MIF	*	23,040	99	96
RA6CZ	*	2,387	31	31
*UA4FRL	A	1,412,760	1195	579
*RN3AHL	A	939,575	791	455
*RL3WX	A	787,086	778	438
*UA4PAN	*	759,850	822	455
*RW1CW	*	659,490	772	445
*UA4PJM	*	560,400	695	400
*RU3GB	*	560,351	728	421
*UA3LHL	*	435,120	614	336
*RW3XZ	*	385,875	531	343
*UA6GF	*	321,574	494	311
*RU6YJ	*	293,410	470	305
*UA4CCC	*	282,256	446	299
*RL3AJ	*	263,340	470	308
*RV6LFE	*	250,614	436	306
*RV3QX	*	248,254	438	278
*RV3LO	*	220,616	399	253
*UA4WMA	*	197,633	400	257
*RX3OM	*	187,999	377	251
*RA3MB	*	184,508	314	239
*RA6FZ	*	179,129	350	257
*UA4FER	*	136,735	302	205
*RD3DT	*	121,788	246	199
*UA1CUR	*	114,240	294	204
*U1BA	*	110,142	294	211
*RN4AT	*	101,365	294	209
*RU6YZ	*	99,360	283	230
*RX6LP	*	95,448	215	164
*RU4WD	*	92,456	240	182
*UA3FDX	*	79,655	243	179
*RV4LC	*	77,220	223	165
*RV6BK	*	69,252	211	174
*RN4CA	*	67,782	190	158
*RU3FT	*	64,467	201	171
*RA6GW	*	62,328	171	147
*RZ3ATE	*	61,824	197	161
*RU3DZ	*	53,130	182	154
*UA4LL	*	52,530	215	170
*UA3AIU	*	51,750	172	138
*RW3TA	*	51,168	204	164
*RW3APX	*	48,360	149	130
*RA3TUT	*	46,964	138	118
*RZ3DC	*	45,356	155	116
*RX3AGD	*	45,344	134	104
*RX3VF	*	40,310	173	145
*RA3VE	*	36,888	140	106
*RZ3DH	*	36,442	166	137
*UA3DKN	*	35,990	144	122
*UA4FEN	*	35,700	153	119
*RU3UW	*	26,851	130	107
*RV3MI	*	26,096	118	112
*RW3WX	*	24,617	115	103
*UA3MCW	*	23,381	123	103
*RA1QDP	*	22,356	103	92
*UA4FEL	*	22,113	102	81
*UA4WAG	*	21,844	105	86
*UA3UBT	*	19,012	110	97
*RK6CK	*	18,620	109	98
*UA6LJU	*	16,720	110	95
*RU3FF	*	16,170	84	77
*RU3VD	*	15,183	78	63
*RW1AU	*	14,104	89	86
*RN4AM	*	13,504	75	64
*RX3MM	*	11,859	68	59
*UA4FUW	*	11,055	79	67
*RA3WCG	*	8,732	74	74
*RA3RGQ	*	8,325	55	45
*RX3DCN	*	8,192	75	64
*RA6AAW	*	5,986	49	41
*RL3DR	*	5,400	51	40
*UA3DSS	*	5,125	46	41
*RK3DSW	*	4,788	44	38
*RW1AI	*	4,050	48	45
*UA1AFZ	*	3,990	45	42
*RU4AN	*	3,920	44	40
*RU4CS	*	1,728	25	24
*RA6HCN	*	1,276	22	22
*UA1WBV/6	*	27	3	3
*UA6AK	28	3,264	38	32
*RW6AH	21	30,396	118	102
*UA4LW	*	18,860	90	82
*RU3SD	*	17,876	90	82
*RW4LQ	*	7,332	54	47
*RV6FT	*	1,800	25	24
*UA3AKI	*	990	23	22
*RV6BU	*	7,150	60	50
*UA1AQA	14	266,112	506	352
*UA1CEC	*	64,071	235	189
*UA3DFR	*	54,756	198	169
*RA3DGH	*	46,410	197	170
*RL3AB	*	34,979	144	133
*RA3TYL	*	1,260	30	30
*UA6HHE	7	51,612	149	132
*UA6LPY	*	23,920	97	80
*UA4AAC	3.7	48,233	161	139

KALININGRAD

*RU2FL	A	8,442	65	63
*RN2FA	14	225	9	9

UKRAINE

UW2M	A	5,874,001	2731	973
(Op: URØMC)				
UV5U	A	1,888,694	1224	659
(Op: UX1UA)				
UR5AS	A	360,360	502	308
UZ3RR	"	355,152	484	302
UR5TW	"	130,468	255	193
UR4EI	"	62,016	197	152
UT8EL	"	56,538	199	162
USØQG	"	47,712	160	142
UR5IFB	"	17,219	73	67
UX1IL	21	570,375	643	375
UU5WW	"	54,526	152	137
UR4MRD	14	2,155,140	1809	780
UZ4E	14	750,080	1077	512
(Op: US-E-6Ø1)				
UZ5DZ	"	128,620	305	236
US5D	3.7	1,100,886	985	502
(Op: UT7DX)				
UT2II	3.7	798,784	742	448
UR4EXW	"	156,630	291	230
(Op: UT7EZ)				
UT5ECZ	"	51,042	165	141
UX2X	1.8	207,974	389	247
(Op: UT2XQ)				
UT3SA	1.8	137,280	293	220
*UZ7M	A	1,886,643	1596	649
(Op: UT9MZ)				
*UR8QR	A	437,649	607	339
*UR5ETN	A	432,480	605	340
*UR6QS	"	362,202	517	318
*UY5TE	"	213,819	396	271
*UR5ZPV	"	207,264	372	254
*US7LM	"	204,022	387	266
*UY7C	"	203,310	348	270
(Op: UR3CMA)				
*UR7EQ	"	173,824	343	256
*UX8IR	"	138,084	302	222
*US2YW	"	130,743	279	199
*UT5ERV	"	80,355	210	165
*UV5EEO	"	78,020	214	166
*US5EEK	"	52,745	158	137
*UT3NA	"	51,185	167	145
*UZ5UA	"	42,360	141	120
*UU2JG	"	41,912	149	124
*US6IKV	"	28,197	131	117
*UR4IXM	"	20,817	92	81
(Op: US6IPD)				
*UT5UN	"	17,820	102	81
*UR8IDX	"	6,600	51	50
*US7IB	"	434	15	14
*UR6MX	21	17,043	87	69
*UX3IO	"	9,028	66	61
*UR5QRB	14	92,120	290	235
*UY3AW	"	22,680	120	105
*URØQX	"	18,291	111	91
*UW2F	7	72,540	166	156
(Op: UTØFT)				
*UX4LA	"	12,415	68	65
*UW8SM	3.7	124,146	272	209
*UR5IKN	"	4,455	46	45
*UT4EK	1.8	29,160	126	108

LATVIA

YL2KO	A	2,735,460	1671	780
YL9T	A	727,065	806	453
YL2GD	"	512	16	16
YL6W	7	1,920,270	1180	605
(Op: YL2GD)				
*YL2PP	A	221,760	425	280
*YL3FT	A	213,360	418	280
*YL2CR	"	150,224	340	229
*YL2BJ	"	384	12	12
*YL3BZ	21	28,536	126	116
*YL2II	14	28,405	143	115
*YL5W	"	15,147	107	99

ROMANIA

YO5PBF	A	1,122,862	1008	494
YO7ARY	A	348,846	513	318
YO9HG	"	24,274	122	106
YO2RR	21	54,860	158	130
*YO7LFV	A	747,000	783	450
*YO3CZW	A	579,362	729	406
*YO3FRI	A	520,421	617	391
*YO7FB	"	333,380	458	316
*YO3XL	"	247,040	362	320
*YO5CEA	"	243,504	389	267
*YO9CWY	"	225,924	407	268
*YO6MT	"	195,529	349	251
*YO4AUL	"	171,580	295	230
*YO5TP	"	109,400	253	200
*YO2ARV	"	103,400	229	188
*YO8BPK	"	77,810	200	155
*YO6QT	"	43,332	165	138
*YO2LXW	"	39,530	151	134
*YO6AJI	"	39,406	145	122
*YO9IKW	"	26,864	98	92
*YO5BWI	"	17,927	103	91
*YO8GF	"	13,725	79	75
*YO7BGB	"	11,844	91	84
*YO7LTQ	"	9,514	70	67
*YO7LYM	"	8,370	65	62
*YO2MET	"	5,588	45	44
*YO9HJY	"	1,736	29	28
*YO4ATW	28	27	3	3
*YO4RDN	21	409,640	510	308
*YO2LZP	"	63,027	165	141
*YO5OAG	"	27,048	106	98
*YO7DAA	"	21,040	93	80
*YO9BXC	"	16,798	83	74
*YO5PAP	14	42,450	167	150
*YO3HKW	14	40,572	166	147
*YO9AGI	"	17,014	109	94
*YO2BPZ	"	8,775	79	75
*YO2MAX	"	7,308	66	63
*YO4BTB	"	3	1	1
*YO3CVG	7	38,396	124	116
*YO5VAF	"	2,964	39	38
*YO3JB	3.7	37,638	137	123
*YO9XC	"	27,068	111	101

