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Amateur Radio

SERVING AMATEUR RADIO SINCE 1945

MAY 1999

CQ

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K4HF

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UR'S JOURNAL

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The most versatile series of compact, multi-banded rigs ever made.

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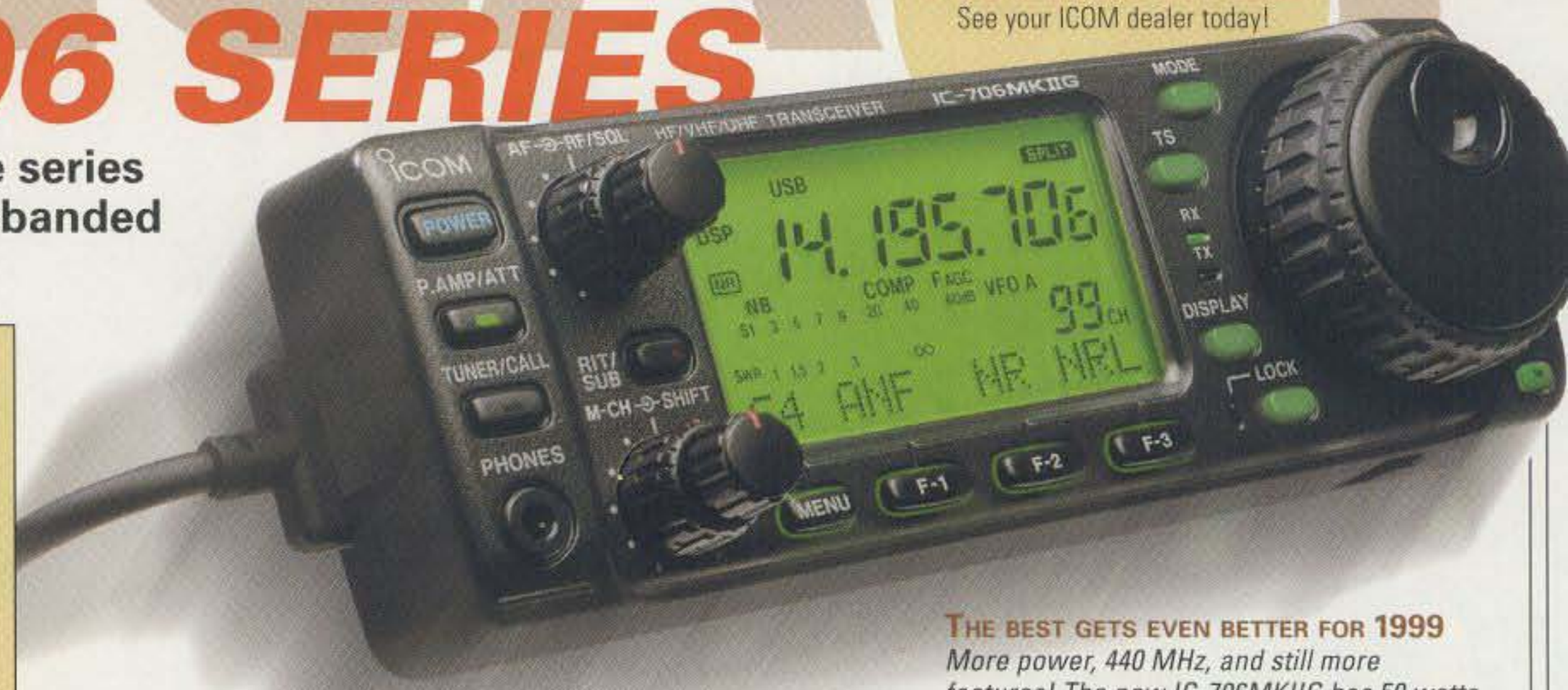

PROVEN PERFORMANCE:

"Great portability vs. performance ratio. It's great to have a radio where you can talk on your local repeater, work on your mobile DXCC total and still not miss out on six meter openings!"
– Kevin Olson, K3OX

"I enjoy everything about the IC-706MKII; size, ease of operation, power."
– Richard Lemme, K9FA

"This is my first ICOM & I am very pleased with it."
– Merlin R. Myers, KAØQZK,

"God, I love this rig. My little 706MKII goes with me everywhere and is on 24 hours a day."
– James H. Weidner, K2JXW

"The DSP unit works great for knocking out the heterodynes from the foreign broadcast on 40 meters. Thanks for making such a great compact rig."
– Bill Youse, N6DZS

"706 -- the love of my life."
– Gary Mashburn, KF4PTW

Try out all the latest ICOM rigs in the Funmobile at the Dayton Hamvention®, May 14 thru 16. Come have fun and enter our upcoming Connect 2000 contest. www.icomamerica.com

NEW IC-706MKIIG

THE BEST GETS EVEN BETTER FOR 1999
More power, 440 MHz, and still more features! The new IC-706MKIIG has 50 watts on 2 meters, 20 watts on 440 MHz, DSP as standard equipment, auto repeater, CTCSS, and backlit keys. Tried, tested and proven, the 706 series is your best choice for a complete ham rig.

NOW WITH DSP AS STANDARD EQUIPMENT

SAVE $100. Limited time offer.
IC-706MKII
See your ICOM dealer for details.

IN 1997, HAMS WERE "WOW"ED AGAIN
The IC-706MKII added still more features and more power. Today, the '706 series radios have earned a reputation among hams as rugged, hard working rigs. They perform as well on a serious DX'pedition as they do in a car or in a contest shack.

IC-706

ICOM options required for PC operation:
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OPC-478 Cable
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PC Ready!

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The ICOM IC-706 was introduced to the amateur community. Never before had so many features and so much fun been put together in such a small package. HF, 6 meters AND 2 meters in one box? Yes.

Join the thousands of hams who use ICOM's '706 series radios, and GET IN ON THE FUN! Contact your authorized ICOM dealer today, or call our 24-hour free brochure line. **425-450-6088**

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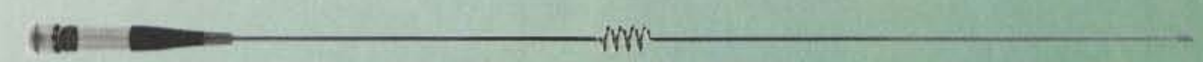
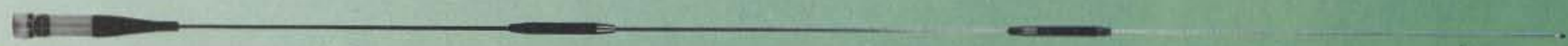
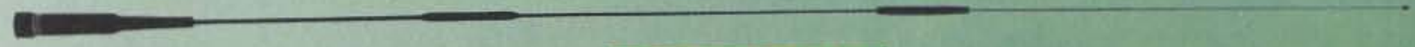


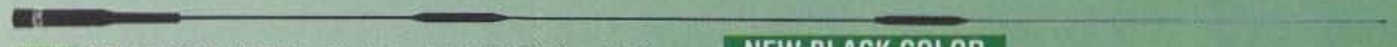
NEW Z750 • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: Gold-plated PL-259 • Max Pwr: 200W



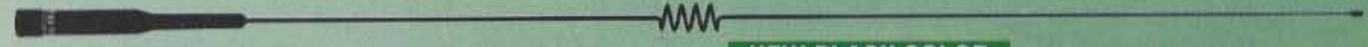
NEW Z780 • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
146MHz 6/8 wave 4.5dBi • 446MHz 5/8 wave x 3 7.2dBi • Length: 62" • Conn: Gold-plated PL-259 • Max Pwr: 150W



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



NEW SBB-7/SBB-7NMO • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
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 SBB-5/SBB-5NMO • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
Gain & Wave: 146MHz 2.5dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 3 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO •
Max Pwr: 120W

CX-224/CX-224NMO • Tri-band 146/220/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 220MHz 3.5dBi 5/8 wave • 446MHz 6.0dBi 5/8 wave x 2 •
Length: 36" • Conn: CX-224 PL-259, CX-224NMO NMO • Max Pwr: 100W

B-20/B-20NMO • Dual-band 146/446MHz w/fold-over
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

SH-55 • Super Flexible 146/446MHz HT Antenna
Gain: 146MHz 1.5dBi • 446MHz 3.2dBi • Length: 15.5" • Conn: BNC •
Max Pwr: 10W

B-10/B-10NMO • Dual-band 146/446MHz 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

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CH-32
Miracle Baby
146/446MHz
HT Antenna
Gain: 0dBi
Length: 1.75"
Conn: BNC

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CIRCLE 112 ON READER SERVICE CARD

CQ Amateur Radio

MAY 1999 VOL. 55, NO. 5

FEATURES

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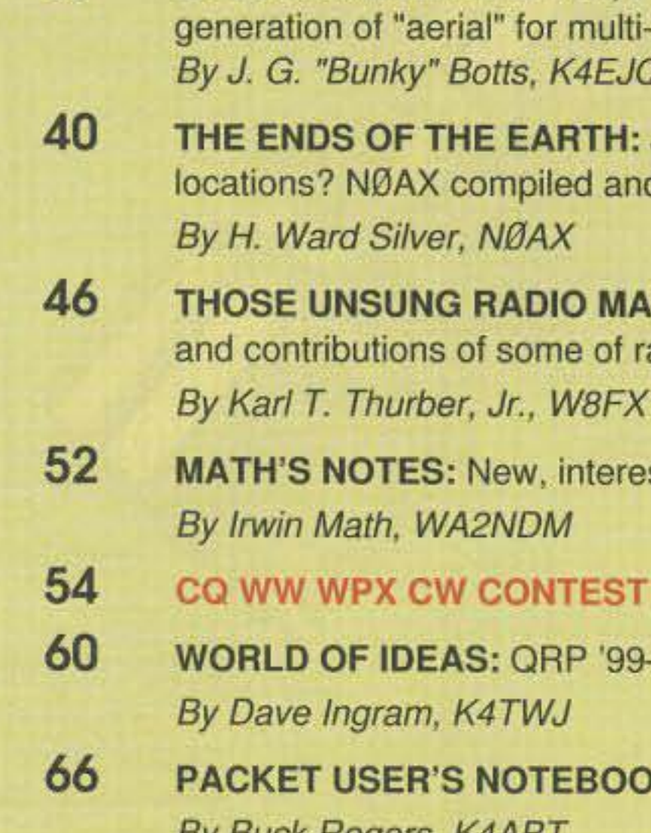
DEPARTMENTS



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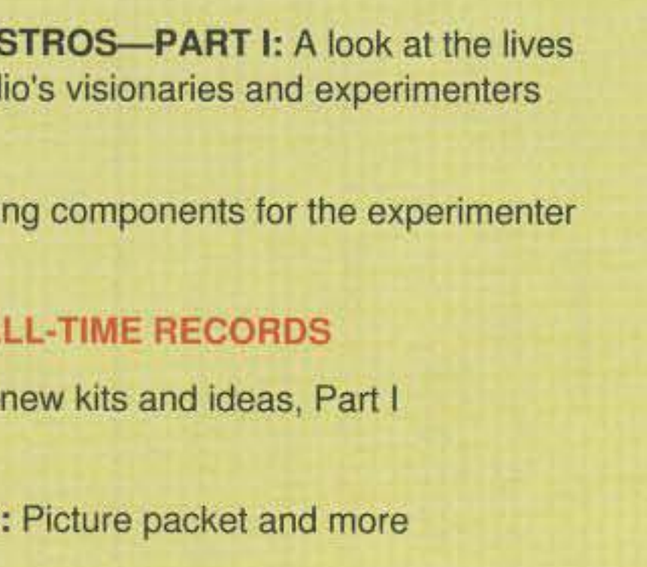
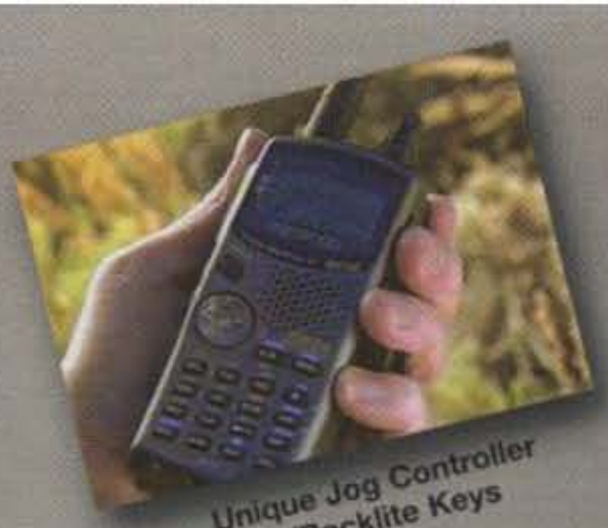


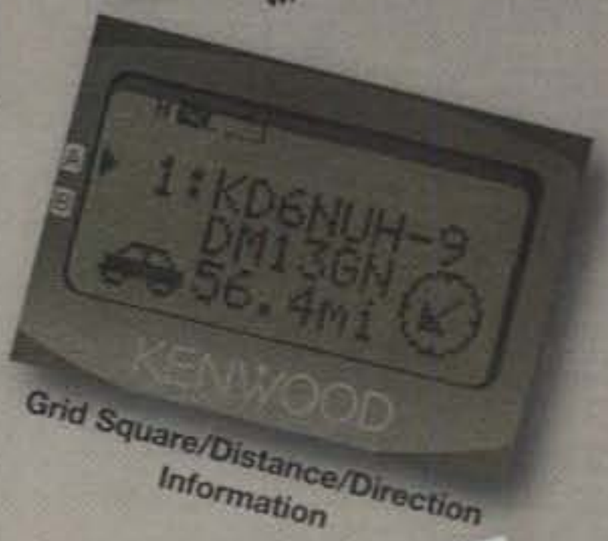
ON THE COVER: A roomful of gear may provide a psychological and operational boost to the operator, but often a modest setup can be extremely effective. That's the case with Charles Littlewood, K4HF, who does his operating from this neat Raleigh, North Carolina QTH. Ex-New Yorker Chuck is very actively involved with the Raleigh Amateur Radio Society, and does his operating on all bands from 160 through 440 MHz. Field Day (coming up real soon!) will find him in the role of band captain for CW operation with the club. (Photo by Larry Mulvehill, WB2ZPI)

TH-D7A
DATA COMMUNICATOR

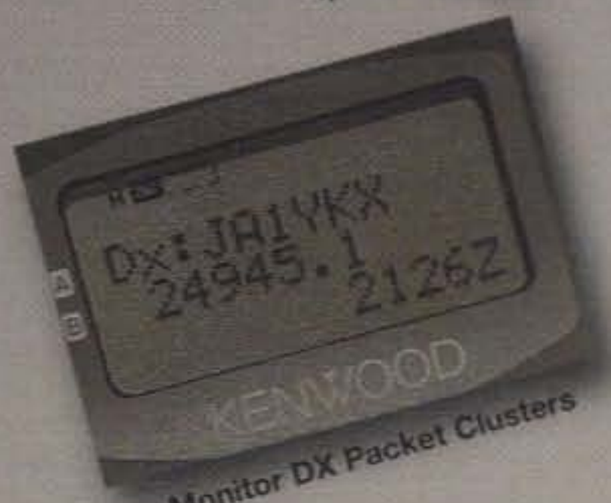
A NEW WORLD OF AMATEUR COMMUNICATIONS


Unique Jog Controller w/Backlite Keys


Emergency Communications and Position



Grid Square/Distance/Direction Information



Monitor DX Packet Clusters


Complete Line of Accessories

- FM dual-band (144MHz/440MHz) hand held
- 5.5 Watts @ 13.6 volts
- 200 memory channels w/8 alpha display
- Built-in CTCSS encode and decode
- Built-in 1200/9600bps TNC (AX.25 protocol)
- Unique cursor key for easy menu navigation
- Built-in APRS (Automatic Position Reporting System) software
- GPS interface for position/directional data (NMEA-0813)
- Manual input of latitude/longitude (No GPS required)
- Large 12 digit x3 line dot matrix display
- 16 backlit keys (laser cut from inside)
- Dual RX on the same band for voice and data (VHF only)
- PC Programmable for frequency and name (PG-4W required)

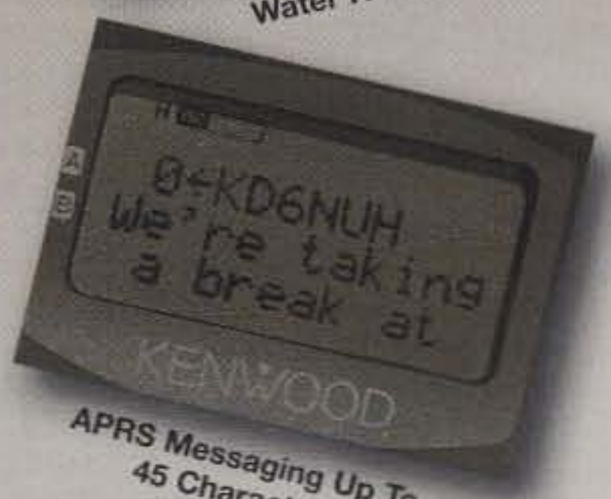

PC Connectivity Used For Programming/APRS/Packet

Advanced VC-H1 Controller

MIL-STD 810 C/D/E Water Resistance

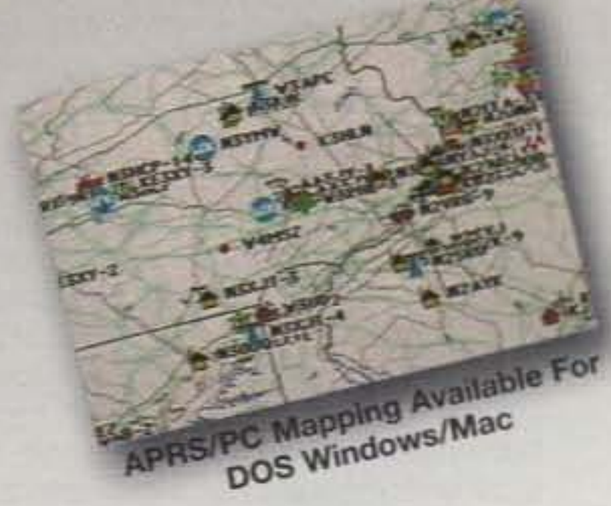
Weather Station & PHG Data Reception

- 16-digit 10-channel DTMF memory
- SkyCommand System (KSS) II for remote control of fixed HF transceivers
- Monitor DX Clusters
- DTMF remote control (TM-742A/TM-V7A)
- Dual receive on same band V+V/V+U
- AIP (intermod rejection)
- Free Operation manual at ftp://ftp.kenwood.net



APRS Messaging Up To 45 Characters


Remote Control HF Operation w/SkyCommand


APRS/PC Mapping Available For DOS Windows/Mac

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ZERO BIAS

AN EDITORIAL

The operant word is *prescient.* It took about two weeks after I wrote my last editorial to put my words in some sort of perspective. At the end of February, within days of each other, two items in the "press" proved my point. The first item appeared in the newspaper and was entitled "Intel Unveils 'Souped-Up' Pentium III." Obviously, this now means that everyone who is unfortunate enough to be stuck with and reduced to a Pentium II might as well be driving a Gremlin back and forth to work. Without a Pentium III, you'll be forced to move along now at about the same speed as a slug moving on a hot pavement in mid-July. It's time to move on up to the big time in the fast track and hope that a Pentium IV doesn't come along too soon. I can almost see piles of "old" and slow stuff discarded near the curb on garbage day.

The next item was in an amateur publication and was a feature article on how to breathe new life into an FT-101. By this stage in our collective amateur radio history, locating a good, inexpensive source of 6JS6Cs can prove quite daunting, unless you want to break into some museum on a dark and moonless night. The article described how to modify the FT-101 to use the more plentiful 6146s and thereby extend the life of these transceivers. I'm not making fun of the article, and in fact, I was quite interested in the approach and novel idea.

If the model numbers above don't mean much to you, then you're probably too young and have already put in your order for a Pentium III. For the rest of us, getting another 20 or 30 years out of our rigs shouldn't be too hard if we think about it. By now I'm sure the folks at Yaesu regret making a product that is virtually indestructible and timeless. The other manufacturers of amateur equipment can probably say the same thing, as you can always see a wide assortment of "vintage" gear pictured in this and other amateur radio publications.

Perhaps, if we have "Straight Key" night, we should also have some special logging programs to include Altair, Sinclair, MITs, and TRS-80 participation. It would sort of be in keeping with the mood and basic "pioneer spirit" of the event. It would also be a vindication for our saving and hanging on to those thousands of dollars worth of software we bought, borrowed, or "appropriated" over the years and still keep in the basement. You know, it's the stuff that hasn't been relevant or runable for years, but is still too good to throw out and nobody wanted to buy it at the last two local fleamarkets. If we could somehow resurrect some of that software (and hardware), we probably could find something useful to do with all those plastic containers from film and Chinese take-out food that are piling up in the basement, too.

Perhaps one of the reasons why amateur radio is not as exciting to others as we know it to be is simply the thrill of changing equipment every six months is not there. There are two different mind-sets at work here—computers and amateur radio—which some of us see as one, but most of the world sees as two. The proliferation of computers has evolved to a point where the hardware and software are basically the necessary evil to rapidly arrive at one's desired nirvana. The faster the better. With amateur radio, speed is not the main concern, unless you're trying to break Ted McElroy's CW record. Our concern, it seems to me, is that we strive to have enough equipment to maintain the ability or potential to do something, without necessarily having to do it. Maybe that's why we value, cherish, maintain, and almost have a death grip on some of our equipment, while carefully and methodically providing for back-up rigs (just in case).

While we strive for greater recognition and acceptance among young people, hoping that they can see the wonders that amateur radio has to offer, we can re-engineer out thinking and our equipment to be totally compatible with the digital world. Think of the benefit to the hobby and to our industry if all of our equipment had a life expectancy or point of obsolescence of no more than three years. We would begin to come into line with everyone else and in a sense become mainstream. We wouldn't look stagnant or old-fashioned with new stuff every couple of years. The old stuff, of course, would be tossed out with the obsolete computer stuff. Same principle. It would make people think we continue to be on the cutting edge of technology.

Okay, maybe that's not too practical a solution, but we do need a bigger, faster, better image. As a lot of us will head out to Dayton in mid-May, anticipating the wonders of amateur radio, I began to think of a solution that might help the DX community, aid technology, and in some small measure conserve HF spectrum space should the FCC announce any changes. For the most part, the technology exists now and would only require a bit of reconfiguration in existing transceiver models. Basically, we'd need only two internal variations of transceiver. The outside could vary with multitudes of controls, readouts, and nonspecific automatic functions (a little whirring sound emanating from the inside). The A model would have a normally functioning transmitter and a TRF or superregenerative receiver. The receiver would only respond to very strong signals, and so most DX pile-ups simply wouldn't be there. If by chance the signal was there, an internal clock would start to count the number of times you sent the last two letters of your callsign with no response and gradually reduce the power level of the transmitter until an automatic dummy load kicked in. At that point, frustration would have set in and an individual could keep on going for at least an hour or so without ever expecting a response, thereby freeing up spectrum space for the rest of us.

The B model would have the same transmitter and a highly sensitive and selective receiver. It would also have a built-in microprocessor to receive, translate, and display digital information superimposed on the DX station's signal (as required by a new law). The information displayed would include the DX station's or DXpedition's complete call, exact location, beam heading, and at least three sources of QSL information. This information could, of course, be automatically transferred (more little whirring sounds) to your computer (obviously, a Pentium III) for storage, logging program, and QSL printout. I'm sure you can see how this would not only free up spectrum, reduce RF in the air, and expedite DX and DXpedition contacts, again, for the rest of us. All future DXpeditions would have to install one of the new Info-Chips in each of their rigs prior to departure. Gone forever would be "What's his call?"; "Listen up!"; "Where is he?"; etc.

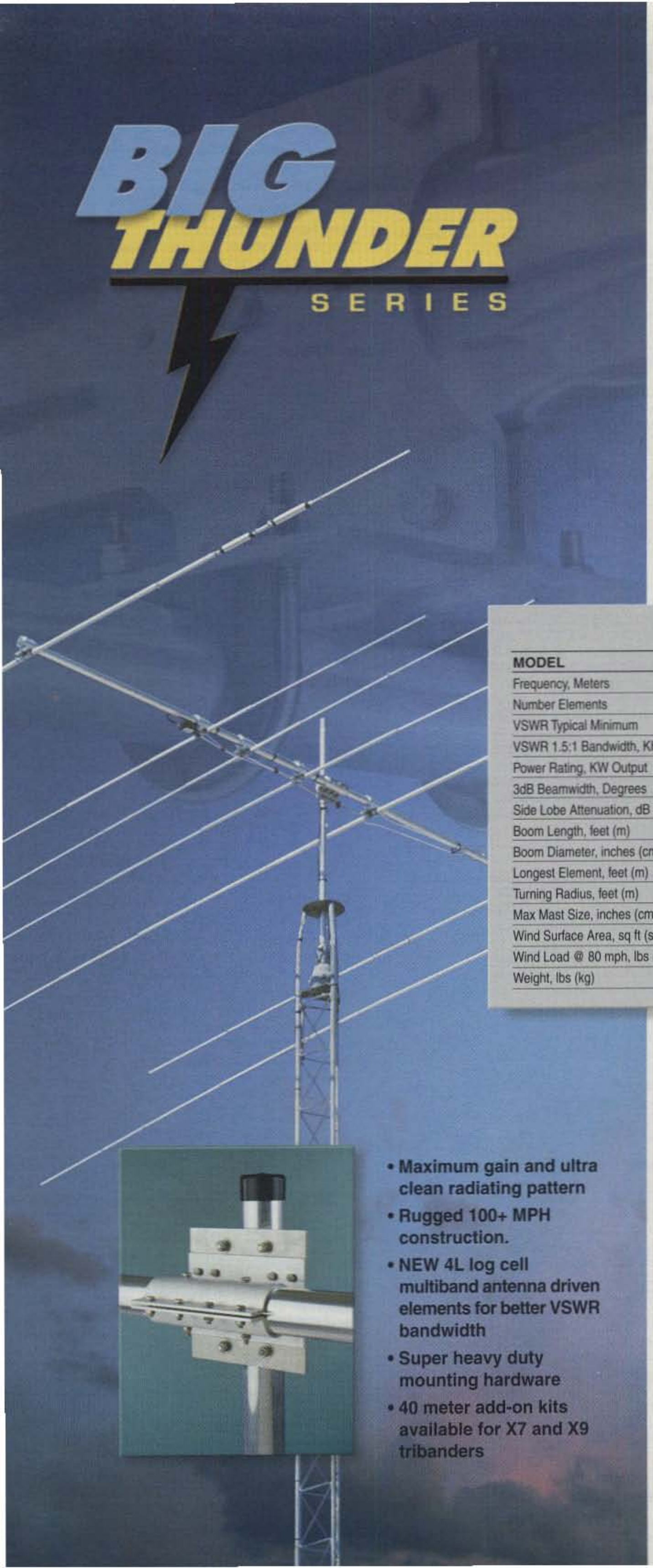
Both new models, the A and B, would, of course, presuppose that any new inrush of HF active amateurs would be very similar to the old batch. The old batch traditionally likes to talk and avoid any wasted time by listening. We all know that listening takes up a lot of valuable time and may even require a very time-consuming response, which may also mean having to pay attention to what is being said by others. It's a very lengthy process, one to be avoided if you can. If this can be worked out, we can move on to other bands and make plenty of room for everyone. In the extreme event that someone with an A model figures out how to disable the automatic dummy load, someone with a model B could simply reply with a "5/9" and let the model A amateur move on. It would be several months before he realized he was not in anyone's log.

While we're waiting for manufacturers to come out with their own versions of A and B transceivers, you might want to explore your local hamfest or the big one at Dayton to locate a good deal on some tubes (thermionic emission valves) to update your FT-101 or whatever you might still be using. As for me, I have prepared my list of things I'm looking for and hope to find. In the true ham spirit, I might even look around and try to pick up a few hundred thousand 6SN7s to perk up my old computer from a Rectox II to a Selenium III.

In case you were wondering, I did get a new amateur radio map (which does have Temotu, H40 on it) at the Charlotte Hamfest. I also had the opportunity to once again visit the woodworking show to round out a great hobby weekend. You're probably tired of me telling you to get out of the house now and then to attend a local hamfest. Really, it's okay if someone else gets a chance to use the repeater or to work DX or do any of the other things that occupy our free time. At a hamfest you get to meet some terrific people; see, touch, and examine the latest gear; shop for bargains galore in just about every area of amateur radio there is; and be amazed at some stuff that is out in the fleamarket that nobody seems to know what it is or what it does. However, if the price is right, you'll bring it home and worry about what to do with it later. Behind the microphone, key, or keyboard we tend to forget that amateur radio is a people hobby and sometimes that means looking them in the eye.

Maybe this year at Dayton we'll find out which way the FCC has decided to go with regard to amateur radio licensing restructure. In the long run, it won't matter who's happy with the results and who isn't. There will just be new rules and regs that all of us will get used to in a couple of months, and new people will think that this is the way it's always been.

73, Alan, K2EEK



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Multiband and Monoband Directional Antennas
Big Thunder rugged, high gain tribanders cover 10, 15, and 20 meters with 40 meter add on kits available. Cushcraft's four new monoband antennas cover 10 through 40 meters for the DXer who wants the ultimate in high performance and long service life.

High Performance
The superior electrical multiband antenna designs do not utilize traps in the high current driven elements and reflectors. The 4L log cell design technique yields maximum performance and power handling capability.

Reliability and Long Service Life
Each component has been chosen based on a threshold 1.25 times that needed to achieve a 100^{+} MPH wind survival rating.

SPECIFICATIONS

MODEL	XM240	XM520	XM515	XM510	X9	X7
Frequency, Meters	40	20	15	10	10/15/20/+40	10/15/20/+40
Number Elements	2	5	5	5	9	7
VSWR Typical Minimum	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1
VSWR 1.5:1 Bandwidth, KHz	150	> 350	> 450	> 750	*	**
Power Rating, KW Output	1.5	1.5	1.5	1.5	2.0	2.0
3dB Beamwidth, Degrees	70	56	56	56	55/57/64	64
Side Lobe Attenuation, dB	>35	>40	>40	>40	>40	>40
Boom Length, feet (m)	22 (6.7)	35 (10.7)	24 (7.3)	19 (5.8)	28 (8.53)	18 (5.49)
Boom Diameter, inches (cm)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)
Longest Element, feet (m)	43 (13.1)	36.3 (11.1)	24 (7.3)	18 (5.5)	36.7 (11.2)	36.7 (11.2)
Turning Radius, feet (m)	24.3 (7.4)	25.9 (7.9)	16.3 (5.0)	13.0 (4.0)	21.7 (6.61)	20.0 (6.09)
Max Mast Size, inches (cm)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)
Wind Surface Area, sq ft (sq m)	5.5 (.51)	9.2 (.85)	4.5 (.41)	3.4 (.32)	9.9 (.92)	7.9 (.73)
Wind Load @ 80 mph, lbs (kg)	142 (64.4)	250 (113.4)	115 (52.3)	85 (38.5)	255 (116)	202 (92)
Weight, lbs (kg)	55 (25)	92 (41.8)	47 (21.1)	38 (17.2)	85 (38.5)	60 (27.2)

* X9 - (20M) 350, (15M) 450, (10M) 1500

** X7 - (20M) 600, (15M) 750, (10M) 1700

A Lifetime of DXing Fun
These antenna designs truly reflect the needs of the modern DXer. Their electrical performance will never leave you wanting. Their mechanical integrity and ease of installation and maintenance is unsurpassed. The modular components used throughout the series are available as replacement parts that can be purchased direct from the factory. As such, these antennas may truly provide you a lifetime of DX fun and excitement.

- **Maximum gain and ultra clean radiating pattern**
- **Rugged 100+ MPH construction.**
- **NEW 4L log cell multiband antenna driven elements for better VSWR bandwidth**
- **Super heavy duty mounting hardware**
- **40 meter add-on kits available for X7 and X9 tribanders**

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ANNOUNCEMENTS

1999 FAR Scholarships: The Foundation for Amateur Radio is administering 66 scholarships for the academic year 1999–2000 to assist licensed radio amateurs who are planning to pursue a full-time course of studies and have been accepted for enrollmenmt in an accredited university, college, or technical school. Scholarships range from $500–$2500. Additional info and an application may be requested by letter or QSL postmarked prior to April 30, 1999 from FAR Scholarships, P.P. Box 831, Riverdale, MD 20738.

Indiana QSO Party: Sponsored by the Land of Lakes ARC, 1800Z May 8 to 2300Z May 9. Categories: Single op, multi-op, club station, VHF/UHF, CW and phone. All stations worked once per mode on each band. Mobiles may be worked once oer mode per Indiana county they operate from. No repeater contacts. Exchange: Indiana stations, signal report and county; non-Indiana stations, signal report, state, province, or country. Scoring: phone contacts 2 QSO points; all other modes 3 points. Indiana stations multiply QSO points by total of Indiana counties + states + provinces + countries worked. Non-Indiana stations multiply total QSO points by number of Indiana counties worked. Freq: CW 1810, 3539, 3715, 7045, 7115, 14045, 21045, 21120, 28045, 28120; phone 1860, 3890, 7280, 14285, 21385, 28400, 50.14, 144.215, 432.120. Certificates for first and second place in each category, state, province, and country. Send logs with SASE to Sharon Brown, 905 W. parkway Dr., Pleasant Lk., IN 46779, or e-mail: <sharon.l.brown@gte. net>. Logs must be received by June 11, 1999.

Box Elder County/Golden Spike QSO Party: 1500Z May 8 to 0700Z May 11, all bands and modes. Repeater operation OK. Work stations only once per band/mode. Box Elder County stations work all. Others work Box Elder County stations only One QSO point for each contact made while operating or assisting during 24 consecutive or nonconsecutive houirs of operation. Control operator/net controls get additional 0.2 point for all QSOs made while acting as CO or NC during the contest. Final score: total QSO points squared plus total CO/NC points squared. Exchange: operator's name and station callsign. Log: mode, band, date, time, callsign of station worked, exchange sent, exchange received, and name of NC/CO if applicable. Send reports and logs to Bob Anderson, K7UB, 995 N. Tremont St., Tremonton, UT 84337 by June 10, 1999. All entraants with 20 or more QSOs will receive a certificate.

Six Club Contest: Last weekend in May, 2300Z Friday to 0300Z Monday. Each QSO is worth one point in own country and two points for every contact made outside own country. Hawaii/Alaska separate countries. Multiply total QSO points by total grids worked. Awards available. All entries must be received by June 21, 1999. For more information and snail-mail address e-mail: <sixclub@6mt.com>.

KB1BZB, a WW II memorial station, may be copied on 7045 MHz on Sunday afternoons. Certificate for a QSL.

• The following Special Events are scheduled for May:

1-land, from Martha's Vineyard Island (IOTA NA046), Fall River ARC, 1600Z April 30 to 2100Z May 2 on IOTA net frequencies 3.755, 14.260, 21.260, 28.460. Also working Massachusetts QSO Party. QSL with SASE via N1JOY.

K2M/WA2VJA, from CQ Memorial Day, Nutley, NJ; Robert D. Grant United Labor ARA, 1200Z May 28 to 2400Z June 1 on 28.420, 52.525. For certificate send QSL to RDGULARA WA2VJA, P.O. Box 716, Nutley, NJ 07110-0716.

W2CVT, from Samuel F.B. Morse's home, Poughkeepsie, NY; Poughkeepsie ARC; 1200–2200Z May 15 and 16 on 7.120, 14.270, 21.120, 28.375. QSL/certificate Don Stein, W2PTF, 3 Little Rd., Wappingers Falls, NY 12590.

K3A, from sesquicentennial of Altoona, PA; Horseshoe ARC; 1400–2200Z May 15–16 on 146.01/61 and lower 25 kHz of 40, 20, 15 meter General phone bands or 10 meter Novice/Tech Plus band. Certificate. Contact Ted Holland, 217-19 Fifth Ave., Altoona, PA 16602 or WB3AVD callbook address.

N3HOW/8, from National Safe Boating Week and 85th anniversary of U.S. Power Squadrons, Great Lakes Maine and U.S. Coast Guard Memorial Museum, Ashtabula, OH; 1400–2200Z May 29–30 on 7.267, 14.267, 21.367, 28.367 MHz. For certificate send SASE to Doanld R. Stark, 65 Stark Spur, Eighty Four, PA 15330.

W5S, from celebration of 300 years of Acadian French influence on culture of Lousiana and start of "Tour de Lousiana," Springhill, LA; May 22 to June 4 in General portions of 80–10 SSB and CW. For certificate send 9×12 SASE to SARC, Inc., P.O. Box 722, Springhill, LA 71075.

K6AA/mm, from Tug Boat "Angels Gate" to celebrate the Los Angeles Harbor's World Trade Week; United ARC of Los Angeles Harbor; 1600–2400Z May 15 and 16 on 14.250, 21.350, 28.450, 146.55 MHz. QSL info: SASE to URAC/K6AA, Berth 84, Foot of Sixth St., San Pedro, CA 90731.

W6P, from National Police Week; Cops Contest Club; 0000Z May 9 to 2400Z May 15 during the day on weekends and evenings during the week on 3895, 7275, 14275, 21325, 28425 kHz ±QRM. For certificate send $2.00 ($1.00 of which is donated to the National Law Enforcement Officers Memorial Fund) and 9×12 SASE to Jerry Boyd, K6BZ, Cops Contest Club, P.O.B. 252, Igo, CA 96047 (e-mail: <k6bz@c-zone.net>).

K7UB, N7WFM, etc., from anniversary of the driving of the Golden Spike, Promontory, UT; UBET ARC; 1500Z May 8 to 0700Z May 11; all modes, all bands. For certificate send QSL and SASE to UBET ARC, 995 N. Tremont St., Tremonton, UT 84337.

KB8UUZ, from 1999 Loyalty Day Celebration, Freedom Township, OH; 1200Z May 1 to 0200Z May 3 on 7.265, 14.265, 28.480, 50.145. For certificate QSL with SASE to Tom Parkinson, KB8UUZ, 9992 State Route 700, Mantua, OH 44255.

W8YAF, from Memorial Day celebration, Yankee Air Museum, Willow Run Airport, Belleville, MI; 1200–2000Z May 31 on SSB 7.270. For certificate send QSL and 9×12 SASE to Frank Nagy, N8BIB, 24315 Waltz Rd., New Boston, MI 48164-9167.

• The following hamfests are scheduled for May:

May 1, **3rd Annual SARS Tailgate Party**, Windsor Community Center, Co. east of **Aiken, SC.** Contact Ray Thomas, WA4OMM, 484 Rosewood Farm Lane, Elko, SC 29826 (phone 803-266-4759; e-mail <rose2@sc.tds.net>).

May 1, **Amateur Radio & Computer Swap Meet**, Cadillac Middle School, **Cadillac, MI**. Contact Dan, KE8KU, Waxaukee ARC, P.O. Box 163, Cadillac, MI 49601 (616-775-0998; e-mail: <ke8kundan@juno.com>). (Exams)

May 1, **Moulton, Alabama Hamfest**, H.A. Alexander Park, **Moulton, AL**. Contact Rex Free, KN4CI, 256-905-0822, or Ed Weatherford, K4EKW, 256-974-0436; web: <http://www.symetric-inc.com/N4IDX>. (Exams)

May 1, **Louisa, Kentucky SwapFest/HamFest**, Fallsburg Community Center, **Louisa, KY**. For information, send e-mail to <wa4swf@foothills.net>.

May 1, **Monument, Colorado Area Swapfest**, Lewis-Palmer HS, **Monument, CO**. Contact Dennis Major, NØABC, P.O. Box 62343, Colorado Springs, CO 80962-2343 (719-535-1160; e-mail: <NØABC@qsl.net>).

May 1, **OVMRC Amateur & Computer Fleamarket,** Stittsville Arena, **Stittsville, Ontario, Canada**. Contact John Barnhardt, VE3ZOV, 613-521-8910, fax: 613-523-7889, e-mail: <ve3zov@rac>.

May 1–2, **1999 Trenton Computer Festival**, New Jersey Convention and Exposition Center at Raritan Center, **Edison, NJ**. For information, check the Trenton Computer Festival Web site <www.tcf99.com>, or contact Marin Light, KGP Productions, 800-631-0062, e-mail: <marinlight@earthlink.net>.

May 1–2, **Abilene Convention & Hamfest**, Abilene Civic Center, **Abilene, TX**. Contact Peg Richard, 1442 Lakeside Dr., Abilene, TX 79602 (915-672-8889; e-mail: <jimr@swconnect.net>). (Wheelchair access; exams)

May 1–2, **Birmingham Hamfest & Computer Show**, Zamora Temple, **Birmingham, AL**. Contact Glenn Glass, 8368 Country Circle, Pinson, AL 35126 (205-681-5019; web site: <bro.net/barc>).

(Continued on page 82)

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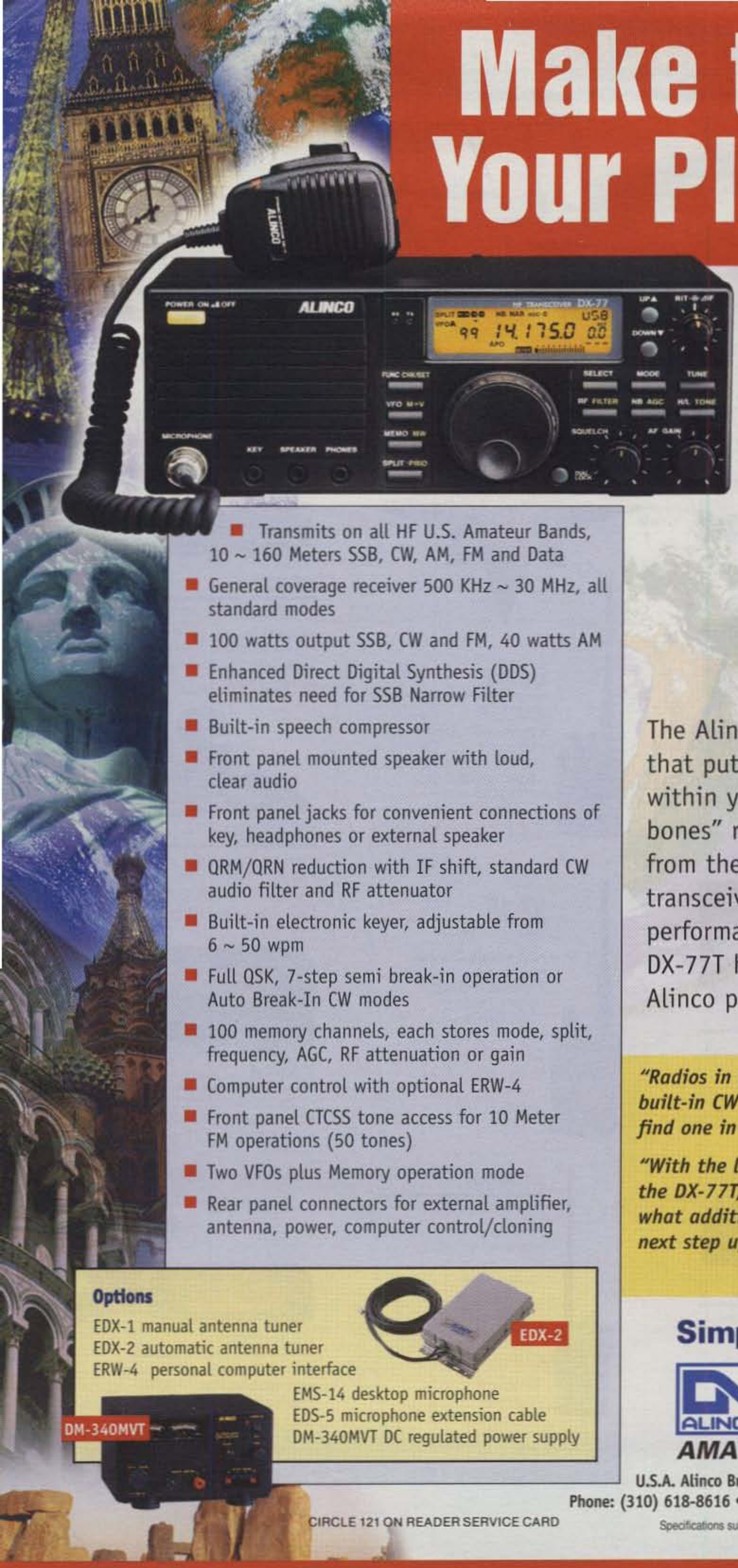

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Results of the 1998 CQ WW WPX CW Contest

BY STEVE BOLIA*, N8BJQ

All RF paths ended in Cyprus in 1998, or so it appeared. Two world records, two more category wins, and three top ten finishes from the island made 5B4 the "hot spot" of the '98 WPX CW Contest. Add this place to your list of places to operate from in the future. And as often happens with this contest, conditions ran the gamut from bad to very good during the weekend.

DX

Although conditions were "less than ideal," 3V8BB managed to pull off a "three-peat." Hrane has extended his string of consecutive wins to three with his win in 1998. During this streak the opponents have changed and conditions varied widely, but YT1AD has overcome all to remain on top. N5KO at HC1OT's fine station provided plenty of competition, but in the end, Trey came up a few Q's short. Ernesto, LU5CW, was a very competitive third with LT1F, with Ivo, C46A (5B4ADA), breathing down his neck in fourth place. Very close behind in fifth was Manuel, EA8ZS, followed by Carl, P49V, and Marios, C4W (5B4WN). Chris, A45XR, finished eighth, followed by DL2CC at OT8T and JM1CAX at 3DA5A.

Ten meter scores showed considerable improvement over 1997. PR5W nearly topped 1.5M to take the top spot, followed by LU8DW and LP champ PU2RUX. 4X4DZ was the Asiatic champion, and '97 champ 9H0A was the top EU entry in fifth place. WP3A was the 15 meter leader, followed by LP champ CP6AA and EU champion 9A5Y. YZ9W edged out XV7SW for fifth place. EA9LZ established a new AF record on 20 meters with his number one finish. Second-place finisher FM5BH was the new NA record holder. W5ASP at VP5Z took third, with YM2ZW fourth and HG3O fifth. There was a real battle for the 40 meter title, with TI1C (TI2CF) narrowly edging out F2CW at ZM1A for the top spot. Both Carlos and Jacky turned in really outstanding scores. Third place went to H24LP, with DL5AWI fourth and YU7NU fifth. The summertime conditions on the low bands make operating a real challenge. EU3FT pulled enough stations out of the QRN to take the top spot on 80 meters, followed by DL8WN and T91DNO. On top band, IH9/OL5Y set a new world record with his fine 341K effort. Second place went to SN3A, with LY6K third.

In the low power category, Gadzo, 5B4/T97M was the all band winner with nearly 4.4M points. Gary, VE7NTT, was second, followed by KN4T, S57DX, and 7M1MCT. C6AKA was sixth, S59AA seventh, TA4/DK5IM eighth, S57J ninth, and K1KTV tenth.

This is all you need for a contest nowadays, folks! Here is Rolf, XV7SW, with his IC-706, keyer, and computer.

PU2RUX was the top LP 10 meter entry (and third in the world overall), followed by PU1KDR and LU2DW. Fifteen meter honors went to CP6AA (second overall), with Rolf, XV7SW, second and YBØECT third. By the way, Rolf promises to be someplace very interesting for this year's contest. 5B4/T93Y edged out CY7A for 20 meter honors, with VK2APK third. S54A was the 40 meter champion. He was followed by F/OK1EE and YZ1V. HA4FV just edged out EU1CL for 80 meter honors, with RV3LO third. HA8BE took the top band title, with 9A2OO very close behind and LZ2CJ in third.

In the increasingly popular Triband/Single Element category, 3V8BB was the winner, with C4W (5B4WN) second, 3DA5A (JM1CAX) third, RN6BY fourth, and LP champ 5B4/T97M fifth. 4N9BW, EM4U, S53R, 7Z5OO, and HA2SX rounded out the top ten. The number of entrants in this category is increasing each year as more folks find out about it. You can be competitive in this category without having to build a mega station.

The QRP/p race was extremely close, with YU1EA edging out RW4WR by 9K for the top spot. LY2FE was less than 30K behind in third place, followed by YU1LM and K1VUT. LW3EBJ was the 10 meter champion, with LU6HI the winner on 15 and RA3FO the 20 meter champ. KU7Y was tops in the world on 40, with SP4GFG the 80 meter champion.

GIØKOW was the Assisted champ, followed by U.S. champ K3MM and DK3GI. DL1IAO finished fourth and ED5FV fifth. EA7DPU was the 15 meter assisted winner as is KC6ETY on 20, Z39Z on 40, and YU1RA on top band.

USA

It was KQ2M again! Showing his versatility, Bob won both modes in 1998. Less than 300K behind was Rich, KE3Q (also second in SSB), with Bill, W4AN, right on Rich's heels. N6IG as WR6AAA took fourth, followed by K3ZO and NB1B. K5ZD, K7BV, WC4E, and WW7OR (W7GG) rounded out the top ten.

NN5AA operated by K5NA turned in an excellent 10 meter score to edge out N4BP for the top spot. N6MU was the 15 meter champion, with K4OAQ second and WW4RR third. Bob, N6TV, turned in the top U.S. single band score on his way to the 20 meter title. Second place went to Mark, KØEJ, with WØTM third. LP champ WA8WV was the 40 meter winner, with N2GM second and KR1G third. K2TW edged out K1LZ and W3BGN for the 80 meter title.

KN4T turned in a fine score to win the U.S. Low Power championship, with K1HTV second, AA5B third, WQ5L fourth, and WD4AHZ fifth. K4EA was the LP 10 meter champion, as was KN4Y on 15 and AE6Y on 20. WA8WV and N2GM were one and two, respectively, on 40, and W1MK was the 80 meter winner.

WV2LI operated by N2GA topped W9IW (ES2RR) for the US Tribander/Single Element crown. Third place went to K7VS, with W1CU less that 5K behind in fourth and NU4Y 1K behind in fifth place. AA1SU was the top Rookie, with AB1BX second and KØXQ third. Welcome to the contesting ranks!

K1VUT was the U.S. QRP champ, followed by NØKE and WA2HZR. NX5M finished first on 10, with W4DEC tops on 15, W6YJ the 20 meter winne,r and KU7Y the world and U.S. champ on 40 meters.

K3MM was the U.S. Assisted champion (and second in the world). W8AV was second, AB2E

*7354 Thackery Road, Springfield, OH 45502
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UT4UZ operated both modes as EM4U in the Tribander/Single Element category.

third, K1TO fourth, and KT4W fifth. K6III took 15 meter honors, and KC6ETY was the world and U.S. champ on 20.

Multis

H20A was the world Multi-Single champion (and new world record holder), with NA champ NP4Z second, SA champ ZX5J third, and AF champion IH9/OK5DX fourth. V26TT finished fifth, with JY8B, HG1S, 6Y6A, 9M6AAT, and UD6M filling out the top ten.

The third world record went to the gang at P3A, the winners of the Multi-Multi category. Second place went to SA champion AZ4F, with EU powerhouse 9A1A third and RW2F fourth. EA4ML was fifth, LY5A sixth, NA champ WL7E seventh, and JH5ZJS eighth. U.S. champ WT2Q broke into the top ten at ninth place and LY7A was tenth.

In the U.S., KW2O took the Multi-Single title, with KVØQ a very close second. Third place went to WU3V/5, with fourth place going to WO8CC and KC7V fifth. WT2Q took the U.S. Multi-Multi title, with KO6N a close second and NJ4F third, W4MYA fourth, and AJ4Y fifth.

The Rest of the Story

Entries were up a couple of hundred over 1997, and I hope the trend will carry over into 1999. With improving conditions and the addition of the "1 point in country QSO," there should be plenty of action for everyone on the last weekend in May. Make sure you've updated your logging program to reflect the rule change, and please pass the word to those in countries where the word may not get to them for weeks or even months.

Over 50% of all logs made it into the CW database, which provides a very representative sample of what was actually on and gives us a good basis for log checking. Thanks to the untiring efforts of N6AA, the programming skills of N6TR, and electronic log submission, we are able to more accurately scrutinize your logs. Some logs took some pretty good "hits" for the usual "bad calls," etc. Some of these errors in copying can be avoided by thinking just a bit about what you thought you copied. A working knowledge of prefix allocations would indicate that there are probably not any SH3's on (at least not nearly as many as showed up in the database). There are many other common copying errors that cost you not only QSO points, but mults as well. Speed is great, but accuracy is more important. Another common occurrence is using a zero (Ø) in place of an O or vice versa. The database will flag the call as bad, but your logging program probably won't and will most likely give you credit for a new multiplier.

There were many special prefixes and expeditions on for your operating pleasure. Please thank these folks for being (or going) there, and increasing our multiplier totals and our DXCC totals. Even though every prefix has the potential to be a new multiplier, these special prefixes and calls add some flavor to the contest.

A new trophy was added for this contest and will continue in the future. We now have a plaque for the top Zone 3 Single Op All Band station, sponsored by N6IG. This should give the guys on the other side of the U.S. and Canada something to shoot for.

Again, lots of thanks to my "crew." NA2X (who appears to be a glutton for punishment) typed in a bunch more logs for the database as well as did some checking and rescoring.

TROPHY WINNERS AND DONERS

SINGLE OPERATOR, ALL BAND

WORLD: Steve Bolia, N8BJQ Trophy. Won by: **Station 3V8BB operated by Hranislav Milosevic, YT1AD**.
USA: Steve Bolia, N8BJQ Trophy. Won by: **Bob Shohet, KQ2M.**
EUROPE: Ivo Pezer, 5B4ADA/9A3A Trophy. Won by: **Station OT8T operated by Frank Grossmann, DL2CC.**
OCEANIA: Tom Morton, K6CT Trophy. Won by: **Martin Luther, VK5GN**.
CANADA: Radio Amateurs of Canada (RAC) Trophy. Won by: **John Sluymer, VE3EJ**.
JAPAN: The DX Family Foundation Trophy. Won by: **Masaki Okano, JH4UYB**.
CANADA Low Power: Amateur Radio League of Alberta Trophy. Won by: **Gary Caldwell, VE7NTT.**
Zone 3 High Power: Jim Pratt, N6IG Trophy. Won by: **WR6AAA operated by Jim Pratt, N6IG**.
USA QRP/p: CQ Magazine Trophy. Won by: **David Clemons, K1VUT.**

SINGLE OPERATOR, SINGLE BAND

WORLD: Pedro Piza, Sr., KP4ES Memorial Trophy. Won by: **Jorge Pareja, EA9LZ (14 MHz).**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Station TI1C operated by Carlos Fonseca, TI2CF.**
WORLD 3.5 MHz: Lance Johnson Digital Graphics Trophy. Won by: **EU3FT**.
OCEANIA: D. Craig Boyer, AH9B Trophy. Won by: **Station ZM1A operated by Jacques Calvo, F2CW (7 MHz).**
USA: Kansas City DX Club Trophy. Won by: **Robert Wilson, N6TV (14 MHz)**.
USA 28 MHz: Bernie Welch, W8IMZ Memorial Trophy. Won by: **Station NN5AA operated by Richard King, K5NA.**
USA 21 MHz: Wayne Carroll, W4MPY Trophy. Won by: **John Desloge, N6MU.**

MULTI-OPERATOR, SINGLE TRANSMITTER

WORLD: Ron Blake, N4KE Trophy. Won by: **Station H20A operated by YL2KL, RZ3BW, RA3CQ, RZ3BY, RX3APM, RZ4HF.**
USA: Austin Regal, N4WW Trophy. Won by: **Station KW2O operated by K2LE & N2UN.**

MULTI-OPERATOR, MULTI-TRANSMITTER

USA: Yankee Clipper Contest Club Trophy. Won by: **Station WT2Q operated by KB1W, N1BB, N1GA, NJ3K, KØTB, W1IX, K1TTT, WT2Q.**

CONTEST EXPEDITION

WORLD: Ed Roller, K4IA Trophy. Won by: **Gadzo Edin, 5B4/T97M**.

COMBINED SSB/CW
SINGLE OPERATOR, ALL BAND

WORLD: Al Slater, G3FXB Memorial. Won by: **Ivo Pezer, 5B4ADA/9A3A (C46A).**
EUROPE: Les Nouvelles DX Group Trophy. Won by: **Tine Brajnik, S50A (S56MM).**
USA: D. Craig Boyer, AH9B Trophy. Won by **Bob Shohet, KQ2M**.

Club (SSB & CW)

WORLD: *CQ* Magazine Trophy. Won by: **Contest Club Finland**.
USA: Oklahoma DX Association Trophy. Won by: **Potomac Valley Radio Club**.

