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Amateur Radio

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COMMUNICATIONS & TECHNOLOGY

MARCH 2007

CQ

FCC Code Tests End February 22– Pgs 5 & 52

- **CQ Interviews: NASA Boss Mike Griffin, NR3A**

- **CW Results: 2006 CQ WPX Contest, p. 18**

On the Cover: A night launch of shuttle Discovery, overseen by NASA Administrator–and Extra Class ham–Michael Griffin, NR3A. See page 11.

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KENWOOD SKYCOMMAND TURN IT ON!

Kenwood SkyCommand has FCC approval.

Allows Global communication through remote operation on HF frequencies at home or in the field utilizing Kenwood's TS-2000 series transceivers.

Kenwood's TH-D7AG or TM-D700A required for remote use.

Perfect for use in hurricane or tornado zones, as well as Search and Rescue areas for Long Distance Communications when other normal modes of communications are out.

A great tool to monitor propagation while doing other things at home!

No cables or adaptors to fool with or buy!

No software or computer required!!

Step by step setup and programming taking only minutes.

Ease of use.

See your local dealer for details.

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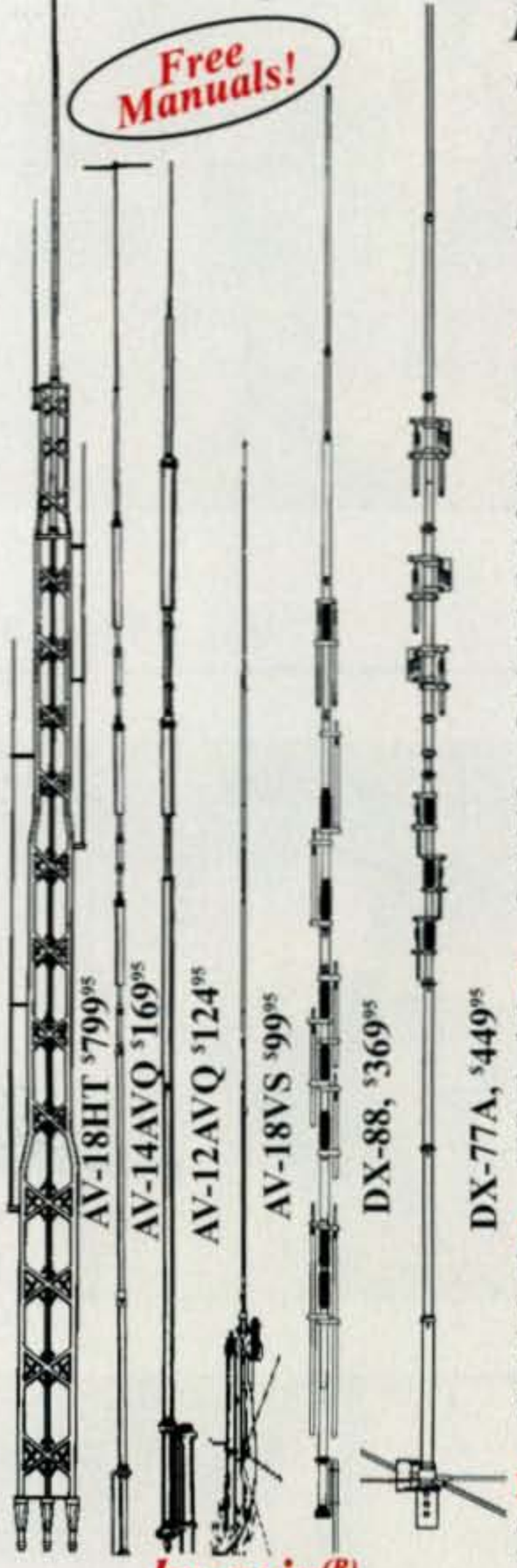
hy-gain® HF VERTICALS

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, $849.95. (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, $189.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

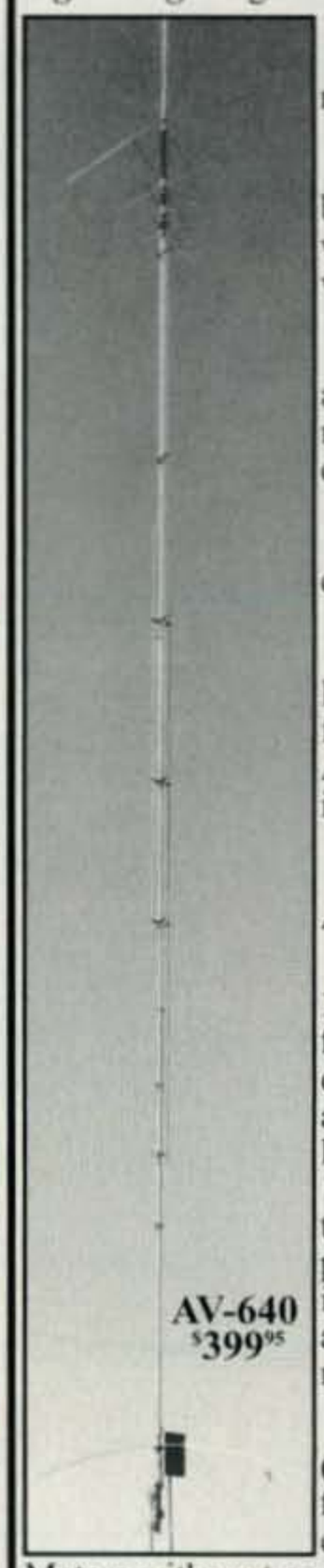
DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs.

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

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$849.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$134.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$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 — guy**	**1.5-1.625"**

hy-gain® PATRIOT

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



No ground or radials needed

Effective counterpoise replaces radials and ground.

Automatic bandswitching

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

Sleek and low-profile

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

Full legal limit

Handles 1500 Watts key down continuous for two minutes.

Built-to-last

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

hy-gain® warranty

Two year limited warranty. All replacement parts in stock.

AV-640, $399.95. (6,10,12, 15,17,20,30,40 Meters). 25.5 ft., 17.5 lbs. The AV-640 uses quarter wave stubs on 6, 10, 12 and 17 meters and efficient end loading coil and capacity hats on 15, 20, 30 and 40 meters -- no traps. Resonators are placed in parallel not in series. End loading of the lower HF bands allows efficient operation with a manageable antenna height.

AV-620, $299.95. (6,10,12,15,17,20 Meters). 22.5 ft., 10.5 lbs. The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

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ON THE COVER: NASA Administrator Mike Griffin, NR3A, has overseen the agency's return to space and is planning a return to the Moon. He talked with *CQ* about ham radio's role in his life and in the manned space program. See page 11 *(NASA Photos)*

hy-gain® ROTATORS

. . . the first choice of hams around the world!

HAM-IV

HAM-IV
$559.95

The most popular rotator in the world!

For medium communications arrays up to 15 square feet wind load area. *New* 5-second brake delay! *New* Test/Calibrate function. *New* low temperature grease permits normal operation down to -30 degrees F. *New* alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *New* indicator potentiometer. *New* ferrite beads reduce RF susceptibility. *New* Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced antenna movement. North or South center of rotation scale on meter, low voltage control, max mast size of $2^{1}/_{16}$ inches.

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
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.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II

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

T-2X
$649.95

T-2XD
$1029.95
with DCU-1

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	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**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II

CD-45II
$389.95

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

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	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.
Effective Moment (in tower)	**1200 ft.-lbs.**

HAM-V

HAM-V
$949.95
with DCU-1

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

ROTATOR OPTIONS

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

AR-40

AR-40
$289.95

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

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	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**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

HDR-300A

HDR-300A
$1379.95

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

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

Digital Automatic Controller

DCU-1
$649.95

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

AR-35 Rotator/Controller

AR-35
$69.95

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

RBD-5
$34.95

NEW! Automatic Rotator Brake Delay

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

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zero bias — a CQ editorial

BY RICH MOSESON,* W2VU

The (R)Evolution Continues

"Ham radio as we know it" has taken another step toward the dustbin of history ... and it's a darned good thing! If it didn't, we'd still be arguing over spark vs. CW, CW vs. phone, and AM vs. SSB; our rigs would still use tubes and weigh a couple of hundred pounds each, and we'd still be tied to actually sitting in front of our rigs in order to operate them. Wait a minute, what was that last item again? Well, that's our topic for this month (and you thought I was going to write about code tests, didn't you?)

Every so often, a radio comes along that dramatically shifts the way we "do" ham radio ... in the "distant past," it was the first single sideband transmitter, the first transceiver, the first frequency-synthesized VHF FM rig, etc. More recently, the ICOM IC-706 put HF, VHF and UHF all-mode capability into a compact package, spurred a resurgence in mobile operating and helped blur the line between HF and VHF operating; Yaesu's FT-817 sparked the sub-hobby of on-foot HF operating (HFPacking), and Kenwood's TH-D7A incorporated a packet controller and APRS (Automatic Position Reporting System) software for no-computer-needed packet reception. (Still to come in that arena, rigs with built-in GPS receivers *and* APRS software for single-unit tracking capability.)

Now, a new radio from Ten-Tec may join that short list. The Omni-VII, an HF+6-meter transceiver, is what the company calls "the world's first completely Ethernet-remoteable HF transceiver." This is a radio with an Ethernet jack that may be connected directly into your broadband router (no computer needed) and operated by computer *from anywhere* via the internet. Software is included, so all you need is a computer mic (you can send code from the computer keyboard or use a computer-compatible keyer, such as K1EL's WinKey) and a high-speed internet connection and you're on the air. And oh, yes, software upgrades may be downloaded into flash memory either through a serial port on your computer or via the Ethernet connection.

Of course, this isn't the first time HF ham stations have been accessible via the internet. The most notable examples are Keith Lamonica's W7DXX and YI9DXX remote bases. But Keith's setup is complex and one-of-a-kind (all right, two of a kind). Kenwood's TS-480 includes the Network Command System, which permits rig control and voice operation via the internet, but requires a dedicated computer at the shack end. The Omni-VII is "plug-and-play," permits all-mode operation, and will put this sort of capability into the hands of every ham with a moderate equipment budget and a broadband internet connection.

Ten-Tec's ad for the Omni-VII offers the scenario of operating your home station from your hotel room while on a business trip. But there are other possibilities as well, including a way to beat antenna restrictions and emergency communication links. If I have an internet-connected ham station and you live in an antenna-restricted neighborhood, I can give you copy of the operating software and a password, and you can operate my station whenever I'm not! Or imagine this—you're hunkered down in an EOC (Emergency Operating Center) after a disaster without telephone or internet service and you need to make HF contact with your state Office of Emergency Management. Your HF station at home in the suburbs is OK, but the HF rig at the EOC has blown a final. You can't get back home because of blocked roads. But you do (bringing in another element that's changing "ham radio as we know it") have a D-Star link to a nearby city that hasn't suffered as much damage. So you plug your laptop into your ICOM ID-1, connect with the internet via D-Star, access your Omni-VII at home, and you're on the air! Or maybe it's someone else's rig completely outside the disaster area. The possibilities of this concept are endless. And it's further proof that the internet, far from destroying ham radio, is helping it to thrive and grow.

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

Balancing Progress and Tradition

Clearly, we are at a major turning point in ham radio history, as one of our oldest traditions—demonstrating code proficiency as a licensing requirement—becomes a thing of the past. Of course, as we've discussed here before, passing a code test and operating CW on the air are two entirely different things. We will continue to encourage hams to learn, use and enjoy Morse code on the air. It's part of our history and an important element of "ham radio magic." Human nature being what it is, though, it is most likely that even those hams who *do* decide to learn code will want to get started on HF with something more familiar—talking. This means a likely surge in activity on the 10-meter band segment between 28.3 and 28.5 MHz. Many of the most active 10-meter operators belong to a group known as 10-10, and its latest newsletter included a realistic look at the likely effect on 10 meters of the FCC ruling, and on the responsibility of more experienced hams to be patient and helpful:

"This will probably mean unprecedented growth with lots of growing pains. It will become the responsibility of the general ham community and especially members of 10-10 to teach all these newcomers the proper etiquette and operating procedures for HF bands. It is sure nothing like operating local repeaters!"—*10-10 International News*, Winter 2007.

There is an equal responsibility on the part of the new HF operators: Be receptive to friendly advice and comments from experienced ops. There are long-established ways of doing things on HF and you'll find that you will fit in much more easily and be accepted more quickly if you are willing to learn and follow these unwritten rules and protocols. There are certain traditions that need to be upheld, even if they don't seem to make a lot of sense at first. Your goal should be to become part of the group, rather than to try to get the group to change to accommodate you.

Another one of our traditions that has waxed and waned through the years is that of building your own gear. At first it was a necessity, and as it became less necessary, it also became less popular. But in recent years, building has enjoyed a resurgence as excellent kits have come on the market and project articles continue to be among the most popular in the ham magazines. Its value goes beyond ham radio, as evidenced by the comments you'll find in our interview on page 11 this month with NASA Administrator Mike Griffin, NR3A. A ham and a builder since his youth, Griffin says "building stuff ... gave me a feel for reality that some design engineers never get a chance to get" and that "the knowledge of having your own hands on stuff has stood me well for 40 years ... you couldn't put a price on it."

Or, as the MasterCard® people might put it: "Building the International Space Station, $130 billion[1]. Returning to the Moon, $104 billion[2]. Having the head of NASA promote building and ham radio, priceless."—*73, W2VU*

Notes:

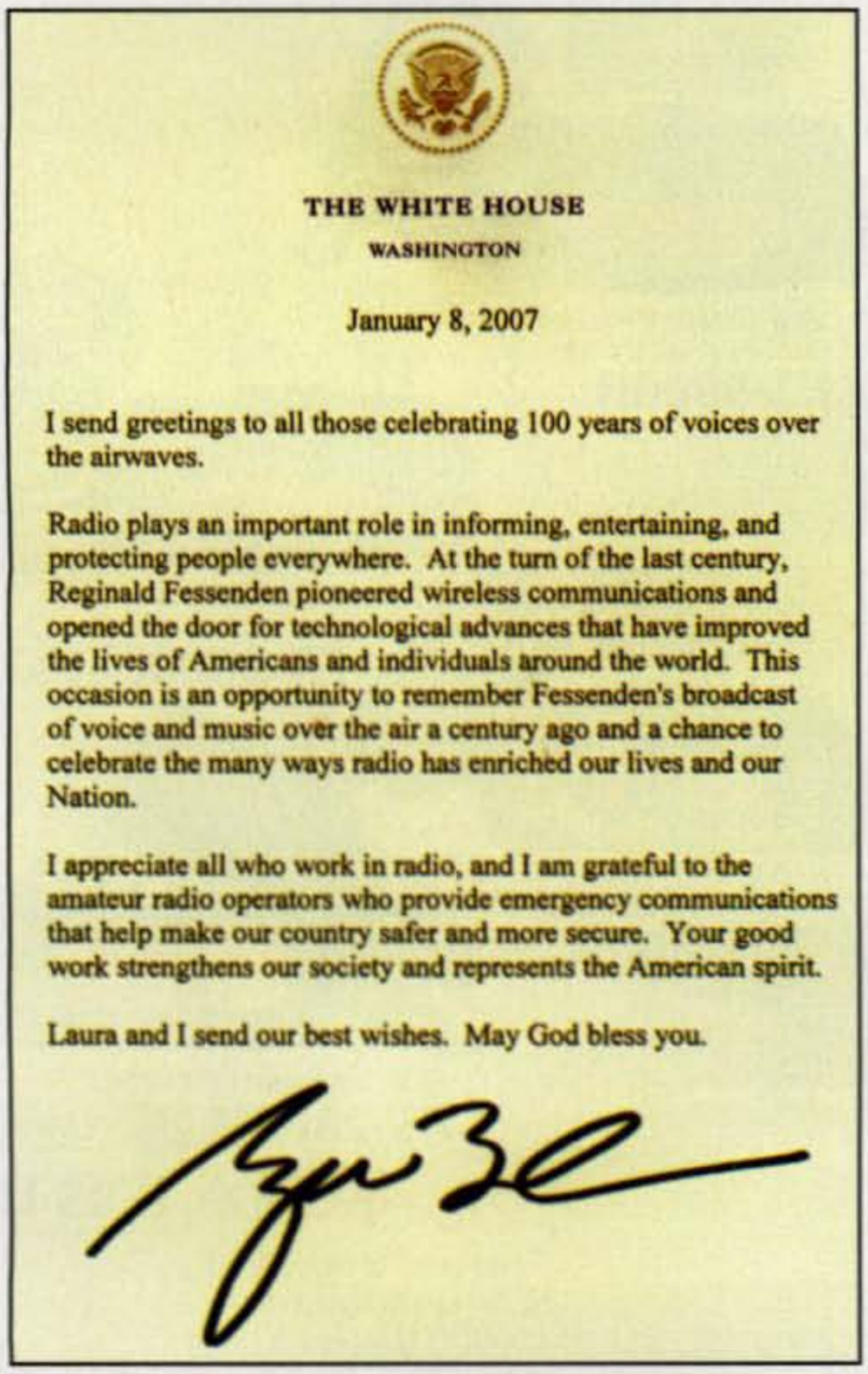
1. European Space Agency estimate, total cost of ISS, 100 billion Euros
2. NASA estimate, per MSNBC

Codeless Licensing Takes Effect Feb. 23

The FCC's final rules on eliminating Morse code testing for all levels of amateur radio licenses, and extending limited HF operating privileges to all Technicians, was published in the *Federal Register* on January 24, 2007, making the effective date for the new rules February 23 (30 days after publication). As of that date, only written exams will be required for earning or upgrading an amateur license. Technicians holding valid Certificates of Successful Completion of Examination (CSCEs) showing credit for written element 3 may upgrade to General without further testing, and those with CSCEs showing credit for elements 3 and 4 may similarly upgrade to Amateur Extra. However, it will still be necessary to go to a volunteer examination session, present a current license and CSCE, and *pay the examination fee* in order to process the upgrade. Limited HF operating privileges for all Technicians (see pages 52 and 56) took effect automatically on February 23.

Bush Thanks Hams on 100th Anniversary of Voice Over Radio

The campaign to celebrate the centennial of voice over radio was capped off by special event operations on New Year's weekend and by a letter of recognition and thanks from President Bush. According to the ARRL, commemorative stations were on the air December 29th and 30th from W1AW, the League headquarters station; W1F from Brant Rock, Massachusetts, where Reginald Fessenden made his first announced voice broadcast on Christmas Eve 1906; and GB1FVT in Scotland. The President's letter (see photo) expressed his gratitude "to the Amateur Radio operators who provide emergency communications that help make our country safer and more secure."



THE WHITE HOUSE

WASHINGTON

January 8, 2007

I send greetings to all those celebrating 100 years of voices over the airwaves.

Radio plays an important role in informing, entertaining, and protecting people everywhere. At the turn of the last century, Reginald Fessenden pioneered wireless communications and opened the door for technological advances that have improved the lives of Americans and individuals around the world. This occasion is an opportunity to remember Fessenden's broadcast of voice and music over the air a century ago and a chance to celebrate the many ways radio has enriched our lives and our Nation.

I appreciate all who work in radio, and I am grateful to the amateur radio operators who provide emergency communications that help make our country safer and more secure. Your good work strengthens our society and represents the American spirit.

Laura and I send our best wishes. May God bless you.

New Vanity Calls on Hold

The FCC in mid-January put a temporary hold on processing new vanity callsign applications for a software upgrade required by part of the Commission's "omnibus" rulemaking in December. One portion of the new rules contained provisions intended to discourage hams from making multiple applications for the same callsign. Vanity callsign renewals continued to be processed as usual. At press time, there was no indication on the FCC website as to when the processing of new applications would be resumed.

Fred Campbell New FCC Wireless Chief

FCC Chairman Kevin Martin has named Fred Campbell as the new Chief of the Wireless Telecommunications Bureau, which oversees amateur radio as well as other two-way radio services. Campbell is a communications attorney who had been a member of Chairman Martin's personal staff, serving as his legal advisor for wireless issues. He succeeds Acting WTB Chief Catherine Seidel, who was appointed by Martin at the same time to be Chief of the Consumer and Governmental Affairs Bureau.

Wayne Mills, N7NG, Leaves ARRL in Staff Shakeup

ARRL Membership Services Manager Wayne Mills, N7NG, resigned in mid-December, citing unspecified "fundamental differences" with ARRL Chief Operating Officer Harold Kramer, WJ1B. However, there may be a connection between Mills' departure and the announcement in mid-January that the League's Membership Services Department and Field and Educational Services Department are being merged into a new Programs and Services Department, to be managed by Dave Patton, NN1N. Mills, a well-known DXer and DXpeditioner before joining the ARRL staff in 2000, oversaw the startup of the Logbook of The World (LoTW) online QSO database program, but Patton was also deeply involved in that project. In approving the new department, the ARRL board also created a new position of Emergency Communications Manager.

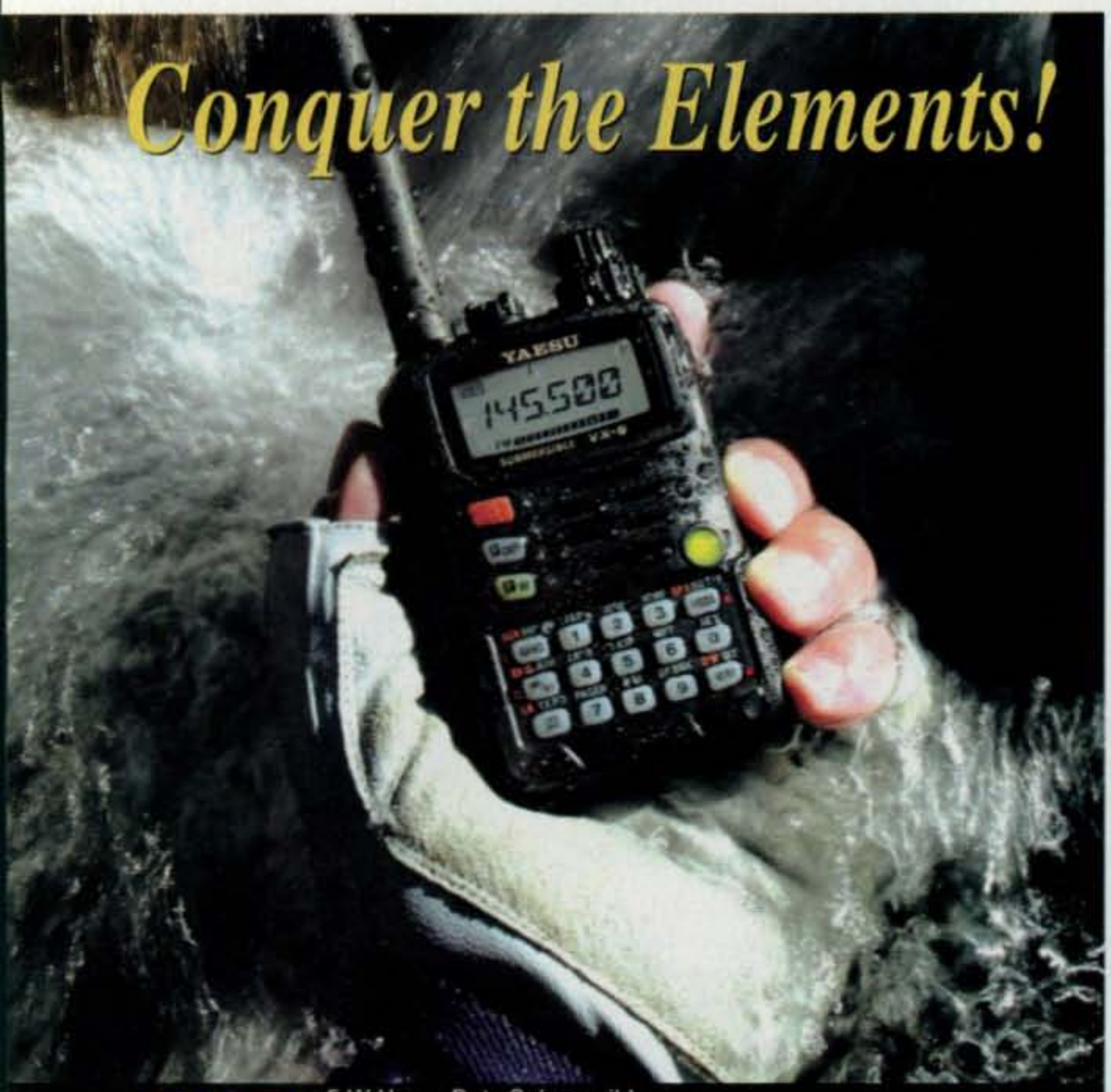
California Ham Helps in Sea Rescue

A Novice Class ham in California had an unconventional role in helping to facilitate the rescue at sea of a sailor attempting a solo trip around the world. The sailor, Ken Barnes, apparently did not have ham gear aboard his 44-foot ketch, which was foundering off the coast of Chile, and his satellite phone would only stay connected for 30 to 60 seconds at a time. According to Newsline and the *ARRL Letter,* Miguel "Mike" Morales, KC6CYK, heard about Barnes' predicament on local TV news and called Barnes' fiancé, offering to try to contact hams in Chile to see if they could help. Morales is a native of Chile and speaks fluent Spanish.

Morales was able to make contact on 10 meters with hams in Chile, who in turn got him in touch with Polar Pesca, a fishing company that had a trawler in the area. Guided by the Chilean Navy, the *Polar Pesca 1* was able to locate and rescue Barnes, while Morales kept his family in the U.S., as well as the U.S. Coast Guard, informed of progress. The City of Riverside, California, where Morales lives, announced plans to honor the ham for his role in the rescue.

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.

Conquer the Elements!



IPX7 Submersible 3 feet (1m) for 30 min.

5 W Heavy Duty Submersible
2 m/70 cm Dual Band FM Hand held (220 MHz: 1.5 W)
VX-6R

IPX7 Submersible 3 feet (1m) for 30 min.

6 m/2 m/70 cm Tri-Band

5 W Ultra-Rugged,
Submersible 6 m/2 m/70 cm
Tri-Band FM Hand held
VX-7R/VX-7RB
(220 MHz: 300 mW)

2 m / 70 cm Dual Band

5 W Heavy Duty
2 m/70 cm Dual Band
FM Hand held
FT-60R

2 m / 70 cm Dual Band

1.5 W Ultra Compact
2 m/70 cm Dual Band
FM Hand held
VX-2R

(8 key)

IPX7 Submersible 3 feet (1m) for 30 min.

(16 key)

5 W Heavy Duty Submersible
2 m FM Mono Band Hand Helds
VX-120 VX-127
2 m Mono Band
70 cm FM Mono Band Hand Helds
VX-170 VX-177
70 cm Mono Band

2 m Mono Band

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DUAL BAND

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Dual Band FM Mobile
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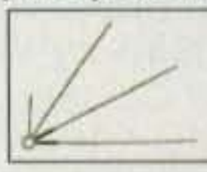

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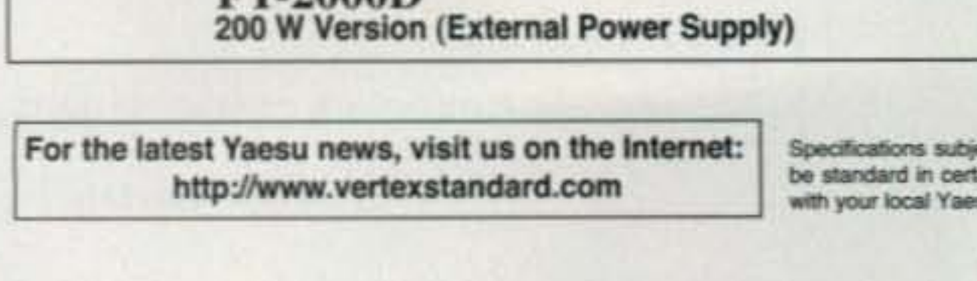

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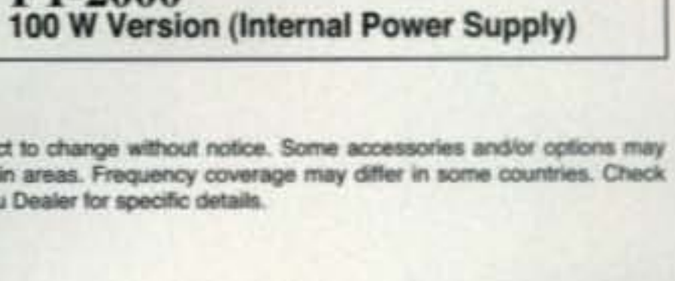

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announcements

Ham Radio Course via podcasting – John Martin, KF8KK, and Mike Dell, N7LMJ, both Extra Class hams with nearly 50 years combined experience in ham radio, have produced a podcast that teaches listeners what they need to know to get their Technician Class license. The Ham Radio Podclass podcast can be found at <http://www.hamradioclass.org>. To subscribe (for free) using Itunes or another podcast catching program, subscribe to <http://feeds.feedburner.com/hamradio>.

Virginia QSO Party – Sponsored by the Sterling Park ARC from 1800Z March 17 to 0200Z March 19. For details go to <www.qsl.net/sterling/VA_QSO_Party/QSOParty.htm>.

The following special event stations are scheduled for March:

W4BKM, from the 25th annual Cherry Blossom Festival, Macon, Georgia; Macon ARC; 1500–2200Z March 17 on phone 14.240, 145.370 MHz; CW 7.055, 10.110, 14.055 MHz. For certificate send QSL and 9×12 SASE to Macon ARC, P.O. Box 4862, Macon, GA 31208.

N7UW, from the highest elevation (7250 ft.) university in the U.S., Laramie, Wyoming; University ARC N7UW; 1500Z March 31 to 0100Z April 1 on 28.450, 21.350, 14.250, 7.250, 3.850 MHz. For QSL or certificate send SASE to University Amateur Radio Club, 1000 East University Ave., Dept. 3265, Laramie, WY 82071 <http://uwacadweb.uwyo.edu/UARC/>.

The following hamfests, etc., are slated for late February and March:

Feb. 24, **Orange, Texas Hamfest**, VFW Hall, Orange, Texas. Contact Sheila, N5HL, e-mail: <sheilapo@midcountypc. com> or Delores at <kc5neo@gt.rr.com>. (Talk-in 147.180; exams).

Mar. 4, **Bergen ARA Annual Auction**, Westwood Regional Jr/Sr High School, Washington Township, New Jersey. Contact Jim Joyce, K2ZO, e-mail: <k2zo@arrl.net>, 201-664-6725; <http://www.bara.org>. (Talk-in 146.19/79 PL 141.3)

Mar. 10–11, **Charlotte Hamfest & Computer Fair**, Charlotte Merchandise Mart, Charlotte, North Carolina. More more information, go to <www.w4bfb.org/hamfest.html>, or call 704-948-7373. ***See us at the CQ Booth.***

Mar. 10, **St. Patrick's Day Hamfest, ARRL West Texas Section Convention, & Texas VHF-FM Society Winter Meeting**, Midland Lions Club, Midland, Texas. Contact Joe Coldewey, KK5ZG, e-mail: <kk5zg@sbcglobal.net>, phone 432-697-7846; web: <http://hamfest.w5qgg.org>. (Talk-in 147.30+; exams Saturday 1 PM)

Mar. 17, **Charleston, WV Hamfest**, Coonskin Armory, Charleston, West Virginia. Contact Jim Damron, N8TMW, e-mail: <n8tmw@arrl.net>; <www.karc.wvhamradio.com>. (Exams 12:30 PM)

Mar. 18, **Contoocook Valley RC Hamfest**, Henniker Community School, Henniker, New Hampshire. Contact Jim McElroy, NS1E, 603-428-7436. (Talk-in 146.895 MHz W1CPL; exams 9 AM, preregistration requested, contact Al Bardwell, NS1O, 603-228-1407)

Mar. 31, **HAM-EX™ 2007 Hamfest**, Brampton Fall Fairgrounds, Brampton, Ontario, Canada. For more information go to <www.ham-ex.ca>, questions: <info@ham-ex.ca>. (Talk-in 145.430– 103.5 tone; 146.880– no tone)

Mar. 31, **Columbus ARC Hamfest**, Bartholomew County 4H Fairgrounds, Community Building, SW of Columbus, Indiana. Contact Marion Winterberg, WD9HTN, e-mail: <carc_in@-yahoo.com>, phone 812-342-4670. (Talk-in 146.790/146.190, PL 100.0; exams 11 AM, contact person Dave Wendt, KA9OOH, e-mail: <veteam@midstatehams. org>, phone 317-881-6531, walk-ins OK)

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our readers say

Weight Ratio and the Hitch-Mounted Box

The following letter was written to CQ Features Editor Gordon West, WB6NOA:

Dear Gordon,

We don't know each other, but your article in the November *CQ* on the hitch-mounted box (CQ Reviews: The Rola Adventure System Hitch-Mounted Box," p. 36) might mean we never will meet.

I live in Billings, Montana, where we get lots of snow, ice and wind. If that box is put on the back of your van where the axle is about 3 to 4 feet from the bumper, and the box is 2 feet from the bumper or so, you will have changed the weight ratio of the van. Dry pavement and slow driving might not matter much, but in ice, snow, windy conditons, gravel roads and such, a turn of the wheel will not produce the same effects as dry solid pavement without the box attached. You may never notice nor experience this problem, I hope you never do, but even extended vans have crashed because the weight behind the wheels made steering unstable,and winds have pushed vans off the road.

I'm not lecturing you on this, heavens to Betsy, you can see this for yourself, but you made no mention of it in your article. If you need proof, put the van on a scale without the box and hookups, then attach and fill the box. I have also seen tourists with a box such as this on both ends of their pickups. It seems to work just fine, but even so, there can be an overloading of the front wheels causing steering problems.

I love your articles. You make them so easy to read. Keep up the good work.

J. R. Maxwell

Frequency Chart Error?

Editor, *CQ*:

I may be amiss, but it appears the line on the bottom of the chart (December 2006 issue) for Novice Class current CW privileges should read 28,100–28,300 and the new CW privileges should read 28,000–28,300.

John Grout, KT4AD

W2VU replies:

While the 10-meter entry for Novices and Technicians (with code at the moment) may appear to be in error, it is not. Novices and Technicians are permitted to operate *only* CW and data between 28,000 and 28,300 kHz. However, they are also allowed to operate CW *as well as SSB voice* between 28,300 and 28,500 kHz. Therefore, a Novice or Technician may operate CW on 10 meters anywhere between 28,000 and 28,500 kHz. (The only amateur frequencies on which CW is not permitted are the five channels of the 60-meter band.) Since that part of the chart dealt only with CW privileges, it is correct. Thanks for reading closely, though!

Keep the Prop Charts

Editor, *CQ*:

Received my January *CQ* today (Hawaii is a little slow getting mail) and was extremely disappointed to see that the prop charts have been discontinued. They were my guidelines and the *primary* reason for subscribing to the magazine.

Tom Thornton, AH6ZZ

Editor, *CQ*:

My vote is for you to keep the propagation and short-skip charts. They are very well done and very useful to me. I would be inclined to drop my subscription without these articles, especially since I do not have a ham license yet and have much to learn!

Jim Meyer

W2VU replies:

Tom and Jim,

As you'll see in this month's "Propagation" column, NW7US has agreed to bring back his "Last -Minute Forecast" and offer guidance in using the master charts in *The NEW Shortwave Propagation Handbook*.

(Courtesy of NASA/Bill Ingalls)

Imagine if the head of America's space program was also a ham who loved CW contesting and building gear from scratch. ... Well, he is!

CQ Interviews:

NASA Administrator Michael Griffin, NR3A

BY BOB HOPKINS,* WB2UDC, AND RICH MOSESON,† W2VU

Building is a major priority these days at NASA, as the nation's space agency works on building new launch and crew vehicles to replace the shuttle fleet and to eventually return astronauts to the Moon . . . with plans to build a permanent base there. It should come as no surprise, since building things is in the blood of NASA Administrator Michael Griffin, and ham radio was responsible for much of his early building experiences. Today, he says, ham radio's ability to build bridges with the larger community is one of its greatest values to NASA, and he anticipates an ongoing, if informal, relationship between amateur radio and the manned space program.

Building on a relationship that Bob, WB2UDC, has developed over the past decade with Astronaut Don Thomas, KC5FVF[1], *CQ* recently had the opportunity to interview Griffin, who's been a ham since age 14 and holds Extra Class callsign NR3A. The interview was conducted by telephone by Bob and Rich, W2VU, from Bob's office at Cooper Union in New York City.

Despite his insisting that he's "just a regular guy" and that we call him Mike, Mike Griffin has a very impressive background, including a Ph.D. in aerospace engineering and five master's degrees (in aerospace science, applied physics, electrical engineering, civil engineering, and business administration) from five different universities. He is the recipient of various honors from NASA, the Department of Defense, and the American Institute of Aeronautics and Astronautics. Griffin is also a licensed Professional Engineer and a member of various engineering and aerospace societies. In addition to holding an Extra Class ham license, he is a certified flight instructor with instrument and multi-engine rating. Before becoming NASA Administrator in April 2005, Mike held top management positions in several private aerospace companies. He also worked previously at NASA, as Chief Engineer and Associate Administrator for Exploration, and as Deputy for Technology at the Strategic Defense Initiative Organization.

So far during his tenure at the helm of the nation's space agency, Griffin has presided over the return to flight of the shuttle fleet, and the ambitious initiative of returning to the Moon by 2020 and on from there to explore Mars. *CQ*'s

*e-mail: <bob@cooper.edu>
†Editor, CQ, e-mail <w2vu@cq-amateur-radio.com>

NASA Policy: Ham Radio on the International Space Station

Despite Mike Griffin's statement that ham radio is only a leisure-time activity for astronauts and that it is not part of NASA's official plans for space projects, there is an official NASA policy regarding amateur radio on the International Space Station:

International Space Station Reference Ham Radio

When astronauts, cosmonauts and mission specialists from many nations fly on the international space station, they will have amateur, or ham, radio as a constant companion.

Since its first flight in 1983, ham radio has flown on more than two-dozen space shuttle missions. Dozens of astronauts have used the Space Shuttle Amateur Radio Experiment, or SAREX, to talk to thousands of kids in school and to their families on Earth while they were in orbit. They have pioneered space radio experimentation, including television and text messaging as well as voice communication. The Russians have had a similar program for the cosmonauts aboard the Russian Space Station Mir. When U.S. astronauts were aboard Mir in preparation for the long duration missions of the international space station, they used amateur radio for communication, including emergency messaging while Mir was in distress.

As human space flight moves into a new uncharted era, an organization called ARISS, which stands for Amateur Radio on International Space Station, has been formed to design, build and operate equipment. In 1996, delegates from major national radio organizations and from AMSAT, which stands for the Radio Amateur Satellite Corporation, in eight nations involved with the international space station signed a Memorandum of Understanding to form ARISS.

NASA and the Russian space organization Energia have signed agreements that spell out the place of amateur radio on the station. A technical team, called ISS Ham, has been officially established to serve as the interface to support hardware development, crew training and on-orbit operations.

In the United States, the American Radio Relay League, which is also known as ARRL, and AMSAT provide leadership and consultation. They also donate and build hardware as well as making sure safety and qualification tests are successfully completed so the equipment can fly. The Russians have provided ports so that antennas can be mounted on the station's Zvezda Service Module—the space station unit that provides living quarters for the astronauts and cosmonauts. United States and Russian teams have trained the astronauts and cosmonauts to operate the equipment. The Italian team has designed and built antennas. The German team has built sophisticated repeater stations that will allow crews to make recorded reports on their daily activities and permit hams on Earth better contacts with men and women aboard the station.

The initial space station operations will be mostly voice and packet, a text messaging device. The first initial radio station was flown onboard the space shuttle Atlantis on STS-106. The crew transferred the ham radio gear into the space station for future use by the Expedition One crew.

More than 40 missions over five years will be required to assemble the international space station in orbit. The astronauts and cosmonauts will work hard on these missions, but they plan to take some time off for educational outreach contacts with schools. NASA's Division of Education is a major supporter of the amateur radio activity.

The sponsoring agencies have stated that they consider access to a ham radio system a requirement for psychological support of the crews, by providing family and general contacts for people who will be in space many weeks at a time.

As the international space station takes its place in the heavens, the amateur radio community is prepared to do its part by helping to enrich the experience of those visiting and living on the station.

Source: <http://spaceflight.nasa.gov/station/reference/radio/>

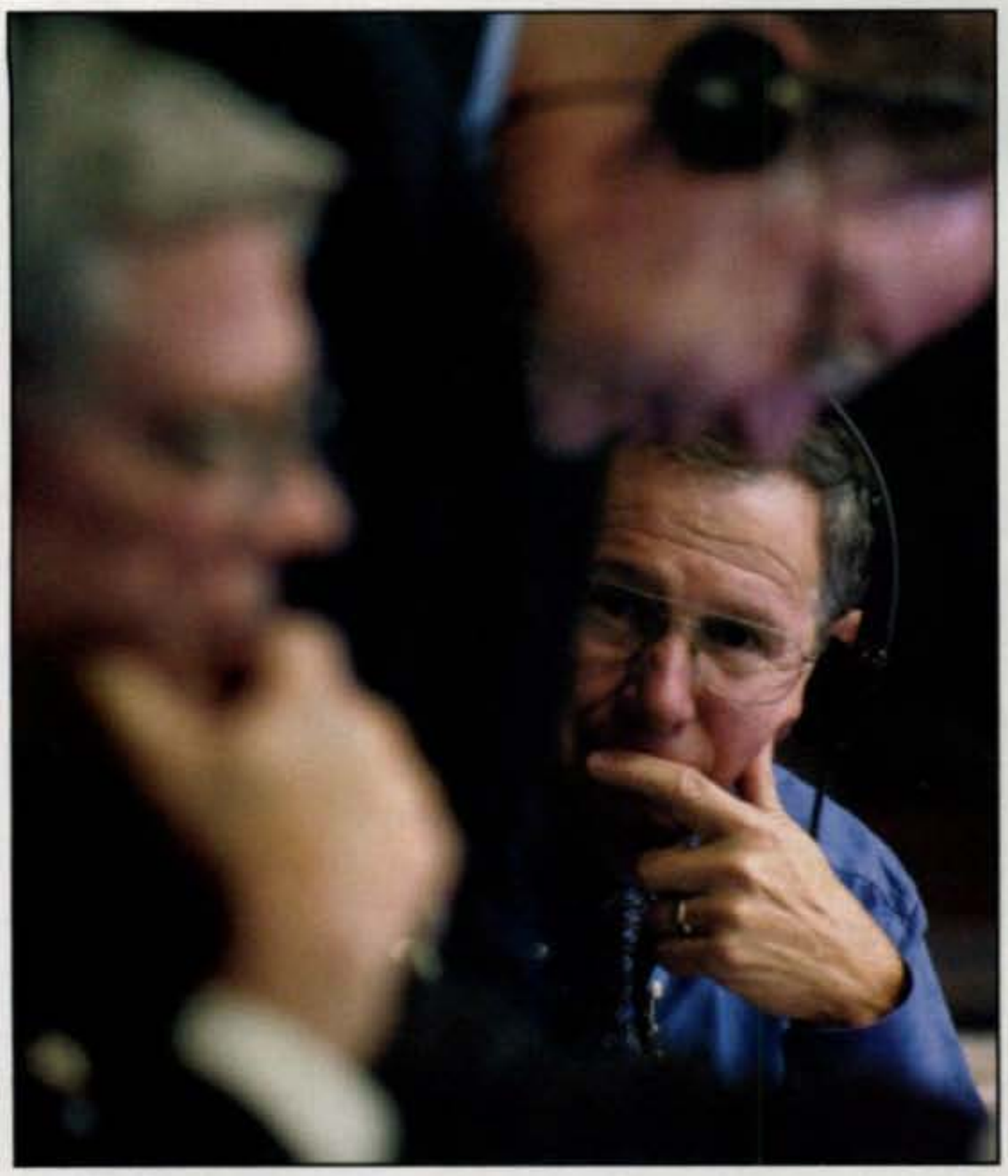
talk with Griffin focused on ham radio, of course, including discussion of the hobby's role in his own professional development and its current and future role in relation to NASA and the manned space program.

Starting Early

"I was always going to be an engineer," said Griffin, noting that "from the time I was as small as I can remember, I was interested in technical things. I mean, I was a little kid who was asking his parents for an Erector Set for Christmas, and building my own kites and bows and arrows by going out and cutting down appropriate-size branches. ... I was interested in the space program from when I was five or six—and that was before there *was* one! So I was a very geeky little kid. I guess I'm probably still a geeky adult."

As he grew, Mike got involved in Scouting, along with many other boys his age. "I got interested in the Radio Merit Badge," he recalled, "and started building my own radios out of junk com-

A hands-on Administrator, Mike Griffin (left) talks with STS-121 crew members (left to right) Michael E. Fossom and Steven W. Lindsey after the landing of the Space Shuttle Discovery last July. Associate Administrator Rex Geveden is at the right. (NASA photo by Bill Ingalls)



Wearing headphones comes naturally for NASA Administrator Mike Griffin, who tells CQ he loves CW and contesting, although he rarely has time to operate these days. In this photo he is listening in as other NASA officials discuss options for launching Space Shuttle Discovery last December after the planned launch was scrubbed due to bad weather. (NASA photo by Bill Ingalls)

ponents and things like that." Between the merit badge and the fact that at the time one needed to learn Morse code to advance to Second Class rank, Mike discovered ham radio and began the journey from Novice to Extra.

"About the time I was 13, I decided I would go on and get a license," he explained, adding that at his age, "that was pretty daunting, because I obviously didn't have a car. I had no money. I mean, my parents weren't wealthy by any means, so I had to scrounge components. I would try to find radios and other appliances that weren't working and I would mine them for their components. ... I would use them to make things, get circuit diagrams and make them." Mike noted that he was a vacuum-tube guy then, since the only transistors available "were low-power, low-frequency audio transistors such as the 2N107 and the 2N109 and the CK722, and transistors I don't think you can see on the market today, and most everything we did that was of any practical nature involved tube designs."

Griffin's ham radio journey included convincing his mother to take him along to Baltimore, where she was to attend a teacher's convention, so he could go to the FCC to take his General Class exam. "All of this had to be very carefully plotted. If you can remember back to when you were 14 and had no wheels, plus we lived in a small town about an hour's drive from Baltimore at the time. My mother was a teacher, and once a year they had in-service days where teachers would meet at a convention in Baltimore. And so ... I managed to correlate one of those days with a day they were giving examinations for General Class ticket. ... I got my mom to drive me, to let me take a day off from school ... and drive me into Baltimore so I could take my General Class exam."

Mike noted that his parents always supported his ham radio activities. "I never had any trouble persuading my parents. I didn't ask them for anything and they were happy to have me in the basement working on stuff as opposed to being out causing trouble."

Over time, the definition of an *active ham* changes with growing professional and family responsibilities. Some of us are lucky just to keep our licenses current. Mike is an example of this. "All throughout my high school period and college period, I was really pretty active in ham radio. I eventually ended up getting an Extra Class ticket, and I used to enjoy it a lot," he explained, adding that life has since gotten in the way of remaining active. "Ever since I left college, really, my involvement's been sporadic, although when I was at the Jet Propulsion Lab in the late '70s, I was president of the ham radio club there. JPL's club call is W6VIO. ... Over the decades since then, the most I've been able to fit in is find a club and participate in an occasional Field Day now and then, which I still enjoy. ... I've always loved CW operating and contests. I'm very competitive."

"A Feel for Reality"

When we asked Griffin whether ham radio had helped guide him toward his career as an aerospace engineer, he said no, but that it was still important. "It didn't point me along the path," he explained. "It was just one of the things that was on the path that I was on. I mean, I was never going to be anything else."

While Griffin's professional responsibilities have kept him from being as active as he'd like to be on the ham bands, the skills he learned as a ham have helped him in his career, starting early on. "I worked as a technician one summer when I was in college, at Aberdeen Proving Ground, at what was then called the Land Warfare Laboratory," he told us. "I spent the summer building and testing mine detectors for the engineers. This was during the Vietnam War and mine detection was a big thing. (My) ham radio background helped me get the job, because the guys knew that I would be able to build their hardware for them. ..."

As Mike's career path moved him from engineering into management and administration, he says those early ham skills have continued to be important. "When you spend your entire teenage years and young adulthood, year after year, building stuff, at least on the electronic end of things, it gave me a feel for reality that some design engineers never get a chance to get, because in the engineering world technicians are usually putting together your designs," Griffin explained.

He added that this was not limited to ham radio. "I'm a pilot. I'm a flight instructor, in fact. And you know, owning and flying my own plane, teaching people to fly, gives me a feeling for what the environment of flight is like, and that's very helpful in my job."

"Any time you can connect with reality in the areas that you have to manage, I think it's a good thing," said Griffin, adding, "the knowledge of having your own hands on stuff has stood me well for 40 years. I mean, you couldn't put a price on it."

Ham Radio and NASA

Hams have been involved with the space program since its beginning, and OSCAR-1, the first ham satellite, was also

Astronaut Bill McArthur, KC5ACR, has been one of the most active hams in space, making over 1800 contacts during his six months in orbit as Commander of International Space Station Expedition 12. (NASA photo)

the first non-governmental satellite ever orbited when it was launched in 1961. Ham radio's relationship with the manned space program goes back to 1983, when Owen Garriott, W5LFL, became the first astronaut to operate ham radio from orbit. In the nearly 25 years since then, ham radio has become a frequent, and then constant, companion on manned space missions, starting with a presence on occasional shuttle flights, and moving on to permanent installations on the Russian Mir space station and now the International Space Station (see sidebar, "NASA Policy: Ham Radio on the International Space Station").

Today, the ARISS (Amateur Radio on the International Space Station) program provides students at schools around the world the opportunity to talk with and ask questions of astronauts in orbit. In addition, those astronauts who are so inclined may also use the ISS ham station in their spare time to make random contacts with hams back on Earth. The most active ham in recent years was ISS Expedition 12 Commander Bill McArthur, KC5ACR, who made 38 school contacts and more than 1800 random ham contacts during his six months on the space station (McArthur is the first ham to contact all 50 states and more than 100 DXCC "entities," or countries, from space).

An additional, though less publicized, benefit to having a ham station aboard an orbiting outpost is its ability to function as a backup communications system should the primary systems fail. Twice in 1997, after a fire and then a collision aboard Mir, ham radio briefly became the primary communications medium. Just last fall, when a Russian Progress supply rocket was docking with the International Space Station and an antenna on the Progress that was supposed to retract didn't, controllers feared it might interfere with the docking and that the station—which had turned as part of the docking process—might lose contact with Earth via the Tracking and Data Relay Satellite (TDRS) system normally used for ISS communications. Amateurs in the little-known ISS Ham Radio Contingency Network were placed on standby in case backup was needed and were up and running within 15 minutes. We asked Griffin if he was even aware of that little detail, and his response showed how much he continues to be a hands-on administrator.

"Yeah, I was aware of that, of course," he said. "I was following that in real time, because the Progress antenna did get squashed, but everything turned out all

This unpiloted Progress supply vehicle prompted the first-ever activation of the little-known ISS Ham Contingency Network when an antenna failed to retract as it approached the International Space Station. Griffin said the hams' quick response was a great example of amateur radio public service, even though it turned out that their help was not needed. (NASA photo)

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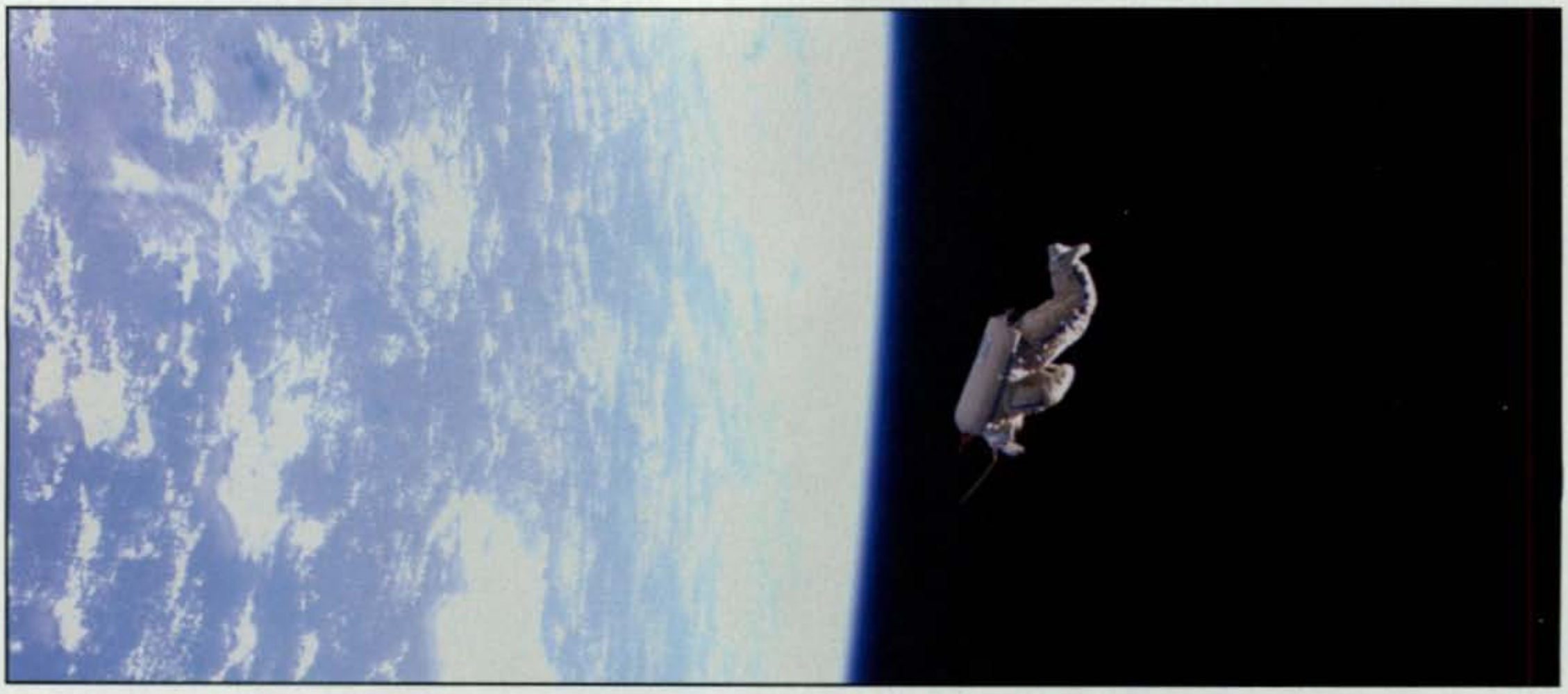

SuitSat, a surplus Russian spacesuit loaded with ham equipment and "launched" from the International Space Station in 2006, provided great news coverage of both NASA and amateur radio. However, NASA Administrator Mike Griffin, NR3A, says he'll only approve a second SuitSat "launch" if there are objectives from the first one that were not met. (NASA photo)

right there. But yeah, that was a great example of the public service aspect (of ham radio)."

Education and Outreach

Beyond providing a backup communications channel in an emergency, Griffin said ham radio's greatest value to NASA right now is as an ambassador between the agency and the public. "I think the main value is really ... education and outreach, into the community of like-minded technical people who may not be directly involved in the space program."

In addition, said Griffin, ARISS school contacts play another important role. "Anything at all that can be done in this country to encourage kids to study difficult subjects such as science, math, and engineering I think is a good thing, because we need that to compete in the world," he explained, noting that "ham radio is one of those things, and to the extent that NASA can help encourage it, I think that's great."

What about the future? Griffin was careful to point out that ham radio activity on space flights, while sanctioned by NASA, is not an official part of its program and astronauts are not required to become hams or use ham radio while in orbit. On the other hand, he suggested that it's not likely to go away anytime soon.

"This is a volunteer activity," he explained. "There's a ham radio station on the space station right now, and guys who want to do it have our encouragement ... and certainly that will continue under me, but by definition of the terms, amateur radio is a hobby for amateurs, and the guys get to do it in their spare time. I think it's terrific ... but it's not something I'm going to tell people to do or not to do. "

What about a possible ham station on a future Moon base, considering the fact that there is already an established base of hams on Earth who are already set up for moonbounce communication?

"Well you're way ahead of us," replied Griffin, "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.'" On the other hand, he wasn't quite ready to make any promises. "We're almost 15 years from that point," he noted, "so I'd say ... as Ernest and Julio Gallo used to say, 'We'll sell no wine before its time.'"

The only negative note sounded by Griffin about future ham projects had to do with the proposed "SuitSat-2," in which a surplus spacesuit crammed full of radio gear would be hand-launched from the ISS to operate until its orbit decayed and it re-entered the atmosphere. The first "SuitSat" was launched last year and was heard by many hams, although signals were weaker than expected and many other hams missed the opportunity. It also provided both ham radio and NASA with a lot of positive publicity.

"To be honest with you, I don't know if we need to redo that experiment," said Griffin, explaining, "we are pretty busy and whatever we do costs a lot in terms of time and money, so we would not do it again unless there were objectives that weren't met." So it looks like the ARISS folks working on plans for a second SuitSat will have a good deal of persuading to do in order to get NASA approval for the project, although Griffin did admit, "It was a cool experiment."

Finally, the obvious question: When he was active during college, did this ham whose career revolves around space and spaceflight ever operate any of the ham satellites? "No, I never did," said NR3A. "I knew a lot of guys who did, and I still know a couple, but for one reason or another that just wasn't something in which I was most interested. You know, it's a big hobby with a lot of room for different kinds of interests."

For Mike Griffin, that interest—today, as it was when he first got into ham radio—still centers on building. In an e-mail after our interview, WB2UDC mentioned how much he enjoyed building and using a QRP (low power) transceiver kit, and Griffin responded, "(I)f I ever again have any free time, I think I'd like to build something from scratch, rather than with a kit.—Mike" ■

Note

1. See "The Nine-Minute QSO," in the March 2003 issue of *CQ*.

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MFJ-5124I, $19.95, *ICOM*. Supports IC-706, 707, 718, 725, 728, 736, 746, 756, 765, 775, others that support AH-3 or AH-4.

MFJ-5124A, $19.95, *ALINCO*. Supports DX-70, DX-77 and others.

MFJ-5124K, $59.95, *KENWOOD*. Supports TS-50S, 450S, 570S, 690S, 850S, 870S, 2000 and others that support AT-300.

MFJ-5124Y, $59.95, *YAESU*. Supports FT-100D, FT-857, FT-897, others.

MFJ-5124Y2, $59.95, *YAESU* FT-847.

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Results of the 2006 CQ WW WPX CW Contest

BY STEVE MERCHANT,* K6AW

We are approaching the 50th anniversary of the CQ WPX Contest. May 2006 was the 48th running of the CW contest. While it is obvious to everyone that conditions are down, enthusiasm for this event continues to grow. We saw another 5-percent increase in logs received for the CW section. Last year the world top Single Operator All Band (SOAB) honors went to Hrane, YT1AD, operating as 3V7A.

Single Op, All Band CU2A in the Azores, operated by Pertti, OH2PM.

DX

3V7A (YT1AD) took the top SOAB spot as mentioned above, followed by EG8FAS (Valery, RD3AF op). In third place was the familiar callsign P40W, operated by John, W2GD. Fourth place was taken by Ken, K6LA, as VY2TT, and PJ2T was fifth, this time operated by Jim, WI9WI. Sixth place was taken by a low power entry from CN2WW (Patrick, F6IRF op), and seventh went to Dick, WC1M. In eighth place was Vlad, UN9LW, operating UP0L. Pertti, OH2PM, was number nine operating CU2A, and Alex, LZ4AX, finished up the top ten from KC3R.

The 10 meter category was won again this year by Juan, LU1HF, from his 10-meter superstation in Argentina. He had a comfortable 1-million point margin over the number two entry from Richard, K5NA. Third place was won by Pavel, OK1MU, operating TA2ZAF, while the low power entry from L55D (Carlos, LW1EXU op) and Victor, UA4RC as RC4Q, took fourth and fifth place, respectively.

The 15-meter single-band scores showed mostly European winners: Mate, 9A4M, had a big score for first place win as 9A1V, and Nikola, 9A5W, was not far behind in second. Third place went to Carol, N2MM, followed very closely by Bob, UT1IA, as EO1I. Fifth place was taken by Ken, K1UM.

On 20 meters the winner was Vaho, 4L8A. There was a very close battle for second place with John, N2NC operating N2RM, narrowly defeating Ranko, YT6A, who operated as 4O3T. The race for fourth and fifth was tight as well, with Milan, YU1ZZ operating YZ0Z, just beating Andrius, LY2TA, who was on as LY7Z.

The 40-meter competition was clearly won by John, KK9A operating P40A, with a commanding lead over second place Laurent, FM5BH. Third place was won by TM7XX, operated by Lee, F5MUX, and the fourth spot went to Paolo, YV1DIG operating YW4D. Fifth place went to Faisal, 9K2RR operating 9K2HN.

The first three places in the 80-meter competition were closely contested by YU1BV operating 4N1A, followed by Thomas, DL4MCF, narrowly edging out Emil, T99W, in third. Zoran, 4N2K, was in fourth place. Darko, YZ1KA, was fifth operating from YT8T. The 160-meter honors went to Kaz, SP2FAX, operating SN2B and edging out Arunas, LY2IJ, and Giulio, IV3RLB. Raimo, OH2BCI, was fourth and Al, EU1AZ, took fifth.

The world low power SOAB winner was Patrick, F6IRF operating CN2WW. Second place went to IH9N (Martin, OL5Y op), and third was Andy, AE6Y operating from P49Y. Fourth was Yuri, VE3DZ as VC3T, and Nikolai, UN3M, took fifth place. Ed, N1UR, was in the sixth spot as NV1N. Eric, K9GY, took seventh as C6AYM; LY9A (Gedas, LY3BA op) was eighth; Igor, UA4FER, was in ninth place; and Rimas, LY2BM operating LY6A, was tenth.

The low power 10-meter category was won by Carlos, LW1EXU operating L55D, followed by Alex, UA3QG, in second place and Ed, KN4Y, was third. Sany, RA3XO, was fourth, and Yuri, UA4LCQ/9, was fifth. The 15-meter low power race was again tight, with Yuri, UA9AFS just edging out Alex, RA6YY. Yuri, T93C, was third; Leonard, WB4TDH, was fourth; and Dick, K9OM, was fifth. The 20-meter low power competition was won by Boban, YZ1AU operating YZ2A. Second place went to Ove, SM0PSO at SF0F. Third place went to Zoltan, HG4F, and fourth was Andy, RA9KM. Vlad, VE3JM, was in fifth place. The 40-meter low power winner was Peter, HA8DU, with Al, WP3C, second and Con, ZA/DF4SA, third. Goran, YT7AW, took fourth place as 4N0W, and Yuri, DJ6BQ, was fifth. Eighty meters was won by Jan, OK1QM, with Nesa, YU2M, in second and Savi, LZ1UK as LZ9X third. Jan, LA9HW, took fourth place, and Ladi, OL6T, was fifth. The 160-meter low power category was won by Vitas, LY2OU, with Anatoly, US9PA, in second place. Leonid, UX5NQ, was third; Adam, SP5JTF, was fourth as SP5KEH; and fifth was Andrzej, SP6GCU.

The Tribander-Single Element category was won by P40W, operated by John, W2GD. Martin, OL5Y, was second with a fine low power score from IH9N, and Yuri, VE3DZ, was third as VC3T, also low power. Jorge, CX6VM, took fourth place, and Eugene, RU9CK, was fifth. Boyan, LZ8A, was sixth, YU1AU took seventh place as YZ9A; Charlie, NF4A, was eighth; Bernd, VK2IA, was ninth operating VK6AA; and Joel, KG6DX, was number ten. The 15-meter winner in the TS category was Alex, RA6YY, a low power entry. twenty meters was won by Vlad, VE3JM; with Alexey, VE2XAA, in second; and Icko, JA1BPA's station operated by SWLer JA6-9330 third—all three finishers running low power. On 40 meters Sergey, UA1ANA, was first, Edwin, F/G3SQX, was second, and Takao, JA2PFO, third, again all low power. On 80 meters Nico, PA0MIR won again (low power). Sinisa, YU1RA, won the 160-meter top spot, followed by Roberto, IK0EIE (both low power).

The Rookie category winner last year was Mike, AB3CX, followed by a low power entry from Juris, YL3GFT, and Kanichi, AB2RF/6, in third place. RU9CD took fourth and Mike, CT1IUA, was in fifth with a low power entry.

Single Op Assisted was decisively won by Jack, RW3QC operating 5B/NN3AA, followed by RG9A (Yuri, UA9AM op.). Jiri, OK1RI, was

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

USA TOP SCORES

SINGLE OPERATOR ALL BAND

WC1M		8,518,054
KC3R (LZ4AX)		8,058,600
NY4A (N4AF)		7,819,686
K4ZW		6,766,872
NN5J (N5DX)		6,492,946
NN3L (N3RS)		6,248,718
AA3B		5,933,952
WW4R		5,371,465
K3ZO		5,325,120
WK1Q (K1MK)		5,032,720
NT5C (N3BB)		5,025,367
KM7W (N6MJ)		4,950,750
WE4OJ (N4GI)		4,397,013
NN8UU (N8VW)		3,906,810
*NV1N (N1UR)		3,843,783
NF4A		3,694,704
W3ABT (K5MA)		3,324,564
WT4M (N6ZO)		3,164,577
W5WMU		3,060,909
WN1GIV(N4BP)		2,676,576

28 MHz

K5NA		315,228
*KN4Y		91,298

21 MHz

N2MM		1,369,485
K1UM		1,238,775
*WB4TDH		500,187
*K9OM		416,860
K2AAW		358,200

14 MHz

N2NC (@N2RM)		5,418,630
NQ4I (VE7ZO)		3,871,790
W7WA		3,565,967
NA4K (@K4BP)		3,232,525
NI6W (W4EF @W6BCQ)		2,022,741
WM6A (K6TA)		1,152,735
W9WI		991,185
NG9T (K8IR)		886,305
KØFX		855,120
W4NZ		769,896

7 MHz

WE3C		2,468,039
K9NW		1,771,266
KT5J (K5OT@K5NA)		1,547,520
W2/T98T		1,472,895
N3CZ (@K4SV)		1,445,108
K6NA		1,263,093
N2GC		1,121,835
NJ4U (K4EA)		862,242
*NK2F		213,900
KY2J (W2XL)		206,910

3.5 MHz

W3BGN		222,681
KU1CW		148,874
*NE5D (K5RX)		33,222

1.8 MHz

*NT1E (K3BU)		2,030

LOW POWER ALL BAND

NV1N (N1UR)		3,843,783
K9QVB		2,522,536
WR7HE (K7QQ)		2,392,137
WK2G		2,362,920
W1AF (NF1R)		2,207,348
N4OGW		2,173,216
WO4O		2,137,905
WD4AHZ		1,899,728
W4TAA		1,726,075
WD5K		1,719,260
NT2A		1,508,801
W4PM		1,377,392
KV8Q		1,137,992
N7WA		1,065,180
W2TZ		1,020,675
AA4FU		926,440
K4IE		899,294
AE1T		796,630
WO3Z		761,904
N7ZG		710,640

28 MHz

KN4Y		91,298

21 MHz

WB4TDH		500,187
K9OM		416,860
W9ILY		66,038

14 MHz

N2GM		744,144
NT2Y		633,955
N2WN		467,390
K3MQ		385,187
KR2AA		287,624
W8IQ		225,875
W3FAF		224,800
KØCAT (K9WIE)		185,420
W2DX		76,320
NØGOS		59,262

7 MHz

NK2F		213,900
K5WAF		161,007
KN7T		71,162
AA7FK		61,924
N1IW		44,620

3.5 MHz

NE5D (K5RX)		33,222

1.8 MHz

NT1E (K3BU)		2,030

TRIBANDER SINGLE ELEMENT

NF4A	A	3,694,704
WN1GIV (N4BP)	A	2,676,576
N3UM	A	2,250,144
K4PV	A	2,176,020
*WD4AHZ	A	1,899,728
*WD5K	A	1,719,260
*NT2A	A	1,508,801
W1CU	A	1,407,431
AD4EB	A	1,342,839
WØBH	A	1,266,345
NØKE	A	1,188,066
K4BAI	A	1,177,660
*KV8Q	A	1,137,992
W9IL	A	1,065,900
W6TK	A	1,062,734
W4BQF	A	1,056,090
*K4IE	A	899,294
K4DJ	A	888,888
K2LE	A	816,442
*AE1T	A	796,630
*N4NX	A	690,202
W6RKC	14	301,248
*KØCAT (K9WIE)	14	185,420
NT6K	14	184,536
*KØCOP	14	18,392
N2GC	7	1,121,835

ROOKIE

AB3CX	A	1,203,248
AB2RF/6	A	691,336
NB3O (K3TM)	A	359,260
*KA4H	A	260,848
*AG9U	A	42,875
*K3MQ	14	385,187

QRP/P

WA4PGM	A	801,940
N7IR	A	537,168
N1TM	A	397,826
W4QO	A	371,904
NQ5D	A	311,170
W5KDJ	A	249,686
WA8REI	A	249,066
K2TA	A	240,384
K9CS	A	208,128
WA8WV	A	189,442
WA6FGV	21	36,720
KR2Q	21	34,224
NU4B	14	191,919
NZ5A	14	57,585
KRØI	14	50,024
NØLY	7	63,560
AA2U	7	60,270
N2JNZ	7	45,453
W1CVE	7	45,368
NE6M	7	22,528

SINGLE OP ASSISTED

N3KS	A	5,961,584
K3WW	A	5,888,442
NU5F (K5YA)	A	4,707,620
K3MD	A	3,726,268
WN9O (W9IU)	A	3,574,692
WO8CC (N8BJQ)	A	3,116,568
NO2R	A	2,521,054
NF6A (K6XX)	A	2,359,868
AB2E	A	2,150,842
WW5X (@K5TT)	A	2,066,008
KF6T	A	1,763,258
KD2HE	A	1,747,499
AJ3G	A	1,662,645
KTØR	A	1,587,510
K6RIM	A	1,274,400
*NP3D	A	1,063,503
*N4BAA	A	943,412
N6QQ	A	787,397
*WF4W	A	725,373
N5JR	A	703,192
K7RL (K7RL)	14	1,937,628
WA3AAN	14	671,255
W2IRT	14	406,269
N3GJ	14	403,520
AA4VV	7	229,200

MULTI-OP SINGLE TRANSMITTER

NR4M	7,249,473
KT3Y	7,000,664
NK7U	5,783,352
W4SAA	4,726,652
N4CW	1,496,358
NE3MD	1,044,993

MULTI-OP TWO TRANSMITTER

KD4D	15,763,712
NZ1U	12,861,342
WR3Z	7,238,023
WX5S	5,878,531
N4WW	5,567,380
WX3B	2,142,224

MULTI-OP MULTI-TRANSMITTER

KM3T	17,666,300
NX5M	8,171,222
NR6O	2,178,036
KC2NMZ	1,045,330

*Low Power

The antenna farm at NK7U, Multi-Single from eastern Oregon.

third; Kamal, N3KS, was fourth; and Chas, K3WW, was fifth. On 15 meters Sasa, 9A3NM, won operating 9A35Y. On 20 meters Janos, HA4A, had a nice score for first place. The 40-meter top spot in SO(A) went to Alex, YO9HP operating YR9P. Milos, 4O2A, won 80 meters, and Istvan, HA3MY operating HG3M, was again the 160-meter winner.

