Amateur Radio

SERVING AMATEUR RADIO SINCE 1945

MARCH 2000

CQ

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Plus two new columns:

- **Computers and Internet... p. 72**
- **"Magic in the Sky"... p. 58**

da hams Cecil Sipma, KA3BCR,
nd Steven White, W4SNW, of Bradenton.

U.S. $

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THE RADIO AMATEUR'S JOURNAL

ICOM IC-756PRO

This is not your father's HF rig. This is all new, 32-bit DSP processing.

32 BIT

Filter indicators located at the top of the TFT display give you a quick look at the filter status. You can also see what filter you have selected and the mode you are using, and watch what changes are made with the PBT.

It's easy to customize the screen's look by changing colors, fonts, brightness, contrast, and more from this easy to access menu. You may also choose to enter your call sign, which, when chosen, results in the displaying of your call on screen each time the rig is powered up.

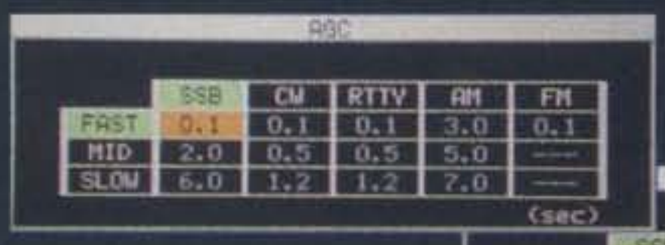
Keep tabs on memory channels with an alphanumeric readout of frequency, mode, filter selection, and channel number.

A digital voice recorder has 4 slots for RX and TX, each 15 seconds long – a good chunk of time to run a contest with.

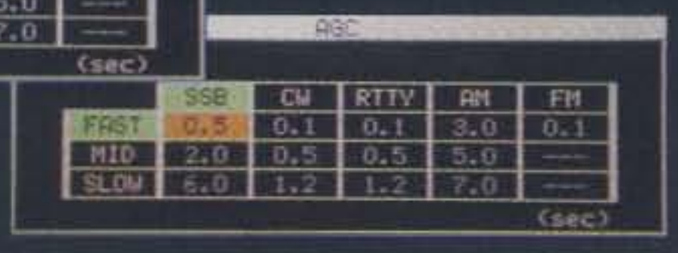
Copy RTTY DX or catch ARRL bulletins without firing up your computer. A dual auto peak filter and tuning indicator make it easy.

Visual indicators of filter selections let you tweak the band pass for optimum performance.

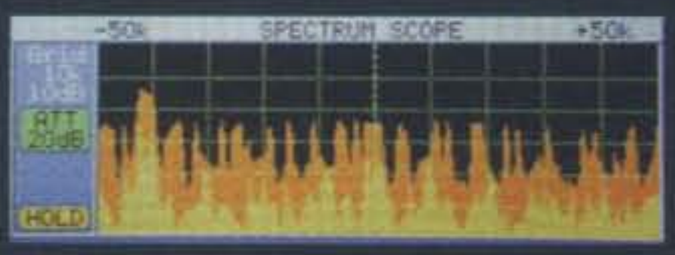
Choose from 31 steps of 100Hz between 3600–600Hz and 10 steps of 50Hz between 500–50Hz.



If the AGC is too fast or too slow, a quick setting change can make it just right.



Different settings for different modes eliminate adjustments when hopping around the band.



A real time band scope lets you select from one of four attenuator levels – signals under S5 can't hide from this rig. The lighter orange area shown is the active spectrum. The darker orange is a max hold display history.

THE GREATEST THING TO HIT HF SINCE...

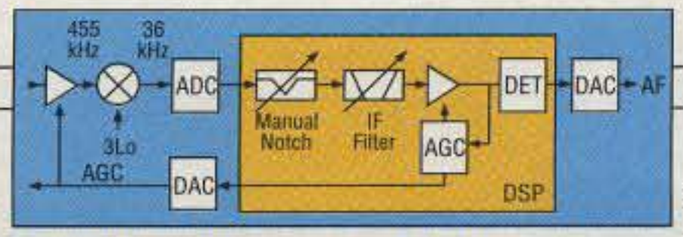
This is no simple upgrade of ICOM's classic IC-756. The new IC-756PRO sets a new standard in ham radio design and construction. At the heart of the 'PRO is a 32-bit (not 16-bit) floating point DSP

EASY TO USE, EASY ON THE EYES *The 'PRO's*

SPECIFICATIONS

All specifications and features are subject to change without notice or obligation

Transmit: ..... All Amateur HF, 6 Meters
Receive: ..... 0.03 – 60 MHz
Receive System: ..... Triple Conversion Superheterodyne
Mode: ..... USB, LSB, CW, RTTY, AM, FM
Power: ..... 5–100W (5–40W AM), continually adjustable
Power Supply Requirement: 13.8VDC, 23A
Memory Channels: ..... 101 Total
Including 99 regular and 2 scan edges
Frequency Stability: ..... Less than ±0.5 ppm
Antenna Connector: ..... SO-239 x 2 and phono (RCA; 50Ω)
Selectivity:
SSB, RTTY (BW: 2.4kHz) . More than 2.4kHz/-6dB
Less than 2.8 kHz/-60dB
CW (BW: 500Hz) ..... More than 500Hz/-6dB
Less than 700Hz/-60dB
AM (BW: 6kHz) ..... More than 6.0Hz/-6dB
Less than 15.0Hz/-60dB
FM (BW: 15kHz) ..... More than 12.0Hz/-6dB
Less than 20.0Hz/-60dB
Size (approx): ..... 13.4(W) x 4.4(H) x 11.2(D) in.
340(W) x 111(H) x 285(D) mm.
Weight (approx): ..... 21 lb / 9.6 kg



DSP IN THE IF, BEFORE THE AGC *Dual loop digital AGC eliminates strong signal pumping.*

unit that operates at an unrivaled processing speed.

THE DX ADVANTAGE YOU'VE WANTED

Faster processing means finer incoming signal sampling, and finer sampling means clearer, crisper reception…with almost no background noise.

YOU'LL NEVER BUY ANOTHER FILTER

The IC-756PRO features 41 built-in, front panel selectable levels of DSP filtering. There's no additional filters or high stability crystal oscillators to buy, because none are needed. It's like going from Zero-to-Contesting in seconds flat. Our filters are the sharpest–more selective than any crystal or mechanical filters. The selectivity lets you pull out the weak signals like never before.

CDs VS VINYL ALBUMS

Remember the first time you heard CD sound quality in a headphone? The 'PRO's audio quality will knock your socks off. You've got to hear this rig to believe it.

FREE Collectable World Clock

Our first 1000 owners will receive a custom clock that'll look great in any shack or den.

Whether you prefer voice, visual, CW or data, the IC-756PRO offers the details and performance capable of topping the contest charts. Contact your ICOM dealer today, or call for a free brochure by mail.

425-450-6088

front panel is well laid out and easy to use. View the TFT LCD display wide angles, day or night. This handsome rig will look great in any home or shack.

FEATURES

- **32 Bit Floating Point DSP Processor**
  - Digital AGC loop operation
  - Digital IF filter, 41 selectable bandwidths
  - Built-in RTTY demodulator / dual peak APF
  - Built-in microphone equalizer
  - Manual notch function
- **5" TFT Color LCD**
  - Wide viewing angle, more information
  - Adjustable colors and settings
- **8 Channel Digital Voice Memory**
  - 4 each, transmit and receive
  - 15 second message max per channel
- **Digital Twin Pass Band Tuning**
- **Built-In Auto Antenna Tuner**
- **Dual Watch**
- **100% Duty Cycle**
- **Continually Adjustable AGC**
  - Even remembers your favorite settings
- **Triple Band Stacking Register**
- **Built-In Memory / Electronic Keyer**
- **Analog AND Digital Metering**
- **Independent RIT / ΔXT Control**
- **VOX • Noise Blanker**
- **CW Keyer Jacks, Front and Rear**
- **50 Frequency CTCSS Tone Encoder**
- **10 Character Memory Note Pad**
- **Voice Synthesizer (optional)**

Are you a PRO?

Clipperton 2000

Work the IC-756PRO in February on the Clipperton 2000 DXpedition

ICOM®

www.icomamerica.com

CQ now including CQ VHF

MARCH 2000 VOL. 56, NO. 3

FEATURES

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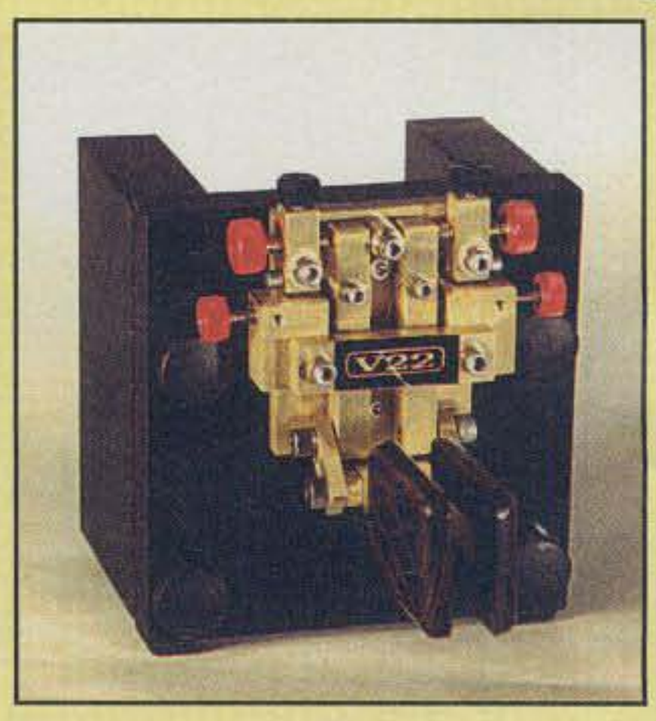

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DEPARTMENTS

ON THE COVER: Upgrade fever! The FCC's restructuring of amateur radio licensing has prompted thousands of hams to hit the books and even created a shortage of license manuals. On our cover, two Florida hams, Cecil Sipma, KA3BCR, of Sarasota (left), and Steven White, W4SNW, of Bradenton, study together. See extensive restructuring coverage in this issue. (Photo by Larry Mulvehill, WB2ZPI)

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

NEW!

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

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

APRS® (Automatic Packet/Position Reporting System)

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

FEATURES

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

ISO 9001
JQA-1205

Communications Equipment Division
Kenwood Corporation
ISO9001 Certification

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Amateur Radio Products Group

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AMATEUR RADIO PRODUCTS GROUP
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6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

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Ham Radio News

From The CQ Newsroom

New Question Pools—Fast Track

The National Council of Volunteer Examiner Coordinators' Question Pool Committee (QPC) was aiming for a February 1 release date of new question pools for the three written exam elements created by the FCC's restructuring decision, issued on December 30. The QPC is responsible for drafting the questions from which amateur exams are constructed. According to the ARRL, QPC Chairman Ray Adams, W4CPA, said a new Technician Class syllabus had already been approved by mid-January, and that the General and Extra Class pools would follow quickly. The new question pools will go into effect on April 15.

For more information on amateur license restructuring, see the extensive coverage in this issue of *CQ*. The FCC's complete decision is posted on our website at <www.cq-amateur-radio.com>.

Challenge to Restructuring Order

Three Extra Class hams from different parts of the country have filed a Petition for Partial Reconsideration of the FCC's decision on amateur license restructuring. Alan Wormser, N5LF, of Austin, Texas; Frederick Adsit, NY2V, of Syracuse, New York; and Michael Dinelli, N9BOR, of Skokie, Illinois, challenged four major components of the FCC Report and Order issued on December 30.

The group says the overall reduction in the number of questions for the various elements has reduced the technical standards required for each of the license classes, and specifically points to language suggesting that the FCC agrees with comments that "it is not necessary for licensees to understand electronics and other technical subjects in order to properly operate commercially-manufactured equipment"; that the decision failed to address the issue of candidates repeating failed exams at the same test session; that the reduction of the 20 wpm Extra code requirement is unjustified; and that eliminating the Tech Plus license from the FCC database will make enforcement more difficult when there is a question of whether a Technician Class ham has HF operating privileges. The text of the petition is on N5LF's website at <http://www.qsl.net/n5lf>. The closing date for comments supporting or opposing the petition was February 16.

ARRL Asks FCC to Reconsider PRB-1 Petition

The ARRL has asked the FCC to reconsider its denial of an earlier League petition to extend the protections of federal pre-emption to hams living where antennas are restricted by deeds or other private agreements. In 1996 the ARRL had asked the FCC to clarify and expand on its 1985 ruling, known as PRB-1, that local governments must "reasonably accommodate" amateur antennas and that any restrictions must be the "minimum practicable." In November 1999 the Commission denied the League's request, saying that private contracts are "outside the reach" of its authority.

In late December, according to the ARRL, it filed a Petition for Reconsideration, pointing out that the FCC has authority to overrule private agreements that restrict TV and satellite receiving antennas, and claiming that the same principle should apply to amateur radio as well. The ARRL also asked the FCC to act on "prohibitive and excessive fees" that some municipalities charge for permits and fees.

ARRL Buys *Communications Quarterly*

The ARRL has purchased *Communications Quarterly* magazine from CQ Communications, Inc., publishers of this magazine. *Communications Quarterly* was published for nine years by CQ as "the philosophical successor of *Ham Radio* magazine," which *CQ* purchased in 1990. It will be merged into the League's technical magazine, *QEX*, starting with the March/April issue.

In a statement, ARRL Executive Vice President Dave Sumner, K1ZZ, said, "merging *Communications Quarterly* into *QEX* provides a rare synergistic opportunity to turn two good publications into one that's even better." *CQ* Publisher Dick Ross, K2MGA, said neither publication by itself had proven to be financially viable, but that the combined magazine could be. "The deal will enable the ARRL to reach the critical mass it needs," he said. "It becomes a win-win situation."

Spread Spectrum Inventor Dies at 86

Austrian-born Hedwig Kiesler, who shared the original 1942 patent for what became spread-spectrum communications, died in January at age 86. The system was designed as a way to reduce the risk of interception or jamming, but was not put to immediate use. Today, spread-spectrum is commonly used in military communications, wireless computer networks, and cordless phones. Amateur spread-spectrum is permitted by recently relaxed FCC rules and may become a significant amateur mode in the future.

Hedwig Kiesler, by the way, was better known as an actress than an inventor, and was known to millions by her screen name, Hedy Lamarr.

Amazon Queen 2000 Expedition

Call it a floating DXpedition. And any "alligators" associated with it (all mouth, no ears) are likely to be real! The Amazon Queen 2000 ham radio expedition was set to get underway in mid-January, according to the *ARRL Letter* and organizer Phil Gonzales, HK3SA. The four to five month trip aboard the 47 foot *Amazon Queen* is due to travel nearly 3000 miles down the Amazon River, from Iquitos, Peru to the Atlantic Ocean.

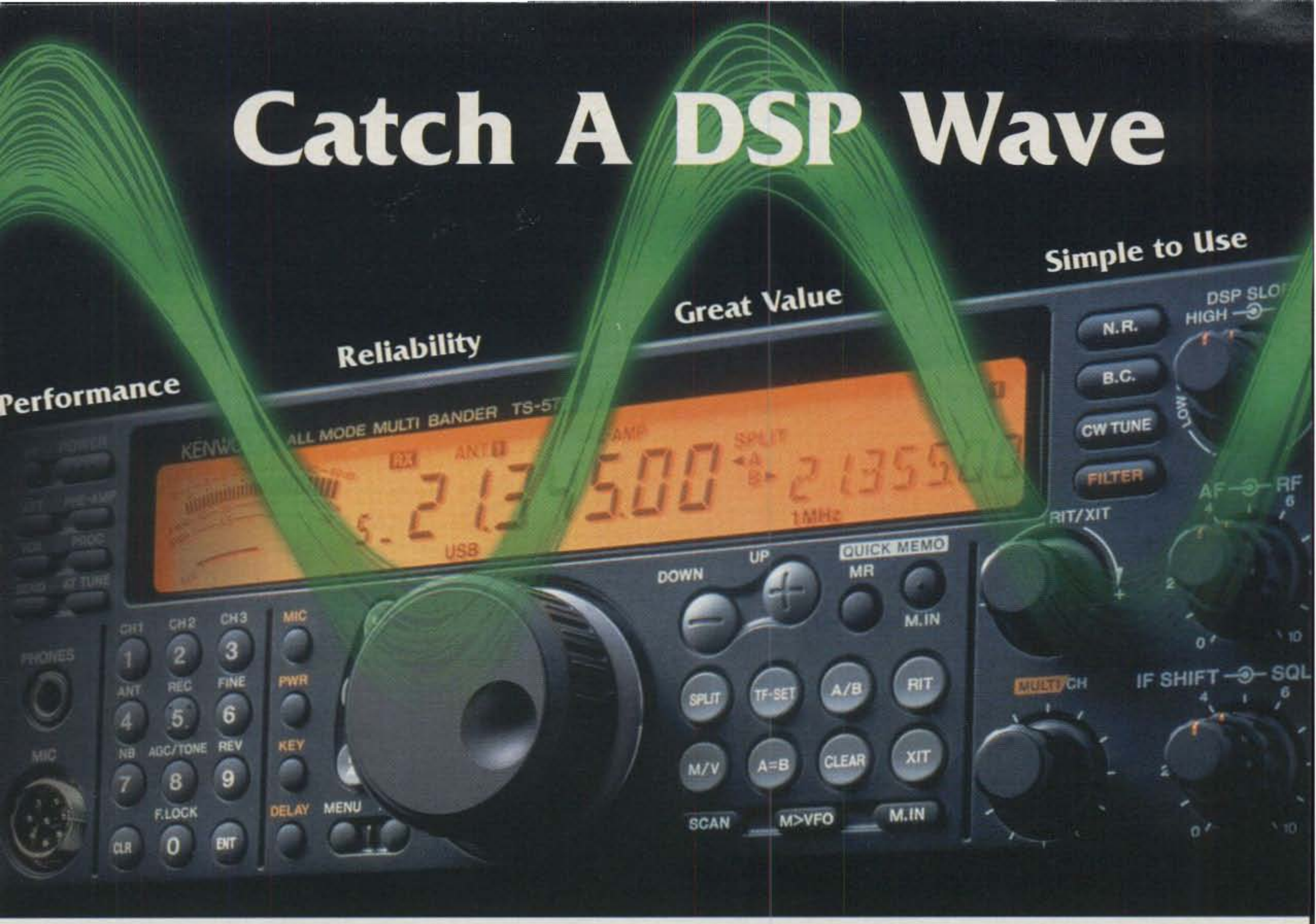
The crew's primary operating frequency will be 14.347 MHz, with others including 28.400, 21.287, and 7.0935 MHz. (*Note: The 40 meter frequency is outside the US phone band.*) Six meter operations were also being considered. For up-to-date details, including the callsign of the DXpedition, visit the *Amazon Queen* website at <http://www.amazonqueen2000.com>. Schools interested in setting up contacts with the expedition should contact Cliff Clark, KB9KSL, e-mail: <kb9ksl@midwest.net>, phone 618-648-2499.

Ham Licenses Turn Blue

And finally... the *ARRL Letter* reports that the familiar beige paper on which our licenses are printed is being replaced with *blue* paper. And there's no connection with restructuring or Y2K or anything else. FCC officials said the only policy regarding license stock is that "safety paper" be used, so a license can easily be identified as an official FCC document. "When the last shipment was received (the paper was) blue," said a spokesperson.

Guess that gives "real hams" one more identifying mark—a 13- or 20-wpm code test *and* a beige license.

Catch A DSP Wave



TS-570D(G) HF TRANSCEIVER/TS-570S(G) HF + 6M TRANSCEIVER

Kenwood has not been standing still since the introduction of the TS-570D/S HF Transceiver last year. Now you can command even more of Kenwood's advanced DSP technology with the G model.

The **DSP** filters and extracts signals with digital technology that is unmatchable with standard analog circuits. It provides **CD-class transmit and receive audio quality** that can be shaped to your needs, and two powerful noise reduction systems: **Line Enhancer Method** for SSB/AM modes, and **Speech Processing by Auto Correlation** (SPAC) for CW mode. DSP also enables the **CW-Auto Tune** feature that automatically zero-beats CW signals.

The **Extensive Memory Functions** provide a bank of 100 memory positions split into 90 standard channels for general operation and 10 for programmable VFO, programmable scan and long-term memory. Memory contents can be scrolled, copied or locked out. In addition there are **5 quick memories** for storing frequencies and modes on the fly, perfect for the busy DX contester.

The powerful **Menu System** incorporates **46 menu features** and an **on-line guide** for instant reference. The **large amber backlit LCD display** provides 4 light levels for clear readability under any lighting conditions.

The TS-570D/S has no shortcomings in the construction and performance area. The **continuous-duty 100 watt transmitter** incorporates a large heavy-duty heat sink with integrated cooling fan for non-stop operation even under extreme environmental conditions. The **wide-band receiver** is rock-stable from 500 kHz through 30 MHz with **dual pre-amps** and **dual bandpass filters** for exceptional selectivity and sensitivity.

With the features and performance of a high-end radio integrated into an affordable mobile-size package, the TS-570D/S is the perfect choice for the field or to build a full station around at home.

- ***FREE* operating manual via FTP site**
  ftp://ftp.kenwood.net
- Beat cancel
- 2 position antenna switch
- CW auto tune adjust (a world's first)
- Channel scan, program band scan, memory scan with channel lock-out and group channel scan, all with TO (time operated) or CO (carrier operated) resume modes
- Compact 10-5/8 inch by 3-3/4 inch front panel size for any travel or installation requirement
- Preset auto antenna tuner with 18 sub-bands
- Variable electronic keyer (0 and 100 wpm)
- Packet and FSK features
- RCP-2 software for PC-based display and memory configurations available via the Internet
- Full functionality on 6M (TS-570S) including DSP, 100 watts output and preset Auto Antenna Tuner

TS-570D/S (G) new features

■ TX sound quality monitor with 9-step monitor volume for absolute control over voice quality ■ NR1 (SSB) is operator controllable in 9-step increments, or automatically tracks input signal strength ■ New CW DSP Filters (80 Hz, 150 Hz and 500 Hz) give you a total of 11 user-selectable filters ■ NR1 and NR2 settings can now re-configure automatically when changing mode groups (SSB/AM/FM to CW/FSK) ■ Manual weight feature (with built-in electronic keyer) for adjusting the relative length of dots and dashes in 16 steps between 1:2.5 and 1:4.0 ■ Equalize receive signals, and use different settings for both TX and RX ■ "One-touch" DSP filter wide mode allows 'resurfacing' to check the band conditions when operating in narrow mode ■ Dual selectable Beat Cancel (BC) works against intermittent beat interference (except in CW mode) ■ CW auto tune mode links only with the RIT frequency without changing the transmit frequency.

Advance Technology Upgrade is available in new production models and for pre-existing TS-570D/S; contact you dealer for details.

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Zero Bias

BY RICH MOSESON, W2VU

An Editorial

Restructuring: Déjà Vu All Over Again

The FCC's restructuring decision, to which we're devoting nearly a dozen pages in this issue, brings the ham radio licensing structure nearly full circle to where it was 50 years ago. (see "Washington Readout" on page 13 for a comprehensive review of the ruling and "A Restructuring User's Guide on page 22 for tips on upgrading for each license class). It doesn't take us all the way back to the beginning of amateur licensing, because there were several earlier changes, but it does take us very close to where it stood at the mid-century mark. As Yogi Berra supposedly said, "It's déjà vu all over again."

The amateur licensing system is in a constant state of evolution, and some of the "radical changes" made last December by the FCC may seem quite familiar to old-timers. A half century ago, in 1950, there were three classes of amateur license—Class A, Class B, and Class C. Class A hams had certain exclusive frequency privileges, as do today's Extras. Classes B and C carried fewer, but identical, privileges (similar to today's Generals), with the only difference being Class C hams lived too far from a major city to be able to take their exam before an FCC examiner.

Bill Orr, W6SAI, writing in the 50th anniversary issue of *CQ* in 1995, described the FCC restructuring of amateur licensing in 1951, renaming Class A, B, and C as Advanced, General, and Conditional, respectively, and imposing a moratorium on issuing new Advanced Class licenses (Why does this sound familiar?). Exclusive Class A/Advanced subbands were eliminated. At the same time, three new license classes were created—Amateur Extra, with no additional operating privileges; Technician, with all privileges above 220 MHz; and Novice, initially a one-year non-renewable license for newcomers that offered code privileges on 80 and 11 meters (which was then a ham band), and voice privileges on 2 meters. Letters to the editors of *CQ* and *QST* bemoaned the lowering of standards (Novices and Technicians only had to learn code at 5 words per minute) and predicted the imminent demise of ham radio. Looking back with 20/20 hindsight, we know that it didn't work out that way.

Ongoing dissatisfaction with this new license structure and slow ham radio growth in the mid-1960s led the FCC, in 1967, to restructure ham radio yet again, this time with its infamous "incentive licensing" decision. Separate subbands were created on the HF bands for Extra Class and Advanced Class hams, resulting in a huge loss of frequency privileges for tens of thousands of Generals, many of whom have never forgiven the FCC and still hold the ARRL accountable. The decision also extended the term of the Novice license to two years and revoked Novice voice privileges on 2 meters.

A decade later it was time to tinker with the system again, as Joe Lynch, N6CL, wrote in *CQ*'s golden anniversary special. In 1976, after proposing a code-free Communicator Class license but meeting with massive resistance among hams, the FCC gave Novices and Technicians extensive new privileges, including giving Technicians all Novice Class privileges. In addition, Novices were allowed to increase their maximum power from 75 to 250 watts and were permitted to use VFOs instead of crystals for frequency control. The Novice license was also made renewable, again prompting letters about lowered standards and the coming demise of ham radio. Actual result: A burst of growth that sustained the hobby for the next ten years.

By the mid-1980s, however, growth had slowed again, and in 1987 the FCC gave us "Novice Enhancement" (voice privileges for Novices on 10 meters, 222 MHz, and 1270 MHz) again to the chorus of wailing from the prophets of doom. At the same time, recognizing that Technicians were not given General Class privileges, the FCC split the Element 3 written exam into two parts, 3(A) and 3(B), with Techs required only to pass 3(A).

Two years later, amid growing pressure to create a code-free ham license, the ARRL proposed replacing both the Novice and Technician licenses with a new, no-code Communicator Class license (a name the FCC first came up with in 1976). The Commission decided instead simply to drop the code requirement for the Tech license, a change that took effect in 1991, again to the very loud protests of the doomsayers who were absolutely certain that the no-code license would kill amateur radio. Result: The number of hams in 1997 was double that of 1977.

Back Where We Started

Well, it's about 10 years later again, and here we are again, actually very close to where we started a half century ago. But while the license structure is simplified, the details are confusing. The FCC's Report and Order, while unusually well-written for a government document, was very long, complex, and difficult to fully comprehend on the first reading. In fact, we made an error in this space last month regarding the elements for which you'll have credit after April 15th if you currently hold a Tech or Tech-Plus Class license. This was because the decision was released on the last possible day that we could hold off sending the February issue to the printer, and we basically had time to read it through only once before putting the information on the page. You'll find the correct information and better advice in W5YI's "Washington Readout" column and in my article, "A Restructuring User's Guide," elsewhere in this issue.

The Impact of Restructuring

As details of the FCC's decision began to spread through the ham world (and I'm pleased to note that *CQ* was the first to get the information out), the initial response tended to fall into one of two categories. *One:* The whiners on the internet started moaning that the end was nigh, that ham radio would soon be given over to the evil CBers, and that they may as well sell all their equipment while it still had some value (see 1951, 1967, 1976, 1989, and 1991). *Two:* Hams who prefer to do their talking on the radio instead of the internet started buying up license manuals, intent on learning the material they'd need to know in order to upgrade—and preferably to have all the puzzle pieces in hand before April 15th so they could walk into a test session and get their upgrade immediately, based on element credit for exams already passed.

Do the math!

2:1
Bandwidth (kHz)

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

6 10 12 15 17 20 30 40

Meter Vertical Antenna

Rig+Amplifier+Tuner+R8=Performance

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

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

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

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

The R8 = operating confidence, versatility and fun.

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

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

R8

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In the first week after the FCC's announcement, the ARRL reported selling 1400 General Class license manuals! In one week! The ARRL isn't the only publisher of license manuals either, so you can easily double that number. And it didn't stop after the first week. People I talked to on the air and at club meetings were overwhelmingly positive and enthusiatic. One gentleman I spoke to on 2 meters has been a General since 1959 (40 years!) and he's all excited about upgrading to Extra.

So who is more likely to be right in the long run? The doomsayers or the folks who are running out and buying license manuals? Will "dumbing down" the hobby by reducing the 13- and 20-wpm code requirements to 5 wpm kill ham radio as some are predicting? Well, since we all know everything was much better, and much tougher, in the old days, let's go waaaay back—as Hans Brakob, KØHB, did about a year ago—to the days when "real hams" used spark, not CW. Hans discovered that the 1912 "Radio Laws of the United States" required applicants for the "Amateur first grade" license, with all privileges, to be "*able to transmit and receive in Continental Morse at ... (a) speed of at least five words per minute...*" That's right. Not 20, not 13, not even 10—5 wpm for a 1912 "Extra." It really is too bad we've "dumbed down" the hobby so much since then.

To the doomsayers, I offer this advice: The decision has been made. The time to complain is past. Now you have a choice: Do you accept it gracefully and offer a welcoming hand to the many hams who will be upgrading and will need to learn the conventions of operating on HF? Or do you get "20 WPM Extra" tattooed on your forehead and refuse to talk to anyone who doesn't have a tattoo to match?

The folks who are studying all those license manuals don't need my advice. They already know what they want to do, and they are taking the right steps to do it. They are ham radio's future. To them, I offer encouragement and this historical note: If *I* could pass my Extra exam, I'll bet *you* can, too!

Staff Notes

We are pleased to welcome Carl Smith, N4AA, as our permanent DX columnist. Last month Carl filled in on virtually no notice after the untimely passing of longtime *CQ* DX Editor Chod Harris, VP2ML/WB2CHO. Both Carl and we were happy with the results, and we've all decided to make the arrangement permanent.

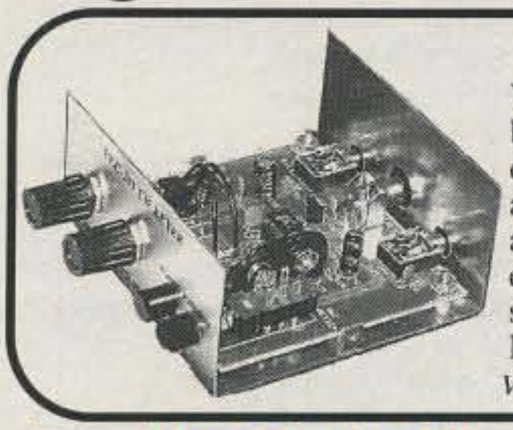
This month features the first installment of our quarterly "Computers and Internet" column, by Don Rotolo, N2IRZ. We're also introducing another new column, "Magic in the Sky," by Jeff Reinhardt, AA6JR. Jeff's goal will be to encourage you to look at ham radio from a fresh perspective. Plus, CO2KK had some computer problems, so his antennas column didn't make it in time for our deadline. Don't worry; it will be back.

Finally, you may have heard by now that our parent company, CQ Communications, Inc., has sold our technical journal, *Communications Quarterly*, to the ARRL, which is merging it with its own technical magazine, *QEX*. We will try to fill the void left by *Comm Quart's* departure by adding even more technical articles, and more articles about cutting-edge technology, to our mix here in *CQ*. We invite your submissions.

In fact, we invite you to the cutting edge this month with Bob Shrader, W6BNB, as he takes a look at the return of the vacuum tube—in ultra-miniature form and with no heater required. Check out Bob's article on "Nano Tubes," along with all of the other great articles you'll find in these pages this month and every month. 73, Rich, W2VU

VECTRONICS® kits

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



Full featured CW Keyer Kit, $24.95!

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

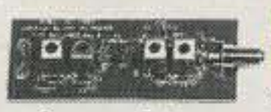
VEC-201K shown in optional case (vinyl cover top not shown), VEC-201KC, $14.95

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

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

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

20/30/40/80 Meter Receiver Kits give high performance! Covers entire band or tailor to cover desired portion. Copy CW/SSB/AM. NE602/ 612 mixer-oscillator, LM386 high gain audio amplifier. 1¾x4¾x 5¼ in. *Moderate skill level.* Order **VEC-1120K** (20 Meters),**VEC-1130K**(30 Meters),**VEC-1140K** (40 Meters), **VEC-1180K** (80 Meters), **$29.95 ea.**



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

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

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

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

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

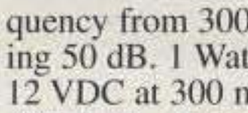
Shortwave Receiver Kit lets you listen to the world! Covers 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15 and 13 Meter bands. Explore AM, SSB, CW, WWV, RTTY and Packet signals. Vernier reduction drive, smooth regeneration control, RF stage. *Includes all metal cabinet.* 2 earphone jacks. Use 9V battery.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

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

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

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

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



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

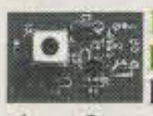
AM Radio Transmitter Kit lets you set up your own AM station and broadcast crystal clear programming from your studio with *you* as the disc jockey or talk show host. Play music from CD player, tape deck or other source. Choose clear frequency from 530-1750 KHz. Standard line level or microphone input.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

Super CW filter/amplifier Kit has powerful 1 watt audio amplifier to drive speaker. 8 poles active IC filtering uses cascaded low-Q stages. 3 bandwidths: 80,110, 180 Hz. Center frequency: 750 Hz. Up to 15 dB. Use 9-18VDC, 300 mA max. 1¾x4 x3½ in. *Simple skill level.* Order **VEC-821K, $29.95.**

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

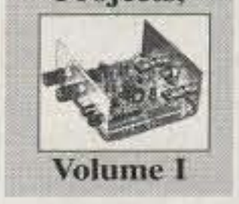
Super SSB Audio Filter Kit improves readability with 8 poles, optimizes audio bandwidth, reduces SSB splatter, low, hi-pitched interference, hiss, static crashes, background noise. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-830K, $19.95.**

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



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

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



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

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VECTRONICS, 300 Industrial Park Road, Starkville, MS 39759 USA • ***Add $6 s/h***

CIRCLE 121 ON READER SERVICE CARD

Announcements

Call for Papers – The Southeastern VHF Society will host its fourth annual conference on April 14–15 at the Atlanta Marriott Northwest, Marietta, Georgia. They are calling for presentations to be made at the conference and papers to be published in the conference proceedings (submissions are due by March 3). Contact program chairman Bob Lear, K4SZ, P.O. Box 1269, Dahlonega, GA 30533 (706-864-6229; e-mail: <k4sz@arrl.net>).

Big Ride Across America – Ham volunteer coordinators are needed for the American Lung Association's Big Ride Across America, a 3500 mile bicycle ride from Seattle to Washington, DC, June 19 to August 5. You can volunteer for the entire ride or choose one or more parts of the country. Detailed info can be found on the web at <www.bigride.com>. To volunteer or obtain more info about volunteer responsibilities, contact Dick Anderson, KE7A, e-mail: <ke7a@arrl.net> or toll free 1-877-752-3868.

• The following Special Event stations are scheduled for March:

WX2PHI, from Mount Holly, New Jersey, to promote the beginning of Severe WX Awareness Week in PA; the National Weather Service; 1500–2100 March 19 on 7.273, 14.273, 28.373. Certificate: John Holmes, WX3TAZ, WX2PHI Special Event 126A, Worman Rd., Bath, PA 18014-9099.

W4BKM, from 18th annual Cherry Blossom Festival, Macon, Georgia; Macon ARC; March 18 on phone 7.235, 14.240, 21.335. For certificate send QSL and 9 × 12 SASE to Macon ARC, P.O. Box 4862, Macon, GA 31208.

• The following hamfests are slated for March:

Mar. 4, **Shriners of Kerbela ARS Hamfest**, Kerbela Temple, **Knoxville, Tennessee**. Contact Paul Baird, K3PB, 865-986-9562. Talk-in 144.83/145.43 or 146.52 simplex.

Mar. 4, **Splitrock ARA North Jersey Hamfest 2000**, PAL Building, **Parsippany, New Jersey**. Contact Mark Turner, 1-888-511-SARA, e-mail: <kc2ki@qsl.net>, web: <http://www.ham.hsix.com/sara>.

Mar. 4–5, **Gulf Coast ARC Hamfest Under the Sun**, Fred K. Marchman Technical Education Center, **New Port Richey, Florida**. Contact Rick, 727-863-1457; e-mail: <richar@gte.net>; web: <http://home1.gte.net/richar/gcarc.htm>. Talk-in 146.670. (Exams 9 AM)

Mar. 5, **Burnaby ARC 14th Annual Fleamarket**, New Westminster Armories, **New Westminster, BC, Canada**. Contact Jim, 1-604-946-9801 (7–9 PM PT). Talk-in VE7RBY 145.35 (–) or 442.85.

Mar. 11, **Scottsdale ARC Hamfest**, Scottsdale Community College, **Scottsdale, Arizona**. Contact Roger Cahoon, KB7ZWI, phone 480-948-1824, fax 602-943-7651, e-mail: <wmgraceco@msn.com>. Talk-in 147.18. (Exams)

Mar. 11, **Hambash 2000**, Ararat Shrine, **Kansas City, Missouri**. Contact Roger Bessmer, KBØIIG, 7817 NW Pleasant Ford, Weatherby Lake, MO 64152. (Exams by advance registration only; send completed Form 610 to Exam Registration, P.O. Box 12757, N. Kansas City, MO 64117; fax 816-842-0800.)

Mar. 11, **HamCom 2000**, Tringali Community Center, **East Englewood, Florida**. Contact George Shreve, KA4JKY, 941-697-3445 (table reservations); <www.flnet.com/~crosby/ears/index.html>. Talk-in 146.700–. (Exams 11 AM, more info Jack Sproat, W4JS, 941-475-1929)

Mar. 11, **Red River Radio Amateurs Hamfest & Computer Fair**, Red RIver Valley Fairgrounds, **West Fargo, North Dakota**. Contact Mark Kerkvliet, KGØFR, 701-282-4716; <http://www.rra.org>. Talk-in 146.76–. (Exams)

Mar. 11, **Yuba Sutter ARC Swapmeet**, American Legion Post 807, **Linda, California**. Contact Ron, W6KJ, 530-674-8533.

Mar. 12, **Waukesha Hamfest & Computer Expo**, Waukesha County Expo Center, **Waukesha, Wisconsin**. For info call 414-835-7035. Talk-in 146.820 PL 127.3. (Exams)

Mar. 12, **Springfest Y2K**, York County Area Vocational-Technical School, **York, Pennsylvania**. Contact Richard Goodman, WA3USG, 717-697-2490; e-mail: <yorkfest@aol.com>; web: <http://members.aol.com/yorkfest>. (Exams info and preregistration Virginia Moore, N3LZS, 717-252-1694)

Mar. 12, **Mt. Tom ARA Amateur Radio & Electronics Fleamarket**, Our Lady of the Blessed Sacrament Parish Center, **Westfield, Massachusetts**. Contact Cindy Loiero, K1ISS, 413-568-1175, e-mail: <kissn1fi@javanet.com>. Talk-in 146.94. (Exams 10 AM)

Mar. 18, **Michigan Crossroads Hamfest**, Marshall High School, Marshall, Michigan. Contact Wes Chaney, N8BDM, 616-979-3433.

Mar. 18, **Cherryville Hamfest**, North Hunterdon High School, **Clinton, New Jersey**. Contact Cherryville Repeater Assn., 908-788-4080; <www.qsl.net/w2cra>. (Exams, preregistration preferred, contact Marty Grozinski, W2CG, 908-788-2644 before 10 PM)

Mar. 18, **Eastern Connecticut ARA Fleamarket**, Pomfret Community School, **Pomfret, Connecticut**. Contact Paul, KE1LI, 860-928-2456; e-mail: <paulrollinson@worldnet.att. net>. (Exams, must preregister)

Mar. 18, **Charleston Area Hamfest & Computer Show**, Coonskin Armory, **Charleston, West Virginia**. Contact Charleston Area Hamfest, P.O. Box 916, St. Albans, WV 25177; e-mail: <crwhamfest@juno.com>. Talk-in W8CHF 145.35 146.52 simplex. (Exams 12:30)

Mar. 18–19, **Midland ARC St. Patrick's Day Hamfest**, Midland County Exhibit Building, **Midland, Texas**. Contact Larry Nix, N5TQU, e-mail: <oilman@lx.net>; Midland ARC, P.O. Box 4401, Midland, TX 79704; <http://www.w5qgg.org>. (Exams 1 PM Sat.)

Mar. 19, **Toledo Mobile RA Hamfest/ Computer Fair**, Lucas County Recreation Center, **Maumee, Ohio**. Contact Paul Hanslik, N8XDB, TMRA, P.O. Box 273, Toledo, OH 43697-0273 (419-243-3836).

Mar. 19, **Tri-County ARC Hamfest Y2K**, Jefferson County Fairgrounds Activity Center, **Jefferson, Wisconsin**. Contact TCARC, phone 920-563-8740 evenings; e-mail: <tricountyarc@globaldialog.com>. Talk-in 145.49. (Exams)

Mar. 19, **Sterling-Rock Falls ARS 40th Hamfest**, Sterling High School Fieldhouse, **Sterling, Illinois**. Contact Lloyd Sherman, KB9APW, 815-336-2434; e-mail: <lsherman@essex1.com>. Talk-in 146.25, 146.85 W9MEP repeater.

Mar. 25, **Plateau ARA/ Black Diamond ARC Hamfest**, Raleigh County Armory Civic Center, **Beckley, West Virginia**. Contact James Martin, 304-465-1428.

Mar. 25, **Columbus ARC Hamfest**, Bartholomew County 4H Fairgrounds Community Building, south of **Columbus, Indiana**. Contact Marion Winterberg, WD9HTN, 812-342-4670; e-mail: <carc_in@yahoo.com>. Talk-in 146.790/146.190.

Mar. 25, **Middle Tennessee ARS Hamfest,** First United Methodist Church, **Tullahoma, Tennessee**. Contact Larry Marshall, WB4NCW, 931-455-0070; e-mail: <lmarsh@edge.net>; <http://www.qsl.net/mtars>. Talk-in 146.70 (–). (Exams 9 AM)

Mar. 25–26, **Greater Baltimore Hamboree & Computerfest**, Maryland State Fairgrounds, **Timonium, Maryland**. Call 410-426-3378 (outside maryland 800-426-3378); <www.gbhc.org>.

Mar. 26, **Lake County ARA Hamfest,** Madison High School, **Madison, Ohio**. Contact Len Sechrist, WS8O, phone 440-255-0112; e-mail: <lennys@ameritech.net>.

Mar. 26, **Framingham Fleamarket/VEC Session**, Framingham High School, **Framingham, Massachusetts**. Contact Bev Lees, N1LOO, 508-626-2012; exam info Ed Weiss, W1NXC, 508-881-2301.

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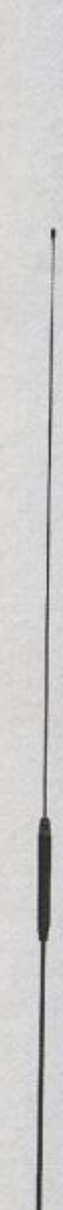
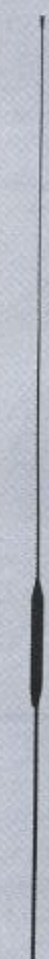
*NEW MH-209SMA • Dual-band 146/446MHz HT Antenna w/SMA Conn
Gain & Wave: 0 1/4 wave • Length: 3" Flexible rubber • Conn: Male SMA • Max Pwr: 5W

NEW SMA-503 • Dual-band 146/446MHz HT Antenna w/SMA Conn
Length: 8.75" • Conn: Male SMA • Max Pwr: 10W

*NEW MH-510 • Tri-band 52/146/446MHz HT Antenna w/SMA Conn
Gain: 0/0/ 3.2dBi • Length: 20.75" • Conn: Male SMA • Max Pwr: 10W

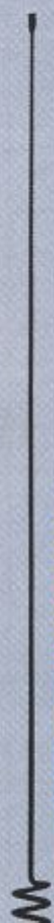


SB-15 • Tri-band 52/146/446MHz w/fold-over
Gain & Wave: 52MHz 0dBi 1/4 wave • 146MHz 4.5 dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W



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

NEW BLACK COLOR



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

NEW BLACK COLOR

THEFT Z750 • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: Gold-plated PL-259 • Max Pwr: 200W

THEFT Z780 • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
146MHz 6/8 wave 4.5dBi • 446MHz 5/8 wave x 3 7.2dBi • Length: 62" • Conn: Gold-plated PL-259 • Max Pwr: 150W

B-20 B-20NMO • Dual-band 146/446MHz w/fold-over • 6/446MHz cellular look-a-like •
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.0dBi 5/8 wave x 2 • Length: 30" •
Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W

B-10 B-10NMO • Dual-band 146/446MHz w/fold-over • 6/446MHz cellular look-a-like •
Gain & Wave: 146MHz 0dBi 1/4 wave • 446MHz 2.15dBi 1/2 wave • Length: 12" •
Conn: B-10 PL-259/B-10NMO NMO • Max Pwr: 50W

NEW CA-UHV • HF/6M/2M/70cm Mobile Antenna40/*20/*17/15/10/6/2M/70cm 40M Thru 70cm!
Gain & Wave: HF-6M 1/4 wave • 2M 3.4dBi 5/8 wave • 70cm 2.15dBi 1/2 wave • VSWR: HF 1.6:1 or less • 6M-70cm 1.5:1 or less • Length: 6'2" •
Max Pwr: HF 120W SSB • 6M 200W SSB/100W FM • 2M/70cm 100W FM • *L-14 Optional 20M coil • *L-18 Optional 17M coil

*NEW MSG-1000C • Dual-band 146/446MHz w/spring whip and fold-over
Gain & Wave: 146MHz 2.15dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: PL-259 • Max Pwr: 120W

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Washington Readout

Regulatory News In The World Of Amateur Radio

BY FREDERICK O. MAIA, W5YI

The New Face of Ham Radio

FCC Adopts Three License Classes, One 5-wpm Code Speed

"Given the changes that have occurred in communications in the last fifty years, we believe that reducing the emphasis on telegraphy proficiency as a licensing requirement will allow the amateur service to, as it has in the past, attract technically inclined persons, particularly the youth of our country, and encourage them to learn and to prepare themselves in the areas where the United States needs expertise."

—From FCC Report & Order, WT Docket No. 98-143, Released Dec. 30, 1999

It seems that most amateurs like how the Federal Communications Commission has reshaped amateur radio for the future. However, there are those who do not . . . especially amateurs who have already passed the higher speed telegraphy exams and equate reducing Morse code exam speeds to a lowering of standards. But one thing is for sure: Amateur radio's historic linking of Morse proficiency to license class levels is no more.

The mad scramble is now on as most radio amateurs find that they will be able to upgrade their amateur radio license to include additional HF privileges without taking the high-speed 13 and 20 words-per-minute Morse code exams, which are being discontinued. Reinforcing the belief that manual radiotelegraphy skills are indeed a barrier to the fuller use of amateur radio—and neither appropriate for or desired by most of today's radio amateurs—hams everywhere are scooping up study manuals needed to pass the higher class licenses.

The euphoria among amateurs is due to the FCC's decision to drastically simplify the U.S. Amateur Service license structure, streamline the license examination process, and reduce the emphasis on Morse code testing. The Commission's long-awaited Report and Order on Amateur Service restructuring was released on the last government working day of the 20th century and sets the tone for amateur radio in the new millennium. Ham radio in the future will be quite different from what it was in the 1900s, when advancing up the license ladder was essentially based on passing progressively higher speed telegraphy examinations.

Background

The FCC's intention to restructure the Amateur Service has its roots in three Petitions for Rulemaking filed by the American Radio Relay League in 1996 and 1997.

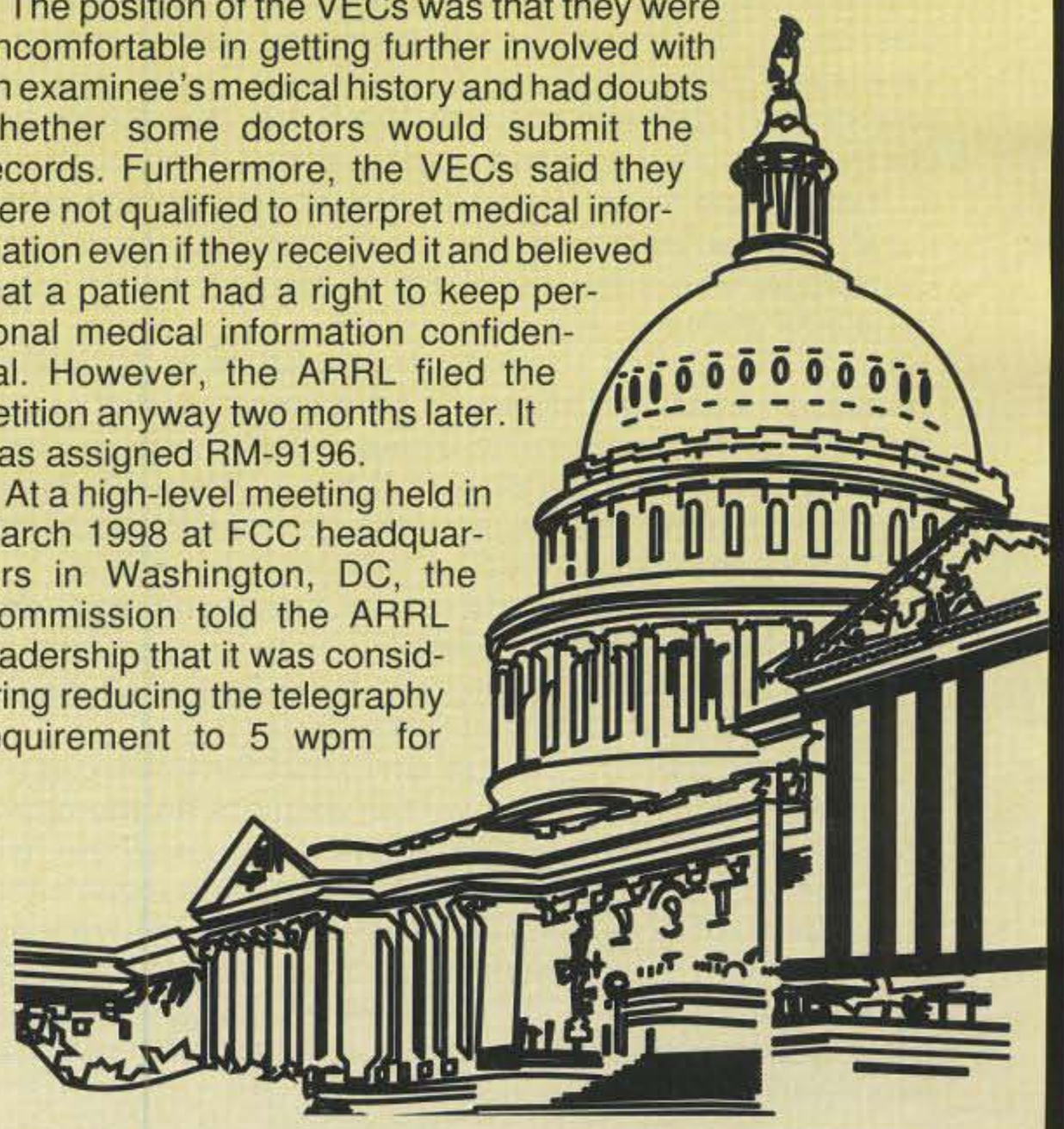
In RM-9148 the ARRL requested additional opportunities for Advanced Class VEs to prepare and administer examinations. In RM-9150 the League proposed to create a private-sector complaint procedure for resolving cases of malicious interference in the Amateur Service. In RM-9196 filed September 23, 1997, the ARRL wanted changes in the Morse code waiver procedures that led to higher speed telegraphy examination credit for the handicapped.

Specifically, the League proposed a requirement that examinees with doctor-certified disabilities be required to attempt the CW test—with any necessary accommodations—before being granted an exam waiver based on a physician's certification. In addition, the ARRL wanted a rule amendment that would require Volunteer Examiner Coordinators (VECs) to obtain from the certifying physician and review medical history pertinent to an applicant's handicap. The medical information would be required to be in the VEC's files before the license upgrade application could be forwarded to the FCC for processing. This last petition is undoubtedly what kicked off the FCC proceeding aimed at taking a hard look at Amateur Service licensing requirements. Here is how it all came about.

It really started in 1997, when the ARRL Executive Committee adopted a position precluding Volunteer Examiners (VEs) who had not passed a regular Morse code exam from administering code examinations to others. The question of code waivers was brought up at the National Conference of VECs (NCVEC) annual conference in July 1997, since the League wanted new FCC regulations tightening up the handling of the Physician's Certification of Disability which led to a waiver of the higher speed code exams. Essentially, the ARRL wanted the examining community to obtain from doctors and review additional medical records of amateurs who apply for code waivers.

The position of the VECs was that they were uncomfortable in getting further involved with an examinee's medical history and had doubts whether some doctors would submit the records. Furthermore, the VECs said they were not qualified to interpret medical information even if they received it and believed that a patient had a right to keep personal medical information confidential. However, the ARRL filed the petition anyway two months later. It was assigned RM-9196.

At a high-level meeting held in March 1998 at FCC headquarters in Washington, DC, the Commission told the ARRL leadership that it was considering reducing the telegraphy requirement to 5 wpm for



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

everyone as a way to eliminate the necessity to issue code waivers to anyone. ARRL President Rod Stafford, W6ROD, came away from that meeting believing that amateur radio was headed for a 5 wpm code speed.

Four months later, at the July 1998 mid-year Board meeting, the ARRL directors voted (during a late Saturday night session) to recommend restructuring of the Amateur Service–an item that was not on their agenda. Charts made earlier that morning discussed two possible plans, one with three license classes and another with four. Pointed out were factors such as a significant decrease in amateur population, license examinations, League members, and the belief that there was a "them and us" split in the amateur community. The Board analyzed a wide variety of options including both smaller and larger numbers of license classes, higher and lower qualification levels, and different privileges.

After lengthy discussion and debate, the majority of the Board decided to go with a simplified four-class plan. Their recommended new lineup would consist of four written examinations instead of the present five, and two Morse code examination elements (5 and 12 wpm) instead of the present three (5, 13, and 20 wpm). Twelve words per minute was selected as the highest speed, since this is the requirement for the top-of-the-line "harmonized" CEPT (European) international license.

ARRL President Stafford told the directors that the restructuring issue "...had to be settled that night." All of the directors were in favor of 5 wpm code for the General Class, but there was a wide difference of opinion, ranging all the way up to 15 wpm, as to what code speeds should be attached to the Advanced and Extra Classes. A majority agreement was finalized just before 11 PM. The vote was 9 to 6. It was also decided that the ARRL should submit its plan to the Commission for consideration before the FCC issued its own NPRM.

The Initial ARRL Restructuring Proposal

The structure proposed by the ARRL was to consist of four classes—A, B, C, and D—with privileges corresponding to the present Extra, Advanced, General, and Technician Class licenses respectively, but with the Extra, Advanced, and General telephony subbands increased by 50 kHz on 75 and 15 meters, and by 25 kHz on 40 meters, in accordance with the December 1996 Final Report of the WRC-99 Planning Committee. The frequency limits of all other bands would remain the same.

The ARRL wanted all amateurs now licensed as General, Technician Plus, and Novice to be automatically upgraded to Class C, equivalent to the General Class, without further examination. The expansion of the telephony sub-bands would result from "refarming" of the Novice CW bands that would no longer be required for their original purpose.

The third step would be known as Class B and would convey the privileges of the present Advanced license, and the final step in the ARRL plan would be known as Class A—equal to the present Amateur Extra Class.

The Board said that the examination for each class of license should consist of a written element on the operational and technical qualifications commensurate with the privileges to be earned and a Morse code examination at the speed of 12 wpm for Class A (Extra) or B (Advanced), and at 5 wpm for the Class C (General). Where the Morse code requirement was to be decreased, the ARRL wanted a corresponding increase in the difficulty of the written examination.

General Counsel Christopher D. Imlay, W3KD, was instructed to submit a letter to the FCC Commissioners proposing the new four-class A, B, C, and D licensing structure. It was hand-delivered to the FCC the following week, on July 22, 1998.

FCC Issues NPRM

The Commission elected to address the three petitions and the ARRL proposal as part of its 1998 Biennial Review of regulations which no longer serve the public interest. These reviews are required by the Communications Act and take place in every even-numbered year.

On August 10, 1998 the FCC released a Notice of Proposed Rulemaking which basically proposed the ARRL plan—that is, to reduce the number of license classes in the Amateur Service from six to four and to permit Advanced Class volunteer examiners (VEs) to administer General Class exams. The FCC also proposed eliminating Radio Amateur Civil Emergency Service (RACES) licenses because the emergency communications that routinely are transmitted by RACES stations can also be transmitted by all other stations.

Responding to the League's concerns, the Commission asked for ideas for improving their Amateur Service enforcement processes. Additionally, the FCC wanted the public to comment on any needed changes to the telegraphy and written examinations that must be passed to qualify for an amateur radio license.

The National Conference of VECs, the umbrella group which consists of all Volunteer Examiner Coordinator organizations, said it believed the Amateur Service should and could be streamlined even further. The NCVEC suggested three license classes and preferably no exam code-speed requirement at all. However, recognizing the requirement for a code exam in the international Radio Regulations, the NCVEC agreed that the absolute minimum examination speed of 5 wpm should be adopted. On the last government working day of the old millennium it was the NCVEC proposal that the Commission adopted— that is, three license classes and a maximum exam speed of 5 wpm. (*The majority of the 2200+ comments filed on the NPRM, including those filed by CQ, also proposed the three-license-class/one-code-test structure that the FCC adopted, but it was the NCVEC proposal that guided the FCC's decision.— ed.*)

The New Amateur Service Structure

The much-anticipated FCC restructuring of the Amateur Service was released on December 30, 1999. Effective April 15, 2000, applicants will only be able to be examined for three license classes: Technician, the VHF/UHF entry level; General, the HF entry level; and Extra, a technically-oriented senior license. The Technician Class continues as a "no code" ticket. No new Novice, Tech Plus, or Advanced Class licenses will be issued after April 15th.

After April 15th there will be only one Morse code examination speed at 5 wpm. It will be called simply Element 1, replacing the old Elements 1(A) the 5-wpm telegraphy exam; 1(B) 13 wpm; and 1(C) 20 wpm. The single 5 wpm code speed also, of course, means the demise of the controversial physician certification waivers by examinees who claim they are unable to pass a high-speed telegraphy exam due to a handicap.

All six classes will remain and will be active in the FCC's Amateur Service database. Current Novice and Advanced Class amateurs will be able to modify their licenses (that is, change their name, address, and callsigns) and renew

their tickets indefinitely. No one is being forced to upgrade his or her license, and no one loses any privileges if he or she doesn't.

The Commission also followed through on its proposal to renew Tech-Plus amateur licenses as Technician class, with indefinite credit for Morse code proficiency. The FCC elected not to increase the operating privileges of any class, a key component of the ARRL's restructuring proposal. The League had proposed a one-time across-the-board upgrading of all Novice and Tech Plus operators to the General class, but the FCC declined to go along. This means that all licensees —including Novice, Tech Plus, and Advanced Class operators—will retain their current operating privileges.

Current HF band segments remain unchanged as well. The NCVEC had also asked the FCC *not* to change the frequency bands authorized to each class, since this was not originally proposed and the amateur community had not been given an opportunity to comment on any realignment. Furthermore, the NCVEC felt that all amateurs upgrading should be required to take the written examination rather than being automatically upgraded. In addition, the FCC gave unprecedented freedom to the VECs in designing amateur exams.

The previously FCC-mandated ten written exam topics have been eliminated, and the VECs' Question Pool Committee (QPC) will now have a free rein to decide on the content of each the three written examinations. The new Technician Class multiple-choice written exam, now called Element 2, and General Class written exam, now Element 3, will each contain 35 multiple- choice questions. The Extra Class written exam, Element 4, will have 50 questions. The question-pool system remains intact, and each of the three remaining question pools is still required to contain at least ten times as many questions as appear on an examination.

There will be no automatic upgrades. Technicians licensed before March 21, 1987 retain exam credit for both the 5 wpm code and the new General Class Element 3. They are thus eligible for upgrade without further examination and are the only group of radio amateurs that achieves additional frequency privileges as a result of the Report and Order. They must, however, apply using an NCVEC Form 605 at a VE session after April 15th and pay the standard ($6.65) application fee to have their license updated to the General class.

These "Old Techs" must submit some sort of proof that they held a Technician license prior to 1987. This proof is usually a copy of an old license dated prior to March 21, 1987. The VECs are being held responsible for reviewing and approving this evidence. Some VECs (including the W5YI-VEC) are able to supply applicants with documentary evidence of their having held a Technician license prior to 1987. The FCC said VECs could use entries in the 1987 and earlier editions of the *Radio Amateur Callbook* to support their pre-1987 Technician Class status if they have confidence in their accuracy. (Call 1-800-669-9594 if you need assistance.)

Should You Upgrade Now?

Existing amateur radio study materials in the marketplace remain valid at least until the new rules become effective in April, and CSCE (Certification of Successful Completion of Examination) credit from these test exams may be used toward the three new licenses.

For example, current Advanced Class amateurs may pass the existing Element 4B (Extra written exam before April 15th and then (after paying the application fee) request an Extra Class license at a VE examination session held after April 15th without further examination. These applicants simply submit copies of their Advanced Class license and the CSCE Element 4B exam credit certificate to the VE team, which will authorize the Extra Class ticket.

Likewise, current Tech-Plus radio amateurs may pass the existing Element 3B before April 15, then use the CSCE to apply for General at a post-4/15 exam session. Current No-Code Techs may pass the existing Element 3B exam before April 15, then have one year to pass the 5 wpm code test for General. A General Class amateur could pass the current Elements 4A and 4B and then trade in the two CSCEs for an Extra Class ticket after April 15th.

Some General Class amateurs believe that since no new Advanced Class examinations will exist after April 15th, they need not take both Element 4A and 4B (Extra). This is incorrect. On that basis, it might be easier for General Class amateurs to wait until after April 15th when passing only one (50 question) Element 4 (Extra Class) written examination need be passed. (*One benefit to Generals in passing both theory elements before April 15 is that they will get an "instant upgrade" to Advanced, opening up the Advanced Class subbands to them immediately. — ed.*)

Effective April 15th Advanced Class radio amateurs are authorized to prepare and administer General Class examinations. Station licenses in the Radio Amateur Civil Emergency Service (RACES) were also eliminated as being unnecessary for amateurs to provide emergency service, but the RACES service itself will remain.

The new Part 97 rules also mention that club and military recreation station licenses must be modified or renewed through a Club Call Sign Administrator who will electronically submit the information to the FCC. The FCC issued a Public Notice on January 3, 2000 and will be approving groups after March 1st to become Club Call Sign Administrators. The new VECs application NCVEC Form 605 was designed to also be used by club and military recreation stations.

The FCC's restructuring document runs to some 70 pages. A copy of the entire Report and Order (FCC 99-412) is available at various Internet sites including the W5YI website at <http:// www.w5yi.org>, the *CQ* website at <http://www.cq-amateur-radio.com>, the ARRL website at <http://www.arrl.org/announce/regulatory/wt98-143ro. pdf> or from the FCC webpages at <http//www.fcc.gov/Daily_Releases/Daily_Business/1999/db991230/fcc99412.txt>.

The FCC's Thinking

The FCC gave its rationale for adopting the measures they did in the Report and Order (R&O). Here are some of the major points:

The Commission said, "The Amateur Service rules are designed to allow licensees in this service to provide emergency communications, advance radio technology, improve operator skills, enhance international goodwill, and expand the number of trained operators, technicians, and electronic experts."

The FCC said it believed " . . . these changes will:

"1. allow current Amateur Radio Service licensees to contribute more to the advancement of the radio art;

"2. reduce the administrative costs that we incur in regulating this service and streamline our licensing processes;

"3. eliminate unnecessary requirements that may discourage or limit individuals from becoming trained operators, technicians, and electronic experts; and

"4. promote efficient use of spectrum allocated to the Amateur Radio Service."

Number of License Classes

The last major restructuring of the Amateur Radio Service rules took place in 1989 (PR Docket No. 88-139) when the Commission eliminated unnecessary rules and simplified complex terminology. The classes of operator licenses and exam requirements to obtain these licenses, however, were not changed.

The Commission said it thought six classes of operator licenses were unnecessary but wondered if reducing the number of license classes would still encourage amateur radio operators to advance their skills in meaningful ways. The FCC felt a side benefit would be to " . . . lessen preparation and administration tasks by Volunteer Examiners (VEs) and ease the Commission's administrative burdens associated with this service."

The FCC pointed out that prior to the adoption of the no-code Technician Class operator license in 1990, the Novice Class operator license was the entry point into the amateur service which required passing a 5 wpm telegraphy examination and a single written examination element. "Currently, most individuals choose the Technician Class operator license as the entry point into the amateur service," the FCC noted.

The FCC believes there is " . . . an unnecessary overlap between the Novice, Technician, and Technician Plus operator license classes." On that basis, the Commission wanted to phase out the Novice Class operator license, with current Novice Class operator licensees being "grandfathered."

By "grandfathering," the FCC means that current Novice Class licensees would be permitted to continue to hold their license and modify or renew it. No new Novice Class licenses, however, would be granted. The Commission believes that grandfathering " . . . provides a mechanism to ensure that a licensee is not adversely affected as a result of changes to the license structure. For example, Novice Class operator licensees would retain their currently authorized operating privileges and would continue to receive examination credit for examination elements passed that also are required to qualify for other licenses."

The Commission also wanted to phase out the Technician Plus Class by renewing Technician Plus Class operator licenses as Technician Class licenses. These operators will retain credit indefinitely for the 5 wpm code exam.

The FCC concluded in the R&O " . . . that the public interest will best be served by reducing the number of operator license classes from six to three and that the three classes of operator licenses in the simplified amateur service license structure should be the Technician, General, and Amateur Extra Class operator licenses. We believe this three-class license structure will provide an incentive for licensees to continue the educational opportunities offered by amateur radio. . . . "

Advanced Class License "Grandfathered"

"We also are adopting the suggestion of the National Conference of VECs (NCVEC) that we not issue new Advanced Class operator licenses and grandfather licensees holding this class. We observe that the primary difference between the Advanced Class operator license and the Amateur Extra Class license is not the difficulty of the Amateur Extra Class written examination but rather the 20

wpm telegraphy examination which we are eliminating as a requirement to obtain the Amateur Extra Class operator license."

The FCC said it would not be automatically upgrading Novice and Tech Plus operators to the General Class, or Advanced Class amateurs to Extra as proposed by the ARRL. Instead these operators will have to pass the appropriate written examinations as requested by the NCVEC.

The FCC also said a three-class operator license structure had substantial support within the amateur service community " . . . and satisfies our goal of streamlining and simplifying the amateur service licensing system to the greatest extent possible."

"A three-class structure consisting of the Technician, General, and Amateur Extra Class operator licenses is supported, among others, by the NCVEC and the Quarter Century Wireless Association (QCWA)," FCC said.

Telegraphy Examinations

The Commission felt that "Today, as opposed to the early days of radio, radiotelegraphy is just one of numerous diverse modes of radiocommunication" and wondered if three telegraphy proficiency levels remained relevant.

Citing privacy concerns, the FCC had already tentatively concluded that VEC access to additional medical records from a certifying physician was not an appropriate way to address potential abuses of the a high-speed code waiver request.

Furthermore, the FCC noted that this issue might well be a moot point because if the higher speed code requirements were eliminated, there would no longer be a need for code exam credit based on an applicant's disability.

The FCC added, "We believe that an individual's ability to demonstrate increased Morse code proficiency is not necessarily indicative of that individual's ability to contribute to the advancement of the radio art. As a result, we find that such a license qualification rule is not in furtherance of the purpose of the amateur service and we do not believe that it continues to serve a regulatory purpose."

The FCC also said that it could not grant the ARRL's request to allow Technician Class licensees to use CW below 30 MHz without first having proved Morse proficiency because the international Radio Regulations " . . . provide that the telegraphy requirement may be waived *only* for an operator of a station transmitting exclusively on frequencies above 30 MHz."

The Commission found that many amateurs believe that the current licensing structure overemphasizes the importance of manual telegraphy. The FCC said a common view is that " . . . potential recruits to the Amateur Radio Service consider the telegraphy requirement archaic and quickly lose interest in becoming amateur radio operators." Also, several believe that " . . . Morse code proficiency is not relevant to modern communications practices and technologies." There is also a widespread belief that " . . . the Morse code requirement exists only as a roadblock to prevent current and possible amateur operators from obtaining worldwide frequency privileges or [exists] to control access to the HF amateur radio bands."

The Courage HANDI-HAM System, a group dedicated to assisting radio amateurs with disabilities, agreed that " . . . while Morse code is fun to use and retains a following in the amateur community, it is no longer essential to HF communications."

The FCC said it had already decided some ten years ago in the Codeless Technician Decision that it did " . . . 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. These traits are also found in individuals who have not passed a telegraphy examination rather that being exclusive to those who have passed such a test."

Morse Code and Advancing the Radio Art

Some amateurs maintained radiotelegraphy was superior to other types of communications. The FCC said these arguments "were not pertinent" since the Commission " . . . did not propose to discontinue the authorization of telegraphy CW emission types on any amateur service frequency. The amateur service in the future, as it has in the past, can provide to those who personally desire to do so the opportunity to communicate by telegraphy."

Because the amateur service is fundamentally a technical service, the Commission believes that emphasis on Morse code proficiency as a licensing requirement is at odds with the basis and (advancement of the radio art) purpose of the service.

"(M)odern communications systems . . . are based on digital communication technologies," the FCC said. " . . . no communication system has been designed in many years that depends on hand-keyed telegraphy or the ability to receive messages in Morse code by ear. In contrast, modern communication systems are designed to be automated systems."

In addition, the FCC asserted, " . . . most emergency communication today is performed using either voice, data, or video modes . . . We also note that most amateur radio operators who choose to provide emergency communication do so, according to the amateur radio press, using voice or digital modes of communication, in part, because information can be exchanged much faster using these other modes of communication.

"Further, we note that in traditional emergency services, such as police, fire, and rescue, there is no requirement that emergency service personnel hold amateur radio licenses or any other license that requires telegraphy proficiency.

"We conclude, therefore, that telegraphy proficiency is not a significant factor in determining an individual's ability to provide—or be prepared to provide—emergency communications."

Number of Code Exam Speeds

"Few issues coming before us present such a clear dichotomy of viewpoints as does the issue of the appropriate telegraphy examination requirements for an individual to qualify for an amateur radio license," wrote the FCC. Nonetheless, many amateurs supported a reduction in the number of telegraphy elements from three to one. The ARRL wanted two, substituting a 12 wpm code exam for both the 13 and 20 wpm speeds, and reducing the General Class requirement to 5 wpm.

After considering the public input on this issue, the Commission concluded that "the required speed for the telegraphy examination element should be 5 wpm. . . . we note that this is the minimum telegraphy speed that has been required for the Novice Class operator license since 1951, and is the minimum telegraphy proficiency that must be demonstrated by a Technician Class licensee to be authorized HF privileges."

Because both of these classes of operator licenses authorize HF privileges, 5 wpm is a speed that the Commission

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

FT-51R
This full-featured 5 Watt Dual-Band Handheld includes dual receive, 120 memory channels (80 if Alphanumeric), Auto Tone Search, Spectra Scope, and V/V, U/U and V/U operation.

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

* Cellular Blocked

FT-11R
This compact 2M Handheld features 150 memory channels (75 if Alphanumeric), 10-memory DTMF Autodialer, Automatic Battery Saver (TX/RX), backlit Keypad, and are available in 1.5 Watt and 5 Watt versions.

FT-411E
The affordable FT-411E is compact and durable. This 5 Watt VHF FM Handheld features a die-cast case, 40 memory channels, 10 DTMF memories, built-in VOX, CTCSS, and multiple scan modes.

FT-23/33R
These ultra-compact, 5 Watt VHF FM Handhelds feature rugged die-cast aluminum cases, 10 memory channels, optional CTCSS, and multiple scan modes. The FT-23R (2M) and the FT-33R (222 MHz) are easy to operate, and give outstanding performance.

FT-10/40R
These single-band handhelds are manufactured to MIL STD 810 specifications, featuring either 30 or 99 memories, CTCSS/DCS operation, Dual Watch, and are available in 2.5 Watt or 5 Watt versions, with four keypad options.

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

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

TOUGH GUYS.

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

YAESU ...leading the way.

FT-1000MP
The radio of choice for world-class contest operators, the FT-1000MP provides 100 Watts of power, Enhanced DSP,™ Dual In-band Receive, Cascaded IF filters, General Coverage RX, and 160-10 M TX. (DC-only version also available.)

FT-920
The FT-920 HF/6M Transceiver is designed for today's active Ham. It features high-speed DSP in all modes, 127 memory channels, AFSK or FSK Digital operation, new-technology MOSFET PA finals, high-speed Automatic Antenna Tuner, and high-resolution LCD display.

FT-1000D
Truly an elite-class HF masterpiece, the 200 Watt FT-1000D provides Dual Receive (in-band or cross-band), Cascaded IF Filters, extraordinary Dynamic Range, DDS, high-speed Automatic Antenna Tuner, and 100 memory channels.

FT-100
This ultra-compact HF/VHF/UHF 100 Watt Transceiver provides SSB, CW, AM, FM and AFSK coverage of the HF, 6M, 2M and 70 CM bands. Features include 300 memory channels, built-in Electronic Memory Keyer, DSP, IF Shift, IF Noise Blanker, and CTCSS/DCS.

FT-840
Affordable yet feature filled, the FT-840 is an ideal traveling companion. It offers 160-10M TX with general coverage RX, 100 memory channels, DDS, CTCSS, Twin Band Stacking VFOs, and excellent receiver dynamic range.

FT-600
This compact 100 Watt HF Transceiver offers the utmost in operating simplicity. The MIL-STD rated FT-600 covers the 160-10M Amateur bands with General Coverage Receive, 100 memory channels, Direct Keypad Frequency Entry, and a front-mounted speaker.

VL-1000/VP-1000
The VL-1000 Quadra System is a Solid-State Linear Amplifier featuring four twin-MOSFET PA modules to produce 1000 Watts of clean power output on 160-15 Meters (500 Watts on 6M, modifiable for 12/10 meters). Included are an Automatic Antenna tuner, 2 Input and 4 Output Antenna Jacks, and extensive status displays on the multi-function LCD.

FT-847
The introduction of the FT-847 completely redefines base station operation by offering three radios in one—HF, VHF/UHF and Satellite. A full power multi-mode transceiver, the appropriately named Earth Station covers the HF, 50 MHz, 144 MHz and 430 MHz bands, and it includes crossband Full Duplex operating capability for satellite work. Its exceptional receiver performance is ready for all aspects of DX work thanks to the DSP filtering. And for local FM work both CTCSS and DCS encode/decode are built in. The FT-847 is an engineering breakthrough offering you the earth, the sky, and the moon in one compact package.

THE TASK MASTERS.

They're out there. Those elusive DX signals that can't poke through the QRM regardless of the late-night hours you put in trying to find them. But when a Yaesu HF enters the picture, weak signals suddenly jump into your headphones. Yaesu's High Frequency transceiver technology uniquely combines years of RF and AF design know-how with cutting edge advancements in IF filtering, noise reduction, and dynamic range. Whether you're on high bands or low, at home or away, the high frequency technology of Yaesu's task masters quickly fills up your log with contacts. Learn more about Yaesu products on the web at www.yaesu.com

YAESU **Choice of the world's top DX'ers.**

has found sufficient to meet the requirement of the international Radio Regulations, and the slowest telegraphy speed in the Amateur Service examination system. "We believe that, consistent with our decision to reduce the number of telegraphy elements from three to one, we also should use the least burdensome requirement, the 5 wpm requirement, as the standard for that element."

The FCC declined, however, to automatically abolish all CW exam speeds when—and if—the ITU (International Telecommunications Union) eliminates a mandatory telegraphy proficiency requirement for the Amateur Service. " . . .we do not believe that it would be prudent, at this time, to premise the resolution of this issue on decisions to be made at the next World Radio Conference (WRC), particularly given that it is uncertain whether the WRC will actually address this issue.

"We also note that the International Amateur Radio Union [IARU] Administrative Council has stated that it opposes changing the [international] Radio Regulations to reduce the minimum international qualifications for an amateur radio license, making the potential changes to this Radio Regulation even more uncertain."

Written Examination Content

The FCC said that the public input convinced it that the current written examination elements are not adequately demonstrating whether an individual is qualified to be an amateur service licensee. " . . . almost all of the comments suggest that some type of change to the current system is needed," the Commission said.

For example, in its comments the NCVEC pointed out that Technician Class examinees are administered questions on electronic circuits, even though all transceivers are purchased in the commercial marketplace.

"In this connection, NCVEC states that the topics currently specified in Section 97.503(c) fail to take into account changes in operating habits, technology, and transmitting equipment that have occurred over the past fifteen years, and that this rule section results in VEs administering examinations that contain questions on topics that are not appropriate to the class of license for which the examination is being administered. It is not necessary for licensees to understand electronics and other technical subjects in order to properly operate commercially manufactured equipment."

NCVEC said that the number of required questions from each general topic need not continue to be established by rule. Rather, it suggested that the mandated topics (Section 97.503(c)) be eliminated and that the VECs' Question Pool Committee (QPC) should determine the topics and questions that are appropriate as part of the process of reviewing and revising the various question pools.

The ARRL disagreed and felt that the required topics specified in the Rules provided the only element of standardization in the examination process and should remain in Part 97. The League did agree, however, that the number of questions per topic on an examination element needs to be changed to emphasize different topics for different classes of licenses.

The Quarter Century Wireless Association, NCVEC, and ham educator Gordon West, WB6NOA, all wanted the present written examination Elements 4A and 4B combined to create the new written examination Element 4 for the Amateur Extra Class license. The FCC said that " . . . appears to be a simple and straightforward method the Question Pool Committee (QPC) should consider for creating this new element."

West also suggested that the present written examination Elements 2 and 3A be combined to create a new written examination Element 2 for the Technician Class license. The FCC agreed: " . . . these suggestions appear to satisfy publishers' concerns that we make changes to the written examination elements in such a way that we not make obsolete study guides that have been published but not sold."

The Commission redesignated the written examination elements as Elements 2, 3, and 4 to correspond with the Technician, General, and Extra Class. The QPC will use existing Element 2 and 3A questions as the basis of the new Element 2 pool, 3B as the basis of the new Element 3 , and 4A and 4B will serve as the framework of the new Element 4 after April 15.The FCC amended its Rules to require that the Technician Class and General Class written examination elements consist of 35 questions each, and that the Amateur Extra Class written examination element consist of 50 technically-oriented questions, including questions about administering amateur radio operator license examinations.

Disposition of the Designated Novice Band

The FCC asked in the NPRM " . . . whether it would be appropriate to delete the frequency limitations on Novice Class operators and the power limitations on other classes of operators using the Novice frequencies if we were to discontinue licensing new Novice Class operators."

The Commission said it had " . . . considered the comments on this issue and have decided that because we are grandfathering Novice Class operator licenses, rather than automatically upgrading them to General Class operator license as requested by the ARRL, we will not adopt any rule changes at this time that would change operating privileges for any licensee within the frequency segments currently authorized Novice Class operators."

Greater VE Opportunities

Currently, only an Amateur Extra Class licensee may administer an examination for a General Class operator license. The FCC proposed in the NPRM to authorize Advanced Class licensees to prepare and administer examinations for the General Class operator license, as requested by the ARRL. The FCC said " . . . this proposal would benefit potential amateur service licensees by having additional volunteer examiners available for the examinations."

The FCC has concluded, " . . . the public interest will best be served by allowing Advanced Class licensees who are certified VEs to prepare and administer examinations for the General Class operator license. In this connection, we note that in all cases, Advanced Class VEs would be preparing and administering elements for which they themselves have received credit and, therefore, allowing Advanced Class VEs to prepare and administer General Class operator license examinations is consistent with the Communications Act.

"The comments we received generally supported our proposal. For example, NCVEC and the ARRL agree that Advanced Class licensees who are VEs should be permitted to prepare and administer examinations for a General Class operator license and that allowing these VEs to perform these functions would help in areas where VEs are needed but are in short supply."

RACES Station Licenses Eliminated

The Radio Amateur Civil Emergency Service (RACES), as it was envisioned when it was authorized in 1952, was to be a temporary service designed to afford radio communication

for civil defense purposes. The FCC permits two types of stations to operate as part of RACES:

(a.) a licensed RACES station, and

(2) any amateur station that has been properly registered with a civil defense organization.

Thus, to engage in RACES communications, it is not necessary to have a RACES station license with a separate and distinct callsign. For that reason, the FCC proposed to amend the Part 97 Rules to phase out RACES station licenses by not renewing them.

The FCC said, " . . . by eliminating the RACES station licenses, we would be taking steps which:

"(1) would eliminate licensing duplication because emergency communications that are now transmitted by RACES stations also may be transmitted by primary, club, or military recreation stations, and

"(2) would conserve our financial resources."

The Commission observed that " . . . no new RACES station licenses have been granted since July 14, 1980. In addition, we proposed to continue the *status quo* by not issuing any new RACES station licenses."

The FCC found that most of the comments addressing the RACES issue supported its proposal to phase out RACES station licenses. " . . . After review of the record, we conclude that we should eliminate RACES station licenses because RACES station licenses are unnecessary for amateur stations and amateur service licenses to provide emergency communications.

"Additionally, these licenses duplicate the communications that we have authorized primary, club, or military recreation stations to transmit, and not issuing RACES station licenses would conserve our financial resources because, currently, such issuance is not an automated process."

Privatization of Amateur Enforcement

The Communications Act authorizes the Commission, for purposes of monitoring violations, to accept and employ the voluntary and uncompensated services of any individual licensed by the Commission to operate an amateur station.

The functions of individuals who provide such uncompensated services, commonly called the Amateur Auxiliary, are limited to the detection of improper amateur radio transmissions, the conveyance to Commission personnel of information which is essential to the enforcement of the Communications Act relating to the amateur radio services, and other functions.

The FCC asked in the NPRM for other ideas for improving the amateur radio enforcement processes. The ARRL suggested that the FCC withhold any additional action on amateur radio service enforcement based on the increasedamateur radio service compliance efforts recently undertaken by the Commission. The FCC agreed, and made no changes in the rules regarding enforcement.