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

3V8BB	**11,914,111**
HC1OT	11,566,273
LT1F	10,407,848
C46A	10,044,034
EA8ZS	9,795,674
P49V	7,891,364
C4W	7,353,213
A45XR	6,930,768
OT8T	**6,187,308**
3DA5A	6,102,345
RN9AO	5,413,320
KQ2M	**5,146,608**
VE3EJ	**4,900,449**
IR4T	4,900,392
KE3Q	4,810,784
DL6FBL	4,711,728
VO1MP	4,667,488
S56MM	4,660,040
RN9XA	4,624,144
W4AN	4,618,200

28 MHz

PR5W	1,421,775
LU8DW	985,920
*PU2RUX	660,652
4X4DZ	658,560
9HØA	498,108
*PU1KDR	472,230
CX5X	372,325
YT1R	254,264
TK5NN	249,387
9K2ZZ	240,195

21 MHz

WP3A	3,038,371
*CP6AA	2,637,560
9A5Y	1,882,494
YZ9W	1,366,964
*XV7SW	1,324,078
S57O	1,254,075
*YBØECT	1,245,308
*4Z5FW	1,074,678
II3T	1,059,355
*4X/OK1DTP	1,037,686

14 MHz

EA9LZ	**5,708,498**
FM5BH	4,642,866
VP5Z	3,713,040
YM2ZW	3,090,750
HG3O	3,000,387
YZ9A	2,879,807
SP2FAX	2,789,352
*5B4/T93Y	2,556,718
GS2MP	2,534,115
9A3MA	2,485,378

7 MHz

TI1C	**5,403,048**
ZM1A	**5,144,480**
H24LP	2,815,230
DL5AWI	1,896,948
YU7NU	1,789,854
T88X	1,570,284
S5ØR	1,394,492
G8G	1,334,700
UN7LG	1,311,552
DK3WW	1,286,860

3.5 MHz

EU3FT	**526,490**
DL8WN	425,156
T91DNO	386,104
UN7LT	380,418
EN1I	351,568
*HA4FV	336,582
*EU1CL	325,314
K2TW	318,560
OH3NE	313,600
UYØZG	311,850

1.8 MHz

IH9/OL5Y	341,068
SN3A	186,588
LY6K	177,650
9A4D	152,250
S5ØC	152,000
S57M	135,660
*HA8BE	120,960
*9A2OO	104,492
*LZ2CJ	61,272
UR4E	58,984

LOW POWER ALL BAND

5B4/T97M	**4,339,200**
VE7NTT	**2,516,520**
KN4T	2,452,140
S57DX	2,112,078
7M1MCT	2,050,722
C6AKA	2,017,115
S59AA	1,993,522
TA4/DK5IM	1,972,355
S57J	1,861,738
K1HTV	1,830,150
L36E	1,737,996
EA8ASJ	1,722,627
RSØF	1,685,690
S51F	1,640,448
AA5B	1,629,067
EA7GTF	1,588,248
HA8MD	1,578,864
SP9XCN	1,574,620
VE6JO	1,533,060
EU1AZ	1,506,600

28 MHz

PU2RUX	660,652
PU1KDR	472,230
LU2DW	229,724
4Z5AX	218,160
TA3D	148,104
CT1ELP	130,810
S51Z	63,640
EX8MZ	63,525
LZ1GU	51,900
9A7P	49,572

21 MHz

CP6AA	2,637,560
XV7SW	1,324,078
YBØECT	1,245,308
4Z5FW	1,074,678
4X/OK1DTP	1,037,686
YB3ZBZ	835,989
PU2WIF	790,229
9A3B	642,108
UA4LM	503,070
YY4GLD	500,536

14 MHz

5B4/T93Y	2,556,718
CY7A	2,328,720
VK2APK	1,927,042
L50I	1,840,893
RJ9J	1,797,458
RO3A	1,671,268
S58AL	1,448,568
JF1SQC	1,247,816
EA3AR	970,717
JR4GPA	707,840

7 MHz

S54A	1,045,068
F/OK1EE	632,968
YZ1V	631,176
PA3AAV	613,888
OK2XTE	601,146
UR3PDT	544,992
LY3JY	536,452
UY8IF	517,132
T95A	503,820
S53F	429,444

3.5 MHz

HA4FV	336,582
EU1CL	325,314
RV3LO	272,938
J49IL	240,960
OK1SI	231,072
EV6M	141,768
W1MK	110,088
UY5WA	95,524
UA6AKD	73,944
UT3WWJ	71,760

1.8 MHz

HA8BE	120,960
9A2OO	104,492
LZ2CJ	61,272
F5RZJ	44,392
RA4NW	39,000
EU6DX	30,528
SP5GH	18,249
EW4AB	15,010
LA4XFA	2,448

QRP/p

YU1EA	A	703,696
RW4WR	A	692,545
LY2FE	A	664,125
YU1LM	A	616,011
K1VUT	A	599,508
NØKE	A	548,730
WA2HZR	A	505,648
VE3KP	A	416,392
SM3CCT	A	396,445
N7IR	A	337,488
LW3EBJ	28	50,874
4X1VF	28	23,306
HAØGK	28	7,812
LU6HI	21	453,768
U5MZ	21	76,000
ES1CR	21	37,386
RA3FO	14	451,320
OK2PYA	14	203,904
JH1GNU	14	177,840
KU7Y	7	154,710
N1TM	7	64,256
W8QZA/6	7	30,488
SP4GFG	3.5	159,094
IV3TAN	3.5	25,740

TRIBANDER/ SINGLE ELEMENT ALL BAND

3V8BB	11,914,111
C4W	7,353,213
3DA5A	6,102,345
RN6BY	4,574,112
*5B4/T97M	4,339,200
4N9BW	4,108,721
EM4U	3,398,720
S53R	3,130,818
7Z5OO	2,949,174
HA2SX	2,790,511
YL3DW	2,663,892
LY5W	2,270,898
LY2OX	2,198,010
DK9IP	2,132,284
JA1YNE	2,056,864
*7M1MCT	2,050,722
WV2LI	1,839,336
UX1UA	1,836,104
W9IW	1,729,954
S52FB	1,681,160

28 MHz

*PY2IQ	14,688

21 MHz

*NN9K	22,444

14 MHz

K8NO	128,454
*RA1ACJ	126,000

7 MHz

G8G	1,334,700

ROOKIE ALL BAND

*PY1KS	548,366
AA1SU	158,589
*AB1BX	120,716
*II0N	107,996
*UT5UGQ	88,320

28 MHz

*PU1KDR	472,230

21 MHz

*PU2WIF	790,229

14 MHz

RZ1AWD	508,260
EA2BDS	157,360

BAND RESTRICTED ALL BAND

FB1CMF	282,133
EC5AEB	203,046
JR5EHB	96,425

ASSISTED ALL BAND

GIØKOW	5,413,376
K3MM	4,196,887
DK3GI	3,518,361
DL1IAO	3,318,798
ED5FV	3,039,456
W8AV	1,930,120
IKØHBN	1,808,282
JG3KIV	1,770,516
AB2E	1,740,291
K1TO	1,633,887
DK7YY	1,471,008
JA9CWJ	1,268,960
FBC5NBX	1,228,500
KT4W	1,125,222
*S56A	1,031,016
SP7NMW	907,120
OH5BM	789,960
N5JR	644,184
*S57XX	621,233
RX3ARI	611,104

21 MHz

EA7DPU	431,200
JA9XBW	111,888
K6III	81,450
JQ1NGT	62,592

14 MHz

KC6ETY	260,820
DL5YM	259,780
*NN5Z	17,200

7 MHz

Z39Z	1,192,324
*4N1A	561,132
*YU1AAX	360,844
DL6RDE	131,712
*9A1CHP	56,170

1.8 MHz

YU1RA	56,170

MULTI-SINGLE

H2ØA	**13,729,156**
NP4Z	12,343,763
ZX5J	11,738,740
IH9/OK5DX	11,205,534
V26TT	9,283,920
JY8B	8,388,198
HG1S	8,346,044
6Y6A	7,735,565
9M6AAT	7,431,753
UD6M	6,630,816
RM6A	6,422,717
9A7A	6,358,744
KH7R	6,328,278
TM9C	6,076,427
RK9CWW	6,004,944
OG5F	5,779,997
OHØW	5,647,740
OH1AF	5,167,164
RU1A	5,125,032
OM5M	5,033,821

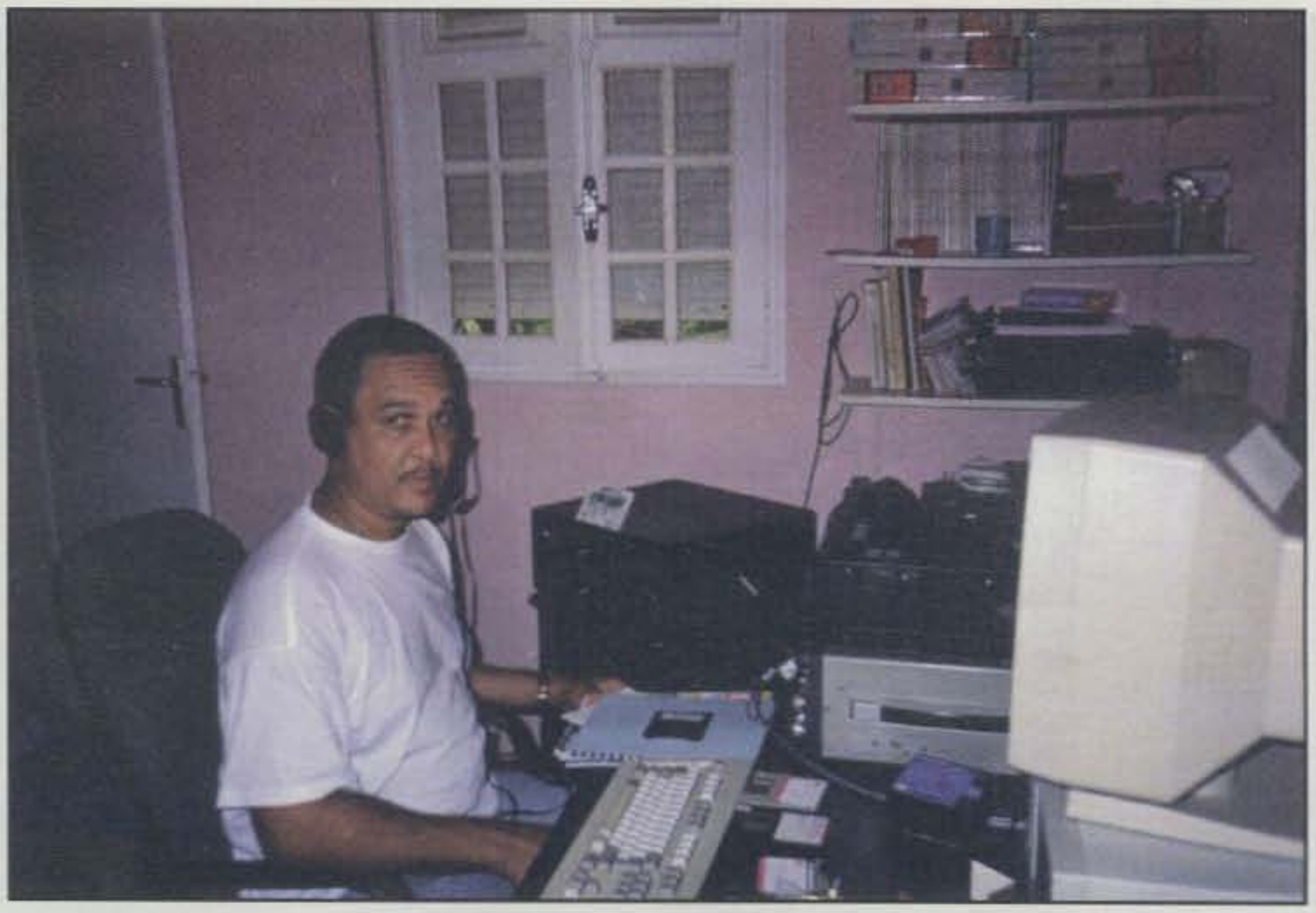
MULTI-MULTI

P3A	30,666,240
AZ4F	18,473,378
9A1A	14,340,387
RW2F	11,981,844
EA4ML	11,524,560
LY5A	10,408,477
WL7E	9,579,008
JH5ZJS	7,896,595
WT2Q	**6,856,659**
LY7A	6,737,976
KO6N	6,281,738
PA6WPX	6,197,749
NJ4F	5,571,475
W4MYA	4,559,348
UØJE	3,864,894

**Low power*

N9AG (who works for food) also provided some much needed help with the logs. EA3DU and OH1EH collected the EA and OH logs and helped to keep me straight. N6AA and N6TR were responsible for much of the database manipulation and reporting, and Dick served as a reality check for me. Thanks to all, and also to Gail at *CQ* who puts all of this together in the magazine and keeps extending my deadline until I get done. Also thanks to K3EST for his excellent work with the expanded results of the new categories in *CQ Contest* magazine.

Keep the electronic logs coming. You can e-mail them to <N8BJQ@ERINET.COM> or send a disk. E-mail is quicker, usually cheaper ,and easier for me to handle in most cases. Please send your files as file attachments if possible. This is much easier to handle than having to cut and paste from huge text files. The output files from most logging programs are acceptable submissions. These include *.bin, *.dat, *.qdf, and *.all files. Plain unformatted ASCII is also acceptable. As a minimum, I will need a summary sheet showing scoring information and an address and your log file. **If you use a computer to log and don't send in the electronic file (disc or e-mail),**



This is Laurent, FM5BH, who set a new North American record on 20 meters.

you will be asked for it. Failure to provide the requested file(s) may result in your not being listed in the results.

The 1999 contest is the last full weekend in May (29–30). If you need logs sheets, you can get them from *CQ* for an SASE or on the WPX Web site at <http://ourworld.compuserve.com/homepages/n8bjq>.

Other WPX related information can also be found at that site. Thanks for taking part in the 1998, contest and I hope you will be on in 1999.

73, Steve, N8BJQ

Random Comments

This year the Radio Oakley Contest Club was ready with the usual five stations, and all but one rotator working. Unfortunately the big flare at 0059Z on day one produced an A index of 21. . . . *KO6N*. First time with this group of ops. Was our first M/M and we really only used two xmters. Was more like M/2 class. Had fun though. . . . *NJ4F*. Conditions were low normal on high bands to normal on low bands the first 36 hours. The last 12 hours the 20m band opened to W/VE, with some pile-up. . . . *OZ5WQ*. Conditions were not as good as many have said. Biggest problem was the heat! A/C quit Friday afternoon. 100+ in shack almost the whole weekend. Will be better next year. . . . *W4MYA*. Special thanks go to our wonderful hosts Alfons (9M6MU) and Doris (9M6DU) for their overwhelming support and understanding. . . . *9M6AAT*.

We tried the new German class 1 license (DH9EO) but we received a lot of question marks! The new German calls were really unknown. . . . *DH9EO*. Condition seemed to be *not good* on first day. . . . *JA2ZJW*. We spent more time at solder station than at

These are the members of the Amur DX Club who used UØJE during the contest. Judging from the drinking glasses in the front, they obviously celebrated after the contest.

the key. . . . *K4VUD.* High noise on the low bands and poor conditions on the high bands made it difficult this go around. We were saved by long openings to Europe and JA on 20. Not much North America on any band. . . . *KH7R.* Our discussions weeks before the contest about band changing strategies really helped. In the WPX, the cost of being on the wrong band is very high. . . . *NP4Z.* Quite a horse race (again) with the other OH/OHØ multi-single groups. Order varied all the time through the contest. Congrats to the OHØW guys for being on top when it all ended. . . . *OG5F.*

This time a new OH record was just enough for the second place in Finland. Sunday much better condx than on Saturday, but very low activity. 15m opened to Asia very late. . . . *OH1AF.* Super location, villa w/pool only five steps from radio, 270 degree view overlooking Gorda Sound. Poor propagation and S9 line noise combined to reduce our operation to 35 hours. Great beach picnic. . . . *VP2VDX.* Conditions were pretty bad, but improved a lot late Saturday through the end of the contest. Lots of Asia and East Europe on 20m until 0600Z. . . . *WO8CC.* We had a great time and hope this contest will spark the club's interest in the upcoming field day event. . . . *WYØB.* It could seem somehow insane to run such a contest with 250 mw, but my first interest is to experiment my QRPp station. . . . *CT1ETT.*

It was hard work as QRPer between all the high-speed kilowatters! . . . *HB9XY.* The tornado, power outages, and frequent lightning strikes made for an interesting contest. . . . *K2CS.* It was like two contests: Friday night, the QRX for a 200 mile trip out of town Saturday, QRV back home and on the air late Sunday morning. Fun! . . . *KG5U.* First WPX in a few years. The new C4SXL/H at 85 ft. sure helped!. . . . *KU7Y.* Five watts and a wire antenna against the world is hard work but great fun. Thanks to everyone who had their contest ears on! . . . *M8O.* Best QSO was having FT5XN answer my QRP CQ on 40 long path. . . . *NØKE.* Not much doing on the 15 meter band from this QTH. . . . *W4DEC.* Between graduations, storms and assorted other interruptions, not much op. time was salvaged. Did, however, manage to work VK2APK for 1878 miles per watt!. . . . *W8DN.*

Twenty-two countries on 40 meters with 5 watts and a low dipole made my weekend!. . . . *W8QZA/6.* Most stations couldn't hear me. Averaged four QSOs/hr. Best hour made 16 QSOs. . . . *W9PNE.* Had a great time. Would have been better if I could have slowed em down a bit. Little fast for me. Thanks for those with patience to pull through the QRP stations. . . . *WA5OJI.* This was truly the last WPX contest from this part of the world. Perhaps I would be operating from JY in the 1999 WPX. . . . *3DA5A.* I had a great time on my first contest DXpedition. We (Edin, 5B4/T97M, and myself) had also lots of fun with our CEPT calls because some people cannot stand two 5B4/T9 stations in the same contest and need extra convincing to get QSO points. . . . *5B4/T93Y.*

My last contest from 7Z5OO. Thanks to all who made it a memorable experience. . . . *7Z5OO.* I worked only for one hour to activate 9AØ prefix and to give out a multiplier to the deserving ones. . . . *9AØCW.* Propagation was not in my favor this time. Nearly two days of search and pounce. Impossible to keep ahead of South Americans/4X, etc., although I could stay ahead when conditions allowed. . . . *9HØA.* I just returned from Ping Island (BI4Q). Great contest. . . . *BA4TB.* My first WPX CW from home in five years. Many tnx to 5B4ADA for lending me one of his amplifiers. This was my first SOAB HP entry in WPX and was greatly enjoyed. Wasted couple of hours chatting with Murphy over low band SWR matters and amplifier temperature complaints. . . . *C4W.*

Thanks for nice contest. Had much fun this weekend! Activity was super. . . . DL1AQB. Sorry, a new sailboat and other distractions kept me from making much of an effort this year. Lots of activity and super ops! Thanks for all the unusual prefixes. Very pleasant contest. At my age 63 this is very hard during the night. . . . *DL5ST.* The worst condx I've ever had. Made 300 QSOs more as compared to last year's results, but still have the same 3.4M points. First day: no JA, very small W/K amount, only EU on all bands. Second day: little better, but got tired. . . . *EM4U.* I sleep all the first night due to computer failure from my old 386.

USA TOP SCORES

SINGLE OPERATOR ALL BAND

KQ2M	**5,146,608**
KE3Q	4,810,784
W4AN	4,618,200
WR6AAA	**4,136,148**
K3ZO	3,950,100
NB1B	3,681,918
K5ZD	3,122,800
K7BV	3,082,852
WC4E	2,930,794
WW7OR	2,676,432
N3BB	2,655,098
AA3B	2,494,296
*KN4T	2,452,140
WK6LA	2,439,556
W3PP	2,397,787
WV2LI	1,839,336
*K1HTV	1,830,150
KT3Y	1,772,659
W9IW	1,729,954
WØGJ	1,725,586

28 MHz

NN5AA	**68,800**
N4BP	50,038
*K4EA	20,882
KF8TM	4,368

21 MHz

N6MU	**463,272**
K4OAQ	269,379
WW4RR	187,824
*KN4Y	60,960
*NN9K	22,444

14 MHz

N6TV	**1,657,717**
KØEJ	1,163,954
WØTM	1,056,678
AD6DO	1,049,958
K5ZM	756,884

7 MHz

*WA8WV	354,548
*N2GM	194,688
KR1G	109,228
*N9ENA	28,296
*K4WW	14,760

3.5 MHz

K2TW	318,560
K1LZ	290,864
W3BGN	230,400
*W1MK	110,088
N2GC	104,598

LOW POWER ALL BAND

KN4T	2,452,140
K1HTV	1,830,150
AA5B	1,629,067
WQ5L	1,385,568
WD4AHZ	1,001,160
K4RO	991,926
NW6S	842,370
N8AA	800,800
WO9S	746,480
WA1LNP	713,388

28 MHz

K4EA	20,882

21 MHz

KN4Y	60,960
NN9K	22,444
NP4IW/NN6	18,880
KØBCN	9,890

14 MHz

AE6Y	208,772
WA1S	129,168
KQ1V	129,033
K9QVB	120,064
W2/U5WF	92,736

7 MHz

WA8WV	354,548
N2GM	194,688
N9ENA	28,296
K4WW	14,760
KU6T	7,200

3.5 MHz

W1MK	110,088
W4WS	3,626

QRP/p

K1VUT	**A**	**599,508**
NØKE	A	548,730
WA2HZR	A	505,648
N7IR	A	337,488
W8DN	A	110,400
NX5M	28	3,619
W4PJ	28	3,456
WA6FGV	28	2,318
W4DEC	21	19,488
K2CS	21	8,614
W6YJ	14	96,120
KU7Y	7	154,710
N1TM	7	64,256
W8QZA/6	7	30,488

TRIBANDER/ SINGLE ELEMENT

WV2LI	1,839,336
W9IW	1,729,954
K7VS	1,212,640
W1CU	1,207,041
NU4Y	1,206,252
*WD4AHZ	1,001,160
NY4A	982,422
KMØL	941,752
NW6S	842,370
*N8AA	800,800
K4BAI	793,592
*W4YE	696,340
*N2ED	601,500
ND5S	558,480
*K2QMF	471,734

21 MHz

NN9K	22,444

14 MHz

K8NO	128,454

ROOKIE ALL BAND

*AA1SU	158,589
*AB1BX	120,716
KØXQ	69,524
*KF6GUH	34,125

ASSISTED ALL BAND

K3MM	4,196,887
W8AV	1,930,120
AB2E	1,740,291
K1TO	1,633,887
KT4W	1,125,222
N5JR	644,184
W1NG	509,754
K3KO	508,715
KC1F	353,158
K4PB	209,716

21 MHz

K6III	81,450

14 MHz

KC6ETY	260,820
NN5Z	17,200

MULTI-OPERATOR SINGLE TRANSMITTER

KW2O	**3,383,680**
KVØQ	3,263,377
WU3V/5	2,918,496
WO8CC	2,616,128
KC7V	2,554,398
KO7X	2,157,265
N7TT	1,722,042
AB5SE	954,666
WG9L	700,557
WYØB	300,456

MULTI-OPERATOR MULTI-TRANSMITTER

WT2Q	**6,856,659**
KO6N	6,281,738
NJ4F	5,571,475
W4MYA	4,559,348
AJ4Y	3,265,152
WR3L	3,118,262
K2SX	558,684

**Low power*

See you next year maybe in All Bands. Have a lot of fun when BY1QH called me. . . . *FM5BH.*

Great contest with plenty to work at all times of the day/night. The bands were considerably better than last year. As with last year, there were a small minority who used rediculously fast CW speed and ignored requests to reduce their speed by the other party. . . . *G3OOU.* Weather was good so XYL and I spent number of hours gardening. . . . *G6QQ.* After winning Europe last year, I decided to try something different this year. Went for the Assisted category. What a bad decision. The packet was more of a distraction than a help. I'll certainly not be doing that again. Back to the "big boys" category for me next year. . . . *GIØKOW.* Bands slightly better on the Sunday. Spent a lot of time beaming USA and working EU!. . . . *GW8K.*

I really enjoyed being there, even with 100 W and wires (or for that very reason?). . . . *HA4YF.* As is often the case during summertime contests, the lights were on but no one was home on 28 MHz. . . . *HC1OT.* Very QRN, band condx to USA second night. But vertical by the sea really work! I have to improve my receiving system (loop antenna?). . . . *IH9/OL5Y.* Better than 1997 but far away from "optimum." Practically all the bands were so crowded that finding a free spot for CQing had been a thriller. . . . *IKØHBN.* Only a few time to spent in the competition with my special call. Poor conditions on 10 meters from my side. . . . *IQ9A.* Here I have big thunderstorm and I lost two hours of contest more. . . . *IR4T.*

Most DX contests end 9AM Monday morning. I went to work after this contest. It is good to make off periods by rule. . . . *JA1YNE.* I set up TS50 and Note

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FEATURES

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- Scan conventional frequencies at 50 channels per second
- Trunk track Motorola and LTR on any frequency band
- Scan conventional and trunked frequencies simultaneously
- Track EDACS systems with additional third party program (E-Trax)*
- Built-in data slicer for decoding of FSK data
- Discriminator audio input and output
- Reaction Tune with Scout/Mini Scout/Super Scout
- Decode CTCSS, DCS, LTR and DTMF
- Motorola control channel monitoring with Trunker software and two Optocoms*
- Motorola control channel monitoring with Trunk Trac*
- Palm Pilot support for frequency and tone display*
- Store and Scan 100 frequencies for use away from computer
- Supported by other third party scanning programs
- *Optocom includes: Trakkstar software, Palm Pilot software, Radio Manger for Windowa, antenna, serial cable, and power supply*

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CW & SSB CLUB COMPETITION

CLUB	SCORE	ENTRIES
CONTEST CLUB FINLAND	**125,880,210**	**58**
POTOMAC VALLEY RADIO CLUB	**95,387,420**	**67**
SLOVENIA CONTEST CLUB	89,489,922	56
N. CALIFORNIA CONTEST CLUB	79,230,601	31
BAVARIAN CONTEST CLUB	75,066,682	31
RUSSIAN CONTEST CLUB	61,050,282	10
RHEIN RUHR DX ASSOCIATION	59,362,453	25
CROATIAN CONTEST CLUB	57,998,889	12
ARAUCARIA DX GROUP	55,640,284	8
MARCONI CONTEST CLUB	51,541,475	28
YANKEE CLIPPER CONTEST CLUB	48,346,235	52
RADIO CLUB ROSARIO	38,870,502	3
FRANKFORD RADIO CLUB	37,857,862	23
KAUNAS UNIV. OF TECHNOLOGY RC	33,075,459	26
YU CONTEST CLUB	31,695,893	12
LITHUANIAN DX GROUP	29,614,824	16
MAD RIVER RADIO CLUB	29,387,046	4
FRENCH CONTEST CLUB	28,483,201	12
NICOSIA CONTEST CLUB	27,108,395	5
SP DX CLUB	25,790,750	28
LES NOUVELLES DX GROUP	25,302,858	27
HA DX CLUB	25,196,632	4
FLORIDA CONTEST GROUP	23,207,638	14
NICOSIA CONTEST GROUP	22,955,636	3
NORTH COAST CONTESTERS	21,687,993	9
URAL CONTEST GROUP	21,380,832	4
UKRAINIAN CONTEST CLUB	17,665,336	28
CZECH CONTEST CLUB	16,969,705	4
BC DX CLUB	16,292,771	6
TAGANROG CONTEST CLUB	15,975,690	3
NORTH TEXAS CONTEST CLUB	15,506,515	14
ARUBA AMATEUR RADIO CLUB	14,563,827	3
SOUTHERN CALIFORNIA CONTEST CLUB	14,221,524	15
LYNX DX GROUP	13,795,228	7
OKLAHOMA DX ASSOCIATION	13,392,934	5
SOCIETY OF MIDWEST CONTESTERS	12,496,131	23
TOP OF EUROPE CONTESTERS	12,002,768	5
KIEV CONTEST GROUP	11,762,387	6
VOJVODINA CONTEST CLUB	11,448,836	6
BERLIN DX GROUP	10,432,680	3
MT RF	9,670,986	3
CENTRAL ARIZONA DX ASSOCIATION	8,841,281	10
FLORIDA CONTEST CLUB	8,114,951	14
UNION FRANCAISE DES TELEGRAPHISTES	8,031,115	5
TENNESSEE CONTEST GROUP	7,697,754	14
SOUTHWEST OHIO DX ASSOCIATION	7,684,766	4
CENTRAL TEXAS DX & CONTEST CLUB	7,352,885	5
SOUTH EAST CONTEST CLUB	7,003,467	6
TEXAS DX SOCIETY	6,981,940	8
FAR EAST ISLANDS DX CLUB	6,837,253	6
WESTERN WASHINGTON DX CLUB	6,795,264	10
LOW LAND CRAZY CONTESTERS	6,566,702	8
ORDER OF BOILED OWLS	6,354,354	6
VOYVODINA CONTEST CLUB	5,372,415	4
TUPY DX GROUP	5,119,584	19
GRAND MESA CONTESTERS	5,090,604	8
GADX	4,980,431	5
WILLAMETTE VALLEY DX CLUB	4,422,891	6
YU DX CLUB	4,392,761	7
CENTRAL WEST VIRGINIA CONTESTERS	3,664,364	3
MARIANA ISLANDS DX ASSOCIATION	3,582,843	4
UNION DE RADIOAFICIONADOS ESPANOLES	3,194,320	8
KANSAS CITY DX CLUB	3,178,824	5
KORYAZHMA DX COMPANY	2,988,556	10
CTRI CONTEST GROUP	2,683,343	3
CW PHILIPPINES	2,665,108	3
CALIFORNIA CENTRAL COAST DX CLUB	2,542,474	3
SP CONTEST CLUB	2,440,605	15
YO DX CLUB	2,033,703	4
FOX CONTEST CLUB	2,022,863	10
URE CARTAGENA	1,895,759	4
SALT CITY DX ASSOCIATION	1,805,160	4
ROCHESTER DX ASSOCIATION	1,731,458	9
RADIO CLUB CSCR SERPUKHOV CITY	1,567,635	3
GREAT SOUTH BAY ARC	1,200,982	3
LYCWCC	1,137,260	3
SAO PAULO CONTEST GROUP	1,137,072	5
SHIZUOKA DX RADIO ASSOCIATION	1,086,221	4
GEO DX GROUP	931,156	3
WESTERN NY DX ASSOCIATION	930,742	4
SARAJEVO CONTEST GROUP	862,390	4
MOTHER LODE DX/CONTEST CLUB	765,081	5
BEEMSTER CONTEST CLUB	666,381	3
GACW	649,515	3
NORTHERN ARIZONA DX ASSOCIATION	511,292	3
BATEA DX GROUP	418,382	3
WEST PARK RADIOPS	313,403	4
NOL CONTEST TEAM	280,506	4
SOUTH JERSEY RADIO ASSOCIATION	207,437	3
NORTHROP GRUMMAN ARC	196,792	3
WESTPARK RADIOPS	61,484	5

PC in a small tent in an open space near my house for avoid neighboring TVI trouble. It was fine weather in spite of Japanese rainy season, so I enjoyed WPX in small tent. . . . *JH3AIU*. I needed more activities of USA stations. . . . *JH4UYB*. It's the contest which the Japanese can enjoy because prefix is multipliers. There is not the value of an entity. . . . *JK1KNB*. Please visit our homepage <http://www.rosarinos.com/badpower>. . . . *LT1F*. I only operated six hrs, but thoroughly enjoyed working the FB EU guys from Liverpool, England. . . . *M/NQ7X*.

My first CW contest. Great feeling. Hope win!. . . . *OE1WEU*. Most of the time poor conditions to NA and Japan. However, nice opening on 20m to NA during last six hours. . . . *OH1NOR*. Nice conditions even for small gun with 100W and dipole. . . . *OH2BSQ*. Tight domestic competition with several OH's. Probably OH1NOR beat me afterall. Sniff. My tactical mistake, however, was to be on the air too much on Saturday. On Sunday evening bands opened well but I had to rest. . . . *OH5NQ*. Third WPX CW entry and first time to reach the 600 QSO mark. Had a great time! Come on, guys—don't forget the QSL chore. Remember the final courtesy. . . . *ON4CAS*. Very pleasant contest. At my age 63 this is very hard during the night. Bad propagation on higher band! I utilize on the S&P method. I hope come back in 1999 to hear all my friends. This is the greater score since the start in contesting. . . . *ON6TJ*.

Could somebody please wake up them Palos Verdes Sundancers. . . . *OZ1HQG*. Thanks to all contesters for the great activity! God bless you. . . . *RK3BY*. Funny condx. Most of USA contacts out of original antenna direction. Some unbelievable contacts with stations which normally could not get through that time. I call such condx *upside down*. Never expected calls from WL7E, TX8A, or KH8/N5OLS. Surprised. . . . *S57O*. Nice with a US pile-up on Sunday afternoon. Lots of EU stations around. . . . *SM2DMU*. Condx were lousy Saturday but improved somewhat during Sunday. Hope they will continue to improve in the following years. . . . *SM6BSK*. Two-el ZR on the roof works well. . . . *T88X*. Bands were in bad shape this year; me as well. I gave up Saturday at 2100Z but operated a few hours Sunday to have some more fun!. . . . *TM8R*.

A real highlight was catching 3V8 on two bands for all time new DXCC!. . . . *VK4ICU*. Conditions were very favorable with low noise levels. I had good signals from Argentina right across to South Africa and all over the Northern Hemisphere. VK/ZL activity low. . . . *VK4XY*. Very strange conditions with strong signals coming from non-standard directions, especially on 15. Made it a real "lucky dip"—you never knew what was going to call next. . . . *VK5GN*. In spite of the solar flare just prior to the start, the opening hours were excellent. Sunday was another story, weak European and variable stateside signal levels but good activity. . . . *VP5Z*. God, pse give better antenna and rotor. . . . *YB4JIM*.

Good opening into EU the first day, but I guess much QRM on the band so that not many EU could hear my call. Glad to get PA6WPX for a new one on 160m! Alhough nothing was heard the second day, I still enjoyed the contest very much. . . . *YCØLOW*. It was one of my last contests from Turkey and it was a nice weekend again. What a propagations! The W6/7 signals were not "classic West Coast signals" and sounded like all others (without the tremolo) and were often stronger than East Coast. . . . *YM2ZW*.

Station Operators
Multi-Op Single Transmitter

4KØADR: 4K5CW, 4J9RI, 4J9NM. **6Y6A**: JE3MAS & WH6X. **9A7A**: 9A3OS, 9A3TR, 9A4BT, 9A4PA, 9A4RX, 9A6DM. **9M6AAT**: UA9CI, UA9CDC, UA9CDV, UA9CLB, RU9DJ. **AB5SE**: AB5SE, K5OY, W5RZ. **BY1QH**: OH2PM & OH2BH. **DA/S57NW**: S57NW & DF3CB. **DFØFS**: Club Group. **DH9EO**: DL5KUT & DK2OY. **DJ5CL**: Club Group. **DJ7AA**: DJ7AA, DL5LYM, DK1BT. **DJ7TO**: DJ6TF, DJ7TO, DL6UST, DL7URH. **DLØKB**: DJ4GX, DK2GI, DL2GBB. **DL1AUZ**: DL1AUZ, DL3TD, DL5ANT. **DL2HYH**: H89CRV, DL2HYH. **EA5BY**: EA5BY, EA5EU, EA5FID, EA5GRV, EA5KW, EA5RS, EA5XC, EC5AL. **EA5YU**: EA5DCL & EA5YU. **ES5Q**: ES5MC, ES3RN, ES5RY, ES5QX. **EW1WN**: EW1AM, EW1MN, EU1CO. **F6KAR**: DL2LSO, F5NYQ, F6IFY. **F6KRK**: F7CIW, F6BPS, F8CHL. **H2ØA**: YL2KL, RZ3BW, RA3CQ, RZ3BY, RX3APM, RZ4HF. **HA/N9NC**: N9NC & WØYR. **HA1KRR**: HA1ZN, HA1ZZ, HA1XU, HG1DUQ, HA1DC. **HA3KNA**: HA3NS, HA3NU, HA3FTA, HA3OU, HA3OV.

HG1S: HA1TJ, HA1DAE, HA1DAC, HA1AH, HG1DAI, HA1BN. **IH9/OK5DX**: OK1CW, OK1FUA, OK1MD, OK2BFN, OK2GG. **IO2L**: IK2MLV, IK2PIG, IK2PFL, IK2NCF. **IYØTC**: IØKHP & IKØCNA. **J41W**: SV1CIB & SV1DPJ. **JA2ZJW**: JL2ICO, JE2PCY, JH2CMI, JQ2KAE. **JA6ZLI**: JG6POJ & JJ6WYS. **JE2YHS**: JA2OLJ, JR2JVR, JE2WWB, JG2NUD, JR2JPU, JI2XUT, JF2KQX, JI2CPX. **JN4FEU**: JI1UTP, JA4EKO, JG4CLV, JN4FEU. **JT1X**: HAØHW, HA1AG, HA4GDO, HA6NL, HA7SK, HA7VK, JT1CJ, JT1CM. **JU1T**: JT1CM & JT1CE. **JY8S**: DL5MBY & JY9QJ. **K4VUD**: N4GI & K4VUD. **KC7V**: KC7V, KY7M, K7WP, N7ZE. **KH7R**: KH6ND, KH6TO, KH7U. **KJØG**: KJØG & KØSX. **KO7X**: W7CT, NG7M, KO7X. **KVØQ**: KTØF, NØNR, N7XM, KVØQ. **KW2O**: K2LE & N2UN. **L5ØV**: LU4VEW, LU5VV, LU7YS, LU8VFM, LU5VC. **LZ9A**: LZ1RF, LZ1UQ, LZ2CC, LZ2DF, LZ2EV, LZ2HE, LZ2HM, LZ2JE, LZ2PO, LZ2TX, LZ2UU.

N7TT: N7TT & Dolores. **NP4Z**: NP3A, KP3L, NP4Z. **OE1W**: OE1JNB & OE1TKW. **OG5F**: OH1JT, OH2HE, OH2IW, OH2JA, OH2XX, OH6CT, OH7JR. **OHØW**: OH2BCI, OH2BQW, OH2KW, OH2NRV, OH2TA. **OH1AF**: OH1EH, OH1MM, OH1MDR, OH1NOA. **OH6WZ**:

THE VECTRONICS HFT-1500 . . .
THE FINEST HIGH POWER ANTENNA TUNER MADE!

- *high current Roller Inductor*
- *SSB*Analyzer Bargraph™*
- *Cross-Needle Meter*
- *6 position Antenna Switch*
- *built-in 4:1 Balun*
- *gear driven Turns Counter*

HFT-1500
$459.95

The VECTRONICS HFT-1500 is not just an antenna tuner . . . it's a beautifully crafted work of art, using the finest components available and the highest quality construction.

Every HFT-1500 aluminum cabinet is carefully crafted with a durable baked-on paint that won't scratch or chip.

The attractive two-color Lexan front panel is scratch-proof. Take a quarter. Scratch the HFT-1500 front panel as much as you want. *You won't leave a mark!*

Arc-Free Operation

Two *heavy duty* 4.5 kV transmitting variable capacitors and a massive *high current* roller inductor gives you arc-free operation up to 2 kW PEP SSB.

Precision Resetability

A sturdy hand cranked roller inductor lets you quickly *fly* from band to band. A precision 5-digit *gear* driven turns counter lets you accurately return to your previous settings.

Large comfortable knobs and smooth vernier drives on the variable capacitors make tuning precise and easy. Bright red pointers on logging scales make accurate resetability a breeze.

Absolute Minimum SWR

***You** can tune your SWR down to absolute minimum!*

Why? Because *all* three matching network components, the roller inductor and both variable capacitors, are *fully* adjustable.

Tune any Antenna

You can tune any real antenna from 1.8 to 30 MHz, including all MARS and WARC bands. You can tune verticals, dipoles, inverted vees, yagis, quads, long-wires, whips, G5RVs, etc . . .

*SSB*Analyzer Bargraph™*

***VECTRONICS'** exclusive* 21 segment bargraph display lets you visually follow your instantaneous voice peaks. Has level and delay controls.

Accurate SWR/Power Meter

A *shielded* directional coupler and backlit Cross-Needle meter displays *accurate* SWR, forward and reflected power simultaneously. Reads both peak and average power on 300/3000 Watt scales.

6 Position Ceramic Antenna Switch

Select two coax fed antennas (tuned or bypassed), balanced line/wire or bypass.

Built-in Balun

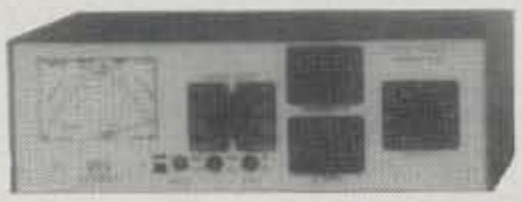
A 4:1 Ruthroff voltage balun feeds dual high voltage Delrin terminal posts for balanced lines. HFT-1500 is 5.5x12.5x12 inches.

Try any product for 30 days

Call toll-free 800-363-2922 and order any product from VECTRONICS. Try it for 30 days. If you're not completely satisfied return it for a full refund, less shipping and handling -- no hassles. All VECTRONICS products come with a one year warranty.

300 Watt Antenna Tuner

VC-300DLP
$159.95



VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any antenna 1.8-30 MHz. Custom 48 position switched inductor and continuous rotation 1000 Volt capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, built-in 50 ohm dummy load, peak reading backlit cross-needle SWR Power meter, 4:1 balun for balanced line antenna. Scratch-proof Lexan front panel. 10.2x9.4x3.5 in. Weighs 3.4 lbs.

300 Watt *Mobile* Tuner

VC-300M
$109.95

The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna and *any* mobile HF transceiver and is compact enough to fit in the most compact car.

It can also be used at home with dipoles, vees, verticals, beams or quads fed by coax.

Backlit dual movement meter simultaneously monitors Power and SWR. Covers 1.8-30 MHz. Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz.). 7.25x8.75x3.6 in. Weighs 3.4 lbs.

SWR/Power Meters

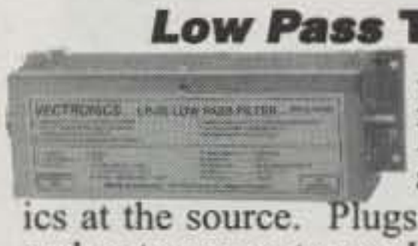
PM-30
$79.95
PM-30UV
$89.95

PM-30, $79.95, for 1.8 to 60 MHz. Displays forward and reflected power and SWR simultaneously on dual movement Cross-Needle Meter. True *shielded* directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction includes scratch-proof case/front panel. 5.3x5.75x3.5 inches. SO-239 connectors.
For 144/220/440 MHz, 30/300 Watt ranges. PM-30UV, $89.95, has SO-239 connectors. PM-30UVN, $89.95, has N connectors. PM-30UVB, $89.95, has BNC connectors.

1500 Watt *dry* Dummy Load

DL-650M, $64.95. Handles 100 watts continuous, 1500 Watts for 10 seconds to 650 MHz. Ceramic resistor. SWR < 1.3. SO-239 connector. **DL-650MN, $69.95** has N connector.

Low Pass TVI Filter



LP-30, $69.95. Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1500 watts.

High Pass TVI Filter

HPF-2, $24.95. Installs between VCR/TV and cable TV or antenna lead-in cable. Eliminates or reduces interference caused by nearby HF transmitters.

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CIRCLE 15 ON READER SERVICE CARD

CONTINENTAL LEADERS

AFRICA

1.8	IH9/OL5Y	341,068
3.5	No Entrant	
7	No Entrant	
14	EA9LZ	5,708,498
21	*EA8ABF	79,534
28	*EA8ADJ	42,328
AB	3V8BB	11,914,111

ASIA

1.8	No Entrant	
3.5	UN7LT	380,418
7	H24LP	2,815,230
14	YM2ZW	3,090,750
21	*XV7SW	1,324,078
28	4X4DZ	658,560
AB	C46A	10,044,034

EUROPE

1.8	SN3A	186,588
3.5	EU3FT	526,490
7	DL5AWI	1,896,948
14	HG3O	3,000,387
21	9A5Y	1,882,494
28	9H0A	498,108
AB	OT8T	6,187,308

NORTH AMERCA

1.8	No Entrant	
3.5	K2TW	318,560
7	TI1C	5,403,048
14	FM5BH	4,642,866
21	WP3A	3,038,371
28	NN5AA	68,800
AB	KQ2M	5,146,608

OCEANIA

1.8	YC0LOW	96
3.5	VK4XY	43,428
7	ZM1A	5,144,480
14	*VK2APK	1,927,042
21	*YB0ECT	1,245,308
28	No Entrant	
AB	VK5GN	1,703,312

SOUTH AMERICA

1.8	No Entrant	
3.5	*PY1SL	1,368
7	*LU1FNH	66,000
14	*L50I	1,840,893
21	*CP6AA	2,637,560
28	PR5W	1,421,775
AB	HC1OT	11,566,273

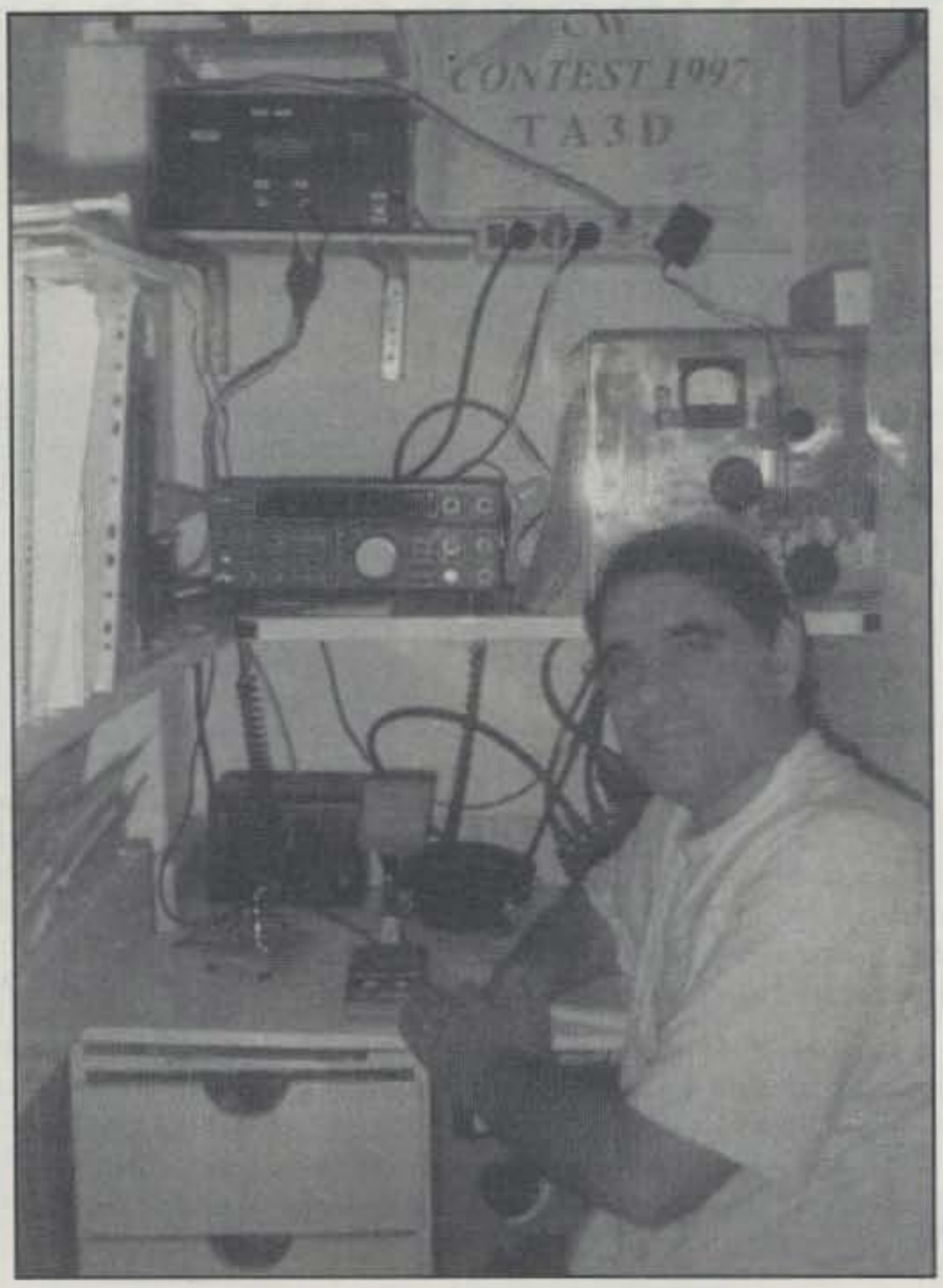
MULTI-SINGLE

AF	IH9/OK5DX	11,205,534
AS	H20A	13,729,156
EU	HG1S	8,346,044
NA	NP4Z	12,343,763
OC	9M6AAT	7,431,753
SA	ZX5J	11,738,740

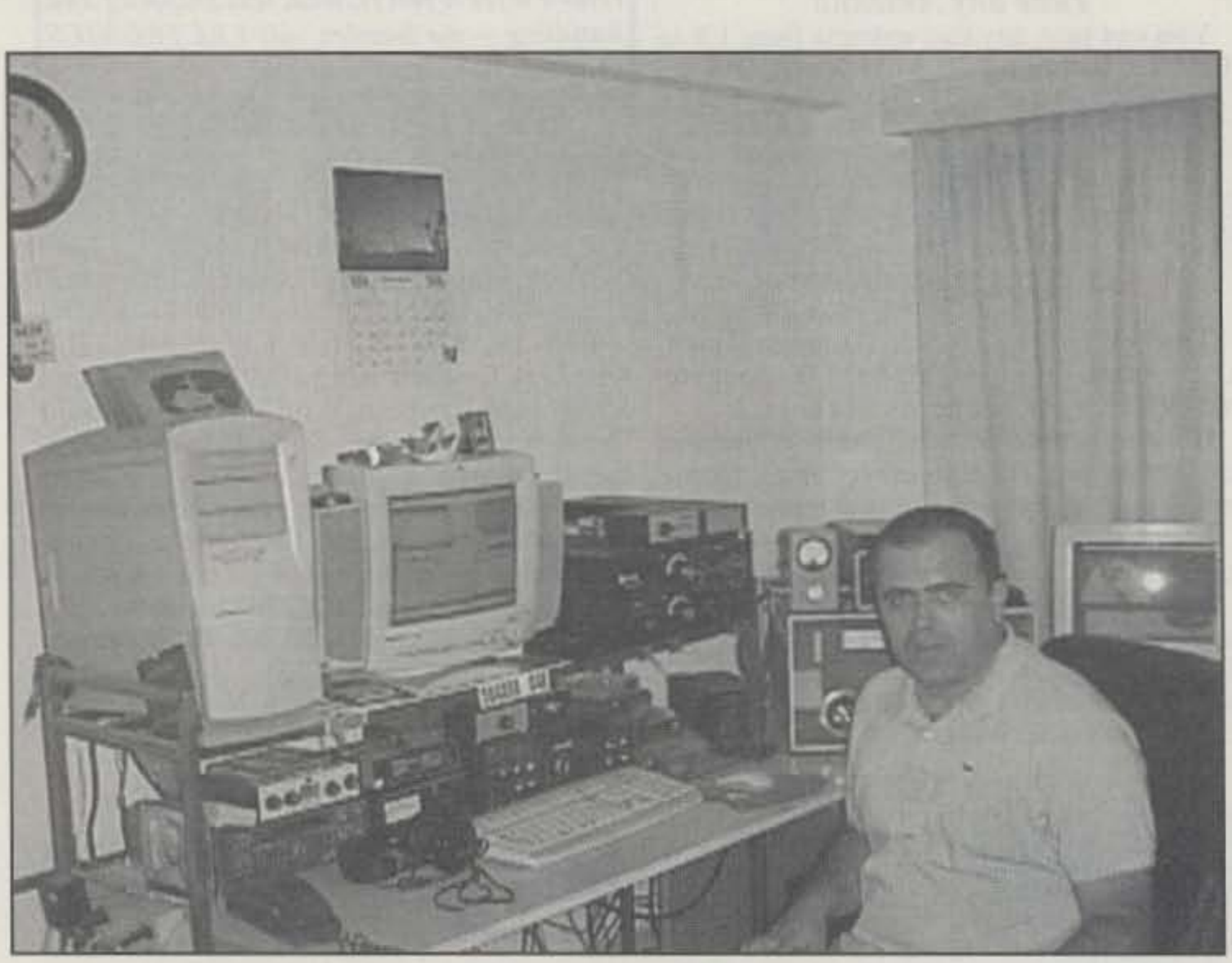
MULTI-MULTI

AF	No Entrant	
AS	P3A	30,666,240
EU	9A1A	14,340,387
NA	WL7E	9,579,008
OC	No Entrant	
SA	AZ4F	18,473,378

** Low power*



This is TA3D, who operated Low Power 28 MHz.



Ivo, C46A (5B4ADA/9A3A), finished first in Asia and fourth in the world.

OH6WZ & OH6CS. **OK1KCF**: Club Group. **OK1KIR**: OK1AWH, OK1IPN, OK1PG. **OK2KOD**: OK2BDI & OK2BNX. **OK5SAZ**: Club Group. **OL5Q**: OK1HRA, OK1FLC, OK1FFU. **OL5T**: OK1NR, OK1TC, OK1DNR, OK1FLM, OK1FHI, OK1HSK. **OM3RKA**: OM5DP, OM5XX, OM5MZ, OM5TX, OM5TZ. **OM5M**: OM1KM, OM2RA, OM2ZA, OM3BH. **OM7F**: OM7PY, OM7PA, OM7IR, OM7JG, OM7ALC, OM7ARI. **PI4CC**: PB0AIU, PA3EPD, PA3FVW, PA3BSQ. **PI4ZLD**: PA3EOB, PA3GCU, NL8884. **RK3AWE**: RA3FF, RK3FT, RK3FM, RU3DGD, RX3DUK. **RK3AWL**: RK3AWL, UA3QDX, RK3AD, RW3QO, RA3ATX, RA3QFB, RV3BA, RK3AW. **RK9AWN**: UA9AR, RW3FO, RZ9AR, RA9AX. **RK9CWA**: RW9CF, UA9CGA, UA9DD. **RK9CWW**: RZ9CO, RA9CKQ, RA9CMO, UA9CDT.

RM6A: RN6BN, RA6CM, RA6CO, RV6YZ, UA6AAY, RA6AX, RV6ASU, UA6YDX, RW6YY. **RN3R**: UA3RAR, RA3RFA, UA3RJ. **RU1A**: RW1AC, RV1AW, Alex, Vadik. **RX0LWC**: UA0LS, RU0LAX, RW0LIS. **RZ1AWO**: RA1ARZ, UA1ACC, KB2WKE. **S53BM**: S53BM, S53MA, S55A, S59KW. **S57W**: S57W & S59L. **S59UAR**: S51UE & S53XX. **SK3GW**: SM3SGP, SM3OSM, SM5TXT, SM5IMO. **SP6YAQ**: Club Group. **SP9KRT**: SP9ADU, SP9ZW, SP9-1753-KA. **TM2S**: F5CW & F5PED. **TM2X**: F5DTZ & F5NGA. **TM9C**: F5IN, F6ARC, F6DZS, F6FVY. **U0JE**: UA0JQ, UA0JFG, UA0JH, RA0JD, RA0JAB, UA0JB, UA0JGV, UA0JGI, RA0JJ, RW0JR, UA0JL, U0JE, UA0JCC, RA0JX. **UD6M**: UA6LO, UA6LV, RV6LNA, UR5MVZ, RA6LBX, UA6LFQ, UA6LP, RA4AJF/6, UT6IZ. **UR4MWU**: UR5MB, UR5MA, UR4MT, US5MAX. **UR4PWC**: UT4PZ, UR3PFJ, US-P-272. **UY4WWA**: UR5WAL & UT1WZ.

V26TT: K5TT & W5AO. **VE7ZZZ**: VE7DP, VE7SK, VE7QO. **VP2VDX**: N6CW, K9VV, K6CT. **W8VM**: W8IDM, AF8C, N8WS, W8KH, N8OSM. **WG9L**: WG9L & W9VU. **WO1N**: NF1A & WO1N. **WO8CC**: N8BJQ, N8NR, N9AG, W8QID. **WU3V/5**: W5WMU & KZ5D. **WY0B**: KC0BYE, N0EG, WY0B, KB0RNH, KB0BIB, N0LCW, N0MON, N0ONP, KC0DPB, Sheila, Al, KC0BIE. **YP3A**: YO3ND, YO3FWC, YO3FF. **YR8A**: YO8AXP, YO8RXP, YO8RIJ. **Z30M**: Z31GX, Z31JA, Z31GB, Z32XX, Z32RY. **ZB2/DL5JAN**: DL5JAB & DL5JAN. **ZX5J**: PY2NY, PY2XE, PP5BRV, PP5UA, PP5WG, PP5UB, PP5JR.

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Multi-Op Multi-Transmitter

9A1A: 9A5W, 9A6A, 9A2TS, 9A3NR, 9A2EU, 9A3GW, 9A2R, 9A6D, 9A7R, 9A2DO, 9A3SC, 9A4OM, 9A9A. **AJ4Y**: K4OJ, W1CW, W1YL, N9RV, AJ4Y. **AZ4F**: LU1FAM, LW1EXU, LU3FP, LU4FD, LU4FPZ, LW4DYI, LU5ER, LU5FAO, LU5FC, LU5FF, LU6KK, LU6UBN, LU7DW. **EA4ML**: EA4AKQ, EA4ET, EA4KA, EA4MC, EA4MS, EA4TX, EA4UA, EA7WA. **JA1YPA**: JA1ATK, JA1PEJ, JI1ERV. **JH5ZJS**: JA5BJC, JA5FDJ, JA5JCC, JH5RXS, JR5JAQ, JR5PDX. **KO6N**: AE0M, KX7M, K6AW, K3EST, W6RGG. **LY5A:** LY2PAJ, LY2KW, LY2PX, LY2LA, LY2IJ, LY2BTA. **LY7A**: LY2AO, LY2BMX, LY3NJM, LY2OC, LY4AA, LY2KZ, LY1EE, LY2NK, LYR-346, LYR-728. **NJ4F**: K1SE, K4EC, K4EU, K4GMH, K4ZW, K7SV, NJ4F, WA4JUK, Daisy. OK1OKE: OK1DUT, OK1FUT, OK1EP, OK1FDR, OK1FHL, OK1VBA. **OZ5WQ**: OZ1BIZ, OZ3PE, OZ3ZW, OZ5WQ. **P3A**: RA9JX, RZ9UA, UA9MA, UA3TT, UA3TU, RZ3TX, RW3TJ, RU3AA, RV3AJ, UA3NFY.

PA6WPX: Club Group. **PY1GCW**: PY1OB & PY1ON. **RW2F**: UA2FB, UA2FC, UA2FF, UA2FM, UA2FX, UA2FZ, RA2FA, RA2FZ, RN2FA, UA2-125-767. **W4MYA**: WA4ODM, W4HZ, KF4SPT, W4MYA. **WL7E**: KL2A, KL7Y, KL5E, WL7E, WA2GO, KL7FH, WL7KY. **WR3L**: WR3L, N3NT, W2GG, WR3Z, K3FT. **WT2Q**: KB1W, N1BB, N1GA, NJ3K, K0TB, W1IX, K1TTT, WT2Q. **YU1HFG**: YZ1GD, YT1KZ, 4N1FII, 4N1FKA.

(Continued on page 98)

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SS-18	15	18	2.3 x 6 x 9	3.6
SS-25	20	25	2 7/8 x 7 x 9 3/8	4.2
SS-30	25	30	3 3/4 x 7 x 9 5/8	5
SS-25M*	20	25	2 7/8 x 7 x 9 3/8	4.2
SS-30M*	25	30	3 3/4 x 7 x 9 5/8	5

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CQ REVIEWS

The AEA CIA-HF Complex Impedance Analyzer

BY PAUL CARR*, N4PC

Some people may choose to take me to task for the following statement, but here goes: There are very few places left in amateur radio where the experimenter feels comfortable these days. However, with the appearance of some of the modern antenna analysis programs, many amateurs are encouraged to try their hand at the design and construction of their dream antenna. This is only a part of the challenge. After the antenna is designed and built, there is still the problem of properly matching and feeding the system. Well, this task is no longer as intimidating as it once was. There is now high-quality test equipment that makes this one of the most rewarding parts of the entire project. Meet the CIA-HF Complex Impedance Analyzer.

Introduction

The AEA CIA-HF Complex Impedance Analyzer combines a microprocessor-controlled direct digital synthesizer with an accurate low-power impedance bridge to present a graphical display of SWR, impedance, resistance, or reactance. To create these graphical displays, the analyzer continuously sweeps and plots a user-selectable frequency range. Alphanumeric data blocks common to each screen are updated after each frequency sweep.

The CIA-HF Analyzer provides two modes of operation: a simple mode and an expert mode. When first activated, the analyzer defaults to the simple mode, which operates with two graphing screens and enough data for basic antenna assessment only. The expert mode provides the experienced user with four additional screens and more detailed data.

Features

Features of the CIA-HF Complex Impedance Analyzer include:

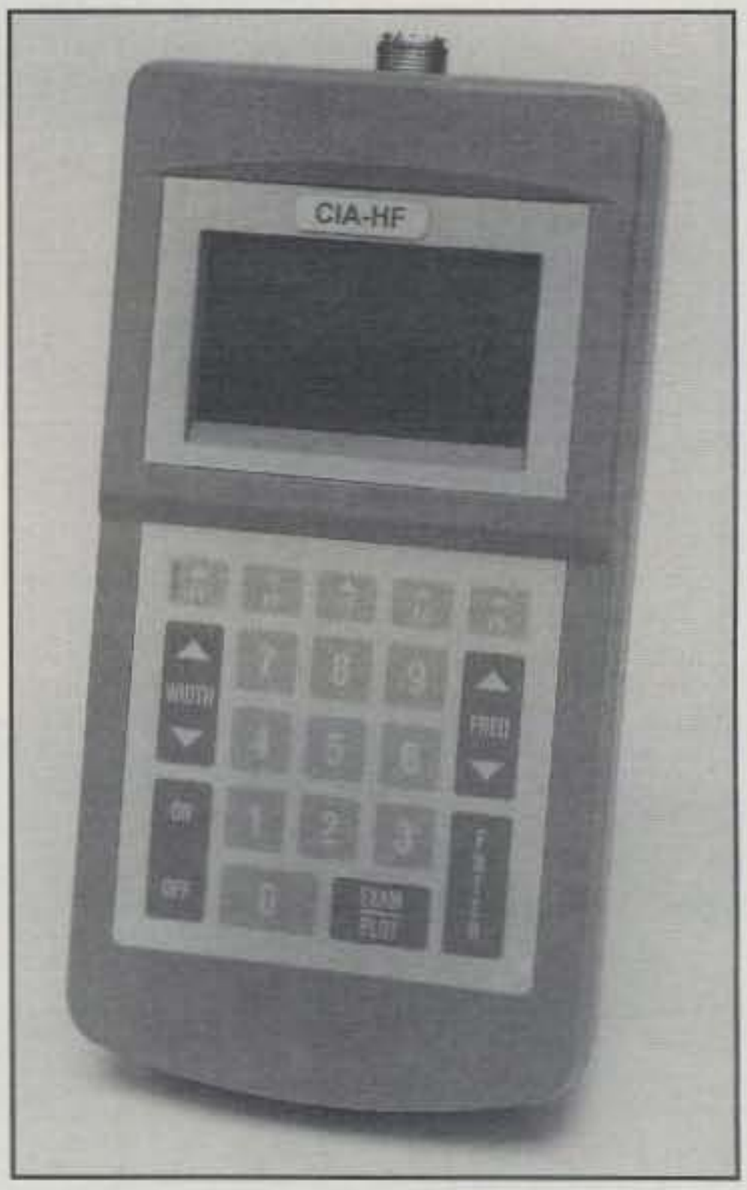
- Graphical display of SWR, total impedance, resistance, and reactance vs. frequency.
- Graphical vector display of real, imaginary, and total impedance with phase angle.
- Data screen which displays: real and imaginary components of impedance at a given frequency; phase between real and imaginary components of impedance at a given frequency; capacitive or inductive value of reactance at the plot's center frequency; capacitive or inductive value required to provide a conjugate match; Q factor; 2:1 and two user-selectable SWR bandwidths.
- Auditory cues.
- Self-tests.
- Automatic off.
- Low-voltage DC voltmeter.
- Simple frequency generator.
- Built-in serial port for PC interfacing and printout capability.
- Display grid.
- Optional AC-1 Wall Cube (available from AEA).
- Optional softcase with shoulder strap with swivel hook (available from AEA).