SERBIA

4N8A	A	5,459,623	2459	911
(Op: YU1EA)				
YT6T	"	28	4	4
YT7Z	21	245,784	398	266
(Op: YU7SK)				
YT6ØW	"	148,035	279	213
YT2B	14	4,198,050	2479	950
(Op: 4N1JA)				
YT5A	7	5,086,240	1833	830
YZ1U	3.7	1,596,105	1071	563
(Op: YU1XA)				
YT9X	3.7	1,512,500	1166	550
(Op: YT1RX)				
YT6Y	1.8	220,215	362	265
*YU7BW	A	163,850	272	226
*YU7WI	A	81,286	229	194
*YT6ZMG	"	61,388	197	149
*YU1EQ	"	43,419	133	123
*YU7W	21	68,484	183	156
(Op: YU7KQ)				
*4N7N	14	938,028	976	546
(Op: YU7WW)				
*YU5T	"	29,972	148	127
(Op: YU1JU)				
*YT1BX	7	69,434	165	149
*YT8W	3.7	505,274	640	374
(Op: 4N1KW)				
*YU1RA	1.8	4,944	48	48
*YUØ7HST	"	209	11	11
(Op: YU1UA)				

MACEDONIA

Z35G	14	89,284	296	221
*Z35M	A	237,372	453	302

ALBANIA

*ZA/UT7DW	14	126,187	371	257

OCEANIA

EAST MALAYSIA

9M6AAC	A	867,008	802	368
(Op: DL2QT)				

PHILIPPINES

4D9RG	A	2,425,945	1376	547
DZ1BP	A	584,820	836	228
(Op: DU1BP)				
*DV1JM	A	1,038,240	907	315
*DV1EG	21	174,247	373	163
*DU1ACV	7	1,080	20	18

SAIPAN

*WHØS	A	296,738	510	202
*WK3D/NHØ	28	29,640	156	65

GUAM

KG6DX	A	455,455	621	245

HAWAII

KH6WT	A	5,459,815	2307	659
(Op: K1YR)				
KH6FI	"	202,808	354	202
AH6RR	"	9,292	47	46
NH6P	21	1,405,740	1201	420
(Op: W6YM)				
KH7U	14	2,585,883	1527	599
KH6GMP	"	178,752	310	196
KH6FKG	7	677,565	495	239
AH6OZ	3.7	723,138	486	254
AH6JR	"	325,243	320	179
AH7C	"	2,898	23	21
KH6ND	1.8	26,432	78	59
(@KH6YY)				
*NØRB/KH7	A	228,492	414	198
*KH6/NØCO	"	22,046	99	73
(Op: NØCO)				

AUSTRALIA

VK3TZ	A	424,386	418	271
VK3KE	"	110,385	217	165
VK2BCQ	A	15,174	60	54
VK6DXI	7	503,174	372	254
*VK4EJ	A	548,723	604	301
*VK2AEA	A	149,962	267	194
*VK4FJ	"	40,698	142	102
*VK3FM	A	37,128	120	104
*VK4XES	"	29,795	109	101
*VK2KRM	"	2,370	39	30
*VK4DMP	14	30,704	112	101
*VK1KBN	14	4,251	41	39

INDONESIA

YBØIR	A	107,070	214	166
YBØA	3.7	12,502	51	47
*YB1TJ	A	769,500	680	375
*YBØEIN	A	451,980	492	310
*YB1UUN	A	332,310	429	265
*YBØKYM	"	332,024	373	242
*YCØNFL	"	158,137	244	203
*YBØCOU	"	3,937	36	31
*YC3BDJ	21	1,914,780	1165	564
*YB4IR	21	1,099,350	827	450
*YCØMJY	"	204,975	323	225
*YC6LAY	"	160,475	323	175
*YC5OUB	"	157,722	277	194
*YB2OBL	14	201,450	292	237

NEW ZEALAND

ZL3NB	A	52,304	134	112
ZM3WW	7	5,130,345	1395	649
(Op: ZL3WW)				
ZL1KMN	3.7	32,550	95	75
*ZL3DW	A	4,995	43	37
*ZL3TE	7	22,869	80	63
(Op: W3SE)				

KERMADEC IS.

ZM8CW	A	918,792	946	252

SOUTH AMERICA

TRINIDAD AND TOBAGO

*9Y4LDK	14	679,648	728	317

CHILE

CE4CT	A	4,443,523	2040	721
*CE1E	A	516,621	575	337
*CA1UGE	"	41,764	138	106
*XQ4CW	28	4,320	56	45

BOLIVIA

*CP1FF	A	42,090	138	115

URUGUAY

*CX4AAJ	28	103,935	233	169
*CX4DX	"	9,858	71	62
*CX1AV	21	1,230,492	879	492
*CX2TG	21	595,493	553	391
*CX3TQ	7	33,480	109	60

FRENCH GUIANA

FY1FL	21	3,899,835	1879	711

ECUADOR

*HC1JQ	14	177,612	285	228

COLOMBIA

*HK3JJH	A	1,034,978	817	413
*HK6PSG	A	565,130	657	310
*HK3BVD	"	286,520	342	260
*HK3W	"	133,000	176	175
*HK3AXY	"	109,182	231	186

ARGENTINA

LU7MCJ	A	274,296	381	264
LW9ETQ	"	2,639	33	29
LU1HF	28	1,946,606	1312	523
LS1D	21	4,437,965	1907	805
(Op: LW9EOC)				
LV5V	21	2,459,344	1313	656
(Op: LU5VV)				
*LU1HLH	A	2,045,736	1205	594
*L5ØN	A	1,544,244	1070	521
*LU5EVK	"	143,218	291	202
*LU6KA	"	78,030	244	153
*LU5CAB	"	70,528	196	152
*LU1ARV	"	50,232	164	138
*LR1A	"	37,296	153	112
*LW6DW	"	22,204	111	91
*L44DX	28	372,240	502	282
(Op: LW1DTZ)				
*LW1HR	28	193,856	346	208
*LU8EOT	"	149,600	298	187
*LU6FOV	"	92,106	232	153
*LO7D	"	13,703	79	71
(Op: LW1DRH)				
*LU3DX	21	964,886	771	442
*LR2D	21	663,264	618	392
(Op: LW7DUC)				
*LU4WG	"	130,290	247	202

PERU

OA4SS	14	1,194,804	990	414

ARUBA

P49Y	A	13,408,078	3915	1018
(Op: AE6Y)				

BRAZIL

ZX2B	A	10,202,364	3281	1002
(Op: PY2MNL)				
PY5HOT	A	10,002,030	3029	1010
PY5QW	A	2,220,540	1241	622
PV8DX	"	1,298,844	794	436
PY7VI	"	177,600	253	192
PY2BT	"	152,004	172	159
PY3PA	"	40,920	135	110
PY2KP	"	9,660	67	60
PP5AMP	28	831,444	758	386
ZX5J	21	11,767,820	3528	1130
(Op: PP5JR)				
PY3PDR	"	182,684	294	218
PP5NW	14	3,008,970	1525	670
PY5ZHP	"	696,992	656	368
PP5BZ	7	1,593,648	657	432
PY3ZL	"	10,622	52	47
PY2EYE	"	1,482	20	19
*ZX7A	A	3,579,840	1637	704
*PY2NY	A	2,865,888	1452	642
*PY3DX	A	2,155,615	1156	605
*PS5S	"	953,394	726	442
*PX2E	"	359,744	452	292
(Op: PY2EJ)				
*PY2NA	"	230,832	354	229
*PY1SX	"	193,795	311	245
*PX8I	"	191,836	317	199
(Op: PV8IG)				
*PP5JY	"	118,846	230	182
*PY2BN	"	32,445	125	105
*PY7RP	"	10,584	69	56
*PY2IQ	"	9,145	65	59
*PY2DXX	"	9,130	68	55
*PY4PW	"	9,024	73	64
*PY5KW	"	6,804	68	54
*PY2ZZO	"	4,896	70	51
(Op: N5ZO)				
*PY3BIL	"	2,759	32	31
*PP5JEB	"	798	21	19
*PY1EJ	"	456	22	19
*PP7ZZ	"	210	13	10
*PY2CX	28	184,228	335	212
*PY2MTV	"	22,632	106	82
*PY2ZK	"	14,625	97	75
*PU1KYC	"	7,830	65	58
*PU1KGG	"	7,410	65	57
*PY2ZY	"	6,075	61	45
*PU2MTS	"	5,151	65	51
*PP5JD	21	3,505,950	1623	742
*PX2T	21	1,818,725	1095	575
(Op: PY2DN)				
*PY4DEL	"	26,136	108	99
*PY4CEL	"	22,466	101	94
*PP5AIM	14	116,816	230	196
*PY2ZR	14	113,230	244	169
*PY4RDS	"	40,136	142	116
*PT2ND	"	27,648	112	96
*PP2RON	"	1,323	23	21
*PR7DZ	7	244,024	229	188
*PS8ET	"	8,760	40	40
*PP5JAK	"	7,332	39	39
*PY2DEZ	"	4,165	37	35
*PS7DX	"	14	2	2
*PR7AR	3.7	13,064	49	46
*PS8NF	"	4,379	31	29