Dramatic Change Ahead

Effective April 15th, therefore, the U.S. Amateur Service changes dramatically. There will only be three written examinations and one 5 wpm code exam speed. Volunteer examiners will begin using new Element 2, 3, and 4 question pools, which are on the fast track for completion by the QPC. It is hoped that the new pools will have been developed and turned over to the study manual writers and publishing community by the time you read this.

As far as the content of the new exam questions go, you might have difficulty recognizing a difference from the questions contained in the previous examinations. There will be a minimum amount of new questions and revisions, and the existing ten topics initially are being carried over without change to the new pools.

At this point, it appears that the Element 2 and 3 pools will contain slightly less than 400 questions each, and the Element 4 (Extra Class) pool will have around 600. Nothing concrete had been decided at press time, though. We do expect, however, that publishers will have new license preparation materials available in April, or at least in time for the Dayton HamVention, which takes place a month later.

It does not appear that implementation of the new pools will be delayed by the filing of Petitions for Reconsideration, but there is a remote chance that it could happen.

It is time to accept and rally around the new system and get on with amateur radio in the new century. It will be exciting as new technologies find their way into the hobby.

73, Fred, W5YI

How will restructuring affect YOU? How will your current license change? Should you upgrade now or wait? Is your study manual still good? Our guide will try to answer these questions and clear up any confusion.

A Restructuring User's Guide

BY RICH MOSESON,* W2VU
Editor, *CQ*

The material in this article updates and corrects some information presented in "Zero Bias" last month. That information was based on our very brief first view of the Report and Order. —*ed.*

The FCC has simplified ham radio's license structure. However, the Report and Order announcing its decision was complex. As a result, there has been a lot of confusion, misinformation, and, unfortunately, some *dis*information (lies). To help you sort through the effects of restructuring on *you*, we'll go through each license class and explain any changes that are forthcoming, along with our advice on the best time to upgrade.

One basic tenet applies to all license classes: No one loses any current operating privileges, and in nearly all cases nobody gets any new privileges for "free." Also, there will be no automatic upgrades. You must apply through the Volunteer Examiner (VE) system and pay your $6.65, even if you don't need to take any new tests.

Most of the material in the current license manuals will still be good after April 15th (and all of them are good until then). There may be some changes in specific questions, but what you need to know is not going to change significantly.

Let's get started with what some marketing folks (but not us) might call the *prelicensed ham*. If you currently have...

... No Ham License

Your options for joining our hobby/service will become more limited as of April 15, 2000, when all of these changes take effect. After that date, the only entry-level ham license will be the Technician Class, which requires no code test and offers all amateur privileges above 50 MHz. Actually, you may start out at any level, but most new hams traditionally have started with either the Technician or Novice Class license. The Novice license, which has a 5 word-per-minute (wpm) code test and a very basic written exam, and allows limited operation on the worldwide shortwave bands and some VHF/UHF bands, will no longer be offered. For most prospective hams, this will pose no problem, as the vast majority in recent years have chosen to enter through the Technician path. If you prefer the Novice route, you must pass your test before April 15th.

The Technician exam will be shorter after the new system is in place, with a single 35-question test replacing the current two-part exam, with 35 and 30 questions, respectively. In addition, the pool of possible questions for the Technician exam most likely will drop from its current 800-something to around 400-something. If you plan to take the Technician exam, you may be best off waiting until after April 15th (unless, of course, you simply can't wait that long to get your license and get on the air!).

Current license manuals for both Novice and Technician definitely will be good until April 15th. The new Technician question pool will likely include many of the same questions that are in the current pool, except that the specifics of some questions may be changed. If you currently have a...

... Novice License

You may continue operating with your current privileges and may renew or modify your license as often as you need to (modify, in this sense, means things such as changing your address or requesting a vanity callsign). As long as you keep your license current, you will have permanent credit for your 5 wpm code test, which on April 15th becomes the only code test you'll ever have needed to take. If you want to upgrade and take the current Element 3(A) Technician exam before April 15th, you will get a Tech-Plus license and all the VHF/UHF privileges that go with it.

Here's the complicated part: Since the Element 2 written exam you took to get your Novice will be combined with the current Element 3(A) to form the new Technician Class Element 2, you will not have any written element credit after April 15th based on your Novice license alone. Thus, you might want to pass at least Element 3(A)—becoming a Tech Plus—before April to avoid having to retake the new Element 2 as well as the new Element 3 in order to upgrade to General. If you pass *both* Elements 3(A) and 3(B) before April 15th, you'll get not only an instant upgrade to Tech Plus, but you'll then have all the credit you'll need to go back to a test session *after* April 15th and upgrade to General without taking any additional exams. This also will cut down the total number of exam questions you'll have to answer. The new Elements 2 and 3 each will have 35 questions (70 total). The current Elements 3(A) and 3(B) each have 30 (60 total), so you'll have 10 fewer questions to answer if you take your exams before April 15th. Now, if you have a...

... Technician License

Things get really complicated, because there are several different "flavors" of Techs. We'll start with the basic, or no-code, Technician license; then look at the Tech-Plus license (including pre-1991 Techs who passed a code test and were "grandfathered" to Tech Plus status); and the so-called "grandpappy" Tech, pre-1987 Tech licenses which included not only 5 wpm code but the full General Class written exam. So here we go. If you have a...

... Basic Tech License. Your operating privileges remain the same, and you'll still need to pass a code test in order to gain privileges on HF. The big difference here is that the only

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code test you'll ever have to take is a 5 wpm exam. That, combined with the new Element 3 written exam, will get you a General Class license, with voice and digital privileges on all amateur bands. Will you benefit by taking any or all of your exams before April 15th? Well, the immediate benefit of passing your 5 wpm code test will be an instant upgrade to Tech-Plus, which includes voice privileges on the incredibly hot 10 meter band. The code credit will be permanent. There will be little or no change in the content of the new Element 3 exam in relation to the current Element 3(B) exam. However, the current exam is 30 questions versus 35 on the new one. If I were you, I'd go for the code test first and get those Tech Plus privileges immediately. Then you can take the additional written exam whenever you're ready for it and upgrade to General on or after April 15. If you have a...

... Tech Plus License. Your privileges will not change, either. If you pass Element 3(B) before April 15th, you may apply for an upgrade to General as soon as that magic date passes. If you wait, you'll have to take the new Element 3 (your Tech license will give you credit for the new Elements 1 and 2) before getting your upgrade. There's only a 5-question difference between the two (30 now, 35 later), so there's no clear benefit to you in either rushing out now or waiting until after April 15th.

Now here's a source of major confusion: The Tech-Plus license is the only one of the three license classes being phased out that will disappear completely. If you renew your license (without upgrading) after April 15th, your new license will simply say Technician. *However,* your HF privileges and code credit will remain intact. It is *extremely important* for you to keep a copy of your Tech Plus license, as the FCC database will no longer have a record of your passing a code exam.

What if you have a pre-1991 Tech license, when you had to pass a code test to qualify? Again, if you have a license dated prior to February 14, 1991, hold onto it. However, since *all* pre-1991 Techs had to pass 5 wpm code tests, you'll also have available the same backup options that we'll describe below for "grandpappy" Techs who were licensed before March 21, 1987. Speaking of whom, if you have a ...

... Pre-1987 Technician License. You will be able to upgrade to General without taking any additional license exams. This is because your written exam contained all of the material currently in *both* Elements 3(A) and 3(B). *But* you must be able to prove you had a Tech license before March 21, 1987 to get full credit for all of the elements and a no-test upgrade. How do you do this? There are three possibilities:

1. If you have a copy of your pre-1987 Tech license, that's all you need (along with your current license, of course);

2. If you can't find your old license, you may write to the FCC Licensing Division, Att: Amateur Radio Section, 1270 Fairfield Rd., Gettysburg, PA 17325 and ask for certification that you were licensed as a Technician before March 21, 1987 ("grandfathered" pre-1991 Techs who need proof of having passed their code test may do the same thing).Your letter must include your date of birth and telephone number. Assuming that you were licensed when you said you were, the folks in Gettysburg will mail you a letter that the VEs will accept as proof of appropriate element credit. Please note that you must write and mail an actual letter, on paper. You may not request this certification by phone or e-mail.

3. Some VE teams will also accept a listing in a pre-1987 (or pre-1991, for code credit only) *Callbook* showing you as a Technician. This is at the VE team's

option, though, so you may want to check with the team contact person before coming to the test session.

An interesting note based on a quirk in the rules: Since all licenses issued prior to 1987 have necessarily expired, and since the FCC rules specifically permit an expired pre-1987 Tech license to be used as element credit, *you may still get full credit even if your license has lapsed*. However, you must now hold a current Tech license. So ... if you were licensed as a Tech before 1987 and your license has lapsed, go out now and take your Technician exam (and pass it) *before April 15th*. Then, after April 15th you will be able to upgrade to General on the basis of your current license and your old license. *This is the only circumstance in which this quirk applies, and you must be relicensed before April 15 to take advantage of it.*

Moving on, if you currently have a ...

... General Class License

Your current operating privileges remain intact and you will never have to take another code test in order to upgrade. In your case, it may be to your benefit to wait until after April 15 to make the jump to Extra (even though we told you just the opposite last month), as the new exam will have only 50 questions, as opposed to the 90 questions on the current Advanced and Extra exams combined. On the other hand, some people to whom code speed is very important are thinking about upgrading only to Advanced (before April 15th), as this will be the only license class that will advertise to anyone who cares that you have passed a 13 wpm code test. The only other benefit to passing the current Elements 4(A) and (B) before April 15th is that you will get an instant upgrade to Advanced, and all the additional operating privileges that go with it. But beware: After April 15th an Advanced Class license without credit for Element 4(B) will not exempt you from taking the new Element 4 exam for Extra. You must have credit for both 4(A) and 4(B) in order to claim an upgrade based on element credit. Now, if you have an...

... Advanced Class License

You will keep all of your current privileges and you will be able to renew or modify (e.g., change your address) indefinitely as an Advanced Class ham. No *new* Advanced Class licenses will be issued after April 14th (likewise, no *new* Novice or Tech Plus licenses will be issued after April 14th). If you want to upgrade to Extra, taking Element 4(B) before April 15th will save you 10 questions and being retested on some material. The new Element 4 exam will combine Element 4(A), which you have already passed, with Element 4(B), but after April 15th you'll have to take the entire test in order to upgrade. Of course, if you've had your Advanced license for a long time, you may need to review some of the material in the current Advanced Class license guide in order to fully prepare for the Extra exam.

Bottom line: If you want to upgrade to Extra, you have a choice between a 40-question test now (all on new material) and wait until April 15th or later to have your application processed, or a 50-question test later (some of which may be material you already know). If you don't want to upgrade, you may go on forever with your Advanced Class license. Finally, if you currently hold an ...

... Extra Class License

You already have all amateur operating privileges, so they won't change. You will soon have more company in the rarified air of the Extra subbands, however. On the other hand, there will be a lot of new people getting active and involved, and that can only be good for ham radio. Some Extras are upset that "all their hard work" in passing a 20 wpm code test will now be for naught. Naught true. Passing any amateur exam is only a matter of personal achievement—you won't get a pay raise at work because of it—and that personal achievement will not be lost. If it's important to you that others recognize your code-copying ability, sit down for one of the ARRL's Code Proficiency Runs at 20 wpm or higher, and get a nice certificate for your wall that will certify to anyone interested that you have a distinguished level of code proficiency.

As for upgrading, exams, and element credit ... wasn't the promise of never having to worry about that again one of the reasons you became an Extra in the first place? I know it was for me!

A Final Note

Some of you think the FCC's restructuring decision was a good thing for ham radio; some of you think it was bad. Frankly, though, what you think doesn't matter anymore. There was plenty of opportunity for comment—and more than 2,200 people took advantage of that opportunity—but now the FCC has made its decision and the time for arguing its merits is over. The new license structure will take effect on April 15th, whether or not you like it. We will have many new neighbors on our HF bands, and many of them won't yet be familiar with what activities traditionally happen on what frequencies, how to work a pile-up on a DX station, or the other fine points of HF etiquette. Remember that you were new at this once, too, so do your best to be patient and polite and follow the amateur tradition of sharing your knowledge and experience with your fellow hams.

If you are new to HF, please remember that you have a lot to learn. Seek out those hams who will help you (there are plenty of them out there) and try not to be discouraged by the very few who resent your presence. Work to make yourself the best operator you can be, and make sure your operating standards don't stoop to the level of those who are trying to discourage you.

We at *CQ* take seriously our responsibility to educate newcomers to any ham activity, and we will do our part on the pages of this magazine. We hope that you do your part on the air as well. Now go get those manuals and start

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.875"	$1.00/ft	1.750"	$2.25/ft
1.000"	$1.10/ft	1.875"	$2.50/ft
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CPK, Counterpoise Kit	$119
RMKII, Roof Mount Kit	$139
STRII, Roof Radial Kit	$109
TBR160S, 160m Kit	$109

More Bencher/Butternut–call

COMET ANTENNAS

GP15, 6m/2m/70cm Vertical	$149
GP6, 2m/70cm Vertical	$149
GP9, 2m/70cm Vertical	$179
B10NMO, 2m/70cm Mobile	$36
B20NMO, 2m/70cm Mobile	$49
SBB2NMO, 2m/70cm Mobile	$39
SBB5NMO, 2m/70cm Mobile	$49
SBB7NMO, 2m/70cm Mobile	$75
Z750, 2m/70cm Mobile	$55
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C4XL	10/12/15/17/20/40m, 9 el	$929
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Results of the 1999 CQ WW WPX SSB Contest

BY STEVE BOLIA,* N8BJQ

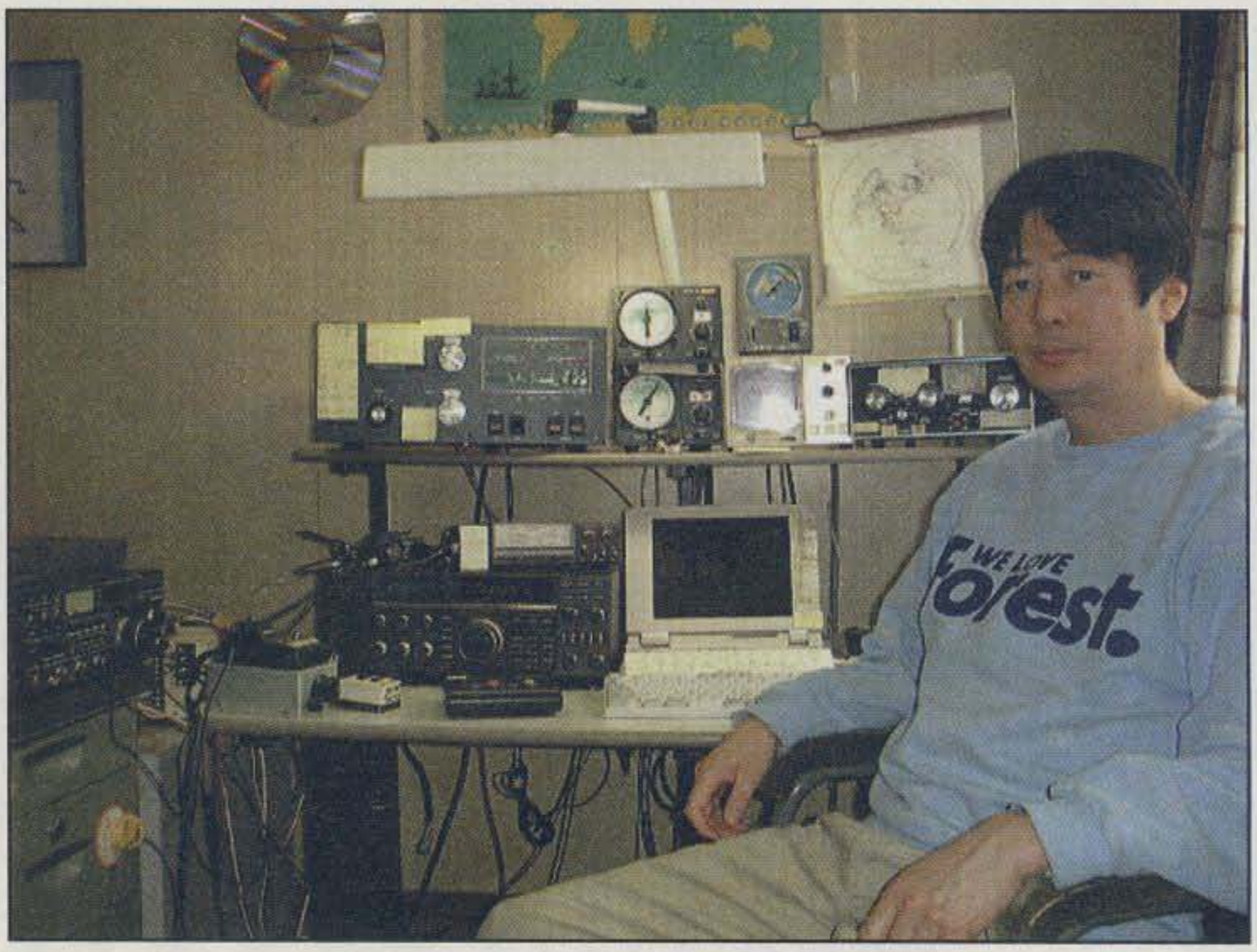
The last CQ WW WPX SSB Contest of the 20th century also proved to be one of the most exciting. Nearly around-the-clock openings on 15 and 20 meters and excellent 10 meter openings kept both the "big gun" and casual operators hopping. Scores went up and records fell. Four world records were broken, along with five USA and 19 continental records. In addition, almost everyone had fun! The good conditions contributed to the fun, but also skilled, courteous operators played a big part in making the weekend enjoyable for all. Congratulations to the all of the winners.

Here is the multi-multi crew at NK7U. Back row (left to right): NK7U, K9JF, K7NT, W7UA, and KC7OPD. Front row: W7ZAC, K7ZO, and K7MK.

DX

HC8A was king of the single ops. Rich missed breaking his 1992 record by less than 200K. Second place went to W2GD at P4ØW. This was John's first SSB attempt from Aruba, and he had this to say: "Congrats to HC8A/N6KT. He *is* the very best." John's 17.6 meg effort was not too shabby either. Carlos, TI1C (TI2CF), wasn't far behind John, taking third place. Carlos did break the North American record. Fourth was P4ØN (KW8N), with VF3EJ fifth and EA8ZS (EA3NY) sixth. Perennial US champ KQ2M was seventh, with 8P2K (8P6SH) eighth, IH9/OL5Y (OK1FUA) ninth, and KF3P (K3MM) tenth.

A world record and all continental records were broken on 10 meters. ZX5J (PP5JR) nearly doubled the score of last year's winner on his way to the world record. K6NA at ZD88A broke the African record on 10 with his second-place effort. WP2Z (W6XK) was in at number three with a new North American record. H22A, KH6ND, and 9H3XY were responsible for the other continental records. ZD8Z (N6TJ) took the 15 meter title and now owns the African record, followed by EA8AH and P43A. 9A3GW was fourth with a new European record, with AH7DX (KH6TO) less than 60K behind in fifth place. DJ7AA's European record entry topped the 20 meter box, followed by PP5JD and RW4WR. US champ KK9A was fourth, and IV3TAN as IQ3A was fifth. Proving that there is still life in the low bands was 9A9A, who just edged out LZ5W for the top spot and a European record. WH7Z (K9QQ) was third with a new Oceania standard, followed by S53M (S55OO) and ED8WPX (EA8PP). OK2RZ took 80 meter honors, with LX6T (LX1KC) second and KE1Y third. YP2A (YO2LIF) was fourth and DL1ZIH was fifth. VA1A operated by K3BU was the Top band champion and is holder of the world record with his fine 535k effort. Second place plus the African record went to EA8/OH1MA. OMØWR was third, OZ3SK fourth, and US champion AA1BU fifth.



JA8RWU's 5.3M points placed him second in Japan and fourth in Asia.

*7354 Thackery Road, Springfield, OH 45502
e-mail: <n8bjq@erinet.com>

TROPHY WINNERS

SINGLE OPERATOR, ALL BAND

WORLD: Stanley Cohen, WD8QDQ Trophy. Won by **Station HC8A operated by Rich Smith, N6KT.**
WORLD Low Power: Steve Bolia, N8BJQ Trophy. Won by: **Station VP5E operated by Ken Ruddock, K6HNZ.**
USA: Atilano de Oms, PY5EG Trophy. Won by: **Bob Shohet, KQ2M.**
USA Low Power: Oklahoma DX Association Trophy. Won by: **Gordon Muise, WA1LNP.**
AFRICA: Peter Sprengel, PY5CC Trophy. Won by: **Station EA8ZS operated by Eddie Stark, EA3NY.**
EUROPE: Jim Hoffman, N5FA Trophy. Won by: **Jiri Pesta, OK1RF**.
SOUTH AMERICA: Ron Moorefield, W8ILC Trophy. Won by: **Station P4ØW operated by John Crovelli, W2GD.**
CANADA Low Power: Amateur Radio League of Alberta Award. Won by **Glenn Wyant, VA3DX.**
OCEANIA: Philip Fraizer, K6ZM Memorial. Won by: **JF2QNM.**
***JAPAN:** The DX Family Foundation Trophy. Won by: **Masaki Okano, JH4UYB.**
WORLD QRP/p: Dayton Amateur Radio Assn. Trophy. Won by: **Doug Zwiebel, KR2Q.**
USA QRP/p: Doug Zwiebel, KR2Q Trophy. Won by: **John Desloge, N6MU.**

SINGLE OPERATOR, SINGLE BAND

WORLD: John N. Reichert, N4RV Trophy. Won by: **Station ZD88A operated by Glenn Rattmann, K6NA (28 MHz).**
WORLD 28 MHz: Alan Dorhoffer, K2EEK Memorial Trophy. Won by: **Station ZX5J operated by Sergio Almeida, PP5JR (28 MHz).**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Zdravko Balen, 9A9A.**
WORLD 3.7 MHz Low Power: Nilay & Berkin Aydogmus, TA3YJ & TA3J Trophy. Won by: **Station YP2A operated by YO2LIF.**
OCEANIA: D. Craig Boyer, AH9B Trophy. Won by: **Michael Gibson, KH6ND (28 MHz).**
USA 3.7 MHz: Lance Johnson Engineering Trophy. Won by: **Rolf Seichter, KE1Y.**
USA 7 MHz: Lewis Sayre, N7AVK Trophy. Won by: **Claude Oakes, NC4NC.**
USA 14 MHz Low Power: Boomer Contest Club Trophy. Won by: **Station AK4L operated by Christopher Penick, K4PC.**
USA 21 MHz: Bernie Welch, W8IMZ Memorial. Won by: **Chad Kurszewski, WE9V.**
USA 28 MHz Novice/Tech: Jon Engelhardt, KAØZFX. Won by: **Robert Lutz, W2BZR/3/T.**

MULTI-OPERATOR, SINGLE TRANSMITTER

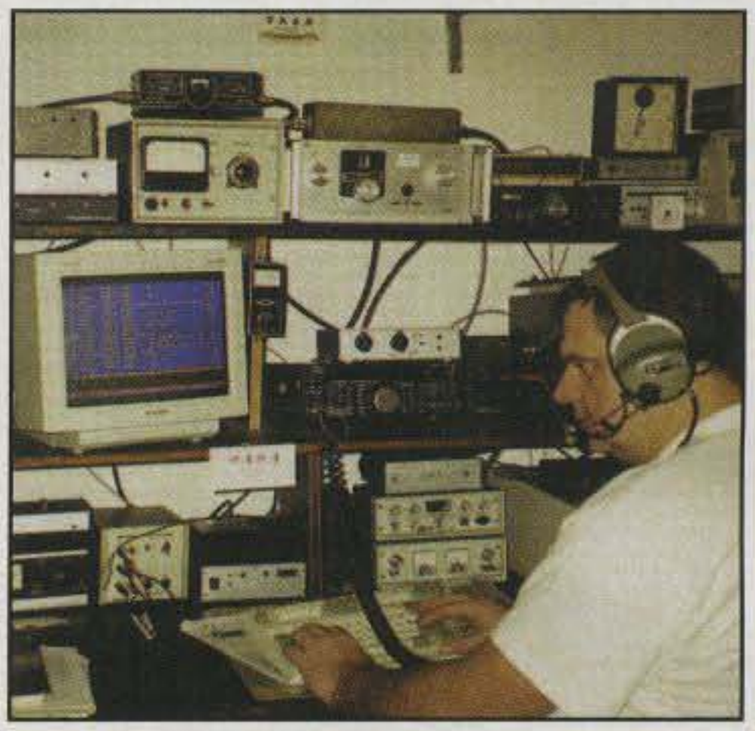
USA: Oklahoma Comm Center Trophy. Won by: **KM3T operated by KM3T & W4AN.**

MULTI-OPERATOR, MULTI-TRANSMITTER

NORTH AMERICA: Burt Curwen, KL7IRT Memorial (James Dixon, NL7HI, sponsor). Won by: **VF6JY operated by VE5MX, VE6TX, VE6BF, VE6JTM, VE6JY, VE6JO, VE6DYB, VE6SLV, VE7AV.**
USA: Glenn Tracey, KC3EK Trophy. Won by: **Station WT6V operated by N6RO, K4KR, K6RC, K3EST, N6IG, K6AW, AEØM.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **Station T33RD operated by OK1RI, OK1TN, OK1RD.**



Petar, 9A6A, was tops in Croatia and fifth in Europe on 14 MHz.

K6HNZ at VP5E was a repeat winner of the low power category. Ken nearly broke 7 million points. Second place went to KHØ/JF2QNM, with UP5P (UN5PR) third, PW1S (PY1KS) fourth, and VA3DX fifth. LU5FC moved up from second in '98 to win the LP 10 meter title, with VP2VF second, LR6D(LW5DX) third, TI7/N4MO right behind, and L2ØF fifth. CI7A (VE7SV) topped the 15 meter box, with UA4LCQ second, SU9ZZ third, P43DJ fourth, and LU3FZW fifth. RSØF was the 20 meter champion, with AK4L (K4PC) second and UA3BL third. S54A topped the 40 meter box, with UT1T (UR7TZ) second and HA9MDN/5 third. Bobby, YP2A, set a low power EU record on 80 meters with his 866K effort. 4X1IM was second, followed by J4Z (SV2CWY) and TA3J. OK2SNX was the low power Top band champion, with VY2MGY/3 second and EA1DVY third.

The Tribander/Single Element category was won by LA8W operated by LA4DCA. JHØ/JF2QNM was second (and the low poper T/S champion), LY2BTA third, RA3AUU fourth, and LUØH (LU3HU) fifth.

This year's Rookie category produced some outstanding scores. PW1S (PY1KS) turned in the top score with over 4.3 meg low power. Second was V73UX with 2.6 meg with Emily, P43E just 7K behind in third.

The top-scoring station in the Band Restricted category was S57IIO, with EF3AGC second and OH1LEG third. More coverage of these categories can be found in the March *CQ Contest* magazine.

Doug, KR2Q, was the QRP champ and US record holder, just edging out Bob, VE3KZ, for the title. HA2SX was third and LY3BA fourth, with N6MU edging out NØKE for the fifth spot. KT3RR was the 10 meter QRP high scorer, followed by LW3DWX. NA4CW topped the world on 15, WJ8C took 40 meter honors, SP4GFG was the 80 meter champ, and US7MQ was the leader on 160.

TM2V (F6GLH) and NV4X (K4MA) were one and two in the Single Op Assisted category, both with over 6M. OH9W was third, NY6DX fourth, and IN3ZNR fifth. In the single band Assisted categories, JG3KIV turned in the top 10 meter score, JI3OPA the top 15 meter score, and TM7XX the top 20 meter score. Z39Z nearly broke a million to win on 40 meters, JK1GKG topped the world on 80, and KN2T was the Top band Assisted champion.

USA

I have a function key in my word processor that types in the first line of the USA results every year. It said KQ2M won again! Bob used K1TTT's excellent station to capture the top spot (and a US record). Second place went to KF3P (K3MM). Tyler reported, "15 meters was just awesome!" N5KO used W6NL's great station to finish third, KE3Q at W3LPL's QTH was fourth, and KM5X(K5TR) at W5KFT was fifth. The top five all broke the 1992 record. Rounding out the top ten were WZ4F (K4AB), NB1B, K3ZO, KVØQ (NØNR), and WB9Z. Ten meters was pretty competitive, with KZ5MM edging out NX5M (N5XJ) for the top spot, followed by W5WMU, K5NZ, and K4JYO. WE9V closed out activity at W9JA's superstation with a 15 meter record. KKØT (N2IC) was second, with K6LL/7 (using a tribander) third, N4PN fourth, and KGØZI (also with a tribander) fifth. KK9A was the 20 meter winner, followed by NA5B (W5AO) and AK4L (K4PC), K1KJT and AKØA. Low band activity in the States was down quite a bit with the higher bands open so much. NC4NC topped the 40 meter leader box, followed by AE5B. Perennial 80 meter powerhouse KE1Y nearly broke 1 million points to lead in that category, and AA1BU edged out NE5D (K5RX) for Top band honors.

If you look at the low power results, you will see a pretty even race. WA1LNP finished on top by less than 70K. ACØW was second, W2TZ third, WD5K fourth, and K1VUT fifth. W2BZR/3/T edged out W3NO for 10 meter honors, followed by WJ7S. NI9C topped the 15 meter box, with AE1B second and W6BSY third. On 20 meters AK4L operated by K4PC turned in the top low power score (and third overall in the US). AKØA was second, and AE6Y was third.

N6ED moved up from fifth in '98 to take the US T/S title. There was quite a challenge from NX9T, W1CU, and KE9A, all making over 3 million points. WD4AHZ was the 10 meter champ, and K6LL/7 and KGØZI both turned in great 15 meter scores using just a tribander.

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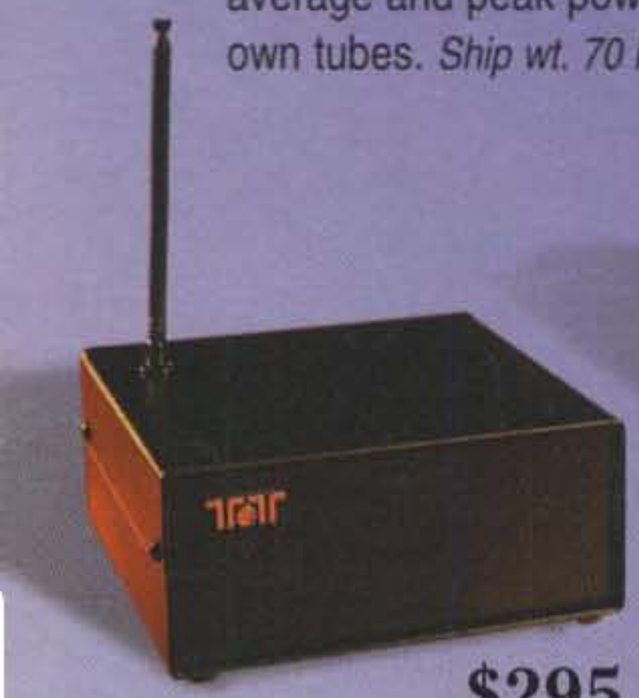

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EA8ZS(EA3NY)	12,941,740
KQ2M	10,855,264
8P2K(8P6SH)	10,044,678
IH9/OL5Y(OK1FUA)	9,822,384
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N5KO/6	8,741,115
KE3Q	8,718,082
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28 MHz

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ZS6EZ	6,700,992
KH6ND	6,442,856
L1ØF(LU2FFD)	6,326,250
P43W	6,050,472

21 MHz

ZD8Z(N6TJ)	12,032,740
EA8AH	11,192,181
P43A	9,001,687
9A3GW	6,504,371
AH7DX(KH6TO)	6,439,698
UAØZBK/Ø	6,289,371
XO7X(VE7AHA)	6,112,756
WE9V	6,067,704
CG3MM	5,975,200
SP5GRM	5,631,668

14 MHz

DJ7AA	5,744,320
PP5JD	4,169,683
RW4WR	3,810,807
KK9A	3,518,190
IQ3A(IV3TAN)	3,500,793
OK5W(OK2ZW)	3,421,880
9A6A	3,248,430
SM2DMU	3,210,269
KH7U	3,150,160
RSØF	3,025,609

7 MHz

9A9A	4,624,188
LZ5W	4,596,207
WH7Z(K9QQ)	4,582,773
S53M(S55OO)	3,732,300
ED8WPX(EA8PP)	3,601,456
9A5Y(9A7W)	2,892,300
OL6X(OK1DIG)	2,364,584
HA9BVK	2,017,356
9A8DX	1,621,822
SKØUX(SMØTQX)	1,578,960

3.7 MHz

OK2RZ	1,636,910
LX6T(LX1KC)	1,068,844
KE1Y	998,760
*YP2A(YO2LIF)	866,123
DL1ZIH	824,569
AH6OZ	670,970
LY2HM	624,312
*4X1IM	528,002
*J4Z(SV2CWY)	474,810
LY1FW	469,044

1.8 MHz

VA1A(K3BU)	535,225
EA8/OH1MA	404,976
OMØWR	296,474
OZ3SK	242,028
AA1BU	114,818
LY2OU	109,682
IR1A(IK1GPG)	95,976
NE5D(K5RX)	88,740
*OK2SNX	83,386
OK1TP	74,196

LOW POWER ALL BAND

VP5E(K6HNZ)	6,927,135
KHØ/JF2QNM	4,537,056
UP5P(UN5PR)	4,493,280
PW1S(PY1KS)	4,315,248
VA3DX	4,016,320
PY2YU	3,547,918
PY2MNL	3,486,525
4M5E(YV5NWG)	2,948,140
LU9HO	2,853,630
S53EA	2,687,482

28 MHz

LU5FC	4,057,340
VP2VF	2,672,460
LR6D(LW5DX)	2,582,784
TI7/N4MO	2,561,540
LØF	2,129,445
LU4DX	1,909,616
KP3A	1,577,760
LU4OJS	1,505,534
PY2NW	1,502,609
PY3RK	1,289,340

21 MHz

CI7A(VE7SV)	4,456,374
UA4LCQ	2,615,722
SU9ZZ	2,406,909
P43DJ	2,076,325
LU3FZW	1,949,652
JR3RIY	1,836,315
JL3VUL/3	1,694,951
PP5UA	1,664,216
OH4MDY	1,654,137
OK2SBL	1,364,750

14 MHz

RSØF	3,025,609
AK4L(K4PC)	1,147,461
UA3BL	1,025,411
PY5HSD	908,604
AKØA	901,192
VE6TP	668,536
TA2NC	546,766
UA3IKO	361,368
AE6Y	348,480
UA9BS	314,765

7 MHz

S54A	430,604
UT1T(UR7TZ)	396,088
HA9MDN/5	164,416
CT1BWW	94,962
YO3GOD	79,960
DJ2YE	51,030
OK2PPM	42,189
UA6NZ	38,880
G4KHM	32,400
UU9JQ	15,392

3.7 MHz

YP2A(YO2LIF)	866,123
4X1IM	528,002
J4Z(SV2CWY)	474,810
TA3J	396,865
S51Z	368,440
IV3KTY	272,742
S57KAA	241,362
CT1AOZ	170,856
PAØMIR	166,116
UA3QOG	153,648

1.8 MHz

OK2SNX	83,386
VY2MGY/3	71,820
EA1DVY	17,696

TRIBANDER/ SINGLE ELEMENT ALL BAND

LA8W(LA4DCA)	A	5,701,805
*KHØ/JF2QNM	A	4,537,056
LY2BTA	A	4,534,979
RA3AUU	A	4,460,316
LUØH(LU3HU)	A	4,366,677
EA3NY(EA3FUM)	A	4,071,228
N6ED	A	4,000,752
UA2FB	A	3,765,951
NX9T	A	3,609,089
*PY2YU	A	3,547,918
W1CU	A	3,298,752
VK3TZ	A	3,226,950
KE9NA	A	3,118,299
KL1V	A	3,063,744
S58WW	A	3,054,656
K6LL/7	21	4,401,600
KGØZI	21	2,824,935
SMØGYX	14	102,934

BAND RESTRICTED

*S57IIO	A	1,005,452
*EF3AGC	A	684,760
OH1LEG	A	657,090
*JA5EO	A	646,726
*JAØBMS/1	A	440,231
*LW1EGD	28	967,471
*LW7EGO	28	487,860
*K6KAY/T	28	434,634
*KA9UQT	28	204,314
*W5CTV	28	75,112
*JA9SCB/1	21	390,892
AN1DMQ	21	135,108
EC1AOD	21	91,053

ROOKIE

*PW1S(PY1KS)	A	4,315,248
V73UX	A	2,635,736
*P43E	A	2,628,840
YZ7EM	A	1,443,780
NA1DX	A	1,166,459
*XE2AUB	A	922,545
LX2LX	28	527,880
*K6KAY/T	28	434,634
F5AOV	28	307,710
*EA7ASZ	28	62,440
*PY5DZ	28	33,800
*RU3DVR	21	168,466
*JJØFDT	21	35,020
*TA2NC	14	578,136
*F8BDQ	14	32,994

ASSISTED

TM2V(F6GLH)	A	6,939,080
NV4X(K4MA)	A	6,476,886
OH9W	A	4,775,040
NY6DX	A	3,875,012
IN3ZNR	A	3,607,872
N3MKZ	A	3,421,596
N5JR	A	3,073,048
VE1RX	A	2,862,510
NA2NA	A	2,806,060
DF6QV	A	2,673,260
JG3KIV	28	2,190,951
S51AY	28	1,324,960
IQ5Z	28	576,360
JH1FSF	28	559,912
ON7LX	28	364,812
JI3OPA	21	6,328,407
UT5UGR	21	2,412,727
Z3ØM	21	2,170,168
YU1NR	21	1,517,760
JI2QKJ	21	1,422,390
TM7XX	14	3,073,304
IU9S	14	2,569,320
LY8X	14	2,088,280
Z39Z	7	976,848
S57AL	7	617,862
JK1GKG	3.7	39,776
KN2T	1.8	113,088
AA4MM	1.8	75,192
W2MF	1.8	54,264

QRP/p

KR2Q	A	1,765,404
VE3KZ	A	1,717,035
HA2SX	A	1,340,598
LY3BA	A	1,110,880
N6MU	A	1,070,000
NØKE	A	1,062,831
DL2NBU	A	1,026,630
KT3RR	28	506,258
LW3DWX	28	287,985
JA5GPJ	28	272,384
NA4CW	21	462,579
W6YJ	21	114,800
S59D	21	65,886
W5FO	14	322,077
UA9AAZ	14	303,592
SP9EWO	14	102,384
WJ8C/P	7	13,066
SP4GFG	3.7	20,608
US7MQ	1.8	24,384
UT/UAØQGQ	1.8	9,472

MULTI-OPERATOR SINGLE TRANSMITTER

ZXØF	28,360,192
VP5N	21,618,144
T33RD	18,639,376
ZW5B	18,030,330
UA7A	15,347,348
TM1C	14,531,328
KM3T	14,383,360
HG1S	14,177,390
IR4T	13,836,279
YL4U	12,987,359
RF9C	12,919,802
FM5BH	12,842,000
RM6A	12,451,096
JA5BJC	11,792,333
M6T	11,584,832
OH2U	11,299,536
S56MM	11,219,032
CQ9K	10,775,514
LZ9A	10,265,769
VE5RI	9,773,808

MULTI-OPERATOR MULTI-TRANSMITTER

CN8WW	56,206,986
P3A	51,779,190
OT9A	36,925,089
TX8DX	24,278,920
VF6JY	23,204,568
KL7RA	22,808,240
NP3X	22,363,327
4M4X	21,223,125
WT6V	21,165,040
HG6Y	19,572,525
KU8E	18,428,886
RU1A	18,123,564
S51S	17,496,432
VE7ZZZ	16,427,315
LO1F	16,106,785
LY7A	13,888,680
NK7U	13,755,216
WO8CC	13,252,393
EA4ML	13,184,170
W7RM	13,111,144

** Low Power*

NA1DX was the top US Rookie operator, with K4BEV and AA1SU both making strong showings. K6KAY/T and KA9UQT topped the B/R class.

In the Assisted class NV4X (K4MA) topped the USA box, with NY6DX second, N3MKZ third, N5JR fourth, and NA2NA fifth. W6RKC was the US 40 meter Assisted winner, and KN2T topped the USA and the world on 160.

Multi-Ops

CN8WW and P3A battled it out in the multi-multi category with both putting in big efforts. When the dust settled, the gang at CN8WW came out on top with a new world-record 55 million points. The ops at P3A were second at 47 million, followed by EU champion OT9A with a European record 35.4M (and a new prefix record with 1421). KL7RA topped the North American multi-multi's to finish fourth with TX8DX fifth.

The USA multi-multi competion was also very competitive. WT6V emerged as the winner with a new US record. Providing plenty of competition was KU8E at K8CC's station. NK7U nipped WO8CC (at N8NR) for third, with W7RM finishing a very close fifth. I was one of the ops at WO8CC, and we enjoyed the competition with KU8E as did the crews at NK7U and W7RM.

The gang at ZXØF did not quite get the world record, but did win the multi-single title, with NA champion VP5N second, T33RD third, last year's champion, ZW5B, fourth, and UA7A fifth.

KM3T (plus W4AN) teamed up to take the US multi-single title and managed to destroy WC4E's 1992 record in the process. KI1G was second, followed by WC4E, W6XR, and NM9H.

The Rest of the Story

Judging from the comments received, the change to allow 1 point for intra-country QSOs was well received. After looking at many of the 2000+ logs received, I can't say that I saw where anyone seemed to make any strategy changes to look for 1 point Qs. I would expect that it does help the low band operators during this part of the cycle and will be a help to the high band operators during the low portions of the cycle. Check your logging program to see if it supports the 1 point QSO. All of the major software vendors have updated their software.

USA TOP SCORES

SINGLE OPERATOR ALL BAND

KQ2M	10,855,264
KF3P(K3MM)	9,516,830
N5KO/6	8,741,115
KE3Q	8,718,082
KM5X(K5TR)	7,909,344
WZ4F(K4AB)	7,189,216
NB1B	7,128,912
K3ZO	6,637,680
KVØQ(NØNR)	6,235,218
WB9Z	6,196,480
K7RI	5,661,361
N3OC	4,192,200
KR1G	4,166,890
N6ED	4,000,752
WC1M	3,980,830
K8OQL	3,858,184
AB5SE	3,725,860
NX9T	3,609,089
AI7B(W7GG)	3,340,474
K3JT	3,332,951

28 MHz

KZ5MM	2,455,008
NX5M(N5XJ)	2,150,988
W5WMU	1,814,067
K5NZ	1,724,448
K4JYO	1,697,704

21 MHz

WE9V	6,067,704
KKØT	4,435,201
K6LL/7	4,401,600
N4PN	3,277,968
KGØZI	2,824,935

14 MHz

KK9A	3,518,190
NA5B(W5AO)	2,377,808
*AK4L(K4PC)	1,147,461
K1KJT	1,029,591
*AKØA	901,192

7 MHz

NC4NC	296,922
AE5B	172,931
KE8GG	78,262
N9LCR	45,472

3.7 MHz

KE1Y	998,760
NP2N/AGØ	37,680

1.8 MHz

AA1BU	114,818
NE5D(K5RX)	88,740
KØCS	10,050

LOW POWER ALL BAND

WA1LNP	2,568,445
ACØW	2,495,460
W2TZ	2,360,340
WD5K	2,226,248
K1VUT	1,987,143
WS1A	1,918,800
WN6K	1,282,752
WA4IMC	1,222,610
WA1S	1,092,896
NT5D	993,990

28 MHz

W2BZR/3/T	655,191
W3NO	605,244
WJ7S	490,674
K6KAY/T	434,634
NU6S	400,197

21 MHz

NI9C	666,169
AE1B	555,000
KU6W	500,960
W6BSY	489,898
KW2O(K2SG)	457,166

14 MHz

AK4L(K4PC)	1,147,461
AKØA	901,192
AE6Y	348,480
NP4IW/NX6	216,920
KU6W(K6RO)	176,754

TRIBANDER/SINGLE ELEMENT

N6ED	A	4,000,752
NX9T	A	3,609,089
W1CU	A	3,298,752
KE9NA	A	3,118,299
NA1Q(W1NT)	A	2,705,750
*W2TZ	A	2,360,340
*WD5K	A	2,226,248
KA1UQ	A	2,211,462
N2ED	A	2,158,572
KY3ORK(KC3TL)	A	2,043,743
*WD4AHZ	28	206,668
K6LL/7	21	4,401,600
KGØZI	21	2,824,935

BAND RESTRICTED

*K6KAY/T	28	434,634
*KA9UQT	28	204,314
*W5CTV	28	75,112
*KA1RLI/T	28	66,476
*NØOFR	28	60,580

ROOKIE

NA1DX	A	1,166,459
K4BEV	A	580,263
AA1SU	A	546,820
KC8HWV	A	108,108
K6KAY/T	28	434,634
KC8KSX	28	32,330
KB9QFO	28	13,440
KD7DQO	28	8,436
WA4SEX	28	3,234

ASSISTED

NV4X(K4MA)	A	6,476,886
NY6DX	A	3,875,012
N3MKZ	A	3,421,596
N5JR	A	3,073,048
NA2NA	A	2,806,060
W6RKC	7	40,920
KN2T	1.8	113,088
AA4MM	1.8	75,192
W2MF	1.8	54,264

QRP/p

KR2Q	A	1,765,404
N6MU	A	1,070,000
NØKE	A	1,062,831
KB3TS	A	711,870
N1TM	A	331,296
WJ8C/P	7	13,066
KT3RR	28	506,258
WA6FGV	28	93,372
NA4CW	21	462,579
W6YJ	21	114,800
W5FO	14	322,077
WB7OCV	14	24,990

MULTI-OPERATOR SINGLE TRANSMITTER

KM3T	14,383,360
KI1G	9,410,058
WC4E	9,151,008
W6XR	8,930,573
NM9H	6,024,540
NE6N	5,713,038
AA5NT	5,112,443
NR6R	4,833,030
KR9A	4,526,754
N7TT	4,186,434

MULTI-OPERATOR MULTI-TRANSMITTER

WT6V	21,165,040
KU8E	18,428,886
NK7U	13,755,216
WO8CC	13,252,393
W7RM	13,111,144

** Low Power*

Check out the March issue of *CQ Contest* for some additional WPX analyses. K3EST has taken the TS, BR, and Rookie categories and added more tables and some comments from operators. In addition, you will find some extra WPX goodies which may be of interest. Look for more bonus WPX coverage in *CQ Contest* in the future.

As many of you know, we at *CQ* lost a good friend when *CQ*'s Editor Alan Dorhoffer, K2EEK, passed away last July. Alan was a good friend for nearly 20 years, an avid supporter of contesting, and also an avid prefix chaser. Chuck Coleman, K5LZO, also passed away in 1999. Chuck was a long-time supporter of contesting and the WPX contests and was a joy to talk to on his annual Dayton trips.

There are no *major* rule changes for the 2000 contest, but there is a rule change that could affect you. The WPX contest will now **require** a disk or electronic log if you use a computer to score the contest. We don't need to send a paper log if you send us an electronic log. That will save you the expense of mailing a large paper log. E-mail is the preferred mode. However, a disk (3.5 inch, PC format) will also be gladly accepted. If you send a disk, please send a printed summary sheet showing all scoring information and an address where we may contact you. If you send an e-mail log, please attach a summary sheet also. There are always a few logs that are corrupted, or files don't really get attached, or the wrong contest files are sent. With no summary sheet, it's often difficult, or impossible, to ask for a new log. We will accept the new CABRILLO format (make the extension *.CBR if your program does not do it for you) as well as CT, TRLog, NA, SuperDuper, and most other common programs. Multi-column logs are extremly difficult to process. If in doubt, please ask if we can handle your format. E-mail logs go to <n8bjq@erinet.com> only. All mail logs should be sent to CQ Magazine at 25 Newbridge Road, Hicksville, NY 11801 and be plainly marked as CQ WPX SSB logs. That will get them put in the right box and sent to the cor-

rect contest director. In Europe you may send your log to the French *CQ* office or the Spanish *CQ* office. Ari, OH1EH, collects OH logs.

Speaking of electronic logs, nearly 1200 made it into the database. This represents nearly all of the top logs in every category with a good distribution world wide. While we understand that we will never get 100% electronic log submission, more logs could be submitted that way. More electronic submission accomplishes two things. It puts more logs into the data base, and it speeds up log processing. The first is good for better log checking, and the second may enable the results to get into print sooner. It would be a worthwhile contest club project to collect logs from club members who don't have access to a computer and convert them to computerized logs. It might be a good way to boost club scores and recruit some new members.

As the database gets more sophisticated and more logs get entered, our checking gets better. Overall, the majority of logs submitted are very good. However, for various reasons there are a few who turn in logs that are way at the opposite end of the spectrum. With the software tools that are now available, it is relatively easy to spot these stations. There were a few rather large score reductions and one disqualification resulting from poor logging/operating. These large score reductions cost several stations many positions in the final results. Take a few extra seconds to verify whom you just worked before you hit the enter key. Asking for a fill instead of guessing could save you many points when the checking is done. This is not like a test where guessing is encouraged if you don't know the answer. A good knowledge of callsign structure and what constitutes a valid callsign is a plus.

The use of packet by single operators may be misunderstood by some. If you enter the single operator, non-assisted category, you may not use packet to receive spots or to self-spot yourself. This includes web surfing to clusters in different countries or getting spots from the web clusters. If you must use packet, then by all means enter the Assisted category.

The WPX Contest is a collective effort of many people. Bob, NA2X, and Scott, N9AG, provide much needed log-checking support. Sergio, EA3DU, Ari, OH1EH, and Mark, F6JSZ, are log collection points in Europe and also provide assistance with log problems. N6AA does a tremendous job with the database creation and validation. Dick continues to amaze me with all the different ways he can catch me making mistakes. Also a big thanks to N6TR for the fine software that we use and the support he provides. If you talk to these guys on the air, or at hamfest, thank them for all of the work they do behind the scenes.

As always, a big thank you goes to the participants, from the smallest station to the largest multi-multi. The effort you put into getting a special callsign or operating from a rare QTH plays a large part in making the contest a success. A big part of the fun in the WPX is not knowing what unique call will answer your next CQ. The following statement made by XE2AUB shows why many enjoy the WPX: "I really enjoyed this contest, was my first time in it, liked the nice sportsmanship of all contesters."

The 2000 contest will be held 25 – 26 March. Mark down those dates and give the WPX a shot if you have not already done so. If you need a log or summary sheet, you can get it from *CQ* for an SASE. Visit the WPX Contest web site at <http://ourworld.compuserve.com/homepages/n8bjq> for a listing of logs received, current rules, and other WPX Contest related items. See you in the 2000 contest!

73, Steve, N8BJQ

Random Comments USA

Used the multi-op manpower to put up a new antenna instead of operating . . . **KØGQ**. First multi-op between uncle and nephew combo . . . **KD3TB**. Wow, great condx. Great operating with Bill, W4AN, at his fine station. First time he and I operated together. Looks like a new M/S record . . . **KM3T**. Much improved from last year. Still wonder if the 1 pointer is a crutch. We were gunning for top 10 in US (14th last year; forget it) . . . **KO4MM**. Best we ever did from here. Thanks for the great contest . . . **KR9A**. Worked Papua New Guinea and Hong Kong . . . **KW3Y**. Sure would be nice to get rid of the 10-minute rule so you could really utilize a multiplier station . . . **N5YA**. Small effort between tower and antenna projects. Condx seemed better than the numbers indicated . . . **NT4L**. We wish the big guns would identify themselves more often. This habit of saying QRZ after numerous Q's is arrogant, counterproductive, and in this country, illegal . . . **NY4T**. Ken, WØETT, and I have over 80 years of contesting between us. We're both "over the hill," but having as much fun as ever . . . **WØAH**. This was the last W3USS contest operation from the historic Russell Senate Office building across the street from the US Capitol. The station existed for 30 years. In May 1999 the club disbanded . . . **W3USS**.

Really liked the 1-point rule. However, as a percentage of three years of submissions, I worked fewer W/K stations. Please make "last two letters" illegal. It slows things down big time! . . . **W6XR**. Lots of fun this year. This is our favorite contest bar none! The scoring change gave us more incentive to dig the weak stations out of the mud. Thanks to all who worked us . . . **WV2LI**. In our view, the 1-point rule was a tremendous success. It really helps the multi-multis because other stations are now willing to make QSOs on multiple bands . . . **KU8E**. This was the smoothest running operation in recent memory. It was great fun to go up against the crew from NK7U in eastern Oregon . . . **W7RM**. Our score was up almost 75% from last year; a supreme team effort!. Nice to have 20 and 15 play well. The restoration of the 20 meter stack in the last month paid off . . . **WT6V**. Kept waiting for an opening to Europe. Finally got a few Sunday afternoon . . . **KIØII**. Glad some people could hear me . . . **N8XA**. With the new scoring, the unusual US prefixes will work the common prefixes, too. Good change . . . **W6YJ**. The 1-point intra-country rule worked great. I no longer had to beg the US multi's for a Q, and then hope they actually logged me . . . **W8QZA/6**. Not many Europeans heard here. Sunday was really tough. 5X1Z was country #270 with 3 watts . . . **WAØVBW**. My 14-year-old nephew got to observe ham radio at its best until Saturday PM. He called me two days later bitten by the ham bug. Looks like a new amateur soon . . . **WB7OCV**.

The whole contest was a thrill. It was my first attempt at QRP SSB . . . **WN6HYX**. What a fun contest! Did not have much luck calling CQ with 100 watts as I thought I would . . . **AA1SU**. Thank you for a fun contest . . . **AB1BX**. Limited hours this weekend but very much enjoyed my first WPX. I'm looking forward to the CW weekend . . . **AF7Y**. Good conditions. My best effort ever with a modest station, using FT1000MP, Alpha 76A, and 5-ele monobander at 50 feet . . . **AI3Q**. The 1-point QSO in your own country is great. Not many of them worked, however. Was expecting more of the /n and /t+ guys. Condx were better than the sunspot numbers indicated. Pretty strong JA's Sunday afternoon . . . **AJ4Y**. Beam stuck to the east. Oh well. Not this year . . . **AKØA**. The WPX was the first real use of the new club callsign and it certainly paid off. My thanks to all of you whom we worked and was glad to give some a new prefix as well as a new multiplier. See you in the next test! . . . **AK4L**. Great to finally be back on the air . . . **K1KJT**. Second year in a row WX too nice to contest! . . . **K2CS**. Still fun after many years! . . . **K2FR.** Hunt & pounce works even with my modest setup with help from sunspots . . . **K2SZ**. Under the vanity program I got my original Panama Canal Zone call back . . . **K4BAI**.

Decided to do single band 10 meters. Saturday the band was hot; Sunday it was not! Didn't hear a single JA on Sunday, and the opening to Europe was really weak but had major fun anyway . . . **K4JYO**. The new 1-point rule was long overdue. It made a search & pounce mode looking for domestic prefixes less embarassing when you have a K prefix . . . **K4VX**. The new 1-point rule seemed to help activity and made working W's much more fun! . . . **K5ZD**. I was comfortable calling former 0 pointers who would now at least get point credit for a QSO with a lousy K6. It seemed like there were lots more W/K QSOs being made than last year but they *by no means* turned the contest into an "American QSO party"! . . . **K6GT**. Contest is much improved with the 1-point USA rule . . . **K6LL/7**. Operated about 34 hours. Seemingly as usual, conditions on Sunday were poor from this QTH. Also 10 meters was huge disappointment with very limited band openings . . . **K7RI**. Lots of fun. Be back next year with antennas . . . **KBØMZG**. Conditions very good here except 10 meters only open to south, no EU or JA's. Last day was stormy and very noisy . . . **KC7UP**. Spent the first few hours Sat. morning to finish installing the new C-3SS. It tuned up perfect the first time without any adjustments and worked flawlessly . . . **KD6DAE**. I had a good time. Wish I'd put in the whole time. I'd like to contact some Africans and more Pacific Islands . . . **KD7DQO**.

WPX contest and a little overwhelmed by everything at first, but got in the groove as the contest progressed . . . **KE4MCE/T**. Just dabbled an hour here and there. There was no lack of good signals every time I turned the radio on . . . **KE4OAR**. Great contest! Had a blast. Can't wait to do it again. My best effort ever . . . **KE9NA.** Fifteen meters was just HOT! . . . **KF3P.** This was my first time running them!. . . **KG2FH**. I am a quadriplegic. 85 QSOs is an achievement for me . . . **KI7LS**. Great condx. Almost

Here are most of the ops at BV2B who operated multi-single and demonstrated contesting during their convention.

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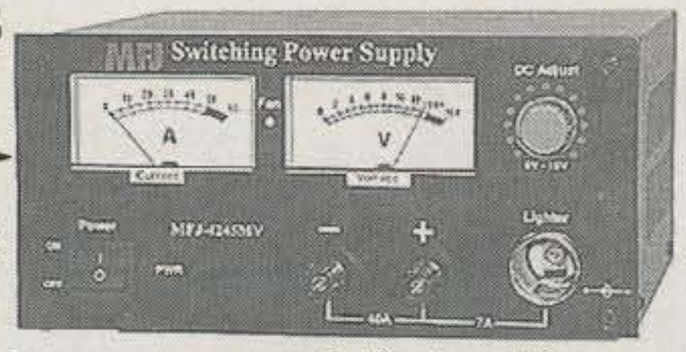

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AFRICA

1.8	EA8/OH1MA	404,976
3.5	No Entrant	
7	ED8WPX	3,601,456
14	5N3CPR	83,200
21	ZD8Z	12,032,740
28	ZD88A	13,170,159
AB	EA8ZS	12,941,740

ASIA

1.8	No Entrant	
3.5	*4X1IM	528,002
7	No Entrant	
14	*RSØF	3,025,609
21	JI3OPA	6,328,407
28	H22H	5,789,817
AB	JH4UYB	6,659,952

EUROPE

1.8	OMØWR	296,474
3.5	OK2RZ	1,636,910
7	9A9A	4,624,188
14	DJ7AA	5,744,320
21	9A3GW	6,504,371
28	9H3XY	6,033,012
AB	OK1RF	8,751,637

NORTH AMERICA

1.8	VA1A	535,225
3.5	KE1Y	998,760
7	NC4NC	296,922
14	KK9A	3,518,190
21	XO7X	6,112,756
28	WP2Z	7,566,636
AB	TI1C	17,078,930

OCEANIA

1.8	AH6PR	18,963
3.5	AH6OZ	670,970
7	WH7Z	4,582,773
14	KH7U	3,150,160
21	AH7DX	6,439,698
28	KH6ND	6,442,856
AB	*KHØ/JF2QNM	4,537,056

SOUTH AMERICA

1.8	No Entrant	
3.5	*LU5FCI	312
7	No Entrant	
14	PP5JD	4,169,683
21	P43A	9,001,687
28	ZX5J	14,405,820
AB	HC8A	24,660,043

MULTI-SINGLE

AF	CQ9K	10,775,514
AS	UA7A	14,441,808
EU	TM1C	14,127,966
NA	VP5N	21,618,144
SA	ZXØF	27,446,570
OC	T33RD	17,778,372

MULTI-MULTI

AF	CN8WW	55,151,562
AS	P3A	47,680,574
EU	OT9A	35,425,530
NA	KL7RA	22,808,240
SA	4M4X	19,873,728
OC	TX8DX	22,641,087

** Low Power*

OT9T finished first in Belgium and fourth in Europe in the single op all band category.

hit 1M pts. Should have stayed up another 6 hours . . . **KM7TM**. Lots of fun. Looking forward to next year. Activity low on top band. Highlight when AH6PR, VK6HD, and VK4SX called us on run freq. Thanks to everyone who worked us. See you next year . . . **KN2T**. Struggled with the strange conditions on Friday and Saturday until 15 *really* opened on Sunday. Wonderful to be able to hear and work JA and Asia for the first time in years on 15. Dave, K1TTT, put in many hours of work taking apart and rebuilding the station for this SOAB effort. Thanks to Dave for his hard work, hospitality, and allowing me to use his top-notch station. I was pleased we broke 10 Meg in this effort . . . **KQ2M**. CN8 on 40 meters and 5X1 on 10! . . . **KQ6VQ**. Thanks for the 1-point change, guys. It really added to the fun! Just wish I hadn't had my low band antennas down for maintenance . . . **KS4XG**.

Propagation just won't hold up here long enough to crack a million, but this is the closest have come. Guess will have to wait till the next century to do it now! . . . **KS7T**. Murphy brought three computer crashes and one antenna failure, but still a great contest . . . **KU6J**. Working 20 meters with low power and a small beam was hard work. Too many hi-power stations with over-driven linears . . . **KU6W**. Under the Vanity program I got my original Panama Canal Zone call back. Got several comments from some of the old timers . . . **KZ5BCN**. Missed the last 1 1/2 hours of contest. Had to leave to go see the Rolling Stones concert! . . . **N1NQD**. Spent too much time chasing DX on the first evening! . . . **N3HBX**. Murphy strikes again: computer failure on Saturday. Had to commandeer the XYL's to continue logging . . . **N4SEA**. Very impressive openings to Far East Friday and Saturday night . . . **N4UH**. I got a bit more operating time in than last year. Three new countries in the log, so it was a success! A highlight was working ZXØF on five bands. Next year I've got to get that R-7 up and use computer logging during the contest . . . **N6TPT**. What a fun contest! Good propagation on all bands. My personal best contest to date . . . **N8CN**.

Should have put an antenna on the computer. It was the only thing that didn't break . . . **N8EXS**. Conditions were definitely disturbed. Not one JA, OH, or UA1, 3, 4 area worked; no G's worked second day. Activity was pretty good from southern EU. I had marginal success running the States (skip was long with only the West Coast available + backscatter) . . . **N8II**. Worked my first VR station ever! . . . **N9GUN**. Second WPX phone contest. It was only the second full contest from my home station. Had great fun trying to break through the pileups and even tried calling CQ. Search & pounce worked well . . . **NA1DX**. Another great SB WPX. Found the 1-point rule to be of little assistance to score. Game from here is to run Europe . . . **NB1B**. Love the new 1-point rule; added 50,000 points to my score. Also conditions Friday night were totally awesome on 15 meters. Worked BY, HS, JT, 9V, YB with incredibly strong signals. Never heard such things before, let alone work them with 100 watts and a 2-ele quad. My best score ever . . . **NI9C**. Using the club call seemed to generate considerable interest. Nice to see JA's on 10 meters again after their absence at the end of last cycle. One point for domestic QSOs is a real plus . . . **NK6U**.

Bands were *too* hot. I couldn't keep up with all the new multipliers. It was exciting to have TZ6DX return to my CQ . . . **NN6NN**. I would love to dedicate my first ever one million point score in memory of my mentor, K5LZO, who passed away Monday 3/29/99. I will miss you, ole friend . . . **NT5D**. Got a new country (5X1Z) . . . **NX9B**. What a lot of fun. Bands seemed great and my little station seemed to play. Thanks for all the Q's, and especially to those who had great patience with me when I couldn't pull them through the QRM. It's hard for a little fella to steal any spectrum, much less clean it up around him! . . . **NX9T**. Very few decent runs, lots of fun search and pounce . . . **WØZP**. First CQ WPX, second contest ever. Great fun! . . . **W1NXB**. This was my first single operator contest. I

Krzysztof, SP6DVP, provided a multiplier to many on 21 MHz with his special 3Z6V call.

had lots of fun and I'm looking forward to the next one . . . **W2MF**. First serious attempt in WPX SSB contest. Lots of action . . . **W2TZ**. TS-830 with tired tubes and 2-element quad . . . **W3CP**. It's amazing who calls in on a QRZed when you are beaming Asia or the Pacific! . . . **W3NO**. Worked Mongolia on a 20 meter loop (ends on him) . . . **W4NTI**. Finally worked more JA's than LU's. Band was really open. Really improved my score from last year . . . **W5RNF**. It was pretty stupid to try SB–LP assisted on 40 SSB! (But fun anyway!) . . . **W6RKC**.

Found the new 1-point rule for intra-country contacts much more enjoyable and got more operating hours out of me. Many more DX contacts, too! . . . **W6TKV**. Sure was great to work E41/OK1DTP for a new country! Also nice to have P2ØX call me with 12 minutes left in the contest! . . . **W7FP**. Since I got a late start and had weekend work commitments, I decided to go multiplier hunting . . . **W7YAQ**. Great contest. My best effort in years! . . . **W8CK**. Three VK's and a KH6 while I was mobile made the contest very enjoyable on 10 meters with only 25 watts . . . **W9CNF/4/M**. Was sick and didn't operate as much as last year but had fun . . . **W9YS**. Looking forward to the CQ WW! . . . **WA4SEX**. Nailed the JA's on 45 watts and a dipole during a pileup . . . **WB4SQQ**. Best conditions in years. Great to have 10 meters open. My best score ever . . . **WB8TLI**. Great way to close down the KS9K/W9JA superstation. Break the USA record! Paul is moving to Virginia. Look for K4JA in 2000 . . . **WE9V**. Great contest! I am a regular, but casual part-time S&P only contester. This is the first time I have ever made 400 QSOs in any contest . . . **WK5K**. First time in contest. Lots of fun . . . **WN6CTY**. Holding 14.158 as a run frequency with only 100 watts and rates up to 120/hr was a thrill I'll not soon forget . . . **WS1A**. First time entrant to this contest. Great time! I'll be back next year. Hope to break 500K points. Tried all weekend to get CN8WW. Finally got 'em on Sunday . . . **WWØDX**.

Random Comments DX

9H3XY was a single-op DXpedition by Steve Telenius-Lowe, G4JVG, from the station of Jeff Morris, 9H1EL. I am claiming a new WPX EU 10 meter record to add to my Oceania 10 meter record (P2ØA) and Oceania M/S record as P2ØX. Thanks to 9H1EL for his hospitality and good luck to Jeff in claiming the record back again next year . . . **9H3XY**. For me still the best contest . . . **CT1BWW**. It was fun to operate with my new 2×2 callsign . . . **DJ2MX**. License holder is Helmet, DL7MAE. Op was Robert, 10 years old, our trainee station . . . **DN1MA**. First international contest for me. Was not able to reach 1000 QSOs or 1,000,000 points, but not bad for a first timer, I guess . . . **DU7MHA**. Good condition on high bands. I enjoyed much pileup from EU and USA . . . **JR4QZH**. This was not supposed to be a serious effort. I hurt my back just three days before the contest, so I was not sure if I could spend 36 hours in the chair. Hearing LA9HW also entering SOAB changed my mind. Back hurt, but took a break every now and then to stretch out . . . **LA8W**. I need more power to win! . . . **LU9AWM**. Bad luck—the PC was silent key the Tuesday previous to the CQ WPX (is very hard to come back to paper logs after four years); and bad luck during first 16 hours—problems with amplifier relay. But lovely and funny contest. Many stns from EU, JA, and NA. A little problem with OMs from USA called me as W7DX or KW7DX or NW7DX (the last was also contesting)! . . . **LW7DX**.

Good condx in direction of Asia . . . **LX1EP**. My first single op contest. Thanks for the rookie category . . . **LX2LX**. Nice contest and good activity. One point per own country good idea (but only for Japan, Russia, and USA). Too many bad signals and splatters on bands especially from Russian 200 watters . . . **LY2BTA**. Europeans were biggest DX in this contest. Only two DL and G QSOs. Even backscatter sigs were too weak for working . . . **LY2OX**. Learned a lot in the contest about my new beam ant . . . **MØBRK**. Thanks for a nice contest. Great condx and a lot of activity. Nice to be called by D44BC, T2ØDX, and others. Thanks to Karel, OK1CF, for the tcvr, and special thanks to OK5W for letting use their beautiful QTH . . . **OK5W**. Great contest, great QRM. Broke my personal top score . . . **OL6X**. Finally broke the 1M points and 1000 QSO barrier. Highlight was when T33RD was worked on first call on 20. . . . **ON4APU**. I decided to connect to the DXCluster to catch some new prefixes for my WPX award. Although I made lots more QSOs last year, I had a ball—lots of new prefixes and even a new DXCC entity: T33RD. Some even think ham radio is only a hobby. They should ask my XYL . . . **ON4CAS**. My first WPX SSB from Aruba. Hope to do it again. Congrats to HC8A/N6KT; he *is* the very best . . . **P4ØW**.

Thrilled to have XV, HSØ, VR2, and other rare Asian stations break the pileups to work me . . . **P43A**. A nice contest weekend with old-fashioned conditions direction

JA and to the rest of the world, but I forgot to work on 160 and the 40 meter bands. I hope to come back next year with 2500 QSOs . . . **PAØIJM**. Worse than last year, but I'm sure that will be nice next year . . . **PU2VYT**. Enjoyed a lot the funny time in the contest. The big award was T33RD coming till my frequency. Unbelievable! Tnx folk for the nice time I had passed in front of the rig calling CQ contest . . . **PY3RK**. My first contest, my skills improved . . . **PY8AZT**. 15 meters was great open! . . . **RW4AA**. Thanks to guys at S53M/S59DBD for their hospitality . . . **S53M**. On early Sunday afternoon the main tuning knob blocked and was very hard to move up and down with knobs on microphone. Lost at least 100 QSOs, as with low power you cannot remain on one frequency calling CQ . . . **S54A**. I very much enjoyed the few hours I could participate . . . **SM4BTF**. Good SSB contest. This is my first SSB contest . . . **SP2QVS**. It's tough in the fast lane with all the high-power guys wanting your frequency . . . **TI7/N4MO**. Tnks to my friend Gerard, F6FGZ, for lending me his super station . . . **TM7XX**.

RU1A refused to work me. He thought I was a joke! So much for trying to have a rare pefix. Must be getting better with age; managed to beat last year's score and record, thanks to VE1ZZ QTH and all who shared noisy band. Thanks for 1-point domestic QSO, welcome change . . . **VA1A**. They never quit calling on 15 meters. Unbelievable! . . . **VA3DX**. Great contest. Had to have hard helmet on for 20 meters—tough bunch, hi! . . . **VE1RX**. Biggest thril: not realizing whom I was contacting and where they lived until I edited their name and location. The fact that at one moment I spoke to a person and the next to someone else thousands of miles away without leaving my home . . . **VE2TPR**. My first single op contest attempt with my new home station. I had a great time!! Conditions were good!! Thanks to all who worked me . . . **VE3SS**. My best showing ever in this contest! But as you can see by the score, the crowds and my antennas fought me on the low bands. I'm working on it this spring . . . **VE3STT**. A great contest with great conditions, despite having to be in the QRL for several hours over the weekend . . . **VE3ZZ**. First try at contesting. Great time was had! . . . **VE4HAZ**.

My first CQ WPX contest. Operated from summer cabin at Timothy Lake, B.C. Powered station from battery and Honda generator . . . **VE7UQ**. Biggest thrill was making over ten times the score from last year (and not having to work as hard to do it) . . . **VE7YJ**. Working BY1DX first contact and then Taiwan later in the test . . . **VE9WH**. Why don't we have propagation like this weekend's to the Caribbean for CQ WW? . . . **VR2BG.** Working from WP2Z was "ham heaven" . . . **WP2Z**. I really enjoyed this contest; was my first time in it; liked the nice sportsmanship of all contesters . . . **XE2AUB**. Unfortunately, many other things interfered with working this contest. However, band was great and I had fun in spite of it all. First experience of single band only. This is still my favorite contest! . . . **XJ1JS**. I was new multiplier to all stations I worked . . . **Z37FCA**. First time ever: more EU than USA! . . . **ZD8Z**. Log turned into a single band effort halfway through. Ten was spectacular, but couldn't get anything running on the low bands . . . **ZS6EZ**.

Congratulations to WPX gang for the new 1-point rule. I worked a lot of PY stations. It's wonderful to see the contest "virus" increase his action in my country. See you next year . . . **ZX5J**. TNX for the wonderful WPX contest. In BV-land the China Radio Association and Amateur Radio of Taipei, we combined a contest team running BV2B club station and enjoy the world's largest festival on air . . . **BV2B**. A very good score with the newcomers . . . **FM5BH**. First try at an HF contest by seasoned VHF contesters and enthusiastic "never befores." We loved every minute (except for the technical problems!). Will try harder next time . . . **GD6IA**. Hey! This is the second year as a "fun-multi"; maybe we'll get serious next time. . . . **GW4BLE**. Big fun on new cycle propagation. Sixty stations less to our target over 3000 (hi) . . . **JA6ZPR**. Marico Radio Club (JI2ZJS) is first entry of WPX Contest. This QTH is very beautiful location at 150 km southwest of Tokyo and near Mt. Fuji. Club house is 10 square meters wide and two towers . . . **JI2ZJS**. Great propagation on 15 meters! Well, propagation on 10 meters will wait for the next year . . . **OH1F**. Great competition between OH M/S teams again! The ops at OH2U were still a bit rusty after the long winter, but under pressure, the "old diesel" fortunately got started . . . **OH2U**.

We were running WPX for first time and it was a great experience . . . **SW8L**. The propagation drop on Sunday was horrible. There were periods longer than 10 minutes when we could not make a single contact. Low bands were very bad. T33 is simply too far! . . . **T33RD**. Great conditions on 15 meters into Europe during the day and into Japan in the early evenings. Was a privilege to operate with a world-class operator like Yuri, VA3UZ (ex-UT4UZ) . . . **XL3D**. WPX contesting is our dream . . . **YBØZCE**. Thanks to Oms, PY5EG, for opportunity and Marcia, PU5MCO, for your help. They are very very special friends . . . **ZW5B**. Big fun on new cycle propagation . . . **JA6ZPR**. Ten was great a few days before the contest, but never really opened for us . . . **KL7RA**. We tried some fun in M/M category with a couple of wires and only three TX . . . **S57M**. Extremely difficult to work in this contest with just a little bit more power than nothing . . . **HB9AYZ**. Ten meters QRP, this is one chance in a million! . . . **JA5GPJ**. Amazed at 40 meter and 80 meter QSOs! . . . **KH6/WB6FZH**. A novel QRP experience—98% S&P, 50% Europeans, 97 countries . . . **VE3KZ**.

Station Operators Multi-Op, Multi-Transmitter

4M4X: OHØXX, YV4GME, YV5AMH, YV5FAA, YV5EED, YV5IQJ, YV5JCB, YV5LMW, YV5LMX, YV5MHX, YV5OBU, YV5NSV, Freddy Rivero. **AD4TR**: AD4TR, WB2WIH, KE4RGH, KE4JZT, WB2QLP. **AJ1I**: Club Group. **BV9A**: BV2KI, BV4KR, BV4ME, JG3TRB, JH3GCN, JP1RIW, JR7TEQ, 7M1STT. **CN8WW**: CN8LI, CN8NK, CN8OO, DJ9MH, DL1MFL, DL6FBL. **DX1DBT**: John, Marvin, Marlon, Joey, Arlan, Danilo, Pocholo, Christopher, Dervin, Menardo, Andrew, Joel, Arem, Norman, Joey, Glazer, Sean, Biboy, Lennart, Maui. **EA4ML**: EA1JE, EA2TV, EA4BT, EA4CT, EA4ET, EA4KD, EA4TX, EA5GRC, EA7DBO, EA7JB, EC4AGN, EA4KA, EB4AKI, EB4EPJ. **ED4RAX**: EA4AHW, EA4ABW, EC4ANZ, Javi, Nacho, Montse. **ED4RCT**: Julian, Esther, Alberto, Badolo, Jesulin, Gema, Oscar, Jacobo, Pilar, Eduardo, Juan-Carlos. **ED7VG**: EA7HY, EA7ATX, EA7CCA, EA7EZQ, EA7GNC, EA7CCN. **ES5Q**: ES5MC, ES5MG, ES5QX, ES5RAH, ES6RN, ES5RW, ES5RY. **HG6Y**: HA2RX, HA3OV, HA6DX, HA6ND, HA6NY, HA6PX, HA6OB, HA6OI.

JA1YPA: JA1ATK, JA1PEJ, JA1QJK, JH1AZO, JI3ERV. **JA6ZPR**: JH6JSR, JH6SQI, JR6CKX, JI6MYW, JA6PBO, JG6WIO. **JK3KDH**: JK3KDH, JN3GVM, JS3CTQ, Ako, Kawabata. **JN1YUU**: Shuzuka (age 11), Saori (age 11), Chisa (age 11), Ayumi (age 11), Yumeho (age 11), Mami (age 12). **KL7RA**: KL7RA, K5ZO, AL7IF, AL7MU, AL7RF, KL7TC, KL7XD. **KU8E**: K8CC, K8DD, K8GL, K8GT, K9TM, KU8E, N8BTU, N8VW, W8MJ, WD8S. **LO1F**: LU1's FAM, FOW, FZR; LU2's FYU, JCW; LU3's FCK, FP, FR; LU4's FA, FPZ; LU6's FA, FEC, FFQ, FUQ, FWN; LU7FW; LU8's FPT, FQQ; LU9FIO. **LY7A**: LY2BMX, LY2BUE, LY2BUU, LY2DQ, LY2KX, LY2NK, LY2NLL, LY2UF, LY2WJ, LY3DA, LY3HD, LY3IT, LY3RJ, LY4AA. **NØNI**: KØKD, NØNI, WØFLS, WØETC, NØAMI, WOØV. **N6IJ**: K6EP & N6DE. **NK7U**: NK7U, K7ZO, W7ZRC, K7MK, K7NT, K9JF, W7UA, KC7DPD. **NP3X**: WP3A, WP4NHM, WP3C, WD4JNS, W4OV, KP2BH. **OT9A**: Ops.

P3A: RA9JX, UA9MA, RZ9UA, RZ3TX, UA3DPX, RAØAM, RVØAR, UA9YAB, UN2O, RU9MA, Alex, Vadik. **S51S**: S51TA, S51XO, S56A, S57MW, S57PW, S57RW, S59W, S56VXO. **S57M**: S57M, S51DI, S51RE, S59O. **SK6NP**: SM6FUD, SM6WQB, SM6WQA, SM6FKF, SM6BUV, SM6VUL, SM6WET, SM6WWK, SH6ADN, SH6AEP, SH6AEO. **SV1DKR**: SV1DKR, SV1DET, SV1DZB, SV1DKL, SV1DNW, OK1YM. **T42R**: CO2KG, CO2JA, CO2NT, CO2II, CO2WF, CO2GQ, CO2GK, CM2VA, CM2KL, CM2KC, CL2OT. **TX8DX**: FK8GM, FK8FI, FK8HC, FK8VHN, FK8VHT, FK8HW. **VE7ZZZ**: VE7AGJ, VE7CV, VE7EME, VE7LRS, VE7PTT, VE7SK, VE7TLL, VE7WJA. **VF6JY**: VE5MX, VE6TX, VE6BF, VE6JTM, VE6JY, VE6JO, VE6DYB, VE6SLV, VE7AV. **W7RM**: K1TA, K5ZM, K7ZUM, KC7TWZ, KD7BSW, KI7Y, KK7GW, N7ATM, N7TO, W7BX, W7RM. **WO8CC**: N8NR, N8BJQ, N9AG, K9NW, W8KKF, KB8PVQ. **WT6V**: N6RO, K4KR, K6RC, K3EST, N6IG, K6AW, AEØM. **YO3APJ**: Club Group.

Station Operators Multi-Op, Single Transmitter

4G1A: DU1WHO, 4F1Z, 4F1DMD, 4F1GYE, 4F1QJW, 4F1QJV, DY1PDO, DU3AZ, 4F1BYN, 4F1EAA, DU1MGG, DY1GYU. **4NØX**: 4N7RGH & YZ7DM. **6Y5MM**: 6Y5MM & 6Y5KW. **9A1CMS**: 9A5TR, 9A5RJ, 9A4RJ, 9A5AVW,9A5ATW, 9A5AHD, 9A6KZH, Damjan. **9V1YC**: 9V1YC & 9V1BH. **AA2AD**: AA2AD & KC2AKT. **AA5NT**: N5NJ, W5WW, N5QQ, N5EE, AA5NT. **AB2DE**: N2KPB, KC2AVE, KC2DZY, KB2IZB. **BV2B**: BV2WA, N2IT, BV2KS, BV2CE, BV2NT, BV2PU, BV2UJ, BM2AAL, BM2AOT, BM2AAV. **BY4CSZ**: Yu, Xu, Wangweijun, Cao Lei, Gu. **CE3AA**: Club Group. **CQ9K**: CT3BD, CT3CD, CT3DL, CT3HF, CT3HK, CT3IA, CT3KN. **CS9Z**: CT3CK, CT3EX, CT3FJ, CT3FQ, CT3HT, CT3HV. **DAØGF**: DL3OCH & DL2JRM. **DFØHTE**: DH1TW, DL1SFK, DL3SBI. **DH2RAL**: Club Group. **DKØSU**: DL9SEV, DL2SFI, DF7SA, DJ3TZ, DL3SFB, DK9TN. **DK1NO**: DK1NO, DL1IAO, DL2MEH, DL2CC. **DLØSLZ**: Club Group. **DL2ARD**: DL2ARD & DH1NAX. **DL3KZA**: DL1KZA & DL3KZA. **DL6RAI**: DL1MGB, DL4RDJ, DL6RAI. **DN1NA**: Manuela, Bettina, Anita, Bernd, Wolfgang, Gerd, Thomas, Andrew, DO1NR, DO1NRL. **DX1DX**: DU1SAN, DU1MHX, DU1JXP, DU1HDG.

E41/OK1DTP: OK1TD, OK1DTP, OK1CW. **EA1EEY**: EA1EEY, EA1CS, EA1DZW, EA1CUB, EA1BVP, EA1BXW. **EA5FFC**: EA5AFH, EA5DF, EA5FFC, EA5ZI. **ED1BD**: Club Group. **ED2RCA**:

EA2CBY, EC2AFA, EA2ARW, EA2ABM. **ED2WPX**: EA2MQ, EA2ATU, EA2CCG, EA2CNB. **ED3TR**: EA3CT, EA3KG, EA3BIP, EA3GGO,EA3GEP, EA3BJO, EC3CVD. **ED4RKU**: EA4EKH, EA4AD, EA4CWH, Santi, Chus, Suso, Jose Luis, Juan Carlos. **ED4ST**: EA4ATI, EA4TD, EA4ST. **ED8GCC**: EA8AKN, EA8AZM, EA8BIK, EA8BVH, EA8BVX, EA8CAJ, EA8DP, EA8NL, EA8RA, EC8ABT, EC8APU. **EM4E**: UR5EAW, UR5ECW, UR5EDX, UR5EFJ. **EM5ØUWC**: US-U-Ø73, US-U-Ø76, US-U-Ø75, US-U-Ø91, Denis. **EM7Q**: UR5QN & UY5ZZ. **EN5J**: UU1JA, UU2JQ, UU2JZ, UU3JD, UU4JDX, UU5JR, UU8JY, UUØJX. **ES2X**: ES21RJ, ES2QH, ES2FM, ES1MW, ES1NJ, ES1TBR, ES1TFT, ES2NA. **EU5F**: EU6AR, EV6M, EW6AF, EU6DX, EV6Z, EW6AW, EU6PW, EU6TV, Vitaly, Sany, EW6MM, EW6OO, EW6EW.