The top QRP spot was again taken by TI5N, this year operated by Bill, W8QZA. He was followed by Kaz, JK3GAD operating OT6A, for second place. Stefan, OM7DX, was third, with Antonin at OK7CM fourth, and Kyle, WA4PGM, fifth. UR5ZQV was in the top 10-meter spot. Sergey, DL9ZP, was the winner on 15 meters. Anatoly, EU8RZ, won 20 meters, and Milan, OK2BYW, was again the 40-meter champion. Arturas, LY2GW, was the winner on 80 meters, and Jonas, LY5A, once again won 160 meters.

USA

There was not much spread between the top ten scorers in the SOAB category. Dick, WC1M, did a nice job winning the top SOAB USA spot. He was followed by Alex, LZ4AX

TROPHY WINNERS AND DONORS

SINGLE OPERATOR, ALL BAND

WORLD: Steve Bolia, N8BJQ. **Won by: 3V7A operated by Dr. Hrane Milosevic, YT1AD.**
USA: Dennis Motschenbacher, K7BV. **Won by: Richard Green, WC1M.**
EUROPE: Ivo Pezer, 5B4ADA/9A3A. **Won by: CU2A operated by Pertti Simovaara, OH2PM.**
OCEANIA: Tom Morton, K6CT. **Won by: KH6WT operated by Louis Cohen, K1YR.**
CANADA: Radio Amateurs of Canada (RAC). **Won by: VY2TT operated by Kenneth Widelitz, K6LA.**
JAPAN: The DX Family Foundation. **Won by: Masaki Masa Okano, M.D., JH4UYB.**
WORLD LOW POWER: Caribbean Contesting Consortium. **Won by: CN2WW operated by Patrick Destrem, F6IRF.**
CANADA LOW POWER: Contest Club Ontario. **Won by: VC3T operated by Yuri Onipko, VE3DZ.**
USA LOW POWER: Terry Zivney, N4TZ. **Won by: NV1N operated by Edward Sawyer, N1UR.**
USA ZONE 3 HIGH POWER: Jim Pratt, N6IG. **Won by: KM7W operated by Daniel Craig, N6MJ.**
USA ZONE 4 HIGH POWER: Society of Midwest Contesters. **Won by: NN5J operated by Kevin Stockton, N5DX.**
USA ZONE 4 LOW POWER: Society of Midwest Contesters. **Won by: John Meyer, K9QVB.**

SINGLE OPERATOR, SINGLE BAND

WORLD 7 MHz: William D. Johnson, KVØQ. **Won by: P40A operated by John Bayne, KK9A.**
WORLD 3.5 MHz: Lance Johnson Digital Graphics. **Won by: 4N1A operated by YU1BV.**
USA: Kansas City DX Club. **Won by: John Golomb, N2NC @ N2RM (14 MHz).**
USA 28 MHz: Bernie Welch, W8IMZ Memorial. **Won by: Richard King, K5NA.**
USA 21 MHz: Wayne Carroll, W4MPY. **Won by: Carol Richards, N2MM.**

MULTI-OPERATOR, SINGLE TRANSMITTER

WORLD: Ron Blake, N4KE. **Won by: 7W2OM operated by 7XØRY, OM3BH, OM3GI, OM3NA, OM3RM.**
ASIA: W2MIG Memorial (NT4TT Sponsor). **Won by: 5B/KIØBP operated by KIØBP, 5B8AD, UA6AA.**
USA ZONE 4: Society of Midwest Contesters. **Won by: WC8VOA operated by W8ND, W8CDA, W8FEJ, KC8ZGW, K8FB, N8JK, KB8ZYE, N8CHS, K8MCN.**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Steve Merchant, K6AW. **Won by: LZ9W operated by LZ2CJ, LZ2UZ, LZ1PM, LZ1ZD, LZ2FV, LZ1UQ, LZ2PO, LZ4UU, LZ1ANA, LZ2UU, LZ2HM, LZ3FM, LZ3FN, LZ5VK, LZ3UM.**

CONTEST EXPEDITION

WORLD: Steve Bolia, N8BJQ. **Won by: ZA/DF4SA operated by Cornelius Paul, DF4SA.**

COMBINED SSB/CW
Single Operator, All Band

WORLD: Al Slater, G3FXB Memorial. **Won by: VC3L operated by Ron Vander Kraats, VE3AT.**

CLUB (SSB & CW)

WORLD: *CQ* magazine. **Won by: Bavarian Contest Club.**

2006 CQ WW WPX SSB Contest Errata

The following were left out of the SSB results line scores. We apologize for the omission.

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.

SINGLE OP ASSISTED
UNITED STATES

N6QQ	A	1,300,728	1049	572
KB4ET	*	215,213	382	250
AD6WL	*	183,708	410	243
NW4V	*	102,850	236	187
W4CU	*	94,507	211	161
W6SZG	*	11,256	61	56

DX

YR9P	**A**	**3,885,310**	**2051**	**845**
DH0GU	*	699,696	744	451
JF2SKV	*	688,554	776	369
YC3MM	**A**	**409,752**	**485**	**271**
DM5JBN	*	212,948	381	278
DL8AAM	*	189	9	9
PY5TJ	**28**	**6,519**	**59**	**53**

MULT-SINGLE
UNITED STATES

KM9P	**7,292,880**	**2905**	**1008**	**#1 US**
WT4M	4,528,080	2126	912	#3 US
KD2HE	**2,822,910**	**1688**	**730**	

NORTH AMERICA

VE3MIS	1,399,560	921	535	

OCEANIA

YE1ZAT	**3,255,592**	**1600**	**664**	**#1 YB**
VK4XES	41,496	131	114	

ASIA

TC3A	**7,826,625**	**2760**	**773**	**#3AS**
HZ1F	**S5,809,984**	**2461**	**736**	**#4AS**
RZ9WXK	622,812	530	284	
8J1S	278,074	706	257	

EUROPE

J43P	**4,109,126**	**2931**	**841**	
DAØCA	3,642,030	2030	846	
OT6P	**2,959,870**	**1619**	**757**	
PI4TUE	**2,695,531**	**1604**	**719**	
RL4W	2,377,830	1795	670	
UT4IYZ	876,744	985	492	
EE1D	841,680	870	501	
SP9HZR	446,720	577	349	
8SØC/5	440,817	524	381	
RK4HYT	341,295	523	305	
OR6N	188,568	339	243	
DQØA	122,202	299	219	
LN1T	28,245	124	105	
RW6AWW	21,402	107	87	
OK5SWL	4,559	50	47	

MULTI-TWO
EUROPE

EM7J	**10,471,188**	**4246**	**1118**	**#1EU**

ASIA

EKØB	**9,928,604**	**3133**	**854**	**#1 AS**

NORTH AMERICA

VE7SV	**9,315,492**	**3336**	**906**	**#5 NA**

MULTI-MULTI
SOUTH AMERICA

YW4M	**27,076,209**	**6235**	**1227**	**#1 WRLD**

OCEANIA

YE2O	**2,444,532**	**1444**	**521**	**#1 OC**

CONTINENTAL LEADERS

AFRICA

1.8	No Entry	
3.5	No Entry	
7	*CT3KN	1,639,644
14	*CT3EE	463,252
21	*ZS4U	123,024
28	No Entry	
AB	3V7A	15,207,075

ASIA

1.8	JE1SPY	88
3.5	RX9WR	398,720
7	9K2HN	4,541,970
14	4L8A	6,083,910
21	JH7XMO	983,040
28	TA2ZAF	219,895
AB	UPØL	8,315,160

EUROPE

1.8	SN2B	323,140
3.5	4N1A	905,622
7	TM7XX	4,829,660
14	4O3T	5,313,554
21	9A1V	2,012,800
28	RC4Q	124,320
AB	CU2A	8,153,512

NORTH AMERICA

1.8	*NT1E	2,030
3.5	W3BGN	222,681
7	FM5BH	5,179,932
14	N2NC	5,418,630
21	N2MM	1,369,485
28	K5NA	315,228
AB	VY2TT	10,314,612

OCEANIA

1.8	YCØLOW	14
3.5	No Entry	
7	KH6ND/KH5	3,230,688
14	*VK4BUI	283,529
21	No Entry	
28	*KH6RZ	65,072
AB	KH6WT	6,319,701

SOUTH AMERICA

1.8	No Entry	
3.5	No Entry	
7	P4ØA	6,506,368
14	PY3AU	40,926
21	*YV7QP	155,400
28	LU1HF	1,235,584
AB	P4ØW	11,189,328

MULTI-OP SINGLE TRANSMITTER

AF	7W2OM	19,164,355
AS	5B/KIØBP	13,762,224
EU	OE4A	10,839,220
NA	ZF1A	14,278,796
OC	ZM1A	4,334,014
SA	PS2T	14,279,652

MULTI-OP TWO TRANSMITTER

AF	EA8PP	19,211,164
AS	JA3YBK	10,388,106
EU	9A7A	17,274,276
NA	KD4D	15,763,712
OC	ZL6QH	12,000,720
SA	No Entry	

MULTI-OP MULTI-TRANSMITTER

AF	No Entry	
AS	No Entry	
EU	LZ9W	21,066,864
NA	KM3T	17,666,300
OC	No Entry	
SA	No Entry	

**Low Power*

operating from KC3R, in second, and Howie, N4AF operating NY4A, in third place. Ken, K4ZW, was fourth; Kevin, N5DX, was fifth from NN5J; Sig, N3RS, was sixth as NN3L; and Bud, AA3B, was seventh. WW4R (Don, N4ZZ op) was eighth, and Mike, K1MK, took ninth place as WK1Q. The number ten spot this time went to Jim, N3BB, operating as NT5C.

Richard, K5NA, was the 10-meter champ. On 15 meters Carol, N2MM, got by second place winner Ken, K1UM. Edib, K2AAW, was third, Jay, KT5E, was fourth, and Mike, KC7V, took fifth place. Twenty meters was again dominated by John, N2NC, operating from the N2RM multi-op station, with Jim, VE7ZO, operating NQ4I in second place. Dan, W7WA, was third this time; Bob, N4BP, was fourth operating NA4K; and Mike, W4EF, was fifth operating from W6BCQ's station as NI6W. On 40 meters the winners were John, WE3C, first; Mike, K9NW, second; Larry, K5OT, from K5NA as KT5J in third; W2/T98T fourth; and Vlad, N3CZ, fifth, operating from K4SV. The 80-meter winner again this time was Steve, W3BGN, and Alex, KU1CW, was second.

Dave, K1ZZ, operated Single Op, All Band in the contest.

Ed, N1UR, again captured the U.S. SOAB low power title as NV1N; followed by John, K9QVB, in second; with Rex, K7QQ, operating as WR7HE third; Merrill, WK2G, in fourth; and fifth place going to Clayton, NF1R operating W1AF. Ed, KN4Y, was the 10-meter U.S. winner. Fifteen meters was won by Leonard, WB4TDH; with Dick, K9OM, second; and John, W9ILY in third. Gheorghe, N2GM, had the top 20-meter low power entry, followed by Eugene, NT2Y, and Julius, N2WN. Forty meters was won by Rudy, N2WQ operating as NK2F, with Bill, K5WAF, second. Jim, NE5D, was the winner on 80 meters, and Yuri, K3BU, won 160 meters operating as NT1E.

Charlie, NF4A, won the U.S. T/S category; followed by WN1GIV (Bob, N4BP op) in second; Ben, N3UM, third; Jim, K4PV, fourth; and Jon, W1CU, fifth. Ron, WD4AHZ, was the top low power winner in the T/S category. Mike, AB3CX, won the Rookie top spot, with Kanichi, AB2RF/6, in second place.

Single Op Assisted top honors went to Kamal, N3KS, who this time narrowly beat out Chas, K3WW, who took second place. NU5F (Dennis, K5YA, op) took third; followed by John, K3MD; Don, W9IU, operating as WN9O; and WPX Chairman Emeritus Steve, N8BJQ, operating as WO8CC. Mitch, K7RL, had the top 20-meter score, as did Tom, AA4VV, on 40 meters.

The USA QRP winners were Kyle, WA4PGM, in first place (and fifth world); with Gary, N7IR, second; followed by Tom, N1TM; Jim, W4QO; and Lonnie, NQ5D. Single band winners were Ron, WA6FGV, and Doug, KR2Q, on 15 meters; Larry, NU4B, and Bob, NZ5A, on 20 meters; and Jonas, NØLY, on 40.

Multi-Ops

The multi-Single category was won this time by 7W2OM. PS2T was second, ZF1A was third, and 5B/KIØBP was fourth. OE4A scored fifth, with OM7M in sixth place and UU7J seventh. TM2Y was eighth place,

HG1S ninth, and AN6IB took the tenth spot.

NR4M won the top USA Multi-Single spot. Close behind in second place was KT3Y. Third place was claimed by NK7U. Fourth went to W4SAA, and in fifth place was N4CW.

The Multi-Two category was won by EA8PP. JA3YBK was second, 9A7A barely took third place over DR1A, and EI7M took fifth place.

KD4D won the top USA Multi-Two award. Second place went to NZ1U. Third place was claimed by WR3Z. Fourth went to WX5S, and in fifth place was N4WW.

LZ9W was the winner of the Multi-Multi category. Second place went to KM3T. Third spot went to LY9A. DQ2006M was fourth, and OM4F was fifth.

In the U.S., KM3T easily took first place in the Multi-Multi category. Second place went to NX5M, followed by NR6O in third, and KC2NMZ fourth.

The Rest of the Story

E-mail log submissions are required to be sent in Cabrillo format. Refer to the WPX website (http://www.cqwpx.com) for detailed instructions. Please do not rely on your logging program to get the Cabrillo header filled out correctly, especially if you are entering one of the two categories that require a Category Overlay line in the header. If you make any changes to your Cabrillo file, please use a simple text editor such as Notepad, not a word processor.

Special thanks go to the many operators who travel to remote locations all over the world so the rest of us have interesting and exciting prefixes to work. Also thanks to the many operators who arrange for special prefixes solely for use in this contest.

Thanks to WT4I for his log-checking software, and to EA3DU and OH5DX for help in handling logs from their respective countries. Many thanks also to members of the CQWW Contest Committee for helping with various log-handling issues in local languages. Thanks as well to N5KO and his robots; they are a huge help in the log-checking process.

We check the entire contest exchange, including serial numbers. If we receive a log without sent or received serial numbers it will reclassified a Check Log. If you encounter problems with serial numbers in your log, please take up the matter with your logging

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

3V7A (YT1AD)	15,207,075
EG8FAS (RD3AF)	13,194,712
P4ØW (W2GD)	11,189,328
VY2TT (K6LA)	10,314,612
PJ2T (WI9WI)	8,968,869
*CN2WW (F6IRF)	8,628,444
WC1M	8,518,054
UPØL (UN9LW)	8,315,160
CU2A (OH2PM)	8,153,512
KC3R (LZ4AX)	8,058,600
*IH9N (OL5Y)	8,041,632
VC3J (VE3EJ)	7,977,030
VC3L (VE3AT)	7,976,320
NY4A (N4AF)	7,819,686
CT/OK1RF	6,796,962
K4ZW	6,766,872
JH4UYB	6,673,986
S58A	6,620,276
VE3EY	6,507,252
NN5J (N5DX)	6,492,946

28 MHz

LU1HF	1,235,584
K5NA	315,228
TA2ZAF (OK1MU)	219,895
*L55D (LW1EXU)	134,334
RC4Q (UA4RC)	124,320
*UA3QG	110,121
*KN4Y	91,298
4X1VF	85,342
*RA3XO	84,727
*UA4LCQ/9	77,440

21 MHz

9A1V (9A4M)	2,012,800
9A5W	1,698,386
N2MM	1,369,485
EO1I (UT1IA)	1,298,052
K1UM	1,238,775
9A5BM	1,132,977
JH7XMO	983,040
VR2BG	947,139
UN2E	683,085
LZ5W (LZ1MC)	617,841

14 MHz

4L8A	6,083,910
N2NC (@N2RM)	5,418,630
4O3T (YT6A)	5,313,554
YZØZ (YU1ZZ)	4,659,068
LY7Z (LY2TA)	4,133,697
G3TXF	4,087,520
NQ4I (VE7ZO)	3,871,790
YTØA (YZ1BX)	3,804,128
W7WA	3,565,967
4L2M	3,456,297
JH3AIU	3,425,240

7 MHz

P4ØA (KK9A)	6,506,368
FM5BH	5,179,932
TM7XX (F5MUX)	4,829,660
YW4D (YV1DIG)	4,635,168
9K2HN (9K2RR)	4,541,970
ZC4LI	4,329,216
S5ØA	4,298,432
IY4W (IK4ZGO)	4,167,072
4N2W (YU1LA)	3,813,045
KH6ND/KH5	3,230,688

3.5 MHz

4N1A (YU1BV)	905,622
DL4MCF	895,323
T99W	859,570
4N2K	804,531
YT8T (YZ1KA)	721,992
LY8O	684,450
SN8F (SP8FHK)	571,098
*OK1QM	539,805
*YU2M	535,444
SP6A	527,782

1.8 MHz

SN2B (SP2FAX)	323,140
LY2IJ	299,980
IV3RLB	209,760
OH2BCI	177,287
EU1AZ	166,581
ES5QX	151,085
OH4MDY	142,329
EU3AR	127,314
*LY2OU	117,660
RK3XWO	97,552

LOW POWER ALL BAND

CN2WW (F6IRF)	8,628,444
IH9N (OL5Y)	8,041,632
P49Y (AE6Y)	5,590,900
VC3T (VE3DZ)	5,025,120
UN3M	3,889,760
NV1N (N1UR)	3,843,783
C6AYM (K9GY)	3,571,780
LY9A (LY3BA)	3,539,336
UA4FER	3,115,983
LY6A (LY2BM)	2,849,656
E21EIC	2,697,843
K9QVB	2,522,536
EA7TN (EA1AK)	2,452,046
S52OP	2,442,615
WR7HE (K7QQ)	2,392,137
LY9Y (LY2CY)	2,383,760
WK2G	2,362,920
YO3APJ	2,321,433
W1AF (NF1R)	2,207,348
EA8MQ	2,177,585

28 MHz

L55D (LW1EXU)	134,334
UA3QG	110,121
KN4Y	91,298
RA3XO	84,727
UA4LCQ/9	77,440
RW6ATJ	75,164
UA6AK	71,004
KH6RZ	65,072
PY2MTV	45,900

21 MHz

UA9AFS	577,291
RA6YY	557,512
T93C	515,871
WB4TDH	500,187
K9OM	416,860
JF3BFS	371,961
OK2N (OK2NN)	289,224
UA3AO	266,198
RW9DX	226,566
HA3GE	215,172

14 MHz

YZ2A (YZ1AU)	2,483,505
SFØF (SMØPSO)	2,134,928
HG4F	1,813,020
RA9KM	1,522,416
VE3JM	1,494,692
YL5W	1,448,793
LA3S (LA3BO)	1,430,832
UN6LN	1,264,640
UXØZX	1,065,038
RX3BP	1,023,238

7 MHz

HA8DU	3,071,844
WP3C	2,807,112
ZA/DF4SA	2,504,916
4NØW (YT7AW)	2,421,698
DJ6BQ	1,937,403
CT3KN	1,639,644
S57J	1,478,144
SP4TKR	1,218,606
UX1UX	1,150,047
DL7BY	1,061,004

3.5 MHz

OK1QM	539,805
YU2M	535,444
LZ9X (LZ1UK)	479,556
LA9HW	427,938
OL6T	407,991
SM5MX	307,390
OK2TRN	300,174
SN5J (SP5JXK)	275,724
DL9CW	269,416
OK1WF	267,732

1.8 MHz

LY2OU	117,660
US9PA	88,375
UX5NQ	82,422
SP5KEH (SP5JTF)	82,303
SP6GCU	81,008
OMØTT	74,880
YZ8A	73,710
OM4JD	56,800
OK1JOK	49,446
OL4W (OK1IF)	42,240

TRIBANDER SINGLE ELEMENT

P4ØW (W2GD)	A	11,189,328
*IH9N (OL5Y)	A	8,041,632
*VC3T (VE3DZ)	A	5,025,120
CX6VM	A	4,661,154
RU9CK	A	4,603,560
LZ8A	A	4,548,239
YZ9A (YU1AU)	A	4,107,279
NF4A	A	3,694,704
VK6AA (VK2IA)	A	3,233,572
KG6DX	A	2,879,992
IN3QBR (K7QB)	A	2,716,350
*E21EIC	A	2,697,843
WN1GIV (N4BP)	A	2,676,576
*EA7TN (EA1AK)	A	2,452,046
UA9CMQ	A	2,342,278
HA3LI	A	2,328,944
*YO3APJ	A	2,321,433
N3UM	A	2,250,144
RA3UT	A	2,208,598
DL7ANR	A	2,183,436
*RA6YY	21	557,512
OH3BU	21	251,514
JR1NHD	21	75,932
*VE3JM	14	1,494,692
*VE2XAA	14	945,514
*JA1BPA (JA6-9330)	14	699,732
JA9CWJ	14	694,278
W6RKC	14	301,248
VK6DXI	7	1,638,524
N2GC	7	1,121,835
*UA1ANA	7	516,792
*F/G3SQX	7	161,837
*JA2PFO	7	107,308
4N2K	3.5	804,531
IK2AOO	3.5	326,488
RA6CZ	3.5	90,037
*PAØMIR	3.5	82,280
EU1AZ	1.8	166,581
*YU1RA	1.8	23,218
SA5D	1.8	22,932

ROOKIE

AB3CX	A	1,203,248
*YL3GFT	A	1,056,729
AB2RF/6	A	691,336
*RU9CD	A	681,688
*CT1IUA	A	562,485
NB3O (K3TM)	A	359,260
*KA4H	A	260,848
*UA3QGT	A	219,501
*UA4CRH	A	215,496
*DB7MA	A	140,833
*EA2BOV	21	147,987
*K3MQ	14	385,187
*IZ8FAV	14	257,936
*RW3QF	14	104,420
*EA3EU	7	65,565
*RA3YAO	1.8	2,812

QRP/p

TI5N (W8QZA)	A	1,259,452
OT6A (JK3GAD)	A	1,193,030
OM7DX	A	1,112,412
OK7CM	A	1,029,860
WA4PGM	A	801,940
EA1FAQ	A	800,976
SM6EQO	A	774,525
JA1MCU	A	769,920
SP2DNI	A	685,795
VA3DF	A	675,904
UR5ZQV	28	6,032
DL9ZP	21	191,706
CT1AOZ	21	104,856
ES1CR	21	49,725
RA3XEV	21	49,050
WA6FGV	21	36,720
EU8RZ	14	925,704
YO5KIP	14	601,200
HA6IAM	14	433,600
RWØAJ	14	431,024
UN7CN	14	331,785
UA6LCJ	14	297,894
OK2BYW	7	520,086
UU2CW	7	461,720
F5UL	7	285,930
ON4BHP	7	131,040
SP4TBM	7	119,002
LY2GW	3.5	251,075
YU1AFI	3.5	176,054
OZ7BQ	3.5	103,045
HG6EU (HA6VA)	3.5	63,550
UR5LAM	3.5	50,688

SINGLE OP ASSISTED

5B/NN3AA (RW3QC)	A	12,500,501
RG9A (UA9AM)	A	8,323,500
OK1RI	A	6,099,968
N3KS	A	5,961,584
K3WW	A	5,888,442
LX7I (DL4SDW)	A	5,129,678
UW8M (UR5MID)	A	4,930,794
OR2M (ON4IA)	A	4,923,886
S53O	A	4,860,000
NU5F (K5YA)	A	4,707,620
S57DX	A	4,571,640
DK3GI	A	3,972,960
TM3C (F6IFY)	A	3,909,218
K3MD	A	3,726,268
SV8CS (SV3SJ)	A	3,709,089
WN9O (W9IU)	A	3,574,692
OQ5M (ON5ZO)	A	3,459,410
RN3QO	A	3,188,856
WO8CC (N8BJQ)	A	3,116,568
SM6CNN	A	2,775,932
*9A2U (9A3ZA)	28	37,050
*PY2XC	28	21,060
9A35Y (9A3NM)	21	1,748,345
LY4XX	21	548,580
*UN4PG	21	324,900
I1NVU	21	283,200
HA4A	14	4,244,581
UT7I (UT2IO)	14	4,136,796
EO3Q	14	3,910,923
S59ABC (S51DS)	14	2,873,494
SN5M (SP5UAF)	14	2,830,506
OK7M (OK1DIG)	14	2,535,702
K7RL	14	1,937,628
UA4LU	14	1,907,666
LA6FJA	14	984,924
WA3AAN	14	671,255
YR9P (YO9HP)	7	1,708,091
S5ØU	7	962,136
*ES5RY	7	734,240
*DL6UAA	7	668,152
*IZ1HIV	7	611,625
4O2A	3.5	710,447
IZ1GAR	3.5	428,800
*F6FJE	3.5	235,538
DL4FAY	3.5	216,106
HG3M (HA3MY)	1.8	191,760
S57M	1.8	166,988

MULTI-OP SINGLE TRANSMITTER

7W2OM	19,164,355
PS2T	14,279,652
ZF1A	14,278,796
5B/KIØBP	13,762,224
OE4A	10,839,220
OM7M	9,745,552
TM2Y	9,073,701
UU7J	8,914,620
AN6IB	8,263,430
HG1S	8,077,980
VA7OO	7,758,315
OE2S	7,623,802
LR2F	7,383,903
TM4Q	7,149,554
UA3R	7,123,801
OLØW	6,673,248
TC3A	6,599,502
OH6XX	6,343,074
P41S	6,291,360
RF3A	6,228,705

MULTI-OP TWO TRANSMITTER

EA8PP	19,211,164
JA3YBK	10,388,106
9A7A	17,274,276
DR1A	17,096,352
EI7M	14,168,448
OF6AA	13,293,320
YR7M	10,145,162
SQ6Z	7,461,390
ES1A	7,050,330
DR2ØØ6B	6,289,136

MULTI-OP MULTI-TRANSMITTER

LZ9W	21,066,864
LY7A	12,190,152
DQ2ØØ6M	12,055,956
OM4F	11,172,410
OHØV	8,859,779

Low Power

Number two in the U.S. Multi-Single KT3Y, operated by Phil, KT3Y (pictured) and CQ WW Contest Director Bob, K3EST.

program author. With close to 5000 logs to process each year it's not possible for us to fix everyone's log.

The biggest thank you must go to Steve Bolia, N8BJQ, for his endless energy and enthusiasm.

The 2007 CQ WW WPX CW Contest will be held on May 26 and 27. Please plan to participate. Rules can be found both on the CQ website (www.cq-amateur-radio. com) and the WPX website (http://www.cqwpx.com). Again, logs are requested to be submitted by e-mail in Cabrillo format. Send CW logs to <cw@cqwpx.com>. 73, Steve, K6AW

QRM

Very nice contest. Managed to take part in it after almost 10 years. Was just testing my new antennas at University of Novi. CU next year for sure . . . **4NØW**. Nice contest. Expected more from the 40m propagation . . . **4N2W**. This year we chose to take part as Multi Single and this is because we are getting older—hi. The condx were rather normal with no special openings to JA or W. We are too far up north for this . . . **7S2E**. Had a blast from sunny Nassau Bahamas. First time single op low power from DX location . . . **C6AYM**. My first QRP entry in a contest and enjoyed very much. Many thanks to all of you for all the reports. Conditions were very good on 21 MHz. Great QSOs. Tks agn, but it is very hard to get through in a pile-up . . . **CT1AOZ**. Hi all CW fans. My second WPX and again low-end score (proudly, better than my first). I did low power operating in many stages with around 10 hrs in total. So it's hard work to claim a QRQ and to hold it within a QRO contest community . . . **DD1IM**. Conditions on 15 meters were not too bad. Unfortunately, my participation time was very limited this year . . . **DJ6XB**. We were invited to a wedding in southern Bavaria over the contest weekend, so I took my IC-706MKIIG, an antenna tuner, and some wire along and used the little spare time we had to join the WPX fun! . . . **DL5XL**. The contest was nice. Sunday afternoon I lost my dipole for 80/40m by heavy winds, so used my vertical Gap . . . **DL7UMK**. Good fun, but maybe some further effort could be put into the timely completion of the pre-contest tasks, like fixing the rotor of the beam. I'd like to thank all the QSO partners. Let's do it again! . . . **DM1TT**. In memory of our friend Antonio (EA7NK/EA1NK), who passed away on 18/1/2006. Together we did many contests . . . **EA7GV**. Thanks to the organizers for this great contest. I have been very happy. The propagation was not very good but there was much participation. Thanks to all the OMs that I have been able to contact . . . **EA8MQ**. It was a real fun on 10m with 5 watts QRP operation . . . **EW6BN**. Great weekend. Long live CW . . . **FM5BH**. Very much enjoyed contest. Band condx excellent; 20m seemed to be open all over the weekend. Nil from VK or ZL and not very much activity from SA or the Caribbean. Lots of QSB at times. Also a lot of AF weak signals this year. My best score ever with QRP . . . **G3LHJ**. Had fun with my mundane G3 prefix. Hard going on the higher bands with nothing even heard on 10m. Still, I managed by best-ever score in WPX anyway! . . . **G3VQO**. Conditions varied. It was a pity there was no sporadic-*E* on 10m during the contest. The previous two weeks had plenty of *Es*! Some interesting DX to be had elsewhere, but most of the stuff was European and not too inspiring. Collapsed into bed on Saturday . . . **G3YMC**. Great contest again. Nice to see low static levels on LF. Some really wide CW signals. Some appeared intentionally noise-modulated to keep others away from the frequency! 10m really quiet as expected, but 40/20 just great . . . **G5W**. Good condx this year. Enjoyable contest, good activity. Thanks for Qs . . . **HA2MN**. First test with my balcony antenna, 2x 3 meters of wire. Wow! . . . **HB9CSM**. My first experience with this contest. Sure next year! . . . **IT9RZU**. Only 6 months licensed. I'm also Rookie . . . **IZ1HIV**. This year the propagation on 20m was pretty good over the North Pole. Both Europe and North America were open most of the time . . . **JA1BPA**. I entered on single-op 160m low power. The conditions between the USA and JA were very bad. I could not hear the USA stations and I could QSO with only one DX, UAØDC. Recently we Japanease hams have received very heavy the over horizon ladder from China . . . **JE1SPY**. Operating from our sailboat "Belladonna" on Lake Ontario or various ports in VE3. Always great fun (mixed with other pleasures of life). As my XYL tells me: "There's more to life than sailing." Right on! . . . **K2NV/VE3**. This was my first WPX. I was in Alaska this summer as a campground host. Elecraft K-2 and a vertical worked OK. Must be the salt water of Cook Inlet 20 yards away! 19 hours of sunlight helped keep the RY battery charged with the solar panels! . . . **KB7Q/WL7**. Great signal reports, but no multitudes calling. Guess no one needs Palmyra on CW . . . **KH6ND/KH5**. It has been long time since I operated this contest in SOAB cate-

gory. It was fun to compete with my Lima Alfa contest club college . . . **LA8AJA (operating from LN3Z).** Used a short trip to LX to set up a makeshift dipole deep down in the bottom of a very beautiful valley. Worked out nicely, except that I had to QRT Saturday afternoon to return home. . . . **LX/OE3GEA**. I planned the contest for months, but the weekend was based on Murphy's Law. At the end I had 10 hours with a 20m dipole running QRP. Special thanks to YW4D, who took the time to get an exchange and who was a new one for me. CU next year! . . . **MMØDWF**. Wow. Propagation from Finland in WPX CW can't get much better. 20 meters was open 48 hours and on Sunday even 15 meters re-opened later to States. On 15m we could run JAs till very late afternoon on Saturday. Propagation was excellent for most of the weekend . . . **OF6AA**. Thrilled to work the Japanese on 15 meters. Long time since I did this the last time in a contest. Brings back memories of the 1980s when I had just entered the art of radio. . . **OH3BU**. Good condx on 14 MHz all days. I worked EU, AS, AF, NA, SA, OC continents. See you again, friends . . . **OK2SWD**. Special prefix OM50KKF is 50 year-old Radioclub . . . **OM50KKF**. Very nice time spent with CW friends! Propagation was good and lots of stations on the air! It was good preparation for the next Field Day . . . **ON5SV**. Another fun WPX contest and an enjoyable dinner afterwards with the other P4 operators . . . **P40A**. Terrific condx, a pleasant surprise . . . **P40W (W2GD)**. Assuming 80m would be my start I was not focused on starting right from the beginning. Also I had not checked propagation forecasts so started at 0130Z on 80m and got a shock to notice 20m was wide open to the West Coast when I wanted to switch to 40m . . . **PA3ARM**. Warm up for WRTC 2006. Looking for propagation and trying to have ears prepared . . . **PY2NY**. With such a call it was really fun! . . . **R3R**. Very nice propagation on 15m. I have only magnetic loop antenna and QRP station. Thank you for the interesting test. All the best and I hope to meet you next year . . . **RA3XEV**. For my age and my physical condition 36 hours is way too much! So 24 hour contests would be just fine . . . **S51J**. Nice test. This time only on 20m band with vertical antenna and 5W. Thanks to all who answered my weak sigs . . . **S56C**. Very nice conditions and opening to JA and U.S., better than expected. Just a limited effort to Saturday daytime (abt 11 hours) due to some other commitments later . . . **S57AW**. Super condition. Low level noise on all bands in first 36 hr of contest. SO2R operation mostly in "dualing mode" . . . **S58A**. Thanks to SM2HWG for letting me use his station. Also big thanks to his wife Cindy for the great service through the contest . . . **SJ2W**. Had the opportunity to make a partial entry. Got astonished by finding the bands so alive. Where are the poor conds everyone is talking of? . . . **SM3/EA8CN**. Condx were bad as is expected at the bottom of the cycle and my score was down 26% from last year. But there were still a lot of exciting moments, like working ZA/DF4SA on 40 meters

SSB & CW COMBINED CLUB SCORES

BAVARIAN CONTEST CLUB	**187,690,396**
POTOMAC VALLEY RADIO CLUB	**151,360,923**
NORTHERN CALIFORNIA CONTEST CLUB	131,856,142
CONTEST CLUB ONTARIO	111,885,169
YANKEE CLIPPER CONTEST CLUB	97,468,657
FRANKFORD RADIO CLUB	91,266,864
CONTEST CLUB FINLAND	88,358,450
FLORIDA CONTEST GROUP	72,776,392
ARAUCARIA DX GROUP	70,165,051
RHEIN RUHR DX ASSOCIATION	63,181,044
RUSSIAN CONTEST CLUB	60,263,209
UKRAINIAN CONTEST CLUB	54,383,849
WORLD WIDE YOUNG CONTESTERS	53,646,006
SOUTHERN CALIFORNIA CONTEST CLUB	48,156,048
SLOVENIA CONTEST CLUB	45,902,748
SOCIETY OF MIDWEST CONTESTERS	45,859,399
KAUNAS UNIVERSITY OF TECHNOLOGY RADIO CLUB	43,185,790
URAL CONTEST GROUP	39,337,922
SOUTH EAST CONTEST CLUB	37,259,613
YU CONTEST CLUB	35,171,830
CROATIAN CONTEST CLUB	32,632,500
CENTRAL TEXAS DX & CONTEST CLUB	32,478,864
CRIMEAN CONTEST CLUB	31,901,193
LATVIAN CONTEST CLUB	31,899,597
TENNESSEE CONTEST GROUP	27,236,003
HA DX CLUB	26,476,095
AUSTRIAN CONTEST CLUB	26,391,583
MAD RIVER RADIO CLUB	26,302,506
WESTERN WASHINGTON DX CLUB	25,673,184
EAST COAST CANADA CONTEST CLUB	24,479,302
EAST COAST CANADA CONTEST CLUB	24,479,302
SP DX CLUB	23,617,175
SOUTHWEST OHIO DX ASSN	22,279,205
LES NOUVELLES DX	22,124,971
BRITISH COLUMBIA DX CLUB	21,998,762
LITHUANIAN CONTEST GROUP	19,604,187
SUCC	18,145,189
CHILTERN DX CLUB	17,314,964
VK CONTEST CLUB	16,881,221
WILLAMETTE VALLEY DX CLUB	15,077,746
TIKIRRIKI CONTEST CLUB	15,024,912
TUPY DX GROUP	14,857,518
CT RI CONTEST GROUP	13,675,721
NORTH TEXAS CONTEST CLUB	12,704,568
MARITIME CONTEST CLUB	12,515,508
GUARA DX GROUP	11,963,462
SKY CONTEST CLUB	11,388,775
LU CONTEST GROUP	11,366,917
ATCC	11,353,124
VRHNIKA CONTESTERS	10,596,551
TOP OF EUROPE CONTESTERS	10,519,516
ORENBURG CONTEST CLUB	10,228,825
MARCONI CONTEST CLUB	9,213,856
NORTH COAST CONTESTERS	9,150,239
FOX CONTEST CLUB	8,508,737
BASHKORTOSTAN DX CLUB	8,319,962
Z30M CONTEST TEAM	7,536,200
LOW LAND CRAZY CONTESTERS	7,431,875
MINNESOTA WIRELESS ASSOCIATION	7,408,008
WINDBIRD CONTEST CLUB	7,312,122
DXXE	6,838,410
BANAT DX GROUP	6,450,900
ALBERTA CLIPPERS	6,194,977
LYNX DX GROUP	5,815,146
CONTEST GROUP DU QUEBEC	5,727,362
UDMURTIA	5,683,812
GRAND MESA CONTESTERS	5,377,706
UIRAPURU DX GROUP	5,176,667
OKDXF	4,871,159
EMPIRE CONTEST CLUB	4,832,715
EMPIRE CONTEST CLUB	4,832,715
HUDSON VALLEY CONTESTERS AND DXERS	4,706,080
TARTU CONTEST TEAM	4,566,052
CAROLINA DX ASSOCIATION	4,562,446
SOUTH URAL CONTEST CLUB	4,463,671
SP CONTEST CLUB	4,366,325
YAMAL RADIOCLUB	3,926,621
KANSAS CITY DX CLUB	3,879,027
KIEV CONTEST GROUP	3,718,797
SRR	3,639,510
KRS	3,617,541
SIAM DX GROUP	3,544,101
BOSNIA AND HERZEGOVINA CONTEST CLUB	3,496,649
CENTRAL SIBERIA DX CLUB	3,473,396
ORDER OF BOILED OWLS OF NEW YORK	3,153,513
UTAH DX ASSOCIATION	3,127,506
MOSCOW CONTEST CLUB	2,973,277
CENTRAL ARIZONA DX ASSOCIATION	2,951,804
RADIO CLUB "VOLOGDA" (RCV)	2,899,667
IVANOVO DX CLUB	2,689,878
ROCHESTER (NY) DX ASSN	2,424,323
ALRS SAINT PETERSBURG	2,284,250
UYC	1,818,137
SASKATCHEWAN CONTEST CLUB	1,782,724
MOTHER LODE DX/CONTEST CLUB	1,740,760
UA2 CONTEST CLUB	1,667,162
TEXAS DX SOCIETY	1,565,227
IZHEVSK RADIO CLUB	1,528,524
NORTHERN ILLINOIS DX ASSOCIATION	1,520,252
SHAKHAN CONTEST CLUB	1,306,214
KENTUCKY CONTEST GROUP	1,286,768
FOC	1,237,138
SERPUKHOV RADIO CLUB	1,202,916
CONTEST CLUB KRASNODARSKOGO KRAYA	1,194,383
OREL	1,017,049
BERGEN ARA	907,692
LKK	850,660
YO-DX-CLUB	803,599
LEIA CONTEST CLUB	784,704
LOW COUNTRY CONTEST CLUB	772,070
KEMEROVO RADIO CLUB	771,253
NOVIOMAGUM DX CLUB	770,065
WEST PARK RADIOPS	754,856
ALMETEVSK RADIO CLUB	568,368
MOSCOW RADIO CLUB	553,708
PODOLSK RADIO CLUB	447,482
OKLAHOMA DX ASSN	442,829
DANISH DX GROUP	425,578
SPOKANE DX ASSOCIATION	352,398
TEMIRTAU CONTEST CLUB	351,933
YOSHKAR-OLA DX CLUB	323,188
VLADIMIR RADIO CLUB	277,481
DX FAMILY CLUB	237,011
ISTRITA BUZAU	226,508
ORARI	212,462
RTTYCJ	212,163
BELARUS CONTEST CLUB	183,219
RU-QRP CLUB	171,134
YAROSLAVL RADIO CLUB	132,498
BFRR	132,449
GACW	116,430
HEARTLAND DX ASSOCIATION	99,612
METRO DX CLUB	88,354
RADIO CLUB DUBROVNIK -9A1BHI	525

CQ WW WPX CW CONTEST
ALL-TIME RECORDS

The contest is held each year on the last full weekend of May. The All-Time Records are updated and published annually. Data shown below is: callsign, year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS
Single Operator

1.8	IH9/OL5Y('98)	341,068	182
3.5	TAØ/Z33F ('02)	1,452,522	348
7.0	LU1IV('97)	7,671,456	702
14	4L8A('06)	6,083,910	870
21	ZX5J('05)	7,061,000	920
28	ZX5J('02)	6,787,440	857
AB	D4B('04)	16,619,000	1000

Multi-Operator Single Transmitter

P49V('01)		19,760,774	1034

Multi-Operator Two Transmitters

HC8N('03)		54,697,072	1189

Multi-Operator Multi-Transmitter

HC8N('99)		54,697,072	1264

U.S.A. RECORD HOLDERS
Single Operator

1.8	K1ZM('95)	40,446	107
3.5	K1ZM('93)	406,080	288
7.0	KG1D('05)	3,594,822	651
14	N2NC('06)	5,418,630	915
21	NU5A('99)	4,411,299	789
28	WW4M('01)	2,547,046	674
AB	AK1W('05)	8,650,704	916

Multi-Operator Single Transmitter

KM9P('01)		10,691,724	964

Multi-Operator Two Transmitters

KM4M('04)		16,283,745	1095

Multi-Operator Multi-Transmitter

KM3T('01)		21,103,320	1110

CLUB RECORD
Northern Calif. Contest Club('02).....253,543,497

WPX (Prefix) RECORD
HC8N('01).....1299

QRP/p RECORD
P4ØW('97).....4,018,208

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	IH9/OL5Y('98)	341,068	182
3.5	EA8/OH2KI('96)	1,358,852	347
7.0	IG9B('04)	5,187,819	613
14	EA9LZ('98)	5,708,498	758
21	5X1Z('01)	6,362,352	782
28	ZS4TX('01)	4,602,028	722
AB	D4B('04)	16,619,000	1000

ASIA

1.8	4X4NJ('96)	259,420	170
3.5	TAØ/Z33F('02)	1,452,552	348
7.0	9K2HN('06)	4,541,970	606
14	4L8A('06)	6,083,910	870
21	A45XR('99)	6,557,697	843
28	HZ1AB('02)	3,669,994	659
AB	P3A('01)	10,723,620	870

EUROPE

1.8	SN2B('06)	323,140	302
3.5	S57AW('04)	1,333,014	489
7.0	TM7XX('06)	4,829,660	757
14	4O3T('06)	5,313,554	986
21	9HØA('02)	5,389,008	933
28	9HØA('01)	3,965,315	841
AB	CU2A('06)	8,153,512	964

NORTH AMERICA

1.8	VA1A('99)	103,680	120
3.5	FM5BH('97)	833,490	315
7.0	V26BA('97)	6,227,550	659
14	N2NC('06)	5,418,630	915
21	ZF1A('99)	5,330,129	799
28	FM5GU('01)	2,849,769	621
AB	WP2Z('99)	12,506,280	890

OCEANIA

1.8	KX6DC('88)	12,240	45
3.5	KH6ND('05)	476,928	207
7.0	ZM1A('98)	5,144,480	592
14	KH6ND('03)	4,126,690	730
21	KH6ND('99)	6,107,256	813
28	KH6ND('00)	1,523,008	424
AB	KH6ND('02)	7,996,774	862

SOUTH AMERICA

1.8	YV1OB('86)	11,550	35
3.5	YX3A('89)	1,004,060	305
7.0	LU1IV('97)	7,671,456	702
14	YW1A('91)	4,617,456	732
21	ZX5J('05)	7,061,000	920
28	ZX5J('02)	6,787,440	857
AB	P4ØW('94)	14,168,115	845

MULTI-OPERATOR SINGLE TRANSMITTER

AF	7W2OM('06)	19,164,355	1039
AS	P3A('02)	18,176,342	1046
EU	9A7A('01)	10,915,020	1044
NA	8P4A('02)	18,516,960	1056
OC	AH2R('01)	11,541,420	957
SA	P49V('01)	19,760,744	1034

MULTI-OPERATOR TWO TRANSMITTERS

AF	EG8FAS('05)	27,959,740	1115
AS	RT9W ('03)	12,006,568	872
EU	RU1A('05)	14,648,208	1128
NA	KM4M('04)	16,283,745	1095
OC	ZL6QH('05)	13,312,768	952
SA	HC8N ('03)	30,928,268	1187

MULTI-OPERATOR MULTI-TRANSMITTER

AF	6V6U('97)	9,938,896	758
AS	A61AJ('02)	42,766,232	1244
EU	4OØA('00)	20,932,902	1143
NA	6Y2A('02)	38,821,328	1274
OC	ZL6QH('04)	16,143,840	1010
SA	HC8N('99)	54,697,072	1264

QRPp

AF	5Y4FO('92)	649,057	311
AS	ZC4BS('02)	2,515,388	521
EU	LY5A('01)	2,331,414	646
NA	TI5X('01)	2,568,470	615
OC	FO8JP('86)	572,131	259
SA	P4ØW('97)	4,018,208	632

in one call. I certainly miss all the JA contesters of 10 years ago . . . **TI5N**. This time I participated in the contest with K2/5 watts and 2-ele quad. Very much appreciated to all who picked up my weak signal . . . **UK/JI2MED**. Best wishes from Kazakhstan! . . . **UN2E**. My first time in CQ WPX CW. It was a pleasure to participate . . . **VA3RKM**. Our youngest operator was ten years old and did very well on the run station this year . . . **VA7OO (operating from VE7GL)**. Never seen such a quiet 40m band in Europe. We'd been on holidays in an RV and I enjoyed participating "from the other side." . . . **VE6/LX1NO**. After 26 years on air solely SSB, my first CW contest. If I do not get disqualified it will be a great feat—hi . . . **VK3FM**. Cndx never stable but anyway have fun . . . **XE2TG**. 5 watts output to a phased 15m vertical array improved things over last year's all band QRP total. 15 was off and on and search and pounce with about 25 watts EIRP was a challenge. If they were loud it was easy to get a reply . . . **YB5AQB**. For the memory of Ataturk's 125th birthday. Happy birthday Ataturk . . . **YM125ATA**. Besides taking a shot at the European 40m low power record, another goal of this operation was to test a 40m 2-ele Moxon beam with 8m long fiberglass spreaders. It worked quite well. However I think our next construction will be a real 3-ele Spiderbeam . . . **ZA/DF4SA**.

(Continued on page 107)

Every LDG Electronics Product has a Two-Year , "No Questions Asked" Warranty

Your Power Problems—Solved!

New! The Multi-DC, a 12 Volt DC Distribution Box

The provided cables have the right coaxial DC power plug to connect to all your LDG products. The Multi-DC can source up to three amps; each of the six outputs can provide up to .5 amps to your LDG accessories. The Multi-DC comes with an input cable, and six output cables, each 3 feet long.

The six outputs are organized in three groups of two. Each pair is internally regulated to 12 vdc, thermal protected and short-limited; a short circuit just shuts down the regulator and turns off that output. So, with the Multi-DC, you can easily and safely power your LDG tuners and accessories (with more coming, by the way!).

LDG ELECTRONICS 2 YEAR WARRANTY

List Price $49

"The Forward Power is 112 Watts"

The "Talking" Watt Meter

The TW-1 Talking Wattmeter provides an aural spoken indication of power and SWR using a digitally recorded voice. It is ideal for the vision-impaired, for those of us in the "bi-focal set", or just for those times when you need to be looking somewhere else. At the press of a button, the TW-1 speaks the forward power, reverse power or SWR. Three languages are available: English, Spanish and German. It includes its own internal speaker; no external audio hookups are needed. Also available the TW-2 for UHF/VHF.

List Price $149

AT-897 for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897 Autotuner mounts on the side of your FT-897 just like the original equipment. We even added the ability to mount the "feet" on the side of the tuner so when you are transporting your rig by the handle, you can safely set it down and not worry about scratching the case. The AT-897 takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so if you are using another CAT device, hooking it up couldn't be easier.

List Price $199

No Questions Asked! Every LDG Product comes with our industry leading 2-Year warranty on the performance of your product. Just contact us to let us know your problem and we will repair or replace your product—**NO QUESTIONS ASKED!**

LDG ELECTRONICS 2 YEAR WARRANTY

Your Eye Strain Problems — Solved!

Yaesu's popular FT-857 and FT-897 transceivers are wonders of compact efficiency. These do-anything, go-anywhere transceivers were science fiction just a few years ago, but ham's today are using them in shacks, mobiles and on expeditions from the back yard to the top of the world.

The FT-Meter presents a lush, highly readable 2.5" meter face with calibrated scales for signal strength and discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit.

LDG ELECTRONICS 2 YEAR WARRANTY

Each function is selectable from the radio's menu.

Easily visible from anywhere on your desk or dash, the FT-Meter is illuminated by any external 12 vdc source.

The FT-Meter comes fully assembled and ready to go; just plug it into the radio and you're in the picture like never before.

List Price $49

Your Cable Problems—Solved!

RCA-14 is a breakout box for the accessory jacks on most popular transceivers. It comes with cables with the right DIN plugs, and all the outputs are blessedly simple RCA jacks. You simply plug the RCA-14 into your radio's accessory jacks, and all your ports are right there at your fingertips; just plug and play, one function or all of them, makes no difference. And, you can change things around as often as you like; it's as simple as swapping out an RCA plug.

The RCA-14 comes with a DIN 13 cable, a mini DIN 6 and a mini Din 8. The DIN 13 cable breaks out the functions to RCA jacks 1 - 13, while the mini DIN 6 goes to RCA 1 - 6, and the mini DIN 8 goes to RCA 7 - 14.
You can use the DIN 13 or the mini DIN 6 and/or 8, depending on your radio.

The RCA-14 is compatible with: Icom 703, 706, 718, 746, 756, 7000 and 7800, Yaesu 817, 857, 897 and 840, Kenwood 480, 570, 2000 Ten Tec Orion and many more radios.

List price $59

The DTS Series

Antenna Switches

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List Price DTS-4 $79, remote $39
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All of the Cables Included - Nothing More to Buy

At LDG Electronics we have always been the innovators in the automatic tuner industry. We built the first desktop switched-L tuner, the first automatic tuner for QRP radios, the first automatic tuner with a remote control head, and the first automatic tuner with 3-D memories. We were also the first manufacturer with a two year warranty on all of our products. **Now we are including all of the necessary interface cables with every tuner we sell.** No more getting your new tuner home and not having the right interface cable—**everything you need is included in the box!**

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The first auto tuner specifically designed for today's high-powered transceivers.

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Ready to go right out of the box!
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List Price $249

Getting the Most Out of Your IC-7000

The AT-7000 is the ideal tuner for IC-7000 & other ICOM Radios: Covers all frequencies from 1.8–54 MHz **(including 6 meters),** and will automatically match your antenna in a flash. Requires just 0.1 W for operation, but will handle up to 125 W (100 W on 6 m), making it suitable for everything from QRP (IC- 703Plus) to a typical 100 W ICOM transceiver.

Ready to go right out of the box!
No extra cable to buy.

Tune with the AT-7000 or use your radio. Includes over 2,000 memories, uses latching relays, tuning range is 4-800 ohms, powered by your radio. Includes ICOM interface cable.

List Price $169

AT-100Pro

An Autotuner for use with your amplifier!

No more knob spinning or inductor rolling. Tunes your antenna in 1 to 8 seconds when you QSY either in the same band or to a different band! Easy installation and use make this the choice for any Amateur Radio Operator with an amplifier. Power rating HF (1.8 to 30 MHz): 1000 Watts Single Side Band, 750 Watts CW, 500 Watts Digital (RTTY, Packet, etc.) **including 6 meters**.

Ready to go right out of the box!
No extra cable to buy.

List Price $599

Z-100

The definitive low cost automatic antenna tuner!

Designed from the ground up to provide the 100 watt power handling you asked for, in a small, lightweight package, perfect for portable as well as sitting on your desk in your shack!

The Z-100 will tune with 0.1 to 125 watts (50 watts on 6 meters), making it an excellent choice for almost any radio or operating style. Backpackers and QRP operators will appreciate the latching relays. Power can be removed from the tuner once you have tuned. Additionally, when the tuner is not tuning, it draws nearly zero amps.

Ready to go right out of the box!
No extra cable to buy.

List Price $149

AT-100Pro

Automatic Antenna Tuner

This desktop tuner covers all frequencies from 1.8 – 54 MHz **(including 6 meters)**, and will automatically match your antenna in no time. It features a two-position antenna switch, allowing you to switch instantly between two antennas. The AT-100Pro requires just 1 watt for operation, but will handle up to 125 watts. The AT-100Pro includes over 2,000 memories for each antenna, automatically storing tuning configurations for each frequency and band as you use them.

List Price $219

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Fax: 410-586-8475

Don't let antenna restrictions keep you off the air. One solution is to move your shack to your vehicle and take your hamming on the road. W7ALA offers some excellent tips for putting together a safe and efficient mobile installation.

Taking Your Hamming on the Road

BY LARRY ARAVE,* W7ALA

This is one of an occasional series of articles on the ways in which different hams are dealing with antenna restrictions, all proving that "CC&Rs" should not translate into "off the air." —W2VU

My desire to operate mobile started way back in 1965 with 11 meters (CB). There were only three or four of us in our small country town who had a radio in the car, and it was very exciting to talk to someone all the way across town while driving down the road. After becoming a ham, my desire for mobile radio never stopped. Many of you may remember that the radios of the time were very large (so were the cars) and a good efficient antenna did not exist for the most part. However, the excitement of actually talking to another ham while going down that little two-lane road at a whopping 55 miles an hour was breathtaking.

Well, here it is 2007 and we have come a long way since those exciting days. The transceivers are smaller and have much more power, cover many more frequencies, and do almost everything except our laundry. The antennas are generally much better and the selection is huge . . . and yes, the cars are faster.

Why HF Mobile

Does anyone else out there live in a neighborhood with antenna restrictions? Did you finally figure out a way to hide that much-wanted antenna only to find out your neighbors own the most inexpensive, unfiltered, RF-attracting, pieces of plastic junk that can be found in telephones, stereos, computers, TVs, and other electronic gizmos? How many of us have had the experience of trying to explain to the person next door that the interference he only gets when you transmit is really his fault? Goes over big, huh?

Those are a couple of good reasons to take the HF rig and hit the road. You want more reasons? How about a drive out in the countryside with no manmade noise? Or how about a drive up to the top of that favorite mountain? Here in Colorado, within an hour's drive I can have an 11,000-foot tower. Then there is the long, boring commute or that long vacation trip. Time goes by more quickly while you're enjoying your hobby. For the practical type, a mobile station is also a great emergency station. Oh yeah, there's another reason for mobile operating: It's fun!

Photo A– In today's cramped, crowded cars it's much easier to safely install a remote-control head than an entire radio. (All photos by Kari Arave, KF7DP)

Where to Start

The key to success in mobile operating is the right gear for your needs, installed in a way that promotes safe and efficient operation. First off, I must say that HF mobile is not plug-and-play. A great working mobile installation will take some time. Your satisfaction level will be tied directly to the amount of time and money spent. You will want to decide up front what you expect before you spend a lot of money on your mobile setup. When I hear other stations, I expect them to hear me over the background noise. It would be wise to choose your level of satisfaction and work toward that goal.

Probably the easiest part of a mobile installation is the radio. I say this because with the selection on the market it isn't hard to find the transceiver that meets your needs. The hard part of the radio installation is finding a place to

**3121 Yellowstone Circle, Fort Collins, CO 80525*

Photo B– Installing a mobile antenna means finding a balance between keeping it low enough for a safe and secure installation and high enough that the loading coil is clear of the roof.

locate it in today's small, crowded cars. The days of mounting a rig under the dashboard are long gone. Ffirst, then, I would suggest getting a radio with a removable control head (see photo A). You will find it a lot easier to fit the control head in a good, safe operating position than to try it with a large, bulky radio. With this method, the radio itself can easily be bolted under the seat or in the trunk.

To me, the second, and most important, item to look for in a mobile transceiver is a good noise blanker. I say this because there is nothing more discouraging than to complete that mobile setup you have always dreamed of, get in the car, start the engine, and all you hear is "pop, pop, pop" as the ignition and other automobile noises drown out all incoming signals. Sure, you can spend days crawling under the car placing ground bonding wires and putting RF suppressors on various parts of the engine, but wouldn't you rather just push a button on the radio labeled "noise blanker" and instantly have the noises disappear? If you get nothing else from this article, please, before purchasing a mobile rig check the product reviews and talk to others to find out what models have a noise blanker that really works. This may make the difference between having a wonderful time mobiling and having an unpleasant experience.

The Antenna

This is the part that can make your hair turn bright silver or white in color. However, if you sit back and really think it over and learn from the experiences of others, this can become the fun part of the installation. Before purchasing an antenna or antenna mount, think it over, plan, and sleep on it, because better ideas will often pop up. When you're sure of your plan, go for it. Order that antenna and mount. OK, you're locked in now. No turning back. It can be a challenge, but it is fun and the effort of this project will be well worth it.

After many years and many mobile antennas I have learned a lot. No, I don't know everything there is to know, but with all the time and money spent, I should. I have tried almost every type (not every brand) of mobile antenna. I can't say what is best, but I can offer some general guidelines.

First, get the best antenna you can afford. Someone asked me why I would spend so much on a mobile antenna. If I could get back the money spent on antennas I was very unhappy with, it would buy the most expensive antenna on the market. Gold plated. (Yes, you can buy gold-plated mobile antenna coils, and no, I am not saying that gold plating is or is not worth the extra cost.) Again, think things over and use common sense in your decisions.

My decision for an efficient antenna started with advice from a friend. He said "get the biggest, meanest, ugliest antenna you can find." Well, as it turned out it was the most efficient antenna I could find, but not the ugliest. In fact, when my wife saw it, she said it looked better than the last one. Music to my ears.

After a lot of planning, I decided on the Hi-Q1 4/80 RT (see photo B). I like 20 and 40 meters, and this one—good for 6 through 80 meters—was the most efficient for 40. For serious 6-meter operation, I'd suggest a separate antenna. For all other bands, though, this antenna is one of the best, if not *the* best, I have ever used. There are other antenna choices, but be careful. Do your research and think it over.

Antenna Installation

There are three things to consider when installing a mobile antenna: location, location, and location! Start by standing outside your vehicle and looking at every possible mounting location. Somewhere there is a balance between getting the antenna up where it belongs for efficiency and keeping it low and strong enough to be safe. You need to be sure it will be stable at high speeds. Don't forget the height limit; stay under 14 feet. Too tall and that overpass can ruin your antenna . . . and that low overhead power line can ruin your day.

For my installation, I sat in the lawn chair and stared at my truck for about an hour, looking over the possibilities.

Photo C– The author mounted his mobile HF antenna just above his left tail light. It attaches inside the tail gate (see photo D).

Photo D– Detail of the mount installation. The author drilled holes in the plate to match existing holes in the truck.

My goals were: (1) the antenna needed to be very stable; (2) it needed to be located where it would be efficient; and (3) I did not want to drill any holes in my truck. You say that can't be done? Continue on and we'll see.

The Antenna Mount

If you look at photo C, you'll see that the mount is located just above the driver's side tail light on my Dodge truck. This puts the antenna coil clear of the vehicle to improve efficiency. The antenna base was built using a stainless-steel plate 1/8-inch thick, 4 inches high, and 7 inches long. Welded to this is a heavy piece of 3-inch stainless angle cut 2 1/2 inches long. The stainless plate is very strong and fits in the grove between the truck body and the tail gate (photo D). I used a piece of cardboard to mark where to drill the holes in the plate to match the existing bolts that hold the tail gate closed. This made it very strong and also provided a location for grounding.

On the inside of the stainless plate where it bolts to the truck, I added a 1 1/2-inch solid-copper strap to lower RF resis-

Photo E– Extra support comes from a nylon brace on the outside of the vehicle.

tance. Next to location, a good RF ground is the most important thing you can do to improve efficiency. In this case, the ground point is so close to the antenna base that the copper strap may not have been needed, but I wanted no shortcuts. The angle that is welded to this plate has the proper size hole for the antenna, and there is a bolt at the ground strap for both the coax ground and the base impedance matching coil. (For this coil I used #10 solid copper with 11 turns at 1 1/4-inch diameter.) There are several ways of doing feed-point impedance matching, so the choice is yours. Check your antenna manual or one of the antenna/mobile operating books on the market.

Extra Antenna Support

Extra support is optional, but here again, I wanted no shortcuts. I wanted to be able to grab the antenna and shake the truck. This gives me peace of mind going down the road and it keeps the antenna at a true vertical position. By now you may think I went off the deep end, but when doing a project like this I want quality. The support is made from nylon 1 inch thick, 2 3/4 inches wide, and 8 inches long (see photo E). Attached to this nylon brace with stainless bolts is a very nice 1 1/2-inch insulated clamp purchased from DX Engineering.[2] They have a great hardware selection for antenna building.

Items such as thumb bolts to remove your antenna without tools can be found at your local hardware store.

Grounding

Next to the antenna itself, RF grounding may be the most important part of a good, efficient HF mobile installation. I have learned through experience that the quality of the ground will make the difference in getting the most out of that expensive antenna. When grounding a mobile antenna, do not think of your wire as if it is a DC power circuit. I have seen people ground an antenna with a small #12 or #14 wire. This is fine for regular electricity but *not* for radio frequency. That much-needed RF ground from your antenna to the vehicle doesn't even *see* that tiny little 12- or 14-gauge wire. Some use a large 1-inch to 2-inch wide braid strap (braid is good where a lot of flexing is required). This is fine, but I like to take it a step further. What has worked best for me is a solid-copper strap 1 1/2 inches wide (any width between 1 and 3 inches is fine) and as short as possible. I say this because I once had a mobile antenna grounded with braid, and I

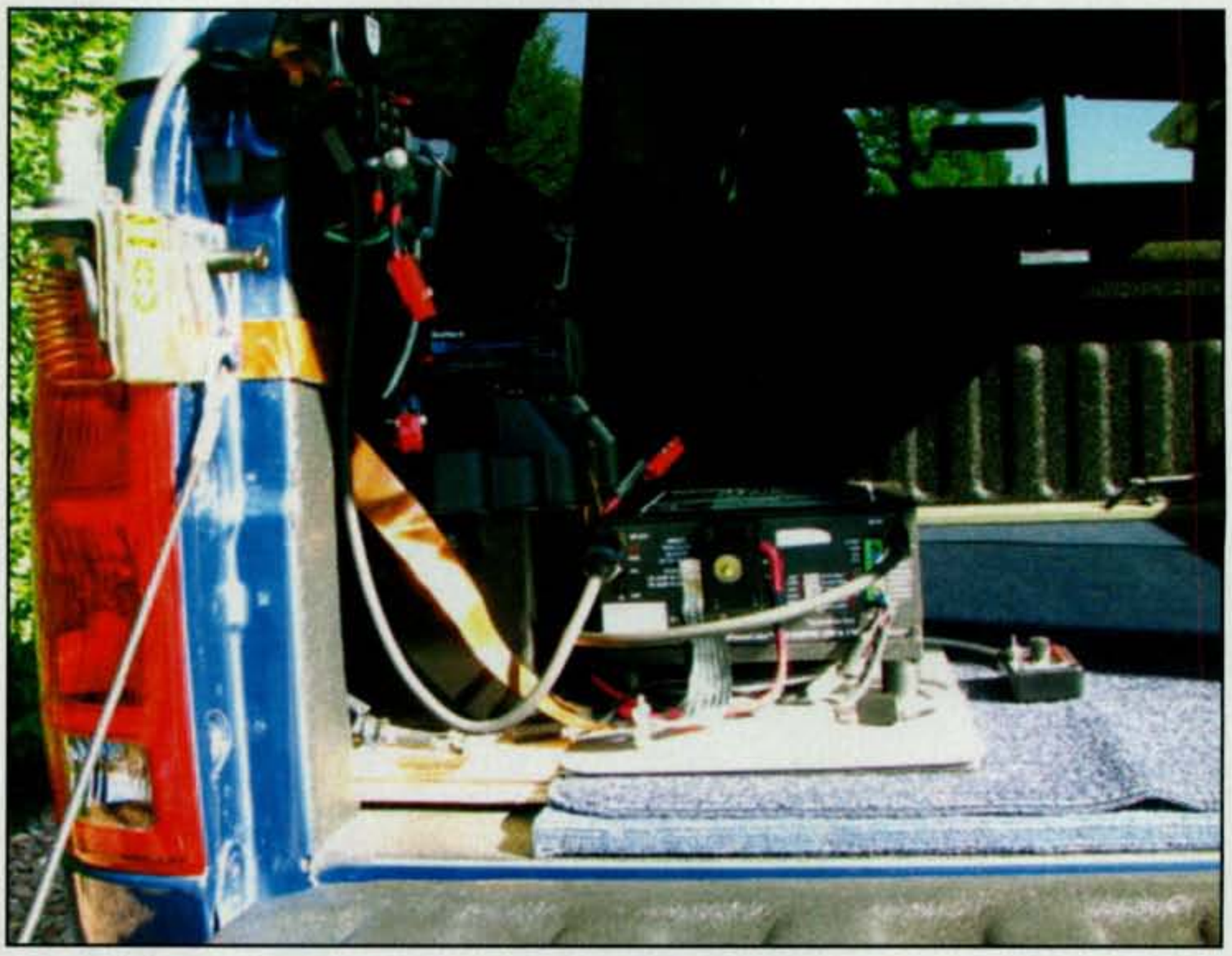

Photo F– "Life's too short for QRP," as they say, so W7ALA's mobile installation includes an SGC-500 amplifier and extra car battery in the back of his truck. He operates from the road at 400–500 watts.

changed it over to a short solid-copper strap and received higher signal reports from friends I talk to on a regular schedule. It was enough to convince me. The antenna ground is the important one. For the transceiver, amplifier, or other equipment, I just use a braid strap, because it flexes easily and is in out of the weather so it cannot corrode.

High Power

High power is optional. Not everyone is interested in running more than 100 watts mobile. I chose to go this route for two reasons. First, there are times with poor band conditions when I like having the extra power in order to be heard. Second, I just happened to have an SGC-500 amplifier sitting around in the house not being used (because of neighbor RF interference problems). Installing high power in your vehicle does require more time, money, and work, but it's just a matter of how serious you want to be with your mobile station. I use 400 to 500 watts. There are others who run full legal power while cruising down the road. I have enjoyed having more power, especially at the bottom of the sunspot cycle.

Amplifier Intallation

As noted above, installing an amplifier in your vehicle (see photo F) does require extra effort. While installing it, there were times when I wondered if it was worth the trouble. However, using it on the road has allowed me to talk to almost anyone I can hear, and I have no more second thoughts.

Installing enough DC power to run an amplifier does take a little planning. I went to the local automotive parts store and got a couple of fuse blocks. I came off the auto battery with a heavy wire to the first fuse block, which I installed under the hood. This block has two fuses. One is a 30-amp (#10 awg wire) circuit going to the transceiver. The second is a 40-amp (#6 awg wire) charging circuit for the amp and goes all the way to the back of the truck. Extra-large wire is a good idea for reducing voltage drop. This charging wire goes directly to the other fuse block in the back of the truck. This normally would not be required, but I did it for DC power distribution to charge the amplifier battery and have auxiliary DC sources.

With an extra automobile battery and a circuit to charge it while driving, the mobile station is now ready for amplifier power. The amp is located right next to the second battery. The amp can draw 45 amps on SSB and up to 90 amps on CW, so the short wire from the battery to the amp needs to be very large. I didn't plan on full key-down power,so I used an Anderson Power Pole 70-amp plug and it works fine. Power management on this amp/battery can be handled several ways. I chose to wire it so I can unplug the amp for easy removal. I can plug in the amp

battery for charging while driving and unplug it when parked to prevent discharging the vehicle battery. I also installed a small 110-volt battery charger and can plug it in when parked if there is a source of external power.

Depending on the amplifier and how you choose to connect it, you may also need a cable going up front to the transceiver for PTT or remote band changing.