A Quick Overview of The Analyzer's Operation

To give you an idea of the simplicity of the operation of the analyzer, let's take a brief look at the basic quick start of the unit. When you press the ON key, the analyzer will activate and an introductory screen will flash briefly on the display followed by a simple SWR plot. Since there is no antenna connected to the unit, the plot given is an out-of-range value which is represented by a straight line across the top of the display.

There are several soft keys beneath the display labeled F1 through F5. Each of these keys has a programming function for the analyzer. If the F5 key is pressed, the screen will toggle between SWR and total impedance as indicated by small letters in the lower right of the display.

The F3 soft key allows you to scroll through three data blocks displayed below the horizontal axis. In the initial mode, there is a default bandwidth of 100 kHz per division and a default frequency of 14.200 MHz. Both these values can be altered by using convenient UP/DOWN keys so the values can be changed by using the data entry keypad. The bandwidth can be varied from a maximum of 1 MHz to a minimum of 10 kHz. If the bandwidth is reduced below 10 kHz, an audible alarm sounds to signify the reading displayed is for the frequency indicated at the bottom of the display only.



The AEA CIA-HF Complex Impedance Analyzer.

Two additional numerical data packages are controlled by the F3 key. The second display is reading the SWR and the return loss of the system. This can be used as a handy adjunct to the graphical representation. The third set of numerical data are for system impedance, resistance, reactance, and phase angle.

I have introduced only a few features of the CIA-HF, but you can see that there is a vast amount that you can learn about your antenna system with just the features mentioned thus far. I can't wait to attach an antenna, so here goes.

An Initial Antenna Evaluation

For my initial antenna evaluatio, I chose my 40 meter extended double Zepp. I had always used this antenna in conjunction with a transmatch, but I have been curious about the natural resonances that the antenna has.

*97 West Point Road, Jacksonville, AL 36265

Specifications of the AEA CIA-HF Complex Impedance Analyzer

Frequency range	0.4 to 54 MHz
Frequency resolution	increments of 1 kHz
Frequency accuracy	±200 Hz
Display width	0 to 10 MHz
Harmonics and spurious	<–30 dB
SWR impedance	50 ohms
SWR range	1:1 to 20:1
Impedance magnitude ranges	0 to 100, 0 to 250, 0 to 1000 ohms
Reactance ranges	0 to 100, 0 to 250, 0 to 1000 ohms
Resistance ranges	0 to 100, 0 to 250, 0 to 1000 ohms
Return loss range	–1 to –40 dB
Phase angle	–90° to+90°
Q factor range	1 to 1000 (defined as 2:1 bandwidth/Fc
Measurement speed	approx. 1.2 seconds/sweep
Antenna connector	SO-239
Output power	<5 mw into 50 ohms
DC voltmeter	2.5 digits, ±10% accuracy, 25 volts maximum
Power requirements	8 AA alkaline or NiCad cells; 12 to 16 VDC @ <150 ma
Battery saver mode	entered after 5 minute idle time
Size	4.3"W × 2.25"H × 8.5"L (including connector)
Weight	1 lb. 10 oz. (including batteries)

The evaluation began by setting the center frequency of the CIA-HF to a center frequency of 7 MHz and a resolution of 1 MHz per horizontal division. This would give me a glance at the spectrum from 2 to 12 MHz. With this display I could see the frequencies that would warrant closer investigation. The display indicated drops in the SWR at approximately 4.5, 6.4, 8.4, and 11.1 MHz.

To zoom in on these points of interest, I changed the center frequency to the appropriate value, and changed the horizontal sweep to produce greater resolution. The first "resonant point" was about 4.9 MHz. At this frequency the SWR was 4.65 and the return loss was 3.8 dB. The second investigation was at 6.3 MHz. Here the SWR was 1.8 and the return loss was 10.6 dB. At 8.4 MHz, the SWR was 1.73 and the return loss was 11.5 dB. The last investigation was at 11.1 MHz. Here the SWR was 1.25 and the return loss was 19.1 dB. These were the best values obtained, and I chose this frequency for further evaluation.

A More Detailed Investigation

I continued the evaluation by placing the CIA-HF into the expert mode. This is accomplished very easily: press the F1 soft key to access the menu screen. Press the Width down key until the cursor aligns with the Extra Features. Press Enter to turn this feature ON. This will enable the additional screens and data blocks included in the expert mode. Press the F1 soft key again to return to the S screen. Now the F5 soft key will access four new screens and the F3 soft key will scroll through all 12 data blocks. Now that the unit is programmed, let's see what it will do—back to the antenna under test.

In the interest of brevity I will not attempt to list all the information that the unit will provide in the expert mode. I will only cover those items that I think would be of interest during an antenna evaluation.

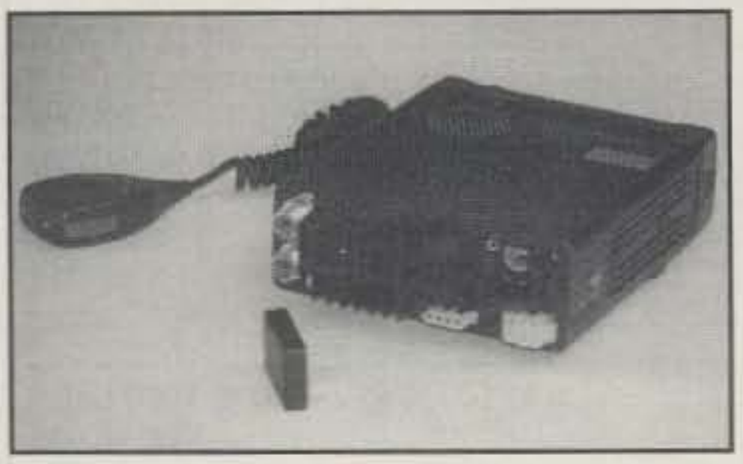
When I returned for a closer look, I found that the impedance at 11.1 MHz was 56.0 ohms with a resistance value of 48.1 ohms and a reactive component of 14.9 at a phase angle of –20 degrees. The 2.0 to 1 bandwidth was 120 kHz with a Q of 85.3. The minimum SWR was 1.4 to 1 at a frequency of 11.090 MHz. I could also find values of inductance and capacitance necessary for a conjugate match to put the antenna "on the money" if I so desired. A normalized value for the impedance is also available if you are inclined to play around with a Smith Chart.

I could continue to list additional values that are available at the flick of a switch, but I think you get the idea. The versatility of the instrument is limited by your experience and your engineering curiosity.

Not only is the CIA-HF invaluable for tuning simple antennas, but there are also detailed instructions for tuning 1/4- and 1/2-wave transmission lines and stubs. The unit can be used to determine inductor and capacitor values. It is also invaluable for tuning antenna traps, testing baluns, adjusting antenna tuners, determining resonant frequency, and determining characteristic impedance.

The CIA-HF Complex Impedance Analyzer is available from AEA or their authorized distributors. They can be contacted at 1-800-258-7805 or visit their web site at <www.aea-wireless.com>. The suggested retail price is $359.95 plus $7.50 shipping and handling. ■

CQ SHOWCASE



Model 706 Tune Control From The BetterRF Co.

The Model 706 Tune Control accessory lets you make the TUNE/CALL button work on an ICOM 706 (all models). No longer do you have to lower the power, switch to RTTY or AM, and hold the PTT switch. Push the TUNE/CALL once and the 706 emits 10 watts, steady carrier and sidetone through the speaker (internal or external). Use the signal to tune your antenna, and antenna tuner, or check SWR. Press again and the 706 reverts back to the previous power and mode.

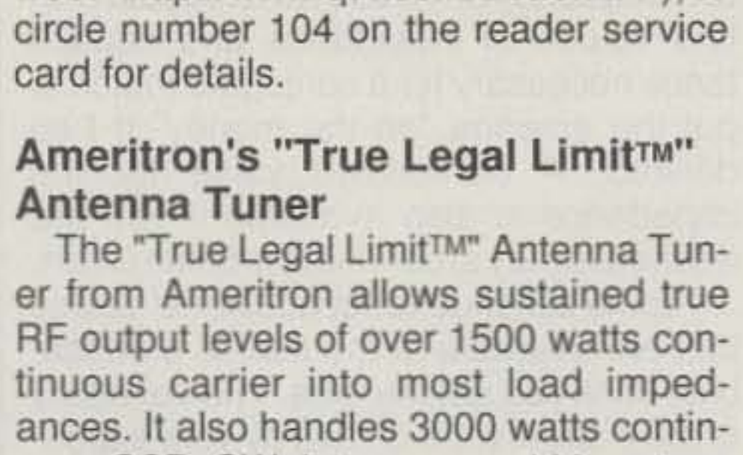
The small PC board (1" × 2"), in a plastic case, plugs into the 706's Molex connector on the rear of the radio. No radio modification is required, and it works 160 through 6 meters (original 706 through 10 meters). The accessory is priced at $32.95 plus $3.00 shipping and handling in the U.S. and Canada ($8.00 elsewhere). There is a 90-day warranty. To order or for more information, contact The BetterRF Co., 43 Dusty Trail, Placitas, NM 87043 (505-771-400; fax 505-771-8289; web: <http://www.qth.com/BetterRF>); or circle number 104 on the reader service card for details.

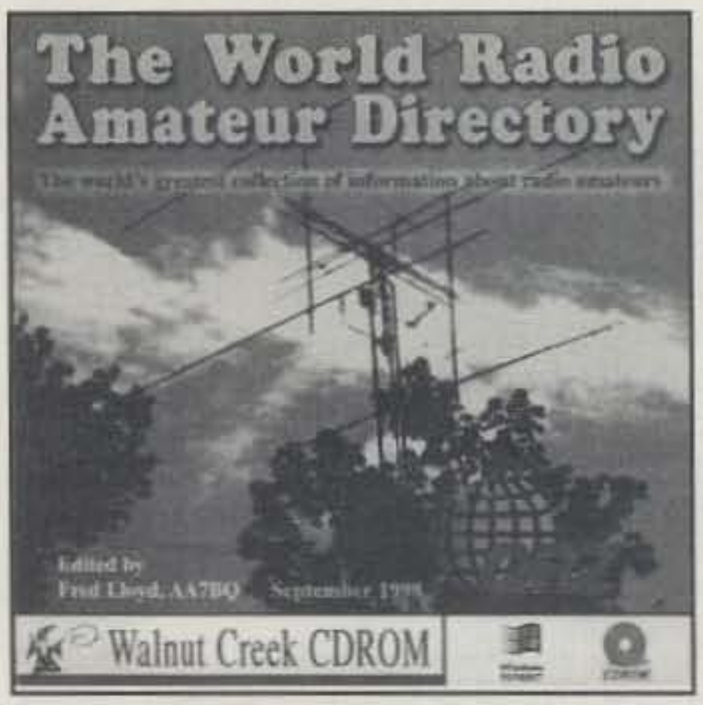
Ameritron's "True Legal Limit™" Antenna Tuner

The "True Legal Limit™" Antenna Tuner from Ameritron allows sustained true RF output levels of over 1500 watts continuous carrier into most load impedances. It also handles 3000 watts continuous SSB, CW duty even on 160 meters. It easily handles the AL-1500, Ameritron's highest power amplifier. The tuner features High-Q, high-current, edge-wound silver-plated roller inductor and high tuning capacitance (500 pF). It covers 1.8 to 30 MHz, including all MARS and WARC bands. The ATR-30 uses a roller inductor T-matching network. It can match nearly any antenna using either coax or balanced feedlines.

Ameritron's illuminated Cross-Needle true Peak-Reading SWR/Wattmeter measures peak or average forward and reflected power plus SWR. It has an electronic circuit that allows accurate peak power to be measured. An optional external 12 VDC or an internal 9 volt battery is required. It has 3000/300 watt ranges. The ATR also features a three-core choke balun, six-position antenna switch, 6:1 vernier reduction drives, and more.

The unit is covered by Ameritron's one-year warranty. For more information, contact Ameritron, 116 Willow Road, Starkville, MS 39759 (601-323-8211; fax 601-323-6551; e-mail: <mfj@mfjenterprises.com>), or circle number 105 on the reader service card.





QRZ's World Radio Amateur Directory

The new WRAD put out by Walnut Creek CDROM, who publishes QRZ! CD includes the same callsign database as QRZ, but also focuses on the people behind the callsigns, featuring 2700+digital images, over 2500 biographies, personal stories, more than 125,000 e-mail addresses, and more. It has the U.S. FCC license data, plus that of many other countries. It contains an extensive free-form search engine with over 12 million keywords, making it possible to instantly locate people by their names, town, street address, states, countries, zip code, or any keyword that appears in the callsign listing. WRAD also offers a NOTES function that allows the user to keep and store detailed notes on a callsign-by-callsign basis. It is designed to run on Windows 95/98/NT with 486 or better processor and 16MB RAM.

WRAD retails for $39.95 and is available from Duane Heise, AA6EE, 16832 Whirlwind, Ramona, CA 92065 <aa6ee@amsat.org> <http://www.radiodan.com/aa6ee/>, or circle 106 on the reader service card.

M² Antennas Catalog

The new catalog from M2 features antennas, positioners, and accessories. Included are HF log periodics; 40, 20, 17, 15, and 10 meter monobanders; 6 meter antennas; 2 meter Yagis; 2 meter specialized antennas; 220 MHz and UHF Yagis; UHF specialized and microwave antennas; and rotators and accessories. Included are diagrams, specifications, descriptions, and a price sheet.

For a copy of the catalog, contact M2 Antenna Systems, Inc., 7560 N. Del Mar Ave., Fresno, CA 93711 (209-432-8873; fax 209-432-3059; e-mail: <m2sales@aol.com; web: <www.m2inc.com>), or circle 101 on the reader service card.

Drake Ends Factory Service For Older Amateur Rigs

The R. L. Drake Company says it can no longer provide factory service for most of its older ham rigs, including the venerable T-4X, T-4XB, and T-4XC transmitters; R-4 and R-4A receivers; TR-3 and TR-4 transceivers; power supplies for most of those units; and the TR-22, 22-C and 33-C 2 meter transceivers. According to the *ARRL Letter*, Drake Service Manager Bill Frost, WD8DFP, says it's getting very difficult to get replacement parts for these older units. A complete list is posted on the R. L. Drake Web site at <http://www.rldrake.com/tech/Outofservice.html>. Frost said Drake still has some parts for these units in stock and might be able to supply individual owners with parts for do-it-yourself repairs.

For more information, call Frost at 513-746-4556, or e-mail him at <Bill_Frost@rldrake.com>. You can also write to: Bill Frost, R. L. Drake Co., Service Dept., 230 Industrial Dr., Franklin, OH 45005.

MFJ-414 Professional Classroom Morse Tutor

Designed for volunteer examiners, clubs, teachers, Elmers, schools, and individual amateurs alike, MFJ's new Code Tutor features include an LCD readout, printer port, audio tape recording output, loud powerful audio with true sinewave and no keyclicks, computer interface, ability to store 16 FCC exams for VEs, HF/ VHF radio interface for on-the-air practice, and a full-featured memory keyer. The MFJ-414 has everything that's in the MFJ-418 pocket-sized code tutor and more. The printer port is useful for printing correct answers for students to check copy after a code practice session. You can record high-quality code tapes for additional home study. A serial port lets you up or download custom practice groups to or from your PC.

If a student is having trouble with certain characters, you can build and save three custom sets (16 characters each) for extra practice. You can combine these to give you 48 characters for using the KOCH method. You can customize random words for practice also. You can use the MFJ-414 with the 144/440 MHz FM handheld or HF transceiver for on-the-air Morse code practice. VEs can give up to 16 FCC exams. You can computer-generate actual FCC exams and download them to the MFJ-414 to test future amateurs and upgrades.

It is also a full-featured memory keyer, with 1000-character memory, semi/auto modes, iambic A/B, reverse paddle, and the ability to change speed and tone on-the-fly. You can practice sending into the MFJ-414 with an Iambic paddle or straight key. Use built-in speaker or external speaker or headphones. Includes serial port cable and open-end patch cable (soldering required). Use 12 VDC or 110 VAC. Dimensions are 2¼"H × 8½"W × 6"D. It comes with a one-year limited warranty.

To order or for your nearest dealer, contact MFJ Enterprises, Inc., P.O Box 494, Mississippi State, MS 39762 (phone 601-323-5869; orders/dealer locations 800-647-1800; fax 601-323-6551; Internet <http://www.mfjenterprises.com>), or circle 100 on the reader service card.

Okay, so we have this letter and term "Q" that we use and toss around as if it was a real thing capable of being pinpointed and measured in much the same way as we can find Butte, Montana on a map. Most of us have never been to Butte, nor is it likely that we'll visit, but like Q, we have it on good faith that it's there. As VE3ERP puts it, "The Q of a coil is not a quantitative value like ohms or watts. It is a qualitative factor, more like the familiar 'on a scale of one to ten' method of evaluating girls in bikinis."

The Elusive Q of Single-Layer Air-Core Coils

BY GEORGE MURPHY*,[1], VE3ERP

Just as bikini–clad girls[2] of the same weight can have a variety of shapes from short and fat to long and skinny, so too can coils of the same inductance. The only difference in both cases is the L/d (Length–to–diameter) ratios of the members of each group. While a bikini beauty's L/d ratio may have little effect on her behavior, the behavior of a coil varies with frequency. Therefore, its L/d ratio is further factored into a Nebulous Abstract Frequency–Sensitive Relative Value known as "Q."

Definition of Coil Q

Coil Q is difficult to define. Inductors are the problem children of the component world. They are perhaps the most non-ideal of real-world components.[3] Q has been defined as "a figure of merit or quality (no units), and in the case of inductors is the inductive reactance divided by the sum of all the resistances associated with energy losses in the inductor (in ohms)."[4] But what if you do not know the sum of the resistances and energy losses?

True Coil Q can be determined for a specific frequency from the physical properties of the coil using the elegantly simple equation developed by M. V. Callender[5] from Medhurst's formula for Q.[6] Callender's equation is the one shown in the Q Equations, Table I.[7] Coil Q can be calculated mathematically, either using the equations shown in Table I, or by a computer using software such as HAMCALC (version 38 or later).[8]

The Q equations in Table I compute theoretical mathematically true Q, which because of factors other than frequency and physical dimensions affecting Q, may not be attainable in the "real world." For these and other reasons to be discussed a little further on, the measured Q of a coil may be less than its theoretical true value.

Coil Q should never be thought of as an absolute stand-alone evaluation of quality. Coil Q is really just an abstract indication of relative performance of a coil of a specific L/d ratio at a specific frequency.

A relatively high Q indicates a physically large coil, a relatively high frequency, or both. On the other hand a relatively low Q indicates a physically small coil, a relatively low frequency, or both. By the same correlation, small coils at high frequencies and large coils at low frequencies commonly used in amateur radio applications typically have true Q values of up to about 800. Very few practical circuits require a Q above 900. Attempting to design a coil with a True Q much over 1,000 usually results in a coil with abnormal physical dimensions, wire sizes, and/or number of turns.

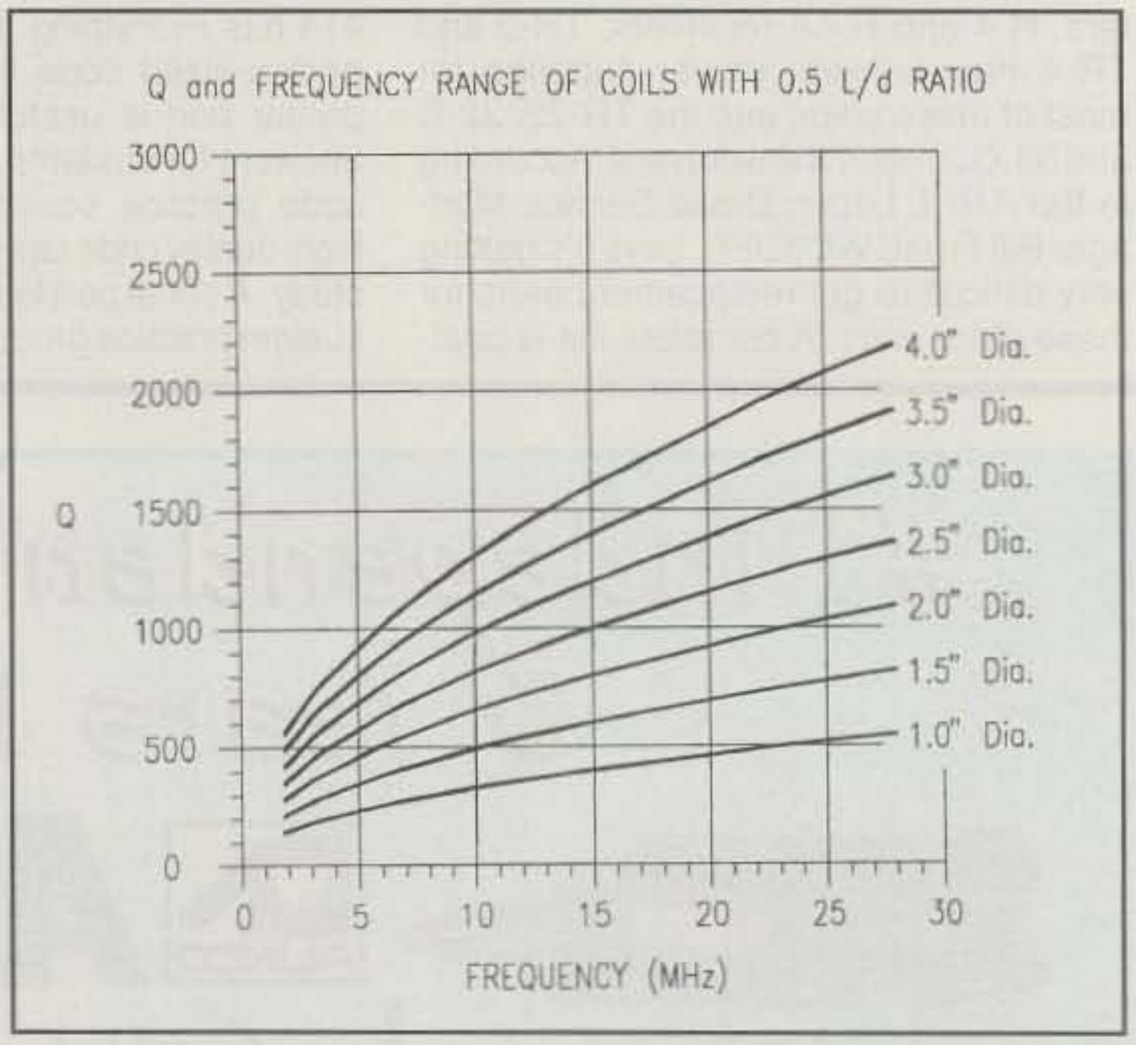


Fig. 1– Q and frequency range of coils with 0.5 L/d ratio.

Measurement of Q

This is a gray area. Do not confuse coil Q with the Q of any circuit of which the coil is a component, including the internal circuitry of a Q meter. The two Q's are separate and can be quite different in value. According to Terman,[9] Q meters assume the coil Q to be the same as the circuit Q (which it may not be), and the presence of the coil's distributed capacity causes the Q observed by the Q meter to be lower than the true Q of the coil.

The Effect of Coil Q In Circuit Design

When testing a circuit involving a coil, if the sharpness of a fil-

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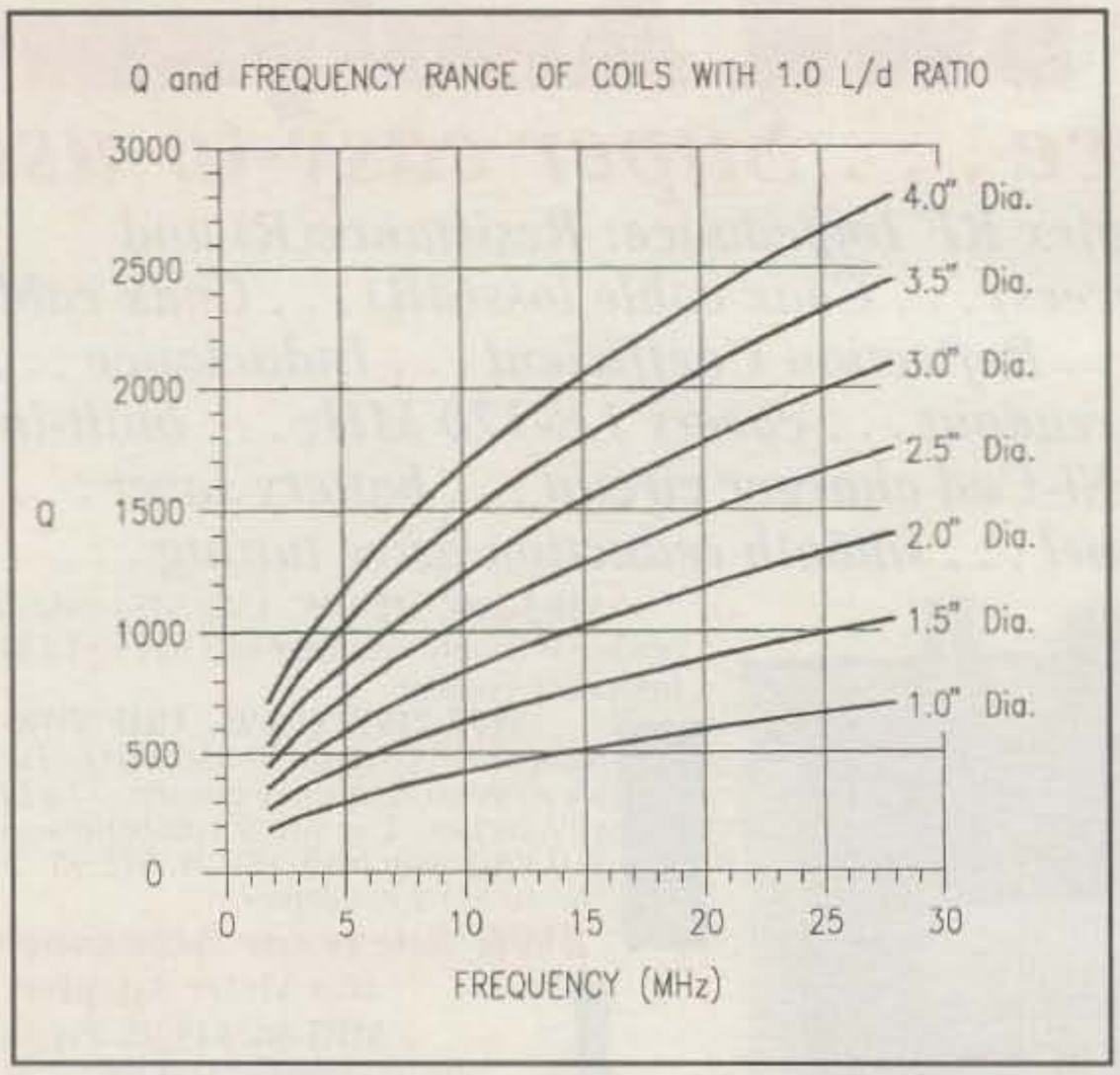

Fig. 2– Q and frequency range of coils with 1.0 L/d ratio.

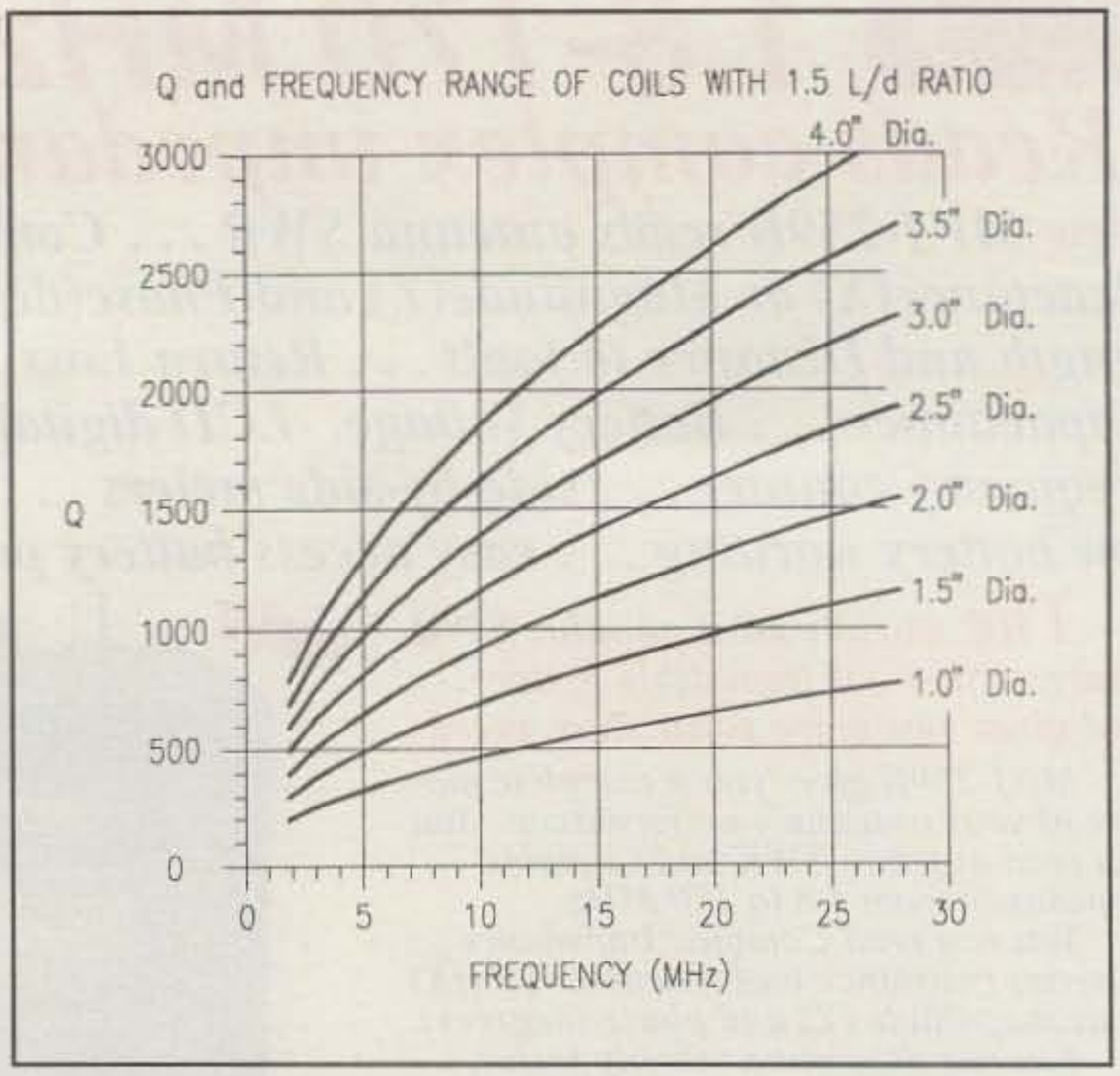

Fig. 3– Q and frequency range of coils with 1.5 L/d ratio.

ter or the bandwidth of a tuned circuit is not quite as expected, it is probably because the coil L/d ratio (and thus the Q) is inappropriate for the application.

A high Q (low L/d ratio) coil is recommended for applications requiring high efficiency, narrow bandwidth, and minimum wideband noise. Some circuits require a coil of maximum Q, some a specific Q at a specific frequency, and others a relatively low Q. Many circuits do not mention coil Q at all. Unfortunately, current popular handbooks offer little advice on selecting L/d ratios (and hence Q) for various applications.

As a general observation, L/d ratios from about 0.5 to 2.0 are commonly used in many practical amateur radio circuits.

The Rules of Coil Q

1. The conductor diameter must be within the range of 0.45 and 0.70[10,11,12,13] times the center–to–center distance between adjacent turns (not all commercial stock coils meet this condition).

2. Maximum Q occurs at a coil L/d ratio of between (depend-

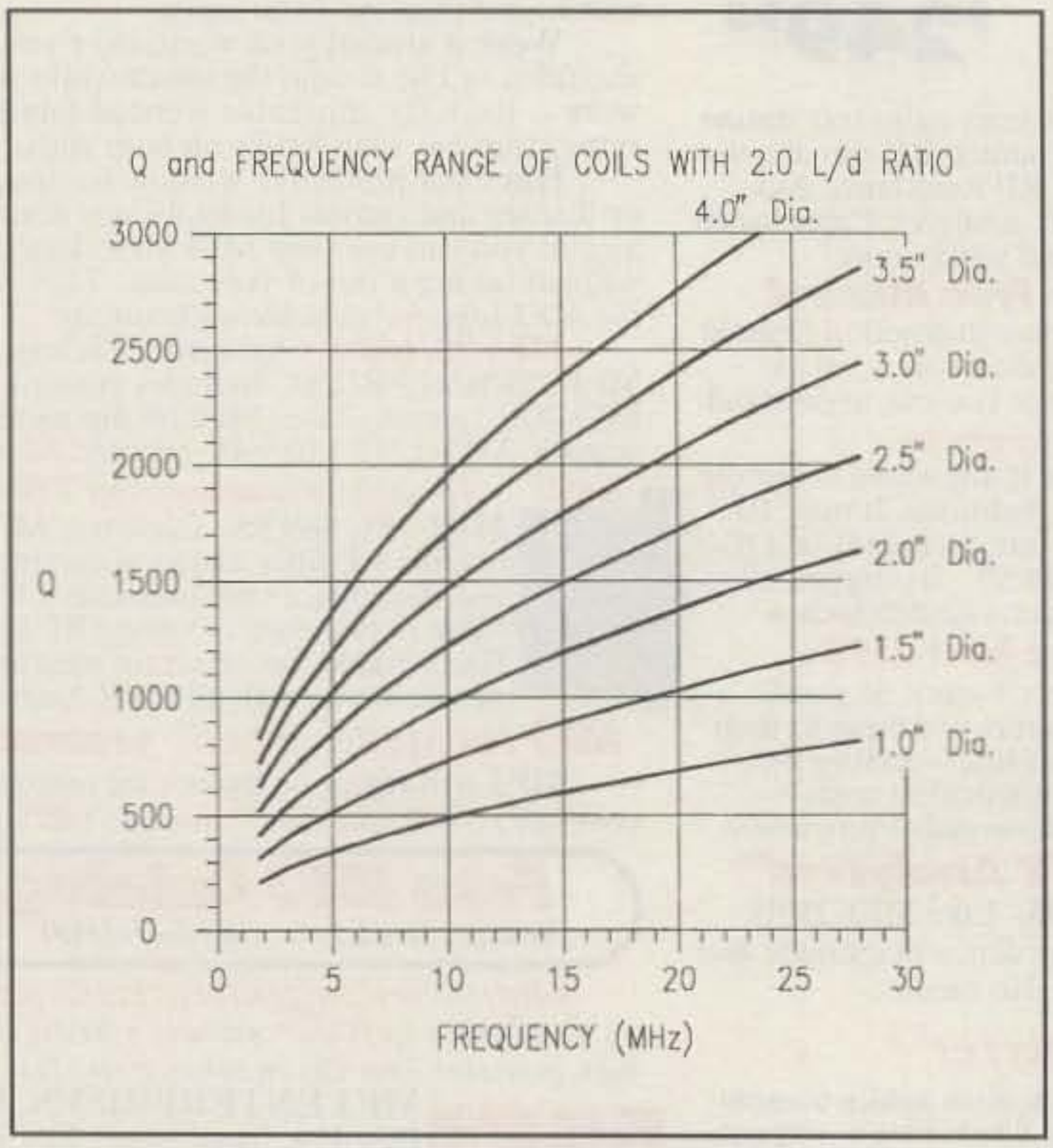

Fig. 4– Q and frequency range of coils with 2.0 L/d ratio.

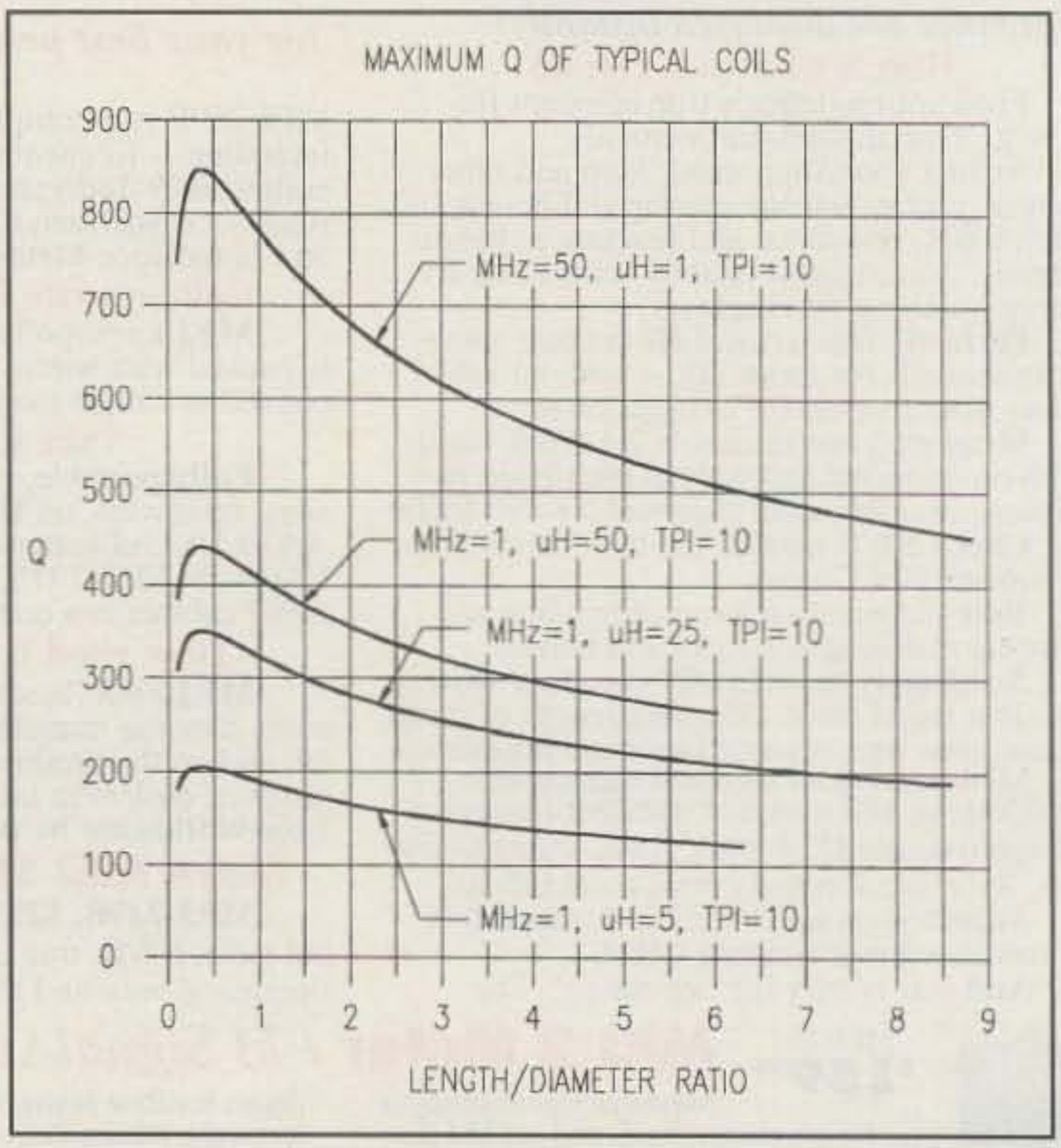

Fig. 5– Maximum Q of typical coils.

COIL DESIGN EQUATIONS
For Single-Layer Air-Core Coils

These equations do not allow for length of leads or losses due to dielectric properties of insulation or coil form material.

The equations do not hold for coils with a length-to-diameter ratio of less than 0.35:1, coils with less than about 4 turns, or coils with conductor diameter-to-turn spacing ratios of less than 0.45:1 or greater than 0.70:1.

INDUCTANCE EQUATIONS

$$L_\mu = \frac{d^2n^2}{18d + 40L_{GTH}} \qquad n = \frac{\sqrt{L_\mu\,(18d + 40L_{GTH})}}{d} \qquad L_{GTH} = \frac{\frac{d^2n^2}{L_\mu} - 18d}{40}$$

Q EQUATIONS

(*Radiotron Designer's Handbook*, 4th Edition, chapter 11.5)

$$n = \frac{\sqrt{f_{Hz}}}{\frac{6.9}{R_{cm}} + \frac{5.4}{L_{cm}}} \qquad L_{GTH} = 0.3937\,\frac{5.4}{\frac{\sqrt{f_{Hz}}}{Q} - \frac{6.9}{R_{cm}}}$$

$$S_w = \frac{L_{GTH}}{n} \qquad W_{MAX} = 0.70S_W \qquad W_{MIN} = 0.45S_W$$

where:

L_μ =	inductance in µH
n =	number of turns
d =	coil pitch circle diameter in inches
L_{GTH} =	coil length in inches
Q =	coil Q
f_{Hz} =	frequency in Hertz
R_{cm} =	coil pitch circle radius in centimeters
L_{cm} =	coil length in centimeters
S_W =	turn spacing (center-to-center) in inches
W_{MAX} =	maximum wire diameter in inches
W_{MIN} =	minimum wire diameter in inches

ing on other coil design parameters) 0.35 and 0.45, decreasing rapidly below that ratio and more slowly above (see fig.5).[14]

3. To allow margin for error in designing a practical coil, an initial design L/d ratio of not less than 0.5 is recommended.[15]

4. Q increases with coil diameter (see figs. 1–4).

5. Q increases with coil length, rapidly when the L/d ratio is small, and very slowly when the L/d ratio is 1:1 or more (see fig. 6).

6. Q increases with frequency (fig. 6).

How to Find the True Q And Inductance of a Coil

Measure the diameter and length of the coil, and count the number of turns. Use the Inductance Equations in Table I for $L\mu$ to find inductance, and the Q Equation for Q to find the coil true Q at the frequency of your choice. Or you can input the known factors into HAMCALC's "Coil Equation Calculator" and it will find both, as well as further define the coil.

How to Design a Coil With a Specific Q

There are three ways to do this:

1. The interminable and tedious way—by hand using only the equations in Table I (takes forever).

2. The slow and approximate way—use the accompanying graphs and

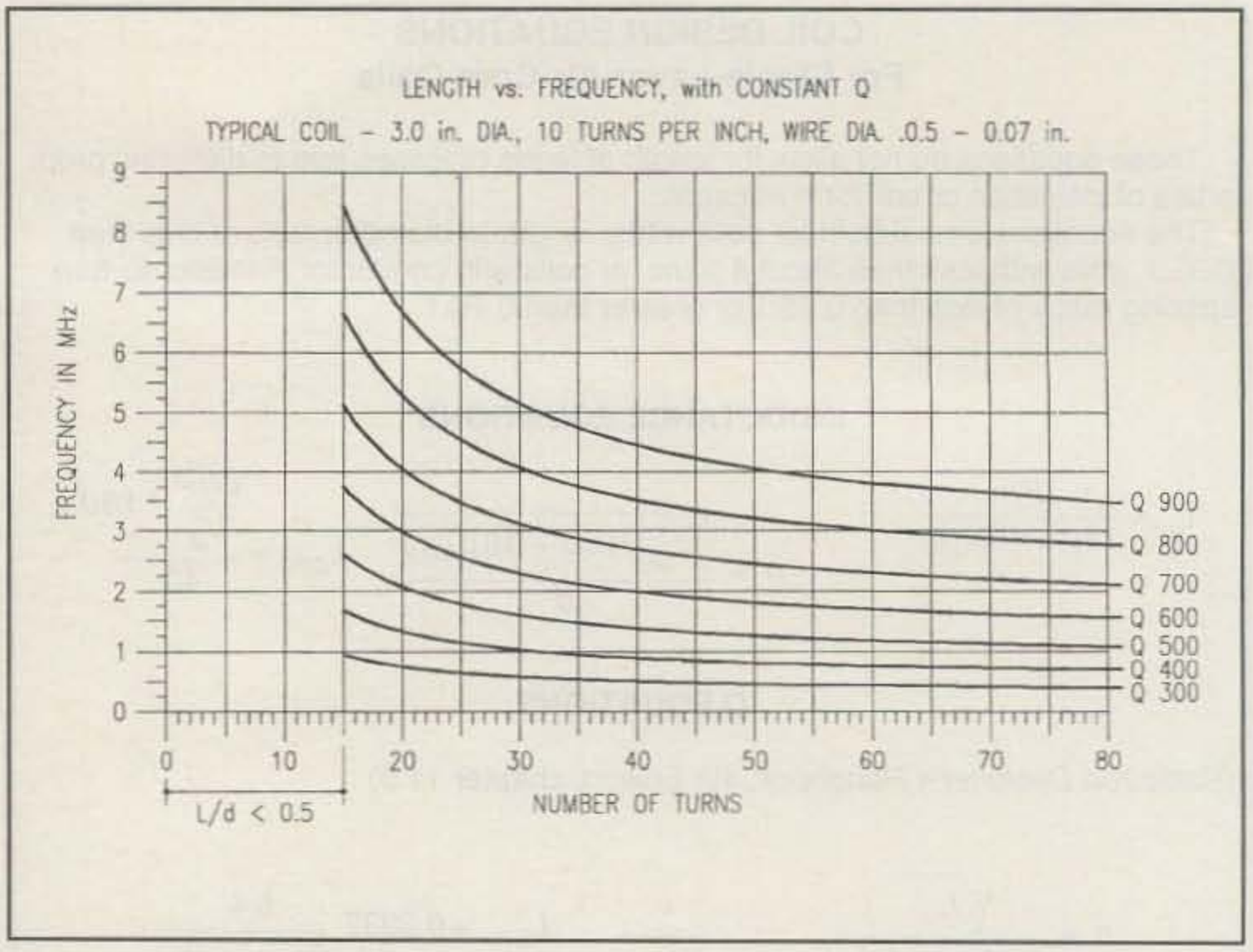

Fig. 6– Length vs. frequency, with a constant Q.

make a few calculations (takes several minutes).

3. The fast and easy way—use HAMCALC's "Coil Q Calculator" computer program (takes a few seconds).

Method 1

From known values of Q, inductance, and frequency, by iterative solution of simultaneous equations find the coil length where L_{GTH} (Inductance Equation) is equal to L_{GTH} (Q Equation). From the known L/d ratio and the Inductance Equations calculate the coil diameter and number of turns, and from the Q Equations determine the allowable range of wire sizes for the coil.

To demonstrate methods 2 and 3, assume a coil with an inductance of 9 µH, an L/d ratio of 0.5:1, and a true Q of 500 at 10 MHz.

Method 2

Select from figs. 1 to 4 the graph closest to the known L/d ratio (in this case fig. 1). Draw lines from the known Q (500) and frequency (10 MHz). At the point where the lines intersect read (or extrapolate) the coil diameter (1.5"). From the known L/d ratio (0.5) and diameter (1.5) calculate the length (Lgth = 0.5 × 1.5 = 0.75). From the Inductance Equations calculate n (15 turns) and L_μ (9 µH), and from the Q Equations determine the range of allowable wire sizes.

Method 3

Input Inductance, Frequency, Desired Q, and L/d ratio. Eureka![16] As fast as you can type in four numbers, you get a detailed specification for a coil 1.531" dia., 0.765" long, with 14.9 turns using a conductor diameter within the range .045" to .071". Using HAMCALC's "Coil Designer" program you can further refine this to a practical coil with 15 turns of AWG 28 wire wound on a 1 1/2 inch form, with a Q of 499.

Conclusion

Coil design is far too complex a subject for some of its aspects (such as Q) to be resolved by simple equations containing only some of the factors involved. However, Callender's approximation of Medhurst's formula[17] for Q (as shown in Table I) comes close enough for many amateur radio applications, and as a starting point for further development, experimentation, and research.

For less-than-laboratory-research purposes the best advice I can offer is forget about coil Q when designing a circuit. Concentrate on the L/d (Length-to-diameter ratio) and let Q fall where it may. All you really have to decide is what L/d is best for your application (Low L/d = High Q, High L/d = Low Q, Maximum Q occurs when L/d = 0.5). If in doubt about the most suitable L/d to select, do what I do:

Imagine coils as a lineup of bikini-clad girls sorted in order from short and fat on one end to long and thin on the other. Then do what comes naturally—pick one near the middle and hope for the best.

Footnotes

1. . . . with a lot of help from Yardley Beers,

WØJF;, L. B. Cebik, W4RNL; and Bob Tellefsen, N6WG.

2. If you are a YL or XYL, wherever reference is made herein to girls in bikinis, replace with muscular beach boys.

3. The *1997 ARRL Handbook for Radio Amateurs*, page 10.8.

4. The *1997 ARRL Handbook for Radio Amateurs*, page 6.21.

5. Callender, M. V. (letter) "Q of solenoid coils" Wireless Engineer 24.285 (June 1947) 185.

6. Medhurst, R. G. "H.F. resistance and self-capacitance of single-layer solenoids" (1) Wireless Engineer 24.281 (Feb.1947) 35; (2) Wireless Engineer 24.282 (March 1947) 80.

7. *Radiotron Designer's Handbook*, fourth edition, Wireless Press, chapter 11.5 "Short–wave coils."

8. HAMCALC, over 200 programs of interest to radio amateurs and professionals, is shipped on a 3 1/2" 1.44 Mb floppy disc that will run in either MS-DOS or Windows computers that contain a GWBASIC.EXE file. For a free HAMCALC disc send US$5.00 (US$6.00 if you want a GWBASIC.EXE disc [80Mb] included) to cover my costs of materials and airmail shipping anywhere in the world, to the author at the address shown at the beginning of this article.

9. Terman, *Radio Engineers' Handbook*, 1943, page 916.

10. Approximately 0.45 claimed by Meyerson, A. H. "V-H-F coil construction" (1) Communications 24.4 (April 1944) 29; (2) "Coil Q factors at v–h–f" Communications 24.5 (May 1944) 36.

11. Approximately 0.5 claimed by Barden, W.S. and D. Grimes "Coil design for short-wave receivers" *Electronic Engineering* 7.6 (June 1934) 174.

12. Approximately 0.6 claimed by Harris, W. A. and R. H. Siemens "Superheterodyne oscillator design considerations" R.C.A. Radiotron Division Publication No. ST41 (Nov. 1935).

13. Approximately 0.7 claimed by Pollack, D. "The design of inductances for frequencies between 4 and 25 megacycles" (1) R.C.A. Review 2.2 (Oct. 1937) 184; (2) *Electronic Engineering* 56.9 (Sept. 1937) 1169.

14. All graphs accompanying this article were plotted from tabular data generated by HAMCALC's "Coil Q Calculator" program.

15. Terman, *Radio Engineers' Handbook, 1943*, page 74.

16. As near as I can figure, "Eureka!" is an ancient Greek translation of the French "Voila!" which is a medieval translation of the contemporary American "Bingo!"

17. *Radiotron Designer's Handbook*, fourth edition, 11.5(G), page 464. ■

Did you ever arrange for a demonstration of amateur radio, have the people show up, and find either a dead band or experience the effects of the biggest solar storm ever recorded? Embarrassing, yes, but not too vital. One contact is all it would take to make a difference and a true believer for life.

Riding White Water Rapids Maritime Mobile

BY MICHAEL L. DALE*

Some of the toughest white water adventuring in Arizona is on the Verde River in a two-man canoe loaded with gear, beer, and steaks for a three-day wild ride. We made the trip over last Memorial Day weekend and counted on Kevin Swesey, KA7GQX, to keep us in contact with the rest of the world.

Kim Swesey (Kevin's brother) and I planned an eight-man, four-canoe trip with all the gear we could load into waterproof plastic bags. Two nights and three days of excitement for our crew and a world of entertainment to be supplied by KA7GQX sounded like fun.

Paddling canoes in class two and class three white water is full of excitement, especially in Arizona, where you see cacti in bloom, eagles' nests located on sheer cliffs, and beautiful cottonwood trees along virgin fishing waters. Gliding down river rapids in a canoe is not the most stable place to operate a radio, so we agreed on limiting our operations to riverbank resting spots.

For our radio equipment we used a 10 meter AR-3500 Ranger with a dipole. For local contacts we brought along a handheld and a homebrew, 4-element cubical quad, as we would need maximum gain to get out of deep canyons and sheer cliffs.

Our power supply was a marine battery rated at 60 Ah tied down under the back seat of the canoe. That seat was assigned to the lightest crew member. Operating one hour each morning, one hour at noon, and starting again at 1300 GMT until band closing, we estimated that the battery would last the whole trip. All of our radio gear, along with cameras, personal effects, and other necessary equipment was stowed in waterproof bags and tied to the canoes in the event we capsized.

*19802 N. 32nd Street #57, Phoenix, AZ 86024

Three days of fun, excitement, and adventure await the intrepid crew boarding the two-man canoe.

We arrived at Childs, Arizona (our launch site at the Childs Power Plant) on Friday evening to camp overnight. Our families came along to cook, watch the launch, and drive vehicles back over the switchback trail to Phoenix. Kevin tried out the AR-3500 in early evening but was unable to make a contact. Solar flares were disrupting the band, and we all hoped that conditions would improve the next day.

The morning light danced across my eyelids as I stirred from a deep slumber. Raising up on one elbow, I looked out at the four canoes that would carry us on waters of adventure. The slow awakening of our campers and crew members escalated as breakfast began to perk along with the coffee. Can you imagine bacon and eggs, fried potatoes, and wheat toast all cooked on the grill a hundred miles from nowhere? While the canoeists were being teased with the tantalizing odors of all that good food, they were busy loading equipment. Our radioman was excused from this activity, as he tried once again to make some contacts, but the band was still dead. I kept busy taking color photos of all the activities to illustrate my article.

Now it was time to hit the water and start paddling. The first rapids were only 200 yards downstream. Everyone that wasn't in a canoe rushed ahead to watch the crews shoot through the narrow opening that was fortified on each side with huge boulders.

The first canoe made it through as though they had done this a hundred times. The second canoe, where Kevin and all the radio gear was riding, made it through with flying colors, but then bashed against the rock-bordered bank and swamped. The third and fourth canoes also swamped. We soon discovered that

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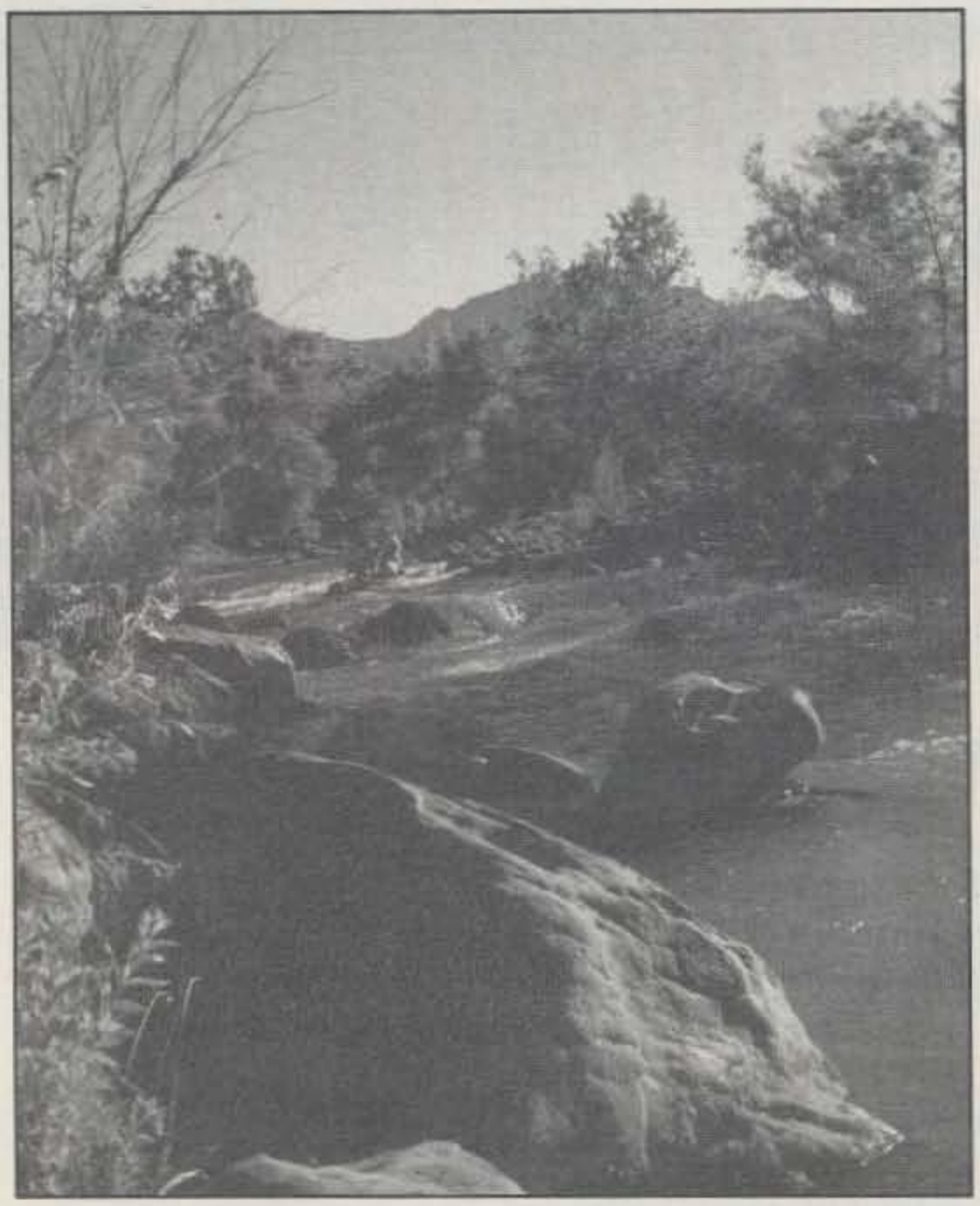
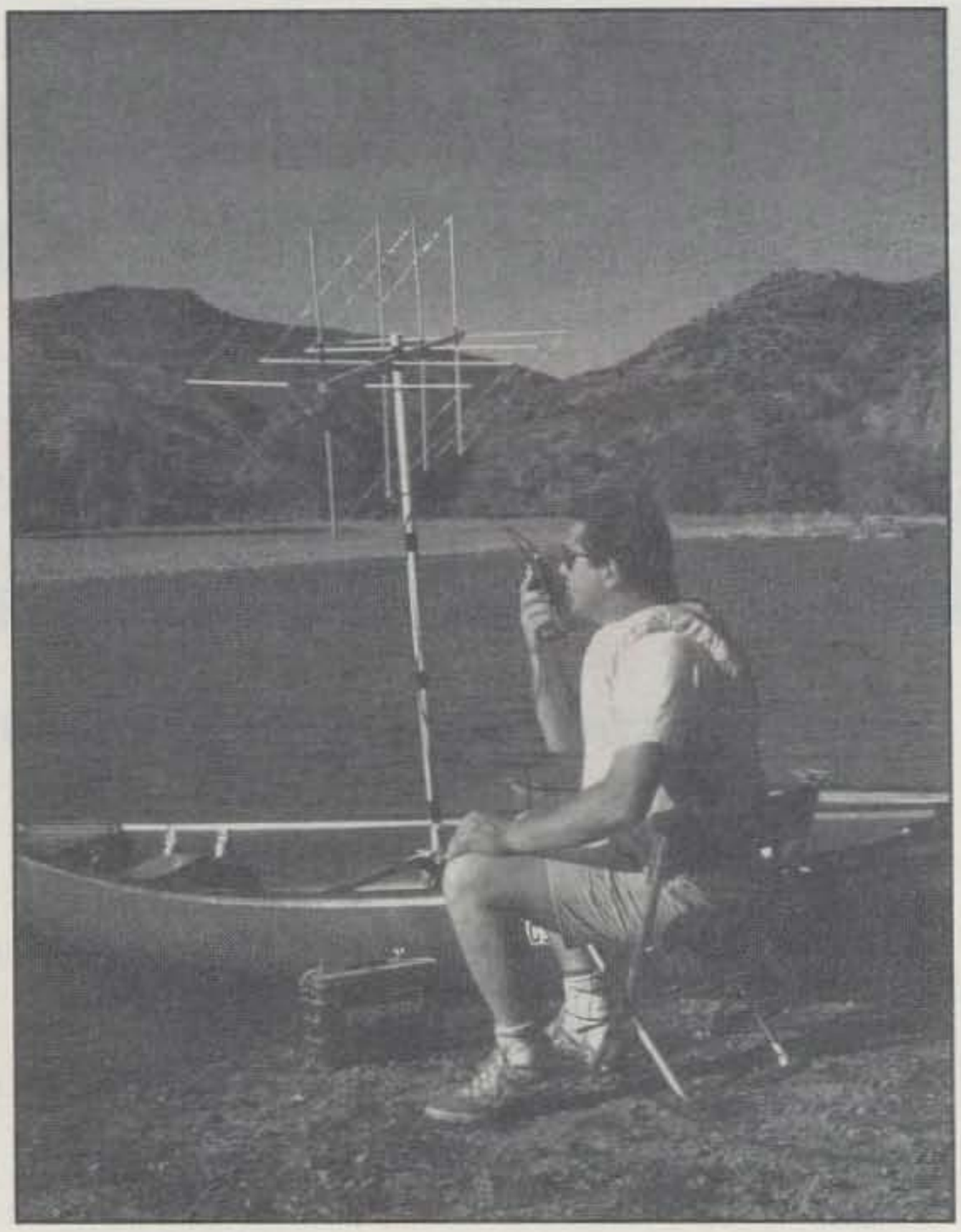


It's a little tricky to maneuver the rapids without getting the canoe swamped and going for a sudden swim. Life jackets (or PFDs)) are a must for personal safety. On the other hand, the magnificent scenery makes it all worthwhile.