FM5BH: FM5FJ, FM5DS, FM5NA, FM5DN, FM5BH. **G1Y**: GØUDT, MØAYQ, G4KCT, GØLPX, G7LXK. **G5N**: GØHVQ, GØTYA, G3LVP, G7BPX, G7ETZ, G7HTS, G7KCG. **G8A**: GØKXL, GØDBE, GØIEQ, GØSTU, G1AOF, G3RTU, G4WSE, G4NXG. **GD6IA**: GD3UMW, GØTOU, GDØTEP, MDØBXX. **GJ3DVC**: GJØNYG, GJ4TXB, MJØBJU. **GW4BLE**: GW4BLE, GWØARK, GWØLKA, GWØRYT. **HG1S**: HA1TJ, HA1DAE, HA1DAC, HA1EAI. **HI3CR**: HI3HCE, HI3LFE, HI3LRR, HI3JMQ. **HSØAC**: HS1CKC, HS1BZY, HS6NKD, HSØGBI, E21ENF, E21CJN, E21EIC. **IK1SLE**: Club Group. **IO2A**: IK2HKT, I2IFT, IK2CIO, IK2ANI, IK2YCN. **IO2L**: I2OKW, IK2YYE, IZ2ACZ, IZ2CEF. **IO5A**: I5JHW, I5NSR, I5NXH, I5OYY, I5UKS, IK5EKB, IK5GQK, IK5JAN, IK5NAW, IK5ZTW, IZ5BAM. **IQ7R**: Club Group. **IQ9K**: IT9KWF, IT9EWG, IT9CYH. **IR4T**: I4UFH, I4JMY, IK4IEE, IK4MHB, IK4UPB, IK4MTF, IK2QEI, IK2SGC. **JA5BJC**: JA5BJC, JA5FDJ, JH5FXP, JH5RXS, JR5JAQ. **JA6ZPR**: JH6JSR, JH6SQI, JR6CKX, JI6MYW, JA6PBO, JG6WIO. **JE6ZIH**: JR6GKT & JF6DEA. **JI2ZEY**: JA2BY, JA2BIV, JA2BIL, JM2CCL, JQ2BBC. **JI2ZJS**: JA2AXB, JA2JSF, JE2HCJ, JG2TSL, JH2MYN, JH2UVL. **JR1ZTI**: JA1QXY, JF1DHS, JP1OGL. **KØCOP**: KØCL & KØCOP. **KØGQ**: KØOU, KBØRTH, KGØUS. **K2TW**: K2TW, W3BGN, W9NGA. **K3TG**: K3TG. **K6ZM**: K6WG, KD6RMN, RWØFO. **K7PAR**: Club Group. **KD3TB**: KD3TB & N2WKS. **KD9ST**: KD9ST, K9SD, KA9SQR, KA9SQS, KB9EXE. **KI1G**: KI1G, K1SD, WF1B, W1WFZ. **KM3T**: KM3T & W4AN. **KO4MM**: KO4MM, N4VHK, WB4MSG, KD4RGB. **KR9A**: KR9A, K9XD, N9VVV, K9YO. **KW3Y**: KW3Y & W4UEA.

LR5ØD: LU8DY & LU9DC. **LU1NF**: LU1NAF, LU1NDC, LU8NA, LU9AY, Otto. **LV2V**: Club Group. **LZ6A**: LZ4BC, LZ2EG, LZ1CNN. **LZ9A**: LZ2CJ, LZ2DF, LZ2PO, LZ2UU. **M4U**: GØDVJ, GØOZS, G4FTP, G7HOW. **M5W**: GØMTN, M1CFI, GØEYO, G7UGC. **M6T**: G4PIQ & G4BAH. **M8S**: G4AGQ & MØAGQ. **N1JJ**: WØGJ, NØMLJ, WØPRJ, KL7YL. **N5YA**: N5YA, KM5UB, N5KB, AD5PU, KD5ETC, WB2LMA, N5KR. **N7TT**: N7TT & Delores. **NC7J**: NG7M, NC7W, K8EI, AC7H, W7CT, NY4I, KO7X. **NE6N**: K6XC, KI7WX, W6AQ, W6ORD, W6EEN. **NK4U**: K4EA, K4RF, K4SZ. **NM6Q**: ND6A. KF6PCW, W6UC, K6DAW. **NM7I**: K7ON & NU7I. **NM9H**: NM9H, NO9Z, KX9X, N1HRW. **NR6R**: N6KI, K6AM, N6NC, KB2T. **NT4L**: K1KY, W4NI, N4GHU. **NY4T**: NY4T, KF4GNV, W1ADE, KD4BAM, N4SSD, KE4KMG, KF4GKN, KE4GKE. **OE2M**: Club Group. **OH1F**: OH1EH, OH1MDR, OH1NOA, OH3WW. **OH2U**: OH2HE, OH2IW, OH2XX, OH7BX, OH7JR. **OH7M**: OH4XX, OH6LNI, OH7KD, OH7MHL. **OH8LQ**: OH8LQ & OH8MCT.

OL1C: OK1AN, OK1UZW, OK1IPS, OK8AAM, OK1TIC, OK1IEC. **OL5Q**: OK1HRA, OK1FLC, OK1FFU, OK1INC. **OL5T**: OK1TC, OK1DXF, OK1HSK, OK1FLM. **OM3KWZ**: OM7AB, OM7AG, OM7AA, OM7ALH, OM7AC, OM7ARC. **OM5M**: OM1KM, OM2KW, OM2RA, OM3BH, OM6NM. **ON4LCE**: ON5WA, ON4KVI, ON4LCE. **OT9C**: ON4QJZ, ON4ALT, ON4AMI, ON4CEQ, ON6MR, ON6SK, ON7UN. **OT9K**: Club Group. **OT9P**: ON4LAM, ON5OO, ON6AH, ON6MH, ON6QR, ON6VL, ON7PC, ON5AV. **OT9R**: ON4BAL, ON4UW, ON4AKH, ON4AVJ, ON4BBF, ON7EF. **OZ/K8HT**: K8HT, DL8AAE, DH5ABH, DH4AAH. **OZ7HAM**: OZ1ETA, OZ1BIZ, OZ1MAT. **OZ7RJ**: OZ1IVA, OZ5ABD, OZ1/5LH. **OZ9KY**: OZ9AAR, OZ1GWD, OZ1DLD, OZ1EEZ. **P2ØX**: P29KJP, P29KPH, P29ZMC, P29ZJM. **P39P**: Club Group. **PY1NEZ**: PY1NEZ & PY1NEW. **RF9C**: RZ9CO, RA9CMO, RA9CKQ, UA9CIR, UA9FQY. **RK1OWZ**: UA1OZ, RA1OJ, UA1OMX, UA1OMZ. **RK3AWE**: RK3FM, RU3DGD, RA3DKE. **RK3AWV**: RX3ARI, RX3ANX, RW3ARA, Tania. **RK3QWM**: RA3QH & RA3OU. **RK4WWA**: UA4WA, RW4WA, UA4WAN. **RK6XWA**: UA6XDX, RA6XR, UA6XHT, UA6BS, RA6XMF. **RK9CZO**: RX9CAZ, RV9CFY, RA9CDF, RV9CDW. **RK9JWJ**: UA9JLZ, UA9JMA, UA9JMP, RA9JAC, UA9WO/9. **RK9KWI**: UA9KJ, UA9KE, UA9KEK.

RM6A: RN6BN, RA6CO, RA6CM, RA6AX, RA6YY, RA6YDX, RU6AB, Slava. **RW2F**: RA2FA, RN2FA, UA2FF, UA2FM, UA2FZ, UA2FJ. **RW4LYL**: RA4LW, RA4LZ, RW4HTT, RW4LE, UA4HTT, UA4LU. **RW9UWK**: Alex, Victor, Denis, Yakov. **RX3RXX**: UA3RAR, UA3RV, UA3RJ, UA3RA, RA3RFA, UA3-157-611. **RZ9AZN**: UA9ALE, UA9ATQ, RA9A-ØØ4, RA9AQT. **S5ØE**: S5ØR & S5ØU. **S5ØG**: S5ØQ, S56M, S57AW. **S5ØS**: S5ØS & S58A. **S53APR**: S53DX, S59DZ, S57W. **S54DL**: S54DL, S54E, S57NMQ. **S56MM**: S5ØA & S57J. **S59ABC**: S51C, S51DU, S57MFC, S53W. **SK3LH**: SM3PZG, SM3JLA, SM3BIZ, SM3WMU. **SK6DG**: SM6TKT, SM6RXZ, SM6TZD, SM6SIF, SM6SMY, SM6WKH, SM6WKB, SM6WKC, SH6ACE. **SM2KW**: SM2HWG, SM2NOG, SM2ODB, SM2SYV. **SM4VPZ**: SM4VPZ & SM4AIO. **SP3KPN/P**: SP3SFN & SQ3EPX. **SP9KJU**: SQ9HHV & SP9MDY. **SW8L**: SV8CRI & SV8DCY. **T33RD**: OK1RI, OK1TN, OK1RD. **T77V**: T77V, IV3TMV, IV3ARJ, IV3NVN, IV3FSG, I8NHJ, I1JQJ. **TF3IRA**: TF3AO, TF3GB, TF3HP, TF3YH. **TM1C**: F6CTT, F5ITK, F6FVY, F5TRO, F5PSG, F8AKS. **UA7A**: RU9AN, RU9AZ, RW9MG, RZ9AZ, UA9AJ, UA9BA, UN4L.

UF3CWR: RA3CW, RV3BR, RZ3AZ, RZ3BW. **UK8BWO**: UK8BN & UK8BDA. **US8U**: UT5UUF, UT5UDG, UT5UPN, US-U-Ø93. **UT4UWL**: Club Group. **VA3SK**: VA3SK & VA3MW. **VE3RM**: VE3RM & VE3WIB. **VE5RI**: VE5FA, VE5FF, VE5FN, VE5WI, VE6BBP, VE6EZ, VE6HMG, VE6KDD. **VE6AO**: VE6BIR, VE6NJK, VE6TC, VE6WSI, VE6KC, VE6RSX, VE6UUG, VE6WTD. **VE6FI**: VE6FI, VE6AQ, VE6NA, VE8WD. **VE6SV**: Ops. **VE8QL**: VE8XYL & VE8QL. **VF4VV**: VE4XT & VE4VV. **VK4UI**: VK4IU, VK4XY, VK4MZ, VK4CEJ, DL2GAC. **VP5N**: IK2SGC & IK2SFZ. **VR2SS**: JK2PNY, 7K1OUO, JO3TND, UA3QJC. **WØSAH** & WØETT. **W1AF**: K3UOC & K9HI. **W3USS**: K3ZJ & W9JG. **W6XR**: N2AU & W6XR. **WA1RR**: N1HRA, KB1LN, KA1VMG. **WB2WPM**: Club Group. **WC4E**: WC4E, K4XS, K1KNQ, ON4AUC, K4OJ. **WV2LI**: N2GA & K2DO. **WX3B**: WX3B & N3SB. **XL3D**: VE3RSE & VA3UZ. **YBØZCE**: YBØAZ, YCØLBK, YCØLCF, YCØLDA. **YL4U**: YL2KL, YL3CW, YL3DW. **YP4A**: YO4NF & YO4FRF. **YV4AA**: YV4YC, YV4GLD, YV5CVE. **YV5NIQ/EA1**: YV5NIQ & EA1EB. **ZK2GEO**: DL1EMH & DL2YAK. **ZW5B**: PY2KC, PY5GU, PU5MCO, PP5UB, PP5WG. **ZXØF**: PY5EG, PY5CC, N5FA, PYØFF.

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.)

SSB RESULTS
QRP/p SECTION

WORLDWIDE

KR2Q	**A**	**1,765,404**	**1,119**	**551**
VE3KZ	**A**	**1,717,035**	**1,045**	**565**
HA2SX	**A**	**1,340,598**	**1,088**	**541**
LY3BA	**A**	**1,110,880**	**964**	**530**
N6MU	**A**	**1,070,000**	**895**	**500**
NØKE	**A**	**1,062,831**	**856**	**473**
DL2NBU	**A**	**1,026,630**	**902**	**495**
JA6GCE	**A**	**892,080**	**774**	**413**
LY2FE	*	728,252	780	434
JR4DAH	*	714,870	659	390
KB3TS	**A**	**711,870**	**640**	**389**
NP2Q	**A**	**425,047**	**703**	**287**
UU4JO	**A**	**340,998**	**523**	**322**
EA1GT	**A**	**334,332**	**538**	**333**
N1TM	**A**	**331,296**	**426**	**272**
LU1VK	**A**	**309,812**	**410**	**292**
DX3T	**A**	**238,941**	**319**	**191**
		(Op: DU3AR)		
W8QZA/6	*	228,585	368	245
DH2UL	*	220,968	306	226
NW7DX	**A**	**144,600**	**297**	**241**
KH6/WB6FZH	**A**	**102,529**	**220**	**151**
9A2EY	**A**	**73,179**	**240**	**173**
OH5NHI	**A**	**62,390**	**203**	**170**
KIØII	*	57,222	191	153
SP5FKW	**A**	**55,352**	**160**	**148**
UAØSE	**A**	**52,245**	**155**	**135**
KS4RX	**A**	**48,506**	**162**	**158**
UAØKCL	*	45,125	140	125
WN6HYX	*	37,842	137	119
NM1K	*	32,364	137	123
OK1AIJ	**A**	**32,125**	**165**	**125**
KV6T	*	24,205	124	103
EA3AAW	*	21,708	112	108
AF9J	**A**	**10,428**	**88**	**79**
N8XA	**A**	**8,202**	**121**	**117**
HB9AYZ	**A**	**3,348**	**43**	**36**
JH3DMQ	*	1,650	38	15
UR5EDO	*	680	17	17
KT3RR	**28**	**506,258**	**584**	**319**
LW3DWX	**28**	**287,985**	**385**	**263**
JA5GPJ	**28**	**272,384**	**374**	**266**
HA5BSW	**28**	**162,992**	**326**	**244**
LU2HNP	*	140,400	267	208
I3VFJ	**28**	**129,928**	**236**	**204**
WA6FGV	**28**	**93,372**	**247**	**186**
JA3LFK	*	64,155	177	141
WBØIWG	**28**	**62,550**	**176**	**139**
WAØVBW	*	51,831	153	117
WB1FWQ	**28**	**46,720**	**150**	**128**
K2FF	**28**	**23,800**	**100**	**100**
WZ2T	*	21,336	100	84
KA8NRC	**28**	**15,048**	**128**	**114**
N5YV	**28**	**10,044**	**64**	**62**
JE7DOT	*	3,515	40	37
YO3III	**28**	**2,071**	**55**	**19**
URØET	**28**	**874**	**20**	**19**
N2UHR	*	36	4	4
NA4CW	**21**	**462,579**	**524**	**377**
W6YJ	**21**	**114,800**	**259**	**205**
S59D	**21**	**65,886**	**193**	**158**
W7/JR1NKN	**21**	**25,728**	**128**	**96**
JA4AKN	**21**	**15,975**	**85**	**75**
OM7PY	**21**	**4,408**	**40**	**38**
PA3EXS	**21**	**3,330**	**38**	**37**
VK4MOJ	**21**	**1,872**	**30**	**26**
EF1ANC	**21**	**1,254**	**34**	**33**
		(Op: EC1ANC)		
OH1UP	**21**	**35**	**5**	**5**
W5FO	**14**	**322,077**	**451**	**343**
UA9AAZ	**14**	**303,592**	**401**	**274**
SP9EWO	**14**	**102,384**	**307**	**216**
OK1GW	**14**	**92,400**	**246**	**200**
WB7OCV	**14**	**24,990**	**111**	**102**
PY2APQ	**14**	**15,323**	**80**	**77**
GWØVSW	**14**	**12,060**	**102**	**90**
JL3SBE	**14**	**253**	**11**	**11**
WJ8C/P	**7**	**13,066**	**49**	**47**
SP4GFG	**3.7**	**20,608**	**122**	**92**
JM2RUV	**3.7**	**270**	**11**	**10**
US7MQ	**1.8**	**24,384**	**114**	**96**
UT/UAØQGQ	*	9,472	67	64
YL2GUV	**1.8**	**6,600**	**60**	**55**

SINGLE OPERATOR
NORTH AMERICA

UNITED STATES

KQ2M	**A**	**10,855,264**	**3733**	**989**
NB1B	**A**	**7,128,912**	**2626**	**866**
KR1G	**A**	**4,166,890**	**1916**	**665**
WC1M	*	3,980,830	1979	742
W1CU	*	3,298,752	1645	736
K5ZD	*	2,903,615	1371	655
NA1Q	*	2,705,750	1515	685
		(Op: W1NT)		
KA1UQ	*	2,211,462	1414	657
KC1F	*	1,792,505	1206	545
KZ1K	*	1,713,948	1163	613
		(Op: K1PLX)		
N1EU	*	1,258,218	906	494
NZ1Q	*	754,114	719	422
WA1KKM	*	560,700	578	350
W1KRS	*	455,390	403	403
W1WFZ	*	129,960	232	190
K1KJT	**14**	**1,029,591**	**945**	**513**
WA1MKS	*	86,152	202	178
AA1KM	*	31,668	125	116
KE1Y	**3.7**	**998,760**	**742**	**406**
AA1BU	**1.8**	**114,818**	**332**	**187**
***WA1LNP**	**A**	**2,568,445**	**1454**	**697**
***K1VUT**	**A**	**1,987,143**	**1215**	**593**
***WS1A**	**A**	**1,918,800**	**1146**	**585**
*WA1S	*	1,092,896	792	544
*W1KT	*	861,692	653	454
*AA1SU	*	546,820	645	380
*K1HT	*	523,562	521	338
*K1DCB	*	358,190	463	301
*N1DS	*	313,252	428	284
*W1TO	*	236,262	339	233
*KU4BP	*	105,834	251	186
*AB1BX	*	78,805	200	159
***K1GBX**	**28**	**287,000**	**456**	**280**
***KA1RLI/T**	**28**	**66,476**	**184**	**148**
*K1VSJ	*	3,605	39	35
*W1NXB	*	169	15	13
***AE1B**	**21**	**555,000**	**584**	**375**
*WØMHK/1	*	392,265	449	345
N2ED	**A**	**2,158,572**	**1341**	**606**
AF2K	**A**	**1,783,366**	**1282**	**607**
N2CU	**A**	**1,063,692**	**830**	**469**
N2WK	*	1,040,520	748	460
NA2X	*	760,760	674	440
WR2V	*	605,172	572	348
K2FR	*	562,380	595	364
NA2A	*	512,230	600	363
W2FUI	*	101,500	228	175
W2HCA	*	41,846	129	122
WM2V	**21**	**979,583**	**835**	**473**
WB2OSM	*	429,780	468	348
***W2TZ**	**A**	**2,360,340**	**1407**	**620**
***NJ1F**	**A**	**532,700**	**554**	**350**
***K2SZ**	**A**	**469,623**	**502**	**321**
*KA2NDX	*	444,780	494	315
*W2AD	*	404,139	493	321
*K2UF	*	401,320	460	316
*KG2FH	*	275,842	394	266
*N2ST	*	250,723	377	253
*WA2LXE	*	229,250	353	250
*N2CK	*	174,600	300	225
*N2LQQ	*	162,495	292	207
*NY5C	*	153,120	305	220
*N2LK	*	134,320	252	184
*K7TL	*	118,818	216	161
*W2MKW	*	111,081	240	183
*KX2H	*	81,220	195	155
*NG2C	*	75,818	203	167
*W2IC	*	63,063	174	143
*N2MTG	*	27,170	137	110
*WB2OQQ	*	23,220	100	90
*WB2AIV	*	11,844	98	84
***K2BQW**	**28**	**103,250**	**227**	**175**
*N2OPW	*	25,245	111	99
*K2CS	*	22,796	100	82
***KW2O**	**21**	**457,166**	**521**	**358**
		(Op: K2SG)		
KF3P	**A**	**9,516,830**	**3543**	**965**
		(Op: K3MM)		
KE3Q	**A**	**8,718,082**	**3306**	**947**
K3ZO	**A**	**6,637,680**	**2721**	**840**
N3OC	*	4,192,200	2068	765
KY3ORK	*	2,043,743	1356	613
		(Op: KC3TL)		
AJ3M	*	1,389,920	983	552
NA1DX	*	1,166,459	841	497
N3RD	*	1,022,767	741	463
KF3BE	*	133,350	267	210
W3JRY	*	26,784	100	93
N3HBX	**21**	**2,464,253**	**1416**	**649**
AI3Q	**21**	**1,724,409**	**1152**	**549**
WI2T	*	468,528	564	344
W3KLG	*	39,960	122	111
			(Op: K3ND)	
***WK3I**	**A**	**676,272**	**630**	**386**
***AA3LX**	**A**	**555,373**	**571**	**359**
*NV3V	*	67,536	183	144
*W3FQE	*	29,100	110	100
*KF3BN	*	2,296	28	28
***W2BZR/3/T**	**28**	**655,191**	**773**	**387**
***W3NO**	**28**	**605,244**	**634**	**372**
*WO3Z	*	185,313	316	223
***W3CP**	**21**	**59,850**	**150**	**150**
WZ4F	**A**	**7,189,216**	**3042**	**928**
			(Op: K4AB)	
NX9T	**A**	**3,609,089**	**1833**	**737**
AI2C/4	**A**	**2,083,066**	**1330**	**601**
NW6S	*	998,148	829	446
N4MM	*	703,470	619	383
KS4XG	*	671,402	713	422
K4BAI	*	531,152	568	373
K4ZW	*	444,150	512	329
N4UH	*	333,126	392	279
KR4TG	*	308,825	383	275
KE4OAR	*	142,590	276	210
W4YE	*	128,164	255	179
W4YDY	*	110,032	235	184
W4PA	*	83,650	202	175
W7QF	*	44,700	126	100
K5VG	*	37,632	122	98
K4HA	*	28,215	101	95
W4OGG	*	14,664	90	78
K4JYO	**28**	**1,697,704**	**1313**	**548**
AG4W	*	316,830	448	295
N4PN	**21**	**3,277,968**	**1761**	**752**
K4WX	**21**	**1,525,920**	**1092**	**528**
K4SN	**21**	**1,142,350**	**939**	**550**
WA4QDM	*	1,138,340	887	470
W3AU	*	353,136	420	336
NC4NC	**7**	**296,922**	**348**	**246**
***WA4IMC**	**A**	**1,222,610**	**944**	**515**
***K4BEV**	**A**	**580,263**	**597**	**381**
***N4GJ**	**A**	**532,602**	**579**	**378**
*KU4FP	*	452,880	500	306
*N4ZNH	*	326,480	405	265
*WA4ET	*	254,254	373	254
*WO4O	*	227,906	316	223
*N1CC	*	202,911	348	239
*KF4ZR	*	161,490	275	210
*WA4VIY	*	158,155	315	235
*N4CW	*	121,200	228	202
*AF4FO	*	48,363	150	141
*WB9BSH	*	35,385	123	105
*KF4VMT	*	33,372	123	108
*WB4SQQ	*	17,593	83	73
*K4HBI	*	3,780	36	36
***AJ4Y**	**28**	**317,538**	**435**	**299**
***NK4P**	**28**	**218,943**	**397**	**243**
*WD4AHZ	*	206,668	336	244
*KA9UQT	*	204,314	330	251
*KE4MCE/T	*	60,348	187	141
*W4JIK	*	43,848	141	116
*WA4SEX	*	3,234	41	33
*W9CNF/4/M	*	1,144	23	22
***AK4L**	**14**	**1,147,461**	**965**	**541**
			(Op: K4PC)	
KM5X	**A**	**7,909,344**	**3241**	**947**
			(Op: K5TR)	
AB5SE	**A**	**3,725,860**	**2006**	**773**
K5XR	*	638,112	626	408
			(Op: W5ASP)	
N5QDE	*	571,155	563	377
N5MYH	*	496,910	597	370
W5OXA	*	188,232	318	248
N5DD	*	175,875	275	201
KZ5AM	*	68,295	203	157
WD5AAH	*	62,152	173	136
N4GCA	*	28,871	502	302
KM5LO	*	20,292	127	76
KZ5MM	**28**	**2,455,008**	**1775**	**642**
NX5M	**28**	**2,150,988**	**1570**	**609**
			(Op: N5XJ)	
W5WMU	**28**	**1,814,067**	**1354**	**571**
K5NZ	*	1,724,448	1317	552
KM5FA	*	510,864	715	348
W5HUQ	*	73,080	198	140
KB5UOK	*	44,118	142	114
N5ZC	**21**	**493,306**	**610**	**374**
NA5B	**14**	**2,377,808**	**1808**	**706**
			(Op: W5AO)	
AE5B	**7**	**172,931**	**274**	**199**
NE5D	**1.8**	**88,740**	**330**	**170**
			(Op: K5RX)	
***WD5K**	**A**	**2,226,248**	**1426**	**661**
***NT5D**	**A**	**993,990**	**920**	**510**
***WA5IYX**	**A**	**529,948**	**612**	**367**
*W5GZ	*	287,912	438	292
*WK5K	*	270,322	430	281
*KF5YZ	*	244,314	367	277
*KZ5BCN	*	103,740	238	190
*AC5GH	*	68,103	199	161
*W5GCX	*	63,310	149	130
*KB5ZFO	*	29,982	149	114
*N5PA	*	21,924	107	87
*N5AF	*	11,220	73	55
***K5EME**	**28**	**134,268**	**319**	**201**
***W5WYN**	**28**	**119,756**	**239**	**182**
*W5CTV	*	75,112	207	164
*KC5QBG/T	*	49,686	201	147
*WA5VKS	*	21,590	101	85
***W5RNF**	**21**	**251,559**	**388**	**297**
***NN5Z**	**14**	**128,961**	**356**	**267**
			(Op: K5PX)	
N5KO/6	**A**	**8,741,115**	**3456**	**955**
N6ED	**A**	**4,000,752**	**2042**	**756**
NK6U	**A**	**2,059,744**	**1468**	**674**
			(Op: K6BZ)	
W6TK	*	1,235,304	1000	513
K6III	*	1,215,158	986	511
NN6NN	*	1,185,867	1101	501
			(Op: N6EE)	
AB6WM	*	1,102,100	972	515
K6GT	*	1,010,568	884	474
WM6A	*	869,456	791	392
			(Op: K6DB)	
KU6J	*	717,200	704	400
W6TKV	*	695,868	729	412
NT6K	*	645,814	764	421
AK6R	*	560,900	647	395
WK6LA	*	552,348	695	402
			(Op: K6LA)	
AF7Y	*	533,250	589	375
N6TNX	*	139,150	254	242
KR6/JH3PRR	*	83,468	238	154
W6ISQ	*	24,572	160	128
K6HRT	*	13,728	79	66
AJ6V	*	10,098	84	66
N6TNW	*	8,967	63	61
W6AFA	**28**	**782,574**	**836**	**381**
K7BV	**21**	**2,413,116**	**1483**	**612**
NJ6P	**21**	**1,045,980**	**955**	**540**
WN6CTY	*	681,777	772	443
***WN6K**	**A**	**1,282,752**	**1054**	**524**
***KQ6QW**	**A**	**844,536**	**822**	**462**
***N6JM**	**A**	**380,568**	**443**	**314**
*WB6NFO	*	373,425	513	325
*W6PLJ	*	349,851	466	277
*WR6WR	*	280,320	437	292
*W6SA	*	217,496	341	248
*K6ASK	*	154,934	299	202
*K6UM	*	117,151	230	193
*KO6XB	*	103,040	300	224
*KQ6VQ	*	101,675	224	175
*KE6QR	*	91,176	212	174
*NN3V	*	85,680	17	170
*AA6PW	*	68,362	221	133
*K6CTA	*	31,284	110	99
*K6ACZ	*	28,126	101	98
*AD6Z	*	24,100	120	100
*N6QPF	*	20,619	101	87
*W6DQ	*	20,020	100	91
*AA6EE	*	18,966	97	87
*K6WWL	*	1,665	30	15
***K6KAY/T**	**28**	**434,634**	**621**	**321**
***NU6S**	**28**	**400,197**	**609**	**323**
*W6ZQ	*	23,128	105	98
*N6IFW	*	9,300	78	62
*KD6TRH	*	4,600	46	40
*KJ6NO	*	660	12	11
*KF6NNX	*	660	34	10
***KU6W**	**21**	**500,960**	**600**	**404**
			(Op: K6RO)	
***W6BSY**	**21**	**489,898**	**549**	**397**
*WA7BNM	*	411,480	489	360
*KD6DAE	*	109,798	266	206
***AE6Y**	**14**	**348,480**	**502**	**352**
***NP4IW/NX6**	**14**	**216,920**	**398**	**290**
*WF6O	*	25,047	102	99
*N2ALE	*	744	25	24
K7RI	**A**	**5,661,361**	**2718**	**853**
AI7B	**A**	**3,340,474**	**1807**	**719**
			(Op: W7GG)	
W7EB	**A**	**1,713,456**	**1224**	**584**
W8AEF	*	1,658,840	1206	565
W7NN	*	1,303,728	1033	519
KM7TM	*	977,218	895	473
KS7T	*	754,641	707	439
W7QN	*	619,510	627	410
NF7E	*	590,352	660	392
KC7UP	*	492,615	526	369
K7JJ	*	108,288	255	188
KA7TDH	*	73,458	205	159
W7HS	*	35,305	138	115
KAØWBP/7	*	19,581	109	61
K6LL/7	**21**	**4,401,600**	**2254**	**840**
W7FP	**21**	**1,320,384**	**974**	**552**
W7UPF	*	421,648	489	361
W7AYY	*	212,680	327	260
W7IC	*	83,476	200	164
K7ZZ	**14**	**732,109**	**759**	**469**
***WS7V**	**A**	**924,015**	**812**	**479**
***N7RQ**	**A**	**691,335**	**701**	**405**
***N7VM**	**A**	**433,316**	**541**	**338**
*W7YAQ	*	412,000	400	400
*AB7RW	*	323,214	444	309
*N7LOX	*	308,535	456	307
*K7TR	*	229,080	373	249
*N7FL	*	224,136	335	264
*KW7N	*	167,857	351	229
*W7YS	*	58,110	166	149
*NA7R	*	39,625	175	125
*N6TPT	*	37,088	152	122
*KB7PNI	*	10,624	69	64
*KC7WUE	*	7,080	67	60
***WJ7S**	**28**	**490,674**	**705**	**318**
*KI7LS	*	14,688	85	68
*KD7DQO	*	8,436	66	57
*KD7CFF	*	78	6	6
***KG7RZ**	**14**	**161,772**	**288**	**244**
*KC5AC	*	1,680	28	28
K8OQL	**A**	**3,858,184**	**1877**	**748**
K3JT	**A**	**3,332,951**	**1787**	**733**
WB8TLI	**A**	**1,324,816**	**944**	**496**
NE8I	*	1,203,200	943	470
AA8PA	*	1,083,730	980	505
K2UOP/8	*	903,000	764	430
W8JY	*	873,976	759	428
W4NTI	*	835,280	735	394
N8KOJ	*	320,812	416	278
K5ZG	*	227,664	350	248
N8UBK	*	56,170	180	137
W8TWA	*	40,902	141	102
K8PYD	*	14,288	76	66
N8II	**28**	**1,130,983**	**966**	**466**
WZ8T	**21**	**989,920**	**815**	**460**
W8XI	*	91,728	200	168
W8SJU	**14**	**80,848**	**192**	**163**
KE8GG	**7**	**78,262**	**124**	**105**
***K5IID**	**A**	**866,951**	**788**	**443**
***KI8CS**	**A**	**708,981**	**668**	**371**
***N8CN**	**A**	**618,930**	**637**	**390**
*N8DXR	*	441,046	541	349
*NW8F	*	269,280	388	272
*KB8QO	*	264,550	383	286
*N8FWA	*	195,444	367	244
*AF8C	*	141,075	278	209
*KG8DH	*	129,645	272	201
*KC8HWV	*	108,108	229	189
*K8VUS	*	105,225	243	183
*W8IDM	*	54,662	154	151
*WD8DJB	*	24,360	100	84
*N8WTH	*	20,672	92	76
***N4SEA**	**28**	**178,461**	**311**	**237**
*KC8KSX	*	32,330	119	106
***W8CK**	**14**	**9,112**	**72**	**67**
*N8EXS	*	2,580	32	30
WB9Z	**A**	**6,196,480**	**2704**	**940**
KE9NA	**A**	**3,118,299**	**1799**	**723**
KI9A	**A**	**1,300,419**	**1075**	**531**
K9ZO	*	904,950	833	450
W9RN	*	328,755	451	303
WA9CCQ	*	218,232	366	252
KC9FC	*	215,390	296	238
N9WKW	*	203,949	325	279
AB7L	*	55,535	187	145
			(Op: W9RE)	
WE9V	**21**	**6,067,704**	**2645**	**888**
KK9A	**14**	**3,518,190**	**1919**	**806**
N9LCR	**7**	**45,472**	**110**	**98**
***WT9U**	**A**	**635,356**	**691**	**386**
***NX9B**	**A**	**227,070**	**328**	**290**
*K9SH	*	224,660	327	239
*KB9HAY	*	122,388	240	186
*KF9VJ	*	87,857	213	163
*N9NW	*	56,628	153	132
*W9YS	*	55,424	153	128
*N9NT	*	41,114	144	122
*WB9LRK	*	40,131	141	117
***N9NUN/T**	**28**	**191,394**	**294**	**217**
*KB9QFO	*	13,440	98	91
***NI9C**	**21**	**666,169**	**626**	**413**
*N9GUN	*	154,068	275	222
***WD9DJD**	**14**	**3,150**	**5**	**45**
KVØQ	**A**	**6,235,218**	**2618**	**891**
			(Op: NØNR)	
WØTM	**A**	**2,907,880**	**1632**	**695**
NØIJ	**A**	**2,526,336**	**158**	**688**
			(Op: AAØBY)	
KØCAT	*	1,318,572	1024	522
			(Op: K9WIE)	
WØZP	*	830,810	954	502
WØTT	*	540,588	598	354
K4VX	*	525,184	524	352
WWØDX	*	291,146	407	298
WØPPF	*	192,213	332	243
K1LR	*	171,250	335	250
WØAJ	*	5,856	50	48
KKØSS	**28**	**695,145**	**692**	**363**
KKØT	**21**	**4,435,201**	**2186**	**827**
			(Op: N2IC)	
KGØZI	**21**	**2,824,935**	**1662**	**705**
AGØ/NH7C	*	241,020	502	234
NP2N/AGØ	**3.7**	**37,680**	**269**	**157**
KØCS	**1.8**	**10,050**	**113**	**67**
***ACØW**	**A**	**2,495,460**	**1518**	**660**
***KDØN8**	**A**	**580,414**	**578**	**397**
***KCØCN**	**A**	**513,011**	**563**	**359**
*KØCF	*	255,712	350	244
*KØHOF	*	242,858	419	266
*KØDAT	*	140,220	252	228
*KBØMZG	*	113,263	253	191
*KBØWPY	*	98,512	235	188
*WDØGQA	*	50,850	183	150
*KAØEIC	*	6,528	70	68
***KTØK**	**28**	**182,600**	**307**	**220**
*NØOFR	*	60,580	168	130
*NZØ/NH7CC/T	*	35,568	211	114
*NEØP	*	7,480	43	40
*NØLER	*	363	11	11
***KGØUA**	**21**	**170,170**	**280**	**238**
***AKØA**	**14**	**901,192**	**937**	**508**

JAMAICA

***6Y4Y**	**28**	**429,852**	**575**	**317**
		(Op: YO3YB)		

BARBADOS

8P2K	**A**	**10,044,678**	**3818**	**933**
		(Op: 8P6SH)		

BAHAMAS

*C6A/WI9WI	A	1,655,235	1210	549

PANAMA

*HO3A	A	24,153	100	83
		(Op: KG6UH)		

ALASKA

KL1V	A	3,063,744	1795	648

US VIRGIN ISLANDS

WP2Z	28	7,566,636	3616	862
*NP2DJ	A	130,020	283	197

PUERTO RICO

KP3O	14	6,000	52	48
*WP4LNY	A	920,659	949	409
*WP4KOE	*	89,244	322	134
*KF3A	28	1,577,760	1280	519
*WP4MYD	*	437,775	585	325

COSTA RICA

TI1C	A	17,078,930	54901117	
		(Op: TI2CF)		
*TI7/N4MO	28	2,561,540	1709	607

CANADA

VF3EJ	A	13,745,202	42151069	
VO1MP	A	9,331,928	3451	943
VF3AT	*	5,306,738	2288	778
VE7IN	A	4,010,526	1897	702
VE5CPU	A	1,853,379	1308	579
VO1WET	A	1,479,828	1087	474
VE9FX	A	802,272	712	411
VY2LI	A	402,598	479	298
VE7XO	*	336,487	395	283
VA2MP	A	85,973	187	149
XO7X	21	6,112,756	2689	874
		(Op: VE7AHA)		
CG3MM	21	5,975,200	2597	800
VA3MG	3.7	253,000	369	184
VA1A	1.8	535,225	471	271
		(Op: K3BU)		
*VA3DX	A	4,016,320	1714	770
*VE5SF	A	1,411,389	1038	521
*VF7CFD	A	1,264,335	1240	465
*VF6FR	A	1,221,200	918	500
*VE3STT	*	1,127,145	821	461
*VA3SWG	*	1,066,542	807	447
*VF3JFF	*	920,727	784	421
*VF2AWR	A	915,082	731	401
*VE3BUC	*	808,248	749	408
*VO1IMB	A	724,125	659	375
*VE7UQ	*	710,233	700	397
*VE3ZZ	*	581,889	605	363
*VE9MY	A	519,831	486	351
*CF1GO	*	479,192	523	344
*VE9WH	*	361,920	389	320
*VE2SAI	*	320,902	418	281
*VE4MG	A	254,286	362	277
*VE4YU	*	247,020	358	276
*VE6ZT	*	220,869	325	253
*VE2GW	*	186,102	287	211
*VA3IX	*	176,614	356	233
*VO1HE	*	144,288	230	216
*VE7YJ	*	76,156	193	158
*VE7HA	*	56,115	177	129
*VE7LRB	*	17,490	100	66
*VE3NQK	*	9,362	104	62
*VO1RE	*	98	7	7
*VE3FU	28	495,929	540	349
*VE3UZ	*	103,152	222	168
*VE6BMX	28	92,664	263	156
*VE3ZT	*	87,265	207	155
*VE5GC	28	15,904	84	71
*CI7A	21	4,456,374	2227	741
		(Op: VE7SV)		
*XJ1JS	21	404,690	492	286
*VF5RMO	21	280,500	438	275
		(Op: VE5RMO)		
*VE3OI	21	134,480	266	205
*VE3SKX	*	42,840	125	120
*VE6TP	14	668,536	665	428
*VE2TPR	14	39,804	136	124
*VE3XDT	14	37,516	135	113
*VE3EVV	*	14,112	83	72
*VE4HAZ	3.7	3,696	34	33
*VY2MGY/3	1.8	71,820	182	108

BRITISH VIRGIN ISLANDS

*VP2VF	28	2,672,460	1958	606

TURKS & CAICOS

*VP5E	A	6,927,135	3002	883
		(Op: K6HNZ)		

MEXICO

*XE2AUB	A	922,545	937	415
*XE2MX	A	619,008	585	403
*XE1RG	*	74,448	207	144

AFRICA

MAURITIUS

*3B8/DL6UAA	A	2,273,070	1494	510

NIGERIA

*5N3CPR	14	83,200	176	160

KENYA

5X1Z	28	7,044,180	2759	858
		(Op: SM7PKK)		

MADEIRA ISLAND

CU3AD	14	62,457	200	191

CANARY ISLANDS

EA8ZS	A	12,941,740	3900	953
		(Op: EA3NY)		
EA8AD	*	92,272	200	158
EA8LS	28	2,074,856	1258	553
EA8AH		2111,192,181	37421001	
ED8WPX	7	3,601,456	1101	548
		(Op: EA8PP)		
EA8/OH1MA	1.8	404,976	326	208
*EA8AEI	28	316,364	392	278

CUETA & MELILLA

*EA9/EA7RU	A	1,351,558	992	458
*EA9IB	28	1,022,763	797	431

AFRICAN ITALY

IH9/OL5Y	A	9,822,384	3082	891
		(Op: OK1FUA)		

EGYPT

*SU9ZZ	21	2,406,909	1489	541

MALI

TZ6DX	A	1,274,120	1010	424
		(Op: K4RB)		

ASCENSION ISLAND

ZD88A		2813,170,159	4435	993
		(Op: K6NA)		
ZD8Z		2112,032,740	39251028	
		(Op: N6TJ)		

SOUTH AFRICA

ZS6HO	A	16,310	79	70
ZS6EZ	28	6,700,992	2757	816
*ZS6PHD	A	286,578	382	261

ASIA

AZERBAIJAN

4K9W	A	9,455	61	61

ISRAEL

4X4DZ	28	5,017,620	2809	694
*4X0F	A	1,542,525	1142	471
*4Z5FI	*	198,990	329	198
*4Z5CP	*	980	21	20
*4X6DK	28	1,060,050	955	382
*4Z5FW	*	256,208	400	239
*4X1IM	3.7	528,002	429	227

CYPRUS

H22H	28	5,789,817	3148	753
		(Op: 5B4MF)		
H2T	21	5,179,551	2444	767
		(Op: 5B4XF)		

WEST MALAYSIA

*9M2TO	A	1,103,509	1077	473

CHINA

*BD4DW	A	2,190,896	1587	596
*BY1DX	21	1,199,996	1096	476
		(Op: OH2BH)		

ARMENIA

*EK6CC	A	2,199,171	1231	527

KYRGZSTAN

EX0Y	28	870,185	1188	395
EX8MDA	21	962,388	972	469
*EX2T	A	1,640,837	1166	473

TURKMENISTAN

EZ8CQ	21	13,407	123	41

JAPAN

JH4UYB	A	6,659,952	2783	821
JA8RWU	A	5,341,320	2287	802
JA7BEW	A	3,728,994	1763	739
JS2LHJ	*	3,315,281	1626	653
JM1XCW	*	3,280,488	1598	636
JR2AGL	*	2,782,035	1519	633
JA2BNN	*	2,571,441	1497	591
JR1UJX	*	2,381,346	1407	594
JA2ZJW	*	2,229,850	1381	575
		(Op: JH2CMI)		
JQ1BVI	*	2,197,327	1335	583
JA2FSM	*	1,142,505	864	465
JA6ZLI	*	925,683	762	441
		(Op: JJ6WYS)		
JR1LEV	*	686,454	629	382
JH4NMT	*	407,554	459	301
JA1KAL	*	173,580	309	220
JH1CTV	*	126,024	252	178
JA1ASO	*	81,776	180	152
7J1ABD	*	42,619	134	109
		(Op: WA6URY)		
JR1JCB	*	36,966	140	101
JM4MXS	*	11,033	67	59
JF2FIU	*	6,528	52	48
JEØVFV	*	4,092	44	31
JA3ARM	*	2,688	34	32
JG3WCZ	*	900	17	15
JQ6NAW	28	752,856	728	381
JE1LFX	28	587,124	626	347
JG2TKH	*	419,420	508	313
JH9VSF	*	385,280	502	301
JE1PMQ	*	223,908	104	86
JH1UUT	*	91,287	215	161
JA1ANA	*	49,911	140	127
JS1KQQ	*	27,930	113	98
JH7QXJ	21	1,035,180	838	426
JR1MQT	21	870,750	791	405
JA9JFO	*	515,970	545	351
JA2CWU	*	322,848	416	288
JA1NQU	*	186,960	306	228
JA9IKL	*	143,420	259	202
JJ1JRH	*	12,033	73	63
JA3FZI	*	4,368	46	39
7L1RLL	*	1,449	23	21
JR3WXA	14	197,538	303	246
JRØWZR	*	30,458	110	97
JA3CE	*	704	16	8
JA2DLM	3.7	2,436	30	28
*JF1SQC	A	2,379,936	1346	624
*JR7WAB	A	2,104,560	1268	592
*JJ1VRO	A	1,443,840	1009	480
*7L4IOU	*	961,775	768	425
*JA7NVF	*	941,800	771	425
*JH5OXF	*	825,432	735	422
*7K4GUR	*	662,496	594	402
*JA5EO	*	646,726	605	382
*JAØBMS/1	*	440,231	481	341
*7M1MCT	*	337,288	441	266
*JG1OWV	*	329,858	420	262
*JA1BUI	*	316,071	411	261
*JE1UFF	*	297,579	409	281
*JA1GYO	*	251,082	354	261
*JA2BQX	*	211,500	335	235
*JR1MRG	*	206,358	355	211
*JH6OPP	*	204,972	314	228
*JP1SPV	*	194,586	306	226
*JA1AB	*	174,708	318	207
*JG1JQJ	*	167,616	296	216
*JH9DNK	*	139,200	247	200
*JA3UWB	*	137,416	260	193
*JJ3TBB	*	129,960	288	171
*JA4YPE	*	129,766	250	182
		(Op: JF3EBO)		
*JG2REJ	*	113,240	212	190
*JA1XUY	*	107,184	242	174
*JA2GHP	*	90,400	232	160
*JF2IWL	*	73,461	182	141
*JJ3APB	*	60,489	185	143
*JF1VXB/6	*	53,972	154	131
*JA9EJG	*	50,370	158	115
*JA1BPN	*	47,652	139	114
*JI2VLM	*	44,064	154	108
*JL3RDC	*	35,600	128	100
*7L4PWR/1	*	30,167	120	97
*JH1RDU	*	27,057	102	87
*JR5EHB	*	22,968	101	87
*JA2CUS	*	22,610	101	85
*JH2WHS	*	21,746	94	83
*JA3LUM	*	21,663	110	87
*JL3IVX	*	19,836	107	76
*JG3NKP/1	*	19,558	90	77
*JF1PZF	*	18,878	154	122
*JE8KKX/1	*	16,116	75	68
*JA1XRH	*	12,322	71	61
*JA9NOF	*	11,440	71	65
*JA7ARW	*	7,800	77	40
*JH1RMH	*	5,084	45	41
*JA1STY	*	2,296	31	28
*JI7OED	*	1,725	25	25
*JM1IXB	*	1,672	25	22
*JA3WFQ	*	1,235	21	19
*JF7GDF	*	945	21	21
*JA1EIS	*	624	14	13
*JL6IPK	*	420	16	12
*JK2VNL	*	21	4	3
*JA6WFM	28	777,294	735	398
*JO3JYE	28	364,650	467	286
*JK1KNB	28	312,040	426	290
*JA6EFT	*	139,178	258	202
*7J7ACZ	*	109,011	243	179
*JA6CBW	*	68,242	176	149
*7N2UQC	*	62,604	176	141
*JA1EEG	*	38,940	138	118
*JG1TVK	*	34,944	138	112
*JA6QDU	*	24,930	101	90
*JA4AQR	*	24,440	94	94
*JA1ALX/9	*	16,450	89	70
*JO1TLP	*	7,130	55	46
*JL2VLG	*	6,095	56	53
*JE1HXZ	*	4,484	44	34
*JR1BSV	*	2,349	29	27
*7K2PBB	*	2,304	34	32
*7J1AJH	*	2,106	29	26
*7K1EQG	*	1,600	25	25
*JF5FGY	*	12	2	2
*JR3RIY	21	1,836,315	1121	585
*JL3VUL/3	21	1,694,951	1127	557
*JR2LIS	21	1,107,594	847	486
*JA9SCB/1	*	390,892	457	316
*JA3LEZ	*	218,370	316	251
*JH6TYD	*	157,734	268	207
*JR7LVK	*	152,352	268	207
*JK6ISK	*	152,040	270	210
*JI7VUR	*	136,710	263	186
*JF3IYW/3	*	126,350	265	190
*JA4BAA	*	105,424	223	176
*JA8TEZ	*	71,485	173	145
*JA1KK	*	61,425	172	135
*JR3CVO	*	41,772	128	118
*JE4QGF	*	40,446	132	107
*JJØFDT	*	35,020	128	103
*JA3BBG	*	19,276	91	79
*JH1BUB	*	15,708	102	51
*JI8GZS	*	14,560	78	70
*JK8HOS	*	13,534	74	67
*JA1YQH	*	8,855	59	55
		(Op: JRØEFE)		
*JK1BII	*	8,428	64	49
*JH1KZQ/1	*	8,120	63	56
*JG1GCO	*	5,280	44	44
*JK8FRL	*	4,998	43	42
*JF2FKJ	*	3,348	36	31
*JR3KAH	*	3,060	40	34
*JN2QYN	*	2,976	34	31
*JH1TUX	*	2,937	33	33
*JQ1AHZ/2	*	1,400	32	25
*JR7HOD/6	*	630	16	15
*JN4GHQ	*	198	12	11
*JHØEPI	14	153,204	281	204
*JH6QIL	14	122,210	241	202
*JE1GZB	*	43,524	133	124
*JH1SWD	*	11,776	66	64
*JG5VIA	*	2,697	33	31
*JG3EHD	*	1,121	21	19
*JR3NDM	*	540	16	15
*JA1MXY	*	390	14	13
*7L2ICS	*	126	8	7
*JE1SPY	3.7	5,850	50	45

OGASAWARA

JD1BIA	A	417,206	713	337

JORDAN

JY9QJ	A	4,937,931	2450	681
*JY9NE	A	130,095	249	177

TURKEY

*TA3BN	A	275,872	362	233
*TA4BN	*	4,470	30	30
*TA3YJ	28	8,272	62	47
*TA2NC	14	546,766	636	319
*TA3J	3.7	396,865	339	203

ASIATIC RUSSIA

RMØF	A	2,741,158	1589	674
		(Op: RAØFU)		
UAØCW	*	121,270	225	181
UAØAGI	*	6,204	50	47
UAØZBK/Ø	21	6,289,371	2643	909
*UAØFDX	A	2,075,535	1352	599
*UAØSJ	*	87,615	210	165
*RUØSU	28	214,326	492	243
*RUØAT	21	2,752	33	32
*RSØF	14	3,025,609	1639	731
RI9C	A	4,374,056	1985	718
		(Op: UA9CDV)		
UA9CLB	A	4,087,208	1896	697
UA9JDP	*	1,821,582	1172	549
RW9QA	*	1,279,164	896	444
UA9CKP	*	1,251,625	888	475
RA9AC	*	397,769	470	311
UA9XEN	*	26,975	114	83
RW9UT	28	161,000	287	200
RA9DX	14	2,027,720	1208	622
UA9LAC	14	1,082,164	802	491
RA9XF	*	142,888	249	212
*RZ9WZ	A	2,207,496	1266	618
*UA9CAW	A	1,733,550	1121	525
*RZ9SR	A	1,554,168	1011	462
*UA9ACJ	*	820,227	666	373
*RW9HA	*	529,540	601	332
*RW9RF	*	247,205	362	245
*UA9JMS	*	63,332	166	142
*RV9AZ	28	263,375	438	245
*UA9UR	*	79,200	190	160
*RV9SV	*	52,690	177	110
*RA9JP	21	1,186,031	939	511
*UA9YAU	*	327,080	494	296
*UA9BS	14	314,675	371	307
*RX9UKF	*	58,930	160	142

KAZAKHSTAN

UN6P	A	34,632	135	104
UP4L	14	2,638,833	1447	673
		(Op: UN7LZ)		
*UP5P	A	4,493,280	2164	740
		(Op: UN5PR)		
*UP6F	*	1,245,924	951	477
		(Op: UN7FZ)		
*UPØF	21	639,180	778	402
*UN9DDX	*	286,718	425	271
*UN7DA	14	214,008	325	241

HONG KONG

VR2BG	21	1,402,347	1271	527

INDIA

VU3VLH	A	6,283,251	3299	663
		(Op: OK1MM)		
*VU2FOT	A	144,576	248	186
*ATØDJQ	14	90,364	228	164
		(Op: VU3DJQ)		

MACAO

XX9TRR	A	6,082,565	3416	817
		(Op: OH2PM)		

EUROPE

MONACO

*3A2MG	21	45,504	174	144

CROATIA

9A3ZG	A	1,566	30	29
9A7R	28	2,725,125	1619	645
9A3GW	21	6,504,371	2795	887
9A7A	21	5,331,849	2412	807
		(Op: 9A3TR)		
9A6A	14	3,248,430	1962	779
9A9A	7	4,624,188	1769	724
9A5Y	7	2,892,300	1403	622
		(Op: 9A7W)		
9A8DX	*	1,621,822	1052	504
9A4W	3.7	468,384	632	328
9A3SC	*	374,288	561	298
*9A2R	A	1,937,924	1343	593
*9A2YC	A	726,225	706	421
*9A6ACY	*	328,338	455	306
*9A1CZZ	*	195,546	333	299
		(Op: 9A3LM)		
*9A5J	*	134,611	300	227
*9A4KA	*	101,260	231	166
*9A3CY	*	65,208	190	152
*9A1CFB	*	1,980	32	30
*9A2FK	28	830,960	810	376
*9A2RD	28	298,773	417	267
*9A3RE	*	291,600	412	270
*9A1CRS	*	202,176	332	216
*9A5AZZ	*	168,057	295	213
*9A1CRJ	*	114,392	235	181
		(Op: 9A3QM)		
*9A3SO	*	5,043	47	41
*9A2TX	21	3,690	43	41
*9A4RV	14	46,480	212	166

MALTA

9H3XY	28	6,033,012	2899	852
		(Op: G4JVG)		

PORTUGAL

CS5AUO	A	1,493,030	1192	554
		(Op: CT1AUO)		
CT1CLR	*	227,532	367	268
CT1AHU	28	1,404,298	1137	518
CT8T	21	5,318,603	2740	901
		(Op: CT1ESV)		
*CT1FAC	A	186,732	372	252
*CT1ELF	*	125,209	277	219
*CT7GOX	*	73,299	192	159
*CT1DYV	*	64,092	180	147
*CT2FQA	*	2,204	31	29
*CT1EAT	*	969	19	17
*CS7GPQ	28	585,918	699	387
		(Op: CT2GPQ)		
*CQ7ERK	28	502,200	669	372
*CT2FUN	*	245,160	400	270
*CT1GFK	*	213,855	457	269
*CT2GQN	*	163,560	326	232
*CT2GFQ	*	33,990	127	110
*CT2GVG	*	1,300	26	25
*CS8EWA	21	138,816	399	241
		(Op: CT1EWA)		
*CT1FLD	*	44,840	170	152
*CT1BWW	7	94,962	149	119
*CT1AOZ	3.7	170,856	272	216
*CT2GPT	*	3,096	39	36

GERMANY

DL3TD	**A**	**5,680,505**	**2261**	**835**
DJ6QT	**A**	**5,081,427**	**2410**	**837**
DK2OY	**A**	**2,514,640**	**1533**	**680**
DJ3HJ	*	1,243,560	1009	516
DL9DYL	*	985,675	850	443
DJ2MX	*	859,248	800	432
DK5WQ	*	598,776	593	409
DM3HZN	*	560,694	631	391
DL3ABL	*	448,910	542	385
DL2KUW	*	261,888	392	264
DL8DAX	*	190,513	327	271
DL6DVU	*	143,412	303	228
DL6AG	*	108,416	224	176
DL6MHW	*	101,132	227	193
DK1EAW	*	99,981	254	189
DL8SDI	*	32,890	145	115
DK5KJ	*	13,588	85	79
DL1JGG	*	1,825	25	25
DJ1ZU	**28**	**807,946**	**806**	**397**
DL8UD	**28**	**742,976**	**700**	**416**
DK3GG	*	534,192	581	372
DAØEUR	*	384,930	392	315
		(Op: DL4AKW)		
DK3KD	*	207,424	341	224
DL8PC	**21**	**1,802,952**	**1194**	**612**
DL9ZWG	*	21,018	100	93
DJ7AA	**14**	**5,744,320**	**2582**	**928**
DL1ZIH	**3.7**	**824,569**	**878**	**397**
DL3LAB	*	132,405	277	195
***DL3ZAI**	**A**	**480,342**	**574**	**359**
***DF1ZN**	**A**	**400,785**	**502**	**347**
*DK6BT	*	288,036	400	324
*DL8SDC	*	272,583	417	279
*DK7FP	*	231,035	370	245
*DJ3OE	*	183,560	325	260
*DH2PL	*	165,953	322	263
*DK7ZH	*	156,100	287	223
*DL3BRA	*	140,556	300	221
*DL3KDC	*	106,338	251	222
*DL5AUA	*	90,055	200	155
*DJ9NMH	*	77,600	195	160
*DL7UXG	*	48,477	170	143
*DL1AQY	*	38,184	142	129
*DJ8UV/P	*	33,840	141	120
*DM3XI	*	30,082	116	89
*DN1MA	*	26,814	122	109
*DL6UAM	*	25,839	121	99
*DL6AKK	*	18,876	88	78
*DL3YEI	*	16,791	100	87
*DL6NDQ	*	6,720	73	64
*DL9NEI	*	4,560	50	48
*DL1HSR	*	4,030	35	31
*DL5ANS	*	1,456	26	26
***DJØBX**	**21**	**22,515**	**100**	**95**
*DL2NEQ	*	21,894	104	89
***DJ2YE**	**7**	**51,030**	**156**	**135**

SPAIN

EA3NY	**A**	**4,071,228**	**2275**	**714**
		(Op: EA3FUM)		
EA7DHP	**A**	**2,235,870**	**1606**	**637**
EA1BLX	**A**	**1,661,310**	**1252**	**567**
EA5AL	*	353,772	436	317
EA3MR	*	142,120	290	220
EA3DUW	*	135,700	331	230
EA7CWA	*	126,635	253	241
EA5CMQ	*	88,560	214	180
EA3GBU	*	79,182	219	159
EA1AAA	*	10,126	63	49
EA3DUZ	**28**	**109,060**	**215**	**190**
EA1BZP	*	78,288	196	168
EA1BCK	*	41,402	138	127
EA3BCP	**21**	**1,434,762**	**1142**	**531**
AN1DMQ	*	135,108	476	243
EC1AOD	*	91,053	202	151
EA1AUT	**14**	**466,669**	**702**	**409**
EA7CD	*	323,178	553	366
***EA7GTF**	**A**	**2,545,330**	**1626**	**670**
***ED3GEG**	**A**	**1,315,000**	**1042**	**526**
		(Op: EA3GEG)		
***EF3AGC**	**A**	**684,760**	**902**	**424**
*EA5EOR	*	568,806	701	406
*EA7AFM	*	428,180	700	395
*EA5ASF	*	342,144	517	352
*EA1CP	*	286,178	450	323
*EA1AAW	*	270,600	414	300
*EA2BNU	*	252,580	404	292
*EA5WX	*	224,664	373	253
*EA1ET	*	206,448	380	276
*EA7HCU	*	192,874	329	242
*EA1EVR	*	190,025	413	275
*EA2BEY	*	186,325	332	257
*EA3ASX	*	124,179	258	213
*EA4EJR	*	104,895	232	189
*EA5AJX	*	104,832	240	192
*EA3NA	*	87,576	192	178
*EA5FWW	*	80,290	188	155
*EA7GXX	*	72,075	201	155
*EA3DVJ	*	72,000	232	180
*EA1CDH	*	62,225	256	131
*EA4CIE	*	58,259	180	149
*EA3FAJ	*	52,548	164	151
*EC1ANZ	*	50,312	221	152
*EA1GL	*	47,064	160	148
*EA3ASS	*	42,280	142	140
*EA1FBJ	*	40,326	157	141
*EA5CZL	*	25,970	115	106
*EA7GUO	*	24,800	109	100
*EA1AW	*	23,896	108	103
*EA7DUT	*	17,550	105	90
*EA2BDR	*	13,122	88	81
*EA2AVM	*	8,550	100	38
*EA4ECF	*	840	20	20
*EA1DFP	*	444	12	12
***ED7FTR**	**28**	**1,207,713**	**1037**	**537**
***EA3FCQ**	**28**	**445,195**	**543**	**331**
*EA1FAD	*	300,199	470	317
*EA5DFX	*	239,645	377	287
*EA5BX	*	123,420	239	204
*EA5AAJ	*	121,272	258	186
*EA1AUM	*	107,876	240	181
*EA4EAP	*	102,564	224	154
*EA7ASZ	*	62,440	169	140
*EA3KT	*	16,950	82	75
***EA3KA**	**21**	**855,261**	**869**	**477**
***AM1JJ**	**21**	**815,712**	**920**	**464**
			(Op: EA1JJ)	
*EA1AE	*	105,600	235	200
*EA3ELZ	*	80,460	201	180
*EC7DNE	*	42,600	163	142
*EC4DBB	*	25,029	119	103
*EC7DYH	*	18,228	108	53
*EC3AJQ	*	17,922	102	87
*EC1ARZ	*	4,576	57	52
*EC2AEW	*	2,442	40	37
***EA1ACP**	**14**	**151,525**	**333**	**275**
*EA5XC	*	53,985	225	177
*EA3EAN	*	4,374	81	54
*EA4DKS	*	3,570	34	34
***EA1DVY**	**1.8**	**17,696**	**100**	**79**

IRELAND

EI/EA3BOX	**A**	**1,104,065**	**1221**	**527**

MOLDOVA

***ER5AA**	**28**	**37,968**	**147**	**112**

ESTONIA

ES1RA	**A**	**148,654**	**299**	**233**
ES1BH	*	80,448	238	192
ES1ABR	**28**	**60,515**	**181**	**133**
***ES4NG**	**A**	**456,179**	**630**	**373**
*ES1QD	*	201,072	300	284
*ES1QX	*	127,801	311	227
*ES5RIM	*	41,938	205	178
***ES6RHB**	**21**	**20,315**	**90**	**85**
*ES5AAV	*	2,967	33	13
***ES4BG**	**14**	**138,250**	**330**	**250**

BELARUS

EU1AZ	**A**	**3,242,421**	**1838**	**749**
EW3LN	*	61,659	138	117
EW3EW	**14**	**405,210**	**614**	**390**
***EU6FF**	**28**	**24,464**	**110**	**88**
***EW1NA**	**21**	**96,624**	**238**	**176**
*EW6GB	*	36,000	150	120
*EW4EW	*	1,914	39	38
*EU6DX	7	96	4	4

FRANCE

F5RZJ	**A**	**2,898,566**	**1624**	**718**
TM7T	**A**	**2,357,748**	**1552**	**684**
F5BBD	**A**	**1,384,980**	**1094**	**563**
F6BBQ	*	150,495	326	237
F6HKA	*	110,170	275	230
F6BEE	**28**	**2,064,700**	**1412**	**550**
F5AOV	*	307,710	488	263
TM4W	**21**	**3,671,325**	**1997**	**735**
			(Op: F5HRY)	
F/NH7A	**21**	**2,743,120**	**1680**	**680**
F5AJG	**14**	**82,170**	**230**	**180**
***F5ASD**	**A**	**1,144,332**	**1021**	**532**
***F8BJI**	**A**	**695,147**	**704**	**397**
*F8BCZ	*	557,190	642	369
*F5POJ	*	386,535	531	353
*F6FTB	*	347,720	941	320
*F6IJG	*	319,272	414	318
*F5PVJ	*	258,594	400	282
*F6DRP	*	248,024	419	301
*F5RAB	*	213,792	330	262
*F5JBF	*	200,895	317	260
*F5TVG	*	140,400	236	234
*F8AGX	*	15,990	163	65
*F5PXF	*	8,296	77	68
***F5RRO**	**28**	**3,760**	**42**	**40**
***F5BMK**	**21**	**1,082,992**	**985**	**452**
*F6FNA	*	132,466	266	214
***F8BDQ**	**14**	**32,994**	**170**	**141**

ENGLAND

G3VAO	**A**	**1,447,230**	**1073**	**570**
G4BUO	*	165,845	300	205
***MØBRK**	**A**	**842,298**	**831**	**474**
*GØVBD	*	184,184	330	253
*M4T	*	84,630	246	182
			(Op: GØVQR)	
***GØAEV**	**28**	**453,103**	**537**	**343**
*G8L/M	*	64,253	165	137
***M4R**	**14**	**46,680**	**207**	**160**
***G4KHM**	**7**	**32,400**	**121**	**108**

SCOTLAND

GM3BCL	**A**	**600,650**	**643**	**410**
GMØECO	**21**	**1,589,520**	**1201**	**537**

HUNGARY

HA8JV	**A**	**4,282,640**	**2251**	**799**
HA7UG	**14**	**791,444**	**910**	**482**
HA9BVK	**7**	**2,017,356**	**1041**	**527**
***HA6NL**	**A**	**949,530**	**847**	**465**
*HA9MDP	*	881,475	821	483
*HA5OFN	*	30,785	143	131
***HG9VHF**	**28**	**124,830**	**250**	**190**
			(Op: HG9MET)	
*HA3FT	*	84,480	208	160
***HA8CQ**	**14**	**17,510**	**115**	**103**
***HA9MDN/5**	**7**	**164,416**	**324**	**224**

SWITZERLAND

***HB9ARF**	**A**	**363,460**	**518**	**340**
*HB9/DJ5JH	*	22,344	131	114
*HB9HQX	*	13,659	92	87

ITALY

IV3YYK	**A**	**3,958,422**	**1915**	**741**
IK6JNH	**A**	**1,271,748**	**985**	**524**
I2SVA	*	549,692	626	341
IK6PMF	*	512,826	655	381
IK2UCK	*	430,248	543	312
II3L	*	197,286	399	262
			(Op: IV3KAS)	
IKØJMS	*	65,520	223	168
IK2YSJ	*	60,400	187	151
IV3RLB	*	36,414	145	119
IY4W	**28**	**3,695,040**	**1986**	**720**
			(Op: I4LEC)	
IR4B	*	750,048	712	416
			(Op: IK4AUY)	
IK8UND	*	568,032	600	366
IQ3A	**14**	**3,500,793**	**1971**	**789**
			(Op: IV3TAN)	
IU2C	*	695,188	777	461
IR3T	*	189,504	455	288
			(Op: IV3AJZ)	
IR4R	**7**	**1,364,016**	**934**	**471**
			(Op: IK4ALM)	
IR1A	**1.8**	**95,976**	**262**	**172**
			(Op: IK1GPG)	
***IZ1AWD**	**A**	**683,055**	**528**	**353**
***IV3SKB**	**A**	**676,039**	**722**	**437**
***FM5GU/I**	**A**	**624,800**	**792**	**400**
*IK4QJM	*	547,404	640	377
*IK4QIB	*	344,520	463	330
*IK7RVY	*	248,469	368	277
*IZ7CDB	*	232,680	362	280
*IK7WPD	*	221,656	370	269
*IK3PQG	*	156,864	324	228
*IKØXBX	*	105,395	272	197
*IZ2ABN	*	80,028	193	156
*IK2ZJN	*	59,792	159	148
*IRØF	*	46,812	178	166
*IZ8AJQ	*	20,564	113	97
*IK3CXG	*	18,032	102	98
*IKØSTM	*	14,040	80	78
*IK4CBM	*	11,340	89	81
*IZØBPI	*	2,706	33	33
*IV3KSE	*	1,950	31	30
***IK2YSA**	**28**	**249,776**	**371**	**268**
*IK2UVR	*	144,210	268	209
*IV3RCH	*	22,695	100	89
*IZ1CRR	*	7,344	52	51
*IK4YNR	*	1,600	26	25
***I7FMN**	**21**	**194,578**	**401**	**271**
*IK8IFW	21	8,733	79	71
*IZ1ASP	21	32	4	4
***IV3KTY**	**3.7**	**272,742**	**464**	**262**

SARDINIA

ISØNHT	**28**	**114,920**	**260**	**170**

SICILY

IT9PZM	**A**	**1,625,601**	**1268**	**573**
IR9T	**28**	**959,636**	**913**	**436**
II9R	*	556,612	615	386
***IT9RZR**	**A**	**1,765,995**	**1493**	**605**

NORWAY

LA8W	**A**	**5,701,805**	**2633**	**893**
			(Op: LA4DCA)	
LA9HW	**A**	**4,339,440**	**2179**	**784**
LA2MJA	**28**	**70,720**	**195**	**160**
LA5YV	*	4,572	46	36
LA1NG	**3.7**	**221,859**	**386**	**249**
***LA9GY**	**A**	**122,976**	**303**	**224**
***LA7TN**	**A**	**96,005**	**270**	**211**
*LA7CL	*	70,378	190	154
*LA5JX	*	50,064	188	149
*LA1PHA	*	1,127	23	23

LUXEMBOURG

LX1EP	**A**	**1,033,464**	**1272**	**447**
LX2LX	**28**	**527,880**	**648**	**332**
LX9DX	**14**	**1,288,050**	**1147**	**554**
			(Op: LX1RQ)	
LXØRL	**14**	**1,087,408**	**1000**	**532**
LX6T	**3.7**	**1,068,844**	**1144**	**413**
			(Op: LX1KC)	
***LX1JH**	**A**	**151,182**	**304**	**227**

LITHUANIA

LY2BTA	**A**	**4,534,979**	**2204**	**851**
LY1DT	**A**	**2,995,461**	**1751**	**729**
LY3BH	*	1,037,628	900	444
LY2AE	*	351,288	497	328
LY3NFW	*	121,688	297	212
LY2OX	**21**	**1,452,589**	**1113**	**499**
LY2GF	*	925,990	822	442
LY3BX	**7**	**265,680**	**416**	**270**
LY2HM	**3.7**	**624,312**	**780**	**348**
LY1FW	*	469,044	691	303
LY2OU	**1.8**	**109,682**	**311**	**173**
***LY3MM**	**A**	**1,218,990**	**1001**	**537**
***LY2DX**	**A**	**797,008**	**849**	**436**
*LY2FN	*	262,031	406	287
*LY6M	*	69,762	207	151
			(Op: LY1DS)	

BULGARIA

LZ1BJ	**A**	**635,954**	**800**	**422**
LZ5W	**7**	**4,596,207**	**1592**	**707**
LZ2FO	*	173,328	184	157
***LZ2NB**	**A**	**385,749**	**550**	**351**
***LZ2GS**	**28**	**32,136**	**120**	**103**
*LZ3RN	*	15,184	85	73
***LZ2FM**	**21**	**20,330**	**124**	**107**
***LZ1ZC**	**14**	**6,324**	**72**	**68**

AUSTRIA

OE1EMS	**A**	**7,931,614**	**3181**	**982**
OE8CIQ	*	752,095	847	431
OE5OHO	*	151,731	360	207
OE3I	**21**	**862,960**	**796**	**460**
***OE9MON**	**A**	**1,834,406**	**1282**	**566**

FINLAND

OH5LF	**A**	**8,087,141**	**3273**	**983**
			(Op: OH1WZ)	
OH1MM	**A**	**5,644,800**	**2562**	**882**
OH6RX	**A**	**5,345,568**	**2529**	**864**
OH5BM	*	4,968,380	2400	830
OH6XY	*	1,953,020	1287	628
OH1LEG	*	657,090	602	447
OH8BQT	*	416,268	543	373
OH3JR	*	288,426	403	318
OH1BV	*	282,460	397	290
OH7WW	*	59,974	175	157
OH2BR	*	39,349	130	109
OH6AW	**21**	**1,453,956**	**1108**	**532**
OI5AX	**7**	**810,400**	**723**	**400**
			(Op: OH2JTE)	
OH3BU	**1.8**	**53,865**	**189**	**135**
***OH2LYP**	**A**	**674,970**	**814**	**447**
***OH5NE**	**A**	**101,904**	**249**	**193**
*OH4YT	*	79,732	201	173
*OH6SU	*	75,295	199	185
***OH4MDY**	**21**	**1,654,137**	**1192**	**549**
*OH1KSD	*	225,760	412	272

CZECH REPUBLIC

OK1RF	**A**	**8,751,637**	**3201**	**919**
OK1EP	**A**	**1,558,823**	**1181**	**581**
OK2HBR	*	379,562	529	346
OK1FRO	*	172,293	355	253
OK2BJT	**28**	**41,952**	**128**	**114**
OK5W	**14**	**3,421,880**	**1887**	**808**
			(Op: OK2ZW)	
OK1AKF	*	63,169	221	181
OL6X	**7**	**2,364,584**	**1251**	**568**
			(Op: OK1DIG)	
OK1IE	*	253,872	328	258
OK2RZ	**3.7**	**1,636,910**	**1297**	**506**
OK1FPS	*	156,123	315	209
OK1TP	**1.8**	**74,196**	**458**	**162**
***OK2VWB**	**A**	**1,463,676**	**1060**	**566**
***OK1DSZ**	**A**	**677,646**	**670**	**423**
***OK1DCF**	**A**	**610,280**	**678**	**418**
*OK1BA	*	573,804	633	396
*OK1MQY	*	545,211	651	381
*OK1DKS	*	347,548	460	323
*OK2PMS	*	203,056	340	251
*OK5ACR	*	106,148	291	223
*OK1DOL	*	100,005	238	177
*OK1FHI	*	85,314	205	177
*OK1AOU	*	69,394	202	157
*OK2SWD/P	*	51,051	213	143
*OK2PBG	*	28,943	121	103
***OK2HZ**	**28**	**156,354**	**275**	**206**
*OK2PCN	*	41,952	137	114
***OK2SBL**	**21**	**1,364,750**	**1024**	**515**
*OK2HI	*	114,390	254	186
*OK1MMN	*	20,230	103	85
***OK1DVK**	**14**	**15,190**	**99**	**98**
***OK2PPM**	**7**	**42,189**	**147**	**123**
***OK2ZV**	**3.7**	**12,648**	**80**	**68**
*OK1HXH	*	7,208	68	53
***OK2SNX**	**1.8**	**83,386**	**255**	**173**

SLOVAKIA

OM5RW	**21**	**2,780,832**	**1631**	**664**
OMØWR	**1.8**	**296,474**	**504**	**271**
***OM5AW**	**A**	**1,673,349**	**1289**	**589**
***OM8DD**	**A**	**522,958**	**670**	**382**
*OM4DN	*	426,642	618	337
*OM4KK	*	386,841	520	327
*OM3YK	*	275,196	443	284
*OM8FF	*	265,694	400	286
*OMØCW	*	101,430	311	210
*OM6ACW	*	77,488	220	167
*OMØCR	*	57,619	201	157
*OM8CA	*	45,474	156	143
***OM7YC**	**21**	**43,432**	**139**	**122**
*OM9AZ	*	7,236	72	54

BELGIUM

OT9T	**A**	**7,069,280**	**2762**	**920**
ON5GQ	**A**	**1,550,193**	**1128**	**591**
ON4BBW	*	263,836	378	284
ON9CLV	*	98,787	256	221
ON4DPP	**14**	**2,840,913**	**1721**	**729**
***ON4APU**	**A**	**1,394,169**	**1081**	**591**
***ON6CR**	**A**	**422,816**	**554**	**362**
*ON4XG	*	314,104	470	316
*ON4CFA	*	104,468	256	196
***ON6LO**	**14**	**28,944**	**162**	**134**

DENMARK

OZ9Y	**A**	**2,594,330**	**1618**	**610**
OZ7DN	**A**	**724,607**	**622**	**401**
OZ5EV	*	490,360	492	410
OZ3SK	**1.8**	**242,028**	**463**	**249**
***OZ1AA**	**A**	**672,750**	**682**	**414**
***OZ1ACB**	**A**	**565,956**	**620**	**398**
*OZ4NA	*	166,320	328	264
*OZ1JVX	*	130,752	300	227
*OZ5EDR	*	41,713	144	101
*OZ7AEI/P	*	13,284	100	81
*OZ6OQ	*	2,548	53	26

THE NETHERLANDS

PAØIJM	**A**	**1,922,790**	**1498**	**599**
PI4COM	**A**	**426,020**	**559**	**340**
			(Op: PE1PZS)	
PA1BX	*	153,738	299	234
PA7KW	*	147,972	277	209
PA6WPX	**14**	**2,779,920**	**1692**	**715**
			(Op: PA3EWP)	
***PA1TT**	**A**	**714,495**	**700**	**437**
*PA3CAL	*	128,843	277	221
*PAØRBS	*	63,271	191	157
***PAØJR**	**28**	**31,600**	**116**	**100**
*PA5BW	*	2,024	47	44
***PA2SWL**	**21**	**77,504**	**200**	**173**
***PAØMIR**	**3.7**	**166,116**	**339**	**218**

SLOVENIA

S5ØK	**A**	**5,326,053**	**2641**	**841**
S57S	**A**	**5,000,813**	**2340**	**739**
S57DX	**A**	**4,183,568**	**2027**	**746**
S58WW	*	3,054,656	1841	704
S53R	*	1,340,874	1020	486
S59L	*	343,361	511	313
S52DK	*	76,653	223	167
S54AA	**28**	**2,480,333**	**1561**	**619**
S53O	**28**	**1,326,045**	**1069**	**511**
S52ZW	**21**	**3,384,518**	**1911**	**691**
S53ZO	**21**	**2,698,495**	**1615**	**599**
S51CK	**14**	**1,063,797**	**1052**	**537**
S53M	**7**	**3,732,300**	**1464**	**660**
			(Op: S55OO)	
S53T	**3.7**	**157,320**	**341**	**207**
			(Op: S57CQ)	
***S53EA**	**A**	**2,687,482**	**1701**	**680**
***S51F**	**A**	**1,771,299**	**1299**	**597**
***S57U**	**A**	**1,188,134**	**1009**	**529**
*S57IIO	*	1,005,452	899	482
*S54X	*	564,534	654	397
*S57MSU	*	303,747	433	309
*S57NPR	*	292,152	442	296
*S57AW	*	140,490	301	223
*S51T	*	124,478	310	218
*S59AA	*	25,200	123	100
***S52OT**	**28**	**509,922**	**588**	**342**
*S51W	*	286,465	419	265
*S57UYX	*	279,270	410	261
***S51SK**	**21**	**43,136**	**155**	**128**
***S54A**	**7**	**430,604**	**497**	**332**
***S51Z**	**3.7**	**368,440**	**567**	**302**
*S57KAA	*	241,362	453	253

SWEDEN

SM6HRR	**A**	**535,626**	**575**	**378**
SK3GW	**21**	**2,121,600**	**1358**	**600**
			(Op: SM5IMO)	
SMØKV	*	132,057	300	201
SM6FJY	*	70,064	202	151
SM2DMU	**14**	**3,210,269**	**2019**	**773**

SKØUX	**7**	**1,578,960**	**1009**	**510**
		(Op: SMØTQX)		
***SM2KAL**	**A**	**346,076**	**588**	**359**
***SM7BJW**	**A**	**138,375**	**282**	**205**
*SM7AIL	*	36,010	168	130
*SMØBDS	*	33,866	123	118
*SMØFM	*	25,152	110	96
*SM3CVM	*	23,496	93	88
*SM5AJV	*	21,186	115	99
*SM5AAY	*	21,060	94	81
***SK4UW**	**28**	**14,941**	**89**	**67**
		(Op: SM4JHK)		
*SM4HEJ	*	3,465	37	35
***SM4BTF**	**21**	**34,560**	**135**	**120**
***SMØGYX**	**14**	**102,934**	**273**	**214**
*SM6AHU	*	975	27	25
***SM3ARR**	**7**	**7,410**	**69**	**57**
*SM7HSP	*	1,176	14	14

POLAND

SP6IXF	**A**	**2,708,677**	**1652**	**677**
SP9QMP	**A**	**2,035,530**	**1536**	**630**
3Z4N	**A**	**2,031,120**	**1318**	**620**
		(Op: SP4NI)		
SP5MXA	*	447,120	501	360
SP9W	*	433,056	550	347
SP7FDV	*	78,854	246	176
SP3HRN	*	64,779	179	143
SP9IIL/P	*	55,142	173	158
SP9KJM	*	51,305	166	155
SP5BB	*	45,500	150	125
SP9CLO	*	42,673	164	139
SP3MGP	*	25,474	108	94
SP5IKC	*	1,824	26	24
SP9PT	**28**	**461,376**	**515**	**324**
SP9LAS	*	10,824	68	66
SP5GRM	**21**	**5,631,668**	**2769**	**826**
SP7GIQ	**21**	**5,061,056**	**2520**	**728**
SP5UAF	*	156,366	280	219
SP4OZ	*	60,256	234	112
SP3FFP	*	10,325	59	59
SP9IKN	**14**	**3,528**	**63**	**42**
SP6FBD/3	**3.7**	**39,780**	**168**	**117**
***SP9KRT**	**A**	**1,069,596**	**756**	**657**
***SP4TKR**	**A**	**1,032,240**	**1000**	**506**
***SP7SEW**	**A**	**828,504**	**898**	**444**
*SP1NY	*	489,376	584	373
*SP1MVG	*	375,375	462	385
*SP7A	*	299,880	451	306
*SP9XWD	*	284,970	415	295
*SP5LCC	*	227,221	448	301
*SP3WVG	*	203,036	356	263
*SP7LZD	*	185,409	346	243
*SP5ICS	*	181,222	343	251
*SQ9DXN	*	158,418	310	234
*SQ5BPM	*	85,050	210	175
*SP9HQC	*	65,661	224	129
*SP6EII	*	40,166	165	133
*SP6FJ	*	36,842	120	109
*SP9XUE	*	19,952	100	86
*SQ1EUO	*	6,435	111	33
*SP7LHX	*	6,010	111	92
***SQ9HYM**	**28**	**75,153**	**196**	**141**
*SP3GTS	*	25,650	102	90
*SQ8GBN	*	18,170	87	79
*SP2AHD	*	8,262	56	51
*SP8OOB	*	3,663	43	33
*SP9RPW	*	2,340	30	26
***SP9BBH**	**21**	**469,359**	**551**	**363**
***3Z6V**	**21**	**458,544**	**551**	**328**
		(Op: SP6DVP)		
*SP2QVS	*	18,954	100	81
*SP9MDY	*	748	18	17
***SP5IVC**	**14**	**245,079**	**424**	**313**
*SP8HXN	*	100,276	328	212
*SP2GNB	*	61,540	211	170
***SP3MY**	**7**	**4,200**	**70**	**28**
***SP4SAF**	**1.8**	**992**	**33**	**16**

GREECE

SV3AQR	**A**	**315,884**	**531**	**314**
SVØAN	**28**	**373,692**	**545**	**298**
***SV7/UYØMF**	**A**	**654,925**	**821**	**391**
***SW2A**	**28**	**1,251,234**	**1010**	**493**
		(Op: SV2AEL)		
***J4Z**	**3.7**	**484,810**	**592**	**323**
		(Op: SV2CWY)		