Cabling

I have seen many mobile installations where a lot of money is spent on a good transceiver and a very expensive antenna, and then everything is connected with the smallest, most inefficient coax and connectors available. I know some will say, "but it is a short run." This is true, but think about this: First, with HF mobile you are dealing with a situation where you are limited in height, size, and RF ground. Regardless of how much you spend, your antenna efficiency is limited compared with an antenna for a fixed location. So why do things to bring down efficiency even more?

Second, your cable runs are short, so you don't need to buy much. May I suggest you purchase the best, most efficient coax and connectors you can find? While you're at it, stay away from all those extra little 90-degree and coupler connectors. Remember, with extra connections comes extra loss.

Try to route your cables away from your automobile electrical cables as much as possible, especially if running high power. Use RF suppressors if needed and keep your connections clean.

Summary

The truth is, a good mobile installation is a challenging endeavor, but think about this while mobiling down the road:

- You don't have to worry about that knock on the door from the CC & R police.
- You don't have to worry about that knock on the door from the neighbor angry about interference.
- You have time to talk. Nothing else to do but drive on that boring commute.
- The DX station that says, "I'll take the mobile station."
- Those drives up the mountain with a low noise level and a several thousand foot tower.

I'd recommend HF mobile to anyone. It's fun.

Notes

1. www.hiqantennas.com
2. www.dxengineering.com

Today it is rare to find much in the way of new ham radio equipment that doesn't have a microprocessor tucked away inside which controls just about every function. This article is intended to introduce you to a simple-to-use processor and provide actual examples of circuits and programs that should tempt you to exercise your imagination in creating your own homebrew projects.

The BasicX-24™

Add An Easy-To-Use Microprocessor To Your Homebrewing Skillset

BY DENNIS NENDZA,* W7KMV

Many of the bells and whistles now standard on radio equipment would not be possible without little computers called *microprocessors* on board. Admittedly, the programs written to orchestrate the latest big-buck transceivers are very complex and generally not open to examination or modification. Few hams have the ability to dig in and successfully change such devices. However, not all processors are difficult to use.

There actually are a few processors, or controllers as they are also known, that were created to be easily understood and used. A popular small controller that has been around for a number of years is the Basic Stamp II™[1] made by Parallax, Inc. It is programmed in a fairly simple English-like language called BASIC.[2] However, there are significant constraints to this particular device, which include limited program size, speed, and a very small workspace for variables, which are the places where information is stored. Another impediment when considering interfacing with analog circuits is this controller's inability to directly read voltage levels.

NetMedia, Inc.[3] addressed these limitations with the advent of its BasicX-24™ (BX-24) controller. With vastly superior performance for nearly the same price, this little gem has not received the same attention as the Basic Stamp II™. It is a remarkable computer system on a chip. After building what I felt was a rather complex application for a messaging APRS tracker[4] using this processor, I felt more hams should be exposed to this very useful tool. I approached NetMedia for this article and received samples of its processor family, which are employed in the examples. Let's see what it takes to fire up one of these devices and how to make it do our bidding.

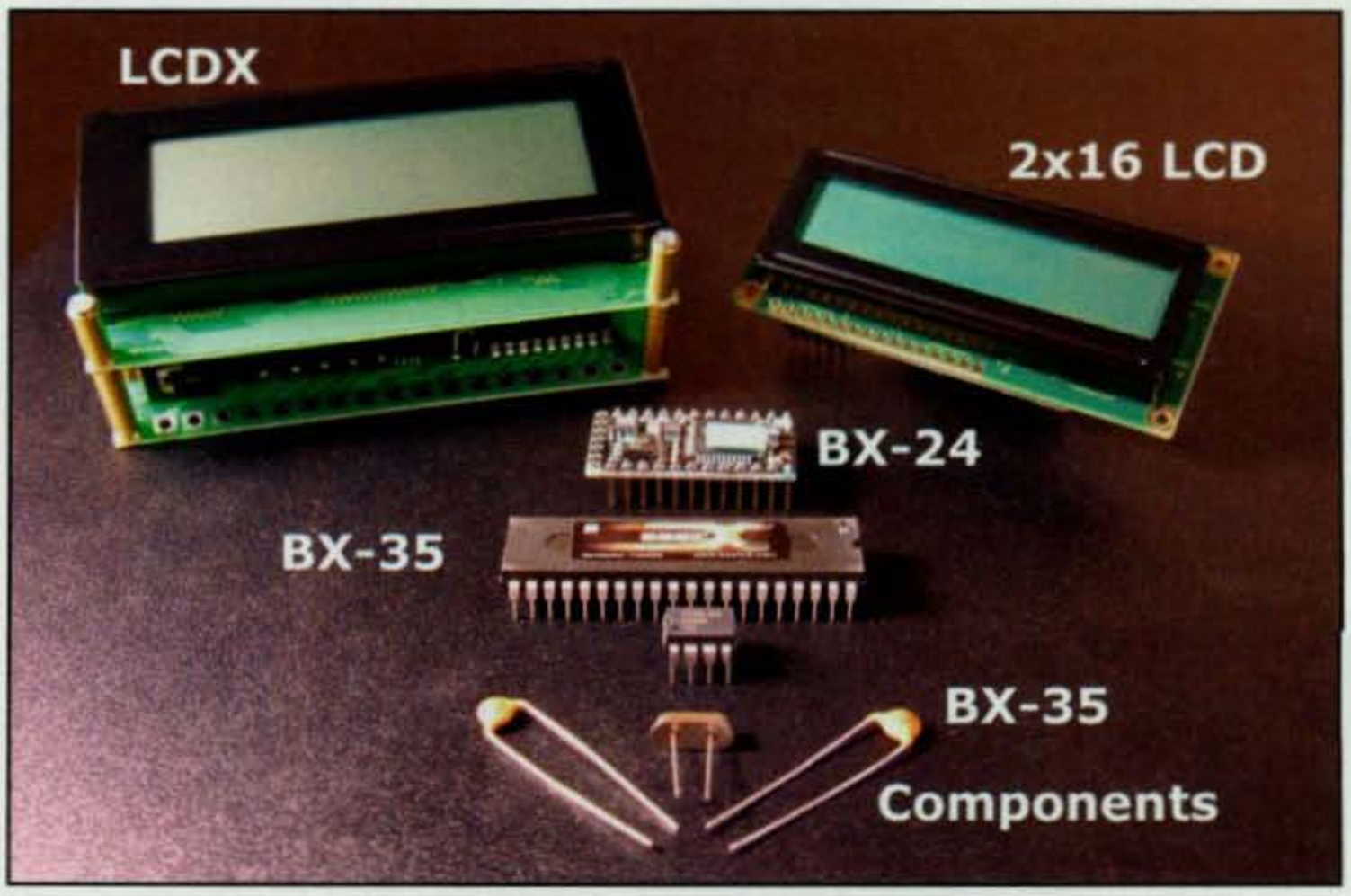

Fig. 1– The BX-24/35 family. The complete BX-24 one-chip system is surrounded by the BX-35, which sports more I/O lines and an off-chip EEPROM and oscillator; the LCDX, a complete computer with 4×20 character display with sounder, 16-key keyboard decoder, relay drivers, and adjustable ADC inputs; and the 2×16 serial data LCD display.

Support System

Most small processors are "spoon-fed" their programs from another computer, typically the ubiquitous personal computer. Any PC running Windows 95™ or better will suffice to develop a program and upload it to the BX-24. The same computer can also be used as an

*34 E. MacIver Place, Tucson, Arizona 85705
e-mail: <W7KMV@arrl.net>

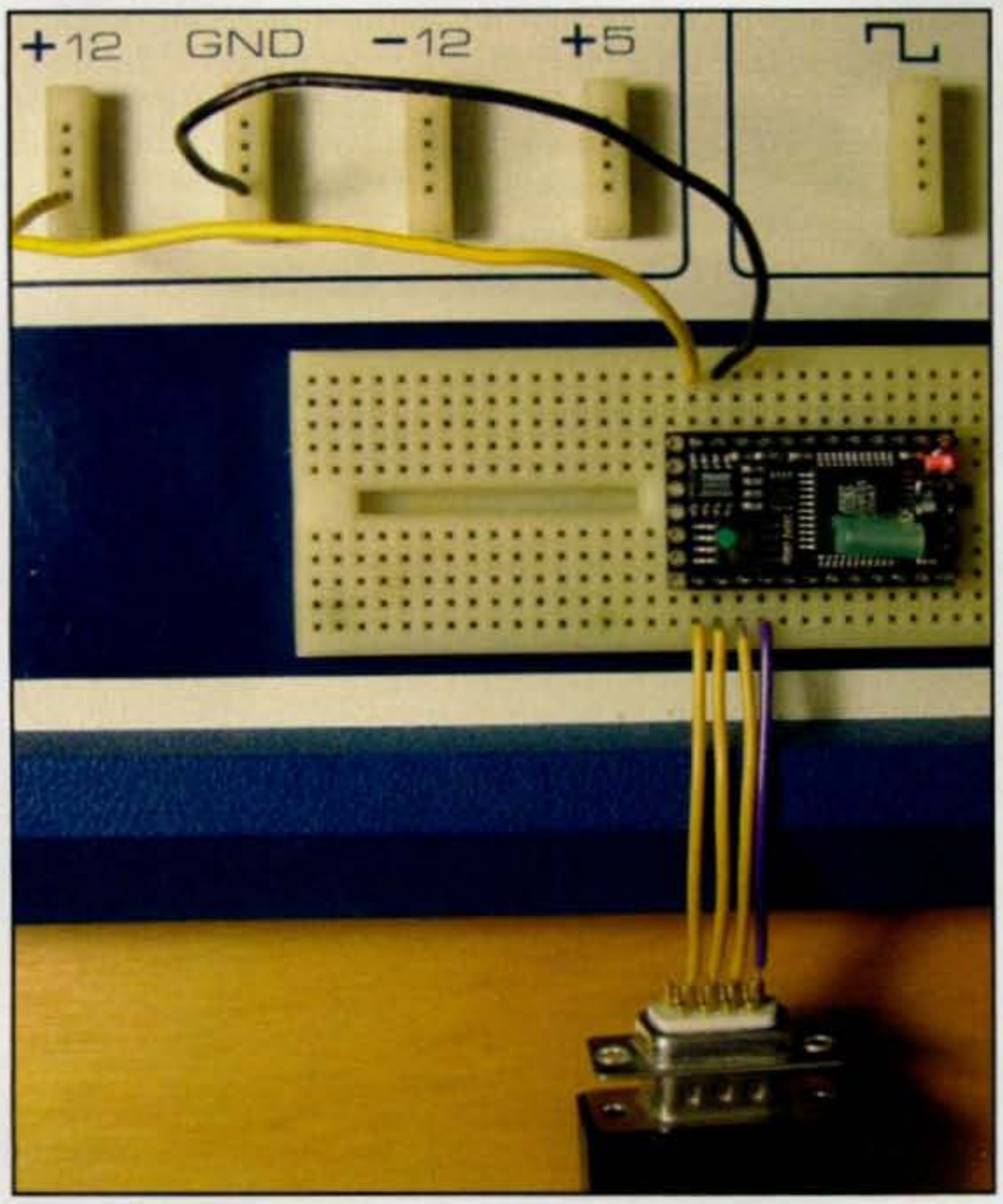

Fig. 2– The BX-24 basic connections; a 5.5–15 VDC source and serial port. Onboard red and green LEDs can be programmed for simple visual I/O tests.

output device for data coming out of the controller if we choose to keep the computers linked after uploading the program. You will need a machine with a serial port for communication. This is worth noting, as some computers are now being sold with only USB ports as the replacement for the once-standard serial connection. USB to serial converters *do* exist[5] should you be fortunate enough to have a late-model machine with no serial port.

The BX-24 computer arrives as a miniature collection of surface-mount components pre-assembled on a 24-pin carrier. It plugs into a solderless breadboard or perf board just like any other 24-pin chip and is ready to go once power and the serial port are connected. It is one of several physical implementations available which share the same programming and development environment. Fig. 1 shows the BX24/35 family of devices currently available. The BX-35 has more I/O pins and uses an outboard crystal oscillator. Fig. 2 shows the basic setup of a BX-24 on a breadboard, and fig. 3 is the schematic. In addition, prepared experimenter boards available from NetMedia and Peter H. Anderson[6] provide room for additional circuitry of your own design. I find that nothing beats a good-size solderless breadboard (or two) for trying out the latest idea.

In fig. 3 you can examine the pin-out diagram of the processor, showing a connection to power and a serial path to the PC . There are two ground pins. Pin 23 is to be used for the negative power connection, and Pin 4 is used as common for the serial I/O connection to the PC. Pin 24 accepts +5.5 to 15 VDC, which is used to power the processor. A small on-board voltage regulator allows for the wide range of input voltage. If you have regulated 5 VDC and wish to use *only* that to power the device, then connect it to Pin 21 in lieu of any connection to Pin 24. Pins 1–3 comprise the processor serial out, serial in, and attention signals, respectively. The additional circuitry in fig. 3 is used and explained later in this article.

Now that the hardware is connected, we need to establish a means of talking to the processor and sending it the programs we are going to develop on the PC. On the BasicX-24™ website (see note 3), there is a download page where both the documentation and the programming environment may be obtained. I leave it to the reader to go through the install process and peruse the documentation.

When starting the BasicX 2.10 development environment, you will notice that it consists of two major sections. The first part that opens a window is the "Downloader." From this window we can set parameters that relate to the specific model of the processor that we are using (there are three variants), the download port, and even stop and start the processor via the serial connection. For now, let's make sure the following menu items are set:

File-Set Starting Directory: Choose a directory where you want your program to reside.

Processor-Processor Type: Set to the processor type you have.

I/O Ports-Download Port: Set to the serial port to use on your computer and **OPEN** it.

At this point we can invoke the editor window by selecting **File-Open Editor**. This new window is the one in which we will build the example applications in this article. Select **File-New Project** to get started and set the project type to "**General Purpose**," project name to "**CQBlink**," the module name to "**CQBlinker**," and click OK. You will notice that the window now has the project name in the title bar and several lines of program code already included inside.

It is important to understand the difference between a project, a module, and subroutines. Briefly stated, a project contains all files and programming that relate to a particular undertaking, such as a data logger, a GPS decoder, a digital thermometer, or a digital SWR meter. A project contains one or more modules. A module name shares the file name in which the module is stored. Within modules you may define and use subprograms which may be made accessible to other modules by declaring them public, or inaccessible by declaring them private. Confusing? Don't be too concerned at this point, as the examples will help to get us past all this. We will employ one module in one file with several subroutines. Now, enter the program in Table I into the editor window or pick up a copy of it from the <members.cox.net/desert-lavender/bxprojects.htm> web site[7], where all the example programs can be found. If you download the program, you can just copy it and paste into the editor window. Delete any duplicate lines at the beginning or end of the window following the paste. It is good practice while typing in a program to periodically perform a **File-Save Project** operation to ensure that our work is saved as we progress. Note that complete programs are saved as projects and have several components described by the "projectname.bxp" file. The editor will only open ".bxp" files.

With all the typing complete, it's time to let the BX-24 compiler scan our program and see if there are any errors that it can find. Select the **Compile-Compile** menu item or press the **F4** function key to have the program scanned and compiled. When errors are found, the line number and error type will be displayed. This compiler does not supply a list of errors, since it stops on the first error found. Cleaning up the compile errors is an iterative process in which you fix the line in

question and compile again. If the compile finds no errors, a status line at the bottom of the editor window will indicate success with a "**Compiled OK**" message and show the length of the program as well as how much RAM is used for variable storage.

The next step is to transfer the compiled program to the processor. This is accomplished from the first window we encountered, the Download Window. The **Processor-Download** menu item will initiate the transfer if the download port has been specified and opened and there is a powered-up BX-24 correctly connected at the other end of the serial cable. Following a successful download, it is necessary to restart the processor. This can be done by either selecting **Processor-Execute**, clicking on the green light of the traffic signal icon, momentarily grounding Pin 22 on the processor, or cycling the processor power. If all went well, you should see a red LED blinking out "CQ" on the controller.

FREQOUT!

A variant of this visible code sender adds sound, which requires the addition of a small piezo speaker or simple headphone. Fig. 3 shows how to add sound output to the processor by connecting a sound-generating component to a

```
Option Explicit

    This program blinks the red LED on the BasicX-24 chip to send a
visible CQ.

    Define useful constants
Const RedLED    As Byte = 25          Red LED's equivalent pin
                                       number
Const LEDon     As Byte = 0           To set an OFF condition
Const LEDoff    As Byte = 1           To set an ON condition
Const SpeedConstant  As Single = 1.20 Constant used to compute
                                       element time
    SpeedConstant/Speed(WPM)=element time
Const Speed     As Single = 13.0      Set speed at 13 wpm
    Define variables
Public TDit     As Single             Dit time
Public TDah     As Single             Dah Time
Public Ie       As Single             Inter-element time (Dit time)
Public Ic       As Single             Inter-character time (3x Dit
                                       time)
Public Iw       As Single             Inter-word time (7x Dit time)

Public Sub Main()
Call RedOff                           Ensure red LED off
Call Delay (1.0)                      Wait one second
TDit=SpeedConstant/Speed              Set Dit time
TDah=TDit*3.0                         Set Dah time
Ie=TDit                               Inter-element time
Ic=TDah                               Inter-character time
Iw=TDit*7.0                           Inter-word time
Do
    Send a "C" via the red LED
  Call Dah                            Call the Dah subroutine
  Call Dit                            Call the Dit subroutine
  Call Dah
  Call Dit
  Call InterChar
    Send a "Q" via the red LED
  Call Dah
  Call Dah
  Call Dit
  Call Dah
    Send an inter-word delay
  Call InterWord
Loop                                  Go back and continuously
send

End Sub

    Subroutines follow

Public Sub RedOn()
    Turn red LED on
  Call PutPin(RedLED, LEDon)          Turn red LED on

End Sub

Public Sub RedOff()
    Turn red LED off
  Call PutPin(RedLED, LEDoff)         Turn red LED off

End Sub

Public Sub Dah()
    Turn red LED on for TDah time and follow with Ie time off
Call RedOn                            Light it up
Call Delay (TDah)                     Wait TDah time
Call RedOff                           Turn it off
Call Delay (Ie)                       Follow with inter-element
time off

End Sub

Public Sub Dit()
    Turn red LED on for TDit time and follow with Ie time off
Call RedOn                            Light it up
Call Delay (TDit)                     Wait TDit time
Call RedOff                           Turn it off
Call Delay (Ie)                       Follow with inter-element
                                       time off

End Sub

Public Sub InterChar()
    Perform inter-character delay assuming last element was
followed by an inter-element delay
Call Delay (Ic-Ie)                    Wait

End Sub

Public Sub InterWord()
    Perform inter-word delay assuming last element was followed
by an inter-element delay
Call Delay (Iw-Ie)                    Wait

End Sub
```

Table I– CQBlinker program listing.

processor output pin (Pin 15 in this example). The program alterations to create an audible tone in addition to the visible LED are shown in Table II.

The FREQOUT system library routine used in this example allows you to specify a processor output pin and two frequencies to output simultaneously for a given length of time. To produce a single tone, just specify a zero for the unused one. For the forward thinking among you, it may have just become apparent that DTMF (dual tone multi-frequency) audio for phone dialing or control purposes can be created this way, and indeed it can. Referring back to our CW sending example, the time spent sending a tone to the speaker can replace the delay of our LED-only example. If you were to use the processor as an audio-generating device for connection to a transmitter or audio amplifier, it would be a good idea to smooth out the harsh-sounding square-wave with some capacitance in parallel with the output and use a small audio transformer to couple to the external device's input.

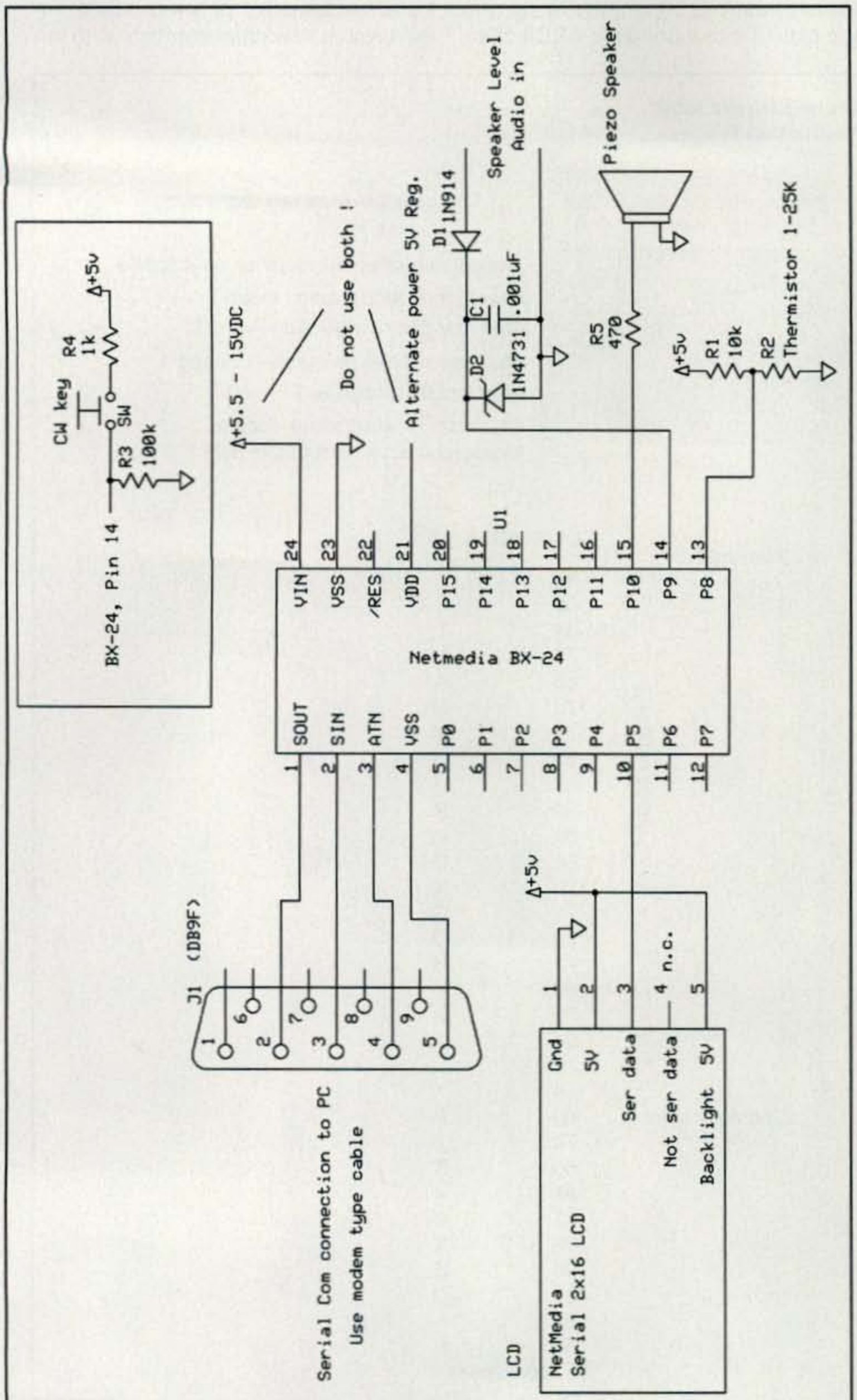

Fig. 3– BX-24 connections referenced in the examples. Zener diode, D2, is 4.3 V. D1 can be any small signal diode. R2 is a RadioShack 271-110A 10K ohm thermistor. The piezo speaker can be a headphone or All Electronics PE-38.

A Simple Morse Decoder

When considering how fast this little processor could copy Morse code, I did some back-of-the-envelope figuring and estimated that it would be lucky to hit 20 to 30 wpm. I thought the timing would become skewed by the program's inability to execute fast enough to keep up with the next element at higher speeds. Boy, was I surprised when it flawlessly copied an audio source timed at 99 wpm! At 99 wpm the dits are about 12 milliseconds long—not much time for a small processor running a tokenized[8] BASIC programming language to keep track of things.

Keep in mind that if you wrote a program to strictly follow all the timing rules for CW, it wouldn't work very well. There is a great deal of variation in CW, as everyone has a slightly different way of sending it or tuning their keyer. With straight keys the timing is most variable. The best solution is to follow the "heuristic rules" that we use in our heads when we copy CW manually. These simple rules are:

1. If an element is about twice as long as or longer than a previous dit, then it is probably a dah.

2. Following each element, recompute a new dit and dah time based on that element.

3. If a space is longer than 2.5 dits, it is probably a character space.

4. If a space is longer than 2 dahs, it is probably a word space.

Rule 1 makes the element decision easy, and best of all, it works. Rule 2 helps the program track changing speeds. Abrupt changes in speed are tough to deal with, but by averaging the last dit or dah with the current one, the program adjusts quickly to speed changes. Rules 3 and 4 seem to work pretty well for a variety of spacing experienced.

To set up the processor to work with the program we need an external keying

source. It can be a straight key, set of paddles for an electronic keyer, or an audio source. It all comes down to the need to provide the processor with a logic 1 and 0 to indicate whether the key is down or up. My first experiment was with a straight key, and it works pretty well to demonstrate the effectiveness of the algorithm or method of decoding CW.

The program to copy CW is too long to print here, but it is available at the download website (see note 7), and a few words are in order to explain how it is organized. Common characters and punctuation are six elements or less. By noting this, I started to develop some ideas on how to copy a character and translate it into a printable ASCII character. My technique may not be original, but I am unaware of another example that uses it. By considering dits as zeros and dahs as ones, I would shift in a 0 or 1 on the right side of a byte, which is 8 bits wide. Here's how the idea works: Following a silence that indicates a character or word break, we establish a new character byte with the

CW Character Element Input
Byte Construction Process

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	CW example received character is "P" (. _ _ .)
0	0	0	0	0	0	0	1	Immediately after character or word space
0	0	0	0	0	0	1	0	After first dit recognized - insert 0
0	0	0	0	0	1	0	1	After first dah recognized - insert 1
0	0	0	0	1	0	1	1	After second dah recognized - insert 1
0	0	0	1	0	1	1	0	After last dit recognized - insert 0
0	0	0	0	0	0	0	1	Character or word space occurs - lookup character, reset input byte

Resulting Byte: 00010110 binary, or 22 decimal

Resulting value is used to index the code table and pick up the ASCII representation of the received character

22nd entry in table

Printable codes for the ASCII characters

CODETABLE255

```
94  '  ^
69  '  E
84  '  T
73  '  I
65  '  A
78  '  N
77  '  M
83  '  S
85  '  U
82  '  R
87  '  W
68  '  D
75  '  K
71  '  G
79  '  O
72  '  H
86  '  V
70  '  F
94  '  ^
76  '  L
94  '  ^
80  '  P
74  '  J
66  '  B
88  '  X
67  '  C
89  '  Y
90  '  Z
81  '  Q
94  '  ^
94  '  ^
```

(continues)

Fig. 4– The steps that occur as a CW character is received are outlined in the process shown here. CODETABLE255 is constructed so that a "received" CW character can be directly interpreted as an equivalent ASCII character by adding its value to the base of the table to perform the lookup.

Changes to CQBlinker: Existing lines(bold type) are shown with action such as delete or insert after.

a visible CQ
Delete, then replace with
a visible and audible CQ.

Const LEDoff	**As Byte = 1**	**To set an ON condition**
Insert after—		
Const Tone	As Integer = 1000	Cw tone is 1000 Hz
Const TonePin	As Byte = 15	Send tone on pin 15
Call Delay (TDah)		**Wait TDah time**
Delete, then replace with		
Call FreqOut (TonePin, Tone,0,TDah)		Wait TDah time while sending tone
Call Delay (TDit)		**Wait TDit time**
Delete, then replace with		
Call FreqOut (TonePin, Tone,0,TDit)		Wait TDah time while sending tone

Table II– Modifications to CQBlinker to add sound.

value "1" in it, a binary "00000001." This 1 will continually be shifted to the left in the byte each time a dit or dah is detected and the respective "0" or "1" is shoved into the right side of the byte. Look at fig. 4 to see the steps to building the character byte using the CW character "P" (·– –·) as an example.

To keep the program simple and fast, I broke the decoding technique into several parts. The first part is determining when a change of state occurs. Either the key has closed or it has opened. A change of state makes it easy to time the length of the previous state. When the state changes, we read the timer of the processor that keeps time in approximately 2-millisecond ticks and compute the length of the previous state. This leads to the second part, which looks at key-up or key-down intervals. If the current state is key up, then the previous must have been key down and it is time to compare the key-down time to the current dit length. This yields a dit or dah and the character byte is modified accordingly. Conversely, if the current state is key down, then the previous was key up and we check to see if that represented the space between an element, character, or word. If it's a character or word space, we look up the ASCII[9] representation of the received CW character we've built and send it to the display device. This lookup requires a table built to allow the numerical representation of the received CW character to be used as an index which, when added to the table's beginning, points to the corresponding ASCII printable character.

To move from decoding CW sent by a straight key to off-the-air signals requires some extra work outside the processor. The simplest method, given enough audio power, is to rectify the audio and provide a bit of filtering with a capacitor. To protect the processor we have to ensure that the level of the filtered audio does not rise above the 5V logic level. Fig. 3 also includes the simple audio rectification filter and Zener diode input protection circuit. I used this to "listen" to 5 – 99 wpm CW audio (from powered speakers) that was created on the PC by the Wavgen program[10], which creates a playable audio file. This rudimentary circuit will work on quiet receiver passbands with no adjacent signals audible. It does require speaker-level audio to generate enough voltage for the detector. A more sophisticated circuit employing narrow audio filtering and automatic gain control is necessary for better copy under less-than-ideal conditions.

An additional note on the above example is the use of a 2×16 character LCD display. Fig. 3 shows how simple it is to employ such a device for output. If we wanted to incorporate the processor and display in one ready-to-use package, the LCDX pictured in fig. 1 would be an ideal choice. It also contains relay drivers and scalable voltage measuring interfaces.

I hope the above examples demonstrate how easy it is to become familiar with small programmable processors. Their speed and flexibility allow them to replace boards full of digital logic and many analog circuits while allowing the designer/builder freedom to make changes and updates without lifting a soldering iron.

A final note: You may have noticed that fig. 3 shows a thermistor connected to Pin 13 of the processor. Curious? Go to the website <members.cox.net/desertlavender/bxprojects.htm> for more ideas on using these computers on a chip. ■

Notes

1. <www.parallax.com>
2. BASIC—the Beginner's All-purpose Symbolic Instruction Code—was developed at Dartmouth College. For more historical information see: <en.wikipedia.org/wiki/Dartmouth_BASIC>.
3. <www.netmedia.com> and <www.basicx.com>
4. D. Nendza, "Anatomy of a Homebrew Messaging APRS Tracker," *QEX*, January 2005, pp. 16–28.
5. One source of USB to serial converters is *CQ* advertiser West Mountain Radio. See the ad for more information.
6. Peter H. Anderson: <www.phanderson.com/>.
7. Examples mentioned in this article, and more, are available at: <members.cox.net/desertlavender/bxprojects.htm>.
8. Tokenize—see: <en.wikipedia.org/wiki/Tokenize>.
9. ASCII definition: <en.wikipedia.org/wiki/Ascii>.
10. Wavgen is available at <ah0a.org/AH0A.html>.

What You've Told Us...

Our December survey asked how the FCC's "omnibus" rulemaking proceeding would affect your operations. More than two-thirds of the readers who responded (68%) said the Novice band "refarming" would have no effect on their phone operating, and 69% said it would have no impact on their CW operating. In addition, 18% said it will have a positive impact on their phone operating, 12% said it would have a minor effect and 1% said the impact would be negative. On the CW side, 6% said the changes would be positive, 17% said minimal, and 8% said there would be a negative impact on their CW operating.

Nearly half of you (48%) felt the decision to permit auxiliary operation on 2 meters would have little or no impact on your future operating, while 20% said it could give them new operating possibilities, and 30% didn't know what effect the rule might have down the road.

On the option of specifying a radio club to receive your callsign after your death, a majority of you (53%) said you probably would *not* exercise that option and 21% said you don't even want to think about it, while 14% said you *would* probably consider doing so and 9% said "definitely, yes."

A majority (54%) disagreed with the FCC's decision to no longer require that VE teams publicize their upcoming exam sessions, feeling it will hurt the process of licensing new hams, while 20% felt it would have no impact, 14% didn't know and 10% believe it will be helpful. The question about the impact of expanding code exam credit for former licensees is now moot.

The FCC's decision to allow spread-spectrum on 222–225 MHz drew a big yawn, with only one in five respondents offering an opinion about its likely effect on weak-signal operating on the band—12% think it won't be harmful and 9% think it will.

On the other hand, there's no shortage of opinions regarding the decision to drop the ban on commercially-manufactured amplifiers that include 12 or 10 meters. Nearly half of you (47%) believe CBers will exploit every loophole they can to modify those amps for 27 MHz, but 48% think the change is good, with 25% saying the problem was overstated all along and 23% saying the new rules provide adequate protection against abuse.

This month's free subscription winner is David Taylor, KB2KBY of Palmyra, NY.

Reader Survey
March 2007

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

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

It is said that a QSL card is "the final courtesy of a QSO." Yet, the costs associated with sending out traditional printed cards have put the practice in decline and there are now online alternatives. This month, we'd like to know about your QSLing practices.

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

1. Do you collect QSL cards?
- Yes 1
- No 2

2. Do you have your own QSL cards that you send out?
- Yes, from commercial QSL printer 3
- Yes, from local printer 4
- Yes, self-printed 5
- Yes, online 6
- No 7

3. Which, if any, of the following online confirmation services do you use?
- ARRL Logbook of the World (LoTW) 8
- eQSL.cc 9
- Other 10
- None 11

4. Which of the following types of contacts do you QSL?
- Most or all DX contacts 12
- Most or all domestic contacts 13
- Contacts I need to confirm for an award 14
- Contacts for which I have received a QSL card 15
- Contacts with special event stations 16
- Contacts with special significance to me 17
- Other 18
- None 19

5. Do you use the ARRL's incoming DX QSL Bureau?
- Yes 20
- No 21

6. How do you send QSLs to DX stations? (Circle all that apply)
- Direct with IRC (International Reply Coupon) 22
- Via QSL manager with SASE (self-addressed stamped envelope) 23
- Via ARRL Outgoing QSL bureau 24
- Via DX station's QSL bureau 25
- Via other organization's QSL bureau 26
- Do not QSL DX stations 27

7. How do you store/organize your received QSL cards? (Circle all that apply)
- In a shoebox or similar 28
- In one or more albums 29
- In hanging displays 30
- Other 31
- Do not collect QSL cards 32

Thank you for your responses. We'll be back with more questions next month.

New ARD9000 MK2 steps up to the mike!

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With thousands of AOR digital units worldwide, digital HF is rapidly gaining a dedicated group of followers. **Isn't it time you joined the fun?**

Using the open G4GUO protocol, the ARD9000 or ARD9800 allows any ham to convert any existing HF analog transceiver to work digital voice in one easy step! No radio modifications are necessary and it works with any brand of transceiver. The unit automatically detects digital signals and decodes them, but you also maintain full analog capabilities. Whether a contact comes in as digital or analog, the ARD9000 and ARD9800 can handle it.

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- Digital voice communications using existing analog transceivers
- Works on Single Side Band (SSB) mode.
- Automatic digital receive
- Optional interface cables for most popular transceivers
- Built-in high grade Vocoder (AMBE)
- Built-in FEC
- Compact unit. Easy to operate.
- Utilizes a uniquely designed high performance DSP engine
- Uses the established G4GUO open protocol

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COMET
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Med-duty, 3 adj planes, 60" ant.
RS-720: Accepts SO-239 conn
RS-720NMO: Accepts NMO conn

COMET
RS-520
Light-duty, 3 adjustment planes, up to 45" antenna.

Maldol
PRM-T
Heavy-duty, 3 adjustment planes, up to 80" antenna.

Maldol
MK-30H
12VDC motorized mount. Mounts to vertical or horizontal door lip. Up to 70"/19 oz. antenna.

Maldol
EM-B80
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COMET
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CP-5NMO	NMO / PL-259
CP-5 3/8-24	3/8-24 / PL-259

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Maldol EX-510B / EX-510BNMO **TRI-BAND 6M/2M/440MHZ WITH FOLD-OVER** • Gain & Wave: 52MHz 1/4 wave • 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 VSWR • Length: 37" • Conn: PL-259 or NMO style • Max Power: 50W FM

COMET SB-15 **TRI-BAND 6M/2M/440MHZ WITH FOLD-OVER** • Gain & Wave: 52MHz 0dBi 1/4 wave • 146MHz 4.5 dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

COMET UHV-4 **QUAD-BAND 10M/6M/2M/440MHZ WITH FOLD-OVER** • Gain & Wave: 10M & 6M 1/4 wave • 2M 2.15dBi 1/2 wave • 70cm 5.5dBi 5/8 wave x 2 • Length: 55" • Max Power: 10M 120W SSB 6M2M/70cm 100W FM • Conn: PL-259 • 10M and 6M bands have individual tuning stubs

COMET UHV-6 **HF/6M/2M/440MHZ MOBILE ANTENNA** *80/*20/*17/40/15/10/6/2M/70cm Mobile antenna with fold-over hinge• Gain & Wave: 2M 2.15dBi 1/2 wave • 70cm 5.5dBi 5/8 wave x 2 • VSWR: HF 1.6:1 or less, 6M-70cm 1.5:1 or less • Length: 44" (min), 78"(max) • Max Pwr: HF 120W SSB, 6M 200W SSB/100W FM, 2M/70cm 100W FM • ****L-14 optional 20M coil *L-18 optional 17M coil *L-3.5 optional 80/75M coil** • Features: • 6M/2M/ 70cm operation is constant. You CHOOSE the HF coils you want to add, up to four stock or optional. One vertical, the rest horizontal. • Easily mounts to standard trunk/door mount in minutes • Economical • Fold-over hinge built in• Select the duplexer or triplexer for your specific radio(s). CF-706A, CF-530, CFX-514N • Conn: PL-259

UHV-6 in fold-over position.
Fold-over hinge included for easy entry to garage, parking structure, drive-thru etc... SB-15 / UHV-4 / UHV-6 / HMC-6S fold-over hinge has a threaded collar to lock the hinge vertically in place. It can't fold-over by itself at highway speed!

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Slow scan TV is 50 years old this year—an "old mode" that has found new life in the world of computers and digital video, and new fans in a new generation of hams. Best news? You probably have nearly everything you need to get started.

Want to Spice Up Your QSOs? Go Video!

BY PETE KEMP,* KZ1Z

Imagine having not just a conventional conversation, but actually seeing what is happening in places far away. Anyone can talk about the weather, but to actually *see* the weather at the same time adds richness to the conversation. Exchanging images with foreign stations provides an extra opportunity to learn more about geography, culture, and society.

Amateur radio operators have always had a fascination with communication. Whether they transmit across the yard or around the world, hams want to experience the thrill of communicating. This process is personally rewarding on many levels, representing a technical achievement, coupled with the enjoyment of learning more about the world around them.

Speech and the written word are common forms of communication on and off the radio. Add the visual dimension, and you will enhance your QSO many times over. As the old Chinese proverb says, "One picture is worth ten thousand words," and that is a very important concept in visual communication. Ham radio traditionally has embraced two major forms of visual communications —full-motion amateur television (ATV), which is limited to UHF and higher frequencies because of its bandwidth, and still-image-based slow-scan television (SSTV), which is no broader than a voice signal and may be used on HF. This article will focus on SSTV.

SSTV, an Old New Mode

Fundamentally, radio amateurs work with sounds; they use their ears. Originally, amateurs listened to spaced-out, raspy static sounds that traveled through the air via spark-gap transmitters. These wideband signals carried information in a basic format that had to be decoded by ear. As time passed, this format evolved into what became the International Morse Code, affectionately called the "original digital." As newer technology developed, these static bursts became tones, via CW, a continuous wave. In time, these tones could be put together and speech became possible.

Not willing to limit communications to the auditory realm, radio amateurs explored a variety of image strategies for transmitting still pictures. The word *television* was formed from the Greek word *tele* (for something acting at a distance) and the Latin word for vision (sight). Hams not only wanted to talk around the world, they wanted to see who and what was on the other side of the conversation. The addition of a visual dimension allowed radio amateurs to open up a new way to enhance their QSOs.

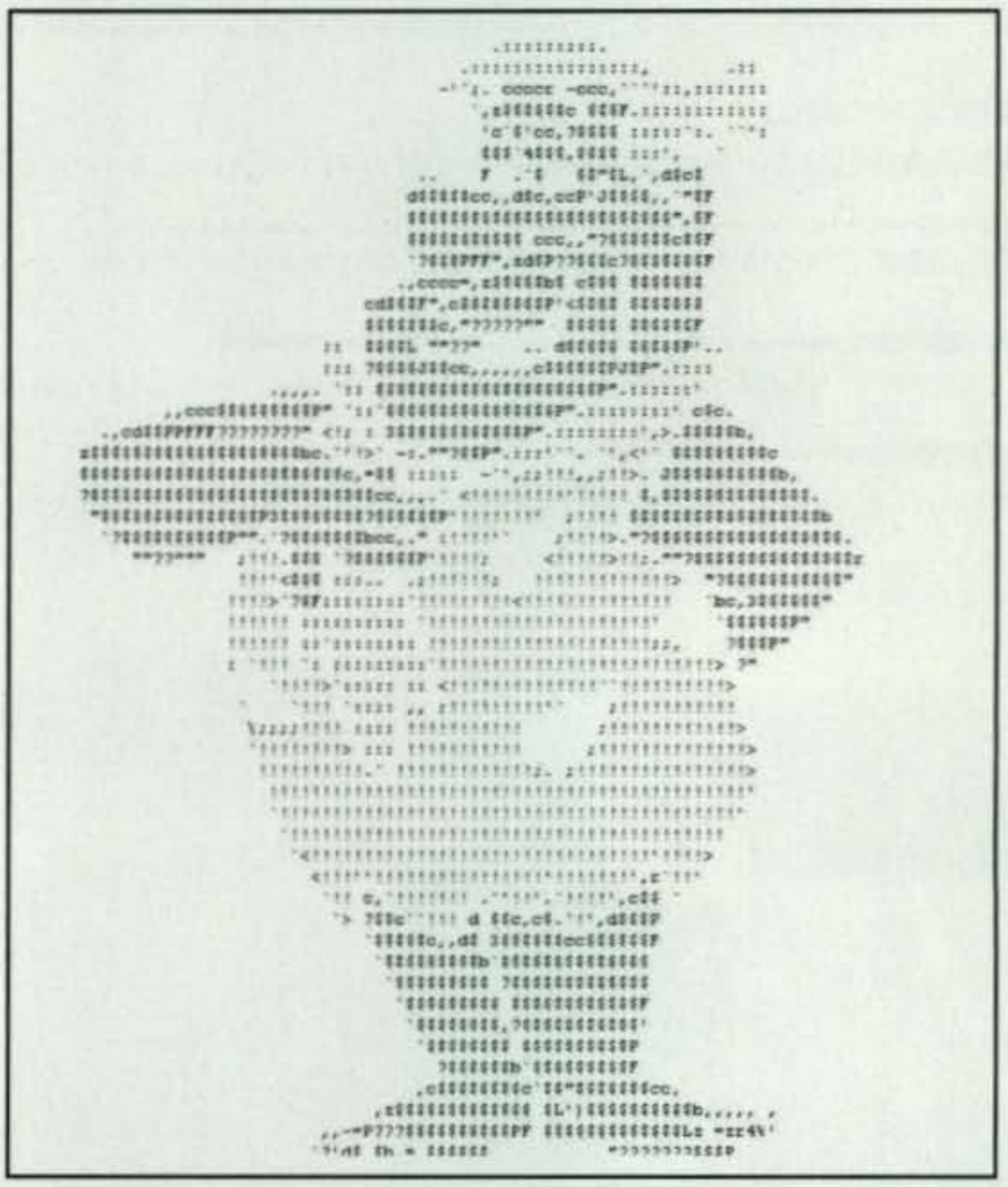

Fig. 1– Hams' first attempts at exchanging visual images, using "keyboard art," were transmitted via radioteletype (RTTY).

Radio amateurs were early experimenters with pictures via teleprinting, RTTY. Not content to send only text, hams shared simple pictures via keyboard art (fig. 1). This technique uses printed characters, in various combinations, to create pictures. The final product was primitive when compared to a Norman Rockwell print. These prints usually looked much better from a distance. Naturally, hams wanted to go to the next step, developing a method to send real pictures over the radio waves.

Slow-Scan TV (SSTV) was pioneered in 1957 by Copthorn Macdonald, WA2BCW, now VY2CM, when he was a student at the University of Kentucky. The Federal Communications Commission legalized SSTV transmission for radio amateurs in 1968.

The original slow-scan pictures had very low resolution and the images didn't last long on the screen. A temporary picture was created on a round picture tube with a phosphorous coating. This coating would glow for a few seconds, when hit by an electronic beam, as a picture slowly appeared on the screen and then faded out. To offset this factor many amateurs connected tape recorders to their systems. They would save pictures, via their audio signal, to replay in the future or

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50MHz 650W PEP max.

Matching Transceivers for Auto Band Decoder:
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Drain Current:
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Output Impedance:
50 OHM (unbalanced)

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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:
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AC 115V (100/110/124V) – 20A max.

AC Consumption:
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Approx. 20kgs. or 45.5lbs.

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User Manual

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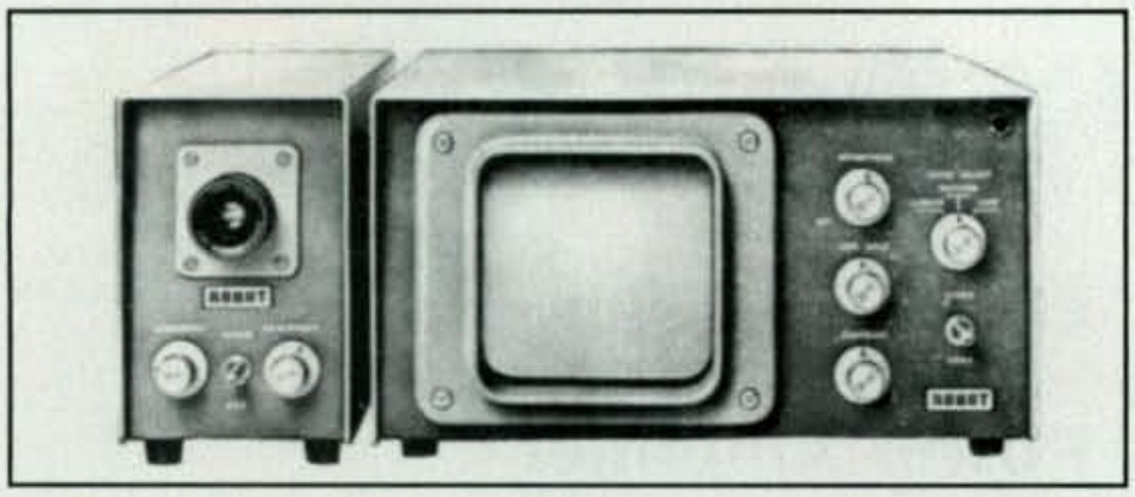

Fig. 2– In the early days of SSTV special equipment was required. Today, a personal computer and a digital camera are all you need.

to share. In later years, with the advent of integrated circuits, amateurs could freeze a picture on the screen. Today, in our computerized world, a click of a mouse will save a picture for archiving or for future rendering in a graphics editing software package.

During the early years, radio amateurs would listen to the atmospheric noise on the radio, thinking there must be a signal there. This was like a wishful-thinking DXer making a phantom "contact" with a very weak station. Hams would stare at the mono screen monitor, seeing snow, believing that there may be a television signal lurking. This process was like the early days of watching commercial television, before the test pattern came on, and "snow" was a common sight. Amateurs often had to think creatively to "fill in the picture," to find the image.

When a legitimate signal was heard, one's heart would race, tuning the signal in to get a lock onto the synchronization pulse. Bingo, all of a sudden a real picture would materialize in black and white. Pushing the envelope, hams wanted more. They wanted color. Using high-end SSTV hardware, multiple signals were received and combined into a single color image. SSTV was expensive, though. For example, the Robot 400 scan converter (B&W) cost nearly $800 in the 1970s. SSTV operating was considered too exotic for the average ham.

Initially, hardware devices by Robot (fig. 2), Wyman Research, and a few other manufacturers were the only options available for adding SSTV capability to a station's operation. However, the introduction of personal computers rapidly opened up the world of SSTV to all amateurs.

Enter the Computer

Early computer approaches to SSTV involved video capture boards. This card approach saved a lot of space in the shack, as separate SSTV converters were no longer needed. As a side benefit, many board-software combinations would also decode received FAX signals, for another visual application. Personal computers allowed the cost of operating SSTV to become affordable to the average ham. Even so, the software was a bit cumbersome in the DOS days. Faster computer speeds improved SSTV operating by cutting down the processing time during receive/ transmit cycles.

Since SSTV signals, as well as those of other digital modes, are audio tones in different combinations, the introduction of the computer sound card spurred development efforts in using the sound card to encode and decode all of these audio-based modes. Once this link was achieved, multiple digital modes developed. PSK31, MFSK, Olivia, Throb, and other "exotic" modes became popular and are still evolving. SSTV hams are even exploring high-definition and three-dimensional transmissions. The sound card brought the ability to operate SSTV, along with RTTY and other digital modes, into the shack of virtually any ham with a computer.

Starting Your Own Two-Way TV Station

A simple audio connection from a receiver to your sound card and some SSTV software are all you need to start viewing pictures. To transmit, interfacing the transceiver to the computer link may be accomplished in a few ways, from basic to advanced. Although a simple patch cord setup, such as the one shown in fig. 3, will work, most amateurs save time by using commercially available devices such as the ones shown in fig. 4. When interfacing a computer, be aware of the requirements for a traditional serial port or a USB connection, as well as any possible auxiliary power needs. Some of the more popular interface units, as well as some of the more popular software packages (commercial and shareware) available for various computer platforms are listed alphabetically in Table I.

Most SSTV software allows the importation of images from a digital camera, scanner, live camera, or image files creat-

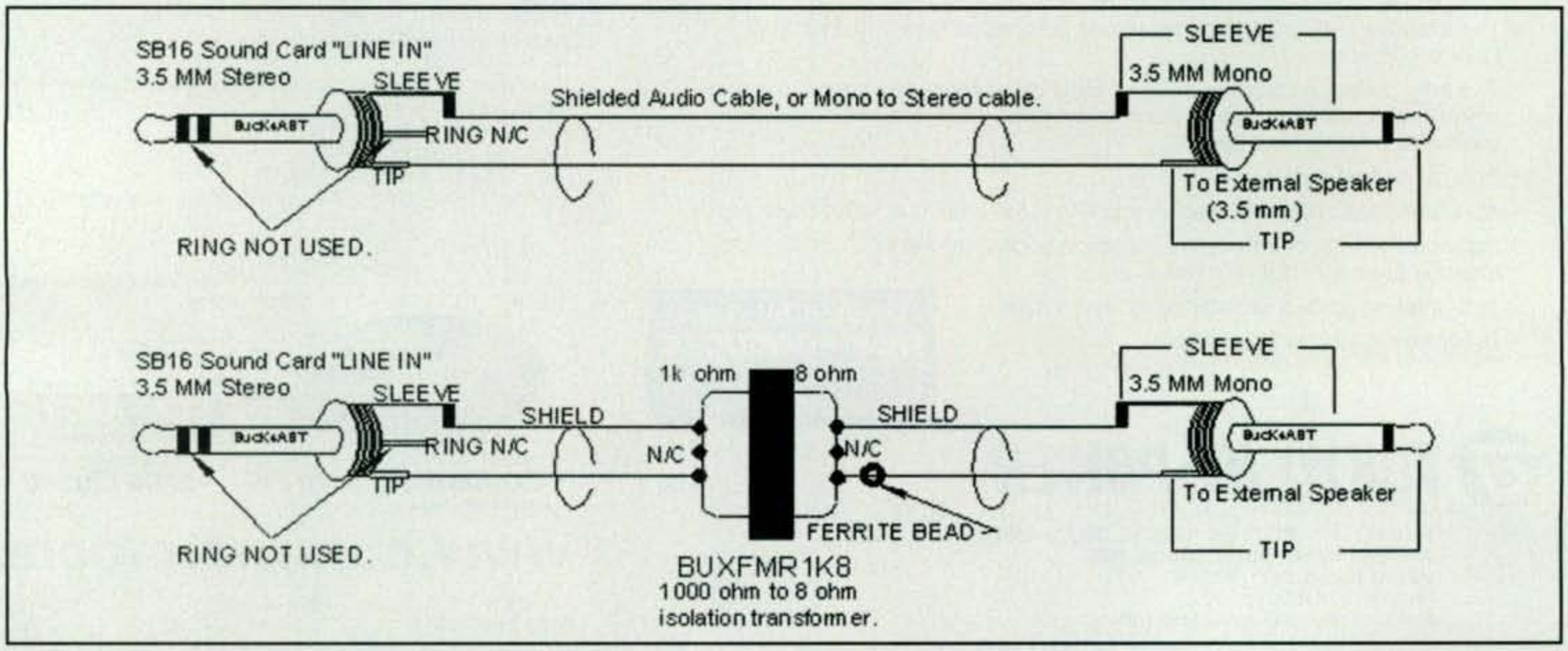

Fig. 3– The simplest radio-computer interface, such as this one from Buxcomm, consists of patch cables and an isolation transformer.

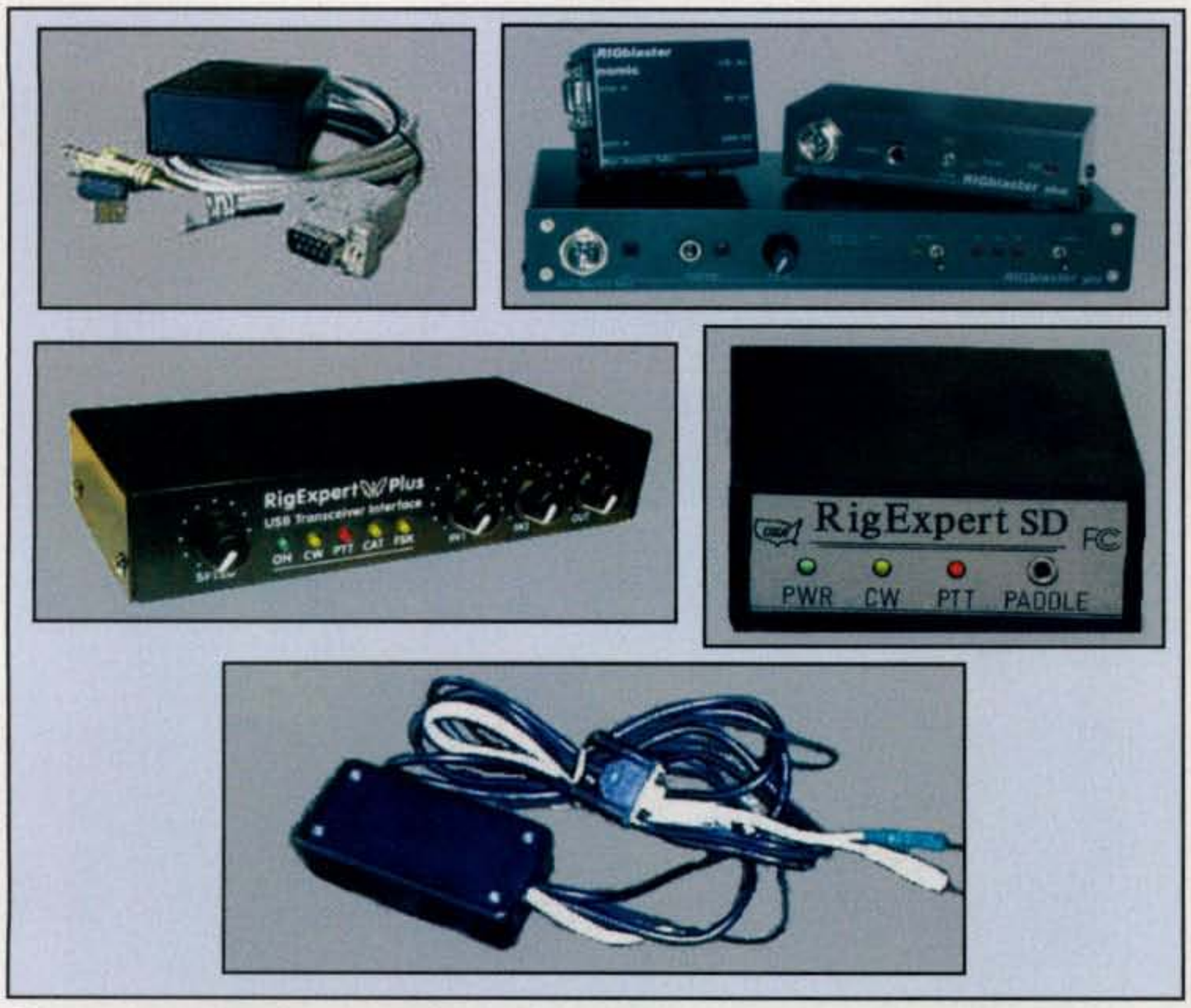

Fig. 4– A variety of commercial interface boxes are also available to connect your computer to your radio.

Fig. 5– More and more DXpeditions are including SSTV in their operations.

ed with a graphics editing software program. Once you start seeing the pictures appearing on your computer monitor, you'll be hooked.

SSTV Operating

Tuning across the bands, there are a variety of digital sounds. To find the SSTV ops, the following frequencies are common starting points: 28.680, 24.975, 21.340, 18.160, and 14.230 MHz. In addition, if 14.230 is very busy, you might find activity on 14.227 or 14.236. You'll find High-Definition SSTV as well as analog signals on 14.233 MHz. On 40 and 80 meters, 7.171, 7.228, and 3.845 MHz are popular, with 3.740 used in Europe. On 28.680 and 21.340 you may occasionally find SSTV repeaters/robots. Sending SSTV via FM repeaters is also done in many areas. Researching digital capabilities in a repeater directory or online will make your operating time more productive. Due to technical requirements and good operating practices, never blindly send SSTV signals on an FM repeater. There are also various modes of transmitting SSTV. As a general rule, *Scotty 1* (S1) and *Martin 1* (M1) are the most popular.

The RSV Reporting System

When operating SSTV, the RST reporting system isn't used to represent a station's signal quality. Video transmissions instead use the RSV System: Readability 1–9, Signal Strength 1–9, Video 1– 5. Using the RSV system, a perfect, or "closed circuit," picture would be a 595.

The Cookbook QSO

SSTV operators, like all ops, fall into a number of categories. Some ops like to ragchew, others DX or contest, and others are actively involved in public-service activities. The basic cookbook QSO is an exchange of three or more pictures. Here's a guide to getting started:

First, listen to the frequency. Check your audio levels. Be sure to have your speech compression off. Consider the area of world you would like to QSO with, if DXing. While Scotty 1 is the most common method of transmitting on SSTV, Martin 1 has a large following outside of the United States and for DX work. In today's world, most software will automatically select the proper receiving method. Transmitter adjustments may then be made accordingly. If the band is poor, or you are making quick contacts, you may wish to consider Scotty 2 or Martin 2. (Modes such as Robot or B&W 8 are still used occasionally, mostly for quick DX exchanges or slant testing. Modes such as PD, MR, ML, and ATV are rarely used, but are available.)

Then send your CQ picture (unless you're responding to someone else's CQ).

Some operators prefer to use their microphone, stating "CQ Slow Scan this is…" and their call. After calling a video CQ, allow time or other operators to respond. Often the other operator has to add your call to his/her software program, or select a picture appropriate for a response.

At this point, you will receive either an SSTV signal or a voice call. Because SSTV is conducted on a few frequen-

Interface Units

Buxcomm Rascal <http://www.buxcommco.com>
Donner Digital <http://home.att.net/~n8st/>
Microham <http://www.microham.com>
RigBlaster, various models <http://westmountainradio.com>
RigExpert <http://www.rigexpert.com>

Software Packages

Digtrx (DSSTV) Windows <http://www.tima.com/~djones/digtrx3.htm>
HamPal (DSSTV) Windows <http://www.kiva.net/~djones/hampal.htm>
MMSSTV Windows <http://mmhamsoft.amateur-radio.ca/>
MixW Windows (Commercial) <http://www.mixw.net/downloads.htm>
MultiMode OSX (commercial, for Macs) <http://www.blackcatsystems.com/software/multimodeOSX.html>
QSSTV (for Linux) <http://users.telenet.be/on4qz/>

Table I– For starting your own two-way TV station, here are some of the more popular interface units, as well as some of the popular software packages (commercial and shareware) available for various computer platforms.

Fig. 6– Using SSTV can be a good way to work a "new one" when pile-ups on CW and phone get to be too heavy.

Fig. 7– SSTV can be a perfect fit for public-service and emergency/disaster communications. Kenwood's VH-1 is a camera you can connect directly to a VHF or UHF transceiver to send or receive pictures over the air.

cies, multiple responses are common. Depending on the location and signal quality, an operator may wish to go back to the loudest signal. An operator may wish to acknowledge both stations, using a microphone. Roundtable operating, sharing the frequency, is very common on the SSTV mode. The option of asking one a station to stand by is also common. Relaying video among stations is a widespread practice. It is also important to listen to the frequency, as sometimes an operator who only has SSTV receive capabilities may want to QSO. Listening also allows you to better tune in another station or to judge audio quality.

The follow-up picture usually contains a signal report and, often, a replay of the other station's picture. Ops enjoy seeing what their own pictures look like. This helps them when designing future pictures for transmission and assists in evaluating their own signal for adjusting slant and other technical issues.

Subsequent images are wild cards. Often if you see a common theme in the other operator's pictures—such as animals, scenic views, or cars—you may wish to respond with a similar category image.

If the band is really active, you may wish to send an SSTV QSL or a 73 image.

There are times when the band isn't active, so additional pictures and phone exchanges, in a rag-chew style, may be used.

Usually after the last image is sent, an operator will come on the microphone, say 73, and thank the other station for swapping pictures.

This boilerplate QSO takes less than ten minutes. If time and image quality are important, an operator may desire to use Scotty 2 or Martin 2. This change in method will reduce the exchange time. When the band is really flying, or when there is an SSTV contest, you may wish to send in the Robot or B&W image. Using this method you can send a picture more quickly. This is the visual equivalent of the quickie DX contact

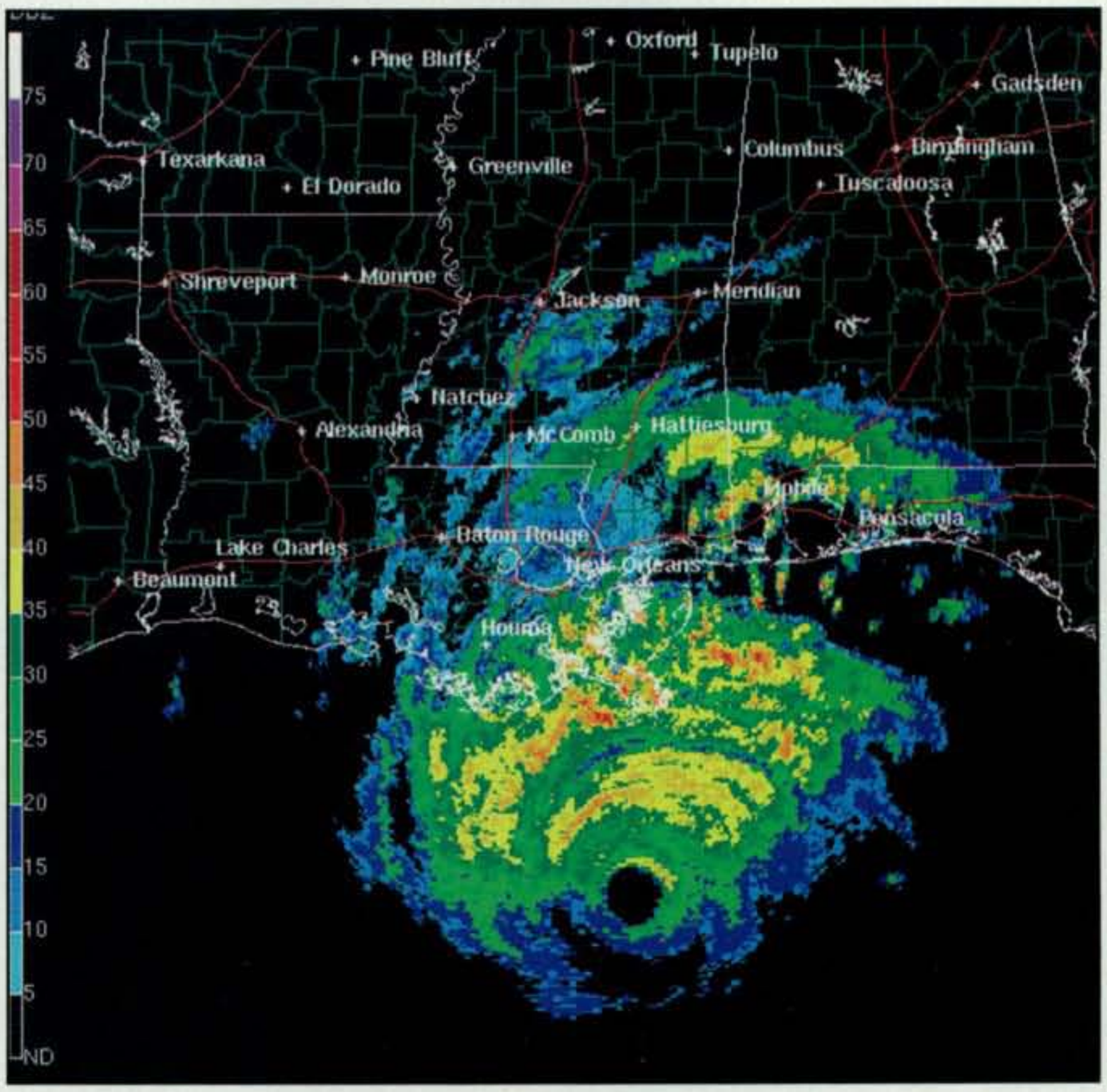

Fig. 8– Hams in the field may use SSTV to receive weather radar images from an incident command post or emergency operating center.

("59, 73…"). With the advent of laptop computers, many DXpeditions are now including SSTV in their schedules (see fig. 5). In some cases the odds of working a new DX station may be enhanced when the pile-ups are running wild on phone and CW (fig. 6).

In addition to routine operating, SSTV has applications for public service and emergencies. A laptop computer, interfaced with a transceiver, provides an opportunity to increase portable/mobile operations. Using a digital camera, web-cam type device, or specialized hardware, such as the Kenwood VH-1 (fig. 7), an amateur may transmit images from a disaster area. Images often may be used to provide an EOC or Red Cross with information for damage assessment. On the receive side, amateurs in the field may obtain maps or weather radar images (fig. 8) from an incident command post or emergency operating center.

See You on the Air

I hope this introduction to SSTV will get you interested enough to hook up your sound card, download some software, and give this fun mode a try. Once you get started, looking good on the screen is important. In the next installment of this article, tips for creating effective graphics will be presented. ■

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The **Icom PCR1500** wideband computer receiver connects externally to your PC via a USB cable. This provides compatibility with many computer models, even laptops. Incredible coverage is yours with reception from 10 kHz to 3300 MHz (less cellular gaps). Modes of reception include AM, FM-Wide, FM-Narrow, SSB and CW. (CW and SSB up to 1300 MHz only). The PCR1500 comes with an AC adapter, whip antenna, USB cable and Windows™ CD. *#1501* **$499.95**

The **Icom R1500** is similar to the above, but also includes a controller head for additional operation independent of a PC. *#1500* **$599.95**

ICOM PCR2500 R2500

The **Icom PCR2500** wideband computer receiver uses a similar form-factor to the PCR1500, but has several enhancements, including two powerful features: *dual watch* (the radio can receive two signals simultaneously) and *diversity reception* (two antennas can be connected at the same time and employed to provide stable reception). The optional UT-118 Digital Unit provides D-STAR® digital voice reception and the optional UT-121 supports APCO25 digital voice decoding. The R2500 is shown above. *#2501* **$729.95**

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This device has not been approved by the Federal Communications Commission. This device may not be sold or leased, or be offered for sale or lease, until approval of the F.C.C. has been obtained.

The **Icom R9500** clearly raises the bar for professional receivers. Covering 5 kHz to 3335 MHz, this instrument represents the state-of-the-art in receiver technology! Visit the Universal website for complete details.

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washington readout

BY FREDERICK O. MAIA,* W5YI

Details on the FCC Report & Order Ending Code Exams

"In summary, we believe that the public interest will be served by revising the amateur service rules to eliminate the telegraphy testing requirement. We also believe that these rule changes will allow amateur service licensees to better fulfill the purpose of the amateur service and will enhance the usefulness of the amateur service to the public and licensees." —From FCC Report & Order, WT Docket No. 05-235

After a lengthy wait, the FCC finally acted on its proposal to eliminate all Morse code testing in the Amateur Radio Service. In a news release issued at the close of business on Friday, December 15, 2006, the FCC called telegraphy testing "...an unnecessary regulatory burden" and said it was eliminating the five words-per-minute Morse code examination requirement for General and Amateur Extra licensees.

"This change reflects revisions to international radio regulations made at the International Telecommunication Union's 2003 World Radio Conference (WRC-03), which authorized each country to determine whether to require that individuals demonstrate Morse code proficiency in order to qualify for an amateur radio license with transmitting privileges on frequencies below 30 MHz," the FCC said in the one-page release.

This previous international regulation required that "Any person seeking a license to operate the apparatus of an amateur station shall prove that he is able to send correctly by hand and to receive correctly by ear texts in Morse code signals. The administration concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 30 MHz."

The United States is one of the last countries to eliminate telegraphy testing in its Amateur Service. Many countries began abolishing telegraphy testing right after WRC-03, and by 2004 most countries in the world had followed suit.