Kevin, KA7GQX, gives 2 meters a try to no avail. Even with the quad it was mighty quiet down there.

vital to our success on this trip were our Coleman canoes and waterproof bags.

Kevin's canoe was bent in half in a sort of "V" shape. However, with a little effort the fiberglass canoe popped right back into perfect shape as though nothing had happened to it. The ultra-light canoes and transport bags made it possible to carry the extra weight of the radio and battery over rough waters and still keep them bone dry in spite of frequent swamping.

There was only one place to make our first stop, and that was where sheer cliffs rise several hundred feet and the river makes a sharp right turn. We landed there for a breather and discovered an eagle's nest perched on an overlooking jutting rock high on the cliff. In our excitement to take pictures of fledgling eagles with their parents flying overhead, we forgot about the noon schedule to transmit.

After making our first campsite, unloading the canoes and equipment only took a few minutes. Kevin found a couple of trees, spread out the dipole antenna and started scanning the band. For the next 30 minutes we heard nothing but static and background noise. Kevin also tried the 2 meter handheld, but even with the quad plugged in, he wasn't able to make contacts.

In the early stages of planning this trip, Kevin started passing the word along to his friends to tune in on this adventure. Now we wondered how many were actually listening. The solar flares kept it a secret, so we shut down to save energy until our next stop.

All the guys were setting up the campsite and portable stoves for dinner. I decided to try to catch some rainbow trout and threw a line in the water. I thought it be great to fry some fresh fish for dinner out in the open Mazatzal Wilderness of the Tonto National Forest. Sure enough, I got my first fish and pretty soon there were others catching them, too. This was virgin fishing grounds you could only get to by canoe or helicopter.

After a wonderful steak and fresh fish dinner cooked over hot charcoals, we sat around pondering our fate and drinking cold beer. What a wonderful feeling of freedom from the grind of everyday living in a big city.

On the second day we paddled down a fast stream of rapids with plenty of action and thrills. The high winds we were encountering presented us with special concerns. Our support crew was due to pick us up at Horseshoe Dam on the third day, but because of the wind we were beginning to doubt that we could make it that far. It became increasingly important to make contact with someone who could relay a message for the support crew to change the pick-up point farther upstream to Sheep Bridge.

We stopped more frequently than planned so Kevin could try to raise someone, but no one could hear him. We finally made our second campsite, and Kevin dug out the 10 meter rig again. He called CQ for a solid hour. Making radio contact took on an air of desperation, but it was either that or we would all have a long hike from Sheep Bridge after a punishing three days on the river. More important, we didn't want to worry the support crew and wives by not being at the designated pick-up point on time.

At the last minute Kevin decided to give it one more try. He heard some Australian stations on the band. Then it happened! We heard "KA7 . . . Golf . . . Quebec . . . X-Ray, What say Matey. Can you hear me?" Kevin gave him a fast response, and we had our first contact. Kevin explained our situation to Dick Webb, VK3AHT, who offered his help from Melbourne, Australia. We could only hope that he would be successful in getting our message to Phoenix.

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> Highest gain, superior patterns, stepped gain for stacking.
> Wide-spaced 3el 20 & 4el 15, 7el on 10 mtrs, all full size
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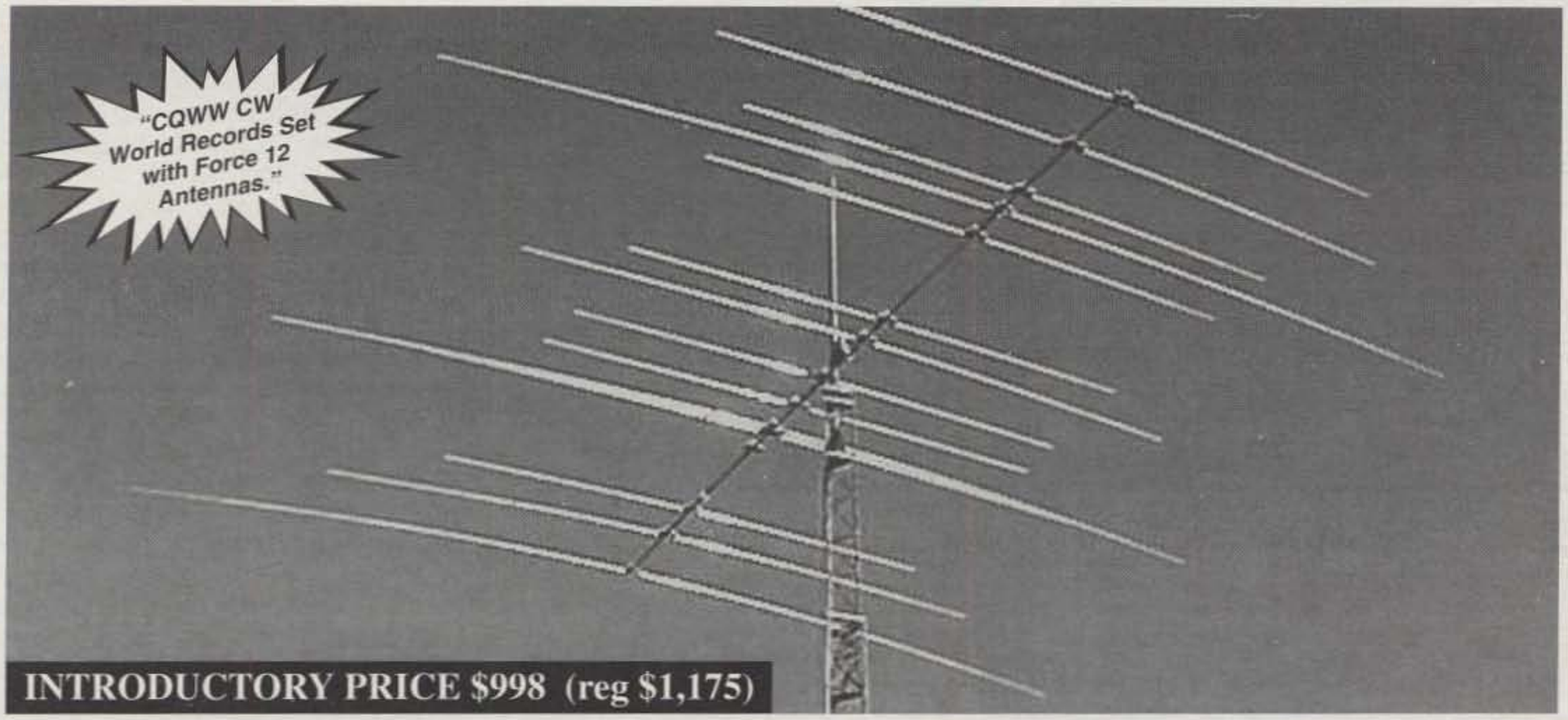

The **C-31XR** is truly the next generation in tribanders; designed for maximum performance on 20-15-10 mtrs, plus strength, ease of assembly, low mast torque, side mounting and stacking. The **C-31XR** is 3 monoband Yagis overlaid on the same boom. There is a wide spaced 3el 20, a wide spaced 4el 15 and 7 elements for 10 mtrs. The gain target to beat was our own **C-3**, which was shown to have the most gain across 20 & 15 mtrs according to independent testing by K7LXC and NØAX. We did it! The **C-31XR** exceeds the C-3 by 1.4dB on 20, 1.5 on 15 and 3dB on 10 mtrs. F/B and side nulls are exactly what you would expect; excellent. There is nothing better than the **C-31XR**.

C-31R

31' boom, 14 elements, 85lbs, 10.5sqft, 100mph, 5KW, single feedline, no traps, all elements full size

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CIRCLE 9 ON READER SERVICE CARD

The 10 meter rig and dipole made the all important contact, albeit on the other side of the globe, but that's all it took.

Our day-long battle with the fierce winds had taken its toll. We nibbled on our supper and called it a day.

As night time descended on our small troop of pioneers, I'm sure each man's last thought that night was of what lay ahead of us the next day. We were soothed only by the dim hope that our support crew would be at Sheep Bridge and that somehow our Australian contact would work the miracle to save us from another grueling day against the wind.

As I lay looking out at the bright stars glittering above from my sleeping bag, I could hear the crickets and the coyotes howl, and experience the wonder of a beautiful place such as this.

At dawn on the third day out, our entire crew was showing wear and tear from the demons of Mother Nature. Sunglasses, hats, and sun screen were all necessary equipment. Our long-sleeved shirts, kept wet for cooling purposes, seemed to bake under the relenting sun. One of the crew suffered painfully sunburned ears because his hat did not have a brim. (Those Aussie Bush-hats, the Overlander or the Crocodile, would have been ideal for this trip.) Although the wind had died down during the night, it was beginning to pick up again, and we knew we were in for another day of fighting the elements.

At the noon stop Kevin tried again to make contact with anyone on 2 or 10 meters, but to no avail. We gave up and pushed on against the wind—always against the wind. The only thing that kept us going was looking for the bridge. Around every turn we expected to see it, only to find more river and another turn. Finally one of the oarsmen in the lead canoe bellowed, "I smell barbeque!" Take my word for it, the paddling speed picked up considerably. Just around the next turn we spotted our support crew cheering us to shore.

It was late afternoon, and the wind had helped time our arrival just right. We had not kept the support crew waiting long. Nothing had ever looked better than those people resting against the vehicles, framed by the smoke of a campfire cooking up big, juicy hamburgers—and plenty of them—along with lots of cold drinks. After greetings and handshakes, we asked how contact had been made.

VK3AHT from Australia had made contact with David Oustayan, KC6BFM, in Inglewood, California. KC6BFM then made a collect call on the land line to Phoenix to our crew chief's wife, informing her of the new pick-up destination and time. I am never surprised, but always gratified to know that an amateur had handled a critical relay message. Both of these operators responded in a professional and timely manner to rescue us from our dilemma. We all were very grateful and let them know with QSL cards just how much it meant to us.

Speaking of QSL cards, we had a quantity of them printed specifically for this trip that were never used, so if you'd like to have one, just send a note to Kevin Swesey, KA7GQX, at P.O. Box 54635, Phoenix, AZ 85078. You can't take credit for a contact, but it will sure serve as a reminder to make careful plans, such as taking along a transceiver, before going canoeing in remote areas. As for the sun, the wind, and the solar flares, well, you know what they say about the best laid plans of mice and men. . . . Gosh, we sure did have fun. ■

Last November K4EJQ presented us with an interesting article called "The Aerial Here Is." Obviously, he's not one to rest on his laurels, as he now presents the next generation of "aerial" which provides multi-band operation. I'm sure the next generation is on the drawing board (and workbench) as we go to press.

The Aerial Here Is . . .
Part II

BY J. G. "BUNKY" BOTTS*, K4EJQ

Flushed with success (for a change!) after the first version appeared in print ("The Aerial Here Is . . . " *CQ*, November 1998, p. 28), I began to cast about on how I could improve this most basic of antennas. Since I work all amateur bands (160 meters through 3 cm—"DC to Daylight") and have a surplus of aerials at my QTH, my thoughts turned to multi-banding the 160/30 meter wire.

With the basic tuner and antenna in place, I focused on adding as many other bands as I could without resorting to traps. Right off the bat, I discovered the basic system would also work the 17 and 15 meter bands without any further additions or modifications—love those "freebies." Next I concentrated on adding 80, 40, and 20 meters to the system.

Some "trial and error" (a.k.a. many trips to/from the shack to the base of the aerial) resulted in the modified tuner that appears in fig. 1. Relays 1 and 2 are 28 VDC latching types that act as the "bandswitch" to allow operation on either 80 meters or 40/20 meters. These relays may be the hardest to locate components used in this project. I do not recommend trying to use the small encapsulated relays in the DIP packages, as their contacts do not appear to have sufficient voltage or current rating. If you cannot find the larger open-frame type latching relays, you can substitute regular relays that require a continual supply voltage. You then could wire the relays to operate your favorite band(s) in the "relaxed" or de-energized mode. Whichever type relays you select, use ones that do not require more than 28 VDC for operation.

I added a miniature toggle switch to the tuner's control box to allow power to be removed from all relays during periods of inactivity. An LED, with associated dropping resistor, was also added to indicate when power was applied to the units. A word of caution here: When using this system, you must have the control unit's power turned ON to energize the relays in the system. **Failure to do so could result in damage to the tuner and/or your transmitter!**

Inductor (coil) L1 and capacitor C1 make up the matching network for the 40 and 20 meter bands. The trick here is to find the proper tap point that allows both bands to be tuned using the fine-tuning control, "Cs." Coil L2 and capacitor C2 perform the same function for the 80 meter band. I also added capacitor "Cx" to relay contacts "B" of relay 2 (which was not being used in the 160/30/17 and 15 meter position) to allow a bit better match on 17 and 15 meters. The value of "Cx" is approximately 75 pF, but this value should be determined in the field by measuring antenna.

SWR on these two bands. Note that two different values are given for capacitor C2—140 pF for use if the aerial is supported from a metallic structure, or 235 pF if the center support is nonmetallic, such as a tree or wooden mast. C2 is actually constructed from 3-470 pF mica capacitors connected in series to increase their voltage rating to over 1 KV. The individual 470 pF units are rated at 500 VDC. Capacitor C1 is a 50 pF ceramic "door knob" type rated at 5 KV.

Building the Modified Tuner

If you are starting from "scratch," I recommend a 9 mm or larger U.S. military surplus *metal* ammunition box. Do *not* use a plastic "look alike" box. Select one with a *good* rubber gasket on its lid and one with paint in good condition. If at all possible, refrain from drilling holes in the box's lid; mount the internal parts from the inside walls. Keeping the enclosure as "water tight" as possible is of prime importance, and to that end seal around all hardware passing through the sidewalls. This is especially true around the barrier strip used to bring control voltages into the tuner. Regardless of the types of relays used for relays 1 and 2, mount them using 3/4 to 1 inch standoff insulators to prevent the relays from arcing to chassis-ground, especially if you are going to be using high power.

Before you reach for the drill, study parts placement carefully. Keep in mind and take into consideration how you will get to these parts, once mounted, to change coil taps and/or capacitor values when and if necessary. This is time well spent!

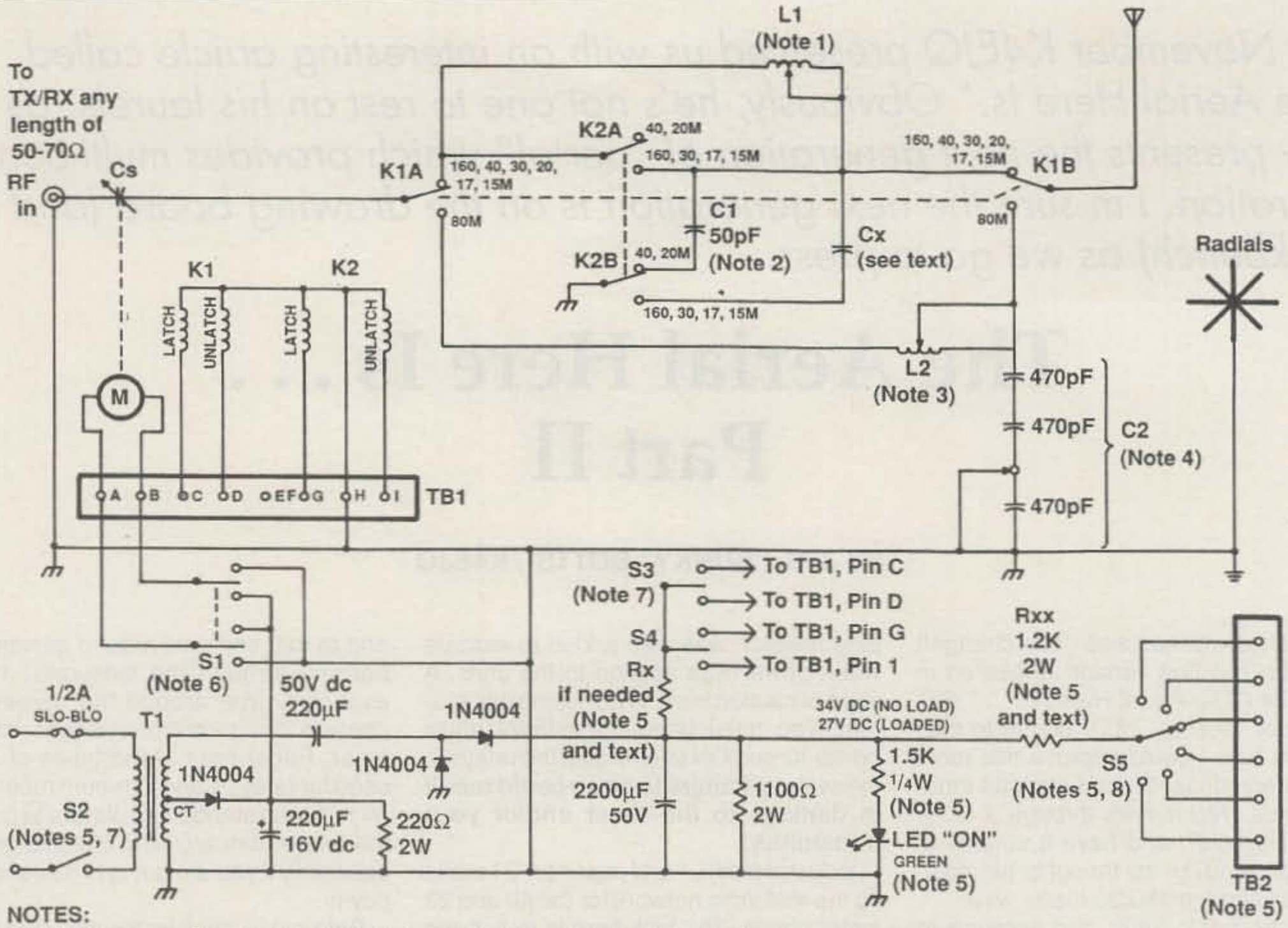
Modifying the Control Unit

Here again, if you are starting this project from "scratch," build the unit in a 4"W × 6"D × 2"H or larger enclosure to allow for expansion and ease of construction and servicing. This is especially true if you contemplate making this a directional system, the last step in the array's construction.

Fig. 1 also shows the modified control unit, with the addition of the 160/30/17/15 meter and the 80 and 40/20 meter "bandswitches" as well as toggle switch S1 to turn the power off to all units. The power supply in the control unit was originally configured to supply several different values of output voltages—the lower voltage (8.5 VDC) for the small reversible DC motor and higher voltage (34 VDC) to operate the latching relays used as bandswitching devices. If lower voltage relays are to be used (such as 6 or 12 VDC units), an appropriate series resistor, labeled "Rx" will need to be added.

Calculate the value Rx using Ohm's law, taking into account the required voltage drop and current required to hold the relays in. Allow some leeway for a voltage drop through the control cable, too. For example, if you are using a multi-conduc-

*220 Hillsboro Rd., Blountville, TN 37617



NOTES:

1. L1 = 21 turns No. 16 wire, 1¼" dia tapped 9 turns from end. Tap will vary with each installation.
2. C1 = 50pF from tower, 15pF from tree.
3. L2 = 28 turns No 14 wire on 2" dia tapped 3 turns from end. Tap will vary with each installation.
4. C2 = 145pF from tower, 235pF from tree.
5. Indicates added modification to control unit for directional control of multi-band array.
6. S1 = Momentary-center off DPDT relay (spring loaded). Radio Shack #275-709.
7. S2, S3 - Center off SPDT (spring loaded) (Radio Shack #275-709.
8. S5 = Single pole-4 position (minimum recommended)-non-shorting-miniature rotary switch.
9. Control cable = 12 conductor, No. 22 stranded wire.

Fig. 1– The basic remote tuning assembly (fig. 2 in the original article in November) is now modified for multi-band and directional control.

tor control cable that is 100 feet in length and the individual wires are, say, No. 22 or so, and the relays used for K1 and K2 are 12 VDC, it would be wise to set up the value of Rx to provide roughly 13 to 14 volts output to the control cable, which should be sufficient to overcome the voltage drop along the control cable. The wattage rating of Rx also needs to be calculated and a value selected to prevent it from overheating. This is especially true if non-latching relays are used for K1 and K2.

The other modification you will notice is the addition of a miniature rotary switch, S5. This will be used in conjunction with the directional control for the array. This switch should be a single pole, four or more positions, non-shorting. The voltage source for the rotation of the array is taken from the 34 volt supply through another dropping resistor, Rxx. The value of this dropping resistor is also calculated using Ohm's law, taking into consideration the coil voltage and current of the relays selected, in this case 12 VDC @ 35 ma. Calculate its required wattage accordingly.

I cannot stress enough the need to lay out the parts and get a mental picture of how they should be placed in the control unit's enclosure. This is the unit that visitors to your shack will see, so take some extra time to lay out the unit's panel. Make it reflect your pride in your workmanship.

Setting Up the Modified Tuner

Once the control unit and tuner have been built or modified from their original configuration as they were in the 160/30 meter version, they can be connected together through the required length of multi-conductor control cable. Later, during final installation, this cable can parallel the coax feedline. These cables should be routed to prevent exposure to heavy, abrasive traffic.

First, check to make sure you have no shorts in the control circuitry. Next make certain that the band-switching relays in the tuner and their corresponding toggle switches on the control unit are working together in the proper sequence. *Note:* Checking is best done while it is still on the bench, *before* you install the tuner in its outside location. It will save you considerable walking back and forth between the two units.

With the original single wire antenna for 160/30 meters attached to the output of the tuner, your coaxial cable feedline attached to the tuner's input, and the ground strap from the tuner's case over to the ground system, we are ready to set up the 80, 40, and 20 meter bands in the tuner. If possible, you should add a few radials for 80, 40, 30, 20, and 15 meters.

Before trying out the newly added frequency bands you need to recheck operation of the system on both 160 and 30 meters. With power turned on to the control unit, and its "bandswitching" toggle switches set for the 160/30/17 and 15 meter bands, an SWR bridge is connected between the transceiver and the modified tuner to check the SWR on 160 and 30 meters. If the reading is acceptable on the original bands, plus 17 and 15 meters, then continue the set up of the tuner. If there have been drastic changes in the SWR on these original bands that cannot be corrected with the "fine tuning" control, you should investigate the possibility of a wiring error in the relays that switch the new tuned circuits that add the 80 and 40/20 meters bands in and out of the original tuner's circuit. Do *not* proceed further until this problem has been corrected, or you'll waste lots of time chasing yourself in circles.

80 Meters: Initially set the tap on coil L2 for three turns from the end that connects to capacitor C2. This will be your starting point. With the control unit's "bandswitching" toggle switches set for 80 meters, tune up the transceiver or transmitter at reduced power at midband. Note the SWR of the system.

Now tune the "fine adjust" (capacitor Cs) for minimum indicated SWR. If the SWR did not go below 2:1, try changing the transmitter frequency up or down 200 kHz, and try tuning the "fine tuning" control again. The initial tap point should be close, but not necessarily the one that will provide the best bandwidth (lowest indicated SWR over the greatest frequency range). If the resonant frequency is lower than you desire, change the tap position to reduce the amount of inductance—i.e., move the tap a turn or so *away* from the junction of L2 and C2. Conversely, if the resonant frequency of the system is too high, increase the inductance of L2 by moving the tap *toward* the junction of L2/C2.

At some point you should find a tap on L2 that, used in conjunction with the tuning range of Cs, will provide a reasonable bandwidth of 150 kHz with less than a 2:1 SWR. If you fail to achieve these figures, look to the value of C2. You may have to adjust its value (by adding or subtracting capacitance) somewhat to achieve an optimum bandwidth over the part of the band you intend to operate.

40 and 20 Meters: Initially set the tap for nine turns from the end of coil L1 that connects to capacitor C1. This will be your starting point; take note of it. Make sure you have changed the "bandswitching" toggle switches to the 40/20 meter positions. Tune up your transmitter for midband operation on 40 meters (just as you did on 80) at reduced power. Now, as you did before, tune the "fine tuning" control (Cs) for the lowest indicated SWR. As before, if the system seems to be resonant too low in frequency, reduce the amount of inductance—i.e., move the tap away from the junction of coil L1 and capacitor C1. Or if the frequency is too high, move it in the opposite direction. Be sure to run the capacitor through its entire range. The trick here is to find a common tap point on L1 to allow you to work both 40 and 20 meters with *no* additional switching.

Once you have found the proper tap point on 40 meters, you will now proceed up to 20 and make the same checks. *Note:* In my system the antenna tunes rather broadly on 40 meters—i.e., the SWR increases/decreases very slowly as the "fine tuning" is used—while on 20 meters it is *quite sharp* (bat your eye and you might miss the minimum point!).

Setting up this tap on L1 is going to take a little trial and error, but it can be achieved. As was the case on 80 meters, if you cannot achieve the desired good bandwidth on both 40 and 20 meters with tapping L1 and making the last adjustment with the "fine tuning," look to the value of C1. It may have to be changed slightly to achieve the lowest SWR over the widest frequency range on both bands.

With a minimal ground system (two or three radials cut slightly longer than 1/4 wavelength *per band)* it is possible to obtain an SWR of 2:1 or less over the desired operating frequencies. Here again let me remind you that during periods of heavy precipitation the SWR will probably change somewhat as the resonant frequency of the system changes. Retuning the "fine tuning" control will allow the SWR to be reduced to a lower value on most, if not all, bands under these conditions.

This completes the multi-band modifications to the aerial. It may take a little time for you to get accustomed to using the control unit to change bands and tuning for the lowest SWR (match between the 50 or 70 ohm feedline and the aerial on different bands), but you will "get the hang of it." You will probably note that you can use the received signals and background noise on the different bands to set up the tuner initially on the different bands without ever transmitting. Before long you will find yourself hopping from band to band taking advantage of this multi-band aerial. Enjoy! ■

One of the great things about having some sophisticated computer hardware and similar software is that you can generate enormous amounts of data to prove or disprove just about anything. NØAX has done yeoman's service in a Herculean task to substantially prove what each of us truly and secretly believed in our heart of hearts. In order for each of us to be a really successful DXer, each and every one of us licensed amateurs will have to move from our present QTH to someplace else where we might have an edge.

The Ends of The Earth

BY H. WARD SILVER*, NØAX

If there is one thing that DXers all can agree on, it's that each one of them personally lives at the worst spot of anyone for DXing. There is always someone closer to the DX, and thus there are good excuses for not being the first to get through the pile-ups.

This article discusses the process of trying to find just where those extraordinary points may be—the most difficult DX locations of all. While distance isn't always the predominant factor with a particular location in the relative difficulty in making QSOs, it is certainly a major factor and one of the most easily understood. Thus, my quest became to be able to find out who is truly farthest from whom and, conversely, who is closest to all—the Ends and the Center of the Earth!

The Data

In the course of putting together a distance-measuring method for my operator rating system project, I developed an Excel™ spreadsheet that would calculate a matrix of distances in nautical miles between sets of latitude and longitude coordinates. Recently, I edited the CT9.CTY file used by contest logging programs (maintained by AD1C—thanks, Jim!) and shoveled it into the maw of the calculating engine, continent by continent.

The CTY file lists each DXCC Entity and CQ DX country by name, its *CQ* continent, a representative latitude/longitude pair, zone information, and a list of prefixes that a particular entity has been known to use. The zone and prefix info were removed. Dueto the limitations on number of columns, I was unable to do all of the continents in a single table. Therefore, I processed each continent against all entities in a set of spreadsheets. The distance calculation was based on a public-domain spherical distance algorithm from W9IP and N1BWT.

After taking a satisfyingly long time (I love to see a Pentium processor complain about workload.), a prodigious table was created showing, for all of the entities in a given continent, the average, maximum and minimum distances to all of the CTY entities. Man, that's a lot of numbers!

Once the data was calculated, the resulting columns of distances were sorted in order of the average distance. To extract the meaning of the huge table of densely packed numbers, I then processed each list of sorted QTHs into a map-like figure, tracing out a path through each continent from least- to most-distant latitude and longitude pairs. Some of the

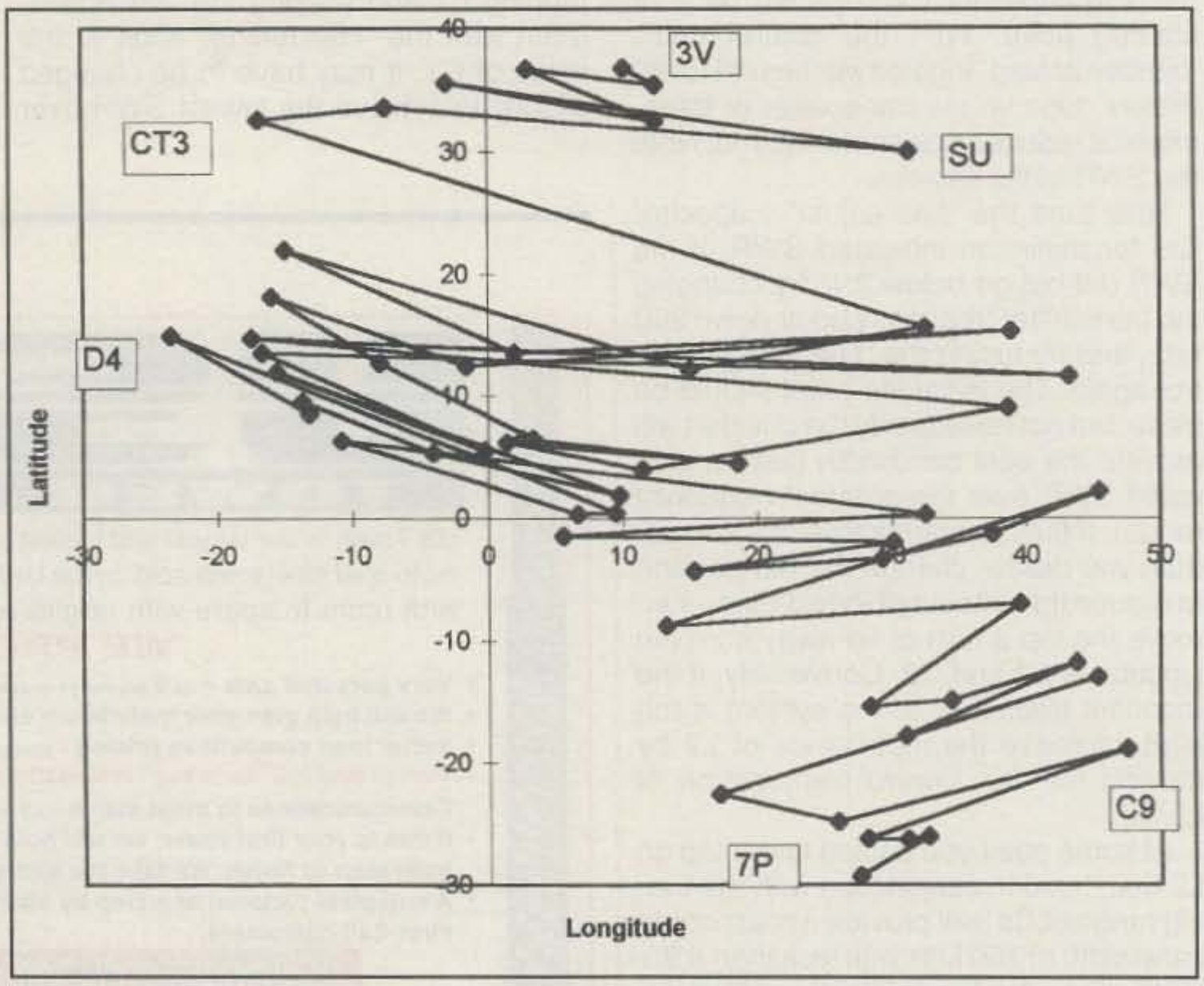


Fig. 1– African traveling distance.

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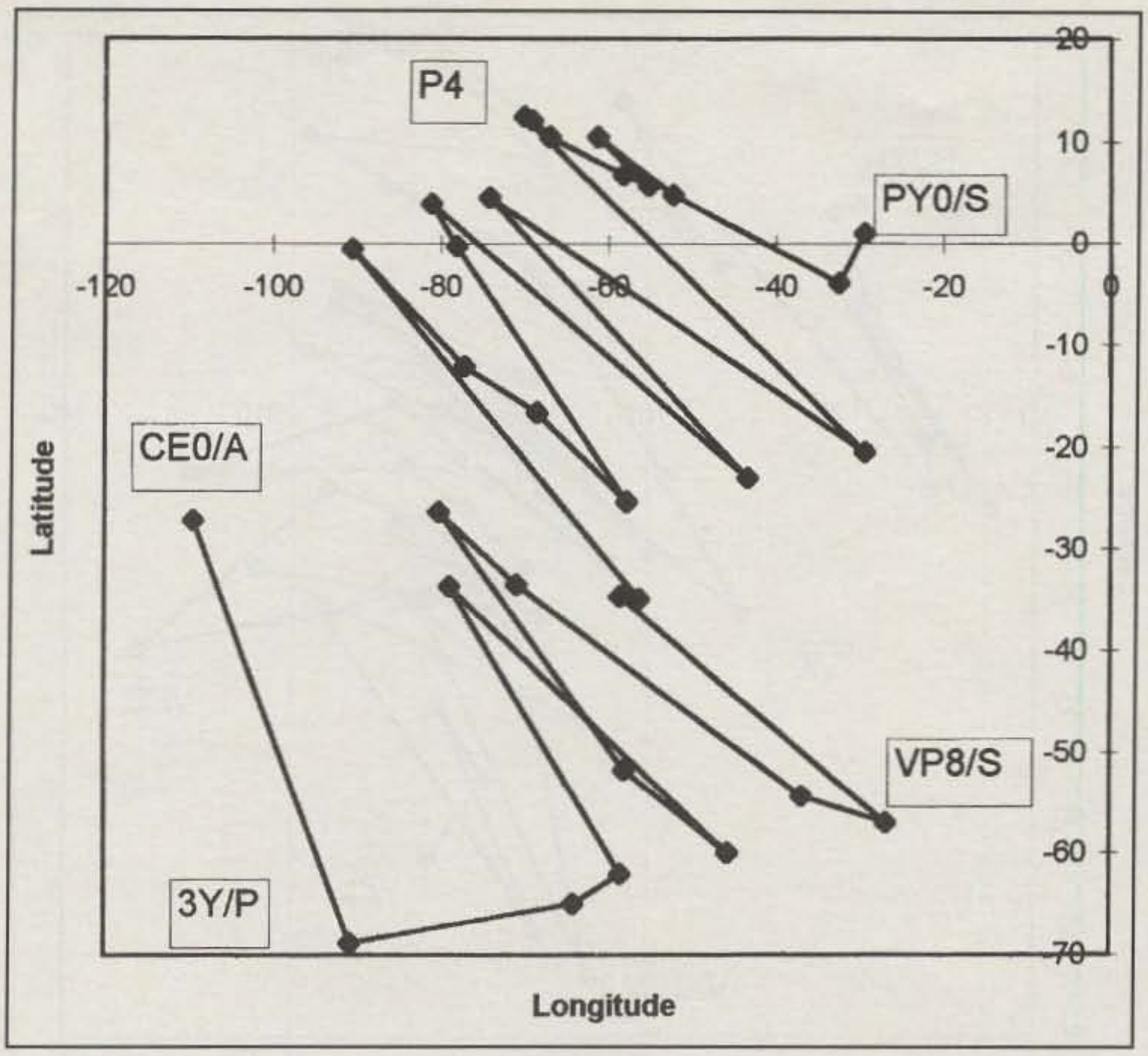


Fig. 2– South American traveling distance.

longitude numbers will look funny on the tracing maps. I had to multiply longitude by –1 or convert to a zero-to-360 degree scale in order to get the results to line up like a conventional map.

Results by Continent

Africa was the first continent analyzed, and I immediately ran into a bit of a conundrum. The Indian Ocean and Atlantic Ocean island entities are a set unto themselves and relatively isolated. These include FR, FR/G-T-J, 3B6-7-8-9, VQ9, 8Q, FT/W-X-Z, VKØ/H, 3Y/B, ZS8, S7, ZD7-8-9, and EA8. They were excluded from the mainland African continental list. Islands closer to the coast—such as S9, FH, D4-6, and 5R—were retained. One would expect the northern coast to be the least distant and that is the case, as 3V, IG9, and 7X are the most neighborly.

As fig. 1 shows, the list moves across northern Africa before zooming back across the continent to the Sudan and the Sub-Saharan and Gold Coast countries. From there, we zig and zag our way down the continent, swinging back and forth like a pendulum.

At the most distant end of the scale, we find ZS, 3DA, C9, and 7P bringing up the rear. ZS6EZ isn't kidding when he talks about feeling isolated in major DX contests! If the islands are also included, EA8 is the closest of the lot and lonely Heard Island is all alone in last place. I wonder why Martti and Ville go to the Canaries and not Heard, HI.

A look at South America (fig. 2) reveals an almost mirror image of Africa. PYØ/S, nearly on the equator, leads off and then the distance gradually increases as we race back and forth, finally winding up on Easter Island, CEØA. Easter is more isolated than even the Shetlands, Antarctica, and Peter I. (I added the Antarctic entities into the mix, since they seemed kind of lonely.)

Oceania (fig. 3) has two interesting phenomena buried in the island-hopping. Scarborough Reef, BS7H, leads off as the least distant, and a hopscotch through Southeast Asia moves farther and farther to the southeast. Then a curious thing happens. Notice the large easterly jump from YJ to VP6 just to the lower right of center, touching down on Pitcairn and then leaping back to the northwest to land on the North Cooks. Pitcairn is so far to the east that the relative proximity of the South American countries start to have an effect. Almost at the bottom of the list, ZL8 and ZL9 have another subtle surprise: They're far enough south that the average is skewed in favor of the over-the-South-Pole route to the more numerous northern countries. Of the more populous entities in Oceania, New Zealand is the most distant and Chatham, ZL7, is the very farthest.

Speaking of those more numerous northern countries, it sure is starting to look as if our reference point is somewhere east of Asia and north of Africa. What continent lies in that direction, I wonder? Let's finish the lot with the Asian and North American continents, shall we?

Asia (fig. 4) doesn't surprise us. Turkey is least distant and the averages gradually increase in a semblance of order as we move toward the Pacific Rim. James, 9V1YC, once told me that Singapore is the Contest Black Hole of Asia and the data bear him out Only Ogasawara, JD1/O, has a longer distance to travel. Japan, with all the many active DXers, is the fifth-most distant.

Moving to the North American continent (fig. 5), we see a familiar pattern as the trace starts in VO1 and stutter-steps in arcs to the southwest. To spice up the data set, all of the U.S. states and Canadian provinces are analyzed along with the regular DXCC entities. Maine is the most-blessed U.S. state, less distant on average than even VP9 out in the middle of

Continent	Entity	Average Distance (mi)
Oceania	Chatham Island, ZL7	7957
South America	Easter Island, CEØ/A	7251
Africa (including islands)	Heard Island, VKØ/H	6661
North America	Clipperton Island, FO/C	6602
Asia	Ogasawara, JD1/O	6120
Africa (mainland)	Lesotho, 7P	5676
Europe	Franz Josef Land, R1FJ	5055

Table I– Ends of the continents.

Continent	Entity	Average Distance (mi)
Oceania	New Zealand, ZL	7857
South America	Chile, CE	6608
North America	California, W6	6262
Asia	Japan, JA	6241
Africa	South Africa, ZS	5602
Europe	Iceland, TF	4789

Table II– The most distant populated places.

Continent	Average Distance (mi)
Oceania	7287
South America	6217
North America	5401
Asia	5377
Africa (all)	5241
Africa (mainland)	5046
Europe	4540

Table III– Average entity-entity distance for each continent.

Entity	Average Distance (mi)
Chatham Island, ZL7	7957
New Zealand, ZL	7857
Kermadec Islands, ZL8	7838
Campbell Islands, ZL9	7809
South Cook Islands, ZK1/S	7758

Table IV– The top five most distant places of all.

the Atlantic! The W6's can now begin to lament, as they are the farthest away, even behind Mexico. Only Revilla Gigedos and Clipperton island are lonelier.

The Center of the Earth

A drum roll, please! It is not entirely surprising that with the densely packed European map some QTH in Europe (fig. 6) is the least distant from everywhere—everywhere being the CTY list, that is. But where in Europe? Croatia, that's where! 9A lies buried in the tangle at the center of the map, followed by Slovenia S5, San Marino T7, and Bosnia-Herzegovenia T9. Is there a large red-and-white striped barber pole in the capital with a large plaque announcing the "Center of the World"? It seems like that might be a good project for an enterprising Croatian club!

The Ends of the Earth

On our journey we bumped into several candidates for being considered an "end." Table I shows the absolute hinterlands of each continent in order. None of the hinterlands has much in the way of a resident amateur population, so it seems appropriate to list the most distant populated areas on each continent so that the truly disadvantaged DXers may validate their plight (Table II). New Zealand has it the worst by a substantial margin—nearly one hop farther on average than any other population center on earth. If one considers that a hop costs around 20 dB or 3 S-units, it seems a wonder that the ZL DXers work anything through a pileup! Californian and Japanese DXers can share a cold beer and commiserate on their nearly equal isolation at the far shoulders of their respective continents.

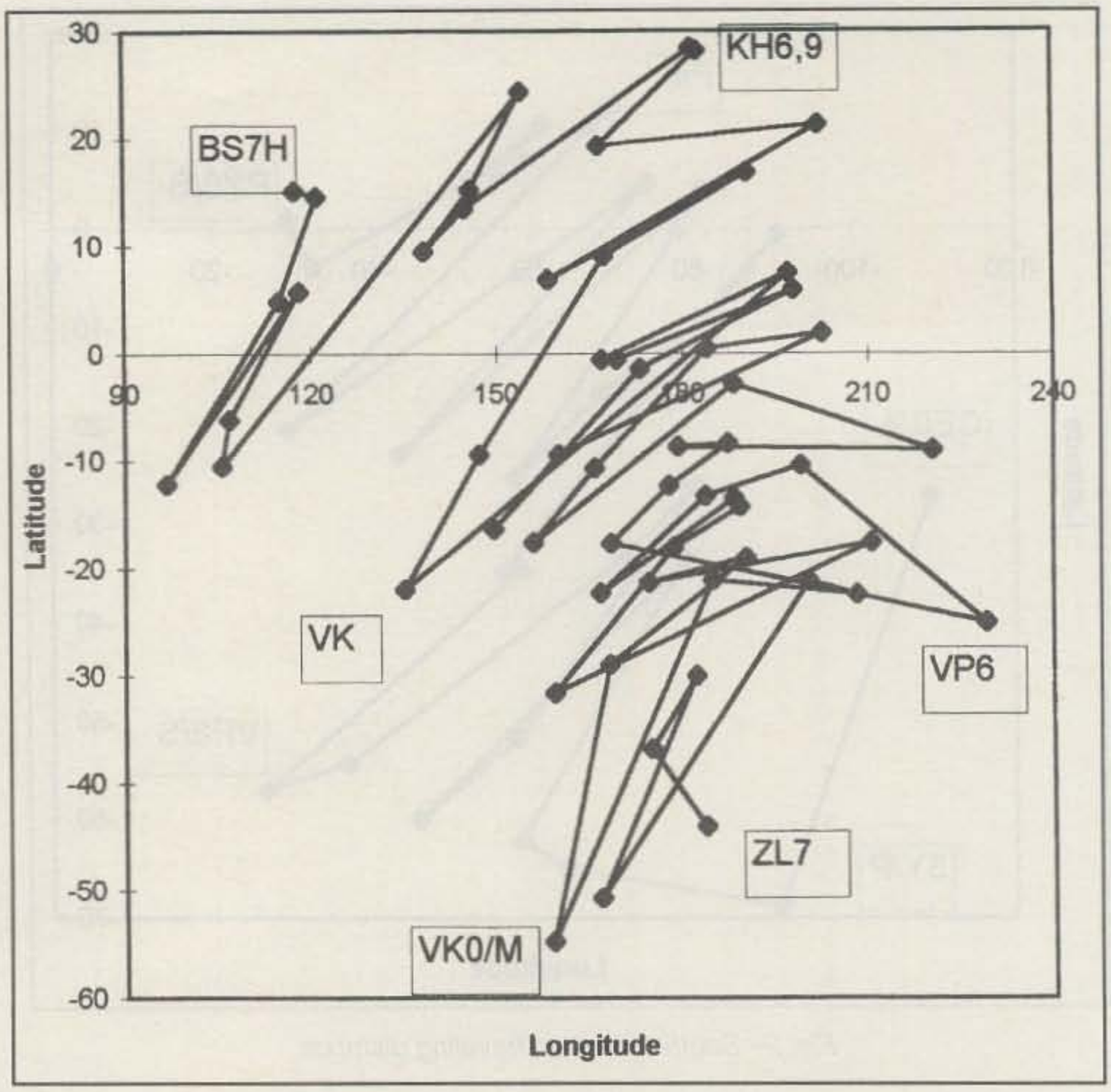


Fig. 3– Oceania traveling distance.

Entity Pair		Distance (mi)
Heard Island, VKØ/H (AF)	Saskatchawan, VE5 (NA)	12412
Burkina Faso, XT (AF)	Rotuma, 3D2/R (OC)	12401
Taiwan, BV (AS)	Paraguay, ZP (SA)	12393
Gibraltar, ZB (EU)	New Zealand, ZL (OC)	12373
Clipperton Island, FO/C (NA)	Chagos Island, VQ9 (AF)	12200
Easter Island, CEØ/A (SA)	Pakistan, AP (AS)	12176
Ogasawara, JD1/O (AS)	Brazil, PY (SA)	12030
Chatham Island, ZL7 (OC)	Croatia, 9A (EU)	11838
Lesotho, 7P (AF)	Hawaii, KH6 (OC)	11788
Franz Josef Land, R1FJ (EU)	Peter I Island, 3Y/P (SA)	11433

Table V– The longest of short paths.

age distances for entire continents (Table III). Which is the most remote when taken on a continental basis? As Table III suggests, the absolute, most remote, farthest flung places on the face of the DXer's Earth are found in the continent of Oceania. Beginning with ZL7 at 7957 miles and wending our way west to VK at 7263 miles (measured from the big cities in the southeast) there are 38 entities at the top of the list of distances before we encounter the first non-Oceanian entry—Easter Island, CEØ/A at 7251 miles average distance and still in the Pacific. In fact, two thirds of the entire Oceania roster outdistances all others! Oceania is a pretty tough place from which to bag DXCC or post a big contest score. Of those 38, the top five are shown in Table IV.

To find the worst-case separations, I looked for the "ends" for the "ends." Table V is a list of the pairs of entities that lie farthest from each other on each continent and from the previously identified continental hinterlands. That VE5-VKØ/H path (and all the others) is a monster; long path is only 172 miles farther on a 25,000-mile full-circle path! There are no other land-to-land paths on Earth that are longer. If these QSOs are not real DX, I don't have a clue what is. (I'm intentionally ignoring that the Earth is fatter at the equator, mak-

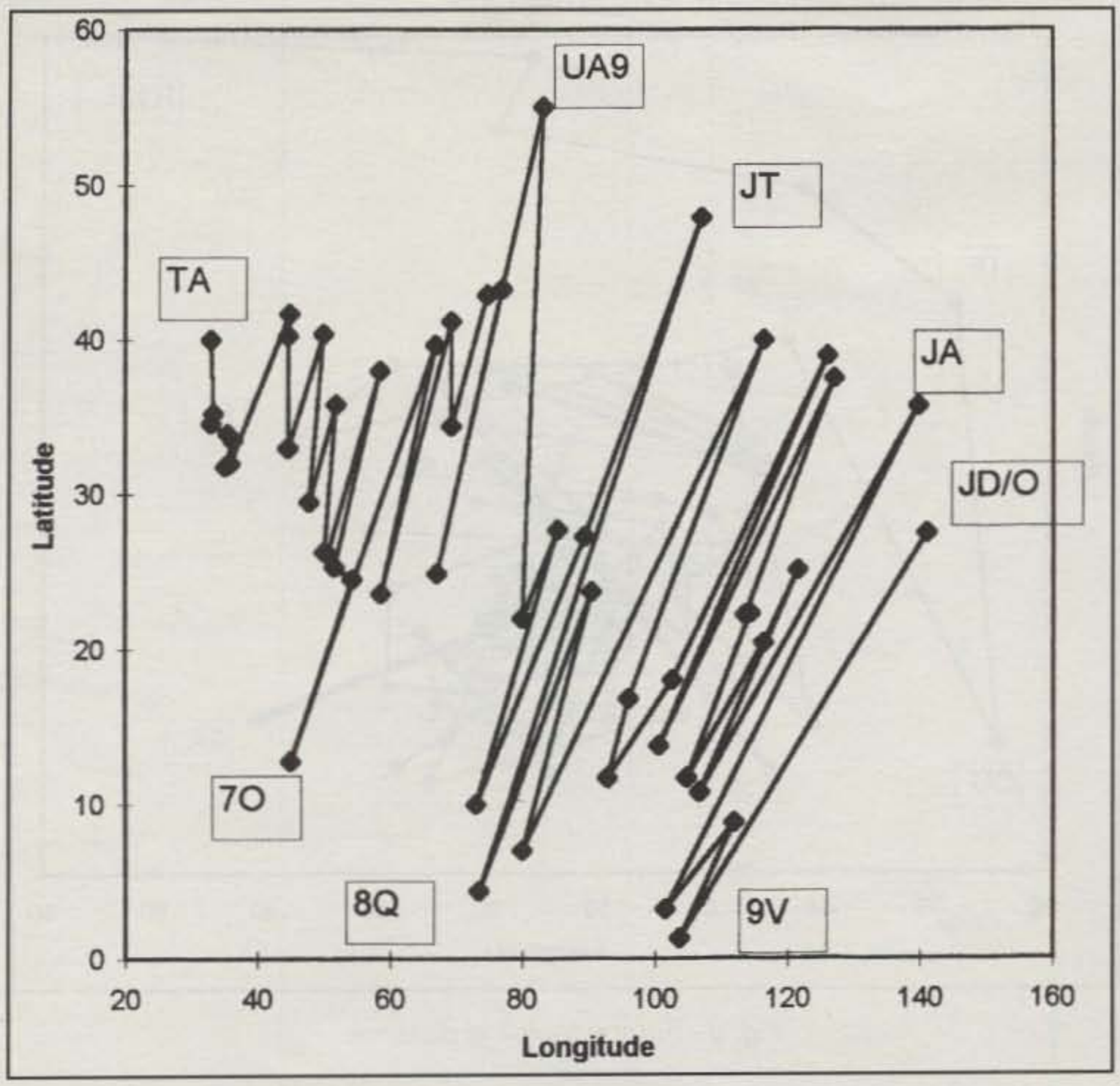


Fig. 4– Asian traveling distaance.

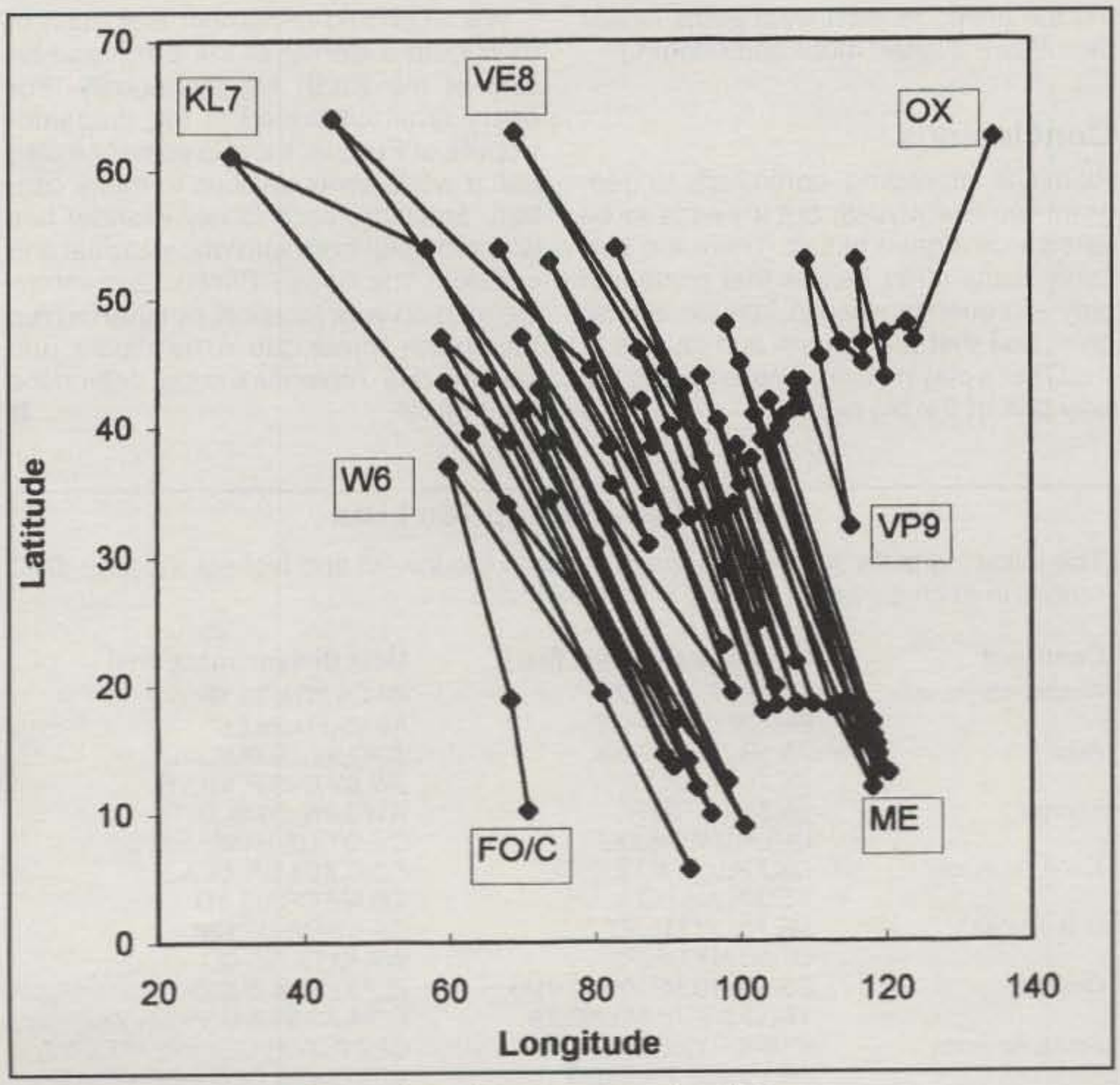


Fig. 5– North American traveling distance.

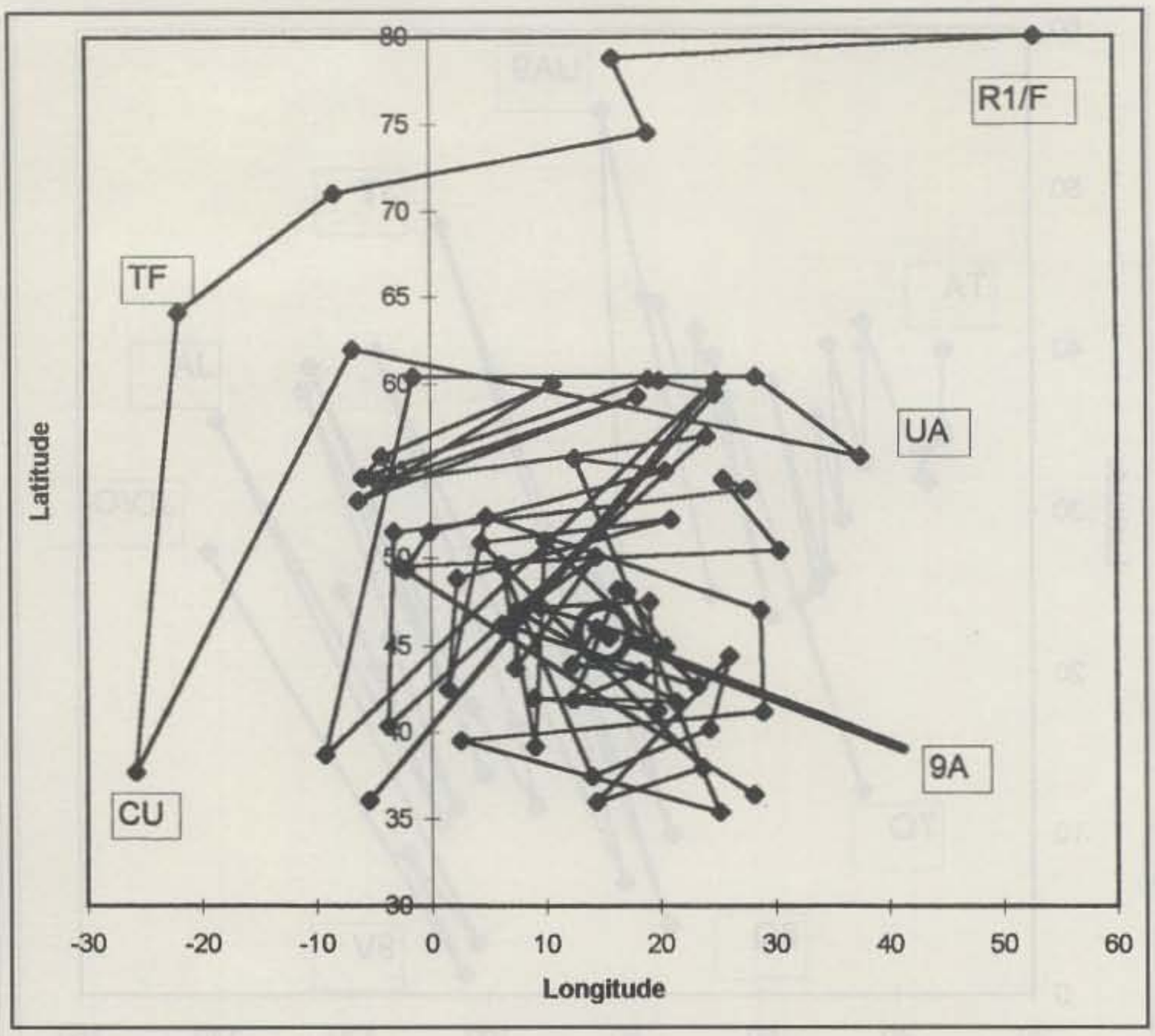


Fig. 6– Europe traveling distance.

ing the antipodal east-west paths longer than those aligned more north-south.)

Conclusions

All this is interesting, particularly to geographiles like myself, but it needs to be taken with a grain of salt. There are certainly many other factors that come into play—frequency, season, latitude, and so on— and that put bumps and valleys in the DXer's playing field. These figures are only part of the big picture.