BOSNIA & HERZEGOVINA

T97M	**A**	**90,093**	**253**	**177**

EUROPEAN TURKEY

***TA1BM**	**28**	**47,432**	**143**	**121**

CORSICA

***TK/OK2SW**	**A**	**186,293**	**364**	**241**

EUROPEAN RUSSIA

RW4AA	**A**	**5,594,617**	**2812**	**917**
RA3AUU	**A**	**4,460,316**	**2278**	**812**
RW4PK	*	998,493	969	501
RV1CC	*	227,700	335	253
RZ1AZ	*	176,418	298	243
RZ6HDX	*	54,054	159	143
RN3AY	*	20,064	111	96
RV6LOB	**28**	**132,858**	**291**	**198**
RA4LC	*	109,752	304	204
RV3ACA	**21**	**679,687**	**802**	**431**
RU6FA	*	242,535	544	285
UA3BZ	*	57,834	176	153
UA3DJY	*	53,320	196	155
RA3XO	*	41,690	133	110
RW4WR	**14**	**3,810,807**	**2077**	**819**
RN3D	**14**	**1,937,416**	**1506**	**676**
		(Op: RX3DCX)		
UA4RC	*	948,816	903	527
RX3RZ	*	146,234	341	253
RV3YR	*	114,869	300	233
RA4CU	*	65,514	207	179
U1BB	*	44,037	253	189
RV6LNA	**7**	**1,483,044**	**945**	**498**
***RA3WA**	**A**	**1,738,704**	**1352**	**592**
***RA6LBS**	**A**	**1,118,150**	**1040**	**535**
*UA4FER	*	848,320	886	482
*UA6AN	*	762,520	721	440
*RV6LFE	*	624,950	811	431
*RK4FD	*	554,452	572	388
*UA4ASE	*	520,070	773	397
*UA3LHL	*	444,686	573	374
*RA3LBW	*	426,020	560	349
*RA1AKE	*	368,854	553	350
*U1BA	*	316,287	517	339
*R3/DL7BO	*	262,482	438	291
*RW1CW	*	209,212	400	271
*RU6CZ	*	207,944	365	278
*RV4LM	*	132,076	260	212
*RX3AEX	*	83,224	255	202
*UA3AGW	*	37,442	130	97
*UA1AKE	*	27,573	113	91
*UA4LDP	*	25,410	126	110
*UA4ACP	*	16,716	100	84
*UA4HAK	*	9,072	75	72
*UA4LU	*	5,945	50	41
***UA1OMS**	**28**	**108,924**	**284**	**174**
*RV3AJN	*	1,830	45	30
***UA4LCQ**	**21**	**2,615,722**	**1730**	**719**
***UA3ADN**	**21**	**1,100,352**	**1032**	**528**
*UA3SAQ	*	612,450	7223	450
*RA3DNC	*	305,659	503	337
*RU3DVR	*	168,466	333	262
*UA3XDO	*	129,260	270	230
*UA4LBK	*	74,925	233	185
*UA1AQF	*	13,612	88	83
*UA4HA	*	11,248	90	74
***UA3BL**	**14**	**1,025,411**	**1053**	**551**
*UA3IKO	*	361,368	574	378
*RA1AW	*	257,278	450	322
***UA6NZ**	**7**	**38,880**	**136**	**120**
***UA3QOG**	**3.7**	**153,648**	**330**	**194**
*UA3XGM	*	924	21	21

KALININGRAD

UA2FB	**A**	**3,765,951**	**1967**	**791**
RN2FA	*	1,127	23	23

UKRAINE

UX8IXX	**A**	**2,413,312**	**1910**	**704**
UY1I	**A**	**1,926,092**	**1603**	**634**
		(Op: UXØIK)		
UX1UA	**A**	**1,243,104**	**1134**	**552**
UTØU	*	558,102	633	382
UT6EE	*	351,415	515	335
UY5ZZ	*	159,630	374	255
US1QA	*	560	14	14
UT2ID	**28**	**359,909**	**521**	**299**
ERØN	**28**	**327,990**	**435**	**290**
		(Op: UT7ND)		
UX7MM	*	99,648	253	173
UT5UUF	*	12	2	2
EO1I	**21**	**4,160,076**	**2725**	**844**
		(Op: UT1IA)		
EN5E	**21**	**2,473,569**	**1651**	**711**
UTØH	**21**	**1,187,182**	**1000**	**526**
UT8IM	*	949,611	1028	507
UR6MX	*	260,100	440	300
UT7MD	**14**	**39,038**	**160**	**149**
UT1QW	*	18,096	120	104
UX2MM	**7**	**70,824**	**198**	**156**
US2IZ	**3.7**	**249,300**	**397**	**277**
UT9NA	*	80,256	219	152
UT1KT	**1.8**	**1,200**	**25**	**25**
***UR7M**	**A**	**1,316,952**	**1433**	**603**
		(Op: UT5MB)		
***UR5QBB**	**A**	**930,762**	**938**	**498**
***US3IZ**	**A**	**604,854**	**785**	**414**
*UT1WA	*	338,940	450	315
*UR5XAJ	*	319,010	414	365
*UT4TA	*	266,012	440	292
*UT5NR	*	205,600	336	257
*UT5JCE	*	177,876	305	243
*UR5ASM	*	126,218	331	223
*UR5NX	*	100,858	272	211
*UT3UZ	*	97,161	314	139
***UT7QL**	**28**	**141,303**	**306**	**201**
*US3WD	*	94,250	382	250
*UX1KR	*	44,892	149	116
*UY5QZ	*	30,098	122	101
*UT4EO	*	18,549	109	81
***UU7JX**	**21**	**766,488**	**962**	**436**
***UT2IW**	**14**	**164,375**	**353**	**263**
***UT1T**	**7**	**396,088**	**536**	**308**
		(Op: UR7TZ)		
*UU9JQ	*	15,392	83	74
***UT2QT**	**3.7**	**145,464**	**331**	**209**
*UX3M	*	81,356	216	172
		(Op: UR3MP)		

LATVIA

YL2KO	**A**	**2,745,472**	**1611**	**712**
YL2KA	**A**	**438,048**	**510**	**338**
YL2MR	*	409,833	605	353
YL2IP	*	7,203	51	49
YL2GN	**7**	**667,776**	**721**	**376**
***YL2PP**	**21**	**36,120**	**140**	**120**
*YL3BZ	*	31,979	115	114
***YL3FW**	**14**	**214,320**	**433**	**304**
*YL1YZ	*	22,540	132	98

ROMANIA

YO4CIS	**21**	**1,103,256**	**1070**	**504**
***YO5CYG**	**A**	**862,752**	**840**	**456**
***YO6BHN**	**A**	**457,100**	**620**	**350**
*YO3FWC	*	381,537	560	351
*YO9JIM	*	168,820	290	230
*YO9GJY	*	74,175	222	129
*YO4US	*	43,676	159	122
*YO9XC	*	42,160	145	124
*YO8BGE	*	36,663	156	121
*YO2LIM	*	33,439	123	119
*YO6SD	*	26,001	134	107
***YO3NL**	**28**	**48,875**	**150**	**125**
*YO7AQF	*	7,657	97	31
***YO9FJW**	**21**	**5,742**	**64**	**57**
***YO3GOD**	**7**	**79,960**	**291**	**208**
***YP2A**	**3.7**	**866,123**	**822**	**323**
		(Op: YO2LIF)		

YUGOSLAVIA

YZ7EM	**A**	**1,443,780**	**1070**	**585**
***YU1BO**	**A**	**59,052**	**185**	**148**
*YU7AL	*	23,800	123	100
***YU7KM**	**28**	**45,162**	**144**	**117**
*YU7SF	*	40,290	136	110

MACEDONIA

Z31RB	**A**	**353,735**	**503**	**269**
Z37FCA	*	1,380	25	23
Z32KV	**7**	**1,650**	**27**	**25**
Z31GX	**3.7**	**115,566**	**256**	**187**
***Z31JA**	**A**	**2,428,800**	**1752**	**690**

OCEANIA

EAST MALAYSIA

***9M6AAC**	**21**	**795,555**	**768**	**355**
		(Op: VR2CT)		

PHILIPPINES

DU1QKU	**21**	**369,512**	**921**	**286**
***DU7MHA**	**A**	**884,800**	**906**	**316**
*DU1LER	*	509,784	668	264
***DU3RCM**	**28**	**832,365**	**804**	**349**
*DU1FZB	*	173,880	330	184

MARIANA ISLANDS

KHØCE	**21**	**781,812**	**697**	**381**
***KHØ /JF2QNM**	**A**	**4,537,056**	**2571**	**566**
*NHØE	*	226,982	361	217

GUAM

WH2/N2NL	**A**	**2,628,020**	**1678**	**505**

HAWAII

KH6ND	**28**	**6,442,856**	**3082**	**721**
AH7DX	**21**	**6,439,698**	**2748**	**786**
		(Op: KH6TO)		
KH7U	**14**	**3,150,160**	**1578**	**676**
WH7Z	**7**	**4,582,773**	**1539**	**507**
		(Op: K9QQ)		
AH6OZ	**3.7**	**670,970**	**496**	**229**
AH6PR	**1.8**	**18,963**	**67**	**49**
***WH6O**	**A**	**181,488**	**307**	**199**

AMERICAN SAMOA

AH8A	**28**	**6,017,164**	**2852**	**724**

MARSHALL ISLANDS

V73UX	**A**	**2,635,736**	**1580**	**577**

AUSTRALIA

VK4EMM	**A**	**3,365,280**	**1614**	**608**
VK3TZ	**A**	**3,226,950**	**1664**	**639**
VK3IO	*	83,754	170	162
VK4DZ	**28**	**1,796,652**	**1316**	**468**
VK2ARJ	**28**	**1,310,816**	**1224**	**368**
VK2APK	*	1,021,347	879	401
VK5GN	**21**	**78,432**	**182**	**152**
***VK2NNN**	**A**	**397,218**	**482**	**277**
*VK2CZ	*	6,120	60	51
***VK5EMI**	**A**	**2,821**	**31**	**31**
***VK5KAW**	**21**	**66,308**	**181**	**137**

INDONESIA

YB2UU	**A**	**3,525,804**	**1743**	**666**
YBØRP	*	35,802	127	102
YBØAS	*	30,590	114	95
YE3C	**21**	**1,667,744**	**1160**	**494**
YBØHD	**14**	**110,704**	**206**	**187**
***YB1KOR**	**A**	**994,906**	**743**	**451**
***YB3ZES**	**28**	**4,641**	**45**	**39**
		(Op: YD3JTR)		

NEW ZEALAND

ZL1ANJ	**A**	**959,010**	**716**	**390**

SOUTH AMERICA

CHILE

CE3F	**28**	**7,003,440**	**2824**	**854**
		(Op: CE3FIP)		
***CE6TBN**	**A**	**158,760**	**276**	**216**
*CE8NKR	*	137,904	258	204

BOLIVIA

CP6UA	**A**	**1,670,490**	**1113**	**538**
CP6PL	**28**	**1,305,732**	**1002**	**466**

URUGUAY

CW8C	**28**	**7,501,624**	**2943**	**884**
		(Op: CX8CP)		
CX5BE	*	652,960	615	371
***CV8W**	**28**	**751,530**	**697**	**390**
		(Op: CX8AT)		

ECUADOR

HD1J	**A**	**2,514,950**	**1503**	**562**
		(Op: HC1JE)		
HD2RG	*	957,884	804	404
HC2GT	**21**	**459,270**	**513**	**351**
HC2AQ	**14**	**733,096**	**670**	**371**
***HC1JQ**	**28**	**272,664**	**390**	**252**

GALAPAGOS

HC8A	**A**	**24,660,043**	**66231159**	
		(Op: N6KT)		

COLOMBIA

HK6KKK	**A**	**5,582,171**	**2306**	**769**
***HK6PSG**	**A**	**544,570**	**524**	**355**

ARGENTINA

LUØH	**A**	**4,366,677**	**1950**	**773**
		(Op: LU3HU)		
LT7H	**A**	**4,079,473**	**1883**	**757**
LS7D	*	1,450,605	1032	519
		(Op: LU7DW)		
LTØH	*	1,286,928	919	486
		(Op: LU3HY)		
LU2FT	*	1,063,232	830	449
L1ØF	**28**	**6,326,250**	**2840**	**875**
		(Op: LU2FFD)		
L2F	**28**	**5,582,720**	**2712**	**880**
		(Op: LU9FDG)		
LW7DX	*	4,668,510	2089	770
LU2YAX	*	694,365	631	389
LW7DQW	*	24,795	115	95
LOØD	**21**	**1,606,319**	**1073**	**517**
LQ4I	**14**	**1,005,480**	**800**	**441**
		(Op: LU4IC)		
***LU9HO**	**A**	**2,853,630**	**1453**	**702**
***LO7H**	**A**	**1,968,252**	**1202**	**572**
		(Op: LU7HN)		
***AY5E**	**A**	**1,488,606**	**1004**	**529**
		(Op: LU5DV)		
*L44D	*	1,438,395	994	515
		(Op: LU4DA)		
*LU3HKA	*	518,580	551	335
*LW1DX	*	267,615	361	285
*LU5EVK	*	41,724	141	122
***LU5FC**	**28**	**4,057,340**	**1908**	**730**
***LR6D**	**28**	**2,582,784**	**1496**	**608**
		(Op: LW5DX)		
***L2ØF**	**28**	**2,129,445**	**1256**	**599**
*LU4DX	*	1,909,616	1178	568
*LU4OJS	*	1,505,534	1004	529
*LU2EC	*	1,045,642	808	459
*LW1EGD	*	967,471	799	419
*LU9HOA	*	781,902	754	363
*LU7DR	*	651,987	611	393
*LW7EGO	*	487,860	493	346
*LU5HA	*	462,882	510	321
*LU3OJZ	*	203,281	301	247
*LU7DS	*	86,815	197	179
*LU4HXJ	*	58,752	161	144
*LW8DXJ	*	39,984	138	112
*LU4MGJ	*	39,738	134	111
*LU9AWM	*	1,675	27	25
***LU3FZW**	**21**	**1,949,652**	**1213**	**558**
*LU5HCI	*	833,160	695	424
*LU2BA	*	779,271	666	421
*LV5V	*	541,944	558	351
		(Op: LU5VV)		
***LU1HN**	**14**	**12,342**	**67**	**66**
***LU5FCI**	**3.7**	**312**	**14**	**12**

ARUBA

P4ØW	**A**	**17,639,370**	**50071037**	
		(Op: W2GD)		
P4ØN	**A**	**14,002,632**	**4671**	**972**
		(Op: KW8N)		
P43W	**28**	**6,050,472**	**2705**	**776**
P49M	**28**	**3,246,705**	**2131**	**693**
		(Op: VE3MR)		
P43A	**21**	**9,001,687**	**3168**	**961**
***P43E**	**A**	**2,628,840**	**1508**	**570**
***P43DJ**	**21**	**2,076,325**	**1233**	**575**

BRAZIL

ZW7BZ	**A**	**6,682,221**	**2555**	**861**
		(Op: PT7BZ)		
PV2V	**A**	**832,824**	**782**	**387**
		(Op: PY2KP)		
ZZ7Z	*	54,320	172	140
PT2HO	*	23,305	97	91
PY7BEL	*	18,509	103	83
PR7FMT	*	7,844	56	53
ZX5J	**2814,405,820**	**45021095**		
		(Op: PP5JR)		
ZY2DX	**28**	**5,417,352**	**2358**	**804**
		(Op: PY2QE)		
PY3CGP	*	99,554	216	182
PU3WPA	*	19,135	89	89
PT1A	*	16,147	85	67
PU7ENW	*	9,768	84	66
ZX2DR	*	3,552	40	37
PR7FN	*	2,960	48	40
PU7EEL	*	247	15	13
PY4OY	**21**	**564,759**	**566**	**351**
PR7AYE	*	1,408	22	22
PP5JD	**14**	**4,169,683**	**1903**	**749**
***PW1S**	**A**	**4,315,248**	**1994**	**756**
		(Op: PY1KS)		
***PY2YU**	**A**	**3,547,918**	**1701**	**737**
***PY2MNL**	**A**	**3,486,525**	**1737**	**687**
*PY8AZT	*	1,388,520	970	532
*PY2OZF	*	1,311,712	259	196
*PY2NY	*	423,094	510	329
*PY2KQ	*	401,280	474	320
*PP2RON	*	399,464	500	334
*PY2DJ	*	285,136	421	284
*PY2TI	*	59,714	163	146
*PR7QI	*	27,400	131	95
*PV8DX	*	25,641	83	77
*PY1AFS	*	18,146	99	86
*PY5AG	*	17,238	81	78
*PY7IQ	*	8,932	61	58
*PP5OW	*	3,690	42	41
***PY2NW**	**28**	**1,502,609**	**980**	**547**
***PY3RK**	**28**	**1,289,340**	**1079**	**522**
*PY2BSY	*	1,260,020	892	502
*PY4BK	*	1,053,946	1214	569
*PU2MRY	*	836,684	717	436
*PY2ELG	*	457,246	515	334
*ZV2VT	*	347,667	478	289
*PU2YDX	*	173,340	300	230
*PY5BF	*	151,264	266	232
*PY2EJN	*	129,540	295	204
*PY3HSP	*	114,156	230	189
*PY5TJ	*	102,305	220	185
*PY1ACV	*	77,500	178	155
*PQ5W	*	44,730	155	126
		(Op: PP5BRV)		
*PU2XLO	*	42,408	150	124
*PY5ZT	*	39,930	150	121
*PY5DZ	*	33,800	121	100
*PY2EL	*	17,696	94	79
*PU2STK	*	11,180	72	65
*PU7XAF	*	8,432	68	62
*PY5DC	*	8,100	200	162
*PY2MYS	*	2,555	35	35
*PY7YL	*	2,485	35	25
*PT5TC	*	336	16	14
*PY2NYK	*	198	12	11
***PP5UA**	**21**	**1,664,216**	**1031**	**554**
*PT2AW	*	84,854	205	154
***PY5HSD**	**14**	**908,604**	**742**	**423**
*PR7SM	*	31,000	1091001	
*PR7SD	*	2,320	30	29

VENEZUELA

***4M5E**	**A**	**2948,140**	**1442**	**667**
		(Op: YV5NWG)		
***YV7QP**	**28**	**159,355**	**277**	**203**

PARAGUAY

ZP6CC	**28**	**1,508,352**	**1028**	**512**

TRIBANDER/SINGLE EL

LA8W	**A**	**5,701,805**	**2633**	**893**
		(Op: LA4DCA)		
LY2BTA	**A**	**4,534,979**	**2204**	**851**
RA3AUU	**A**	**4,460,316**	**2278**	**812**

LUØH	**A**	**4,366,677**	**1950**	**773**	**(Op: LU3HU)**
EA3NY	**A**	**4,071,228**	**2275**	**714**	**(Op: EA3FUM)**
N6ED	**A**	**4,000,752**	**2042**	**756**	
UA2FB	**A**	**3,765,951**	**1967**	**791**	
NX9T	**A**	**3,609,089**	**1833**	**737**	
W1CU	**A**	**3,298,752**	**1645**	**736**	
VK3TZ	**A**	**3,226,950**	**1664**	**639**	
KE9NA	**A**	**3,118,299**	**1799**	**723**	
KL1V	**A**	**3,063,744**	**1795**	**648**	
S58WW	**A**	**3,054,656**	**1841**	**704**	
LY1DT	*	2,995,461	1751	729	
NA1Q	*	2,705,750	1515	685	(Op: W1NT)
DK2OY	**A**	**2,534,994**	**1539**	**682**	
JR1UJX	**A**	**2,381,346**	**1407**	**594**	
KA1UQ	*	2,378,978	1465	677	
KY3ORK	**A**	**2,348,549**	**1405**	**631**	**(Op: KC3TL)**
JQ1BVI	*	2,197,327	1335	583	
N2ED	**A**	**2,103,672**	**1380**	**618**	
AF2K	*	1,819,476	1295	612	
IT9PZM	**A**	**1,666,266**	**1292**	**582**	
OK1EP	**A**	**1,661,027**	**1228**	**599**	
VO1WET	**A**	**1,479,828**	**1087**	**474**	
LS7D	*	1,450,605	1032	519	(Op: LU7DW)
AJ3M	*	1,428,576	983	552	
S53R	*	1,340,874	1020	486	
KØCAT	**A**	**1,331,202**	**1033**	**527**	**(Op: K9WIE)**
LTØH	*	1,286,928	919	486	(Op: LU3HY)
K6III	*	1,274,368	1004	524	
N1EU	*	1,258,218	906	494	
UX1UA	**A**	**1,243,104**	**1134**	**552**	
W6TK	*	1,235,304	1000	513	
NN6NN	*	1,185,867	1101	501	(Op: N6EE)
N2CU	*	1,084,116	838	473	
AA8PA	**A**	**1,083,730**	**980**	**505**	
LU2FT	*	1,063,232	830	449	
NW6S	*	998,148	829	446	
ZL1ANJ	**A**	**959,010**	**716**	**390**	
JA6ZLI	*	925,683	762	441	(Op: JJ6WYS)
K2UOP/8	*	903,000	764	430	
W8JY	*	873,976	759	428	
DJ2MX	*	859,248	800	432	
WØZP	*	830,810	954	502	
VE9FX	**A**	**802,272**	**712**	**411**	
KU6J	*	717,200	704	400	
N4MM	*	703,470	619	383	
JR1LEV	*	686,454	629	382	
NT6K	*	645,814	764	421	
W7QN	**A**	**619,510**	**627**	**410**	
K2FR	*	562,380	595	364	
KC7UP	*	492,615	526	369	
VY2LI	**A**	**402,598**	**479**	**298**	
OK2HBR	*	379,562	529	346	
KR4TG	*	308,825	383	275	
RV1CC	*	227,700	335	253	
K5ZG	*	227,664	350	248	
RZ1AZ	*	176,418	298	243	
N5DD	**A**	**175,875**	**275**	**201**	
JA1KAL	*	173,580	309	220	
UY5ZZ	*	159,630	374	255	
PA1BX	**A**	**153,738**	**299**	**234**	
OE5OHO	**A**	**151,731**	**360**	**207**	
PA7KW	*	147,972	277	209	
KE4DAR	*	142,590	276	210	
W4YE	*	128,164	255	179	
JH1CTV	*	126,024	252	178	
W4YDY	*	110,032	235	184	
W2FUI	*	101,500	228	175	
DL6MHW	*	101,132	227	193	
KZ5AM	*	68,295	203	157	
5X1Z	**28**	**7,044,180**	**2759**	**858**	
IK8UND	**28**	**568,032**	**600**	**366**	
LA5YV	**28**	**4,572**	**46**	**36**	
K6LL/7	**21**	**4,401,600**	**2254**	**840**	
KGØZI	**21**	**2,824,935**	**1662**	**705**	
AGØ/NH7C	*	241,020	502	234	

LOW POWER

KHØ/JF2QNM	**A**	**4,537,056**	**2571**	**566**	
PY2YU	**A**	**3,547,918**	**1701**	**737**	
EA7GTF	**A**	**2,545,330**	**1626**	**670**	
W2TZ	**A**	**2,360,340**	**1407**	**620**	
3B8/DL6UAA	**A**	**2,298,608**	**1500**	**514**	
JR7WAB	**A**	**2,258,781**	**1322**	**609**	
WD5K	**A**	**2,256,272**	**1438**	**664**	
9A2R	**A**	**2,024,040**	**1372**	**606**	
S51F	**A**	**1,808,980**	**1313**	**604**	
4XØF	**A**	**1,563,720**	**1157**	**471**	
L44D	**A**	**1,530,110**	**1028**	**530**	**(Op: LU4DA)**
OK2VWB	**A**	**1,463,676**	**1060**	**566**	
ED3GEG	*	1,363,180	1063	535	
EA9/EA7RU	**A**	**1,351,558**	**992**	**458**	
WN6K	**A**	**1,317,942**	**1069**	**531**	
UP6F	**A**	**1,245,924**	**951**	**477**	**(Op: UN7FZ)**
VE3STT	**A**	**1,132,035**	**829**	**463**	
VA3SWG	*	1,066,542	807	447	
SP4TKR	**A**	**1,032,240**	**1000**	**506**	
WS7V	**A**	**924,015**	**812**	**479**	
VF3JFF	*	920,727	784	421	
JH5OXF	*	825,432	735	422	
UA9ACJ	**A**	**820,227**	**666**	**373**	
PA1TT	**A**	**714,495**	**700**	**437**	
F8BJI	**A**	**696,399**	**704**	**397**	
N7RQ	*	691,335	701	405	
WK3I	**A**	**676,272**	**630**	**386**	
7K4GUR	*	662,496	594	402	
K4BEV	**A**	**580,263**	**597**	**381**	
EA5EOR	*	568,806	701	406	
HK6PSG	**A**	**544,570**	**524**	**355**	
LU3HKA	*	518,580	551	335	
UA3LHL	**A**	**444,686**	**573**	**374**	
N8DXR	**A**	**441,046**	**541**	**349**	
RA3LBW	*	426,020	0	349	
PY2KQ	*	401,280	474	320	
7M1MCT	*	337,288	441	266	
JG1OWV	*	329,858	420	262	
F6IJG	*	321,112	414	318	
N1DS	**A**	**313,252**	**428**	**284**	
W5GZ	*	287,912	438	292	
ZS6PHD	**A**	**286,578**	**382**	**261**	
EA1CP	*	286,178	450	323	
PY2DJ	*	285,136	421	284	
NW8F	*	269,280	388	272	
F5PVJ	*	258,594	400	282	
WA4ET	*	254,254	373	254	
N2ST	*	250,723	377	253	
KØHOF	**A**	**242,858**	**419**	**266**	
K7TR	*	229,080	373	249	
EA5WX	*	224,664	373	253	
F5RAB	*	213,792	330	262	
RW1CW	*	209,212	400	271	
EA1ET	*	206,448	380	276	
JR1MRG	*	206,358	355	211	
N1CC	*	202,911	348	239	
ES1QD	**A**	**201,072**	**300**	**284**	
JP1SPV	*	194,586	306	226	
EA1EVR	*	190,025	413	275	
EA2BEY	*	186,325	332	257	
N2CK	*	174,600	300	225	
IK3PQG	*	156,864	324	228	
NY5C	*	153,120	305	220	
VU2FOT	**A**	**144,576**	**248**	**186**	
JJ3TBB	*	129,960	288	171	
CT1ELF	**A**	**125,209**	**277**	**219**	
EA3ASX	*	124,179	258	213	
LA9GY	**A**	**122,976**	**303**	**224**	
K6UM	*	117,151	230	193	
KU4BP	*	105,834	251	186	
IKØXBX	**A**	**105,395**	**272**	**197**	
EA5AJX	*	104,832	240	192	
9A4KA	*	101,260	231	166	
KE6QR	*	91,176	212	174	
EA7GXX	*	72,075	201	155	
EA3DVJ	*	72,000	232	180	
LY6M	**A**	**69,762**	**207**	**151**	**(Op: LY1DS)**
NV3V	*	67,536	183	144	
CT1DYV	*	64,092	180	147	
PAØRBS	*	63,271	191	157	
EA1CDH	*	62,225	256	131	
JJ3APB	*	60,489	185	143	
EA4CIE	*	58,259	180	149	
VE7HA	**A**	**56,115**	**177**	**129**	
W9YS	**A**	**55,424**	**153**	**128**	
JA9EJG	*	50,370	158	115	
AF4FO	*	48,363	150	141	
EA1GL	*	47,064	160	148	
IRØF	*	46,812	178	166	
K6CTA	*	31,284	110	99	
K6ACZ	*	28,126	101	98	
JH1RDU	*	27,057	102	87	
EA7GUO	*	24,800	109	100	
EA1AW	*	23,896	108	103	
SM3CVM	**A**	**23,496**	**93**	**88**	
WB2OQQ	*	23,220	100	90	
JA3LUM	*	21,663	110	87	
SM5AAY	*	21,060	94	81	
JG3NKP/1	*	19,558	90	77	
EA7DUT	*	17,550	105	90	
JA9NOF	*	11,440	71	65	
UA4LU	*	5,945	50	41	
JI7OED	*	1,725	25	25	
WD4AHZ	**28**	**206,668**	**336**	**244**	
JA4AQR	**28**	**24,440**	**94**	**94**	
XJ1JS	**21**	**404,690**	**492**	**286**	
KGØUA	**21**	**170,170**	**280**	**238**	
JF3IYW/3	**21**	**126,350**	**265**	**190**	
KD6DAE	**21**	**109,798**	**266**	**206**	
JA1YQH	*	8,855	59	55	
JH1KZQ/1	*	8,120	63	56	
SMØGYX	**14**	**102,934**	**273**	**214**	
JA1MXY	**14**	**390**	**14**	**13**	

BAND RESTRICTED

***S57IIO**	**A**	**1,005,452**	**899**	**482**	
***EF3AGC**	**A**	**684,760**	**902**	**424**	
OH1LEG	**A**	**657,090**	**602**	**447**	
***JA5EO**	**A**	**646,726**	**605**	**382**	
*JAØBMS/1	*	440,231	481	341	
*S57MSU	*	303,747	433	309	
*S57NPR	*	292,152	442	296	
***OK2PMS**	**A**	**203,056**	**340**	**251**	
*JG1JQJ	*	167,616	296	216	
LY3NFW	**A**	**121,688**	**297**	**212**	
***SQ5BPM**	**A**	**85,050**	**210**	**175**	
*EC1ANZ	*	50,312	221	152	
*JR5EHB	*	22,968	101	87	
***LW1EGD**	**28**	**967,471**	**799**	**419**	
*LW7EGO	*	487,860	493	346	
***K6KAY/T**	**28**	**434,634**	**621**	**321**	
***KA9UQT**	**28**	**204,314**	**330**	**251**	
***W5CTV**	**28**	**75,112**	**207**	**164**	
***KA1RLI/T**	**28**	**66,476**	**184**	**148**	
***NØOFR**	**28**	**60,580**	**168**	**130**	
***KE4MCE/T**	**28**	**60,348**	**187**	**141**	
KB5UOK	**28**	**44,118**	**142**	**114**	
***KC8KSX**	**28**	**32,330**	**119**	**106**	
*WA4SEX	*	3,234	41	33	
***7K2PBB**	**28**	**2,304**	**34**	**32**	
***KD7CFF**	**28**	**78**	**6**	**6**	
***JA9SCB/1**	**21**	**390,892**	**457**	**316**	
AN1DMQ	**21**	**135,108**	**476**	**243**	
EC1AOD	*	91,053	202	151	
*EC3AJQ	*	17,922	102	87	
*EC2AEW	*	2,442	40	37	

ROOKIE

***PW1S**	**A**	**4,315,248**	**1994**	**756**	
V73UX	**A**	**2,635,736**	**1580**	**577**	
***P43E**	**A**	**2,628,840**	**1508**	**570**	
YZ7EM	**A**	**1,443,780**	**1070**	**585**	
NA1DX	**A**	**1,166,459**	**841**	**497**	
***XE2AUB**	**A**	**922,545**	**937**	**415**	
***MØBRK**	**A**	**842,298**	**831**	**474**	
***IZ1AWD**	**A**	**683,055**	**528**	**353**	
***OZ1AA**	**A**	**672,750**	**682**	**414**	
***K4BEV**	**A**	**580,263**	**597**	**381**	
***F8BCZ**	**A**	**557,190**	**642**	**369**	
***AA1SU**	**A**	**546,820**	**645**	**380**	
***VK2NNN**	**A**	**397,218**	**482**	**277**	
***RA1AKE**	**A**	**368,854**	**553**	**350**	
***EA5ASF**	**A**	**342,144**	**517**	**352**	
***KC8HWV**	**A**	**108,108**	**229**	**189**	
***CT7GOX**	**A**	**73,299**	**192**	**159**	
LX2LX	**28**	**527,880**	**648**	**332**	
***K6KAY/T**	**28**	**434,634**	**621**	**321**	
F5AOV	**28**	**307,710**	**488**	**263**	
***EA7ASZ**	**28**	**62,440**	**169**	**140**	
***PY5DZ**	**28**	**33,800**	**121**	**100**	
***KC8KSX**	**28**	**32,330**	**119**	**106**	
PT1A	**28**	**16,147**	**85**	**67**	
***KB9QFO**	**28**	**13,440**	**98**	**91**	
***KD7DQO**	**28**	**8,436**	**66**	**57**	
***IZ1CRR**	**28**	**7,344**	**52**	**51**	
***WA4SEX**	**28**	**3,234**	**41**	**33**	
***RU3DVR**	**21**	**168,466**	**333**	**262**	
***JJØFDT**	**21**	**35,020**	**128**	**103**	
*JN4GHQ	*	198	12	11	
***TA2NC**	**14**	**546,756**	**536**	**319**	
***F8BDQ**	**14**	**32,994**	**170**	**141**	

ASSISTED

UNITED STATES

NV4X	**A**	**6,476,886**	**2487**	**933**	**(Op: K4MA)**
N3MKZ	**A**	**3,421,596**	**1627**	**698**	
N5JR	**A**	**3,073,048**	**1612**	**743**	
NA2NA	**A**	**2,806,060**	**1482**	**692**	
K3WW	*	2,487,436	1306	686	
K4UVH	*	2,230,800	1346	624	
KD6WW	**A**	**2,104,942**	**1279**	**658**	
WN9O	**A**	**2,055,933**	**1296**	**627**	**(Op: W9IU)**
W7OM	**A**	**1,515,190**	**996**	**547**	
KTØR	**A**	**1,458,212**	**1045**	**532**	
N1NQD	**A**	**1,322,906**	**827**	**533**	
N2FF	*	1,219,113	869	523	
N2TX	*	1,156,896	801	468	
N3ED	*	1,035,258	747	471	
K3DI	*	711,750	613	390	
WA5VGI	*	557,826	559	389	
K1TH	*	524,600	510	344	
W3HVQ	*	412,960	436	308	
N1XYR	*	328,644	418	306	
K3KO	*	325,689	402	273	
N3AM	*	320,628	374	308	
K6JG	*	230,786	309	257	
WO9S	*	184,212	321	238	
K1KU	*	57,456	152	133	
KE1KD	*	48,856	133	124	
K4VV	*	27,645	107	97	
KF2O	*	19,173	86	83	
KN2T	**1.8**	**113,088**	**331**	**186**	
AA4MM	**1.8**	**75,192**	**295**	**156**	
W2MF	*	54,264	222	136	
***NY6DX**	**A**	**3,875,012**	**1820**	**761**	
***WW3S**	**A**	**2,294,572**	**1264**	**644**	
*W2GG	*	2,015,860	1211	595	
***W9RM**	**A**	**495,471**	**500**	**317**	
*KA2D	*	485,109	503	339	
***N6RT**	**A**	**441,700**	**505**	**350**	
***WA1ZYX**	**A**	**341,334**	**413**	**301**	
***KR4QI**	**A**	**150,508**	**259**	**191**	
*NC1N	*	56,140	164	140	

*W3DQ	*	18,285	77	69
***W6RKC**	**7**	**40,920**	**106**	**93**

DX

TM2V	**A**	**6,939,080**	**2872**	**940**
		(Op: F6GLH)		
OH9W	**A**	**4,775,040**	**2369**	**829**
		(Op: OH6EI)		
IN3ZNR	**A**	**3,607,872**	**1966**	**736**
VE1RX	**A**	**2,862,510**	**1545**	**634**
DF6QV	**A**	**2,673,260**	**1576**	**730**
SMØDJZ	**A**	**2,335,021**	**1534**	**689**
DF6VP	*	2,125,884	1404	613
OM3IAG	**A**	**1,803,732**	**1315**	**591**
JR4QZH	**A**	**1,627,626**	**1049**	**546**
ZZ2Z	**A**	**1,508,934**	**1024**	**518**
		(Op: PY2NY)		
DL8NFU	*	342,186	467	321
OK1DXW	**A**	**221,496**	**379**	**264**
EA5FID	**A**	**186,990**	**300**	**271**
PY7ZY	*	75,998	171	158
PA7BT	**A**	**25,506**	**127**	**109**
EA7AGW	*	17,679	96	83
LZ1MC	**A**	**16,848**	**79**	**72**
JG3KIV	**28**	**2,190,951**	**1381**	**581**
S51AY	**28**	**1,324,960**	**1019**	**520**
IQ5Z	**28**	**576,360**	**625**	**360**
		(Op: IZ5AXA)		
JH1FSF	*	559,912	600	358
ON7LX	**28**	**364,812**	**479**	**303**
PU2VYT	**28**	**1,440**	**24**	**24**
JI3OPA	**21**	**6,328,407**	**2585**	**853**
UT5UGR	**21**	**2,412,727**	**1567**	**709**
Z3ØM	**21**	**2,170,168**	**1655**	**616**
		(Op: Z32RY)		
JI2QKJ	*	1,422,390	1029	510
RK6CZ	**21**	**1,015,744**	**1044**	**538**
IC8JAH	**21**	**810,898**	**894**	**451**
DK7YY	**21**	**517,498**	**572**	**353**
JQ1NGT	*	485,709	565	303
EA3EJI	**21**	**254,709**	**407**	**311**
TM7XX	**14**	**3,073,304**	**1832**	**754**
		(Op: F5MUX)		
IU9S	**14**	**2,569,320**	**1942**	**732**
		(Op: IT9BLB)		
LY8X	**14**	**2,088,280**	**1547**	**680**
		(Op: LY1FF)		
G4MM	**14**	**191,860**	**406**	**265**
		(Op: G4PDQ)		
Z39Z	**7**	**976,848**	**812**	**433**
		(Op: Z32AM)		
S57AL	**7**	**617,862**	**495**	**313**
JK1GKG	**3.7**	**39,776**	**117**	**88**
***RAØFF**	**A**	**2,139,675**	**1320**	**607**
***VE3SS**	**A**	**1,587,660**	**965**	**564**
***TM9K**	**A**	**1,189,888**	**1019**	**512**
		(Op: F5BEG)		
***JK2VOC**	**A**	**237,600**	**410**	**240**
***S57XX**	**A**	**157,716**	**316**	**234**
***ON4CAS**	**A**	**153,419**	**266**	**217**
***T93Y**	**A**	**76,884**	**186**	**149**
***IT9STG**	**A**	**30,508**	**131**	**116**
*JA2EFZ	*	21	4	4
***PU2MZI**	**28**	**161,590**	**292**	**226**
***DJ6TK**	**28**	**20,174**	**92**	**77**
***YU1NR**	**21**	**1,517,760**	**1166**	**558**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

KM3T	**14,091,468**	**4448**	**1077**
KI1G	**9,410,058**	**3219**	**987**
WC4E	9,151,008	3415	1038
W6XR	**8,569,041**	**3360**	**943**
NM9H	**5,793,846**	**2461**	**914**
NE6N	**5,497,065**	**2569**	**831**
AA5NT	**5,050,643**	**2370**	**877**
NR6R	4,669,119	2303	819
KR9A	4,205,550	2111	795
N7TT	**4,130,670**	**2079**	**784**
NK4U	3,943,944	2117	744
WØAH	**3,939,810**	**2172**	**771**
NM6Q	3,856,497	2188	773
KO4MM	3,856,158	1973	757
WV2LI	3,532,920	2056	708
K6ZM	3,439,312	1761	688
KD9ST	3,436,431	1818	731
NC7J	3,264,560	1880	730
N5YA	2,799,207	1665	711
WA1RR	2,503,622	1539	682
AB2DE	2,379,252	1386	642
KØCOP	1,470,130	1093	565
NY4T	1,203,788	996	514
NM7I	1,115,114	1151	557
N1JJ	1,101,230	780	559
WB2WPM	1,094,436	812	516
W3USS	**555,940**	**626**	**385**
KW3Y	458,443	524	359
WX3B	416,415	542	355
KØGQ	347,378	449	289
W1AF	240,620	351	265
NT4L	107,184	223	168
KD3TB	105,184	229	173
AA2AD	97,566	212	161
K7PAR	77,408	210	164
K3TG	75,504	191	143
K2TW	57,350	179	155

NORTH AMERICA

VP5N	**21,618,144**	**6204**	**1179**
FM5BH	**11,939,049**	**3904**	**969**
VE5RI	**9,279,648**	**3445**	**1008**
VE6SV	**8,695,568**	**3333**	**952**
VE3RM	**6,893,816**	**2620**	**888**
VA3SK	5,511,835	2222	835
XL3D	4,897,156	2245	748
6Y5MM	**4,630,262**	**2427**	**721**
VE6FI	4,099,964	1785	788
VE6AO	3,812,896	2238	688
HI3CR	**3,137,526**	**1932**	**666**
TF3IRA	**2,958,163**	**2048**	**727**
VF4VV	**2,555,597**	**1621**	**613**
VE8QL	**529,660**	**659**	**355**

AFRICA

CQ9K	**10,775,514**	**3662**	**818**
CS9Z	1,585,069	1036	511
ED8GCC	**1,312,004**	**857**	**482**

ASIA

UA7A	**14,441,808**	**4300**	**1032**
RF9C	12,689,556	3969	1004
JA5BJC	**11,292,648**	**3966**	**996**
E41			
/OK1DTP	**9,054,975**	**3607**	**785**
JA6ZPR	7,576,200	2964	920
JE6ZIH	7,082,359	2774	881
9V1YC	**6,348,952**	**3084**	**856**
JI2ZJS	6,270,076	2489	872
P39P	**5,129,034**	**2435**	**619**
RK9KWI	5,035,212	2200	812
JI2ZEY	4,911,940	2100	830
RK9CZO	3,157,704	1566	648
HSØAC	**2,018,280**	**1538**	**605**
VR2SS	**1,613,766**	**1496**	**499**
JR1ZTI	1,375,464	920	514
RK9JWJ	1,195,575	836	475
RW9UWK	1,190,748	860	442
RZ9AZN	1,056,960	844	367
BV2B	**957,924**	**1142**	**451**
BY4CSZ	**100,980**	**661**	**110**
UK8BWO	**9,870**	**101**	**54**

EUROPE

TM1C	**14,127,966**	**4425**	**1098**
IR4T	**13,414,584**	**4245**	**1101**
HG1S	**13,125,780**	**4309**	**1115**
YL4U	**12,464,114**	**4341**	**1097**
RM6A	**12,071,015**	**4718**	**1111**
S56MM	**11,219,032**	**3866**	**964**
OH2U	**11,179,618**	**3850**	**1042**
M6T	**11,129,853**	**3252**	**1043**
LZ9A	**9,765,960**	**3334**	**970**
EN5J	**9,586,308**	**3931**	**1081**
RW4LYL	9,064,530	3973	1035
YP4A	**8,965,896**	**4123**	**1002**
OH8LQ	8,808,229	3493	1007
RW2F	**8,731,788**	**3147**	**1004**
OH1F	8,595,752	3587	1007
OH7M	8,107,344	3359	1008
OM5M	**7,891,416**	**3012**	**936**
UF3CWR	7,876,512	3566	1008
OT9C	**7,828,812**	**3077**	**993**
GW4BLE	**7,811,232**	**2962**	**858**
DK1NO	**7,660,752**	**3202**	**968**
S5ØG	7,567,920	2928	920
S5ØS	6,967,743	2831	849
S5ØE	6,506,520	2971	885
IO5A	6,487,169	2916	877
DL6RAI	6,292,300	2747	890
G8A	6,170,150	2757	850
T77V	**6,066,240**	**3174**	**852**
OZ9KY	**5,814,180**	**2714**	**873**
EU5F	**5,453,400**	**2725**	**894**
RK3AWE	5,284,975	2640	895
OL5Q	**5,165,910**	**2569**	**795**
ED4RKU	**4,906,391**	**2492**	**889**
SK3LH	**4,855,437**	**2471**	**837**
IK1SLE	4,691,442	2355	795
OT9P	4,654,431	2247	831
DFØHTE	4,611,336	2239	813
DL2ARD	4,310,176	2204	797
ED3TR	4,055,733	1864	781
OL5T	3,993,548	2110	793
RX3RXX	3,792,144	2244	794
IO2A	3,697,398	2060	774
DL3KZA	3,589,270	2005	755
SM2KW	3,518,916	1874	762
RK3AWV	3,447,378	1991	759
EA5FFC	2,772,460	1832	670
IQ9K	**2,731,540**	**1921**	**736**
EM4E	2,685,444	1859	708
TM2000	2,642,112	1718	704
S54DL	2,429,352	1628	648
RK4WWA	2,398,134	1820	683
OT9K	2,107,950	1404	650
SW8L	**2,065,800**	**1785**	**660**
IQ7R	2,042,222	1559	637
LZ6A	2,002,752	1508	608
IO2L	2,002,574	1277	626
RK1OWZ	1,997,660	1535	665
G5N	1,966,892	1367	626
ED4ST	1,941,793	1507	607
GD6IA	**1,939,515**	**1532**	**645**
OZ7HAM	1,931,920	1501	620
ON4LCE	1,843,382	1296	619
ED1BD	1,779,440	1287	590
EA1EEY	1,383,184	1133	542
G1Y	1,372,908	1100	573
DAØGF	1,346,880	1236	552
US8U	1,345,712	1326	557
S59ABC	1,070,190	1009	517
EM7Q	1,020,587	1106	503
RK3QWM	997,002	1013	499
ES2X	979,090	905	497
9A1CMS	**935,901**	**870**	**459**
DKØSU	904,876	814	476
OM3KWZ	874,608	887	456
GJ3DVC	**822,864**	**809**	**474**
ED2WPX	741,512	860	472
SM4VPZ	701,343	760	447
M5W	695,856	786	436
OT9R	653,643	695	387
OZ/K8HT	620,672	675	416
OZ7RJ	526,154	633	386
DLØSLZ	521,100	649	386
RK6XWA	438,468	668	366
SP3KPN/P	**435,000**	**601**	**348**
ED2RCA	433,131	695	353
OL1C	422,261	594	337
EM5ØUWC	407,817	482	401
M4U	302,085	500	315
OE2M	**270,548**	**382**	**283**
DH2RAL	254,928	396	282
SK6DG	248,234	429	298
S53APR	240,768	410	288
ON6BR	237,600	706	204
M8S	223,130	401	265
YV5NIQ/EA1	189,658	348	266
UT4UWL	59,940	240	180
SP9KJU	36,875	149	125
4NØX	**27,160**	**111**	**97**
DN1NA	9,729	77	69

OCEANIA

T33RD	**17,778,372**	**5670**	**998**
VK4IU	**4,168,638**	**1725**	**646**
P2ØX	**3,588,534**	**1901**	**657**
4G1A	**2,255,058**	**1733**	**414**
DX1DX	2,152,403	1564	467
DX1E	1,852,320	1311	480
YBØZCE	**1,708,920**	**1237**	**470**
DX1FLR	677,040	832	280
ZK2GEO	**515,743**	**683**	**263**

SOUTH AMERICA

ZXØF	**27,446,570**	**7138**	**1135**
ZW5B	**16,020,504**	**4695**	**1107**
LU1NF	**8,819,558**	**3173**	**946**
YV4AA	**4,841,080**	**1994**	**740**
LV2V	3,447,422	1552	698
CE3AA	**2,522,767**	**1552**	**559**
LR5ØD	484,784	530	328

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

WT6V	**20,381,112**	**7,025**	**1,202**
KU8E	**17,678,262**	**5,779**	**1,213**
NK7U	**13,220,220**	**4,933**	**1,105**
WO8CC	12,914,018	4,498	1,118
W7RM	12,528,192	4,680	1,104
AJ1I	**12,237,885**	**4,196**	**1,107**
NØNI	**10,467,954**	**3,866**	**1,071**
AD4TR	**4,657,980**	**2,410**	**870**
N6IJ	1,883,840	1,337	560

NORTH AMERICA

KL7RA	**22,808,240**	**6,492**	**1,205**
VF6JY	**22,520,225**	**6,332**	**1,235**
NP3X	**20,997,000**	**6,524**	**1,125**
VE7ZZZ	**15,902,352**	**4,987**	**1,124**
T42R	**11,914,637**	**4,464**	**1,003**

AFRICA

CN8WW	**55,151,562**	**11,637**	**1,334**

ASIA

P3A	**47,680,574**	**10,858**	**1,322**
BV9A	**10,656,996**	**6,363**	**879**
JA6ZPR	**6,781,116**	**2,794**	**876**
JA1YPA	2,998,548	1,574	657
JN1YUU	51,831	165	117
JK3KDH	6,968	61	52

EUROPE

OT9A	**35,425,530**	**9,579**	**1,421**
RU1A	**17,132,206**	**5,761**	**1,183**
HG6Y	**17,057,064**	**6,087**	**1,146**
S51S	**16,221,158**	**5,507**	**1,174**
LY7A	**12,827,528**	**5,048**	**1,099**
ES5Q	**12,413,856**	**4,594**	**1,131**
EA4ML	**12,370,857**	**4,746**	**1,049**
ED7VG	6,127,892	3,224	919
SK6NP	**4,175,478**	**2,190**	**842**
SV1DKR	**3,948,347**	**2,959**	**793**
S57M	3,861,054	2,324	762
ED4RCT	2,156,220	3,993	540
ED4RAX	1,341,826	1,109	526
YO3APJ	**249,000**	**366**	**249**

OCEANIA

TX8DX	**22,641,087**	**6,968**	**1,029**
DX1DBT	**1,134,508**	**1,096**	**362**

SOUTH AMERICA

4M4X	**19,873,728**	**5,398**	**1,116**
LO1F	**14,526,672**	**4,468**	**1,072**
PY3MHZ	**165,658**	**285**	**226**

CHECK LOGS

The following logs were used for cross-checking. SWL and check logs are always appreciated: 4M3B, 9A1CBV, 9A4SS, 9A5ZZ, CE5BPE, CF3EL, CT1DJE, CT1ELF, CX9AU, DJ1MM, DL1DXX, DL2AL, DL2TG, DL3MG, DL3NEO, DL5JMN, DL5NA, DL8AXJ, DM4XCE, EA1CM, EA1SZ, EA2ABM, EA2ABQ, EA2CHL, EA3AM, EA3BJM, EA3BSE, EA3GDX, EA4BSC, EA4CEN, EA4EMC, EA4OI, EA5AFH, EA5DIT, EA5FNE, EA5GRB, EA5GRO, EA5RKL, EA5TD, EA7ARD, EA7FNK, EC1DOI, EC2AFA, ED1JW, EF1ANC, EF1DAH, ER1BF, HA3GN, IK3XTY, IV3BKH, IV3ZUY, IYØTC, IZ7BJT, JA1BE, JA1JLP, JJ2IER, K3SWZ, K4AGT, K4KCL, K6FM, K6FM, KE4RB, KF4UCJ, LA4BHA, LA4OGA, LA7FJA, LA9LO, LU5IBL, LY3BCY, LY3QN, LZ1DM, LZ2EE, LZ3HI, LZ4BU, N7MOK, OK2PSA, OK2YN, ON7SS, OZ6TL, PAØMIR, PAØWTK, PA2ALF, PA3HGF, PY3AJB, PY3CEJ, PY3FBI, PY3NDB, RK3BY, RN3AM, RU3DG, RW1QM, RX3AJM, RZØCQ, RZØLWA, RZ4SWM, SK4UW, SL7ZXW, SMØBXT, SMØNJO, SM3CBR, SM7LZQ, SP2BRI, SP3GHK, SP3VAU, SP4KVX, SP4MPA, SP4TKO, SP4X, SP5CEQ, SP6BEN, SP6KEP, SP6OJG, SP7ICE, SP7KPK, SP7MFW, SP7UWT, SP8EEX, SP9GNM, SQ2HEB, SQ9AOR, SQ9BDV, U6HU, UA1AJW, UA3UBT, UA4PAQ, UA9XEN, UA9XK, UN9PQ, US9QA, UUØJC, UY5QQ, VE3VIG, VE6GEL, W9BZP, WA2FVL, WA9LKZ, WA9PSV, XX9AU, YCØSIK, YC5SKR, YC5SST, YC5VYH, YC5YCT, YL1ZC, YL2PJ, YO2AIX, YO4ATW, YO4BSM, YO4RHK, YO6AVB, YO6ODN, YO8AII, YO8CRU, YO8KOS, YO9HH

DISQUALIFIED: Station LT1F operated by LU1FKR for excessive unverifiable QSOs (Rule XV).

First there was "wireless," which became "radio," which is now called "wireless" again. First there were vacuum tubes, followed by transistors, integrated circuits, and microprocessors. What's next in leading-edge technology? Believe it or not . . . vacuum tubes!

Nano Vacuum Tubes

New Electronics for the Future?

BY ROBERT SHRADER,* W6BNB

With the beginning of the new millennium, will we be completing a big circle? Back in the early days of the century, when radio was known as "wireless," unknown to us we had solid-state "diodes" (meaning two-element devices), but they were called "crystal detectors." They consisted of a piece of crystal against which a thin, sharp wire called a "cat whisker" made a one-way-current contact. With radio frequency AC applied, more current would flow in a positive voltage direction through these point-contact devices than would flow in a negative half-cycle direction.

Then came "thermionic" diode vacuum tubes using hot-cathode electron emitters to provide freed electrons that could flow only one way through the tubes—from the hot cathode to the anode, or "plate," but only when the plate was positively charged. When used with AC voltages such one-way devices are said to be "rectifiers."

By adding a coiled metallic wire "grid" between the hot cathode and the plate, a vacuum "triode" (three-element tube) resulted. Triodes had the advantage of being able to amplify radio and audio frequency signals. This was followed by the development of thousands of different types of tetrode tubes, pentode tubes, cathode-ray oscilloscope tubes, TV picture tubes, etc.

In 1947 it was discovered that if a germanium-crystal point-contact diode had a second gold cat-whisker touching the crystal near the first one, a device was formed that could produce amplified signals, similar to what triode vacuum tubes could do. Further progress produced triode-type point-contact semiconductor transistors, and later the junction transistors we know today, as well as a varied assortment of germanium, silicon, etc., solid-state devices. Because of their tremendous reduction in size and heat loss, transistors took over almost all of the applications once held by the larger, less efficient diodes and triodes.

Today vacuum-tube devices are relegated pretty much to high-power RF and AF amplifier tubes, cathode-ray oscilloscope tubes, and TV-type picture tubes, which now may also be on their way out. However, tubes may be about to stage a comeback!

The November 6, 1999 issue of *Science News* magazine tells of an English team that has developed a new form of vacuum tube. It requires no hot cathode. It can be made as small as transistors, so small that the eye can hardly see it. It can provide faster operation than transistors. These tiny new vacuum devices have been named "nano" (which means "billionth of," or in this case, very, very small) diode or triode vacuum tubes.

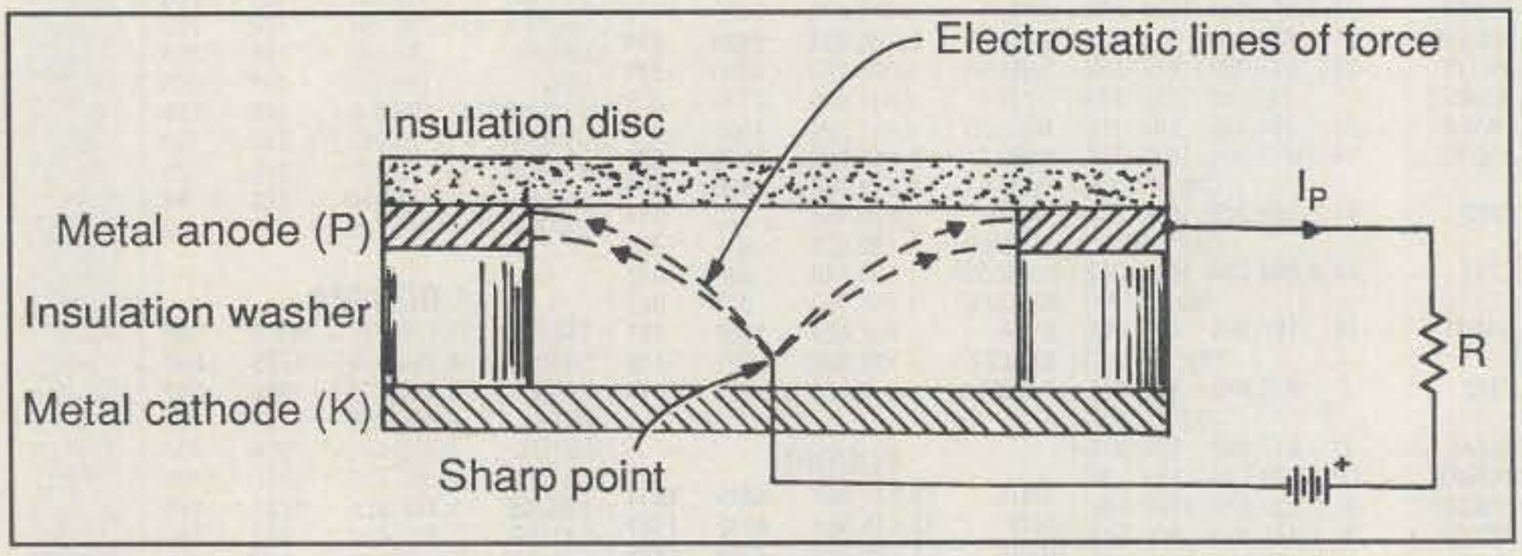

Fig. 1– Fundamentals of a nano diode.

Fig. 1 shows how a *nano diode* might be constructed. At the bottom there is a round, flat metal disc, and above this a round disc of insulating material with a hole in the center, which we will call a "washer." On top of this is a round metal washer and finally a round disc of insulating material. The bottom metal element has several tiny, sharp needle-like tips, but only one is shown here for simplicity, acting as a cold metal "cathode" (k) or electron emitter. The sharp cathode needle is pointed up into the cavity formed above it by the insulating washer and the metal washer "anode," or electron collector. The insulating disc at the top seals off the evacuated cathode-anode cavity.

When the positive terminal of a DC power supply, such as the battery shown, is applied to the anode through a load resistor, R, and its negative terminal is connected to the sharp-point cathode, a very concentrated electro-

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static field (dashed lines) is produced at the sharp point. This intense concentration of lines of force at the sharp tip pulls electrons off of it with a relatively low positive battery voltage. The freed electrons follow the lines of force to the positive anode. In this way a current (I) of electrons travels along the lines of force, landing on the inside surface of the metallic anode washer. This results in electrons being circulated cathode to anode, through the load resistor, the battery, and back to the cathode. Producing an electron flow from a sharp point in this manner is termed "field emission." In common vacuum-tube parlance the anode is usually known as the "plate" (p). Any anode or plate current flowing through the load resistor and the rest of the circuit is indicated as "I_p."

If the battery connections are reversed, there is a reversed electrostatic field from the broad, smooth anode surface to the sharp-point cathode. The concentrated electrostatic field lines at the sharp point are now in the wrong direction to emit electrons, and there is no point on the smooth anode surface where field lines can be concentrated enough to allow field emission to occur.

Suppose the battery shown was replaced with a source of AC. During the half cycle when the plate is positive, current can flow in the plate circuit. During the half cycle when the plate is negative, no current can flow. By having a diode in an AC circuit, the AC voltage can produce one pulse of unidirectional I_p per AC cycle. The diode rectifies the AC voltage into pulses of DC current.

Actually, field-emission of electrons from a sharp point is not a new theory. Back in the earlier days of radio, in the 1920s, cold-cathode diode tubes were used as rectifiers in receiver power supplies. They had tiny, sharp metal cathodes and large-area anodes. Because field emission does not normally emit a great quantity of electrons per volt of electrostatic field, such "BH" tube rectifiers had some hydrogen gas molecules introduced into their evacuated space. The hydrogen would ionize and increase the amount of current the tube could carry.

Taking this theory another step produces a *nano triode,* a signal-amplifying device. It might be constructed somewhat as shown in fig. 2. The sharp-point cathode and the metal plate would be similar to those in the nano diode. However, a current-controlling element termed a "gate" (g), which is analogous to the "grid" in common vacuum triodes, is added between cathode and anode. The gate element is produced by using

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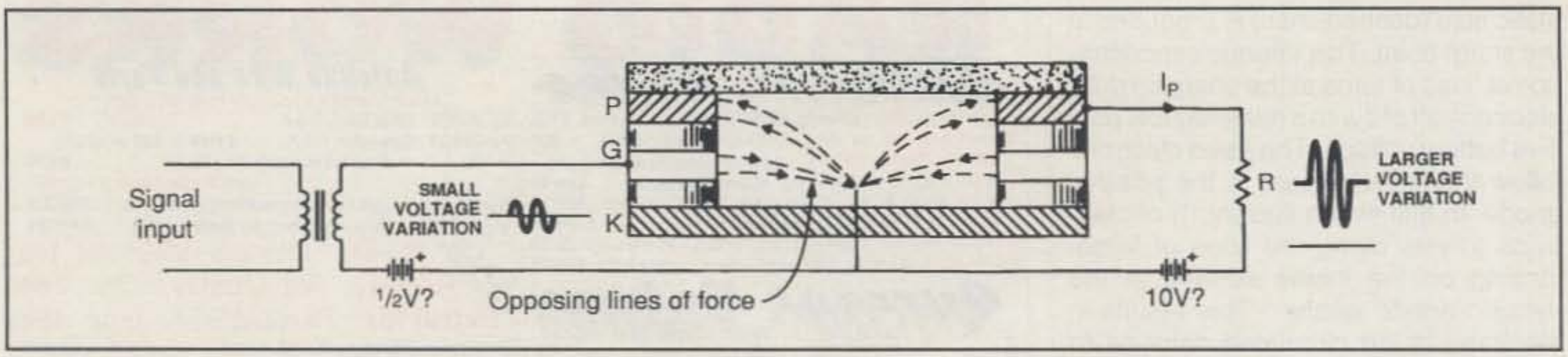

Fig. 2– Fundamentals of a nano triode.

both a second insulating washer (g) and a second metal washer below the plate (p) washer. If a low negative voltage is applied between g and k, its field will oppose the k-to-p field, partially reducing the latter. The result will be a reduced amount of I_p making its way to the plate and through the plate circuit. If g is made negative enough, its field will cancel all the k to p lines of force and cut off I_p entirely.

If a negative varying 0.1 volt is applied between g and k and it produces enough I_p variation to produce 1 volt of output voltage variation across the load resistor, the circuit is said to be amplifying the input voltage change 10 times. By manipulating the gate element's size and position, the "amplification factor," or ability of a nano triode to amplify, may be increased or decreased. Added plate voltage and load resistance can also increase the amplifying capabilities of such a triode amplifier circuit.

Nano triodes are still under development. There is a lot of data about them not available as yet, such as: How many plate volts are required to start plate current flowing with a given negative DC gate "bias" voltage? It is indicated that positive voltages between 2 and 10 volts are usable, but how much more might be used is not known at this time.

The cavity in nano triodes is said to be only a *billionth* the volume of a grain of table salt. No wonder it is said that they can't be seen. We are talking about very small devices here! It must be quite a challenge to construct such a tiny thing and then pump out all of the air molecules in its cavity. It cannot be done with everyday methods and tools.

Apparently no one successfully developed a cold-cathode triode in the early days, possibly because the current capabilities were so limited. With today's low power requirements for computers and electronic control circuits, low current is no longer a disadvantage. With nano vacuum tubes, their diminutive size, their speed of operation due to no slowing of electrons colliding with solid-state materials, their low power requirements, their ability to withstand heat, their minimal internally generated heat, and their being able to withstand strong electro-magnetic field pulses as well as high radiation fields far better than transistors can, it seems that nano tubes should find many applications where transistors are used today. There is no reason why they could not be used in low-power radio-frequency oscillators and amplifiers way up into the high gigahertz range, as well as in faster computer-type digital circuits.

Field-emission devices are also expected to be developed for flat-displays, possibly to take the place of cathode-ray tubes, computer monitors, TV screens, and radar display panels.

It appears we are in the process of completing that circle, or of seeing the pendulum swing back to a former starting point! Maybe we had better dig out some of those old textbooks and brush up on vacuum tubes and their circuits. Obviously such tiny nano tubes will not be available as single units as are vacuum tubes. Is it possible that larger cold-cathode diodes and triodes will make an appearance? There is really no telling today what the future holds for electronic micro-circuitry if the little nano vacuum tubes can be made to do what it appears they are capable of doing. Only time will tell. ■

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What You've Told Us...

Our November 1999 survey in *CQ VHF* asked about readers' participation in non-radio hobbies in which ham radio could play a role. Among those who responded, 84% said yes, they *were* involved in at least one such hobby. Most often cited were camping (46%) and hiking (38%), followed by "other" (34%), RVing (29%), bicycling (28%), and a tie between boating and hunting (20% each). Next came computer experimentation (18%), motorcycling (14%), astronomy (12%), and radio astronomy (11%); followed by radio-control (R/C) modeling (9%), flying (8%), chess (3%), and hang-gliding/parasailing (2%).

All of these readers understood the value of ham radio in their non-radio hobbies. In fact, 15% of them became hams on the basis of its usefulness in those other activities, and 34% knew someone else who did. Yet 78% of them feel this link between ham radio and their other hobbies is not adequately promoted.

Well, folks, you're the experts. You're the ones *doing* all this stuff. How about writing an article—either for us for a magazine catering to your non-radio hobby (better yet, *both*)—on how *you've* benefited from combining the two. Even if you don't think you have it in you to write a magazine article, get in touch with us anyway. We've got a few people around who love to write about anything related to ham radio. We can hook you up with one of them and try to get things rolling.

As always, thank you for your responses. Next month, we'll have the results of the first *CQ* reader survey, in the January 2000, issue. This month's winner of a free one-year subscription is John Tucker of Hometown, West Virginia.

Reader Survey
March 2000

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

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

This month, we're going to take a break from our demographic questions to see how you feel about the FCC's restructuring decision and what course of action it might prompt you to take.

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

1. Which statement most closely matches your overall view of the FCC's restructuring decision . . .
- I like it; it's good for ham radio 138
- I'm not real happy but I can live with it 139
- I think the FCC made a mistake 140

2. Which statement most closely matches your views specifically about reducing the maximum code speed on license exams to 5 words per minute . . .
- YES! It's what I've been waiting for 141
- It won't affect me directly but I agree with it 142
- It doesn't matter much to me one way or the other 143
- I disagree with it but understand the reasoning 144
- BAD MOVE! It's going to kill ham radio 145

3. Whether you filed comments with the FCC on its restructuring proposal during the comment period . . .
- Yes 146
- No 147

4. Whether you're likely to upgrade your license as a result of the FCC's restructuring decision...
- Yes 148
- No 149
- Undecided 150
- Extra Class; can't upgrade 151
- Not currently licensed 152

5. If you answered yes to question 4, whether you're planning to take your upgrade exam(s) before or after the new license structure takes effect on April 15th...
- Before April 15th 153
- After April 15th 154
- Part before and part after 155
- Whenever I'm ready 156

6. Your current class of amateur license...
- Not currently licensed 157
- Novice 158
- Technician (basic) 159
- Tech-Plus 160
- General 161
- Advanced 162
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Thank you for your responses. We'll have more questions for you next time.

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In Part II of this look at shortwave listening from an amateur radio standpoint W8FX covers more of what you need to enjoy this low-stress pastime.

Shortwave DXing for Hams—Part II

BY KARL T. THURBER, JR.,* W8FX

In Part I of this article we told you what shortwave listening is all about and discussed why you might want to join in on this enjoyable pastime. This month we will cover the equipment you need, plus HF propagation fundamentals, and identifying and reporting what you hear. We'll start off with receivers and antennas for DX shortwave listening.

Receivers for Shortwave DX

As in selecting an amateur receiver, when choosing a shortwave radio you need to consider issues such as price, features, where to buy, warranty coverage, repairs, and the like. To many, features are paramount. Besides issues such as sensitivity and analog vs. digital readout (almost a necessity today), another decision involves receiver frequency coverage.

There are three major types of sets: (1) general-coverage radios, with continuous shortwave coverage from at least 1.8 to 30 MHz; (2) shortwave-bands-only receivers, with selected shortwave bands only; and (3) ham-bands-only receivers and transceivers, which cover the HF amateur bands only. Remember that many older ham-bands-only radios normally cover just the "old" amateur bands from 1.8 to 30 MHz and not the newer ones at 10, 18, and 24 MHz.

Above all you need a shortwave radio that really works! Of course, if you're a radio amateur, you may already have an HF radio that's suitable for general shortwave radio use. If your main station receiver isn't suitable for general shortwave use, there are several very good portable shortwave radios on the market, sets about as good as some lower-priced desktops. These are widely available from major mail-order radio-electronic distributors. Catalogs from EDCO, Lentini Communications, EEB, C. Crane Co., and Universal Radio can help, as can receiver reviews and reports in the publications we note in part one of this article last month.

Are you tired of HF hamming, and listening and DXing only the HF shortwave bands? Try searching the radio basement below 500 kHz. The Palomar Engineers VLF Converter lets you enter the world of VLF and LF radio for about $90; all you need is a communications receiver and an antenna. Covering 10 to 500 kHz, the Model VLF-A converts VLF signals to the 80 meter amateur band, while the Model VLF-S converts signals to 4010–4500 kHz for general- coverage shortwave receivers. (Photo courtesy Palomar Engineers)

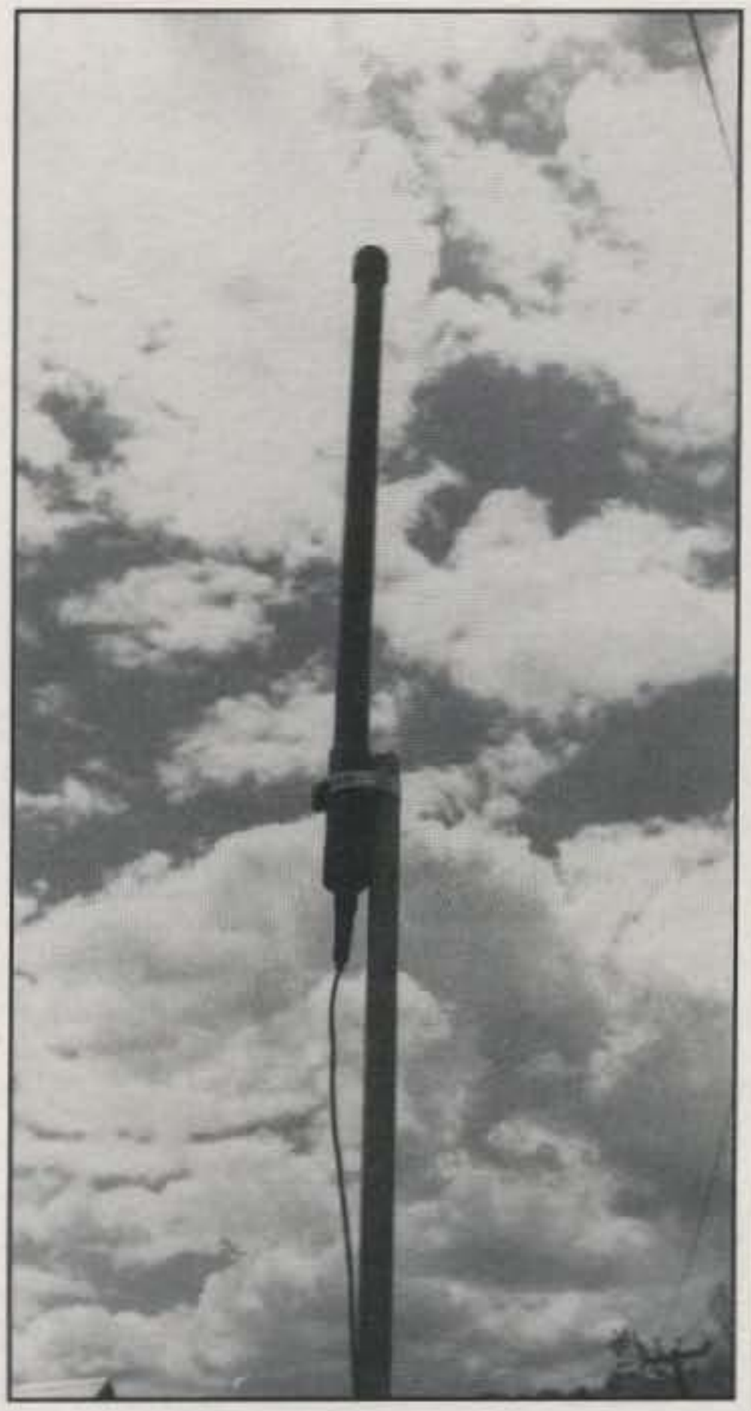
Antennas for Shortwave DX

Antenna design can be complex, but fortunately there are many books—some specifically for shortwave listeners (SWLs), and others for amateurs—that address shortwave antenna theory, design, and construction. Whatever the shortwave antenna, you want to do two things: maximize the signal to the receiver and minimize the pickup of noise or interference.

Usually you can obtain good reception of strong stations with a modest antenna. Often the built-in whip antenna on a portable is adequate, and for many, especially apartment and condo dwellers unable to install an outdoor antenna, this may be the only choice. Also for many, indoor loop and either indoor or outdoor "active" (amplified) vertical antennas can offer good performance.

As a rule, though, for serious shortwave DXing an outdoor antenna is better; if you're a radio amateur, your existing antenna may do quite well as a shortwave antenna. Fortunately, most portable radios and practically all communications receivers have an external antenna jack, or you can adapt the set for use with an outdoor antenna. An antenna tuner often can improve recep-

*289 Poplar Dr., Millbrook, AL 36054-1674
e-mail: <w8fx@cq-amateur-radio.com>



Active antennas are practical alternatives to longwires in which restricted space or local noise would prohibit effective use. LF Engineering offers several active antennas to cover VLF, LF, MF, and HF frequency ranges. One example is the H-800 Skymatch LF/MF/HF Active Antenna System, which covers 10 kHz through 50 MHz. Its active components are housed in a 26 inch sealed probe and are powered via a coax feed from a remote coupler interface. It sells for about $109.(Photo courtesy LF Engineering Co., Inc.)

tion with a marginal antenna, and a preamp can help boost reception in receivers lacking in sensitivity.

Enter the Longwire. Most SWLs make do with less-elaborate wire antennas of limited size. The simplest is the SWL standby, known as the "longwire," or inverted-L (because of the L-shape of the horizontal "flattop" and the vertical lead-in portion). The flattop usually is a random length of wire, preferably more than 25 feet and less than 150 feet long, as high above the ground as practical, mounted far from noise sources. While the flattop normally is constructed parallel to the ground, you can bend or slope it. The flattop is terminated at each end with glass or ceramic insulators and end-fed by a single lead-in wire

The Palomar PT-340 Engineers Tuner-Tuner™ is designed for radio amateurs but is also great for SWLs. The $99.95 unit literally tunes your antenna tuner for you. You connect the device between your rig and the tuner. You then tune the receiver to the desired frequency. You'll hear a loud noise when you do. Adjust the tuner until the noise drops out completely; turn off the device and you're ready. (Photo courtesy Palomar Engineers)

leaving the horizontal flattop at roughly a right angle.

HF Radio Propagation Fundamentals

Even the best shortwave radio and antenna are practically useless if you don't have a basic understanding of HF radio propagation fundamentals. This includes knowledge of when to listen to which band—day vs. night, and time of year. Dialing around randomly is guaranteed to yield poor results. To many amateurs this is "old hat," but in any case, here's the quick read on what you need to know about shortwave radio wave types, the ionosphere, and what to expect on each shortwave band.

Types of Radio Waves. One practical way you can classify radio waves is by propagation type: ionospheric, tropospheric, or ground waves. Ionospheric waves, or skywaves, make up most of the EM radiation that leaves a transmitting antenna. As amateurs know, skywaves reflected from the ionosphere can traverse great distances and, in fact, enable global HF radio communication.

The Ionosphere and its Layers. Most long-distance HF communication depends on the ionospheric bending or refraction of waves in the region about 50 to 650 kilometers (km), or 31 to 404 statute miles, above the surface. The ionosphere consists of ionized regions caused by the sun's x-ray and ultraviolet (UV) radiation, radiation sufficiently intense to affect the properties of radio waves passing through it.

The ionosphere is divided into three major regions, or layers: *D*, *E*, and *F*, in order of increasing altitude and electron density. Each layer plays a distinct role in ionospheric propagation, and each reflects or refracts radio waves less than some critical frequency and critical angle. The two useful lower layers of the ionosphere, the *D*- and *E*-layers, are absorbing layers, while the *F*-layers are reflecting layers.

The highest ionospheric region is the *F*-layer, at about 210 to 420 km (130 to 261 miles): it's this layer that most influences long-distance HF communication. In the daytime, the *F*-layer splits into two parts: *F1*, at roughly 225 km (140 miles) high, and *F2*, at about 320 km (199 miles) high. At night and during the winter, the *F1*- and *F2*-layers recombine into a single *F*-layer.

A Quick Shortwave Band Profile. If you're a radio amateur familiar with HF band propagation, you can pretty much figure out the way the various shortwave bands previously listed behave. Easiest to visualize are the 75, 41, 22, 19, 15, 13, and 11 meter shortwave bands; they act essentially like the co-located or close-by amateur bands. You know, for example, that 75 and 41 meters are essentially nighttime shortwave bands best in the winter; while 15, 13, and 11 meters are daytime shortwave bands that are heavily dependent for performance on the stage of the sunspot cycle.

The other bands—such as 120, 90, 60, 49, 31, 25, and 16 meters—have performance characteristics somewhere between the two closest adja-

cent amateur bands. For example, 120 meters behaves like a cross between the 160 and 80 meter ham bands, while 31 meters can represent a cross between 40 and 20 meters.

HF Radio Propagation Prediction

As in amateur radio pursuits, it's one thing to understand shortwave propagation, but it's equally important to be able to predict when conditions will be "right" for good shortwave DX. You can read monthly propagation predictions in *CQ* and *QST* and in the communications listener-oriented *Monitoring Times*.

As another propagation aid, the National Institute of Standards and Technology (NIST) operates radio stations WWV in Ft. Collins, Colorado and WWVH in Kauai, Hawaii. Both NIST stations broadcast continuously on 2.5, 5, 10, and 15 MHz. WWV also broadcasts on 20 MHz.

NIST offers many services besides propagation information, which is updated at 18 minutes past each hour. These services include voice and digital time, standard frequencies and time intervals, astronomical time corrections, geophysical (solar-terrestrial environment) alerts, marine storm warnings, and Global Positioning System (GPS) reports.

Identifying What You Hear

Keeping a Radio Log. Radio amateurs tend to get lazy about logkeeping unless they are operating in a contest or in pursuit of an award. Keeping a shortwave log can be very useful, however, especially if you're SWLing for the first time. Keep a log of the new stations you hear. After a few months you should have a list of several hundred stations. After that you can search for the rarer, tougher-to-log stations. Just remember, though, in this article we're stressing relaxation and "smelling the roses" rather than the competitive aspects of the hobby.

Station Listings. Most shortwave DXers use published station listings of some sort to determine where to find stations. Station lists also are invaluable to narrow the possibilities when it comes to station identification. Lists can guide you to the right frequency to hear a given station, but they can't actually identify it for you. Too heavy reliance on lists leads to the frowned-upon SWL practice of "list logging."

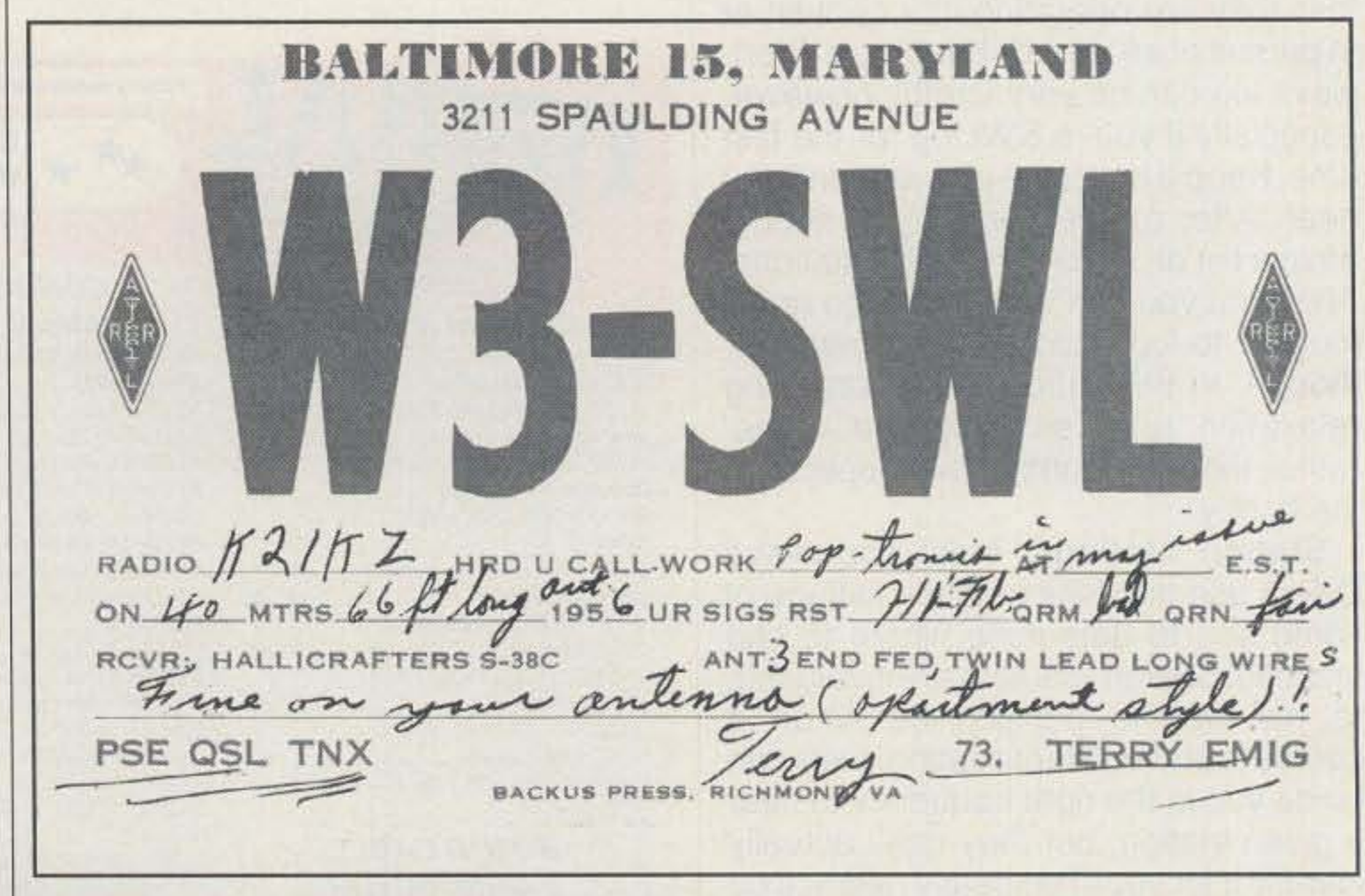
Factors Contributing to Station Identification. Your ability to identify a station depends largely on your profi-

This now-discontinued Palomar Engineers P-405/P-408 receiver preamplifier is representative of units that helps enable weak-signal reception, especially with shortwave receivers that are not as sensitive as they might be. Many older radios, especially tube-types and portables, could use a signal boost. (Photo courtesy Palomar Engineers)

ciency at interpreting what you hear. Even if you're highly experienced, you won't be able to identify everything you hear. Several factors contribute to the confidence you can place in station identification. These factors include frequency, time of reception, signal quality, and type of programming.