SURINAM

PZ5A	A	4,667,160	1884	712
(Op: PZ5RA)				

VENEZUELA

*YY1LGW	A	50,172	130	113
*YY1JGT	28	82,859	249	133
*YV1RDX	21	1,717,940	1218	490
*YV7QP	"	1,380	24	23
*YV1CTE	14	635,364	677	324
*YV1FYZ	"	20,999	101	83

PARAGUAY

*ZPØR	A	7,445,619	2575	909
(Op: ZP5AZL)				

TRIBANDER/SINGLE ELEMENT

UNITED STATES

WT4PF	A	2,716,912	1910	718
(Op: N4PN)				
NF4A	"	2,461,846	1972	698
K4PV	"	2,058,381	1728	657
K4BAI	"	2,026,141	1815	631
W6TK	A	1,260,544	1373	512
K4SN	"	1,042,825	1087	505
NJ2F	"	902,286	866	462
AB3CX	A	872,413	894	457
WN2O	"	833,958	821	433
(Op: N2GC)				
N3UM	A	773,190	724	426
KU8E	"	498,201	633	341
ND1X	A	414,800	580	340
NX9T	"	354,765	556	335
WA4ASJ	"	185,164	342	238
WR5G	A	174,930	342	238
WA5ZUP	A	146,258	394	217
WK4Y	"	144,976	339	208
WA3OFC	"	115,776	251	201
W7TTE	"	107,439	213	177
AK9I	A	103,944	315	183
K9IDQ	"	92,799	232	189
K4WX	"	85,738	202	163
WD5JNC	"	83,660	236	178
WAØHLJ	A	75,342	200	174
AB1BW	"	67,940	201	158
W8JMF	A	65,395	181	145
NT6K	"	55,386	251	153
K2RD	"	38,850	159	111
KV7DX	"	34,560	158	120
(Op: KN5H)				
NJ4F	"	30,210	113	106
N8ILU	"	27,072	118	94
WØBH	"	15,714	97	81
K4EU	14	739,297	795	481
WØPPF	14	29,402	125	122
N5VYS	14	17,900	144	100
WG7X	14	14,616	102	87
W9IL	14	9,860	59	58
N7XY	"	5,000	52	50
WA3AAN	7	39,270	143	110
KK9V	3.7	37,332	158	122
*WD5K	A	1,108,359	1058	511
*N2RRA	A	568,400	693	406
*NX6T	A	558,215	824	389
(Op: K6AM)				
*WB8TLI	A	539,478	603	369
*WZ8T	"	459,756	608	387
*W4LT	A	457,026	669	361
*W4TMN	"	333,940	466	295
*NA1QP	A	202,500	366	225
*AAØNK	A	191,730	370	249
*WBØTSR	"	130,390	316	221
*NG9C	A	95,760	282	190
(Op: W9EYE@NG9C)				
*K9JE	"	95,749	257	181
*N8HC	"	66,171	220	161
*KA2D	A	53,466	154	134
*K1JMD	"	51,786	166	137
*W1CRK	"	51,606	183	141
*AA6EE	"	47,676	194	137
*W1HBR	"	33,276	151	118
*N3CZ	"	28,365	109	93
*K8BSG	"	24,823	124	103
*N7VPN	A	21,658	129	98
*K6UM	"	19,184	110	88
*KN7T	"	13,689	103	81
*K7TR	"	12,950	75	70
*WI7F	"	10,725	96	75
*N5DTT	"	10,725	85	75
*KI7Y	"	9,660	82	70
*KD5IKG	"	8,896	74	64
*NV2G	"	5,096	60	56
(Op: N2ZN)				
*W6FB	"	4,140	54	45
*N4IOZ	"	3,268	40	38
*K6CSL	"	2,775	39	37
*W4AMP	"	2,607	37	33
*KG2V	"	40	5	5
*W7UPF	21	39,780	129	117
*AJ5DX	21	21,315	103	87
(Op: WØVX)				
*NV8N	14	454,987	601	403
*KØPK	14	136,416	271	232
*K7ACZ	14	71,000	170	142
*KD2MU	14	37,572	144	124
*K7MY	"	20,304	110	94
*K5PX	14	3,192	51	42
*WA4VJC	7	3,483	47	43
*N9HOE	7	2,380	41	35
*KEØL	3.7	18,100	127	100
*NØYY	"	6,272	53	49

DX

ZX2B	A	10,202,364	3281	1002
(Op: PY2MNL)				
V31RG	A	6,097,132	3174	761
(Op: K4VU)				
C52T	A	4,559,620	2121	710
(Op: GØTSM)				
C4M	A	4,086,459	1702	689
(Op: 5B4AGM)				
OH1RX	A	1,279,308	1081	543
VE3CR	A	1,202,769	783	479
EI4DW	A	1,154,104	943	557
VO1TA	A	992,297	701	421
YL9T	A	727,065	806	453
VC5X	A	698,625	826	375
(Op: VE5UF)				
OZ7AM	A	657,900	694	425
JR7WAB	A	594,055	629	385
DZ1BP	A	584,820	836	228
(Op: DU1BP)				
GØMTN	A	579,800	645	446
EA5ON	A	579,012	679	452
VE1MC	A	562,487	520	347
II1M	A	546,270	606	417
(Op: IK1SOW)				
JE1LFX	A	522,546	576	327
JA7COI	"	498,370	598	305
IK1YED	"	497,448	605	376
KG6DX	A	455,455	621	245
OQ7T	A	426,240	535	360
VK3TZ	A	424,386	418	271
DL9GWD	A	418,834	534	362
VY2LI	A	343,671	388	291
SV9COL	A	276,066	481	313
IK8SEU	"	218,960	353	280
UN5J	A	135,660	260	204
JG4AKL	"	127,982	250	178
YBØIR	A	107,070	214	166
S51DX	A	86,376	235	183
GMØNTL	A	84,889	218	181
HA5NB	A	62,208	192	162
ZL3NB	A	52,304	134	112
PAØJNH	A	35,154	133	126
OH1N	A	4,922	50	46
(Op: OH1BOI)				
9A3ST	A	1,680	26	24
DL1NEO	"	532	14	14
IZ8EDL	28	5,203	51	43
ZC4LI	21	593,280	623	384
JH7XMO	21	366,865	503	307
JG1ZUY	"	189,662	364	233
(Op: JA6-933Ø)				
9M2/JH3GCN	21	47,399	193	139
MØWLF	14	376,705	467	329
S57RTH	14	274,160	484	298
SM5U	14	210,023	447	313
(Op: SM5UGC)				
VK6DXI	7	503,174	372	254
LY4Q	3.7	479,408	617	361
DL3BQA	3.7	312,634	493	326
*LU1HLH	A	2,045,736	1205	594
*S51F	A	1,325,722	1031	554
*F6KZC	A	1,147,225	924	545
(Op: F8AOF)				
*YB1TJ	A	769,500	680	375
*OM7DX	A	760,189	783	461
*EA8/DL3KVR	A	728,037	665	369
*DR4G	A	666,636	684	438
(Op: DJØGM)				
*VE2XAA	A	640,461	580	381
*HK6PSG	A	565,130	657	310
*UA9ACJ	A	528,496	499	268
*RZ9OW	"	515,151	595	357
*VE3KPP	A	495,872	509	298
*LY2BET	A	447,744	610	384
*UA3LHL	A	435,120	614	336
*EI/W5GN	A	417,960	519	360
*EW4AB	A	349,163	539	323
*JH7CUO	A	311,080	434	280
*E21YDP	A	302,211	451	273
*VE3OX	"	298,095	392	255
*OZ1ACB	A	297,850	465	322
*VE1JS	A	292,998	345	282
*F5LIW	A	253,728	383	288
*PY2NA	A	230,832	354	229
*VE4EAR	A	228,636	363	219
*7J1AQH	"	228,004	383	238
*VE3RCN	"	215,340	314	222
*PE1MMZ	A	197,626	338	286
*PX8I	"	191,836	317	199
(Op: PV8IG)				
*RZ9HG	"	190,588	328	212
*VE3TW	"	178,277	288	209
*VA2SG	"	168,682	293	193
*VK2AEA	A	149,962	267	194
*JA2PFO	"	140,790	279	190
*UX8IR	A	138,084	302	222
*VU2NKS	A	133,056	239	198
*US2YW	"	130,743	279	199
*RX9DJ	"	125,795	261	181
*JH6OPP	"	121,146	254	183
*F1FPL	"	113,905	245	209
*IZØEHL	A	107,250	250	195
*IK2YSJ	"	96,432	238	196
*PE2JMR	"	77,256	222	174
*EI9FVB	"	71,232	200	159
*JA4AQR	"	53,317	169	131
*US5EEK	"	52,745	158	137
*OZ4RT	"	50,700	164	156
*GWØTKX	A	49,086	179	162
*IZ4DIG	"	44,022	153	138
*SV1GRD	A	41,409	154	129
*G6CSY	A	39,852	149	123
*AO4T	A	39,680	159	128
(Op: EA4TV)				
*SE6C	A	36,378	163	129
(Op: SM6CDN)				
*F4CUI	"	35,754	142	118
*F2RD	"	30,090	129	118
*VK4XES	"	29,795	109	101
*JHØNEC	"	26,730	117	90
*IT9AJP	A	26,656	122	112
*HA5YG	"	24,453	116	99
*IWØGYC	"	22,050	104	90
*G4NXG/M	"	21,620	102	92
*VA3XOV	"	21,600	93	90
*EB5ALB	"	21,462	109	98
*JO1SIM	"	19,007	125	83
*DG7RO	"	18,909	113	99
*9A4VV	"	11,715	73	71
*PY2IQ	"	9,145	65	59
*PY4PW	"	9,024	73	64
*EA1AOE	"	7,772	62	58
*F4CGJ	"	7,625	64	61
*PY5KW	"	6,804	68	54
*S57U	"	6,384	60	57
*OM4DX	"	4,800	46	40
*DGØLFG	"	4,752	50	48
*MMØGOR	"	3,984	49	48
*EB1EVX	"	990	22	22
*EA1CRL	"	893	20	19
*JJ1WWL/1	"	253	11	11
*VE7BGP	"	180	9	9
*PA3CEB	"	136	11	8
*YC6LAY	21	160,475	323	175
*IKØEIE	21	51,221	145	131
*DH8BQA/M	21	10,626	75	69
(Op: DH8BQA)				
*JL3RDC	21	6,018	54	51
*9Y4LDK	14	679,648	728	317
*RA9UN	14	217,115	357	251
*PG2AA	14	24,075	120	107
*JO3FUO	14	171	9	9
(Op: JJ1BDX)				
*JR4URW	7	27,784	115	92
*JH9AMJ	"	15,104	67	59
*UR5IKN	3.7	4,455	46	45
*EA3AKA	1.8	31,524	124	111
*YU1RA	1.8	4,944	48	48
*YUØ7HST	"	209	11	11
(Op: YU1UA)				