Petitions for Rulemaking seeking to end all code testing started rolling in to the FCC right after WRC-03 ended in July 2003, setting off a preliminary 30-day comment period. The FCC considered all proposals from the public and issued its version (in the form of a Notice of Proposed Rulemaking) two years later, on July 19, 2005. That was followed by a more formal comment and reply period. "Government of the people, by the people and for the people" necessarily moves slowly, since by law, the public must be involved in federal rulemaking.

The question of whether to drop the Morse code requirement altogether has been the subject of often heated debate over the past several years. Many long-term hams—especially those who had to pass telegraphy tests—wanted Morse code examining to continue. Some saw it as a way to reduce competition on the HF bands. Others thought the quality of amateur radio operators would decline. The handwriting has been on the wall, however, for more than a decade.

The FCC was already on record in the No-Code Technician proceeding: "We do not concur with the comments alleging that the passing of a telegraphy examination is an indication of the examinee's good character, high intelligence, cooperative demeanor, or willingness to comply with our rules," the FCC said in PR Docket No. 90-55 (December 1990).

Most newcomers to ham radio, especially those who entered the hobby in the 1990s without passing a 5-wpm code test, had difficulty understanding why it was necessary to pass a telegraphy exam in order to transmit in the voice mode on the high-frequency bands where long-distance communication is possible.

A year and a half after the NPRM was released—on Tuesday, December 19, 2006—the FCC finally issued the full blown text of its Report and Order (R&O). The Commission noted that "a division of views" still exists within the amateur radio community, but after reviewing the comments, it elected to stick with its initial proposal to end code testing. However, it did change its original plan to leave all license privileges as they were, opting instead to grant all Technicians the limited HF privileges already available to Techs with credit for passing a code test.

The R&O was 41 pages long, with more than half being devoted to a listing of everyone who submitted comments on the proceeding—nearly 4,000 names! The Commission wanted the members of the amateur radio community to know that their comments on the volatile Morse testing issue were indeed received and considered.

There really were not many surprises in the R&O. The importance of Morse communications had already been hashed out by the FCC and the ama-

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

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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.

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MFJ RF Isolator

MFJ-915 *RF Isolator*

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$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.

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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.

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MFJ-1778M, $34.95.
Half-size 52 foot *G5RV Jr* 40-10 Meters, 1500 Watts.

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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.

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teur community over the years and all positions were pretty well known. The Commission essentially followed its July 2005 NPRM. Here is a summary of the key elements:

FCC: Written Examinations are Sufficient

The Commission made it clear that Morse code testing should not be required and that it feels the written examinations are "...sufficient to determine whether a person is qualified" to be an amateur radio operator and that there is no relationship between telegraphy knowledge and on-the-air conduct.

The Commission amended Section §97.501 of the Part 97 Amateur Service Rules to eliminate the requirement that an individual demonstrate 5-wpm Morse proficiency in order to qualify for a General or Amateur Extra Class operator license. In the future, the only examination requirement for a General Class license will be passing written Elements 2 and 3; for Amateur Extra Class: Elements 2, 3, and 4. Any radio amateur may, of course, still use CW on the air even though he/she has not passed a telegraphy examination.

The entry level into amateur radio will continue to be the Technician Class license, which will continue to be obtained by passing the 35-question (multiple choice) Element 2. With the elimination of code testing, there will now be no difference between the Technician and so-called Tech Plus operator (a Technician who has passed a 5-wpm telegraphy test and has limited privileges on HF), either in terms of licensing requirements or operating privileges. "In eliminating this disparity we are simplifying the Amateur Service licensing structure and promoting regulatory parity," the FCC said.

The new rules authorize all Technician licensees to operate on 80, 40, 15, and 10 meters CW and 10 meters single sideband (SSB) voice between 28.300 and 28.500 MHz. The Technician HF CW privileges will be those of a Novice Class operator, specifically: 3525–3600 kHz (80m CW), 7025–7125 kHz (40m CW), 21025–21200 kHz (15m CW), and 28000–28300 kHz (10m CW, RTTY, and data). Technicians may also operate CW in addition to SSB between 28.3 and 28.5 MHz. Novices and Technicians are still restricted to 200 watts PEP power output below 28.5 MHz.

ARRL: Retain Code Exam for Extra Class

The Commission disagreed with those commenters who supported eliminating the telegraphy requirement for the General Class operator license, but wanted it retained for the Amateur Extra Class operator license.

The American Radio Relay League (ARRL) and others argued that the telegraphy requirement for the Amateur Extra Class operator license should not be eliminated because the Extra Class license ought to represent "...the ultimate in achievement in both technical and operating skills in Amateur Radio," and "...the number of radio amateurs who have achieved this ultimate license class clearly demonstrates that a 5 words-per-minute telegraphy requirement is not a significant deterrent to those who aspire to it." (*CQ* had also urged the FCC to keep the code requirement for Extra while dropping it for General, based on the broad consensus favoring that arrangement, which was evident in the preliminary comments.—*ed.*)

The Commission disagreed and said it believes that the public interest is not served by requiring Morse code proficiency "...when the trend in amateur communications is to use voice and digital technologies for exchanging messages." The FCC added, "... because the international requirement for telegraphy proficiency has been eliminated, we should treat Morse code telegraphy no differently from other amateur service communications techniques. This reasoning applies equally to the General Class and the Amateur Extra Class operator licenses."

The Commission stated it was "...not persuaded that the Amateur Extra Class being the highest license class is a sufficient reason alone to retain a requirement that we conclude is otherwise inappropriate and unnecessary." The FCC noted that anyone could pursue Morse code proficiency without a test should they so desire.

The ARRL was somewhat disappointed that the code requirement was not retained for the Extra Class, but seemed to take the decision in stride with a "glad it's over" and "now let's move on" mentality. The League stated it would maintain its traditional support of Morse code as an operating mode and would continue to offer Morse training materials and on-the-air Morse code practice through its headquarters station, W1AW.

Emergency Communications

The Commission acknowledged that an important aspect of the Amateur Service is providing emergency communications to the public. It did not agree, however, with those who argued that telegraphy proficiency should be required because amateur radio stations might need that mode to provide or assist with emergency communications. "Voice or digital communication can be exchanged much faster than telegraphy," the FCC said, adding that Morse code proficiency "...is unrelated to a licensee's ability to provide or assist with emergency communications."

The Commission concurred with one amateur who commented, "(m)odern digital protocols and voice modes are far superior to Morse code for public service and emergency communications, and dropping the Morse code requirement will increase the pool of licensed amateur radio operators available for public service and emergency communications."

No New Entry-Level License Class

In the NPRM, and subsequently in the Report & Order, the Commission denied several requests asking that it authorize additional frequency bands and emission types in the MF and HF bands to the Technician Class.

The Commission also refused requests for the establishment of a new entry-level license class that would not have a Morse code requirement but would give licensees access to all VHF and UHF amateur bands and limited telegraphy, data, and voice privileges in the HF bands. Both the ARRL and the National Conference of VECs (NCVEC) submitted petitions supporting a new beginning path into amateur radio.

"Accordingly, we believe that the current licensing structure, as modified herein, provides significant and sufficient incentives for participation in the Amateur Radio Service," the FCC said in the R&O, adding, "based on the record before us at this time, we decline to establish a new introductory class of amateur radio license."

The Commission concluded that the elimination of telegraphy testing makes new frequency bands for the Technician Class or a new entry-level license class "unnecessary." This reasoning was based on the fact that new entrants could qualify for a General Class license which yields all-mode access to all amateur frequency bands simply by passing two (35-question multiple-choice) written examinations.

Automatically Controlled Digital Stations

The FCC also took the opportunity in the R&O to resolve a petition filed by the American Radio Relay League. The ARRL

requested partial reconsideration of the Report and Order in WT Docket No. 04-140 (the Phone Band Expansion proceeding), which the Commission released on October 10, 2006.

In that proceeding, the Commission authorized amateur stations to transmit voice communications on additional frequencies, including the 75-meter band. The League argued that the 75-meter band should not have been expanded below 3635 kHz, in order to protect automatically controlled digital stations limited by FCC rules to operating in the 3620–3635 kHz portion of the band.

The FCC said it did not intend to reduce the spectrum available to automatically controlled digital stations, but concluded that these operations can be protected by providing alternate spectrum in the 3585–3600 kHz frequency segment.

"We believe that because this frequency segment is very near the 3620–3635 kHz frequency segment now authorized for RTTY and data communications and because licensees generally have frequency-agile equipment, they will be able to shift their operations to this frequency segment with minimal difficulty," the FCC observed.

The FCC left the newly expanded Extra Class phone segment intact and amended Section § 97.221 Automatically controlled digital station subparagraph (b) to read: "A station may be automatically controlled while transmitting a RTTY or data emission on the 6m or shorter wavelength bands, and on the 28.120–28.189 MHz, 24.925– 24.930 MHz, 21.090–21.100 MHz, 18.105–18.110 MHz, 14.0950– 14.0995 MHz, 14.1005–14.112 MHz, 10.140–10.150 MHz, 7.100–7.105 MHz, or 3.585–3.600 MHz segments."

Reciprocal Operation by CEPT Licensees

The FCC also amended Part 97 to conform FCC rules to those of the European Conference of Postal and Telecommunications Administration (CEPT). Since telegraphy proficiency is no longer internationally required, CEPT reduced its number of amateur license classes from two to one in 2003. A Class 2 CEPT amateur license previously required Morse code knowledge.

"The United States is a signatory to the CEPT agreement," the FCC said in the R&O. "We thus must give effect to CEPT's establishing a single license class." FCC rule Section § 97.301(a) now grants Extra Class privileges to any radio amateur who holds a CEPT license "...issued by the country of which the person is a citizen." However, it warned that this does not apply to any foreign amateur who also holds an FCC-issued amateur license below Extra Class.

Upgrading to General and Extra Class

Since telegraphy testing has been eliminated, Technician Class radio amateurs may upgrade to General simply by passing written Element 3, and to Extra by passing Elements 3 and 4.

Many Technicians have already passed Element 3 in anticipation of the removal of code testing and have received a Certificate for Successful Completion of Examination (CSCE). Be aware that CSCEs are valid for examination credit only for 365 days from the date issued. Since it has been more than a year since the NPRM was released, some CSCEs may have expired. Amateurs with expired CSCEs (beyond 365 days) must be retested.

Once the new rules are in place, anyone holding a valid CSCE may apply for an upgrade at a VE examination session. Volunteer Examiner Coordinators (VECs) are handling all upgrades through their Volunteer Examiner (VE) teams.

Candidates for General or Amateur Extra simply present their valid CSCEs to a local VE team along with a completed NCVEC form 605 and the test session fee. (Note that even though no actual testing will be conducted, a session fee is still due.) The VE team will forward the paperwork to its VEC. The NCVEC form 605 may not be sent directly to the FCC or the VEC.

Judging by the skyrocketing sales of General Class license training materials since the FCC Order, it appears that thousands of Technicians will be taking the Element 3 examination and upgrading. The question pool for Element 3 is in the process of being revised by the VECs' Question Pool Committee (QPC), and applicants obviously are trying to pass the current exam before the new, upgraded questions go into effect on July 1, 2007.

The new rules will take effect 30 days after publication in the "Federal Register," a daily document published by the Government Printing Office (GPO) that informs the public of new regulations. The final rules were published in the "Federal Register" on January 24, just before we went to press, and will take effect at 12:01 a.m. on February 23, 2007. (Additional updates may be found on the CQ website news page at <http://newsvc.cq-amateur-radio.com>.) 73, Fred, W5YI

BY WAYNE YOSHIDA,* KH6WZ

Introducing Your New HF Privileges

By Rich Moseson, W2VU

KH6WZ has been traveling on business and wasn't able to complete this month's column by deadline. Editor W2VU fills in.

By the time you receive this issue, if you hold a Technician Class license, you will either have or be about to have brand new operating privileges on four HF bands. Since operating on these bands hasn't been covered in the Technician exam since 1987, we thought it would be helpful to give you a brief introduction to your new privileges, along with some operating tips. Table I shows you what these privileges are.

Let's start by looking at each of the bands on which you may operate, and what you can expect of them.

80 Meters (3025–3600 kHz)

The 80-meter band is primarily a local and regional band during the day, with contacts likely out to about 500 miles. At night, though, the band opens up for worldwide DX, particularly in the winter and at the bottom of the 11-year sunspot cycle (which is where we are right now). In the summertime, static from distant thunderstorms limits DX range.

40 Meters (7025–7125 kHz)

Forty is a regional band during the day, with contacts likely out to about 1500 miles. Like 80, it opens up for DX contacts at night and is at its prime right now, at the bottom of the sunspot cycle. It is less susceptible than 80 meters to lightning-induced static and is good year-round. You're likely to hear foreign hams using voice in the U.S. CW (Morse code) segment when the band is open. In Europe and elsewhere, the 40-meter band is much smaller (it's shared with international broadcasting at the higher frequencies), and most other countries have no mode limits. This will be especially noticeable during the phone weekends of DX contests. With practice, and learning how to best use the filters on your rig, you should be able to copy a reasonable-strength CW signal around a voice signal, as long as you both are not on the exact same frequency.

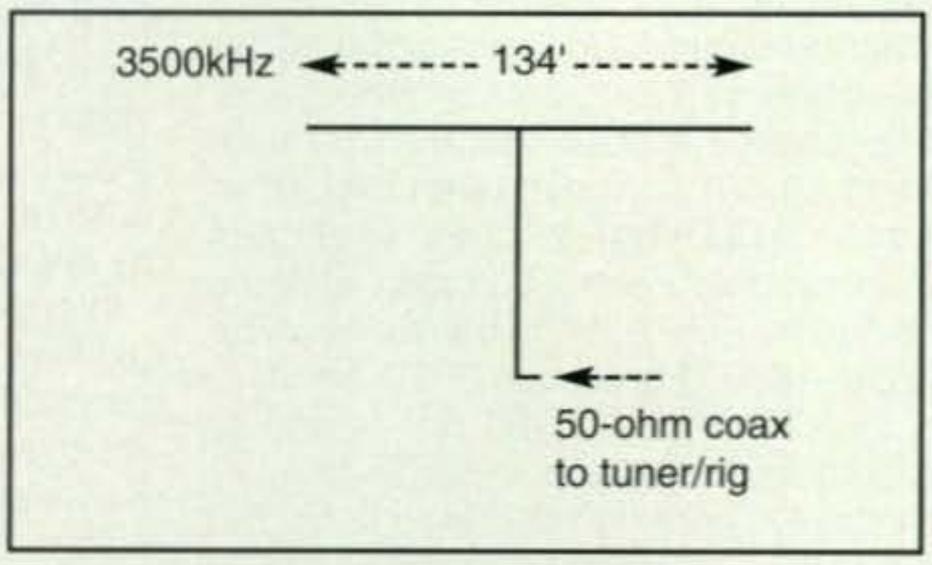

Fig. 1– An 80-meter dipole. Many hams use this antenna plus a tuner to cover the entire HF spectrum.

15 Meters (21,025–21,200 kHz)

Fifteen meters is a prime DX band, but it is subject to the "mood swings" of the sunspot cycle. Even now, though, there are regular openings to distant continents (they're just fewer and of shorter duration than during peak sunspot years). Unlike 80 and 40, 15 is primarily a daytime band, with worldwide contacts possible during daylight hours and even a few hours after sunset (mostly to places where the sun is still up). During the peak of the sunspot cycle, 15 can be open for DX around the clock.

10 Meters (28,000–28,500 kHz)

The 10-meter band offers you the greatest choice of operating privileges and, when the sunspots start climbing, the greatest DX possibilities of any HF band. Don't ignore this band while waiting for the sunspots, though. There are still regular DX openings, mostly north-south right now, and the situation will only improve from here as we begin the new sunspot cycle sometime this year. Like 15, 10 meters is a daytime band, and it can be fascinating to spend the day on the band watching the propagation move from east to west as it tracks the sun. Nighttime on 10 is very quiet right now, except for the occasional local contact. During the peak of the sunspot cycle, though, it can be open worldwide virtually around the clock.

The FCC allows you to operate RTTY (radioteletype) and other keyboard data modes, such as

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

New Technician Class Operating Privileges

Effective February 2007

HF

Band	Frequency Range	Notes
80 meters	3525–3600 kHz	CW only
40 meters	7025–7125 kHz	CW only
15 meters	21,025–21,200 kHz	CW only
10 meters	28,000–28,300 kHz	CW, RTTY, Data
	28,300–28,500 kHz	CW, SSB voice only

(Maximum power 200 watts PEP on all HF band segments)

VHF/UHF

All amateur privileges above 30 MHz

Table I– The new privileges available to Technician Class licensees.

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Two 500 pf -- *the highest of any antenna tuner* -- variable transmitting capacitors give you no-arc wide range impedance matching for true high power performance.

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Super Balun, 6 position Antenna Switch

Super heavy duty three core choke balun lets you match virtually any balanced feedline antenna without core saturation.

A 6 position antenna switch lets you select your desired operating antenna.

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with Eimac® 3CX1200A7 toughest tube

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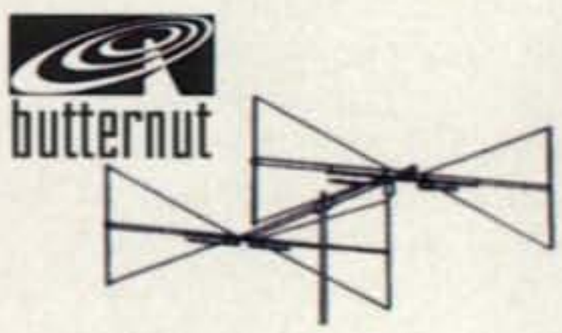

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Hygain, Ham-IV	$499
Hygain, Ham-V	$849
Hygain, T2X	$569
Hygain, T2X Digital	$929
Hygain, HDR-300A	$1269
M2, OR-2800PDX	$1379
Yaesu, G-450A	$249
Yaesu G-550	$299
Yaesu, G-800SA	$329
Yaesu, G-800DXA	$409
Yaesu, G-1000DXA	$499
Yaesu, G-2800DXA	$1089
Yaesu G-5500	$599

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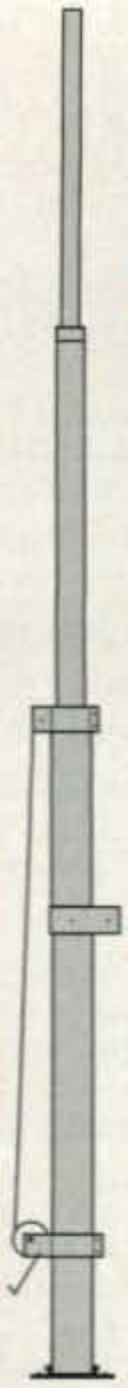

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Neighbor Friendly Design offers a flag-pole-like appearance, while supporting antenna loads up to 22 square feet. Models range from 40–85 feet in height and come with a hand winch and house bracket. Optional self supporting bases are also available.

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Universal

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Light Duty Aluminum Self Supporting Towers. Five models range from 30–50 feet in height, and support up to 12 sq. ft. of antenna load.

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B-26 SERIES

Medium Duty Aluminum Self Supporting Towers. Thirteen models range from 30–90 feet and support up to 34.5 sq. ft. of antenna wind load.

CALL FOR MORE INFO!

B-30 SERIES

Heavy Duty Aluminum Self Supporting Towers. Nineteen models range from 40–100 feet, and support up to 34.5 sq. ft. of antenna wind load.

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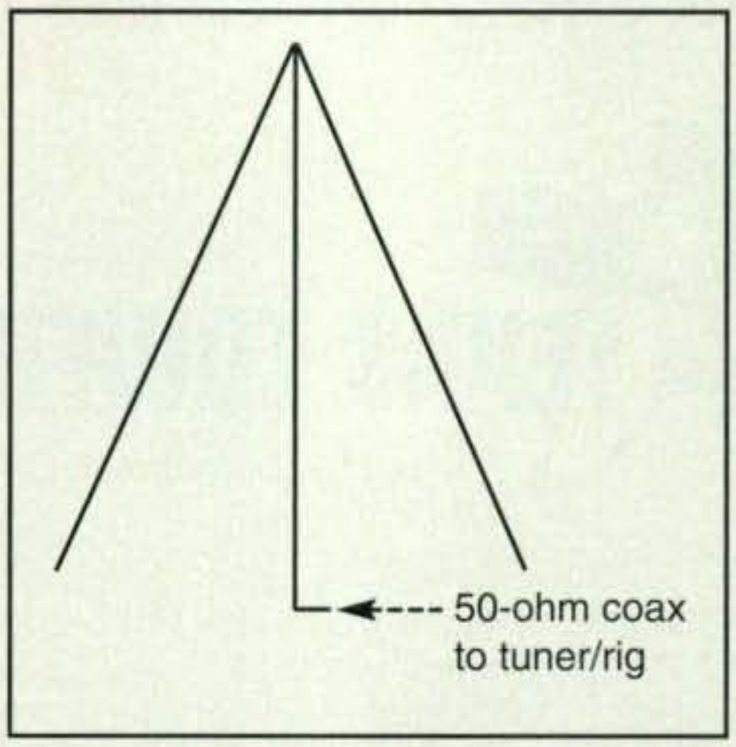


Fig. 2– The inverted-Vee is a variation on the dipole. Lengths are the same, except that the "legs" are put up at angles to each other rather than in a straight line. An inverted-Vee may be installed horizontally or vertically or somewhere in between.

PSK-31, on the 28,000–28,300 kHz segment of 10 meters, in addition to CW. So if these modes interest you, this is the place to try them out. Of course, you're also allowed to operate SSB voice (as well as CW) on the 28,300 to 28,500 kHz segment. This is where some of the best DX can be found, even now. So keep an ear to 10 meters during the day, especially on phone contest weekends (see our "Contesting" column for a calendar of upcoming contests). Even if you're not competing in a given contest, those who are would like to hear from you. You're worth points to them! If you're not sure what information they need, just ask (usually, it's something like a contact number—starting with 001—and your location, either state, ARRL section, or CQ zone, plus a signal report, which is virtually always 59 for contest contacts).

Antennas

There are a few mandatory pieces of hardware for getting on the air on HF: an HF transceiver, a code key and/or microphone, and an antenna. The most common antenna, especially for getting started, is the half-wave dipole. Many hams put up an 80-meter dipole, either in the traditional flat-top configuration (see fig. 1) or as an inverted-Vee (fig. 2) and use a tuner between the antenna and the rig to operate all HF bands with just one antenna. The only potential problem is its length–about 134 feet—and while you can bend it and take it around corners, some people simply don't have that much space (see Table II for dipole lengths at other frequencies).

Frequency	Length of dipole (feet & inches)
3500 kHz	134'
7075 kHz	66' 2"
21100 kHz	22' 2"
28300 kHz	16' 6"

Table II– Half-wave dipole lengths for the approximate center of the Technician Class segment of each band with new Tech privileges, based on the formula 468/f (MHz). (For the purist, a 134-foot dipole at 80 meters is actually resonant at 3492.5 kHz, but the lengths are not ultra-critical, especially if you're using an antenna tuner.)

Another popular (and shorter) all-band option is the G5RV antenna (named for Louis Varney, G5RV, who developed it). This combines a 102-foot top section with a 34-foot vertical segment made from 300- or 450-ohm twinlead, which then connects to 75-ohm coax to your rig or, preferably, a tuner (see fig. 3). The twinlead section is actually a radiating part of the antenna (if you calculate 102 + 34, you'll get 136, right in the same ballpark as the traditional version).

If (like me) you don't have even that much room, a 40-meter dipole (about 66 feet long) will also work well on 15 meters. Another option is to run multiple dipoles (e.g., 40, 15, and 10 meters) to a single feedpoint and run one piece of coax back to the shack (see fig. 4). All of the wires on one side connect to the center conductor of the coax cable and all of the wires on the other side connect to the coax shield.

Multiband verticals are another option. In this case, you're moving out of the realm of the do-it-yourself wire antenna to the commercially-manufactured antenna, so cost becomes a greater issue.

Learning CW

Your privileges generally limit you to Morse code, or CW (except on 10 meters), with a 200-watt power maximum, but most HF rigs put out only 100 watts anyway, and some of the juiciest DX is available on CW (it's easier to pull a weak CW signal out of the noise than a weak phone, or voice, signal). Don't be afraid to try to contact some of these stations. Some may be as new to CW as you are, and more experienced CW operators know to slow down to match the speed of the person they're talking with (so don't send faster than you can copy).

If you don't yet know a dit (dot) from a dah (dash), don't worry. There are

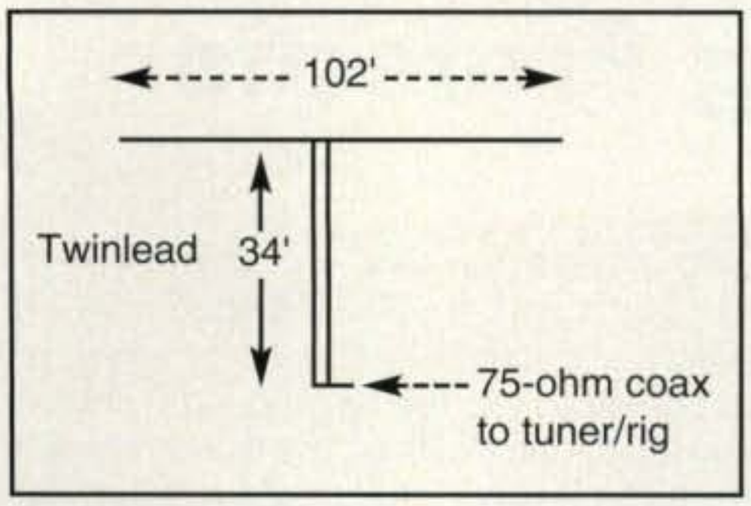


Fig. 3– The G5RV antenna is a shortened dipole which is also useful for all-band HF operation. The 34-foot section of twinlead is part of the radiating area of the antenna.

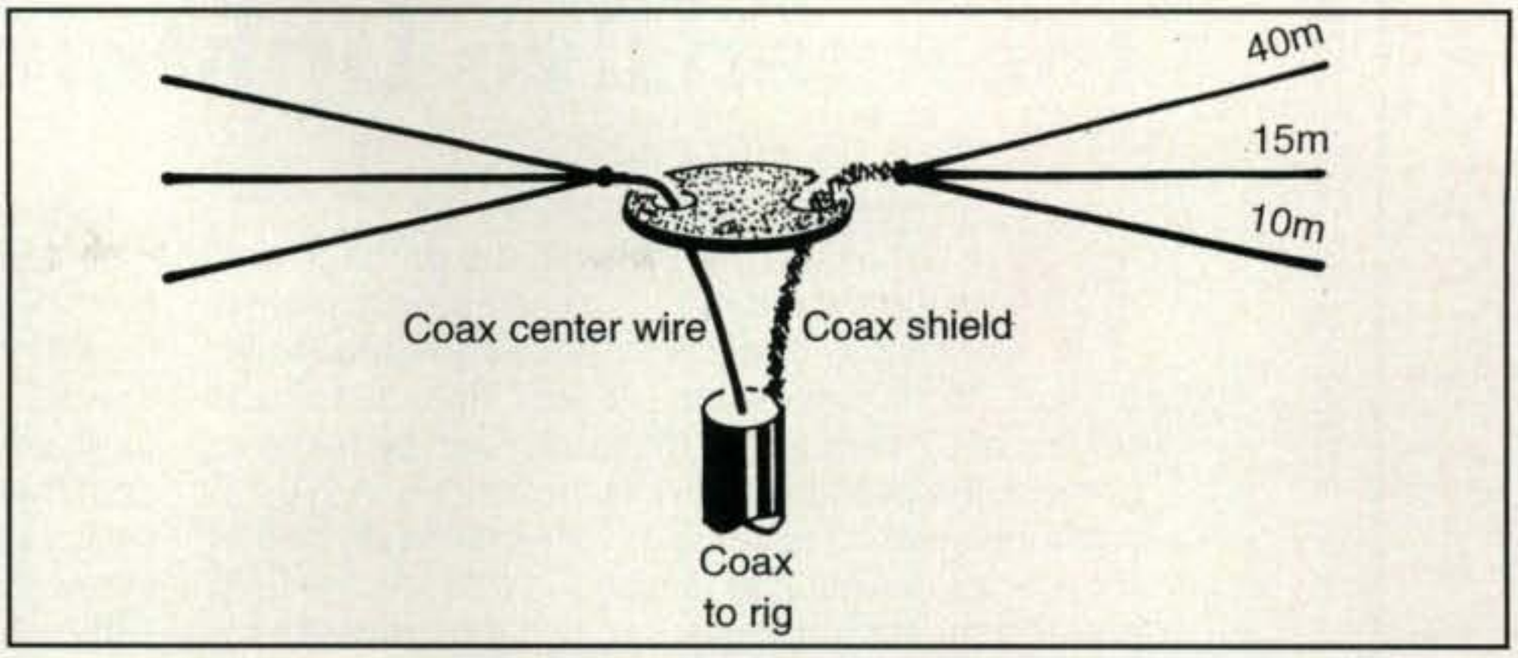


Fig. 4– Another option for a multiband dipole is bringing two or more single-band dipoles to a single feedpoint and running one piece of coax back to the rig. Your transmitted signal will "choose" which antenna is closest to resonance with its frequency.

plenty of training programs available online, either for downloading to your computer or for practice via the internet … or even over the air. One great resource is the AC6V website's Morse training page at <http://www.ac6v.com/morseprograms.htm>, which provides links to more than 40 different code training options. In addition, the W5YI Group offers code training programs on CD and tape (see the ad here in *CQ*). Many radio clubs are also planning code training classes for those interested.

On the Air

Some practices on HF differ from what you may be used to on VHF. First of all, if you're looking for a contact, you call CQ instead of saying that you're "listening" or "monitoring." CQ calls on HF should be longer than on VHF, so that someone tuning the band will have an opportunity to hear you. On voice, no longer than about 30 seconds before listening and then calling CQ again if you want to. On CW, the format is "CQ de (your call)"; you will want to send CQ two or three times before the "de," which means "from," and then your call two or three times. At the end, send a "K" to indicate you're finished transmitting. Here's a typical CQ sequence in CW:

"CQ CQ CQ DE W2VU W2VU CQ CQ DE W2VU CQ DE W2VU W2VU K"

In all cases, you should listen before transmitting to make sure the frequency is not busy, and since propagation can be strange on HF, it is best to ask if the frequency is in use before calling CQ. On phone, you should say, "Is the frequency in use? W2VU" (substituting your call, of course), and on CW, you should send, "QRL? W2VU." If someone says the frequency is busy, move somewhere else. It means there's a QSO in progress but you can't hear one end of it. Generally, the response will be "QRL" (without the question mark) in CW or "Yes, the frequency is in use" on phone.

Jump on In, the Water's Fine

The world is literally at your fingertips with the new privileges granted to Technicians under this latest round of restructuring, and privileges on all HF bands are just one 35-question multiple-choice test away. But take advantage of these new privileges now, whether you choose the multi-band flexibility that will come with learning code, or listening for band openings on 10-meter phone (weekend afternoons are best right now) while studying for your General. The world of HF is yours to explore and discover. Have fun!

BY IRWIN MATH,* WA2NDM

Inexpensive Lightning Protection

Most of us are familiar with the damage and havoc a lightning strike can cause when it occurs in the vicinity of our amateur radio station. While little can prevent the disastrous results of a direct strike, measures can be taken to prevent the problems of a nearby strike. A typical lightning strike of millions of volts can easily cause thousands of amperes to flow. As a result, the field created by such a strike can produce dangerous voltages into nearby antennas or transmission lines. Of course, the best prevention is to always disconnect the antenna during any potentially hazardous weather, but the techniques described here can help when one doesn't have the time, simply forgets, or is away from the shack during a thunderstorm.

Before starting this discussion, I would like to state that both of the lightning arrestors we will describe are not equal to the commercial types specifically made for this purpose. However, they will protect against discharges that could easily take out your equipment, and at the least they are certainly better than no protection at all.

Since most antennas are connected to transmitters, receivers, or transceivers with coax, we will start there. An inexpensive coaxial-cable-compatible lightning arrestor can easily be made from a common PL-259 male-to-male adapter such as the Amphenol type 83-1J. You will need a #51 drill bit, a 2-56 tap (and tap handle), a 2-56 × 1/2-inch machine screw, a #2 lock washer, a crimp-type #2 lug, and two 2-56 hex nuts.

Referring to fig. 1, first carefully drill a hole through one side of the adapter at the center as shown. Drill completely through the brass outer sleeve, but stop as close to the central conductor as you can without actually passing through it. Be careful with the drill bit, as it can break easily. Using a power drill (at a slow speed) or a drill press to cut through the brass is okay, but as soon as you are through the metal, remove the drill bit and use your thumb and forefinger to finish the job through the plastic. If you look through one end of some versions of the adapter the insulating plastic material is clear enough (Amphenol in particular), and with a good light on the other side you can actually see the progress of the drill. Next carefully tap the hole you just drilled. Only allow the tap to pass through the brass. Thread onto the screw one hex nut, the crimp-type lug, the second hex nut, and finally the lock-washer. Now screw the assembly into the hole you just tapped.

Fig. 2 is an exploded view of what the final assembly should look like. Such an assembly should be fine for transceivers in the 100-watt class. Higher powered units or linear amplifiers would need a bigger gap.

To adjust the unit, first slowly turn the machine screw CW until it just shorts to the center conductor, and then turn it two full turns CCW. Connect the adapter in series with your transmitter and a 50-ohm dummy load. Now key your transmitter (in the CW mode) at full power (a duration of one "dit" will be enough) and be sure that the gap doesn't arc. If it does, turn the 2-56 screw another full turn CCW and repeat the procedure until you reach the point where the gap doesn't arc at the maximum power level you plan to use (or that your radio will produce). Now repeat this process with the actual antenna you plan to use. This will assure that the gap will not short your signal on peaks. If the actual SWR with the antenna is higher than that of the dummy load, the gap again may arc and you will have to turn the 2-56 screw a bit farther CCW.

Once you have found the correct setting, tighten the first hex nut (on top of the lock-washer) to secure the screw in position. Next tighten the second nut over the crimp-lug and connect a #10 to #14 wire from the lug to a good earth ground. Finally, if the arrestor is located outdoors, cover it with some sort of weather-proofing material. While this arrestor obviously is not as perfect as a gas-discharge or similar commercial type arrestor. it is certainly better than using nothing at all.

Fig. 3 is a lightning arrestor designed for use with balanced line or twin lead. This is an older design and has been described many times in the past. Three insulated stand-off insulators are arranged on an insulating base with approximately the same

*c/o CQ magazine

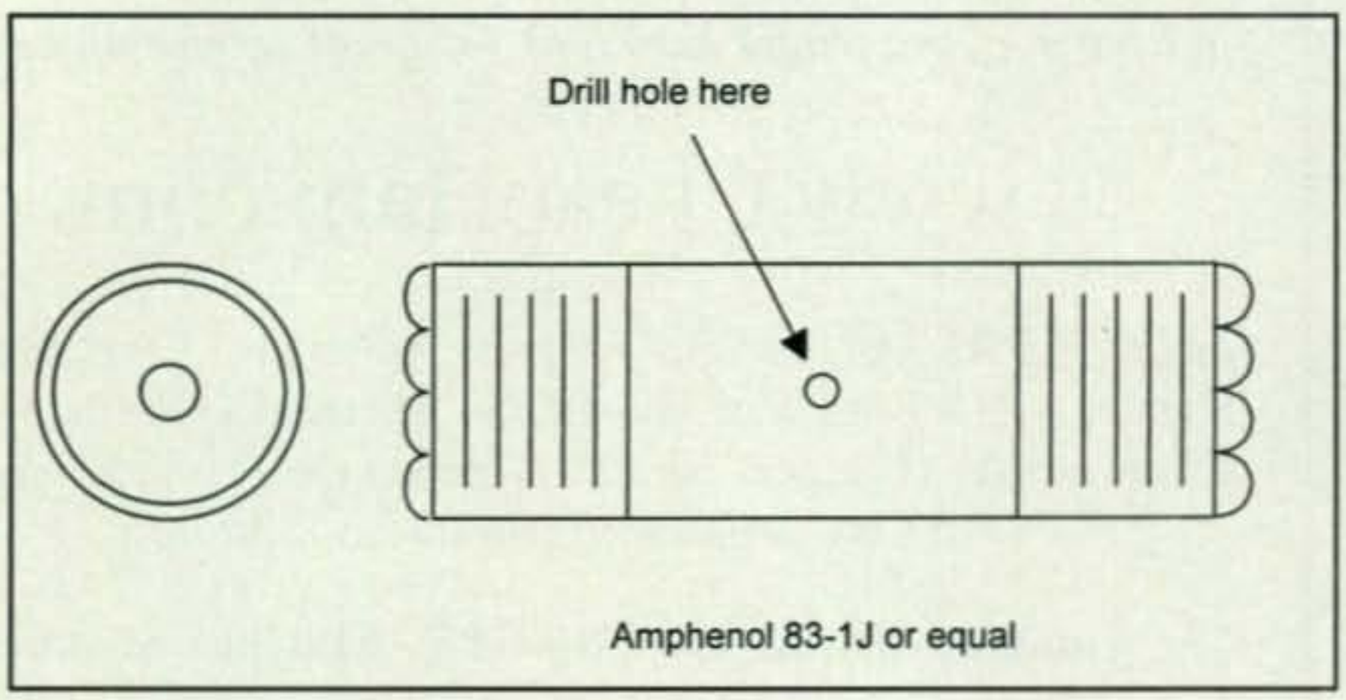


Fig. 1– Location for tap drill to make the coaxial-cable-compatible lightning arrestor.

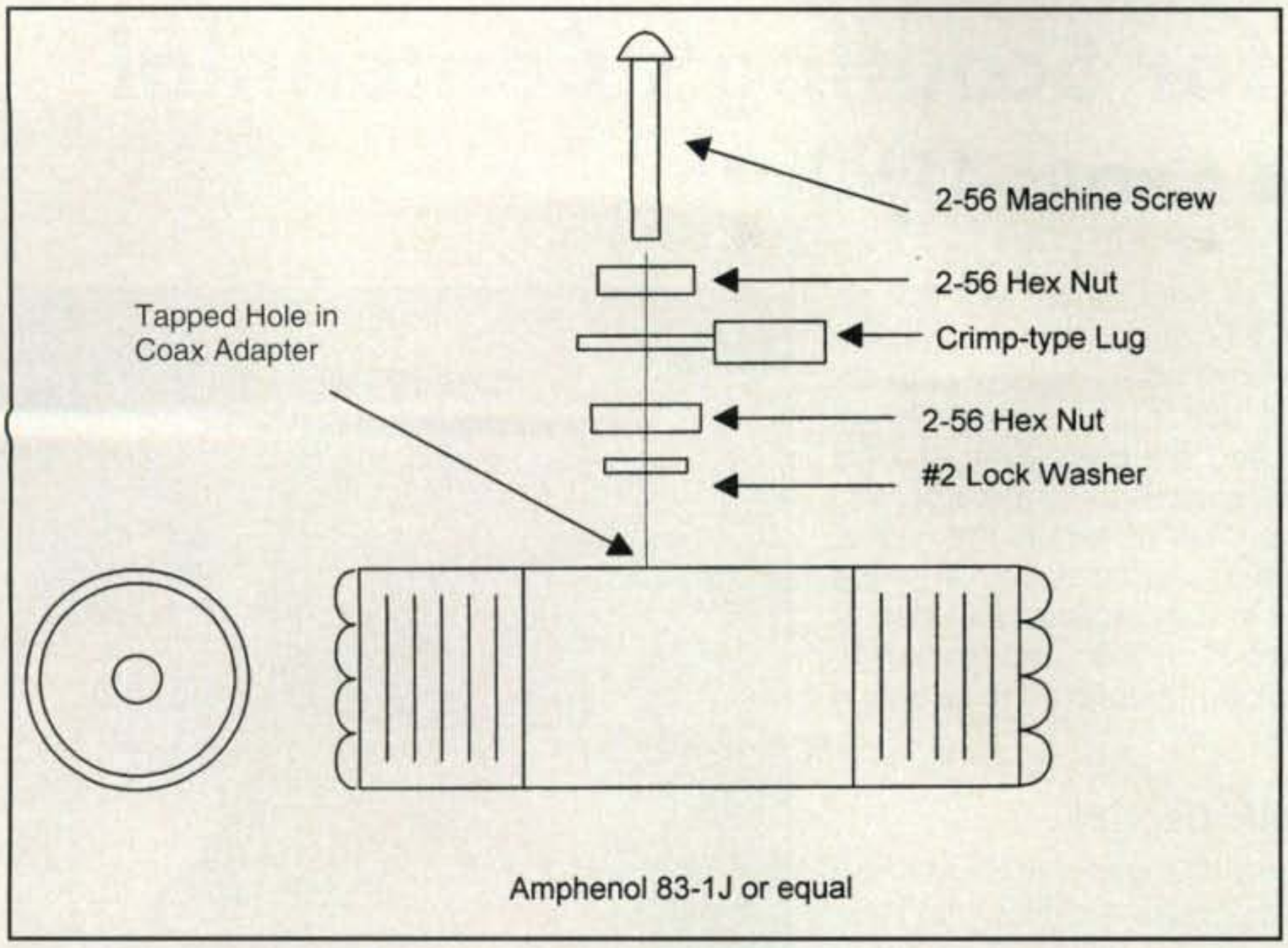


Fig. 2– Component assembly details of the coaxial-cable lightning arrestor.

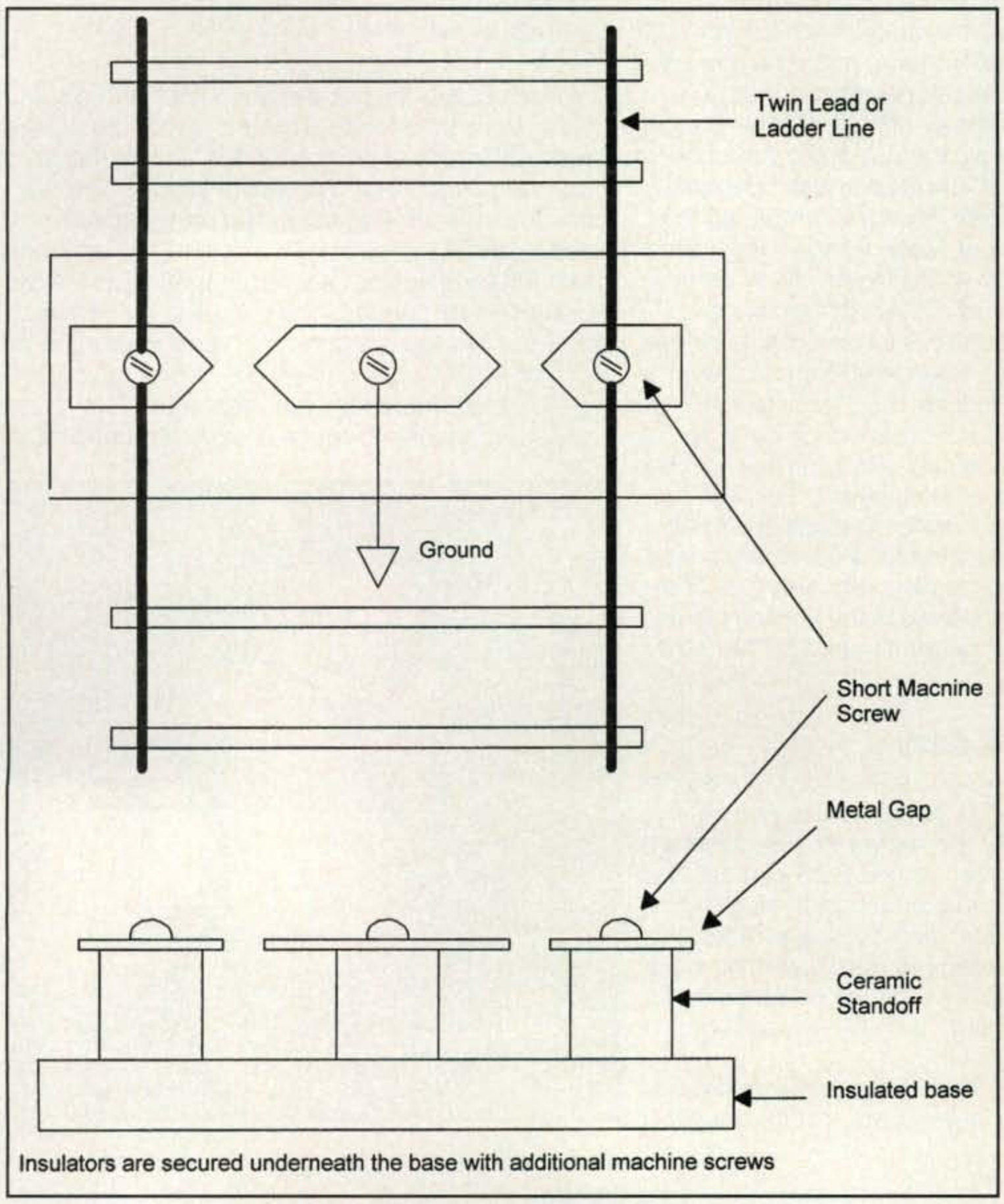


Fig. 3– A lightning arrestor for balanced lines.

spacing as the twin lead or ladder line you are using. A double-sided metal gap and two single gap elements then are cut from 1/16-inch thick sheet metal and secured to the insulators as shown. It is a good idea to use sheet metal that is treated to prevent rust, such as the galvanized type of which heating ducts and accessories are made. The two conductors of the transmission line are then secured under screws and washers as shown. Finally, the center gap portion is connected to ground through a #10 to #14 wire. The insulators are of the type that is not threaded through but only a short distance in on either side, such as the Keystone 7700 series. If ceramic insulators are not available, you can use polystyrene rod instead and thread each end a short distance into the rod. The spacing of the gaps is adjusted in a manner similar to the coaxial arrestor, just wide enough to prevent arcing at maximum power and worse-case SWR.

Both of the arrestors described are generally passive and should not significantly upset the impedance (or SWR) of your setup from 160 meters to at least 10 meters.

Good luck, and please let us know of your successes (or failures).

73, Irwin, WA2NDM

public service

BY BOB JOSUWEIT,* WA3PZO

Events for Scouting's Centennial plus Red Cross Update

The Scouting movement began in 1907 on Brownsea Island, England in an experimental camp for 20 boys from a variety of backgrounds. Following a successful camp, Robert Baden-Powell published his book *Scouting for Boys*. As boys read the book, Scout patrols sprang up around the world. The common themes of Scouting's history are the enthusiasm of young people to participate in the exciting activities of Scouting and the support of men and women of goodwill around the world to enable the Scouting program to happen.

Stan Subhan, N2FMI, helps a Scout make an HF contact at Sarnoff Library Radio Merit Badge Day. (Photo courtesy of Gary Wilson, K2GW)

Education is Public Service

There are over 100 merit badges that Scouts can earn. One of the more popular merit badges is for radio. Boy Scouts may earn any merit badge at any time. They no longer have to hold a certain Scout rank to be eligible. The Radio Merit Badge allows hams to introduce radio in general as well as amateur radio to scouts who might be interested in becoming the next generation of hams.

In central New Jersey, Radio Merit Badge Counselor Gary Wilson, K2GW, and 18 members of the David Sarnoff Radio Club and the Delaware Valley Radio Association recently completed their third annual Boy Scout Merit Badge Day at the David Sarnoff Library in Princeton, New Jersey, which was the home of RCA's Engineering division. E-mail announcements were sent to the three local Scout councils. They had 49 Scouts earn the Radio Merit Badge in one day. Assistance was also provided by ten scout leaders.

Wilson said, "Many of those Scouts will now be starting a Tech course next week." The enthusiasm is there. One dad wrote, "I would like to sign up myself and my son for the amateur radio license class that is being offered.... My son just completed the Radio Merit Badge at the Sarnoff Center last weekend and I thought it would be fun to try this with him."

Getting Started is Easy

The Radio Merit Badge focuses on three areas—an introduction to radio, components and safety, and amateur radio. At the recent Boy Scout Merit Badge Day in Princeton, an HF SSB station, two VHF radio stations, and a direction-finding exhibit were also set up. Standing by at the other end of the VHF exhibits, ready to make contact, were NJ2BB, the Battleship New Jersey Amateur Radio Club, and Mercer County (NJ) Skywarn Coordinator Stan Partyka, KC2JRJ.

Wilson explained, "In our case, we divide our large group into four patrols who rotate between the three one-hour classes and the on-the-air and station-visit experience. This lets us handle a large group but keeps each actual class experience intimate." He continued, "We also set up two VHF stations and one HF station for the on-the-air experience to eliminate waiting in line. The VHF stations are our hedge against poor propagation. Once the Scouts have logged their on-the-air contact, another ham leads them on a short foxhunt to fill out that hour."

"I've been surprised how kids really like to do handheld foxhunting, even though it's not part of

Scout talking to an operator at the Battleship New Jersey, NJ2BB, on VHF with Dave Willmore, NØYMV. (Photo courtesy of K2GW)

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

the merit badge," said Wilson. "Get some local foxhunters to put out a foxbox and show the kids how to find it on foot." He also said that running a station off solar panels and batteries attracts a crowd.

During lunch they showed the ARRL video "Amateur Radio Today" and ICOM's 2004 Dayton Hamvention® video (part 3) to help break up the event.

Getting Started

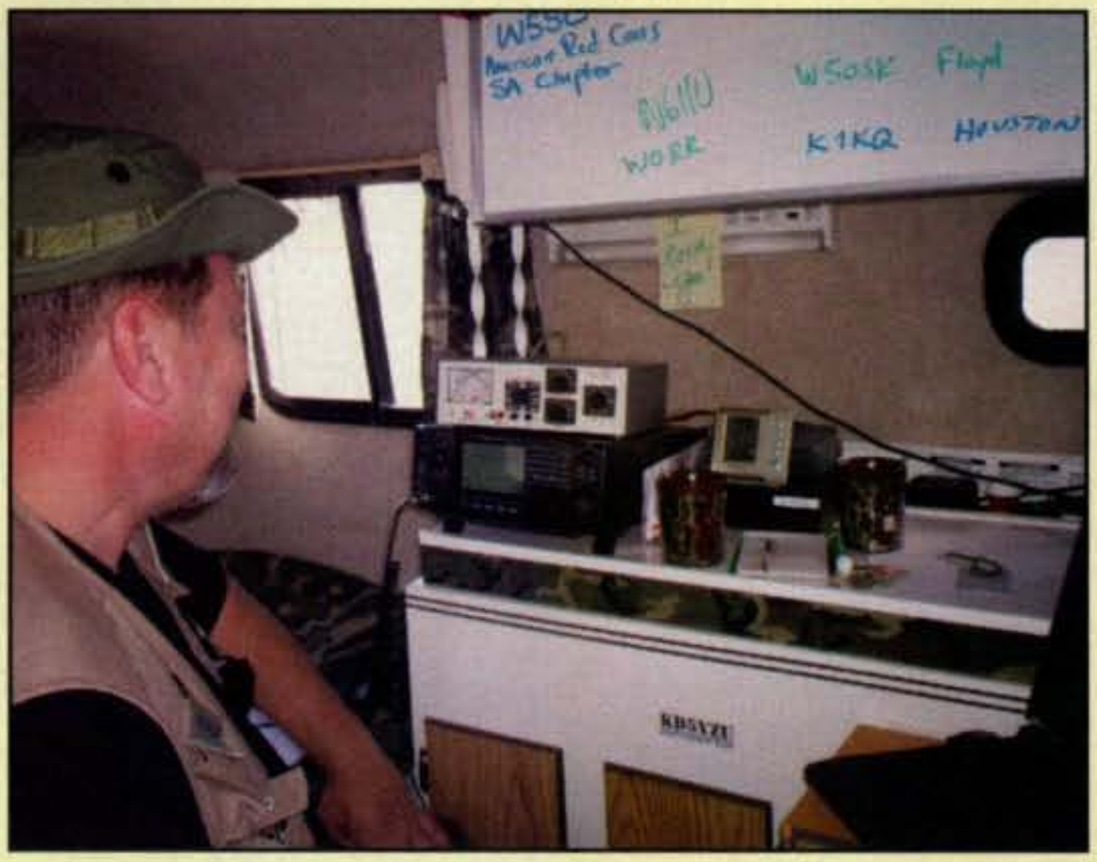
If someone wants to organize a Radio Merit Badge Day, Wilson suggests that they mention their interest at a club meeting or on a ham mailing list to find a ham or someone else who knows a registered Scouter in their area. Then they can use that Scouter to find a ham who is a registered Radio Merit Badge counselor to sign the cards and to publicize the event through the local Boy

Red Cross Update

In January we reviewed the Red Cross policy for background checks. ARRL President Joel Harrison, W5ZN, asserted, "They are also requiring permission to draw a consumer and/or investigative consumer report on the volunteer." Harrison said that could also include a credit check and a mode-of-living check. Not only have ham radio operators objected to this new policy, many general Red Cross volunteers are also refusing to allow a check that goes beyond a standard criminal background check. With so many volunteers concerned about providing their personal information, and because the risk of losing volunteers is there, the national Red Cross extended the December 31, 2006 deadline to March 31, 2007.

Rhode Island Red Cross CEO John Holt told the Kent County *Daily Times*, "I do know the BCI (Background Check Investigation) part of it will always be required regardless of what happens. What will be required above and beyond that is in flux." However, the credit check "caused some consternation amongst our volunteers, and rightly so," said Holt. He said he was confident that changes will be made so volunteers will be OK with it.

At Ham Radio University, ARRL New York – Long Island Section Emergency Coordinator Michael Lisenco, N2YBB, said hams would continue to respond if called by the American Red Cross. He felt confident that the background check issue would be worked out at a national level.



Erik Rabe, KD5YZU, operates from inside The EGG, The Emergency Get-up and Go trailer. (Photo courtesy of Lee Besing, N5NTG)

Hams Participate in Red Cross Drill

At the height of all of the concern over the background check, amateur radio operators in Arkansas, Louisiana, New Mexico, Oklahoma, and Texas participated in an Amateur Radio Preparedness Exercise. Participating Red Cross chapters invited members of their local amateur radio community to visit and tour their chapter facilities. Some chapters were going to request that hams participate in a simulated local disaster response. Each chapter was to develop its own program and "disaster."

In some cases, local hams may work with chapter staff in advance to create the scenario. On Disaster Day hams may be asked to travel to specified locations served by the chapter and report a simulated situation or need by radio to the local chapter headquarters. This could include delivery of critical information regarding the "disaster" or requesting supplies or facilities be obtained or delivered to the location. According to the Red Cross. the over-reaching goal was to introduce local Red Cross chapters to the disaster communication capabilities of amateur radio, and to reacquaint local ham radio operators with potential Red Cross needs for communicator assistance and other disaster volunteer opportunities.

Shane, NS5D, briefs Red Cross Rep Mac McNeil on the radio operations while Schuylar Crist, KE5VIP, passes a message reporting tornado touch down near Hondo, Texas with unknown damages. (Photo courtesy of N5NTG)

Hams Do it with More Frequencies

As the drill began, ham radio operators started to check in with the main operations center in Dallas, Texas using various bands and modes. Operators were on 20, 40, and 2 meters. Besides passing messages via voice, Winlink was also used. Several operators were licensed on GMRS and that radio service was also tested. As chapters near and far checked in with the coordinating chapter in Dallas, Red Cross officials were awed by the overwhelming show of force from the ham community. The success of the exercise was ensured within the first few minutes, as chapter after chapter came booming in with simulated emergency traffic. Several examples were posted on the <arcdallascomm.org> website:

K5FTW: Straight line winds N Richland Hills. Local Chapter requests RACES support for damage assessment X RACES activated.

K5GVL: 15 shelters and 655 people. On battery power.

W2MY: Team Bravo is in transit from Corpus Christi to Agua Dulce area to investigate tornado damage.

AB5ER: White County AR Chapter. Twenty homes destroyed; 40 have major damage. Shelter set up at church near affected area. Snacks to be delivered shortly. Canteen operation going for emergency workers. Adjoining chapters sending help to shelter. Expect phone lines to be operational within one-half hour. This will be last transmission.

Rebecca Mercuri, KA3IAX, works with a Scout during the Radio Merit Badge Day. Photo courtesy of K2GW)

Scout council. Once a Radio Merit Badge counselor is located, then other hams can participate.

"If a ham wants to become a registered Radio Merit Badge counselor," said Wilson, "he or she should call the local Boy Scout council and ask them to send an adult member application and a merit badge counselor application. The phone number of local councils may be found at <http://www.scouting.org/>."

"Folks don't necessarily need to start out with an ambitious program accommodating 60 Scouts at time. If they want to limit themselves to 15 Scouts to start, the program could be done with two adults in a single classroom. We just put the whole rotation procedure in to let us make it an annual big event. A single counselor could present the three one-hour classes and the on-the-air experience at four troop meetings or four evenings at a nearby Scout summer camp."

"It would be great for amateur radio," said Wilson, "if the appeal of a "one-day merit badge" could be made annually in each council across the country!"

Wilson and others have made it easy for you to set up a similar Radio Merit Badge program. In the Yahoo Groups "Scoutradio" file section are outlines for the Radio Merit Badge Day, PowerPoint® presentations, student workbooks, and other files to help make your event run smoothly.

Other Ways to Celebrate

In another celebration of the 100th anniversary of Scouting, the New Hampshire Scouting Service Club will be offering special awards to encourage Scouts to get on the air. The following awards will be offered to the following Scout levels:

WASR—For Cub Scouts who work one Scout station from each of the regions of the Boy Scouts of America.

WASS—For Webelos and Boy Scouts who work one Scout station from each state in the USA.

DXSC—For Boy Scouts, Venturers, and Scouters who work one Scout station from 25 countries.

DX Friendship Club—For making contact with Scouts from 50 or more countries. (The award will list the total amount applied for.)

The awards will be certificates that resemble the Scout certificates offered to Scouts many years ago.

Younger Scouts who meet the more difficult requirements are invited to apply for the more advanced awards. Scouts from any country will be encouraged to participate. While the United States does consider "Boy Scouting" a separate program from "Girl Scouting" and the structure of the awards has been set up under the Boy Scouts of America structure, these awards are open to any Scout, Guide, Sea Scout, or Venturer of either gender. As not all countries use the same terminology for their Scouting programs, please consider the following guidelines:

Any registered Scout or Guide under ten years old would qualify for the Cub Scout level. Registered Scouts and Guides under 18 years old qualify for the Boy Scout level. The Venturing level would be open to Scouts, Guides, Sea Scouts, and Venturers under 21 years old. Scouters would be considered registered adult leaders who are over the age of 21. Any Scouting contacts after January 1, 2007 qualify. The application form will be posted up on the NHSSC website in October to coincide with the 50th annual Jamboree On The Air. More information can be found at <www.nhradio.org/scouting>.

Scouting 100 Radio Award

The Scouting 100 Radio Award is given for contacting Scout stations during 2007, the Centenary year of Scouting. This is an International award. It is also available on a listener basis, with the same requirements as the operator award.

Objective: To help celebrate the centenary of Scouting through the medium of radio. To help publicize the centenary, and to provide radio amateurs the opportunity of gaining another award. Although not intended for profit, any surplus made will go to support radio Scouting in developing countries.

Duration: The award will begin on January 1, 2007 and finish December 31, 2007.

Bands and Modes: The award is available for all bands and all modes, within the terms of the individual's radio license. The award is also available through Echolink and IRLP modes. The award can be endorsed for any special modes or bands—e.g., all satellite contacts; all QRP contacts, etc. Activity for the award should be focused around the Scout frequencies.

Requirements: Stations are required to contact Scout and Guide stations to count for points as follows: Each ordinary Scout station counts one point. Special Event Scout stations count 2 points. The World Jamboree, Gilwell Park, and Brownsea Island stations count 5 points.

Your logs should be verified as being accurate by two other local radio ama-

Hams Assist in Colorado Blizzard

Amateur radio operators kept busy in late December as the second major Colorado snowstorm in less than ten days pounded the Denver area. According to news reports two feet or more of snow fell on Denver, closing its airport and stranding both air and highway travelers. Colorado Section Emergency Coordinator Ben Baker, KBØUBZ, told the ARRL that teams from several ARES districts had been reporting snowfall totals and providing communication between shelters and the Red Cross and The Salvation Army. Baker said, "ARES districts from the New Mexico border to Wyoming expected to be quite active transporting medical personnel as well as providing communications for shelters and providing weather condition reports."

Congrats!

Ricky Martinez, KD8EYO, gets in some low-band practice while his dad serves as the control operator. (Photo courtesy of Katy Martinez, KD8EFS)

We would like to congratulate 10-year-old Ricky Martinez, KD8EYO, of Stockbridge, Michigan for passing his Technician Class license test. Ricky, son of Rick, W8RCM, and Katy Martinez, KD8EFS, has been diligently studying every day, after doing his home work, for the last two months. According to Dick Renaud, Vice President of the Livingston Amateur Radio Klub, Ricky has already participated in the National Weather Service SKYWARN Spotter training program and will no doubt become part of the county's amateur radio emergency communications support team as he continues in his pursuit of his amateur radio adventure. In the meantime, he will communicate with his parents on their way home from work and with his dad as they enjoy hunting together.

teurs. Normal log information is required with the following additional information: Name, Scout details, and age of the operator of the station you contact. Your age should also be submitted when applying for awards. Female operators send "YL" as their age! You can claim points for contacting Scout stations regardless of the callsign of the station you are operating from. Therefore, if you are operating a club station, then the points still count for your total. Please note: Only the person operating can claim the points for that contact, not everyone within earshot! For further information check out <www.scouting100award.org>.

Final Thoughts

This month we offered some insight into teaching a Radio Merit Badge course and getting more young people interested in amateur radio. We also brought you an update on the Red Cross background-check discussion.

With Morse Ccode being eliminated as an exam element, this is a perfect opportunity to reach out to the community. Robert Baden-Powell's last message to Scouts seems to apply to us all. It says, in part, "But the real way to get happiness is by giving out happiness to other people. Try and leave this world a little better than you found it and when your turn comes to die, you can die happy in feeling that at any rate you have not wasted your time but have done your best."

This month we would like to thank Gary, K2GW; Shane O'Neil, NS5D; Lee Besing, N5NTG; Dick Renaud, W8KDR; and the ARRL for providing information. As reported last month, I was under the weather in December. I was sent on an unexpected "vacation" to the local hospital. Thanks to all who sent get-well wishes. Until next month...

73, Bob, WA3PZO

BY DAVE INGRAM,* K4TWJ

Emergency Preparedness and You – Part II

This month's column continues our study of emergency preparedness which began in the February issue with an overview of emergency situations and general factors for survival during such occasions. Our emphasis this time is on the two closely related areas of communications gear and alternate energy systems to power them. We will consider portable radios and TVs, VHF and HF transceivers, gasoline-engine-driven generators, wind-powered generators, solar energy systems, and associated peripherals. Hopefully, you will find this discussion beneficial for staying prepared and ready to assist your family and community in times of need. The threat of more terrorist attacks and more major hurricanes is not a matter of if, but a matter of when, and we must be prepared. Let's begin with a look at communications gear for emergencies.

Equipment Considerations

As mentioned in Part I, the basic equipment you need for emergency communications is a 2-meter or dual-band handheld FM transceiver (with extended receive coverage of NOAA weather and public-service bands) and a 12-volt DC-powered HF transceiver. Separate rigs are preferable here, as they can be cabled to separate antennas and used simultaneously—possibly in two different locations to serve two different needs. Another benefit of using two rigs is if one fails or is needed elsewhere, the full communications system is not disabled. Naturally, you should know how to use each transceiver and how to access its various menu functions on the spot. This may seem trivial (of course I know how to use my rig!), but if you own two or three transceivers and do not use each one frequently, it is easy to become confused about how to call up hidden features.

One simple solution to this dilemma is purchasing or writing your own quick reference guide and remembering to keep it with your rig(s). The FM handheld should be complemented with an extra set of alkaline batteries (their shelf life is much longer than regular rechargeables), and the HF transceiver should be supported with extra DC cables plus a motorcycle-size battery or equivalent for use when an auto battery is not accessible. Both rigs should be complemented with extra

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e-mail: <k4twj@cq-amateur-radio.com>

Photo 1– What do you pack in a grab-and-go kit for emergencies? A dual-band FM handheld with extended frequency coverage for monitoring police, fire, and NOAA weather; a 12-volt-capable HF transceiver; extra antennas for both; a portable TV; a battery-powered shortwave broadcast receiver; and a pocket flashlight. Carrying a tiny charge-card-size FM handheld in a shirt pocket for instant preparedness is also clever thinking.

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Usage 450 MHz and Higher.

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600C125	125 ft	$235.95
600C100	100 ft	$205.95
600C75	75 ft	$175.95
600C50	50 ft	$145.95
600C25	25 ft	$115.95
600C3	3 ft	$ 88.95

PL259(UHF) TO "N" MALE CONNECTOR

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"N" MALE CONNECTORS EACH END

Part #	Footage	Price
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600N75	75 ft	$139.95
600N50	50 ft	$108.95
600N25	25 ft	$ 77.95
600N15	15 ft	$ 66.49
600N6	6 ft	$ 55.49

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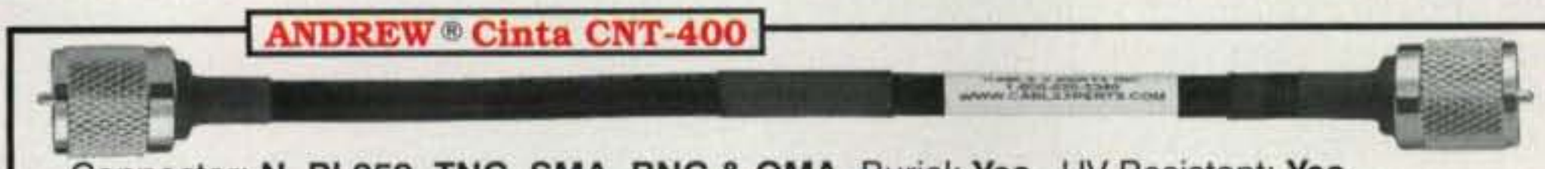

RG8U SIZE SHOWN

Connector: **N, PL259, TNC, SMA, BNC & QMA,** Burial: **Yes**, UV Resistant: **Yes**.
Shields: **2** (100% bonded foil +90% TC Braid) **VP 85%,** Attenuation 6.0dB @ 2 GHz at 100ft.
Usage 450 MHz and Higher.

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Part #	Footage	Price
400C100	100 ft	$ 82.49
400C75	75 ft	$ 63.95
400C50	50 ft	$ 45.49
400C25	25 ft	$ 27.49
400C6	6 ft	$ 14.95
400C3	3 ft	$ 11.95

"N" MALE CONNECTORS EACH END

Part #	Footage	Price
400N50	50 ft	$ 54.95
400N6	6 ft	$ 22.95
400N3	3 ft	$ 20.95

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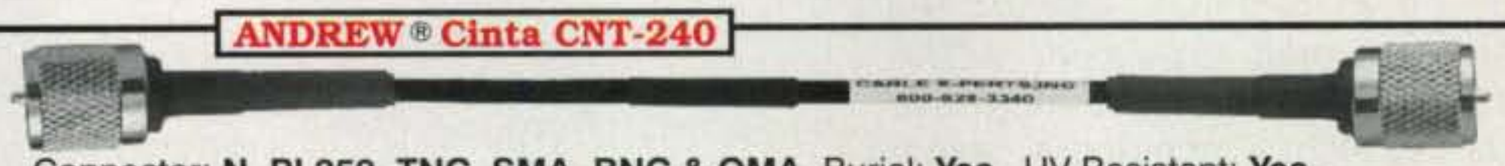

RG8X SIZE SHOWN

Connector: **N, PL259, TNC, SMA, BNC & QMA,** Burial: **Yes**, UV Resistant: **Yes**.
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Photo 2– Portable gasoline-engine-driven generators in the 1000-to 4000-watt range are made by several well-known manufacturers and are quite popular sources of power during short-term emergencies. They are also handy for backing up a solar- and/or wind-powered system. Never attempt directly connecting one to your home's existing wiring. Use a separate and fused extension cord for safety. The generator shown is available from <www.mayberrys.com>.

(break-down or rollup) antennas, and they should be small enough to carry anywhere for emergency use. Even a charge-card-size FM handheld is a good preparedness companion if you can carry it with you almost everywhere.

Additional and always beneficial items include a small power amplifier for "direct" communications with the FM handheld, a portable/battery-powered television, NOAA weather monitor, hand-crank or battery-operated shortwave broadcast radio, and pocket flashlight. Once again, "separates" rather than "all in one" items have the advantage of simultaneous and/or split location operation, and again, failure of one does not disable the others. Selecting units that use the same type batteries (AA cells, for example) is another idea worthy of consideration, as maintaining and rotating a "standard supply" for all household needs, including emergency preparedness, is optimized.

Estimating how long an item should operate on a set of relatively fresh batteries is also easy. If wattage or current consumption is not marked on the item's case or if you lose its manual, just insert a milliamp meter in series with one battery connection. Measured current is its milliamp hour (mah) rating. Compare that figure with the batteries mah rating to determine the number of operating hours available. As an example, the popular Grundig FR-200 AM/FM/Shortwave Radio sold by Universal Radio (www.universal-radio.com) draws approximately 40 ma during operation and Energizer® AA cells are rated at 2850 mah (info obtained from <www.energizer.com>; 1-800-383-7323). Now calculate: 2850 (mah rating of batteries) ÷ 40 (current draw of radio) = 71 (hours operation before depletion). Note, also, operation need not be continuous. It can be divided over several days or weeks. You simply keep track of milliamp hours used, just like folks kept track of gasoline used in early-model Volkswagens without a fuel gauge. Remember to use all your rigs and radios regularly, both for the enjoyment and the assurance that they (probably) will be operational when needed.

Alternate Energy Systems

The availability of commercial AC power is unpredictable during outbreaks of bad weather or any significant emergency. Fortunately, most power outages are of short duration (less than three days), and batteries carry our lower power radios through such times. Other alternatives are necessary for use during longer term outages, however, and assembling such a system—or at least understanding what's involved in planning and assembling a system and how to calculate supplied/demand values before needed—is always good practice.