Especially when you're trying to identify a weak shortwave DX station using an unfamiliar language, you must ask at what point you've *actually identified* a station. We won't get into the details of how serious SWLs classify the certainty of identification of stations heard; instead, we'll suggest you be realistic and honest with yourself and others in your loggings.

Time Confusion. Most shortwave stations give the time of day in Greenwich Mean Time (GMT), or more properly, Coordinated Universal Time (UTC). Consequently, shortwave broadcasting schedules usually are given in GMT/UTC. Some magazines also provide broadcast times referenced to


BALTIMORE 15, MARYLAND
3211 SPAULDING AVENUE
W3-SWL
RADIO K2IKZ HRD U CALL-WORK Pop-tronics in my issue E.S.T.
ON 40 MTRS 66 ft long and 6 195 UR SIGS RST 7H-7Hb QRM bd QRN fair
RCVR: HALLICRAFTERS S-38C ANT 3 END FED, TWIN LEAD LONG WIRE S
Fine on your antenna (apartment style)!.
PSE QSL TNX Terry 73, TERRY EMIG
BACKUS PRESS, RICHMOND, VA

For those shortwave DXers who want QSLs, actually getting a response to a report may be difficult. You have to provide more detailed information to make your report useful to a shortwave broadcaster. To this end, some SWLs make up their own personal SWL report cards to better organize their reception reports. Here's a card I received as an amateur from an SWL years ago.

Eastern Time and Pacific Time for listeners' ease.

Reporting What You Hear

In radio's experimental early days stations relied on listener reports to know their signals' range and quality. Today many shortwave broadcast stations use reports from commercial monitoring stations, and they have more accurate and technical coverage predictions available. Stations are under no obligation to verify reports. Thus, for shortwave DXers who want QSLs, simply hearing a station is only half the problem; actually *getting* a response may be much harder.

You have to provide more detailed information to make your report useful to an international shortwave broadcaster, making it worth his or her while to reply. Most shortwave stations welcome reception reports from listeners, many acknowledging reports with a QSL card as a rather expensive (to them) public relations exercise.

For shortwave stations, answering reception reports can be a waste of time and money. As a result, you need to follow some guidelines when requesting verifications. To actually receive a QSL from a station, you first must hear it, and second you must convince the station that reception really took place. You also need to make the station's task of replying as simple as possible. Here are some QSL tips:

1. Write in the station's native language, unless it's a large broadcaster.
2. Use the station's local time to avoid time conversions.
3. Include program details.
4. Write to the person who signs verification requests, if known.
5. Offer useful, constructive comments on signal quality and interference.
6. Include return postage (mint stamps from the country), International Reply Coupons (IRCs), or a "green stamp" (dollar bill).
7. Be polite, being sure to say thanks.
8. Be persistent. Track your "verie" request and follow up your request if need be.

Other QSL tips include correctly stating the frequency and meter-band, being sure to use the station's complete address, getting both the date and time correct (midnight UTC means a new day!), noting your equipment and antenna, honestly reporting the station's readability and signal strength, and commenting on the programming. Also be sure that your reports are diplomatic and frank.

Summary

This article presented some of the myriad attractions of the radio listening hobby for radio amateurs. The article discussed why one would listen to shortwave radio in this high-tech era, what shortwave broadcasting is all about, receivers and antennas for DX reception, HF radio propagation fundamentals and prediction, and identifying and reporting what you hear. In part one we included various Internet-based resources, such as showing how to use the Net to improve your shortwave DXing enjoyment. ■

Equipment Resources

The following companies offer equipment of interest to shortwave listeners:

C. Crane Company, 558-10th Street, Fortuna, CA 95540 (1-800-522-8863; e-mail: <ccraneco@aol.com>; web: <http://www.ccraneco.com>).

Electronic Distributors Corp. (EDCO), 325 Mill Street N.E., Vienna, VA 22180 (703- 938-8105; e-mail: <edco@cni.net>; web: <elecdist.com>).

Electronic Equipment Bank (EEB), 323 Mill Street, N.E., Vienna, VA 22180 (1-800-368-3270).

LF Engineering Co., Inc., 17 Jeffry Road, East Haven, CT 06513 (203-248-8851).

Lentini Communications, Inc., 21 Garfield Street, Newington, CT 06111 (1-800-666-0908; e-mail: <radio@lentinicomm.com>; web: <http://lentinicomm.com>).

Palomar Engineers, P.O. Box 462222, Escondido, CA 92046 (760-747-3343; e-mail: <palomar@compuserve.com>; web: <http://www.palomar-engineers.com>).

RSM Communications, P.O. Box 1046, Key Largo, FL 33037-1046 (305-853-0379).

Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068-4113 (1-800-431-3939; e-mail: <dx@universal-radio.com>; web: <http://www.universal-radio.com>).

** Note: See part one of this article for a variety of print and online shortwave resources.*

Magic In The Sky

BY JEFF REINHARDT, AA6JR

New Views of Amateur Radio

A New Perspective

I'd like to welcome Jeff Reinhardt, AA6JR, to CQ's family of Contributing Editors. I've known Jeff for several years, and have particularly admired his positive attitude and approach to amateur radio. As the title implies, the goal of this column is to share the magic of ham radio, to help you rediscover the magic if you've lost it, and to show you how to share the magic with others.

When Jeff proposed this column I initially said no, we've got enough columns already. The more I thought about it, however, the more I realized that this is not only a good column for CQ, it is a necessary column for amateur radio. After all, if you look at the statistics, our growth problems stem not from a lack of new hams entering the service, but from too many experienced hams dropping out. One way to help reverse that trend is by encouraging these old-timers to think differently, and to see things—as Jeff suggests in his title for this first installment—with a new perspective. — W2VU

What a great time to be alive! We've rolled the calendar over to the "20 hundreds," and many of us have seen radio communications rise from its vacuum-tube infancy to its digi-silicone present. But as those (ancient) 20th century vaudeville performers would say, "You ain't seen nothin' yet!" Radio may have come of age in the past 50 to 75 years, but the indicators are that now it will hit its stride.

I share warm greetings with you. I was a closet ham aficionado for much of my life, but finally got past the excuses and self-imposed economic limitations that kept me from becoming licensed until 1991. Now I want to make up for lost time. I enjoy HF, VHF/UHF FM and weak signal, digital, including HF digital modes and VHF packet along with APRS, messing around with ATV, and more. Along with my wife, kids, and career, ham radio has brought me great pleasure in life. My intent in taking on this column in *CQ* is to share some of what I discover and provide *you* with an outlet for ideas and playing out "what if" scenarios in the real world. My challenge is to take an unconventional look at things for our mutual enjoyment. Example: Who was the first ham? Some say Marconi. Some say Hiram Percy Maxim. My vote: the two unknown people who communicated across the forest thousands of years ago by pounding sticks on a hollow log.

With this column I'll try to meet the challenge I received in one of my first HF contacts. On responding to a crusty veteran's CQ, he came back to me. I was prepared for the normal location, signal report, yada, yada, until he closed his acknowledgement with my callsign and a response that contained a bit of "attitude."

"Tell me something I haven't heard," he said. Not always easy, but I'll try.

Magic!

As the title of this piece implies, I truly believe "There's magic in the sky." That's what we as radio operators deal in—*magic*.

59045 Lake Lindero Drive, Agoura Hills, CA 91301
**e-mail: <aa6jr@cq-amateur-radio.com>*

Just a few hundred years ago, if you claimed to be able to talk to someone across Massachusetts Bay with a hand-held device you may have earned yourself a date with a trial judge in Salem. When I speak to kids' groups, I like to pull out a hand-held radio and ask what General Custer might have been willing to pay for a couple of these units. Ditto for Napoleon at Waterloo. Yet it seems so easy for us, so simple to take it all for granted. I hope never to get over the wonder I see in an invention that allows us to communicate across the street, around the world, even with people in outer space. If you don't see magic in that, maybe it's time for another hobby (or an undertaker)!

We have one of the few hobbies that combines a need for technical and regulatory knowledge; requires some common sense, a helping of civility and cooperation with others (after all, you do need someone on the other end); has a price structure that starts from "next to nothing" and goes to "the sky's the limit"; and can be a source of recreation and, at a moment's notice, transform itself into a medium that protects life and property. This description only begins to scratch the surface.

Grow With The Flow

So what have *you* done for ham radio lately? That's not a question intended to start you on a guilt trip; it's an invitation to rediscover the magic of ham radio and your own creativity. Certainly there are the traditional ways to promote ama-

teur radio such as classes and public-service communications. There are many non-traditional methods, too, and I hope you will share some with me. Sometimes just getting on the air and using your privileges in a positive way is a firm contribution. Helping a friend with an antenna project or a mobile installation, repairing a broken device for someone not as technically gifted as you (like me!), and speaking up for the hobby in your community are but some of the avenues open to you.

The Most Powerful Transmitter

As mentioned above, like it or not we are subject to government regulation. Let's make an effort to turn that into a "positive" and work *with* government.

I recently spoke to a club about the most powerful transmitter you own. It's a 33-cent postage stamp. If you do nothing more than take a QSL card and write "Please support H.R. 783," sign it and send it to your Congressman, you have done a lot. (H.R. 783 is a bill before the House of Representatives that would prohibit the FCC from reallocating amateur radio frequencies, or from increasing the loading on shared bands without providing equivalent replacement spectrum.) Don't know who your representative is? It's easy to look it up on the web at <http://www.house.gov>. Each Congressional rep has a web page and his or her mailing address is always part of it. You can send e-mail too, but the "delete" key is very easy to press. A letter or QSL is hard to ignore; it must be dealt with. When a whole bunch of mail arrives on the same subject, believe me, someone takes notice.

The same goes for local government. If your city, village, town, whatever is holding a hearing on antennas, even if they are commercial installations, your "radar" should go off. Be there. Learn the issue. Address any concerns that pertain to amateur radio in a polite, honest, forthright fashion. Ignore these issues and we all may pay the price. Wherever possible, try to get amateur radio completely separated from discussions that pertain to commercial antenna installations. A generic ruling about "antennas" in general could poison the well for all of us, now and in the future.

The Good Stuff

So what about ham radio turns you on? Chasing DX? Building projects? Collecting grid squares? CW? Being able to talk to your spouse on the way home from work? Drop me an e-mail and let me know. You may find your interesting story part of a future column.

It's exciting to see some of the combinations of technology—such as APRS, which combines computers, GPS (Global Positioning System)/geo-locating and ham radio—that are taking place. I have found it to be relatively easy to get going and educational, and it has many practical applications. Kudos to Bob Bruninga, WB4APR, and the growing list of APRS software developers who brought this fascinating area to our hobby.

I have a good friend who once described an elaborate system used on public-safety vehicles which showed the position of the vehicle on a map by counting wheel revolutions. The system was very expensive and was subject to errors in "real world" positioning. With GPS technology you can get a pretty precise fix with a system that comes in at between five and six hundred dollars.

What other opportunities exist for blending technologies? We've seen "computer controlled" radios come to pass. How about some integration for the mobile user? We now have mobile radios combined with packet terminal units and LCD/NTSC video display technology. With the limited space in today's vehicles, I'd love to see the manufacturers come out with a combined AM-FM stereo 2m/440 transceiver in DIN size for in-dash placement (cassette or CD player included). If you have tried to install a mobile radio in a newer car, you probably have a story to tell about the challenges encountered. Let me know and we'll try to share your tips for a given vehicle.

The Ham's Creed

This column reserves the right to have some fun and sacrifice a few "sacred cows" as well. Two bits of wisdom I'll share come from some wonderful associates I have had the pleasure of knowing through ham radio.

Early on, John Deegan, K9XT, instructed me that I must memorize the "Ham's Creed." I asked if it was found in the writings of *The Old Man*. He said no, the real Ham's Creed has never been published (up until now). It is "buy low, sell high, steal software." If you doubt this pearl of wisdom, you have never been to the Dayton Hamvention!

The second bit of advice comes from the late Bob Osborne, N6MSO (SK). Bob literally was a rocket scientist. He worked on the Apollo program and much more. Bob lost his comfortable Malibu home, a lifetime of work, and his elaborate ham station to a California wild fire, but he was unflappable. Bob's legacy: "Every day above ground is a good day."

An Invitation

You are invited to help me and others discover the magic of amateur radio through your eyes and the experiences you wish to share. The "20 hundreds" are an adventure into uncharted territory, but there's no rule saying we can't have fun along the way! I'll close with a story that may open your eyes to the brave new world we live in.

A few years ago I was testing an older receiver that was to be sold at a hamfest. My daughter Jessica, KD6ARA, was in her early teens at the time. I called her in to hear the rich tones coming from the radio. She looked through the vents at the top and asked, "What are those orange things?" I aged a hundred years at her innocent question, flashing back to the days in the 1950s when my dad would make TV repair calls and I was the expert "tube checker" at the age of eight.

We're at a rare turning point that defines ages and generations. There are very few World War I veterans still among us. As Tom Brokaw pointed out in his wonderful book *The Greatest Generation,* there are many stories still waiting to be told from the World War II era folks, and they often are too humble to share them. This point was driven home with the passing of my father, Jim, KB2YAL, in mid-1999.

I'm betting that you have some aspect of ham radio in your experiences that would be useful to share with others, particularly if it's something we can use today or tomorrow. I'd love to hear it. Drop me a note. Maybe we can add to everyone's enjoyment of the magic that is ours—*the magic in the sky*.

73, Jeff, AA6JR

Introducing AA6JR

Jeff Reinhardt is a partner at a marketing firm. He is also an elected member of the City Council of Agoura Hills, California. In addition to his professional and governmental pursuits, Jeff is chairman of TASMA, the Two-Meter spectrum coordination body for Southern California, a Volunteer Examiner, a member of the ARRL's national Public Relations Committee, Public Information Coordinator for the ARRL's Santa Barbara Section, and a member of two clubs in his area. He is married to Melissa, KD6BIT, and they have two children, Jessica, KD6ARA, and Steven, K6SJR.

Public Service

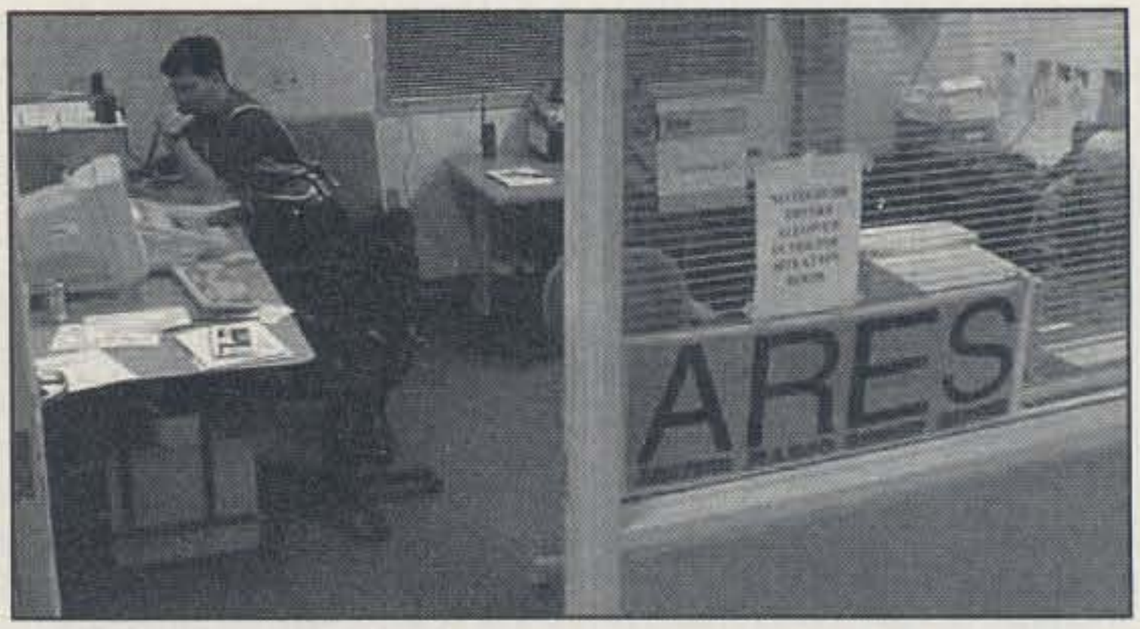
BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Celebrating Like It's Y2K

If you think "Y2K" was a dud, think again. It provided hams with an unparalleled opportunity to showcase our emergency communication capabilities. Thousands of amateur radio operators around the world skipped partying like it was 1999 and staffed emergency communications positions in local emergency operation centers (EOCs), hospitals, fire halls, and Red Cross offices. These amateurs served in the public interest for one of the most unique events any of us will experience. Others stayed in their shacks monitoring local and worldwide nets to see if ol' bugsy Y2K would strike somewhere else first. Still others spent New Year's Eve at work, monitoring crucial computer and communications networks.

Ham radio operators around the world were on duty, harnessing their knowledge for the good of their employers, the good of local government, and more important, the well being of the general public. According to a poll taken on the ARRL web page in December, over 36% of those responding said they'd either be on Y2K duty or at work. Another 18% would be in their shack. The poll had over 5000 participants.



The Oakland, California EOC's ARES/RACES Room is right next to the Situation Room. Staffing the station here are Chris, KQ6JZ, and Herb, WA6CUY. (Photocourtesy Mike Pompa, KB6MP)

Why Skip the Party When Nothing is Going to Happen?

James Wades, WB8SIW, wrote in the December 1999 Michigan NTS (National Traffic System) Newsletter, "The answer to this is simple: Those agencies we serve are relying on us to be there. Even if the evening is very quiet, the Y2K rollover provides us an opportunity to demonstrate our capabilities to a vast number of public officials. The event will be very high profile and the opportunities for media visibility are significant. Participation in Y2K operations may be considered an investment in the future of Amateur Radio!

"Please take a few moments," he continued, "to consider the fact that we are allowed free access to some very valuable RF 'real estate.' This is done simply because we have proven to be of value to the public through our support of community public and private relief agencies." Wades suggested, "When your EC (Emergency Coordinator) or RO (Radio Officer) telephones you and asks that you be available to assist on New Year's eve, what he is really asking you to do is make a small investment in the future of the Amateur Radio Service." *(Good advice anytime — ed.)*

At the National Level...

Even the Coast Guard asked for help. The US Coast Guard asked the amateur radio community to help during what it called "the Y2K event"—from 1700 UTC December 31, 1999 until 2400 UTC on January 2, 2000. If a Y2K-related outage disrupted normal reporting methods, the Coast Guard requested that hams accept any reports destined for its National Response Center and forward them to respective state Emergency Operations Centers (EOCs) via "RACES/ARES or other available methods." The Coast Guard said hams should follow "established reporting procedures for their respective jurisdictions." Hams should forward any appropriate reports via established amateur radio nets, expected to be in operation during the Y2K time frame.

The National Response Center is the sole national point of contact for reports of oil, chemical, and other spills or releases into the environment in the US and its territories. The state EOC would relay reports received to the Coast Guard via telephone, the Internet, or the FEMA (Federal Emergency Management Agency) HF radio network.

The Salvation Army Team Emergency Radio Network (SATERN) ran a nationwide net on 3.920 MHz on December 31 in anticipation of the Y2K phenomenon. The net ran during the crossover period in the central United States. Local SATERN groups across the nation were on standby in support of local Salvation Army disaster teams' response due to Y2K. In a number of areas SATERN personnel were available to provide communication between local, county, and state emergency management personnel and The Salvation Army. Many also conducted local and state Y2K nets.

National SATERN Director Major Patrick E. McPherson, WW9E, said SATERN personnel took advantage of their established Internet operation to maintain backup communications to SATERN administrators and ancillary personnel in addition to monitoring worldwide Y2K activity.

In addition, the American Red Cross had three regional stations on the air, including K4ARC, at the National Headquarters.

State and Local Levels

In Michigan and many other areas, local ARES and RACES programs provided back-up communications between local public safety communications centers, hospitals, and emergency services. Some counties required only a handful of hams. Still others needed dozens of hams, working in shifts, to carry out local responsibilities. Members of the Michigan National Traffic System provided communications on behalf of the Michigan State Police, Department of Corrections, and American Red Cross.

In California, Mike Pompa, KB6MP, describes how the Oakland Radio Communication Association (ORCA)

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

Monitoring for any Y2K activity is Brad Pioveson, W9FX, the national training officer for SATERN. Brad lives in Benton, Illinois. (Photo courtesy Maj. Patrick E. McPherson, WW9E)

planned and prepared for the unknown.

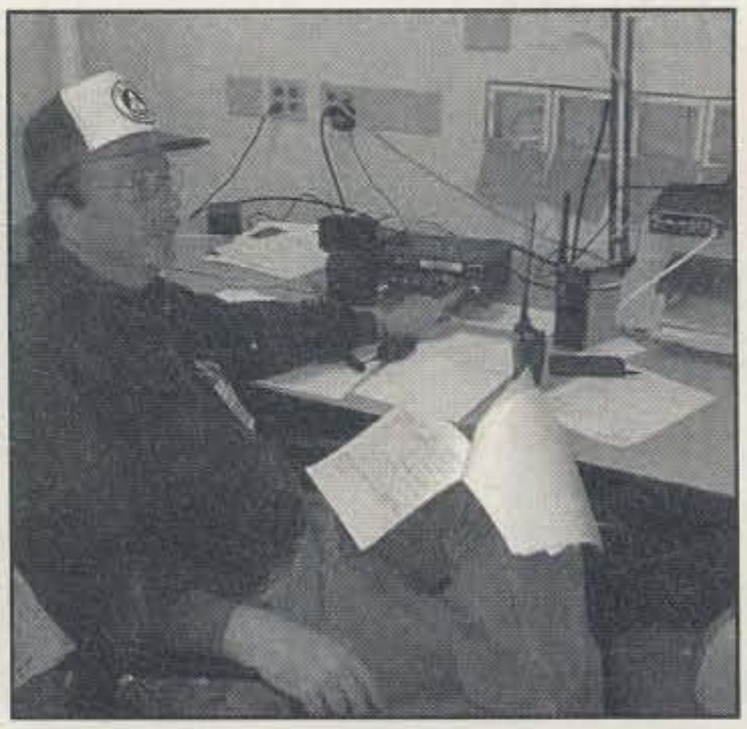
"A plan (for Y2K activation) was presented that begins with Phase I worldwide HF monitoring, 4-hour shifts leading up to Phase II, a 19:30 net, and Phase III at 23:00—deployment of ham radio operators to implement the disaster plan, coordinate with neighboring agencies, and shadow public officials. At Fire Station 1, 16th Street will be closed for secure parking on the evening of the 31st. Volunteers at the OES will be fed. The importance of having a working radio with spare batteries to prevent embarrassment in front of news media was stressed. If nothing happens at midnight, bored reporters looking for a story will gravitate towards yellow jacketed ham radio operators for a human interest angle. The media room should get video feeds of our activities in the RACES room. A contingency plan was made to set up a personal HF rig Field-Day style if the city owned HF radio could not be installed. Christian Peeples, KE6MQW, offered to pull some strings in Public Safety in order to get our … allocations approved. Suggestions were made to coordinate our activities with other Oakland agencies. In all, there was a lot of enthusiasm from the members present at the meeting to have everything ready by the end of the year.

"The City of Oakland and ORCA's RACES group benefited greatly from Y2K preparations, as they directly improved earthquake preparedness. Without the deadline of December 31 looming, the city's brand-new EOC probably would not have been completed for quite some time. The week before, the situation room was bustling with activity by telephone installers, cable layers, computer network installers, and construction workers putting the final touches on everything. The RACES group spent the final month installing antennas, pulling coax, and piecing together HF, VHF, and UHF radios in both the police dispatch and fire dispatch buildings.

"Packet radio was installed and tested to communicate between the Oakland EOC and Alameda County EOC. In the event of a communications failure between police and fire dispatch, we were ready to install another packet system so that fire-related 911 dispatch messages could be relayed between the two sites, which are four miles apart. Most of all, amateur radio presence at the EOC gave high-level public officials in the city a face-to-face view of who might be carrying their communications in the event of a real disaster."

Getting the Word Out

The McHenry County, Illinois group known as E.S.C.A.R. staffed its local EOC. The group operated a 2 meter net starting at 6:00 PM Central Time, with 100 amateurs on standby throughout the county, with signs in the front yards of members' houses stating that emergency communications could be obtained there. John Jensen, KB9KQN,



Oakland RACES Radio Officer Jim, K6JAT, monitoring HF and reviewing the dis-aster plan. (Photo courtesy Mike Pompa, KB6MP)

placed the sign in front of his home the day after Christmas so people would have a chance to see it beforehand.

In northern Florida approximately 50 Crown District hams were active in response to a call by government agencies. Fortunately, problems were minimal and they were not required to activate. In Duval County, ECs Al Elmore, WA4RGO, of Jacksonville, and Miller Norton, N4RYX, of Palatka, recruited around 40 volunteers to set up at key fire stations and hospitals on New Year's Eve from 9 PM until 1 AM. A net was established on the 146.76 MHz repeater, controlled from the ham station at the Duval County EOC downtown. Operators stationed at the Beaches also played an important role.

Other hams staffed the Northeast Florida Red Cross Headquarters and JEA (Jacksonville Electric Authority) power-control locations. Jacksonville resident John Reynolds, W4IJJ, organized the Red Cross operation and Mike Key, N4GIH, of Fruit Cove, coordinated the JEA ham network. Putnam County hams under the direction of Mark Bradford, WF3F, were on duty at the EOC and other key locations. Crown District operations were conducted on the NOFARS (Northern Florida Amateur Radio Society) 146.7/444.4 MHz system where voice and digital gateway stations were ready to relay messages from local EOCs to the state EOC in Tallahassee. KC4FL, K4DEL, K4JTD, and N4UF monitored county, district, and state frequencies simultaneously. Tom Nolan, KD4MWO, and Wayne Norton, WB4YTJ, operated on the Southeastern Digital Association Network (SEDAN), which provided a digital path to the state EOC.

Local media coverage of amateur radio activity in the Jacksonville area was widespread on December 30–31. WA4RGO was interviewed by ABC 25 News. A *Times Union* article featured a good story and pictures of the hams' setup at the Duval EOC, with N4RYX running the controls. WJXT-TV Channel 4, WAWS Fox 30, and Channel 47 interviewed Billy Williams, N4UF, and the Red Cross station was shown by WTLV-TV Channel 12. Although problems did not surface, the role of hams as back-up communicators was publicized.

Around 40 county and city EOCs were active on the 80 meter voice net where the ham station at the State EOC maintained constant contact via the Northern Florida Emergency Net. Around 200 hams took part, with the heaviest activity in Jacksonville, Pensacola, Panama City, and Orlando.

Moving North...

Kentucky's state Operations and Recovery Branch Manager, Cash Centers, sent a note to state radio amateurs. It sums up the comments of many emergency managers around the country. "Now that there is a lull in the excitement, I wanted to take the time to tell you and all the folks who devoted their time to this evening how much I appreciated it. While Y2K was a non-event, it could have been much different. Please thank everyone for me and let me know if there is anything I can do for your outstanding group of folks."

In Pennsylvania, Philadelphia area hams staffed local EOCs and many hospitals, including the Veterans Administration Hospital, W3PVA, in Philadelphia. Montgomery County Radio Officer Bob Lees, W3ZQN, commented that even during a "non-event lessons can be learned." Some of those lessons included the need to have a repeater directory with local repeater information and the discovery that alternate repeaters had to be used when one of the hospitals could not check into the county repeater.

Many counties activated their RACES stations. In tuning across 2 meters in Pennsylvania and New Jersey, you could hear many net control stations identifying with their WC2xxx or WC3xxx callsigns. With the FCC recently announcing the elimination of RACES callsigns (as part of the restructuring decision), this may have been the last large scale usage of RACES callsigns.

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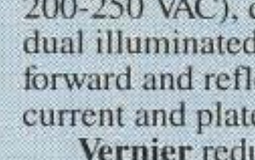

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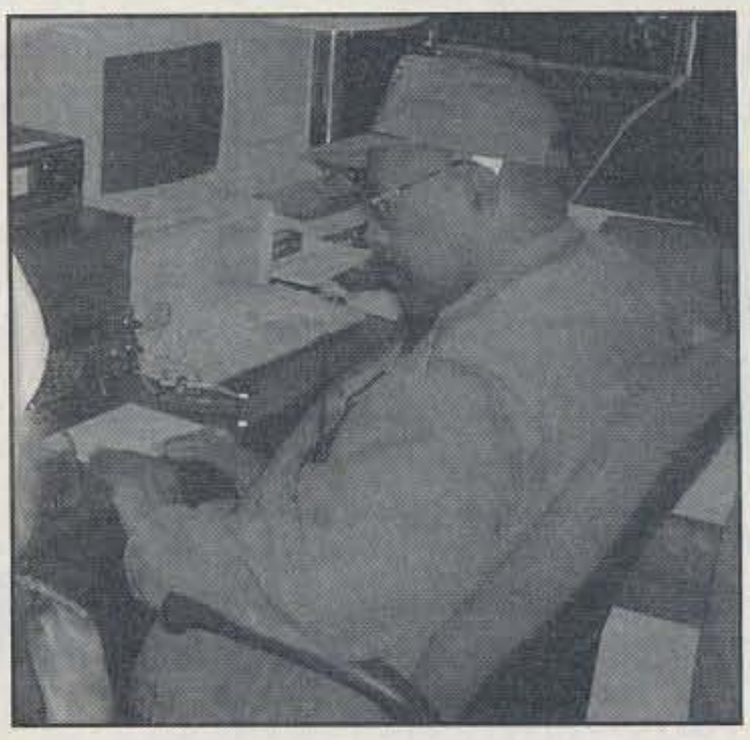
Weather Predictions

Dr. William Gray, a nationally recognized hurricane expert, and his colleagues are calling for a "moderate" hurricane season in 2000, with 11 named storms, 7 hurricanes, and 3 intense hurricanes predicted. This is a smaller number of storms than occurred in the United States and the bordering Caribbean Basin over the previous two years. However, the team is calling for "an above-average probability of U.S. major hurricane landfall," with intense storms reaching wind speeds above 110 mph.

According to the University of Colorado, the team's record for the 1999 season was one of the best in the 16 years the seasonal forecasts have been issued. In 1999 the team retained its original forecast throughout the season, predicting 14 named storms, 9 hurricanes, and 4 major, or intense, hurricanes. At the end of the June 1st through November 30th season, observed totals were 12 named storms, 8 hurricanes and 5 major hurricanes.



Charlye Johnson, K3CJ, keeps tabs on Y2K activity in the City of Brotherly Love from the Philadelphia Veterans Hospital, W3PVA. (WA3PZO photo)

In terms of the probability of landfall, this year's forecast calls for the U.S. Atlantic Coast, including peninsular Florida, to have a 45 percent chance of being hit by one or more major storms with winds above 110 mph. The Gulf Coast faces a 37 percent probability of one or more major hurricanes making landfall. Gray, Professor of atmospheric sciences at Colorado State, and his colleagues believe the 2000 season will start earlier than the seasons of 1998 and 1999.

How can you be radio-ready for possible emergencies? Various methods can be used. A New Jersey group was disappointed in the number of messages that were passed during a Simulated Emergency Test. Their response was to conduct on-the-air training on message handling and the National Traffic System. Another group will discuss what items you should have in a "go" or "ready" kit if you are called. The San Bernardino SATERN group is sponsoring a seminar on emergency communications. Some of the topics include "From the Disaster Director's Viewpoint," "Wildfires and the Amateur Radio Operator," and "Amateur Radio Satellite Tracking."

We want to thank everyone for sending in their Y2K stories. Do you have a story to tell? Is there a topic you would like to see covered in the column? Send me a note. Also check out the new Public Service and Emergency Communications forum on the *CQ* web page: <http://www.cq-amateur-radio.com>. ■

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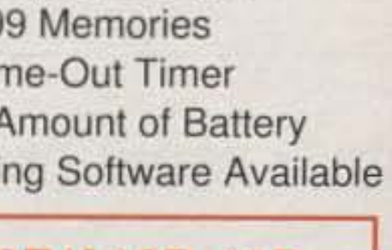

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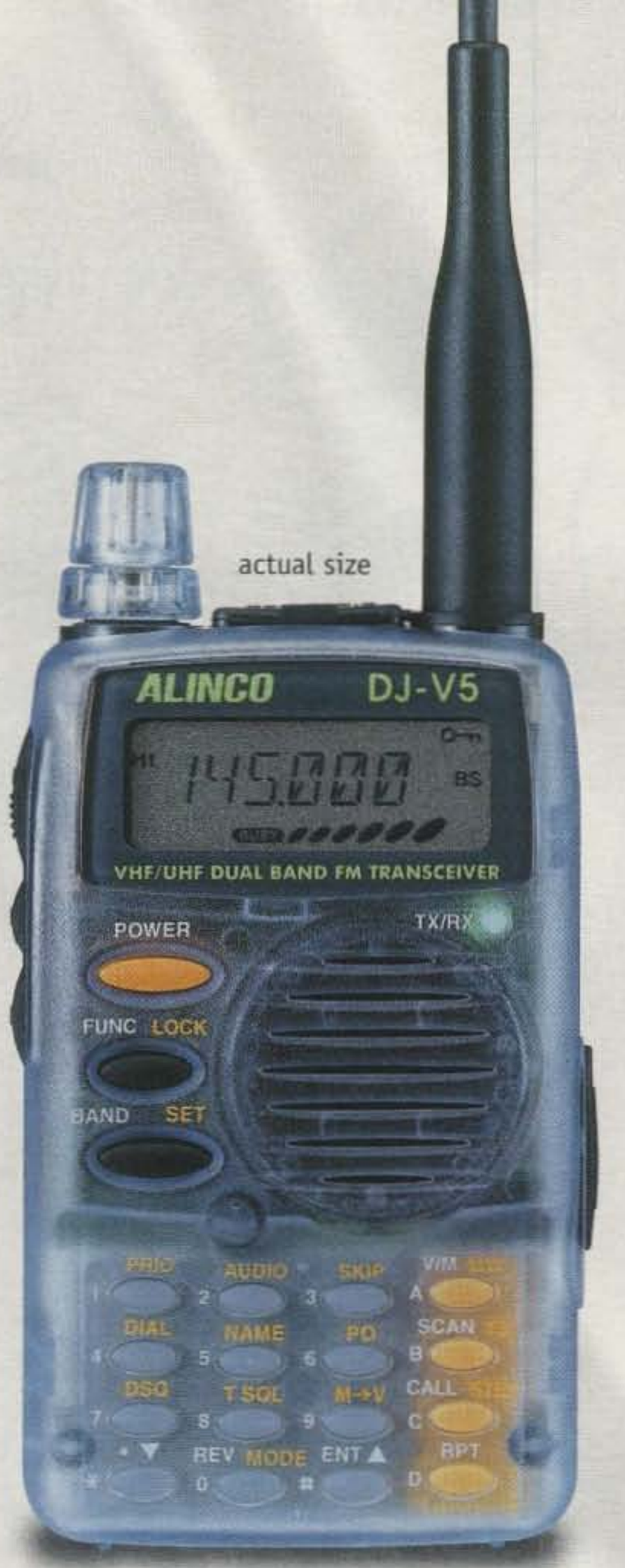

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CIRCLE 176 ON READER SERVICE CARD

In the December 1999 issue of CQ VHF, KF6FGB wrote about what he expected would happen at midnight on December 31, and what the real need for hams likely would be. He also promised to tell us what really happened. Here's Brent's boring (but interesting) story.

Y2K: What Really Happened?

BY BRENT WALTON,* KF6FGB

On Friday afternoon Pacific Time on December 31, 1999 an Internet news service reported, "Global clocks safely struck 0000 for the year 2000 on Saturday with the millennial rollover of Universal Time."

Less than 24 hours later I was purchasing a copy of the *San Francisco Examiner* at the Oakland Airport. It was the final edition of the 1/1/2000 paper. Big colorful letters spelled out "2000." With the exception that we rolled from 1999 to 2000, nothing else in the headline article was worthy of selling newspapers. Yet "2000" took headlines over Boris Yeltsin's resignation as President of Russia. *(This scenario was repeated by newspapers all over America—ed.)*

As an amateur radio operator, my Y2K rollover was not as exciting as it could have been, but it wasn't as boring as the morning newspaper either. I had been activated as a RACES member and assigned to a San Francisco Bay Area hospital as the RACES operator. (RACES is the Radio Amateur Civil Emergency Service.) Additional hams in our net were at police stations and other emergency service locations.

In the final issue of *CQ VHF* I wrote an article about what we might expect for Y2K and how we, as hams, could help. My expectation was that all of our technology would keep on working, and my only doubts were about people.

Well, as I write this it is 12:24 PM PST on January 1, 2000, and my computer fired right up. At the stroke of midnight last night the lights didn't even flicker. And, I used my PCS phone to call my wife to say, "Happy New Year!" However, as I said in my *CQ VHF* article, "We know it is going to happen," and so we were prepared.

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Does the general public really know what was going on around midnight on December 31?

Let me take you through a chronology of what helped us make it through the Y2K rollover from my first-hand experience. My experience started in September 1999, when I attended my first meeting with hospital board members about their Y2K plan. I was there because they made RACES an integral part of their disaster plan, and I was assigned to be the "first responder" for the hospital. (A first responder is the first person to be called out if the hospital requires the assistance from an amateur radio operator.)

The following month I was invited to take part in the hospital's Y2K drill. The drill encompassed more than just the hospital to which I was assigned. It included every hospital in California!

On the day of the drill I was led to a dark, tunnel-like room with a concrete floor and telephone punch-down blocks on the wall. The radio was in the corner, sitting on top of a power supply, and both were covered with dust. When I flipped the switches, I felt fortunate that the rig worked.

The drill appeared to go quite smoothly. However, in a review session after the drill, I learned that I had not received a critical piece of information to communicate to the net. Apparently, my dark, dingy location must have discouraged a nurse from delivering the crucial information to me.

I talked to the maintenance supervisor at the hospital about the radio's location. He assured me that by New Year's Eve the radio would be located at the nurses' station in the emergency room (ER). I guaranteed him that I would be there prior to New Year's Eve to test the new setup.

It was the week of Thanksgiving when I called the ER supervisor to see if the remodeling job was done. I told her I would like to take a tour and see where the radio had been located. We couldn't match schedules and agreed to talk sometime after the first week of December. However, due to some unfortunate circumstances I found myself in the ER without an appointment on the Monday following Thanksgiving. The place was still being remodeled, and nurses and doctors were working around construction walls and cramped quarters.

On December 23rd I meet the ER supervisor for a tour. The ER area was still under construction. She pointed to a cramped nurses' station and said, "We'll put your radio right there."

We hams are used to cramped quarters—small rooms in the corner of the house crammed with computers, radios, tools, and miscellaneous junk. Therefore, I didn't think a corner of a nurses' station would be any problem for me.

"It won't be too noisy for you here, will it?" she asked.

Again, we are used to working parades and public events where noise... well, it's just another form of QRM we have to learn to filter out. Most hams can extract a message from the noise quite well. Thus, my reply was, "No, the noise won't bother me. Will the noise from my radio bother your nurses?"

I explained that RACES operators would be checking in all night, and the radio would have to be up loud enough for me to hear the traffic being passed. Looking at the radio, I noticed there was no provision for headphones, so I explained that I would have to listen over the radio's built-in speaker. (She talked about possibly having the radio moved, but it didn't happen.)

December 30th: I stopped by the ER to see the setup. The ER desk receptionist pointed to a corner and said, "I think the radio will go there."

I was a bit panicked. I asked, "Does anyone know where the radio is? I'd like to test it."

She paged someone from engineering. Shortly thereafter a man arrived and took me to the old "radio room." We carried the radio and power supply to the ER. Within a few minutes I had it connected, programmed for the next night, and tested. After making a couple of calls on local repeaters designated for use on Y2K, I called my wife, KF6OQV, on simplex. It looked like I was all set.

I went home that night and charged all my HT batteries, PCS phone batteries, and a couple of large gel-cells. I also set out my readiness and 72-hour kits. Personally, I was prepared to go three days without power or a normal supply of food. Between my two kits I had enough food for myself and my radio (batteries) to last until January 3, 2000.

The big day finally arrived. I spent December 31, 1999 inspecting my handheld transceivers, batteries, and miscellaneous parts; checking news reports from around the world; and worrying about my teenage daughters, who were going to a dance.

At 7:40 PM I drove my daughters to their friend's home, where they would catch a ride to their church dance. My daughter Laura, KF6WBD, had her radio with her. That gave me a great feeling of comfort knowing that if bad things were to happen, she could at least get a hold of her dad.

I arrived at the hospital right at 8:00 PM. They were already in a yellow status. (The conditions of red, yellow, and green represent the status of the area hospitals. Green represents no problems, yellow is borderline, and red means major problems. Each area—power, communications, ER, staffing, etc.—was given a green, yellow, or red status, along with an overall status.) I immediately was informed that earlier in the day they had had to divert patients to other hospitals because they were full, so they were already status "yellow."

By 8:30 PM I was checking in to the established RACES net for our county. Except for the ER, the status for our hospital was condition green. There were no computer, power, supply, or staffing problems. It was simply a busy ER because physicians' offices were closed for New Year's Eve, and people who normally would have visited their doctor were appearing at the ER because of flu or cold symptoms.

By 10:00 PM the ER supervisor informed me that it was the quietest night they had had in five weeks. However, shortly after this announcement the police brought in a hit-and-run suspect. The 19-year-old man was so drunk, I heard him ask, "When you cops came to my house you were hanging from the roof. How did you do that?" So much for a quiet evening!

With the exception of some entertainment provided by several police officers and a drunken 19-year-old being read his Miranda rights, it remained fairly quiet. Midnight came and went, and had the local 2 meter repeater not announced, "The time is 12 midnight," I might not have even noticed.

One of the doctors invited all of us in to the staff lounge to toast in the new year. Plastic cups filled with sparkling apple cider made a slight "thud" as we raised our cups and said, "Cheers." I quickly made my way to the cafeteria, where numerous ambulance drivers and police officers were taking advantage of a nice buffet sponsored by the hospital administration. (Yes, the night was slow for them, too!)

Within minutes after midnight other RACES operators were asking if they could shut down and go home. Our net control forbade them, asking them to hold on until at least 1:00 AM. Some of them persisted. I think their assignments were quite boring also.

At about 12:30 AM the ER started getting busy. Two 16-year-olds—one hit over the back of the head by a bottle, the other with his front teeth bashed out by a rock—were brought in by ambulance. A stabbing victim was transferred from a nearby hospital to ours. The police were bringing in several drunks from a local parking lot fight. In spite of all this, the hospital ER remained in condition green.

Within the hour net control closed the RACES net and released us. I packed my gear, shut off the hospital's radio, and went home.

Were Hams Really Needed?

Some of you might argue that we were not needed for this Y2K event. I disagree. Even though we were not needed to pass emergency traffic (because phones and power didn't fail), we were still needed. Like an automobile insurance policy held by a good driver, we were there for that just-in-case incident.

I may never use my 72-hour kit or readiness kit except to show it off at a RACES training session or pull it out for a mock-disaster exercise. However, it brings me peace of mind knowing that I have it and I'm ready if I ever need to use it.

To those at the hospital, my service was greatly appreciated. Granted, all I did was sit there all night engaged in some small talk with doctors, nurses, and staff and eat snacks and drank sparkling cider, but I felt their sincere appreciation when they said, "Thanks for volunteering your New Year's Eve to be here tonight." ■

Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

Charge Pump Inverters

Those of you who have ever had the need to convert a positive Vcc line into a negative Vee line for various applications are well aware of the common 7660 family of charge pump inverters. These devices can be used for polarity inversion as well as voltage doubling just by adding a couple of external capacitors as shown in fig. 1.

Special inductors and hard-to-find additional components are not needed with these devices, which is why they are so popular. They do suffer from one fault, however, and that is the actual inverted voltage output is a function of the current to be drawn. The common (original) ICL7660, for example, when connected in a +5 to –5 volt inverter can only provide 15 to 20 ma of negative voltage before the output drops to below –4 volts. The MAXIM MAX660 (and others) can raise this to 100 ma before –4 volts is reached, and there are also intermediate charge pump converters that can provide outputs of 35 to 50 ma under the same conditions. Still, all suffer from the same problem: The output is still very much a function of the load drawn, or simply, the output is not regulated. This normally is not a problem for op-amp biasing or very constant negative voltage/current requirements, but sometimes a more stable negative voltage is called for.

To solve the problem, manufacturers such as MAXIM, Linear Technologies, and Texas Instruments have begun to introduce regulated charge pump converters. These devices use the simple circuit of the charge pump technique to double or invert the input voltage, but in addition contain on-chip regulators. Typical of these is the LTC1261L from Linear Technologies. This device, shown in fig. 2, will accept an input of +5 volts and provide a regulated output of –4 volts at up to about 20 ma. Although this is not a tremendous amount of current, the output voltage is independent of the load current up to the limit, and if this is what you need, the chip may be just the ticket. No doubt higher current models will become available in time.

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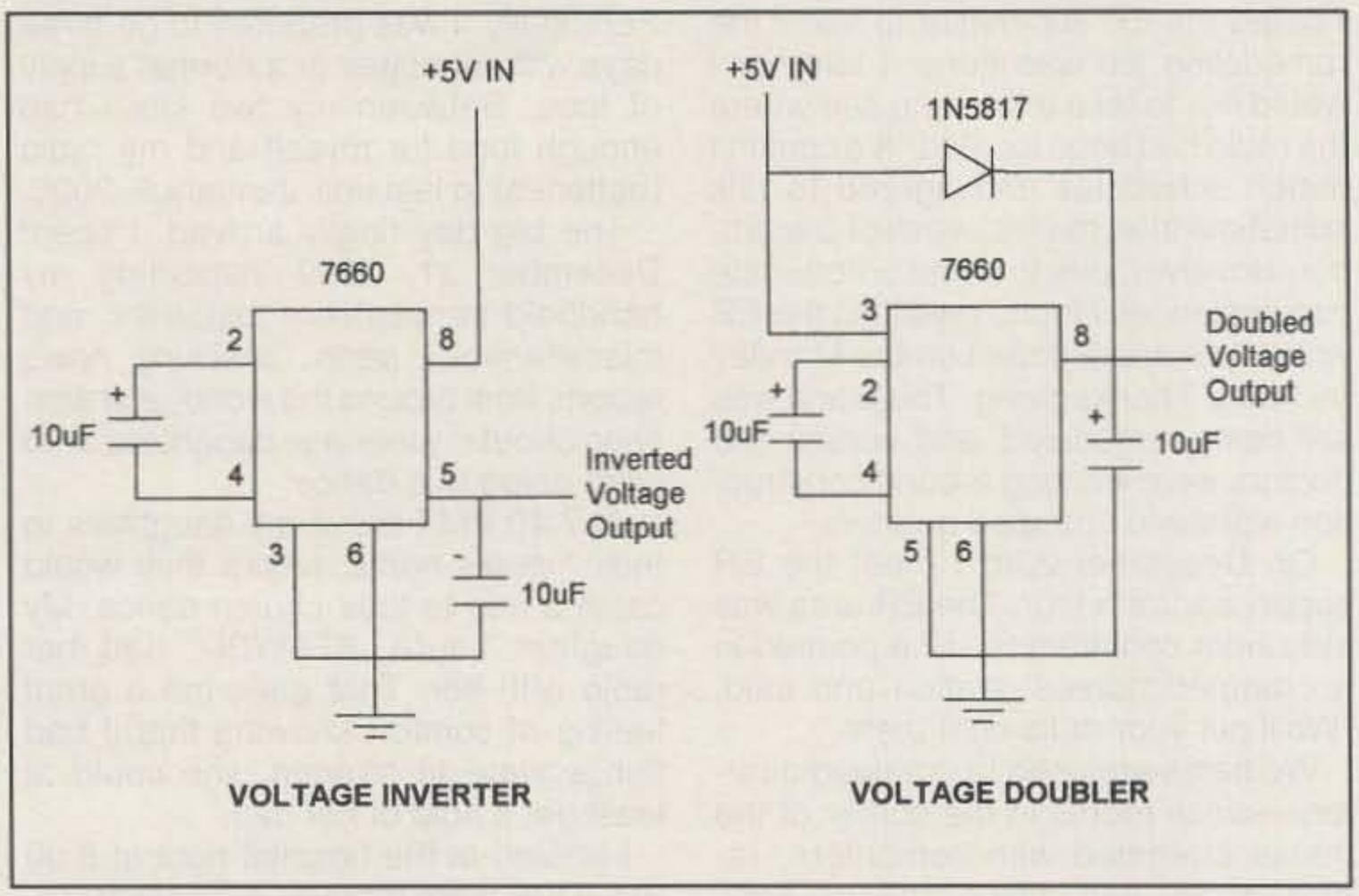

Fig. 1– Typical 7660 charge pump circuits.

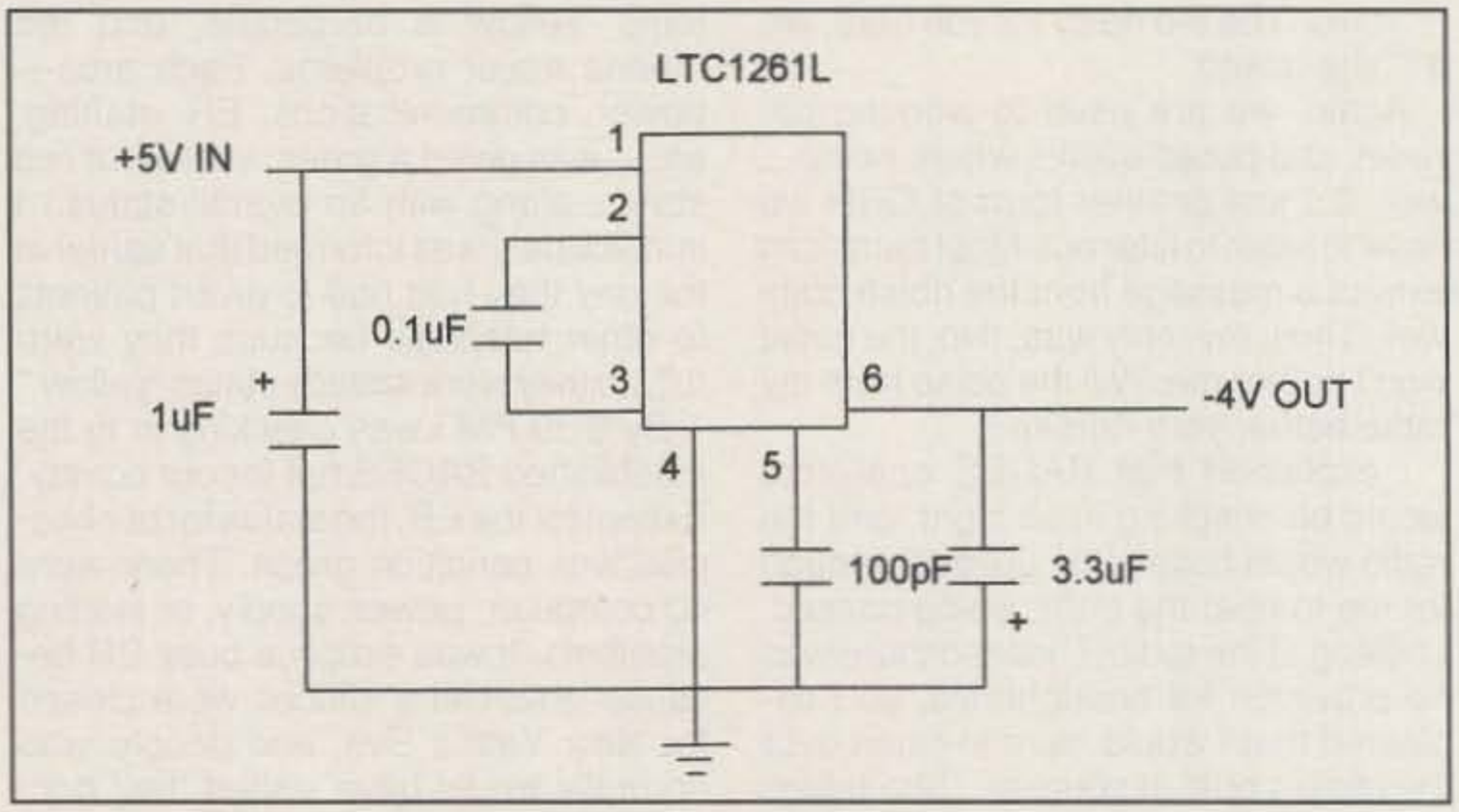

Fig. 2– Regulated charge pump inverter.

For those applications in which 5 volts are needed from a varying supply, a new series of charge pump devices is available which will take an unregulated input and produce a regulated 5 volt output (but not inverted at this time). One such offering is the TPS6011 from Texas Instruments; fig. 3 shows the typical circuit configuration. This device will accept an input of from +2.7 to +5.4 volts and produce a regulated output of +5 volts at up to 150 ma. Such a device is ideal for stepping up a couple of D cells to run a wide variety of portable devices. It may also be ideal as a solar battery output conditioner.

Since most of the above chips are available in tiny surface-mount packages, implementing a "microscopic" inverter or "DC step-up transformer" is

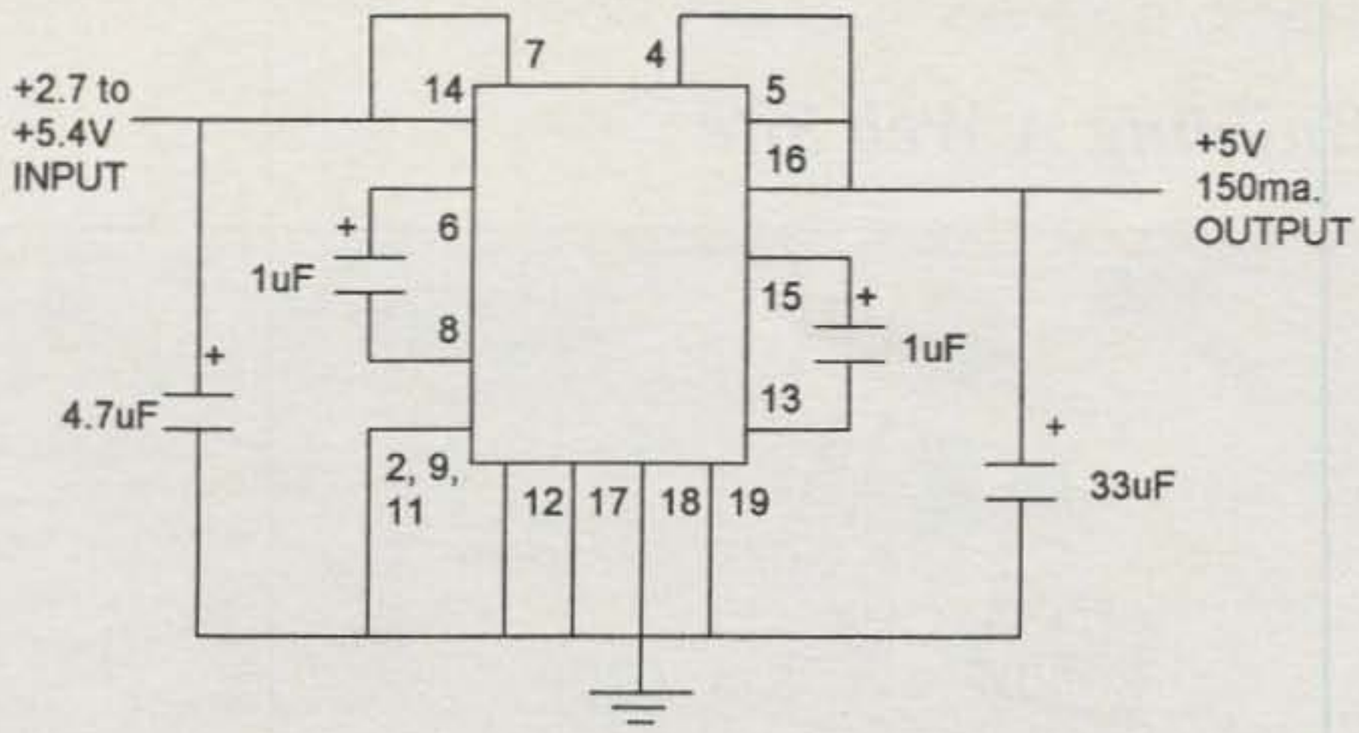

Fig. 3– Regulated high-current charge pump converter.

well within the capabilities of the average experimenter. For further information and circuitry be sure to check out the MAXIM web site at <www.maxim-ic.com>, the Linear Technologies site at <www.linear.com>, and the Texas Instruments site at <www.ti.com>. Details on these and other offerings are there, as well as fairly explicit tutorials on charge pump operation.

See you next month.

73, Irwin, WA2NDM

Looking Ahead in CQ

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

- "Exploring Aurora Communication," by WB2AMU
- "*CQ* Reviews: The 5-Band HEX Beam," by W1ICP
- "Global Optimization of Yagis," by K6STI
- "*CQ* Reviews: The Transtronics SW Receiver Kit," by N2OZ

Plus . . .

- "A Skeleton Sleeve-Fed Monopole," by K6MHE
- "Amateur Radio Astronomy," by KC4YER
- "The 2000 *CQ* National Foxhunting Weekend," by KØOV

Writer s wanted: If you have a ham radio story to tell, we'd like to hear about it and consider sharing it with our readers. If you'd like to write for *CQ,* please send a request for writers' guidelines, along with a self-addressed, stamped envelope (SASE), to: CQ Writers' Guidelines, 25 Newbridge Road, Hicksville, NY 11801. We plan to have an online version available soon on our website: <http://www.cq-amateur-radio.com>.

Computers and Internet

BY DON ROTOLO, N2IRZ

Ham Radio's Online Connection

Building A Web Site

Welcome to the first of a new quarterly column in *CQ* dealing with computers, the Internet, and how these relate to amateur radio. This is a new idea for a regular column, and the waters ahead are uncharted, so I'd like to invite each of you to write and let me know what you might enjoy seeing here. It's ultimately up to you, the reader, to determine if we have succeeded or failed in providing what you want. I look forward to hearing from each of you.

To those 30,000 or so folks who used to read *CQ VHF*, my name is (I hope!) familiar. However, to the majority of readers my name and call are new, so a brief introduction is called for. I got my Novice ticket in 1987, upgraded to Technician in 1988, and became a Tech Plus by default in the '90s. Since I first got my Novice license I've been very involved in digital communications. My first piece of amateur equipment was an AEA PK-232, which I used on 10 meter HF packet at 300 baud (on a Heathkit SB-102!). That was the only activity I could get into, as I hadn't upgraded to Tech yet. Since the FCC changed the license classes late last year, I've collected the CSCEs for Extra.

More recently I've been involved with the Radio Amateur Telecommunications Society (RATS), the ROSE folks (remember ROSE?), as well as the North East Digital Association (NEDA). I also wrote a digital communications column for *CQ VHF*, as well as articles for a number of ARRL/TAPR Digital Communications Conferences. Professionally I'm an Electronics Engineer for a major automobile importer. My interests revolve around electronics and computers, especially design and construction, but I enjoy working on and around my house and spending time with my family. For my first article in *CQ* let's take a look at building a web site.

Most of us have a computer in our shack, whether for contest logging or just surfing the web. Of course, if you don't have a computer, there won't be much interest in this particular article, but I plan on fixing your dilemma in an upcoming column, so stay tuned.

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Fig. 1– The WebWizard home page. Web Wizard is a useful tool for authoring documents in HTML directly. It is a simple package which prepares a home page after a question-and-answer session with the user, and one of the few available for both 16-bit and 32-bit Windows platforms. WebWizard is available from <http://www.halcyon.com/artamedia/webwizard/>

Most of the larger Internet Service providers (ISPs), and many smaller ones, provide some disk space on their server for a personal web page. Since each ISP uses a slightly different upload procedure, you'll need to ask them how to get your files onto their server. Nevertheless, I can give you some tips on creating a web site (a bunch of web pages), what kinds of information you might want to put there, and some of the finer points of web-page design. If you're not sure if web-page hosting is part of your access package, just ask your ISP. If you have Internet access, Yahoo! offers free web space.

The first thing to consider is why in the world you should even put up a web site. The best reason is that a web page is by far the easiest and cheapest way to transfer information. If you run a small business, or even just a hobby service, here's a place you can get publicity and dispense information for nearly free. Maybe you know a lot about hardline connectors and want to share your experience. How about those photos of when you put up your tower or last year's Field Day? You are only limited by your imagination.

The first step is to collect information you might have already and convert it to a standard web-page format. The next step is to create a home page to link those pages together, like an index.

The standard format for web pages is HTML, an abbreviation for HyperText Mark-up Language. We use this pure-text format so that anyone, regardless of computer or browser type, can see it. Nearly every modern word processor, such as Word or WordPerfect, can convert a document into HTML. If you run Windows 95 or 98, you probably have a version of FrontPage, which is easy to use (but a little limited in features). You also can get freeware and shareware HTML editors on the web. Just understand that you sometimes get what you pay for.

If all this sounds strange right now, don't worry. You're in good company. I'll never be able to give you all of the intricate details—that would take a few

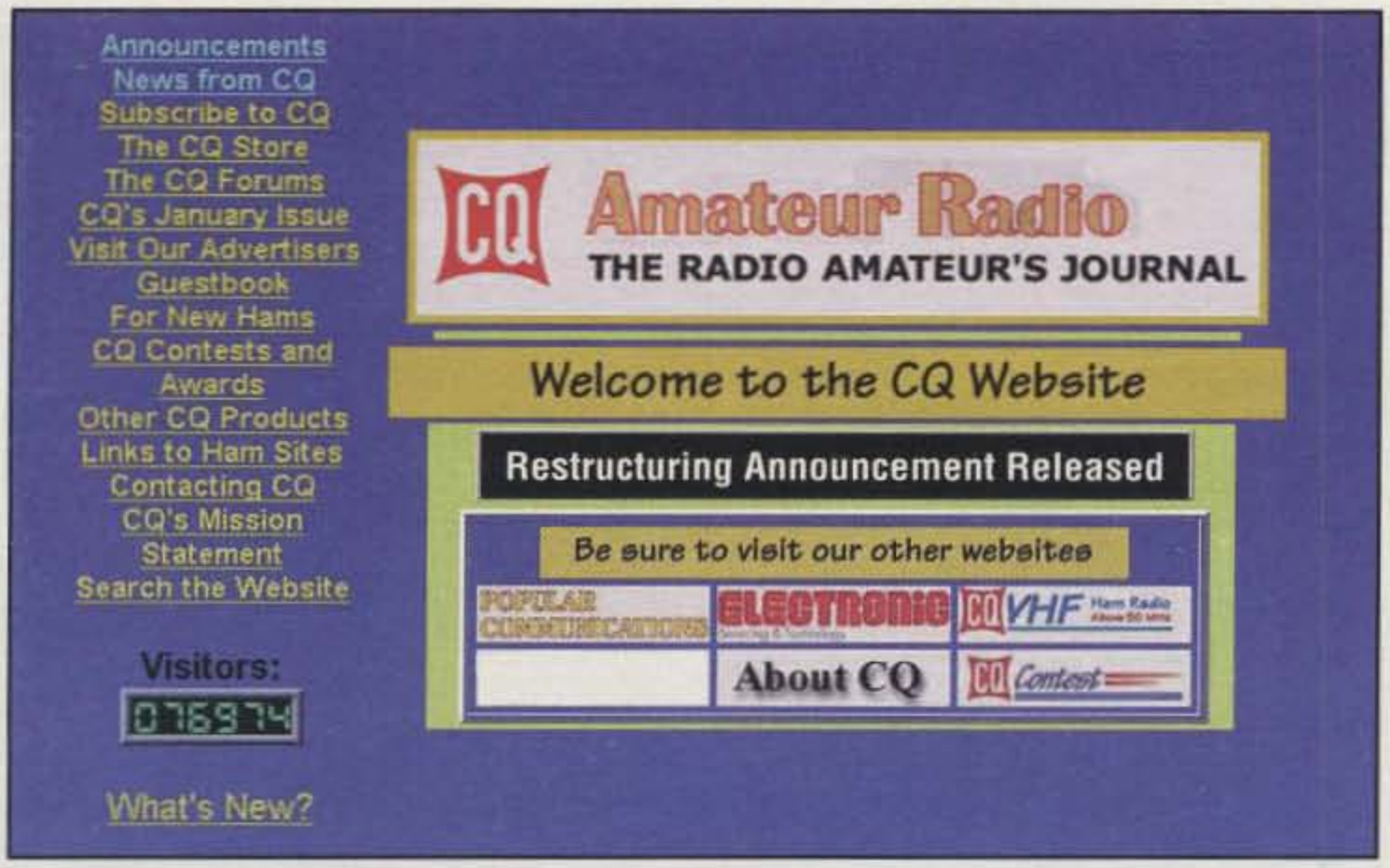

Fig. 2– The world-famous CQ web site, a good example of a home page. Note that all the information fits on a single screen, with a few links on the left and some interesting graphic-based links towards the center. The graphics are small, loading quickly, and they don't overwhelm the page. If you didn't already know, visit us at <http:www.cq-amateur-radio.com>

books—but the basics will help you understand the concepts involved, and the rest can be found on the web itself, as well in a multitude of books on the subject.

The process of building a web site is actually quite simple: First you create a main index page, which we call the Home Page. Then you create any number of Daughter Pages, which is where the information resides, and create clickable links to them on the Home Page.

The most important concept is that of clickable links, or Hyperlinks. Anyone, using any combination of browser and computer, just clicks on the hyperlink, and the page defined by the web-page designer (you!) is shown on the screen. Hyperlinks are extremely powerful. Having the ability to link to any other file, whether on your own web site or any other site on the Internet, means that you never have to duplicate any information that's already posted somewhere. You just provide a link to it! Hyperlinks also make it very easy for the user to jump to another page. They are kind of like footnotes, in that you can jump out of a document for a moment, read something else, then jump right back to where you were.

The web is also an excellent way to look at pictures and drawings—graphics. You can even make a graphic into a hyperlink so that when someone clicks on the picture (or a smaller part of it—a Hot Spot), they are linked to another file. Remember, that file can be another web page, a graphic, a program, or any file!

Now some pointers on web-page design.

Web Resources

One of the best listings of web resources is found at <http://www.netspace.org/~dwb/www-authoring.html>. Some of the links are outdated, as explained on the home page, but the ones that work are great.

A great introduction to HTML is found at <http://www.cwru.edu/help/introHTML/toc.html>. This is a comprehensive guide to the HTML language. Remember, as a pure-text language, you can write HTML using any simple ASCII text editor, but you might want to use an HTML editor to maintain your sanity.

A useful and very, um, insistent guide to web page design is found at <http://www.mcs.net/~jorn/html/terrorist.html>. Jorn, *aka* the HyperTerrorist, has put together a really comprehensive guide to what makes good and bad web pages, and tells the story with a bit of humor. Also at this site is a checklist for good page design: <http://www.mcs.net/~jorn/html/net/checklist.html>.

Finally, a search for related topics on any of the web search engines will yield a bounty of links.

The best source for formatting tips is to look around the web. When you see a page you think looks good, save it to your hard disk, and edit it to erase the old text and add your own. This kind of format borrowing is almost always okay, as long as you replace all of the existing text and avoid using copyrighted graphics or text. Remember, everything is copyrighted, so don't use anyone else's graphics, text, or other files.

Since graphics take much longer to download to the user than text, keep graphics small (under 20 kB) and use as few as possible. It is good practice to locate graphics at least one screen height below the top of the page, so the user sees the text appear almost instantly and has something to read while the graphic downloads. This makes your pages appear to load faster. Avoid the unnecessary use of graphics, as they just clutter the page.

Graphics can be saved in two web-compatible formats: JPEG and GIF. JPEG format is best for photographs, while GIF format is best for drawings. Play with these two formats and see what happens. If a graphic just cannot be shrunk below 20 kB, make a Thumbnail (a very tiny copy of the image), place it on your page, and use it to link to the larger version. Also, remember that a 256 color image (with "dithered" color palette) looks just as good as a true color image, at one third the file size.

Text should be black, and backgrounds should be white or another light color, but not yellow, which is hard on the eyes. Remember that different browsers might see your page differently, so wild color schemes might make the page unreadable.

Good home pages are small, ideally only one or two screens high. They shouldn't be just links to other people's sites. Put up your own ideas (Content) instead. Be sure to organize your site logically, like an index to a book, or like the folders and subfolders of files on your computer. Be creative and have lots of depth to your content. Let your personality show through. Don't write for the sake of writing. Keep it short; cut to the chase. Just don't slice long documents into tiny pieces. It makes it difficult to print and annoys the reader.

Oh, yes: Every page should have a hyperlink, either at the bottom or the top, to get you back to the last page viewed and the home page. These navigation aids really make a site easier to use. It's also good practice to put your name, and the date the page was last changed, in tiny text at the bottom of each page.

Your best source of information about web pages—including design, content, and technical information (such as the details on HTML, a fascinating formatting language that uses only plain ASCII text)—is, of course, the web itself. The resources section offers a few of the better sites I've seen, but there are literally thousands more. A visit to your local library or bookstore will yield even more information on the topic. I encourage you to give it a try. Who knows what it might lead to?

73, Don, N2IRZ

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SS-12	10	12	1⅛ x 6 x 9	3.4
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 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 AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
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VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

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SS-18GX
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SS-18EFJ
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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

World Of Ideas

A Look At The World Around Us

BY DAVE INGRAM, K4TWJ

Keys and CW: Timeless Treats—Part I

Amateur radio's love affair with CW and keys is truly amazing. Even in this new millennium when high-tech modes and microprocessor-based systems are commonplace, basic CW operations with personally appealing keys—not keyboards or computers, but real keys—is a popular worldwide pursuit. Why, you ask? Everyone has his or her own opinion here, but I see keys and CW as an irresistible combination of skill, tradition, and plain old radio fun. It is an interest that just becomes more enjoyable with each passing day! Almost every key, bug, paddle, and miniature also represents a piece of telegraphic history you can hold in your hand, a true artifact of amateur radio's proud legacy.

In many respects, sending great-sounding CW with a key can be like playing a bugle. Both items are basic one-function instruments, and both require skillful, artistic use to bring out their full beauty. Yes, CW is an art form—and one of amateur radio's fine arts! Work more CW with a special key and you will agree. Need more convincing on the merits of Morse? Check out the sidebar "Morse Alive: The Morse 2000 Outreach Program" elsewhere in this month's column.

Okay, friends, I sense your wandering eyes and code-tapping fingers, so let's fast-forward to the key photos. First, a big thank you to our photo contributors: Bencher Company; Stan Hails, W9WBL; the Tippecanoe Radio Company; Gil Schlehman, K9WDY; and Des O'Brien, ZL2UOB. The photographs are indeed captivating. Folks are always interested in unique keys they can purchase new today (finding classic oldies is a formidable challenge), so let's begin with some infrequently seen treats of the present. Then we will progress to studying some unusual hand keys and rare bugs. We will move quickly, so hold onto your pocket magnifier and read carefully as we pack the maximum amount of information into the minimum amount of space.

4941 Scenic View Drive, Birmingham, AL 35210

New for 2K Treats

Our curtain opens to reveal a real glitz and glamour item many folks consider one of the world's most exotic paddles—the famous N2DAN "Mercury" shown in photo 1. This magnetically tensioned dual-lever paddle sports a positive snap action with a feel and "personality" that set it apart from all other paddles. Super-smooth bearings and an incredibly well-built upper assembly, plus silver contacts with rhodium plating, further place the Mercury in a class of its own. Chrome plating on the finish is so dazzling that accurately photographing a Mercury is almost impossible.

Unfortunately, Steve Nurkiewicz, N2DAN, passed away in 1998 (and his Mercury paddles immediately became prized collectables). Now the good news. Bencher Company has made an agreement with Mrs. Nurkiewicz and is now producing Steve's Mercury on a special-order basis. Hearty congratulations, folks! Not only will the venture perpetuate Steve's work (the ultimate compliment), it will also allow all CW devotees with $500 to own "Le Ne Ultra," as Steve called it. More details are available from, and orders go to, Bencher, Inc., 831 N. Central Avenue, Wood Dale, IL 60191.

Next up is another special gem, the V22, a new version of the popular W9WBL vertical twin-lever paddle made by Stan Hails and highlighted in this column a few years ago (photo 2). The paddle is not widely advertised (as was with N2DAN,

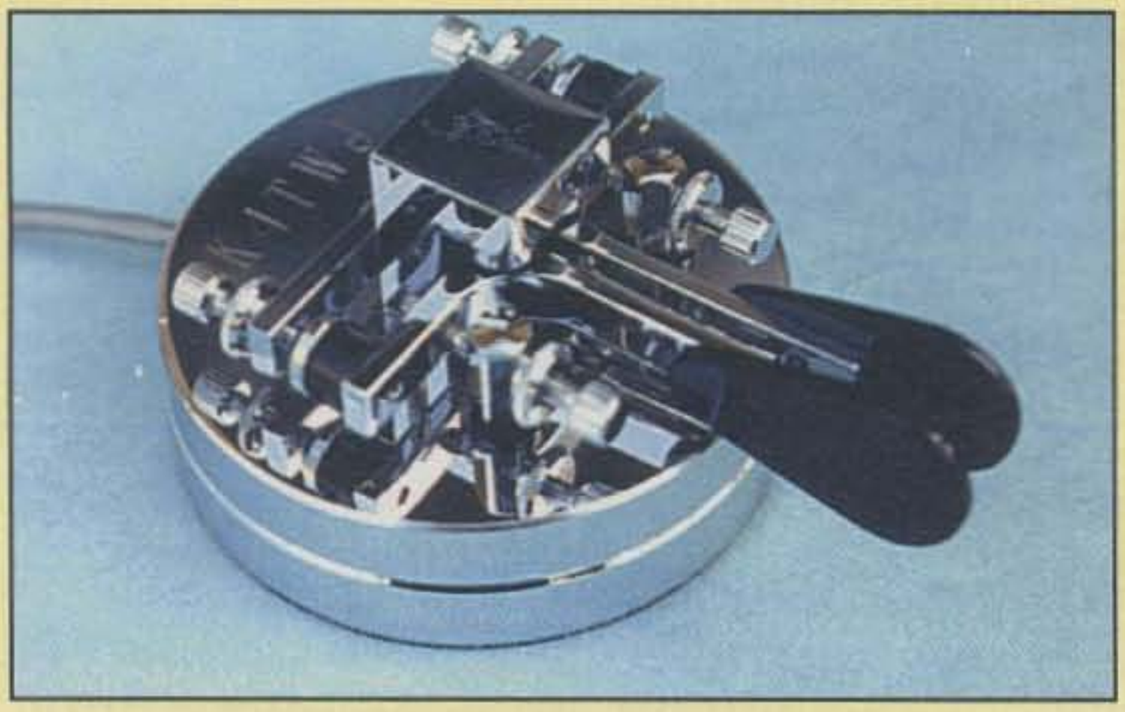


Photo 1– The world-famous N2DAN "Mercury" iambic paddle. Item sports ultra-smooth mechanism, Alnico magnet tensioning, exquisite feel, and brilliant chrome finish that captures attention in any environment. Original Mercury paddles are no longer available, but commercially produced counterparts can be special-ordered from Bencher as discussed in text.

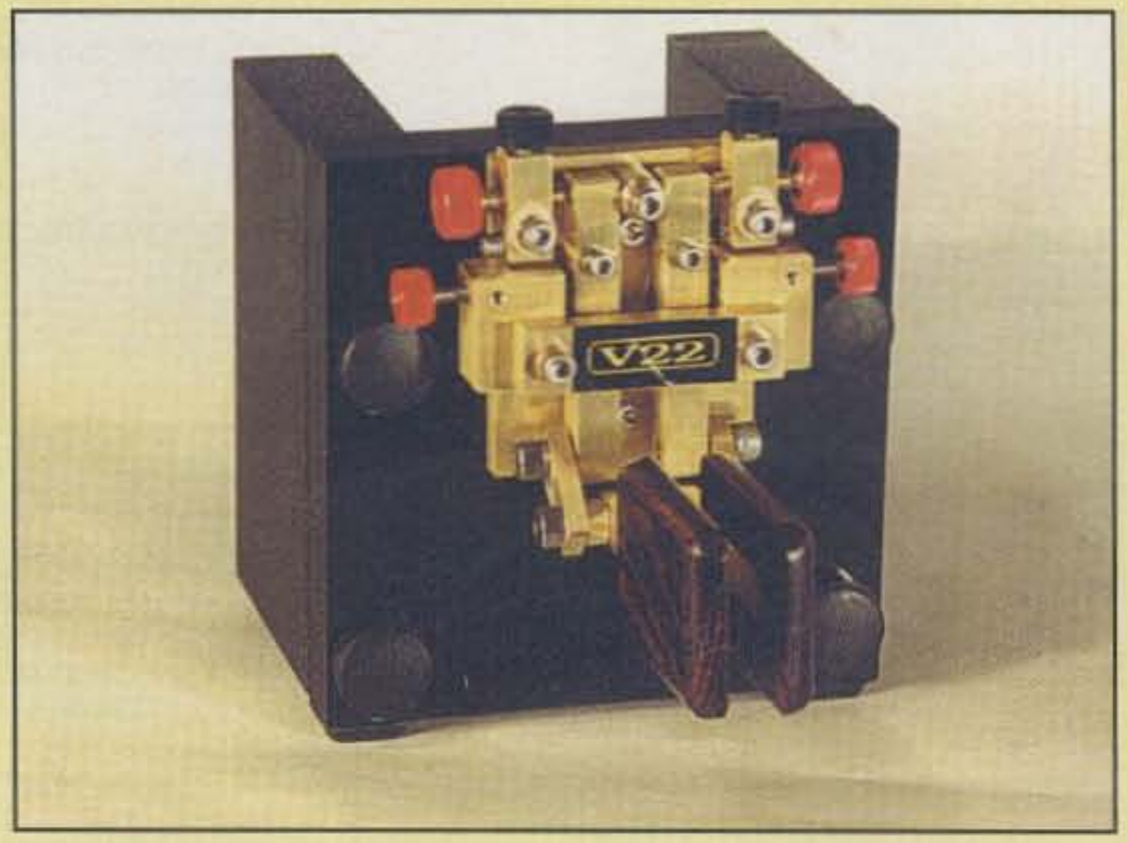


Photo 2– Looking for an unusual paddle with an outstanding feel? Check out this new W9WBL V22 vertical twin-lever item. It's a neat conversation piece and is quite versatile in adjustments to fit any fist. (Photo courtesy W9WBL)

even word-of-mouth exposure keeps Stan busy filling orders), so here are the pertinent details.

The paddle's mechanism is polished brass with stainless-steel screws and bearings and gold-plated contacts. It sits vertically on a heavy 3.5" × 2.5" frame for solid footing and "no walk" operation. Each lever has separate gap and tension adjustments, plus set/lock screws that drive tiny nylon balls against threads to minimize "burrs" from overtightening. Fingerpieces are smooth cocobolo wood with adjustments for both height and angle or tilt. The paddle handles exceptionally well and is available for $140 plus postage from Stan Hails, W9WBL, 6345 Coffman Road, Indianapolis, IN 46268. Unofficially, I hear Stan is working on an optional spell checker for the V22, so ask him about one when ordering the paddle.

Our final "new, available right now" collectable key is the impressive Tippecanoe ZK-1 made by Jeff Pipenur, WA8IKW, and shown in photo 3. This showpiece measures 3"H × 4"W × 6"D, weighs 3 pounds, and has the look and feel of maritime CW supreme. Its arm and adjustments are solid brass with stainless-steel ball bearings and include silver-plated contacts for both "make" and "break." The knobs (two are supplied—one of traditional shape, one round) are glazed ceramic, and the base is polished granite with ten coats of wax for a beautiful, deep luster. Large rubber feet are secured to the base with decorative hardware, the arm is coated to prevent darkening, and the key is topped with a Navy insignia by its nameplate for added flair. The key is available from the Tippecanoe Radio Company, P.O. Box 321, Tipp City, OH 45371 (telephone 937-667-9399).

Far-out Hand Keys

Let's now move into the hand-key category and take a quick "walk on the wild side" by looking at some very unusual items. Space is limited, so bear with me on this whirlwind tour.

I nicknamed our first little marvel the "bellboy's key," or "waitress key," because of its overall appearance (photo 4). Looks can be deceiving, however, as this "Plunger Key" sports a full-working mechanism, complete with adjustments for gap and tension, under its bell-housing-type brass top cover. The key was originally designed as an aid for telegraphers suffering from carpal-tunnel syndrome. Did it help? Doubtful, but what a showpiece! The photo is courtesy key collector extraordinaire Gil Schlehman, K9WDY.

Next is another incredible find—the amazing "Pump Handle Key" made by the Twentieth Century Mfg. Co. during eras past and shown in photo 5. This key was also designed as an alternative item for telegraphers battling carpal-tunnel syndrome, and it too has a full hand-key mechanism mounted inside its vertical fixture. Notice the adjustments and locknuts for gap and tension on the fixture's sides, the tastefully finished brass, and the neat decorative base. Truly, this is one fantastic, far-out key!

Think you've seen it all? Not yet, friends. Cast your eyes on the Frankfurt Cable key made by The Hartmann and Braun Company of the 1930s (photo 6). This key is seldom displayed in public. Pressing down on the key's knob (it's in the middle) breaks one circuit (upper contact) and makes another circuit (bottom contact). Such double-action keys were often used by linemen and/or were installed at test facilities of landline telegraph systems. This type of key was also used to send opposite-polarity signals (positive for dots, negative for dashes) on a single cable. Interesting! Thanks again to K9WDY for this view.

Yet another totally awesome key from those golden days of telegraphy is shown in photo 7. This one is called the London Cable Key, and it was made by Nalder Brothers and Company of England. Studying this key carefully and comparing it with the Frankfurt Cable Key in photo 6 will reveal the London Cable Key's twin levers operate independently and close two separate circuits rather than interrupting one circuit while closing another. This arrangement was often employed on international/undersea cables where one line or wire conveyed dots and another line or wire conveyed dashes. Special thanks to K9WDY for views of this key.

Sizzling Semis

Now shifting into the "sweet semis from yesteryear" category, our spotlight falls first on the Canadian F. A. Wilcox bug

Photo 3– If you appreciate big-time CW with robust full-size hand keys, you will love this new Tippecanoe key made by Jeff Pipenur, WA8IKW. It is similar to the types found on British navy ships, and looks terrific and handles very well.