ROOKIE
UNITED STATES

KG6ZHC	**A**	**32,686**	**149**	**118**
KI4EUP	**A**	**26,936**	**105**	**104**
K3VQR	**A**	**8,450**	**77**	**65**
W7TAX	**A**	**8,024**	**68**	**59**
AB1EP	**14**	**100,746**	**224**	**193**
***AC4TT**	**A**	**307,695**	**495**	**281**
***KB3LJX**	**A**	**189,054**	**358**	**243**
*KI4IMA	*	113,274	266	203
*N3XZ	*	97,128	262	171
*AD2H	*	42,210	163	126
***KE5DHY**	**A**	**33,516**	**151**	**114**
***W9KB**	**A**	**31,527**	**160**	**113**
*N3VMD	*	25,452	123	101
*WB5NMZ	*	21,182	105	89
***AD7KG**	**A**	**18,834**	**126**	**86**
*N5KLE	*	18,228	97	84
*WF8P	*	16,770	100	86
*K3RMB	*	12,936	83	77
*KB3LHT	*	11,808	88	72
***W2ANQ**	**A**	**10,656**	**81**	**72**
*AI4ME	*	9,455	71	61
*K7LMM	*	7,688	76	62
*K9TCD	*	6,930	70	66
*AD7LJ	*	5,684	66	58
*N2TEV	*	5,562	55	54
*KC9HJO	*	3,243	49	47
*KE5KWD	*	455	15	13
***KI4KNS**	**14**	**17,487**	**96**	**87**
*KI4MUG	*	3,854	50	47
***KB3NDS**	**14**	**1,430**	**26**	**26**
***N9ABC**	**14**	**1,288**	**23**	**23**
***K9WBS**	**7**	**612**	**20**	**18**
*KC9GRD	*	108	9	9

DX

OT2A	**A**	**2,675,460**	**1670**	**732**
XE2WWW	**A**	**2,121,161**	**1549**	**511**
IZ1LBG	**A**	**1,608,152**	**1155**	**611**
EC7ANC	**A**	**467,168**	**604**	**416**
IWØHOU	**A**	**291,247**	**430**	**319**
BD3APX	**A**	**157,617**	**374**	**211**
RV9LM	**A**	**41,106**	**121**	**102**
ON8PH	**A**	**16,965**	**100**	**87**
IZØINT	**A**	**10,508**	**84**	**74**
UA9SAW	*	720	16	15
EA5GKC	**28**	**20,625**	**103**	**75**
EC5ANF	**14**	**15,477**	**84**	**77**
I1NHR	**14**	**13,260**	**92**	**85**
***RK9AJZ**	**A**	**1,068,923**	**781**	**457**
***RN3AHL**	**A**	**939,575**	**791**	**455**
***DQØT**	**A**	**529,720**	**713**	**410**
			(Op: DC7NF)	
*DB7TF	*	468,456	582	393
***IZ3KKE**	**A**	**353,886**	**440**	**338**
***SQ8LSC**	**A**	**188,730**	**302**	**270**
***ISØAFM**	**A**	**177,216**	**314**	**284**
***EA1EWC**	**A**	**166,254**	**297**	**229**
***YCØNFL**	**A**	**158,137**	**244**	**203**
*EB5KAU	*	155,736	305	252
***F4FDA**	**A**	**136,927**	**289**	**217**
*EA3EIQ	*	127,012	257	226
***OL2T**	**A**	**122,807**	**302**	**227**
			(Op: OK2TC)	
*DL6LB	*	94,354	229	191
***BG7MVZ**	**A**	**80,190**	**249**	**165**
*OK6AB	*	76,650	232	175
*IWØHLZ	*	75,480	205	170
*F4FFH	*	64,834	196	154
*RZ3ATE	*	61,824	197	161
*BG1QMU	*	56,502	207	146
*IZ8GBH	*	53,568	191	144
*F8EZE	*	51,649	186	137
***YY1LGW**	**A**	**50,172**	**130**	**113**
***PDØAT**	**A**	**47,716**	**184**	**151**
***VE7BSM**	**A**	**45,980**	**157**	**121**
***VO1DJT**	**A**	**45,628**	**140**	**122**
***VE3NCQ**	**A**	**44,096**	**131**	**104**
*RX3VF	*	40,310	173	145
*EA1AQN	*	35,090	140	110
*BD4IXA	*	34,047	188	117
*IZ8JFL	*	32,754	139	106
*OK5ZH	*	30,866	139	122
*DO1BEN	*	28,024	135	113
***LA5HPA**	**A**	**27,798**	**147**	**123**
***VE4DET**	**A**	**26,772**	**119**	**92**
*UA9QCZ	*	26,180	90	77
*EC3DEL	*	21,160	111	92
***SA8AQT**	**A**	**20,748**	**130**	**114**
***JL8MBF**	**A**	**20,510**	**97**	**70**
*IZØKBW	*	14,250	84	75
*VA3TPS	*	12,672	73	66
*VE3ZIN	*	10,192	66	56
***6I2HUM**	**A**	**8,470**	**65**	**55**
*IV3PGO	*	6,156	59	57
*IZ2HAN	*	5,808	50	48
*DO7GG	*	5,220	51	45
*BG1LKK/4	*	3,600	43	36
*IW3SRZ	*	3,280	42	41
***VK2KRM**	**A**	**2,370**	**39**	**30**
*BG3BXH	*	2,145	33	29
*IZØGXM	*	2,001	30	29
***YO9HJY**	**A**	**1,736**	**29**	**28**
***VY1EI**	**A**	**1,219**	**25**	**23**
*BG3GDB	*	858	30	26
*IZ5HQB	*	688	17	16
***LW1HR**	**28**	**193,856**	**345**	**208**
***PY2ZK**	**28**	**14,625**	**97**	**75**
***PX2T**	**21**	**1,818,725**	**1095**	**575**
			(Op: PY2DN)	
***YV1RDX**	**21**	**1,717,940**	**1218**	**490**
***ED8D**	**21**	**1,118,852**	**874**	**434**
			(Op: EA8BHD)	
***EY8CC**	**21**	**57,260**	**161**	**140**
***DO4ZN**	**21**	**38,985**	**135**	**115**
***RK9UAC**	**21**	**23,925**	**97**	**87**
***EC7DZL**	**21**	**2,296**	**28**	**28**
*F4DOG	*	3	1	1
***EC7DND**	**14**	**420,740**	**641**	**436**
***OH8GZN**	**14**	**31,302**	**162**	**141**
***VA7ALK**	**14**	**13,651**	**90**	**73**
***IZ1GJK**	**14**	**1,148**	**29**	**28**
***BG6AIF**	**14**	**30**	**5**	**5**
*IW3SSA	*	388,150	519	350
***SP5COF**	**3.7**	**132,978**	**288**	**222**