Three options are possible here. One is installing a large (and expensive) system capable of powering your full house, including central heating and air conditioning; that's living QRO style. The second option is using a (non-electric) solar heating system or wood-burning fireplace for heating, cooking, and warming water, candles for light, and powering your rig(s) by alternate energy. That's the QRP approach—cheap and proud of it, so to speak. The third option is putting together your own alternate energy system in a size and configuration of your preference and then modifying or expanding it as warranted. Think about that while we take a brief look at some popular types of alternate energy systems.

Gas-Engine-Driven Generators

Gas-engine-driven generators are available in a wide variety of sizes, ranging from small portable models for light jobs or short-term use, to massive diesel-engine-driven models for full home use. If you can purchase a fairly large generator and store enough fuel to keep it running during long power outages, great. Remember, however, that gas-engine-driven generators must run at high rpm to deliver full output, so fuel consumption (and its high cost per gallon) usually limits their long-term use. Running at or near "full throttle" also requires a fair amount of maintenance and service, and noise during operation may alert vandals to your special resource. Gasoline, too, requires maintenance or rotation, as it is comprised of organic compounds that break down and form gummy deposits that clog fuel lines, carburetors, and injectors.

Wind and Water Power

If we step back and look at the overall concept of converting rotary motion to electrical energy, several other

Photo 3– Maintaining a large gasoline-engine-driven generator for emergency use requires storing an ample supply of fuel, which being organic, can change into a gummy substance over time and clog fuel lines. Annually adding a fuel stabilizer such as STA-BIL helps keep the fuel clean and fresh. STA-BIL is available from variety stores such as Wal-Mart.

Photo 4– Wind turbines are an effective and/or progressive form of alternative energy and work well for powering your ham gear, backing up a solar energy system. Large wind turbines can even power an entire house. Just ask Dan Bartmann, KCØVSU. He lives 11 miles from commercial power lines, builds and sells plans and parts, plus offers free advice for making this 20-foot model wind turbine, which powers his house and workshop. Details in text and at <www.otherpower.com>.

ideas come into focus. One example is using a wind turbine or propeller to rotate a generator. Another is using a small water turbine in a nearby stream for the same purpose, and a third idea is adding an additional propeller or turbine to drive an automobile air-conditioner compressor (visualize that, friends—a portable, engine-driven air conditioner!). If you live near a beach, atop a mountain, or on the open plains, a wind generator charging two or three deep-cycle storage batteries through a charge controller holds good merit.

One of the more impressive units we have seen is the 20-foot wind generator designed and made by Dan Bartmann, KCØVSU, of <www.otherpower.com> and shown in photo 4. This generator delivers up to 3000 watts of power in winds of 20 to 25 miles an hour. The generator also produces a cred-

Photo 5– A good example of the homebrew approach to solar power is this economical three-panel setup built by Ewan Moore, N4LMI, in Florida. The panels produce a total of 3 amps of current at 15 volts and connect to three deep-cycle batteries through a charge controller. Ewan uses the resultant energy to power a 100-watt HF setup plus shack lights an hour per day.

itable amount of power at lower wind speeds and folds up or furls at higher wind speeds for self-protection. Dan and his friend plus business assistant Dan Fink, KCØBRD, live approximately 11 miles from any commercial power. This is their only means of acquiring electrical energy. The wind turbine is used to power both home and workshop and to provide some electrical heating energy in wintertime on windy days. It sits on a 75-foot tower. Dan sells parts and plans and offers free help in making your own wind turbine. You can e-mail him at <danb@otherpower.com>.

Solar Energy

Solar power systems are the most popular and widely used means of acquiring long-term alternate energy, and with good reason. Solar panels are easy to handle and reasonably priced, and the only maintenance required is occasionally cleaning their surface (or replacing a damaged panel after a severe hail storm). Solar panels do not produce high-output current like wind or gas-driven generators, but they are good for slow-recharging deep-cycle batteries. Looking closer, we also see that while there is usually some sunlight, only that portion when the sun is high in the sky (such as between 9 AM and 3 PM) is useful for producing energy. That is because sunlight must pass through more of the Earth's atmosphere during early morning and late afternoon hours.

A well-planned solar system should be designed with one or more solar panels charging one or more deep-cycle batteries. The panel(s) should be capable of supplying sufficient energy to fill daily needs, while ensuring the batteries have enough extra charge to power the rig one or two hours a day for a week without sunshine.

All of this may seem complex, but it is actually easy to understand. We will delve further into precise electrical connections and current values next month. Stay tuned, and together we will continue expanding horizons.

73, Dave, K4TWJ

Photo 6– The heart of any alternate energy system is its deep-cycle batteries, and your diligence in properly maintaining them directly influences their life. Keep them well charged, water level above interior plates, and do not subject them to extreme heat or cold, and they will reward you with dependable long-term service. The battery shown is produced by Rolls Battery Engineering. Details at <www.rollsbattery.com>.

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SS-12	10	12	1⅛ x 6 x 9	3.4
SS-18	15	18	1⅛ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅜	4.2
SS-30	25	30	3¼ x 7 x 9⅝	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅜	4.2
SS-30M*	25	30	3¼ x 7 x 9⅝	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅜	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅜	6.5
SRM-30M	25	30	3½ x 19 x 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 9⅜	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 9⅜	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 GT-ML81
EF JOHNSON GT-ML83
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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
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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

*ICS – Intermittent Communication Service

antennas

BY KENT BRITAIN,* WA5VJB

Small Loop Receive Antennas for the Low Bands

Winter is the time of the year when the low bands propagate best, so I wanted to take a look at some low-band antennas that go beyond the dipole or the vertical (photo A). Many low-band DXers do not use the same antenna for transmit and receive, and the lower you go in frequency, the more likely this is to be true.There are many reasons for wanting to use separate antennas. First, a really long wire can pick up an awful lot of RF energy. This can be good, of course, and it's one reason why many low-band operators with space to spare use long receiving antennas, such as the venerable Beverage. On the other hand, there can be too much of a good thing. In one recent case I measured almost a third of a watt coming back down the feedline from nearby broadcast antennas (they were not transmitting at the time). These high RF levels can overwhelm many receivers and lower the performance of even the better rigs. That *big* antenna is great for getting out, but may not be the best thing to use when you are listening. Again, this is especially true on our 160-meter and 80-meter bands.

Small Loop Antennas

There has been a lot written about the low-noise, or noise-reducing, characteristics of small loop antennas. Loop antennas pick up the magnetic portion of the electromagnetic or radio waves. Thus, loop antennas tend to reject local E-Field (electrical) noise.

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

Photo A– Receive loop antenna at the Bletchley Park Cryptography Museum in the UK.

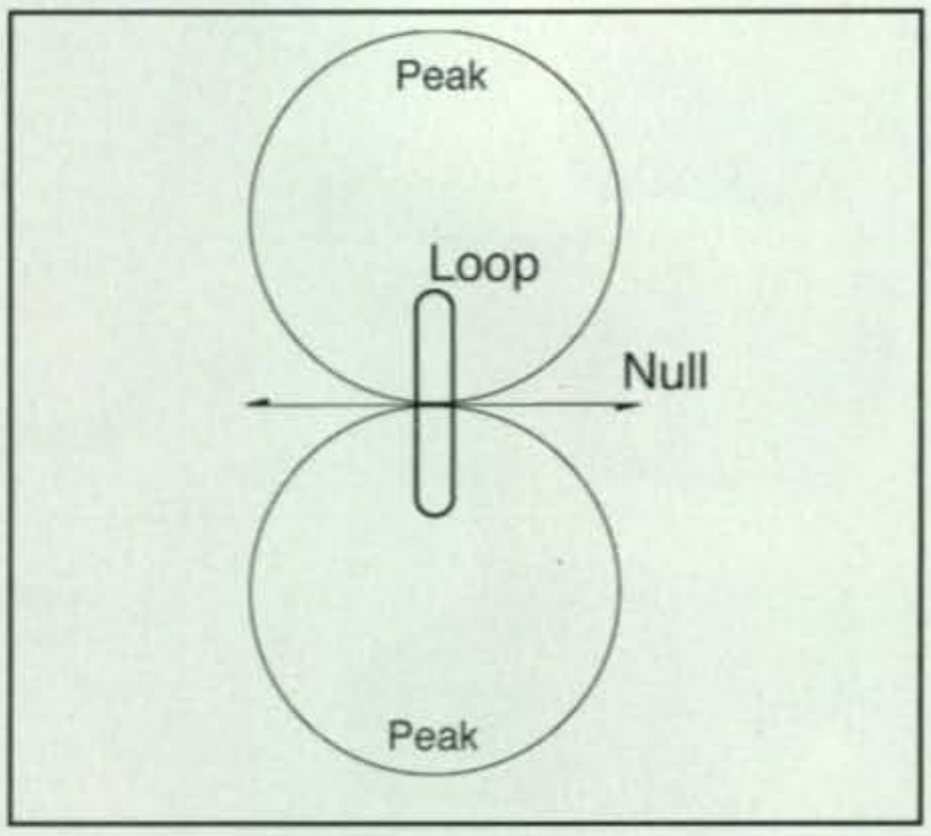

Fig. 1– The loop and its figure-eight pattern.

"But my noise blanker and DSP filters already do that," you may say. Well, yes, but … I can assure you that if you don't pick up a bunch of that noise in the first place, those DSP filters and noise-blanker circuits can do a much better job of cleaning up the leftover noise.

A lot of this E-Field noise is running around on the AC power lines, so it is best to get your loop away from power lines in the house. Sometimes moving a loop just a few feet can really drop the noise floor.

All small loops have a figure-8 pattern with the nulls in the direction of the broad side of the loop, as seen in fig. 1. It is easy enough to test with a small AM radio (photo B). When the ferrite rod is pointed at your local AM station, the loops are broadside to the signal and you get a sharp null or drop in signal strength.

These nulls can be very handy. By turning the loops, you can often put a noise source in the null. Likewise, this can be effective in minimizing QRM from strong stations on adjacent frequencies, or even on your own frequency. Also, if the loop is small enough, you would hardly be the first ham to just set it on top of the rig so you can quickly twist the antenna to a null. I have never tried putting a loop on a small TV rotator, but that is certainly one way to do it. Just twist for best reception.

One subject of endless debate is the best shape for your loop (see fig. 2)—square, diamond, or round? In reality, there is a slight advantage to a round loop, but the differences are microscopic. The important factor is how much area is in the middle of your loop. A big loop catches more signal, but on a noisy band such as VLF or 160 meters,

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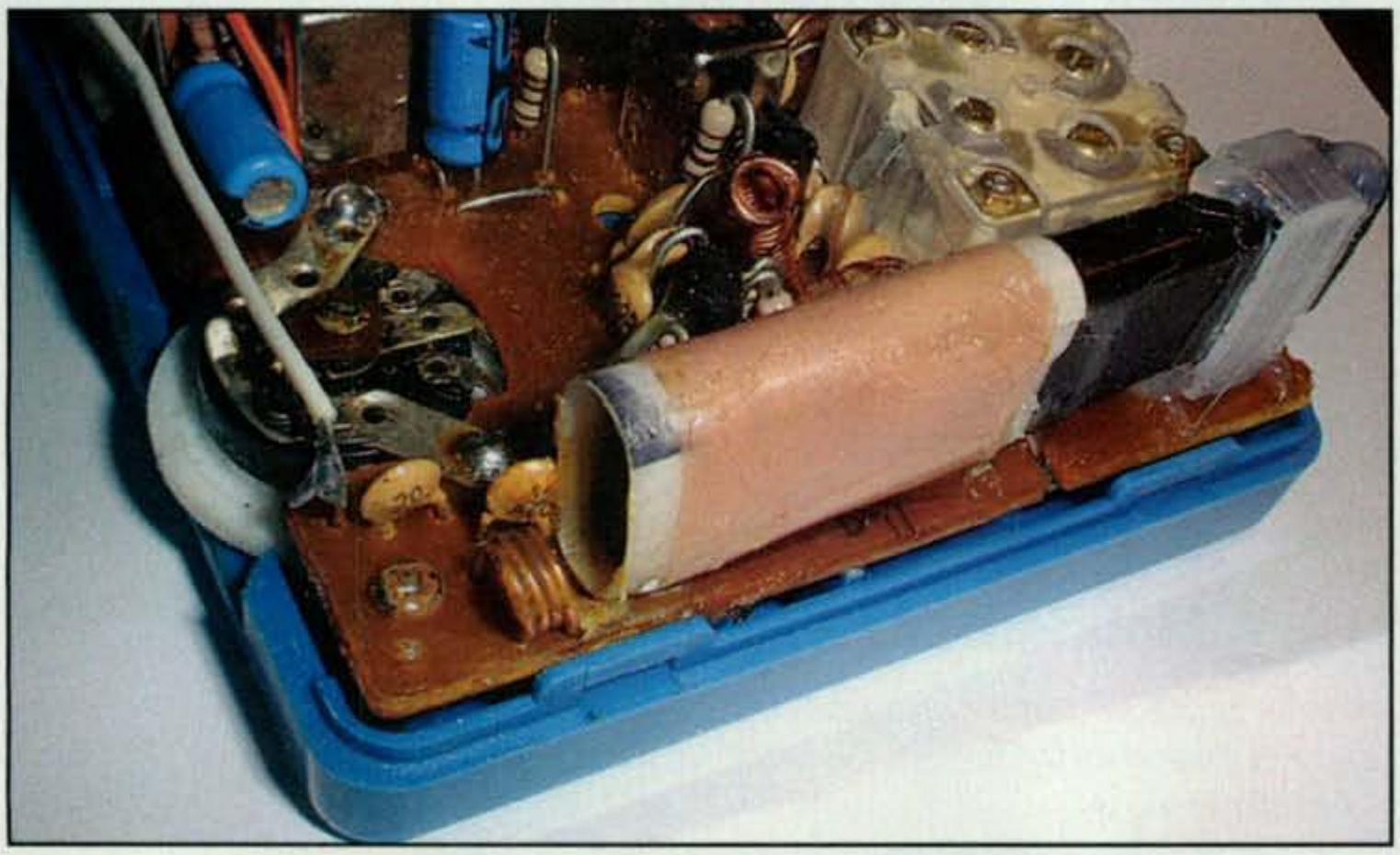

Photo B– The loop antenna in a typical AM broadcast-band radio.

there is no real advantage. It takes a bit more wire, but even a triangle loop would work.

Once your loop is built (I'm still working on the prototypes; watch this space in the May issue), there's nothing complicated about hooking it up and using it. Just connect your receive loop to your HF receiver and start looking for those weak ones. The first thing you're going to notice is that signals are three or four S-units down from what you are used to. This lower signal level is typical, but listen again where there are no signals. Do you notice that the noise floor is down five S-units? Try a few different locations, rotate the loop in a few different directions, and you can probably bring that noise floor down even more. However, more on this after I finish the prototypes.

Station Configurations

There are quite a few ways you can configure your station for separate transmit and receive antennas. First we have the traditional way of doing it, as seen in fig. 3—the Heathkit DX-100 into the transmit antenna, the HQ-180 on the receive antenna. Of course, this can just as easily be an IC-706 on the transmit antenna and an FT-817 on the receive antenna, but you get the idea. This works well, but most operators in the old days rigged up a relay to their speakers or headphones to switch off the speaker when they keyed the transmitter. It saved on the feedback and eardrums.

Fig. 4 shows antenna switching for transceiver use. I kind of cheated and modified my HF rig to have a separate receiver input connector, but on many rigs these days, there is either a jack provided for a receive antenna or there is a software select function. Remember, the goal here is to switch antennas between transmit and receive.

What About Transmitting?

Why can't you use a loop for transmitting? Well, you can, but don't expect to get very far. The high-Q loop will generate

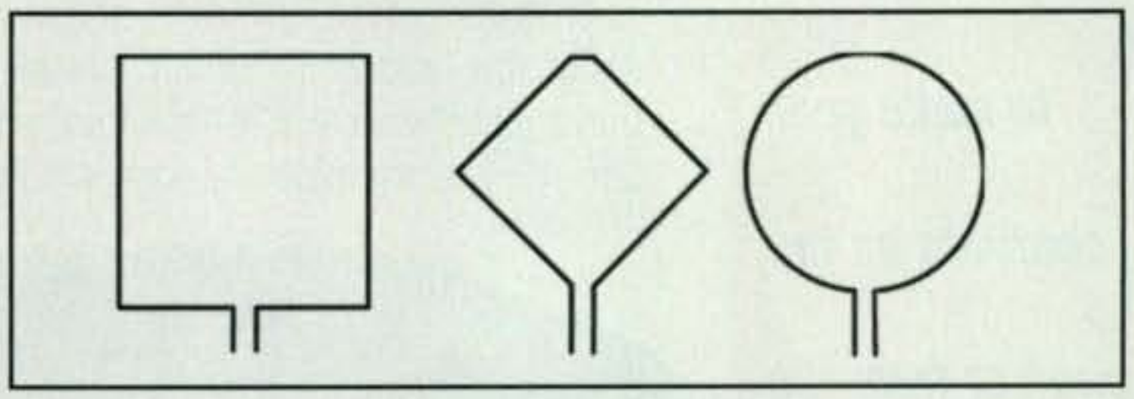

Fig. 2– Which shape is best? Square, diamond, or round? In practice, it doesn't matter.

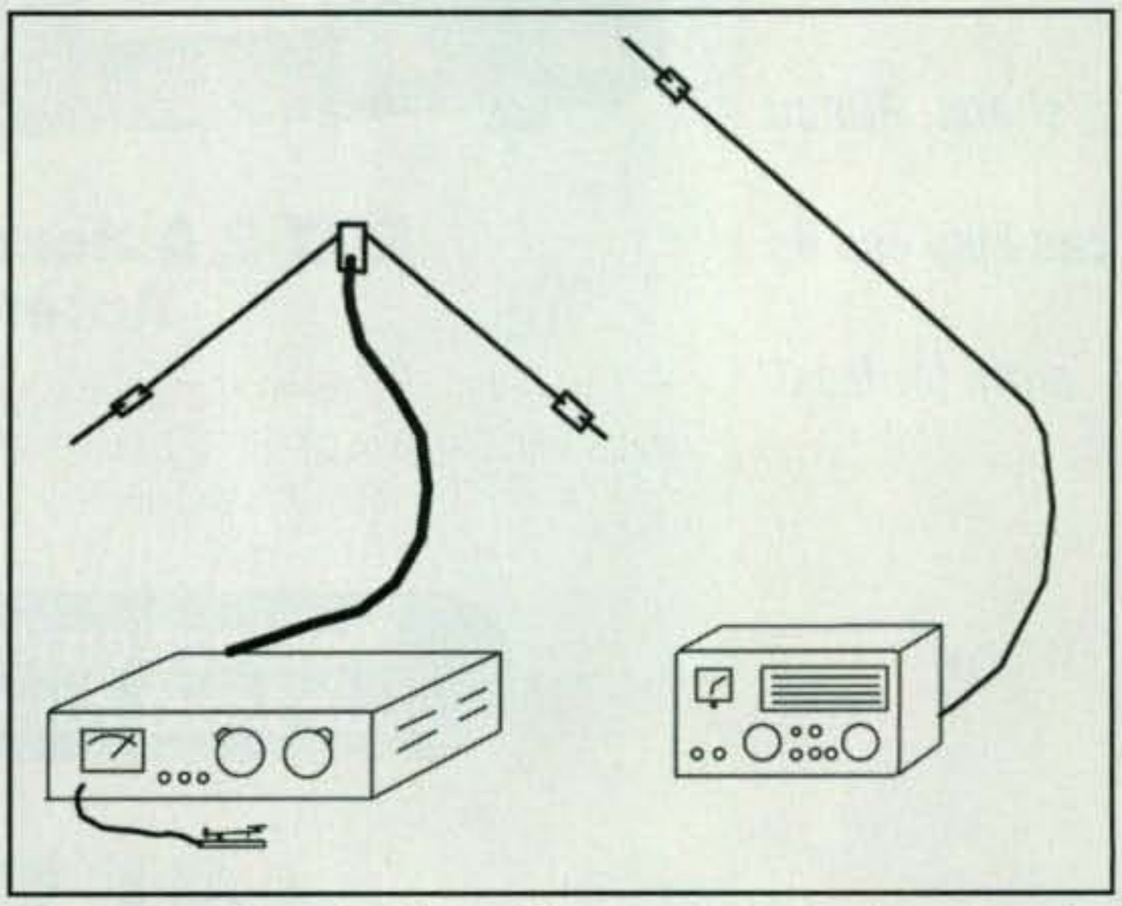

Fig. 3– Traditional station with separate transmit and receive antennas, as well as separate transmitter and receiver.

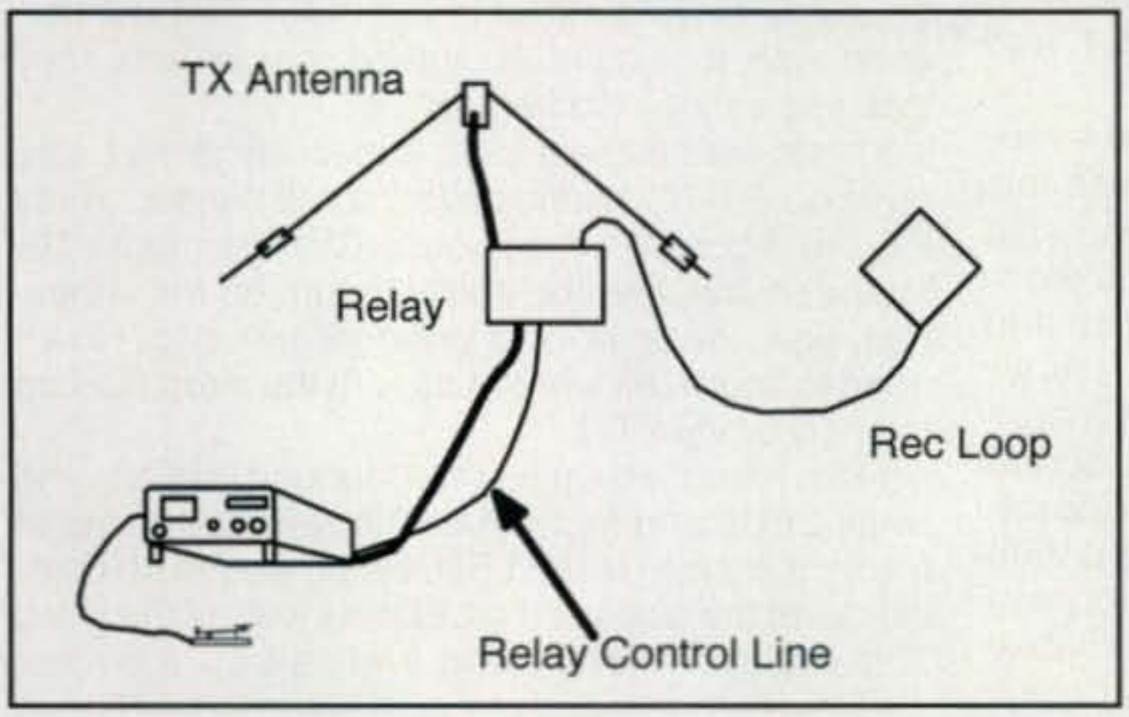

Fig. 4– Switching antennas between transmit and receive

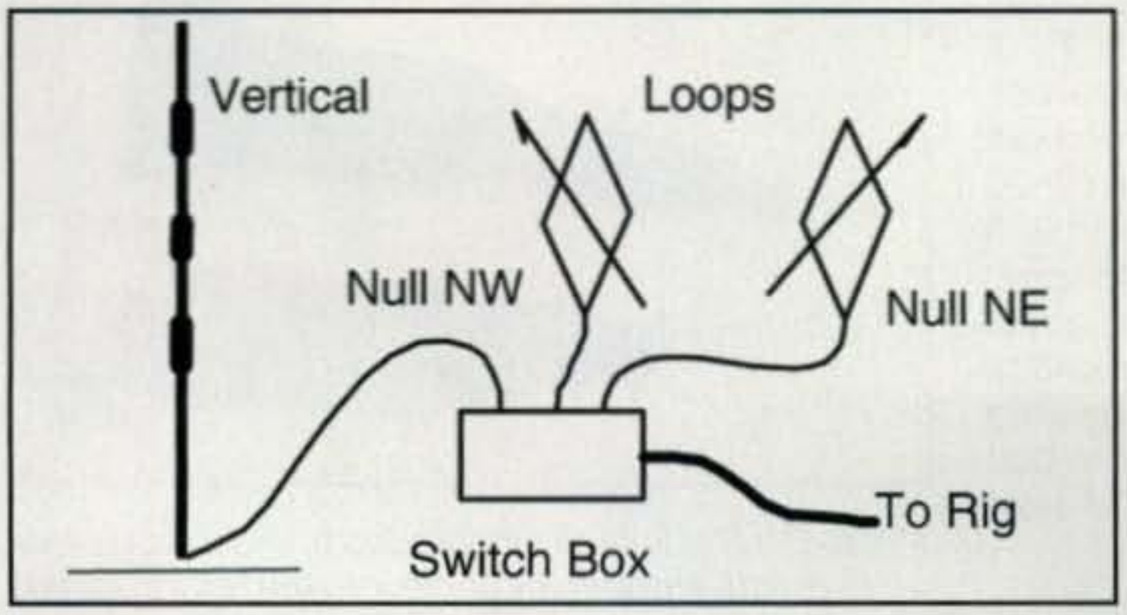

Fig. 5– WA5VJB's 75-meter net-control antenna setup.

some pretty high voltages, and if you run more than a dozen watts or so, the capacitors will usually arc over. Also, if bigger is better, it's going to take a long time to work DXCC with a 2 foot by 2 foot 80-meter antenna!

For a dozen years I was the net control for a 75-meter net. This was a net for VHF and UHF weak-signal operators, so most of them put their efforts into their EME (moonbounce) stations, not their HF stations. In short, there were a lot of puny stations out there trying to check in. My main 75-meter antenna (see fig. 5) is a 35-foot top-loaded vertical with about 400 radials. Four hundred radials? Yep (see my first *CQ* "Antennas" column, back in September 2003), but I also had two loop antennas 90 degrees to each other and a switch. If I was having trouble pulling in a weak one, I would just switch among the three antennas and use the one that was hearing best. Since I was only using the loops on the net frequency, I could just tune them to a single frequency. I didn't have or need the remote tuning back then, but I'm working on that.

Next Time

The plan was for this column to be a construction article. I have a remote tuned loop antenna out on the work bench, but it's not quite ready to become a construction project. Next time, then, look for an electronically tuned low-noise loop antenna that can easily be remote mounted. At a minimum, we'll have a loop antenna for 80 meters, and if Murphy stays away, 160- and 60-meter versions as well.

Just remember, anything in the air works better than that ideal antenna on the drawing board.

73, Kent, WA5VJB

weekender

BY PHIL SALAS, * AD5X

Reader Ideas & Feedback plus a "Probing" Project

I like it when some of my ideas generate more ideas from readers. This month I have a couple of interesting feedback notes.

From Bob, W6BNB: "That was an interesting article you had on attenuators for receivers and getting the receivers to read S-units properly (Weekender, *CQ*, Oct./Nov. 2006). I calibrated my S-meters using a variable-amplitude RF signal generator. My FT-920 has 6-, 12-, and 18-dB attenuation positions. To calibrate my S-meter readings, I set my RF signal generator to produce an S9 reading, assuming this is fairly close to 50 µv. Then I switched in 6 dB of attenuation and used that as S8. I switched in 12 dB and used that as an S7, and I used 18 dB attenuation as an S6. Then I went back to no attenuation and set the signal generator to read S6 and repeated the 6-dB attenuating procedure down to S3. That's as far as I could go, as I was now at S0 on the receiver's meter. The corrected S-meter markings are put on a narrow slip of paper pasted over the receiver's S-meter readings. I assume the +20-, +40-, and +60-dB markings are correct. I never give anything over +20-dB reports anyway. With my TS-930S it was a different matter. The RF attenuation values are in 10-dB steps, so I went directly to 30-dB attenuation and marked that as S5, filling in S6, S7, and S8 by guessing."

Good idea, Bob. For those who don't have a variable-level signal generator, you can also use this idea if you have a nearby friend who can transmit a carrier that he can adjust to give you an S9 reading. Of course, this starts with the assumption that your S9 meter reading is close to correct. For an even better way to do this, take a look at the Elecraft XG1 and XG2 signal generator kits (www.elecraft.com). These put out 50 µv (the generally accepted S9 signal), and 1 µv (approximately S3). With these two levels and your radio's attenuator, you should be able to come pretty close to accurately calibrating your S-meter.

From Lee, W6EM: "Phil—Thanks for writing the idea/article on the LED nite-lite (Weekender, *CQ*, December 2006). After reading this, I decided to try replacing the grain of wheat lamps in my old FT-7 with white LEDs. The incandescent lamps draw so much power. My FT-7 receiver only draws about 100 ma with the lamps off. Adding another 10–20 ma to that with the LEDs (instead of another 200 ma or so with the bulbs) is attractive. I found some 13,000-mcd white LEDs on eBay for a good price. My problem was their relatively narrow beamwidth. I took care of that, at least for the S-meter, by filing the plastic lens at about a 20-degree angle so that the now-translucent angle cut is the source of most of the diffused light. Works slick on the S-meter at about 10 ma with a 1K series resistor. For all the other bulbs, I took some 100-grit sandpaper and "roughed up" the surface. For these, I used a 2K series resistor for about 6 ma each. For the two dial lamps that are in parallel, I used just one 2K resistor to dim them a bit more than the ones for the CLAR and FIX indicators. Before I started, with reasonable speaker volume the total receiver current was 430 ma for the FT-7. Now the total current with the same listening level is 255 mA. What a difference. And, looking at the lighted components, they look just as they did before."

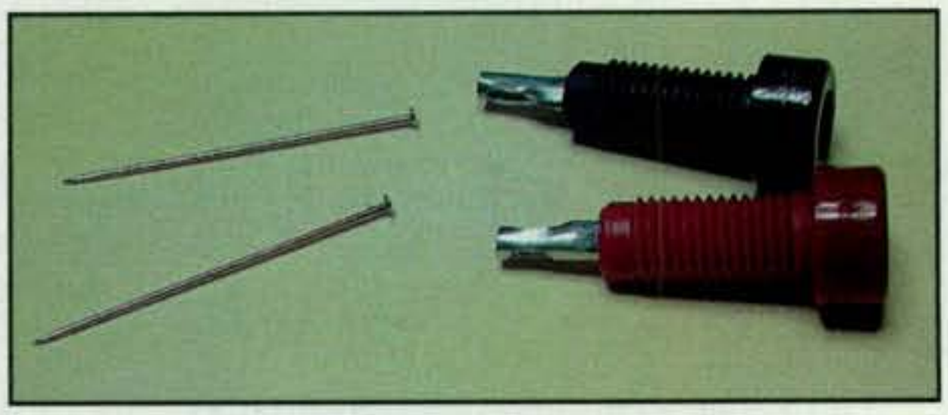

Photo A– Can't get much simpler than this—a set of tip jacks into which you'd plug the banana plugs of a standard multimeter lead, as well as two needles, which can be soldered into place inside the connection end of the jacks (see text for details).

This is also a great idea, especially since I also have an FT-7! I had installed some flip-flop in my FT-7 so I could toggle in/out a CW filter, extra 10-meter crystal, and the ability to turn off the lamps. Lee, your ideas worked great for me also. Now I need to figure out what to do with the extra flip-flop circuitry in my FT-7.

Next, I roughed-up just the rounded end of some white LEDs and found that this reflected some of the light internal to the LED, which wound up coming out of the sides of the LEDs as well as the front. This was great for making a white LED a perfect

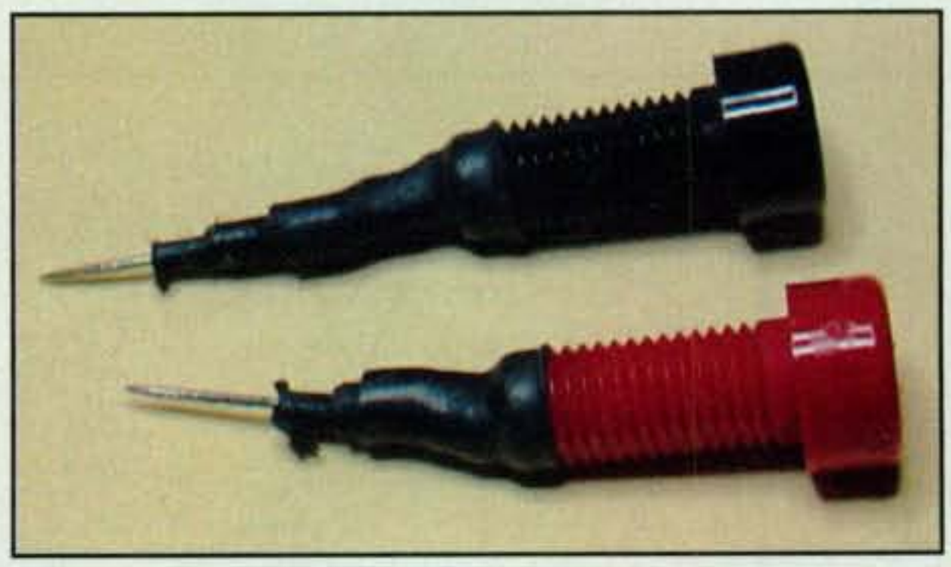

Photo B– The finished tip probes make it much easier to reach a multimter cable into the tight confines of a circuit board than the standard banana plugs that come with most meters.

*1517 Creekside Drive, Richardson, TX 75081
e-mail: <ad5x@cq-amateur-radio.com>

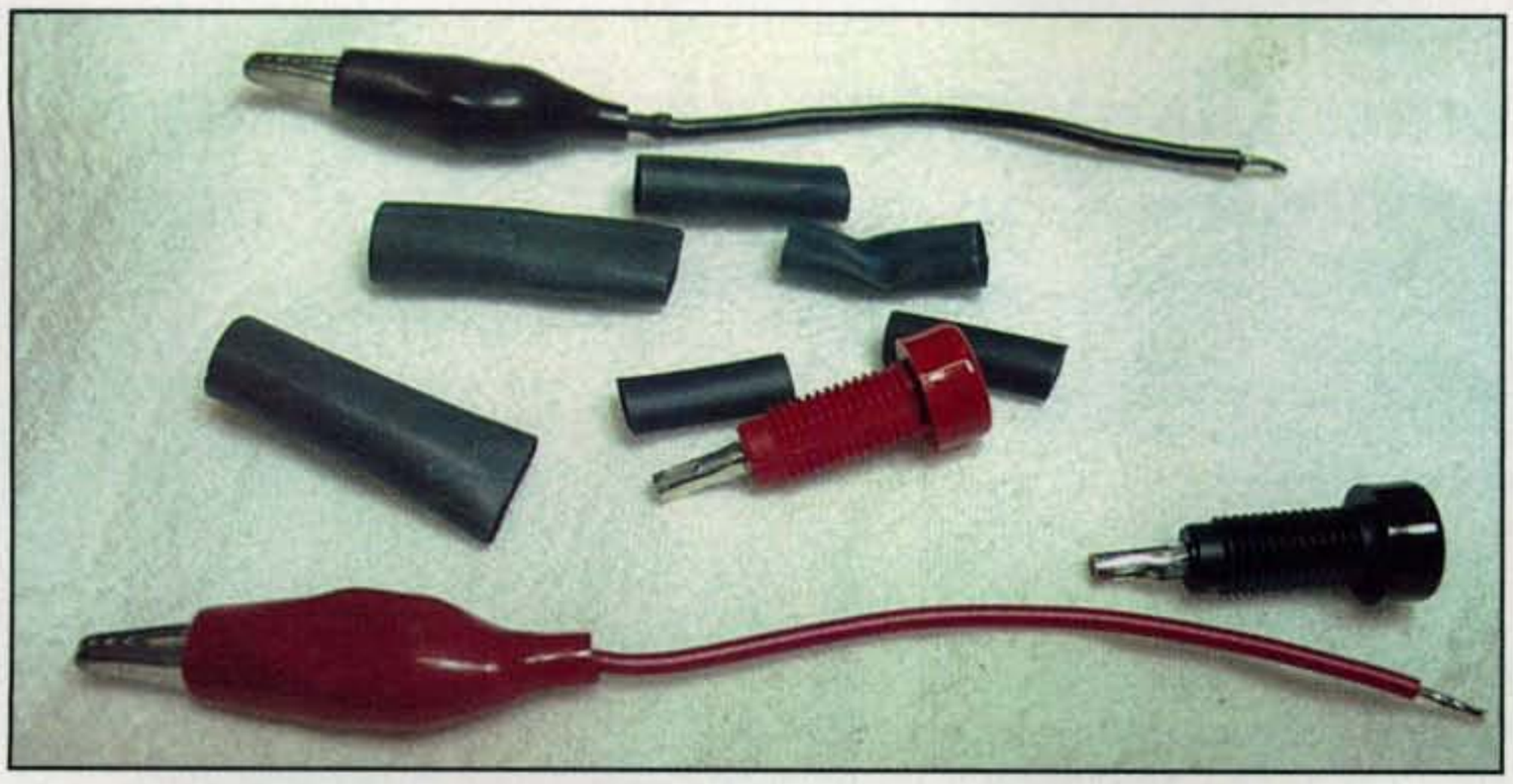

Photo C– Parts for the alligator clip adapter consist of two alligator clips with short wire runs, as well as tip jacks and heat-shring tubing.

replacement for the bulb in the meter of my old Johnson Ranger. Incidentally, there was an error in the equation for calculating the LED current in the December "Weekender" column. The equations should have read:

$$R = E/I = (13.8 - [3 \times 3.6])/0.02$$
$$= 150 \text{ ohms}$$

The "13.8" was accidentally left out. Thanks to all those who e-mailed me about this. The good news is that apparently a lot of you are reading my column!

Super-Simple Projects

I'll finish up this month's column with two very useful, but super-simple projects.

As I'm sure many of you have found, the probe tips on the typical digital multimeter are actually pretty thick—enough so that probing parts on a dense printed-circuit board can be a problem. To get around this, I made some needle-point tips from red and black tip jacks and a couple of needles. The tip jacks can be purchased from Mouser Electronics (www.mouser.com) and are part numbers 530-105-0802-1 (red) and 530-105-0803-1 (black). Just solder the needles into the ends of the tip jacks and put some heat-shrink tubing over the ends. Tin the needles first, as most are stainless steel and may be hard to solder to the tip jacks unless they are tinned first. Photo A shows the parts, and Photo B shows the completed units. These work great! Now when you need sharp probe tips, just slide these on the ends of your normal probes.

Along these same lines, I also made up some clip-on alligator adapters for multimeter leads. I used a pair of the same pin jacks and a couple of cut-up clip-leads along with some heat-shrink tubing. Photo C shows the parts before assembly, and photo D shows the final adapters. These are extremely convenient for clipping your multimeter probes to fixed measuring points in your circuits. Typically, you'll use an alligator clip-on adapter for your multimeter negative lead connected to the chassis, and a needle adapter on the red multimeter lead for probing voltages in your circuits.

73 until next month . . . 73, Phil, AD5X

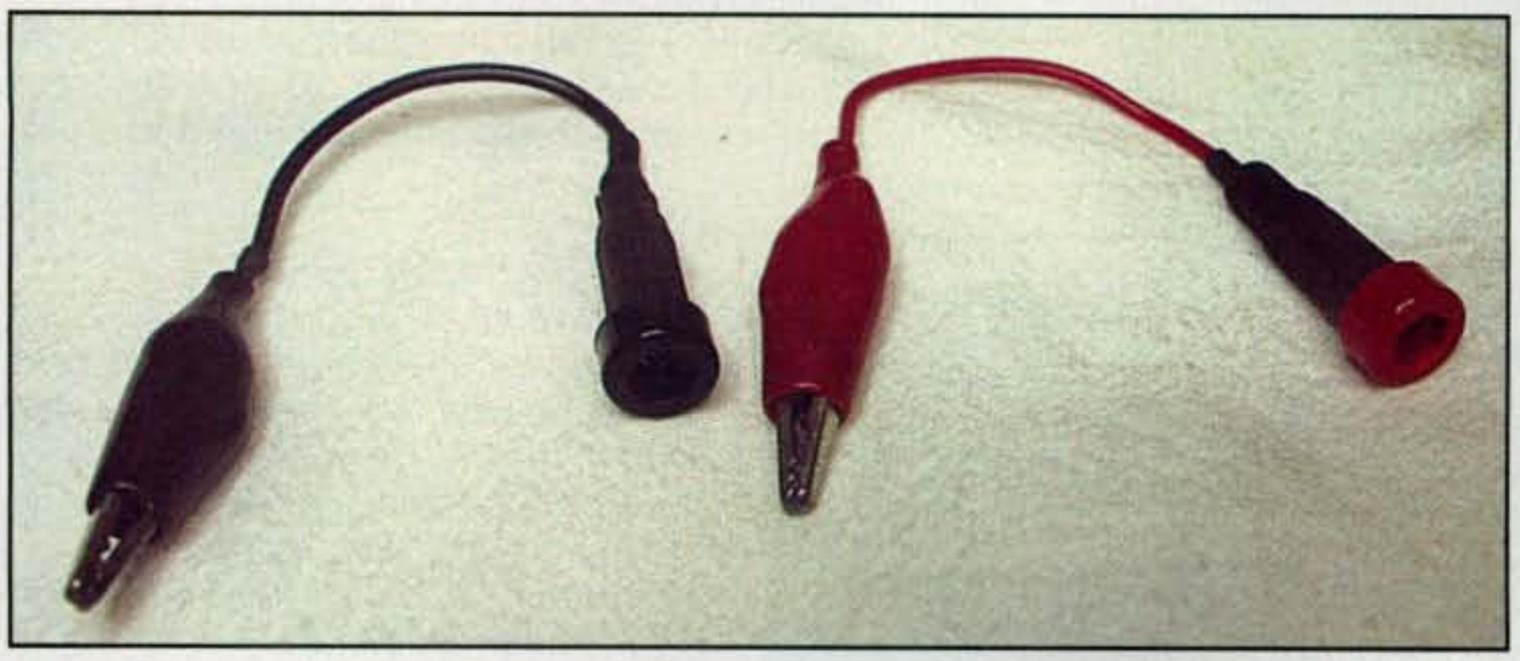

Photo D– The completed clip adapters. The banana plugs on the end of standard multimeter cables should slide right into the jacks.

what's new

BY KARL T. THURBER, JR.,* W8FX

Digital Items: Display for Vintage Gear, RF Wattmeter, Rotor Controller . . . and more

This month we will focus on more accessories for the radio shack; antennas and antenna accessories; and the radio bookshelf, taking a close look at "what's new" in our radio hobby. Are you ready? Well, then, let's dig right in.

Accessories for the Radio Shack

National RF NFD-1 Digital Display for Vintage Gear. The National RF Type NFD-1 Frequency Display Unit (see photo A) is designed for use with vintage and classic communications equipment to display the received or transmitted radio frequency. The new unit incorporates an internal processor that allows the IF (intermediate frequency) to be counted out by the frequency counter. The resultant display is the actual frequency at which the equipment is receiving or operating.

The NFD-1 includes a high-gain radio-frequency amplifier that amplifies the local-oscillator signal of the radio to a level that the counter circuit will count. Four separate memory channels let you program the unit for four different IF frequencies. Typically, vintage/classic receivers may use IF frequencies of 165 kHz, 455 kHz, 1.8 MHz, or 10.7 MHz. Although not limited to these frequencies, each of the four memory channels can be programmed for these IF frequencies, allowing the counter to count out these frequencies and display the actual frequency of reception or operation. If you prefer, no IF offset can be programmed and a sense wire or whip antenna can be attached, allowing the unit to display transmit frequencies of vintage transmitters and transceivers.

A front panel equipment selection switch allows a total of seven pieces of equipment to be interfaced with the unit. You simply select the equipment in use and select the required memory channel to display the operational frequency. The compact unit's counting frequency range is 160 kHz to 55 MHz. Full electric and mechanical specifications are available on the firm's website. The price is $289.95 plus $7 UPS Ground s/h in the continental USA.

Photo A– The National RF NFD-1 Frequency Display is designed for use with vintage/classic communications equipment to display the received or transmitted radio frequency. Details? They are found within this month's column. (Photo from the National RF website)

For more information, contact National RF, Inc., 7969 Engineer Road, #102, San Diego, CA 92111 (858-565-1319; <http://www.NationalRF.com>).

MFJ-655 hamProAudio™ Equalizer/Conditioner. First up from MFJ Enterprises is the MFJ-655 hamProAudio Equalizer/Conditioner (photo B). The new unit has an eight-band equalizer, downward expansion noise gate, smooth and clean compression, limiter, low-noise preamp, universal mic interface, VU-meter, headphone monitor, push-to-talk, and more—bringing "Pro Audio" to ham radio. At $219.95, the new product is said to make sophisticated Pro Audio gear user friendly, affordable, and RF-bulletproof.

A built-in headphone monitor lets you hear audio improvements as you make them, and a VU-meter lets you accurately adjust levels. An auxiliary input lets you use other audio sources, and a push-to-

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

Photo B– The MFJ-655 hamProAudio™ Equalizer/ Conditioner offers a host of features that bring what MFJ calls "Pro Audio" to ham radio. The new product reportedly makes sophisticated Pro Audio gear user friendly, affordable, and RF-bulletproof. (Photo courtesy MFJ)

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You can use nearly any mic with any transceiver. Plug in your headphones to hear your rig's received audio or plug in your MFJ, Heil, or computer boom-mic headset to talk and hear. Also, the Compressor and Equalizer can be used independently of one another. A front-panel controlled, low-noise preamp gives up to 20 dB gain, and you can match dynamic, electret, or high-impedance crystal/ceramic microphones. Also available are several lower cost models (MFJ-651, MFJ-652, and MFJ-654).

MFJ Solar-Powered Atomic Clock and Atomic Wireless Weather Stations. MFJ also has announced a new solar-powered Atomic Clock, as well as compact and deluxe Atomic Wireless Weather Stations.

Photo C– The capable, compact, solar-powered 24/12-hour Atomic Clock from MFJ never needs batteries, has a large LCD display, and displays precision time from WWVB. The MFJ-136RC is housed in a gray/silver plastic cabinet to make a handsome desktop addition. (Photo courtesy MFJ)

Photo D– The MFJ-193RC Compact Atomic Wireless Weather Station gives you wireless display of indoor and outdoor temperature, humidity, atomic clock, and date/day. There also are useful back-light and forecast icons of sunny, slightly sunny, cloudy, rainy, and stormy—all in one inexpensive package. (Photo courtesy MFJ)

We turn first to the MFJ-136RC Solar Atomic Clock (photo C), which never needs batteries and is priced at a modest $29.95. This very capable, compact, solar-powered 24/12-hour atomic clock has a very large LCD display, and displays precision time from time-and-frequency station WWVB. Housed in a gray/silver plastic cabinet to make a handsome desktop addition, there is an alarm function and green backlight.

Also new from MFJ, the MFJ-193RC Compact Atomic Wireless Weather Station (photo D) is $59.95. It provides wireless display of indoor and outdoor temperature, humidity, atomic clock, and date/day functions. There also are back-light and forecast icons—all in one compact package. The weather station has huge, 2 1/4-inch time digits, and with it you can get quick, accurate forecasts at a single glance. Storm alarms warn you when weather conditions become threatening, giving you a welcome chance to unplug your equipment in case of lightning or severe winds.

You can use up to three separate sensors; the outdoor remote sensor has an LCD display. The compact indoor unit has a large display, highly illuminated with a green background. It's in a handsome tan metallic, tough, durable plastic housing for years of service. Batteries (not included) are required.

Also available is the MFJ-196RC Deluxe Atomic Wireless Weather Station (not pictured) for accurate forecasts, at $259.95. This professional atomic, remote, wireless weather station offers a base LCD display station, three sensors, thermo-hygro transmitter, wind and rain sensors, computer control, RS-232 port, CD-ROM software, and an AC power adapter. All of the weather information is simultaneously displayed on the large, user-friendly LCD for up-to-the-minute weather conditions. The MFJ-196RC displays the WWVB radio-controlled time and date.

The MFJ-196RC sports indoor/outdoor relative-humidity displays of air pressure, wind speed, wind direction with LCD compass, wind-chill temperature, dew-point temperature, and a weather-tendency indicator. There's also a storm-warning alarm, large backlighted LCD display, a COM port for easy connection to your computer, and programmable alarm functions for certain weather conditions, as well as records of all minimum and maximum values along with time and date of their recordings. A detailed display gives rainfall data.

The MFJ-196RC is a standalone unit; connection to your computer is optional. It's wireless, but it can be installed with wire connections when wireless operation is not possible. The base uses three AA batteries or 120 VAC (adapter provided). The thermo-hygro sensor uses two AA batteries or an AC adaptor.

All the MFJ products mentioned this month are protected by MFJ's famous No Matter What™ one-year limited warranty. MFJ will repair or replace (at its option) your MFJ products no matter what for one complete year.

For more information, to place an order, to get a free catalog, or to find your nearest dealer, contact MFJ Enterprises, Inc., 300 Industrial Park Rd., Starkville, MS 39759 (1-800-647-1800; e-mail: <mfj@mfjenterprises.com>; and on the web: <http://www.mfjenterprises.com>).

Tac-Comm TRC-1 Tactical Radio Carrier. Tac-Comm has introduced the TRC-1 Tactical Radio Carrier. The TRC-1 is a universally adjustable aluminum carrier that provides a simple and convenient method to protect, package, and organize almost any mobile radios and accessories for portable, tactical, or emergency communication operations. The new product enables convenient tabletop, carhood, and other forms of operation.

The rugged aluminum carrier is designed to adapt almost any mobile

radio to a standalone base station; you can mount your radio in the carrier with the supplied machine screws and nuts, or with optional web strapping. Multiple TRC-1s can be stacked (see photo E) or used side by side to provide an impromptu, on-the-scene, multi-agency communications center. You can, for example, conveniently mount a radio and tuner, radio and power supply, or radio and TNC in one TRC-1 unit.

Besides providing physical protection for the radio, the TRC-1 carrier keeps all parts of the radio together and organized. Fastening the microphone and power cord to the carrier helps prevent loss and assures these necessary items will be available when needed. Radio channel/frequency information also may be attached to the TRC-1.

For more information and product pricing, contact Tac-Comm, 1050 W. 105 N., Orem, UT 84057 (801-224-0299; e-mail: <sales@tac-comm.com>; on the web: <http://www.tac-comm.com>). Be sure to check out the comprehensive Tactical Radio Carrier FAQ (frequently asked questions), which you will find on the Tac-Comm website.

Photo E– You can stack or use side-by-side multiple Tactical Radio Carriers (TRC-1s). Shown here are two stacked TRC-1s that can provide an impromptu communications center boasting a variety of electronics equipment. (Photo courtesy Tac-Comm)

Antennas and Antenna Accessories

TelePost Incorporated LP-100 Digital Vector RF Wattmeter. It looks like the "world of wattmeters" will never be the same! Indeed, the LP-100 Digital Vector RF Wattmeter (photo F) from Telepost Inc. is said to represent a real breakthrough in RF wattmeter design, especially with its unique Vector Impedance display, which provides display of complex impedance and rectangular form, from 0–999.9 ohms and 0–180 degrees.

The LP-100, available as a kit or assembled, offers a unique feature set, one reportedly not found in other wattmeters. This includes a bright LED display; simultaneous power and SWR display, with fast-responding bargraphs and numerical readout; band-by-band power compensation with built-in, user-adjustable frequency counter; SWR alarm with PTT loop and adjustable power threshold; peak hold and/or fast response of numerical readouts for a variety of operating modes; 160- to 6-meter band coverage with included remote coupler; accurate display of power and SWR from 50 mW to 2500 W;

Photo F– The new LP-100 Digital Vector RF Wattmeter from Telepost Inc. is said to represent a real breakthrough in RF wattmeter design. See this month's column write-up for the details. (Photo from the TelePost website)

included remote control and Windows® graphing software; upgradeable firmware via download and "flash" programming; and much more.

For current pricing and other information, contact Larry Phipps, N8LP, at TelePost Inc., 49100 Pine Hill Dr., Plymouth, MI 47170 (734-455-7316; e-mail: <larry@telepostinc.com>; on the web: <http://www.telepostinc.com>). We also should note that since the unit was introduced at the 2006 Dayton Hamvention®, many features have been added and you can check them out at the firm's very comprehensive and informative website.

RT-20 Universal Digital Rotor Controller. The RT-20 Universal Digital Rotor Controller from Green Heron Engineering (see fig. 1) updates your rotor to digital performance and computer control; manages stacked arrays, side mounts, and counter rotation schemes; has an intuitive and simple user interface; and is fully programmable for speed, delays, limits, and more. List priced at $569, the amateur net price is $549.

Fig. 1– The RT-20 Universal Digital Rotor Controller from Green Heron Engineering LLC features the latest technology which yields a truly unique and flexible product with high-quality components and PC boards used throughout. See the text for details. (Image from the Green Heron website)

The RT-20 Digital Rotor Controller features the latest PIC microprocessor technology which yields a truly unique and flexible product. High-quality components and PC boards are used throughout, including the heavy-duty power transformer and high-reliability switches and controls. Operation is as simple as possible: Just turn the knob and it goes. Or you can use the RT-20 for its unique abilities to turn your stacked array as one.

The new unit gives you the flexibility of individual rotation of each antenna in your array, plus the convenience of turning them all together, as with a rotating tower. Go one step further and save adding another tower by utilizing the Counter Rotation feature to put a separately controllable antenna on top of your existing rotating tower.

There are no mechanical adjustments. The alignment to your rotor is accomplished in software for the utmost in accuracy and ease of adjustment. Included as standard is the RS-232 port, which provides the mechanism to download new software to your unit.

Some of the many RT-20 features include master/slave for stacked arrays; counter rotation; fully versatile control; high-visibility advanced backlit LCD display; variable speed control; precision heading accuracy; full support of side-mounted antennas; offset control; travel up to 720 degrees total; fully user programmable for reversal delay, brake delay, motor speed, and soft limits; and compatibility with your favorite logging and content software.

Because of the flexible design, Green Heron Engineering can optimize or customize your unit should you have a special need. As opposed to some rotor manufacturers, the folks at Green Heron Engineering welcome your custom requirements.

For more info, contact Green Heron Engineering LLC, 1107 Salt Rd., Webster, NY 14580 (telephone 585-217-9093; on the web: <http://www.greenheronengineering.com>).

From the Bookshelf

The ARRL Handbook, 2007 Edition. *The ARRL Handbook* (fig. 2) is considered by many to be one of the greatest applied electronics and communications references of all time, being first published in 1926. The content of the new 84th edition reflects the many aspects of today's amateur radio hobby. These include fundamental electronics concepts, components and building blocks, analog and digital radio design, troubleshooting techniques, antennas, and much more. In fact, if you comb through the pages, you will quickly see why generations of radio amateurs, engineers, and technicians have relied on its thorough coverage of theory, references, and practical projects.

The new edition comes bundled with *The ARRL Handbook* CD (version 11.0). It offers the complete and fully searchable book on CD-ROM, including all the text and illustrations, as well as many color images, PC-board templates, additional software, and reference material.

Also, entire sections of the handbook have been updated to reflect the most current state-of-the-art. Included are many new and updated, practical construction projects and weekend builds: radios, antennas, amplifiers, test equipment, accessories, and more. It's said that there's something inside for hams and experimenters of all skill levels

Published by the ARRL, the handbook with the accompanying CD is available in softcover ($44.95) and in hardcover ($49.95). Also, as long as supplies last, the package is bundled with a bonus re-issue of the January 1942 *QST* maga-

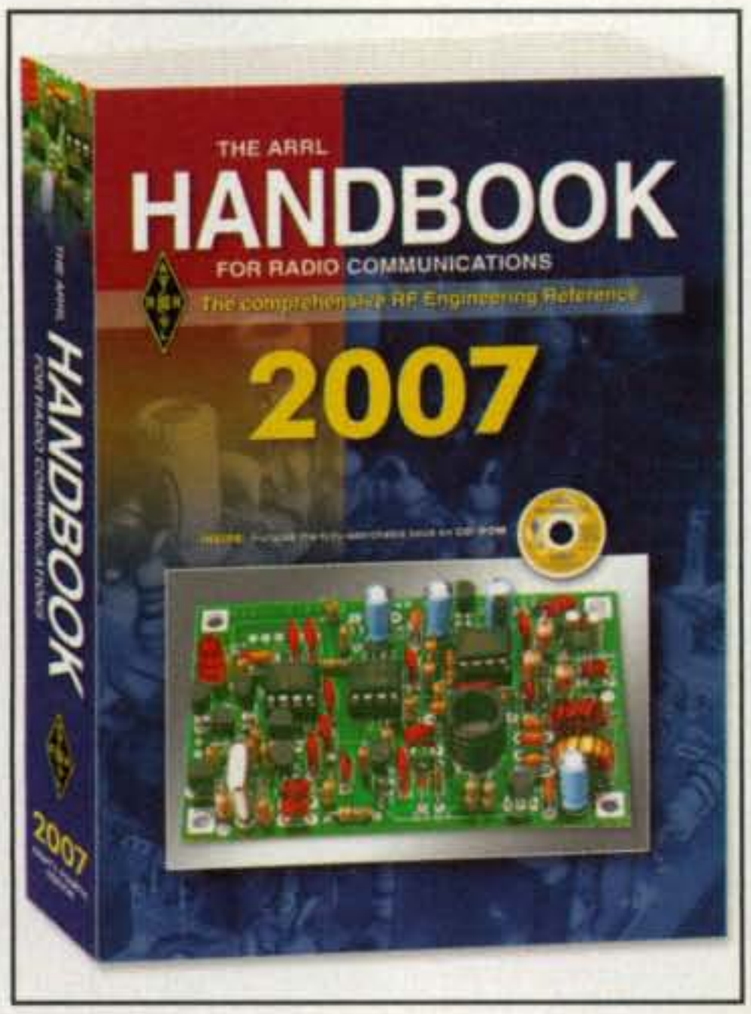


Fig. 2– The ARRL Handbook *is considered by many to be one of the greatest applied electronics and communications references of all time, and the new 84th edition reflects the many aspects of today's amateur radio hobby. It's bundled with* The ARRL Handbook *CD for a complete and fully searchable book on CD-ROM. (Photo courtesy the ARRL)*

zine, a landmark issue that includes the FCC order that suspended amateur radio operation in the U.S. following the attack on Pearl Harbor.

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

Short Bursts

RemComm Inc. Wins Business Plan Competition and Advances Radio-Laptop System for Emergency Communication. Might this intriguing, award-winning system have amateur radio application? RemComm, Inc., a pioneering company offering a portable radio system that establishes and restores communications in emergencies, has won all three phases of the 2006 EnterPrize Business Plan Competition, an annual program of the Pittsburgh Technology Council. The award was made in recognition of the firm's groundbreaking efforts to prevent communications crises and promote rescue and recovery operations in the event of accidents, terrorism, natural disasters, or other catastrophes. Winning the competition will help RemComm to commercialize its software and offer its advanced technology to a wide range of users, including law-enforcement officials, emergency medical teams, and security organizations nationwide.

"RemComm has a very exciting technology that most certainly will assist our country's emergency preparedness and disaster recovery professionals," said Steven G. Zylstra, president and CEO of the Pittsburgh Technology Council, which conducts the annual EnterPrize competition, "but beyond the company's product, RemComm also has demonstrated a very high proficiency in developing its business plan, which is what EnterPrize was designed to teach."

RemComm's software system runs on laptop computers, which are readily available during emergencies because they are portable and use batteries. Data is communicated via hand-held radios, which are commonly found throughout emergency management organizations, and which also run on batteries. Effective in blackouts and remote locations where there is no elec-

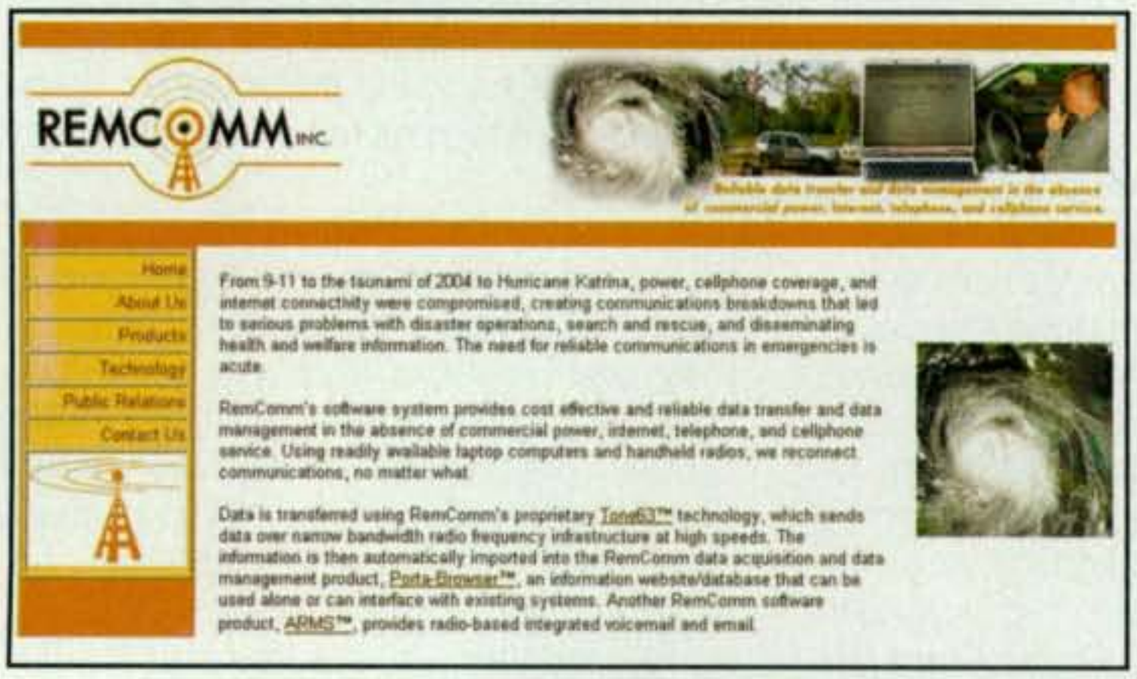


Fig. 3– RemComm, Inc. specializes in emergency radio communications and in providing interoperability solutions for such communications. RemComm's solutions address the critical needs of the public-safety and health-care industries, as well as other markets. Details are within the column. (Image from the RemComm website)

tricity, internet, or cell/telephones, the system fluidly conveys both speech and data across diverse platforms, thereby creating interoperability, or the capacity to communicate smoothly across many platforms. The system creates a uniform way for emergency workers, law-enforcement officials, medical teams, and others who use different types of devices and protocols to share and manage information.

RemComm's president and CEO, Babs Carryer, explained: "Information is transferred using RemComm's proprietary Tone63™ technology, which sends data over a narrow-bandwidth radio-frequency infrastructure at high speeds. The information is imported automatically into the RemComm Porta-Browser™, a database that can be used alone or can interface with existing systems. Another RemComm software product, ARMS™, allows for radio-based integrated voicemail and e-mail."

Based in Pittsburgh, PA, RemComm, Inc. (fig. 3) is a technology company specializing in emergency radio communications, including data acquisition, transfer, management, and dissemination, and in providing interoperability solutions for such communications. RemComm's solutions address critical needs of the public-safety and health-care industries, and other markets.

For details, contact RemComm, Inc., P.O. Box 5567, Pittsburgh, PA 15206 (412-720-0210; e-mail: <Inquiry@remcomm-inc.com>; web: <http://www.remcomm-inc.com>). Or contact Michele Rothert, President, Esteta Communications, 440 East Burgess Street, Pittsburgh, PA 15214-3303 (telephone 412-322-0281; e-mail: <mr@estetacommunications.com>).

Wrap-Up

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

Overheard: If you don't at first succeed, some wags would suggest that you destroy all the evidence that you even tried in the first place!

73, Karl, W8FX

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.*

AMSAT Argentina Announces Launch of the Pehuensat-1 Amateur Radio Satellite

BY JOE LYNCH,* N6CL

AMSAT Argentina announced that Pehuensat-1 (pronounced *pea-when-sat*) was launched from India by an ISRO PSLV-C7 4 stage rocket on January 10, 2007. It attained a 635/640-km polar sun synchronous orbit with an of inclination 97.92 degrees.

Pehuensat-1 is the first satellite of a national university in Argentina (the National University of Comahue); the first satellite of the Argentina Association for Space Technology (AATE); the second satellite of AMSAT Argentina; and the sixth satellite built in Argentina. Also, it is the first satellite to transmit voice messages in three languages: English, Hindi, and Spanish. It transmits on 145.825 MHz, the APRS satellite network frequency. In addition, an AX25 1200-baud packet follows the voice message. More information can be found at: <http://www.amsat.org.ar?f=6>.

As of this writing in mid-January, Alejandro Alvarez, LU8YD, at the Pehuensat control station at the University of Comahue reported hearing weak signals on 145.825 MHz after the satellite was activated. The satellite's controllers were investigating and planned to report on their findings.

A quick view of the next orbital passes at your QTH is available online. Go to <http://www.amsat.org.ar>, then click on the small revolving globe off the coast of Argentina, select your location from the map, and then select PEHUENSAT-1.

Some Background

The satellite is the result of more than five years of work by the faculty and students of the School of Engineering of the National University of the Comahue, as well as personnel from the Association Argentina of Space Technology (AATE) and AMSAT Argentina. Altogether 17 educators and 44 students took part in the design and assembly of the satellite.

In October 2006 the satellite was taken to the launch site in Sriharikota, India by personnel of the AATE and the University of the Comahue. While there, the final tests were carried out and the satellite was placed in the tenth Polar Satellite Launch Vehicle (PSLV) C-7. The 6-kg nanosatellite was one of four satellites onboard the vehicle, which also included the 680-kg Indian remote-sensing satellite Cartosat-2, the 550-kg Indian space-capsule recovery equipment (SRE-1, a prototype of recovery equipment to be used for the first Indian manned space flight), and Indonesia's Lapan-Tubsat. The vehicle was launched from the space-port at the Satish Dhawan Space Centre (SDSC) in Sriharikota at 0428 UTC on January 10.

According to the AATE press release (at <http://aate.org/pehuensat.html>), "The experience in working with ISRO (Indian Space Research Organization) and in general with the excellent specialists of India has been highly successful and beneficial, which permits us to consider other high-level space projects in the future."

The project began in November 1997 with the approval of the board of the School of Engineering of the National University of Comahue, the Argentine Association for Space Technology (AATE), and AMSAT Argentina. The signature of the agreements was made March 20, 1998. The organizations involved decided to have a free information criteria, so all the design information of the Pehuensat would be available to the community.

The Project Goals

The project goals included development, education, and scientific technology. These goals are outlined below.

Development: The development goal was to build and operate a small satellite (a nano-satellite) whose mission is educational, technological, and scientific. This satellite will allow the designers and users to gain important experience for future projects as part of the Pehuensat Program, by way of more complex missions, while at the same time accomplishing the three main goals of the project.

Education: Every attempt has been made to allow students of elementary schools, high schools, colleges, and universities to participate in the project. University students of the School of

VHF Plus Calendar

Mar. 3	Full Moon and Total Lunar Eclipse, Americas, Europe, Africa, and Asia
Mar. 4	Moderate EME conditions
Mar. 7	Moon Apogee
Mar. 11	Very poor EME conditions
Mar. 12	Last Quarter Moon
Mar. 18	Good EME conditions
Mar. 19	New Moon and Moon Perigee and Partial Solar Eclipse, most of Asia and Alaska
Mar. 21	Vernal Equinox.
Mar. 24–25	Second weekend of the European WW EME contest (See text for details)
Mar. 25	First Quarter Moon. Poor EME conditions.

—EME conditions courtesy W5LUU.

e-mail: <n6cl@sbcglobal.net>

Engineering of the National University of Comahue participated in the design, manufacturing, and integration of the nano-satellite. Elementary and high school students of Argentina will be encouraged to participate in using the satellite in their schools.

Scientific-Technological Challenges: The design, construction, launch, and operation of the satellite were and will be scientific and technological challenges. Nevertheless, these challenges will help to gain knowledge and experience in space technology for Argentina and for space research in general. A somewhat dated explanation of the electronics of the satellite can be found on the Argentina AMSAT website: <http://www.amsat.org.ar/?f=6>.

Responsibilities of the Involved Organizations

The School of Engineering of the National University of Comahue has managed the project since the creation of the team. The faculty and students of the engineering school were responsible for the design, constructions, tests, and operation, while the university was responsible for the financial resources.

Argentine Association for Space Technology (AATE) participated in the planning team in order to help create the technical specifications and satellite mission. Because of its experience in space technology, its responsibilities included briefing the School of Engineering in the management of the project and design. Its responsibilities also included jointly operating the satellite once it was in orbit. Also AATE was the responsible party regarding launch service contracts, preparations, final integration, and launch management.

AMSAT Argentina participated in the planning team. It was responsible for creating the technical specifications and satellite mission. Because of its experience with its first Argentine satellite (LU-SAT), its responsibilities also included consulting with the School of Engineering regarding the communications systems for this satellite. It also cooperated in achieving the educational goals of the project in elementary and high schools by providing equipment, when possible, and speakers to schools that want to participate in the project, and allowing the use of the satellite between the students and the amateur radio community of Argentina.

The Satellite's Constraints and Solutions to these Issues

The Pehuensat nano-satellite was designed not only taking into account the mission itself, but also other factors, such as the conditions in Argentina and regional and international constraints. In Argentina the space industry practically does not exist. There is some basic capability with some interesting developments in the past, but it is just starting. There are not yet providers of space-qualified hardware or components.

Also, every participating organization had to face the reality of the country's economic problems. Lack of funding, infrastructure, and human resources make these kinds of projects difficult.

Nevertheless, in the international arena there are several factors that helped the project. The general technological advances allowed the use of smaller components. In addition, systems that are more economical and available with globalization were able to be incorporated in the satellite. Also, nowadays there are several providers of space transportation systems competing in price and service.