Photo 4– What's this? A bellboy's key? A waitress's key? No, it's a Plunger key, and it has a full-blown hand-key mechanism under that top cover. Unbelievable but true! (Photo courtesy K9WDY)

Morse Alive: The Morse 2000 Outreach Program

A couple of years ago in this "Keys Special" series I introduced you to the Morse 2000 Outreach Program spearheaded by the Trace Research Center at the University of Wisconsin and the Johns Hopkins University Center. One very moving story of their work described how a totally paralyzed woman, unable to use a pointer tube and computer keyboard, learned to communicate via eye-blinked Morse code. Within a few month she progressed from an invalid condition to Morse-dictating religious programs and poems of an admirable nature.

A recent issue of the M2000 newsletter, "Morsels," describes yet another motivating tale that begs to be shared. A young woman, Susan Yim, suffered a brainstem stroke that left her a quadriplegic and unable to speak. However, Susan was able to move her thumbs enough to operate touch-sensitive switches. She learned Morse code rather quickly. An engineering friend then built a code reader so Susan could "speak" via an LCD readout. The code reader was interfaced with a modem-equipped computer. Using the setup, Susan studied and acquired a Masters degree in molecular biology. She presently works at home, reading and reviewing articles for researchers at Aberdeen Proving Grounds in Maryland. Susan says she feels comfortable with Morse and works at 15 words per minute. She and Arnold Reinhold, K2PNK (an M2000 supporter), encourage all Morse-literate people to carry Morse ID/medic alert cards, such as the one shown in fig. 1, in their wallets. Great idea!

MORSE CODE POCKET CARD

If I am unable to communicate by other means, I may be able to use Morse code. Observe me for any movement that appears to be a combination of longs and shorts or other alternating movements. You may also tap code on my body.

A .–	M ––	Y –.––	Period .–.–.–
B –...	N –.	Z ––..	Comma ––..––
C –.–.	O –––	0 –––––	? ..––..
D –..	P .––.	1 .––––	/ –..–.
E .	Q ––.–	2 ..–––	Error .....
F ..–.	R .–.	3 ...––	Wait .–...
G ––.	S ...	4 ....–	Message received .–.
H	T –	5	Your turn to send –.–
I ..	U ..–	6 –....	Hello (CQ) –.–. ––.–
J .–––	V ...–	7 ––...	Help (SOS) ...–––...
K –.–	W .––	8 –––..	Laughter (Hi) .....
L .–..	X –..–	9 ––––.	

Fig. 1– Sample of Morse ID card courtesy M2000 Program.

You can learn more about and/or join the Morse 2000 Outreach Program by sending one or two large SASEs with two extra stamps to the following address: Morse 2000 Outreach, Human Sciences and Services Outreach Office, University of Wisconsin-Eau Claire, Eau Claire, WI 54702-4004. Join them. You will be glad you did.

shown in photo 8. This gem looks similar to a Vibroplex "Original" at first glance, but closer inspection reveals some interesting differences. First, notice the arm-travel-limiting screws on each side of the mainframe (yoke) are secured, or locked in position, by two additional screws set at 45-degree angles on the yoke's arms. Notice too the arm's pivot screw is positioned closer to the fingerpieces rather than in the yoke's middle, where Vibroplex puts it. That should produce an unusual "feel" for sure. This bug is not fitted with a nameplate, but if you look carefully at the top of its mainframe or on the side of its rear damper, and you can see F. A. Wilcox stamped in the metal. This rare find is part of the world-class K9WDY key collection.

Our next featured item is another attention-grabbing rare item from K9WDY—the genuine "Speed Bug" made by the Brooklyn Metal Stamping Company of New York (photo 9). With the exception of its rear pendulum damper assembly and double locknuts on its dot-contact screw (which could be

Photo 5– We nicknamed this delight a farm-boy's key or a milkmaid's key for obvious reasons. Rather than pushing down on a knob, you pull down on a lever to make dots and dashes. Every ham needs one of these pumpers for Straight Key Night! (Photo courtesy K9WDY)

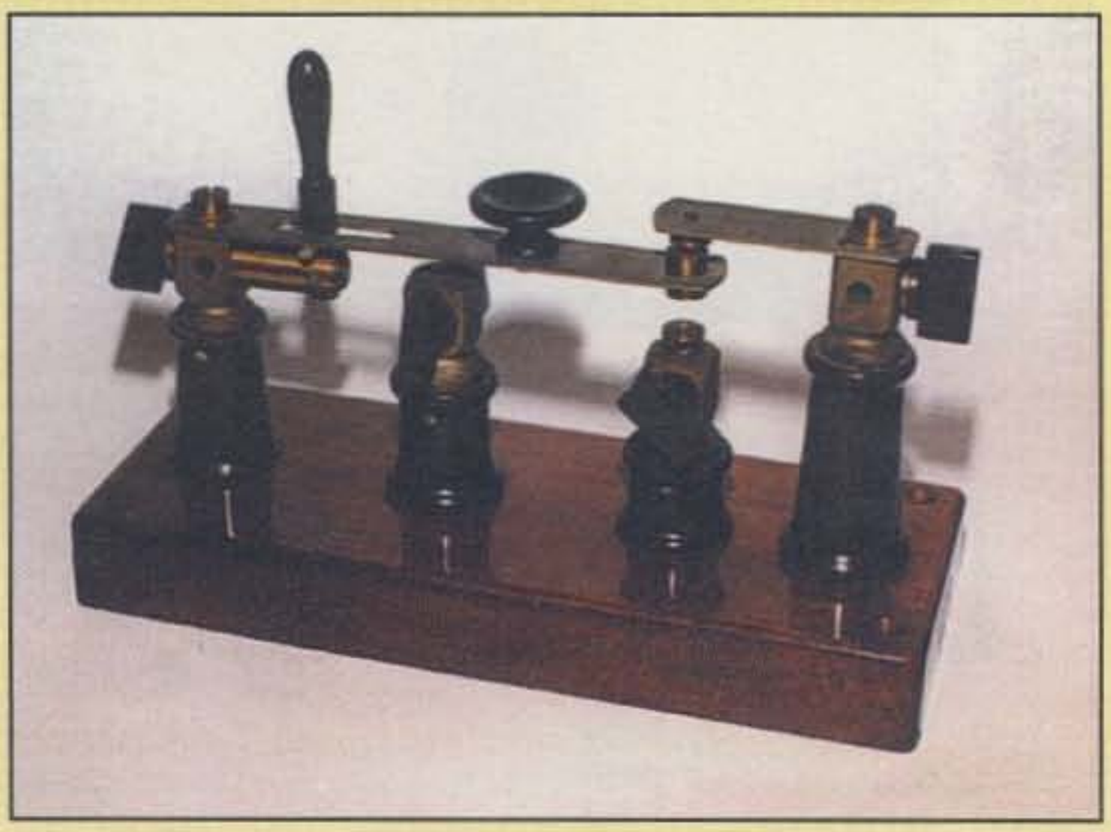


Photo 6– This unusual item is a Frankfurt Cable Key made by the Hartmann and Braun Co. It was designed for use with dual-polarity cable systems of the 1930s. The knob actuates the horizontal arm which "breaks" one circuit while "making" another circuit. (Photo courtesy K9WDY)

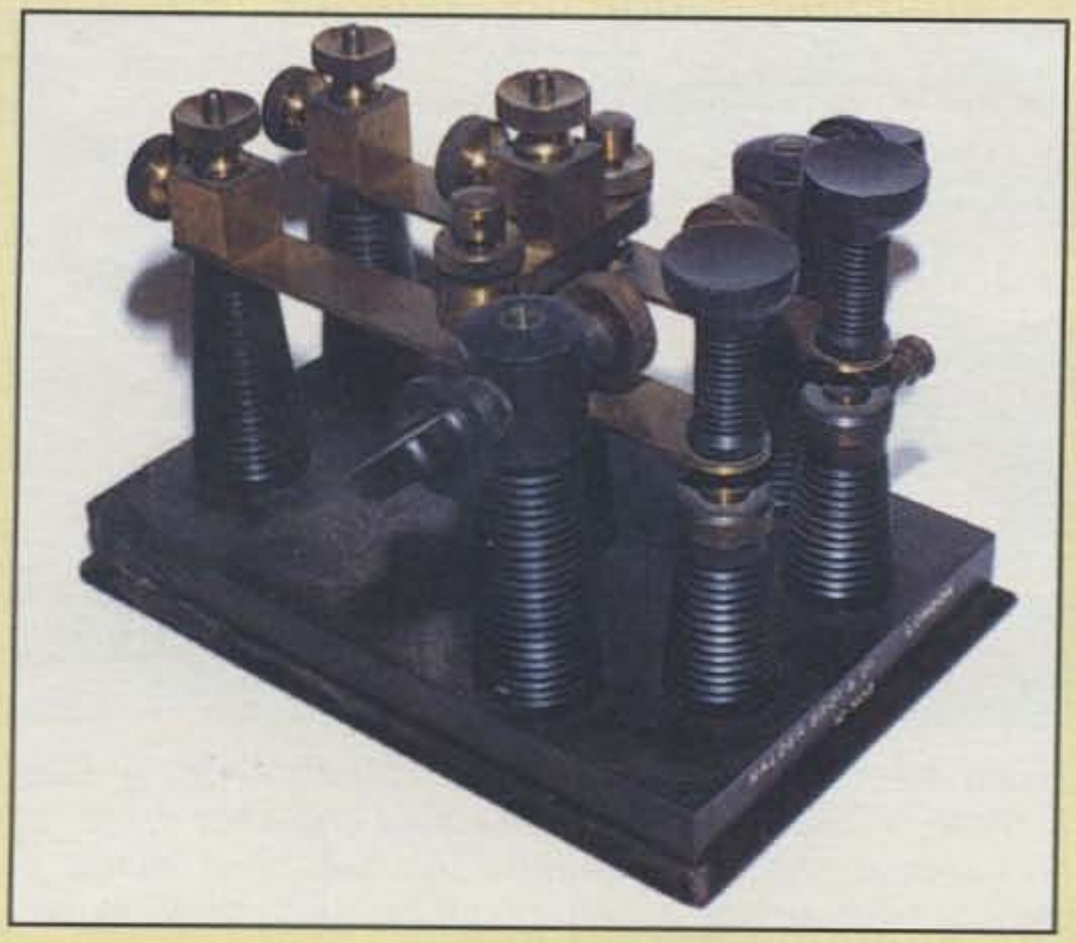


Photo 7– You are looking at a genuine London Cable Key made by Nalder Brothers and Co. of England. It was one of the very first Cricket keys. That's right—a Cricket key. You use your index and middle fingers to send dots and dashes "tabletop drummer style" with the little tyke. Hmm... separate wires could be connected to those two levers for interfacing with a modern electronic keyer. Now that really would make a killer paddle! (Thanks again to K9WDY)

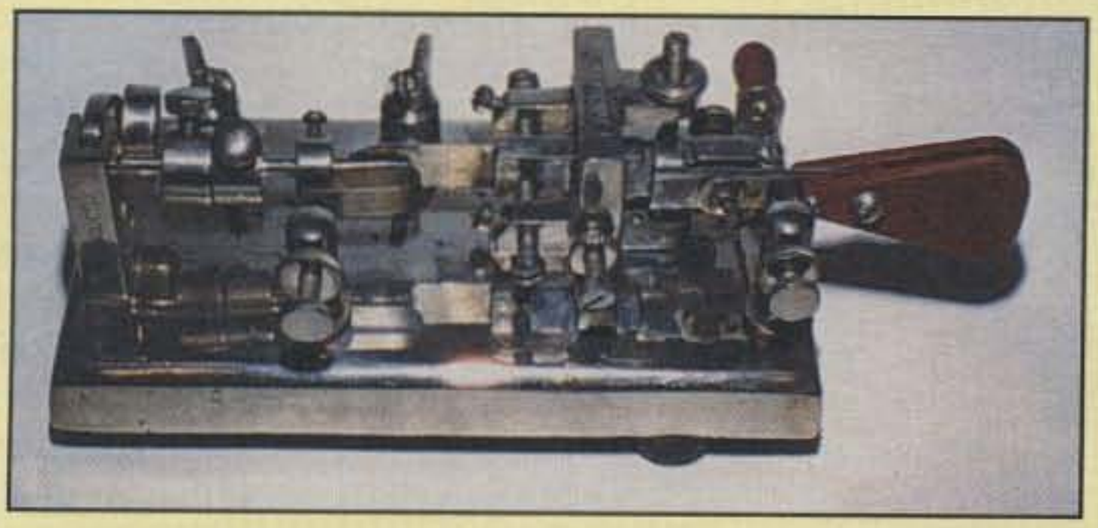


Photo 8– Shown here is the Canadian F. A. Wilcox bug from eras past. Note the manufacturer's name stamped atop the yoke/mainframe and on the side of the rear damper. The bug's combination of a stubby mainspring and short pendulum plus near fingerpiece pivot point should give it a distinctive feel. (Photo courtesy Gil Schlehman, K9WDY)

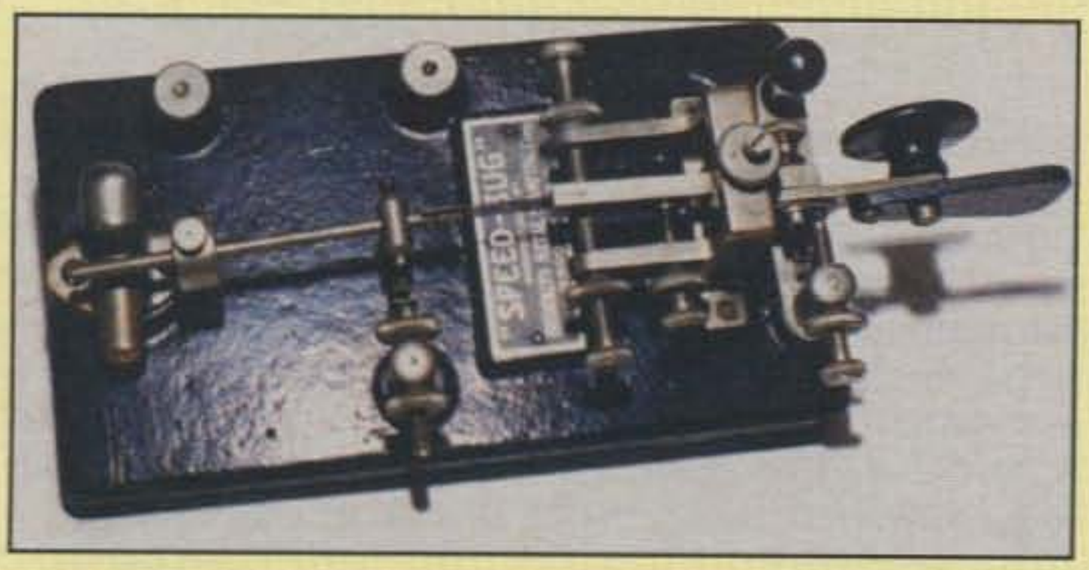


Photo 9– The main attraction of this Vibroplex "look alike" bug is its nameplate. Scrutinize it with your magnifier, and you will see it is a genuine "Speed Bug" made by the Brooklyn Metal Stamping Company of New York. (Photo courtesy Gil Schlehman, K9WDY)

Photo 10– Here is the rare, exotic, fully automatic Melehan Valiant. The pendulum assembly on the left makes dots, while the assembly on the right makes dashes. The two arms are linked to a single main arm fitted with fingerpieces. The key weighs 8 pounds and has 17 adjustments. This is CW operation supreme! (Photo courtesy Gil Schlehman, K9WDY)

Photo 12– This snazzy bug was homebrewed by Des O'Brien, ZL2UOB, from an unusual collection of parts and pieces. Most notable is the fact Des made it without ever seeing a commercially made bug! (Photo courtesy ZL2UOB)

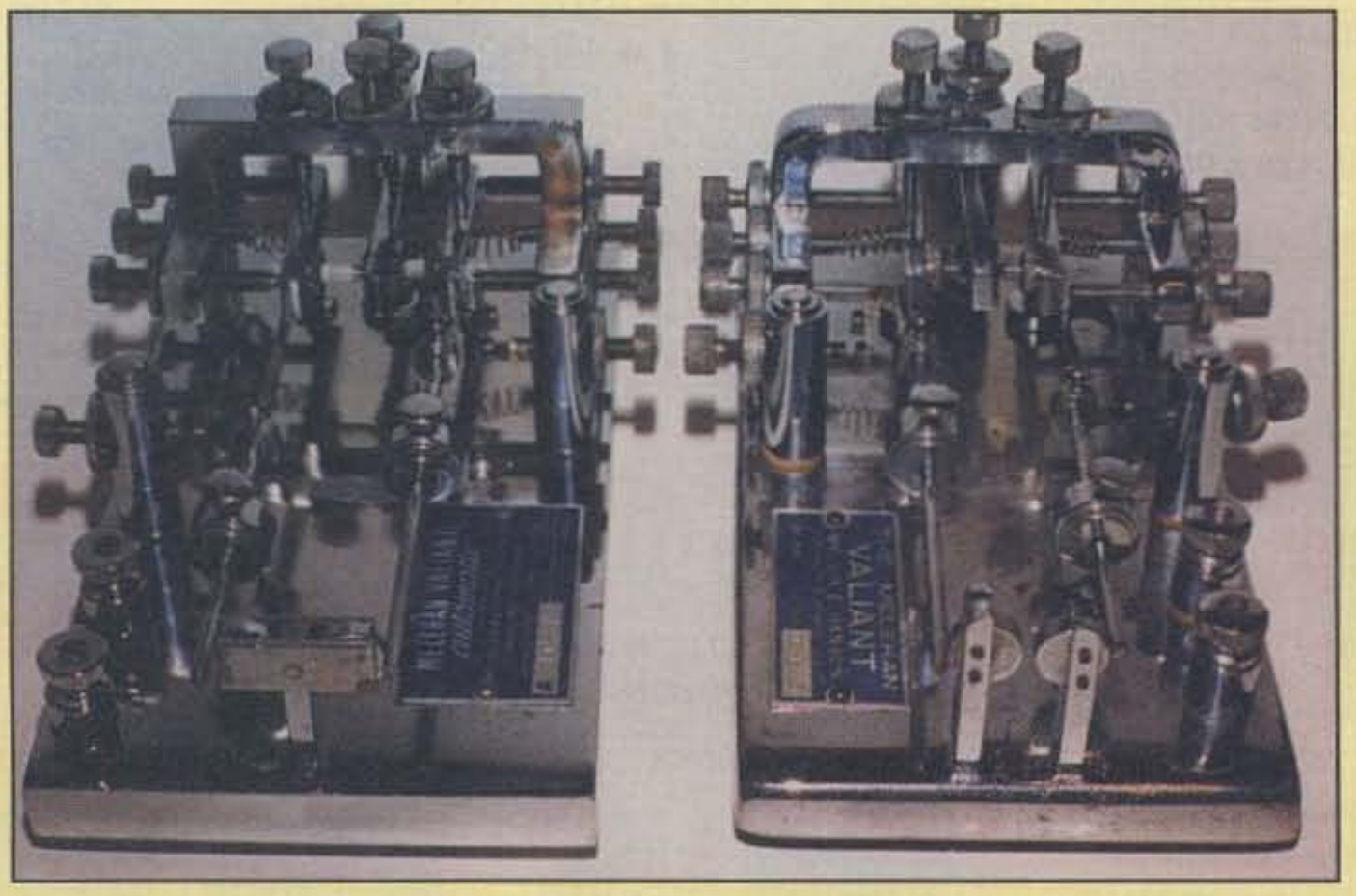


Photo 11– No, you are not seeing double. This is really two rare Melehan Valiants side by side. One is a left-hand model and one is a right-hand model. (Photo courtesy master collector Gil Schlehman, K9WDY)

a modification made by a previous owner), this bug could pass for a Vibroplex. The unique nameplate, however, marks it as a "copy cat" or "look alike" version and makes the key a genuine collectable.

Our views of rare, exotic keys from those golden days of yesteryear continue with the fully automatic Melehan Valiant bug shown in photo 10. This gem sports twin arms and pendulums—one for making dots and one for making dashes. How is that possible? Notice the thin, leaf-type mainsprings; the left one is short for making fast pendulum vibrations or dots, while the right one is long for making slow vibrations or dashes. Each spring's arm is linked to a single center arm, so moving the fingerpiece left and right makes both dots and dashes automatically, like a modern paddle and keyer. Now this is a genuine sizzling semi!

Melvin Hansen, W6MFY, made approximately 500 of these magnificent Valiants between 1939 and 1950. Only a few of them are now known left in existence. The one shown here is in absolute pristine condition and resides in the incredible key collection of K9WDY. In fact, Gil has not one but *two* of these rare bugs (photo 11). Close study reveals one Valiant is a right-hand version and the other is a left-hand version. Bug bliss for sure!

Wrapping up our bug bonanza is a fascinating true story I am sure you will appreciate. Approximately a year ago Des O'Brien down in New Zealand ordered a copy of my self-published *Keys II* book and immediately became infatuated with bugs. Des previously had not seen a semi-automatic key, but he quickly became driven to homebrew one—and to become a radio amateur. Working only from photos and sketches, he produced the impressive little bug shown in photo 12.

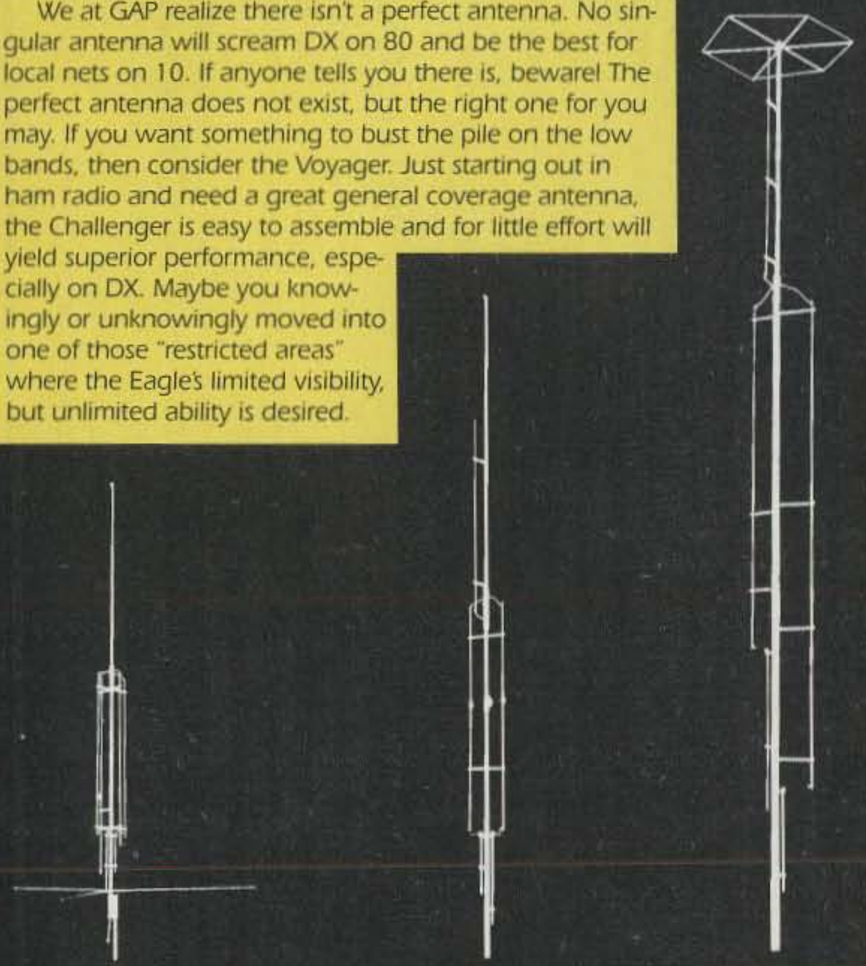
Here is a quick rundown on Des's adaptation of parts for the bug. The base is 80-year-old matai wood, polished and topped with a decorative brass panel from a 1930 radio. The pendulum and weights were salvaged from an old photocopier. The dot and dash contacts were cannibalized from some large relays, and their mating contact posts came from some extinct German telephone equipment. The rear damper assembly came from a hydro station, the knob is from a walking stick, and the thumbpiece is three piano keys. Now that's a real lesson in creative ingenuity!

Our key views could continue for many more pages, but we are once again overfilling allocated space and must bow out. Next month watch for Part II. It is a very special presentation of delightful miniatures. You'll love it! May the force of good signals be with you!

73, Dave, K4TWJ

GAP: The Perfect Antenna

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.



Eagle DX | Challenger DX | Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

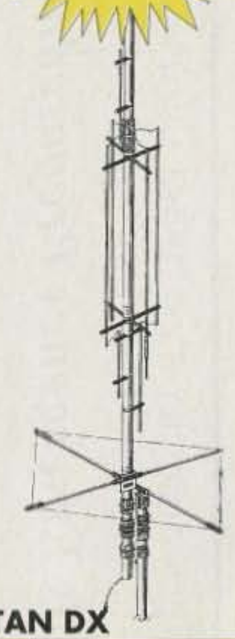
73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

Celebrating 10 Years 1989-1999



TITAN DX

This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$279
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$289
Titan DX			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$319
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

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Packet User's Notebook

BY BUCK ROGERS, K4ABT

Connecting You And Packet Radio In The Real World

Good Communications Equals Emergency Preparedness

Good communications equals emergency preparedness, but there's a lot more to consider. Having plenty of food, water, and the other essentials of life available is but the beginning of being prepared for disaster-related emergencies. There is another key element to the equation that now comes into play.

You soon will notice that this month's "Packet User's Notebook" is built around a topic that strays from the subject of packet radio or digital communications. In a sense, this is true. However, you will find this column is worthy of being placed into your notebook.

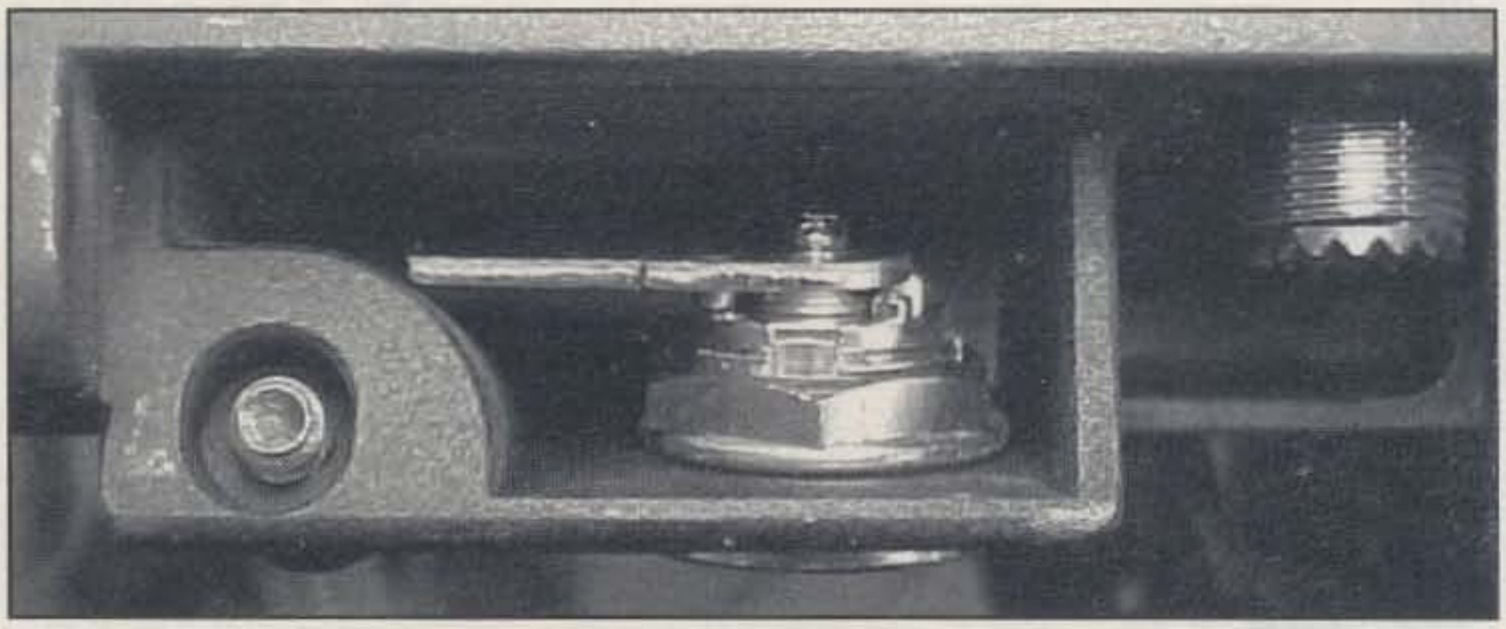


Photo A– As soon as you get the Torx screws out of the top and bottom covers of the RANGR, remove the lock. I use long-nose pliers to remove the large nut that secures the lock. Toss it, or use it for a paperweight. You won't need it again.

As Spring Approaches, So Does . . .

Spring will soon be here with everything in bloom, but along with the good things comes the unpredictable springtime weather. Our topic for this month is to be prepared with our emergency communications equipment, be it digital data or voice. Having said that, let's talk about the project we are about to undertake.

Operating 6 meter voice FM is one means of establishing good communications. In addition, there are many 6 meter voice repeaters now in operation.

Huh? You mean there are repeaters on 6 meters? Yes, this is a band some of us enjoy but don't shout about. Six meters is one of the best bands for good, long ground-wave communications, and it is also one of the best bands on which to experience frequent openings.

6 Meter Propagation

I've been using 6 meters for more than 50 years. When 50.4 MHz was the only crystal that many of us owned (remember the FT-243 encased rock?), there I was. The old two-element, bamboo cubical quad was my gateway into a fraternity that still exists. At first it was the 2E26, then came a more compact version of low-end VHF tube called the 5763. Don't ask me how it got its number—just trust me. I think the Heath Company in Benton Harbor, Michigan gave it a good workout in their "sixer," commonly referred to in those days as the "Benton Harbor Lunchbox."

Later I obtained a GE tube labeled the "6146." This is when my 2E26 at 15 to 20 watts was replaced with the 6146 to give me twice the power. Well okay. There were a couple of minor changes that I had to make to the 2E26 cathode circuit to enable the 6146 to draw more current. The first mod was to change the three parallel 330 ohm resistors to a single 47 ohm, 2 watt resistor.

It didn't take me long to realize that I also needed more current to support the added power output. As a matter of fact, as a young ham I learned a lot of real-time theory from that old 6 meter rig.

Before we move into to the crux of this month's topic, I should make mention of the 6 meter converter that we had ahead of our 3 to 30 MHz receivers. Many Hammarlund HQ-129, Hallicrafters S38 and S40, and National receivers had a converter attached to them to make them receive the first of the VHF ham bands.

I remember my first Hallicrafters S53 receiver. Now this was the next step in the learning curve that taught me "All that glitters is not gold."

I somehow convinced myself that if purchased a communications receiver that already had the 6 meter band built in, I'd be in "fat city." Not so! This turkey was as deaf as a doorknob. At best it was good for local communications on 6 meters, but that was it! The receive RF amplifier in this beast (if there was one) for the 6 meter band was, at best, poor to fair.

It took about three days for me to stop bragging about having a real 6 meter receiver and drag out my old (6AK5 – 6SN7, later to become a 6D5 NuVistor and a 12AT7) 6 meter converter (that output its 6 meter signal at 7 MHz) and attach it between the Hallicrafters S53 antenna terminals and the 6 meter antenna.

Back to the Future

Oh, how times have changed! That was in the days of AM (remember Amplitude Modulation?), now commonly called "Ancient Modulation."

We still have the good qualities of that band, but we also have the good fortune to have much better radios to cover this almost forgotten band. It may be almost forgotten by some, but it is very much remembered by those of us who enjoy the likes of a good ragchew.

Enter the Long RANGR™

No, I did not misspell either of the last two words in this sub-head. Typically, watt for watt the 6 meter FM transceiver with a comparable antenna will communicate over a distance that is almost half again as far as the same power at 2 meters will reach. There are several tables in many radio publications that will support what I just wrote. Having

115 Luenburg Drive, Evington, VA 24550
e-mail: <K4ABT@PacketRadio.com>

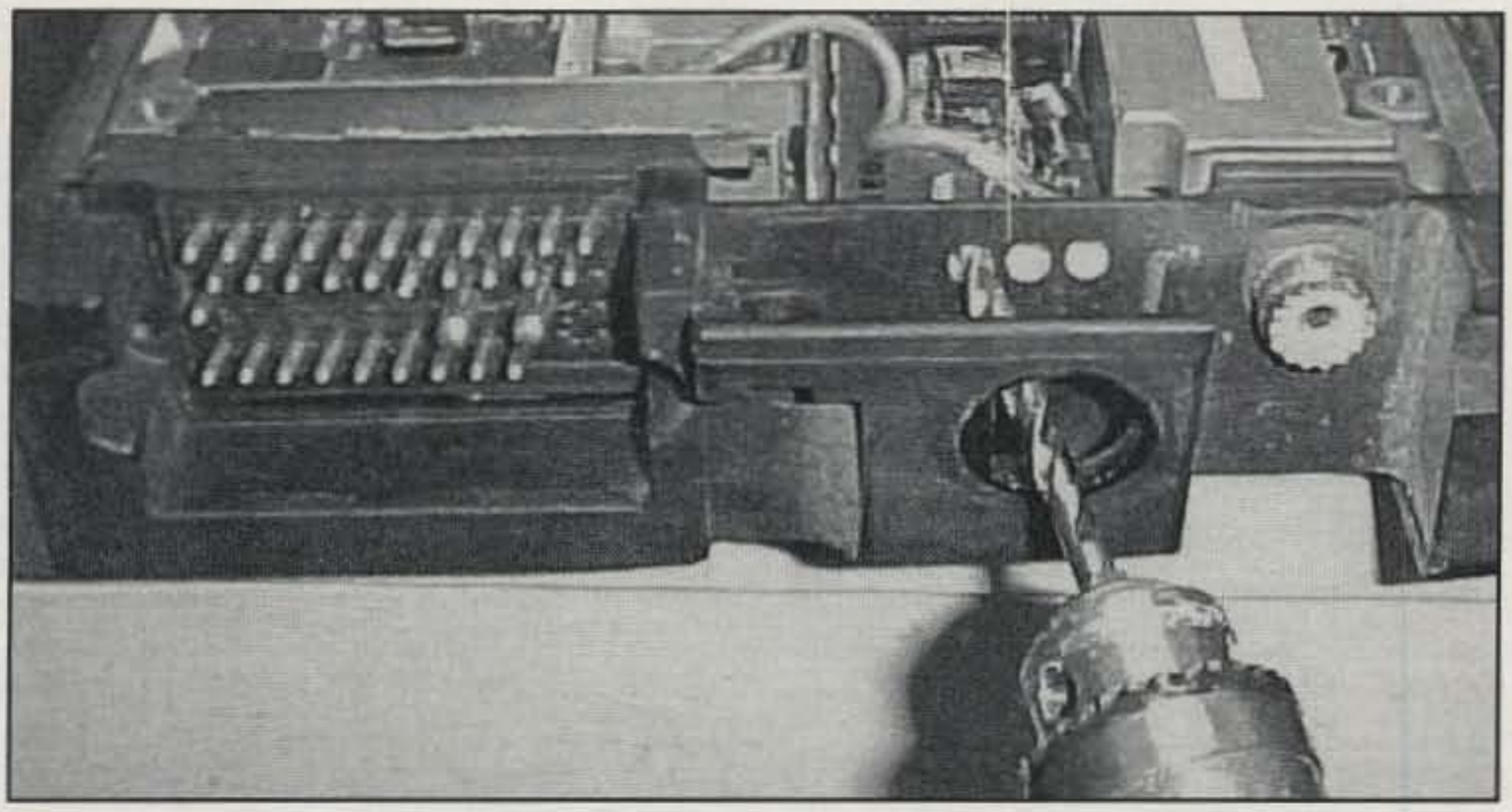


Photo B– Have the drill handy and loaded with a quarter-inch bit, one which is capable of drilling through aluminum casting. Carefully make the hole for the microphone cable. You have a choice of where to drill the access holes for the 12 volt DC power wires. I drilled the front of the RANGR for the mic entry point and the back of the RANGR for the DC leads.

said that, I must explain why more public-safety and public-service groups no longer use the low VHF bands for their communications medium.

Low-band VHF, as it is known, is more susceptible to sunspot activity. Out of each eleven-year sunspot cycle about five to seven years are destined to be cluttered with heavy, distant traffic. DX stations (1000, 2000, and sometimes more than 3000 miles away) are received as well as and often better than stations that are 20 to 30 miles away. Therein lies the problem for the public-safety and public-service user. This is why most law-enforcement, public-service, and other commercial radio users of these bands have moved away from the clutter of "low-band" VHF and into the 800 and 900 MHz frequencies, using various coded and encoded encryption formats.

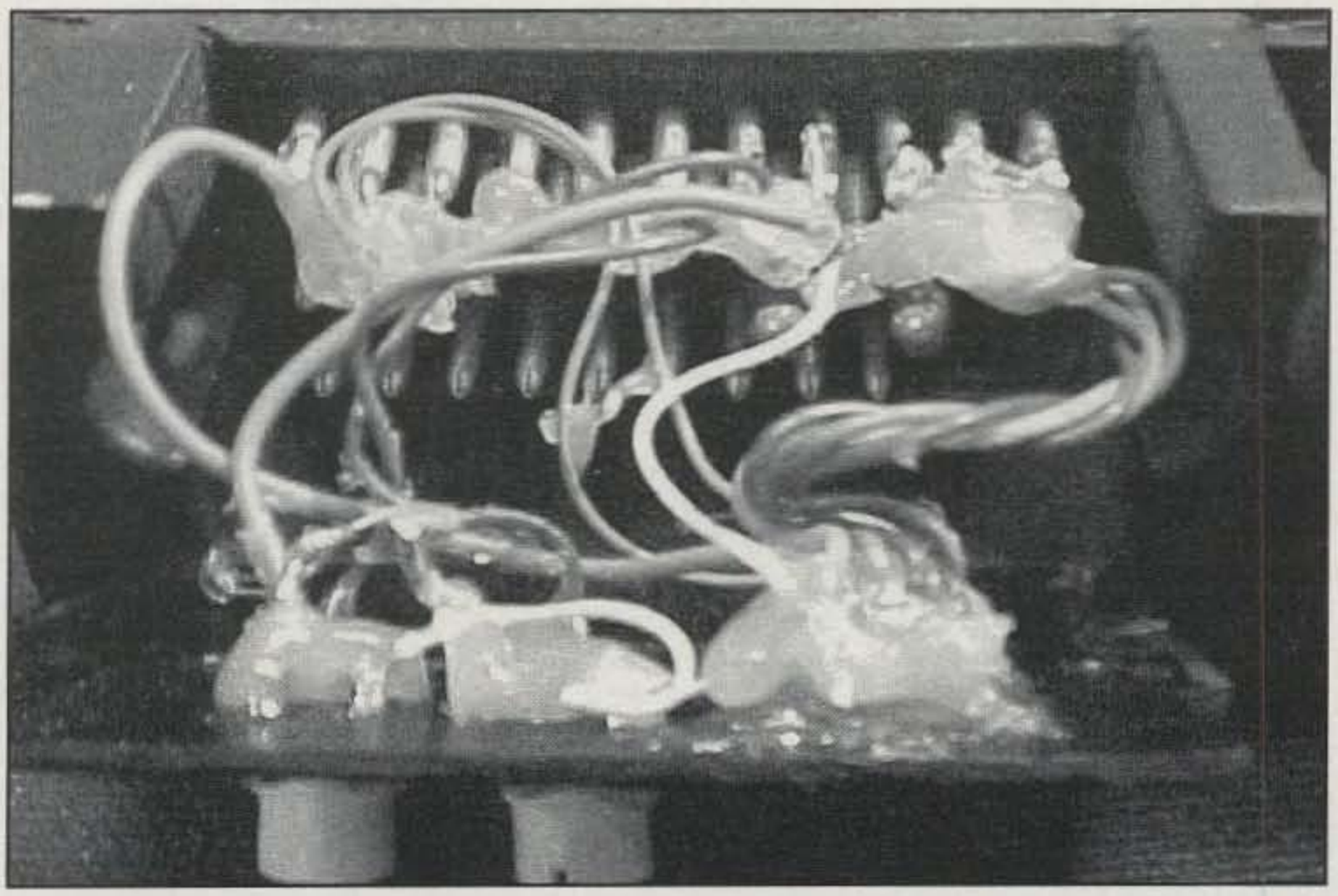


Photo C– The mini control head is built into a plastic RadioShack project enclosure box, part No. 270-1801. The control head is built as detailed in fig. 1. The above view is a bit obscured because I applied a generous portion of hot glue, or RTV, to provide some tensile strength to the small wires. Hot glue was also used to attach the mini control head to the front of the RANGR as shown in photo H.

In the two-way communications industry we refer to the commercial low-band and 2 meter VHF bands as *conventional* two-way radio bands.

As the commercial radio users move away from the low VHF bands in favor of the more stable communication frequencies, we find that more and more of these low-band radios are coming into the amateur radio marketplace. Fleamarkets and hamfests such as Shelby, North Carolina and the Dayton Hamvention are good places to look for them. Since Dayton is only a couple of months away, keep this issue of *CQ* and next month's, too, in a safe place. You'll need them when you return home.

One of the radios (transceivers) which shows up at hamfests is the GE (ComNet-Ericsson) RANGR™.

What's in a Model Number?

Our topic this month is built around the low-band (high split) GE RANGR™. For our reference, we'll call it the model 138-B. There are several others in this family of low-band RANGRs, and for the record, I'll mention them so that you are aware of which is best for our 6 meter FM project. There are the 162 and 169 A and B versions, which we will *not* discuss. Then there is the more versatile 138 series. The model 138-A is the low split 29 to 42 MHz, 60 watt version, and the 139-A is the low-split (29–42 MHz), 110 watt version. These make good 10 meter FM transceivers. However, this column will refer to the RANGR 138-B (60 watt) and 139-B (110 watt) 35 to 50 MHz versions.

A Picture is Worth A Thousand Words

To save you a lot of reading and make this project easier for you, I am presenting photos and drawings in lieu of confusing you with a wordy document. If you just happen to have a GE Communications LBI-31619-D or similar revision, you may wish to use it as an adjunct to the steps where we make changes in the RANGR 138-B.

I'll give you the "cooks" view of the finished control circuit before we begin the rest of the modification. It will be in the form of a pictorial diagram—sort of a duplication of terms, but after you look at the diagram, you'll better understand my description. I created fig. 1 using AutoCAD 14, and I'll explain why I used component symbols integrated in the drawing. As you study the figure, you'll find there is a wealth of information imbedded therein. By carefully going

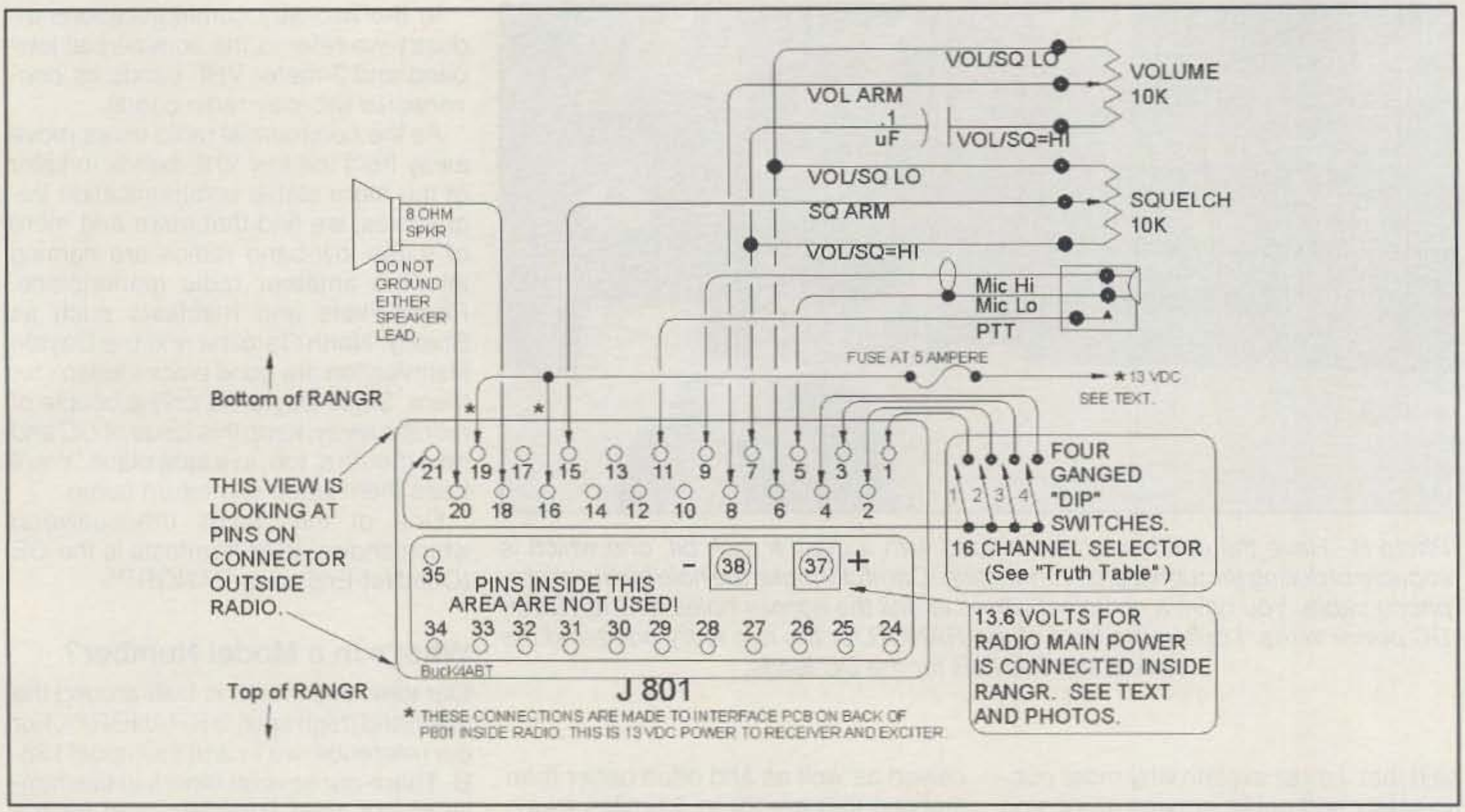


Fig. 1– Study this drawing. As you will soon discover, it represents the heart of the project you are about to undertake. In addition, it will help you better understand my dialog throughout the text. As you study the drawing, you'll find there is a wealth of information embedded in the drawing that relate to the photos.

over the drawing, you'll find it easier to understand the photos that follow.

Always Test Before You Begin Modifying

Connect the RANGR to the control head and cable it to the dummy load and power source. The tests and mods will require that you have either a 20 amp, 13 volt DC supply for the model 138-B, or a 30 amp, 13 volt DC supply for the model 139-B.

If you don't have the control head and cable harness for the RANGR, take the unit to your friendly GE service shop and ask them to give it a quick test using their RANGR test set.

Before we get too deep into this project, and while you are testing the RANGR to make sure it is in good working condition, go to the RF PA section and use RV1 to reduce the power level to around 20 to 30 watts. This will make more sense later when you are testing the transmit and setting the transmit VCO.

Once you're sure your low-band, high-split RANGR is working okay, go ahead and build the control head as described in fig. 1. Photo C is a view of the condensed control head built according to fig. 1. This view may be a bit obscured, because I applied a generous amount of hot glue, or RTV, to provide some tensile strength to the small wires. The mini control head is built into a plastic RadioShack project enclosure box (part No. 270-1801).

The wire size and length are not etched in stone. However, it is good to have an idea of what kind of wire size and type to use for the control-head construction. I used stranded, insulated, and tinned wire similar to #20 or #22 AWG. The length of each wire in the control head was approximately 6 inches.

To make all the mini control head connections easy, I pre-solder-tinned all the pins of J-801 that were to be used, and I pre-tinned all the wire leads. In every case I only cleared about 1/16 to 1/8 inch insulation from each wire. Make all the connections to the mini control head first. Double check all connections and ensure that each connection follows the drawing when the interface is complete.

Building the Bit Bucket

Compile a list of the most-used 6 meter frequencies in your area. Ask local hams for the input and output frequencies of the local repeaters. Be sure you include the local simplex frequencies. Most of all, be certain to include the nationwide calling frequency of 52.525 as one of the frequencies in your listing.

Please note: This next section applies only after you have programmed the RANGR or had the 2212 EEPROM programmed by someone. Many of us use the GE suitcase programmer, and others use the GE TQ-3330 programmer. Many ComNET-Ericsson (GE) two-way service shops will have the latter and will program the 16 channels into the 2212 EEPROM for a small fee.

There are other programmers, and one is made by Niles Radio company. I don't have any information to support the Niles Programmer moving these radios into the amateur bands. There is a disclaimer in the company's software that states the programmer may not support amateur frequencies. You can visit their web site at <http://www.nilesradio.com>.

There is another site which may be of help to you, and it is supported by my friend Gary Marsh, VO1CPU. When making your 2212 EEPROM for some GE two-way radios, go to <http://home.thezone.net/~marsh/>. Gary is always looking for good data to support his EEPROM programmer projects. If you have supporting information he might be able to use, e-mail him at: <gmarsh@thezone.net>.

Important note: It is well known that when configuring the frequency list into the RANGR and Delta EEPROM

(2212), the <Enter> key will cause the programmer to display "Out of Range." When using the suitcase programmer, use the "Insert" key. When using the TQ-3330 RANGR and Delta PC programmer, use a "Ctrl-E" instead of the <Enter> key. This technique will force the programmer to allow the entry of amateur band frequencies.

Enter the Can Opener

First of all you must get into the RANGR, and the rest then is easy—or so it will be after you're finished. As soon as you get the Torx screws out of the top and bottom covers of the RANGR, remove the lock. Aww . . . It's a piece of cake. I use long-nose pliers to remove the large nut that secures the lock (see photo A).

You will need several Torx screwdriver blades from type 10 to type 40. Most WalMart, K-Mart, Lowe's, Big Lots, Sears (Craftsman), and, most definitely, RadioShack stores carry an assortment of Torx screwdrivers.

Modification of the Low-Band, High-Split RANGR for 6 FM

Transmit VCO Setup (lock) Procedure. If you are referencing some of the information from LBI-31619-D or the synthesizer maintenance manual, you'll find this phrase somewhere in the text: "*The synthesizer is factory aligned and should not require further adjustment.*" Yeah, right! That only applies when using the GE RANGR in conventional commercial service, as built.

The next phrase applies more appropriately to our modification, or when we attempt to move the low-band, high-split outside the frequency(s) for which it was intended. Read on: "*Should it become necessary to adjust the synthesizer, please refer to the Maintenance Manual LBI-31714 and the 'Frequency Synthesizer' section.*" This will familiarize you with the operation of the VCOs and make the alignment procedure more understandable.

The label on the cover of the synthesizer must be removed, or go ahead and poke hole in it as I've shown in fig. 2 and photo D. There are holes in the casting below the label that allow you to access the adjustable components through the existing holes in the shield. Again, these hole locations are shown in photo D.

Select the highest frequency transmit channel in the split (50 MHz). With a 50 ohm (200 watt) load on the antenna connector J3, key the radio.

Adjust CV202 until the lock detector indicator CD7l0 goes out. Monitor TP201 with a digital voltmeter and ad-

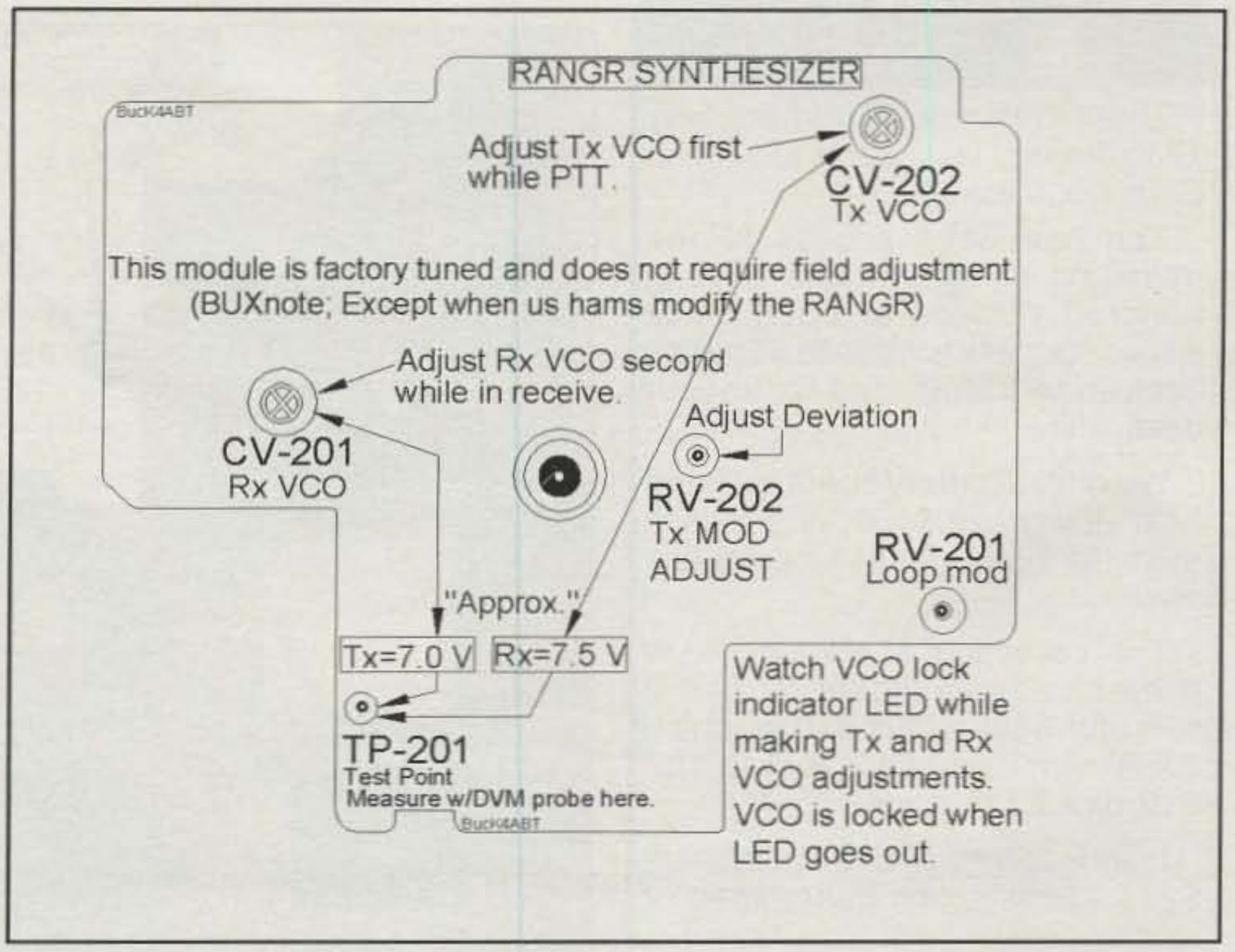


Fig. 2– The label on the cover of the RANGR synthesizer should be removed, or do as I did and poke holes in it as I've shown by the hole locations. There are holes in the casting below the label that allow access to the adjustable components. For a different view, see photo D.

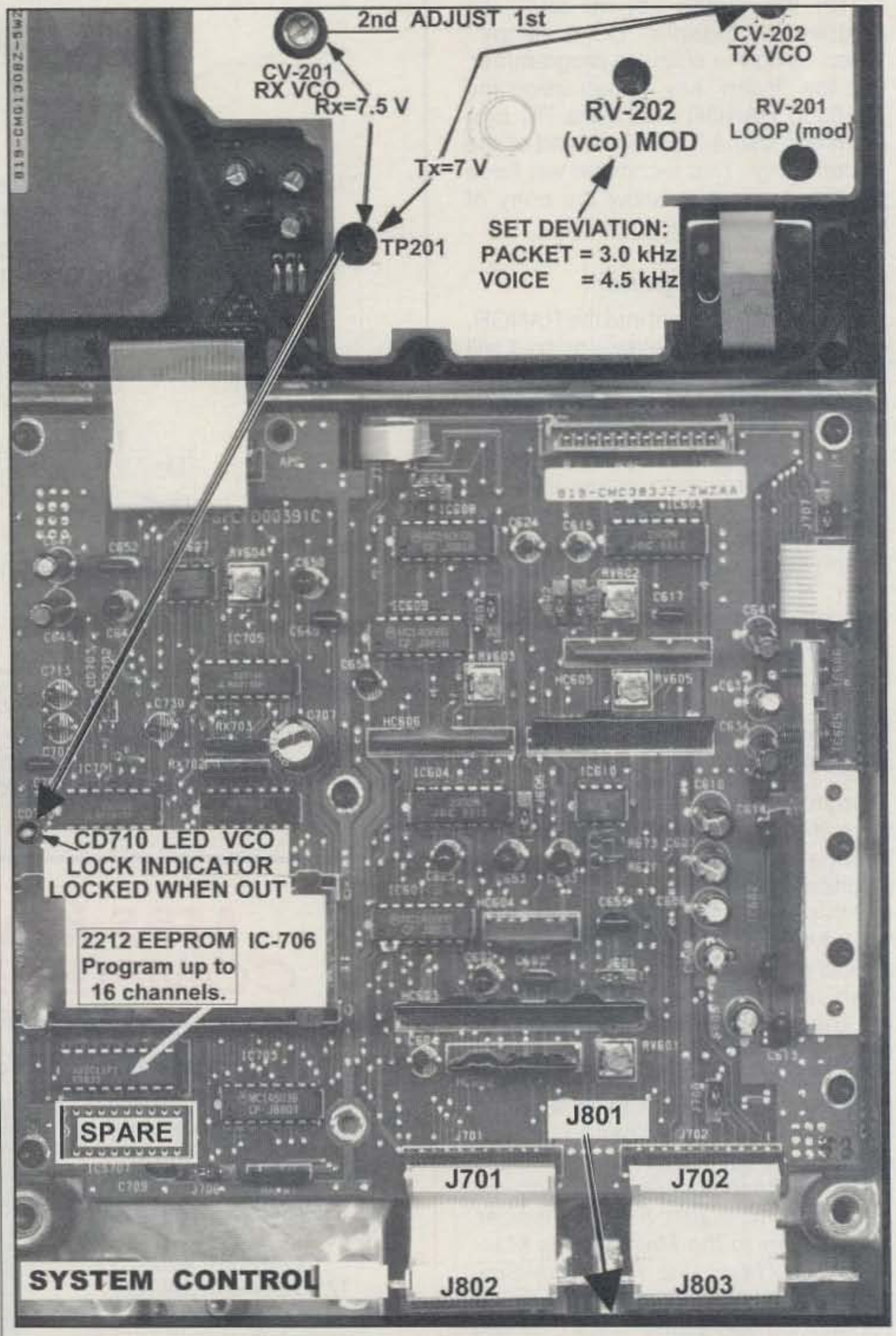


Photo D– The interface board is the small PC board where J802 and J803 are connected. It can be removed by first removing the ribbon cable connectors from J-802 and J-803 shown above, then turning the RANGR over and removing the two Torx screws from the brass flashing that secures J-801. Notice also the location of the "spare" IC socket. For more about the IC socket, see the text and Table I.

just CV202 for a reading of *7.0 +0.5 VDC* for the high split (50 MHz) board. *Check that LED CD710 remains out.*

Feel the heat! Then unkey the radio, as in—*release the mic PTT!*

Receive VCO Setup Procedure

Select highest receive channel in the split *as in Step 1* (release PTT switch). *Adjust CV201 until lock detector indicator CD710 goes out.* Monitor TP201 with a digital voltmeter and adjust CV201 for a reading of 7.5 +0.1VDC. *Make sure that CD710 remains out.* Select each receive and transmit channel. Voltage at TP201 should be between *3.5 and 7.5 VDC.*

Oscillator Frequency Setup

Monitor Tx injection at J207 and Rx injection at J209—Tx injection –3 to +6 dBm; Rx injection –3 to +6 dBm. This

Truth Table

Bits	CH#	Tx MHz	Rx (MHz)	Bits	CH#	Tx MHz	Rx (MHz)
0001	1	52.525	52.525	10001	17		
0010	2			10010	18		
0011	3			10011	19		
0100	4			10100	20		
0101	5			10101	21		
0110	6			10110	22		
0111	7			10111	23		
1000	8			11000	24		
1001	9			11001	25		
1010	10			11010	26		
1011	11			11011	27		
1100	12			11100	28		
1101	13			11101	29		
1110	14			11110	30		
1111	15			11111	31		
0000	16			10000	32		

Table I– The bit structure for channels 17 through 32 in the truth table is for reference only. To activate channels 17 through 32, an 18-pin socket is required at the location in photo D designated as "spare." A switched lead (SPST) from pin 30 of J-801 to ground activates mode 2, thus enabling the channel selector to select the additional 16 channels.

step assumes the frequency is measured when the transmitter is first keyed. If delayed, the rapidly rising ambient temperature must be taken into consideration.

Press the PTT switch while monitoring the Tx injection frequency at J207. Adjust the Freq Trim Control on VCTGXO for the assigned channel frequency within +0.5 ppm.

Note: Assuming you've set the "Freq Trim" correctly, the receiver injection frequency will *automatically be correct.*

If you don't have an IFR 1200S or IFR 120B communications analyzer sitting around, then a receiver or scanner that covers 50 to 54 MHz is always a good test monitor to have at your work station. *"Work station?"* You know: That's the new politically correct way of saying "work bench." Another item that will help make the modification easier is an RF frequency counter.

A more important service tool is the handy-dandy dummy load that we all have sitting around the ham shack. Since we are working on the model 138-B and 139-B RANGRs, let's be sure our dummy load and wattmeter will handle at least 150 watts, for the low-band VHF frequencies through 6 meters.

Connect the lead's control head to the radio. Connect the radio and head to the power supply.

Have the drill handy and loaded with a quarter-inch bit—one capable of drilling through aluminum casting (see photo B). Carefully make the hole for the microphone cable. You have a choice when making the access holes for the 12 volt DC wire in the RANGR. I drilled the front of the RANGR near the mic

entry point, but later decided to enter the DC feed at the back of the unit. I made the connections to the same points where the red and blue leads were removed within the radio (see photo E).

The wire size for the 60 watt RANGR DC power lead should be capable of delivering around 20 amps of current at 13.6 volts during transmit. For the 60 watt RANGR I used #12 stranded, insulated wire, red for the positive and black for the negative leads. I used a bussman fuse holder (available at WalMart or RadioShack) and installed a 20 amp fuse in the holder. The 60 watt RANGR draws approximately 15 amps during transmit.

Hard-Wiring the Microphone

At this point in the modification you may wish to include a mic connector. I didn't have one handy, however, so I opted to hard-wire the mic directly to the J-801 printed-circuit interface board (PCB).

This interface board is easily taken out by first removing the ribbon cable connectors from J-802 and J-803 on the bottom of the RANGR (see photo D) and then turning over the RANGR and removing the two Torx screws from the brass flashing that secures J-801 (see photos F and G). While you're looking at photo F, you can get an idea of how I made the mic connections.

The ferrite beads are optional, but just to be on the safe side I used them to counter any RF feedback (squeals). In this case, I didn't have the No. 73 Amidon beads handy, so I used a couple of hex-holed, ferrite tuning cores extracted from an old, trashed IF can. One bead was slid over the mic audio input at pin 9, and one was placed on the VOL/SQH HI lead.

To pique your interest, the VOL/SQH HI lead can be traced back to the "System Control" PCB and to TP1. The reason I make this point is to give you a "heads up" to be sure you read next month's "Packet User's Notebook." In that column we'll perform a few minor additions to this mod and turn this same RANGR into a trio of ham radio modes: voice, 1200 baud AFSK packet, and 9600 baud DFSK packet.

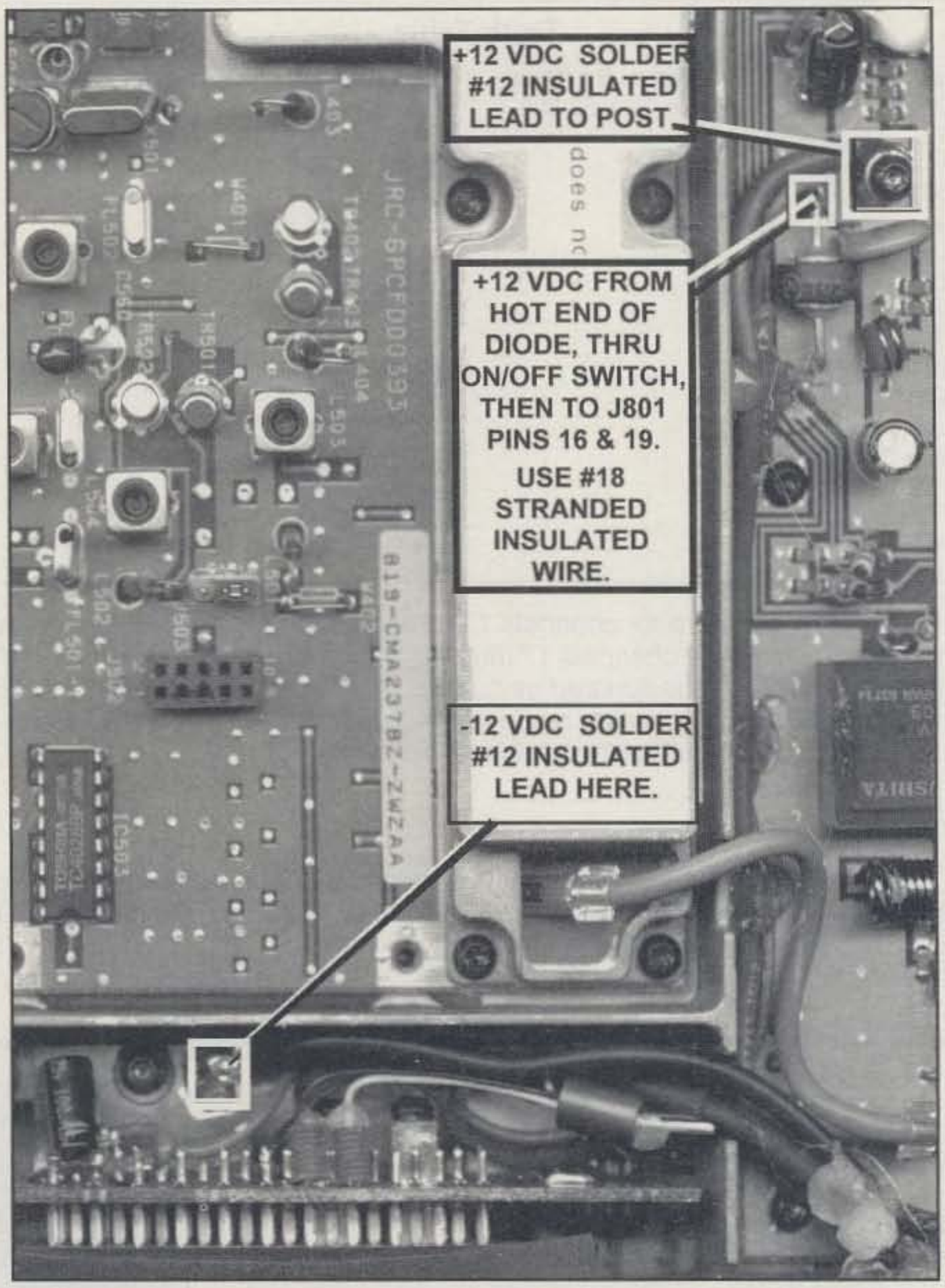


Photo E– The DC power connections are made to the same points where the red and blue lead ends were removed within the radio. This photo illustrates the solder bond connection of the negative lead to the brass flashing (see small square at the bottom of the photo). This photo also displays the microphone cable routing and connection points. The mic cable entry hole is at the bottom right of the photo. I love that hot glue.

The Truth is in theTable

The truth table, shown here as Table I, is executed using a binary switch, be it thumb-wheel, four of six position DIP switches, or hexidecimal rotary switch, 0 through F. In no case do we try to use a BCD switch, unless your head has need for an aching.

Although I've shown the RANGR truth table for 32 channels, in the radio I converted for this article I used only 16 channels. Most RANGR radios you find will have a spare EEPROM socket as shown in photo D. By adding another 2212 IC socket in the "spare" location, popping another 2212 EEPROM with an additional 16 frequencies, and switching pin 30 of J801 to ground, you can realize an additional 16 channels or frequencies for a total of 32 channels of 6 meter FM fun.

In next month's column I'll describe how to include an interface for packet use. This will require that you include a few frequencies for packet operation in your frequency list when flashing the EEPROM(s). Not only will I show you how to include the interface for standard 1200 baud packet, I'll also show you how to make your RANGR operate all three modes: FM voice, 1200 baud AFSK packet, and 9600 baud DFSK packet.

The external speaker, shown in photo H, is an MFJ model MFJ-281 and comes equipped with a 3.5 mm plug. The speaker jack that is mounted in the mini control head is a two-conductor, 1/8 inch (3.5 mm) mini phone jack (open-circuit type) RadioShack, P/N 274-251C.

Bragging Rights—You Did It!

Now you can tell the world above 50 MHz that you are no longer "just the

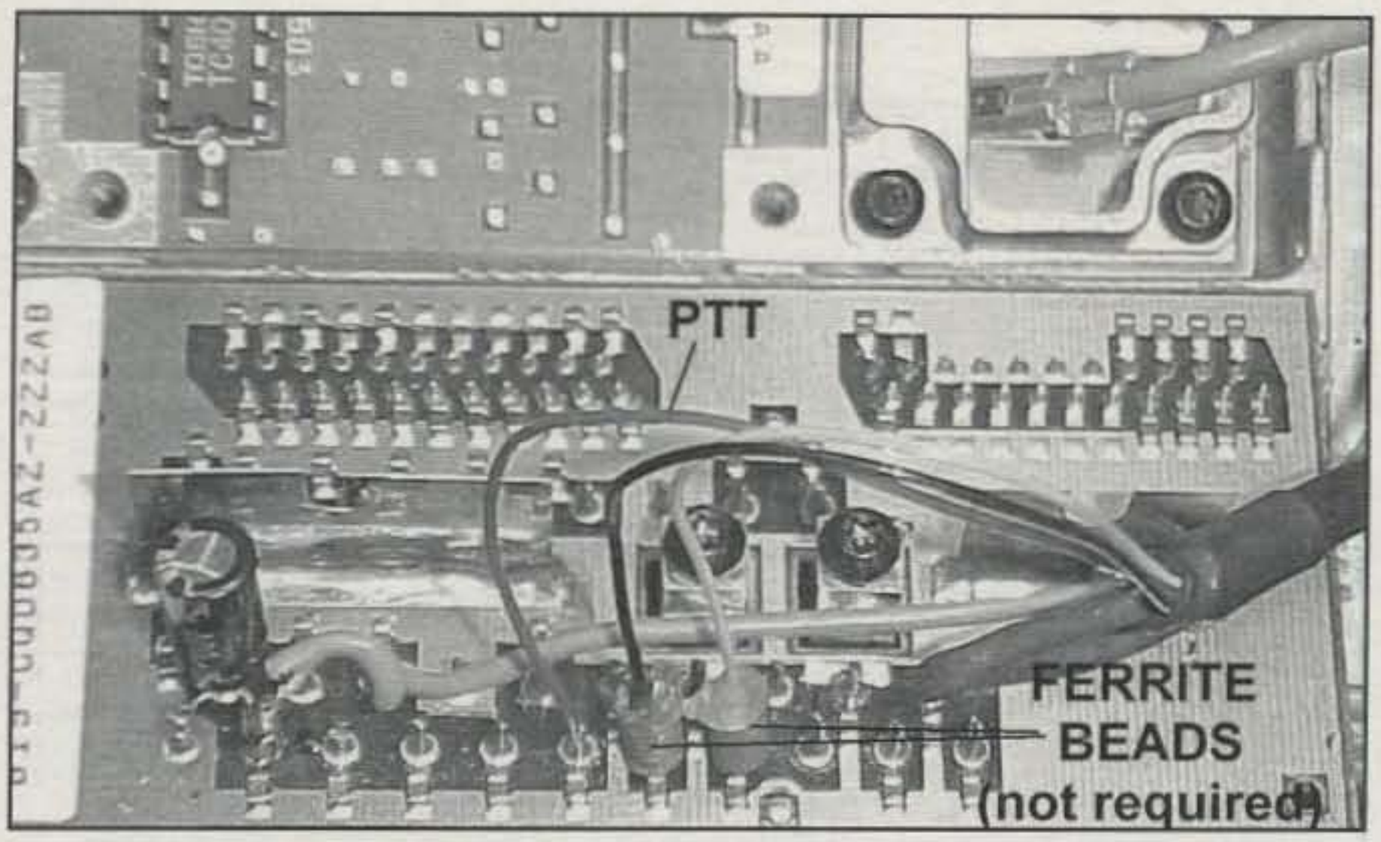


Photo F– The photo above will give you an idea of how the mic connections are made. The ferrite beads are optional, but just to be on the safe side, I used them to counter any RF feedback. I used a couple of hex-holed, ferrite tuning cores extracted from an old, trashed IF can.

holder of an amateur radio license." You are now a *ham* radio operator. You can be proud of the finished product (see photo H).

You've soldered, tweaked, toasted your finger at least once with the soldering iron, dropped a blob of hot solder in your shoe, said "oh darn" (Yeah, right!) a couple of times, and . . . Whoops! Remember RV-1; don't forget to return the power of your newly modified 6 meter RANGR up to 50 watts (MOL). I know it's a 60 watt radio, but since we hams are prone to be a bit long winded, let's save the RF PA transistors.

Fifty watts will cover a lot of territory, and with a couple of stacked "Arrow" 6 meter beams, wow! There's a lot of real estate to be covered. Besides, remember that 2E26 rig I told you about earlier? That was 15 watts, and even worse. It was AM, and I could talk 50 to 200 miles on a clear night using a 2-element bamboo quad.

My thanks to Ben Jones, KB4MPX, and Bill Glahn, AD4YY, at New London Technologies for their assistance in putting together this month's column.

Visit: <www.PacketRadio.com> or <www.AmateuRadio.org>. In Y2K we are having fun already!

73 de BucK4ABT

e-mail: <k4abt@PacketRadio.com>
<k4abt@AmateuRadio.org>

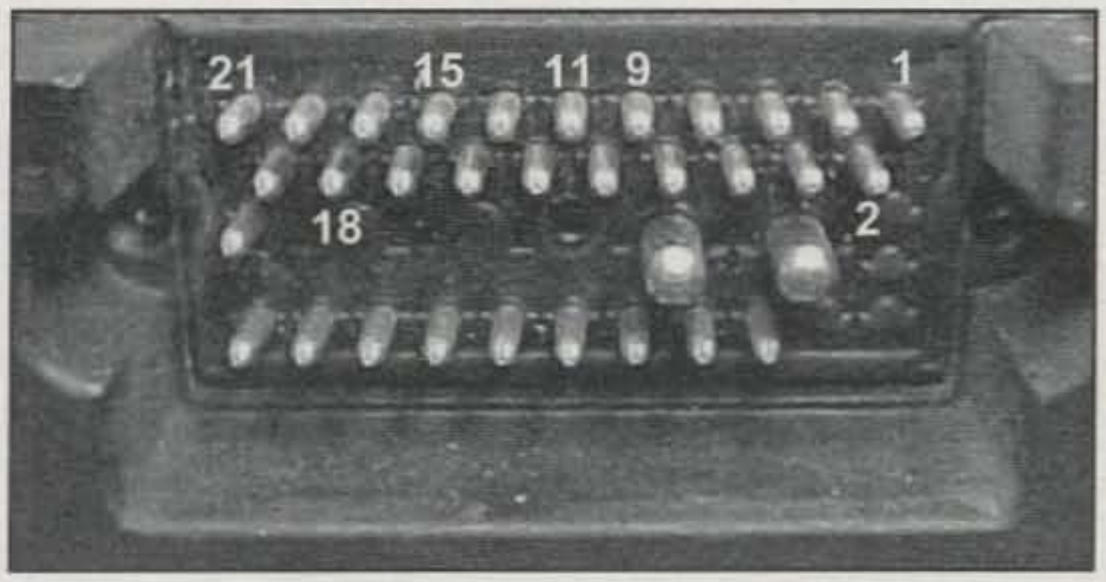


Photo G– This photo will provide you with the pin layout of J-801 so the mini control head connections will be easier to locate. To make soldering the connections easier, I pretinned all the pins of J-801 that were to be used, and pretinned the ends of all wires associated with the mini control head. I cleared about 1/16 to 1/8 inch insulation from each wire. Make all the connections to the mini control head first. Double check all connections and ensure that each connection follows the drawing when the interface is complete.

Photo H– You did it! Now you've earned the bragging rights. There's the finished product. You've soldered, tweaked, toasted your finger at least once with the soldering iron, dropped a blob of hot solder in your shoe, said "oh darn" at least twice. Now let's go have fun above 50 MHz.

Reader Feedback

219–220 MHz: A Difference of Opinion

"Reader Feedback" is another CQ VHF *feature that is being brought into* CQ *as a result of the merger of the two magazines in January. Letters in "Reader Feedback" generally are longer than we can fit into our regular letters column and relate specifically to an article in a past issue. Our first "feedback" comes from ARRL Executive Vice President Dave Sumner, K1ZZ.* —W2VU

Dear *CQ*:

Congratulations on the first issue of the combined *CQ* and *CQ VHF*. I am looking forward to seeing the direction the new columns will take in the coming months.

In Buck Rogers' January "Packet User's Notebook" there is a puzzling reference to the ARRL "not having moved to coordinate [the 219–220 MHz channels] or allow others to do so." I am pleased that Buck recognizes and has called attention to the potential of these frequencies. The ARRL worked hard to obtain access to this band as partial compensation for the loss of access to 220–222 MHz. That being the case, it is a bit surprising that the ARRL would be identified as an impediment to its use.

To recap the situation briefly, the primary occupant of 219–220 MHz is Automated Maritime Telecommunications Systems (AMTS). The amateur allocation is on a secondary basis, which means we cannot cause harmful interference to the primary user and must accept any interference caused to us by the primary user. We must do the same with respect to primary users of adjacent bands. Amateur use is limited to point-to-point fixed digital message forwarding systems with bandwidths of no more than 100 kHz and power output of 50 watts or less. Amateur stations within 640 km of an AMTS Coast Station must notify the station in writing at least 30 days prior to beginning operations. Amateur stations within 80 km of an AMTS Coast Station must get written permission from the AMTS station before beginning operations. Also, the FCC requires that amateur operators intending to use the band provide written notification to the ARRL at least 30 days in advance, for inclusion in a database. The ARRL can provide information on the location of AMTS Coast Stations.

In some parts of the country, AMTS activity precludes amateur use of the band. In other parts, AMTS is not an impediment and we could be making more use of the band than we are. Any amateur with a serious interest in using 219–220 MHz is invited to obtain additional information from Tom Hogerty, KC1J, at ARRL Headquarters, 225 Main St., Newington, CT 06111, e-mail <thogerty@arrl.org>.

Sincerely,
David Sumner, K1ZZ
Executive Vice President, ARRL

CQ Packet Editor Buck Rogers, K4ABT, responds:

It would be thoughtful of David and the League if they would make this "additional information" available to all packet radio users.

If you go to the ARRL web pages, you will note that no mention or search will render any information regarding packet radio. Instead of searching on "PACKET" at the ARRL pages, one can use "AX.25" as the search word, and even it will route the user to a TAPR (Tucson Amateur Packet Radio) page ... not an ARRL page.

I am well aware of the "shared frequencies" with the inland maritime services. However, the League has not taken the time to explain how one might go about getting a node or station "coordinated" within this band of frequencies that it claims to have spent so much time "trading" for.

David might consider using the ARRL voice (*QST*) to make the information fully open to the packet radio community... as it would open a new world of digital communications and give packet radio the shot-in-the arm to make it one of the biggest booms to amateur radio since the FM repeater.

Just imagine, David.... what it would be like to have amateur aadio have its own internet... open only to licensed amateurs... and with 100 kHz channels; this would allow upwards of 64 kb... and that, David, would make you something of a *hero,* as this would enable the ham radio operator to experience speeds that would rival—or exceed—the 56 kb of the current-generation V.90 internet modems.

Think about it... ham radio needs your support. The ball has been in your court since 1995... and there it lies today... in Y2K.

SPECIAL UPGRADE OPPORTUNITY

Beat the Deadline!

Will you be ready to upgrade when new rules take effect on April 15?*

NEWS FLASH — *FCC Eliminates 13 and 20 WPM Morse Code test!*

The FCC has announced changes that will streamline Amateur Radio licensing. Beginning April 15, 2000, there will be three license classes—Technician, General, and Amateur Extra—and a single Morse code requirement of 5 WPM.

If you are a Technician Class licensee:

1) Take your General class written exam before April 15, and receive a credit certificate (CSCE) from your examiners.