ASSISTED
UNITED STATES

WY3P	**A**	**5,569,500**	**2593**	**948**
			(Op: N3KS)	
W5WMU	**A**	**3,341,979**	**2430**	**809**
W6YI	**A**	**2,593,584**	**1962**	**664**
AA3E	*	2,589,276	1492	762
			(Op: W3CF @ NE3F)	
NZ1U	**A**	**2,453,360**	**1435**	**728**
			(Op: N2TTA)	
W1CU	*	2,357,069	1421	689
N2BJ	**A**	**1,999,877**	**1717**	**647**
WN9O	*	1,901,732	1637	644
(Op: W9IU)				
NN4GG	**A**	**1,739,584**	**1399**	**616**
			(Op: N4GG)	
WW5X	*	1,464,006	1707	527
			(Op: WW5X @ W5TM)	
N4WW	*	1,372,400	1040	584
NT4O	*	1,339,576	1120	532
KE2DX	**A**	**1,167,858**	**1121**	**534**
W2IRT	*	1,081,918	938	538
W1GUS	*	1,072,170	1042	495
K3WI	*	1,029,528	1007	474
KT4ZB	*	1,014,040	1044	505
N3ME	*	819,498	759	438
K2DB	*	739,032	750	424
K4CZ	*	721,000	744	412
KN5H	*	654,668	654	412
			(Op: N3DXX)	
WN3R	*	619,429	726	439
W3TZ	*	610,071	968	399
KB1NEF	*	568,260	588	410
NA7XX	**A**	**561,782**	**859**	**403**
			(Op: WØMU)	
WW9R	*	483,918	874	354
AD5XD	*	479,808	770	357
K2QMF	*	476,952	481	357
W2OO	*	457,963	494	341
WK2H	*	448,880	610	362
			(Op: K2ONP)	
KØRC	*	445,038	539	363
WT8C	**A**	**420,831**	**435**	**321**
N2MUN	*	419,232	506	352
K6TD	*	405,055	613	355
W7RN	**A**	**404,737**	**582**	**337**
			(Op: K5RC)	
K9CT	*	354,024	417	297
WX6V	*	353,176	472	337
N2SQW	*	337,850	469	290
WA3G	*	285,760	408	304
K9YC	*	282,492	508	266
K9UQN	*	250,160	407	295
NX4XX	*	232,935	403	293
			(Op: N4FX)	
N4DWK	*	217,000	311	250
N6AJR	*	214,389	402	249
K9UH	*	212,868	411	243
NS9I	*	210,786	335	258
W1TO	*	193,986	305	234
KW3W	*	192,100	300	226
KR4F	*	189,000	304	252
KT6V	*	184,832	427	256
			(Op: K9VV)	
N4ZR	*	183,201	290	237
W5YAA	*	172,608	303	248
KM9M	*	154,258	487	221
K6KD	*	150,501	262	221
			(Op: K6TA)	
W6OAT	*	142,728	312	228
K6EU	*	135,676	310	214
K4IU	*	134,400	302	210
W1EQO	*	130,339	264	187
W4GHD	*	96,390	237	170
KC1F	*	91,948	229	181
N6KI	*	81,291	210	147
N1GLT	*	76,950	190	162
AB2MH	*	68,640	176	160
KB9KEG	*	65,469	219	157
K2PT	*	62,440	203	140
K3KO	*	61,061	143	143
K8SAK	*	58,870	209	145
N6WK	*	57,540	168	140
NE1HP	*	55,130	170	149
			(Op: KV1J)	
W8OHT	*	54,340	156	130
AA8LL	*	42,927	139	123
K9ZW	*	30,081	124	111
NN3W	*	27,930	141	105
N8KDJ	*	26,790	117	94
W6SA	*	26,187	116	87
N2YO	*	22,659	104	91
K4GMH	*	22,227	93	93
W3TUA	*	15,132	83	78
WA3AFS	*	11,718	84	63
K8YC	*	11,078	64	58
W9VA	*	11,055	77	67
NG2P	*	5,031	46	43
KW9N	*	4,350	56	50
			(Op: K9MI)	
KE7FBY	*	1,081	24	23
WW4LL	**21**	**314,604**	**494**	**324**
K7RI	**14**	**1,542,775**	**1432**	**611**
WR2G	**14**	**411,774**	**516**	**357**
KD7JGI	*	255,175	454	295
K3RON	**14**	**9,536**	**67**	**64**
N3GJ	*	4,160	40	40
NØUU	**7**	**36,676**	**122**	**106**
***NR1I**	**A**	**853,160**	**849**	**440**
			(Op: W1NT)	
*NJ1H	*	299,880	422	294
***N7AZ**	**A**	**266,923**	**551**	**293**
***KØKX**	**A**	**245,850**	**315**	**298**
***AC9X**	**A**	**233,356**	**443**	**257**
***W4EE**	**A**	**201,441**	**345**	**249**
*W9QL	*	140,610	335	215
*WA1ZYX	*	130,400	254	200
***W4XO**	**A**	**116,390**	**274**	**206**
*K9TRV	*	110,210	240	206
*N7WI	*	98,820	267	183
*WO1N	*	98,325	226	171
***K6GEP**	**A**	**80,983**	**275**	**161**
*N4VA	*	68,628	170	133
*AD4YQ	*	37,524	151	106
*K4FPF	*	33,277	116	107
*KA4OTB	*	31,857	128	111
***AB2WS**	**A**	**31,106**	**114**	**103**
***K8GT**	**A**	**27,522**	**113**	**99**
*NT4Q	*	16,376	99	89
*N9LF	*	7,744	77	64
*W3AG	*	6,862	56	47
*W4WLC	*	6,850	60	50
*K3GWK	*	6,750	62	54
*K3RWN	*	6,650	56	50
***K7VIT**	**A**	**5,488**	**64**	**49**
*NØBK	*	5,168	49	34
*W1LRY	*	4,770	51	45
*WA7RR	*	3,150	38	35
*W7SST	*	984	27	24
***K8BL**	**14**	**37,752**	**121**	**121**
***NU6T**	**14**	**1,288**	**29**	**28**
***W9ILY/M**	**14**	**40**	**4**	**4**