We all should remember that each of us is both a Center of the Earth and an End of the Earth simultaneously. For every amateur buried in the megametropolis of Europe, there is someone else half a world away anxious to make contact. Similarly, each lonely islander has islander neighbors with whom to chat and consider "the locals." Print out a great circle map on your location, put that big red thumbtack smack dab in the middle, and spin the dial. Adventure is just behind the front panel. ■

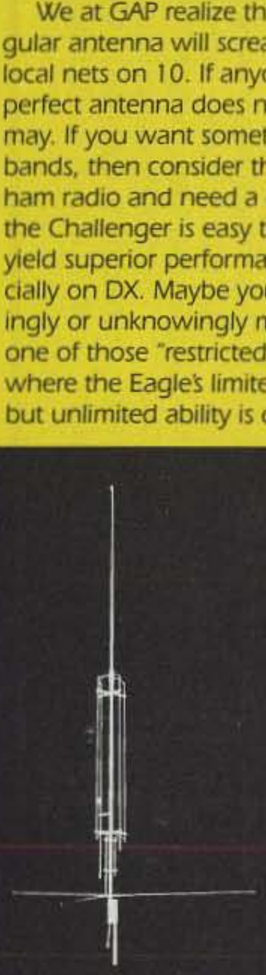
Appendix—The Top Ten Lists

The following table shows the ten entities with the lowest and highest average distances in each continent.

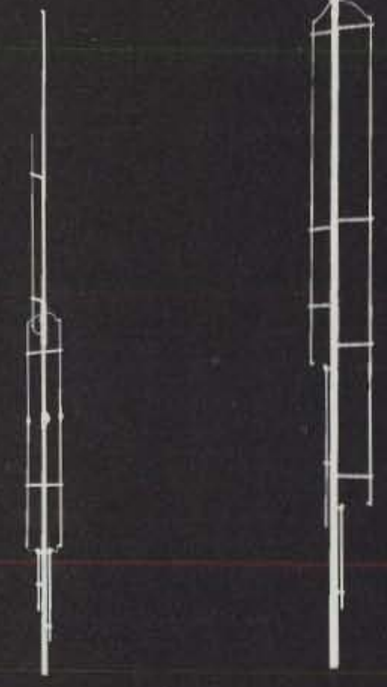
Continent	Least Distant (least first)	Most Distant (most first)
Africa (mainland)	3V,IG9,7X,5A,EA9, SU,CN,CT3,ST,TT	7P,C9,3DA,ZS,5R, A2,V5,FH,Z2,D6
Asia	TA,5B,ZC4,OD,YK, 4X,JY,4L,EK,YI	JD/O,9V,1S,9M2,JA, 3W,BV,BV9/P,XU,VR
Europe	9A,S5,T7,T9,HV, I,1A,4U1V,OE,OM	R1FJ,JW,JW/B,JX,TF, CU,OY,UA,R1MV,GM/S
North America	OX,FP,VO1,CY9,CY0, PEI,NS,NB,PQ	FO/C,XF4,CA,XE,AZ, TI9,NV,OR,UT,TG
U.S. States	ME,NH,RI,MA,VT, CT,NJ,NY,DE,PA	CA,AZ,OR,UT,NM, WA,ID,TX,NE,CO
Oceania	BS7/H,DU,V8,VK9/C,9M6, YB,VK9/X,JD/M,KH0,T8	ZL7,ZL,ZL8,ZL9,ZK/S, FO/A,A3,VK0/M,VK9/N,ZK2
South America	PY0/S,PY0/F,FY,9Y,PZ, 8R,YV,PJ2,P4,PY0/T	CE0/A,3Y/B,CE9,VP8/H,CE0/Z, VP8/O,VP8,CE0/X,CE,VP8/G

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."

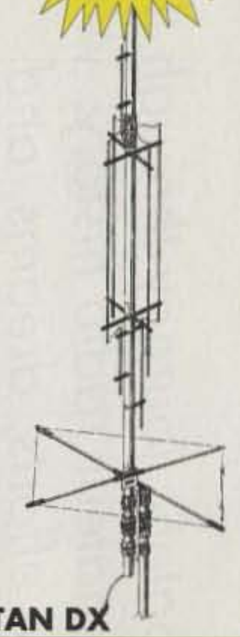
73–"This is a real DX antenna, much quieter than other verticals."

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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This month we're starting a paripatetic journey through the annals of communications and amateur radio history. W8FX introduces us to luminaries whose efforts, dreams, and imagination have coalesced through time to bring us to where we are today.

Those Unsung Radio Maestros—Part I

BY KARL T. THURBER, JR.*, W8FX

"Wireless," or radio, is the communication of information between distant points using radio waves. Interest in wireless goes back to Samuel F. Morse's invention of the telegraph in 1837, which required wires—an expensive proposition. A number of physicists, mathematicians, practical experimenters, and others wondered about sending signals through the air. Could it work?

In 1867 a Scot, James Clerk Maxwell, conceived the electromagnetic theory, which is fundamental to wireless. His theory held that light, electric waves, and magnetic waves of varying frequency travel through the same medium. In 1887 the eminent Heinrich Hertz was able to confirm Maxwell's theory.

Surprisingly, you'll find many have been given credit, or partial credit, for the "invention" of wireless, or radio, or for the development of some of its aspects. They include Guglielmo Marconi (often considered to be *the* inventor of radio), Edwin Armstrong, Lee Deforest, Thomas Edison, Sir Alexander Fleming, Heinrich Hertz, Nikola Tesla, and others. Their efforts are well known. But what about some of the *other* contributors whose names survive today only as relatively obscure historical footnotes?

This article profiles a number of important but mostly lesser-known visionaries and experimenters—unsung radio maestros—who either claim to have invented radio or contributed significantly to the development of radio communications. Relatively obscure but interesting and important personalities such as Alexanderson, Beverage, Collins, Gernsback, Fessenden, Jansky, Loomis, Maxim, Popov, Sarnoff, and Stubblefield are profiled. The contributions of each are indicated, as are significant and unusual aspects of their lives and times. Let's take a look at them in alphabetical order rather than in any order of assumed importance to radio's development.

*289 Poplar Drive, Millbrook, AL 36054-1674

In this historic postcard, Sweden's King Gustav V presides over ceremonies opening Grimeton Station on July 2, 1925. The king arrived by car from the local railway station accompanied by the station's builder, Dr. Ernst F. W. Alexanderson.

Ernst F. W. Alexanderson An Extraordinary Swede

No one claims that the Swede *invented* radio as a practical means of wireless communication, but he nevertheless was quite an inventor. Dr. Ernst F. W. Alexanderson (1878–1975) was an electrical engineer born in Uppsala, Sweden. He came to the U.S. in 1901 to work at General Electric (GE). There he developed many inventions, patenting some 344 of them. He later was chief engineer at the Radio Corporation of America (RCA).

From 1904 he developed special alternators for low frequency (LF) and very low frequency (VLF) radio communications. These transmitters were widely used for transatlantic radio communication during and after World War I.

The "Alexanderson Alternator" was established in Sweden in 1925. It was, and still is, known as Grimeton Station, call-

sign SAQ, the "great radio station." This arguably oldest VLF station was a large, electromechanical sender with a high-speed rotor connected *directly* to its antenna. It broadcast without using tubes; the frequency was generated by an alternator somewhat like an automotive unit, but much larger. The antenna system also was gigantic; it had six 127 meter high towers, spaced 380 meters. On the top of each tower was a 50 meter long T-arm used to carry the 12 wires feeding the six vertical antennas. Power to the antenna system was about 200 KW.

GE and RCA built 20 units for worldwide coverage, including one on Long Island, New York, and another at New Brunswick, New Jersey. Today only Grimeton exists, with the alternator itself part of a museum complex. It actually transmits on ceremonial occasions on 17.2 kHz, using the callsign 7S6SAQ.

Harold Henry Beverage
The Genius at Riverhead

Harold Henry "Bev" Beverage, ex-W2BML (1893–1993), was a radio pioneer involved with antennas and transoceanic radio communication. His nickname comes from his time with RCA at Riverhead, New York, the location of the first full-scale "wave antenna," which we'll note shortly.

Beverage became interested in wireless and with his homemade receiver picked up signals from the *S.S. Carpathia*, a *Titanic* rescue ship. His fascination with wireless led him to study electrical engineering at the University of Maine, where he graduated in 1915. Bev's first job was with GE at Schenectady, New York, and in 1916 he was transferred to Dr. Alexanderson's laboratory.

In 1920 Beverage erected a full-size antenna on poles for further study. From it evolved the "wave" or "Beverage" antenna, destined to become the standard for longwave receiving. This type of antenna uses wires on, near, or slightly below ground level. In fact, the Beverage antenna is simply a wire near the ground running in the direction of the desired station and terminated at the far end in a resistance to ground equal to the characteristic impedance of the line, normally around 500 ohms. The length of a Beverage can range up to thousands of feet for longwave reception—the longer the wire, the stronger the signal.

The wave antenna was named for Beverage by amateur radio operator Paul Godley, 2XE, who was sent to Britain by the American Radio Relay League (ARRL) during the famed amateur transatlantic tests of 1921. There he used a wave antenna for reception of the American signals, including those of Beverage's station, 2BML. Godley so named the antenna because it "extracts energy" from the wave as it travels down the wire.

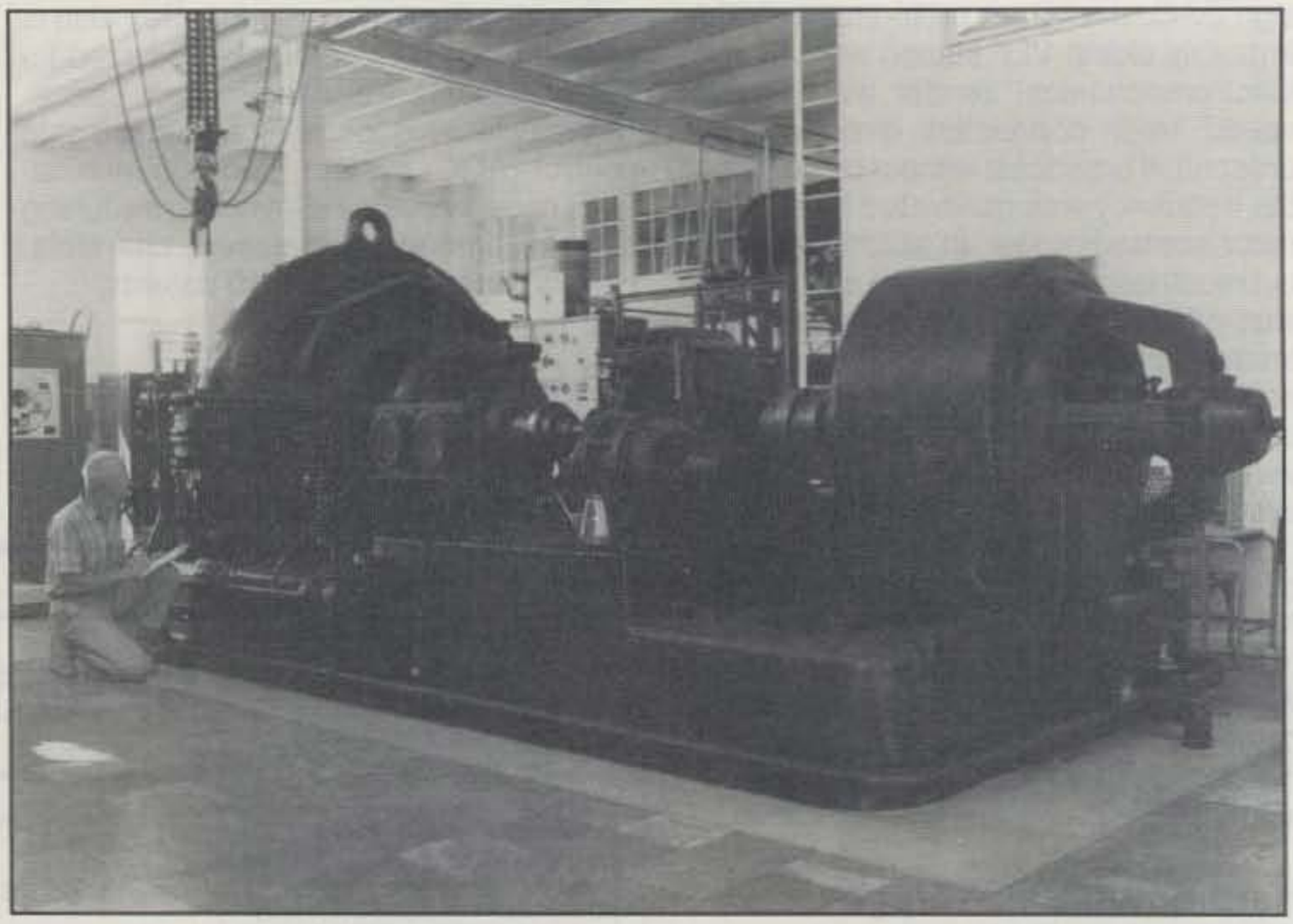
Besides the wave antenna, Bev also is credited with development of noise reduction systems, frequency- and space-diversity techniques, a TV automatic gain control (AGC) system, and communications security systems involving switching signals among multiplexed channels. He's credited with some 40 patents.

Art Collins, WØCXX
The Cedar Rapids Giant

The genius of Arthur Andrew Collins, WØCXX (1909–1987), who founded Collins Radio Company in 1933 in Cedar Rapids, Iowa persists today in the avionics systems developed by the Collins divisions of Rockwell.

True, you can't claim that Art Collins invented *radio*. But he did invent, design, and produce countless *radios* that greatly facilitated practical radio communications. In fact, Collins amateur radio equipment long has been the gold standard used for reliability and performance. And Collins-made single sideband (SSB) products have long been used by the U.S. military.

At about the age of nine, Art Collins



The Alexanderson Alternators, designed by Sweden's Dr. Ernst F. W. Alexanderson, were intended for worldwide communications; only one is left. The device is a large, electromechanical high-frequency alternator with a high-speed rotor connected directly to an antenna. Today Grimeton Station broadcasts on ceremonial occasions on 17.2 kHz. (Photo courtesy Telia AB, Sweden)

became deeply interested in radio. The apocryphal story is told that when a lightning strike claimed his first crystal radio set, he built another from an oatmeal box, a spark coil from a Model T Ford, chunks of coal, and the glass bar from a towel rack!

The old Federal Radio Commission (FRC) set up a system whereby radio amateurs could obtain licenses. Art passed his licensing test in 1923 at the

Hiram Percy Maxim cofounded the American Radio Relay League (ARRL) in 1914. He was revered highly in the amateur community as "The Old Man" for his incisive observations of radio operating practices. Maxim's radio callsign, W1AW, was awarded by the FCC to the ARRL after his death. (Photo courtesy ARRL)

age of 14. At 16 he was asked to write a technical article for *Radio Age* magazine; it appeared in the May 1925 issue. He completed his electronics education at Amherst College, Coe College, and the University of Iowa.

When the depression hit in 1931, the then 23-year-old Collins turned his hobby into a vocation, producing radio transmitting equipment primarily for other amateurs. This milestone marked the first time radio transmitting apparatus was available for purchase as fully assembled and working units.

At the time, most amateurs had their equipment scattered around a basement or attic room where the sight of tubes and wires wouldn't clutter their home. Collins's amateur gear eliminated the clutter by packaging the equipment in neat units. An article in the *New York Times* reportedly quoted an amateur of the day as saying, "Collins brought us up from the cellar and put us into the living room." Thus the vision and industrial philosophy of "Collins quality" was established early on.

The first Collins advertisement appeared in the January 1932 issue of *QST*, the ARRL's journal, with the firm name given as Arthur A. Collins. In March 1932 it changed to Collins Radio Transmitters. By December it was the Collins Radio Company. In 1933 Collins Radio moved out of the basement factory.

Business in general in 1933 was not good, but radio had come of age and Collins prospered. Art Collins directed his company for more than 40 years. After leaving Collins Radio in 1972, he formed a new firm, Arthur A. Collins, Inc., based in Dallas, to conduct engineering studies. Art Collins passed away in 1987, ending an era.

Reginald Aubrey Fessenden The Forgotten Canadian

The Canadian-born American physicist and electrical engineer Reginald Aubrey Fessenden (1866–1932) also is known for his pioneering wireless work. It rivals that of Marconi, and so he is called by some "the father of modern radio." This is because in 1906 he is said to have broadcast the first program of music and voice ever transmitted over long distances.

After a stint as an educator in Bermuda, Fessenden worked for Thomas Edison, whom he met in New York in 1886, and later for George Westinghouse. He became a professor at the Western University of Pittsburgh (now the University of Pittsburgh). Here he began working on radio communications.

Early on, all radio communication was by Morse code. In 1900 Fessenden realized that Marconi's work of about five years past was limited to telegraphy: he wanted to transmit and receive telephony (voice). Fessenden devised a method of making sound waves modulate the amplitude of a radio-frequency (RF) carrier wave. This was amplitude modulation (AM), and it let him broadcast the first radio program of speech and music.

To accomplish this feat, Fessenden directed the famed Ernst Alexanderson of GE in building a 50,000 Hertz alternator at Brant Rock, Massachusetts. On December 24, 1906 wireless operators as far away as Norfolk, Virginia heard speech and music from Brant Rock.

Fessenden also is credited with inventing the heterodyne effect (the heterodyne system of radio reception). He held over 500 patents, including ones for a high-frequency (HF) alternator, fathometer, sonic depth finder, and submarine signaling device. However, a rift grew between

Fessenden and his backers; after a court fight, RCA acquired most of his remaining patents.

Following World War I, President Wilson ordered all radio companies and patent holders to join the new RCA consortium. Fessenden was left out, and he sued the consortium, winning a $2.5 million settlement. The terms appear to confirm the legal recognition of his feats. But Fessenden died in 1932 with little recognition by the public. In the view of some, Fessenden should receive equal billing with Marconi for "father of modern radio" status, or at the least much more credit than he has received.

Hugo Gernsback
The Genius of Fulton Street

The public probably knows Hugh Gernsback (1884–1967) more as a science fiction writer than as an editor, publisher, and inventor. He's best known for his founding of *Amazing Stories* in 1926, the first magazine devoted to "scientifiction" (as he called it), a new genre of fiction based on science fantasy. Other science fiction and fantasy magazines followed, and eventually science fiction became an established field of imaginative writing.

The prestigious Hugo Award, named for Gernsback, was established in 1955 to honor science fiction authors, illustrators, and publishers. It still is awarded yearly, and among its recipients have been premier science fiction writers Isaac Asimov, Arthur C. Clarke, Ursula K. LeGuin, and Frank Herbert.

Born in Luxembourg, Gernsback emigrated to the U.S. in 1904. In 1908 he founded *Modern Electrics*, arguably the first radio magazine. He founded several other radio magazines and established his own technical publishing house that still bears his name, which currently publishes *Popular Electronics* and *Electronics Now*. These publications trace their lineage to earlier, classic Gernsback magazines, including *The Electrical Experimenter* (1913), *Radio News* (1918), and *Radio-Craft* (1929).

Gernsback also was a radio inventor and merchant. He offered his first invention, a dry-cell battery, as well as a wireless transmitter and receiver, at his "great emporium of the amateur world," the Electro-Importing Company. Gernsback's store was in what later was known as New York's Radio Row, on Fulton Street in lower Manhattan. (Sadly, little remains of Radio Row today. The World Trade Center occupies the district now.)

Gernsback's well-stocked radio store arguably was the first one in the U.S. to sell wireless apparatus directly to the public. His shop also was a place where boys could see wireless apparatus close-up and learn something about building their own equipment.

Karl G. Jansky
Scanner of the Radio Skies

Radio astronomy as a field is little over 65 years old, having its beginnings in 1931–1932. Although he certainly didn't invent radio as a communications medium, the Oklahoman radio engineer Karl Guthe Jansky (1905–1950) is one of the recognized early pioneers in the allied field of radio astronomy.

Jansky is said to have initiated the field of radio astronomy when he detected radio waves coming from various places in the Milky Way galaxy while investigating shortwave radiotelephone static and interference for Bell Laboratories in 1928–1931. His published papers (1933–1935) established that the "star-noise" radio disturbances at 20.5 MHz actually were radiation sources that originated extraterrestrially, in distant space. At the time, this was a novel idea, indeed.

Jansky didn't locate a specific source of the static and interference. However, he did note that as he turned his large Bruce Curtain antenna toward the plane of the Milky Way, he recorded an increase in static. He concluded that the source of the interference was coming from the direction of the center of the Milky Way. This discovery led to investigations that today have taken astronomy billions of light years beyond the capability of optical telescopes. The jansky, a unit of radio emission strength, now honors his work, although at the time his exploratory work took many years to be recognized.

In the late 1940s it was found that the radio waves picked up by Jansky and fellow radio astronomer Grote Reber, W9GFZ (1911–), came not only from the "nearby" Milky Way, but also from more distant points. Remarkably, this was so even though there were no visible stars at these points—it was not until 1952 that these "radio stars" were correlated with visible objects. Even then, the objects

were so faint that only the largest optical telescopes could find them. Today, advances in radio astronomy are unlocking many of the mysteries of the universe, and much is attributable to Jansky's pioneering work in the field.

Mahlon Loomis
The Real Father of Radio?

Dr. Mahlon Loomis (1826–1886), a Washington, DC dentist, is asserted by some to have been a major contributor to the development of wireless communication. Almost forgotten today, his wireless experiments could have been more important had it not been for the poor economy of his day. He never had the financial backing needed.

In 1868 Loomis experimented with wireless communications by transmitting and receiving telegraph messages using the Earth's atmosphere as a conductor. His system involved conducting large currents of electricity through salt-water puddles and kites flown by wires, conveying a signal for miles through the ether using "natural electricity."

Loomis sent up kites about 18 miles apart from two West Virginia mountaintops. The kites were covered with a copper screen as aerials and were connected to the ground with copper wires. The wire from each kite string was connected to one side of a galvanometer; the other side was held by Loomis, who was ready to make a connection to a coil buried in the Earth. The receiving station connection, between the meter and the buried coil, was always closed, and whenever the circuit was closed at the transmitting end, the receiving station galvanometer dipped.

Loomis was granted the world's first wireless patent for an "Improvement in Telegraphy" on July 20, 1872. Congress also awarded but didn't fund a large research grant, and it balked when asked to help set up experimental stations in the Rockies.

Although his work may not have been a true "Hertzian wave application," relying more on induction (or so say his critics), his work *did* constitute transmission and reception of a manmade signal predating Marconi's work by decades. It might have been exploited had the world realized the potential. Instead, Loomis fell into obscurity, his contributions were forgotten, and he died in the opinion that he was a failure. However, there was belated recognition in July 1998, when the Library of Congress publicly displayed an exhibit of Mahlon Loomis manuscripts.

Hiram Percy Maxim
The Father of Amateur Radio

Hiram Percy Maxim didn't invent *radio* itself, but he almost singlehandedly created *amateur radio* as a hobby. Around Maxim, an intrepid radio hobbyist, swirls the legend of "The Old Man," or "T.O.M." This is a reference to Maxim, who, with Clarence D. Tuska, cofounded the ARRL in 1914. As the "father of amateur radio," Maxim was the League's president for 22 years until his death in 1936. His callsign, W1AW, was awarded to the ARRL for its headquarters station in his memory.

Maxim was a feisty, straight-arrow standards-setter who was revered in the amateur community. Many "T.O.M. stories" grew up around his accomplishments, principles, and philosophies. Even today, some older amateurs judge controversial developments in the hobby by asking themselves, "What would The Old Man think about that?" And, the proword "old man," or "OM," by which radio amateurs routinely refer to each other over the air, is at least partly derived from this old-time amateur tradition.

Maxim also is closely associated with the symbology of the "Wouff Hong." A mythical instrument of torture, it was mentioned in humorous stories in Maxim's "Rotten Radio" series in the ARRL's journal, *QST*. In the January 1917 issue, T.O.M. referred to the Wouff Hong for the first time, discussing it in his article "Rotten QRM," referring to unnecessary interference by poor operators (whom today's radio amateurs would call "lids").

From this mystical symbol emerged the Royal Order of the Wouff Hong, a sort of radio amateur secret society symbolizing an inner circle of the League. Initiations still are conducted during major ARRL radio conventions at the stroke of midnight.

(To Be Continued)

BY IRWIN MATH, WA2NDM

MATH'S NOTES

WHAT'S NEW AND HOW TO USE IT

Some Interesting New Products

From time to time we scan the literature to bring you up to date on some of the very latest components for your experimentation. This month is one of those times, so here are some goodies we found.

For the ultra-high-frequency fan there is a revolutionary development. Siemens Semiconductor has announced the world's first 45 GHz (yes, gigahertz—1000 MHz) bipolar transistor. And if that's not enough, the device has a noise figure of 0.95 dB and a gain factor of 23 dB (at 1.8 GHz)! The BFP520 can also deliver up to 15 dB of gain at 6 GHz and is great for front-ends and other microwave work. Remember those large, low-noise cooled devices of only a few years ago?

Other pertinent specifications are a collector-to-base capacitance of 0.06 pF, a collector-to-emitter breakdown of 3 volts, and an operating temperature range of –65 to +150 degrees C. The device is a silicon bipolar transistor (not an FET) in a tiny surface-mount SOT343 package. It is shown schematically in fig. 1. You will note that it is designed specifically for conventional common-emitter amplifier use. However, the BPF520 can be used as an oscillator all the way up to 45 GHz.

For further details on this device and its lower frequency cousins you can contact Siemens at <www.siemens.com> on the web. We unfortunately do not have prices at the time this is being written.

Those of you who are familiar with or have used the MAR and ERA amplifiers from Mini-circuits will be interested in a new pre-packaged amplifier the company has announced. The HELA-10 has a gain of 12 dB over the range of 50 to 1000 MHz, flat to within ±0.4 dB, and will provide up to 1 watt of RF output over the same range. Operating from 12 volts DC at roughly 1.5 amperes, the device is designed for use with 50 or 75 ohm input and output matching transformers (also available from Mini-circuits) and should be great for QRP projects from 6 meters up. Cost is $19.95 in single quantities. Full details can be obtained from the company at <www.minicircuits.com>.

Along the same lines are a couple of low-cost amplifiers from ST Microcircuits, a division of SGS-Thompson Microelectronics. The TSH 690 and TSH 691 are 8- pin DIPs that can provide 28 dB of gain and

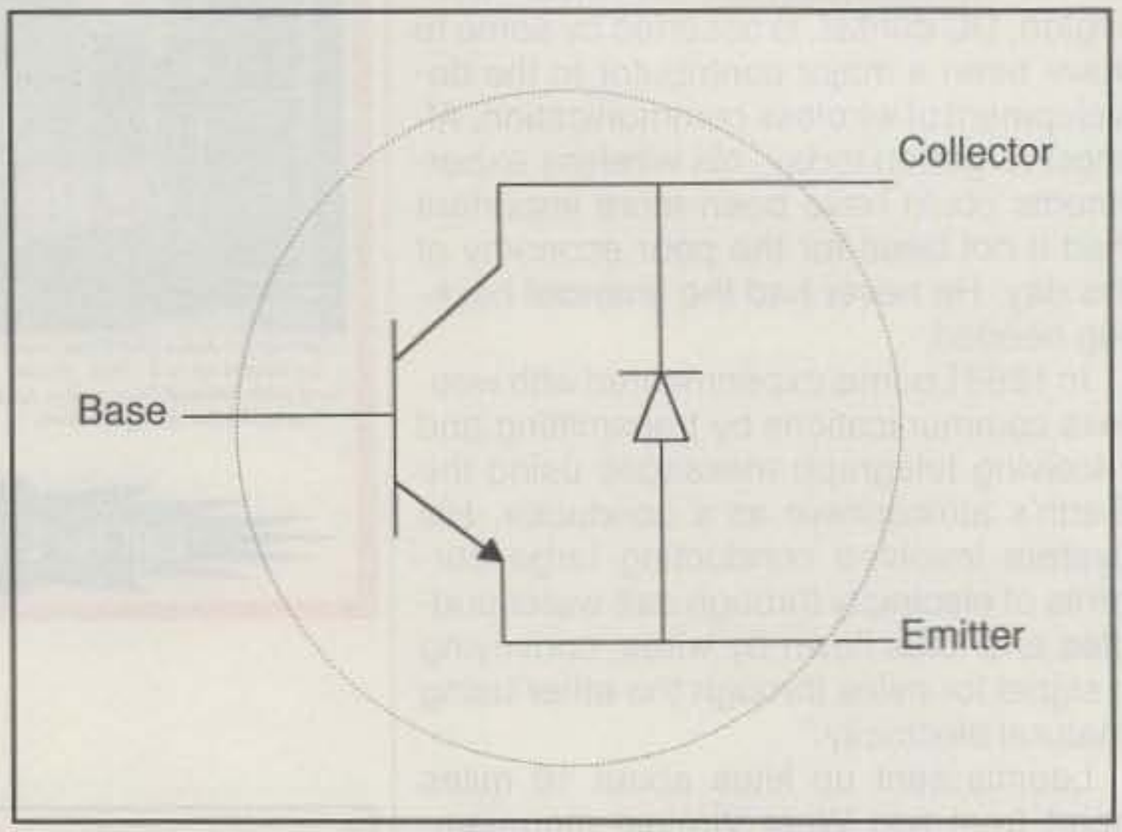


Fig. 1– Schematic of the Siemens BFP520 45 GHz transistor. Note that the transistor is constructed for use as a common-emitter amplifier. The reversed bias diode between collector and emitter does not affect normal operation.

+13.5 dBm (20 mw) of output power over the 40 MHz to 1 GHz range. These units operate with as little as 1.5 volts of Vcc and are properly matched to 50 ohms, both input and output. Fig. 2 is the application schematic. The data sheet provides a circuit layout as well as a description of an evaluation board, which is also available from the company. Present in the chip is a bias input, pin 8, which is shown connected to Vcc in our example. This input can be used to control the power output if connected to an auxiliary supply. The data sheet gives more details

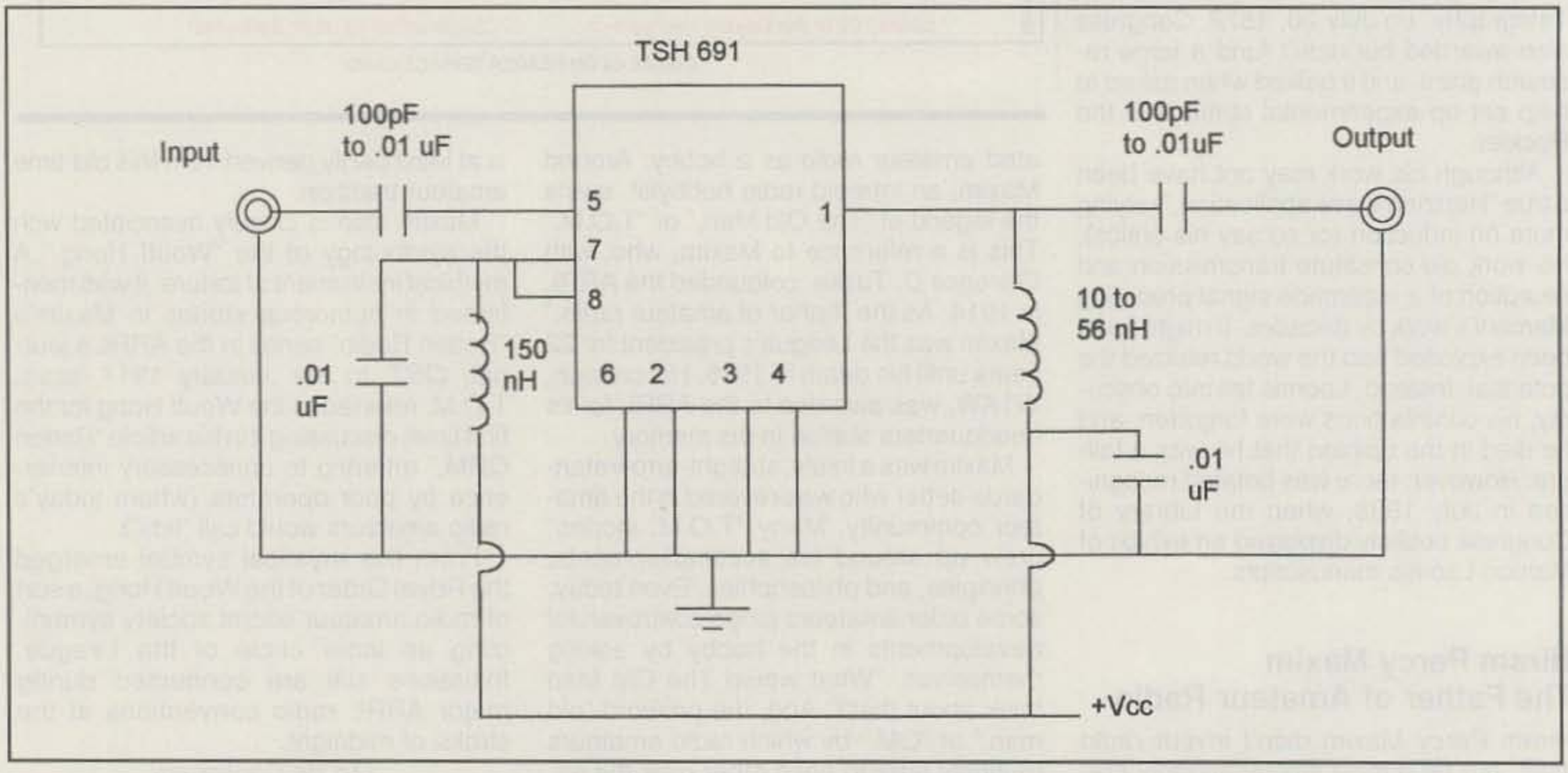


Fig. 2– Applications diagram of the TSH 691 amplifier.

c/o CQ magazine

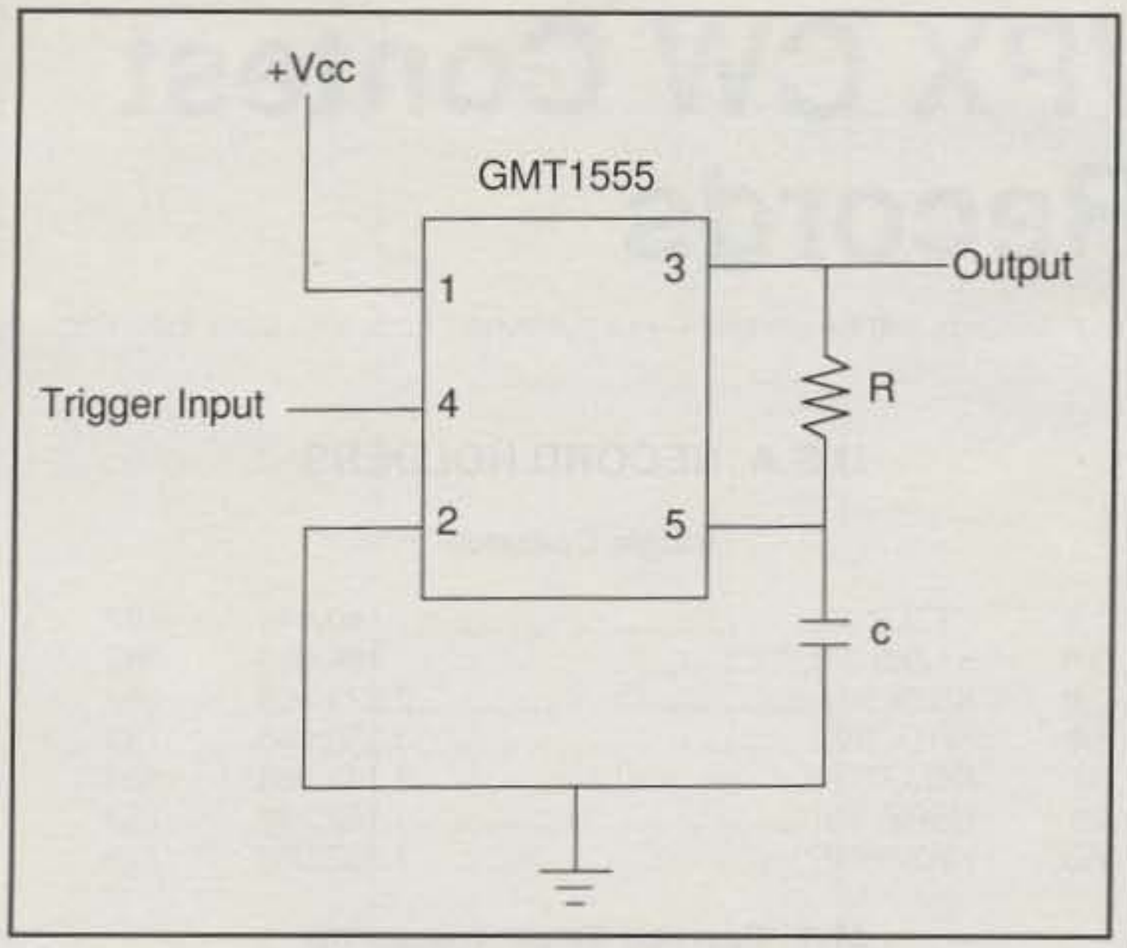


Fig. 3– The GMT1555 one-shot configuration.

on how to do this. You can download further information at the company Internet web site at <www.st.com>.

For our final offering, GMT Microelectronics has announced a micro-555 style chip which should be of interest to all 555 users. This chip is available in two varieties: the GMT1555, which is basically the one-shot function of the conventional 555, and the GMT1557, which is the oscillator/ timer function. Figs. 3 and 4 show typical application circuits for the two versions.

The selection criteria for the values for R and C are similar to those of the 555. Where the GMT1555/1557 differ from the typical 555 is in the frequency range. The one-shot can be used from 0.1 microseconds to several hours, while the oscillator will work to 5 MHz. Input Vcc ranges from +2.7 volts to 18 volts, and the devices are available in a tiny SOT-23-5 surface- mount package. Operation is from –40 to +85C, and the GMT1557 even has a "sleep mode" which reduces current drain to 1 microampere—perfect for battery- operated applications.

Full information is available on the data sheet from GMT Microelectronics, located at 950 Rittenhouse Road, Norristown, PA 19403.

The almost daily advances in solid-state technology never fail to amaze me. Could you imagine all of this with vacuum tubes? Even a 6SN7 was not that good! 73, Irwin, WA2NDM

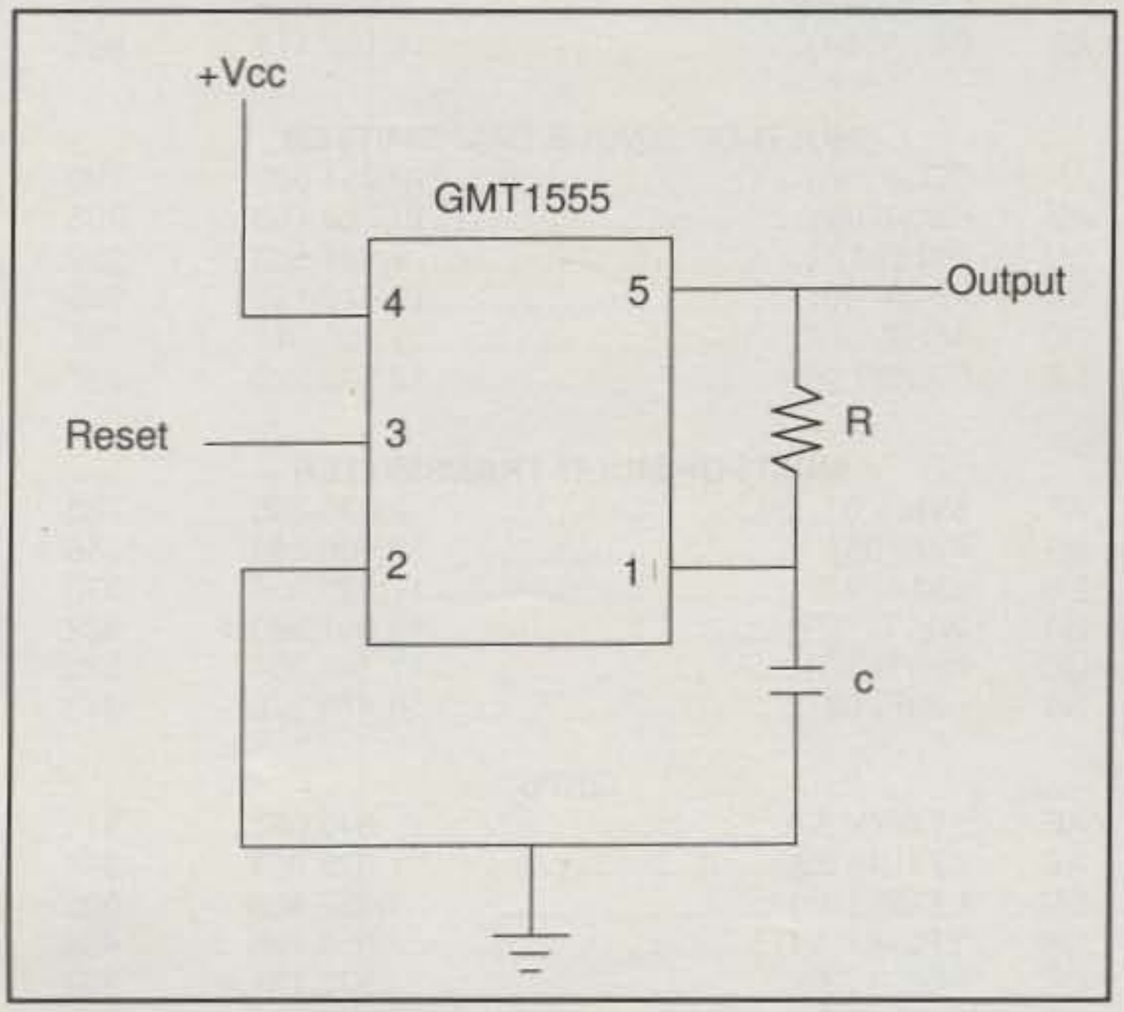


Fig. 4– The GMT1557 oscillator/timer configuration.

CQ World-Wide WPX CW Contest All-Time Records

The contest is held each year on the last full weekend of May. 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	IH9/OL5Y('98)	341,068	182
3.5	EA8/OH2KI ('96)	1,358,852	347
7.0	LU1IV('97)	7,671,456	702
14	EA9LZ('98)	5,708,498	758
21	ZD8LII('91)	5,118,527	743
28	ZS6BCR('91)	3,621,173	617
AB	P4ØW('94)	14,168,115	845

Multi-Operator Single Transmitter

	HSØA('98)	13,729,156	868

Multi-Operator Multi-Transmitter

	P3A('98)	30,666,240	1056

CLUB RECORD

Contest Club Finland ('98) 125,880,210

U.S.A. RECORD HOLDERS

Single Operator

1.8	K1ZM('95)	40,446	107
3.5	K1ZM('93)	406,080	288
7.0	KI1G('96)	2,573,408	587
14	KI1G('95)	3,330,088	788
21	K6LL/7('88)	2,163,388	557
28	N5RZ('89)	162,134	259
AB	KE2PF('97)	7,032,033	779

Multi-Operator Single Transmitter

	NB1B('96)	6,256,128	768

Multi-Operator Multi-Transmitter

	KG1D('97)	12,361,680	944

QRPp RECORD

P40W('97) 4,018,208

WPX (Prefix) RECORD

HG73DX('91) 1120

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	IH9/OL5Y('98)	341,068	182
3.5	EA8/OH2KI('96)	1,358,852	347
7.0	AM9TY('92)	2,007,990	404
14	EA9LZ('98)	5,708,498	758
21	ZD8LII('91)	5,118,527	743
28	ZS6BCR('91)	3,621,173	617
AB	3V8BB('97)	11,884,728	778

ASIA

1.8	4X4NJ('96)	259,420	170
3.5	UP2NK/UF('85)	701,012	221
7.0	9K2ZZ('94)	3,383,676	487
14	4Z6DX('91)	4,614,030	743
21	7L1GVE('91)	2,811,478	601
28	4X4UH('81)	1,081,262	338
AB	P31A('92)	10,293,858	762

EUROPE

1.8	SP5GRM('97)	249,516	261
3.5	LY2BTA('96)	967,974	399
7.0	UA6LAM('96)	3,760,164	701
14	CT2A('95)	4,231,598	826
21	4N4A('88)	2,585,460	615
28	9H1EL('88)	805,552	398
AB	GIØKOW('97)	6,325,953	813

NORTH AMERICA

1.8	VE3BMV('86)	43,428	77
3.5	FM5BH('97)	833,490	315
7.0	V26BA('97)	6,227,550	659
14	FM5BH('98)	4,642,866	762
21	FS5T('89)	4,552,470	702
28	HI8JKA('89)	891,242	374
AB	VP5GN('97)	10,675,330	794

OCEANIA

1.8	KX6DC('88)	12,240	45
3.5	KX6DC('89)	258,258	143
7.0	ZM1A('98)	5,144,480	592
14	N6VI/KH7('95)	3,103,932	606
21	N7DF/WH2('89)	3,243,450	525
28	KG6DX('81)	1,238,806	334
AB	DX1EA('95)	5,942,342	602

SOUTH AMERICA

1.8	YV1OB('86)	11,550	35
3.5	YX3A('89)	1,004,060	305
7.0	LU1IV('97)	7,671,456	702
14	YW1A('91)	4,617,456	732
21	ZP5XF('97)	5,023,872	712
28	CE3DNP('89)	2,857,038	582
AB	P4ØW('94)	14,168,115	845

MULTI-OP SINGLE TRANSMITTER

AF	CQ3X('95)	13,254,620	790
AS	H20A('98)	13,729,156	868
EU	R6L('93)	9,194,688	939
NA	KP2A('89)	12,843,135	835
OC	AG9A/AH2('91)	9,005,641	787
SA	8R30K('96)	12,302,226	837

MULTI-OP MULTI-TRANSMITTER

AF	6V6U('97)	9,938,896	758
AS	P3A('98)	30,666,240	1056
EU	9A1A('97)	17,925,084	1076
NA	WL7E('97)	13,001,280	928
OC	KH7R('97)	11,760,354	822
SA	AZ4F('98)	18,473,378	973

QRPp

AF	5Y4FO('92)	649,057	311
AS	4X4UH('82)	1,028,904	344
EU	LZ2BE('91)	1,137,488	506
NA	VP2MU('91)	1,554,735	469
OC	FO8JP('86)	572,131	259
SA	P40W('97)	4,018,208	632

AMERITRON *True Legal Limit™* Tuner

Easily handles 1500 Watts continuous carrier even on 160 Meters . . . High-current edge-wound silver plated Roller Inductor . . . Two 500 pf high capacitance tuning capacitors with 6:1 vernier reduction drives . . . 3 core choke balun . . . Six position antenna switch . . . True peak reading Cross-Needle SWR/Wattmeter . . .

Call your dealer for your best price!

AMERITRON ATR-30

$599

Suggested Retail

- *Handles 1500 Watts carrier*
- ***Super High Current edge-wound silver plated Roller Inductor***
- ***500 pf tuning capacitors with 6:1 vernier reduction drives***
- ***3 core choke balun***
- ***6 position antenna switch***
- ***True peak reading meter***

AMERITRON's ATR-30 *True Legal Limit*™ roller inductor antenna tuner is ham radio's toughest! It'll handle 1500 Watts *continuous carrier output* on *all* modes and *all* HF bands into most antennas -- even on 160 Meters where most antenna tuners fail.

It's perfect for Ameritron's most powerful amplifiers where the ATR-30 just loafs.

All band coverage lets you operate 1.8-30 MHz including all MARS and WARC bands.

Super High Current Roller Inductor

You'll see Ameritron's new *super high current* air core roller inductor. It's *edge wound* from a thick solid copper strip and silver plated. This produces a large surface area and a massive conductor. It can carry huge circulating RF currents and withstand tremendous heat that'll melt or burn ordinary roller inductors.

A gear driven turns counter and crank knob gives you precise inductance control.

Two 500 pf Tuning Capacitors

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

6:1 vernier reduction drives makes capacitor tuning smooth and easy.

Super Balun, 6 position Antenna Switch

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

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

Read *true* Peak Power

Ameritron's active electronic *true* peak reading meter accurately reads forward and reflected power and SWR *simultaneously* on a lighted Cross-Needle meter.

Roomy Cabinet maintains High-Q

Roomy extra-strong .080 inch thick aluminum cabinet gives highest efficiency and lowest loss. 13¼Wx5⅝Hx17½D inches.

AMERITRON ATR-15 Antenna Tuner

ATR-15, $399. Handles 1500 Watts RF output. Slightly less on 160 Meters. Bandswitched T-Network, peak reading SWR/ Wattmeter, covers 1.8-30 MHz, 6 pos. antenna switch, balun. 13½ W x5½x13¼ in. Perfect for AL-80B/AL572.

Ameritron has the best selection of *TrueLegalLimit*™ HF Amplifiers

AMERITRON's legal limit amplifiers use Peter Dahl super heavy duty Hypersil power transformer capable of 2500 Watts!

Ameritron's *most powerful* Amp

with Eimac® 8877 ceramic tube

AL-1500

$2795

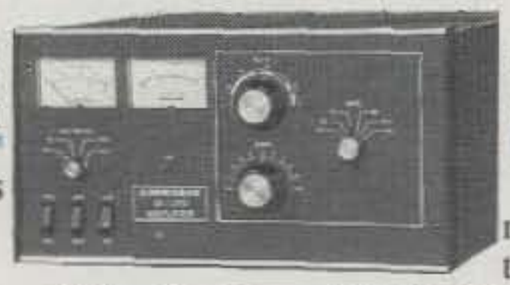
Suggested Retail

TrueLegalLimit™

Ameritron's *most powerful* amplifier uses the herculean Eimac® 8877 ceramic tube. It's so powerful that 65 Watts drive gives you the full output power -- and it's just loafing because the power supply is capable of 2500 Watts PEP. All HF bands, all modes. 77 pounds, 18½Dx17Wx10H in.

Ameritron's *toughest* Amp

with Eimac® 3CX1200A7 tube



AL-1200

$2295

Suggested Retail

TrueLegalLimit™

Get ham radio's *toughest* tube with AL-1200. The Eimac® 3CX1200A7 has a 50 Watt control grid dissipation and the lowest history of field replacement of any modern transmitting tube that we use. 90 Watts in gives you full power out. All HF bands, all modes. 76 pounds, 18½Dx17Wx10H in.

Ameritron's *classic* Amp

with 2 graphite plate Amperex® 3-500ZG tubes

AL-82

$2295

Suggested Retail

TrueLegalLimit™

Most linears using 3-500s can't give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential. AL-82 is ham radio's *only* super 3-500 amp! 100 Watts in gives you full power out. All HF bands, all modes. Hefty 76 pounds, 18½Dx17Wx10H inches.

1.5 *plus* kW SSB HF Amp

with 2 Eimac® 3CX800A7 tubes

AL-800H, $2295 suggested retail. Two Eimac® 3CX800A7 tubes produces 1500 *plus* Watts SSB PEP with 55 Watts drive. 52 lbs., 8½Hx16½Dx14¼W in. **AL-800, $1595** suggested retail, single 3CX800A7, 1250 Watts out with 70 Watts drive.

NearLegalLimit™ Amp

with four Svetlana® 572B tubes

AL-572, $1395 suggested retail. New class of *Near Legal Limit*™ amplifier gives you 1300 Watts SSB PEP power output (70 Watts drive) for 65% of price of full legal limit amps! Instant 3-second warm-up. 40 lbs. 8½Hx15½Dx14½W inches.

1 kW Desktop HF Amp

with Amperex® 3-500ZG tube

AL-80B, $1295 suggested retail. Gives you full kilowatt SSB PEP output (85 Watts in) from a whisper quiet compact desk- top linear. 8½x14x15½ in. Plugs into 120 VAC outlet. Graphite plate *Amperex®* 3-500ZG tube. Nearly 70% efficiency. Weighs 48 lbs.

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CIRCLE 175 ON READER SERVICE CARD

BY KARL T. THURBER, JR., W8FX

THE DIGITAL DIPOLE

FROM SOFTWARE THROUGH ANTENNAS FOR THE SHACK

From The Notebook—Part IV

This month we will again open the "Digital Dipole" notebook for a variety of antenna and book topics. We'll kick things off by opening the notebook first to antennas.

Antenna Notes

The "Porcupine" and Other Protective Goodies from the Wireman. We've covered "The Wireman"™ Press Jones, N8UG's coax, wire, and antenna accessory products several times. One of his more interesting devices is the "Porcupine" static charge dissipator, designed to minimize the risk of a lightning strike at your QTH. Press notes that while you can spend a small fortune on ways to deal with a lightning strike, a modest investment in strike *prevention* (Porcupine is $31.25) can lower strike risk significantly.

In his product flyer Press draws attention to the Porcupine by reminding us of grandpa's house and barn. They typically had lightning rods and weather vanes installed on the roofs. These devices usually were connected to each other and ground by fat loose-weave copper or copper-clad steel stranded cable, providing a perfect path for charge dissipation, if not for a heavy strike.

The Porcupine provides an ionization discharge path at key stress points, such as the highest and outermost points on the tower or antenna. By discharging these points into the air, the possibility of a lightning strike can be reduced greatly.

Ideally, you should place one or more dissipators at the top of the tower, top of the mast, and end of the boom; none should be placed on an active antenna element. For the Porcupine to work effectively, you must furnish a continuous DC path to ground. Normally the tower or mast is adequate for the purpose, provided that it is properly connected to an adequate ground.

Designed to be used with the Porcupine is the GD Grounding Buss. For indoor use, it's a simple and positive "quick disconnect" device for isolating antenna feedlines that also helps to protect your valuable hamshack gear. While providing for quick disconnection of feedlines from equipment, it also affords quick connection of those same feedlines to the ground buss. Both a six-port model ($22.95) and a four-port model ($18.95) are available; each has two quick disconnects.

For more info, contact The Wireman, Inc., 261 Pittman Road, Landrum, SC 29356 (phone 1-800-727-9473; e-mail: <cqwire@juno.com>; Web: <http://www.thewireman.com>).

Second Generation Alpha Delta Coax Surge Protectors. We've long suggested Alpha Delta's high-quality equipment protectors, notably the Transi-Trap™ surge protectors. They use the fast-acting, field-replaceable gas-tube Arc-Plug® cartridges to isolate electronic equipment from transients coming through coax. The devices have been available since 1981 in several versions, including ones incorporated in surge-protected coaxial switches.

The units have convenient stud hardware for direct mounting to a bulkhead, ground strip, or ground wire; commercial models are fully weatherproofed. The protectors are designed for 50 ohm coaxial circuits and are of a constant-impedance through-line design. Arc-Plug cartridges are included.

Alpha Delta now has improved models in its "Second Generation" versions. Models are available with Type N or UHF connectors and power-handling capabilities ranging to 2 KW. Low-loss performance is available through 2500 MHz, depending on model and connector. Several UL-listed designs are available for the amateur market, ranging in price from $39.95 to $49.95.

In an increasingly common vendor move as the Web becomes a sort of all-pervasive information repository, Alpha Delta recently announced that they no longer will publish a printed catalog. Instead, they invite customers to visit their online electronic catalog at their new Website, which you'll find at <http://www.alphadelta.com>. It offers product photos, technical specs, installation and troubleshooting information, and pricing.

Nevertheless, according to Alpha Delta's Don Tyrrell, W8AD, and Jim Burns, WB4ILP, if you're *really* more comfortable curling up with a printed catalog, their complete product listings are included in the Amateur Electronic Supply and Ham Radio Outlet catalogs. Contact Alpha Delta Communications, Inc., P.O. Box 620, Manchester, KY 40962 (1-888-302-8777).

New Ramsey Catalog. It's not easy to find a company that furnishes quality hobbyist kits with good instructions, especially since the old-line firms such as Knightkit, Heath, and EICO are gone. These firms—especially Heath—prided themselves on intensive engineering, easy-to-follow assembly manuals and pictorial diagrams, free consultation, and reasonable repairs.

On the bright side, Ramsey's kits are fun to build. I've crafted a few myself. Best of all, their kits include clear, step-by-step construction and hookup instructions, along with ideas for additional uses. Ramsey also takes care that the components are properly packaged and marked. You don't just get the proverbial "bucket of parts" often found in kits.

The 36-page, 1998–99 Ramsey Electronics catalog describes many inexpensive amateur radio and electronics hobby kits. The catalog includes amateur radio gear; antennas; personal radio broadcasters; miniature FM transmitters; video cameras and transmitters; receivers and converters; test equipment; clocks; kit-building tools; and a variety of what Ramsey Electronics calls mini, function and fun, and hobby kits.

Several antennas and antenna kits are offered. These include VHF and UHF Yagis by Joe Reisert, W1JR; amateur and shortwave listener (SWL) HF dipoles; an FM broadcast antenna; "stealth" antennas for amateur and other mobile applications; and a VHF/UHF telescoping whip for RF sniffing and frequency counting.

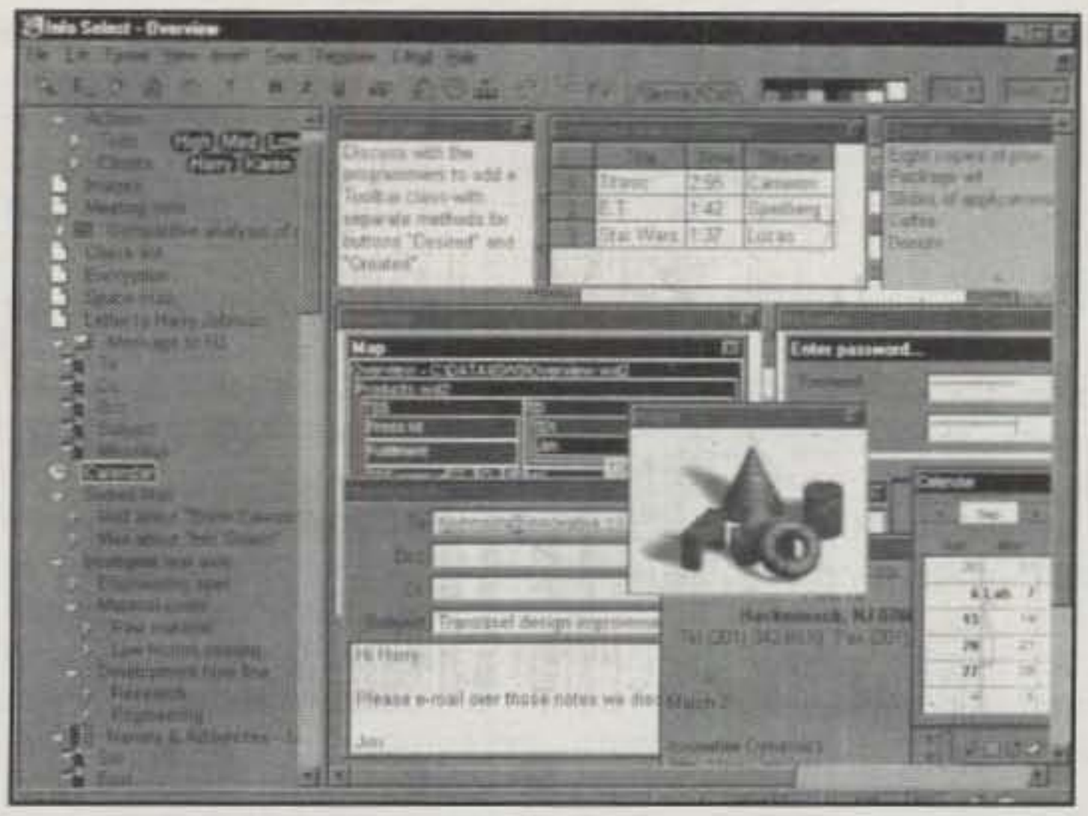
Ramsey offers a 10-day examination period for all kits: as long as you don't build the kit, you can return it. Also, they have a manual preview policy under which you can purchase most manuals for $5 (some manuals are more). They will refund the manual purchase price against future kit purchase.

For a free catalog, contact Ramsey Electronics, Inc., 793 Canning Parkway, Victor, NY 14564 (1-800-446-2295; Web: <http://www.ramseyelectronics>). (The Website features lots of specials and limited availability products.)