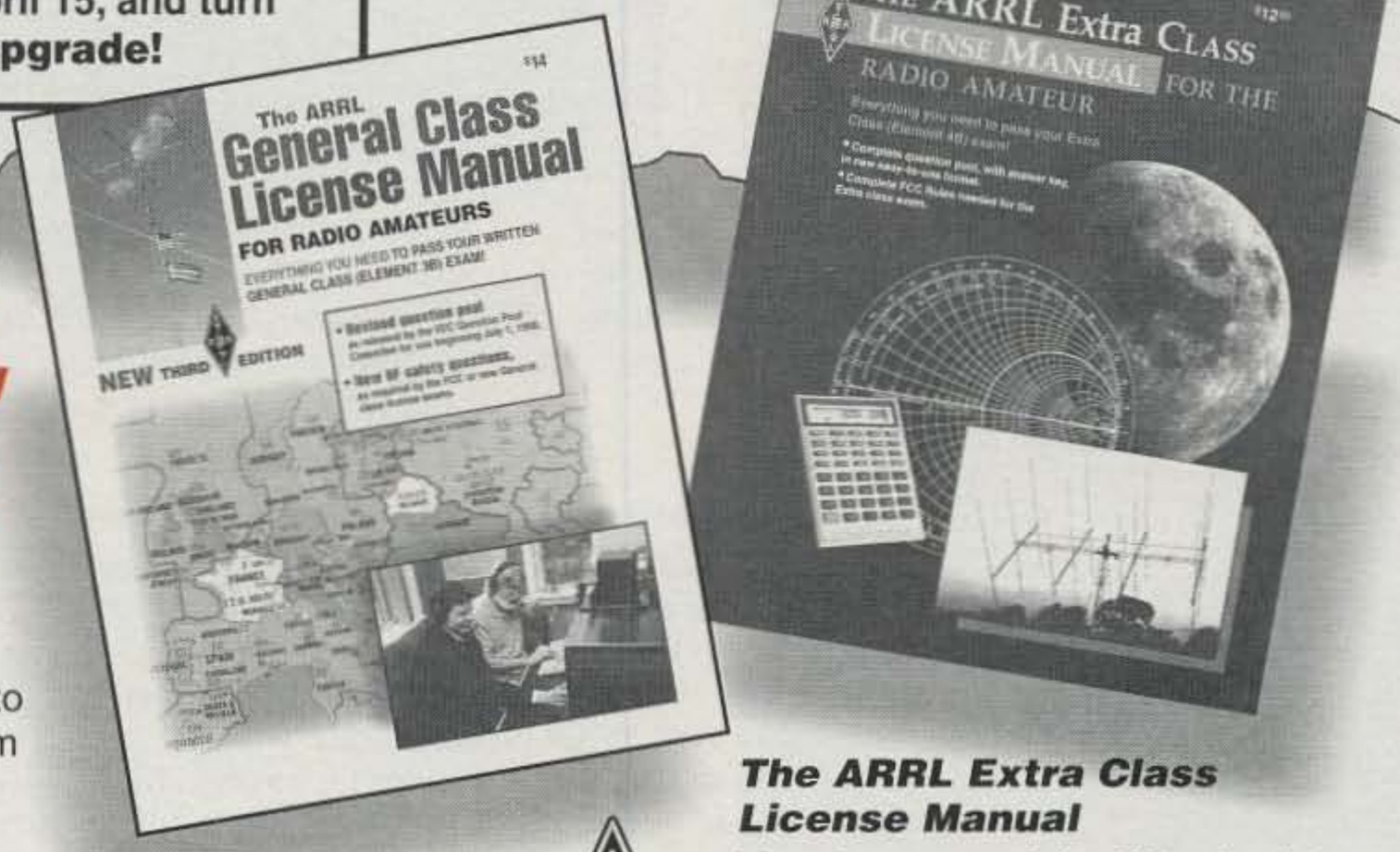
2) Pass the 5 WPM Morse code test before or after April 15, and receive a CSCE. (Note:Tech Plus licensees already have 5 WPM exam credit).

3) Take your CSCEs issued within 365 days to an exam session on or after April 15, and turn them in for a **General class upgrade!**

If you are an Advanced Class licensee:

1) Take your Extra class written exam before April 15, and receive a credit certificate (CSCE) from your examiners.

2) Take your CSCE issued within 365 days to an exam session on or after April 15, and turn it in for an **Extra class upgrade!**



ARRL License Manuals are designed to simplify the process of studying for your license exams.

The ARRL General Class License Manual

Use the current 3rd edition book to pass the 35-question written exam (**also known as Element 3B**).

ARRL Order No. 6761—**$14**
plus $4 shipping (UPS)

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Use the current 6th edition book to pass the 40-question written exam (**also known as Element 4B**).

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plus $4 shipping (UPS)

Hurry....beginning April 15, there will be new question pools and tests.

*** Under the new licensing structure, if you choose not to upgrade you will retain your current operating privileges, including access to various modes and subbands, and will be able to renew your license indefinitely.**

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CQ3/2000

CIRCLE 102 ON READER SERVICE CARD

The Digital Dipole

BY KARL T. THURBER, JR., W8FX

From Software Through Antennas For The Shack

Random Reflections—Part II

This time we'll again set our sights on some "random reflections," reflecting on and updating "Digital Dipole" topics we covered in earlier columns; we'll also cover a great deal of new territory.

Antenna Reflections

New Digital Wattmeter from LDG Electronics. In July 1997 we noted two impressive antenna tuners from Dwayne Kincaid, WD8OYG, of LDG Electronics. We first profiled the fully automatic AT-11 HF antenna tuner. His 1.8 to 30 MHz design was based on his article "An Automatic Antenna Tuner: The AT-11," which was published in January 1996 *QST*. We observed that the tuner ($150 kit only; $180 kit with enclosure; $219 assembled) has the potential to make knob-twisting and roller-cranking obsolete.

In the same column we also profiled the similar but flea-power tuner, the QRP Automatic Antenna Tuner ($100 kit only; $125 kit w/enclosure; $159 assembled). Modeled after the AT-11, it's for QRP, handling 0.1 to 10 watts over the same frequency range.

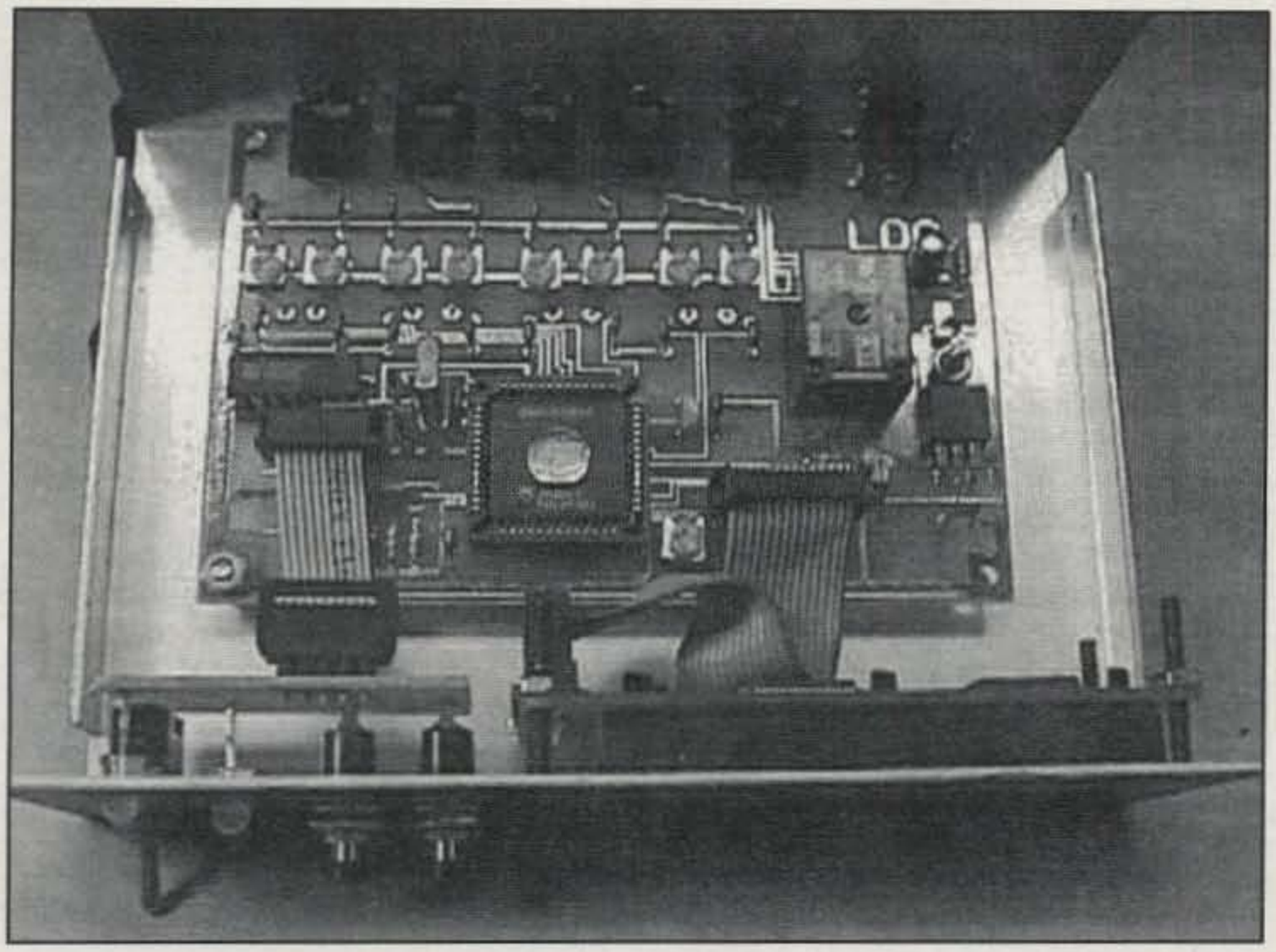
The LDG Electronics DWM-4 Wattmeter centralizes all your HF, VHF, and UHF RF power and SWR metering needs. The multisensor DWM-4 measures peak or average power, which it displays with a bar or numeric readout. The microprocessor-controlled unit offers sophisticated monitoring and warning features, as described in the column.

In January 1999 we examined the BA-1 Balun Box kit. The BA-1 is a 4:1 device that allows the easy interfacing of ladderline-fed antennas and longwires to LDG tuners. The 6 ounce unit covers 1.8 to 30 MHz, handles 200 watts, and is easy to weatherproof. It's a $25 kit with enclosure.

Recently, Dwayne introduced a completely new product, the DWM-4 Digital Wattmeter (see photos). The unit, based on his July 1999 *QST* article, "The DWM-4: A Microprocessor Controlled Multichannel Wattmeter for HF, VHF and UHF," is a handy station accessory intended to centralize all your RF power and SWR metering needs. The multisensor power monitoring system covers HF through UHF, and with it you can use up to four remote sensors to monitor multiple transmitters. A multifunction display gives you full control of the meter's menu system.

The DWM-4 measures peak or average power, displayed in a bar or numeric readout format; there also is a visual LED and relay-actuated alarm system based

289 Poplar Drive, Millbrook, AL 36054-1674



Here's an interior view of the DWM-4 Wattmeter offered by LDG Electronics. The versatile, multisensor unit is based on Dwayne Kincaid, WD8OYG's popular July 1999 QST article, "The DWM-4: A Microprocessor Controlled Multichannel Wattmeter for HF, VHF and UHF." See the text of this month's column for details.

on SWR parameters. The unit has HF power ranges of 15 and 150 watts and a VHF/UHF power range of 150 watts. A microprocessor-controlled unit with built-in error-checking, you can upgrade it through software. The $89 kit comes with one sensor and can be built, on average, in 2 to 3 hours; a kit with one sensor and enclosures is $139. Each additional sensor is $19, or $29 with enclosure.

Contact LDG Electronics, 1445 Parran Road, St. Leonard, MD 20685-2903 (phone 410-586-2177; e-mail: <ldg@ldgelectronics.com>; web: <http://www.ldgelectronics.com>).

NCG Companies/Comet Antennas Enhances Online Access. The NCG/Comet product line has grown significantly over the past few years. In several previous columns, most recently in January and April 1998, we profiled various Comet antennas, including the Comet CYA-240, a dualband Yagi for 146 and 446 MHz, and the CA-HV HF/VHF multiband mobile antenna.

Japan-based Comet Antennas and its American distributor, NCG Companies, have been doing business for years, and NCG has a 10,000 sq. ft. manufacturing and distribution center in Anaheim, California. The extensive amateur product line includes monoband, dualband, and triband antennas along with band combiners (splitters, duplexers, and triplexers) for all combinations of frequency splits. Other products offered by NCG include power/SWR meters and NCG's own Power Pocket, a special battery pack and charger combo that helps your on-the-go rig extend its talk time.

Since we last reported on NCG it has expanded its website, which features information on their most popular products. The site essentially is a company catalog with several additional features, such as a set of frequently asked antenna questions, product descriptions, and product photos.

Contact NCG Companies, 1275 N. Grove St., Anaheim, CA 92806 (phone 1-800-962-2611; e-mail: <micks@cometantenna.com>. web: <http://www.cometantenna.com>).

Online Goodies from State Electronics Parts Corp. Although perhaps not very well known in amateur radio circles since the firm mainly has served commercial accounts, State Electronics is a broad-line stocking distributor of electronic components. As such, it is factory authorized and buys directly from manufacturers. Established in 1956, the firm has built a good reputation of product availability and customer service. It offers the full line of Belden cables and Amphenol RF connectors and also sells Bud relay racks, custom potentiometers and knobs, computer products, and other components.

Contact State Electronics Parts Corp., 36 Route 10, East Hanover, NJ 07936 (phone 1-800-631-8083; e-mail: <salesmgr@state-elec.com>; web: <http://www.state-elec.com>). (See fig. 1.) The data-rich website allows you to rapidly search their online catalog for electronic component by manufacturer or product.

New from Hamtronics. Hamtronics®, founded in 1962 by amateurs with solid backgrounds in technical writing and graphic arts besides knowledge of VHF

Fig. 1– State Electronics is a broad line stocking distributor of electronic components. It offers the full line of Belden cables and Amphenol RF connectors, and also sells Bud relay racks, custom potentiometers and knobs, computer products, and other components. State's website allows you to search their catalog for electronic component by manufacturer or product. You'll find the site at <http://www.state-elec.com>.

and UHF electronics, is—along with a very few other firms, such as Ten-Tec and Ramsey Electronics—helping to fill the "radio kit void" left by Heathkit's long absence from the amateur marketplace. Most of us have come to expect good instruction manuals from Hamtronics, as well as well-built gear that's able to stand up to continuous duty.

Hamtronics makes a wide range of products, but it specializes in products involving VHF and UHF RF design. Some new amateur-oriented equipment includes the low-cost LNY series of receiver preamplifiers. The preamps use surface-mount technology, with very-low-noise, dual-gate MOSFETs, for good performance under a wide range of voltage, signal, and load impedance conditions. Nine models covering various ranges from 24 MHz through 470 MHz are available. All models are priced at $29, and are furnished wired and tested.

Another new series is the LNP VHF receiver preselector designed to minimize or eliminate intermodulation (intermod) problems on VHF from paging transmitters, FM broadcast stations, and other out-of-band signals. Using rugged, diode-protected dual-gate MOSFET technology, offered in the series are three units that cover 132–144, 140–155, and 150–180 MHz. They are $39 each, also furnished wired and tested.

Hamtronics still offers a free, printed catalog of amateur and commercial VHF and UHF radio equipment. Many of the catalog items are available as kits or in wired and tested form. You also can view the catalog online at the Hamtronics website.

Contact Hamtronics, Inc., 65 Moul Rd., Hilton, NY 14468-9535 (716-392-9430; e-mail: <jv@hamtronics.com>; web: <http://www.hamtronics.com>).

Soft Stuff

K6MLO Coil Designer Software. *The ARRL Handbook* formulas you use to calculate coil inductance use the parameters of length, diameter, and number of turns. The resulting inductance is known as the *low-frequency inductance*. However, the actual inductance of the same coil will be *higher* at the operating frequency.

Why is this? It's because the coil's turn-to-turn capacitance, or the distributed capacitance, is in parallel with the coil's inductance; this makes the effective inductance of the coil higher. To complicate things, many low-cost test instruments indicate only the low-frequency inductance, although one notable exception is the Autek Research RF1 RF Analyst, which gives you the inductance at the specified operating frequency. (*Note:* We originally discussed the RF1 in the October 1994 column. Later, in February 1998, we profiled the RF5 VHF Analyst, and in October 1999 we highlighted the VA1 Vector RX Antenna Analyst. For more information on these products, contact Autek Research, P.O. Box 8772, Madeira Beach, FL 33738 [813-886-9515].)

Recently, Harold Wood, K6MLO, developed a loading coil calculation program that helps you find the important parameters in single-layer solenoid coil design. The program considers the effect of distributed capacitance, wire size, and skin and proximity effects that calculate the "real life," or effective, inductance at the specified operating frequency.

The results the program presents include distributed capacitance and self-resonant frequency; at the specified operating frequency, inductance, reactance, resistance, and "Q" factor are all calculated. The program operates over the range 0.1 to 120 MHz, and it handles a wide variety of input parameters. Both English and metric units are supported. The accuracy of results is claimed to be ± 5 percent.

Harold's program uses a unique data-change methodology, in which changing any data digit results in automatic recalculation of results. This means that you can change a single data digit repeatedly and see the effect immediately. This characteristic facilitates your rapidly optimizing data values.

Coil Designer is available on 3.5 inch diskette for $14.95 from The Engineering Physics Co., Harold Wood, K6MLO, 212 Pascual Avenue, San Gabriel, CA 91775 (e-mail: <k6mlo@pacbell.net>; web: <http://home.pacbell.net/k6mlo>). You can download a free demo Coil Designer program from Harold's website.

From the Bookshelf

Unauthorized Guide to Windows® 98 Second Edition. Here's *another* guide to the ever-popular Windows operating system, one carrying the intriguing "unauthorized" label, which suggests things we ordinary consumers are not meant to know.

Macmillan, under the Que® imprint, has issued this 757-page book designed to give savvy consumers foolproof instruction in the Windows techniques that work and those that don't. It presents unbiased, straightforward rec-

ommendations that aren't influenced by any company, product, or organization.

Written by Paul McFedries, the book ensures you're armed with the most up-to-date information on using Windows 98, including the much-ballyhooed "Windows 98 Second Edition" update. (Although "Second Edition" appears in the book's title, it's not just for those who have installed the update. Most of the instructions, insider scoop, tips, and advice apply to any edition of Windows 98, not just to the second edition update.)

You can find *The Unauthorized Guide to Windows® 98 Second Edition* in bookstores, or contact Macmillan directly (see below).

Two Complementary New "Idiot's Guide" Books from Macmillan. In recent "Digital Dipole" columns we've occasionally covered some of the popular "dummy," "idiot's guide," and similar computer books. Surprisingly, many of the books of this genre, such as those in Que's "The Complete Idiot's Guide to (whatever)" series are quite well done. That having been said, we would like to follow up with two related "how to" books you might find useful.

The first is *The Complete Idiot's Guide® to Online Shopping*, Second Edition. It's by noted PC guru Preston Gralla, who is Executive Editor of ZDNet. The book simply and directly helps you "get up to speed" on shopping online. It tells you how to check out a site before buying; find malls, auctions, and specialty sites; safely use credit cards and electronic wallets; recognize and avoid scams; research retail purchases online; get the best deals on a wide variety of products; and more.

While the book is oriented to the general shopper, with just a little improvisation you can adapt the procedures and tips presented into buying computer hardware and software, electronics equipment, and even amateur radio and shortwave gear and components. The well-indexed, 381-page Que book is $16.99.

Besides buying merchandise outright on the Net, are you considering the online auction way of buying and selling things? Check out an informative book that can help you understand this new way of dealing. It's *The Complete Idiot's Guide® to Online Auctions*, by Michael Miller, the author of more than 30 best-selling reference books. The 330-page Que book is $16.99. The book clearly tells you how online auctions work. It helps you discover quick and easy ways to buy new and used items at online auctions, put your own items up for sale, buy and sell at the popular eBay® web-

site, place winning bids, pack and ship merchandise after the auction, protect yourself from shady characters and disreputable tactics, and more. The book also helps you discover which auction sites are best for you.

Like the online shopping book we just mentioned, with a little improvisation you can adapt the knowledge the book presents into buying computer hardware and software, electronics equipment, and even amateur radio and shortwave gear and components, new and used (see "More on Online Auctions" below).

Contact Macmillan Publishing USA, 201 West 103rd Street, Indianapolis, IN 46290-1097 (1-800-858-7674, for a catalog; e-mail: <info@mcp.com>; web: <http://www.mcp.com>).

More on Online Auctions. With the popularity of online auctions soaring—eBay reportedly has well over 1,000,000 items at any given time in over 1,000 categories—many specialized, relatively "small" hobbies such as amateur radio and shortwave radio listening are developing online buying and selling niches.

To help you capitalize on the depth and variety of the offerings on the eBay "megasite" at <http://www.ebay.com>, two radio-savvy "eBayers" have built a radio-related website which contains a page preloaded with eBay search links that cover various electronic components and radio-related equipment. "Prior auction" links also are provided so you can get a feel for how much comparable goods have fetched in the online market.

Check out this web page, which is authored by "Van," E. C. Van Der Eecken, K6QGH, and Eric Force (Eric is the editor of the "Radio and the Internet" column in *CQ*'s sister publication *Popular Communications*). The website is nicely organized, with results being presented as generated by eBay's online search engine in the categories of antennas, capacitors, crystal radios, electronics, resistors, shortwave receivers and transmitters, test equipment, and wire and cable. You'll find it as part of "Van's Think Tank," at <http://www.dobe.com/vea/auction.htm>.

Short Bursts

Where Did "DOS" Really Come From? Okay, time for some personal computer (PC) trivia: Who invented the non-graphical, command-line operating system known as "DOS" that we all love and hate so much? Most would say it was Microsoft's Bill Gates who deserves the accolades (or raspberries). After all, Bill Gates and Microsoft are almost synonymous with DOS, right?

While largely correct in terms of popular usage, since DOS was the first widely installed operating system on PCs, that assumption technically is wrong. The origins of DOS go back much further. DOS has its roots in two earlier operating systems—CP/M, or Control Program for Microcomputers; and Q-DOS, or the "Quick and Dirty Operating System."

As PCs developed in the 1970s, the cumbersome, manual switch-setting and bootstrap loader procedures became tedious for practical use. A young Ph.D. computer whiz, Gary Kildall, mercifully developed a very flexible operating system, CP/M, which could be used with a variety of computers, and which he initially sold to hobbyists for $75. CP/M, truly the first popular disk operating system for PCs, rapidly became the *de facto* operating system in the fledgling 8-bit PC industry.

Now things get really interesting. But for some missteps, a beefed-up CP/M, which Kildall already was working on in the form of CP/M-86, could easily have become the operating system to support the introduction of the 1981 IBM PC. (If it had, what would be the implications for computing today? Would we be using a "CP/M 2000" operating system? Would there be a Microsoft Windows? Or a Microsoft at all? Food for thought, indeed!)

To continue our story, as legend has it, Kildall was approached by IBM to develop CP/M for the IBM PC. After all, his firm, Digital Research (DR), was much better known than was the fledgling Microsoft. However, DR was uncooperative. Kildall reportedly snubbed the IBM reps when they came looking for a viable operating system. Frustrated, IBM turned to Bill Gates and Microsoft. Microsoft then specialized in computer languages (such as BASIC) rather than operating systems, though, which it mostly left to DR. Gates almost had to pass on the IBM opportunity.

Rethinking the situation, Gates found he indeed wanted to supply the operating system for the IBM PC. But to do this he had to obtain the rights to an obscure 16-bit, amazingly CP/M-like operating system, Q-DOS, from the small firm that developed it, Seattle Computer Products. Gates did just that, reportedly obtaining DOS lock, stock, and barrel initially for $50,000 (or for $75,000, depending on which version of the story you read). Surely this was the software deal of the century and one of the best purchases anyone has ever made!

IBM eventually offered its PCs with *both* PC-DOS (the name IBM gave to the Q-DOS successor) *and* a version of CP/M. CP/M cost more, however, which helped solidify Microsoft's DOS as the industry standard. Kildall's DR lost out, and it never quite recovered from its missed opportunity. Ultimately, DR was sold to Novell.

Gates very wisely retained the rights to market a Microsoft version of DOS, which he called MS-DOS, or Microsoft Disk Operating System—even while licensing DOS to IBM. PC-DOS and MS-DOS were almost identical, and most users simply referred to them as "DOS." The rest, as they say, is history.

Wrap-Up

That's all for this time, gang, and for this column, under the name of "Digital Dipole." Next month we'll have a new title—"What's New"— and a broader look at anything and everything in the ham radio marketplace. See you then!

Overheard: With all the uncouth behavior on today's amateur bands, one should remember that words constitute a very powerful weapon that should always be used with extreme care.

73, Karl, W8FX

CQ World-Wide WPX SSB Contest All-Time Records

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

WORLD RECORD HOLDERS

SINGLE OPERATOR

1.8	VA1A('99)	535,225	271
3.5	EA8/OH1MA('97)	4,317,284	562
7.0	ZX9A('97)	10,787,128	814
14	EA8AH('97)	11,142,198	981
21	ZW5B('95)	14,095,142	1054
28	ZX5J('99)	14,405,820	1095
AB	HC8A('92)	24,809,300	1060
QRPp	HC8A('94)	7,520,562	714

MULTI-OPERATOR SINGLE TRANSMITTER

HC8A('93)	32,502,677	1107

MULTI-OPERATOR MULTI-TRANSMITTER

CN8WW('99)	55,151,562	1334

CLUB RECORD

Contest Club Finland ('98) 125,880,210

QRPp RECORD

HC8A('94) 7,520,562

WPX (Prefix) RECORD

OT9A('99) 1,421

U.S.A. RECORD HOLDERS

SINGLE OPERATOR

1.8	K1ZM('95)	327,712	308
3.5	WE3C('95)	1,519,300	475
7.0	KC7EM('95)	1,950,228	495
14	KC1XX('95)	4,787,328	832
21	WE9V('99)	6,067,704	888
28	WM5G('89)	4,213,127	799
AB	KQ2M('99)	10,855,264	989
QRPp	KR2Q('99)	1,765,404	551

MULTI-OPERATOR SINGLE TRANSMITTER

KM3T('99)	14,091,468	1077

MULTI-OPERATOR MULTI-TRANSMITTER

WT6V('99)	20,381,112	1202

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	EA8/OH1MA('99)	404,976	208
3.5	EA8/OH1MA('97)	4,317,284	562
7.0	EA8AH('96)	7,101,380	715
14	EA8AH('97)	11,142,198	981
21	ZD8Z('99)	12,032,740	1028
28	ZD88A('99)	13,170,159	993
AB	ZD8Z('94)	18,118,880	992

ASIA

1.8	UL7ACI('91)	331,008	128
3.5	UA9CSS('94)	1,074,780	315
7.0	H24LP('87)	5,348,975	503
14	H2A('91)	6,297,464	758
21	7L1GVE('92)	6,848,136	838
28	H22H('99)	5,789,817	753
AB	C46A('98)	12,942,160	847

EUROPE

1.8	LY6K('95)	481,164	303
3.5	YT6A('96)	1,976,436	558
7.0	9A9A('99)	4,624,188	724
14	DJ7AA('99)	5,744,320	928
21	9A3GW('99)	6,504,371	887
28	9H3XY('99)	6,033,012	852
AB	GIØKOW('98)	10,563,579	1017

MULTI-OPERATOR SINGLE TRANSMITTER

AF	TS5I('98)	16,157,168	929
AS	TA5/NØFYR('91)	16,474,965	1005
EU	IJ4R('91)	16,027,956	1146
NA	VP2EC('92)	24,409,580	1115
OC	T33RD('99)	17,778,372	998
SA	HC8A('93)	32,502,677	1107

NORTH AMERICA

1.8	VA1A('99)	535,225	271
3.5	TE1C('96)	2,161,568	496
7.0	TE1C('95)	7,281,630	745
14	KP2A('95)	7,088,976	912
21	WP3R('98)	10,167,632	986
28	WP2Z('99)	7,566,636	862
AB	TI1C('99)	17,078,930	1117

OCEANIA

1.8	AH6PR('99)	18,963.00	49
3.5	N6VI/KH6('94)	1,016,652	273
7.0	WH7Z('99)	4,582,773	507
14	KG6DX('90)	4,558,527	733
21	AHØK('92)	7,206,850	698
28	KH6ND('99)	6,442,856	721
AB	WR6R/WH7('96)	11,258,410	815

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	P4ØA('96)	1,715,076	426
7.0	ZX9A('97)	10,787,128	814
14	PYØFM('95)	9,660,432	939
21	ZW5B('95)	14,095,142	1054
28	ZX5J('99)	14,405,820	1095
AB	HC8A('92)	24,809,300	1060

MULTI-OPERATOR MULTI-TRANSMITTER

AF	CN8WW('99)	55,151,562	1334
AS	P3A('99)	47,680,574	1322
EU	OT9A('99)	35,425,530	1421
NA	VP2EC('94)	39,530,455	1285
OC	FKØAW('89)	26,538,972	1002
SA	ZZ5EG('87)	38,096,250	1250

How It Works

BY DAVE INGRAM, K4TWJ

Theory 'n Practice

A Quick and Simple Study of Vertical Antennas

Do you ever look at modern "no ground system required" vertical antennas and wonder how their design or features differ from basic 1/4-wave verticals of past popularity? Are new 3/8- and 1/2-wave style radiators such as the Hy-Gain AV640 shown in photos A and B really better for transmitting and receiving DX-worthy signals than traditional verticals? Well, friends, that is our topic of discussion this time, and I feel sure you will find it beneficial for understanding how the new verticals work.

Although rarely recognized, verticals have always been a mainstay in amateur radio. Why? They are affordable, low-profile antennas, plus one person can install and maintain one without undue stress. Yes, and they really look attractive after you've struggled to lift a multi-element beam over your head atop a swaying tower! Unfortunately, however, some folks consider verticals poor signal radiators, mainly because they install them in cramped spots where their performance is severely stunted. Bear in mind that any antenna needs "breathing room"—at least 1/8 wavelength between it and signal-blocking obstructions such as garages, houses, etc.—in order for you to reap the best results. Ideally, a vertical should have a clear horizon view in at least two of four compass directions. If it is blocked by a house, consider mounting it on the roof. If necessary, use an Alpha Delta tilt mount to raise and lower it from view. Think creatively!

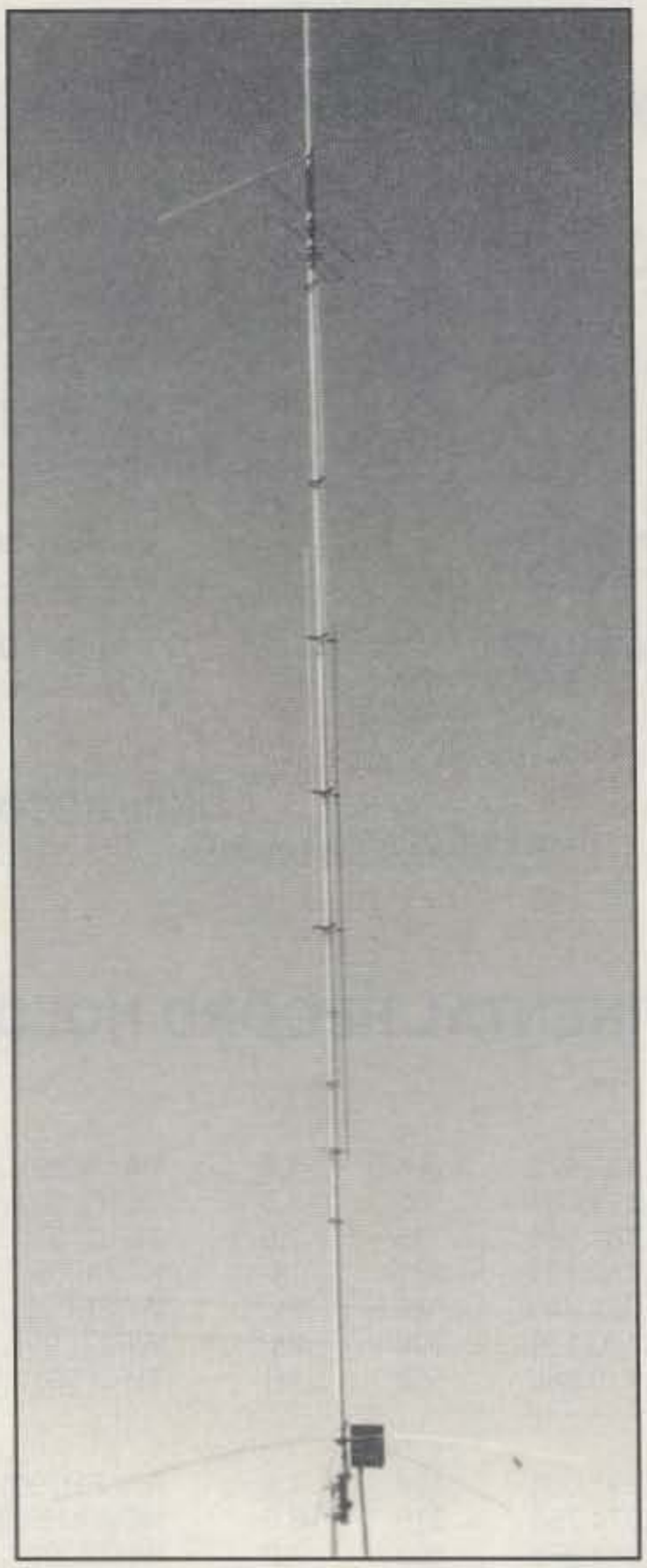


Photo A– Hy-Gain's recently introduced AV640 represents a fresh new approach to vertical antennas. It is easy to assemble and install, does not require an external ground system, and delivers mild signal gain for big-time radio fun on a budget. "How it works" is described in the text. (Photos courtesy Richard Stubbs of Hy-Gain/ MFJ Enterprises)

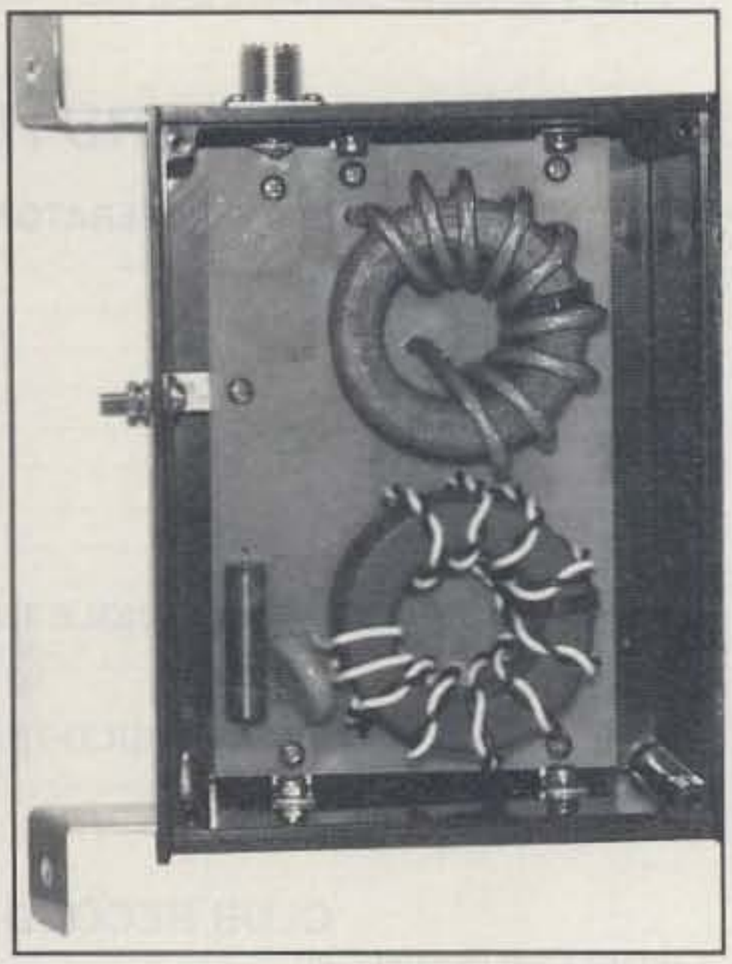


Photo B– Hy-Gain's AV640 utilizes 3/8-wave radiators for each band of operation. These radiators exhibit a high feedpoint impedance. Thus a toroidal RF transformer in a black box at the antenna's base steps up impedance. You are looking at the critter.

Trends in Vertical Antenna Design

In amateur radio's "younger days," 1/4-wave verticals were "worked against" a full ground radial system like the one shown in fig. 1. Technically speaking, it could be compared to half a dipole stood upright with its radials producing a mirror image of the "missing half." Some (many?) amateurs used only their vertical's mounting pipe as a ground rod rather than laying down radials, which reduced the antenna's overall efficiency at least 40 percent (more if the antenna's radiation was blocked by buildings). Hy-Gain addressed that pitfall during the 1950s and 1960s by encouraging amateurs to add 1/4-wave radial kits to the company's "AVQ" series verticals and to mount them above nearby objects. Both Cushcraft and Butternut echoed the same message in the '70s and '80s by reiterating the importance of using radials with their verticals. Folks listened. They began describing their verticals by radial lengths and counts.

Multiband verticals also started gaining in popularity during the 1950s, first as multiple radiators sharing a common support and RF-fed in parallel, as illustrated in fig. 2(A). Next "trapped" verticals, like the one shown in fig. 2(B), gained favor. Then Gap and several other companies entered the antenna arena and longer length radiators plus capacity hats and linear-loading sections entered the picture. A new era dawned in vertical use and popularity.

How Trap Antennas Work

A significant amount of information regarding traps has been distributed, discussed, and debated in the past, yet they still remain a somewhat vague subject among many amateurs. I do not wish to join such debates, so the following information is presented only as my views.

Simply stated, a trap is a parallel-resonant circuit comprised of inductance (a

4941 Scenic View Drive, Birmingham, AL 35210

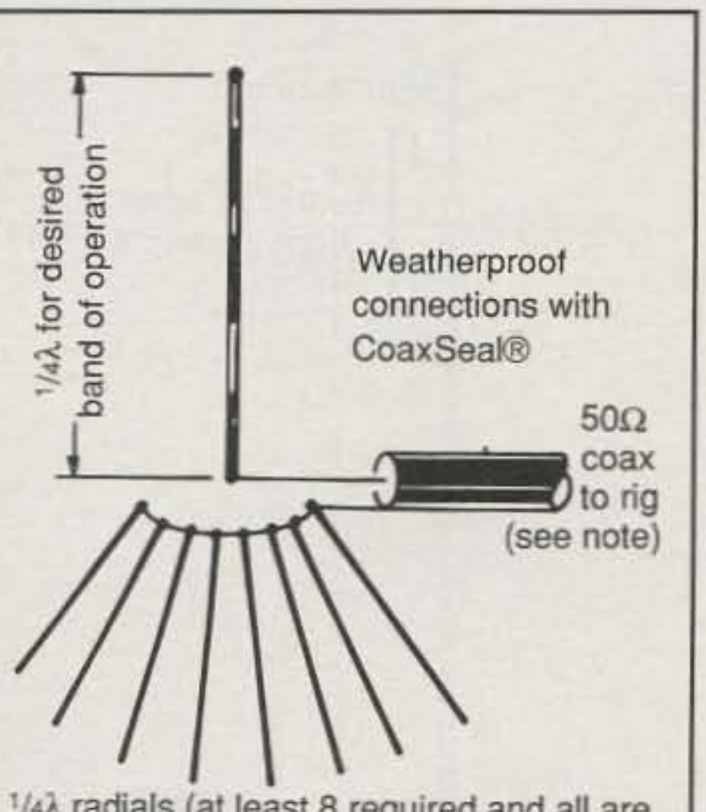


Fig. 1– Outline of a basic 1/4-wave vertical antenna and its associated ground system. Main radiation and reception is broadside to the vertical element. The antenna therefore should be mounted in an area clear of obstructions for best results.

coil of wire), capacitance (often made from concentric lengths of aluminum tubing), and resistance (of the coil). When placed in series with a vertical's main radiator, the trap passes all "outside of resonance" frequencies through it, but acts like a high impedance or "end of element point" to "within resonance" frequencies. With reference to fig. 2(B), that means only element section A would be in operation for 10 meters, and element sections A and B plus the coil in trap #1 would be used on the next lower frequency band. Element sections A, B, and C, plus the coils in traps #1 and 2 would be used on the next lowest frequency band, etc. In other words, the traps act like remote switches that automatically connect or "add in" various lengths to the vertical radiator to mate with a desired band of operation. There is a rather small loss of signal strength due to copper losses in a trap's coils, but it is an acceptable trade-off for the convenience of "hands free" multiband operation.

Capacity Hats and Linear Loading Sections

Two quite effective ways of increasing the electrical length of an antenna without extending its overall physical length (or height) are with *capacity hats* and *linear loading sections* like those illustrated in figs. 3(A) and (B). Both of these techniques have been incorporated in antenna designs for a number of years, and both have their merits.

Implemented in its most conventional form, a capacity hat consists of two thin rods crossed to make an "X" and mounted on the upper section of a vertical radiator (or even a mobile whip). Let's say we wish to make a "short version" 1/4-wave radiator for 20 meters (12 feet tall) or a 1/2-wave radiator for 10 meters (also 12 rather than 16 feet tall). In either case, we simply attach two 2 foot long rods to the top of the 12 foot tall mast/whip as shown in fig. 3(A). Each of the four rods extends outward one foot from the 12 foot section, producing a total electrical length of 16 feet. Clever, eh? Could even more rods of longer length be substituted to further extend electrical height? Sure, but remember that exceptionally large capacity hats increase wind loading and produce unwieldy antennas. Everything has its limits.

A linear loading section also increases a vertical's electrical rather than physical height, and it is usually less apparent to curious eyes than a capacity hat. Simply described, linear loading is achieved by "folding part of an antenna's radiating element back on itself" as shown in fig. 3(B). Since this section is "spread out in the open air," it exhibits better signal radiating and intercepting abilities than a loading coil. Also, linear loading sections are not as prone to copper losses as coils. Overall, we thus can say full-size radiators are the best performers, but their tall height for lower HF bands makes them an illogical choice. In such cases capacitive, linear, and inductive loading reduces their physical height to acceptable dimensions.

3/8- and 1/2-Wave Radiators

The entanglements of installing a full ground system for a 1/4-wave vertical inspired amateur radio's progression to

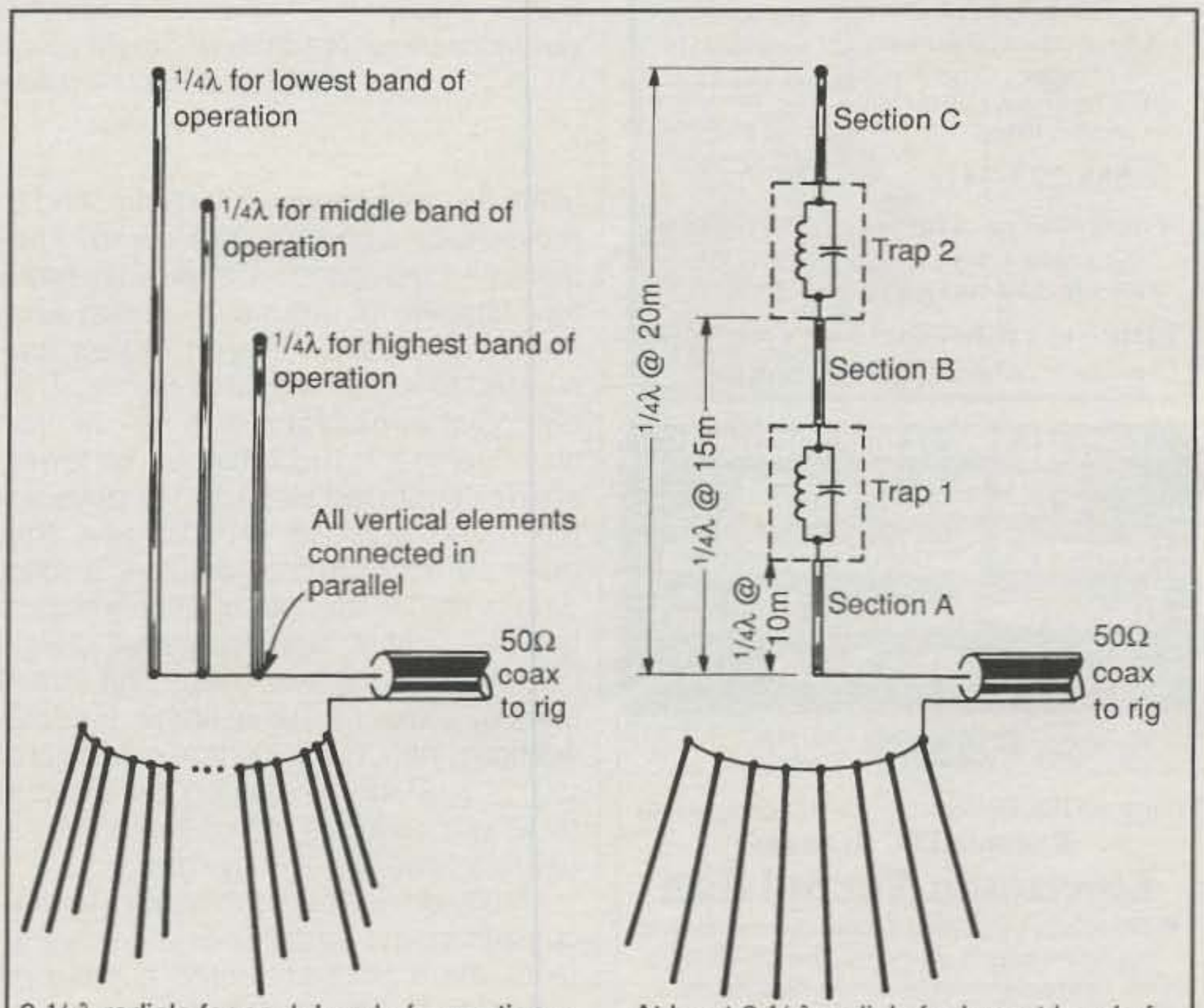


Fig. 2– Original versions of multiband verticals utilized separate 1/4-wave radiators with a common support as shown in (A). Later versions use a single radiator with traps isolating various sections for each band of operation, as shown in (B). (Discussion in text.)

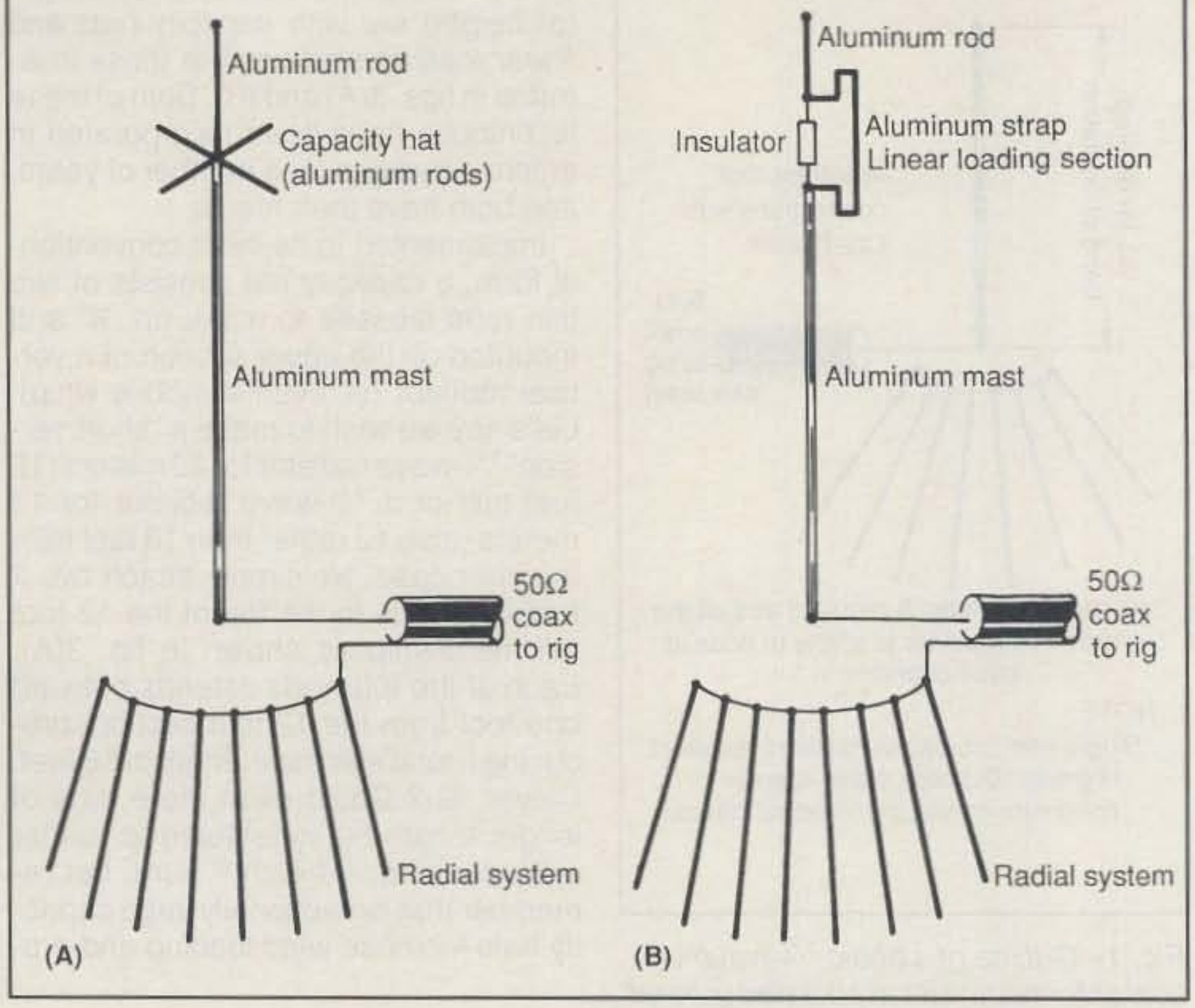


Fig. 3– Two quite effective methods of increasing a vertical's electrical height without increasing its physical height involve the use of a capacity hat as shown in (A) or a linear loading section as shown in (B).

using 3/8- and 1/2-wave verticals, and it proved to be a good move. How so? The feedpoint impedance of a 1/4-wave radiator typically is around 35 ohms, and many 1/4-wave (or longer) radials are needed to match that impedance. The feedpoint impedance of a 3/8- or 1/2-wave vertical is much higher, so fewer shorter length radials fill the bill, or serve the same purpose. Additionally, the taller vertical radiator delivers a mild gain in signal strength of approximately 3 dB—that is, assuming a full physical length radiator is used. The inclusion of capacity hats, linear loading sections, etc., can drop that gain figure to 1 or 2 dB, depending on the amount of length reduced for operation on a (usually lower frequency) band.

I really do not intend to make this discussion sound complex or repetitive in facts; there are just a large number of variables to consider and compare in antennas. Keep that thought in mind, and let's continue.

Matching Impedances

Since the feedpoint impedance of a 1/4-wave vertical antenna is low, it can be directly fed with 50 ohm coax cable. The feedpoint impedance of a 3/8- or 1/2-wave vertical is much higher and must be matched to its cable with a base-mounted transformer or base-located tuner. Let's consider the distribution of voltage and current along a full wavelength of wire as shown in fig. 4 and "plug in" some hypothetical values to illustrate that point.

Voltage (E) is maximum and current (I) is minimum at 1/2-wave points on the wire or conductor, while current is maximum and voltage is minimum at 1/4-wave points. The exact amount of measured voltage and current is directly proportional to the supplied RF power and is thus a "variable." The ratio between voltage and current is predictable, however, and always indicates a 1/4-wave impedance near 50 ohms and a 1/2-wave impedance near 2500 ohms. Since 3/8 wave is midway between 1/4 and 1/2 wave, its impedance is near 1200 ohms. If you study fig. 4 for a few minutes, you will see we can RF-feed any length of wire/conductor longer than 1/4 wave if we simply match its impedance at that point to its feedline. Could a regular antenna tuner fill that need, you ask? Probably, but reaching way out in the yard or atop the house to retune it when changing frequencies would be a tricky feat (we need "Plastic

Man"). Using a broadband toroidal transformer to match the two impedances definitely would be a better bet. Yes, and that RF transformer is what's in the mysterious black box at the base of a typical 1/2- or 3/8-wave vertical.

Applying Our Knowledge

Let's now return to the Hy-Gain AV640 vertical shown in the photos and use some of our acquired knowledge to understand "how it works." First notice, as advertisements of the AV640 state, quarter-wave stubs or radiators for 6, 10, 12, and 17 meters are full length and positioned around the center radiator. But wait, you say. This is supposed to be a 3/8-wave antenna, not a 1/4-wave antenna. How true indeed! Here is the key. Each quarter-wave stub is mounted or positioned up 1/8 wavelength (for its band) from the center radiator's base and connected to the center radiator at only that point. The other "X" type supports insulate the stubs from the center radiator (they are only supports). Add 1/8 wavelength for a given band to the 1/4 (or stated another way, 2/8 wavelength) stub for that band, and bingo: We have a 3/8-wave radiator. Slick, eh?

Now study the center radiator (that large aluminum tube with all the frills on top). Electrically, it must be 16.6 feet tall for 15 meters, 24.7 feet tall for 20 meters, 34.6 feet tall for 30 meters, and 49.6 feet tall for 40 meters. That requirement is filled by the loading coils and capacity hats on the center radiator's upper section (above the stubs). Loading coils alone could do the job, but inclusion of capacity hats minimizes the number of coil turns needed and lowers coil/copper losses.

Since feedpoint impedance is high, seven rods at the vertical's base make a more-than-adequate ground counterpoise. Toroidal cores in the base matching unit (photo B) act as impedance matching transformers, plus one toroid also acts as a current balun to help stop RF from traveling back along the feedline.

Now I wish to add one final note. If you invest in a shiny new vertical (or any type of antenna), connect it to your transceiver using new coax of the highest grade affordable. You should never degrade a good antenna with poor, old, or spliced coax.

We covered a lot of ground in a limited space! Included is a wealth of information you can use for many years. Now read it all again for maximum understanding and retention!

73, Dave, K4TWJ

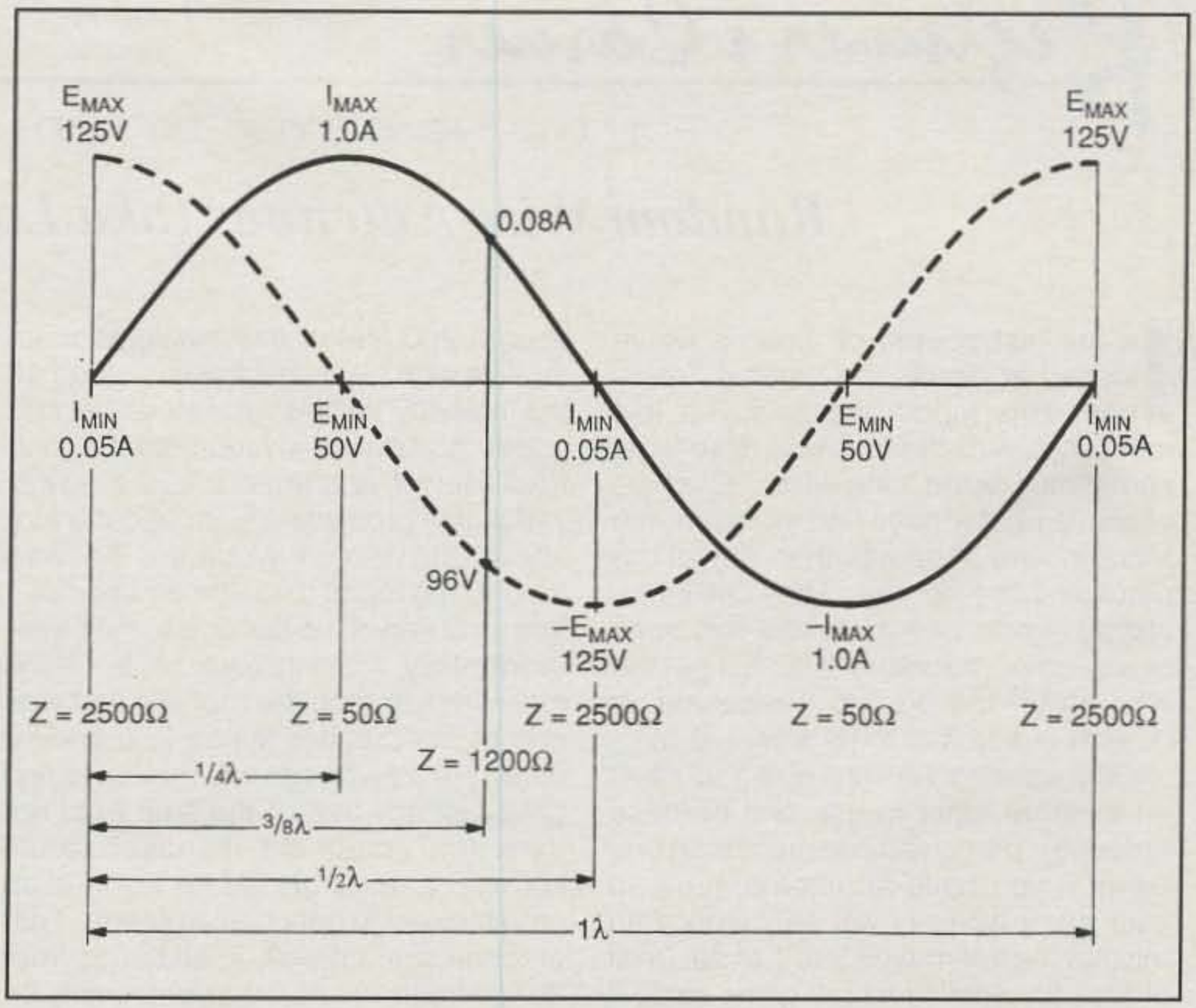


Fig. 4– Graphical study of voltage and current distribution along a wire or conductor of varying length. By inserting some hypothetical values to coincide with peaks and nulls, we can see how feedpoint impedance varies according to length of conductor, etc. (Full discussion in text.)

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

Random Wire Antennas (aka Long Wires)

In the last couple of months we've looked at dipole and vertical antennas. This month we finish up this miniseries with random wire antennas, sometimes called "long wires." Over the years I probably have had more fun with random wire antennas than any of the other simple antennas. They can be installed almost anywhere that has trees or any other "structure" that will get the wire up off the ground. Sometimes it doesn't even have to be a wire at all!

One warning: You are going to need an external tuner to use one of these antennas, particularly on more than one band. If you have an internal tuner in your rig, it typically will only work with mismatches of maybe 3 to 1 or so. In all probability, that's just not going to do it for you. We'll cover tuners a little later in this article.

First let's clear up some of the terminology. A *random wire antenna* is a single wire of some random length—basically, whatever will fit in the available space. It might be 10 feet long, or 50 or 250 feet long. Exact length does not matter. Hence, it is a *random* wire antenna. One end of this wire attaches to the antenna tuner, and the other end is in a tree or attic or somewhere up off the ground—the higher the better. A *long wire* antenna is one which is at least one full wavelength at the operating frequency. Random wire antennas have a more or less omnidirectional pattern; they radiate equally poorly in all directions. A true "long wire," however, has directionality, and the longer it is the more directional it is. It is primarily along the line of the antenna after about two wavelengths of length.

Good "Stealth" Antennas

A couple of lifetimes ago I lived in an apartment building in Michigan. It was one of those three-story high, long things with multiple entrances, and each apartment had its own balcony. I was on the third floor. I had a vertical that was performing poorly in this location. Nothing seemed to work well, so I bought 200 feet of #10 single-conductor wire with black insulation. I stood on the balcony railing, grabbed the rain gutter, and pulled myself onto the roof. Each set of apartments had a sewer ventilation pipe sticking up about a foot above the roof. I wrapped the wire around the top of these pipes and ran it from one end of the building to the other. Incidentally, looking back on it, I think that climbing onto the roof like that was one of the dumber things I have ever done, but we won't go into that list today! Let's just say that at the time I did not think the apartment manager would loan me a really big ladder to climb up onto the roof to put up an antenna. That antenna worked well on all bands from 80–10 meters, and it was practically invisible from street level. What the apartment manager didn't know didn't hurt me.

One of the great things about random wire antennas is that they can be fairly easily put up in places that prohibit antennas. (Mind you, I am not suggesting that you violate the terms of your lease or condo rules. Heaven forbid! I've always given the "Condo Cops" all the respect they deserve!)

I once lived in an apartment complex in Connecticut that absolutely prohibited antennas, but they did accept dogs. I figured it was much easier to hide an antenna than a dog. Fortunately, the building we lived in backed on a swamp. On a Sunday afternoon shortly after we moved in, some ham friends dropped by. We used a Wrist Rocket slingshot and a small fishing pole to run the wire through the trees in the swamp. It's a simple procedure to attach a weight to fishing line, shoot it over a tree limb, attach the wire to the end of the fishing line, and "reel it in."

This time I had gone with some much smaller (probably #18) stranded line with light-blue insulation. I had found it at a hamfest and bought it without knowing for sure what use I would find for it. Nothing can beat dumb luck in some cases. Just picture this: It was a March Sunday afternoon, and three funny-looking guys were out wading through the swamp with a fishing pole and a slingshot doing something weird with a tiny wire. Would you be curious? Well, a 10-year-old kid was.

This kid started following us around asking us what we were up to. I was pretty much content to ignore him, but I could see that it was bothering one of my friends. I was afraid he might actually tell the kid what we were doing, and the kid would run home and tell his father. Next time the cable hiccuped, the father would call the apartment manager to complain. End of clandestine operation. That would have defeated the whole purpose.

I turned around to the kid and said, "I'm putting this up to keep the UFOs away. Every place I have lived, they just bug the heck out of me if I don't put up one of these. But as soon as I put up one, the UFOs go away and leave me alone." The kid turned ashen white and backed away. Even if he had gone home and told his parents, the only thing they would have said to him probably would have been, "Stay away from that crazy man! Don't go near him!" Pity.

Now you've got to understand that this happened several years before it became fashionable to be abducted by aliens. It might not work nearly as well today. Be careful. You could end up appearing on Jerry Springer's show.

I started out with about 400 feet of wire on this antenna. Later on I added another 200 feet to it. It was a truly amazing antenna. I worked a lot of DX off that one. However, there was one problem that cropped up as summer rolled around. My ham station was tucked away in a corner of the bedroom. I awoke one night when a a thunderstorm was nearby. It wasn't the storm that awakened me, though. It was a peculiar "zzzziittt" sound coming from the station area. It preceded each thunderclap by a few seconds. Finally, I realized that the lightning was inducing a fairly strong current flow in the wire that was arcing its way to ground inside my tuner. The next day I installed an SPDT (single-pole, double-throw) knife switch so that I could ground the antenna when not in use.

The longer the antenna, the more this is a problem. If you are going to install an antenna of more than a couple of hundred feet, I would recommend also installing a switch that will allow you to ground the antenna when not in use.

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e-mail: <wb2d@cq-amateur-radio.com>

Also, you can expect to spend a certain amount of time repairing antennas mounted like this. The wire tends to break from time to time as the wind blows the trees about.

A friend of mine lived in an apartment complex that also prohibited antennas. Unfortunately, his building was in the middle of the complex. However, there was an oak tree about 50 feet across the parking lot. He ran a piece of #22 magnet wire from his window to the tree and attached it to the trunk. Oak trees don't sway a lot in the wind, and it was attached only about 15 feet above ground. Apparently, no one ever noticed the antenna in the two years he lived there. It worked reasonably well, too.

In a similar vein, I've spoken with hams who live in city high-rise apartments. One trick that seems to work well is to tie a small rubber ball to the end of the antenna wire. When you want to operate, you drop the wire and ball out the window. When you're done, you reel it back in. A short plastic "yardarm" can be used to keep the wire pushed out away from the building. It also would be a good idea to make sure the length of the wire is such that the ball is suspended between floors so it doesn't crash into someone's window when a breeze is blowing. One friend only operates after dark to further reduce the risk of getting caught. No guts, no glory.

We talked about the random *length* of random wire antennas. They also can be random in other dimensions. For instance, the wire doesn't really have to be wire at all. Any metal object can be made to radiate like this. I have a number of friends who have used gutter pipes for antennas. Just attach a wire to the downspout with a sheet-metal screw. This one can be tricky, though. Sometimes the gutters are not electrically bonded together. You could end up with a "diode" action at one of these joints. What that means to you is lots of interference, making lots of neighbors very unhappy. If you try something like this, check it out with your own TV, radio, and stereo to make sure you are not inadvertently generating interfering signals.

Antenna Tuners

Purists will tell you that *antenna tuner* is a misnomer. It does not tune the antenna, but only matches the transmission line to make your transmitter *thinks* it's seeing a low SWR. Whatever. We'll go on using the common term everyone understands, whether or not it is technically correct. Personally, I think antenna tuners need to meet two main criteria. First, they should be simple to operate. Second, the match should be as broad as possible.

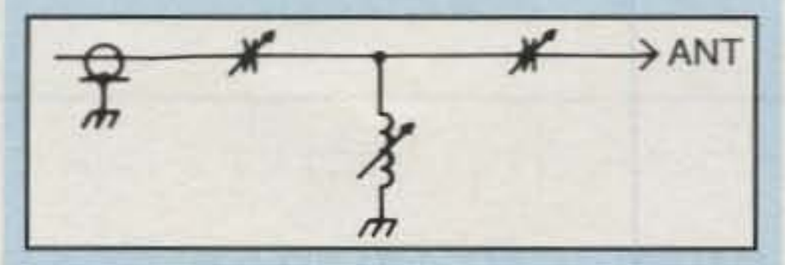

Fig. 1– The basic antenna tuner is one of the simplest of all circuits. It consists of two variable capacitors and a variable inductor. (See text for details.)

A typical circuit consists of some combination of coils and capacitors. The key really is to make sure that they are variable. Variable capacitors are pretty easy to find at hamfests and through the mail. Variable inductors, however, are a little more rare (and usually a little more costly). Essentially, variable inductors come in two forms—roller inductors, which provide infinite variation over the range of the inductor, and fixed inductors, with a switch and taps at various spots on the inductor. Obviously, the roller inductor is preferred.

Fig. 1 shows a simple "T" circuit using two variable capacitors and a roller (or switched) inductor. You will find variations of this circuit in most commercial antenna tuners. This is one of the easiest circuits to build, requiring only these three parts, a few insulators, and a chassis. One additional component that will make life much easier is a *turns counter* on the roller inductor. Once you have determined empirically the best setting for the tuner controls for a given band and frequency, you can quickly return to those settings if you have a counter installed on the roller inductor. The only tune up necessary will be fine-tuning the adjustments.

Component values are not critical. If you are going to build an antenna tuner, you probably are going to do it with parts from your junk box or a hamfest table. The exact value frequently is not marked on the component anyway. Look for a variable capacitor that has at least 1520 plates with 1/4 inch spacing. A roller inductor should have 20–30 turns, be at least 2 inches in diameter, and have a ceramic or phenolic core. Wire size should be at least #16. If you are running barefoot (without an amplifier), this will be more than adequate. Of course, if you want to use an amplifier, then you have to start paying attention to power and voltage ratings, and that is beyond the scope of this article. The important thing is to experiment. What works? What doesn't?

Years ago I needed an antenna tuner in a hurry. When I went to my junk box, I found I had two roller inductors and only one capacitor suitable for use. Therefore, I tried the circuit shown in fig. 2. It worked just fine, thank you. Use whatever is available and adapt.

RF Grounding

There is one additional thing to consider when using a random wire antenna, whether you build or buy your antenna tuner. Your station needs to be grounded for RF—not so easily done on the second or third floor! (*This is different from an electrical ground, which is equally important. –ed.*) A *counterpoise* works wonders here. Simply make up wires one-quarter wavelength long for each of the bands you intend to use and attach one end to the chassis of the antenna tuner. String the wire around your shack along the baseboards. Bending and changing direction is okay. There is at least one commercial product (MFJ's Artificial Ground) that will help with this.

Next month we'll take a look at making your first SSB contacts.

73, Pete, WB2D

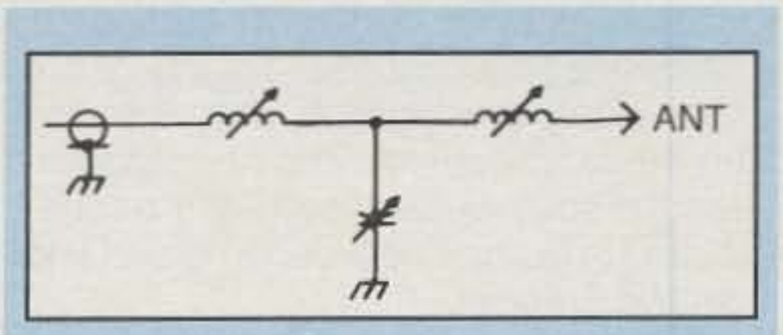

Fig. 2– It pays to experiment. I once needed to build an antenna tuner in a hurry and found I had two variable inductors, but only one variable capacitor. I wired them up like this and guess what? It worked just fine!

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

The Sunspot Prediction Peak and Us

In January I commented on what I thought might be the future for 6 meters. This month I will expand on the subject of predicting the peak of the current sunspot cycle.

According to NASA, this year is the year of the peak of solar Cycle 23, and they are in the position for having a need to know. According to their mission, "Planning for satellite orbits and space missions often requires advance knowledge of solar activity levels. NASA scientists are using new techniques to predict sunspot maxima years in advance." Their writers add, "Predicting the behavior of a sunspot cycle is fairly reliable once the cycle is well underway (about three years after the minimum in sunspot number occurs [see Hathaway, Wilson, and Reichmann Solar Physics 151, 177 (1994)])" (source: <http://science.msfc.nasa. gov/ssl/pad/solar/predict.htm>).

From their analysis comes the prediction that this year is to be the maximum. According to them, the peak of Cycle 23 is to occur sometime over the midpoint of the year, probably this summer. What does this mean to the dedicated VHF+ operator? Enhancement of the *F2*-layer and associated propagation of both *F2* and TE (transequatorial) modes, and a possible increase in aurora propagation. *F2* and TE propagation are both rarer forms of propagation that can affect the VHF+ frequencies of 6 and 2 meters.

F2 Propagation

The *F*-layer is the atmosphere's highest layer and is found between 100 and 300 miles above the surface of the Earth. During the peak of the sunspot cycle this layer receives ionization that will support refraction of wavelengths into the 6 meter band. Worldwide propagation is possible during the years surrounding the peak of the sunspot cycle.

During peaks in the sunspot cycle, *F2* propagation is present. The height and length of the sunspot cycle peak determines how often this form of propagation occurs. When it is available, this mode of propagation permits contacts of 6000+ miles or more. TE propagation is related to *F2* propagation. This form of propagation permits contacts between stations who are equidistant from each other across the magnetic equator. Signals sent and received via *F2* and TE propagation are usually weak, but are sometimes quite loud and intense. I once watched my S-meter for half an hour while a station from Australia kept the needle at the 20+ dB mark. During high sunspot activity, when *F2* type propagation is present more often, sporadic-*E* has been known to contribute to the lengthening of a path of a propagated signal. For example, twice in January 1993 DX contacts appeared to have been assisted by sporadic-*E*. Stations in New Zealand were working stations in Arizona when a path opened to Oklahoma for the ZLs. At the same time, a sporadic-*E* path existed between Arizona and Oklahoma. It looked as if the signal took a ride on *F2* to Arizona, then hopped a ride the rest of the way via sporadic-*E*. Within a few days of that opening Dave Batcho, N5JHV, experienced an unusual opening to central Europe. On both ends (stateside and European) of the circuit sporadic-*E* propagation was reported (in the U.S. between the northeastern and the southwestern parts of the country and in Europe between England and central Europe).

Six meter enthusiasts plan for these times of high *F2* propagation in order to complete the necessary contacts for achieving DXCC. In fact, the peak of the prior cycle (Cycle 22) produced the first recipients of this award and boosted many others within tantalizingly close proximity of their goal. No doubt those operators who didn't quite make it during Cycle 22 will do so during the peak of this cycle.

When the solar cycle is at its minimum, little *F*-layer propagation occurs. Many operators actually disassemble their 6 meter stations and store them until the peak of the next sunspot cycle.

While most *F2* propagation does disappear during sunspot lulls, some signals occasionally are disseminated by this mode. No one knows why; it just happens!

What can we expect from sunspot Cycle 23? Peter Taylor, in his book *Observing the Sun* (Cambridge University Press, 1991), examines recent cycles and compares the even-numbered with the odd-numbered cycles. Taylor concludes that even-numbered cycles have longer extended maxima than odd-numbered cycles. However, he also points out that recent odd-numbered cycles have been higher than their counterpart even-numbered cycles. Finally, he notes, " . . . if the odd-even relationship continues, the maximum of Cycle 23 should also be a very strong one, perhaps with a peak strength which approaches 200 (in mean sunspot numbers)."

(It's interesting to note that indirect correlation to this prediction existed some 17 years earlier. In a phone conversation I had with Dr. John A. [Jack] Eddy, the subject of my July 1976 *QST* article on the Maunder Minimum, he expressed the feeling that we were headed for another Grand Maximum of a long-term solar cycle that stretches into 200–300 years in periodicity and that this maximum would probably occur within the 21st century.)

Even so, in recent years NASA scientists have assembled an array of predictors for their position that this cycle, while being good, will not be as grand as the last one. They base their predictions on the following: According to them, "A number of techniques are used to predict the amplitude of a cycle during the time near and before sunspot minimum. Relationships have been found between the size of the next cycle maximum and the length of the previous cycle, the level of activity at sunspot minimum, and the size of the previous

VHF Plus Calendar

Mar. 5	New Moon. Moderate EME conditions.
Mar. 12	Moderate EME conditions.
Mar. 13	First quarter Moon.
Mar. 14	Highest Moon declination.
Mar. 15	Moon Perigee.
Mar. 19	Full Moon. Good EME conditions.
Mar. 26	Very Poor EME conditions.
Mar. 27	Last quarter Moon and Moon apogee.
Mar. 28	Lowest Moon declination.

—EME conditions courtesy W5LUU

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cycle. Among the most reliable techniques are those which use the measurements of changes in the Earth's magnetic field at, and before, sunspot minimum. These changes in the Earth's magnetic field are known to be caused by solar storms, but the precise connections between them and future solar activity levels are still uncertain.

"Of these 'geomagnetic precursor' techniques three stand out. The earliest is from Ohl and Ohl [*Solar-Terrestrial Predictions Proceedings*, Vol. II. 258 (1979)]. They found that the value of the geomagnetic *aa* index at its minimum was related to the sunspot number during the ensuing maximum. The primary disadvantage of this technique is that the minimum in the geomagnetic *aa* index often occurs slightly after sunspot minimum so the prediction isn't available until the sunspot cycle has started.

"An alternative method is due to Joan Feynman. She separates the geomagnetic *aa* index into two components—one in phase with and proportional to the sunspot number, the other component is then the remaining signal. She found that this remaining signal faithfully represents the sunspot numbers several years in advance. The maximum in this signal occurs at sunspot minimum and is proportional to the sunspot number during the following maximum. This method does allow for a prediction of the next sunspot maximum at the time of sunspot minimum.

"A third method is due to Richard Thompson [*Solar Physics* 148, 383 (1993)]. He found a relationship between the number of days during a sunspot cycle in which the geomagnetic field was 'disturbed' and the amplitude of the next sunspot maximum. His method has the advantage of giving a prediction for the size of the next sunspot maximum well before sunspot minimum.

"Another indicator of the level of solar activity is the flux of radio emission from the Sun at a wavelength of 10.7 cm (2.8 GHz frequency). This flux has been measured daily since 1947. It is an important indicator of solar activity because it tends to follow the changes in the solar ultraviolet that influence the Earth's upper atmosphere and ionosphere. Many models of the upper atmosphere use the 10.7 cm flux (F10.7) as input to determine atmospheric densities and satellite drag. F10.7 has been shown to follow the sunspot number quite closely, and similar prediction techniques can be used" (source: *ibid*).

As a result of their analyses, their predictors indicate a maximum sunspot number of about 154 ±21. Allowing for the less than predicted rise in activity last year, they contend that the numbers indicated are probably correct, albeit on the low side of the ±21.

Those of us who lived through Cycle 22 realize that this prediction for Cycle 23 is considerably lower than for Cycle 22. As a result, we can expect significantly less propagation during this cycle than was experienced during the last.

We here in North America can expect that this year, particularly this fall, we will experience some excellent propagation into Europe. The months of October and November and early December could produce some worldwide DX on the 6 meter band.

This good propagation probably will extend into next year and maybe into 2002. However, based on NASA's predictions it is likely that we will see a drop-off of *F2* propagation beginning in 2003. While NASA is indicating a smoother decline than the incline experienced, because of the high nature of the 6 meter band, we will experience the disappearance of propagation

more quickly and more intensely than our HF colleagues.

Propagation Predictors

For up-to-date information, go to the following URLs: <http://www.sec.noaa.gov/forecast.html> and <http://www.sunspotcycle.com>. The latter lists the somewhat current sunspot number (within a day or so, given weekends and holidays) as reported by the National Oceanic and Atmospheric Administration (NOAA) and is heard on WWV at 18 minutes after the hour.

The frequency spectrum between 30 and 50 MHz is rife with sources of propagation predictors. World wide there are various allocations of stations, from police radios, to older cordless phones, to television stations, to broadcast stations. Various sources on the Internet list some of these stations, which can serve as beacons, or indicators, of the rise in propagation. One such source is The OZ50MHz DX Bulletin and the 50 MHz continental split beacon listings, which can be found at <http://www.qsl.net/oz6om>.

Additionally, "The 50 MHz DX Bulletin," edited by Victor Frank, K6FV, is an excellent source of reporting propagation via this band. A surface-rate subscription to the newsletter is $20 per year for U.S. subscribers and $25 per year for airmail to the U.S., Canada, and Mexico, and surface-rate elsewhere. The DX airmail rate is $30 per year. You can send your subscription request to Victor at 12450 Skyline Blvd., Woodside, CA 94062-4558 USA. His e-mail address is <frank@horizon.sri.com>.

What about F2 On other VHF+ Frequencies?

The MUF of *F*-layer propagation rarely reaches 70 MHz. Only on very rare occasions have European amateurs, who have the 70 MHz ham band, made contact with stations via this form of propagation. In fact, the 6 meter ham band was actually an FCC compromise that recognized the rarity of this form of propagation.

Before World War II, amateurs in the United States had the use of the 5 meter band, which extended between 56 and 60 MHz. As a way of allocating frequencies for the new television services, the FCC set aside certain blocks of 6 MHz for the lower channels. Originally, the Commission was going to give the amateurs a band between 44 and 48 MHz. However, intense lobbying by the ARRL convinced the FCC that there was sufficient occurrence of both sporadic-*E* and *F2* propagation so the attraction of the band " . . . would possess small novelty and much of the eager interest of amateur observers would disappear" (August 1945 *QST*, p. 12).

Owing to the League's urging, the FCC created a channel 1 beginning at 44 MHz, and then granted amateurs the 6 meter band between 50 and 54 MHz. The allocations continued with the assignment of channel 2 between 54 and 60 MHz. Eventually, the FCC abandoned the channel 1 assignment and later subdivided it for use by fixed and mobile services. Such services serve as beacons today, alerting 6 meter operators to possible impending openings on their band.

TE Propagation

Transequatorial propagation is related to *F2* propagation in that its signal is refracted by the *F*-layer. TE also seems to occur most often during the peak of the sunspot cycle. Additionally, TE propagation seems to occur more often in the spring, during the late afternoon or evening.

To take advantage of TE propagation, both you and the station you're trying to work must each be the same distance from the geomagnetic equator. Unfortunately, this rules out all but the southern tips of Florida and Texas and the southern west coast on the continental US. Nevertheless, it does include stations on the opposite end of South America, southern Africa, and in the Pacific.

Such propagation has been reported recently on 2 meters. On December 26, 1999 Ed Rodriguez, WP4O, reported the following: "KP4EIT, KP3A, and myself, WP4O, worked the following stations: LU9EVS, LU5EJT, and CX9DK on 144.300 at 0020 UTC. The signals ranged from 56 to 59. I was running 120 watts with a 6-element quad."

Although it has yet to be reported, propagation up to 432 MHz is possible. With sporadic-*E* link-ups, occasional contacts to more northern QTHs on the continent can occur on 6 meters. More rare are meteor burst links with TE propagation. One such event is believed to be cause of the contact that Larry Lambert, NØLL, had with Nob, VR6JJ. Larry reported that he could barely hear Nob, until all of a sudden he burst through. They quickly completed the contact, and then Nob was gone. Larry attributes that sudden burst to ionization caused by a meteor burn.

TE Propagation— How Does It Work?

Most of the time the southbound signal travels outward to an *F2*-layer north of the equator, is refracted back to Earth at the equator, bounces outward to another *F2*-layer south of the equator, and is finally refracted back to Earth. However, sometimes these two layers break up into ionized clouds and traverse the equator. When this happens, the signal appears to become trapped below these clouds and is continuously refracted until it lands on the surface at the distant location. It is this breakup, which seems to be what occurs during an auroral event, that creates the transequatorial opening on 6 meters.

Forward Scatter Propagation

Another form of 6 meter propagation occurs when signals are bounced back from an ionized *F2*-layer. Sometimes an *F2*-layer is so intense that signals hitting it at just the right angle are refracted back to the source. This is known as Forward Scatter Propagation. Operators trying to work South America have sometimes noticed that the signal hits the first *F*-layer, bounces back to Earth on the Gulf of Mexico or the Caribbean, and then scatters back across the surface of the Earth to its source.

I've heard this form of propagation on the HF bands and 6 meters. The signals are weak and take on a bassy and sometimes watery sound.

F2 Propagation and Awards

The Worked All States Award has been issued to many operators on 6 meters. On 6 meters, depending on where you're located in the country and where we are in the solar cycle, it may take you between one summer and ten years to garner all the states. The most difficult to snag are Alaska and Hawaii. Those who live in the southeast will most likely have to wait until an *F2* propagation mode peak to work Alaska. However, it is possible to work Alaska and Hawaii on multi-hop sporadic-*E*. These events are rare and you must watch for them.

The DXCC award is not one for the casual operator, even though the past sunspot cycle has seen a number of DXCC awards issued for 6 meters. If you are very fortunate, you can work 50 countries via sporadic-*E*. The rest must be via some extended form of propagation, such as TE or *F2*. A QTH in the right part of the country is a must, once again. Fortunately, there's a DXCC rule that states you can count contacts made from anywhere in your home country. Therefore, if you like to travel, you can work all you can from the southwest, move to Maine and work all the Europeans you can, then move to the west coast and work all the Asians you

can. Theoretically, it is possible to achieve DXCC on the move! Here again, though, you must have quite a bit of luck. If this is your plan, though, it still probably will take you at least ten years to reach your goal.

Millennial Prediction Feedback

Speaking of predictions, the following came to me as a result of my predictions over the past two months:

"Regarding High Definition Television (HDTV) operations on the ham bands, we already are doing HDTV and digital TV ATV on an experimental basis here in Dallas. You had mentioned the possibility for the future in your January 2000 article. Although we do it via 50 watt repeaters on 2.4 GHz, because digital HDATV still only takes the traditional 6 MHz space as an analog TV signal, one can actually do HD on the 420 MHz amateur band! (I do not know what the FCC rules call this form of modulation, but assume it's legal.) Perhaps by the time you write the rest of the bands into an article, you can include these microwave activities in 2.4, instead of calling it another garbage band like 902 MHz. (Although 2.4 is fast becoming garbage itself, courtesy of FCC allowances—4 watts ERP without a license!). Thanks, *Lee, AB5IG, Dallas*"

D44BC SK

Julio Vera Cruz, D44BC, suffered a fatal heart attack in Portugal last October. Julio was one of two 6 meter operators on Cape Verde Island. During the last sunspot peak he provided many operators with a valuable needed country on that band. He certainly will be missed during the current upswing of solar activity. Victor Frank, K6FV, reported in "The 50 MHz DX Bulletin" that Julio was making contacts on 6 meters as late as August 22nd of last year.

And Finally . . .