DX

P4ØW	**A**	**15,837,235**	**4235**	**1069**
			(Op: W2GD)	
EA9LZ	**A**	**10,204,688**	**2920**	**923**
CT6A	**A**	**4,881,240**	**2282**	**936**
			(Op: CT1CJJ)	
OH4R	**A**	**4,154,983**	**2420**	**859**
			(Op: OH4JFN)	
EM5U	**A**	**4,018,664**	**2086**	**884**
			(Op: UT5UDX)	
RK4FD	**A**	**3,805,144**	**2149**	**833**
LY8O	**A**	**2,871,000**	**1889**	**750**
RXØAE	**A**	**2,711,280**	**1493**	**624**
RU6FA	*	2,381,526	1706	738
EV1R	**A**	**2,009,040**	**1467**	**660**
			(Op: EU1PA)	
HR2DMR	**A**	**1,881,900**	**1456**	**540**
S5ØA	**A**	**1,700,996**	**1047**	**577**
S56A	*	1,498,068	1058	582
JQ1BVI	**A**	**1,131,345**	**951**	**465**
DL5JS	**A**	**1,108,688**	**881**	**521**
DJ3WE	*	1,051,690	938	502
XR3P	**A**	**982,910**	**780**	**454**
			(Op: CE3PG)	
DJ8OG	*	980,609	820	511
6F75A	**A**	**969,516**	**1024**	**423**
			(Op: XE1KK)	
OK1KT	**A**	**939,165**	**793**	**493**
DB2B	*	861,650	909	475
			(Op: DL8OBF)	
PA1T	**A**	**817,256**	**838**	**502**
YU9VK	**A**	**790,152**	**775**	**492**
I1EIS	**A**	**767,142**	**745**	**414**
DJ5MW	*	738,195	691	435
DHØGHU	*	731,860	747	460
LZ1KSP	**A**	**706,150**	**914**	**487**
			(Op LZ1HI)	
JF2QNM	*	658,950	679	345
DL6EZ	*	604,494	603	426
ZL1T	**A**	**547,560**	**537**	**324**
IK2TDM	*	539,049	598	399
RM9RZ	*	525,141	526	333
DK3W	*	518,805	616	405
			(Op: DL3ABL)	
UT6EE	*	461,916	552	351
JA2AXB	*	382,136	491	296
EA7RU	**A**	**361,928**	**486**	**281**
RWØAQ	**A**	**349,809**	**458**	**323**
DL1EJA	*	310,080	446	323
HAØHW	**A**	**304,637**	**448**	**317**
DG3FK	*	255,207	372	291
ZL1BYZ	*	245,673	347	243
VE3ZZ	**A**	**241,730**	**330**	**230**
DF2LH	*	226,728	355	268
9A5ZP	**A**	**207,922**	**340**	**286**
DL4RCK	*	193,305	336	263
ZS5ZZ	**A**	**172,743**	**285**	**213**
IK3SCB	*	170,160	346	240
JE2LPC	*	161,504	315	196
DJ2ST	*	127,556	257	223
GMØDBW	**A**	**115,768**	**283**	**232**
EA1WX	*	114,124	256	206
JR1NHD	*	112,763	237	181
DF1LON	*	109,725	256	209
MMØGPZ	*	96,784	241	184
JA1XRH	*	95,667	240	143
RX3MA	*	84,680	185	145
MØRNR	**A**	**60,060**	**186**	**156**
JG2REJ	*	57,288	164	154
EG4T	*	57,130	184	145
TA2/AJ3M	**A**	**54,720**	**103**	**96**
IZ2KPI	*	52,298	179	158
OQ5M	**A**	**47,125**	**173**	**145**
			(Op: ON5ZO)	
SD4BJZ	*	44,619	170	139
			(Op: SM5DJZ)	
9M2CCO	**A**	**44,268**	**161**	**119**
UX2HB	*	42,624	118	111
SP4ICP	**A**	**41,629**	**158**	**133**
DKØGYB	*	40,690	147	130
			(Op: DL2KLA)	
RW3MB	*	37,260	147	115
DB9EX	*	33,462	124	117
DL9SEV	*	33,087	140	123
ON4AST	*	30,160	125	116
VE3BK	*	29,726	113	89
JH3EQP	*	25,576	125	92
DP4N	*	24,582	112	102
			(Op: DL4NER)	
VA6XDX	**A**	**23,124**	**99**	**82**
RV9MA	*	17,640	74	63
OM3DX	**A**	**15,756**	**90**	**78**
JS1KQQ	*	13,536	83	72
LZ8A	*	12,172	76	68
			(Op: LZ2BE)	
XE1MEX	*	9,328	54	44
HZ1PS	**A**	**9,177**	**57**	**57**
DP9A	*	9,035	67	65
DJ1MB	*	8,775	70	65
YL2IS	**A**	**7,680**	**70**	**64**
OK5JDC	*	7,672	61	56
TF3AO	**A**	**6,572**	**72**	**62**
VE6TR	*	3,960	36	33
DH6DAO	*	3,959	39	37
UA3MEJ	*	2,574	27	26
DL2GLA	*	2,442	34	33
UA9QQ	*	2,430	28	27
RN3ZJJ	*	1,485	28	27
YC2FAJ	**A**	**1,458**	**21**	**18**
RX3RZ	*	1,416	25	24
RU6YY	*	1,273	19	19
DL2AMD	*	264	12	11
DK6AH	*	240	13	12
JR1BAS	*	220	10	10
DN4NER	*	209	11	11
			(Op: DL4NER)	
SQ5M	*	162	9	9
RV9UP	*	72	6	6
DFØJEN	*	15	3	3
EA5EH	**28**	**35,340**	**138**	**95**
AO7AT	*	8,957	63	53
			(Op: EC7AMT)	
JHØEQN	**28**	**2,730**	**44**	**35**
JH4UTP	*	36	4	3
9A2DQ	**21**	**809,516**	**774**	**461**
DP9Z	**21**	**566,772**	**620**	**438**
			(Op: DF9ZP)	
YCØBCU	**21**	**132,352**	**248**	**188**
DJ1AA	*	88,452	214	182
IZ5ASZ	**21**	**88,146**	**198**	**177**
YO3JW	**21**	**87,039**	**221**	**171**
OM7PY	**21**	**44,030**	**138**	**119**
SP1GZF	**21**	**39,556**	**141**	**124**
EY8DD	**21**	**33,562**	**130**	**97**
HG3DX	**14**	**3,202,110**	**1859**	**846**
			(Op: HA3MY)	
RN3QO	**14**	**2,345,571**	**1883**	**797**
UV8M	**14**	**2,151,282**	**1985**	**786**
			(Op: UX3MR)	
YZ2A	**14**	**1,788,696**	**1414**	**702**
RA6YY	*	1,675,722	1655	734
OM7ZZ	*	1,512,286	1199	646
S53S	**14**	**1,471,492**	**1166**	**631**
			(Op: S5ØXX)	
RK3DZB	*	1,131,690	1137	634
			(Op: RU3DNN)	
DP4K	**14**	**1,005,933**	**975**	**547**
			(Op: DL8OBQ)	
USØYW	*	548,685	705	445
EA1CUB	**14**	**431,907**	**547**	**393**
DL4ØRRDXA	*	213,303	381	291
			(Op: DK1QH)	
EA4AJD	*	194,340	465	316
EA1CS	*	170,520	391	280
DL4CF	*	148,843	307	251
SV1JCZ	**14**	**96,774**	**357**	**254**
IW2MWZ	**14**	**84,825**	**283**	**195**
DL16XXV	*	46,768	192	158
			(Op: DK8JB)	
JM2RUV	**14**	**8,792**	**58**	**56**
SQ6Z	**7**	**2,001,174**	**1044**	**609**
FM5FJ	**7**	**1,014,750**	**491**	**375**
ES5RW	**7**	**903,548**	**830**	**452**
OK1DQT	**7**	**446,782**	**407**	**329**
9A5CW	**7**	**257,070**	**298**	**246**
G3SEM	**7**	**93,264**	**212**	**174**
DJ4PI	**7**	**91,217**	**168**	**157**
VE7KET	**7**	**71,224**	**135**	**116**
JO7KMB	**7**	**23,430**	**86**	**71**
OK7M	**3.7**	**1,099,683**	**906**	**587**
HA1YI	**3.7**	**968,485**	**953**	**469**
4NØW	**3.7**	**840,315**	**767**	**453**
			(Op: YT7AW)	
ES2MC	**3.7**	**720,776**	**749**	**427**
EA5KV	**3.7**	**57,620**	**149**	**134**
YZ7A	**1.8**	**349,168**	**516**	**314**
			(Op: YU7CM)	
UXØLL	**1.8**	**194,810**	**333**	**242**
IC8POF	**1.8**	**66,144**	**208**	**159**
***RD4WA**	**A**	**1,416,870**	**1160**	**630**
***ED1WS**	**A**	**921,335**	**817**	**515**
			(Op: EA1WS)	
***VE1DHD**	**A**	**757,079**	**690**	**397**
***VR2XLN**	**A**	**712,615**	**955**	**359**
***PR7AF**	**A**	**521,002**	**511**	**337**
***LU1BJW**	**A**	**498,780**	**547**	**340**
***I2WIJ**	**A**	**422,216**	**489**	**356**
***S53F**	**A**	**406,296**	**510**	**342**
*RX3ZX	*	375,756	490	346
***PG7V**	**A**	**346,435**	**496**	**359**
*RA6YDX	*	264,996	441	306
***DL75ERL**	**A**	**257,397**	**404**	**309**
			(Op: DL4NN)	
***SP1RKT**	**A**	**240,840**	**388**	**270**
***F4EZJ**	**A**	**235,980**	**358**	**270**