Furthermore, with the Pehuensat Project being a joint endeavor of the School of Engineering of the National University of Comahue, the Argentine Association for Space Technology (AATA), and AMSAT Argentina (all non-profit organizations) and with education as the ultimate goal, these two factors addressed the national and regional constraints and permitted the formation of human resources for the betterment of training for space research.

Why Pehuensat?

The Pehuen or Araucaria is a very special tree that grows only on the south Andes Mountains in a small region of lakes and high peaks. A branch of native Indians known as the Mapuches used the fruit of this tree as their main source of sustenance via the Pehuen seeds found in the pine cones. The legend surrounding this tree is that when first discovered by the Mapuches, it was thought to be poisonous. Therefore, they refused to eat the seeds. However, during a time of intense starvation for the tribe a warrior was sent out for food.

Traveling among a forest of the trees, the warrior was said to have had a vision of the Mapuches' god Unechen, who told the warrior that the seeds were not poisonous after all. Unechen then gave the warrior the following instructions regarding the seeds: "Boil them to make them tender and then toast them, and you will enjoy a delicious and nutritious food. Each pine cone is enough to feed a man for several days, and you can keep them during winter, burying them in holes on tender soil, You will have enough nutritional food despite hunting become scarce."

It is from the inspiration of this legend that the leadership of the consortium derives its motivation as stated in the following regarding the future of space education in Argentina:

> With the designing, building, and successful launch of this satellite—the second of educational type designed and built totally in Argentina—a new phase in the space education of the country has begun, one that permits students of related careers to be better prepared in space education in the country of Argentina. It is the successful gathering together of the human resources by the cooperation of the National University of Comahue, the AATE, and AMSAT Argentina that was responsible for the creation of the Pehuensat-1. This gathering and subsequent cooperation provide the necessary infrastructure for the creation of future Argentine satellites.

Information for this report was obtained from the AMSAT Argentina website: <http://www.amsat.org.ar> and from the Argentine Association for Space Technology website: <http://aate.org/pehuensat.html>. Translation of the latter website from Spanish to English was made possible by the free web-page translation service located at: <http://www.freetranslation.com>. Information on the legend of the Pehuen seeds was obtained from "Tales and Myths of the Patagonia" by Nahuel Montes of Buenos Aries, Argentina (http://www.temakel.com/milagrodelpehen.htm), with translation by Pedro Converso, LU7ABF (lu7abf@amsat.org.ar).

CubeSats Get OSCAR Numbers

AMSAT OSCAR coordinator Bill Tynan, W3XO, has announced that the RAFT-1 ANDE and FCAL Amateur Radio CubeSats have been issued OSCAR numbers. These spacecraft were placed into Earth orbit from the space shuttle *Discovery* on December 21, 2006. The RAFT-1 and ANDE are projects of the US Naval Academy Satellite Lab. RAFT-1 has been designated as NAV-OSCAR-60, or NO-60. ANDE has been designated as NAV-OSCAR-61, or NO-61. The RAFT-1 and ANDE ham radio payloads digipeat 1200-bps packet on 145.825 MHz. When it's enabled, RAFT-

1 has a PSK-31 uplink from 28.117 to 28.120 MHz with the downlink also on 145.825 MHz.

FCAL is a project of the US Naval Research Labs. It has been designated as NRL-OSCAR-62, or NO-62. The downlink frequency for FCAL is 437.385 MHz AX.25 AFSK 1200 baud and the callsign is KD4HBO. For more information on the ANDE, RAFT, NMARS, and FCAL operations visit the web page: <http://www.ew.usna.edu/~bruninga/ande-raft-ops.html>.

Information for this report was obtained from the AMSAT-NA website: <http://www.amsat.org> and from the January 12, 2007 *ARRL Letter* (Vol. 26, No. 02).

New VK 24-GHz Record

The following is courtesy Colin Hutchesson, VK5DK, via the January/February 2007 issue of the newsletter "Feedpoint" (Vol. 21, No. 1):

On November 27, 2006 at 1010 UTC Russell Lemke, VK3ZQB, and Alan Devlin, VK3XPD, extended the existing 24-GHz distance record from 200.8 km to 230.05 km. They exchanged initial reports of 5×5 on SSB, and as the contact proceeded, signals increased to 5×9 both ways. Russell was operating portable on Mount Warrnambool and Alan was operating portable from Berwich in the eastern suburbs of Melbourne. A contact between VK3ZQB and Colin Hutchesson, VK5DK, was also made on 24 GHz over the previous distance record straight after with signals exchanged at 5×9 both ways also on SSB. Signals between Russell and Alan did deteriorate on 24 GHz later in the evening. A contact between VK3XPD and VK5DK was attempted on 24 GHz over a 400-km-plus path but without results. However, contacts between VK3XPD, VK3ZQB, and VK5DK were made on 10 GHz with 5×9 signals received at all locations.

New in-Canada DX Records Set for 3.4, 5.7, and 10 GHz

The following is courtesy Pierre Jolin, VE2PIJ, via the January/February 2007 issue of "Feedpoint":

On August 12, 2006 Jimmy Howard, VE2JWH (With Pierre Jolin, VE2PIJ), and Chip Taylor, W1AIM/VE2, broke the in-Canada DX records on three microwave bands: 3.4, 5.7, and 10 GHz. W1AIM operated in FN35ca and VE2JWH/VE2PIJ were in FN57dn. Distance per "BD" was 424.494 km. VE2JWH was worked on two-way CW on all three bands. VE2PIJ was worked on SSB (with difficulty) just on 10 GHz. Conditions were flat with no tropo. It was a big struggle just to liaison on 2 meters! Farther distances will likely require the use of HF for liaison.

Data for grid FN35ca: 45° 01' 12" north, 73° 48' 41" west, and elevation 1050 ft. Data for grid FN57dn: 47° 34' 14.2" north, 69°42' 33.3" west, and elevation 664 ft. From grid FN57dn to grid FN35ca: Distance = 263.768 mi., 424.494 km; true bearing = 229.61° and reverse bearing = 46.64°.

Records broken:

3.4 GHz SSB: VE2JWH 55 FN47oc 1.5w 12/AUG/2006 1803 W1AIM/VE2 53 FN35ca 20W.

3.4 GHz SSB: VE2PIJ 55 FN47oc 1.5w 12/AUG/2006 1803 W1AIM/VE2 53 FN35ca 20W.

5.7 GHz SSB: VE2JWH 53 FN47oc 10w 12/AUG/2006 1817 W1AIM/VE2 53 FN35ca 10W.

5.7 GHz SSB: VE2PIJ 53 FN47oc 1 0w 12/AUG/2006 1818 W1AIM/VE2 53 FN35ca 10W.

New records (records broken the second time on 3.4 and 5.7 GHz):

3.4 GHz CW: VE2JWH 559 FN57dn 1.5w 12/AUG/2006 2252 W1AIM/VE2 FN35ca 20W.

5.7 GHz CW: VE2JWH 559 FN57dn 10 w 12/AUG/2006 2303 W1AIM/VE2 FN35ca 10W.

10 GHz CW: VE2JWH 559 FN57dn 1.0w 12/AUG/2006 2320 UTC W1AIM/VE2 FN35ca 5W.

10 GHz SSB: VE2PIJ 41 FN57dn 1.0w 12/AUG/2006 2327 UTC W1AIM/VE2 FN35ca 5W.

Current Contest

European Worldwide EME Contest 2007: Sponsored by *DUBUS* and REF,

the European WW EME Contest is intended to encourage worldwide activity on moonbounce. Multipliers are DXCC countries plus all W/VK/VE states. The contest dates and bands are as follows: First weekend: 50, 144, 432, and 1296 MHz, 24–25 February, 0000 to 2400 UTC, digital only. Second weekend: 432 MHz and 5.7 GHz and up, CW/SSB, 24–25 March, 0000 to 2400 UTC. Third weekend: 144 MHz and 2.3 and 3.4 GHz, CW/SSB, 21–22 April, 0000 to 2400 UTC. Fourth weekend: 1296 MHz CW/SSB, 19–20 May, 0000 to 2400 UTC. Sections and awards include the following: QRP 144 MHz <100 KW EIRP, 432 MHz <400 KW EIRP, 1296 MHz <600 KW EIRP, but no separate QRP/QRO categories.

Complete rules can be found at: <http://www.marsport.demon.co.uk/EMEcont2007.pdf>. Questions can be addressed to: <info@dubus.de>.

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings,* or both. For more information, questions about format, media, hardcopy, e-mail, etc., contact the person listed with the announcement. The following organization or conference organizer has announced a call for papers for its forthcoming conference:

Southeast VHF Society: The Southeast VHF Society is soliciting papers and presentations for this year's conference, to be held in Atlanta, Georgia, on April 27–28. The deadline for the submission of papers and presentations is March 2. All submissions should be in Microsoft Word (.doc) or alternatively Adobe Acrobat (.pdf) files. All text, drawings, photos, etc., must be black and white only (no color). Please 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 bound *Proceedings* by the ARRL. Send all questions, comments, and submissions to the technical program chair Jim Worsham, W4KXY, at <w4kxy@bellsouth.net>. For further information about the conference go to <http://www.svhfs.org>.

Central States VHF Society Conference: The Central States VHF Society is soliciting papers, presentations, and Poster/tabletop displays for the 40th Annual CSVHFS Conference to be held in San Antonio, Texas on July 26– 28, 2007. Papers, presentations, and posters on all aspects of weak-signal VHF and above amateur radio are requested. Deadline for submissions: for the *Proceedings,* May 7; for presentations at the conference and for notifying the society you will have a poster to be displayed at the conference, July 2. (Bring your poster with you on the 26 July!)

Further information is available at the CSVHFS website; go to: <http://www.csvhfsorg/conference/callforpapers.html>. Contacts: Lloyd Crawford, N5GDB, e-mail: <N5GDB@austin.rr.net>. Alternate: Thomas Visel, NX1N, e-mail: <Thomas@neuric.com>. Snail mail: RMG, P.O. Box 91058, Austin, TX 78709-1058.

Meteor Showers

The *g-Normids* shower is expected to peak on March 14 and again on March 17. For more information on the above meteor shower predictions see Tomas Hood, NW7US's "Propagation" column elsewhere in this issue. Also visit the International Meteor Organization's website: <http://www.imo.net>.

Harry Conowal, WA4OFS, SK

Harry Conowal, WA4OFS, passed away on January 12, 2007 from a heart attack. Harry is survived by his wife

Jackie, and daughter Terry, and four sons, Michael, Tom, Mark, and Ted.

The following is from Condy Alley, NI4Z:

Harry Conowal, WA4OFS was an amazing man. When I first met Harry he had recently gotten back into VHF and UHF after being away from ham radio for a few years. Using only hand tools, Harry began to construct amplifiers, preamps, antennas, HV power supplies, and who knows what else. Not too long after Harry's return to hHam radio he suffered a stroke that left him with a limp and not a great deal of use of his left arm. It neither slowed his spirit nor his ability to put together some of the nicest amplifiers one could hope to see. Harry could literally build anything. As soon as he was back on his feet, Harry started a project to get on EME on 70 cm. He built the 7239 amplifier, HV supply, preamp, antennas (eight Yagis) stacking framework, and last but not least an elevation rotator system. When the phase distortion on EME plagued Harry, he designed and constructed a rotator system to rotate the entire array for polarity.

Harry was a people person. He was involved with the Osceola (Florida) Radio Club and became the chief examiner, giving exams through ARRL certification. There are a good many people in central Florida who took a test administered by Harry and his group. I am very proud to say that because of Harry I became a Volunteer Examiner and helped Harry spread ham radio in central Florida.

Even after his stroke, Harry was never down in spirit nor enthusiasm. He was a great influence for me and a wonderful mentor. I will miss him. Rest in peace my good friend.

From Pete Heins, K1FJM/N6ZE:

During the 1980s, as a fellow VHFer and UHFer then living in Homestead, Florida, I frequently talked with Harry on 2 meters and also occasionally on 70 cm. We even had a CA-FL 6-meter QSO in 2000. Like Harry, I worked at Eastern Airlines and always stopped by the maintenance line shack in Orlando to see Harry when he passed through on Eastern Airlines trips. When I had layovers in Orlando from the early 80s until 2006, Harry and I frequently got together to talk about ham radio and old times. Harry usually drove up to my layover hotel, and several times Harry drove me down to St. Cloud to "inspect" the latest ham radio amplifier project.

Harry was a true gentleman. Even though he had met my wife Robin just once and had met my daughter at a couple of hamfests, Harry never failed to ask how they were doing. Several times Harry gave me new insight into my minor problems, and he never complained about his strok-induced challenges. I always admired how he used ham radio construction projects as therapy and motivation in his life.

Longtime VHF/UHF operator and designer Ott Fiebel, W4WSR, said, "It always amazed me how Harry could do so much after his debilitating stroke."

And Finally . . . AMSAT-NA and Education

In last month's column I reprinted the AMSAT-NA press release pertaining to its new lab. This month I want to focus on the education component the new lab represents to AMSAT-NA, to the amateur space program, and to space exploration as a whole.

What is significant about the education connection is contained in one of the memorandums of understanding signed between AMSAT-NA and the University of Maryland Eastern Shore (UMES). From the AMSAT-NA press release (which is reprinted in full in the Winter 2007 issue of *CQ VHF* in the "Satellites" column) is the following:

The agreement with UMES calls for AMSAT-NA to work collaboratively with UMES to identify opportunities to work together on satellite and related technology projects as well as to work with their students and faculty to enhance hands-on studies and dissertation research. The possibility also exists for AMSAT-NA scientists and engineers to receive Adjunct status at the UMES.

The heart of the above quote brings me to my point about education, that being the importance that the Project Eagle satellite represents to the future of amateur satellite communications. Without the education component, there is little future for amateur radio. Granted, later this year at the Dayton Hamvention® we will bear witness to a spike in interest in amateur radio because of the elimination of the Morse code requirement for licensing. However, as with other incentive licensing blips, it will be short-lived and will have minimal residual effect on the overall future of our hobby.

What must happen to refill our dwindling ranks with quality members is education. Having the education connection with the new lab is absolutely critical for our future. It will provide for the exposure of amateur radio to students in the University of Maryland. Hopefully, some of these students will be inspired to become a part of our hobby for the long term. Perhaps something that one of these future students develops will be absolutely critical for a future satellite project. Perhaps something developed from that lab will be used on a future NASA mission to Mars. Who knows? Only time and dedication will tell.

Until next month...

73 de Joe, N6CL

awards

BY TED MELINOSKY,* K1BV

JARL Award Series, Part II

The Japanese Amateur Radio League (JARL) offers an extensive award program to keep certificate hunters occupied. This is the second of a two-part series (see the February issue for Part I) which provides rules for the more popular of these awards.

General Requirements: The awards are available to both amateurs and SWLs. GCR list is accepted. The form of the list is specified, when required, in the rules for each award. There is a fee of 12 IRCs for each award. Endorsement stickers for the JCG awards are 6 IRCs per application. An additional 2 IRCs will be charged for airmail delivery regardless of the number of awards claimed.

Applicants may request up to three of the following endorsements:

1. Specific band.
2. Modes (only contacts made in the same mode)—CW, AM, SSB, FM, SSTV, RTTY, ATV, and FAX.
3. Satellites—only contacts made through an amateur satellite.
4. QRP—only contacts made through transmitters with a final output of 5 watts or less.
5. QRPp—only contacts made through transmitters with a final output of 0.5 watt or less.

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

USA-CA Special Honor Roll

Alan E. Koch, KA7OAI
USA-CA All Counties #1147
November 27, 2006
(All SSB with mobile stations)

USA-CA Honor Roll

500		2500	
U5WF	3393	KA7OAI	1260
W5XFM	3394		
KC2JPM	3395	**3000**	
		KA7OAI	1171

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.

Only contacts/receptions made on or after July 29, 1952 will be accepted.

Only land station QSOs are accepted. Contacts with Far East Military Auxiliary stations in Japan are *not* accepted for the awards. All contacts must be made on land within the same call area, or if no call area exists, within the same country. Apply to: Japan Amateur Radio League, Award Desk, 1-14-5 Sugano, Toshima-ku, Tokyo 170-8073, Japan <http://www.jarl.or.jp/English/4_Library/A-4-2_Awards/Award_Main.htm>.

Asian DX Award (ADXA). Contact (SWL okay) and receive a QSL card from a station located in each of at least 30 Asian countries, including Japan. Cards should be arranged in order of the listing in Table I.

A4 Oman	VR2/VS6 Hong Kong
A5 Bhutan	VU India
A6 United Arab Emirates	VU Andaman & Nicobar
A7 Qatar	VU Laccadive Isl.
A9 Bahrain	XU Kampuchea
AP Pakistan	XW Laos
BV Taiwan	XX9 Macao
BY China	XZ Burma
EP Iran	YA Afghanistan
HL Korea	YI Iraq
HS Thailand	YK Syria
HZ Saudi Arabia	ZC4 UK Bases Cyprus
JA Japan	1S Spratley
JD1 Ogasawara Isl.	3W, XV Vietnam
JT Mongolia	4S Sri Lanka
JY Jordan	4W Yemen
OD Lebanon	4X, 4Z Israel
S2 Bangladesh	5B Cyprus
TA2–8 Turkey	8Q Maldive Isl.
UA9/Ø Asiatic Russia	9K Kuwait
4J/4K/UD Azerbaijan	9M2 W. Malaysia
4L/UF Georgia	9N Nepal
EK/UG Armenia	9V Singapore
EZ/UH Turkmenistan	J2/A Abu Ail, Jabal at Tair
UJ/UM/UI Uzbekistan	
EY/UJ Tadzhiksitan	
UN/UQ/UL Kazakhstan	
EX/UM Kirghizia	

Table I– For the Asian DX Award (ADXA), cards for submission should be arranged in this order.

The Asian DX Award available from the Japan Amateur Radio League for contacting at least 30 Asian countries, including Japan.

Asian DX Award Half (ADXA-Half). Contact (SWL okay) and receive a QSL card from a station located in at least of the 15 Asian countries listed in Table I, including Japan.

WARC Bands Awards. The JARL offers a series of awards that are designed to promote use of the WARC bands. You may earn the JARL award for 10 MHz when you provide a listing of at least 100 confirmed contacts. There are separate awards for 18- and 24-MHz WARC contacts, plus one for the real WARC enthusiast with 1000 cards representing contacts on any combination of the three bands. See theJARL's website for details.

A JARL award for contacting 100 different amateur stations on 10 MHz.

10 MHz – 100 Award. Available to all amateurs (SWLs) who submit a list of QSL cards that show two-way communications (contacts) with 100 different amateur stations on 10 MHz. Contacts must be dated April 1, 2002 or later. Applicants must have all QSL cards concerned, but no GCR list needed. A list of QSL cards should be indicated in alphabetical order by prefix followed by suffix. Contacts may be made from any location. The fee is 1,000 yen (8 IRCs or $US8 for non-JARL members).

JCG (Japan Century Guns) 100 Award. Hunting for Japanese cities and "guns" is a great way to put to work all those JA QSLs in your collection. Japan has 47 prefectures. Prefecture is the major political subdivision, similar to a state in the United States or a very large county. Within each prefecture are the more traditional cities, towns, and villages. A gun is a regional congregation of towns and villages.

The JCG –100 Award is earned by contacting a station located in at least 100 different guns of Japan.

Confusing? Look at a small pile of Japanese QSL cards from your collection. Many of them will show something such as "JCC-1009" or "JCG-40016." This tells you that the first card will count for the Japan Century Cities award, valid for area 1009, which is Chofu City (09) in the Tokyo prefecture (10). We covered this award last month.

The second card counts for gun #40016, which is Munakata gun (016) in Fukuoka prefecture (40). Note that in this numbering system, whether you are looking for new cities or new guns, the first two digits always stands for the prefecture, and the numbers that follow stands for the specific city or gun within that prefecture. Japanese hams are pretty good about identifying these indicators, and when you get familiar with the procedure, you can use the extensive lists found on the JARL website to identify them from the address alone.

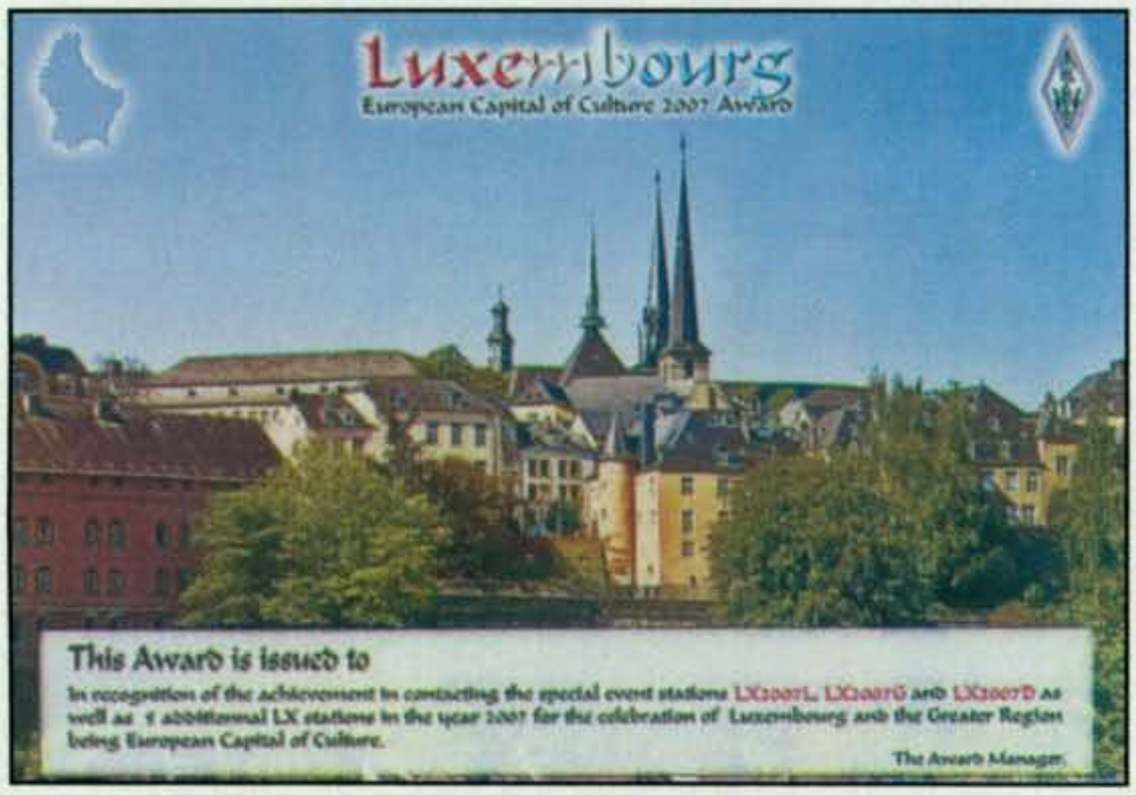
For the JCG 100 Award, contact (or hear) and receive a card from a station

The JARL Award Master recognizes hams who have earned ten or more awards sponsored by the JARL.

located in at least 100 different guns of Japan. JCG-200, 300, 400, 500, and 600 will be issued as separate awards. The list of cards should be arranged in order of JCC reference number. However, the name of the city may be omitted.

JARL Award Master (JAM). To recognize the efforts of the veteran award hunter, the JARL sponsors the following award honoring those who have earned at least ten JARL awards. On occasion, the JARL will sponsor special short-term awards. If you have earned any of these in past years, you may include them in your application.

The award is issued in four classes: Bronze for 10 awards, Silver for 25 awards, Gold for 50 awards, and Platinum for 100 awards. You may count the same award multiple times if you have earned endorsements for different bands or modes. Send a list that includes



The Luxembourg Capital of Culture Award.

the name of the awards, endorsement(s) if applicable, the serial numbers of issue and date as given by the JARL. The fee is 1000 yen or 5 IRCs for each class. Applications will be accepted on or after October 1, 2004.

Luxembourg Capital of Culture Award 2007

After having been designated as a capital of culture in 1995, Luxembourg has again been designated the Capital of Culture for 2007, together with the Greater Region of Germany (Saarland, Rhineland-Palatinate), France (Lorraine), and Belgium (Wallonia). The Greater Region is about 65,401 square kilometers, has three national languages (Luxemburgish, French, and German), and has around 11.2 million inhabitants. More information about Luxembourg and the Greater Region can be found at the website <www.luxembourg2007.org>.

The Luxembourg Radio Society is offering a this short-term award and beautiful certificate for those who contact special event stations that will be active in 2007. The award is available to licensed radio amateurs and shortwave listeners and the award period begins on January 1, 2007 and ends December 31, 2007. Two-way contacts must be established with the following three special event stations—LX2007L (district of Luxembourg), LX2007G (district of Grevenmacher), LX2007D (district of Diekirch)—and 5 different LX stations. Each station may be counted only once. Contacts made via earthbound reflectors, repeaters, and Echolink may not be counted. There is no restriction on the mode used. Applicants should submit a list showing the date, station worked or heard, time, frequency, and mode (GCR list). Use the application form available on the RL website. Send award fee of 5 Euros or $US8 to: Réseau Luxembourgeois des Amateurs d'Ondes Courtes, The Awards Manager, P.O. Box 1352, L-1013 Luxembourg, Luxembourg.

QSL information: For LX2007L, LX2007G, and LX2007D, your QSL card is not needed. All QSL cards for these three special event stations will be sent automatically by the national club. However, you may check the online log at <www.rlx.lu> to see if your contact has been recorded. For any questions, contact LX1KC at <www.rlx.lu>. Logs will be available on eQSL and LoTW by December 31, 2007.

For information on awards celebrating the 100th anniversary of Scouting, see this month's "Public Service" column. Also, if you are looking for some help in publicizing your group or club's award, please send all details to me. 73, Ted, K1BV

BY CARL SMITH,* N4AA

Shame on Us

For quite some time I have been working to improve the operating habits of DXers. Much time and money has been spent trying to get the word to those who don't read "QRZ DX," *The DX Magazine*, or this column in *CQ*.

Peer pressure can make a difference if we will only exercise it. It's time to get our act together and tell these people we don't appreciate the way they operate.

The following was received from a reader, and I felt it was important enough to share it with you. I believe at least some of you out there know who those are who do the things mentioned below. No, I won't say who this came from. That is not important; the message is important. Also, to answer some who have asked, *no*, I did not write this!

A rare photo of Mike, KM9D/E51QMA, and Jan, KF4TUG/E51TUG, on North Cook. (Photo courtesy of Bill, N7OU)

I never felt as ashamed of amateur radio as I did when I came across a pile-up on 14.011–14.014 trying to work 1A4A. He kept asking for NA and W6, W7 stations and many stations across the country kept calling anyway. But was that enough? No, they wouldn't stop calling. And they kept calling even while the station called was attempting to get his report across. Every one of these stations was operated by an Extra class licensee, if they were legal. I remember no time in the past that rivals the sheer lack of discipline being exemplified by so many American amateurs today. I wonder just how many of them are out there. It appears that they don't know Morse code and can't hear/understand the DX, the dynamics of the interaction, and the proper time to call. I wonder just how many of them are using code readers and sending machine code. I only had one QSO with 1A4A, on 15 meters CW. I wanted a second QSO to hedge my bet, but I turned off my rig and left the shack. Having to witness the Amateur Service going down is undermining my desire to even be associated with it.

I blame DX spotting for the situation. If that had not made DX easily available to a whole class of hams that had neither the initiative, nor the motivation, to find DX on their own, we would not have this problem on this scale today. I am sorry to see DXing become just another activity of the unwashed masses. It now ranks right up there with the juvenile game of "king of the mountain." Sadly, I think this class doesn't read DX publications and will not respond to any form of instruction.

I heard the same thing on 160 recently when a station in the Caribbean kept asking for EU, EU and American hams kept calling. It makes me respect the JA ops all the more.

Some of the responses I got when I ran the above in "QRZ DX" were interesting. Here are a few of them:

Your "Shame on Us" editorial was right on target. While I don't work CW, I can hear a good number of lids in the phone bands—and a lot of them have two-letter suffixes. They have U.S. or Canadian callsigns, but they don't seem to understand basic English such as "Up 5." And, of course, there is often the case of the DX asking for "XX only," but "YY" or "AA" will call instead. I've not been on 40 phone for a couple of years, but I would very often hear U.S. guys calling DX on the DX frequency, which was out of the U.S. band. Every morning there seems to be a European vendetta of sorts on 14.195 for an hour or more. As the FCC observed, Morse code exams did not function to "screen" objectionable people from the ham bands.

DX spotting has made DX capturing much easier, without a doubt. We don't have a computer running all day, looking for DX spots. But, perhaps I'm in the minority.

Look around you, however, and you will note a general decline in the entire social structure in the U.S. of A. In summary, too many now have the attitude of "Me and Only Me" and to heck with everybody else. Perhaps, if some of the old timers have the opportunity to advise the newbies, the airwaves will again become disciplined and a joy to listen to. Unfortunately, I wouldn't want to hang by my microphone cord until it happens." ***W4—***

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

Operating site of the 1A4A Operation in January. (Photo courtesy of Rick, NE8Z)

The WPX Program

CW

2700 .....I7PXV

SSB

2967 .....IZ8EZP

SSB: 750 K7SAM. 2400 I3ZSX. 4450 F6DZU.
Mixed: 1800 SV1EOS. 2400 7K3QPL. 3150 ON4CAS.

Award of Excellence: UA4RZ
160 Meter Bar: UA4RZ

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MDD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GO, W4BQY, I0JX, WA1JMP, K0JN, W4VQ, KF2O, WB8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SM0AJU, N5TV, W6OUL, WB8ZRL, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DE0DXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8UB, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KB0G, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YB0TK, K9QFR, 9A2NA, W4UW, NX0I, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DE0DAQ, I1WXY, LU1DOW, N1IR, IK4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBF, W5ODD, I0RIZ, I2MQP, F6HMJ, HB9DDZ, W0ULU, K9XR, JA0SU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, K0IFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, I7PXV, S53EO, DF7GK, S57J, EA5BM, DL1EY, DJ1YH, KU0A, VE2UW, 9A9R, UA0FZ, DJ3JSW, OE6CLE, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RA0FU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, K4LQ, K0KG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX, WB9IHH, CT1EEN, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, KT2C, UA9CGL, AE5B, DK0PM, SV1EOS, UA0FAI, N4GG.

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, SM0DJZ, DK5AD, W3ARK, LA7JO, SM0AJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DE0DXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, KB0G, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YB0TK, K9QFR, W4UW, NX0I, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, W5ODD, I0RIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JA0SU, I5ZJK, I2EOW, KS4S, KA1CLV, K0IFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, DJ1YH, KU0A, VR2UW, UA0FZ, DJ3JSW, OE6CLD, HB9BIN, N1KC, SM5DAC, S51U, RA0FU, CT4NH, EA7TV, LY3BA, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, DL6ATM, W2OO, RU3DX, WB9IHH, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, UA9CGL, SM6DHU, K0DEQ, DK0PM, SV1EOS, N4GG.

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 January 1, 2007, 710 stations have attained the 200 zone level and 1527 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
None

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

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
W2YY, 199 (26)
VE7AHA, 199 (34)
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)
CT3DL, 199 (26)
N0IJ, 199 (21)
RU3DX, 199 (6)
N4XR, 199 (27)
W0PGI, 199 (26)
HA5AGS, 199 (1)
EA8AYV, 199 (27)
VE3XN, 199 (26)
K7BG, 199 (22)
W6XK, 198 (17, 34)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
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)
WA5VGI, 198 (34)
W7VJ, 198 (34, 37)
W0CP, 198 (18, 40)
K9MIE (18, 21)

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

N5PA (173 zones)
WS1L (153 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>.

I share your concern and disgust at the operating habits of many U.S. DXers. I've been brainstorming, trying to think of a solution. There is no good solution and maybe none at all. These people aren't breaking any FCC rules, best I can tell. Except maybe the guys who shout "Echo Tango, etc." on phone.

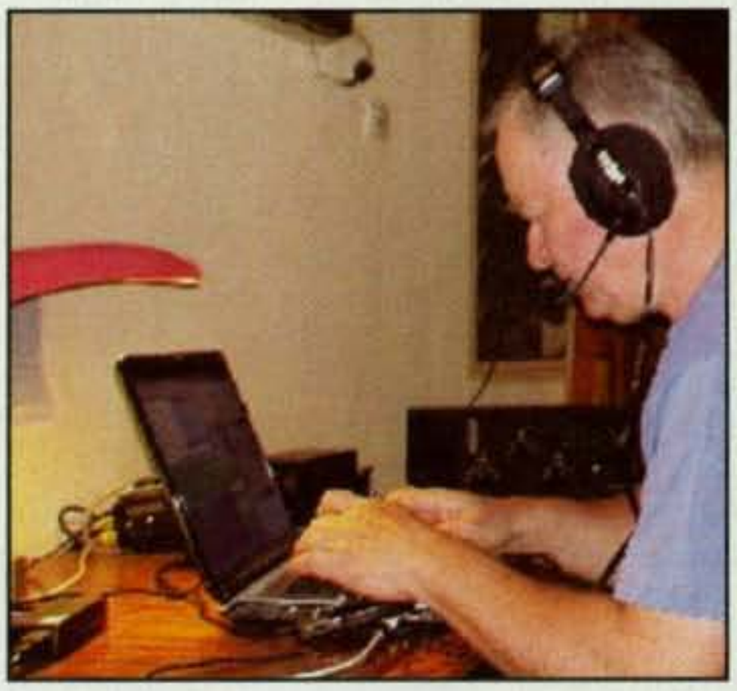
Perhaps if some club would take it on itself to send such stations a friendly note in the mail or e-mail reminding them that they are not operating with good manners. Maybe post the offenders' calls on a website. ***W4—***

It is horrible and increasingly out of control. I don't know about the phone bands, but I've never seen anything like this. I don't know if it's a result of less frequency options due to the solar cycle minimum or just complete and total disregard for the DX station, other amateurs, and their own ARS. Honestly, I get embarrassed when I make a mistake with my station and callsign, but these people have no shame.

I also don't know if it's a result of code reader programs, the lack of skill knowing code, or they just don't care. Maybe it's just a result of what our society has deteriorated to.

I have total respect for the guys and gals out there getting these rare DX locations on the air. I don't know exactly what they can do on the other end, but they can announce prior to the operation that bad operating practices will result in NO QSL.

Tail ending a QSO is unbelievable. 99.9% of these guys don't know how to do it (that's assuming they stop calling long enough to tail end a QSO). They just end up interfering with a QSO and delaying the next QSO. I don't use that practice because I don't think I'm good at it.



Bernard, F9IE, operating from Burkina Faso as XT2C in January. (Photo courtesy of Bill, N2WB)

I do know one thing: I'm not in favor of quantity over quality. I'm in favor of continuing code testing to receive a code endorsed license to operate in the CW subbands. And I'm talking about 13 and 20 wpm. I'm also in favor of harder written tests.

I really wish we would go back to the Novice license with a year or two to upgrade. Sure we may have less amateurs, but what have we got now?

I just have a hard time believing that if you sit some kids in a room with some parts for a simple transceiver and teach them how to solder, teach them about simple circuits, and antennas that you wouldn't spark some interest in a few of them.

As for CW, yes it's a mode, but there is also skill involved. On any mode, having some "class" comes in handy. I don't know what the ultimate answer is, but we as hams need to address this fairly quickly. ***N4—***

There were lots of other comments but these are representative of them all. I'll keep on with my project of trying to "educate" the offenders, but you can help. As I said at the start of this subject: Peer pressure can make a difference if we will only exercise it. It's time to get our act together and tell these people we don't appreciate the way they operate.

DX News

We've had some interesting activity over the last few months. The 1A4A operation apparently was quite successful, and the XT2C operation from

The WAZ Program

10 Meter SSB

581 .....K5RA

15 Meter SSB

633.....UR5WBQ

17 Meter CW

63.....N4BAA

30 Meter CW

75.....N4BAA

20 Meter RTTY

60 .....JA3DLE

All Band WAZ

Mixed

8439 .....JJ1IDW
8440 .....KØGSV
8441.....UA9JLL
8442 .....K5RA
8443 .....K6GMM

SSB

5018 .....DS5AAQ
5019.....7L1JHN
5020 .....K5RA
5021 .....SV3FUP

CW

496 .....DS5AAQ
497 .....K5RA
498 .....JA8JC

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>.

CQ DX Awards Program

CW

1079.....KA1LMR

SSB Endorsements

330.....NØFW/337
330 .....W6DPD/337
330.....W3AZD/336
330 .....VE2PJ/336
330 .....K7LAY/336
330 .....K9HQM/335
330.....EA3BMT/335
320.....F6HMJ/329
310.....KA1LMR
300.....N2LM/302
275.....W5PVE/288

CW Endorsements

330.....F3TH/335
330.....WØJLC/335
330 .....W4OEL/335
330 .....NØFW/335
330 .....K7LAY/334
320 .....F6HMJ/323
250 .....N2LM/271
200 .....KA1LMR/211

The basic award fee for subscribers to *CQ* is $6. For nonsubscribers, 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.

Lunch on Rarotonga. Left to right: Marianne, Henrik's wife; Henrik, OZ6TL/E51TLA; Jim, E51JD; Bill, N7OU/E51NOU; and Bob, W7YAQ/E51YAQ. (Photo courtesy of Bill, N7OU)

Burkina Faso was doing a great job as this was written. The Spanish group at S21XA lost one amplifier but was pressing on in mid-January.

VU7 – Lakshadweep. The latest operation from Lakshadweep by NIAR's (National Institute of Amateur Radio) group, VU7RG/ VU7MY, should be up and running shortly and many are looking forward to that one. The VU7MY callsign was added for operation from the IOTA's (Islands On The Air) Most Wanted in Asia—Minicoy Island. It has been many years since there was any activity from Minicoy, and NIAR credits Bharathi, VU2RBI, for her efforts in gaining permission to operate from there. An extensive list of operating frequencies was distributed for the four separate operating locations. Although the sites are widely separated, the operating frequencies were chosen to minimize any interference and make it easier for everyone to locate the various operating sites. All except Minicoy will be using VU7RG, so it really makes no difference which one you work, as they all will count for Lakshadweep. DXpedition updates and on-line log search is available at <http://www.vu7.in>.

3DA – Swaziland. Members of the IRTS (Irish Radio Transmitters Society) will be in Swaziland March 16–30. This period covers both St. Patrick's Day and the CQ WW WPX SSB Contest. The team leader is Paul, EI2CA, and others on the team are Peter, EI7CC; Aidan, EI8VE; Paddy, EI8BFB; David, EI4DJ/GI4UFM; Rory, EI4DJB; Brendan, EI3GV; Pete, GI4VIV; and Paul, EI2CA.

African DXpedition. Frosty, K5LBU, is organizing another of his expeditions to Africa, this time to Botswana (A22) and/or Lesotho (7P8). Plans are to arrive on July 9 and depart on July 23, including two weekends, as well as the IARU Contest. If Frosty can find five or more operators to join him, he will set

QSL Information

HA501DAE via HA1DAE
HA506NF
HA6NF
HC1MD via K8LJG
HI/CT1EHX via CT1EHX
HI2/IW2OAZ via IW2OAZ
HI3K via HI3CCP
HI8/IW2AOZ via IW2AOZ
HI8/IW2OAZ via IW2OAZ
HQ4D via W3HNK
HQ9R via N6FF
HR9/WQ7R via N6FF
HS6MYW/1 via HS6MYW
IA5/IK5ABG via IK5CBE
IA5/IK5BCM via IK5CBE
IA5/IK5BQW via IK5CBE
IA5/IK5CBE via IK5CBE
IA5/IK5CRH via IK5CBE
IG9/IT9CVO via IW9HLM
IG9/IT9RKR via IW9HLM
IG9/IW9GUR via IW9HLM
IG9/IW9HLM via IW9HLM
IG9/IW9HQP via IW9HLM
IG9C via IV3OWC
IO4T via IK4XCL
ISØA via ISØMYN
IY1TTM via IW1RIK
J3/KU4J via KU4J
J37ZE via KU4J
J79Z via K3TEJ
JW8DW via LA8DW
JW8XU via LA8XU
K6P via KM6HB
KH2RU/KP4 via KH2RU
KH7Q via VE3HO
KH7U via AH6NF
KH7X via K2PF
KH8/ON5AX via ON5AX

(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>.)

Stan, K5NY(left), was presented with the Magnolia DX Association's 2006 Member of the Year award. John, KC5LK, received the association's DXer of the Year award. (Photo courtesy of George, N5GH)

up two stations. Those interested should contact Frosty by e-mail at: <frosty1@pdq.net>.

Ham Atlas

Darek, SP6NVK, has started a new Ham Atlas service on the web after four years of work. It contains complete information on all 337 DXCC entities (countries), with over 3000 pictures and 1100 maps. Take a look at: <http:www.hamatlas.eu/>.

NCDXF Video

A new video about the Northern California DX Foundation is now available. It explains the history of NCDXF and highlights the foundation's many accomplishments, including its scholarship program, the sponsorship of DXpeditions, the NCDXF/IARU International Beacon Network, and support for the World Radiosport Team Championship (WRTC).

The video, produced by James Brooks, 9V1YC, is just under ten minutes in length. DVD copies will be available soon, but it can be viewed on-line under the "Videos" section of the NCDXF website: <http://www.ncdxf.org>.

Until next time, enjoy the chase and Have Fun!

73, Carl, N4AA

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	F3TH 335	K3UA 334	K7LAY 334	N4AH 332	N5HB 329	KE3A 323	W6YQ 314	G3DPX 284
N7FU 336	W4OEL 335	DL3DXX 334	K4CEB 333	HB9DDZ 332	K1HDO 329	N7WO 323	UA9SG 310	DJ1YH 281
N4JF 336	N4CH 335	K2ENT 334	W0HZ 333	VE3XN 331	K7JS 329	KF8UN 323	W9IL 309	XE1MD 280
K4IQJ 336	W0JLC 335	OK1MP 334	N5FG 333	K2JF 331	W6OUL 329	F6HMJ 323	EA3ALV 309	WD9DZV 277
K2TQC 336	K9MM 334	NC9T 334	K4CN 333	K3JGJ 331	W7IIT 328	IK0TUG 321	YU7FW 306	W2JLK 277
K2FL 336	W7OM 334	W2VJN 334	W4MPY 333	WA8DXA 331	KA3S 328	W3II 320	LU3DSI 302	
N4MM 336	K2JLA 334	G4BWP 334	K5UO 333	K9OW 331	SM5HV/HK7 327	IK0ADY 320	N1KC 302	
K4MQG 336	K2OWE 334	W1JR 334	KA7T 333	N6AW 331	K6CU 326	WG5G/QRPp 320	RA1AOB 300	
N7RO 335	F3AT 334	I4LCK 334	K4JLD 333	W2UE 330	W4LI 325	F5OIU 320	VE7KDU 300	
W8XD 335	WA4IUM 334	PY2YP 334	K8LJG 332	W4UW 330	N4OT 325	PY4WS 320	KT2C 300	
N0FW 335	EA2IA 334	W7CNL 334	K5RT 332	N5ZM 330	K1FK 324	OZ5UR 319	WA4DOU 299	
WB4UBD 335	PA5PQ 334	K9IW 334	YU1AB 332	G3KMQ 329	YV5ANT 324	YT1AT 317	K4IE 291	

SSB

K6YRA 337	K2FL 336	EA4DO 335	W4UNP 334	VE2WY 333	CT1AHU 331	CP2DL 327	N8SHZ 316	WA1ECF 295
IK1GPG 337	W8AXI 336	PA5PQ 335	VE2GHZ 334	WB3DNA 333	EA3JL 331	NI5D 327	XE2NLD 315	KW1DX 295
K5TVC 337	K4JLD 336	K9OW 335	OE2EGL 334	K9PP 333	K1HDO 331	K7TCL 326	VE7SMP 315	W4EJG 295
N0FW 337	VE2PJ 336	XE1VIC 335	WA4IUM 334	DL3DXX 333	N7WR 331	HB9DDZ 326	IZ6CST 314	K7ZM 292
KZ2P 337	W3AZD 336	K2ENT 335	K5RT 334	EA3EQT 333	AB4IQ 330	YV4VN 326	W6NW 314	K1RB 292
K4MZU 337	K2JLA 335	OK1MP 335	W6SHY 334	YV1KZ 333	AE5DX 330	WR5Y 325	W0ROB 313	K7SAM 292
N4JF 337	K9MM 335	IK6GPZ 335	W5RUK 334	KE3A 333	KB2MY 330	KC4MJ 325	W7GAX 312	W9ACE 291
W4WX 337	XE1AE 335	NC9T 335	K4CN 334	W7BJN 333	K3PT 330	PY2DBU 325	KA1LMR 312	KU4BP 291
K2TQC 337	W7OM 335	K0KG 335	EA3KB 334	K3JGJ 333	ZL1BOQ 330	YT1AT 325	WA5MLT 310	W5PVE 288
K5OVC 337	IK8CNT 335	EA3BMT 335	K3UA 334	W2FKF 333	WS9V 329	KE4SCY 325	RW9SG 310	XE1MW 287
W6BCQ 337	VK4LC 335	K1UO 335	N5ZM 334	N2VW 332	W9OKL 329	K6GFJ 324	KK4TR 306	KK0DX 285
DJ9ZB 337	OE7SEL 335	I8KCI 335	AA4S 334	YV1AJ 332	W2FGY 329	W6WI 323	WB2AQC 305	VE7HAM 285
W6EUF 337	VE3MR 335	I8LEL 335	CT3DL 334	KS0Z 332	CT1CFH 329	EA3CYM 323	XE1RBV 304	N8LIQ 284
K4MQG 337	VE3MRS 335	DU9RG 335	W9SS 334	LU4DXU 332	EA1JG 329	WA4ZZ 322	K3BYV 303	W0IKD 283
N7BK 337	ZL3NS 335	DU1KT 335	VE7WJ 334	VE4ROY 332	W9IL 329	WN9NBT 322	JR4NUN 303	KB0RNC 282
N4MM 337	OZ3SK 335	CT1EEB 335	YZ7AA 334	W7FP 332	F6HMJ 329	W6OUL 322	VE7KDU 302	IK8TMI 281
XE1L 337	K7JS 335	W1JR 335	CT3BM 334	N2VW 332	KF8UN 328	KD5ZD 322	W5GZI 302	F5INJ 279
4Z4DX 337	YU1AB 335	I4LCK 335	N6AW 334	CT1EEN 332	W0ULU 328	CT1ESO 321	W4PGC 302	WD9DZV 278
W6DPD 337	OE3WWB 335	PY2YP 335	WS9V 334	K9IW 332	K1EY 328	KD2GC 321	EA8AYV 302	W5GT 276
N4CH 337	N5FG 335	ZL1HY 335	W2CC 334	K5UO 332	K3LC 328	N1KC 320	YV2FEQ 301	HS0/EA4BKA 276
OZ5EV 336	PY4OY 335	K9HQM 335	4N7ZZ 333	DL9OH 331	K4DXA 328	W5GZI 320	AC6WO 301	K9DXR 275
N7RO 336	VE3XN 335	WD0BNC 334	VE1YX 333	YV1JV 331	LU5DV 328	SV3AQR 320	4X6DK 301	XE1MEX 275
K9BWQ 336	I0ZV 335	W0YDB 334	W2JZK 333	WA4WTG 331	XE1MD 327	KD2GC 320	N5WYR 300	
WB4UBD 336	EA2IA 335	W4UW 334	K8LJG 333	K3JGJ 331	DK5WQ 327	LU3HBO 317	K4IE 300	
K7LAY 336	IN3DEI 335	W4NKI 334	VE4ACY 333	N5ORT 331	KE5K 327	WB4GMR 317	RA1AOB 300	

RTTY

WB4UBD 334	K3UA 328	N5FG 325	G4BWP 325	OK1MP 322	N5ZM 321	EA5FKI 320	PA5PQ 311	W4EEU 297
K2ENT 333	NI4H 325							

BY JOHN DORR,* K1AR

Hunting for Multipliers

March's Contest Tip

Contest operating has as much to do with what's going on inside your head as it does with the station hardware and radio conditions. Remember that if times are slow or propagation is poor, the same scenario is happening to your competitors as well. Keeping a positive attitude throughout the contest is a critical factor in making a great score!

Contest operating would be much less exciting if multipliers weren't part of the mix. Depending on the contest, multipliers are countries and zones (CQ WW), countries and states (ARRL DX), sections (ARRL Sweepstakes), prefixes (CQ WW WPX), or a wide variety of other possibilities. The definition of multipliers varies almost as much as contesting itself. When combined with your QSO totals you arrive at a final score.

Whether you're new to contesting or a 50-year veteran, I hope you find this month's topic useful in increasing your contest scores. Depending on the contest, a single multiplier can be worth ten or more QSOs, so being skilled in this area of contesting can have an enormous impact on how well you do.

Tracking Multipliers

At the risk of stating the obvious, if you don't know whom you've worked, you won't be able to easily capture new ones! Fortunately, most of today's logging programs easily provide multiplier information, right at your fingertips. For example, the CT by K1EA logging program will show you the countries you've worked by continent by entering Alt-M. CQ zones are identified by entering Alt-Z. The point is you have an easy way to see what you've worked and more important, what you still need. In the absence of a computer, keeping a handwritten list of new multipliers is a valuable investment. Use whatever works for you.

Once you have your tracking mechanism worked out (hopefully before the contest!), the key is to utilize it on a regular basis. One of the great sins in contesting is to miss the easy ones. One example would be to miss an easy country on a particular band in the ARRL DX Contest, or even worse, forgetting to work your own country or zone in the CQ WW. Tracking multipliers certainly will help avoid these snafus as you operate.

Part of the tracking technique used by many is to maintain lists of multipliers you have not worked that should be easy to get into the log. For example, you still may be missing an Italian station or zone 20 on 80 meters after a full night of operating. Writing a list of country prefixes on the back of a blank QSL card works for most operators. Tracking what you have and need is the first step to working them. Finding the ones you need is another skill altogether!

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Calendar of Events

All year	**CQ DX Marathon**
Feb. 24–25	**CQ WW 160M SSB Contest**
Feb. 24–25	REF SSB Contest
Feb. 24–25	UBA CW Contest
Feb. 24–25	Mississippi QSO Party
Feb. 24–25	North American RTTY QSO Party
Feb. 25–26	North Carolina QSO Party
Mar. 3–4	ARRL SSB DX Contest
Mar. 10	DIG QSO Party (10–20 Meters)
Mar. 10	AGCW QRP Contest
Mar. 10–11	Idaho QSO Party
Mar. 10–11	RSGB Commonwealth Contest
Mar. 10–11	Oklahoma QSO Party
Mar. 11	North American RTTY Sprint Contest
Mar. 11	DIG QSO Party (40–80 Meters)
Mar. 11	UBA Spring Contest
Mar. 11–12	Wisconsin QSO Party
Mar. 17–19	BARTG Spring RTTY Contest
Mar. 17–18	Russian DX Contest
Mar. 17–19	Virginia QSO Party
Mar. 24–25	**CQ WW WPX SSB Contest**
May 26–27	**CQ WW WPX CW Contest**

Finding Multipliers

As you probably already have figured out, making a list of what you need is one thing; working them is quite another. After all, if you're also a DXer, you already know what it means to have a "needed list." However, actually working that elusive Scarborough Reef is the real challenge.

Finding new multipliers is a special component of operating skill that is developed over time. While there is a "sixth sense" to it, there are also some basics that apply to the task. Propagation characteristics are the first place to start. Obviously, you are dependent on finding multipliers based on band conditions. There's no point in looking for an elusive KL7 in Sweepstakes if the band is not open in that direction. However, when the band is wide open to a particular area, take advantage of it. You may not have the opportunity later in the contest.

One point I've made continuously over the years is to look for multipliers in the less obvious places. That may be high up on a band where activity is less or on a band that is barely open. You may want to find net operations that have some downtime for the casual contester's "check-in." Also, you may want to beam in odd directions at non-standard times to find that occasional rare one coming in from the south on what otherwise sounds like a dead band.

The bottom line is that one of the best methods of finding multipliers is to combine a mix of the obvious and the obscure. However, finding them is just part of the battle. Now you need to work them, too.

Techniques for Working Multipliers

Working multipliers is just one of the many on-the-air operating techniques that a contester has to learn. It often requires special skills, because unlike simply running stations, you are competing against

2007 Dayton Happenings for Contesters

There are two fantastic events taking place at this year's Dayton Hamvention®: The 15th annual Contest Dinner and a new one, Contest University, both led by Tim Duffy, K3LR. I can assure you that anything Tim does is first-class, so read on:

The 15th Annual Dayton Contest Dinner

The North Coast Contesters are pleased to announce the following:

The 2007 Contest Dinner tickets are now on sale exclusively via the web this year at <http://www.contestdinner.com>. Master of Ceremonies for the Contest Dinner is *CQ* magazine Contest Editor John Dorr, K1AR. The 2007 Contest Hall of Fame Inductions will be formally presented by CQ World-Wide Contest Director Bob Cox, K3EST. Dr. Barry Merrill, W5GN, will be this year's outstanding keynote speaker.

The Contest Dinner will be held on Saturday evening, May 19, 2007 at 6:30 PM. A cash bar opens at 5:30 PM. It will be at the Crowne Plaza Hotel (the official contester's hotel) at 5th and Jefferson Streets (next to the Convention Center), Dayton (downtown), Ohio in the Van Cleve Ballroom. Menu: prime rib of beef, potato, vegetables, rolls, chocolate fudge cake, choice of beverage (coffee, tea, or iced tea). A vegetarian dish will be available by request at the dinner. Price is $34 per person or $265 for a reserved table of eight. You must bring your web receipt to the dinner to gain admission. Seating is random. Tables are set in rounds of eight. There will be no dinner tickets for purchase at the door.

Many contest operators from around the world attend this event. If you enjoy radio contesting, you do not want to miss the Dayton Contest Dinner!

Contest University, Dayton 2007

In cooperation with the Potomac Valley Radio Club (www.contestuniversity.com), Contest University will be held on Thursday May 17, 2007, from 8:30 AM to 5:30 PM at the Crowne Plaza Hotel. This is the day before the Dayton Hamvention® officially opens. Don't miss this rare opportunity to gain knowledge that otherwise may take you years of practice, trial and error, or lost time to learn. Get the edge to improve your scores and put your station in the winners' circle!

Registration fee (see below) will include the following:

For both beginners and advanced contesters:

- Topics taught by "veteran contesters"
- Breakfast and lunch included on-site
- A full day of training and knowledge enhancement

Veteran Contester staff instructors: Jim, K8MR; Dean, N6BV; Randy, K5ZD; Dick, N6AA; Dave, W9ZRX; Andy, N2NT; Jeff, N5TJ; and Mark, N5OT.

Activities to include the following discussion topics: Practical Ideas, Antennas, Propagation, Towers, Grounding, Contest Operating, Station Design, Equipment, Contest DXpeditions, Contest Logging, Hints and Tips, facets of contesting from RTTY to mobile to QSO parties, and much more!

Registration Fee: $80.00 from 2/28/07 until 4/15/07 (last day to sign up). No sign-ups at the door! Scholarships are available for those 25 years old or younger.

a pile-up of other enthusiastic operators who have the same objective—making the QSO!

Before worrying about the task of working multipliers, you have to consider when to do it. Put another way, when does one "search and pounce" vs. call CQ and run guys? Unfortunately, there is no scientific answer to this age-old question; gut feeling and experience have a lot to do with the answer. However, a little math can help as well. Again, your logging program can help in this area. For example, most programs provide you with real-time information that includes the value of a multiplier in terms of number of QSOs. This is one metric you can use, when your rate slows, to determine if you should spin the dial and look for new multipliers.

Another technique is to make multiplier chasing a key aspect of your search-and-pounce operation. All too often we get into the mode of looking for multipliers and sometimes simply pass over needed QSOs because we're hunting for multipliers. By combining both, you add leverage to the activity and drive both activities in the right direction. Remember, the ultimate goal in contesting is to get QSOs into your log.

Once you find a needed multiplier, you're at another decision point. If the pile-up is large and your station is not, you likely will need to move on. There's no point in increasing your electricity bill without any return on that investment! Make a note of the multiplier's frequency and come back later. You may find him (or her) gone altogether, or if you're lucky he will have practically no one calling.

If you decide to try and work a multiplier, be smart about it. Calling techniques are a huge differentiator when working new ones. On phone, time your calls to land when the least number of stations are calling. That may mean avoiding your natural tendency to jump right into a pile-up as soon as the other station stops transmitting. If you hear the other station working tail-ending stations, try that tactic. Good operators

work tail-enders, and it's often the fastest way to break a nasty pile-up. However you choose to call, make sure to use regular, punchy phonetics and save the non-English calling for your Berlitz® lessons during the week. You can be cute with your call after the contest. Last, call with authority in your voice. Sound like you really want to work the station without giving yourself a coronary in the process.

If you're calling on CW, don't be afraid to transmit a little off frequency. Put yourself in the other station's shoes; you want to be heard and very often the best way to do that is to call where others are not. Again, the tail-ending technique works here, but be sure the other station is up to the task. Make sure your CW speed is at or near that of the other station and that it reflects the current band conditions. At the risk of stating the obvious, calling a weak VK6 on 80 meters at 40 wpm is not particularly effective. However, you'd be amazed at how many people do it!

Special Actions

At this point, with some of the above tactics in place, you're now ready to enter the master's program for multiplier chasing. One of the most popular techniques to build your totals is passing needed multipliers to other bands. Also, while it often can be a bother for the rare station, you'll never know unless you ask. More often than not, rare stations simply are operating to help out others and are more than willing to move to a needed band if asked. Make your request short and sweet: "Can we now QSY to 21350?" I'll leave it up to you if you feel like asking someone with a huge pile-up calling (not that I've ever done that!).

While more difficult, moving multipliers on CW can be done quite effectively as well. Again, brevity is the key to success: "QSL, nw pse QSY 7050?" It's amazing how many stations will move for you by just asking.

Some multiplier stations will be working the contest split. S9SS comes to mind, along with many others. Again, the key to success, especially for a smaller station, is to try to call where others are not. You'll be amazed how effective that can be in logging new ones.

Last, you'll notice I've said nothing about packet spotting. While it's a potentially useful tool in finding new multipliers, it can also be your enemy, as instant pile-ups are often generated from a single spot. Sadly, what started as a fun and effective aid to the contester many years ago has now become a monster. For now, let's leave it at that.

Conclusions

For some of you, this month's commentary may serve as nothing but a reminder of things you already know. For others, it's new ground. No matter where you are on the subject, successful contesters are the ones who know what they need, are adept at finding it (and knowing when to look), and have particular skill in working stations once found. Regardless of your station's size, developing expertise in this area will always result in more fun and a higher score. Give it a try and best of luck!

Final Comments

It's amazing how many resources are available to us to improve our contesting skills. Whether it's the new Contest University at Dayton this year (see sidebar) or information that is readily available on the internet, you have the opportunity to learn so much about contest operating with advice from experts around the world right at your fingertips.

Well, that's it for this month. As I type this in mid-January, the team at VU7RG is really going at it, so I'm off to the rig. See you next time! 73, John, K1AR

BY TOMAS HOOD,* NW7US

The Debate Continues

A Quick Look at Current Cycle 23 Conditions

(Data rounded to nearest whole number)

Sunspots
Observed Monthly, December 2006: 14
Twelve-month smoothed, June 2006: 16

10.7 cm Flux
Observed Monthly, December 2006: 84
Twelve-month smoothed, June 2006: 81

***Ap* Index**
Observed Monthly, December 2006: 14
Twelve-month smoothed, June 2006: 8

As we close out solar Cycle 23, a number of forecasts have been submitted to the public regarding the new solar activity cycle. The majority of them do concur that Cycle 24 will be much more active than Cycle 23. However, at least one forecast model indicates that this new cycle may well be one of the strongest in many decades. This has generated a minor debate between solar and space weather scientists.

Solar Cycle 24, due to peak in 2010 or 2011, should begin during 2007. Solar physicist David Hathaway of the National Space Science and Technology Center (NSSTC) postulates that Cycle 24 will be one of the most intense cycles since record-keeping began almost 400 years ago. David's prediction is based on cutting-edge models of the sun's dynamics applied with the vast collection of space weather and solar event data.

The solar activity record of the last 400 years reveals a curious pattern. Four of the five biggest cycles on record have come in the past 50 years. "Cycle 24 should fit right into that pattern," says Hathaway.

David Hathaway and colleague Robert Wilson first presented their prediction at the American Geophysical Union meeting in San Francisco, California. They explained that their forecast is based on historical records of geomagnetic storms. Hathaway explains: "When a gust of solar wind hits Earth's magnetic field, the impact causes the magnetic field to shake. If it shakes hard enough, we call it a geomagnetic storm." In the extreme, these storms cause power outages and trigger the Northern and Southern Lights.

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for March 2007

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 1-10, 16-22, 24, 28-31	A	A	B	C
High Normal: 13-15, 25-27	A	B	C	C-D
Low Normal: 11-12	B	C-B	C-D	D-E
Below Normal: none	C	C-D	D-E	E
Disturbed: 23	C-D	D	E	E

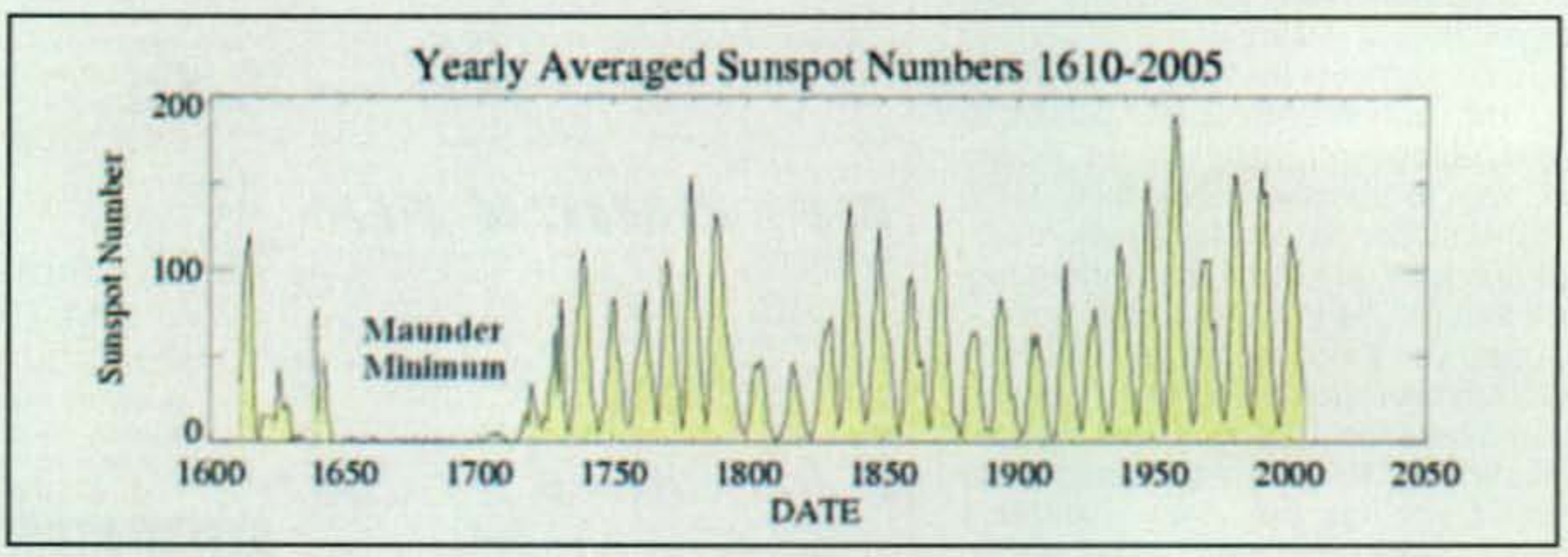
Where expected signal quality is:
A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some 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 (available from CQ).

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be Excellent on March 1 through March 11, Fair to Good on March 12, Good on March 13, and so forth.

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.



This chart reveals that there have been some very weak solar cycles, and that the more recent ones have been quite powerful compared to earlier cycles. If this pattern holds true, the predictions that solar Cycle 24 will be one of the biggest in over 400 years may be valid.

During moderate to severe geomagnetic storms, the aurora can become energetic enough to produce *E*-region ionospheric patches and curtains. These "clouds and curtains" act as reflectors for HF and VHF radio signals, a phenomenon known as aurora-mode propagation (*Au*).

Looking at records of geomagnetic activity stretching back almost 150 years, Hathaway and Wilson noticed that the trends of the amount of geomagnetic activity actually indicate what the solar cycle is going to be like six to eight years into the future. According to their analysis, the next solar maximum should peak around 2010 with a sunspot number of 160, plus or minus 25. If this prediction comes true, solar Cycle 24 will be one of the strongest solar cycles of the past 50 years. It could even become one of the strongest in recorded history.

As I reported recently in this column, other predications are in agreement that Cycle 24 should be "big." For instance, Mausumi Dikpati and colleagues at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado prognosticate that Cycle 24 could produce solar activity second only to the exciting and historic solar maximum that occurred in 1958.

Like most experts in the field, Hathaway has confidence in the conveyor-belt model and agrees with Dikpati that the next solar maximum should be historic. However, he disagrees with Dikpati's forecast regarding when the peak of the cycle will occur. Dikpati predicts the solar maximum in 2012, while Hathaway believes it will arrive sooner, in 2010 or 2011.

What's the Space Weather Like?

Speaking of debates, a very small number of readers wrote to me asking me to bring back the propagation charts. The charts were a useful resource for those operators who did not wish to use a computer in their daily operations. A much larger number of readers confirmed that they use software and other more immediate and more accurate tools (such as the radio beacons).

I've decided to compromise at least for the short-term. You will notice that this month's column again includes the Last-Minute Forecast. This was the heart of the charts that used to be included in this column. The Last-Minute Forecast is still valuable on at least two levels. You can use the Last-Minute Forecast directly with the charts found in the updated *The New Shortwave Propagation Handbook* by George Jacobs, W3ASK, Ted Cohen, N4XX, and Bob Rose, K6GKU (published by CQ). However, you can also gauge the general space weather and geomagnetic conditions to be expected during the month simply by referring to the Last-Minute Forecast for those days in the different categories (Above Normal and so forth).

Nevertheless, there is strong consensus that using the modern, easily obtained tools for planning radio operations is really the best way to go. Computers are affordable, powerful, and nearly all operators are equipping their radio shacks with one. Arm that computer with the right software (such as my favorite, ACE-HF (http://www.acehf.com), and you will have the ability to drill down to the exact radio circuit. That is just not possible with the generalized charts that only provide conditions in a limited number of geographical areas. If you live far away from one of those locations used in the chart, you could only hope that you would experience somewhat the same conditions as forecast for the actual charted location.

On the workbench is the project of adding to this column some form of chart system that would be more useful and accurate. This is a complex question and will take some time to resolve. Yet another reason to stay tuned!

March Propagation

Because we are at the very bottom of the current 11-year solar cycle, the ionosphere is not being energized enough to support propagation on the higher HF frequencies. With the reduced energy level of the ionosphere, bands such as 20 meters suffer with early closures, becoming quiet quickly after dark. Overall, signals are generally weaker over many radio circuits.

Even so, March is one of the optimal DX months. As the Spring Equinox approaches, the gray line begins to run straight north and south. With the return of sunlight to the polar north, the HF bands are improving.

Ten meters will be spotty, with the most reliable propagation along north/south paths. I've been following the revealing reports from the PropNET propagation research group (http://www.propnet.org). They conduct daily propagation tests on 10 meters. The reports confirm that even during the lowest phase of the solar cycle, 10 meters does have life. This month we can even expect occasional strong but short openings between stations on east/west paths into Asia from the North American west coast and into Europe from the North American east coast. These paths will quickly disappear as we move into April, so don't miss out.

Fifteen meters will be much more usable than 10. We will find 15 opening up to more areas and for somewhat longer periods into the evenings. Those daytime paths that do open up (certainly much less often than during the peak solar cycle years) will not degrade much until mid-summer. You will see these openings mostly from regions close to the equator, as the current solar activity is not supporting the propagation of these higher frequencies via the *F*-layer of the ionosphere.

Seventeen and 20 meters will remain in good shape. Both short- and long-path circuits will be reliable and solid. All nighttime paths will be wide open during March. Primetime evening hours in the United States are sunrise hours across Russia, Africa, and both the Near and Far East. Expect a lot of short- and long-path DX into these areas of the world. The daytime band of choice will be 20 meters, as has been proven in contests during past solar cycle minimums.

Between sunset and midnight, expect DX openings on all bands between 20 and 160 meters, with occasional openings on 15 and 17 when conditions are High or Above Normal. Conditions on 30, 40, 60, 80, and 160 meters should favor openings to the east and south. These bands should peak for openings to Europe and Africa near midnight.

From midnight to sunrise, expect optimum DX conditions on 30, 40, 60, 80, and occasionally 160 meters. Conditions should favor openings toward the west and south. Some rather good 20-meter openings should also be possible toward the south and west during this time.

The seasonal drop of daytime maximum usable frequencies (MUF) continues, and the geomagnetic activity as reported by the planetary *A*-index (*Ap*) is on its seasonal rise. Take advantage of the current excellent conditions and work the world before the summer conditions create greater challenges.

VHF Conditions

The possibilities for ionospheric openings on the VHF bands usually improve during March and the spring months. Many of the solar-ionospheric relationships that can produce ionospheric openings on the VHF bands tend to maximize during equinoctial periods.

A seasonal increase in short-skip openings due to sporadic-*E* propaga-

tion generally takes place during March, and an occasional 6-meter opening may be possible during this month. Sporadic-*E* openings most often occur during the daylight hours over distances between about 1000 and 1400 miles. There is also a fair chance for an increase in widespread auroral activity during March, since we continue to experience coronal-hole activity during the solar cycle minimum. These auroras could be accompanied by auroral-scatter-type openings on 6 and 2 meters. Check the Last-Minute Forecast at the beginning of this column for those days in March that are expected to be Below Normal or Disturbed. These are days on which auroral activity is most likely to occur.