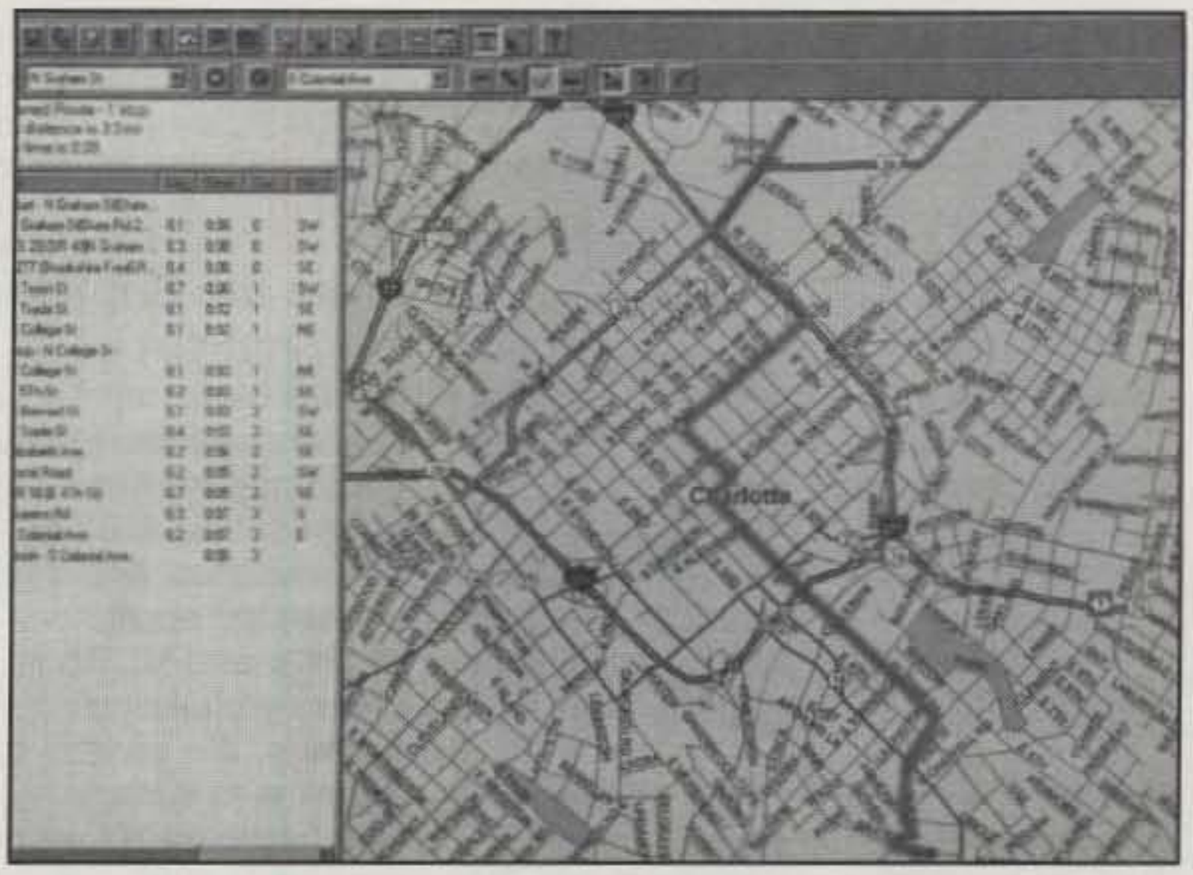
Soft Stuff

Info Select Version 5. In several columns, most recently last March, we described Micro Logic's Info Select for Win-

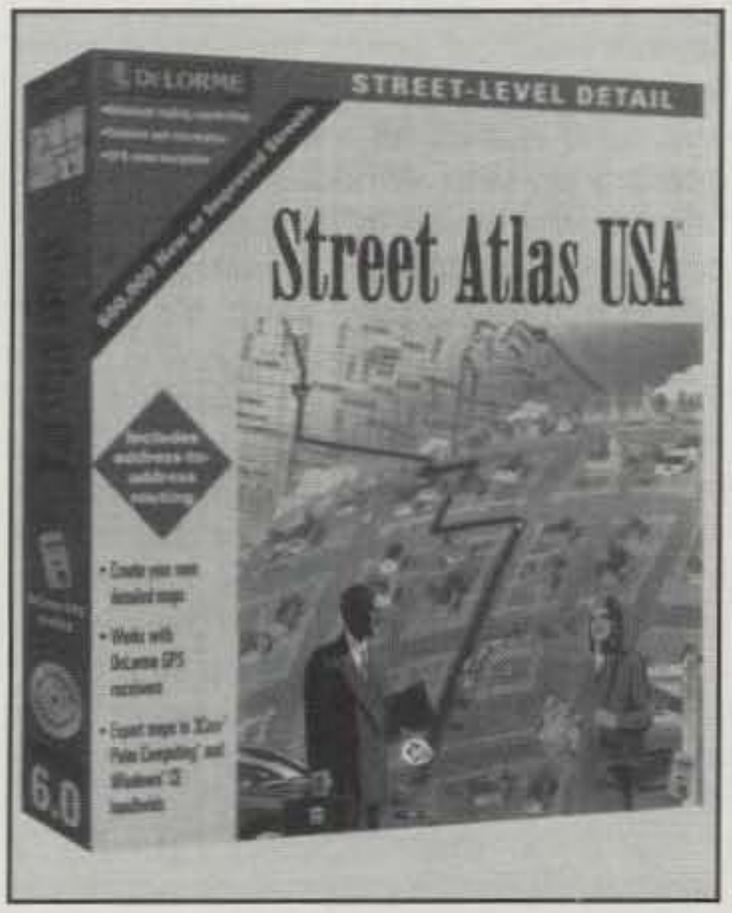
289 Poplar Drive, Millbrook, AL 36054-1674



Micro Logic Info Select Version 5 for Windows 98, 95, and NT is a full-featured personal information manager (PIM) that offers fast information retrieval, free-form and structured data management, outlining, calendars, scheduling, e-mail management, web browser integration, wordprocessing, telephone dialing, flexible reporting, data sharing, and more. See the text of this month's column for details. (Photo courtesy Micro Logic)



Here's Street Atlas USA 6.0 at work. The software offers customized "address to address" routing in which you can create your own routes with the new "Via" function, an easy way to indicate which roads or routes you prefer when traveling. Detailed highway exit service information, some 600,000 new or improved streets, and online links highlight the new version. (Photo courtesy DeLorme)



DeLorme Street Atlas 6.0, which includes detailed street-level maps of the entire USA, lets you expertly map a trip. With the help of Global Positioning System (GPS) technology, it allows you to track your progress as you move and follow spoken directions when using a multimedia laptop computer in conjunction with DeLorme's Earthmate™ GPS receiver. (Photo courtesy DeLorme)

dows. As we have noted, it's a capable PIM, or "personal information manager," one that's easy to learn, since it uses a data structure analogous to the familiar "stacks of paper" in which people tend to accumulate information.

A PIM is a free-form database that lets you enter, retrieve, analyze, and cross-reference data, both words and numbers. It handles "random information" that can cover your home, office, or ham shack. It can include notes, names, addresses, parts lists, projects, and magazine articles. All this information often doesn't fit into well-defined formats required in a conventional database, so a PIM helps you deal with a hodgepodge of unstructured material—sort of the way life itself comes at you.

Info Select Version 5 for Windows 98, 95, and NT offers fast information retrieval, free-form and structured data management, outlining, calendars, scheduling, e-mail management, web browser integration, wordprocessing, telephone dialing, flexible reporting, data sharing, and additional capabilities.

More than a year in development, the new version offers more than 200 enhancements. Like most everything else in the computer world, the product recently has been reengineered to better harness the power of the Internet and the Web. For example, the new version includes a Web Transporter feature that lets you instantly transfer information that you collect from Web pages, newsgroups, wordprocessor software, and other applications.

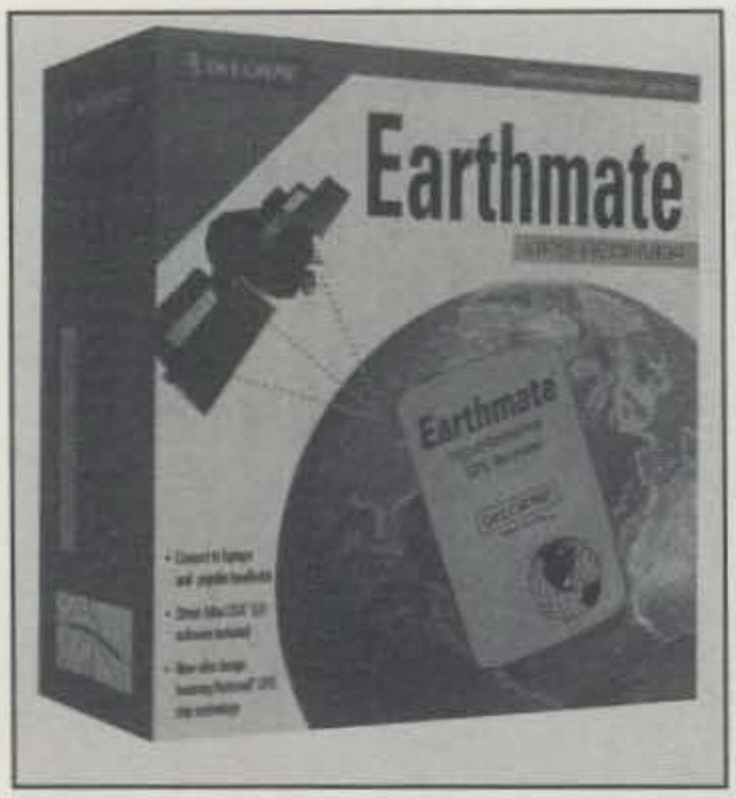
While visiting a Website, for example, you need simply highlight a section of a Web page and click on the transporter icon to transfer information instantly to the program. The program also sports automatic Web address recognition that sends your Web browser to a given Web address with a single click.

Info Select Version 5 is $99.95, but previous users may upgrade for $69.95. For more info, contact Micro Logic Corp., P.O. Box 70, Hackensack, NJ 07602 (201-342-6518; e-mail: <info@miclog.com>; Web: <http://www.miclog.com>).

DeLorme Street Atlas USA 6.0. DeLorme's Windows flagship software product, Street Atlas USA, has undergone steady development over the years. Recently, Street Atlas 6.0 was released (see our coverage of V5.0 in May '98). V6.0 includes many new and enhanced functions. The new version, which includes detailed street-level maps of the entire USA, lets you expertly map a trip. With the help of Global Positioning System (GPS) technology, it allows you to track your progress as you move and follow spoken directions when using a multimedia laptop computer in conjunction with DeLorme's new Earthmate™ GPS receiver.

The new V6.0 offers all the functions of V5.0 and much more. The latest release offers new street data; a new "intersection finder"; more detailed highway exit services information; custom, user-defined routing controls; and even the ability to send your route maps and route directions to 3Com® Palm Computing® or Windows® CE handheld computers. There's also an "Exit Alert" feature you can use to find upcoming highway exit services, including even RV-friendly stops, ATMs, vehicle repair shops, and more.

Using the new Solus™ Basic mapping application that's included in Street Atlas USA 6.0, you can download a single map or route directions to a handheld computer. And when you toss in a GPS receiver, such as Delorme's Earthmate, you can create a highly portable, accurate, and easy-to-use navigation system that fits in your coat pocket. Used with a laptop on



About the size of a deck of cards, DeLorme's GPS receiver, Earthmate™, makes hitting the road a lot easier than it used to be. The 12-channel GPS receiver offers a powerful and streamlined approach to navigation and handheld computer mapping in conjunction with laptop PCs or handheld computers. The receiver is available bundled with Street Atlas USA 6.0 for $159. (Photo courtesy DeLorme)

the road, Earthmate guides you along your chosen routes and even allows automatic recalculation if you go off course.

Street Atlas USA 6.0 has an estimated street price of $45, or $159 if bundled with the Earthmate GPS receiver; upgrading from the Solus Basic mapping application to Solus Pro is $39.95. For more info, contact DeLorme, Two DeLorme Dr., P.O. Box 298, Yarmouth, ME 04096 (1-800-452-5931; e-mail: <info@delorme.com>; Web: <http://www.delorme.com>).

From the Bookshelf

The ARRL RFI Book. Some would label it a full-blown epidemic; to others, it's a mild annoyance. In any case, while radio frequency interference (RFI) may not be as serious as AIDS or a killer virus, RFI is all around us. And as technologically sophisticated appliances and devices such as PCs and VCRs fill our homes in increasingly urbanized, interference-prone settings, the greater the chance for RFI gremlins to surface.

In February '97 we profiled the ARRL's excellent, 1991-vintage RFI text, *Radio Frequency Interference: How to Find It and Fix It.* The 250-page book was edited by the ARRL's Ed Hare, KA1CV/W1RFI, and Robert Schetgen, KU7G.

Technological times have changed considerably, RFI-wise, in the past seven years, prompting an extensive revision. Now ARRL Lab Supervisor Hare (Does the W1RFI callsign say something about Ed's field of specialization?) has a new edition. The revised book also includes the latest RFI regulations and suppliers' list, as well as a completely updated and expanded bibliography.

The well-indexed 1998 edition is a comprehensive reference having 18 chapters and five appendices written by a team of RFI experts. Included are chapters devoted to RFI basics, RFI troubleshooting techniques, radio direction finding (RDFing), cable TV (CATV) interference, telephone RFI, VCRs and stereos, powerline interference, "intermod," and automobiles. Hamshack computers are treated in some depth.

The new 314-page book is $20 plus $5 s/h from the ARRL, Inc., 225 Main St., Newington, CT 06111-1494 (1-888-277-5289; e-mail: <pubsales@arrl.org>; Web: <http://www.arrl.org>).

Microsoft® Windows® 98 Goodies from Macmillan. In recent columns we've noted the many excellent books Macmillan publishes that can help you become familiar with almost any aspect of PCs, software, and computing. Macmillan Publishing USA, with its stable of trademarked imprints (Que, Sams Publishing, New Riders, etc.), is introducing dozens of new Windows 98-related titles, some of which we mentioned in previous columns.

This month we would like to mention a few additional titles of interest to new Windows 98 users (like myself). My personal favorite is an extremely readable Que® book, *Dan Gookin Teaches Windows 98,* by respected computer guru Dan Gookin. One of the first in the firm's "author teaches" series, the book delivers expertly written, straightforward, humorous, and above all informal advice on gearing up with Windows 98. The 660-page book, which is divided into seven parts and 48 chapters, is suitable for beginner to intermediate users. It's $19.99.

A second, much smaller book is *Sams Teach Yourself Internet Explorer 4 in 10 Minutes,* by Joe Lowery. Like the other books in the series, the 206-pager is designed with quick steps for fast results in mind, its objective being to give you the basic skills you need in just 10 minutes. I found it to be very handy as a "first book" in painlessly explaining the browser that's an integral part of Windows 98. The book is $12.99.

Many PC manufacturers "bundle" a variety of software with their computers to help get you started, typically at prices that are hard to refuse. For the most part, it's Microsoft software, such as Home Essentials™ or a version of Microsoft Office, which in turn contains a variety of productivity software. The "catch" is that the bundled software usually comes without hardcopy manuals, requiring you to rely entirely on skimpy online help files. This may be okay most of the time, but occasionally you need to go into greater depth and/or need some "hand holding." Help files usually aren't great teachers!

Numerous books are available from Macmillan and other computer publishers to fill this void. For example, my PC came bundled with Microsoft Office, which included the Microsoft Excel spreadsheet and Microsoft Publisher software. I've found a good "how to do it" Que text for

Excel to be *Using Microsoft(R) Excel 97*, by Julia Kelly. The 594-pager is both thorough and understandable, and is priced at $29.99. Too, a helpful text to get you up and running with Microsoft Publisher is *How to Use Microsoft® Publisher 98*, a full-color visual Sams text by Rebecca Reese. At 248 colorful pages, it's $24.99.

Finally, if you're interested in Web publishing, and your PC includes Microsoft Front Page or Front Page Express (the latter is the free version included with Windows 98), check out Laura Lemay's *Microsoft® FrontPage® 98*, a highly readable yet authoritative 807-page book/CD-ROM combo priced at $39.99.

Contact Macmillan Publishing USA, 201 W. 103rd St., Indianapolis, IN 46290-1097, 1-800-858-7674, for a free computer books catalog. (E-mail: <info@mcp.com>; Web: <http://www.mcp.com>.)

We Get Letters

Once again, we're just about out of space. Before wrapping it up this month, we'd like to acknowledge a few of the folks who wrote, faxed, e-mailed, phoned, or otherwise corresponded with us over the past several months. A tip of the hat goes to Steve Lawrence, WB6RSE; Leonard Tedeschi, KC4WQS; Harry Ricketts; Ronnie Cohen, K4GHG; Bill Fanckboner, W9INN; Velery Karchenko, RA6YR; "J" Gresham, K4MIN; and Rick F. McCusker, KO6DJ.

Correspondent "J" Gresham, K4MIN, pointed out an error in our November column. He e-mailed us to note that the prices we listed for KB6KQ's 6 meter and 432 MHz loop antennas were incorrect. "J" has the antennas himself and says the prices are $85 and $45, respectively. (For more info, contact Norm Pedersen at KB6KQ Antennas, 70 Arrowhead Drive, Carson City, NV 89706; 702-885-7885; e-mail: <kb6kqnorm@aol.com>.)

Also, while thanking us for our November review of Ken Neubeck, WB2AMU's *Six Meters: A Guide to the Magic Band*, *Worldradio* Editor Rick McCusker, KO6DJ, notes that the correct e-mail address for the publisher is <n6wr@ns.net>. (For more info, contact *Worldradio*, 2120 28th St., Sacramento, CA 95818; 916-457-3655; e-mail: <n6wr@ns.net>; Web: <http://www.wr6wr.com>.)

Many thanks, folks—and keep those cards and letters coming!

Wrap-Up

That's all for this time, gang. Next time, more "Digital Dipole" topics of current interest. See you then.

Overheard: If you work at a job that doesn't have any problems at all, then it probably isn't much of a job!

73, Karl, W8FX

BY DAVE INGRAM, K4TWJ

WORLD OF IDEAS

A LOOK AT THE WORLD AROUND US

QRP '99: More New Kits and Neat Ideas—Part I

Once again, the facts are undeniable and worthy of reiteration. QRP is today's hottest and most rapidly expanding area of special interest and pursuit. Listen around the popular QRP frequencies of 7.040, 14.060, and 28.060 MHz almost any weekend of the year to realize the full impact of that statement. You will find QRPers having a ball using low-power rigs such as the MFJ 90's, Ten-Tec 1300's, SGC 2020's, Wilderness Sierras, and SST's plus many other types of pocket-size transceivers. Notice the increasing amount of QRP activities and forums at hamfests. They represent the heartbeat of modern homebrewing action. Check out some of the numerous QRP clubs. They are alive with on-the-air activities, easy brew kits, and projects galore. It's easy to get in on the action and have a lot of fun!

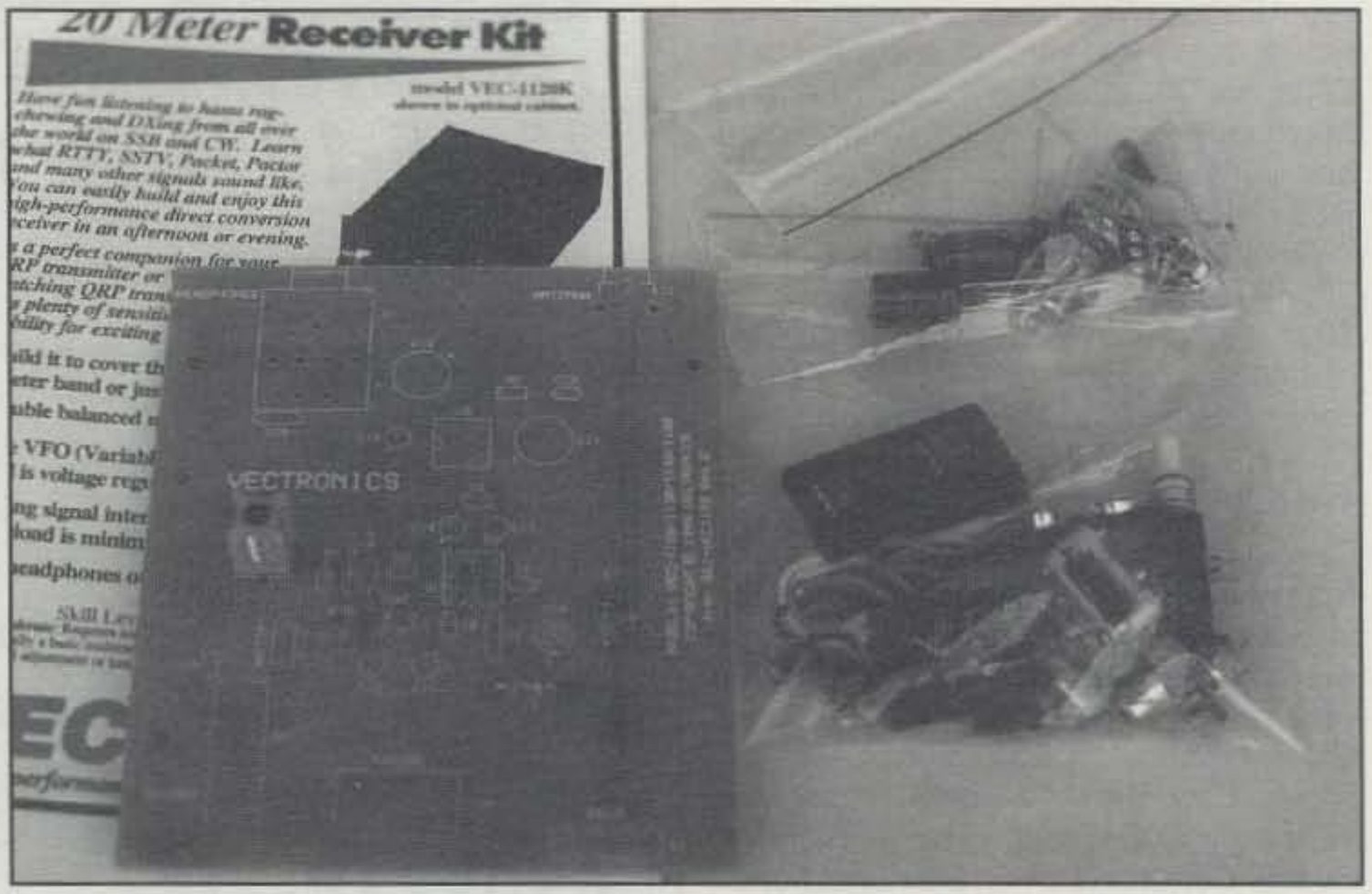


Photo 1– We begin assembly of the new Vectronics receiver kit by installing one small bag of frequency-determining components for our selected band of operation. Additional components that will be installed in two more steps await their turn in two more bags beside the receiver.

New Vectronics QRP Kits

As you may have heard, Vectronics recently added an impressive group of low-cost, easy-to-build kits to their amateur radio product line (photos 1–3). Two of the kits, a small QRP transmitter and receiver, were briefly highlighted in our December "Christmas Gifts" column, and I mentioned additional details would be presented later.

Time for checkout has progressed well, and I can now report these mini rigs are neat little fun projects I think everyone will enjoy building and using at home, when hiking or backpacking, or even mobile. Indeed, the creative applications for these versatile kits are unlimited. They could be sandwiched together and fit into a padded underseat carrier on a bicycle for silent sport mobiling. They might be installed in a car's ashtray, mounted in a small box wedged between a car's seat and center console for a "no rig showing" mobile setup, or stuffed into a fanny pack for "walking portable" use. You can probably visualize more ways to utilize these gems.

The receiver kit is similar to the direct-conversion "two chipper" Micronaut receiver from Steve Bornstein, K8IDN, featured last year in this column and in my recently self-published book *QRP Now!* (available direct from me, K4TWJ, for $16 plus $2 regular or $3 priority mail). It uses an NE602/NE612 mixer and local oscillator IC coupled to an LM386 audio amplifier IC, with the NE602's L.O. being L-C tuned rather than VXO controlled. Frequency stability is accomplished by heavy capacitive loading of the L.O. plus incorporation of a 78L05 regulator.

The receiver consists of approximately 28 parts (all board mounted for neat and clean assembly) and goes together in one or two hours. The PC board measures 4.0 by 4.7 inches and is silk-screened with parts numbers and locations marked for no-miss assembly. Construction is also "error proof" by building the kit in three small steps with parts for each step packaged in separate bags. If you install one bag of parts at a time (and double check your work as you go—hunting for errors, not just looking to see all is okay), I would say the rig has a 95 percent chance of working on the first try. The receiver kits (models VEC-1120K, 1130K, 1140K, and 1180K for 20, 30, 40, and 80 meters, respectively) operate from a 9 volt battery and exhibit 3 μV or better sensitivity. Kits are $29.95 each, and an optional metal case with knobs and other "final touch" trimmings is $14.95.

The Vectronics transmitter kit is ever-so-slightly more complex than the receiver, but it is still in the easy-brew category (approximately 40 parts total). It utilizes a classic oscillator-driver-RF amplifier design with crystal/VXO frequency control for high stability, transistor keying, and solid-state T/R switching. Transistor lineup is a 2N3904 driving a PN2222 that in turn drives a well-heat-sinked and 4 to 5 watt capable 2N3053 to a cool and comfortable 1 or 1.5 watt output (when powered by 12 or 13 VDC). Capacitive coupling between stages cuts down tedious work to winding only one toroid (for the output filter), and even that step takes only a couple of minutes. The transmitter's PC board measures 3.5 by 4 inches and is also silk-screened with parts numbers and locations marked for smooth assembly.

Like the receiver, this transmitter kit is available for 20, 30, 40, and 80 meters (VEC 1220K, 1230K, 1240K, and 1280K respectively). It also is a setup for success-ensuring assembly with a three-step construction procedure and parts for each step packaged in separate bags. Pricing is also similar: $29.95 for the transmitter kit and $14.95 for the optional metal case with hardware.

The manuals for both kits (indeed, manuals for all the Vectronics kits I have seen) are most impressive. They cover everything from identifying and installing parts to proper alignment and testing. The man-

4941 Scenic View Dr., Birmingham, AL 35210

uals also have check-off boxes by each step for "do some now and some later" assembly, directions on homebrewing a balun and dipole antenna, plus a section on how to successfully work QRP.

Performancewise, the little kits do a good job for their simplicity and low cost. They also recapture the thrills and joys of homebrewing—an art that traditionally has been a mainstay in amateur radio. You hear both sidebands with the direct-conversion receiver, but I personally find being able to keep an ear on what's happening near a selected operating frequency is good for hands-free monitoring and casual QRPing. That must be a holdover from my Novice days with a BC-455 receiver. You did not tune that critter. You just listened for a station sending your call and remembered the pitch of that tone. What an era! Is one watt enough transmitted power for good QSOs? You bet, Sherlock! Just check the real-life testimonials in our upcoming "Show and Tell" section to verify that fact.

Overall, the Vectronics kits make good low-cost, fun rigs for lighthearted hamming. In many ways they strike me as modern equivalents to those dear little two-tube receiver and transmitter kits of yesteryear—Knight Space Spanners, Ameco MOPAs, etc.— rigs we all enjoyed building and using. Vectronics kits can be ordered toll-free by calling 1-800-363-2922, or you can write to Vectronics at 1007 Highway 25 South, Starkville, MS 39759. Check out the whole line. It also includes 2, 6, and 10 meter FM rigs, preamps, keyers, SSB and CW filters, battery chargers, TV transmitters, and more!

Show and Tell Time

Folks continue to ask me what kind of results can be expected when running less than 2 watts of power. I glanced in my log book and thought about a couple of recent QSOs to answer that question.

First, Brian/KE4QZB, answered one of my CQs on 30 meters, and his signal was just as strong as that of other callers. I did not realize he was running QRP until he described his rig. It was a little deck-of-cards-size Wilderness SST transceiver running slightly less than 2 watts to a basic inverted-V, no more, no less. And we conducted a rather lengthy solid-copy QSO—not just a quick exchange of signal reports. Now that's what I call real QRP'n!

During another operating stint, signals from Stan, W3TFA, caught my ear because they sounded a wee bit weaker than normal. Out of curiosity I asked about his rig and almost fell out of my chair when he said it was hand-wired, homebrewed, and running 500 milliwatts to an indoor dipole bent to fit in his attic. And I was copying Stan on my rig's speaker, not straining

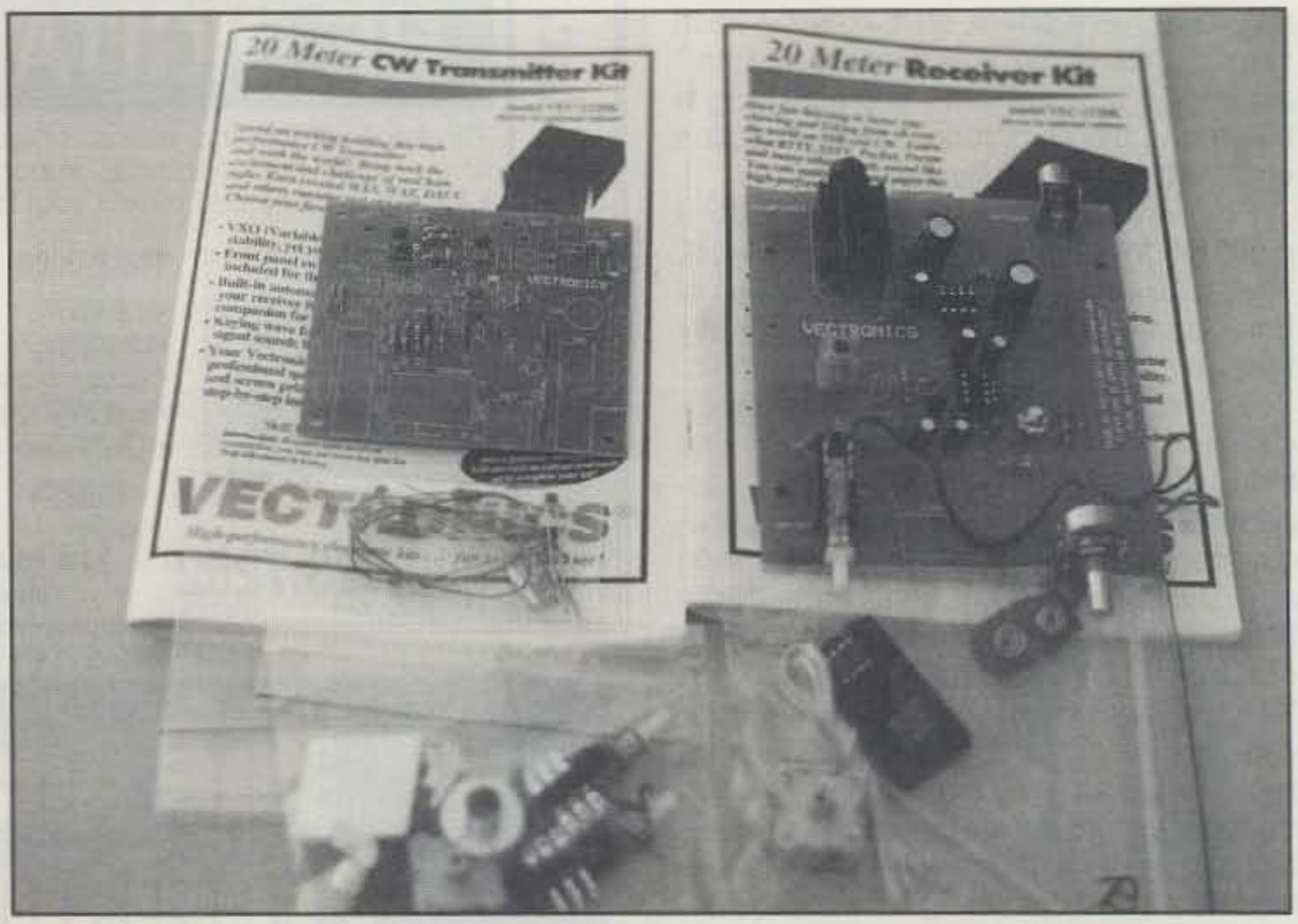


Photo 2– Two bags worth of components (plus a tad more for the receiver) have been installed on our Vectronics transmitter and receiver PC boards. If you are new to kit building, these Vectronics items are good starting points with assured success.

with earphones. Naturally, I asked more questions.

Stan's 30 meter transmitter/receiver combo is built in a 3 by 5 by 5 inch case and includes a hefty 12 volt internal battery pack plus a small speaker for total portability (photos 4 and 5). The little rig's transmitter is a classic 2N2222/2N3553 design with a front-panel-mounted crystal socket and output meter. The rig's receiver is similar to Vectronics 1130K, except Stan added a third IC (UA741) between the NE612 and LM386 for audio preamplification. If this gem does not kindle your enthusiasm for QRP'n from anywhere, indoors or out, nothing will! It's terrific!

Classic Argo on 30 Mod

A while back I worked Ray Henry, AA4LL, running a classic Argonaut transceiver on 30 meters. He passed along his mod info for putting a Ten-Tec 509 or 515 on this popular QRP WARC band. Thanks to Ray's interest in sharing knowledge and helping others, we are proud to reprint his mod details for this collectible rig. The mod involves adding only four capacitors and

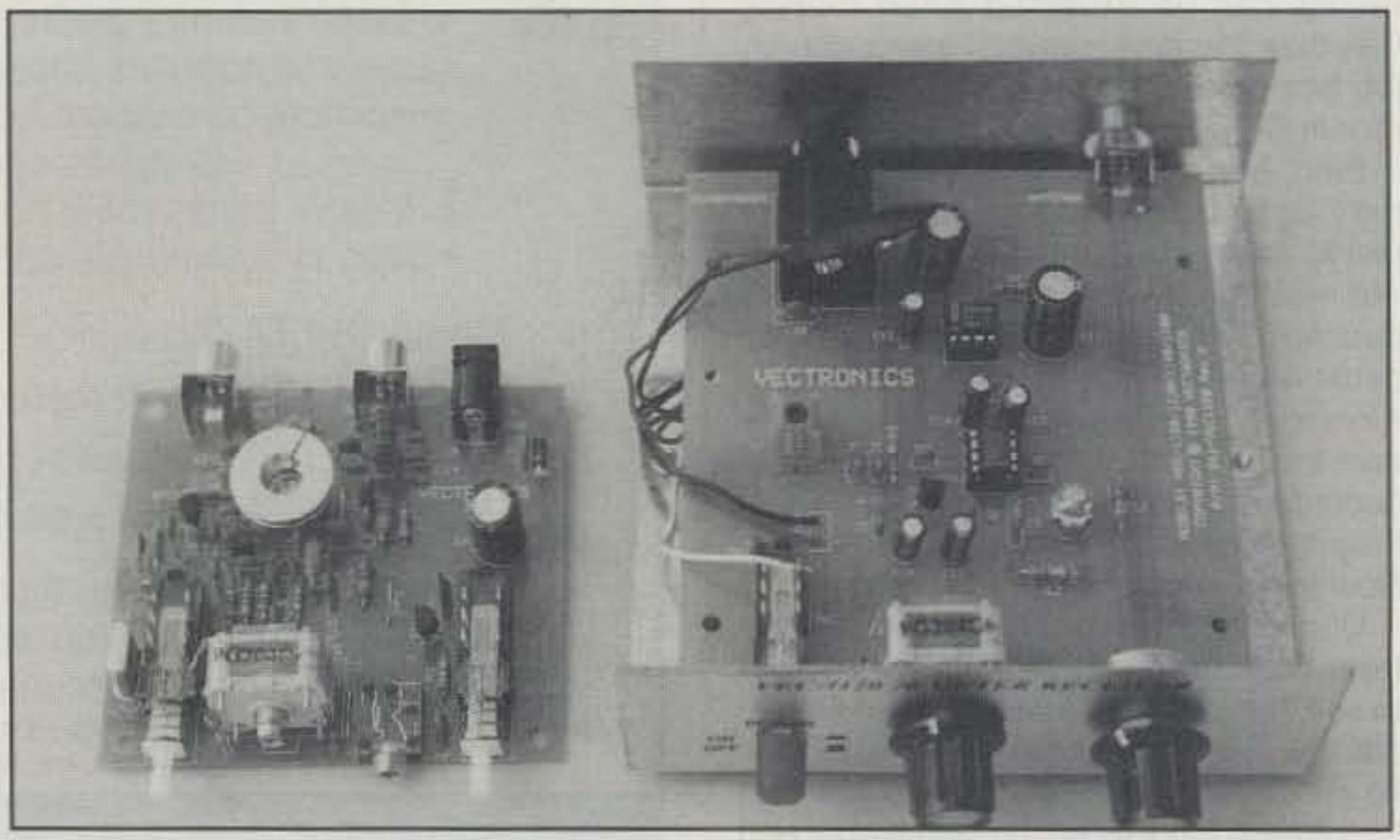


Photo 3– Both new Vectronics kits have now been assembled and quick-tested, and the receiver has been mounted in its optional enclosure. Receiver tunes a CW or SSB band segment. Transmitter's VXO covers 4–7 kHz. Ten minutes to QSO time!

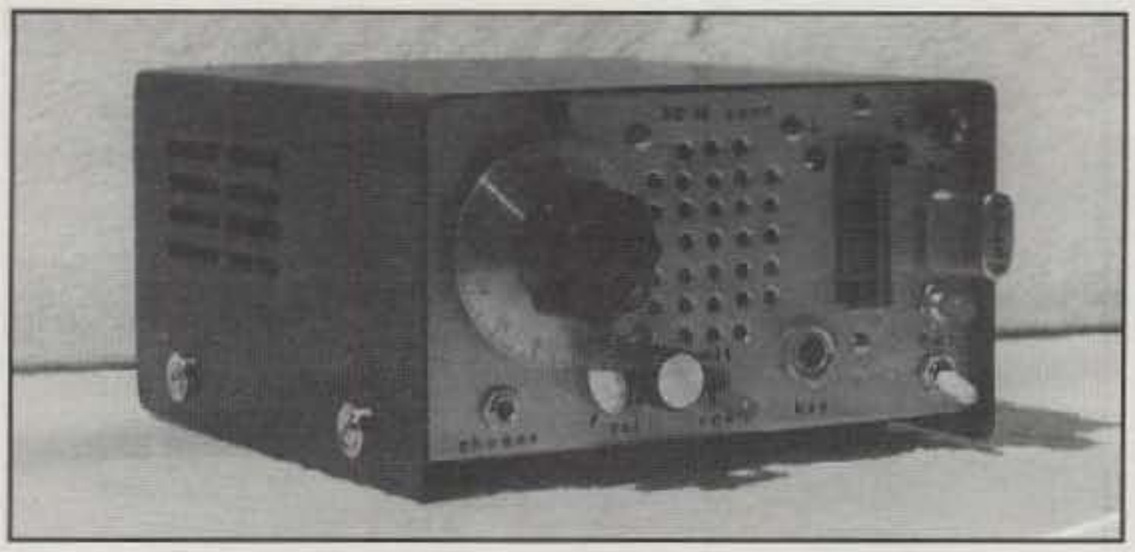


Photo 4– Front view of the neat homebrewed 30 meter QRP trans-receiver made from scratch by Stan, W3TFA. Transmitter is crystal controlled with sidetone and front-panel output meter. Receiver is three-IC design with VXO tuning and produces sufficient audio to drive the front-mounted speaker. Battery pack is included, so Stan just plugs in an antenna and key to operate. Size is 3 by 5 by 5 inches. (Photo by Stan Brigham, W3TFA)

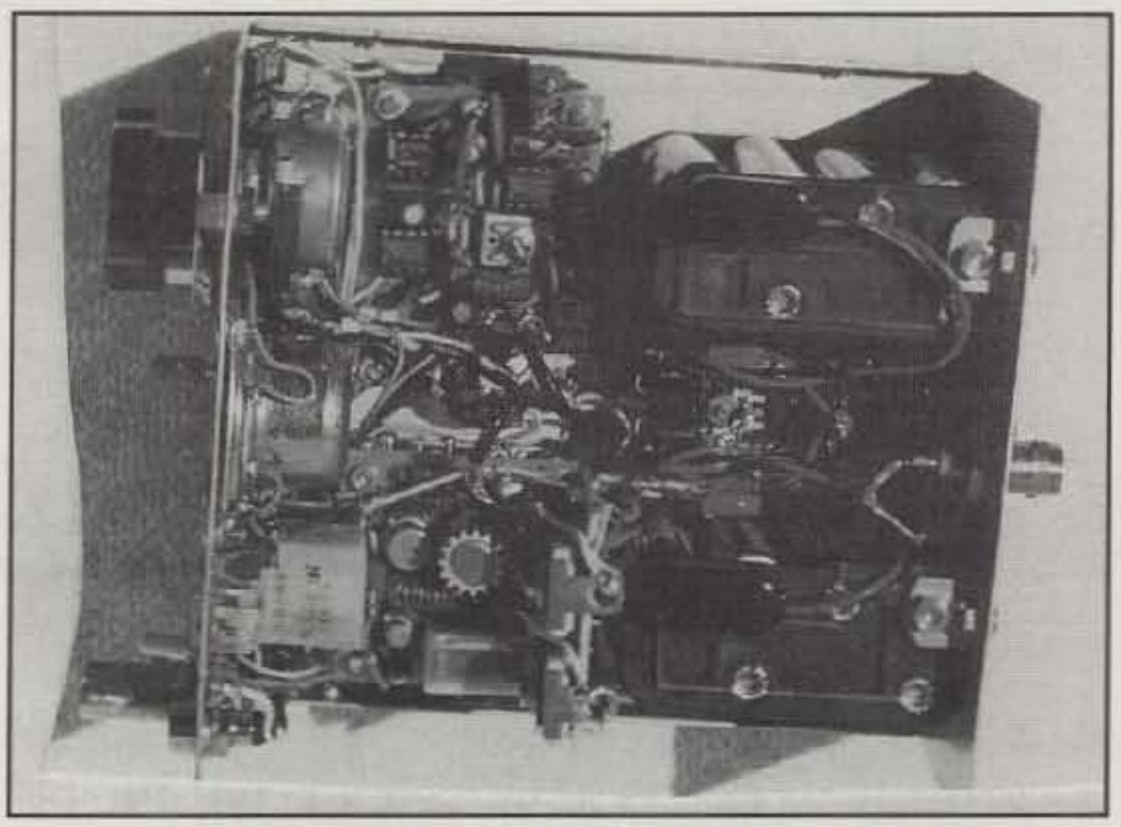


Photo 5– Internal view of the W3TFA handwired-on-perfboard 30 meter rig. Left/top pot tunes receiver, and small speaker is mounted in the middle of the front panel. Beside the speaker, you can see the top of the meter (it's white). Two ICs in receiver are visible behind the tuning pot. The transmitter's 2N2222 and 2N3553 (in finned heatsink) are behind the meter. Twin battery packs holding eight AA cells each are mounted between the circuitry and rear panel. (Photo courtesy W3TFA)

one jumper to swap 10 meter operation for 30 meter operation. Mod time is only a few minutes, and lifting one end of each component easily restores 10 meter operation, if and when desired. Ray's details follow here.

"Ten-Tec uses a 9 MHz IF with appropriate VFO frequencies. On 10 meters, the VFO ranges from 19 to 21 MHz. If we use the difference mixer product, rather than the sum, as in the original design, output occurs on 10 MHz rather than 28 MHz. Since the transmitter stages are broadband amplifiers, the only changes required for 10 MHz transmit are to re-resonate the appropriate bandpass filter, composed of T7 and capacitors C17 and C18 on the 80262 front-end board (see fig. 1). Shunt C17 and C18 each with an additional 91 pF of capacitance. Depending upon component tolerances, retweaking T7 cores may be necessary for adequate output. The addition of the two 91 pF capacitors completes transmitter modification.

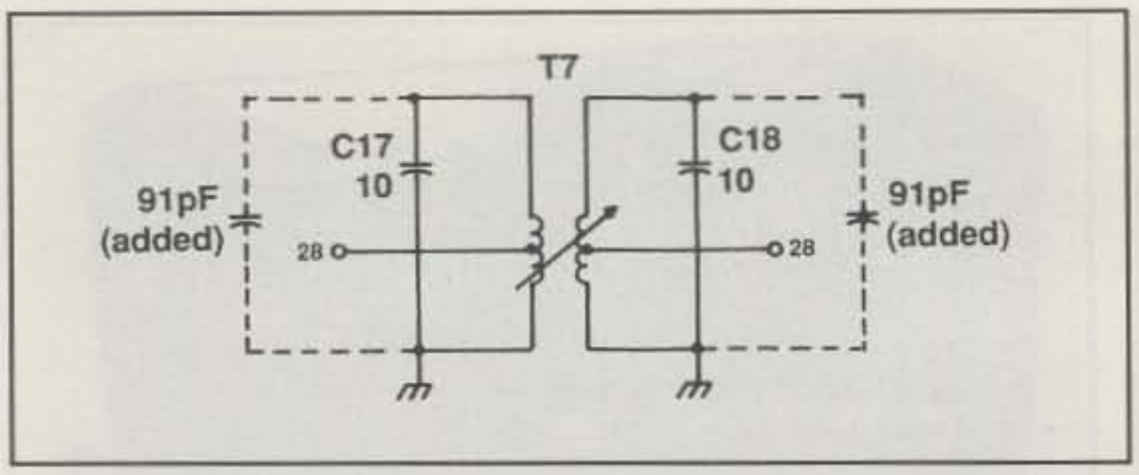


Fig. 1– Modifying the Argonaut's transmitter section for 30 meters involves adding only two capacitors to the T7's tuned circuit on the 80262 board.

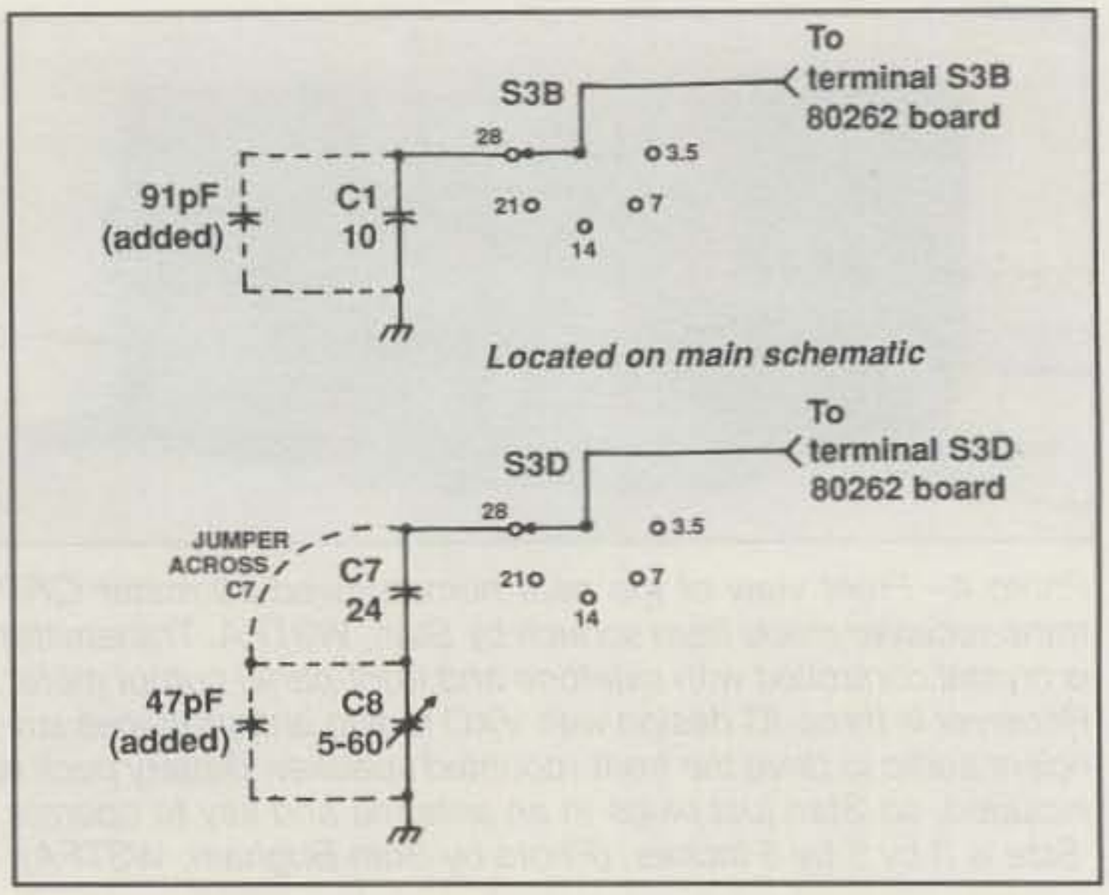


Fig. 2– Modifying the Argonaut's receiver section for 30 meters requires mild additions to components switched by S3b and S3d in the rig. (Original drawing courtesy AA4LL) →

"The receiver will function with reduced performance without modification by turning the receive preselector completely counterclockwise, as mentioned in the manual for WWV reception. To improve 10 MHz performance the receiver front-end needs additional capacitance.

"C1, on the main schematic, is switched across T1 to resonate at the desired band. For our purposes, C1 needs to be shunted with another capacitor, again of 91 pF, as seen in fig. 2. T2, on the other end of the RF amplifier front end, must also be resonated at 10 MHz. Shorting C7 with a piece of tinned bus wire and paralleling variable C8 with an additional 47 pF completes our modification."

Thanks, Ray! Running an original Argonaut on 30 meters is a most unique and exhilarating experience for sure!

Quick Wrap Up

That is all the QRP news and views that will fit into Part I, gang, but stay tuned to this same channel for more late-breaking info coming in Part II next month. Meanwhile, check out the new wintergreen Altoids tins at your corner store. They are aqua colored rather than red, but as I always say, you know it's QRP if it's in an Altoids tin! Keep on QRP'n and listen for me on 30 meters (I will be the weak one running QRP)!

73, Dave, K4TWJ

BY JOE LYNCH, N6CL

VHF PLUS

ALL ABOUT THE WORLD ABOVE HF

KH6HME Receives Special Achievement Award

Paul Lieb, KH6HME, of Hilo, Hawaii, will be honored this month at the Dayton Hamvention with a Special Achievement Award. The awards committee cited Paul for "his pioneering and record-setting work in tropospheric ducting and VHF, UHF, and microwave communications." The award will be presented at the Hamvention banquet on 15 May.

What is so incredible about Paul is that he is the holder of eight VHF, UHF, and microwave DX records. All of these records include Paul as the Hawaiian end of the QSO. The latest records are the following in band order:

144 MHz: On 1 July 1995 Paul worked Jim Costello, W7FI, in CN87 to stretch the existing record he held to 2692 miles. On that same day he was heard in Vancouver, BC.

220 MHz: On 15 July 1989 Paul worked Jack Henry, N6XQ, operating as XE2/N6XQ in DL29, to stretch the existing record he held to 2574 miles.

432 MHz: Also on 15 July 1989 Paul worked Jack on this band to stretch the existing record he held to 2574 miles.

903 MHz: On 12 July 1994 Paul worked Jack, this time at his home QTH in San Diego (DM12), to stretch the existing record he held to 2523 miles.

1296 MHz: Also on 15 July 1989 Paul worked Jack as XE2/N6XQ, to extend that record he held to 2574 miles.

2304 MHz: On 11 July 1994 Paul worked Chip Angle, N6CA (DM03), for the first Hawaii to the mainland QSO on that band. That set the distance record to 2469 miles.

3456 MHz: On 28 July 1991 Paul worked Chip for the first Hawaii to the mainland QSO on that band.

5760 MHz: The next day, 29 July 1991, Paul worked Chip for the first Hawaii to the mainland QSO on that band. The only band remaining that has long-distance tropospheric propagation capabilities is 10 GHz. Both Jack and Chip are working with Paul to establish a record-breaking QSO on that band.

Who is Paul Lieb? Paul is 71 years old, is not married, and lives with a family on the island of Hawaii. He is an electrical contractor by trade, and works six days a week wiring houses in the Hilo area. As a devout Catholic, he will not work on Sunday and is faithfully in church, even if it means driving off the Mauna Loa volcano during a band opening. He also owns and maintains one of the few private water companies in Hawaii. He first arrived in Hawaii in December 1969 while working for a building contractor. He was so entranced by the islands and their people that he decided to stay.

Paul's interest in VHF predates this, however. Paul was first licensed in 1952 as W6ZOP. His interest in the hobby predates his licensing by almost two decades. He started out listening to KFI in LA when was five years old. He remembered ordering a crystal set from Allied Radio that he put together in order to hear KFI. He said that it took a week after he sent an airmail letter to Allied for the set to arrive at his home.

The first time Paul used a microphone was when he was ten. Clarence, W6DYG, was his Elmer. Paul made his first third-party QSO on 160 meters AM. He reports that he remembers seeing Clarence's tuner on the wall and how critical that tuner was to his successful 160 meter operation. After being licensed, Paul operated almost exclusively on VHF. He said that it was his first love. He reported that while in California operating he built all of his own equipment.

In 1955 the San Bernardino Microwave Society was formed. Paul became one of its charter members. When John Chambers, W6NLZ, began his odyssey to work Hawaii on the VHF and above bands via tropospheric propagation, Paul became fascinated with his efforts. It was in 1957 that John and Tommy Thomas, KH6UK, conducted experiments based on airline pilots' reports of being able to hear the Honolulu tower once in the air after take-off from a west coast airport. These two tropo pioneers made their first contact on 2 meters on 8 July 1957 and set the next record on 22 June 1959—this time on 125 cm. During those years of John's operations Paul became a friend of his. Paul reported that while John was at times reticent about whom he would let into his shack, Paul found the door was always open to him.

Following John's death, Paul was given the 7 foot rack containing the KWS1 and all of the other equipment that John used to make the 2 meter, 125 cm, and 70 cm contacts. He stated that the equipment has never been used since then and remains stored in California.

After moving to Hawaii, Paul longed for the day when he could replicate his friend's Hawaii-to-the-mainland DX accomplishments. It would be ten years before his first entry into the record books.

Immediately after his move to Hawaii, Paul became intensely aware of one of the disadvantages of living there—no amateur radio stores. During those ensuing years he begged and bought equipment from friends on the mainland. His principal benefactor was Chip, who built all of the beacons and much of the VHF and microwave equipment that Paul has used over the years.

Finally, on 18 July 1979 an initial contact was made on 70 cm between Hawaii and the mainland. Louis Anciaux, then WB6NMT, now KG6UH, who then lived on a ridge of Point Loma, in San Diego, had an excellent view of the Pacific Ocean. When he heard the 70 cm beacon located on the side of the Mauna Loa volcano, he called Paul on the phone. He had to wait five hours for Paul to get off work and make the 2½ hour drive up to the site to complete the first contact.

Five years later Paul again found himself in the record books. This time the first contacts were made on yet another VHF+ band. On 24 June 1984, Chip Angle, N6CA, heard the 23 cm beacon on Mauna Loa that he had built and sent to Paul a few years earlier. Chip alerted Paul and made plans to drive to Palos Verdes. Meanwhile, Paul made his way up the side of Mauna Loa. The two made contact with relative ease.

It would be another five years before Paul would again find himself in the record

VHF Plus Calendar

May 2	Very poor EME conditions.
May 5	Lowest Moon declination.
May 8	Last quarter Moon.
May 8-9	Nevada QSO Party. (See text for details.)
May 9	Moderate EME conditions.
May 13-16	Dayton Hamvention.
May 15	New Moon and perigee.
May 15-16	6-meter Spring Sprint contest.
May 16	Poor EME conditions.
May 18	Highest Moon declination.
May 22	First quarter Moon.
May 23	Good EME conditions.
May 28	Moon apogee.
May 30	Full Moon. Very poor EME conditions.

** EME conditions courtesy W5LUU.*

P.O. Box 73, Oklahoma City, OK 73101
(phone 405-528-6625; fax 405-528-0746)
e-mail: <n6cl@fuller.edu>

books, this time with Jack Henry, N6XQ, who was operating from his Mexico QTH. Commenting on that experience, Jack wrote: "It was a day to remember. All bands were armchair copy for hours except for 1296, which had lots of fading. The path on 2 meters was so strong that I dropped the power down to a few hundred milliwatts and was still able to comfortably work him.

"You can see I owe a debt of gratitude to Paul for all his tenacity. The following are records we made from Mexico to Hawaii: 13 July 1989, 144 MHz, 2659 miles; 15 July 1989, 222, 432, and 1296 MHz.

"Once Paul got to his 8200 foot perch on the volcano, he would not leave until the band collapsed. During is stay, he slept on the front seat of his station wagon. We are now attempting to make it on 10 GHz. We both know it can be done; it's just a matter of time."

Two years later again Paul would make history. On 28 July 1991 Chip and Paul managed two record-breaking QSOs on SHF. The first was on 3456.1 MHz and the second, an hour later, was on 5760.1 MHz. These QSOs established new terrestrial records of 2469 miles for each band.

Chip reported that his homebrew equipment was used on both ends of the path. Each station was running 5 watts into a 4 foot dish. Chip was operating near the Palos Verdes City Hall at an elevation of 400 feet.

What is more remarkable about this record is that the QSOs took place at all. Earlier that summer I spoke with Paul and he was a bit disappointed that very little propagation had taken place between Hawaii and California. (By then it had become a regular event for people on the west coast to work Hawaii on 2 meters SSB in late June to early July.) At that time Paul doubted that any realistic propagation would take place that summer. However, Chip and Paul decided to try for the record anyway. Weather reports were monitored daily. On the 28th the weather reports indicated the possibility of a tropospheric duct being formed between California and Hawaii.

Chip set up his station in anticipation of the possible opening. Paul drove up to his beacon site on the volcano from his home in Hilo to fire up his end of the path.

Finally the band started to cooperate. Paul started giving out contacts on 144 and 432 MHz. All the while, Chip and Paul used 144 MHz for liaison and monitored 1296 MHz for band openings. Ultimately, they were able to establish contact on 3456 MHz. Then, an hour later, they made contact on 5760 MHz. The contacts took place on CW, and Chip reported that there was tremendous QSB on both bands, but that for periods as long as 30 seconds they had copyable signals, making for the official contacts. Chip reported that both antennas were aimed precisely at each other. However, Chip says that they did have a margin of error of about three degrees on these frequencies. Normally, Chip sets up at his home QTH at the 1200 foot level. However, they found that this duct pipeline was at an unusually low level, requiring that Chip set up at the 400 foot level.

The previous 3456 MHz record of 614 miles was held by Chip and Jack Henry, N6XQ, operating within Mexico.

Three years later again Paul made record-setting history. Chip recounts what happened then: "After 13 years of attempting and making contacts on most of the microwave bands, Paul Lieb, KH6HME, and I finally made the shot from Hawaii to California on 2304 MHz. This leaves 10 GHz as the only band left to be worked. The latest two-way CW QSO took place on 11 July at 2321 UTC.

"The opening will be remembered as the great Hawaiian opening of 1994. As of this writing, the band is still open to everyone on 144 MHz. At times mobiles with Omni antennas have been worked easily by Paul and Russ Sakai, KH6FOO, on 144 MHz. Additionally, Paul worked many stations on 144 through 1296 MHz. They both wore out their voices.

"The KH6HME station was located on the Mauna Loa volcano at 8200 feet elevation, at 19:35:19N and 155:27:10W (grid BK29go) and N6CA was at Palos Verdes City Hall at 33:44:45N and 118:24:16W (grid DM03tr) and an elevation of 340 feet. Distance for the contact was 2468.8 miles. Paul said many times he has never seen it so windy up on the volcano.

"The contact was made on CW with signal reports of 559 both ways with QSB. An SSB QSO was attempted for a few minutes but was not completed because of our rushing up to 10 GHz. We ran for several hours on 10368 MHz but with no success. We finally ended up on 5760 MHz, also with no success. This was a not so common type of opening with no elevation restriction on the California end along with good 1296 MHz propagation. It's been many years since this type of opening last occurred.

"Equipment consists of identical totally home-brew transverters built by N6CA running 12 watts output to 4 foot dishes and 1.5 dB noise figure receivers. They are direct conversion to 28 MHz. The 4 foot dishes have interchangeable feeds for 2.3 GHz to 10 GHz and require about 4 or 5 minutes to do so."

Two days later another record was broken. On 13 July 1994 Paul and Jack

hooked up on 903 MHz to extend that record to 2523 miles.