*OL7Y	A	233,568	393	288
		(Op: OK1BOA)		
*YO4RST	A	223,856	389	272
*VK4NEF	A	221,328	352	212
*PY2BRZ	A	207,705	336	227
*EB1TR	*	205,774	373	274
*ON6LR	A	204,516	318	276
*VE1RAR	*	161,304	266	188
*PD2J	*	142,780	319	242
*YB3MM/9	A	142,688	266	182
*UA3SAQ	*	142,560	302	240
*JA1MZM	A	128,895	288	195
*EA2DR	*	127,758	259	199
*GØRTN	A	122,816	254	202
*PE1FTV	*	122,080	299	218
*DD1LD	*	105,123	258	201
*4N7TA	A	102,486	228	186
*DL1GDS	*	95,570	235	190
*EA1ASC	*	92,315	217	185
*RN4NF	*	86,730	224	177
*LN5O	A	77,952	215	174
		(Op: LA6FJA)		
*PB2JJ	*	77,868	225	189
*ON6FC	*	77,648	239	184
*LU2EE	A	60,168	182	138
*SP7HTD	*	59,328	169	144
*DF1HE	*	48,980	176	155
*JA1XUY	*	48,384	163	108
*JK2VOC	*	44,172	181	108
*AM5DWS	*	43,615	174	143
		(Op: EA5DWS)		
*JA3PYC	*	42,402	143	111
*DL4SDW	*	40,992	132	112
*VE6TN	A	40,710	148	115
*JH1GUO/4	*	35,245	137	95
*EA5AFF	*	33,934	118	94
*SP7TES	*	32,412	124	111
*VK2KDP	A	29,939	116	91
*DF1HF	*	25,272	113	108
*JF3SAD	*	24,682	109	82
*DL1ECG	*	24,400	124	100
*VA3PL	A	20,540	99	79
*F1TIM	*	20,293	105	91
*JA2KPW	*	20,254	107	82
*JS1PWV/3	*	18,830	104	70
*JA1BJI	*	17,340	94	68
*VE9WGS	A	15,708	78	68
*EA3EYD	*	14,931	85	79
*EA7OT	*	12,036	69	68
*KJ4YDX/KH6	A	9,078	58	51
*RZ9CJ	A	8,791	61	59
*IW9GUR	*	6,885	54	51
*VE3TTN	*	4,940	50	38
*VU2PTT	A	3,332	38	34
*DL3DRN	*	3,120	39	39
*SM6MVE	*	2,623	44	43
*IW7ECJ	*	1,914	31	22
*YO9GJX	*	1,620	31	30
*RAØANO	A	1,125	26	25
*RK3TT	*	1,080	24	24
*DO2NPG	*	220	11	11
*LU3JVO	28	21,330	107	79
*9A2U	28	17,510	102	85
		(Op: 9A3ZA)		
*PY2XC	28	3,854	46	41
*F8AKC	28	720	16	15
*ZP5MAL	21	5,028,127	2057	839
*UA3BS	21	231,256	364	274
*NH7FY	21	193,842	361	198
*JP1JFG	21	125,370	267	210
*SQ4HRN	21	60,551	169	151
*YT5J	14	2,696,898	1876	779
		(Op: YU1JW)		
*LU7YZ	14	260,036	378	251
*SV1CER	14	134,640	357	272
*SJØWPX	14	117,925	343	265
		(Op: SMØOGQ)		
*EW4DX	14	89,162	269	218
*S58L	14	74,239	223	187
*SP5XSD	*	18,286	85	82
*LA7GNA	14	15,444	108	99
*S5ØDX	14	11,832	94	87
*MØLSK	14	6,867	65	63
*SQ5BB	*	5,922	50	47
*RK2FZV/M	14	273	13	13
		(Op: UA2FT)		
*F8CGL	7	54,102	156	142
*YV1FM	3.7	51,304	100	88
*EA4DFE	3.7	4,326	43	42
*SQ9HYN	3.7	1,512	29	27
*RA3XDX	1.8	402,690	449	310

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

WR3Z	5,450,956	2585	959
KM9P	4,847,360	2773	896
WC6H	3,112,368	2474	708
WA7XX	2,390,544	1753	624
AJ9C	1,876,670	1352	670
WX5S	1,642,901	1215	559
NQ5D	1,518,237	1290	609
W7EB	1,233,690	1556	510
WF3C	1,062,404	1063	532
KC9ARR	1,013,005	1062	515
WX7P	669,900	956	420
AB2DE	480,588	543	348
WJ2DX	465,877	544	373
K3MJW	419,843	522	361
WC8VOA	355,776	570	327
KE3OM	278,103	471	287
W4BFB	151,848	286	222
W5LCC	110,715	276	183
W6JAZ	91,686	250	177
N8AJN	85,008	291	168
WV2ZDW	76,440	229	147
W6YRA	74,034	203	162
W6IER	60,858	218	161
N9ADG	45,080	287	140
N2NGW	42,418	162	127
WVØT	39,260	158	130
AD3PA	39,116	154	127
W5UMS	26,250	133	105
KM6HB	10,248	109	84
KD8EUW	7,392	62	56
W4WS	7,021	67	59
KB7UVB	4,465	56	47
WØNT	2,960	43	40
KE7MAN	35	5	5

NORTH AMERICA

KP2TM	15,493,164	4930	1108
HI3C	8,654,300	3219	925
VE7SV	5,921,790	2353	815
VC7GL	4,758,729	1957	717
VC6R	4,570,720	2056	784
HR9BFS	3,955,560	2192	680
VE3YAA	1,996,040	1138	556
VE6AO	806,896	762	376
VE3MIS	794,345	617	395
VA2TG	390,285	421	315
VE5MX	336,077	431	287

AFRICA

5D5A	31,141,293	6037	1347
D44AC	18,836,384	4650	1172
CN5W	12,972,960	3464	1040
CQ3T	11,485,149	3310	1019
ZS9X	7,674,896	2689	856

ASIA

5B/AJ2O	23,822,253	5335	1239
9K2HN	14,408,235	4081	1035
RT9W	8,944,155	2680	951
RZ9OZO	8,159,480	2667	920
HZ1FS	7,545,726	2819	774
UA9UZZ	7,023,033	2548	843
9N7JO	6,815,935	2973	805
A62ER	4,038,792	1919	646
UN8LF	4,016,080	1675	680
TA2K	2,102,462	1072	491
B7M	1,891,260	1386	570
UP9L	1,662,276	983	514
RK9XWO	1,071,846	729	414
JI2ZEY	1,000,184	824	436
RWØLT	868,280	865	392
BY1QH	539,400	756	348
RK9CYA	380,160	456	264
8J3YAGI	318,600	557	270
RKSAWN	183,201	293	237
8J1S	178,600	450	235
BY1TT	103,888	354	172
UA9AZA	50,160	142	132
8J1ØØS	19,780	102	86

EUROPE

OMØA	13,018,941	3967	1279
EI7M	11,182,480	3902	1237
HG1S	9,459,212	3249	1172
S5ØC	8,980,512	3086	1112
OLØW	8,161,771	2998	1091
SJ2W	6,901,416	2822	1077
TM2Y	6,564,398	2645	1019
TM7F	6,402,640	2685	982
OH5Z	6,236,105	2841	1055
EA3OP	5,854,125	2324	1005
RDØM	5,782,872	2739	964
OL3Z	5,523,834	2363	991
IO4T	5,276,808	2287	996
Z37M	5,008,654	2614	917
4O2A	4,894,797	2282	951
RF3A	4,469,520	2618	880
TMØR	4,322,220	2271	861
OE3GCU	4,057,480	1884	860
9A8M	4,011,728	1975	833
IQ5GR	3,881,910	1887	830
OE9R	3,871,560	1913	840
DR6IOTA	3,662,610	2238	815
OL1C	3,595,475	1803	845
9A3B	3,148,080	1779	780
UT7L	3,041,144	1901	776
S57M	2,993,528	1726	766
AO3A	2,971,100	1705	803
IW3IE	2,861,286	1576	722
SO9Q	2,759,265	1607	757
J43P	2,748,330	2307	754
9A7D	2,467,048	1572	718
9A5D	2,224,928	1527	736
ES1A	2,179,584	1587	688
G6MC	2,071,664	1386	698
IQ3UD	2,061,267	1375	663
OR6N	2,037,750	1440	650
ER3R	1,915,800	1540	618
SP9KDA	1,895,710	1317	647
CT1DWT	1,893,320	1328	662
OL7T	1,649,504	1206	608
G5X	1,372,560	1318	602
DLØCS	1,350,622	1084	574
IR6T	1,120,818	891	509
EE2K	1,106,634	902	543
RK3DXS	834,169	894	443
RZ4CWW	782,856	842	524
IQ2LS	675,132	665	443
RW3WWW	670,956	806	429
DFØRW	647,634	661	437
SZ1A	611,991	827	477
OT5P	580,144	645	404
UT4UWR	544,072	651	376
IW9FRA	519,992	591	418
RK4HYT	517,452	687	372
DLØMB	513,258	533	393
UR4ZZZ	453,750	594	375
8SØC/5	450,856	552	388
YU1LD	449,226	559	354
G1T	438,141	564	363
YO8KRR	417,520	568	340
UX4E	409,500	626	375
DL1A	379,090	481	334
PA5W	372,945	522	345
OK2KDJ	342,360	518	317
UR4ZYD	336,330	432	303
9AØR	316,826	458	314
DQ5X	288,787	434	317
OE5D	286,110	375	306
SN5T	263,808	431	288
DKØURS	259,010	451	295
UZ1H	239,645	387	287
RK3YWT	192,256	340	256
YL1XN	160,425	359	225
SP9KRT	160,080	304	230
GCØEZQ	109,484	253	202
SP1KZE	105,664	269	208
OZ5THY	105,630	279	210
RZ3DZF	92,264	188	152
DLØKB	88,164	232	186
M6Q	86,108	270	206
RK3AWK	79,152	246	194
YO2KJJ	72,393	213	177
YO2KBK	66,780	192	159
YL3JSN	63,407	201	163