Conditions should be optimal during March for trans-equatorial scatter propagation between the southern tier states and countries deep in South America. The best time for TE openings should be between 8 and 11 PM local time. Don't forget to check out my column in *CQ VHF* Magazine for more details on VHF propagation and conditions.

Current Solar Cycle Progress

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 84.3 for December 2006. The 12-month smoothed 10.7-cm flux centered on June 2006 is 80.6. The predicted smoothed 10.7-cm solar flux for March 2007 is 74, give or take about 13 points.

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for December 2006 is 13.6, a fairly large jump back down from the one-month spike during November. The lowest daily sunspot value recorded was zero (0), on December 18–23 and December 28–29. The highest daily sunspot count was 34 on December 1. The 12-month running smoothed sunspot number centered on June 2006 is 16.3. A smoothed sunspot count of 10, give or take about 8 points lower to 12 points higher, is expected for March.

The observed monthly mean planetary *A*-index (*Ap*) for December 2006 is 14, up from the trend of an *Ap* staying between 8 and 9 since May. Last month's figure was adjusted from 8 to 9. The 12-month smoothed *Ap*-index centered on June 2006 is 8.3. Expect the overall geomagnetic activity to vary greatly between quiet and active during most days in March, especially as we near the spring equinox.

Website Status

If you were waiting patiently for my server to return on-line during January, thank you. It took about three months (starting in October 2006) to finally get all of the hardware problems, software configurations, and security issues ready for the harsh internet environment. Please take a look at what's new, as well as browse the space weather and radio propagation resources at my amateur radio website listed below. Included on the site is an up-to-the-day Last-Minute Forecast for you to use to get the very latest forecast for the month.

My online propagation resource is located at <http://propagation.hfradio.org/>. Also, 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. I'd also love to hear any feedback you might have on what I have written. Until next month . . . 73, de Tomas, NW7US

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.)

CW RESULTS
SINGLE OPERATOR
QRP/p

TI5N	**A**	**1,259,452**	**986**	**461**
			(Op: W8QZA)	
OT6A	**A**	**1,193,830**	**993**	**530**
			(Op: JK3GAD)	
OM7DX	**A**	**1,112,412**	**1015**	**476**
OK7CM	**A**	**1,029,860**	**987**	**466**
WA4PGM	**A**	**801,940**	**798**	**404**
EA1FAQ	**A**	**800,976**	**837**	**444**
SM6EQO	**A**	**774,525**	**860**	**449**
JA1MCU	**A**	**769,920**	**646**	**401**
SP2DNI	**A**	**685,795**	**872**	**407**
VA3DF	**A**	**675,904**	**658**	**358**
YT7TY	**A**	**576,147**	**615**	**429**
N7IR	**A**	**537,168**	**641**	**361**
UA1CUR	**A**	**532,515**	**739**	**393**
G4DBW	**A**	**518,400**	**690**	**360**
RL3DZ	*	511,488	670	432
UXØLL	**A**	**497,658**	**625**	**357**
SP6LV	*	497,511	676	371
RW3AI	*	468,720	726	360
G3YMC	*	457,932	632	372
OK1FKD	*	441,438	629	354
DL8MBS	**A**	**404,622**	**622**	**354**
N1TM	**A**	**397,826**	**395**	**286**
W4QO	*	371,904	554	298
NQ5D	**A**	**311,170**	**460**	**290**
UK/JI2MED	**A**	**308,610**	**444**	**270**
EW1NA	**A**	**298,808**	**510**	**328**
UX8ZA	*	296,670	537	290
DF5RF	*	280,182	429	294
YZ2M	*	278,536	486	296
			(Op: YU1LM)	
EA7AAW	*	265,594	471	311
I1BAY/P	**A**	**259,618**	**413**	**271**
W5KDJ	*	249,686	476	262
WA8REI	**A**	**249,066**	**427**	**274**
K2TA	*	240,384	366	256
K9CS	**A**	**208,128**	**318**	**256**
LY3BY	**A**	**200,634**	**437**	**281**
WA8WV	*	189,442	288	218
8J4P/4	*	182,160	436	207
			(Op: JA4MRL)	
HA1WD	**A**	**178,824**	**330**	**238**
MM3AWD	**A**	**177,870**	**364**	**242**
IT9LNH	**A**	**163,350**	**371**	**242**
NA4BW	*	161,210	391	235
K4ORD	*	147,232	331	214
W8VE	*	124,640	270	190
K3TW	**A**	**113,088**	**264**	**186**
DL1LAW	*	73,748	246	179
SP9FWQ	*	73,620	233	180
IK1RAC	*	73,017	202	171
USØYA	*	63,960	201	164
GM4HQF	*	63,612	230	171
MM3DWF	*	57,150	199	150
RK9DO	**A**	**54,834**	**147**	**114**
HB9AYZ	**A**	**52,972**	**202**	**164**
ON7CC	*	50,170	179	145
7K1CPT	*	48,792	142	114
RL3DD	*	48,506	215	158
K8ZT	*	46,355	151	127
VA3RKM	*	46,090	171	110
K4KSR	*	39,560	136	115
KD2MX	*	38,468	169	118
RX9JM	*	30,212	119	91
WC7S	*	27,352	153	104
F6ABI	**A**	**24,522**	**140**	**122**
ON3AD	*	23,265	120	99
DG8VE	*	21,320	120	104
PA1W	**A**	**20,010**	**105**	**87**
DH8BQA	*	16,720	108	88
PA1B	*	16,647	103	93
SP9RQH	*	14,534	99	86
DJ5QK	*	14,070	170	82
LA1ENA	**A**	**11,468**	**96**	**94**
PAØATG	*	11,352	95	88
K1QW	*	9,590	90	70
K5OI	*	9,240	77	70
NGØK	**A**	**8,001**	**71**	**63**
K9FOH	*	3,450	62	46
DL3BVA	*	2,769	41	39
AF9J	*	2,730	63	42
NX4U	*	2,698	42	38
			(Op: K4AQ)	
VK2NU	**A**	**2,640**	**36**	**38**
SQ5MGG	*	1,421	29	29
YO2MAX	**A**	**1,239**	**23**	**21**
KE6CC	**A**	**851**	**23**	**23**
DL2TM	*	792	32	24
8J6P/6	*	396	13	12
NF8M	*	336	18	16
HI7/AD8J	*	80	5	5
UR5ZQV	**28**	**6,832**	**82**	**52**
VU2LYX	**28**	**630**	**15**	**14**
EW6BN	**28**	**616**	**24**	**22**
DL9ZP	**21**	**191,706**	**352**	**267**
CT1AOZ	**21**	**104,856**	**224**	**204**
ES1CR	**21**	**49,725**	**180**	**153**
RA3XEV	**21**	**49,050**	**205**	**150**
WA6FGV	**21**	**36,720**	**180**	**136**
KR2Q	**21**	**34,224**	**137**	**124**
YB5AQB	**21**	**33,504**	**121**	**96**
JR1NKN	**21**	**28,620**	**123**	**108**
LU5FZ	**21**	**16,310**	**79**	**70**
RX9TL	**21**	**6,424**	**50**	**44**
HA7MW	**21**	**3,774**	**38**	**37**
SV5DKL	**21**	**2,318**	**43**	**38**
JA1KPF	*	96	8	8
EU8RZ	**14**	**925,704**	**896**	**559**
YO5KIP	**14**	**601,200**	**728**	**450**
HA6IAM	**14**	**433,600**	**580**	**400**
RWØAJ	**14**	**431,024**	**476**	**341**
UN7CN	**14**	**331,785**	**415**	**303**
UA6LCJ	**14**	**297,894**	**530**	**379**
DL9LM	**14**	**281,880**	**448**	**324**
S56C	**14**	**229,371**	**421**	**303**
G3LHJ	**14**	**228,384**	**404**	**312**
NU4B	**14**	**191,919**	**313**	**259**
SP4GFG	**14**	**185,310**	**389**	**290**
RU2FM	**14**	**119,830**	**295**	**230**
RZ9IB	*	94,978	220	169
UAØSBQ	*	78,894	195	162
NZ5A	**14**	**57,585**	**201**	**165**
YO6CFB	*	50,076	207	156
KR8I	**14**	**50,024**	**168**	**148**
9A8MM	**14**	**46,880**	**191**	**160**
UX8IX	**14**	**24,321**	**161**	**121**
OK1DSA	**14**	**21,924**	**123**	**116**
UA9FEG	*	6,026	49	46
SN3K	*	6,006	53	42
			(Op: SP3SLA)	
G4RGK	**14**	**5,307**	**55**	**61**
SN16B	*	4,160	54	52
			(Op: SP9NSV)	
OK1JOC	*	4,002	49	46
9A2EY	*	2,696	39	38
JE1CAC	**14**	**615**	**15**	**15**
KC2KME	*	80	6	5
OK2BYW	**7**	**520,086**	**539**	**366**
UU2CW	**7**	**461,720**	**475**	**340**
F5UL	**7**	**285,930**	**413**	**270**
ON4BHP	**7**	**131,040**	**290**	**195**
SP4TBM	**7**	**119,002**	**258**	**199**
OH6NPV	**7**	**72,072**	**206**	**156**
NØLY	**7**	**63,560**	**178**	**140**

SINGLE OPERATOR
UNITED STATES

WC1M	**A**	**8,518,054**	**2947**	**901**
WK1Q	**A**	**5,032,720**	**2202**	**770**
			(Op: K1MK)	
W3ABT	**A**	**3,324,564**	**1737**	**662**
			(Op: K5MA)	
AK1W	*	1,759,290	1002	507
			(Op: K5ZD)	
K1ZZ	*	1,688,868	1063	516
W1CU	*	1,407,431	930	547
KQ2M	*	893,727	778	419
NN1N	*	608,124	629	374
W1CX	*	435,456	484	324
N1MGO	*	39,240	145	120
***NV1N**	**A**	**3,843,783**	**1876**	**713**
			(Op: N1UR)	
***W1AF**	**A**	**2,287,348**	**1370**	**572**
			(Op: NF1R)	
***AE1T**	**A**	**796,530**	**719**	**410**
*K8PO	*	609,588	620	369
*W2JU	*	417,570	494	310
*K1HT	*	378,752	414	269
*K1IB	*	359,454	396	278
*W1TO	*	275,616	390	261
*K1SM	*	222,981	335	233
*K1TR	*	167,232	274	201
*KX1E	*	160,847	310	239
*N1CGP	*	49,724	156	124
*AE1D	*	45,990	173	126
*W1EQ	*	21,712	103	92
*AB1FY	*	12,222	66	63
*K2SQS	*	3,440	45	43
***N2GM**	**14**	**744,144**	**688**	**444**
***NT2Y**	**14**	**633,955**	**711**	**413**
*KR2AA	*	287,624	407	314
*W2DX	*	76,320	200	180
*K2MK	*	38,750	145	125
***NK2F**	**7**	**213,900**	**272**	**230**
***NT1E**	**1.8**	**2,030**	**43**	**29**
			(Op: K3BU)	
KC3R	**A**	**8,058,600**	**3200**	**888**
			(Op: LZ4AX)	
NN3L	**A**	**6,248,718**	**2592**	**854**
			(Op: N3RS)	
AA3B	**A**	**5,933,952**	**2472**	**808**
K3ZO	*	5,325,120	2252	774
N3UM	*	2,250,144	1293	601
N7TT	*	1,593,705	1321	543
K2LNS	*	1,242,450	1063	502
AB3CX	*	1,203,248	984	479
K3WI	*	908,145	853	465
N3KR	*	656,640	657	380
W7YS	*	475,999	621	367
W9GE	*	42,420	114	101
W3BW	*	11,814	66	66
AD7AV	*	1,610	24	23
W4UAT	**14**	**522,838**	**540**	**394**
K3GW	*	335,920	422	340
WE3C	**7**	**2,468,039**	**1037**	**553**
AD4EB	*	1,342,839	1218	543
K4BAI	*	1,177,660	1116	505
WJ9B	*	1,154,722	1010	463
K4LQ	*	1,069,967	892	449
W4BQF	*	1,056,090	998	470
K4DJ	*	888,888	804	444
W4QM	*	838,929	918	439
N6CY	*	678,814	723	382
W4FDA	*	639,996	620	399
WR3O	*	570,092	750	397
			(Op: K4RO)	
K1PT	*	479,207	574	347
W7QF	*	477,286	529	334
N4ES	*	460,952	544	314
W4NTI	*	413,440	530	323
NB3O	*	359,260	384	253
			(Op: K3TM)	
W4YE	*	357,991	401	271
KM4M	*	261,349	370	253
			(Op: W3BP)	
W1MO	*	184,386	347	237
AF4DX	*	158,513	301	203
WB4MSG	*	122,496	263	192
N4UH	*	116,372	251	188
NA4DR	*	92,925	268	177
			(Op: W4ATL)	
WC4E	*	34,320	143	120
KGØZ	*	12,284	78	74
			(Op: W4ZW)	
KT6V	*	11,704	83	77
			(Op: K9VV)	
NE8J	*	5,202	59	51
K1UM	**21**	**1,238,775**	**1090**	**597**
NQ4I	**14**	**3,871,790**	**2002**	**845**
			(Op: VE7ZO)	
NA4K	**14**	**3,232,525**	**1878**	**775**
			(@K4BP)	
W9WI	*	991,185	910	507
W4NZ	*	769,896	738	444
WK4Y	*	494,910	581	351
N3CZ	**7**	**1,445,108**	**824**	**511**
			(@K4SV)	
NJ4U	**7**	**862,242**	**594**	**393**
			(Op: K4EA)	
KY4DX	*	50,688	168	128
			(Op: K4WW)	
WD4DDU	*	49,464	116	108
***WK2G**	**A**	**2,362,920**	**1608**	**609**
***WO4O**	**A**	**2,137,905**	**1605**	**617**
***WD4AHZ**	**A**	**1,899,728**	**1399**	**592**
*W4TAA	*	1,726,075	1240	611
*W4PM	*	1,377,392	1046	496
*AA4FU	*	926,440	899	424
*K4IE	*	899,294	849	451
*N4NX	*	690,202	731	433
*K4HAL	*	344,253	486	291
*KU8E	*	305,280	412	265
*K4GM	*	301,000	435	280
*AA4LR	*	275,776	468	278
*KI3O	*	273,182	462	266
*KA4H	*	260,848	418	274
*W4HZD	*	244,454	451	266
*NK4A	*	238,875	494	273
*N4BG	*	213,548	376	271
*N4ESS	*	210,924	475	243
*K5RQ	*	200,970	335	231
*NE4M	*	162,132	346	236
*WA4OSD	*	155,820	348	212
*K4FPF	*	149,513	282	217
*AI4MT	*	141,159	274	211
*K4LW	*	140,553	271	207
*N4LF	*	135,251	292	211
*N4ARO	*	110,374	239	173
*K4BX	*	107,562	296	197
*W4RQ	*	106,106	208	182
*N4HXI	*	105,525	295	201
*W4MY	*	101,928	261	186
*W4CC	*	97,278	254	186
*WA2KHO	*	95,325	201	155
*AC4PQ	*	91,512	197	164
*K4BEV	*	76,440	233	182
*AF4UU	*	73,720	221	152
*K4FTO	*	72,000	203	144
*K4BK	*	67,320	194	170
*KB4N	*	57,589	167	133
*WA4DOU	*	53,339	174	143
*AA4KD	*	49,956	156	138
*K4GMH	*	43,641	129	117
*NE4AA	*	43,524	151	124
			(Op: K1TO)	
*W4VIC	*	42,408	159	124
*NJ8J	*	39,824	197	131
*N4DXI	*	36,957	146	127
*W4BCG	*	36,356	139	122
*NR4X	*	29,682	121	102
			(Op: K4SB)	
*N4WO	*	26,936	104	104
*N4KM	*	24,795	99	87
*AE4EC	*	24,748	116	92
*N4TB	*	22,466	134	94
*K3MZ	*	18,924	81	76
*KI4EZC	*	17,578	109	94
*K6ETM	*	15,366	79	78
*WA4GLH	*	9,648	85	67
*AA3VA	*	3,914	40	38
***KN4Y**	**28**	**91,298**	**404**	**191**
***WB4TDH**	**21**	**500,187**	**665**	**411**
*K9OM	*	416,860	615	380
***N2WN**	**14**	**467,390**	**517**	**385**
*WIØR	*	51,246	160	146
*W2TX	*	37,654	151	134
*N4MM	*	29,792	103	98
*KØCOP	*	18,392	96	88
*W4OGG	*	4,134	40	39
NN5J	**A**	**6,492,946**	**2823**	**874**
			(Op: N5DX)	
NT5C	**A**	**5,025,367**	**2676**	**817**
			(Op: N3BB)	
W5WMU	**A**	**3,060,909**	**1964**	**713**
N5PO	*	1,395,446	1112	562
NQ5K	*	1,016,056	1121	482
			(Op: W5ASP)	
WF6C	*	970,454	889	479
			(Op: N6XI)	
N5ER	*	760,984	859	428
N5KA	*	245,340	414	261
K5NA	**28**	**315,228**	**760**	**327**
KT5J	**7**	**1,547,520**	**947**	**520**
			(Op: K5OT@K5NA)	
***N4OGW**	**A**	**2,173,216**	**1485**	**601**
AA2U	**7**	**60,270**	**115**	**105**
N2JNZ	*	45,453	123	109
W1CVE	**7**	**45,368**	**120**	**107**
SA2E	**7**	**22,800**	**109**	**95**
			(Op: SM2EKA)	
NE6M	**7**	**22,528**	**103**	**88**
LY2GW	**3.5**	**251,075**	**433**	**275**
YU1AFI	**3.5**	**176,054**	**353**	**226**
OZ7BQ	**3.5**	**103,045**	**259**	**185**
HG6EU	**3.5**	**63,550**	**206**	**155**
			(Op: HA6VA)	
UR5LAM	**3.5**	**50,688**	**172**	**132**
F5VBT	**3.5**	**46,596**	**174**	**132**
OM4DN	**3.5**	**19,598**	**124**	**82**
SM5OUU	**3.5**	**10,728**	**76**	**72**
DL5CL	**3.5**	**7,847**	**80**	**59**
YU1EA	**3.5**	**2,405**	**39**	**37**
UT3EK	*	1,075	26	25
LY5A	**1.8**	**114,075**	**292**	**195**
LY4BF	**1.8**	**27,604**	**140**	**103**
OH4MFA	**1.8**	**17,334**	**111**	**81**
SM3C	**1.8**	**14,400**	**100**	**75**
			(Op: SM5CCT)	
SP6IHE	**1.8**	**1,431**	**28**	**27**
DJ3GE	**1.8**	**946**	**25**	**22**
*KA1VMG	*	7,448	63	56
*KM1P	*	3,255	32	31
*WV1M	*	936	25	24
***N1IW**	**7**	**44,620**	**108**	**97**
K2FU	**A**	**1,830,973**	**1194**	**551**
W2LK	**A**	**984,785**	**743**	**445**
W2YC	**A**	**968,856**	**720**	**474**
K2LE	*	816,442	679	407
W2FUI	*	88,425	168	131
KC2GOW	*	56,964	189	141
N2MM	**21**	**1,369,485**	**1066**	**585**
N2NC	**14**	**5,418,630**	**2351**	**915**
			(@N2RM)	
W2/T98T	**7**	**1,472,895**	**782**	**461**
N2GC	**7**	**1,121,835**	**670**	**429**
KY2J	*	206,910	262	190
			(Op: W2XL)	
***NT2A**	**A**	**1,508,801**	**989**	**527**
***W2TZ**	**A**	**1,020,675**	**753**	**439**
***K2UF**	**A**	**424,865**	**451**	**305**
*WB2AA	*	322,920	400	276
*WB2WPM	*	317,240	387	308
*AI2N	*	270,137	370	259
*WA2MCR	*	163,530	279	207
*WW2P	*	77,120	197	160
*WA2JQK	*	57,057	177	143
*WA2BMH	*	33,030	108	90
*AI2I	*	31,968	126	108
*N2ZN	*	30,636	107	92
W3BGN	**3.5**	**222,681**	**305**	**199**
***WO3Z**	**A**	**761,904**	**722**	**396**
***N8NA**	**A**	**559,680**	**535**	**330**
***WA3KYY**	**A**	**461,070**	**580**	**327**
*W7LPF	*	460,701	560	339
*K2BB	*	247,750	403	250
*K3NCO	*	200,000	353	250
*KE3W	*	187,790	298	211
*NS3T	*	138,924	293	204
*N3XL	*	87,966	193	162
*K3MRG	*	37,518	130	111
*N3GE	*	9,009	65	63
*N3CHX	*	4,141	42	41
***K3MQ**	**14**	**385,187**	**445**	**361**
*WR3L	*	34,128	118	108
NY4A	**A**	**7,819,686**	**2985**	**906**
			(Op: N4AF)	
K4ZW	**A**	**6,766,872**	**2828**	**857**
WW4R	**A**	**5,371,465**	**2488**	**769**
WE4OJ	*	4,397,013	2363	771
			(Op: N4GI)	
NF4A	*	3,694,704	2184	764
WT4M	*	3,164,577	1590	689
			(Op: N6ZO)	
WN1GIV	*	2,676,576	1984	672
			(Op: N4BP)	
NJ4I	*	2,222,688	1508	624
			(Op: K4LTA)	
K4PV	*	2,176,020	1762	628

***WD5K**	**A**	**1,719,260**	**1335**	**590**	**W9RE**	**A**	**2,108,004**	**1282**	**582**	*VC3U	*	663,404	707	406	JA7NVF	*	1,956,150	1223	567	RK9CWW	*	48,216	140	123
***KC5R**	**A**	**504,360**	**577**	**360**	**W9IL**	**A**	**1,065,900**	**933**	**510**	*VE3IAE	*	94,160	207	176	JF1SQC	*	1,894,832	1170	542				(Op: UA9CIR)	
*W5RYA	*	477,620	684	334	**W9YO**	**A**	**670,096**	**700**	**434**	***VA7KOJ**	**14**	**70,370**	**180**	**155**	JA1JKG	*	1,745,112	1049	534	RZ0AF	*	36,888	134	106
*K5KA	*	203,159	494	253	K9UQN	*	623,220	673	390	*VA3OBR	*	69,204	178	146	JA7IC	*	1,123,060	871	466	UA0FDX	*	9,060	64	60
*K5YAA	*	169,320	387	249	WE9N	*	402,896	473	338	*VE7NH	*	68,068	166	143	JA1HP	*	325,304	443	296	RU0AJD	*	7,350	63	50
*W5MPC	*	158,236	350	221	K9WWT	*	235,704	365	276	*VA3HUN	*	3,404	39	37	JA7COI	*	433,664	489	308	**UA9HR**	**28**	**57,155**	**187**	**115**
*K7IA	*	123,500	259	190	**K2AAW**	**21**	**358,200**	**556**	**360**	*VE3XAT	*	1,449	23	23	JI1ALP	*	355,173	393	273	**RA0AA**	**21**	**304,947**	**449**	**279**
*AA5CH	*	94,122	266	189	**W9OP**	**14**	**472,815**	**526**	**399**	***VY1EI**	**14**	**779**	**21**	**19**	JO7KMB	*	340,400	423	296	RA0QC	*	1,731,606	1172	573
*KM5PS	*	66,303	180	139	KØTG	*	199,364	373	253	*VE2DWA	*	731	17	17	JA1QOW	*	232,320	346	240	**RKØUT**	**14**	**1,362,920**	**983**	**520**
*K5GM	*	63,431	165	137	**K9NW**	**7**	**1,771,266**	**969**	**543**	***VE2FU**	**7**	**832,824**	**507**	**344**	JA1BNW	*	227,155	313	251	UA0AZ	*	619,840	542	416
*K5PI	*	53,704	171	137	***K9QVB**	**A**	**2,522,536**	**1623**	**664**	***VE1NB**	**7**	**771,792**	**458**	**336**	JA2FSM	*	167,877	295	207	**UA9KE**	**14**	**215,552**	**308**	**256**
*W5PQ	*	50,908	176	143	***K9OR**	**A**	**218,526**	**292**	**242**				(Op: VE3JAQ)		7N4WZI	*	98,325	199	171	RA9ST	*	168,632	296	197
*KC5LK	*	48,117	182	129	***NA9U**	**A**	**183,232**	**326**	**224**	***VE3CR**	**7**	**43,884**	**101**	**92**	JH1SWD	*	55,328	144	112	UA0ZAM	*	112,670	269	190
*K5NER	*	46,784	188	136	*W9OA	*	132,430	250	205	***VE6/LX1NO**	**7**	**15,660**	**72**	**58**	JE6UWU	*	42,966	127	99	**RX9WR**	**3.5**	**398,720**	**329**	**224**
*NQ5Z	*	35,644	146	133	*K9CC	*	88,548	242	157	***VE3OSZ**	**3.5**	**131,176**	**202**	**152**	JG7IJM	*	35,040	127	80	***RK9JWV**	**A**	**2,131,558**	**1266**	**514**
*W5RW	*	14,630	75	70	*K9JWI	*	59,607	147	111						7J1ABD	*	32,742	116	102	***RA9XF**	**A**	**1,471,554**	**1086**	**458**
*W1DY	*	7,130	67	62	*W9LYA	*	46,248	154	123			**MEXICO**			JQ2EHD	*	14,840	64	56	***UA9OD**	**A**	**1,470,096**	**857**	**492**
*K5WW	*	3,567	46	41	*AG9U	*	42,875	149	125	**XE1MM**	**A**	**1,580,904**	**1258**	**468**	JE1LFX	*	14,283	93	69	*RA9AC	*	1,367,640	983	435
*W0ZW	*	1,587	24	23	*N9LYE	*	35,518	207	118	XE1V	*	325,755	420	285	**JH7XMO**	**21**	**983,040**	**790**	**480**	*UA9XS	*	1,274,289	828	453
***K5WAF**	**7**	**161,887**	**207**	**187**	*KJ9D	*	33,915	141	119	**XE2TG**	**7**	**269,692**	**332**	**191**	JR1NHD	*	75,932	183	164	*UA9APA	*	1,033,717	712	383
***NE5D**	**3.5**	**33,222**	**114**	**98**				(Op: WN9O)		***XE1CT**	**14**	**200,860**	**340**	**242**	JF2FIU	*	40	4	4	*RK9CR	*	949,488	757	393
			(Op: K5RX)		*N9GY	*	28,724	89	86	*XE1ZVO	*	2,387	32	31	**JH3AIU**	**14**	**3,425,240**	**1681**	**728**	*RX9WN	*	838,832	716	412
					*KK9DX	*	19,734	80	78						**JA9CWJ**	**14**	**694,278**	**611**	**414**	*RU9CD	*	681,688	657	329
KM7W	**A**	**4,950,750**	**2413**	**805**	*NE9A	*	7,003	54	47			**AFRICA**			JA1PCY	*	645,954	621	398	*UA9CBR	*	542,570	508	322
			(Op: N6MJ)		*K9HCK	*	5,335	60	55			**AFRICAN ITALY**			JA5APU	*	555,614	552	379	*RA9UN	*	500,174	603	313
KZ5D	**A**	**2,420,080**	**1574**	**676**	*AD9T	*	1,242	31	27	***IH9N**	**A**	**8,041,632**	**2522**	**794**	JM4WUZ	*	161,238	272	231	***UA0ACG**	**A**	**483,923**	**560**	**319**
			(Op: W6NL)		***W9ILY**	**21**	**66,038**	**204**	**178**				(Op: OL5Y)		JA3DAY	*	73,312	176	158	*RV9YK	*	406,200	533	300
AA6PW	**A**	**1,623,309**	**1412**	**573**	***KB9WBM**	**14**	**1,947**	**34**	**33**			**TUNISIA**			JK1LUY	*	1	1	1	*RX9DJ	*	372,060	452	265
NG6O	*	1,178,540	987	484											**JH7XGN**	**7**	**885,456**	**506**	**344**	*UA9WIK	*	315,750	389	250
			(Op: K2KW)		**KØØU**	**A**	**2,342,130**	**1609**	**665**	**3V7A**	**A**	**15,207,075**	**4079**	**975**	JE1ZWT	*	260,678	285	187	*RX9FB	*	233,466	320	233
W6TK	*	1,062,734	927	502	**KEØUI**	**A**	**1,510,842**	**1243**	**551**				(Op: YT1AD)					(Op: JG1VGX)		***RAØAY**	**A**	**127,656**	**219**	**162**
AB2RF/6	*	691,336	694	412	**WØBH**	**A**	**1,266,345**	**1326**	**535**			**MOROCCO**			JE2HVC	*	87,352	132	122	*RV9AZ	*	109,047	236	163
K6LRN	*	402,688	501	352	NØKE	*	1,188,066	1092	517	***CN2WW**	**A**	**8,628,444**	**2685**	**807**	**JA7MJ**	**3.5**	**6,762**	**48**	**42**	***RWØUM**	**A**	**50,274**	**174**	**126**
KE6QR	*	334,597	528	313	KRØY	*	1,039,005	1044	495				(Op: F6IRF)		***JH2NWP**	**A**	**1,187,145**	**882**	**465**	*UA9OV	*	32,851	120	91
NZ6K	*	282,967	510	281				(Op: KØRAY)		*CN8YR	*	12,168	59	52	***JA2KVB**	**A**	**1,078,708**	**838**	**479**	*RN9AA/9	*	27,710	109	85
			(Op: K6RB)		KØDEQ	*	910,575	843	475						***JH7CUO**	**A**	**832,713**	**698**	**399**	*RUØAT	*	24,210	101	90
W6CUS	*	149,388	318	211	KJØG	*	172,315	303	241			**MADEIRA IS.**			*JA7BME	*	579,303	567	337	*RU9UG	*	22,792	98	88
			(Op: K6SRZ)		WØJPL	*	27,063	101	97						*JA1MZM	*	374,238	462	306	*RX9FW	*	10,395	60	55
NF6V	*	100,467	269	183	NØXM	*	23,500	126	100	**CT3BD**	**A**	**168,702**	**258**	**186**	*JH3CUL	*	306,656	391	259	*UAØCA	*	10,035	51	45
NA6Q	*	77,922	213	162	**KT5E**	**21**	**328,956**	**586**	**316**	***CT3EE**	**14**	**463,252**	**438**	**358**	*JA7LMZ	*	237,405	370	245	*UA9SAW	*	9,100	61	52
W6FRH	*	62,910	180	135	**KØFX**	**14**	**855,120**	**736**	**509**	***CT3KN**	**7**	**1,639,644**	**662**	**417**	*JA4AQR	*	233,766	328	243	*RUØAE	*	315	11	9
KYØW	*	59,189	214	157	**KU1CW**	**3.5**	**148,874**	**267**	**202**						*JH6QFJ	*	221,175	320	225	***UA4LCQ/9**	**28**	**77,440**	**205**	**128**
			(Op: WØYK)		***KØCF**	**A**	**281,685**	**482**	**267**			**CANARY IS.**			*JA1CP	*	207,900	332	225	*UA9QA	*	7,611	65	43
W6VNR	*	45,260	140	124	***KØHW**	**A**	**221,496**	**439**	**264**	**EG8FAS**	**A**	**13,194,712**	**3699**	**956**	*JA1BJI	*	203,732	292	212	*RV9WZ	*	3,332	42	34
KG6ZHC	*	6,847	50	41	***ACØW**	**A**	**177,120**	**332**	**240**				(Op: RD3AF)		*JA1BPN	*	152,950	252	190	***RAØCDF**	**28**	**475**	**21**	**19**
NI6W	**14**	**2,822,741**	**1348**	**679**	*KSØM	*	154,734	318	222	***EA8MQ**	**A**	**2,177,585**	**1104**	**491**	*JH1FNU	*	129,870	269	195	***UA9AFS**	**21**	**577,291**	**585**	**367**
		(Op: W4EF @W6BCQ)			*K6MJ	*	136,939	280	211	***EA8AVK**	**14**	**170,820**	**262**	**219**	*JS1OYN	*	126,720	244	192	*RW9DX	*	226,566	349	246
WM6A	**14**	**1,152,735**	**926**	**555**	*NØBUI	*	55,680	255	145	***EA8NQ**	**7**	**477,042**	**314**	**258**	*JA1XRH	*	120,184	220	166	*RK9QWZ	*	29,070	130	95
			(Op: K6TA)		*KØRY	*	51,660	184	140						*JA2QVP	*	114,840	241	180				(Op: RW9QA)	
W6RKC	*	301,248	398	288	*KØMPH	*	45,816	171	138			**SOUTH AFRICA**			*JA3AVO	*	113,355	229	165	***RA9KM**	**14**	**1,522,416**	**1004**	**552**
NT6K	*	184,536	431	264	*WØPC	*	43,428	189	132	***ZS4JAN**	**A**	**1,495**	**24**	**23**	*JA0BMS	*	74,760	202	140	***UA9CCL**	**14**	**954,240**	**722**	**480**
W6OUL	*	29,746	113	107	*KØLDS	*	35,631	152	111	*ZS1AJS	*	770	15	14	*JA2KKA	*	73,296	198	144	***UA0SAD**	**14**	**943,874**	**798**	**433**
K6NA	**7**	**1,263,093**	**820**	**417**	*NNØQ	*	7,021	61	59	***ZS4U**	**21**	**123,024**	**235**	**176**	*JA1HNW	*	68,080	172	148	*RA9XU	*	777,567	671	427
***N6MU**	**A**	**185,614**	**286**	**286**	*NZØR	*	4,171	47	43	*ZS6CCW	*	7,003	51	47	*JN7OJA	*	59,658	184	122	*RW9MD	*	735,420	633	420
***WDØAVV**	**A**	**155,041**	**351**	**227**	*NØJL	*	2,001	29	29						*JA2VZL	*	55,440	145	126	***RXØQA**	**14**	**565,404**	**590**	**371**
***W6ZL**	**A**	**139,750**	**310**	**215**	***W3FAF**	**14**	**224,808**	**392**	**281**			**ASIA**			*JA1IWP	*	54,840	145	120	*UA9OA	*	534,446	541	374
*NK6A	*	97,920	294	180	*KØCAT	*	185,420	337	254						*JA2AXB	*	52,598	144	119	*UA9OMT	*	178,632	311	216
*K6AAB	*	82,620	204	153				(Op: K9WIE)				**AZERBAIJAN**			*JP1SRG	*	43,142	124	106	*UAØLQO	*	160,320	300	240
*K6CSL	*	67,782	199	158	*NØGOS	*	59,262	190	166	***4K9W**	**A**	**1,087,575**	**758**	**425**	*JA1PS	*	40,040	126	110	*RW9SZ	*	113,460	232	183
*WA6BOB	*	33,790	141	109											*JA1IZ	*	38,755	125	115	*RV9UF	*	24,924	116	93
*WB6S	*	10,512	87	73			**THE BAHAMAS**					**GEORGIA**			*JA1XPU	*	33,304	129	92	*RW9UU	*	18,792	94	81
*W6ZZZ	*	4,968	66	54	***C6AYM**	**A**	**3,571,780**	**1830**	**659**	**4L8A**	**14**	**6,083,910**	**2495**	**870**	*JA1HG	*	22,575	99	75	*UA9CHL	*	16,940	80	77
*N6CK	*	2,664	39	37				(Op: K9GY)		**4L2M**	**14**	**3,456,297**	**1749**	**687**	*JA4BOY	*	20,935	97	79	***UA0SR**	**7**	**128,136**	**169**	**152**
*AE6RF	*	16	4	4			**CUBA**								*JA2KCY	*	20,584	102	83	***RW9QA**	**3.5**	**10,824**	**49**	**44**
***NP4IW/KK5**	**21**	**33,782**	**198**	**127**	***CO6LPB**	**14**	**137,865**	**272**	**195**			**SRI LANKA**			*JE1UKM	*	13,452	73	59					
***NE6I**	**14**	**24,780**	**118**	**105**						**4S7EXG**	**A**	**177,905**	**313**	**221**	*JA1WHG	*	11,470	69	62			**KAZAKHSTAN**		
***KU6T**	**7**	**25,850**	**102**	**94**			**MARTINIQUE**								*JN1HYU	*	10,752	74	64	**UP0L**	**A**	**8,315,160**	**2909**	**798**
					FM5BH	**7**	**5,179,932**	**1469**	**684**			**ISRAEL**			*JO3FEU	*	10,716	57	57				(Op: UN9LW)	
NC7J	**A**	**1,615,930**	**1312**	**566**						**4X6FR**	**A**	**67,137**	**169**	**139**	*JJ1WWL/1	*	8,112	62	52	**UN9L**	**A**	**2,152,752**	**1145**	**516**
			(Op: W7CT@NI7T)				**DOMINICAN REPUBLIC**			**4X1VF**	**28**	**85,342**	**204**	**142**	*JA1XUY	*	8,109	61	53	**UP4L**	**A**	**1,925,532**	**1218**	**567**
N6MA	**A**	**1,153,930**	**1053**	**514**	***HI3LFE**	**A**	**279,400**	**348**	**254**						*7N4QCQ	*	7,656	51	44				(Op: UN7LZ)	
KS7T	**A**	**377,062**	**487**	**322**								**CYPRUS**			*JL2CZY	*	6,902	59	58	UN7QF	*	158,191	278	197
KØ7X	*	375,951	567	339			**PANAMA**			***H2E**	**A**	**1,419,616**	**972**	**436**	*JA1HFY	*	6,110	56	47	**UN2E**	**21**	**683,085**	**619**	**403**
KV7DX	*	351,424	580	323	**HP1WW**	**A**	**1,114,116**	**759**	**409**				(Op: 5B4AGE)		*JF9JTS	*	5,888	54	46	**UN7GCE**	**14**	**361,335**	**419**	**327**
			(Op: KN5H)												*JR1UMO	*	3,658	33	31	**UP1G**	**7**	**119,196**	**164**	**132**
W7QN	*	339,228	573	324			**NICARAGUA**					**KUWAIT**			*JO1SIM	*	3,325	37	35	***UN3M**	**A**	**3,889,760**	**1756**	**604**
NR7DX	*	314,874	410	306	***HR1RTF**	**A**	**43,785**	**174**	**105**	**9K2HN**	**7**	**4,541,970**	**1356**	**606**	*JA2KPV	*	656	17	16	***UN8GV**	**A**	**1,654,367**	**1121**	**503**
N7BF	*	295,474	429	314									(Op: 9K2RR)		*JGØMWU	*	459	19	17	***UN7FW**	**A**	**1,143,100**	**882**	**460**
K7UT	*	106,764	232	186			**ALASKA**					**WEST MALAYSIA**			***JE2SOY**	**28**	**3,440**	**54**	**43**	*UN4PD	*	6,762	54	49
KC7V	**21**	**70,125**	**246**	**165**	**AL1G**	**A**	**134,520**	**284**	**190**	***9M2TO**	**A**	**1,202,565**	**986**	**455**	*JE1ALA	*	420	18	15	***UO1E**	**28**	**5,633**	**53**	**43**
W7WA	**14**	**3,565,967**	**1871**	**811**	***KB7Q/WL7**	**A**	**625,590**	**623**	**315**						***JF3BFS**	**21**	**371,961**	**473**	**333**	***UN6LN**	**14**	**1,264,640**	**894**	**520**
W7VJ	*	384,200	488	340								**NEPAL**			***JE1JAC**	**21**	**12,765**	**75**	**69**					
KC7UP	*	38,988	116	114			**PUERTO RICO**			***9N7JO**	**A**	**614,999**	**662**	**343**	*JH1DJD	*	5,106	49	46			**HONG KONG**		
***WR7HE**	**A**	**2,392,137**	**1526**	**657**	**KP4JRS**	**A**	**28,906**	**122**	**97**				(Op: LA7JO)		*JA1AAT	*	2,370	33	30	**VR2BG**	**21**	**947,139**	**861**	**491**
			(Op: K7QQ)		***WP3C**	**7**	**2,807,112**	**1046**	**539**						*JH9BWC	*	1,890	28	27	***VR2XLN**	**A**	**30,680**	**119**	**104**
***N7WA**	**A**	**1,065,180**	**926**	**492**								**SINGAPORE**			*JA3RAZ	*	126	8	7					
***N7ZG**	**A**	**710,640**	**732**	**423**			**CANADA**			**9V1YC**	**A**	**2,708,784**	**1585**	**624**	***JA1BPA**	**14**	**699,732**	**614**	**418**			**AFGHANISTAN**		
*AB7RW	*	667,719	726	439	**VY2TT**	**A**	**10,314,612**	**3396**	**924**	**S65X**	**A**	**1,388,464**	**1129**	**506**				(Op: JA6-9330)		**T68G**	**A**	**8,265**	**67**	**57**
*NG7Z	*	432,820	649	335				(Op: K6LA)					(Op: 9V1CW)		***JR4GPA**	**14**	**549,315**	**575**	**351**					
*W7ZMD	*	286,440	442	308	**VC3J**	**A**	**7,977,030**	**3015**	**870**						*JHØEPI	*	194,484	341	228			**UK BASES ON CYPRUS**		
*NQ7R	*	256,650	425	290				(Op: VE3EJ)				**UNITED ARAB EMIRATES**			*JE1REU	*	110,898	244	183	**ZC4LJ**	**7**	**4,329,216**	**1334**	**576**
*N7NT	*	173,712	418	231	VC3L	*	7,976,320	2874	880						*JAØBJY	*	42,700	130	122					
*KI7Y	*	133,984	364	212				(Op: VE3AT)		**A61M**	**14**	**241,750**	**371**	**250**	*JE1RRK	*	23,232	98	88			**EUROPE**		
*WA7YAZ	*	121,170	345	210	VE3EY	*	6,507,252	2420	828						*7K1EQG	*	17,120	84	80					
*K6UM	*	104,468	252	196	**VE2TZT**	**A**	**2,859,570**	**1476**	**623**			**TAIWAIN**			*7K2GMJ	*	12,512	76	68			**SICILY**		
*W7VXS	*	103,037	261	209	**VA1CHP**	**A**	**2,241,031**	**1249**	**559**	***BU2AI**	**A**	**212,000**	**514**	**212**	*JA1BUS	*	5,535	45	45	**IT9ESW**	**A**	**361,114**	**652**	**323**
*N7VS	*	90,900	234	180	VA2WDQ	*	2,006,690	1204	545						*JK1NSR	*	2,400	30	30	IT9ZAU	*	2,838	46	43
*AE7DX	*	45,000	162	120	VA3QP	*	1,967,254	1258	522			**CHINA**			*JR2SQU	*	2,088	30	29	*IT9GXE	**28**	234	14	13
*N6KW	*	40,176	171	124	VE1MC	*	694,162	653	358	**BD1WC**	**A**	**365,715**	**529**	**301**	*JA7ZP	*	108	6	6	**IT9BLB**	**21**	**347,464**	**556**	**338**
*N7EIE	*	34,472	161	124	**VE7UF**	**A**	**483,480**	**423**	**280**	**B6QD**	**14**	**487,225**	**597**	**325**	***JH1APZ**	**7**	**121,069**	**160**	**139**	***IT9RZU**	**14**	**162,707**	**365**	**289**
*W3CP	*	13,454	66	62	VE2FK	*	316,956	384	244				(Op: BA6QD)		***JA2PFO**	**7**	**107,388**	**187**	**139**	***IT9LWP**	**3.5**	**44,070**	**158**	**130**
***W7HS**	**14**	**48,006**	**140**	**126**	VE7JKZ	*	135,150	225	170	***BD4VE**	**A**	**386,052**	**598**	**318**	*JL2LFK	*	11,092	55	47					
*K7ESQ	*	3,645	48	45	**VE6EX**	**A**	**119,680**	**276**	**187**	***BG1DRJ**	**A**	**197,768**	**369**	**236**	*JA1VVH	*	700	14	14			**TURKEY (EUROPE)**		
***KN7T**	**7**	**71,162**	**232**	**161**	VA7CAB	*	61,924	182	137	*BD1AQH	*	32,966	113	106	***JE1SPY**	**1.8**	**88**	**10**	**8**	***YM125ATA**	**14**	**25**	**5**	**5**
*AA7FK	*	61,924	180	137	VE7ZBK	*	33,363	111	99	***BD1DCG**	**14**	**94,500**	**219**	**180**									(Op: TA3J)	
					***VC3T**	**A**	**5,025,120**	**2202**	**760**	*BD3AF	*	30,250	133	110			**MONGOLIA**							
NN8UU	**A**	**3,906,810**	**2016**	**747**				(Op: VE3DZ)							**JT1CO**	**A**	**2,416,800**	**1375**	**570**			**CROATIA**		
			(Op: N8VW)		*VE3XL	*	1,571,742	929	522			**KYRGYZSTAN**												
K2UOP	**A**	**716,030**	**691**	**371**	***VA7ST**	**A**	**1,382,589**	**916**	**507**	**EX2X**	**A**	**1,860,460**	**1279**	**548**			**TURKEY**			**9A3ST**	**A**	**253,332**	**375**	**279**
N8PW	**A**	**535,695**	**572**	**355**	***VA1MM**	**A**	**1,218,522**	**897**	**447**	**EX2M**	**14**	**3,105,552**	**1638**	**696**						9A2VN	*	21,093	96	89
W8PN	*	417,375	558	315	*VE3XD	*	1,033,175	793	425						**TA2ZAF**	**28**	**219,895**	**389**	**199**	**9A1V**	**21**	**2,012,800**	**1344**	**680**
K3WA	*	368,424	441	306	*VE1OP	*	940,032	726	408			**KOREA**						(Op: OK1MU)					(Op: 9A4M)	
K8DD	*	197,505	306	231	***VE4YU**	**A**	**497,660**	**537**	**334**	**HL5UOG**	**A**	**365,351**	**530**	**287**	***TA4/LY3W**	**A**	**226,442**	**279**	**202**	**9A5W**	**21**	**1,698,386**	**1252**	**607**
NG9T	**14**	**886,305**	**792**	**483**	*VA7LC	*	496,248	527	348	6K2ABX	*	288,630	532	270	*TA3BN	*	143,092	262	166	9A5BM	*	1,132,977	1013	519
			(Op: K8IR)		***VA2SG**	**A**	**432,291**	**478**	**309**	***DS1OFE**	**21**	**45,847**	**269**	**127**						**9A7D**	**14**	**2,133,296**	**1460**	**682**
***KV8Q**	**A**	**1,137,992**	**1030**	**472**	*VE3OM	*	415,808	455	292								**ASIATIC RUSSIA**						(Op: 9A2SD)	
***K9ALP**	**A**	**451,881**	**527**	**333**	*K2NV/VE3	*	272,916	375	252			**THAILAND**			**RU9CK**	**A**	**4,603,560**	**1971**	**681**	***9A3KS**	**A**	**121,824**	**231**	**188**
***NR8I**	**A**	**405,300**	**551**	**300**	*VE3TW	*	266,760	380	247						**UA9KJ**	**A**	**2,858,210**	**1461**	**578**	*9A5YY	*	15,604	102	83
*W8GOC	*	255,368	396	274	*VE3FH	*	266,532	374	228	**HSØAC**	**A**	**296,400**	**482**	**285**	**RUØAW**	**A**	**2,857,690**	**1364**	**626**	***9A3VM**	**28**	**27,156**	**169**	**124**
*K8GT	*	219,816	314	258	*VE3JCV	*	249,360	306	240				(Op: HSØ/OZ1HET)		**UA9BS**	**A**	**2,743,218**	**1422**	**593**	***9A/S52A**	**7**	**990,628**	**809**	**454**
*W8TM	*	204,820	357	245	*VA3PL	*	240,352	336	232	***E21EIC**	**A**	**2,697,843**	**1546**	**597**	UA9CMQ	*	2,342,278	1284	526				(Op: S59AA)	
*K8MJZ	*	72,808	188	152	*VE3GLO	*	144,811	232	179	*E21IZC	*	95,004	268	174	**RUØLL**	**A**	**1,345,990**	**1081**	**479**	*9A/HA2VR/P	*	5,658	48	46
*WB8JUI	*	54,812	167	142	*VE2FFE	*	129,596	230	179	*E2ØYLM	*	61,344	170	144	**UAØFAI**	**A**	**1,311,513**	**1022**	**519**	***9A5AQA**	**1.8**	**19,688**	**109**	**92**
*K8VUS	*	27,795	120	109	***VE6TN**	**A**	**96,320**	**202**	**172**						RWØAR	*	1,018,880	718	398					
*N8NX	*	20,736	114	96	*VE3GSI	*	49,323	146	123	***7Z1SJ**	**14**	**88,068**	**189**	**164**	RK9KWI	*	744,184	700	388			**MALTA**		
*K8ME	*	20,160	94	84	***VA3RJ**	**21**	**12,240**	**82**	**72**						UAØDC	*	689,409	825	353	***9H1XT**	**A**	**3,458**	**39**	**38**
*KC8UR	*	3,440	45	40	***VE3JM**	**14**	**1,494,692**	**1010**	**554**			**JAPAN**			UA9CDC	*	384,956	493	286					
*W8VND	*	1,740	31	29	***VE2XAA**	**14**	**945,514**	**762**	**466**	**JH4UYB**	**A**	**6,673,986**	**2581**	**814**	RU9UC	*	323,136	402	288			**PORTUGAL**		
***W8IQ**	**14**	**225,875**	**325**	**325**	***VE6CNU**	**14**	**719,040**	**707**	**428**	**JA7DLE**	**A**	**3,577,600**	**1710**	**688**	UAØABB	*	260,183	295	217	**CT/0K1RF**	**A**	**6,796,962**	**2992**	**898**
*AF8C	*	42,575	149	131	*VE3UKR	*	271,478	363	298	**JF1PJK**	**A**	**2,167,776**	**1237**	**579**	RX9TX	*	173,264	290	221	***CT6A**	**A**	**1,758,652**	**1263**	**587**
															RAØZD	*	117,390	230	195				(Op: CT1ILT)	

*CT1IUA	A	562,485	635	385
*CS1GDX	"	250,776	493	324
			(Op: CT1DRB)	
*CT1/UA4WEC	"	78,540	202	154
*CT4DX	14	14,043	93	93

AZORES IS.

CU2A	A	8,153,512	3487	964
			(Op: OH2PM)	

GERMANY

DL3YM	A	5,513,679	2576	829
DL5YM	A	2,187,870	1466	626
DL7ANR	A	2,183,436	1530	621
DL1DTC	"	1,180,899	1079	549
DL5RMH	"	671,675	742	401
DL4HRM	"	639,920	751	421
DL3EBX	"	438,697	495	343
DL2RMC	"	437,895	480	333
DL8KJ	"	356,480	451	320
DL7DZ	"	281,088	406	288
DF8AA	"	218,010	431	258
DL6KVA	"	103,104	264	179
DJ9HX	"	93,052	205	172
DK5AD	"	90,528	204	164
DL7BA	"	87,463	200	149
DL5MEV	"	66,834	184	158
DJ4KW	"	17,313	98	87
DL6RBH	"	5,885	58	55
DL2OM	28	2,065	43	35
DJ1AA	21	43,750	146	125
DK3UA	"	16,686	84	81
DL3TD	14	2,906,901	1817	713
DL4CF	7	2,154,345	1222	565
DL4ME	"	193,050	351	234
DL5RBR	"	51,737	173	133
DL4MCF	3.5	895,323	1015	429
DJ6QT	"	201,302	402	251
*DD5M	A	1,509,855	1336	573
			(Op: DJØZY)	
*DL5KUD	A	1,163,636	1013	502
*DFØCI	A	1,105,686	993	477
			(Op: DL8AKI)	
*DF3AX	"	951,993	1008	483
*DL7UMK	"	889,295	992	437
*DL1ARJ	"	735,234	782	433
*DL8QS	"	715,950	808	430
*DL3KWF	"	678,174	909	402
*DL4JYT	"	636,072	845	408
*DL3ZAI	"	544,500	693	396
*DKØALC	"	466,804	610	382
*DJ8UV	"	433,252	560	356
*DM5JBN	"	428,400	632	350
*DL3KWR	"	346,890	558	310
*DJ8EW	"	331,582	512	317
*DL5CD	"	297,206	480	299
*DHØWE	"	289,728	584	288
*DM4D	"	242,703	468	267
*DL5ARM	"	239,412	448	284
*DL2NBY	"	235,727	490	277
*DL8DWW	"	232,247	475	271
*DF2CH	"	230,982	352	274
*DK7GH	"	229,755	372	289
*DK5ZX	"	220,668	392	259
*DL5SVB	"	212,530	397	265
*DK8AX	"	211,680	353	270
*DG7RO	"	187,068	399	262
*DB7MA	"	140,833	359	217
*DL1RTS	"	138,470	303	227
*DL9NEI	"	130,644	319	228
*DR5T	"	130,381	246	241
			(Op: DJ3IW)	
*DL3HSC	"	130,255	324	239
*DL5XL	"	122,610	286	201
*DR2006H	"	112,623	302	217
			(Op: DL6ABB)	
*DL7UXG	"	103,800	291	200
*DM3XI	"	84,300	183	150
*DK7VW	"	76,590	226	185
*DL3ARM	"	64,452	214	164
*DJ6UP	"	60,129	203	153
*DL6UAM	"	55,520	206	160
*DL8ZAJ	"	53,040	173	136
*DL8UVG	"	50,184	193	153
*DL3DRN	"	43,624	166	133
*DK8EY	"	43,542	133	118
*DL1THB	"	35,695	158	121
*DF1HF	"	31,395	123	115
*DL2AXM	"	28,860	151	111
*DL7VRG	"	28,320	142	118
*DL5KUR	"	28,203	130	119
*DJ6TK	"	25,864	119	106
*DL2GBB	"	23,940	115	105
*DL1NUX	"	23,306	95	86
*DJ1HA	"	16,235	97	85
*DL2ANM	"	13,020	94	70
*DL3BRA	"	5,439	54	49
*DF5AU	"	4,329	49	37
*DL2SWN	"	2,184	30	28
*DL1SVA	"	1,690	29	26
*DL2DYL	"	1,664	28	26
*DL1ARD	"	341	12	11
*DJ6XB	21	600	16	15
*DD1IM	14	292,919	447	341
*DJ5GG	14	165,166	318	269
*DC8SG	"	126,636	277	244
*DQ2006N	"	117,626	311	206
			(Op: DK2PH)	
*DL7YAV	"	87,792	276	186
*DJ9UW	"	18,216	106	99
*DJ6BQ	7	1,937,403	1382	571
*DL7BY	7	1,061,004	875	476
*DJ2YE	"	117,344	244	193
*DL8UAT	"	87,296	219	176
*DL1EAL	"	33,600	136	112
*DL8UGF	"	12,410	84	73
*DL9CW	3.5	269,416	450	283
*DL7JOM	1.8	72	6	6

SPAIN

AN3AKY	A	4,506,060	2380	795
EA4KA	A	3,248,532	2115	756
EA1FBU	"	46,488	206	156
EC5CR	21	72,504	224	171
EA2RA	14	1,336,116	1251	564
EA5YU	7	1,244,300	780	460
*EA7TN	A	2,452,046	1779	697
			(Op: EA1AK)	
*AM4DRV	A	1,950,780	1451	610
*EA1JO	A	384,648	584	341
*EA3AVV	"	309,177	478	297
*EA3ALV	"	277,536	411	294
*EA5QB	"	254,070	426	270
*EA1CS	"	145,314	346	234
*EA7AZA	"	133,152	311	219
*EA5VN	"	110,288	245	244
*EA7CWA	"	79,016	218	166
*EA5EOH	"	58,968	209	156
*EA4/UY7CW	"	34,020	138	108
*EA1VM	"	22,360	121	104
*EA5GX	"	5,568	68	58
*EA1MR	"	4,662	49	42
*AN3CEC	"	1,320	24	24
			(Op: EA3CEC)	
*EA1CRL	"	760	20	19
*EA4OA	"	532	14	14
*EA2BOV	21	147,987	301	243
*EA2BNU	"	57,200	166	143
*EC1DMY	"	7,320	70	61
*AM7KJ	14	692,912	965	496
*EA4BF	"	200,018	401	314
*EA3EU	7	65,565	157	141
*EA3CWT	"	1,196	24	23
*EA1FCH	1.8	1,458	27	27

IRELAND

EI4DW	A	382,570	518	335
EI2JD	14	108,155	267	223
*EI4CF	3.5	24,479	97	91

MOLDOVA

*ER100	A	966,790	989	470
*ER3DW	"	199,626	470	294
*ER3ZZ	A	72,504	182	152

ESTONIA

ES5RR	A	6,381,372	3123	894
ES5JR	14	1,707,594	1411	654
ES5QX	1.8	151,085	350	205
*ES4MM	21	60,671	199	169
*ES4RC	14	85,792	267	224
*ES4RD	"	91	7	7
*ES8DH	7	136,120	295	205

BELARUS

EW8CY	A	1,385,456	1210	524
EW2AA	A	760,837	790	451
EW7LO	7	1,614,508	1087	529
EU1AZ	1.8	166,581	355	223
EU3AR	1.8	127,314	307	198
*EW1KT	A	436,650	603	355
*EU4CQ	A	400,200	575	345
*EW6EW	A	138,320	328	260
*EW6GL	"	124,355	274	209
*EW2EO	"	15,225	109	87
*EW6AF	28	31,752	202	126
*EW3LN	"	4,606	74	47
*EU2MM	14	616,590	649	442
*EW6DX	14	204,130	421	298
*EW8OM	"	52,490	214	181
*EU6AA	"	28,919	145	121
*EW6MM	"	1,566	30	29
*EU6DX/1	7	20,792	99	92

FRANCE

TM7XX	7	4,829,660	1831	757
			(Op: F5MUX)	
TM9C	A	4,159,295	2250	755
			(Op: F5IN)	
F5ICC	A	361,305	519	333
TM6X	7	1,804,776	1039	541
			(Op: F5VHY)	
*F5TER	A	896,588	968	451
*F5SGI	A	489,750	584	375
*F3GJ	A	384,592	547	344
*F5UKL	"	270,772	486	278
*F5INJ	"	231,777	385	273
*F6DZD	"	11,644	93	82
*F8DFP	"	8,208	57	54
*F5QF	"	2,296	30	28
*F5VGL	"	800	20	20
*F5LCU	"	121,370	277	229
*F5JY	21	50,094	159	138
*F6FTB	"	30,030	120	105
*F8DVD	14	20,520	112	108
*F/G3SQX	7	161,837	279	211

ENGLAND

G5W	A	5,221,290	2559	807
			(Op: G3BJ)	
G4KFT	A	451,646	567	377
G4HZV	"	226,260	383	270
G3TXF	14	4,087,520	2294	866
GØWKW	14	1,218,888	1118	513
MXØEEE/P	"	521,148	846	411
			(Op: GØVQR)	
*GØMTN	A	1,566,306	1362	558
*MØBJL	A	1,136,722	1068	499
*G4GDY	A	553,770	756	378
*G3RSD	"	445,060	581	340
*G3VQO	"	329,394	555	309
*G4DDX	"	236,448	389	288
*GØUKX	"	126,948	301	213
*G4WGE	"	116,554	302	202
*G4BJM/P	"	60,760	217	155
*MØDSL	"	28,288	141	128
*GØMRH	"	22,422	117	101
*G6BOX	"	12,558	87	78
*MØDZK	"	5,148	51	44
*G4AXX	"	4,171	46	43
*G3KMQ	14	231,307	389	313

NORTHERN IRELAND

GI4FUE	14	173,036	318	239

SCOTLAND

GM4SID	A	1,023,468	1050	493
*2MØKDZ	14	2,376	44	44

GUERNSEY

*MUØFAL	A	241,920	428	280

WALES

GW3NJW	A	273,162	486	318
GW4BLE	"	32,928	129	112
*GWØTKX	A	11,180	71	65

HUNGARY

HA3LI	A	2,328,944	1615	652
HA1TNX	A	1,804,572	1347	588
HA8VK	A	1,467,546	1273	554
HA3OD	"	1,310,040	1057	540
HA9PP	"	1,043,048	984	482
HA6M	28	23,000	160	100
HG4I	14	867,664	900	488
HA3DU	"	310,565	485	347
HA8LNN	3.5	492,891	634	343
*HA8BE	A	1,890,520	1458	604
*HA6NL	A	1,843,324	1387	602
*HA5LZ	A	760,820	840	436
*HA7SBQ	"	637,170	740	402
*HA2MN	"	574,684	684	407
*HA8CQ	"	334,960	507	316
*HA7LW	"	233,625	436	267
*HA8KW/P	"	201,122	298	227
*HA7MI	"	3,977	45	41
*HA3GE	21	215,172	358	278
*HA8TP	"	63,294	189	154
*HG4F	14	1,813,820	1336	615
*HA8DU	7	3,071,844	1402	684
*HA6ZQ	"	282,425	409	275

SWITZERLAND

HB9DHG	A	363,916	585	317
*HB9ARF	A	1,140,870	1018	510
*HB9BXE	A	637,784	709	392
*HB9HQX	"	128,133	319	207
*HB9CSM	"	31,877	148	127
*HB9QA	"	1,258	22	17
*HB9LCW	14	16,530	100	87

ITALY

IR4X	A	6,110,740	2613	890
			(Op: IZ3EYZ)	
IN3QBR	A	2,716,350	1607	650
			(Op: K7QB)	
IV3DYS	"	72,141	207	173
IW7EFC	"	13,167	81	77
IU3X	14	3,248,000	1832	812
			(Op: IV3SKB)	
IY4W	7	4,167,072	1763	728
			(Op: IK4ZGO)	
IK2SND	"	957,820	791	415
IK2AHB	"	322,190	404	290
IK2AOO	3.5	326,488	490	296
IO4T	"	48,106	171	134
			(Op: IK4XCL)	
IV3RLB	1.8	209,760	416	240
*IZ3DBA	A	672,715	848	415
*IK3UNA	A	249,750	426	270
*I6FDJ	A	195,294	415	269
*IQ3ME	"	170,601	316	219
*IK5TUZ	"	157,221	325	243
*II1W	"	153,225	307	225
			(Op: IZ1DXS)	
*I5NXH	"	116,415	265	195
*I2AZ	"	114,570	250	190
*IK2NUX	"	87,032	217	172
*IZ3DVU	"	61,608	196	151
*IK2CZQ	"	41,396	155	131
*IV3KSE	"	39,431	156	131
*IK2NCF	"	30,360	130	110
*IZ1GSO	"	29,484	117	108
*IZ8DVD	"	24,442	117	101
*IZØGYP	"	16,074	106	94
*IR7A	"	14,080	83	80
			(Op: I7ALE)	
*IW2MYH	"	5,712	53	48
*IZ5BLN	"	2,343	35	33
*IK5YJK	"	1,066	27	26
*IZØEHL	"	280	10	10
*IR2M	21	64,015	193	155
*IK6MNB	14	557,208	848	426
*IZ8FAV	14	257,936	456	329
*I2WIJ	"	225,879	367	309
*IZ8DWH	"	67,936	242	193
*IZ5GRS	"	7,345	73	65
*IV3AZV	7	235,216	411	244
*IKØEIE	1.8	242	11	11

SARDINIA

*ISØOMH	A	189,662	329	233
*ISØXDA	7	137,788	222	196
*ISØRDY	"	91,560	199	168

SVALBARD

*JWØHZ	A	306,299	572	343

NORWAY

LN8W	A	5,370,850	2801	815
			(Op: LA7MFA)	
LA7JKA	"	367,650	494	342
LA2AB	7	113,634	213	177
			(Op: LA6GF)	
*LA6CF	A	500,391	529	387
*LA1YE	"	11,890	90	82
*LA3S	14	1,430,832	1191	624
			(Op: LA3BO)	
*LA1QDA	"	7,504	74	67
*LA8WG	7	122,850	257	195
*LA9HW	3.5	427,938	612	322

LUXEMBOURG

*LX/OE3GEA	A	12,400	86	80

LITHUANIA

LY2MM	A	1,846,230	1431	615
LY2IC	A	1,325,700	1221	540
LY4T	A	1,036,912	1105	458
LY2FN	"	1,005,575	1054	475
LY2OO	"	533,520	684	380
LY3CY	"	402,398	640	346
LY1CM	"	160,011	356	207
LY2BO	"	155,992	352	248
LY7Z	14	4,133,697	2207	893
			(Op: LY2TA)	
LY2TS	14	2,591,595	1705	729
LY2F	7	105,072	216	176
LY8O	3.5	684,450	774	390
LY3M	"	47,302	167	134
LY2VA	"	25,149	125	101
LY2IJ	1.8	299,980	499	283
*LY9A	A	3,539,336	2051	776
			(Op: LY3BA)	
*LY6A	A	2,849,656	1847	692
			(Op: LY2BM)	
*LY9Y	A	2,383,760	1662	664
			(Op: LY2CY)	
*LY2DV	"	555,180	690	380
*LY1CT	"	205,792	366	236
*LY2BOS	"	55,936	200	152
*LY2T	14	530,700	734	435
*LY2LF	"	115,440	306	222
*LY1DS	"	46,294	181	158
*LY2AT	7	162,214	308	221
*LY6M	"	44,522	155	113
*LY1F/M	"	2	0	0
*LY4G	3.5	177,080	352	233
*LY2BNL	"	5,635	56	49
*LY2OU	1.8	117,660	310	185

BULGARIA

LZ8A	A	4,548,239	2477	817
LZ1BJ	"	263,700	493	293
LZ5W	21	617,841	723	441
			(Op: LZ1MC)	
LZ86KM	14	230,412	482	273
			(Op: LZ3HI)	
LZ2ZG	"	33,864	157	136
LZ2SX	7	943,488	761	448
*LZ8BR	A	2,150,534	1603	646
			(Op: LZ3YY)	
*LZ5XQ	A	680,846	896	437
*LZ7H	"	284,100	520	300
*LZ1WJ	"	93,854	223	167
*LZ5PL	"	44,436	177	138
*LZ2PB	14	887,661	979	537
*LZ2CE	"	493,582	746	419
*LZ1QV	7	206,756	278	254
*LZ9X	3.5	479,556	606	346
			(Op: LZ1UK)	

AUSTRIA

OE6HZG	A	461,340	555	330
OE1TKW	A	433,053	591	373
OE3KAB	"	151,830	275	210
OE3I	14	1,765,760	1301	640
			(Op: OE1JNB)	
*OE8VIE	7	169,068	371	219

FINLAND

OH2VZ	A	354,244	526	332
OH3BU	21	251,514	473	314
OH3BHL	7	149,552	249	208
OH2BCI	1.8	177,287	368	227
OH4MDY	1.8	142,329	320	209
*OH8GZN	14	26,078	133	118
*OH6RC	7	116,850	225	205

ALAND IS.

OHØZZ	A	6,490,324	3357	893
			(Op: N6ZZ)	

CZECH REPUBLIC

OK4RQ	A	4,707,590	2313	818
OL8R	A	3,546,650	2038	755
OL3Z	A	2,829,870	1825	669
			(Op: OK1FPS)	
OL4M	"	1,580,571	1330	549
OK1AOV	"	817,518	795	446
OK1AVY	"	607,916	712	379
OL6W	"	607,512	756	408
			(Op: OK2FB)	
OK1FRO	"	178,080	364	265
			(Op: OK1FRO)	
OK1AYY	"	89,472	238	192
OK2ABU	28	2,190	49	30
OK1CF	14	2,213,066	1475	662
OK1FIA	"	205,740	360	270
OL2N	7	1,326,432	853	492
			(Op: OK1FDR)	
*OL6P	A	2,140,852	1518	628
			(Op: OK2WTM)	
*OK2ZC	A	1,859,770	1543	583
*OK1FNJ	A	1,839,150	1403	603
*OLØA	"	1,611,869	1259	563
			(Op: OK1CZ)	
*OK6Y	"	1,606,725	1334	555
			(Op: OK2PTZ)	
*OK1VD	"	1,367,574	1078	534
*OK1HX	"	1,267,474	1121	533
*OK1FCA	"	1,101,078	952	498
*OK1DOR	"	916,608	995	448
*OK1ZP	"	898,470	833	447
*OK1FHI	"	896,173	798	467
*OK2EC	"	838,480	829	446
*OK1DKO	"	761,607	786	441
*OK1TC	"	554,015	694	385
*OK2PTS	"	460,992	549	343
*OK2KJ	"	368,712	514	324
*OK2VX	"	324,260	514	310
*OK2BJ	"	304,645	464	319
*OK2SGY	"	286,638	439	303
*OK1MKU	"	263,520	388	270
*OK2PBG	"	176,190	335	210
*OK2PAD	"	135,824	281	208
*OK2SAR	"	126,994	256	193
*OK2SJ	"	125,888	308	224
*OK2BND	"	94,392	247	184
*OK2BDF	"	45,012	133	121
*OK1CJN	"	20,566	96	91
*OK1KMG	"	15,204	96	84
*OK1ANP	"	8,468	70	58
*OK5SWL	"	6,322	61	58
*OK1SRD	"	544	18	17
*OL7A	"	209	11	11
*OK2N	21	289,224	429	312
			(Op: OK2NN)	
*OK2HZ	14	372,552	508	361
*OK1GS	14	356,478	491	354
*OK1BA	"	316,107	451	341
*OK2EQ	"	213,890	378	293
*OK1MMN	"	172,656	330	264
*OK1NE	"	137,860	317	244
*OL6Z	"	92,610	271	210
			(Op: OK2DU)	
*OK2SWD	"	67,760	213	176
*OK2DU	"	11,972	86	73
*OK2YT	7	503,430	472	346
*OK4A	7	253,354	368	262
			(Op: OK1DXR)	
*OK1HMP	"	150,891	309	219
*OK1LO	"	84,630	184	155
*OK1KZ	"	8,533	55	53
*OK1QM	3.5	539,805	680	371
*OL6T	3.5	407,991	600	321
*OK2TRN	"	300,174	490	294
*OK1WF	"	267,732	467	268
*OK2BRA	"	128,641	312	197
*OK5AA	"	5,280	51	48
*OK1JOK	1.8	49,446	194	134
*OL4W	1.8	42,240	174	128
			(Op: OK1IF)	

SLOVAKIA

OM2VL	7	2,950,200	1347	660
OM7JG	14	3,232,632	1804	797
*OM4XA	A	1,178,130	1059	519
*OM8ON	A	875,490	847	462
*OM3CFR	A	650,039	737	403
*OM1AF	"	490,312	671	367
*OM5NL	"	423,000	545	376
*OM5UM	"	371,952	577	336
*OM3BA	"	350,548	500	341
*OM7AG	"	307,095	486	295
*OM6AL	"	304,854	462	298
*OM4DA	"	106,920	256	198
*OM8AG	21	12,062	81	74
*OM3PQ	14	184,800	358	264
*OM4WW	7	703,098	606	402
*OM3CDN	3.5	141,255	308	215
*OMØTT	1.8	74,880	237	160
*OM4JD	"	56,800	202	142

BELGIUM

OR6N	3.5	434,758	607	323
			(Op: ON4NOK)	
*ON5SV	A	685,984	763	416
*OP5T	A	202,070	320	242
*OP4A	"	87,952	246	184
*ON5WL	"	33,794	145	122
*OO9O	"	4,350	55	50
			(Op: ON7SS)	
*ON4XG	14	131,054	320	253
*ON4TTT	"	1,092	"	26

FAROE IS.