The most recent record that Paul set occurred one year later. On 1 July 1995, the 2 meter band was wide open. The tropo duct traveled to its most northern point ever noted. Paul worked several stations in Washington state, the farthest from him being Jim, W7FI.

For almost 30 years Paul has consistently promoted amateur radio and specifically weak-signal VHF activity from his adopted QTH in Hawaii. He has given out hundreds of contacts. He is particularly thrilled to work new amateurs for their first Hawaiian QSO. Often he will go on FM to give out contacts. He said that some people even stay home from work in order to work him. Some of the old, old timers are also equally thrilled to work Paul because as long as they have been on the air, they have never worked the Hawaiian DX.

Paul's QSOs generally are not quick, contest-style QSOs. Paul tries to take a couple of minutes with each person to create a relaxed atmosphere and to acquaint him or her with what the experience is in a contact with Paul. Sometimes he talks to amateurs using their hand-helds. He remembers one QSO where the guy was in the grandstands at the Oakland Coliseum during a game. He was a bit leery about working Paul, but was challenged to try it anyway. The guy couldn't believe that he actually worked Paul while only using a hand-held.

When the band is open, Paul completely rearranges his priorities in order to devote as much time as possible to working as many stations as possible. He will load up his station wagon with as much food as he can carry and make the two-plus hour trek up a not so good road to the shack site. Once there he will fire up the radios and keep making contacts until the bands quit or he has worked everyone on the bands. When he needs to sleep, he takes a nap in the station wagon.

Paul enjoys conducting tours of his island paradise, as can be witnessed by all the callsigns scratched on the door of his Mauna Loa QTH. So if you are making plans to go to Hawaii, be sure to drop Paul a note.

Paul is not on e-mail because he does not own a computer. He said that at this stage in his life he does not intend to do so either.

Some Tributes

Chip, N6CA, states that without Paul he would not have near the enthusiasm to work the VHF and above bands that he has had. Jack says that all west coast VHFers owe him a debt of gratitude. He adds that without his beacons, most of the Hawaiian openings would go unnoticed. Further commenting, he states that Paul

is such a caretaker of the equipment entrusted to him that when the volcano erupted a while back, he single-handedly evacuated every piece of equipment out of the control room and to safe-keeping at his QTH. Chip said that that was the only time the beacons were off the air for any length of time—and that was because fire from the lava consumed the utility poles and the electric company had to wait several weeks for the lava to cool enough to put the poles back up without them catching fire.

In tribute to Paul, Larry, W6OMF, writes the following: "I would like to take a minute to thank Paul Lieb, KH6HME, for all the wonderful contacts he has shared with the amateur community. It has always been a pleasure to listen to his exchanges and realize that he has made each and every one an individual and personal contact, not just an exchange and then on to the next. We have all experienced the excitement of his contacts and appreciate his unselfish efforts. A hearty congratulations to Paul from all the members of the Western States Weak Signal Society and amateur community. 73, Larry, W6OMF"

Arnold Harding, KQ6DI (CM97cq), shared the following: "On 7-20-98 there was a good opening on 2m from California to Hawaii. Paul was kind enough to go up to his location and give lots of contacts on 2 m. I decided I didn't want to compete in the pile-up. My signal isn't strong, and I have two tall ridges between me and the ocean. The next evening the opening was still in progress. Paul went up the mountain again. I heard him call CQ and someone answered. On the next QRZ I decided to give it at try. He came back with my callsign and gave me a 5-2. He was about a 5-7, and we chatted for a few very pleasant minutes. Everyone has told me that Hawaii is easy from California when the tropo is working, but I didn't expect to make the contact with 100 watts and two loop antennas at 25 feet. Thank you, Paul, for giving me a great experience."

Kent Tiburski, WA6TBO, writes: "Glad to hear Paul will be recognized! Have enjoyed working him over the years when the duct is in. Best and most memorable QSO was in August 1986 when I worked him with a Santec LS-202 HT in the low-power position (1/2 or 200 mw?) using the stock rubber-ducky antenna with 5-7 reports both ways. Enjoyed the breakfast we had a few months ago when he came to San Diego."

He added: "A QSO of note that was in your column in 1995. Doug, W2CRS, and I QSOed via a very-very strong *E*-skip opening one afternoon on 2 meters (with a different Santec LS-202 handheld). Coincidentally, Paul's beacon had been 5-9 (Paul was also on prior to our QSO) for two days. Sadly, Doug asked me if the beacon or Paul was on frequency. No dice. About 40 minutes later the beacon was back in 20 dB over S-9. What would have been a potential record was not to be. An Es-to-tropo long-distance QSO. What a contact to remember! I was excited to be the 'middle-man' on a potential record-breaking QSO. Maybe in a few years. Guess that's why we/us/I like VHF, huh? Unpredictable and always exciting! Way to go, Paul!"

Jack, W7PW, wrote: "Congratulations to Paul Lieb, KH6HME, on his reception of Dayton Hamvention's Special Achievement Award for 'his pioneering and record-setting work in tropospheric ducting and VHF, UHF, and microwave communication'! This is an award that is well deserved!"

Joe Reisert, W1JR, comments: "Paul was doing this way back in 1973 when I visited him in Hilo and has deserved this for a long time!" Jordan, VE2SWL/VE6, comments: "The award is *long* overdue. Congratulations to Paul."

Larry Lambert, NØLL, wrote: "At the CSVHF Society get together ad KC last July Jon, NØJK, gave me audio from his laptop of some of KH6HME's 2 m audio recorded in Sacramento, CA last summer. I played that audio as part of a program at the Salina, KS Hamfest, Lincoln, NE club meeting (71 there) and another nearby ARC.

"The hams there were just fascinated; didn't have any idea the West coast could work Hawaii on 2 meters. We need more dedicated heroes in VHF. In the summer of 1996 one late in July afternoon the MUF was high and TV channel 6 from Tijuana was coming in 5-9 down to the shop, so I came home and called CQ on 2 meters. No one answered, but as the TV signals were wall to wall and the FM band was full of Spanish-language stations, I know the band was open somewhere—probably into the ocean or south of San Diego.

"This opening occurred during the days of a tropo duct from CA to HI. I put a ruler to the globe and came out way south of the big island. If the other end of the opening had been 150 or so miles north and Paul had been up on the 8000 foot volcano, we may have had a shot.

"Needless to say, it will take on the ball operators if Hawaii is ever to be worked west of the Rockies on 2 m. It could be done in my lifetime, but it takes timing, just like it does for other VHF rarities."

Lee Wical, KH6BZF, wrote: "Paul, is a VHFer's VHFer. He is a willing amateur involved in the furthering of VHF tropo and studies there to. Words cannot say Paul's worth to amateur radio. Paul is outstanding. Paul is my friend and I'm proud to be his friend. I treasure our close friendship over the years."

Gordon West, WB6NOA, commented: "I consider Paul one of my close personal friends. Words cannot adequately express what he has meant to the VHF community. His award is well earned and well deserved."

Current Conferences

Dayton: As mentioned above, Paul will be honored at the formal banquet on Saturday night. There is another banquet on Friday night that is specifically for the VHFer. From Tom, WA8WZG, comes the following announcement.

Dayton Weak Signal Banquet 99: "The Weak Signal Group that meets Monday nights at 0200 UTC on 3.843 MHz. would like to invite everyone who is coming to the Dayton Hamvention to our annual banquet. We have reserved a room that will seat 125 on Friday night, May 14, at the Holiday Inn North Waggoner Ford Rd. exit off I-75., from 6 PM until 11 PM. There will be a cash bar starting at 6 PM as well as plenty of room to mix and mingle with VHFers from all over the country and the world. There will be over 50 prizes drawn starting at 9 PM. Also, there will be a guest speaker who will provide a short talk on VHF activity. There will also be a noise-figure measuring setup, so bring your preamps through 24 GHz to tweak.

"The cost of a ticket, which includes a buffet dinner, is $30 per person, and they are limited to 125. Spouses are welcome and are eligible for the prize drawings. You may order your tickets by sending $30 plus an SASE to either Tony Emanuele, Wa8RJF, 7156 Kory Ct., Concord Township, OH 44077, or to Tom Whitted, WA8WZG, 4641 Port Clinton East Rd., Port Clinton, OH 43452. Include the names and calls of all ticket purchasers as well as e-mail address.

"If you need more information or if you would like to donate a prize, please contact me at <WA8WZG@WA8WZG.com>.

"This is one of the largest gatherings of VHF weak-signal enthusiasts in the US., so get your tickets early and join us for an enjoyable evening!"

Current Contests

Nevada QSO Party: The 1999 Nevada QSO party, sponsored by the Frontier Amateur Society, will be held on May 8 and 9, 1999 from 0000Z on May 8 until 0600Z May 9. Frequencies 6 through 160 meters; modes SSB, CW, RTTY; suggested frequencies: CW 15 up from bottom of General band; SSB 25 up from bottom of General band; Novice/Tech/Tech-Plus 15–25 up from bottom of band. Exchange Nevada -RST-county; others state-province or DXCC country, and RST. QSO points: 1 point SSB, 2 points CW, RTTY. Multipliers: Nevada stations QSO points multiplied by states, province, DXCC countries worked. Others: QSO points multiplied by Nevada counties worked. Certificates will be awarded to

N6CL Featured in *New Choices* Magazine Article

Joe, N6CL, was featured in the March 1999 issue of *New Choices* magazine, a *Reader's Digest* publication that caters to people over 50. In an article entitled "Your Next Career," author Laura Schenone interviewed Joe about his new career as a United Methodist minister. In the article Joe is among two others who have widely different second career choices. She used her interview with him to illustrate that some second-career persons choose a new career based on life-changing experiences.

We at *CQ* congratulate Joe on the early success of his new career, which includes being selected as a national spokesperson for it.

class winners. Mail logs to Jim Frye, NW7O, 4120 Oakhill Ave., Las Vegas, Nevada 89121-6319 before June 15, 1999. E-mail: <nw7o@anv.net>. Phone 1-702-456-5396.

Spring Sprints: The 6 meter leg of this contest is from 2300Z 15 May to 0300Z 16 May. More information on the Sprints can be found in last month's column.

CSVHF Call for Papers

The Central States VHF Society has issued a call for papers for its proceedings for the 1999 conference to be held at the Sheraton Four Points Hotel (same place as 1984 and 1991) in Cedar Rapids, IA from July 22–25. If you are interested in submitting a paper or giving a talk at the conference, contact the society's president, Rod Blocksome, KØDAS, at <k0das @csvhfs.org> or his callbook address. By the time you read this, the deadline will be almost here, so you had better contact him rather quickly.

And Finally . . .

It has been a lot of fun writing this month's column. I have been able to concentrate on writing wonderful things about a wonderful amateur—a true hero of the hobby. I have e-mailed and made phone calls to my friends on the west coast to get input from them and each one of them had glowing praises of Paul.

I have not yet met Paul or even worked him. I have, however, heard his infamous 2 meter beacon. Once you've heard its distinctive sound, you will never forget it. I heard it on my TR751 that was lying on the passenger seat of my rental car while I was driving around San Diego.

Paul is so right that your heart almost skips a beat when you hear that signal on 2 meters from so very far away. There is unexplainable excitement at the mere observation that a weak VHF signal can travel so very far.

There is where Paul's unselfishness shines. He is always available. Whenever there is even a hint of a band opening, if Paul is on the island he is rearranging his schedule to accommodate the bands and those who want to work him. Paul's tenacity and spunk have given back so much more to the hobby than he will ever gain. In my travels, I sometimes run into old timers who say that they did their fair share for the hobby years before and would not be volunteering any more of their time in their old age. Paul is just the opposite. At 71, Paul is more than qualified to take off and relax. Yet he will not.

We need more people in our hobby like Paul. In fact we really do need someone in Hawaii to step into Paul's shoes when he is no longer able to do what he is doing, although knowing Paul, that may be several years from now.

Carol, my wife, and I hope to take a long-overdue honeymoon in Hawaii. When we do, we will look forward to one of Paul's special tours, and to carving our callsigns in the door as well.

To Paul, I say, thank you so very much and aloha. To the rest of my readers, until next month . . . 73, Joe, N6CL

BY JOHN DORR, K1AR

CONTEST CALENDAR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Balancing Aggressive vs. Courteous Operating

May's Contest Tip

This may be old news to many of you, but I can't tell you the number of times I have received a thank-you on the air from someone who has received my QSL card. A little goodwill and attention to answering your QSLs will go a long way toward having many of those same stations give you a call in the next contest.

Calendar of Events

Apr. 24-25	Helvetia Contest
Apr. 24-25	Florida QSO Party
Apr. 24-25	Ontario QSO Party
May 1-2	Connecticut QSO Party
May 1-2	Massachusetts QSO Party
May 1-2	ARI Int'l DX Contest
May 1-2	MARAC County Hunters Contest
May 8-9	A. Volta RTTY DX Contest
May 8-9	CQ-M International DX Contest
May 8-9	Nevada QSO Party
May 15	EU CW Spring Sprint
May 22-23	Texas QSO Party
May 22-23	Baltic Contest
May 29-30	**CQ WW WPX CW Contest**
June 12	Portugal Day Contest
June 12-13	ANARTS WW RTTY Contest
June 19-20	All Asian CW DX Contest
June 26-27	ARRL Field Day
July 1	RAC Canada Day Contest

Whether it's DXing or contest operating, the issue of operating style has been an age-old question debated for decades. Let's face it: sometimes we can get a little excited when we're on the air. It may be a rare DXpedition that has just moved to your call area after forcing you to wait for 45 minutes, or maybe you just found Nebraska for your last section in the CW Sweepstakes. For most of us, the adrenaline still flows at certain operating times.

Having just come off the end of the ARRL DX Contest season, I'm struck with the need to pose a question to you and myself. Have we recently considered the line we need to draw between courteousness and the operating aggressiveness required to win or achieve our personal operating goals? Let's get into the topic a bit and think it through.

I'm sure we all have our list of fellow amateurs who fall into the unwelcome category of "obnoxious operator." You know the type: "OK, the Whiskey 4, Whiskey 4, please call again?" followed by "Roger, Kilowatt 9—you're five and nine, five and nine, over." In a humorous way, I often compare our on-the-air behavior to real life. Imagine standing in front of the deli line at the supermarket with ticket number 57 in your hand. Would you jump ahead and start placing your order when they called 51, just because it had the number 5 in the request? We sometimes behave very differently in our hobby when provided with the opportunity to hide behind a radio.

Split operations during DXpeditions or large contest pile-ups are another good example. I sometimes just laugh when I hear the operator on the other end asking for a WB2 and hear the scores of non-WB2's continuing to call and call and call. It seems there's a bit of operating freedom afforded for some in split operations, because the world is listening more to the DX station's transmit frequency and less to what's happening on their listening side. The result: we push the envelope a bit more.

Perhaps it would be useful for us to consider some guidelines in drawing that line between aggressive and courteous contest operating styles. I guess it fundamentally begins by having a desire to draw the line in the first place. Some of us, unfortunately, just don't care. And for you, I ask that you at least think about this month's subject. For the rest of us, there's probably a good adage that applies here, which is to draw that line in our minds and then step back about two feet from it.

Keeping in the spirit of our discussion, here is a series of key operating-style questions you may want to ask yourself:

- Am I using a reasonable balance between listening and transmitting when calling in a pile-up?
- Can I really hear the station I'm calling (i.e., 160 meters)? Do I even know who he is?
- If the calling station asks for a "W7" and no one comes back, should I quickly dump my callsign into the frey in order to "sneak in"?
- What's a reasonable amount of bandwidth that I should expect, especially on a crowded band, between surrounding stations and myself when calling CQ?
- If I took a breath and thought about my response for a few seconds, would I say something different to a fellow amateur challenging my use of a certain frequency (especially a non-contester)?
- Do I operate differently when I have the opportunity to hide behind someone else's callsign (i.e., guest operation, multi-op., etc.)?
- Is there a reasonable amount of operating liberty granted to us when operating in contest mode that results in different courtesy standards from those found in the "middle of the week"?
- Do I show the proper amount of patience when waiting for a station to sign their callsign before screaming "What's your call?"
- Do I display any consideration to the interests of non-contesters on the bands I use while operating?
- When operating split, do I truly check and/or care about what may be taking place on the frequency on which I'm about to call CQ?
- Do I operate in a way that treats others the way I would want to be treated, or is it simply just every man for himself?

Anyone who really knows me understands the highly competitive nature I possess. Let's face it: if we weren't competitive by design, I doubt that many of us would have an interest in contest operating in the first place. So let me be clear that I'm not suggesting an unrealistic picture of operating style this time around. Put another way, when most of us are rightfully using an operating frequency, you can bet we'll be in your face if it's challenged in an unjustifiable way. Similarly, you can count on a level of aggressive calling by most serious competitors in pile-ups that some may measure as obnoxious. Again the key is drawing that line.

My challenge to all of you this month is to think about that line. Is there an operating style you can construct that achieves the same result with a "kinder and friendlier" approach to the bands? Are there more appropriate responses we can give to our fellow amateurs who have absolutely no interest in the contest other than "turn your radio off and come back on Monday?"Can we start to listen a bit more and transmit a bit less as part of our operating styles? These are the kind of issues that ultimately make us better contest operators, and more important, help us co-exist with the rest of the amateur population and each other on the bands during a busy contest weekend. I challenge you (and me!) to take a proactive step in this area

2 Mitchell Pond Road, Windham, NH 03087
e-mail: K1AR@contesting.com

and measure the results. You may be surprised what you learn.

Final Comments

A reminder that the 1999 CQ Contest Survey season is in full swing. Please take a few minutes and voice your opinions on the subject of technology in contesting. By the way, you'll now find the survey on <http://www.contesting.com>. There's no easier way to state your views than submitting your input via W4AN's web site (and yes, fellow amateurs, save 33¢!). Check it out!

Please remember to provide any submissions for the August column to me by June 1. More and more of you are catching on, but as you can imagine, you can really help my workload (and accuracy!) by submitting your contest announcements via electronic mail to: <K1AR@contesting.com>. You can also send it via regular mail to 2 Mitchell Pond Road, Windham, NH 03087.

73, John, K1AR

ARI International DX Contest

2000Z Sat., May 1 to 2000Z Sun., May 2

This is the annual edition of the Associazione Radioamatori Italiani's International DX Contest. The ARI DX Contest is managed by veteran contester I2UIY and should offer a significant amount of activity. Stations are allowed to work each other worldwide.

Classes: Single Operator SSB, CW, or RTTY; Single Operator Mixed; Multi-Single Mixed; and SWL Mixed.

Frequencies: 160 through 10 meters (no WARC bands) according to the IARU band plans (RTTY is 80–10 meters). All stations (including single operator) must adhere to the standard 10-minute rule.

Exchange: Italians send RS(T) and province; all others send RS(T) and serial number.

Points: QSOs within your own country count only for multiplier credit. Count 1 point for QSOs inside your own continent, 3 points for QSOs outside your continent, and 10 points for Italian QSOs. Stations can be worked once per band and mode (e.g., 15 CW, SSB, and RTTY).

Multiplier: Italian provinces (103) and DXCC countries (not I or ISØ). Credit multipliers only once per band.

Scoring: Final score is sum of QSO points times the sum of multipliers.

Awards: A plaque will be offered to the highest scoring station in each class. In addition, a certificate will be awarded to the top two to five placing stations as well as the leading scorers in each DXCC country.

Special Award: Two very attractive, large plaques will be awarded by the Santa Barbara Contesters in memory of

IN3ANE. They will be given to the best OM scorer under 21 years of age and the best SWL scorer under 18 years old.

Free logging software is available for the ARI Contest. You may obtain your copy directly from the contest manager ($5 or 10 IRCs for expenses). Entries may be submitted on diskette in N6TR, K1EA, EI5DI, or ASCII format or via e-mail to: <ari@contesting.com>. Logs must be mailed 30 days from the end of the contest and addressed to: ARI Contest Manager, I2UIY, P.O. Box 14, I-27043 Broni (PV) Italy.

MARAC County Hunters CW Contest

0000Z Sat., May 1 to 2400Z Sun., May 2

The Mobile Amateur Radio Awards Club is sponsoring the 33rd Annual County Hunters CW Contest. Mobile, portable, and fixed operation from every county in the U.S. is welcomed, and operation from less-active counties is encouraged. Fixed stations may be worked only once on each band. Mobiles and portable (identified by signing /M or /P after call) may be worked each time they change county or band, and when operating on county lines count as one QSO, but the receiving station may count each county as a separate multiplier. To be eligible for an award, a station must not operate more than one transmitter at one time.

Exchange: Signal report, county, and state for U.S. stations. Signal report, province (Canada) or country for others.

Scoring: QSOs with fixed U.S./Canadian stations are worth 1 point; mobiles and portables are worth 15 points. U.S./Canadian contacts with DX are worth 5 points. Contacts with stations operating under a "net control" are invalid for contest purposes. Final score is total QSOs times the total number of U.S. counties worked. Mobiles and portables changing states during the contest should calculate their scores for (1) individual state certificates and (2) total score for the overall plaque. Total overall score must not count a county as a multiplier more than once regardless of the county or band.

Frequencies: 3.575, 7.040, 14.050, 21.050, 28.050. Fixed stations should operate above the suggested frequencies and allow low-power mobiles to operate below the suggested frequencies.

Awards: MARAC contest certificates will be sent to winning stations as follows: first-place fixed in each state, province, and country; first place mobile in each state; first-place portable in each state. MARAC contest plaqueswill go to winning stations as follows: first- and second-place mobile in the U.S., first-place portable in the U.S., first- and second-place U.S. fixed station, first-place Canadian station, and first-place DX station scoring at least 50,000 points. For contest purposes, DX is any country other than the U.S., Canada, and Mexico.

Send completed logs and summary sheet by June 5, 1998 to Norm Beavers, W3DYA, 3320 McMillan Drive, Tyler, TX 75701-8239.

Massachusetts QSO Party

1800Z Sat., May 1 to 0400Z Sun., May 2
1100Z to 2100Z Sun., May 2

Work Massachusetts in this popular QSO party sponsored by the Framingham Amateur Radio Association. Stations in Massachusetts may work any station. All others may work only Massachusetts stations. Fixed stations may be worked once per band per mode. Mobile or portable stations may be worked once per Massachusetts county/state. Permitted modes are phone and non-phone (CW, RTTY, ASCII, AMTOR, GTOR, PACTOR, CLOVER, SSTV/ATV, and Packet), digipeater node, land-based ATV repeater, and amateur satellite transponder operation. Land-based repeater contacts are not permitted.

Classes: Non-Massachusetts stations, Massachusetts Single Operator Unassisted (single operator performs all transmitting, receiving, and logging), Massachusetts Multi-Operator (single or multi-transmitter)—all transmitters located within a 300 meter diameter circle, Massachusetts Mobile/Portable, and Massachusetts Teams (consisting of up to five single operator members).

Exchange: Massachusetts stations send signal report and county; non-Massachusetts stations send signal report and U.S. state, Canadian province, or DXCC country.

Frequencies: CW—1.810, 3.550, 7.050, 14.050, 21.050, 28.050, 144.070, and 432.090 MHz; SSB—1.850, 3.890, 7.290, 14.270, 21.390, 28.390, 144.220 (SSB), 146.550 (FM), 432.150 (SSB), and 446.000 (FM) MHz; Novices—3705, 7130, 21130, 28130, and 30 kHz up from the band edge.

Scoring: One point per phone QSO, two points per non-phone QSO. Multipliers are: Massachusetts stations—total number of Massachusetts counties, U.S. states (excluding MA), Canadian provinces, and DXCC countries (excluding U.S., Canada, Alaska, and Hawaii) worked on each band. Non-Massachusetts stations—total number of Massachusetts counties worked on each band (maximum 14 per band). Washington, DC contacts shall be counted as a Maryland QSO. Final score is total QSO points multiplied by the sum total of all multipliers worked.

Awards: Certificates will be awarded for the highest score in each of the five entry categories—U.S. state, Canadian

province/territory and DXCC country, Massachusetts club entry, Novice/Technician entry in each category from the state of Massachusetts, and single operator entry from each Massachusetts county. Also, certificates will be awarded to entrants working all 14 Massachusetts counties. Additional certificates may be awarded at the organizer's discretion.

Electronic and printed entries are permitted. Electronic entries should be in either ASCII (example ARRL format) or CT.bin file format. Electronic entries should be sent to <n1tyh@aol.com>. Printed entries must be postmarked no later than 30 days after the end of the contest and should be sent to: Massachusetts QSO Party, c/o Framingham Amateur Radio Association, P.O. Box 3005, Framingham MA 01701.

Connecticut QSO Party

2000Z Sat., May 1 to 2000Z Sun., May 2
Rest Period: 0400Z to 1200Z, May 2

This annual event is sponsored again by the Candlewood Amateur Radio Association and is open to any amateur. The object is to work as many Connecticut stations as possible on 160–2 meters.

Classes: Single Operator—Fixed, Mobile, Novice, QRP (5W), Multi-Single or Multi-Multi stations, and Connecticut club competition.

Exchange: Single report and county or state/province/DXCC country.

Frequencies: CW—40 kHz up from lower band edges, Novices operate 25 kHz up from lower band edges. SSB—1860, 3915, 7280, 14280, 21380, 28380 kHz. VHF—50150, 144200, 146580 kHz. RTTY—Normal operating frequencies.

Scoring: Credit one point per phone QSO, two points for CW/RTTY. QSOs with club station W1QI and ARRL HQ station W1AW count for 5 points. Final score is total QSO points times the number of stations/provinces/DX (DX only counts as a single multiplier) worked. Others use Connecticut counties as the multiplier.

Awards: Plaques and certificates (100 point minimum) will be awarded to category winners. A special certificate will be sent to anyone working all eight Connecticut counties.

Send your results no later than June 2 to: CARA, P.O. Box 3441, Danbury, CT 06813-3441.

CQ-M International DX Contest

2100Z Sat., May 8 to 2100Z Sun., May 9

The Krenkel Central Radio Club of Russia is inviting all radio amateurs of the world to participate in the 43rd CQ-M ("Peace to the World") International DX Contest. Operation is permitted on all amateur bands (no WARC activity) on CW, SSB, and SSTV.

Classes: (1) Single operator—single- or multi-bands (CW only, SSB only, mixed mode, satellites); (2) QRP—mixed (CW and SSB), output power limit is 5 watts; (3) Multi-operator—multi-band, single transmitter, mixed (CW and SSB); (4) SWL—multi-band, mixed (CW and SSB); (5) World War II veteran—single operator, multi-band, mixed (CW and SSB); (6) SSTV—single or multi-operator, multi-band, SSTV only. All multi-band categories must remain on the same band for at least 10 minutes after the first QSO has been made. All mixed mode categories may make only one QSO with the same station on that band. For example, if a QSO with a station is made on a band by using CW, a second SSB QSO gives neither points nor multipliers on the same band.

Exchange: RS(T) and QSO serial number, starting from 001.

Scoring: QSO with own "P-150-C" country, 1 point QSO with another "P-150-C" country, in the same continent, 2 points. QSO with other continent, 3 points. Each country in the "P-150-C" award country list counts as a multiplier only once on each band. SWLs have no multipliers. Final score is the sum of QSO points on all bands, multiplied by a sum of multipliers on all bands.

Awards: Special trophies will be awarded to the world's top-scoring stations in the major categories. Medals will be awarded to each top-scoring station in each continent in the major categories. Certificates will be awarded to the world's top ten scoring stations, a continent's top three, and each country's winner in each category.

Send logs to: CQ-M Contest Committee, Krenkel Central Radio Club of Russia, P.O. Box 88, Moscow, Russia, no later than July 1, 1999. Electronic logs may be submitted via the Internet to <cqm99@mai.ru>. Only ready-to-print ASCII data (ARRL suggested format, N6TR.dat, etc.) placed in the body of a message will be accepted. Please do not send binary files. A confirmation will be sent to each entrant within a week. If you do not receive a confirmation, please send a query to <rw3fo@qsl.net>. In case of no reply, you should send a printed copy of the logs by airmail.

Nevada QSO Party

0000Z Sat., May 8 to 0600Z Sun., May 9

Here's a great chance to work this rare state by participating in the Nevada QSO Party sponsored by the Frontier Amateur Radio Society. The rules were rather sketchy, but operation is planned on 160–6 meters. Look for Nevada stations on CW, 15 kHz up from the bottom of the General band and 25 kHz up on SSB.

Exchange: Signal report and Nevada county or state/province/DXCC country.

Scoring: Credit 2 points for CW/RTTY contacts and 1 point on SSB. One contact is allowed per band and mode. Final score is multiplier (usual counties/state totals) times total QSO points.

Awards: Certificates will be sent to all winners. Send your logs before June 15th to Jim Frye, NW7O, 4120 Oakhill Ave., Las Vegas, NV 89121-6319 or via e-mail at <nw7o@anv.net>.

Texas QSO Party

1400Z Sat., May 22 to 0500Z Sun., May 23
1400Z to 2000Z Sun., May 24

Here's a fun event sponsored by the Texas DX Society. As with most QSO parties, Texas stations work everyone, while others work Texas stations only. You may work stations once per band and mode. Expedition stations (i.e., mobiles) may be worked in each county they activate. Multipliers only count once regardless of number of bands/modes worked.

Classes: Single Operator, Multi-Single and Multi-Multi, Texas Mobile Single and Multi-Op, QRP Single- and Multi-transmitter, and Club Aggregate category.

Exchange: RST and state (province, country, or maritime region). Texas stations use RST and county.

Scoring: Credit two points per phone QSO and three points per CW and other digital-mode QSOs. Non-Texas stations use the number of Texas counties worked as multipliers (total of 254) plus a Armadillo county mystery station; Texas stations use number of Texas counties, states, Canadian provinces, and DX countries (less U.S., Canada, Hawaii, and Alaska). Add bonus points to your final score: Non-Texas stations add 100 points for *every* ten Texas mobiles worked per band/mode. Texas stations add 100 points for *every* ten Texas mobiles worked per band/mode. Texas mobiles add 5,000 points per every five counties covered with at least five contacts per county and add 100 points for *every* ten Texas mobiles worked per band/mode. Final score is total QSO points times multiplier (counties or states/provinces).

Frequencies: CW—30 kHz up from lower band edge; SSB—25 kHz up from lower General class band edge; VHF—50.200, 144.200.

Send logs and dupe sheets (if over 200 QSOs) by June 30, 1999 to TDXS, P.O. Box 540291, Houston, TX 77254, or via e-mail to <W5HNS@aol.com>. For a complete set of rules, see the TDXS web site at <http://n5uh.tech.uh.edu:80/~tdxs/>. The TQP is supported by NA and TR contest logging software.

CQ WPX CW Contest

0000Z May 29 to 2400Z May 30

Complete rules were in the February issue of *CQ*. Rules and summary/log sheets can be obtained from CQ Communications, 25 Newbridge Rd., Hicksville, NY 11801. Rules can also be found at <http://ourworld.compuserve.com/homepages/n8bjq>. Check the current rules for the current trophy list. As with all *CQ* contests, be sure to indicate the mode of operation on your envelope when you mail your logs. Results of the 1998 contest can be found elsewhere in this issue.

BY BUCK ROGERS, K4ABT

PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

Muddled in the Middle of Meanings, Methods, and Definitions

Last month we discussed the use of the new Kenwood THD-7A and the VC-H1 in conjunction with disaster assistance. This is a set of emergency and disaster tools for the new millennium amateur radio operator. Both the THD-7A and the VC-H1 are designed to operate in a "wireless" environment.

Some defeatists say the Internet is about to supplant amateur radio. These shallow thinkers surely need to give some serious thought to what they are saying. To the contrary, packet radio node additions are on the upswing! I certainly am one who knows this to be true, as I'm one of those persons who burn many X1J4 TheNet EPROMs for the packet system node operators (SNO's) all over the United States, Canada, and South America. Voice repeaters are not going away either. Just ask the SERA coordinators. Amateur radio in almost every respect is here to stay!

As long as the Internet is available, it might be a valuable tool during an emergency. However, given the history of disastrous weather-related catastrophes, the telephone (Internet) lines are history when serious storms hit. While the Internet is available and functioning during an emergency, some communications are possible. However, by and large, the bulk of the local traffic is handled by HAMS (Helping All Mankind Survive). Voice and/or packet radio supports these efforts and serves to bridge that gap between the public safety operations and the emergency operations center(s).

Last month I talked about how the VC-H1 could be taken into an area that has been devastated by a tornado, hurricane, flood, or other disaster, and relay pictures directly from the scene to the EOC or other authorities who have the "need to know." The idea is to inform the world of the needs and requirements of the devastated area.

In almost all cases where a disaster strikes, amateur radio operators are there first—before FEMA, before the Red Cross teams (many amateurs are part of the Red Cross), and in some instances before the public safety officials. The amateur with the portable station is *always* at the ready, and he/she has the track record to support what I'm saying. With years of emergency- and disaster-related experience, the amateur holds the lifeline to many who are affected by these disasters.

115 Luenburg Drive, Evington, VA 24550
e-mail: K4ABT@PacketRadio.com

Graphically Speaking

I listen to the local voice repeaters from time to time and to the HF bands a lot. At various times I hear an "Elmer" telling a new amateur how packet radio is used. In many of these QSO I hear dialog like this (and the theme is almost always the same): "Packet is used mostly to monitor the DX spotter frequency." Nothing could be further from the truth!

Many times this kind of dialog gives the new or prospective packet radio user the idea that this is all there is to packet. What happened to having a good cross-country QSO via packet radio? Look at the masses who use APRS, and then look at those who maintain networks of packet nodes to support the many packet radio uses and users. No, DX spotting constitutes only a small percentage of packet radio use and applications.

For the first quarter of this year I've composed most of my columns around the transmission of pictures, graphics, images, and audio (sound) via packet radio. The idea has been to acquaint the new packet user with the "state-of-the-art" where packet is concerned. This effort has been made to thwart the notion that packet is basically a type and send or DX spotting medium.

When I Don't Have A Picture

When I don't have a picture, I am obliged to use a thousand words. I'm into all the picture transfer modes, such as SSTV, Facsimile (FAX), and of course packet pictures. I have to say, the method of picture transfer that I favor most is the latter.

Pictures and digital photos sent and received via packet radio are far superior to the graphic files sent using other modes such as analog Slow-Scan TV (SSTV) or facsimile. The major difference is that packet photos are "digital" and are *error-free!* Allow me to elaborate.

A picture sent via packet radio is sent in long packets that are "forward error corrected" (FEC) at the end of each packet. They

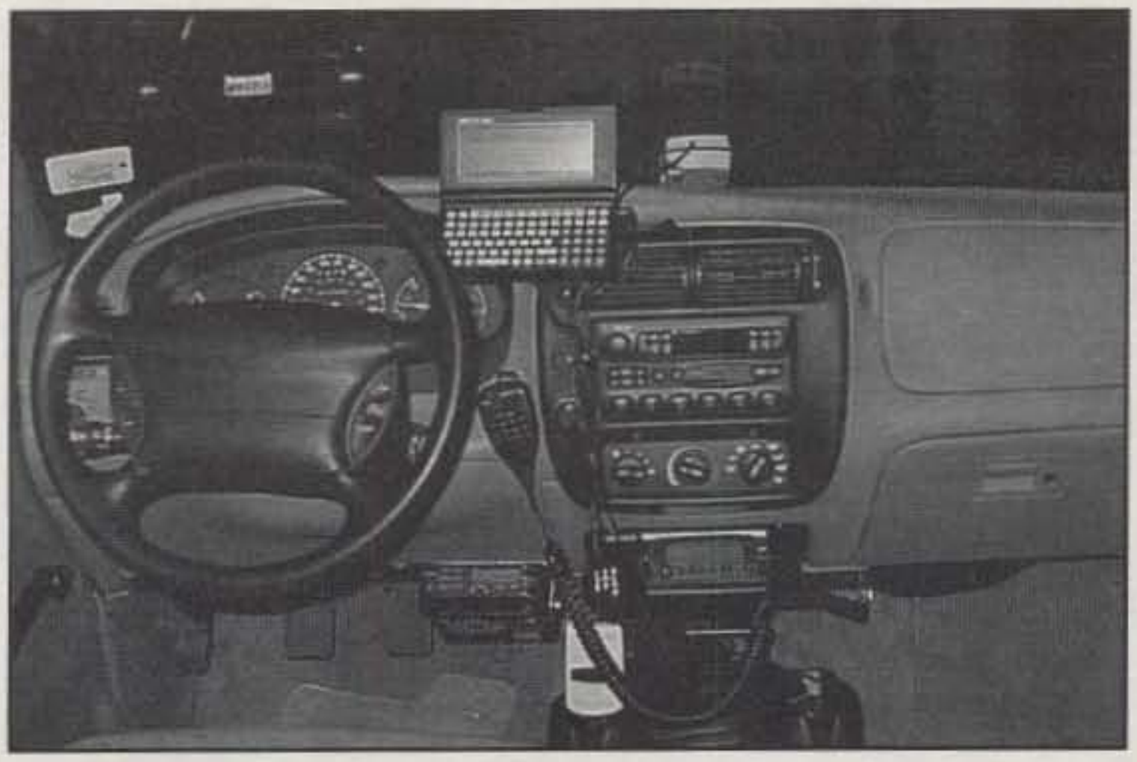


Photo 1– Mobile APRS (see text toward the end of this column). [Eddie, I recognize the DeLorme TripMate on the dash. I use the Delorme EarthMate when operating K4ABT-5, mobile APRS. You have a very nice installation.—K4ABT]

Photo 2– Mobile APRS, backed up by a Kantronics KPC-3. [Boy, I do love those Ford trucks!—K4ABT]

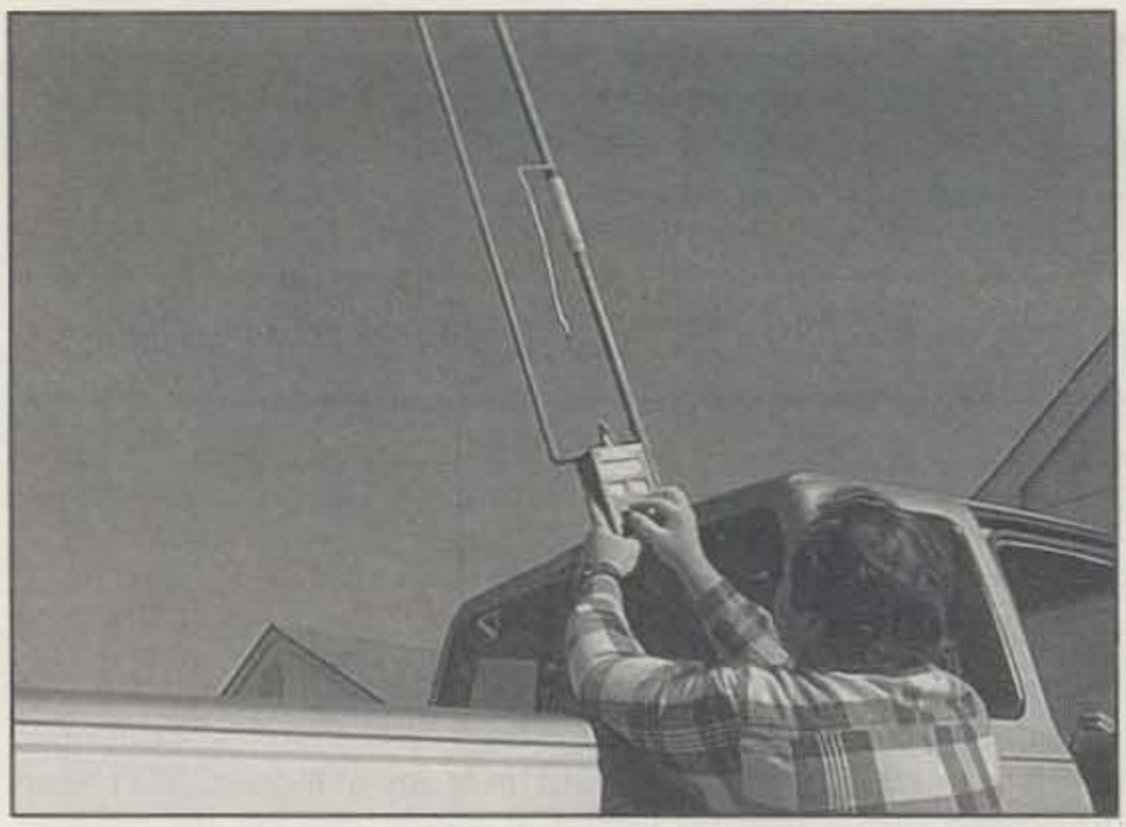


Photo 3– Eddie, I think the proximity of the metal cab of the truck may influence the reading a bit. Introducing a bit of stray capacitance may lower the resonant frequency of the J-Pole, or maybe that's what you have in mind.—K4ABT

Photo 4– We mixed the concepts of an old 2 meter J-Pole design that Paul has been using by wrapping the insulated #12 wire around the radiator.

are received at the target (receiving) station and then automatically displayed on the receiving station's screen. The picture that is displayed is an exact clone of the photo/picture displayed and transmitted from the sending station. This is achieved through the use of Forward Error Correction (FEC). Forward Error Correction is the foundation of the "A"X.25 (packet radio) protocol. By applying a Boolean count (CRC "Check," Ack/Nack) for each packet and for each hexadecimal character sent and received, the correct delivery of each pixel, its corresponding color, and its location on the receiving station's (display) screen is ensured. In short, the packet picture is a *digital* image, whereas the SSTV picture is *analog*.

Back in the March column we discussed new software by Stan Hunting, KW7KW, called "PicturePacket." With PicturePacket we now have the ability to send not only pictures, but also digitized voice. I mention this again because of the great amount of interest shown and the large amount of mail that I've received. Much of the U.S. snail mail and e-mail reflects your concerns as to "which is the best type of graphic image to send via packet radio while using PicturePacket?"

For those who don't yet have the PicturePacket software, the picture files supported for packet radio transfer and display are GIF, JPG, BMP, WMF, RLE, ICO, and EMF. A good viewer and graphics package is a *free*ware download at <http://stud1.tuwien.ac.at/~e9227474/english.htm>. I use the IRFANVIEW32 with most of my graphic files. Just so I cover all the bases, the sound or audio file transfers supported by PicturePacket are WAV, MP2, and MP3. To record and convert my WAV files to MP3, I use a shareware software program called "MusicMatch" I downloaded at <http://www.musicmatch.com/>.

Another question I'm receiving is "Will my KPC-3 or PK-232, or Kludge1200, etc., work with PicturePacket?" So far every TNC, KPC, and multimode packet radio controller that I've used (except the older PK-96) has worked well sending and receiving pictures and sound using the PicturePacket software. I'm not sure what the problem is with the older PK-96 ("B" version), but I often get a lockup during binary file transfers. The problem may have been cleared in later versions of the PK-96.

Which Graphic Format Should I Use With PicturePacket?

Still more questions are being asked relating to the picture and graphic formats for use with PicturePacket.

Okay, I'll answer the question, but I want to do so in a manner that allows you to make the final decision as to which graphics format you can or should use. I'll provide you with a primary understanding of various graphic formats and let you be the judge as to which format is best for you to use for digital image transfer (DIT).

First of all, let's talk about picture, or image, resolution. Your display monitor resolution is a clever way of referring to the maximum number of colors you can view on your screen. One major item that controls this is the type of graphics card and device driver installed on your computer (PC). Most graphics device drivers allow you to control the screen or display resolution.

Most of our discussion here is built around a PC that uses Windows95, 98™© or WINNT™ (all are trademarked and © of MicroSoft). Within the Windows and WINNT environment, there are a myriad of colors and resolution schemes that support our graphics structure within the PC.

As a guideline, we need to stop for a moment and address the relationship between the number of colors and the resolution bit structure.

Resolution Bits: Maximum Number of Colors

1	2 colors, monochrome (black & white)
4	16 colors
8	256 colors
16	65,536 colors
24	16,777,216 colors (True Color)
32	$2x^{32}$ colors (not enough room for all the digits)

You can normally change your display resolution by right-clicking on your desktop and then clicking on "Properties." This will bring up the "Display Properties" dialog. Click on the "Settings" tab. There will be tab named "Color Palette". This tab controls your display resolution. Choose the highest resolution your driver is capable of. If the highest value available is 16 colors, you should consider updating your graphics card, or installing the appropriate driver for your graphics adapter.

Many drawing packages and graphic viewer features are available if your resolution is set to 8 bits (256 colors) or less. The monitor display resolution not only affects how your images appear, but also affects how your images are stored. All of the above depend on the format in which your image is stored!

Bits and Pixels

Now we are about to discover why some picture and graphics file types are larger than others, even though the same image is being stored.

Your display is made up of individual Picture ELementS (PELS). A PEL is usually referred to as a "pixel." The number of pixels your computer is capable of displaying depends on your display settings. Windows normally defaults to a 640 by 400 pixel format. That is to say, the display is 640 pixels across by 400 pixels down. You can often change this default setting in the "Display Properties" dialog box we talked about earlier. It is interesting to note that the amount of memory used by each open image is dependent on the setting of your display resolution.

Once Bitten . . .

There are 8 bits in a byte. A byte is the unit used to measure memory. If your computer contains 32 Mb (megabytes) of random access memory (RAM), it actually has 33,554,432 bytes of memory. There are 1,024 bytes in a single megabyte of memory.

When working in the Windows environment, the displayed images are stored inside the computer as a "bitmap." When an image file is loaded, it must first be converted to a Window's bitmap before it can be displayed. The amount of memory the bitmap occupies depends on the display resolution. If your display resolution is set to 1 bit (two colors: black and white) and the size of your image is 640 × 400, it would take 32,000 bytes of memory to hold the image. How did we arrive at this number?

If there are 640 pixels across and each pixel requires 1 bit to determine its color, and there are 8 bits in a byte, each 640-pixel line occupies 80 bytes. We next multiply the 80 bytes per line by the number of lines (400). Then 80 lines times 400 equals 32,000.

Now That We've Been Bitten—*Twice . . .*

How much memory do we need to display 16- and 256-color images? We apply the same calculation we used above. For 16 colors (4-bit resolution), each pixel requires 4 bits to determine its color. So 640 pixels (1 line) requires 2560 bits (640 multiplied by 4). 2560 bits is translated to 320 bytes (3560 divided by 8 bits per byte). We multiply the number of bytes per line by the number of lines (400). Thus, a 16-color, 640 × 400 pixel image requires 128,000 bytes of memory. A 256-color image (8 bits per pixel) requires 256,000 bytes of memory. No pun intended, but now you are beginning to "get the picture." Four bits require four times as much memory as 1 bit, and 8 bits two times as much as 4 bits.

If 1 bit can hold two values, 0 and 1, it becomes clear as to how a 1 bit pixel can determine its color. Black equals 0 and white equals 1. If 4 bits can hold 16 possible values and 8 bits

Photo 5– There is no "hard" connection from the feed-line center conductor to the copper pipe at all. It's inductively coupled. I mounted an SO-239 on the cross portion of the "J" as shown. [But Eddie, what about the built-in, DC ground lightning protection of the J-Pole?—K4ABT]

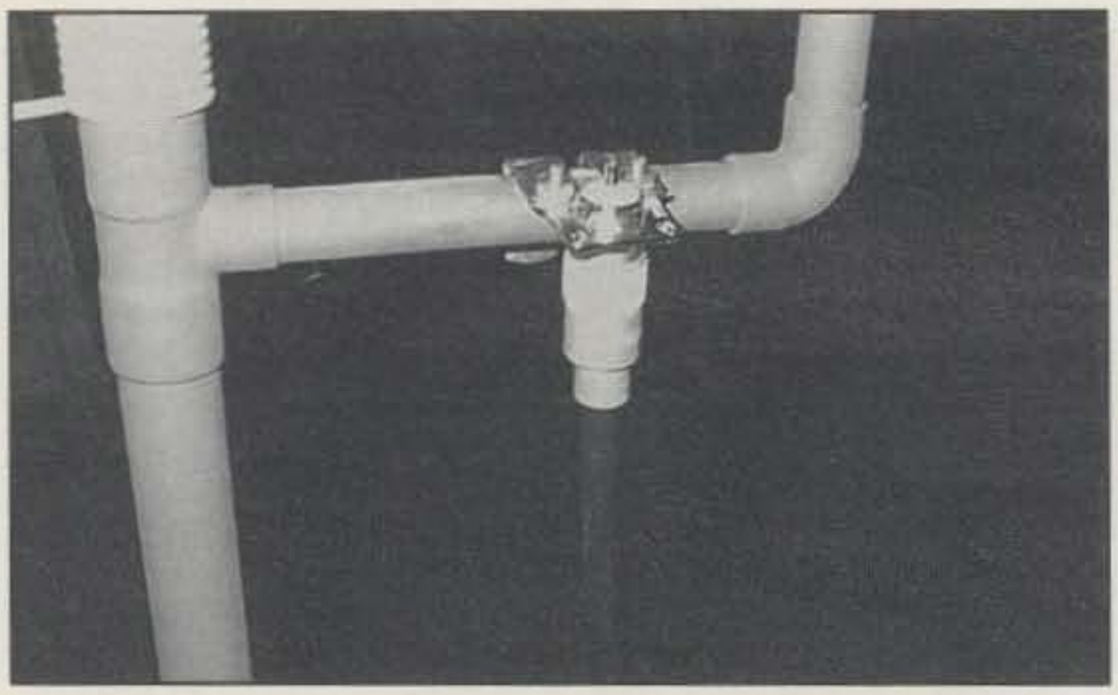


Photo 6– We wrapped insulated 12-gauge copper wire around the main vertical, then attached the end of the #12 to the center conductor of the SO-239.

can hold 256 possible values, how can those values be translated into colors? Here's how. It's called "Windows palettes."

Palettes Are Not Pillows

Palettized surfaces require palettes to be properly displayed. A palette surface, known as a color-indexed surface, is merely a collection of numbers where each number represents a pixel. The value of the number is an index to a color table, or palette. Surfaces that use 16-bit or greater pixel formats do not use palettes.

A palette represents an indexed color table that has 4, 16, or 256 entries to be used with a color-indexed surface. Each entry in the palette is an RGB (Red, Green, Blue) trio that describes the color to be used when displaying pixels within the surface. By default, Windows defines color as a combination of three primary colors—red, green, and blue. Windows identifies a color by giving it a color value (sometimes called an RGB triplet), which consists of three 8-bit values specifying the intensities of its color components. Black has the minimum intensity for red, green, and blue, so the color value for black is (0, 0, 0). White has the maximum intensity for red, green, and blue, so its color value is (255, 255, 255). A 16-color (4-bit) palette consists of 16 RGB color values. As an example, if our palette has the following values:

Index	RGB Color
0	(0,0,0) Black
1	(255,255,255) White
2	(255,0,0) Red
3	(0,255,0) Green
4	(0,0,255) Blue
5	(255,255,0) Yellow
6	(255,128,0) Orange
7	(128,0,0) Maroon
8	(255,0,255) Purple
9	(255,0,255) Purple
10	(255,0,255) Purple
11	(255,0,255) Purple
12	(255,0,255) Purple
13	(255,0,255) Purple
14	(255,0,255) Purple
15	(255,0,255) Purple

each pixel is able to determine its color by referencing the palette. Let's look at four pixel index values: 5, 3, 1, and 9. Their pixels colors should then be yellow, green, white, and purple.

Basic vs. "True Colors"

True-color images are images where each pixel is represented by 16 bits or greater. For example, we'll look at how 24-bit images are stored. 24-bit images require 24 bits, or 3 bytes, of memory for each pixel to determine its color. Rather than using a palette, each pixel's RGB triplet is stored in memory. Therefore, using our 640 × 400 pixel image example, we can see that an image this size requires 768,000 bytes of memory (640 pixels multiplied by 3 bytes per pixel, multiplied by 400 lines).

BMP vs. JPG vs. GIF vs ?

A window's bitmap file is usually stored as it is represented in memory. Therefore, a 24-bit image would take approximately 768,000 bytes of disk space. The JPG format is also capable of storing 24-bit images, but applies a compression algorithm to the image data before saving it. The compression is similar to that used by most Zip utilities. The amount of compression that can be achieved depends on the quality you want in the stored image. For 100% quality, JPG essentially compresses the bitmap data. You could achieve similar results by running a bitmap file through a Zip program. If you are willing to sacrifice some of the image quality, JPG is capable of obtaining even greater compression.

What kind of space savings are we talking about? Well, we captured a desktop and saved it as a bitmap file and it took 921,654 bytes (32-bit display resolution). We then saved the same image in the JPG format at 75% of the original quality. The JPG image required 33,016 bytes of disk space—about a 96% savings in disk space. This is why you don't see web pages with images stored in bitmap format. The same image stored in the GIF file format occupies 25,597 bytes of disk space. GIF is able to achieve better storage results because it saves images in an 8-bit resolution (256 colors).

If we analyze the graphic formats we've just covered, we can see that our best bet is to use either the GIF or the JPG base format for both storing and sending picture graphics. You be the judge and choose the graphic format that suits you best. My personal preference is the JPG format, with some compression

(never more than 33%). This allows me to retain the photo with more resolution and a richer color base than with the GIF format.

If your interest is for image only, and not quality and color, then the GIF format may suit your application better.

Speaking of Images . . .

I get tons of e-mail. Every now and then one of them strikes my fancy. After reading the following message, and after I stopped laughing, I decided to let you see/read some parts of an e-mail I received from Eddie Sinclair, KC5UIB, of Houston, Texas.

From: Eddie Sinclair
To: Buck Rogers (k4abt@packetradio.com)
Subject: Mobile Packet Setup/J-Pole

Buck, I'm amazed at the number of web sites you maintain. I got a bit confused bouncing between your <www.packetradio.org> and <www.packetradio.com> and later I found your personal page, too. Wow!

Photo 1 is an overall view looking in through the back window of the truck. The HP-100LX Palmtop computer is mounted using a cellular-phone mounting bracket. It's running APRS DOS software.

Photo 2 is a close-up of the side of the Kenwood V7 dual-band UHF/VHF radio showing the KPC-3+ Terminal Node Controller tucked in between my custom mounting plate and the radio. I hope to hide the Tripmate GPS unit (the yellow thing on the dash) soon. This should help make a clean installation.

A friend of mine, Paul, WI5F, wanted to build a 6 meter J-Pole using your plans, and so I got commissioned to do the physical construction. We did it a bit differently just for the fun of it. We started with the dimensions from: <http:// www.qsl.net/k4abt/images/9901f1ab.gif>.

We were not too concerned about the wind at his place, so I used less 3/4" tube and more 1/2" tube because I already had lots of 1/2" tube and fittings. I would have had to buy two lengths of 3/4" tube if I went strictly by the drawing.

I designed it to separate into two equal length sections for easy transport. I wish I had a picture of the way I designed the slip joint. It's cool, I think. This way if he moves, it won't be too hard for him to take it with him. I did all the cutting and soldering and painting here in Houston. Then my wife Tina, KD5FME, and I drove to Grapevine (near DFW Airport) for the weekend. Our wives looked for sales so they could "save us money" while we played radio.

We also chose to do the coax connections a bit differently (photo 6). We mixed the concepts of an old 2 meter J-Pole design that Paul has been using for years into the 6 meter copper pipe "J." We wrapped insulated 12-gauge copper wire around the main vertical (photo 3). There is no "hard" connection from the feed-line center conductor to the copper pipe at all (photo 4). It's inductively coupled. I mounted an SO-239 on the cross portion of the "J" as shown in photo 6.

All images (15–19) show it in the testing phase. It was cleaned up nicer in the final version, but I do not have pictures at this time. Paul will have to send them to me along with the final number of turns we used.

Image18.jpg is me wrapping more wire around the pipe.

I wanted to make the thing blend into the sky, so I tried painting it gray. The next one gets painted a bit more blue.

I'm resending the message and pictures for your web site <http:// www.packetradio.org/ photos.htm>. I found so many different e-mail addresses for you last time I sent it, I'm not sure if one finally worked. I sure hope this one gets to you. *(All my e-mail addresses get to me.—de BucK4ABT)*

If you would like to publish any of this, we can get better (higher resolution) pictures, and I can make a drawing if you like.

73's Eddie Sinclair
KC5UIB Houston, TX

Summary

Pete, W4WWQ, and I are having fun packeting and sending PacketPictures here in the beautiful Blue Ridge Mountains of Central Virginia overlooking the historic James River.

That's it for this month. Spring is all aglow and we're having fun packeting. Visit the PacketRadio Networking Home pages at: <http://www.PacketRadio.com><http://www.PacketRadio.org>.

73 de BucK4ABT
e-mail: <k4abt@PacketRadio.com>

BY TED MELINOSKY, K1BV

AWARDS

NEWS OF CERTIFICATE AND AWARD COLLECTING

Robert Devine, KC6AWX, earned USA-CA All Counties #967 on December 24, 1998. He has been interested in amateur radio since his high school days back in the late 1960s. Here is some of his background.

"My uncle, Wayne, K7TCL—and, I might add, my Elmer—used to make yearly, or sometimes every other year, trips down to the San Francisco Bay area from the Tri City area of Washington. During these visits, I remember many times going down to Ocean Beach and listening to him work Japan from his Didge. This really fascinated me at the time, and I tried to learn the code but could never pass the test. I guess aat the time there was so much going on that I just had a mental block about CW.

"I went through the CB days during the 1970s and raised a family. In 1988 I got the urge for amateur radio again. I bought the books and Gordon West tape courses and guess what. I actually learned CW and passed the tests to get my Novice ticket. I really was delighted and still remember my first QSO with PY9TT in Brazil. I then upgraded to Technician, General, and to my current class, Advanced.

"I loved DX and accomplished DXCC and have worked 315 countries to date. The sunspot cycle, though, was going down in the 1990s and DX started to become more and more scarce. At that point I devoted my time to working all states on all bands (5BWAS) and accomplished that in April 1995.

"In 1996 I was off work on disability. During this time I came across the County Hunters Web Page and the County Hunters net on 14.336. I was having lunch one day with two local hams—Mel, AB6QM, and his XYL Mary, AC6OV—and mentioned to them about the net and the idea of working all 3076 counties. I told them this would be a great accomplishment and that I thought it would take forever, if ever. At the time, Mary told me to go for it, that I could do it. That day I started county hunting and I was hooked. I started working more and more counties. I remember Gene, N4ANV, telling me that if I stayed on the net frequency too long it would become an addiction. Well, he was right. As it turned out, this was great therapy for me also and kept me busy.

"During county hunting and the time on the net I have met the greatest group of hams possible. The mobiles go out of their way to help you and make special trips on your behalf just so you can get that needed county. I remember the special trips by KC4UG, N8STF, KKØL, W3CR, and of course N4UJK, who gave me my last county, Glynn, GA, to finish the 3076 counties. Ed, N4UJK, drove 2½ hours just to get me my last one. Thank you, Ed! Ironically, this was only fitting, as in 1996 when I needed help in the beginning of this endeavor, it was Ed who helped me.

"I do want to thank all the net controllers, (especially Jim, KZ2P), fixed stations, and mobiles I worked while accomplishing this award, and especially the mobiles, because without you this would never have been accomplished—*thank you!* Now for the second and third times around!"

65 Glebe Road, Spofford, NH 03462-4411
e-mail: k1bv@top.monad.net

USA-CA Special Honor Roll

Richard C. Neumann, KC9EU
USA-CA All Counties #969
February 22, 1999

USA-CA Honor Roll

500

OK1KT	3061
WB6IGZ	3062
JA6IP	3063
N2LYV	3064
KC9EU	3065

1000

OK1KT	1503
KC9EU	1504

1500

N8GSF	1252
KC9EU	1253

2000

KC9EU	1153

2500

NØZA	1075
KC9EU	1076

3000

KC9EU	986

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.

CW County Hunting And Endorsements

While most county hunting activity takes place on SSB, there is a sizable group devoted to CW. It's a large enough group to have their own sessions during MARAC conventions. You'll find them daily on 14056.5 running some of the mobiles who move back and forth from the SSB to CW mode and some mobiles who pretty much concentrate on CW. You'll have to learn a few new "Q" signals, though, if you've spent most of your time on the SSB nets.

You'll quickly pick up the pace of the operation. When a mobile operator stands by for callers, the pile-ups are not much different than on SSB. There's less chit-chat, of course, because it takes somewhat longer to conduct operations, and this leads to a more clipped and efficient operation. There's probably less deliberate interference on CW. But the big advantage is that if you switch between the modes, you'll work more different counties—and that's the whole idea.