IY4FGM	43,885	148	131
SC5L	43,582	178	154
SP3KCL	38,481	146	127
EW2WW	23,210	120	110
SP5YOC	20,045	103	95
OK1KMG	17,304	102	84
IQ2VC	15,895	101	85
LY3P	14,877	100	87
UR4PWC	3,608	41	41

OCEANIA

9M8Z	12,387,300	3892	942
YE1ZAT	4,248,370	1866	685
9M6BRC	2,592,510	1485	515
ZL6QH	145,604	271	178
ZL1AA	26,896	118	82
KH2INC	27	3	3

SOUTH AMERICA

ZY7C	19,181,715	4315	1245
PJ2T	16,075,749	3987	1063
LR2F	14,123,456	3856	1168
LU7HN	11,605,360	3353	1040
LP1H	9,593,760	2981	1012
PT3T	6,348,888	2347	884
LS2D	3,985,440	1808	760
XR6T	3,899,139	1807	723
L81H	3,092,921	1471	689
PR5R	2,687,638	1358	647
AY7X	968,888	794	431
LV6D	461,290	544	326
CE2LS	263,680	389	256
LU4DQ	227,322	365	219
PY1GOB	416	18	16

MULTI-OPERATOR TWO TRANSMITTER

UNITED STATES

KD4D	11,831,244	4283	1106
WE3C	9,589,086	3689	1118
NØNI	5,876,967	3341	933
NG3U	2,421,955	1678	691
WØEF	292,160	519	332

NORTH AMERICA

VE3SY	9,660,448	2908	976
VE3RM	8,966,184	2860	948
VE6FI	3,054,774	1775	618
J75RZ	849,187	743	389
6H1TD	48,000	173	125

AFRICA

AN8A	47,019,528	8309	1444
3DABEI	8,564,556	3031	897

ASIA

EKØB	16,957,584	4802	1008
C4I	10,148,864	3054	901

VR2C	4,134,222	3016	717
B7P	3,480,690	2287	739
UO6P	2,659,380	1467	635
BY1RX	2,156,128	1771	568
BV1ØTAR	103,740	331	182

EUROPE

OE4A	18,533,494	5493	1337
TM6M	18,056,756	5206	1306
UU7J	14,316,232	5092	1238
DL2ARD	12,012,880	4257	1210
4O1A	11,784,689	4053	1169
LX8M	8,902,125	3745	1025
DR5N	7,489,184	3159	1031
SX5P	5,224,310	2962	910
GM7M	4,916,865	2692	905
OH6NIO	4,487,064	2557	888
G4IIY	1,391,190	1104	587
M2W	1,326,274	1114	542
G4UJS	1,287,360	973	540
EH1A	792,798	777	458
OZ3RIN	772,497	752	459
AO1O	734,048	777	452
ES1XQ	476,733	659	367
PI4WNO	473,570	621	355
YO2KQD	5,405	54	47

OCEANIA

VK6ANC	4,526,434	2024	682
ZM2M	1,686,830	1106	470
YE1ZU	17,328	80	76

SOUTH AMERICA

LT1F	17,877,453	4766	1177
ZV2K	331,485	406	287

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

NR6O	5,689,623	3389	857
NE1C	5,047,455	2667	907
WX3B	4,784,184	2789	856
AG4RZ	2,731,662	1958	711
W4V	2,567,204	1731	646
K2AX	2,086,812	1506	637
WQ2N	867,265	931	497
W9VT	180,296	396	248
WC4J	130,260	297	195

NORTH AMERICA

NP3U	21,936,992	5786	1276
VE5RI	1,813,972	1225	569

AFRICA

CQ9K	29,665,356	5788	1337

ASIA

BVØL	1,415,440	1406	520
RK9CWW	297,568	340	272

EUROPE

DR1A	24,360,839	7099	1451
OM7M	20,410,560	6036	1368
OT5A	16,465,752	5591	1278
EC2DX	10,073,763	3877	1113
AO4R	8,447,004	3679	1044
LY7A	8,137,800	3913	990
S52ZW	5,823,360	2532	960
HF4ØPAZ	5,453,217	2766	903
DCØNAC	990,318	934	511
SC3ØØVL	762,476	849	473
SF6D	733,950	769	450
9A6V	556,710	616	385
HB9CT	234,270	381	274
DLØNT	170,750	313	250

OCEANIA

4E1P	138,444	268	166

SOUTH AMERICA

ZY1ØØS	33,805,464	6833	1452
YW4M	16,016,543	4465	1013
ZW4O	5,749,875	2310	855

CHECK LOGS

The following logs were used as check logs. Check logs and SWL logs are always appreciated: 4U1ITU, 4Z5FL/M, 9A2JG, 9A3MA, 9A6AJ, AE6OU, BG7MTJ, CU2JT, CX4ABO, DF9FS, DG1LS, DH5MM, DJ6BQ, DK6CI, DL1DTC, DL4KUG, DL4NTC, DL5JMN, DL5MG, DL6AL, DL8WAA, EA3AJW, EA3BJM, EA3DGE, EA4AFP, EA4EQF, EA4RH, EA5FFC, EB1FPF, EI9HQ, EV2A, EW2AA, EY3M, G3UHU, G3VQO, G3YOG/M, GMØNBM, GM3YOG/M, HA5AZZ, JA1JLP, JH7MEX, JL7XBN, K3ZO, K5WW, KB9WQJ, KC7UP, KN6Y, KD4Y, LA2AB, LA2LI, LA3BO, LA5UJ, LA6BNA, LT5Y, LU6DU, LY2CO, MØPCB, N1WQ, N5KO, OH1BOI, OH8GDR, OK7N, ON7SS, OO9O, PT2OP, PY2RDS, RA3AD, RA3AJ, RA3ZOM, RA6FUZ, RA6HSM, RA9CIN, RC4Q, RD3A, RK9AD, RK9JYY, RL3FA, RN3AKK, RN9AA, RU3EJ, RV3DUT, RV9WB, RWØAW, RW3CW, RW4FX, RW9UNT, RZ6BU, RZ9WYQ, S59DKR, SN3P, SP3P, SP5ANY, SP5ELM, SP5GDY, SP5UAR, SP6CZ, SP6EWB, SP7CVW, SP7HOV, SP7TEX, SP9AUV, SP9PTG/9, SQ3JVW, SQ9HZM, SV1BFW, SV1DPI, SV9FBM, UAØOAI, UA3BM, UA3DCW, UA3YCC, UA4AQL, UA9CSA, UA9JAK, UA9LGD, UR4UGL, UR5RP, UR6F, UT5SA, UUØJC, UW7W, UXØFY, UZ7HO, VE3FDT, WA6L, XE1FSK, YL2GQT, YL7X, YO4RDJ, YO5KIP, YO6ADW, YO9FNP, YR1A, YR1C, YY4ZD, ZL1GO/B.

On the Cover

Sture Henriksson, OHØJFP, lives in Mariehamn, the only town in the Åland Islands. Some eight years ago, starting from scratch, he decided to build a competitive station on a hill about five miles south of town. His first antenna support was an irrigation pipe and his first power sources were car batteries and a gas generator. Now there are eight impressive towers with some decent antennas. The climate is mild there with warm and sunny summers and a lot of snow in winter, but the winters are windy so very large arrays would not survive the storms and ice. The present shack is only 8 ×10 ft. but a new and larger one is already on the site.

Sture became a licensed ham in 1992, but for many years before that he had been very active on CB radio. For Sture, antenna work is a year-round affair; the last time I visited him, around the CQ WW Contest, it was raining all day yet he did work on his new 40-meter Yagi, which by now is up and swinging. Sture worked as a fisherman for many years and learned practical physics and dynamics at sea. His antennas are often reinforced and rarely fail.

OHØJFP is not an enemy of computers but they are not his favorite things. Consequently, he is not connected to the web, even though there is some information about his station on <www.qsl.net/ oh0jfp>. His favorite bands are 50 MHz and up, but he has antennas up for nearly all the HF bands as well. Guest operators frequently use his station, so if you hear OHØJFP on the air, it does not mean that Sture himself is behind the microphone. However, he is the man behind the good, strong, signals. *(Cover photo and "On the Cover" by Henryk Kotowski, SMØJHF)*

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