*OY4M	14	1,800	40	120

DENMARK

OZ1FAO	A	45,021	159	129
*OZ7AM	A	357,589	531	353
*OZ5UR	A	273,504	422	296
*OZ1BMA	"	176,341	380	253
*OZ/DH8TOM	"	13,728	91	88
*OZ4RT	14	252,081	401	333
*OZ5TTT	"	17,385	103	95
			(Op: OZ2KL)	

THE NETHERLANDS

PA4A	A	3,384,363	2084	723
PAØJNH	A	876,361	761	461
PA2R	A	520,234	657	374
PAØBWL	"	473,796	560	369
PAØLOU	"	340,186	500	329
PA3AAV	"	322,848	503	304
PAØLSK	"	95,745	247	195
PA9CW	"	48,430	188	145
PA3EWP	14	326,304	518	309
PA5WT	7	372,000	496	310
*PA3ARM	A	538,410	640	393
*PAØADP	A	431,866	592	362
*PA3BFH	A	427,141	600	377
*PAØABM	"	350,168	489	338
*PA5TT	"	155,904	321	256
*PA3HGF	"	77,792	241	176
*PA2W	"	63,742	197	157
*PA3GBI	"	36,332	149	124
*PAØWKI	"	15,548	100	92
*PA3DBS	"	10,570	88	70
*PI4ETL	"	6,732	75	68
*PA1BX	"	3,962	54	52
*PA1AG	14	5,757	69	57
*PA3GVI	"	1,740	32	30
*PA5V	7	38,640	110	105
*PAØMIR	3.5	82,280	231	170

SLOVENIA

S58A	A	6,620,276	2836	884
S57AW	21	329,406	483	322
S51FB	"	129,766	306	217
S54K	14	1,931,715	1399	615
			(Op: S51NZ)	
S5ØA	7	4,298,432	1676	752
S56X	7	2,854,800	1397	650
*S52OP	A	2,442,615	1629	645
*S59N	A	2,072,224	1428	616
*S51F	A	1,954,310	1358	586
*S57U	"	1,880,424	1379	588
*S54X	"	1,548,249	1153	569
*S53AU	"	383,396	501	292
*S58P	"	299,495	445	301
*S5ØDX	"	242,929	426	277
*S5ØB	"	194,532	332	258
*S58RU	"	159,936	338	238
*S55VM	"	136,095	298	215
*S55O	"	390	15	15
*S57S	28	11,454	108	83
*S57J	7	1,478,144	937	512

SWEDEN

SJ2W	A	4,221,700	2480	815
			(Op: SM3WMV)	
7S5Q	A	1,193,672	1032	524
			(Op: SM5COP)	
SK6ØCG	A	639,200	746	425
			(Op: SM6CLU)	
SJ6A	"	580,508	664	412
			(Op: SM6JSM)	
SM5QU	"	472,340	638	380
7S3J	"	331,056	499	304
			(Op: SMØDZH)	
SM7CQY	"	146,102	348	229
SM2CEW	14	700,245	877	455
SE5E	7	744,168	687	404
			(Op: SM5AJV)	
SLØW	3.5	433,656	557	342
			(Op: SMØAJU)	
SA5D	1.8	22,932	118	98
*SM3/EA8CN	A	569,640	743	404
*SM6NET	A	524,955	623	395
*SM7BJW	A	220,550	404	275
*SG6T	"	208,560	365	264
			(Op: SM6WET)	
*SF3E	"	140,217	316	231
			(Op: SM3EAE)	
*SM6XKB	"	110,905	280	205
*SM3Q	"	70,135	221	169
			(Op: SM3BFH)	
*SM7EH	"	62,951	189	161
*SM6Z	"	6,063	65	47
*7S6W	"	1,647	29	27
*SC1AG	"	1	1	1
			(Op: SM1TDE)	

*SM1TDE	*	1	1	1
*SL1BD	*	1	1	1
			(Op: SM1TDE)	
*SFØF	14	2,134,928	1520	668
			(Op: SMØPSO)	
*SM2CVH	*	85,904	204	182
*SM6UQJ	7	18,368	95	82
*SM5ARR	*	6	1	1
*SM5MX	3.5	307,390	484	295

POLAND

SP3KCL	A	970,555	972	499
			(Op: SP3FLR)	
SP2HYO	A	126,690	290	205
SP6IEQ	*	81,162	210	167
SP2HMT	*	33,228	180	117
SP4DNX	*	12,403	81	79
SP8TJU	28	1,952	49	32
SP9DLY	21	95,254	241	194
SP2MHC	*	5,712	64	56
SP8IMG	14	2,510,505	1647	705
SN5N	14	1,664,335	1305	635
			(Op: SP5KP)	
SP4BEU	*	396,788	534	383
SN8F	3.5	571,098	665	374
			(Op: SP8FHK)	
SP6A	3.5	527,782	679	361
SP4KHM	3.5	295,236	494	278
			(Op: SP4DEU)	
SN2B	1.8	323,140	513	302
			(Op: SP2FAX)	
*SP4JCQ	A	1,511,265	1280	555
*SP3DIK	A	419,755	610	335
*SP8JUS	A	387,780	552	345
*SQ7B	*	281,064	501	294
*SP4DC	*	264,688	496	284
*SP9DSD	*	258,587	427	287
*SP6BEN	*	202,635	365	285
*SP5TAT	*	193,732	361	238
*SP2UKB	*	192,618	345	261
*SP5MBA	*	185,991	358	247
*SP5CGN	*	179,031	352	249
*SP8FHJ	*	165,658	336	226
*SP3DOF	*	153,199	310	239
*SQ1EUG	*	148,596	292	203
*SP9EMI	*	146,302	279	221
*SP9IBJ	*	93,522	267	218
*SP9IHP	*	78,030	196	135
*SP3HC	*	63,961	207	167
*SP7BDS	*	59,898	190	149
*SP2DKI	*	30,400	114	95
*SP6TRH	*	23,533	125	101
*SP3GRQ	*	22,788	123	108
*SQ9IWT	*	18,432	118	96
*SP2JGK	*	17,876	134	109
*SP3AOT	*	11,856	102	78
*SP3XR	*	5,800	54	50
*SP7MFR	*	1,536	27	24
*SP1DTG	*	1,040	23	16
*SQ6ELV	28	7,830	93	58
*SN7F	28	7,128	98	54
			(Op: SP7LFT)	
*SP2AVE	21	198,560	370	272
*SP8BAB	14	502,775	597	425
*SN9U	14	339,384	542	316
			(Op: SP9UMJ)	
*SN8W	*	245,672	438	287
*SP9GKM	*	203,904	386	288
*SP3ASN	*	78,209	223	197
*SQ5WWK	*	29,928	154	129
*SP3GTS	*	20,800	120	104
*SP1BLE	*	10,952	174	37
*SP4TKR	7	1,218,606	913	498
*SP5CNA	7	803,505	772	411
*SP5CJQ	*	199,515	382	235
*SP7FGA	*	40,061	145	97
*SN5J	3.5	275,724	456	276
			(Op: SP5JXK)	
*SN2N	3.5	243,270	458	255
			(Op: SP2ASJ)	
*SP9DUX	*	231,287	440	259
*SP3MEP	*	72,808	240	152
*SP1YGL	*	324	12	9
*SP5KEH	1.8	82,303	245	169
			(Op: SP5JTF)	
*SP6GCU	1.8	81,008	245	166
*SP3LWP	*	22,560	124	94

GREECE

SV1DPI	14	1,391,520	1284	669
*SV1ENG	A	1,147,182	1278	551
*J48PJ	A	225,910	425	290
*SV1CER	*	113,645	235	191
*SV3AWG	*	74,476	228	172
*SV1JMO	*	20,079	129	97
*SV1BJW	14	825,292	938	538

BOSNIA-HERZEGOVINA

T99W	3.5	859,570	853	430
*T93C	21	515,871	693	387
*T94GZ	3.5	256,208	432	268
*T99F	1.8	32,412	144	111

ICELAND

TF3YH	A	877,933	814	437
*TF3GB	A	861,808	972	488

CORSICA

TK/DL4FF	A	928,800	1129	480

EUROPEAN RUSSIA

R3R	A	5,766,096	3158	917
			(Op: UA3DPX)	
UA6LV	A	5,108,235	2553	913
RS3A	A	3,964,909	2264	809
			(Op: RA3CW)	
RW1ZA	*	3,831,164	2419	811
UA3QDX	*	3,533,112	2317	792
RN4WA	*	3,058,721	2418	739
RN3BD	*	2,387,844	1972	684
RA3UT	*	2,208,598	1668	722
RD4WA	*	2,126,556	1667	684
UA4PN	*	1,472,562	1414	558
RA3NZ	*	1,381,248	1229	576
RV3FI	*	1,121,000	1230	500
RK3QS	*	763,028	979	458
RA3BB	*	620,453	846	409
RA3TT	*	523,754	658	418
RA3RK	*	301,048	459	311
RV1CC	*	175,791	408	231
RA1OD	*	171,130	296	218
UA4RZ	*	135,342	276	219
UA4NCI	*	131,646	309	222
RA4LBS	*	129,696	314	224
RU4WE	*	124,836	331	206
UA3DUJ	*	44,696	206	151
RU6DX	*	19,716	105	93
RC4Q	28	124,320	373	224
			(Op: UA4RC)	
RV3BQ	*	20,806	148	101
RW6HX	14	2,562,373	1769	803
UA3TCJ	14	2,088,450	1527	650
RT3T	14	1,934,766	1524	729
			(Op: UA3TU)	
RK3ER	*	945,165	953	555
UA4SAW	*	517,242	760	461
RX3AP	*	155,020	306	230
RA4SD	*	20,664	92	82
UA3DEE	*	13,468	104	91
RU4CO	7	877,800	734	440
RW4PL	*	341,210	403	298
UA6AKD	*	286,720	402	280
UA3MIF	3.5	150,672	323	219
RN3GM	3.5	104,064	262	192
RA6CZ	*	90,037	234	179
RK3XWO	1.8	97,552	265	182
*UA4FER	A	3,115,983	2112	733
*RW4FO	A	2,149,668	1913	633
*RV1AW/Ø	A	1,735,680	1182	512
*RV3QX	*	1,380,780	1288	540
*UA3ABJ	*	1,266,700	1035	530
*UA1CEC	*	1,188,280	1327	487
*RU4WW	*	1,179,426	1254	527
*RV3LO	*	1,159,200	1073	525
*UA4SMM	*	1,139,094	1205	523
*UA3DMO	*	1,041,420	1058	510
*RN4SS	*	1,016,950	1231	473
*UA4LA	*	978,690	1048	505
*UA3DPM	*	792,540	904	444
*UA4FRL	*	789,376	877	448
*RK6CM	*	756,674	938	478
*UA4FEN	*	598,455	832	403
*RV4LC	*	579,840	813	384
*RX4HB	*	574,084	768	404
*RX3ZX	*	555,696	733	408
*RD3FT	*	518,224	804	392
*RW1CX	*	508,232	683	404
*UA4ALI	*	507,045	799	385
*UA6LTI	*	492,744	684	392
*UA1CE	*	490,688	680	374
*RZ6BU	*	472,972	634	388
*RK4HD	*	460,356	459	454
*RA1QKI	*	459,867	656	381
*RX3RZ	*	452,088	710	378
*RW6AH	*	408,336	596	362
*UA4LL	*	329,987	641	329
*RX3MM	*	325,966	582	349
*RW3TA	*	305,996	571	337
*RL3AB	*	303,968	590	322
*UA3TN	*	238,502	459	293
*RA6GW	*	233,618	482	287
*RV3MR	*	221,904	479	276
*UA3QGT	*	219,501	391	261
*UA6MC	*	217,854	422	273
*UA4CRH	*	215,496	393	292
*RW3LX	*	208,270	420	295
*RA1TV	*	198,039	405	263
*UA6YH	*	196,746	380	271
*RA3DHS	*	135,842	296	217
*UA3AKI	*	131,651	391	247
*UA3RW	*	125,496	306	216
*UA3DSS	*	117,728	302	208
*RK6AQM	*	115,136	294	224
*RN4AO	*	108,756	342	212
*UA4QK	*	104,250	255	250
*RN3FA	*	101,712	295	208
*RW4AD	*	89,397	295	189
*UA1OMS	*	86,515	184	143
*RX3VF	*	78,578	282	202
*UA6LFQ	*	76,896	190	144
*RU4CS	*	69,973	177	167
*UA4PJM	*	67,301	260	167
*RZ6AK	*	47,817	203	161
*UA3QIX	*	34,882	157	107
*UA4FUW	*	33,180	124	105
*RK6MY	*	30,771	156	117
*USØQG	*	23,940	139	114
*UA6HFI	*	22,791	137	107
*RA3DH	*	18,095	84	77
*RW4PY	*	16,320	104	96
*UA4AGO	*	15,548	107	92
*RV6LFE	*	14,250	128	95
*RA6AAW	*	13,048	75	56
*RU3UR	*	13,013	97	77
*RA4AFZ	*	8,832	85	69
*RW4LQ	*	8,268	59	52
*RZ1OK	*	6,909	61	49
*RA6AR	*	5,150	51	50
*RA3FD	*	3,825	58	51
*RA1QX	*	3,696	53	42
*UA3AMZ	*	3,471	51	39
*UA1NDX	*	3,471	43	39
*RA1OW	*	2,077	34	31
*UA6BUX	*	1,943	33	29
*UA4LF	*	1,564	38	34
*RU3DM	*	1,500	32	25
*RA3FH	*	12	2	2
*RA3XO	28	84,727	359	193
*RW6ATJ	28	75,164	303	172
*UA6AK	*	71,004	283	183
*RA6DB	*	32,670	192	121
*RA6YY	21	557,512	752	454
*UA3AO	21	266,198	531	334
*RA3GFG	*	39,903	171	141
*UA4LW	*	33,390	143	126
*RU3XB	*	25,546	119	106
*RX3BP	14	1,023,238	1095	554
*RZ4AG	14	975,839	995	571
*UA4YA	14	961,324	575	556
*RN3QP	*	622,380	829	492
*UA1ZZ	*	616,958	811	502
*RX3DBG	*	281,248	469	352
*RA6MQ	*	254,312	432	332
*RA6MS	*	237,006	459	342
*UX5EFI	*	166,123	360	271
*RW3QF	*	104,420	264	227
*RV3DZ	*	63,336	210	174
*RU3UW	*	42,614	206	149
*UA4LS	*	22,236	116	109
*UX3IO	*	16,640	120	104
*RA4LK	*	14,442	86	83
*RV3LQ	*	12,870	108	99
*UA6LCN	7	922,428	715	438
*UA1ANA	7	516,792	595	353
*RU4SS	7	411,936	501	336
*RU3MW	*	40,716	149	116
*RZ3VA	*	25,414	107	97
*UA6BFE	*	1,015	434	268
*RA3UAG	3.5	196,664	373	248
*RA1AR/3	*	6,018	57	51
*RA3ZC	1.8	13,706	102	77
*RA3YAO	*	2,812	47	37
*UA3QCB	*	2,077	37	31

UKRAINE

UW2M	A	5,768,752	2916	898
			(Op: URØMC)	
UU5WW	A	3,570,432	2216	768
UYØZG	A	2,473,149	1799	651
UX4UA	*	1,704,488	1470	604
UY5ZZ	*	839,322	969	471
UTØIL	*	712,718	812	433
UR5WCQ	*	385,560	563	360
UT4XU	*	269,360	439	280
UT8ID	*	239,324	377	268
UT5ECZ	*	178,750	415	250
US5EEK	*	108,186	283	219
UX8IW	*	96,327	320	231
EO1I	21	1,298,052	1216	606
			(Op: UT1IA)	
EM3H	14	2,181,114	1716	717
UT2FA	14	1,368,639	1291	631
UT4ZG	14	1,128,612	1184	577
UT5UIA	*	801,340	868	515
UR7QC	*	624,312	750	468
UT2AU	*	322,812	516	378
UZ5UA	*	37,125	185	135
UT5I	7	2,129,636	1195	587
			(Op: UT2II)	
UW8SM	3.5	450,984	603	344
UX5I	3.5	252,315	433	267
			(Op: UT5IZ)	
EO6F	1.8	61,047	207	153
			(Op: UXØFF)	
UU2JG	1.8	57,624	202	147
*UT2UZ	A	2,050,176	1430	608
*UW5U	A	2,035,774	1593	634
			(Op: UY2UA)	
*UT9FJ	A	1,601,444	1321	676
*UR6QS	*	1,577,928	1357	556
*UT8EU	*	932,844	1023	444
*UY5TE	*	639,711	908	387
*UY7IQ	*	584,005	755	431
*UY1U	*	582,800	682	400
*UY3AW	*	385,220	607	340
*UT7MA	*	289,275	384	285
			(Op: UY5LO)	
*US1IV	*	287,672	526	308
*UY5ZI	*	285,032	495	328
*UR7EQ	*	236,265	470	285
*US8IM	*	233,450	493	290
*UR5IPD	*	161,656	410	242
*US8MX	*	146,640	380	235
*UR5WX	*	131,285	322	217
*UR7HEC	*	115,712	282	226
*UR3IQO	*	109,710	268	207
*UR3LTD	*	106,166	298	218
*UX8IR	*	99,594	261	198
*US2YW	*	78,320	228	178
*US7IB	*	71,795	217	173
*US3LX	*	61,740	167	140
*UR5EIT	*	46,355	177	127
*USØQG	*	23,940	139	114
*UR5NGI	*	22,088	119	88
*UXØFF	*	21,630	131	103
*UY2RZ	*	12,155	76	65
*UU2JA	*	8,967	66	61
*UTØRM	*	8,509	83	67
*UR6F	*	4,094	50	46
*UR5PG	*	1,900	36	25
*UY6F	*	1,650	37	33
			(Op: UX3FW)	
*US5FFF	*	1,148		28
*UX6F	*	630	18	18
			(Op: UX3FW)	
*UR4FWC	*	63	7	7
			(Op: UT3FW)	
*UT3FM	28	20,010	152	87
*UR8RF	21	79,755	267	195
*UXØZX	14	1,065,038	1055	598
*UR6IJ	14	1,009,008	940	588
*US7IGF	*	882,710	1046	515
*UX7QD	*	283,732	637	356
*UR8QR	*	282,846	477	354
*UT5KO	*	144,336	370	248
*UT1PO	*	132,790	304	245
*UR7QM	*	110,189	347	251
*UT8LO	*	106,714	282	229
*UY5LQ	*	19,110	122	105
*UT8ZL	*	6,552	52	42
*UX1UX	7	1,150,047	898	477
*USØHZ	*	525,960	587	360
*US1PM	*	120,000	260	200
*UR5IHQ	3.5	42,037	159	127
*US9PA	1.8	88,375	254	175
*UX5NQ	1.8	82,422	243	171
*UY5VA	*	29,160	137	108
*UT3N	*	6,804	67	54
			(Op: UT3NK)	

LATVIA

YL6W	A	4,650,420	2552	866
			(Op: YL2GD)	
YL2KO	*	10,428	77	66
YL2PA	7	171,082	259	226
YL2RM	*	26,631	119	99
*YL2TB	A	1,238,182	1296	506
*YL3GFT	A	1,056,729	1035	489
*YL3GCU	*	210,087	404	251
*YL2TD	*	161,480	364	220
*YL2HK	*	33,072	136	106
*YL2PP	21	20,394	114	103
*YL5W	14	1,448,793	1281	621
*YL3DX	7	1,017,730	849	469

ROMANIA

YO6BHN	A	2,077,614	1524	693
YO7BGA	A	419,902	562	337
YO4AB	21	283,361	485	307
YO3AK	14	69,552	231	184
YO5PBF	3.5	11,448	74	72
YO2RR	1.8	31,302	141	111
*YO3APJ	A	2,321,433	1693	677
*YO8KRR	A	538,590	669	390
*YO5ODH	A	486,486	635	351
*YO5DAS	*	378,810	533	345
*YO5CRQ	*	301,903	521	301
*YO9CWY	*	193,772	442	251
*YROWL	*	169,927	357	251
			(Op: YO9IF)	
*YO2CMI	*	166,355	325	245
*YO8BPY	*	146,960	312	220
*YO3BBW	*	140,140	320	220
*YO8SS	*	106,200	295	177
*YO7ARY	*	98,306	271	199
*YO2CJX	*	82,492	252	164
*YO3BL	*	72,556	304	187
*YO7LGI	*	52,852	198	146
*YO2QY	*	40,052	151	124
*YO9HG	*	29,083	150	127
*YO8MI	*	11,178	65	54
*YO9FNP	*	3,320	40	40
*YO3JW	28	4,600	68	46
*YO4SI	*	4,550	61	50
*YO5AJR	21	59,860	195	164
*YO9AGI	*	26,196	131	111
*YO4MM	14	369,027	600	393
*YR1ØØA	14	158,167	389	277
			(Op: YO8BFC@YO8KOS)	
*YO9CXE	*	88,374	263	206
*YO4ATW	*	62,010	194	159
*YO4CSL	*	26,680	164	115
*YO9FYP	*	5,418	70	63
*YO5CBX	7	964,548	802	458
*YO6KEA	7	691,866	682	399
			(Op: YO6GCW)	
*YO2AOB	*	389,372	483	313
*YO2/DL1CW	*	231,795	430	255
*YO6ADW	3.5	175,266	247	182

SERBIA & MONTENEGRO

YT5A	A	4,878,672	2400	804
			(Op: YZ1EW)	
YZ9A	A	4,107,279	2230	781
			(Op: YU1AU)	
YU5ØØBW	*	707,570	754	409
4N8A	*	2,275	42	35
4O3T	14	5,313,554	2597	986
			(Op: YT6A)	
YZØZ	14	4,659,068	2369	932
			(Op: YU1ZZ)	
YTØA	14	3,804,128	2136	848
			(Op: YZ1BX)	
YU1TT	*	1,428,668	1186	586
4N2W	7	3,813,045	1684	699
			(Op: YU1LA)	
4N2Z	7	3,054,168	1452	676
YT7A	7	2,499,408	1315	612
			(Op: YU7GMN)	
4N1A	3.5	905,622	850	447
			(Op: YU1BV)	
4N2K	3.5	804,531	828	421
YT8T	*	721,992	794	402
			(Op: YZ1KA)	
*YT7KM	A	2,158,695	1543	623
*YZ2A	14	2,483,505	1727	723
			(Op: YZ1AU)	
*YU1ED	*	310,458	487	354
*YU1BN	*	82,516	239	196
*4NØW	7	2,421,698	1303	641
			(Op: YT7AW)	
*YT1BX	*	233,216	410	256
*YU2M	3.5	535,444	683	364
*YZ8A	1.8	73,710	226	162
*YU1RA	*	23,218	123	94

MACEDONIA

*Z36W	A	174,414	321	246
*Z31GX	14	910,128	988	566

ALBANIA

ZA/Z35M	A	1,009,400	1082	490
*ZA/DF4SA	7	2,504,916	1585	612

OCEANIA

EAST MALAYSIA

9M6XRO	A	1,925,378	1092	497

PHILIPPINES

DU3NXE	A	120,696	296	141

GUAM

KG6DX	A	2,879,992	1491	601

HAWAII

KH6WT	A	6,319,701	2350	729
			(Op: K1YR)	
AH7C	*	13,056	72	64
*KH6RZ	28	65,072	197	112

PALMYRA

KH6ND/KH5	7	3,230,688	1268	438

AUSTRALIA

VK6AA	A	3,233,572	1454	628
			(Op: VK2IA)	
VK7GN	A	177,030	270	210
VK4ADF	A	96,064	217	152
			(Op: HA3LN)	
VK6DXI	7	1,638,524	692	412
*VK8AV	A	468,568	444	296
*VK4TT	A	80,703	192	147
*VK3KE	A	51,062	146	121
*VK3FM	*	2,407	30	29
*VK4BUI	14	283,529	345	281

INDONESIA

YB2EMK	A	42,612	130	106
*YC3MM	A	242,871	314	219
*YBØWWW	*	24,904	103	88
*YCØLOW	1.8	2	2	

NEW ZEALAND

*ZL3TE	A	244,531	342	193
			(Op: W3SE)	

SOUTH AMERICA

CHILE

*XQ4CW	A	10,282	62	53

URUGUAY

CX6VM	A	4,661,154	1914	762
*CX9AU	A	28,600	96	88

ARGENTINA

LU1AEE	A	2,241,846	1153	538
LU1HF	28	1,235,584	936	448
*LU1EWL	A	561,698	575	326
*LR1F	*	127,848	219	168
			(Op: LU5FD)	
*L55D	28	134,334	298	153
			(Op: LW1EXU)	
*LU4MHQ	7	42,282	90	87

ARUBA

P4ØW	A	11,189,328	3294	912
			(Op: W2GD)	
P4ØA	7	6,506,368	1561	704
			(Op: KK9A)	
P43JB	*	134,640	161	144
*P49Y	A	5,590,900	2088	700
			(Op: AE6Y)	

NETHERLANDS ANTILLES

PJ2T	A	8,968,869	2774	819
			(Op: WI9WI)	

BRAZIL

PY2NY	A	4,049,253	1715	653
PV8DX	A	2,216,634	1172	534
PY7ZY	*	121,326	215	146
PR2F	*	35,235	102	87
			(Op: PY2NDX)	
PY3AU	14	40,926	127	114
*PQ7Q	A	273,088	372	251
			(Op: PY7RP)	
*PR7HR	A	37,840	117	88
*PY7EG	*	28,200	107	94
*PY2IQ	*	25,330	100	85
*PY7OJ	*	11,128	57	52
*PY2KP	*	10,972	55	52
*PY4PW	*	7,003	53	47
*PY2MTV	28	45,900	155	100
*PR7GY	21	72,280	180	139
*PY1DX	*	35,524	118	107
*PY4FQ	*	3,332	34	34
*PP2RON	14	931	19	19
*PY6DX	7	14	2	2

VENEZUELA

YW4D	7	4,635,168	1238	636
			(Op: YV1DIG)	
*YV7QP	21	155,400	256	210

TRIBANDER/SINGLE-ELE

UNITED STATES

NF4A	A	3,694,704	2184	764
WN1GIV	*	2,676,576	1984	672
			(Op: N4BP)	
N3UM	A	2,250,144	1293	601
K4PV	*	2,176,020	1762	628
W1CU	A	1,407,431	930	547
AD4EB	*	1,342,839	1218	543
WØBH	A	1,266,345	1326	535
NØKE	*	1,188,066	1092	517
K4BAI	*	1,177,660	1116	505
W9IL	A	1,065,900	933	510
W6TK	A	1,062,734	927	502
W4BQF	*	1,056,090	998	470
K4DJ	*	888,888	804	444
K2LE	A	816,442	679	407
N6CY	*	678,814	723	382
K9UQN	*	623,220	673	390
N8PW	A	535,695	572	355
W1CX	*	435,456	484	324
W8PN	*	417,375	558	315
W4NTI	*	413,440	530	323
WE9N	*	402,896	473	338
KS7T	A	377,062	487	322
KV7DX	*	351,424	580	323
			(Op: KN5H)	
W7QN	*	339,228	573	324
W6CUS	*	149,388	318	211
			(Op: K6SRZ)	
NA6Q	*	77,922	213	162
WC4E	*	34,320	143	120
W6RKC	14	301,248	398	288
NT6K	*	184,536	431	264
N2GC	*	1,121,835	670	429
*WD4AHZ	A	1,899,728	1399	592
*WD5K	A	1,719,260	1335	590
*NT2A	A	1,508,801	989	527
*KV8Q	A	1,137,992	1030	472
*K4IE	*	899,294	849	451
*AE1T	A	796,630	719	410
*N4NX	*	690,202	731	433
*N8NA	A	559,680	535	330
*KC5R	*	504,360	577	360
*WA3KYY	*	461,070	580	327
*K4HAL	*	344,253	486	291
*AA4LR	*	275,776	468	278
*NK4A	*	238,875	494	273
*KØHW	A	221,496	439	264
*K5RQ	*	200,970	335	231
*K3NCO	*	200,000	353	250
*N7NT	A	173,712	418	231
*K1TR	*	167,232	274	201
*WA2MCR	*	163,530	279	207
*W6ZL	A	139,750	310	215
*N4LF	*	135,251	292	211
*KI7Y	*	133,984	364	212
*K6UM	*	104,468	252	196
*W4MY	*	101,928	261	186
*AA5CH	*	94,122	266	189
*K5GM	*	63,431	165	137
*NØBUI	*	55,680	255	145
*KC5LK	*	48,117	182	129
*W9LYA	A	46,248	154	123
*NJ8J	*	39,824	197	131
*NQ5Z	*	35,644	146	133
*AI2I	*	31,968	126	108

*N2ZN	*	30,636	107	92
*W1EQ	*	21,712	103	92
*WB6S	*	10,512	87	73
*W6ZZZ	*	4,968	66	54
*K5WW	*	3,567	46	41
*W8VND	*	1,740	31	29
***KØCAT**	**14**	**185,420**	**337**	**254**
				(Op: K9WIE)
*KØCOP	*	18,392	96	88

DX

P4ØW	**A**	**11,189,328**	**3294**	**912**
				(Op: W2GD)
CX6VM	**A**	**4,661,154**	**1914**	**762**
RU9CK	**A**	**4,603,560**	**1971**	**681**
LZ8A	**A**	**4,548,239**	**2477**	**817**
YZ9A	**A**	**4,107,279**	**2230**	**781**
				(Op: YU1AU)
VK6AA	**A**	**3,233,572**	**1454**	**628**
				(Op: VK2IA)
KG6DX	**A**	**2,879,992**	**1491**	**601**
IN3QBR	**A**	**2,716,350**	**1607**	**650**
				(Op: K7QB)
UA9CMQ	*	2,342,278	1284	526
HA3LI	**A**	**2,328,944**	**1615**	**652**
RA3UT	**A**	**2,208,598**	**1668**	**722**
DL7ANR	**A**	**2,183,436**	**1530**	**621**
RD4WA	*	2,126,556	1667	684
VA2WDQ	**A**	**2,006,690**	**1204**	**545**
VA3QP	**A**	**1,987,254**	**1258**	**522**
UP4L	**A**	**1,925,532**	**1218**	**567**
				(Op: UN7LZ)
EX2X	**A**	**1,860,460**	**1279**	**548**
HA1TNX	*	1,804,572	1347	588
S65X	**A**	**1,388,464**	**1129**	**506**
				(Op: 9V1CW)
HP1WW	**A**	**1,114,116**	**759**	**409**
GM4SID	**A**	**1,023,468**	**1050**	**493**
TF3YH	**A**	**877,933**	**814**	**437**
PAØJNH	**A**	**876,361**	**761**	**461**
EW2AA	**A**	**760,837**	**790**	**451**
RK9KWI	*	744,184	700	388
VE1MC	*	694,162	653	358
SK6ØCG	**A**	**639,200**	**746**	**425**
				(Op: SM6CLU)
OL6W	**A**	**607,512**	**756**	**408**
				(Op: OK2FB)
PAØBWL	*	473,796	560	369
SM5QU	*	472,340	638	380
DL3EBX	*	438,697	495	343
JA7COI	**A**	**433,664**	**489**	**308**
UA9CDC	*	384,956	493	286
EI4DW	**A**	**382,570**	**518**	**335**
OH2VZ	**A**	**354,244**	**526**	**332**
JO7KMB	*	340,400	423	296
JA1HP	*	325,304	443	296
G4HZV	**A**	**226,260**	**383**	**270**
OE3KAB	**A**	**151,830**	**275**	**210**
PY7ZY	**A**	**121,326**	**215**	**146**
US5EEK	**A**	**108,186**	**283**	**219**
7N4WZI	*	98,325	199	171
OZ1FAO	**A**	**45,021**	**159**	**129**
KP4JRS	**A**	**28,906**	**122**	**97**
OH3BU	**21**	**251,514**	**473**	**314**
JR1NHD	**21**	**75,932**	**183**	**164**
JA9CWJ	**14**	**694,278**	**611**	**414**
JA3DAY	*	73,312	176	158
LZ2ZG	**14**	**33,864**	**157**	**136**
VK6DXI	**7**	**1,638,524**	**692**	**412**
4N2K	**3.5**	**804,531**	**828**	**421**
IK2AOO	**3.5**	**326,488**	**490**	**296**
RA6CZ	**3.5**	**90,037**	**234**	**179**
JA7MJ	**3.5**	**6,762**	**48**	**42**
EU1AZ	**1.8**	**166,581**	**355**	**223**
SA5D	**1.8**	**22,932**	**118**	**98**
***IH9N**	**A**	**8,041,632**	**2522**	**794**
				(Op: OL5Y)
***VC3T**	**A**	**5,025,120**	**2202**	**760**
				(Op: VE3DZ)
***E21EIC**	**A**	**2,697,843**	**1546**	**597**
***EA7TN**	**A**	**2,452,046**	**1779**	**697**
				(Op: EA1AK)
***YO3APJ**	**A**	**2,321,433**	**1693**	**677**
***YT7KM**	**A**	**2,158,695**	**1543**	**623**
***LZ8ØR**	**A**	**2,150,534**	**1603**	**646**
				(Op: LZ3YY)
***S59N**	**A**	**2,072,224**	**1428**	**616**
*S51F	*	1,954,310	1358	586
***HA8BE**	**A**	**1,890,520**	**1458**	**604**
*S57U	*	1,880,424	1379	588
***OK2ZC**	**A**	**1,859,770**	**1543**	**583**
*OK1FNJ	*	1,839,150	1403	603
*OLØA	*	1,611,869	1259	563
				(Op: OK1CZ)
*VE3XL	*	1,571,742	929	522
***GØMTN**	**A**	**1,566,306**	**1362**	**558**
***RA9AC**	**A**	**1,367,640**	**983**	**435**
*OK1HX	*	1,267,474	1121	533
***UA3ABJ**	**A**	**1,266,700**	**1035**	**530**
***JH2NWP**	**A**	**1,187,145**	**882**	**465**
***OM4XA**	**A**	**1,178,130**	**1059**	**519**
*MØBJL	*	1,136,722	1068	499
*JA2KVB	*	1,078,708	838	479
***VE1OP**	**A**	**940,032**	**726**	**408**
***UT8EU**	**A**	**932,844**	**1023**	**444**
*OK1FHI	*	896,173	798	467
*HA2MN	*	574,684	684	407
***LY2DV**	**A**	**555,180**	**690**	**380**
*G4GOY	*	553,770	756	378
*RA9UN	*	500,174	603	313
*VA7LC	*	496,248	527	348
*VA2SG	*	432,291	478	309
***F3GJ**	**A**	**384,592**	**547**	**344**
*RX9DJ	*	372,060	452	265
*G3VQO	*	329,394	555	309
*YO5CRQ	*	301,903	521	301
*S58P	*	299,495	445	301
*US1IV	*	287,672	526	308
*EA3ALV	*	277,536	411	294
***PQ7Q**	**A**	**273,088**	**372**	**251**
				(Op: PY7RP)
*VE3TW	*	266,760	380	247
***CS1GDX**	**A**	**250,776**	**493**	**324**
				(Op: CT1DRB)
*S5ØDX	*	242,929	426	277
*G4DDX	*	236,448	389	288
***DL2NBY**	**A**	**235,727**	**490**	**277**
*JA4AQR	*	233,766	328	243
***SG6T**	**A**	**208,560**	**365**	**264**
				(Op: SM6WET)
*LY1CT	*	205,792	366	236
*S5ØB	*	194,532	332	258
***SP5TAT**	**A**	**193,732**	**361**	**238**
*DG7RO	*	187,068	399	262
*DR5T	*	130,381	246	241
				(Op: DJ3IW)
*DL5XL	*	122,610	286	201
*F5LCU	*	121,370	277	229
*JA1XRH	*	120,184	220	166
*UX8IR	*	99,594	261	198
***OP4A**	**A**	**87,952**	**246**	**184**
***VK4TT**	**A**	**80,703**	**192**	**147**
*US2YW	*	78,320	228	178
*DK8EY	*	43,542	133	118
***IK2CZQ**	**A**	**41,396**	**155**	**131**
*MØDSL	*	28,288	141	128
*JA4BDY	*	20,935	97	79
*JA2KCY	*	20,584	102	83
*OK1CJN	*	20,566	96	91
*RU3UR	*	13,013	97	77
*SP3AOT	*	11,856	102	78
***GWØTKX**	**A**	**11,180**	**71**	**65**
*RW4LQ	*	8,268	59	52
*JJ1WWL/1	*	8,112	62	52
*PY4PW	*	7,003	53	47
*RA6AR	*	5,150	51	50
*OO9O	*	4,350	55	50
				(Op: ON7SS)
***RA6YY**	**21**	**557,512**	**752**	**454**
***VE3JM**	**14**	**1,494,692**	**1010**	**554**
***VE2XAA**	**14**	**945,514**	**762**	**466**
***JA1BPA**	**14**	**699,732**	**614**	**418**
				(Op: JA6-933Ø)
***I2WIJ**	**14**	**225,879**	**367**	**309**
***SP3ASN**	**14**	**78,209**	**223**	**197**
***PA1AG**	**14**	**5,757**	**69**	**57**
***UA1ANA**	**7**	**516,792**	**595**	**353**
***F/G3SQX**	**7**	**161,837**	**279**	**211**
***JA2PFO**	**7**	**107,308**	**187**	**139**
***DL8UAT**	**7**	**87,296**	**219**	**176**
***EA3CWT**	**7**	**1,196**	**24**	**23**
*LY1F/M	*	2	1	1
***PAØMIR**	**3.5**	**82,280**	**231**	**170**
***YU1RA**	**1.8**	**23,218**	**123**	**94**
*IKØEIE	*	242	11	11

ROOKIE

UNITED STATES

AB3CX	**A**	**1,203,248**	**984**	**479**
AB2RF/6	**A**	**691,336**	**694**	**412**
KG6ZHC	*	6,847	50	41
***KA4H**	**A**	**260,848**	**418**	**274**
***AG9U**	**A**	**42,875**	**149**	**125**
*KI4EZC	*	17,578	109	94
***KC8UR**	**A**	**3,440**	**45**	**40**
*AE6RF	*	16	4	4
***K3MQ**	**14**	**385,187**	**445**	**361**

DX

IW7EFC	**A**	**13,167**	**81**	**77**
***YL3GFT**	**A**	**1,056,729**	**1035**	**489**
***RU9CD**	**A**	**681,688**	**657**	**329**
***CT1IUA**	**A**	**562,485**	**635**	**385**
***UA3QGT**	**A**	**219,501**	**391**	**261**
*UA4CRH	*	215,496	393	292
***DB7MA**	**A**	**140,833**	**359**	**217**
*RK6AQM	*	115,136	294	224
*RX3VF	*	78,578	282	202
***UR5NGI**	**A**	**22,088**	**119**	**88**
***JO3FEU**	**A**	**10,716**	**57**	**57**
*UA9SAW	*	9,100	61	52
***F8DFP**	**A**	**8,208**	**57**	**54**
*JJ1WWL/1	*	8,112	62	52
***EA2BOV**	**21**	**147,987**	**301**	**243**
***RW3QF**	**14**	**104,420**	**264**	**227**
***OH8GZN**	**14**	**26,078**	**133**	**118**
***IZ5GRS**	**14**	**7,345**	**73**	**65**
***2MØKDZ**	**14**	**2,376**	**44**	**44**
***ON4TTT**	**14**	**1,092**	**28**	**26**
***EA3EU**	**7**	**65,565**	**157**	**141**
***RA3YAO**	**1.8**	**2,812**	**47**	**37**

SINGLE OPERATOR ASSISTED

UNITED STATES

N3KS	**A**	**5,961,584**	**2488**	**818**
K3WW	*	5,888,442	2341	798
NU5F	**A**	**4,707,620**	**2402**	**820**
				(Op: K5YA)
K3MD	*	3,726,268	1862	754
WN9O	**A**	**3,574,692**	**1925**	**748**
				(Op: W9IU)
WO8CC	**A**	**3,116,568**	**1727**	**728**
				(Op: N8BJQ)
NO2R	**A**	**2,521,054**	**1407**	**661**
NF6A	**A**	**2,359,868**	**1285**	**622**
				(Op: K6XX)
AB2E	*	2,150,842	1303	614
WW5X	*	2,066,008	1547	632
				(@ K5TT)
KF6T	*	1,763,258	1290	602
KD2HE	*	1,747,499	1202	587
AJ3G	*	1,662,645	1196	597
KTØR	**A**	**1,587,510**	**1342**	**558**
K6RIM	*	1,274,400	1038	540
N6QQ	*	787,397	721	481
N5JR	*	703,192	636	433
W4CU	**A**	**651,112**	**620**	**392**
W2LE	*	591,136	611	377
N6HR	*	568,340	525	362
NT4D	*	551,969	625	361
W1EBI	**A**	**514,750**	**520**	**355**
NX6T	*	510,570	643	366
				(Op: N6KI)
K6MM	*	487,680	590	381
K1KO	*	426,436	455	362
K7EG	**A**	**396,115**	**465**	**349**
K2QMF	*	395,164	398	308
WW9R	*	239,932	431	266
W3FV	*	206,568	303	228
WØTT	*	203,808	412	264
K4IU	*	183,000	310	244
AD4IE	*	138,960	246	193
N7XY	*	120,474	240	207
KØBX	*	105,270	201	165
K3KO	*	99,660	173	165
KC1F	*	83,824	223	169
K5HDU	*	59,264	155	128
W7SW	*	52,397	192	151
W4ZE	*	26,532	138	99
K7RL	**14**	**1,937,628**	**1282**	**594**
				(Op: K7RL)
WA3AAN	**14**	**671,255**	**681**	**449**
W2IRT	**14**	**406,269**	**431**	**369**
N3GJ	*	403,520	449	320
AA4VV	**7**	**229,200**	**212**	**191**
***NP3D**	**A**	**1,063,503**	**904**	**459**
				(Op: EW1AR)
***N4BAA**	**A**	**943,412**	**761**	**454**
*WF4W	*	725,373	719	431
*N3UA	*	685,608	641	371
*WF3C	*	626,620	707	380
				(Op: K4EJ)
***KZ3M**	**A**	**513,084**	**500**	**338**
				(Op: K3STX)
***AD6WL**	**A**	**382,495**	**490**	**337**
*NJ1H	*	348,667	501	319
*W4EE	*	253,896	410	284
***KSØT**	**A**	**220,866**	**343**	**262**
*KE1F	*	220,394	404	263
*N3AM	*	210,909	307	229
***NJ7I**	**A**	**209,085**	**397**	**263**
*WM3T	*	191,102	281	214
***KM9M**	**A**	**158,426**	**337**	**226**
*K6DGW	*	144,612	311	234
*KS5A	*	131,320	329	196
*KA7KUZ	*	117,000	242	200
*W6RGG	*	116,017	238	199
*N9JRZ	*	109,218	215	167
***AF5Z**	**A**	**109,140**	**254**	**204**
*KØKX	*	87,318	149	126
*K4CZ	*	84,937	213	157
*KG9N	*	74,734	203	158
*NW4V	*	44,888	135	124
*NØBK	*	37,332	132	122
*NN7SS	*	19,968	145	96
				(Op: K6UFO)
*N4VA	*	15,052	80	71
*NRØL	*	10,332	67	63
*KCØRET	*	7,104	75	64
*N9LF	*	5,684	64	49
*W4WNT	*	5,187	39	39
*K7VIT	*	1,254	22	22
*W7SST	*	322	14	14

DX

5B/NN3AA	**A**	**12,500,501**	**3572**	**953**
				(Op: RW3QC)
RG9A	**A**	**8,323,500**	**2791**	**895**
				(Op: UA9AM)
OK1RI	**A**	**6,099,968**	**2541**	**896**
LX7I	**A**	**5,129,678**	**2435**	**818**
				(Op: DL4SDW)
UW8M	**A**	**4,930,794**	**2819**	**891**
				(Op: UR5MID)
OR2M	**A**	**4,923,886**	**2292**	**814**
				(Op: ON4IA)
S53O	**A**	**4,860,000**	**2211**	**810**
S57DX	*	4,571,640	2406	810
DK3GI	**A**	**3,972,960**	**2161**	**801**
TM3C	**A**	**3,909,218**	**1935**	**782**
				(Op: F6IFY)
SV8CS	**A**	**3,709,089**	**2235**	**789**
				(Op: SV3SJ)
OQ5M	*	3,459,410	2076	755
				(Op: ON5ZO)
RN3QO	**A**	**3,188,856**	**2103**	**771**
SM6CNN	**A**	**2,775,932**	**1674**	**716**
OK1FDY	*	2,505,252	1613	667
DM1TT	*	2,290,752	1616	656
OK1KT	*	2,241,498	1484	643
DQ2ØØ6R	*	2,164,042	1510	653
				(Op: DF1LON)
W1AJT/VE3	**A**	**1,882,452**	**1096**	**572**
RM9RZ	*	1,636,155	958	515
OH3OJ	**A**	**1,595,145**	**1444**	**579**
DR1ØØNAU	*	1,429,394	1093	578
				(Op: DL1RG)
IKØYVV	**A**	**1,327,647**	**1121**	**579**
GI4NKB	**A**	**1,032,550**	**964**	**535**
DP4N	*	930,697	838	479
				(Op: DL4NER)
EA5FID	**A**	**926,160**	**958**	**510**
DHØGHU	*	915,690	949	466
CW7T	**A**	**634,234**	**532**	**337**
VO1HE	**A**	**612,684**	**547**	**366**
SM5DJZ	*	603,024	641	408
UT7UJ	*	565,645	752	415
YU9VK	**A**	**520,746**	**682**	**379**
8SØW	*	489,424	593	362
				(Op: SMØNJO)
VA6XDX	**A**	**453,144**	**486**	**316**
UA3AGW	*	414,800	532	305
DJ3WE	*	342,998	479	298
DK7ZT	*	161,424	288	228
EA1WX	*	133,507	344	229
DL9NDV	*	93,758	234	181
VE5MX	**A**	**81,648**	**213**	**162**
JH7MEX	**A**	**36,570**	**125**	**106**
OH2BO	**A**	**6,480**	**61**	**54**
IC8POF	*	2,040	26	24
IK2RLS	*	1,352	*	26
UU2JQ	*	208	8	8
9A35Y	**21**	**1,748,345**	**1247**	**661**
				(Op: 9A3NM)
LY4XX	**21**	**548,580**	**682**	**410**
I1NVU	**21**	**283,200**	**404**	**295**
RAØALM	**21**	**82,915**	**205**	**161**
OM7PY	**21**	**41,340**	**150**	**130**
HA4A	*	4,244,581	2205	883
UT7I	*	4,136,796	2318	906
				(Op: UT2IO)
EO3Q	*	3,910,923	2273	911
S59ABC	**14**	**2,873,494**	**1687**	**754**
				(Op: S51DS)
SN5M	**14**	**2,830,506**	**1663**	**798**
SP5UAF				
OK7M	**14**	**2,535,702**	**1560**	**767**
				(Op: OK1DIG)
UA4LU	*	1,907,666	1483	734
LA6FJA	**14**	**984,924**	**980**	**502**
S51J	**14**	**657,496**	**714**	**413**
YR9P	**7**	**1,708,091**	**1032**	**539**
				(Op: YO9HP)
S58U	**7**	**962,136**	**773**	**414**
4O2A	**3.5**	**710,447**	**777**	**391**
IZ1GAR	**3.5**	**428,800**	**554**	**335**
DL4FAY	**3.5**	**216,106**	**471**	**242**
RAØAM	**3.5**	**43,092**	**97**	**84**
HG3M	**1.8**	**191,760**	**383**	**235**
				(Op: HA3MY)
S57M	**1.8**	**166,988**	**358**	**218**
***YL3DQ**	**A**	**2,174,040**	**1584**	**648**
***DK5DQ**	**A**	**2,008,160**	**1359**	**616**
***PR7AF**	**A**	**1,527,184**	**966**	**496**
***9A3GI**	**A**	**1,027,829**	**994**	**473**
***JM1NKT**	**A**	**787,952**	**720**	**407**
***SQ3RX**	**A**	**760,347**	**791**	**447**
***VE7FO**	**A**	**725,742**	**629**	**414**
*DJ8OG	*	719,460	720	420
*SP5KVP	*	591,018	716	411
				(Op: SP5AYM)
***PAØKHS**	**A**	**549,664**	**721**	**386**
***RA6YDX**	**A**	**536,766**	**736**	**411**
*SQ9FMU	*	498,108	618	372
***OM7YC**	**A**	**443,040**	**577**	**355**
*DJ9AO	*	420,312	516	332
*DJ8QP	*	390,096	479	336
***OH2FS**	**A**	**335,438**	**418**	**367**
*DK2ZO	*	240,300	446	270
*RZ6HF	*	225,586	430	298
*JP1QDH	*	214,104	303	264
*PC2T	*	194,300	363	268
*JA3PYC	*	189,845	309	215
***S51DX**	**A**	**185,878**	**407**	**238**
*DL9SEV	*	181,944	371	266
*SP2EXN	*	172,260	316	290
***AM7RM**	**A**	**162,540**	**348**	**258**
				(Op: EA7RM)
***ZL4PW**	**A**	**141,114**	**228**	**174**
*EA3AXM	*	137,237	310	233
***IT9ORA**	**A**	**131,970**	**348**	**249**
*DL4RCK	*	119,350	291	217
*DL9JON	*	108,926	286	214
*VE3WO	*	100,905	211	155
*DH5JG	*	81,840	219	176
***G7TWC**	**A**	**81,258**	**207**	**174**
***SAØQ**	**A**	**79,100**	**253**	**175**
				(Op: SMØOGQ)
*JK2VOC	*	34,594	148	98
*JA3VUI	*	33,666	114	93
*MØRUN	*	30,888	134	108
*SA1A	*	24,745	131	101
				(Op: SM1TDE)
*UA1ACC	*	23,128	122	98
*JL7IFR	*	19,350	105	86
*JO3FUO	*	5,670	50	42
				(Op: JJ1BDX)
*YO4RST	*	54	6	6
***9A2U**	**28**	**37,050**	**189**	**130**
				(Op: 9A3ZA)
***PY2XC**	**28**	**21,060**	**92**	**78**
***SP1GZF**	**28**	**3,696**	**70**	**44**
***UN4PG**	**21**	**324,900**	**425**	**300**
***HA5AO**	**21**	**85,833**	**219**	**187**
***SJØWPX**	**14**	**458,380**	**748**	**430**
				(Op: SMØOGQ)
***SP2HPD**	**14**	**399,910**	**545**	**394**
***PY1NB**	**14**	**232,180**	**318**	**247**
***YU1AAV**	**14**	**123,075**	**271**	**225**
				(Op: YT1HA)
***PAØJED**	**14**	**115,962**	**288**	**231**
***YO3III**	**14**	**4,293**	**59**	**53**
***JJ8GFL**	**14**	**2,494**	**30**	**29**
*PY2BRZ	*	1,180	21	20
***ES5RY**	**7**	**734,240**	**618**	**416**
***DL6UAA**	**7**	**668,152**	**712**	**376**
***IZ1HIV**	**7**	**611,625**	**654**	**375**
*IZ8GCB	*	407,363	466	319
*DF2LH	*	197,040	289	240
***YZ5T**	**1.8**	**680**	**21**	**17**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

NR4M	**7,249,473**	**2818**	**951**
KT3Y	7,000,664	2654	836
NK7U	**5,783,352**	**2513**	**876**
W4SAA	4,726,652	2367	812
N4CW	1,496,358	1079	531
NE3MD	**1,044,993**	**972**	**489**
WC8VOA	**182,850**	**340**	**230**
KN6Y	**164,265**	**413**	**235**
AD4ES	150,224	347	229
W1MX	**66,939**	**180**	**159**

ASIA

7W2OM	**19,164,355**	**4677**	**1039**
5B/KIØBP	**13,762,224**	**4222**	**999**
TC3A	**6,599,502**	**2668**	**702**
RN9SXX	**3,791,634**	**1715**	**609**
RU9SWW	2,156,744	1212	514
JF2SKV	**1,852,635**	**1207**	**565**
RT9W	1,609,344	971	528
RL9FYL	402,392	502	281
RZ9UWZ	170,980	312	206
JA1ZGP	10,291	51	41

EUROPE

OE4A	**10,839,220**	**3867**	**1114**
OM7M	**9,745,552**	**3606**	**1072**
TM2Y	**9,073,701**	**3444**	**1053**
UU7J	**8,914,620**	**3890**	**1039**
AN6IB	**8,263,430**	**3875**	**970**
HG1S	**8,077,980**	**3135**	**1010**
OE2S	7,623,802	3103	1018
TM4Q	7,149,554	2881	958
UA3R	**7,123,801**	**3701**	**983**
OLØW	**6,673,248**	**2791**	**928**
OH6XX	**6,343,074**	**3046**	**959**
RF3A	**6,228,705**	**3395**	**959**
7S2E	**5,497,935**	**2857**	**955**
SN2K	**5,328,582**	**2621**	**878**
UW9I	4,857,600	2978	800
ED2PFX	4,470,332	2352	862
TMØR	4,186,405	2145	785
SYØSAIA	**4,165,986**	**2895**	**799**
PI4TUE	**3,889,806**	**1999**	**794**
DA3X	**3,794,264**	**2140**	**782**
OL1C	3,565,680	2057	716
9A3B	**3,381,744**	**1982**	**752**
UW6G	3,187,727	2226	757
OL7D	3,026,557	1837	733
EA7GV	2,950,401	1897	697
SP4KDX	2,941,400	1854	700
OM3RKA	2,817,884	1765	659
OL7T	2,736,336	1748	654
IZ3CAR	**2,718,037**	**1801**	**679**
OH6M	2,679,272	1922	716
9A2W	2,606,190	1742	654
DL4WA	2,524,130	1767	674
TM5B	2,347,320	1999	631
YO8KGA	**1,919,795**	**1568**	**599**
RL4W	1,893,840	1845	607
SK3W	1,751,133	1350	591
G5XV	**1,521,279**	**1386**	**549**
SI9AM	1,366,392	1278	578
OZ3RIN	**1,210,240**	**1130**	**496**
OL1X	809,625	873	425
UWØL	**742,050**	**869**	**425**
SP9KRT	733,250	810	419
RK3AWK	676,791	937	417
UZ1I	467,415	709	423
OM5ØKKF	172,704	339	257
EW8ZZ	**72,584**	**256**	**172**
RK3DXZ	37,520	208	140
SN19ØZS	20,610	111	90
UU4JWZ	18,900	140	108
YL1S	8,437	66	59
9AØR	602	15	14
EW2WW	522	19	18
UR4PWC	391	17	17

NORTH AMERICA

ZF1A	**14,278,796**	**3948**	**1052**
VA7OO	**7,758,315**	**2600**	**909**
VB3O	**4,571,970**	**1982**	**741**
VE5RI	**1,618,026**	**1035**	**547**
T48C	**1,275,603**	**956**	**399**

OCEANIA

ZM1A	**4,334,014**	**1701**	**646**
YE1ZAT	**4,130,974**	**1793**	**626**
YE6P	1,929,005	1208	503
KH2/WX8C	**1,672,188**	**1157**	**476**

SOUTH AMERICA

PS2T	**14,279,652**	**3607**	**1062**
LR2F	**7,383,903**	**2466**	**829**
P41S	**6,291,360**	**2325**	**765**
LTØH	5,157,266	1933	709
ZX3S	2,701,888	1355	592
LU8XW	911,860	564	359

MULTI-OPERATOR TWO TRANSMITTER

UNITED STATES

KD4D	**15,763,712**	**4898**	**1112**
NZ1U	**12,861,342**	**4234**	**1053**
WR3Z	7,238,023	2870	949
WX5S	**5,878,531**	**2810**	**877**
N4WW	**5,567,380**	**2656**	**874**
WX3B	2,142,224	1254	617

AFRICA

EA8PP	**19,211,164**	**4496**	**1058**

ASIA

JA3YBK	**10,388,106**	**3405**	**954**

EUROPE

9A7A	**17,274,276**	**5710**	**1228**
DR1A	**17,096,352**	**5671**	**1236**
EI7M	**14,168,448**	**5184**	**1152**
DF6AA	**13,293,320**	**5293**	**1130**
YR7M	**10,145,162**	**4206**	**1058**
SQ6Z	**7,461,390**	**3267**	**930**
ES1A	**7,050,330**	**3619**	**930**
DR2ØØ6B	6,289,136	3034	932
SN9Z	1,379,742	1234	546
OH2R	**1,221,675**	**1204**	**525**
DQ2ØØ6E	835,257	888	433

NORTH AMERICA

VE7SV	**9,154,912**	**3090**	**944**

OCEANIA

ZL6QH	**12,000,720**	**3321**	**930**
VI9NI	**3,063,995**	**1530**	**565**
WHØW	**2,731,113**	**1423**	**539**

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

KM3T	**17,666,300**	**5437**	**1150**
NX5M	**8,171,222**	**3958**	**982**
NR6O	**2,178,036**	**1447**	**602**
KC2NMZ	**1,045,330**	**923**	**473**

DX

LZ9W	**21,066,864**	**7189**	**1272**
LY7A	**12,190,152**	**5250**	**1068**
DQ2ØØ6M	**12,055,956**	**4751**	**1083**
OM4F	**11,172,410**	**4729**	**1030**
OHØV	**8,859,779**	**4399**	**983**
HG1R	**6,721,924**	**3293**	**908**
OH2K	710,294	886	442
SP5KCR	**3,960**	**46**	**44**

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Looking Ahead in CQ

Here's a look at articles we're working on for upcoming issues of *CQ*:

- "Infrared Communications," by Professor Emil Heisseluft
- "La Cuadrilla De Tifariti—The SO1R DXpedition," by Fabrizio Vedovelli, IN3ZNR/WH0Q
- " Wives, Woodpeckers, and Tall Wooden Masts," by Stew Gillmor, W1FK

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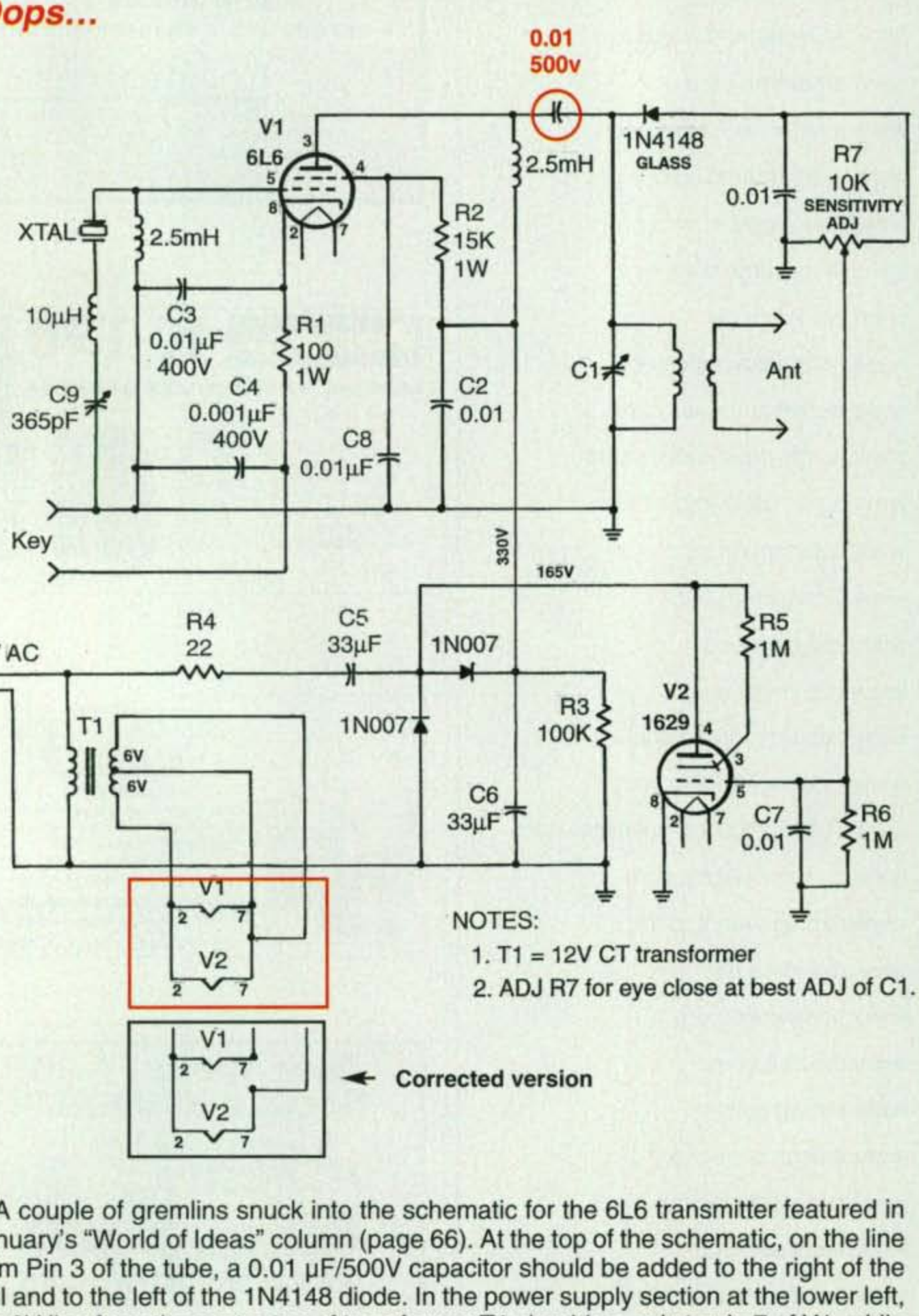

NOTES:

1. T1 = 12V CT transformer
2. ADJ R7 for eye close at best ADJ of C1.

← **Corrected version**

A couple of gremlins snuck into the schematic for the 6L6 transmitter featured in January's "World of Ideas" column (page 66). At the top of the schematic, on the line from Pin 3 of the tube, a 0.01 µF/500V capacitor should be added to the right of the coil and to the left of the 1N4148 diode. In the power supply section at the lower left, the 6V line from the center tap of transformer T1 should go only to pin 7 of V1, while the 12V output at the "top" of the transformer should go only to pin 7 of V2. Thanks to the many eagle-eyed readers who caught these errors. A corrected schematic appears above.

In addition, you might *think* we made a mistake in our printed Morse code in the February issue's Reader Survey. Actually, we *do* know our code but two dahs (dashes) next to each other, while they looked good on a computer screen, appeared in print as a single long dash. So yes, we know that "W" is .-- not .— and M is -- not —. It was probably in anticipation of problems like this that the American Morse code, with its long and short dashes, fell out of favor while the International Morse code, with only dots and one type of dash, became the standard.

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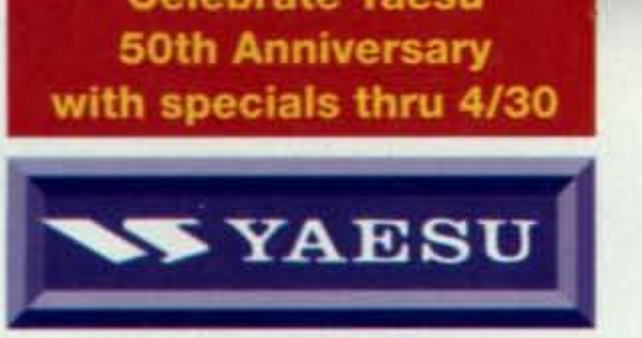

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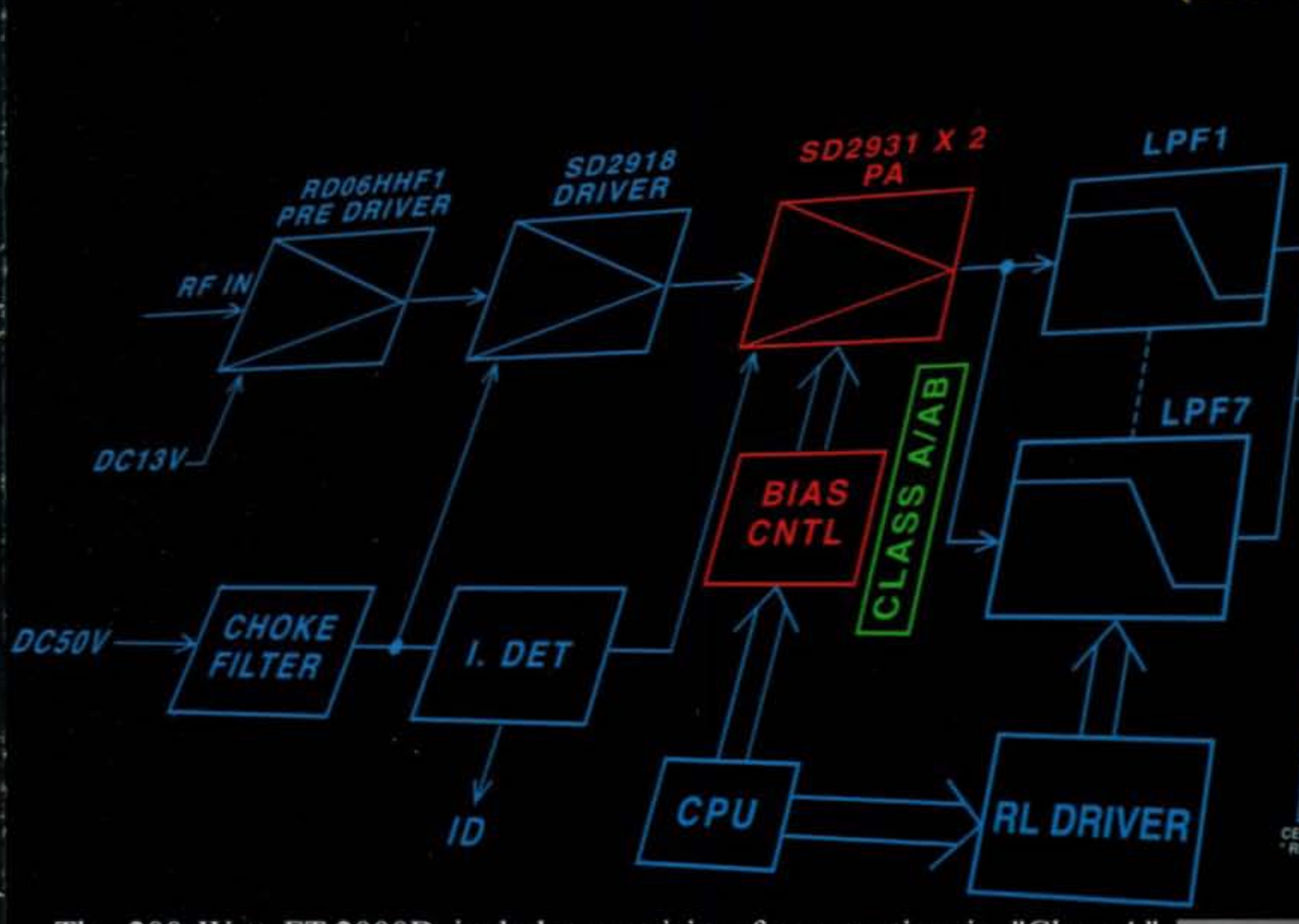

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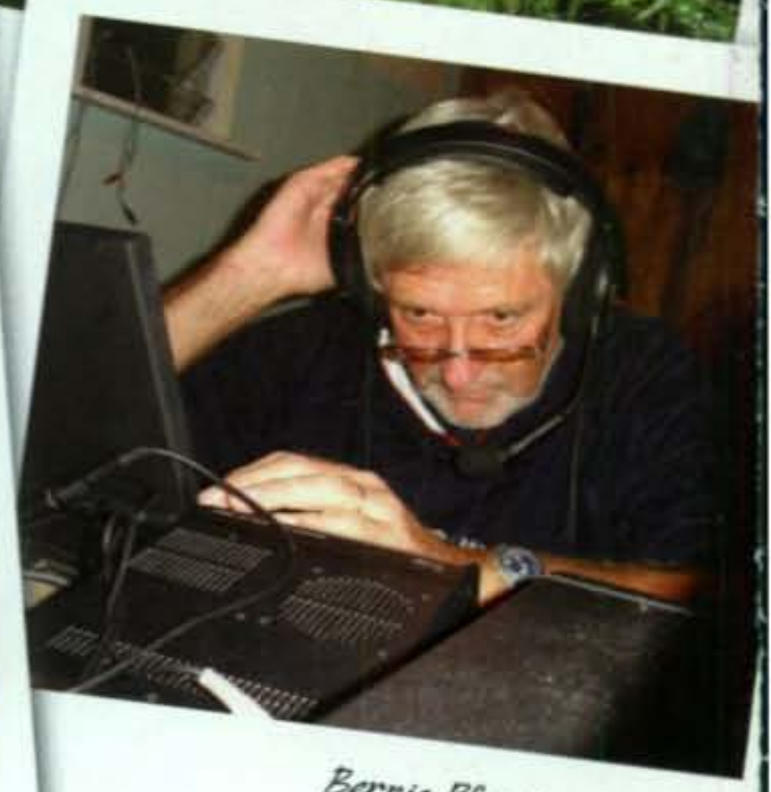

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