For more than nine years my friend and colleague Terry Littlefield, KA1STC, was at the helm of *CQ*'s now former sister publication *Communications Quarterly*. Before assuming the editorship of that magazine, she was the editor of *Ham Radio* when CQ Communications acquired it. With the ARRL's recent acquisition of *Quarterly*, the contents have been merged into *QEX* magazine. Terry will not continue at the helm of the merged magazine. When I spoke to her husband, Rick, K1BQT, at press time, he told me that she was "exploring other options." I am sure that by now her exploration is over and she has landed a wonderful new opportunity.

I met the Littlefields at Dayton on my first trip to that hamfest a few years ago. Terry was working the *CQ* booth, as was I. We three became fast friends, especially because of my keen interest in the contents of *Communications Quarterly*. After my idea to write a book, *The VHF How To Book*, became a manuscript, it was a natural for Terry to be my editor.

We began to work together professionally on my manuscript. It wasn't long before our professional relationship became keenly personal. As a result, over the years we have enjoyed a wonderful friendship. It was Terry and her advice to me about my priorities that played a pivotal role in my new occupation as a minister. For that I will be eternally grateful.

I will miss Terry as a fellow colleague of a sister publication that had earned international respect for its contents. The League has a major reputation to live up to thanks to the efforts of Terry and all those who contributed their time and efforts to the magazine. I salute Terry as "one of the best" in the business of technical editing and wish her Godspeed in her new endeavors.

That's all for this month. I look forward to your continuing support of this, your column. Until next month . . .

73, Joe, N6CL

DX

BY CARL SMITH, N4AA

News Of Communication Around The World

Myanmar, Macquarie, and Pitcairn

WAZ Update

As of press time (mid-January) all WAZ applications *postmarked* prior to October 1, 1999 have been processed. Your QSL cards have been returned to you, and by the time you read this your certificates and/or endorsement stickers should be on their way to you.

If you feel that we've missed your application, please drop a note to K5RT at either of the following:

Paul Blumhardt, K5RT
2805 Toler Road
Rowlett, TX 75089 USA

or

e-mail: <k5rt@cq-amateur-radio.com>

Don Hans Simensen, LAØHI, of Surnadal, Norway, says his LAØ prefix is reserved for foreigners living in Norway. That prefix makes him quite popular when he is on the air. He QSLs 100% through the bureau and belongs to the NRRL.

By the time you read this we will be well into the New Year. Virtually all of us have discovered that *if* there was a Y2K bug, it didn't affect the majority of us. My computers continued to hum along, my radio continued to function, my logging program clicked, and DX continued to be available as we tried to remember to write 2000 instead of 1999.

Most Wanted

The DX Magazine's 1999 survey of the 100 Most Wanted came out in early January. It showed little change in the top 10 or so worldwide. North Korea continues to lead the list, along with Andaman, Bhutan, Scarborough, Yemen, Bouvet, and Lakshadweep (Laccadives). There were rumors that operations from a few of these would happen early in 2000, but that remains to be seen as of this writing. Due to the sensitive nature of some of these countries, any early announcement could jeopardize negotiations. One must keep an open mind in these things.

XZØA—Myanmar DXpedition

The very large XZØA operation from Myanmar was to be conducted from mid-January through early February. This DXpedition included over 20 operators from several countries, with some very serious efforts at making the low bands available to the DX community. They planned a 180 foot tower for 160 meters, along with several beverage antennas up to 2000 feet in length, plus enough antennas for the other bands to satisfy anyone. They created a web site with an interesting feature for propagation. A simple click of the mouse over your approximate location on a map of the world brought up a chart showing bands and times (both in UTC and local time) when each band was expected to have propagation from you to XZØA. Time will tell how well this system worked, but I have to admit that it was an interesting exercise.

QSLing

QSLing is always a pretty hot topic. "When is the XXXX DXpedition going to get its cards out?" "Why haven't I gotten my card from YYYY? All of my friends got theirs." "Why won't ZZZZ accept cards via the bureau? I hear these comments frequently and wonder at the urgency of such inquiries. Granted, some DXpeditions are better organized than others; some are better financed than others; some have better sponsors for QSLs, etc.

I don't know about you, but answering 10–20,000 QSL requests could get very boring, very quickly for me. However, it is a necessary part of any operation, whether from your own personal station or as a result of a multi-thousand QSO DXpedition. All of us would like to be on the air chasing DX rather than filling out cards, but if we want to receive cards, we have to send cards. If we receive QSL requests, we have an obligation to respond to them.

I have been QSL manager for a few stations over the years, including the initial 5A1A operation in July 1995. I volunteered for the job because I wanted to *give back* a little of what I had received over the past 40 years. It was a labor of love, although frustrating at first when I had a problem getting the logs. By the time the logs were in hand, I had already received hundreds of requests. I totally lost count, as there were many boxes full of requests to be answered. After a few months the last of them was finally answered. Remember that this is a *volunteer* thing; I had a full-time job and a family to consider.

Bureau cards are another story. Oh, sure, I got a pile of cards through the bureau system, too, and all of those were answered after the direct requests were finished. There is nothing unusual about that practice, as most QSL managers fol-

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

The WPX Program

SSB

2731 .....IKØOMC

CW

3026 .....JI8MAF 3027 .....UA9CES

Mixed

1847.....ON4CCP

CW: 350 UA9CES. 1000 WA3GNW. 1500 IK5TSS. 1750 IK3GER. 1900 S51NR. 4350 WA2HZR.
SSB: 350 K8NIA. 950 IK6JYY. 1050 WD8ANZ. 1100 WD8ANZ. 4250 ZL3NS.
MIXED: 1050 WD8ANZ, W2EZ. 1100 WD8ANZ, W2EZ. 1150 W2EZ. 1200 W2EZ. 1250 W2EZ. 1300 W2EZ. 1350 WA3GNW. 1400 WA3GNW. 1450 WA3GNW. 1500 WA3GNW. 1750 OZ1ACB. 1800 OZ1ACB. 1850 OZ1ACB. 1900 OZ1ACB.1950 OZ1ACB. 2000 OZ1ACB. 2300 N4UH. 3350 WB2YQH. 4650 W2FXA.

10 meters: IK5TSS
15 meters: K8NIA
20 meters: K8NIA
160 meters: K8NIA

So. America: IK5TSS
Europe: ON4CCP
Oceania: KT2C, OK1DWC

Award of Excellence Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH,, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KB0G, NB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH.

Award of Excellence with 160 meter Endorsement: K6JG, N4MM, W4CR2, N5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDE1, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA.

low the same procedure. I personally don't have a problem with it. If I choose to send my request through the bureau, I should expect it to take longer.

Steve Wheatley, KU9C, wrote a very informative article "Hints for Sending a QSL Card, or The Care and Feeding of a QSL Manager" in the January/February issue of *The DX Magazine*. Steve has been the manager for a large number of DXpeditions and individuals over the years and is well qualified to speak

Franz, DJ9ZB, at the operating position of 7O1A in December 1996.

The WAZ Program

Single Band WAZ

15 Meter CW

278 ..... W9MJ

20 Meter SSB

1053 ..... WO2Q 1054 ..... K4HB

All CW

141 ..... KK4XL
(correction to prior listing)
145 ..... GØCGV
146 ..... KC5TJG
147 ..... VE3WFD
148 ..... VE3SWA
149 ..... LZ1JZ
150 ..... UA3AP

160 Meter WAZ

VO1NA, 35 Zones endorsement
144 ..... NØTB, 36 Zones
145 ..... DKØEE, 35 Zones
146 .... IV3YYK, 40 Zones
147 ..... S59Z, 30 Zones

RTTY

116 ..... K3UA

All Band WAZ

SSB

4519 ..... N9WT
4520 ..... EI2HY
4521 ..... HL2WA
4522 ..... WAØI
4523 ..... UA3AP
4524 ..... JH1HHC
4525 ..... W1RAA
4526 ..... ON4BCM

CW/Phone

7897 ..... OK1DWC
7898 ..... W1NMB
(all CW 11-30-99)
7899 ..... W9RB
7900 ..... F6CUK
7901 ..... HL2WA
7902 ..... RU3DX
7903 ..... IK1RLI
7904 ..... WB4OMM

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award, CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. The WAZ Award Manager is Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75088; e-mail: <k5rt@cq-amateur-radio.com>.

on the subject. For you newcomers, and even some of you old hands at DXing, Steve offers good, sound advice on how to handle QSLing.

DXCC in the 21st Century

I'm sure most of you are aware of the changes in the DXCC awards program effective with the New Year. If you haven't kept up with it, you might want to check the article on "New DXCC Awards for the New Millennium" by Bill Kennamer, K5FUV, in the December 1999 issue of *QST*. There is information on The DXCC Challenge, The DeSoto Cup, DXCC 2000 Millennium Award, and the new 20-Meter Single Band DXCC Award. These new programs are intended to bring some life back to DXing. With so many DXers reaching 300-plus, there just aren't enough challenges for them and a lot of them have just gone away due to lack of interest. With these new awards I believe we will see a renewed interest in working DX of all types, not just the rare DXpeditions. Can you imagine a pile-up trying to work a DL, a G, or a JA? Now that brings back more than a few memories!

2000 SWODXA Dinner

The Southwest Ohio DX Association has announced the 15th annual DX Dinner to be held on Friday, May 19, 2000 of the Dayton Hamvention at the Crowne Plaza Hotel, Dayton, Ohio.

5 Band WAZ

As of 12 January 2000 509 stations have attained the 200 Zone level.

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

NI6T
K7PI
NØTB
EA7EL
CP6NU
RA3DX
EA1QF
ON4ATW

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

N4WW, 199 (26)
W4LI (AA4KY), 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
K1ST, 199 (26)
ABØP, 199 (23)
KL7Y, 199 (34)
NN7X, 199 (34)
OE6MKG, 199 (31)
HA8IB, 199 (2 on 15)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
W6SR, 199 (37)
W3UR, 199 (23)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
N4CH, 199 (18 on 10)
OE1ZL, 199 (1)
W6DN, 199 (17)
W3NO, 199 (26)
K4UTE, 199 (18)
K4PI, 199 (23)
HB9DDZ, 199,(31)
N3UN, 199 (18)
NØTN, 199 (6 on 40)
UA3AGW, 198 (1,12)
EA5BCK, 198 (27,39)
G3KDB, 198 (1,12)
KG9N, 198 (18,22)
DKØEE, 198 (19,31)
KØSR, 198 (22,23)
K3NW, 198 (23,26)
UA4PO, 198 (1,2)
JA1DM, 198 (2,40)
9A5I, 198 (1,16)
K4ZW, 198 (18,23)
OH2VZ, 198 (1,31)
RAØFA, 198 (2 on 10,15)
LA7FD, 198 (3,4)
K5PC, 198 (18,23)
NT5C, 198 (18,23 on 40)
VE3XO, 198 (23,23 on40)
K4CN, 198 (23,26)
KF2O, 198 (24,26)

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

CT1ESO, 183 Zones
OK1DWC, 179 Zones
DK8UH, 170 Zones
N1TC, 194 Zones
WAØI, 170 Zones
LZ1JZ, 184 Zones
UA3AP, 183 Zones
RU3DX, 170 Zones
RV3GW, 180 Zones
SV2CWY, 150 Zones
DL3JSW, 192 Zones
IK5TSS, 164 Zones
HK3JJH, 188 Zones
9A3IJ, 169 Zones
UA4KSW, 172 Zones
DF2IS, 183 Zones

Endorsements:
W9MJ, 168 Zones
K5RT, 200 Zones

1122 stations have attained the 150 zone level as of December 30, 1999.

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

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award, CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. The WAZ Award Manager is Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75088; e-mail: <k5rt@cq-amateur-radio.com>.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 331 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement sticker s is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K2TQC 331	N4MM 330	PAØXPQ 328	WØJLC 327	W4LI 325	KUØS 322	N5HB 316	OH3NM 310	LU3DSI 295
K2FL 331	G4BWP 330	WB5MTV 328	NC9T 326	K3JGJ 325	ON4QX 321	K4JLD 316	VE9RJ 309	WG7A 295
K6JG 331	EA2IA 330	K4IQJ 328	IT9TQH 326	K1HDO 325	KA5TQF 321	K8JJC 315	HB9DDZ 307	G4MVA 294
N4JF 331	W7OM 330	W1WAI 328	4N7ZZ 326	K5UO 325	K9QVB 321	AA2X 314	WG5G/QRPp 307	KB8O 292
K9BWQ 331	WØHZ 330	DJ2PJ 328	NC9T 326	DL3DXX 324	HA5DA 321	NØFW 314	W7IIT 305	DJ1YH 288
K2ENT 331	W8XD 330	WØIZ 327	VE7CNE 326	N6AR 324	K6CU 321	N1HN 313	KE5PO 304	YU7FW 286
K6LEB 331	F3TH 330	K8PV 327	K2JF 326	IT9VDQ 324	IT9ZGY 320	CT1YH 313	G2FFO 303	EA3BHK 282
N7FU 331	N7RO 330	W4QB 327	KA7T 326	N4CH 324	HA5NK 319	W4UW 313	IKØADY 302	YC2OK 280
K3UA 331	KZ4V 329	I1JQJ 327	K9IW 325	WB4UBD 324	VE7DX 318	K9DDO 312	PY4WS 302	XE1MD 278
YU1HA 331	K4CEB 329	I4LCK 327	I5XIM 325	K8LJG 324	N6AV 318	W3II 312	N4OT 301	EA2CIN 278
K9MM 331	W4OEL 329	N5FG 327	WA8DXA 325	I2EOW 324	VE7DX 318	K1FK 311	KH6CF 300	KF8UN 276
WA4IUM 331	K2JLA 329	I4EAT 327	N5FW 325	W6SR 323	YU1AB 317	OZ5UR 311	YV5ANT 299	I3ZSX 276
K2OWE 330	K4CN 329	DL8CM 327	IK2ILH 325	IT9QDS 323	G3KMQ 317	K1VHS 311	KØHQW 299	G3DPX 275
F3AT 331	K6GJ 329	SM6CST 327	9A2AA 325	9A2AJ 323	K7JS 317	WA8YTM 311	K9FYZ 297	
W2FXA 331	W7CNL 329	N4KG 327	OK1MP 325	N4AH 322	LA7JO 316	N6AW 311	F6HMJ 296	
W2UE 330								
W6DN 330								

SSB

K4MZU 331	EA4DO 330	PAØXPQ 328	OE7SEL 326	K6LEB 324	W5XQ 320	N5HSF 316	DK5WQ 305	IK2PZG 289
K2TQC 331	ZL3NS 330	VE2WY 328	DL6KG 326	IK1GPG 324	LU1JDL 320	K6RO 316	EA5OL 305	VK3IR 289
K2FL 331	N4MM 330	VE2PJ 328	W5RUK 326	K3JGJ 324	KF8VW 320	W6NW 315	WB2AQC 305	KF7VC 288
EA2IA 331	XE1VIC 330	W2JZK 328	9A2AJ 325	IØSGF 324	G4ADD 320	KV2S 315	K6CF 304	OK1AWZ 287
W6EUF 331	K9FYZ 330	LA7JO 328	KE4VU 325	AI8S 324	I4WZK 320	WA9RCQ 315	KC4FW 304	IK2DUW 287
K2JLA 331	XE1AE 330	YV1JV 328	WA4WTG 325	N6AR 324	I4SAT 320	N3ARK 315	EA5GMB 304	EA5GMB 287
K6JG 331	VK4LC 330	KZ4V 328	WD8PUG 325	AC7DX 324	W7ULC 320	K7TCL 315	EA3CWK 303	TU2QW 286
K6GJ 331	WB4UBD 330	WDØBNC 328	W2CC 325	KØHQW 324	EA3EQT 320	I4CSP 315	EA3BT 303	KK4TR 286
K2ENT 331	K3UA 330	K1HDO 328	PT2TF 325	EA3BKI 323	KØFP 320	WB8ZRV 314	YC2OK 303	NM5O 285
N4JF 331	K9BWQ 330	VE4ACY 328	KM2P 325	W2FGY 323	KE3A 320	NØAMI 313	WB2NQT 303	EA1AYN 285
VE1YX 331	VE3MRS 330	K5UO 328	N5FW 325	KC8EU 323	N4CSF 320	OH5KL 313	W5GZI 302	VE7HAM 285
K5TVC 331	N4CH 330	N5ZM 328	K9HDZ 325	K6BZ 323	N4HK 320	WDØDMN 313	N5QDE 302	IK2HBX 284
K6YRA 331	KØKG 330	I4EAT 327	WA3HUP 325	YV5CWO 323	DL3DXX 320	K9YY 313	KD4YT 302	F5RRS 284
YU1AB 331	WØYDB 330	CT1EEB 327	I2QMU 325	I8KCI 323	AE5DX 320	W9IL 313	RA2YA 301	KE6CF 283
W7OM 331	WA4IUM 330	W9OKI 327	N6AW 325	VE4ROY 323	KA5TQF 320	W1LQQ 313	N3RX 301	K7HG 283
K4MQG 331	YV1KZ 330	F9RM 327	ZP5JCY 325	VE4AT 323	KB1HC 320	N5HB 312	LU3HBO 301	K7ZM 282
VE3MR 331	YV1AJ 330	VE7DX 327	KA3HXO 325	K4JDJ 323	IØSGF 319	KD5ZD 312	YT7TY 300	WN6J 281
K7LAY 331	W4NKI 330	AA6BB 327	KE5PO 325	KA5TTC 323	WA4DAN 319	IN3ANE 311	W5OXA 300	CP2DL 281
IK1GPG 331	I4LCK 330	SM6CST 327	TI2CC 325	KB2MY 323	KI3L 319	F1OZF 311	K3LC 300	YU1TR 280
K5OVC 331	4N7ZZ 330	W3GG 327	YV5IVB 325	K8YVI 322	KF8UN 319	EI6FR 311	WA4ZZ 300	KN4RI 280
DJ9ZB 331	IK8CNT 330	OZ3SK 327	KD8IW 325	W2FKF 322	F6BFI 319	VE3CKP 311	WZ3E 300	WD9ACQ 280
NØFW 331	W4UW 330	CX4HS 327	N2VW 325	WW1N 322	N6RJY 319	GM4XLU 311	LU5DV 300	OA4EI 280
KZ2P 331	YV1CLM 330	KX5V 327	KF7SH 325	K9HQM 322	ON5KL 319	CT1YH 311	YV4VN 299	KK5UY 280
K1UO 331	K8CSG 330	IT9TQH 327	IKØIOL 325	KC5P 322	CT1EEN 319	KA5RNH 310	K6GFJ 299	WØIKD 279
OZ5EV 331	W2FXA 330	IT9TGO 327	YU1HA 325	W3AZD 322	KF5AR 318	I2MQP 310	KJ9N 298	EA3CWT 278
W6BCQ 331	W7FP 329	WD8MGQ 327	YV5AIP 325	CE7ZK 322	KB1JU 319	HA6NF 310	SV3AQR 296	N1KC 278
YV5IVB 331	N5FG 329	I1EEW 327	K9IW 325	LU7HJM 322	PY2DBU 319	KF7RU 310	KB5W 295	VE3DRN 277
K7JS 331	W8ZET 329	IØZV 327	WA4JTI 325	K5NP 322	I8IYW 318	AB4IQ 310	SV1RK 295	9A9R 277
DU9RG 331	WS9V 329	SV1ADG 327	W8KS 325	KB8O 322	KF5AR 318	W4WX 310	4X6DK 295	K3LC 277
VE3XN 331	OE2EGL 329	DL8CM 327	OK1MP 325	NI5D 322	CE1YI 318	EA5RJ 309	YT1AT 294	VE2DRN 277
K9MM 331	K4JLD 329	KE4VU 327	VE3GMT 325	TI2JJP 321	K4JDJ 318	EA5KY 308	IT9VDQ 293	KC6AWX 276
W4UNP 331	I2EOW 329	I1JQJ 327	WB3CQN 325	YZ7AA 321	ZL1BOQ 318	EA3CB 308	KJ5LJ 293	SV2CWY 276
PY4OY 331	K2JF 329	K9PP 327	KB4HU 325	W6MFC 321	K9QVB 318	EA3BHK 307	W6WL 291	W6UPI 276
W7BOK 331	VE7WJ 329	XE1MD 327	KC4MJ 325	EA8TE 321	I8IYW 318	WZ3E 306	YB1RED 291	KE4SCY 276
N7RO 331	WB3DNA 329	VE2GHZ 327	CX2CB 325	XE1CI 321	WA8YTM 318	WR5Y 306	DJ2UU 291	VE2AJT 275
ZL3NS 331	ZL1AGO 329	W4QB 326	W9SS 325	LZ1HA 321	W9IL 317	N6AV 306	KØOZ 291	US1IDX 275
I8LEL 331	I8KCI 329	K8PV 326	W4EEE 325	WA5HWB 321	WA6DTG 317	TI2TEB 306	N6CFQ 290	Z31JA 275
OE3WWB 331	4Z4DX 329	NC9T 326	YV1CLM 325	TI2HP 320	EA1JG 317	VE3DLR 306	WA3KKO 290	F5NBX 275
W6DN 330	DL9OH 329	W6SR 326	VE7WJ 324	OA4QV 320	WS9V 316	W3YEY 306	OE7KWT 290	KA5OER 275
XE1L 330	K4CN 329	W4LI 326	IT9ZGY 324	OE6CLD 320	CT1AHU 316	XE1MDX 305		

RTTY

K2ENT 327	W2JGR 316	K3UA 304	G4BWP 287	W4EEU 284	YC2OK 280	I2EOW 278	KE5PO 274	PAØXPQ 272
WB4UBD 320	NI4H 305	I1JQJ 289	EA5FKI 284	W4QB 280				

Cash bar at 6:30 PM and dinner at 7:15 PM. Tickets are $31 and must be purchased in advance. Groups wishing to sit together must order as a group (tables sit eight). Make check or money order payable to SWODXA and send an SASE for ticket return. Seats will be assigned (on March 12th) in the order that requests are received. Seating is limited. Tickets may be ordered from Steve Bolia, N8BJQ, 7354 Thackery Road, Springfield, OH 45502. For more information, check out <http://members.aol.com/SteveB4622/> or contact Steve at telephone 937-788-2803, e-mail: <n8bjq@erinet.com>.

VKØLD/VKØMM Macquarie Island

Alan has been on Macquarie for some time now and used VKØLD until the end of 1999. With the new year he was allowed to use VKØMM (**M**acquarie **M**illennium. He will be on the island until the end of the year operating primarily 20 and 15 meters. Alan regularly posts his operating schedule on his web page at the following address: <http://www.geocities.com/vkØld/1.html>.

Alan has indicated that this could be the last operation from Macquarie on CW at least, so if you need it, you would be well advised to work him this year. Although Alan does have some definite operating habits, he is very workable if you just adhere to his schedule and operating parameters. He has stated repeatedly what he considers acceptable calling practices and how he expects callers to respond to his requests to stand by, etc. I am not standing in

CQ DX Awards Program

SSB

2294	W4GJ	2296	ON4LCV
2295	KD5CQT	2297	N1KC

RTTY

30	N1KC	31	I2EOW

SSB Endorsements

320	I8LEL/331	320	NI5D322
320	OE3WWB/331	310	VE3CKP/311
320	W2FXA/330	300	WZ3E/306
320	W4UW/330	275	N1KC/278
320	I2EOW/329	275	KE4SCY/276
320	K5UO/328	150	ON4LCV/197
320	XE1MD/327		

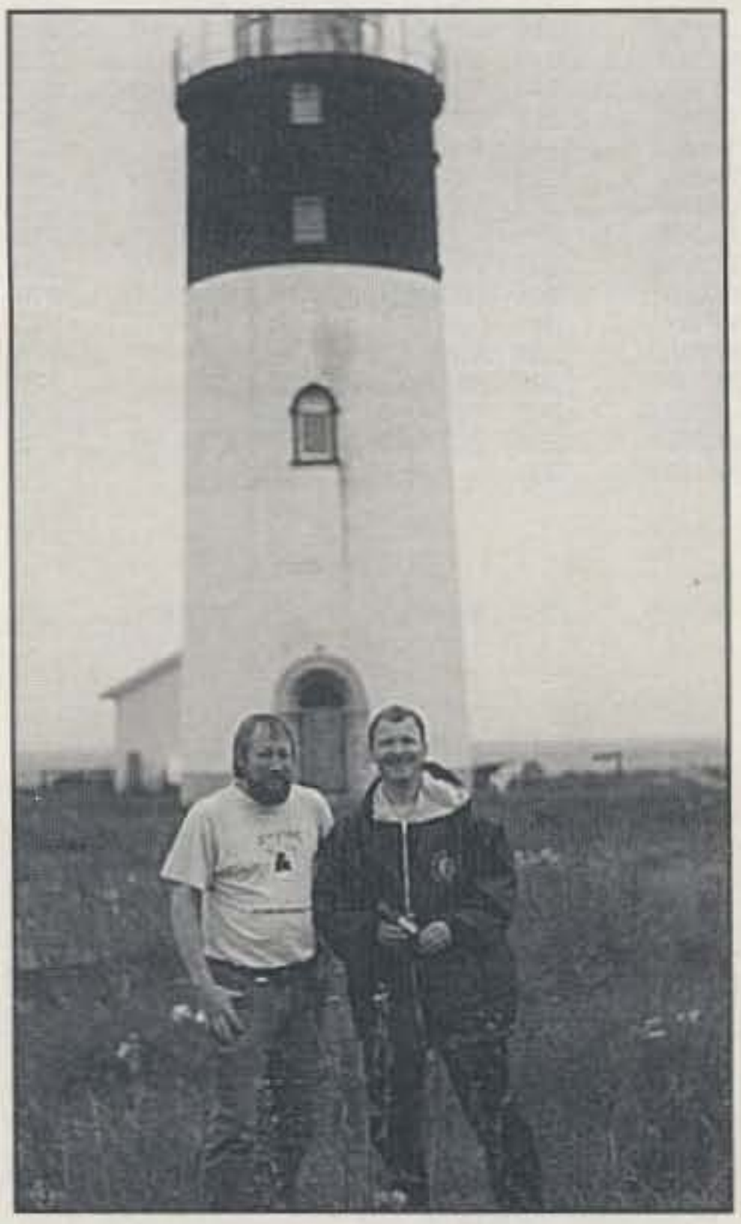
CW Endorsements

320	F3AT/331	320	K5UO/325
320	W2FXA/331	320	I2EOW/324
320	F3TH/330	310	W4UW/313
320	W8XD/330	275	F6HMJ/296
320	W7CNL/329	275	XE1MD/278
320	DJ2PJ/328		

RTTY Endorsement

275	I2EOW/278

The basic award fee for subscribers to *CQ* is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 331 active countries. Please make all checks payable to the award manager.



(Left to right) Mats, SM1NVW, and Mario, DL5ME, in front of the Gotland Island lighthouse. They were there on an IOTA DXpedition for EU-020. (Photo courtesy KDØJL)

judgment, one way or the other, but if you expect to work him, it would be advisable to respect his wishes. Alan does not have a QSL manager and has stated that cards probably will not be available until he leaves the island in December 2000.

VP6BR—Pitcairn Island

Jukka, OH2BR, will have finished his DXpedition to this semi-rare one by now. Jukka went to celebrate his 40 years of ham radio operation. He was expected to stay on the island, as the guest of Tom and Betty Christian, VP6TC and VP6YL, for about three weeks and made plans to be very active in providing VP6 to the deserving, especially in Europe. Pitcairn is not the easiest place to get on or off, as it is not on any regular shipping schedule. He had to make special transportation arrangements.

Jukka was one of the major players in a large operation from Maljy Vysotskik as R1MV last year and also handled the QSLing for that DXpedition. QSLs for VP6BR go via OH2BR.

The Torch is Passed

I am honored to have been asked to write the DX column for *CQ* on a permanent basis. I realize there are some rather large shoes to fill. Chod Harris, VP2ML, wrote this column for a long time and developed many friendships around the world. I will do my best to provide you with information and ideas that will satisfy your wants and needs.

That wraps it up for this month. Any DX news or information, especially photographs with captions, may be sent to me at P.O. Box DX, Leicester, NC 28748-0249 or via e-mail to: <n4aa@cq-amateur-radio.com>.

73 and Good DXing, Carl, N4AA

QSL INFORMATION

3D2VJ to G4ZVJ
3DAØWPX to ZS6WPX
3F2CWB to HP2CWB
3V8ST to DL1BDF
3W5RS to EA5KB
3W6DK to NØODK
3W6US to N2OO
3W6WE to K2WE
3XY2D to VE2DPS
4F2DX to PZ3GKI
4K1HX to IK2BHX
4L1HX to IK2BHX
4T4O to OA4O
4UØG to IK2BHX
5B4AGE to SMØTGG
5H3MG to IN3YYQ
5H4IR to ZS6EZ
5H9IR to ZS6EZ
5P1ER to LA5HE
5R8FU to SMØDJZ
5T5U to JA1UT
5V7VJ to G4ZVJ
5W1VJ to G4ZVJ
6O1GG to I2MQP
6Y3A to KN5H
7S2ØØØM to SK7IJ
8P9CW to N8DCJ
8Q7VJ to G4ZVJ
8R1TT to W6/GØAZT
9AY2K to 9A1A
9G5VJ to G4ZVJ
9G5ZW to OM3LZ
9H3J to JF1SQC
9H3XY to G4ZVJ
9H3ZV to G4ZVJ
9M6RIT to G4SHF
9N7RB to W8NRB
9Q5HX to IK2BHX
9Y4VU to W3EVW
A22EW to KB2MS
A35VJ to G4ZVJ
AH8F to G4ZVJ
AJ1I to KQ1F
BX7AA to BV7WB
C31RC pirate
CT1YWI to CT1GG
CUØX to EA2BX
D2BF to EA8EE
EDØBOD to W3HC
EP2MKO to RU6FZ
ER2ØØØA to ER1DA
ER2ØØØB to ER1BF
ER2ØØØC to ER5AA
ER2ØØØF to ER1FF
ER2ØØØL to ER1LW
ER2ØØØO to ER1OO
ER2ØØØU to ER1AU
EY8XX to GW3CDP
FK8GM to WB2RAJ
FM5GN to F5GN
FM5GU to KU9C
FOØEEN to LA1EE
FOØSUC to F5JJW
FO5QG to XE1L
FT5ZJ to F2YT
H4ØMS to DL2GAC
HB9TT to HB9DHG
HVØA to IKØFVC
IG9A to I2MQP
IQ2ARI to I2MQP
IQ2CC to I2MQP
IU2A to I2MQP
IU2HM to I2MQP
IY2A to I2MQP
IY2ARI to I2MQP
J59OFM to IZ3BIY
J8OK to OK1RD
KC6MX to KQ1F
KG4RF to K8RF
LZØA to LZ1KDP
MØC to G3NUG
OD5NA to IK3ZAW
OHØZ to OH1EH
OY2H to I2MQP
P4ØB to I2MQP
P4ØHQ to I2MQP
PYØFT to JA1ELY
R1AND to NT2X
R3K to W3HNK
S79HX to IK2BHX
SU9ZZ to OM3TZZ
TØVJ to G4ZVJ
T24DX to EA4CP
T5GG to I2MQP
T5MF to I2MQP
T88LJ to JH8DEH
T88XQ to JE2PCY
TA7HTB to TA1KA
TG9IGI to I2MQP
TJ1GD to SP9CLQ
TM5CRO to F5RMY
TU5JL to W3HNK
TZ6VV to KBØVV
TZ6YL to KBØVV
UR3IWA to KI6T
UT2UZ to W4SMG
UXØZ to UTØZZ
V31JZ to NN7A
V31PU to W6DR
V47CA to VE3BW
V47VJ to G4ZVJ
V73CW to AC4G
VK4FOC to EA6ACC
VK9RS to I1HYW
VP6BR to OH2BR
VQ9KH to WJ5R
VQ9PH to W2JDK
WP2Z to KU9C
XM1JF to VE1JF
XU6WE to K2WE
XU7AAR to JS6BLS
XU7AAV to G4ZVJ
XW1UD to K4VUD
YBØECT to K5ZE
YE2K to YB2PBX
YI1SEA to WA3HUP
YMØS to DA2KT
YM2ITA to TA3YJ
YR2OOO to YO4KCA
ZA1C to I2MQP
ZD7VJ to G4ZVJ
ZD8ØV to G4ZVJ
ZD88V to G4ZVJ
ZD8VJ to G4ZVJ
ZF2AA to W8LUI
ZF2AR to N6KI
ZK1DLL to LA9DL
ZK1VMM to LA6VM
ZK1XKK to LA7XK
ZK2GD to PA3AXU
ZK2VJ to G4ZVJ
ZS4GFY to ZS4AE
ZS4IPA to ZS4AE
ZS4WRC to ZS4AE
ZW2OOO to PT2BW
ZY35COM to PY7COM

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," P.O. Box 3071, Paris, TN 38242; phone 901-641-0109; e-mail: <golist@wk.net>.)

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

Is Serious Contesting Limited to the Rich and Famous?

March's Contest Tip of the Month

Most of us are amazed at how our equipment/antennas stand up over years of use in the contest battlefield. However, it's only a matter of time before something fails, and this usually happens at the most inconvenient moment in a contest.

This month's tip is simple: Do you have a game plan to deal with failures? For example, if your amplifier fails, have you arranged for a back-up "loaner" from a good friend? What would your strategy be if your rotator froze on Saturday morning? There are preemptive steps you can take to maximize any contest effort, even when your equipment gives up. Think about it. I'm sure you'll be able to make a contingency list, too.

Calendar of Events

Feb. 25-27	**CQ WW 160m SSB Contest**
Mar. 4-5	ARRL Intl. SSB DX Contest
Mar. 7-8	CLARA & Family HF Contest
Mar. 11	DIG SSB QSO Party
Mar. 11-12	RSGB Commonwealth CW
Mar. 12	UBA Sprint CW Contest
Mar. 12-13	QCWA QSO Party
Mar. 12-13	Wisconsin QSO Party
Mar. 18-19	Alaska QSO Party
Mar. 18-19	Bermuda QSO Party
Mar. 18-19	Russian DX Contest
Mar. 18-20	BARTG Spring RTTY Contest
Mar. 18-20	Virginia QSO Party
Mar. 25-26	**CQ WW WPX SSB Contest**
Apr. 1-2	SP DX Contest
Apr. 1-2	EA RTTY Contest
Apr. 7-9	Japan Intl. DX Contest (20-10m)
Apr. 9	UBA Spring SSB Contest
Apr. 15-16	YU DX Contest
Apr. 15-16	Michigan QSO Party
Apr. 15-16	Holyland DX Contest
Apr. 22-23	Helvetia DX Contest
Apr. 29-30	Florida QSO Party

It's no secret that the cost of entry into serious contesting has risen dramatically over the past decade. When you consider the cost of transceivers, amplifiers, computers, towers, antennas, coax, peripherals, and all the rest, it's imposing indeed.

What exactly does one consider for the big leagues of serious contesting? Clearly, *multiple* towers are in the mix. And who possibly could be competitive with just a single transceiver and amplifier? Also, can you imagine winning contests with single beams and not the usual "4-stack" on 10, 15, and 20 meters and a full-size 40 meter Yagi?

A great deal of what is being described so far is what many individuals use to strengthen their argument regarding the lack of new blood in contesting. Do these pundits have a point or not? Let's consider the facts.

Have Things Really Changed?

When I think about my start in ham radio nearly 30 years ago as a teenager, I vividly remember how in my mind things were so expensive. Would I have preferred one of those fancy Collins S-Lines? Of course! What did I settle for? You guessed it—a Swan 270 Cygnet (bonus points this month to readers who remember that radio). A $500 SB-220 was completely out of reach. The reality is I don't believe it was any easier for young hams to go out and purchase a complete ham station in 1970 than it is today in 2000. To be fair, however, there is one key difference from a contesting perspective. When I consider the equipment barrier of just 15 years ago, I recall the fact that single operators, including myself, were able to win the CQ WW with a single radio, an SB220, and one tower that had single beams on each band—hardly a monster station by today's standards. Were I to use the same station in today's competitive climate, it's unlikely that the same winning results would occur.

2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

Are All Winning Contesters Rich?

An interesting question, to say the least. While I haven't taken a financial poll of everyone I know in contesting circles, it's fair to say that many of them have been blessed financially. However, the next sentence brings up a key point that we often forget about in our fast-paced, instant-gratification mindset of the current decade. Many of the owners of winning contest stations began their quest for equipment and towers a very long time ago. Put another way, the path to their big stations took place via a methodical but arduous plan executed over decades using the techniques of collecting, trading, and the never-ending search for the next great deal. This point is supported when I think of the following successful contesters and what they do for a living. Here's just a sample: K5ZD (marketing manager), W1KM (Dept. of Social Security employee), W3LPL (project manager/engineer), K1DG (marketing manager), N2RM (State of New Jersey employee), and K4XS (school teacher). The list goes on.

It's not that I've just described unsuccessful people in their professional lives; rather, I've mentioned folks who are not living the good life that comes from year-end million-dollar bonus checks on Wall Street. The simple fact is that most of the contesters on the scene today are working people like you and me. In fact, the track record of contesters who have come on the scene with lots of money often is little long-term interest or commitment to the sport, but rather a brief stopping point while en route to the next rich thrill in life.

How Do They Do It?

As I've already commented, the best ally of a new contester is time. The old phrase your mother taught you, patience is a virtue, is absolutely true in this context. The other secret is an unabashed desire to find the deal, which is a combination of checking out ham fleamarkets, scouring the want ads and Internet, a willingness to wheel and deal ethically; trading excess items you own for others you need, taking the initiative to ask a cable-TV installer where his company stores its CATV cable ends (which often can run hundreds of feet and are free for the taking), and any other venue you can think of.

The Bottom Line

There are a number of people (myself included, for the moment) who view the challenge presented above to be achievable but not realistic when balanced against our busy lives. In my case, even if a truck drove up to my front door with all the components required to build a winning station, the stuff probably would sit in my garage and gather dust.

While time constraints may be a big problem for many of us, the path to successful contesting requires patience, ingenuity, and more desire than ever

before. With those elements in place, you can build a station you can be proud of and want to show off to others. Let me know what you think!

Final Comments

I'm out of space and time for this month. Be sure to look for the *CQ* 2000 Contest Survey in next month's column. There will be some challenging questions for you to ponder this year, and as always, your input is invaluable.

Finally, please remember that the deadline for the June issue is April 1st. Whenever possible, please send your contest announcement information to me via e-mail <k1ar@contesting.com> to ensure complete, timely coverage.

73, John, K1AR

CLARA & Family HF Contest

1700Z Tues. to 1700Z Wed., Mar. 7–8

This is the 33rd anniversary of the CLARA Contest, which is open to YLs and OMs around the world on phone and CW on all HF bands. Each station may be contacted twice per band mode.

Classes: Single operator, all bands.

Exchange: Name, RS(T), QTH (Canadian province/DXCC country), and whether CLARA member or Family member.

Scoring: CLARA-CLARA QSOs 5 points; CLARA-YL QSOs 3 points; CLARA-associate OM QSOs 2 points; and CLARA-OM QSOs 1 point.

Multiplier: Canadian provinces and DXCC countries.

Final Score: Multiply total QSO points times multiplier.

Awards: A variety of trophies and certificates will be awarded to high-scoring CLARA members, non-members, and OMs.

Send your entries no later than April 15th to: Janis Cameron, VE7AAP, 3528 11th Avenue, Port Alberni, BC V9Y 4Y7 Canada

QCWA QSO Party

1900Z Sun. to 1900Z Mon., Mar. 12–13

QCWA cordially invites all to participate in the 44th annual QSO party. All licensed radio amateurs worldwide are invited. Both CW and Phone modes may be used.

Frequencies: CW 1910, 3540, 7035, 14040, 21050, 28050 kHz; phone 1910, 3890, 7244, 14262, 21365, 28325 kHz. Any station may be contacted on any or all of the approved operating bands for a maximum of 15 QSOs per station, with no more than one QSO per band. Any station in the same chapter may be counted only once, for a maximum of one QSO per station. No contacts on WARC bands are permitted (10, 18, and 24 MHz bands); no cross-band or repeater contacts are allowed.

Exchange: Year first licensed and QCWA chapter. If you do *not* belong to a QCWA chapter, use your state, province, or country.

Scoring: Each phone QSO is worth *one contact point*. Each CW QSO is worth *two contact points*. A multiplier is given for each QCWA chapter worked and for each state, province, or country reported from stations not belonging to a QCWA chapter. A total of *only one* multiplier point will be given for each state, province, or country. *A multiplier of 3 points* will be given for working our Special Events station, W2MM. It is hoped to have this station active throughout the two parties. Stations within 50 miles (80 km) of W2MM may work W2MM only once for a total multiplier of 3 points. This year the station will operate in the vicinity of the Toronto International Airport.

Sample logs and a summary sheet may be requested from QCWA Headquarters,159 East 16th Ave., Eugene, OR 97401-4017 (SASE).

Awards: Certificates will be issued for the top three world scores. A certificate will be issued for the top score in each participating country.

Send logs to: Dick Newsome, WØHXL, 2924 North 48th St., Omaha, NE 68104-3726.

Wisconsin QSO Party

1800Z Sun. to 0100Z Mon., Mar. 12–13

This popular party is a shorty, only 7 hours, and it is again sponsored by the West Allis Radio Amateur Club. The same station may be worked on each band and mode, and mobiles in each county change. Wisconsin stations may contact other in-state stations for QSO and multiplier credit. Only one transmitter on the air at the same time.

Classes: Single operator and multi-operator and transmitter, both fixed and mobile; Novice, Tech, both single and multi-operator.

Exchange: RS(T) and QTH. County for Wisconsin; state, province, or country for others.

Scoring: Phone QSOs count 1 point; CW 2 points. Wisconsin stations multiply total QSO points by (US states + VE provinces + Wisconsin counties) worked for final score. DX contacts count for QSO points only. Others use total Wisconsin QSO points multiplied

by the number of Wisconsin counties worked (maximum of 72).

Wisconsin mobiles can add a bonus of 500 points to their final score for each county outside their own from which they operate (minimum of 12 QSOs from each county). Mobiles may not sit on a county line and operate.

Frequencies: CW 3550, 3705, 7050, 7125, 14050, 21150; SSB 3890, 7230, 14290, 21350, 28400.

Awards: Awards will be sent to the highest scoring single operator in the contest and for each single operator class in each state and province. *Wisconsin:* The top 10 single operator scorers in each class, as well as highest multi-operator in each class and highest aggregate club score (living within 50 miles of club center with the exception of mobiles) will receive awards. Logs with more than 200 QSOs must include a separate dupe sheet for each mode with their entry.

Complete rules, entry forms, and final results are available from the address below or at <www.warac.org>. Be sure to include an SASE with your request by mail. Send your logs no later than March 31st to: West Allis RAC, P.O. Box 1072, Milwaukee, WI 53201.

Bermuda Contest

0001Z Sat. to 2400Z Sun., Mar. 18–19

This is the 42nd year for this popular contest, which is open to all licensed amateurs. Activity will be on the 3.5, 7, 14, 21, and 28 MHz bands on SSB and CW. Cross-band or cross-mode contacts are not permitted.

You are limited to 24 hours out of the 48-hour contest period. Off times of no less than two consecutive hours must be clearly indicated in the log. Participation is for single operator stations only, and prior winners are no longer restricted from official entries in the contest. No use of external spotting methods (e.g., packet, Internet, etc.) is permitted.

Exchange: RS(T) only.

Scoring: Five points for each QSO. A station may be worked on SSB and CW, but you may not take credit for an additional multiplier. Final score is the sum of QSO points times the number of countries on each band multiplied by the number of different VP9 stations worked on each band. (Note: It's each VP9 station, not each parish.)

Awards: Certificates will be awarded to the top-scoring station in each country (minimum of 100 QSOs and 3 VP9s). The overall worldwide winner will receive a trophy. It is the winner's option to have the trophy mailed to him or to collect it in person at the annual banquet in October. Transportation to Bermuda will be provided by the Bermuda Department of Tourism, and accommodations will be arranged by the Radio Society of Bermuda.

Use a separate log sheet for each band and a dupe sheet for logs with 200 or more contacts. A penalty of three contacts will be deducted for each duplicate contact for which points are claimed. An excessive number of claimed duplicates means disqualification. The usual signed declaration is also required.

Entries must be *received* no later than June 1st by the Radio Society of Bermuda, Box HM275, Hamilton HM AX, Bermuda. Enclose 4 IRCs for acknowledgment.

Alaska QSO Party

0000Z Sat. to 1200Z Sun., Mar. 18–19

The Alaska QSO Party is sponsored each year by the South Central Amateur Radio Club, Anchorage, Alaska. It is a great opportunity to work this very rare state. Stations may work Alaska stations only (Alaska stations may work everyone).

Exchange: Send RS(T) and state/province/DXCC country (Alaska stations send their city).

Scoring: Credit 1 point per phone QSO and 2 points per CW, digital, or SSTV QSO. One-sixty meter, 80 meter,

and satellite QSOs count for double credit. Final score is QSO points times Alaska cities worked (Alaska stations use states/provinces/DXCC countries).

Suggested Frequencies: 1.835 MHz; 3.700, 3.875 MHz; 7.035, 7.135, 7.235 MHz; 14.035, 14.245 MHz; 21.135, 21,335 MHz; and 28.135, 28.335 MHz.

Send logs by June 30, 1999 to: South Central Amateur Radio Club, c/o Jim Wiley, KL7CC, 8023 E. 11th Court, Anchorage, AK 99504. Visit the club's web site at <www.servcom.com/worcester/scrc.htm> for more info.

Russian DX Contest

1200Z Sat. to 1200Z Sun., Mar. 18–19

Sponsored by the Contest Committee of the SRR, this one is open to all amateurs worldwide on 160–10 meters (no WARC bands), SSB and CW. The same station may be worked on other bands or even on the same band (but in this case with two restrictions—use another mode, and do it no sooner than 10 minutes after the previous QSO).

Classes: Single operator, all bands (separately mixed mode, CW, SSB); single operator, single band (mixed mode, CW, SSB) on 160, 80, 40, 20, 15, 10 meters; multi-operator, all bands, single transmitter; SWL (mixed mode). Note that the common 10-minute rule applies to multi-single entries.

Exchange: RS(T) + QSO number starting with 001; Russian stations RS(T) + two letters (oblast designator).

Scoring: QSOs within own DXCC country 2 points; another country on same continent 3 points; other continents 5 points. Contacts with Russian stations 10 points for all participants. Multipliers are DXCC countries and each Russian oblast per band. Final score is total sum of QSO points from all bands multiplied by sum of multiplier points from all bands.

Awards: Winners of single- and multi-op (all band only) categories (separately Mixed, SSB, CW) will be awarded plaques. Other winners and runners- up will be awarded certificates. Stations with 200 or more QSOs will receive certificates of merit.

All entries go to: Contest Committee of SRR, P.O. Box 59, 105122, Moscow, Russia. Logs can also be submitted using .dat or .bin formats plus .SUM files via e-mail: <ra3auu@contesting.com>.

Virginia QSO Party

1800Z Sat. to 0500Z Sun., Mar. 18–19
1100Z Sun. to 0200Z Mon., Mar. 19–20

This is the 25th year the Sterling Park ARC has sponsored this party. The same station may be worked on each band and each mode for QSO credit. VA stations may work other in-state stations for QSO multiplier credit as well as VA mobiles operating from different counties.

Classes: Single operator, multi-single, mobile, club, multi-multi transmitter.

Exchange: QSO number starting with 001 and QTH. County for VA; state, province, or DX country for others.

Scoring: Credit one point for each SSB contact; two points for CW; three points for working a VA mobile. VA stations multiply total QSO points by sum of US states, VE provinces, DX countries, and VA counties. Others multiply total VA QSO points by the number of VA counties worked (maximum of 95). Mobiles add to this the bonus points for Virginia counties in which QSOs were logged.

Frequencies: CW 1805 kHz and 50 kHz up from low end of 10, 15, 20, 40, and 80 meter bands. SSB 1845, 3860, 7260, 14260, 21360, and 28360. Also Novice bands (10 kHz up from bottom of Novice sub-band and 28360).

Awards: Certificates to top scorers in each state, province, DX country, and VA county. There are a variety of plaques available to category winners. Special certificates will be issued to stations working all 95 VA counties.

Logs: Indicate each new multiplier in a separate column as it is worked. Include a summary sheet showing the scoring and other pertinent information.

Mailing deadline for all entries is April 18th to: Virginia QSO Party, Call Box 599, Sterling, VA 20167.

CQ World-Wide WPX Contest

SSB: Mar. 25–26 CW: May 27–28
0000Z Sat. to 2400Z Sun.

Complete rules were published in the January issue of *CQ*. The following are a few points to keep in mind. You may operate 36 hours out of the 48-hour contest period as a single operator station. Off-times must be a minimum of 60 minutes in length. Multi-op stations can operate the full 48 hours.

The definition of the prefix multiplier is spelled out in detail, but consider a prefix to be the letter/number combination which forms the first part of a call.

The multiplier is determined by the number of different prefixes worked and is counted *once* only, regardless of how many times it is worked on other bands.

Another point to keep in mind is that in the multi-operator, single transmitter category, only one transmitter and only one band may be used during the same 10-minute period. Picking up a new multiplier on another band during the same time period is prohibited. Speaking of categories, you may want to take note of the new tribander, rookie, and band-restricted entry classes.

An alphabetical/numerical check list of claimed prefixes is a requirement and must be included with your log. Note that contest logs may be submitted on disk (MS-DOS compatible) in standard ASCII or .bin, .res, .dbf, or .wks formats. To reduce the administrative burden, please label your computer entries with a unique name (e.g., N8BJQ.BIN). In addition, you may now submit your logs electronically (in MIME or UUENCODE format) to <n8bjq@erinet.com>.

Deadline for submitting your SSB entry is May 10th, and July 10th for the CW section. **Be sure to indicate SSB or CW on the envelope.**

All logs go to: CQ Magazine, WPX Contest, 25 Newbridge Road, Hicksville, NY 11801.

Questions pertaining to the WPX Contest can be sent to the WPX Contest Director, Steve Bolia, N8BJQ, 7354 Thackery Road, Springfield OH 45502 or via <n8bjq@erinet.com>.

The RF Applications VFD RF Power/VSWR Meter

VHF VERSION now available

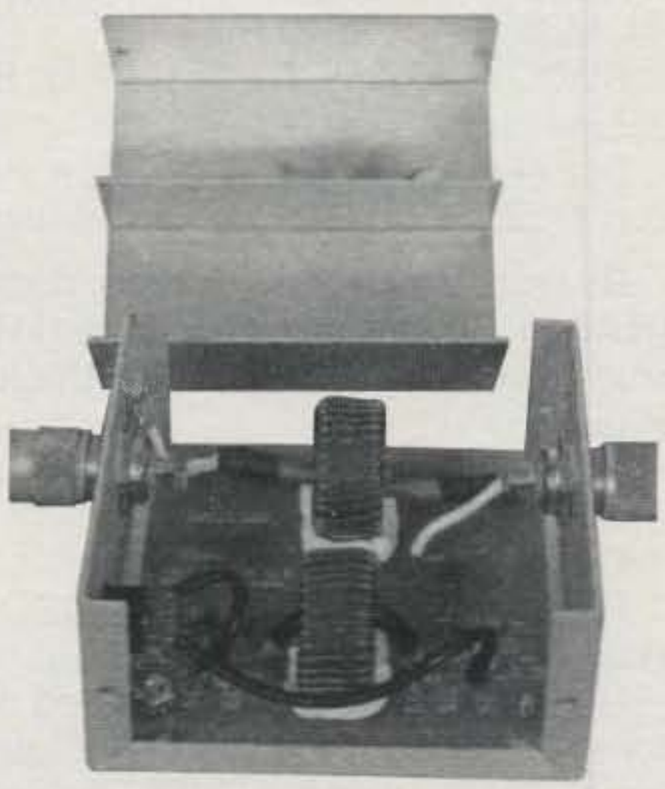
The ONLY Wattmeter for the Serious Operator

EXCITING NEW TECHNOLOGY

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

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

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



ALARM INDICATION

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

THE BEST SENSOR

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

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

IS IT ACCURATE?

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

WHAT YOU GET

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

KEY SPECIFICATIONS

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

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

Nominal impedance: 50 ohms

Accuracy:
Better than ±10% of the displayed reading

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

Connectors: SO-239 (2)

Signal cable length: 62" (24.4 cm)

Shipping weight: 3 pounds

COST AND OPTIONS

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

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

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

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--W3LPL

"Best wattmeter I own."

--W4AN

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CIRCLE 74 ON READER SERVICE CARD

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

The USA-CA award was designed to be a single award with a series of steps, or endorsements, every additional 500 counties up to 3000, then to the 3076 level. As you achieve a particular level, special endorsement wording will be added to your certificate appropriate to the achievement, such as All SSB 20 Meters, All CW/Mixed Band, and so forth. However, we don't issue the certificate nor maintain special records with different sequence numbers based on the endorsement earned. If you earn your first certificate at 500 counties with all 20 SSB then decide to use contacts on other bands, the certificate originally awarded to you will have a notation "All 20 SSB." You may (or may not) change that when subsequent endorsement seals are added.

MARAC provides an excellent awards series when you want to do it all over again and use the same or other bands and modes. Contact MARAC Secretary W2LSH for an information packet, or visit <countyhunter.com> for complete details on the entire series.

Russian Robinson Club Award Series

The Russian Robinson Club was founded in 1993; its name stems from Daniel Defoe's famous island castaway Robinson Crusoe. The club sponsors a colorful series of awards with the theme of contacting islands under the Russian National Islands Program. The club also has done the background work to establish separate numbering of Russian islands for these awards issued as part of the Russian National Antarctic Program.

The RRC goals include publicizing DXpeditions to Russian-governed islands, popularization of the IOTA (Islands On The Air) program to Russian territories, and assistance in establishing radio communications with the mainland for radio amateurs from remote islands, and arctic and maritime mobile stations. As of May 1999 there were approximately 350 members of the organization.

General Requirements: No date, band, or mode restrictions. The awards are equally available to SWLs. Each certificate is awarded in three classes

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

USA-CA Special Honor Roll

Ronald Jones KB6UF
USA-CA All Counties #989
December 2, 1999

Silver Springs Radio Club K4GSO
USA-CA All Counties #990
December 22, 1999

and there are plaques for Honor Roll achievement. Fee for each certificate is $US10. Fee for plaque is $US40. Apply to the following managers:

RU3DX, Eugene Pletnev, P.O. Box 33, Moscow, 109240 Russia.

RW3GW, Valery Sushkov, P.O. Box 3, Lipetsk, 398000 Russia.

DL6ZFG/DLØRRC, Rolf Rahne, P.O. Box 15, D-39241, Gommern, Germany.

Russian Antarctic Bases Award (RABA). Contact stations located in the Russian territory and Russian Antarctic Bases:

Class III: 3 QSOs/1 Base
Class II: 7 QSOs/2 Bases
Class I: 10 QSOs/3 Bases
Plaque level: more than 10 QSOs/3 Bases

Repeated QSO/SWL is allowed only for same operator on different DXpeditions. RABA manager RW3GW; Honor Roll RW3GW c/o DL6ZFG.

Russian Arctic Stations Award (RASA). Contact stations situated above the Arctic Circle.

Class III: 50 points
Class II: 100 points
Class I: 150 points
Plaque level: more than 150 points

Point values:

USA-CA Honor Roll

500		2000	
KB6UF	3103	KB6UF	1177
F3XY	3104	K4GSO	1178
DL9MBZ	3105		
K4GSO	3106		
1000		**2500**	
KB6UF	1535	KB6UF	1103
F3XY	1536	KJ8F	1104
N9STL	1537	K4GSO	1105
K4GSO	1538		
1500		**3000**	
KB6UF	1277	KB6UF	1007
F3XY	1278	K4GSO	1008
K4GSO	1279		

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

1 point—QSO/SWL with station above the Arctic Circle.

2 points—QSO/SWL with continental polar radio stations such as RØ/UR8LV, QTH Cape Cheluskin.

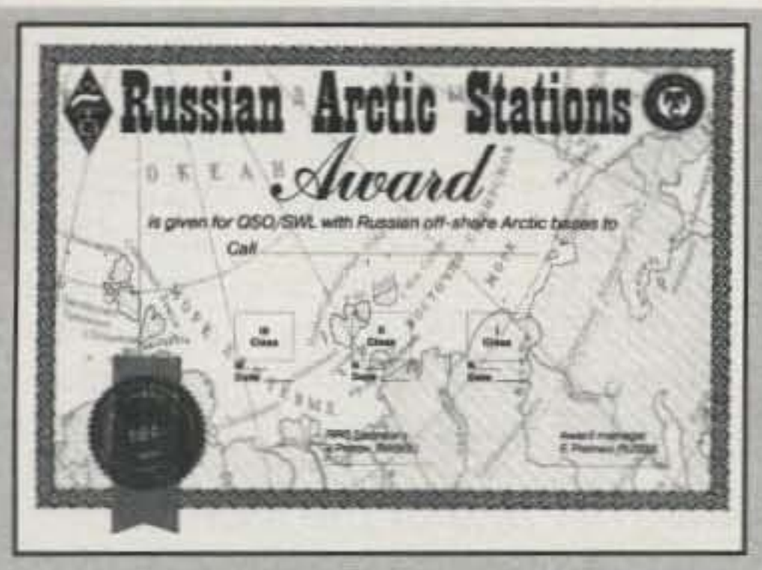
3 points—QSO/SWL with arctic expeditions such as 4K2FJL or insular polar radio stations such as 4K2BCA, R1FJV, Victoria Island.

5 points—QSO/SWL with drift-ice polar radio stations such as 4KØA, 4KØB.

Repeat QSOs are not allowed. RASA Manager RU3DX; Honor Roll RW3GW c/o DL6ZFG.

The Russian Robinson Club membership certificate.

RRC's Russian Antarctic Bases Award.



The Russian Arctic Stations Award.

RRC's Russian Robinson Award.

The Russian Maritime Mobile Award.

Russian Robinson Award (RRA). The Russian Island National Program for contacting Russian Islands.

Class III: 10 different stations, 6 islands
Class II: 16 different stations, 8 islands
Class I: 20 different stations, 10 islands
Plaque level: 50 different stations, 30 islands

Repeat QSOs are not allowed. Island list is available from manager for SASE/IRC. RRA manager RW3GW; Honor Roll RW3GW c/o DL6ZFG.

Russian Maritime Mobile Award (RMMA). Given for QSO/SWL with Russian Maritime Mobile stations.

Class III: 5 QSOs
Class II: 10 QSOs
Class I: 15 QSOs
Plaque level: more than 15 QSOs

Repeat QSOs are not allowed. RMMA Manager RU3DX; Honor Roll RW3GW c/o DL6ZFG.

Franz Josef Land Award (FJL). Contact stations on Franz Josef Land Island.

Class III: 5 QSOs
Class II: 10 QSOs
Class I: 15 QSOs
Plaque level: over 15 QSOs

Repeat QSOs are allowed if on different bands. FJL Manager RU3DX; Honor Roll RW3GW c/o DL6ZFG.

Worked RRC Members Award (W-RRC-A). Contact members of the Russian Robinson Club.

Class III: 20 QSOs
Class II: 30 QSOs
Class I: 50 QSOs
Plaque level: more than 50 QSOs

Members are especially active one week in May every year. W-RRC-A manager RU3DX; Honor Roll RW3GW c/o DL6ZFG.

Italy's Anno Santo 2000 Award

The new millennium is great for award hunters. While the year 2000 has already begun, there's plenty of time to

RRC's Franz Josef Land Award.

The Worked RRC Members Award.

earn the Anno Santo 2000 Award sponsored by the ARI Section of Rome. Catholics all over the world are celebrating 2000 as a Jubilee Year, and amateur radio awards such as this will help to publicize the event.

Contact stations in Rome, Italy and Vatican City during the period 24 December 1999 to 24 December 2000. SWL okay. Each station may be worked once per day per category shown below, except satellite communications, class 1D. You must earn the number of points appropriate to the award categories shown as follows:

1A - HF—Italians need 50 points, Europeans need 30, all others need 20.

1B - 50 MHz—Italians need 20 points, Europeans need 30, all others need 5.

1C - VHF/UHF/SHF—Italians need 50 points, Europeans need 20.

1D - Satellites—All stations need 20 points. You may work the same station multiple times on the same day.

Point values: Stations in ARI, Section of Rome = 1 point; Vatican stations = 3 points.

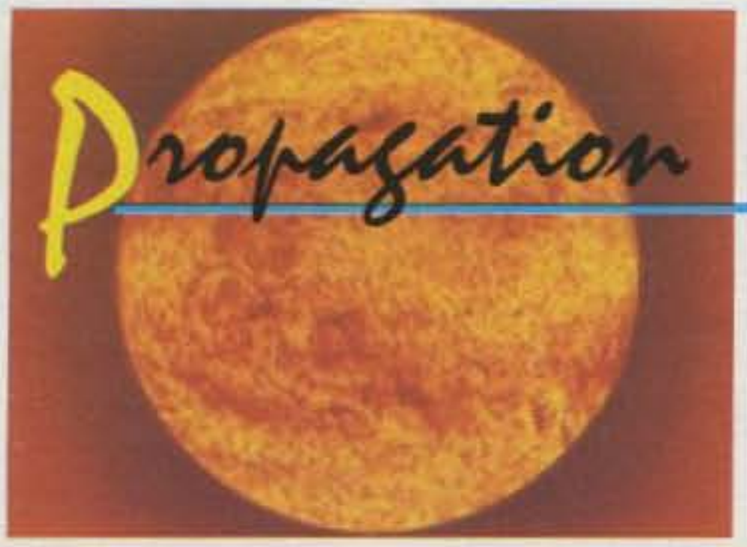
Submit a GCR list prior to 31 March 2001 (use regular mail; Registered Mail will not be accepted) and fee of Lire 15,000 or $US10 (by International Money Order) to: Sig. Ra Olga Versaci, via Conte Verde 50, 00185 Rome, Italy.

Internet Site of the Month

The Activity Group of Belarus sponsors a handsome collection of some 19 different certificates, and the fees for them are definitely reasonable. There's even a "safe" address for sending applications and fees to nearby Lithuania. The site is well designed, is in English, and features an excellent color picture of each award. The URL is: <http://www.qsl.net/eu1eu>.

Please send your award sample and rules to my mailing address shown at the beginning of this column. It may take a few months to run, but we'll give you the publicity to get your program off the ground.

73, Ted, K1BV



BY GEORGE JACOBS, W3ASK

The Science Of Predicting Radio Conditions

49th Anniversary and Counting!

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for March 2000

Propagation Index.....	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 5, 9-11, 16	A	A	B	C
High Normal: 1, 6-8, 12-13, 17-19, 26-27	A	B	C	C-D
Low Normal: 2, 14-15, 20, 23-25, 28-29, 31	B	C-B	C-D	D-E
Below Normal: 4, 21, 30	C	C-D	D-E	E
Disturbed: 3, 22	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be good (B) on March 1st; fair-to-good (B-C) on the 2nd; poor (D) on the 3rd; fair-to-poor (C-D) on the 4th, excellent (A) on the 5th, etc. Fair-to-good (C-B) or better conditions are expected for the CQ WW WPX SSB Contest on March 25–26.

This is the 50th time I have written *CQ*'s "Propagation" column for the month of March. My first was for the March 1951 issue! As Dean of the *CQ* editorial staff I now have 49 years behind me writing this column. That means 588 consecutive monthly columns without ever having missed a deadline.

I now begin my 50th year with this column. Next year's March column will be the golden anniversary one. I will save my reminiscing until then. Meanwhile, I understand archives and the Internet are being searched to see if a new editorial record may be set.

11307 Clara Street, Silver Spring, MD 20902
e-mail: <george@gjainc.com>

Solar Cycle Progress

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a mean sunspot level of 132 for November 1999. This results in a 12-month running smoothed sunspot number of 90 centered on May 1999. This is an increase of five points from the previous month's level. The smoothed running numbers indicate the level of a solar cycle.

During November daily levels of solar activity varied between a high of 206 on the 10th and a low of 78 on the 29th. Cycle 23 has now picked up steam as it approaches its peak. A smoothed count on the order of 112 is forecast for this month.

According to daily observations made at Penticton, British Columbia by the Dominion Radio Astrophysical Observatory of Canada, the adjusted mean level of 10.7 cm solar flux for November 1999 was 187. This results in a 12-month running number of 152 centered on May 1999. The level of 10.7 cm flux is very closely paralleling the increasing activity of Cycle 23. A smoothed 10.7 cm solar flux level of approximately 153 is forecast for March 2000.

While there is some disagreement among the experts, Cycle 23 has either very recently reached its peak or will do so before the end of this year. For example, the prestigious Royal Observatory of Belgium, the world's official keeper of solar records, has provisionally predicted that the peak of Cycle 23 most likely occurred during December 1999 with a count of 119. The Solar-Terrestrial Physics Division of the National Geophysical Data Center in Boulder, Colorado is predicting a peak of 113 to occur sometime between June and September 2000.

While solar Cycle 23 is turning out to be a fairly average cycle rather than the exceptionally high one many experts originally predicted, it is presently at the highest sunspot level observed during the past nine years.

Because of the known relationship among sunspot numbers, solar radiation, and the strength of the ionosphere, radio amateurs on the air now are experiencing propagation conditions on the HF bands and on 6 meters better than they have been since 1991.

March Conditions

During March it should be a toss-up among 10, 12, and 15 meters for the best DX band during the daylight hours from sunrise to sunset, with 20 and 17 meters not far behind. Unusually good DX conditions are also expected on 6 meters during the daylight hours (see the "VHF Ionospheric Openings" section of this column for more details). From sundown to midnight DX honors likely will be shared among 20, 30, and 40 meters, with good openings toward the west and the south also possible on 17 and 15 meters. On days when conditions are High Normal or better, the 12 and 10 meter bands may also remain open toward the south and the west well past sundown. Some fairly good 80 meters openings are also expected during this period, with some 160 meter DX openings also possible. It looks as if DX openings should be possible on all HF amateur bands 10 through 160 meters on many days during March between sundown and midnight!

From midnight to sunrise the best DX bands should be 30, 40, and 80 meters, with openings to many parts of the world also possible on 20 meters. The 160 meter band should also open for DX to many areas of the world during this same period.

All in all March looks like a great month for worldwide DX propagation conditions on all amateur HF bands. For more detailed information, refer to the DX Propagation Charts for March, which appeared in last month's column. This month's column contains Short-Skip Propagation Charts which are valid for both March and April 2000, including data centered on Alaska and Hawaii. The Short-Skip Charts contain band- opening predictions for predominantly one-hop paths, ranging in distance from between approximately 50 and 2300 miles. For day-to-day changes in HF propagation conditions expected during March see the Last-

Minute Forecast at the beginning of this column.

Equinoctial Propagation

During most of March and continuing well into April, relatively similar HF propagation conditions exist in the temperate regions of the northern hemisphere (where it is spring) and in the southern hemisphere (where it is fall), as compared to the more extreme conditions that exist when it is summer in one hemisphere and winter in the other. This widespread equalization of ionospheric conditions results from the equinoctial effect, as the sun crosses the equator in its apparent travels into northern skies. Similar conditions occur during September and early October as the sun travels into southern skies.

During equinoctial periods DX conditions between the northern and southern hemispheres are usually at their best. Therefore, at appropriate times this month exceptionally good intercontinental DX conditions are expected on all amateur bands from 6 to 160 meters. Typical of these openings are the paths between the United States and South America, Australasia, and the central and southern regions of Africa, Asia, and Antarctica.

Inter-continental openings on 30, 40, 80, and 160 meters should peak shortly before local sunrise and again at local sunset. Openings on 20 meters should peak twice, first for a period of an hour or two after sunrise and again for an hour or so after sunset. On 6, 10, 12, 15, and 17 meters intercontinental openings should peak during the daylight hours, with signals from an easterly direction strongest an hour or two before noon; openings toward the south are optimum an hour or two after sunrise and again late in the afternoon; and openings toward the west are strongest for an hour before to a few hours after local sunset. During the equinoctial period long-path openings may often be as strong as, if not stronger than, short-path openings, particularly during the sunrise and sunset periods.

VHF Ionospheric Openings

Worldwide 6 meter *F*-layer openings are expected to continue during March.

Openings should be possible from the USA to almost all areas of the world, particularly when conditions are High Normal or better. Signals arriving in the quadrant between northeast and southeast should peak by mid-morning. Noontime should be best for openings toward the Caribbean, Central America, and the northern countries of South America, although the 6 meter band may open in this direction as early as an hour or two after sunrise. During the afternoon hours expect 6 meter skip to extend deeper into South America and to shift towards the west and northwest. Exceptionally strong signals will be possible at times. Transcontinental openings on 6 meters should be possible from about noon through the late afternoon hours.

Some 6 meter DX openings between southern tier states and countries deep in South America may also be possible as a result of transequatorial scatter propagation. Unlike *F*-layer reflected signals, TE propagation results from scatter between ionospheric layers, and signals are usually weak with flutter fading often severe. TE openings must cross the magnetic equator at or near a right angle; the best time for such openings during March would be between 8 and 11 PM local time. Experimental transmissions conducted over the past year indicate that TE propagation may also take place for 2 meter signals.

Auroral activity tends to peak during equinoctial periods, and there is a good chance that some widespread auroral activity will occur during March, accompanied by auroral-scatter openings on the VHF bands and sporadic-*E* short-skip openings, up to distances of approximately 1200 miles on 6 and 2 meters. Check the Last-Minute Forecast at the beginning of this column for those days during March that are expected to be Below Normal or Disturbed, since these are the days on which auroral activity is most likely to occur.

Except for some minor meteor showers during March 13–14 and 23–24, not much meteor activity is expected during the month.

I want to thank all of you who over the past 49 years have taken the time to drop me a line expressing an interest in radio propagation and this column in particular. This is the most meaningful reward an author can receive.

I have found writing this column for the past 49 years to be a very stimulating and interesting sideline to my deep interest in amateur radio in particular and to communications in general. I look forward to continuing to report propagation events on these pages of *CQ* during the years ahead.

73, George, W3ASK

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last-Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. In the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
March & April 2000
Band Openings Given in Local Standard Time
At Path Mid-Point
(24-Hour Time System)

Band (meters)	*Distance From Transmitter (Miles)*			
	50-250 miles	*250-750 miles*	*750-1300 miles*	*1300-2300 miles*
10	*Nil*	09-13 (0-1)	07-09 (1) 09-12 (1-2) 12-13 (1-3) 13-16 (0-3) 16-18 (0-2) 18-20 (0-1)	07-08 (1) 08-09 (1-2) 09-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-21 (0-1)
15	*Nil*	07-09 (0-1) 09-15 (0-2) 15-19 (0-1)	07-08 (1) 08-09 (1-2) 09-15 (2-4) 15-18 (1-3) 18-19 (1-2) 19-23 (0-1)	07-08 (1) 08-09 (1-3) 09-15 (4) 15-18 (3-4) 18-19 (2-3) 19-21 (1-3) 21-23 (1-2) 23-01 (0-1)
20	11-13 (0-1) 13-16 (0-2) 16-19 (0-1)	08-09 (0-3) 09-11 (0-4) 11-13 (1-4) 13-16 (2-4) 16-18 (1-4) 18-19 (1-3)	06-07 (1-2) 07-08 (3) 08-09 (3-4) 09-18 (4) 18-19 (3-4) 19-22 (2-4)	06-07 (2) 07-08 (3) 08-10 (4) 10-15 (4-3) 15-22 (4) 22-23 (3-4)
40	06-07 (1-2) 07-09 (2-3) 09-18 (4) 18-20 (3-4) 20-22 (2-3) 22-00 (1-2) 00-06 (1)	06-07 (2-3) 07-09 (3-4) 09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-20 (4) 20-22 (3-4) 22-00 (2-4) 00-03 (1-3) 03-06 (1-2)	06-07 (3-2) 07-08 (4-2) 08-09 (4-1) 09-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-00 (4) 00-03 (3-4) 03-06 (2-3)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-03 (4) 03-04 (3-4) 04-06 (3)
80	07-11 (4) 11-18 (4-3) 18-22 (4) 22-00 (3-4) 00-07 (2-3)	07-08 (4-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3) 20-00 (4) 00-05 (3-4) 05-07 (3)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-03 (4) 03-05 (4-3) 05-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-03 (4-3) 03-05 (3-2) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

HAWAII
March & April 2000
Openings Given in Hawaiian Standard Time

To:	*10 meters*	*15 meters*	*20 meters*	*40/80 meters*
Eastern USA	08-09 (1) 09-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-11 (1) 11-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-21 (4) 21-00 (3) 00-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-22 (2) 22-01 (3) 01-02 (2) 02-03 (1) 21-22 (1)* 22-01 (2)* 01-02 (1)*
Central USA	08-09 (1) 09-11 (2) 11-15 (3) 15-17 (4) 17-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-14 (2) 14-16 (3) 16-18 (4) 18-19 (3)	09-14 (1) 14-16 (2) 16-19 (3) 19-23 (4) 23-03 (3) 03-06 (2) 06-08 (3)	19-20 (1) 20-22 (2) 20-02 (3) 02-04 (4) 04-05 (2) 05-06 (1) 22-23 (1)*
Central USA		19-22 (0-2) 22-08 (0-1)	22-00 (1-3) 00-02 (1-2) 02-06 (1)	23-00 (3) 00-02 (2) 02-04 (1-2) 04-06 (1)
Central USA		19-20 (2) 20-21 (1)	08-09 (2)	23-02 (2)* 02-03 (3)* 03-04 (2)* 04-05 (1)*
Western USA	08-09 (1) 09-11 (2) 11-12 (3) 12-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (4) 11-15 (3) 15-18 (4) 18-20 (3) 20-21 (2) 21-23 (1)	15-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-08 (4) 08-10 (3) 10-15 (2)	18-19 (1) 19-21 (2) 21-22 (3) 22-04 (4) 04-05 (3) 05-06 (1) 21-22 (1)* 22-23 (2)* 23-04 (3)* 04-05 (2)* 05-06 (1)*

ALASKA
March & April 2000
Openings Given in GMT

To:	*10 meters*	*15 meters*	*20 meters*	*40/80 meters*
Eastern USA	20-22 (1) 22-00 (2) 00-01 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1)	13-15 (1) 20-22 (1) 22-01 (2) 01-03 (3) 03-05 (2) 05-06 (1)	06-13 (1) 07-12 (1)*
Central USA	20-23 (1) 23-01 (2) 01-02 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1)	14-16 (1) 20-23 (1) 23-02 (2) 02-04 (3) 04-05 (2) 05-07 (1)	07-14 (1) 08-12 (1)*
Western USA	20-23 (1) 23-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3) 04-05 (2) 05-06 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-04 (4) 04-05 (3) 05-06 (2) 08-10 (1)	07-09 (1) 09-12 (2) 12-14 (1) 09-10 (1)* 10-12 (2)* 12-13 (1)*

#See explanation in "How To Use Short-Skip Charts" in box at the beginning of this column.
*Indicates best time for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.
Note: The Alaska and Hawaii Propagation charts are intended for distances *greater* than 1300 miles. For shorter distances use the preceding Short-Skip Propagation Chart.
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

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73, Carl Cook, AI6V/P49V

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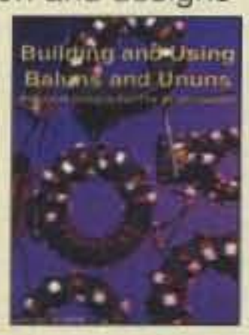

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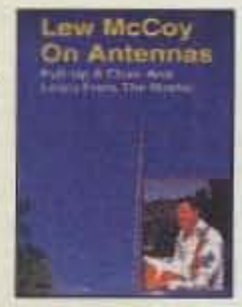

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GROUND IT Ham Station Grounding Accessories. **J. Martin Systems**, 35 Hilltop Ave., Stamford, CT 06907. Voicemail/Fax 203-461-8768; web: http:// **www.jmsystem.com**

P49V's ARUBA COTTAGE FOR RENT with 2 bedrooms, rig, and antennas. For info write Carl Cook, 2191 Empire Ave., Brentwood, CA 94513.

HamMall.Com : Largest Web site dedicated to the sale of all types of amateur radio equipment. Check out the QSL Manager's Listing, add your call to the Call Wall, or get technical assistance. Find us at: <www.hammall.com>.

RADIOAMADORES BRASILEIROS, compre ICOM, Kenwood no Brasil. Tel/Fax: +19-875-6174 ou <www.bestway.com.br/radiohaus>.

WANTED: HAM EQUIPMENT AND RELATED ITEMS. Donate your excess gear—new, old, in any condition—to the Radio Club of Junior High School 22, the Nation's only full time non-profit organization working to get Ham Radio into schools around the country as a teaching tool using our EDUCOM—Education Thru Communication—program. Send your radio to school. Your donated material will be picked up ANYWHERE or shipping arranged, and this means a tax deduction to the full extent of the law for you as we are an IRS 501(c)(3) charity in our 18th year of service. It is always easier to donate and usually more financially rewarding, BUT MOST IMPORTANT your gift will mean a whole new world of educational opportunity for children nationwide. Radios you can write off; kids you can't. Make 2000 the year to help a child and yourself. Write, phone, or FAX the WB2JKJ "22 Crew" today: The RC of JHS 22, P.O. Box 1052, New York, NY 10002. Twenty-four hours call 516-674-4072; fax 516-674-9600; or e-mail <wb2jkj@juno. com>. Join us on the WB2JKJ Classroom Net, 7.238 MHz, 1200–1330 UTC daily and 21.395 MHz from 1400 to 2000 UTC.

FOR SALE: **Transmission Line Transformers** (Baluns and Ununs). Due to QTH downsizing, I have to dispose of the many transformers used in my study of these broadband and highly efficient matching transformers. A suggested price is $20, covering labor, packaging, and shipping. Oldest transformers will be shipped first. They will include a short personal note on the particular experiment. Please, no special requests.Most transformers are uncased. Jerry Sevick, W2FMI, 32 Granville Way, Basking Ridge, NJ 07920 (908-766-6122). **Note:** These are one of a kind, for experimental use only.

ASTRON Power Supply, brand new w/warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249. Call for other models, AVT 626-286-0118 <www.aventrade.com>.

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TRIBANDER COMPARISON REPORT: Find out the real lowdown on HF antenna performance. K7LXC and NØAX test the KT34XA, TH7, TH11, C-3, Skyhawk, and more. Over 60 pages. $15 plus $3.00 s/h. <www.championradio.com> or 888-833-3104.

PHASED ARRAY NETWORKS by COMTEK SYSTEMS deliver gain and front to back. Call 704-542-4808; fax 704-542-9652. COMTEK SYSTEMS, P.O. Box 470565, Charlotte, NC 28247.

QSL CARDS Many styles. Top quality. Order Risk Free. Plastic cardholders, T-shirts, Personalized caps, mugs, shirts. Other ham shack extras. Information and samples: **Rusprint 1-800-962-5783; 913-491-6689; or fax 913-491-3732.**

LOW BAND DXers K1FZ Beverage antenna transformers. Single wire and two wire switchable two direction types. <www.qsl.net/k1fz/> e-mail: <k1fz@agate.net> Clark Electronics, 207-338-0474.

19" RACKMOUNT PC CHASSIS <www.cti-texas.com>.

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FREE GUIDE "THE TEN MOST COMMON TOWER BUILDING MISTAKES": Written by well-known tower expert Steve Morris, K7LXC, this guide will help you avoid dangerous mistakes. TOWER TECH, Box 572, Woodinville, WA 98072; e-mail <UpTheTower@aol.com> or call 800-TOWERS8 or on the web: <www.championradio.com>.

VP5 – Be DX: Newly constructed 2BR/2BA villa with rig and antennas overlooking north coast of beautiful Middle Caicos. Telephone 904-282-0158, or e-mail <islands@southeast.net>.

OVER 2500 DIFFERENT DX AWARDS from 122 DXCC countries listed. K1BV DX Awards Directory. Put your QSLs to work for you! $21 postpaid. Ted Melinosky, 65 Glebe Road, Spofford, NH 03462-4411. <http://top.monad.net/~k1bv>.

HEARD ISLAND commemorative T-shirts, same shirt as team is wearing on QSL card. Proceeds benefit VKØIR DXpedition. Personal checks on U.S. banks okay. Please no credit cards. Sizes remaining: large, extra-large. 100% cotton, U.S. made. $20 Priority Mail stateside, $25 DX Air Mail, postage included. Tom Anderson, WW5L, 3505 Cliffwood Drive, Bedford, Texas 76021-2043 (phone 817-498-2820; e-mail <WW5L@gte.net>).

SX88 Hallicrafters receiver wanted. Jim, W6OU, 714-528-5652.

RAINBOW AMATEUR RADIO Association, the gay/lesbian club. Active weekly HF nets, monthly newsletter, e-mail reflector, web page: <www.rara.org>. Privacy respected. E-mail: <rara@qsl.net>, or P.O. Box 191, Dept. A, Chesterland, OH 44026-0191.

RF TRANSISTORS & TUBES: SD1446, 2SC1969, MRF454, MRF455, MRF422, 2SC2290, 2SB754, 2SC2312, 2SC2166, SAV17, MRF448, MRF151G, 3-500ZG, 3CX3000A7, 3CX400A7/8874, 4CX250B, 572B. WESTGATE 800-213-4563.

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200+ PROJECTS. Secure WEB ordering @ <www.matcopublishing.com/plans1.htm> or send $1.00 (refundable) Matco-5E, P.O. Box 509, Roseville, MI 48066-0509 USA.

COLLECTOR wants pre-1945 QSL cards. Can pay reasonable amount or reimburse mailing costs. Jack Hotchkiss, W7CNL, 3708 Hawthorne Drive, Boise, ID 83703 (208-336-5620).

VIDEO: Steps to Setting Up Your Own TV Repair Store. $115 certified check or money order only. Arnold Burns, 425 East 51st Street, Brooklyn, NY 11203.

WANTED: 6502-based Hardware/Software/Literature, whatever. KIM'S, SYM'S, AIM'S, OSI, anything and everything! John Rawley, 1923 Susquehanna Rd., Abington, PA 19001; phone 215-884-9220; <johnr750@aol.com>.

WANTED: Clegg Zeus, Interceptor (B). Will pick up reasonable distance. Reading, PA. Dan, <K3XR@juno.com>, 610-670-2980.

IWANTED: Manual for Tandy 102 portable computer. W2GTE, 910-253-1239.

WANTED: Drake 2-C receiver. Fred, KBØUUD, 303-678-5830, or <frecon.pilz@juno.com>.

C-502 ICOM 50 MHz transceiver wanted. Must be electronically and cosmetically good. Write to Pierluigi, IW4AA, via Dantona 13, 48100 Ravenna ITALIA, or call Italy–054439373, 18–20 GMT only if you speak Italian.

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