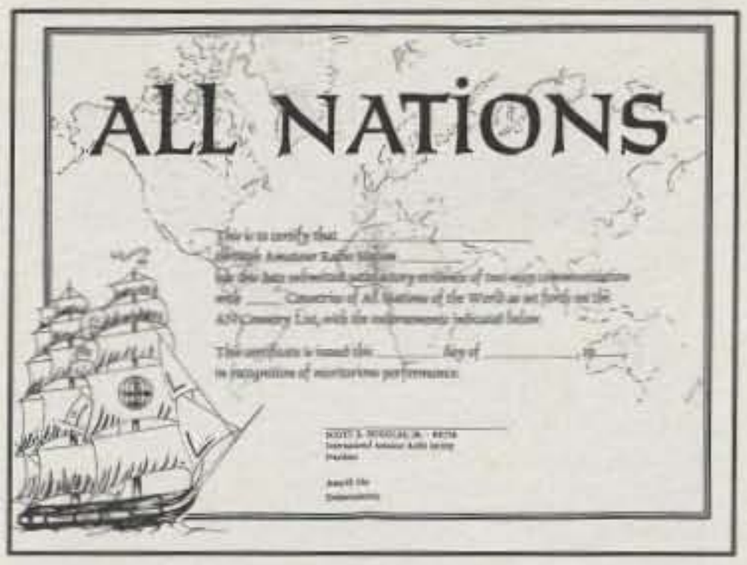
The USA-CA program doesn't have a special endorsement for all CW contacts. But if you apply on that basis, I'll use my new HP Deskjet color printer to print you a unique "sticker" for your certificate. *(Thanks to W6ISQ for the suggestion.)*

The IARS/CHC Series DX Awards

After the death of Clif Evans in the early 1980s, the Certificate Hunters Club he began was acquired by Scott Douglas, KB7SB, who continues to encourage working interesting awards by offering the series described below. It is a DX-oriented series which requires working numbers of countries in well-established geographical areas of the world, islands, and members of the United Nations. Country lists are available for each award and may be obtained from the sponsor for an SASE.

General Requirements: Available to all licensed amateurs and SWLs. GCR is accepted, although the sponsor reserves the right to examine any cards prior to issuance of an award. Requests for band, mode, power endorsements should be made at the time of the original application and all supporting data must appear on your log extract. Fee for each of the awards is $US5. Country lists for each of the awards is available for SASE. Apply to: Scott Douglas, KB7SB, .PO. Box 7320, Bonney Lake, WA 98390-0913.

Worked All Nations (WAN). This is the IARS/CHC version of DXCC. The basic award is issued for confirmed contact with at least 100 of the countries on the AN list of countries; endorsement stickers are available for each additional 25 confirmed countries. An honor roll is maintained listing all stations with a total of 275 countries or more in the following categories: SSB, CW, RTTY, and Mixed. Level endorsements (stickers) are $1 each after the original submission. Using the ARRL-DXCC Country List as the basis, the fol-

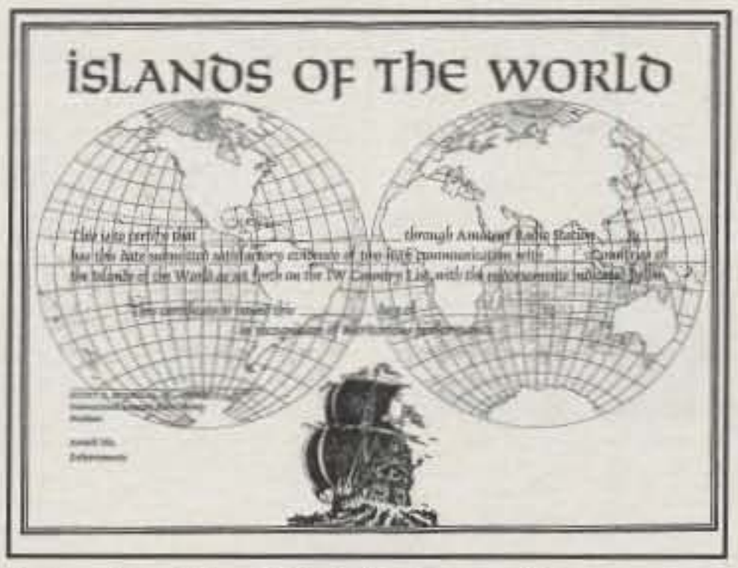


The Worked All Nations award is the IARS/CHC version of DXCC.

lowing additional countries may also be claimed for credit: Basothoqwaqua, Bophuthatswana, Ciskei, Lebowa, North Korea, Sicily, Swazi, Transkei, Vendaland, Zwa Zulu.

Additional cards or log extracts (GCR) may be submitted at any time. Eligible countries may be added or deleted at any time at the discretion of the awards committee. This action usually follows that of the ARRL-DXCC, with rare exception. Deleted DXCC countries will count as credit toward WAN if your contact was made *prior to the date of deletion* by the ARRL. Applicants should feel free to check with the awards manager regarding country status. An SASE is required for reply.

Islands of the World (IOW). This award is available for confirmation of at least 100 of the islands in the following categories: SSB, CW, RTTY, and Mixed. Level endorsements (stickers) are $1 each after the original submission. The IOW Honor Roll lists all stations with a total of 200 or more islands in the following categories: SSB, CW, RTTY, and Mixed. Level endorsements (stickers) are $1 each after the original submission. New islands may be added to the IOW listing at any time. Confirmations for islands not appearing on the list may be submitted with your application. Include your argument for inclusion, and a decision will be made by the awards committee. If accepted, the island will be added to the IOW country listing.



Islands of the World is issued for confirmation of at least 100 of the islands of the world.

Announcements

(from page 6)

May 2, **Wrightstown Hamfest**, Middletown Grange Fairgrounds, **Wrightstown, PA**. Info contact John D'Onofrio (215-675-9165), or write to him at P.O. Box 3211, Warminster, PA 18974. (Exams)

May 2, **St. Petersburg Swapmeet/Tailgate**, Lake Maggiore Park, **St. Petersburg, FL**.. Contact Gerald Turner, N2MNC, 10132 64th St N., Pinellas Park, FL 33783-3040 (727-548-7474).

May 2, **Giant Electronic Fleamarket**, Lincoln High School, **Yonkers, NY**. For information, contact Otto Supliski, WB2SLQ, 914-969-1053. (Exams)

May 2, **Hagerstown Hamfest & Computer Show**, Hagerstown Community College, Athletic & Recreation Building, **Hagerstown, MD**. Contact Tina, KB8ZQM, and Donald, KB8WHW, Jones, 304-728-7769; club fax 304-728-3024; e-mail: <kb8zqm@intrepid.net>; home-page <http://www.erols.com/rjlong61/ara>. (Exams)

May 2, **Sandwich, Illinois Hamfest**, Sandwich Fairgrounds, **Sandwich, IL**. Contact Bob Yurs, W9ICU, 815-895-3219; e-mail: <w9icu@tbcnet.com>; web: <http://tbcnet.com/~jleonard/hamfest.htm>.

May 2, **WACOM Swap & Shop,** 4-H Building, Washington County Fairgrounds, **Washington, PA.** Contact Jim Burtoft, KC3HW, 724-228-0546.

May 8, **Montreal Auction & Fleamarket**, Ste. Suzanne Church, **Montreal, Quebec**. Contact Sam, VE2CWI, fax 514-684-7698; e-mail: <samuel.galet@sumpatico.ca> or <ve2cwi@rac.ca>; web: <http://www. pubnix.net/wiarc>.

May 8, **Anderson Hamfest & Computer Fleamarket**, Anderson County Fairgrounds, **Anderson, SC**. Contact Robert G. Watson, Jr., W4RGW, 501 Ferguson St., Clinton, SC 29325-2419 (864-833-2204; e-mail: <w4rgw@backroads.net>; web: <http://www.brars.org>. (Exams at Anderson College)

May 8, **Manitowoc Hamfest & Computer Swapfest**, Manitowoc County Expo Center, **Manitowoc, WI**. Send SASE to Mancord RC, P.O. Box 204, Manitowoc WI 54221-0204, or call Red at 920-684-3733 or Fred at 920-682-9312. (Exams)

May 14, **Weak Signal Group Dayton Banquet**, Friday, May 14th, 6:30 to 11:00 PM, at the Holiday Inn North, Wagoner Ford Rd., **Dayton, OH**. For a ticket send $30 plus SASE to Tony Emanuele, WA8RJF, 7156 Kory Ct., Concord Township, OH 44077. Web site info: <www.wa8wzg.com>.

May 14–16, **Dayton Hamvention,** Hara Arena, **Dayton, OH**. Contact Dayton Hamvention, Box 1446, Dayton, OH 45401-1446; fax 937-454-5655; web: <www.hamvention.org>; for a brochure e-mail to <info@hamvention.org> or fax 937-274-8369.

May 15, **RI Amateur FM Repeater Service '76 Auction & Fleamarket,** VFW Post 6342, **Forestdale, RI**. Contact Rick Fairweather, K1KYI, 106 Chaplin St., Pawtucket, RI 02861 (401-725-7507 from 7–8 PM only; e-mail: <k1kyi@juno.com>).

May 15, **3865 Drake & Antique Radio Tube Group Dayton Forum**, Saturday 10:45–11:45 AM room 3 Hara Arena, Dayton Hamvention.

May 15, **"ECARC Radiofeast 1999" Annual Swapmeet**, East Carolina Radio Museum parking lot, **Grimesland, NC**. Contact Bill Engstrom, 218 Bent Creek Rd., Greenville, NC 27834 (252-355-8732).

May 15, **Poor Man's Dayton Free Tailgate Party**, on the Beachaven winery grounds, **Clarksville, TN**. Contact Hank Koebler, N3ORX, 1150 Hutcheson Lane, Clarksville, TN 37040 (931-645-5206; e-mail: <n3orx@ arrl.net>).

May 16, **Tailgate Electronics, Computer & Amateur Radio Fleamarket**, Albany and Main St., **Cambridge, MA**. Call 617-253-3776, or write to W1GSL, P.O. Box 397082 MIT BR., Cambridge, MA 02139-7082. (Handicapped accessible)

May 22, **Londonderry Swapmeet**, Lions Club, **Londonderry, NH**. Contact Paul, K1LL, at 603-432-1538, or e-mail: <K1LLX@juno.com>.

May 23, **Fair Oaks Annual Swapmeet**, Bella Vista High School, **Fair Oaks, CA**. Call Earl Mead, K6ESM, at 916-331-1115; e-mail: <nhrc@k6is.org>.

May 30, **West Friendship Hamfest**, Howard Co. Fairgrounds, **West Friendship, MD**. Contact Craig, WA3TID, P.O. Box 19, Annapolis Junction, MD 20701 (410-987-6042).

The Work the Pacific award is available for contacting 30 countries on the TP Country list.

Work The Pacific (WTP). This award (different from the TP described below) is issued for confirmed contacts with at least 30 countries on the TP Country List.

The Pacific (TP). This award, the more difficult of the two (WTP and TP), is issued for confirmed contacts with at least 60 of the countries on the TP Country List.

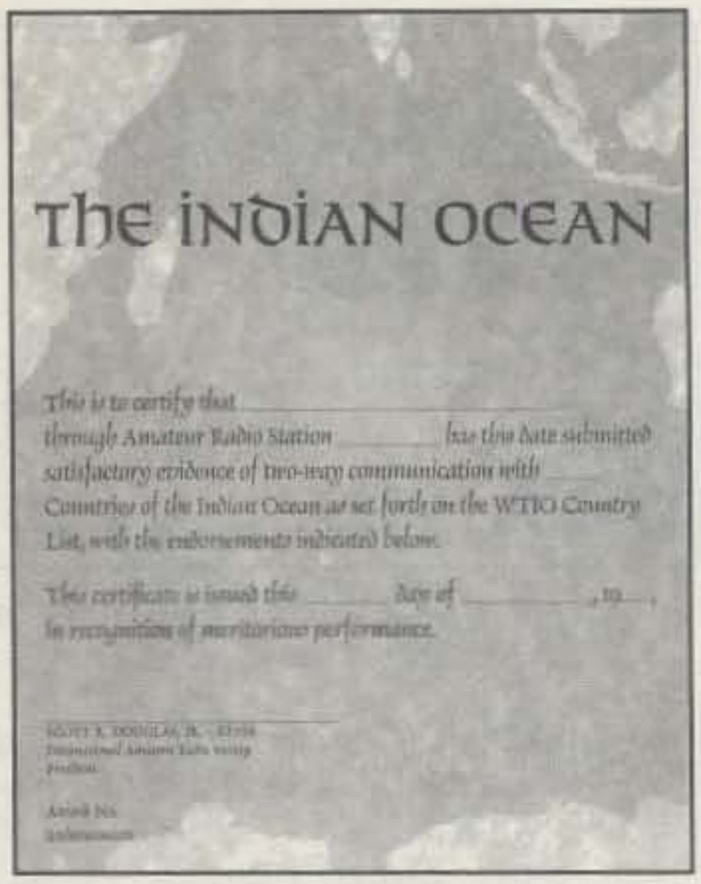
The Work the Caribbean award is isued for contact with at least 20 countries on the TC Country list.

Work The Caribbean (WTC). This award (different from TC described below) is issued for confirmed contact with at least 20 countries on the TC country list.

The Caribbean (TC). This award, the more difficult of the two (WTC and TC), is issued for confirmed contact with at least 40 countries on the TC Country list.

At least 20 countries on the TM Country list must be contacted to achieve The Mediterranean award.

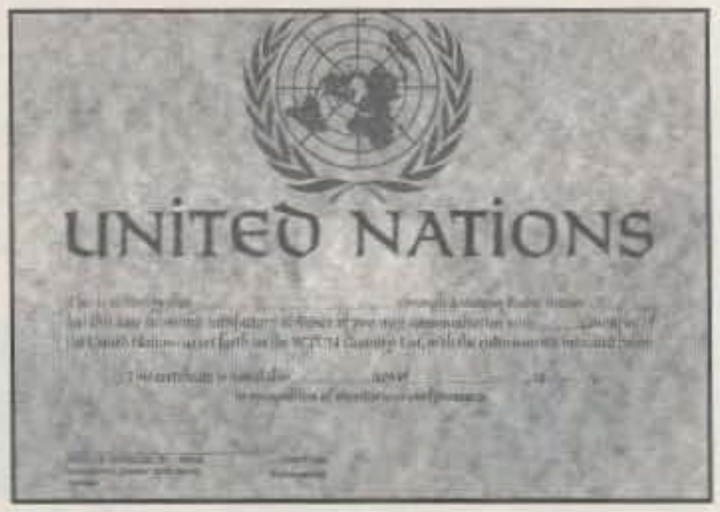
The Mediterranean (TM). This award is issued for confirmed contacts with at least 20 countries on the TM country list.



The Indian Ocean award is issued for confirmed contacts with at least 30 countries on the IO Country list.

The Indian Ocean (IO). This award is issued for confirmed contacts with at least 30 countries on the IO Country List.

United Nations (UN). This award is issued for confirmed contacts with a minimum of 100 member countries of the United Nations. At the time this award was established, the list contained 151 member nations, but it is recommended that you check appropriate reference sources for current member.



The United Nations award is available for contacting a minimum of 100 member countries of the UN.

Internet Site of the Month

The Czech Radio Club features their popular S6S (equivalent to the Worked All Continents Award and one of the very first awards I earned), P75P, and 100CS certificates on this well-designed English language page: <http://crk.mlp.cz/eng/AWARDE.HTM>.

Large, full-color images of each of these awards are displayed on the page as well as the relatively simple requirements. They are recommended for the beginning award hunter especially as conditions continue to improve towards Europe.

I'm still looking for the sample of your club's award and its rules for publication.

73, Ted, K1BV

TRUE MIL-SPEC TOUGHNESS

THE HERITAGE CONTINUES

US MILITARY APPROVED MIL-SPEC 810

FT-2600M

HEAVY-DUTY VHF FM TRANSCEIVER

The FT-2600M is a deluxe, compact FM mobile transceiver providing high power output and outstanding receiver performance for the 144 MHz band. Included in the FT-2600M's feature complement are:

Features

- 60 Watts of power output, with selection of four power levels for every operating situation.
- Expanded receiver coverage: 134-174 MHz.
- Keyboard entry of operating frequencies from the microphone.
- Excellent protection from receiver intermodulation distortion, thanks to Yaesu's renowned Advanced Track Tuning front end.
- Outstanding packet radio capability at 1200 or 9600 bps with easy interface via a dedicated rear-panel jack.
- 175 memories which can store repeater shifts, odd repeater shifts, CTCSS/DCS tones, and 8-character Alpha-Numeric labels.
- Built-in CTCSS and DCS Encoder/Decoder circuits.
- The Smart Search™ feature automatically sweeps a band and loads active frequencies into a dedicated memory bank.
- The Yaesu-exclusive Omni-Glow™ multi-function LCD display.
- Yaesu's exclusive ARTS™ (Auto-Range Transponder System), which alerts the operator when an "out-of-range" condition exists with another ARTS™- equipped station. This feature is especially valuable during search-and-rescue operations with hand-held units.
- Extensive MENU system, which allows customization of a number of transceiver performance characteristics.
- Additional features include a transmit Time-Out-Timer (TOT), Automatic Power-Off (APO), Automatic Repeater Shift (ARS), plus provision for reduction of the TX deviation in areas of high channel congestion. And an all-new S-Meter Squelch circuit allows the owner to set the squelch to open at a programmable setting of the S-Meter, thus reducing guesswork in setting the squelch threshold.

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

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DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Burundi Credits Deleted

In mid-February the DX Century Club (DXCC) desk released the following news item: "Over the years since 1994, the DXCC Desk has received several pieces of documentation for operations from 9U, Burundi. This documentation was accompanied by license copies, complete with stamps and signatures. However, the DXCC Desk had heard rumors that these documents were in fact forgeries, and not authentic documents. Due to the fact that the operators were still inside the country, and that we did not want to take action that could possibly cause them physical harm, and we knew we would be able to purge these contacts from DXCC records if this was found to be true, cards were accepted until we had the opportunity to investigate after the operators left the country.

"This situation came to a head earlier than we expected. The Director General of ONATEL, the communications authorities in Burundi, contacted us by fax inquiring as to whether we had seen licenses from Burundi. After several faxes back and forth, they informed us that the licenses were forgeries. The signature on the documents was that of an official who had not been in that position for some time. The operators were saved from any real punishment other than being expelled from the country, and the entire incident is under investigation by their employer.

"Since that time, the DXCC Desk has been rejecting cards for those operations concerned. As soon as it is possible for the DXCC computer program to do so, all contacts from those operations will be purged from the DXCC database. We expect that will happen before March 1999. This affects all operations since 1994 using a 9U prefix.

"The submission of forged documentation is a clear violation of DXCC Section 1, Basic Rule 7, and also Rule 12 (a)."

The ARRL reports that several thousand 9U DXCC credits will be deleted by this action. Essentially, all Burundi contacts over the past five years, except for those of **4U9U**, have now been eliminated from the DXCC records. The callsigns involved are 9U/F5FHI, 9U/EA1FH, 9U5W, 9U5DX, 9U5T, and 9U5CW. If you have previously received DXCC credit for any of these callsigns, such credit has been eliminated from your DXCC record.

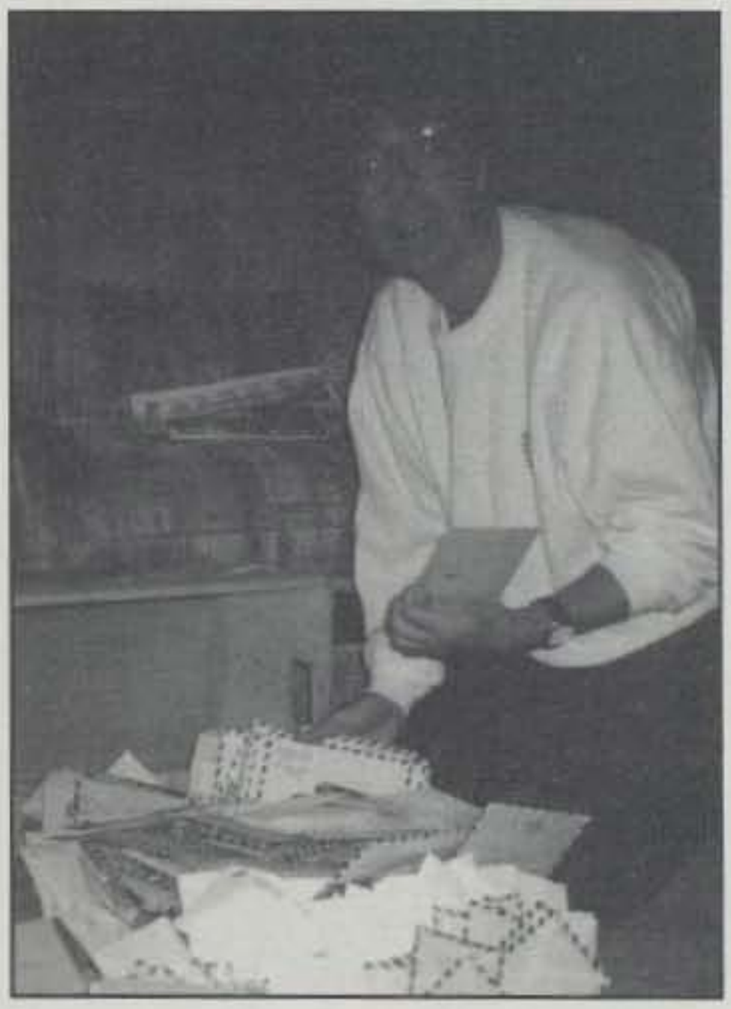
P.O. Box 50, Fulton, CA 95439
e-mail: chod@compuserve.com

Ken Miller, K6IR, Dayton's 1999 Amateur of the Year, with your DX editor at Dayton.

This is the most dramatic retroactive deletion in DXCC history, and is only possible because of the computerization of the DXCC records. In the era of paper DXCC records, such a deletion would have been too expensive to implement. One of the consequences of the benefits of computerization of the program is the ability to go back into existing records and remove country credits. This is not the only time the DXCC desk has taken such an action. The RTTY credits of OD5NG were expunged from the DXCC database in a previous retroactive deletion.

A few DXers have decried this action, saying this is all a simple misunderstanding following a military coup. Some European DXers claim that the documentation was fine and that the new government is trying to bad-mouth the previous administration by claiming the licenses were invalid. However, the real story shows that the DXCC desk not only made the right decision, but did so for several excellent reasons that benefit both the DXCC program and amateur radio in general.

Burundi is one of the many countries for which the DXCC desk requires copies of written documentation before accepting an operation for DXCC credit. For the past few years, the DXCC desk has had doubts about the documents coming from Burundi. Why, you ask, didn't the DXCC desk do something before this? In a case such as this, the DXCC desk is very reluctant to chase down a case of potential fraud while the operators in question are still in the war-torn country. Remember that Burundi is in the midst of a civil war, as the Tutsis and Hutus battle for control. Thousands of civilians and many government officials have died in the conflict, including the suspicious death of the



ON6TT reviews some of his QSL requests. Peter frequently operates from Africa under United Nations contracts.

The WPX Program

SSB

2695 .....JA5OC

Award of Excellence: WA3GNW, S51U, W4MS
Award of Excellence with 160 Meter bar: S51U

CW: 650 WD6CKT. 1100 I2EOW. 1150 W9IL. 1200 W9IL. 1350 WA2EYA. 2200 PAØSNG. 2750 G3OCA. 2800 G3OCA. 2850 G3OCA. 2900 G3OCA. 3000 G3OCA. 3050 G3OCA.
SSB: 350 JA5OC. 650 IV3BKL, ON4BCM. 700 ON4BCM. 750 ON4BCM. 800 ON4BCM. 1350 CT1EEN. 1400 CT1EEN. 1450 W9IL, CT1EEN. 1500 CT1EEN. 1550 CT1EEN. 1600 CT1EEN, W2ME. 1650 CT1EEN. 1700 CT1EEN. 2550 I2EOW. 2600 I2EOW. 3200 WB2YQH. 4450 W2FXA.
Mixed: 1100 WD6CKT. 1250 ON4CAS. 1300 ON4CAS. 1450 AA1KS. 2250 W9IL. 2300 W9IL. 2550 HA5DA. 2600 HA5DA. 2650 HA5DA. 2700 HA5DA. 2750 HA5DA. 2600 HA5DA. 2850 HA5DA. 2900 HA5DA, I2EOW. 2950 HA5DA, I2EOW. 3000 HA5DA. 3900 F2YT. 3950 F2YT. 4000 F2YT. 4100 F2YT.

20 meters: 4XØ/G3WQU
160 meters: K6UXO

Asia: 4XØ/G3WQU, ON4BCM
Europe: WA2VQV, 4XØ/G3WQU, RWØLIA
Oceania: WA3GNW, RWØLIA

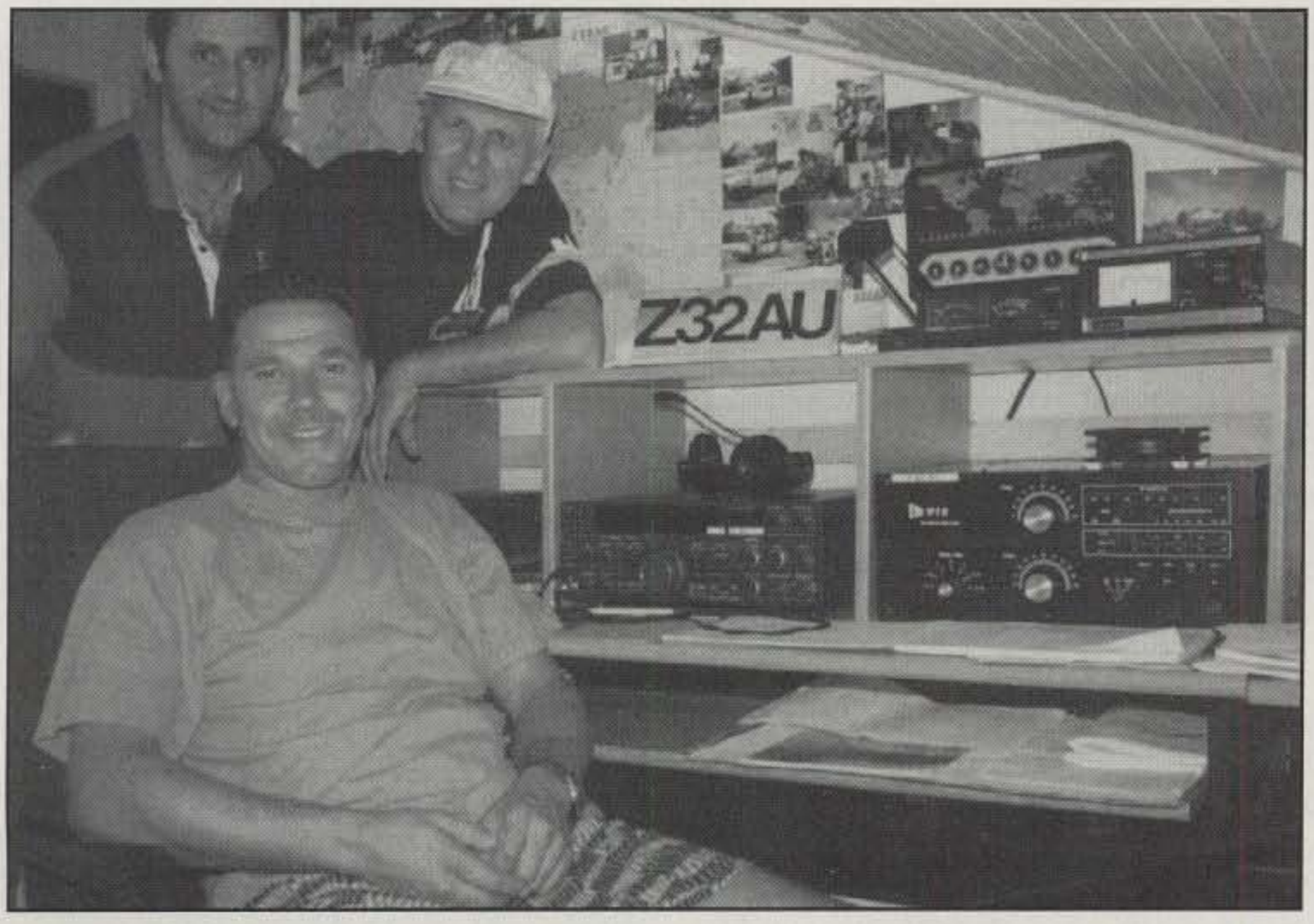
Award of Excellence Plaque Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YTM, 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-4ØØ3, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, IQWXY, 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.

Award of Excellence Plaque Holders with 160 Meter Endorsement: K6JG, N4MM, W4CRW, N5UR, VE3XN, DL3RK, OKMP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BU, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, 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-4ØØ3, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U.

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.

elected president in a plane crash. The ARRL certainly didn't want to put a DXer's life on the line by suggesting that he may have been operating without appropriate permission. Therefore, the ARRL was content to wait until the dust settled before pursuing the matter.

Interestingly, the reason the ARRL was suspicious of the Burundi documentation was that it was too good! All the alleged licenses submitted for DXCC credit over the past five years bore the same official stamp and signature of the alleged Director General of the Burundi telecommunications department. Given the changes in government officials during a turbulent war and military coup, such consistency is unusual. The ARRL decided to investigate this matter in depth, as soon as no lives were at stake.



Vlado, Z32KV; Mladen, Z32MB; and Dragan, Z32AU (sitting).

The WAZ Program

Single Band WAZ

10 Meter SSB

493 .....SM5BRK 494 .....W8WFN

12 Meter Mixed

18 .....UAØMF

15 Meter SSB

516 .....JF6NYY 517 .....N4CH

17 Meter Mixed

32 .....UAØMF

20 Meter SSB

1031 .....SV2YC 1033 .....F6CLT
1032 .....F2GM

20 Meter CW

491 .....F7AM 492 .....HB9DAX/QRP

30 Meter CW

26 .....UAØMF

160 Meter WAZ

131 .....40 zones HB9CIP
132 .....35 zones endorsement SP3CB
133 .....40 zones DK6WL
134 .....30 zones WB8ZRV
135 .....31 zones IK1GPG
79 .....36 zones endorsement DJ7RD
101 .....36 zones endorsement G4BWP

All Band WAZ

SSB

4438 .....HB9LEI 4444 .....OH2KQ
4439 .....W6TNS 4445 .....LU1EYW
4440 .....KFØQR 4446 .....F5LJA
4441 .....W4EQV 4447 .....F5UJK
4442 .....F5SOF 4448 .....K2HJB
4443 .....JA2CEJ 4449 .....KE4SCY

CW/Phone

7811 .....W4SD 7818 .....N6KZ
7812 .....JA1BZS 7819 .....WAØCLR
7813 .....W4JOB(CW) 7820 .....JA3APV
7814 .....KØRX 7821 .....DJ3PP
7815 .....DL1CL(CW) 7822 .....KJ5X
7816 .....KR6C 7823 .....DL4JK
7817 .....KR6C(CW)

All CW

120 .....K7CMZ 122 .....DL3IAC
121 .....KØRX 123 .....DL1AMA

Phone

630 .....KB5GT

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 Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. 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 Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

5 Band WAZ

As of March 7 1999, 485 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

YS1RRD GM3WIL
UT5UAG UY5XE
DJ4GJ W8DX

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

N4WW, 199 (26)
AA4KT, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
W9WAQ, 199 (26)
VE7AHA, 199 (34)
W9CH, 199 (26)
IK8BQE, 199 (31)
JA2IVK,199 (34 on 40)
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)
N6AW, 199 (34)
OE1ZL, 199 (1)
W6DN, 199 (17)
W3NO, 199 (26)
K4UTE, 199 (18)
K5RT, 199 (23)
UA3AGW, 198 (1, 12)
EA5BCK, 198 (27, 39)
K4PI, 198 (23, 26)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
KM2P, 198 (22, 26)
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)
W2YC, 198 (24, 26)
RAØFA, 198 (2 on10,15)

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

YS1RRD, 200 zones
UT5UAG, 200 zones
RAØFA, 198 zones

Endorsements:

DJ4GJ, 200 zones GM3WIL, 200 zones
W8DX, 200 zones K6FG, 189 zones
OE1TKW, 187 zones K4PR, 195 zones
KØVZR, 195 zones UY5XE, 200 zones

1083 Stations have attained the 150 Zone level as of March 7, 1999

****PLEASE NOTE: Due to supplier increases, effective September 1, 1998 cost of the 5 Band WAZ Plaque is now $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 Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. 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 Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

However, the question of validity of the license documents came to a head before the ARRL opened its investigation. Another amateur seeking a license took a copy of one of the previously approved operations to the Burundi Telecom and sought out the official who had supposedly signed the licenses. While the official was working for the Telecom, he was not the Director General, nor did he recognize the signature. Further, he noted that the official stamp was one used for *internal* documents within the Burundi government, and not the one used for public, external documents, such as licenses. He declared the license a clear forgery.

The problem then escalated quickly. The Director General of the Telecom contacted the League, leading to the removal of the DXCC credits. The amateurs involved have lost their jobs and been expelled from Burundi. The situation even rated attention in the Burundi press. The controversy has caused severe problems for the United Nations personnel trying to coordinate their activities in Burundi. The

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Currently there are 330 countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is $1.00.

CW

K2TQC 330	EA2IA 329	N4KG 327	N7RO 326	K8LJG 324	K9QVB 321	N5HB 316	N6AW 311	KH6CF 300
K2FL 330	K2JLA 329	K8PV 327	W1WAI 326	K4CN 324	HA5DA 321	K4JLD 316	OH3NM 310	YV5ANT 299
K6JG 330	W7OM 329	W4QB 327	4N7ZZ 326	DL3DXX 324	N4CH 320	K8JJC 315	OZ5UR 310	KØHQW 299
K2OWE 330	KZ4V 329	K9MM 327	DJ2PJ 326	N6AR 324	IT9ZGY 320	N4AH 315	VE9RJ 309	LU3DSI 295
N4JF 330	WØHZ 329	F3AT 327	WB5MTV 326	IT9VDQ 324	HA5NK 319	AA2X 314	HB9DDZ 307	W4UW 294
K9BWQ 330	F3TH 328	I1JQJ 327	W4LI 325	W4OEL 323	K2JF 319	WB4UBD 313	WG5G/QRPp 307	G4MVA 294
K1MEM 330	K6GJ 328	W7CNL 327	K9IW 325	W6SR 323	K6CU 318	N1HN 313	CT1YH 305	F6HMJ 292
K2ENT 330	PAØXPQ 328	I4LCK 327	I5XIM 325	VE7CNE 323	VE7DX 318	YU1AB 312	W7IIT 305	KB8O 292
K6LEB 330	DL8CM 327	N5FG 327	WA8DXA 325	IT9QDS 323	N6AV 318	K9DDO 312	KE5PO 304	DJ1YH 288
W2UE 330	WØIZ 327	IT9TQH 326	N5FW 325	K5UO 322	VE7DX 318	W3II 312	G2FFO 303	YU7FW 286
W6DN 330	G4BWP 327	K4CEB 326	IK2ILH 325	KA7T 322	I2EOW 318	YU1AB 312	IKØADY 302	EA3BHK 282
N7FU 330	I4EAT 327	WA4IUM 326	9A2AA 325	KUØS 322	G3KMQ 317	K1VHS 311	K1FK 302	YC2OK 280
K3UA 329	SM6CST 327	K4IQJ 326	OK1MP 325	ON4QX 321	NØFW 317	K7JS 311	N4OT 301	PY4WS 276
N4MM 329	W2FXA 327	NC9T 326	W8XD 324	KA5TQF 321	LA7JO 316	WA8YTM 311	W6YQ 300	KF8UN 276

SSB

K4MZU 330	N4CH 329	DL8CM 327	VE3GMT 325	W2FGY 323	G4ADD 320	WA9RCQ 315	DK5WQ 305	WZ3E 290
K2TQC 330	LA7JO 328	XE1VIC 327	W4EEE 325	YV5CWO 323	I4WZK 320	N3ARK 315	EA5OL 305	WG7A 290
K2FL 330	DL9OH 328	KE4VU 327	KE4VU 325	I8KCI 323	I4SAT 320	K6BZ 315	WB2AQC 305	IK2PZG 289
EA2IA 330	VK4LC 328	I1JQJ 327	WA4WTG 325	VE4AT 323	EA3EQT 320	K7TCL 315	K6CF 304	VK3IR 289
W6EUF 330	OE2EGL 328	K9PP 327	WD8PUG 325	KD5ZM 323	KØFP 320	I4CSP 315	KC4FW 304	KF7VC 288
K2JLA 330	KØKG 328	WØYDB 326	W2CC 325	KA5TTC 323	KE3A 320	W2FKF 315	WB2NQT 303	OK1AWZ 287
K6JG 330	KZ4V 328	W4QB 326	PT2TF 325	KB2MY 323	N4CSF 320	NØAMI 314	EA3CWK 303	IK2DUW 287
K6GJ 330	K4JLD 328	K8CSG 326	KM2P 325	EA3BKI 323	NI5D 320	WB8ZRV 314	EA3BT 303	EA5GMB 287
N4MM 330	I2EOW 328	WB4UBD 326	N5FW 325	K8YVI 322	N4HK 320	OH5KL 313	YC2OK 303	TU2QW 286
N4JF 330	W4NKI 328	W2FXA 326	K9HDZ 325	K9HQM 322	DL3DXX 320	WDØDMN 313	KD4YT 302	NM5O 285
VE1YX 330	PAØXPQ 328	N4KG 326	WA3HUP 325	KC5P 322	ON5KL 319	K9YY 313	CT1YH 302	EA1AYN 285
K5TVC 330	VE2WY 328	K8PV 326	YV1CLM 325	WW1N 322	WA4DAN 319	W9IL 313	W5GZI 302	VE7HAM 285
K6YRA 330	OZ5EV 327	NC9T 326	N6AW 325	W6SHY 322	KI3L 319	W1LQQ 313	N5QDE 302	IK2HBX 284
YU1AB 330	N7RO 327	K5UO 326	ZP5JCY 325	W2JZK 322	XE1MD 319	KD5ZD 312	RA2YA 301	KE6CF 283
PY4OY 330	W6BCQ 327	W6SR 326	WB3DNA 325	CE7ZK 322	KB1JU 319	N5HB 312	W2LZX 301	KK4TR 283
XE1L 330	KZ2P 327	W4LI 326	XE1AE 325	LU7HJM 322	PY2DBU 319	IN3ANE 311	N3RX 301	K7HG 283
W7OM 330	VE7DX 327	WDØBNC 326	KE5PO 325	K5NP 322	IØSGF 319	F1OZF 311	YT7TY 300	YC3OSE 282
K4MQG 330	AA6BB 327	KA3HXO 325	K1HDO 325	KB8O 322	KF8UN 319	EI6FR 311	W5OXA 300	WN6J 281
I4LCK 330	EA4DO 327	KF7SH 325	YV5IVB 325	YV1JV 322	KG6LF 319	YZ7AA 311	K3LC 300	CP2DL 281
VE3MR 330	ZL3NS 327	YV5AIP 325	KD8IW 325	VE4ROY 321	F6BFI 319	AE5DX 311	WA4ZZ 300	YU1TR 280
K7LAY 330	SM6CST 327	K9IW 325	W8KS 325	XE1CI 321	N6RJY 319	GM4XLU 311	YV4VN 299	KN4RI 280
W7BOK 330	W3GG 327	WA4JTI 325	N2VW 325	LZ1HA 321	K9QVB 318	KA5RNH 310	LU3HBO 299	WD9ACQ 280
4N7ZZ 330	I4EAT 327	YV1AJ 325	VE2GHZ 325	WA5HWB 321	AA4AH 318	I2MQP 310	WB6GFJ 299	OA4EI 280
IK1GPG 330	W4UNP 327	YV1KZ 325	N6AR 324	TI2JJP 321	KF5AR 318	HA6NF 310	KJ9N 298	WØIKD 279
IK8CNT 330	F9RM 327	W9OKL 325	W4UW 324	W8AXI 321	I8IYW 318	KF7RU 310	KB5WQ 295	EA3CWT 278
K5OVC 330	OZ3SK 327	9A2AA 325	VE2PJ 324	W5XQ 320	WA8YTM 318	AB4IQ 310	SV1RK 295	LU5EWO 278
DJ9ZB 330	CX4HS 327	DL6KG 325	I8LEL 324	KA5TQF 320	KX5V 318	W4WX 310	YT1AT 294	VE2DRN 277
W6DN 330	OE3WWB 327	OK1MP 325	IT9ZGY 324	TI2HP 320	CE1YI 318	EA5RJ 309	IT9VDQ 293	9A9R 277
NØFW 330	K7JS 327	WB3CQN 325	K6LEB 324	KS2I 320	K4JDJ 318	CT1EEN 309	KJ5LJ 293	K3LC 277
K3UA 329	DU9RG 327	I2QMU 325	IK1GPG 324	W7ULC 320	WA6DTG 317	EA5KY 308	TI2LTA 292	KC6AWX 276
K1UO 329	IT9TQH 327	KB4HU 325	VE7WJ 324	W3AZD 320	ZL1BOQ 317	EA3CB 308	K2EEK 291	SV2CWY 276
W7FP 329	IT9TGO 327	KC4MJ 325	AI8S 324	WØULU 320	EA1JG 317	EA3BHK 307	W6WL 291	F5NBX 275
K9BWQ 329	WD8MGQ 327	CX2CB 325	AC7DX 324	CT1EEB 320	N5HSF 316	VE3CKP 307	YB1RED 291	VE2AJT 275
N5FG 329	I1EEW 327	W9SS 325	KØHQW 324	OA4QV 320	KB1HC 316	N6AV 306	DJ2UU 291	US1IDX 275
4Z4DX 329	IØZV 327	TI2CC 325	K2JF 324	OE6CLD 320	K6RO 316	TI2TEB 306	4X6DK 291	Z31JA 275
WS9V 329	SV1ADG 327	IKØIOL 325	OE7SEL 324	W5RUK 320	WS9V 316	VE3DLR 306	WA3KKO 290	
ZL1AGO 329	VE3XN 327	YU1HA 325	KC8EU 323	LU1JDL 320	W5NW 315	W3YEY 306	OE7KWT 290	
I8KCI 329	K9MM 327	WA4IUM 325	VE4ACY 323	KF8VW 320	KV2S 315	XE1MDX 305	N6CFQ 290	

RTTY

K2ENT 325	WB4UBD 309	K3UA 298	EA5FKI 284	W4QB 280	G4BWP 276	PAØXPQ 272
W2JGR 316	NI4H 305	I1JQJ 289	YC2OK 280	W4EEU 280	KE5PO 274	

UN Telecom staff, including well-known DXer Mats Persson, SM7PKK, has reported that their relations with the Burundi Telecom people are in the pits, with even use of satellite telephones eliminated. Not only can they no longer get amateur licenses for their personnel, the UN can't bring in radios, repair their radio networks, and do other radio activities in support of their humanitarian efforts.

The problem may spread beyond Burundi. The forged licenses will certainly eliminate any chance of a legal amateur operation from the country for the foreseeable future. However, the backlash against the United Nations is prompting the UN to consider prohibiting UN staffers under contract from seeking an amateur license. This would be devastating for DX, as many of the most active and confirmable operators from many countries have been the UN radio operators. ON6TT and SMØAGD are just two of the more active operators who would fall under this restriction.

There is yet another excellent reason to expunge the 9U contacts. According to ARRL Membership Services director Bill Kennamer, K5FUV, the ARRL has a "responsibility to not promote bootlegging of amateur radio around the world." Obviously, accepting DXCC credit for operations that the country in question has termed unlicensed would do exactly that. So the ARRL has acted in the best interests of the integrity of the DXCC program, maintaining good relations with the Telecom authorities in Burundi, and amateur radio worldwide. Unfortunately, to accomplish this, several thousand individual DXCC credits had to be removed from the DXers' records.

The question now is to repair the damage this problem has caused with Burundi Telecom officials. These people now have a very negative view of amateur radio. Over time, with diplomacy and hard work, this negative attitude can be overcome. However, the near future looks bleak for anyone trying to get an amateur license in 9U. In fact, any contact between amateurs and the Burundi Telecom officials at this time would certainly be counter-productive. Let's leave the problem to the experts.

The problems in Burundi are neither new, nor unique to the country. The tiny country of Burundi lies on the shore of Lake Tanganyika, surrounded by Zaire, Rwanda, and Tanzania. It is one of the smallest countries in Africa. Its population

QSL INFORMATION

3B8GD to 3B8DB
3D2EK to N6EK
3D2IK to KF7IK
3D2RG to N6VO
5R8FU to SMØDJZ
5T5U to JA1UT
5WØGD to PA3AXU
5W1GL to N6VO
5X1P to G3MRC
7J1ACH to NG7X
7Q7CY to W8CNL
8P9HB to NW8F
C6AKW to K3TEJ
D68WU to F6HWU
EXØV to N6FF
FJ/N6DLU to N7UE
FOØAKI to NX1L
FOØKEO to N7CQQ
FOØMWA to N7NG
FOØWVR to N6VO
FO5PO to N6VO
FO5VO to N6VO
FO8BRD to N6RT
FP/AA8U to NU8Z
FP/K8AQM to NU8Z
FP/KB8ECG to NU8Z
FP/KB8OPT to NU8Z
FP/KDØPF to NU8Z
FP/KF8QE to NU8Z
FP/N8TIB to NU8Z
HC6CR to NE8Z
HR2/KC4CD to HR1JPT
HSØZCY to WB4FNH
HS1NIV to W1ZS
HS98AG to HS1CKC
J28AG to ZL3CW
J33A to N4GN
J37H to N4GN
J38EA to N7UE
J5UAI to NW8F
J76EK to N6EK
JT1M to JT1BG
JU1T to JT1KAA
JW9XGA to LA9XGA
KG4NW to NW3K
KH2/NH6D to N6FF
KH4/NH6D to N6FF
KJ6DL to N5FG
KL7/N5OK to N5OK
KP2/KJ4VH to N4GN
KP5/KP4HL to NG7X
KP5/NJ7D to NG7X
MU/DF2SS to DL2MDZ
OH4GN to N4GN
P39P to 5B4ES
P4ØNG to N7NG
PA6V to PI4KGL
PJ8/ND5S to ND5S
PJ8/W8EB to AA8GL
PJ9Q to W9QQ
PP8ZAT to NW8F
PP8ZBT to NW8F
PY0TI to PY1UP
RAØFF to N6FF
S79OY to KF8OY
S92AT to NJ2D
SVØJF to NJ2D
T2ØJC to N6FF
T32CW to NI6T
T32MP to KØMP
T32PL to WØNF
T32PS to KØMP
T88T to N5OK
TJ1US to NW8F
TJ2US to NW8F
TZ6VV to AAØGL
UEØFFF to N6FF
US1I to N5FG
US1IDX/US1I to N5FG
V2/KJ4VH to N4GN
V2/NF6H to N6RT
V26KW to K3TEJ
V29QQ to G6QQ
V31JP to KA9WON
V31KX to NJ2D
V31KX/VOA to NJ2D
V31PU to N7UE
V31RL to NG7S
V63OH to N5OK
V63RL to NG7S
V63RL/P to NG7S
VK2GUZ to NI6T
VK9XRS to ND3A
VP2EZA to ND3A
VP2M/KJ4VH to N4GN
VP2MDH to N4GN
VP2MDY to NW8F
VP2MFH to NW8F
VP5/KM9D to OM2SA
VP8CEO to N6FF
VP8CSA to DL1SDN
VP9/N1KS to JA1FUI
VP9/US1IDX to N5FG
VP9/US5I to N5FG
VS6/KJ4VH to N4GN
XE1/JH1VRQ to NX1L
XE2GBD to N6EK
XF3/XE2GBD to N6EK
YBØCY to W8CNL
YJ0AOY to KF8OY
YVØ/W6JKV to W8CNL
Z3ØM to NN6C
Z31GB to NN6C
Z31XX to NN6C
Z32XA to NN6C
Z32XX to NN6C
Z350GBC to NN6C
Z37FCA to NN6C
ZE1CY to W8CNL
ZF2AB to WA3EOP
ZF2MO to OM2SA
ZF2VV to NX1L
ZK1AAG to NA7DB
ZK1AW to NA7DB
ZK1MTF to NA7DB
ZK1WTU to NA7DB
ZK1ZRD to NA7DB
ZLØADE to KF7IK
ZLØAFZ to N7NG
ZLØAGH to KF7IK
ZS6IR to DL4EBA
4F1PVS to Vhodick K. Santos, 84 Evangelista St., Batangas City 4200, Philippines
6Y5MM to Mike Matalon, 7-9 Harbour Street, Kingston, Jamaica
8P6CJ to Chesterfield Phillips, Johnson Road, Fitts Village, St. James, Barbados
9M2VZ to Moay Siew Loon, 17, Lorong Tenang, 11600 Penang, Malaysia
A92GH to T. P. John, P.O. Box 11577, Manama, Bahrain
AT2AJ to B. S. Dutt, A 3 New Devrup CHS, Doulat Nagar, Santacruz (W), Bombay 400 054, India
BV4RF to Wang, P.O. Box 922, Taichung, Taiwan
C33BO to Archie Layno, P.O. Box 1150, Andorra la Vella, Andorra
DS2KAG to Jung Bae Lee, Sungwon APT 202-1006, 551-34 Pung-dong Ilsan-ku, Koyang, Kyounggi-do 411-330, Korea
DS2LOV to Yong Bae Lee, Heindol Life Town 612-102, 1193 Baksuk-dong, Ilsan-ku, Koyang, Kyounggi-dp 411-360, Korea
DU5AOK to Cyril Nathan Sm. Eamiguel, P.O. Box 14, TCPO, Tacloban City 6500, Philippines
DU7MHA to Jubert S. De Asis, Sr., P.O. Box 87, 6014 Mandaue City, Philippines
HL4CRV to Hak Gon Lee, P.O. Box 188, Mokpo 530-360, Korea
HL5TP to Kim Youngsun, 303-901 Green Mansion 276 Bon-Dong, Dalseo-ku, Taegu, Korea
LX2DW to Antonio Callixto, 10, Hueschterterbosch, L-1670 Senningerberg, Luxembourg
PJ9I to Ernest Lichtert, Cestorweg 22-24, Curacao, Netherlands Antilles
S21YP to R. E. Parkes, c/o Granger Systems, GIDP Project Office, P.O. Box 11061, Uttara, Dhaka-1230, Bangladesh
VP2VW to Worrell A. Bertrand, P.O. Box B, Road Town, Tortola, British Virgin Islands
VU2AKN to Asoke K. Nandy, 14, Narasingha Avenue, Dum-Dum, Calcutta-74, India
VU2ELJ to Sabu Mathew, Kadavil Manakal, Kaippanchery, Sulthan Bathery, Wayanad, Kerala 673 592, India
VU2EPR to Prem, P.O. B. 26, Kerala 673 101, India
VU2JF to Jivanlal N. Adiecha, 304 Arti Apartment, Kashivishwanath Plot, Rajkot 360 001, India
VU2OGO to S. R. Santhosh, P.O. Box 55, Payyanur P.O., Kerala 670 307, India
VU2RNC to R. N. Sharma, 37A/76, Madhu Nagar, Agra 282 001, India
VU2RTF to R. R. Balasundharam, 10-A, Parameswaran Lay Out, Pappanaickenpalayam, Coimbatore 641 037, India
VU2ZUS to Md. Sofiullah, HMT/Computer, 138 (IND) Field Workshop, A.P.O. 56, India
VU3RNC to Sandhya Sharma, 37A/76, Madhu Nagar, Agra 282 001, India
VU3WIA to D. S. Rajan, 282, Kongu Main Road, Tirupur 641 607, India
YBØTK to M. Maruto, P.O. Box 6763/JKSRB, Jakarta 12067, Indonesia
YC8RRK to Firdaus Bachmid, P.O. Box 145, Tahuna 95800, Indonesia
YS8ZKK to Wolf-D. Horn, Merler Ring 52, D-53340 Meckenheim, Germany

The table of QSL managers is courtesy of John Shelton, K1XN, editor of The GOLIST, P.O. Box 3071, Paris TN 38242 (phone 901-641-0109; e-mail: <golist@wk.net>).

is mostly Hutu. However, more than 400 years ago, the Tutsi moved in and conquered the Hutu. The Tutsi, while making up only a small minority of the population, continue to control the government and the army. This leads to inevitable conflict between the ruling tribe and the majority tribe, producing a very unstable government. It is against this background that the ARRL had to chart a careful path between what is best for DX and amateur radio in general, and the desires of individual DXers for 9U DXCC credit. The ARRL chose the difficult, but best decision of expunging the Burundi credits.

In other DXCC news, DXers enjoyed a very brief glimpse of a potential new DXCC entity in February. The government of Indonesia suggested that it might allow the residents of East Timor to vote on the question of their independence from Indonesia. This would create a new DXCC entity, as soon as it met one of the three requirements for such status: an ITU-issued call-sign block, membership in the United Nations, or presence of an IARU society.

East Timor has been the subject of much discussion and not a little fighting. In colonial times the eastern portion of the island of Timor was under the control of Portugal. In 1975 Indonesia invaded East Timor and annexed it the next year. The ARRL recognized this annexation, and the then-DXCC country of East Timor was deleted from the DXCC list in 1976. However, neither Portugal nor the United Nations recognized the annexation. Both have been pushing for years to return East Timor to its former status. Should this happen now, East Timor would be a new DXCC entity. Under the revised DXCC rules, even if previous "countries" re-emerge, they will count as New Ones, and not as continuations of previously deleted countries. Thus, for a few days DXers salivated at the thought of another DXCC entity to chase, even while trying to work the latest DXCC entity of Palestine. However, this feeling of anticipation was short lived.

Only a few days after apparently consenting to a vote on independence, the Indonesia government denied such a vote. The question of an independent East Timor was back in the hands of the politicians, where no progress has been made for almost 25 years. It appears that DXers will have to continue to wait for the emergence of this potential New One.

Working a Rare One

I was reminded earlier this year of the basic procedures involved in working a

CQ DX Awards Program

SSB

2268 ..... W5GZI

RTTY

29 ..... W2JGR

SSB Endorsements

320	IK1GPG/330	320	K4JLD/328
320	IK8CNT/330	320	I2EOW/328
320	DJ9ZB/330	300	W4NKI/328
320	N5FG/329	320	W2CC/325
320	4Z4DX/329	300	W5GZI/302
320	WS9V/329	275	KK4TR/283

CW Endorsements

320	W2UE/330	310	K4JLD/316
320	N7FU/330	300	W6YQ/300
320	N5FG/327	275	LU3DSI/295
310	I2EOW/318		

RTTY Endorsement

310 ..... W2JGR/316

Total number of active countries is 330. 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. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

Bator Sambu, JT1B.

rare contact. During the excellent **ZL9CI** Campbell Island operation, many DXers seemed confused as to date, time, and band. Perhaps a quick review of what to do when working a rare contact is in order.

First, by rare contact, I mean a QSO opportunity that is not likely to be repeated for a few years, at least. Such was certainly the case with the ZL9CI operation, as increasing environmental restrictions will only make future DXpeditions to Campbell and other Antarctic islands even more difficult that they are today. Don't expect another operation from Auckland-Campbell for several years.

So you have done your homework, listened carefully, mastered the split technique to the DXpedition operation, and made your contact. What do you do next? Your immediate reaction is to shout and holler, call all your friends who haven't worked the DXpedition, and gloat. However, this might not be the best use of the first few moments after making such a momentous contact.

Actually, the first thing to do is continue listening. Listen to the DX operator, and log the next five or so contacts he or she makes. This is an excellent insurance policy to help prevent the dreaded "not in log." Armed with such a list of the contacts made after yours can resolve many of the problems arising from minor callsign errors. If I am logged as W**D**2CHO instead of W**B**2CHO, and I list the next five stations worked (and WD2CHO doesn't claim a contact at the same time), the QSL manager may well consider the log in error and issue me the coveted QSL. This happens more often that most DXers think, as the DX operators are human and make errors, especially under the other than ideal conditions typical of DXpeditions.

The next thing to do is to recheck all the important settings on your radio. You may have quickly changed bands to catch the DX station and not noted that in your log. So stop for a moment and confirm that all your log data—frequency, mode, etc.—is accurate.

Next switch over to WWV or WWVH and recheck your clock. If you haven't reset your station clock recently, it may be off by several minutes (mine loses a minute a day). Confirm the relationship between WWV time and your station clock, and adjust your logged time appropriately. This step is not as important today with the widespread use of computer logging, but was essential in the days of paper-only logs. This is because the DX operator from a rare location may be making up to six contacts a minute. A time error of only a few minutes can put your contact on a different log page. QSL managers hate to have to search through pages of a handwritten log to find a contact that was 10 minutes off in time.

Next double-check the date, remembering that the UTC day changes in the early evening in the U.S. Again, while computer logging eliminates this kind of error, it is always better to have all your data on your QSL correct, just in case. You don't want to wait for the next Campbell Island operation, so do it right the first time.

These simple hints can make the difference between a prompt QSL and a note that begins with "Sorry . . . "

Finally, congratulations to Ken Miller, K6IR, the Dayton Hamvention's 1999 Amateur of the Year. Ken has been licensed since 1940 and is a very active DXer. He earned the honor for his "leadership, vision, and dedication exhibited during his nearly 60 years of continuous involvement in amateur radio."

73, Chod, VP2ML

BY FREDERICK O. MAIA, W5YI

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

FCC Proposes Low Power, Microradio Broadcast Service

"Pirates" May Be Ineligible Unless "Rehabilitated"

"With this Notice of Proposed Rule Making, we explore the possible establishment of new classes of FM radio service to respond to the increasing demand by the public for additional outlets of popular expression which could increase the diversity of voices, views, and sources of information and entertainment available to the American public." [Mass Media Docket No. 99-25, Released: February 3, 1999]

The Federal Communications Commission has taken the first step toward creating relatively low-cost community "alternative voice" radio stations. It proposed to introduce Low Power FM (LPFM) broadcasting, which has not been available since 1978. The proposal launches the FCC itself into what is likely to be tremendous controversy and a predicted "land rush" as thousands try to grab radio licenses.

The 70-page Notice of Proposed Rulemaking (NPRM) in Mass Media Docket 99-25 proposes to establish rules for a new 1000 watt primary (LP1000) and 100 watt secondary (LP100) FM broadcast service.

The FCC said, "We also seek comment on whether to establish a third, 'microradio' class of low-power radio service that would operate in the range of 1 to 10 watts on a secondary basis. Hundreds, if not thousands, of small broadcasters could be approved to run relatively inexpensive low-power FM radio stations.

"We believe that these new LPFM stations would provide a low-cost means of serving urban communities and neighborhoods, as well as populations living in smaller rural towns and communities," the FCC added.

The new service would fall under the FCC's Mass Media Bureau, not the Amateur Service. But the new service is a direct result of two Petitions for Rulemaking filed by Extra class amateur radio operators Nickolaus Leggett, N3NL (RM-9208), of Reston, Virginia, and Rodger Skinner, W4FM (RM-9242), of Pompano Beach, Florida.

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (telephone 817-461-6443 e-mail <fmaia@cwixmail.com>)

The Skinner petition: proposes the creation of three classes of LPFM service: (1) a "primary" service class with effective radiated power ("ERP") levels from 50 watts to 3 KW for antenna heights above average terrain ("HAAT") up to 100 meters (328 feet); (2) a "secondary" service class with ERP levels up to 50 watts for HAAT values up to 46 meters (150 feet);, and (3) a "special event" service up to 20 watts ERP, for which authorizations would be issued for periods not to exceed ten days.

The Leggett Petition: proposes a service limited to one watt of transmitter output power and an antenna height of 50 feet. This "microradio" service would broadcast to very small areas in a cellular arrangement, using a single FM and a single AM channel nationwide, thus limiting the impact on existing radio stations.

Leggett believes such stations would have an appeal for "niche markets" and could establish ties over small areas such as rural towns and urban neighborhoods. He later modified his proposal to suggest a two-tiered system. The first tier would include low-power radio facilities designed for a maximum transmission radius of one mile. The second-tier stations would have a maximum transmission radius of five miles.

Ownership would be limited to individuals whose primary residence is within 25 miles of the station and very small businesses and non-profit entities with primary headquarters located within 25 miles of the station. Petitioners suggests that microradio stations should be required to operate only a minimum number of hours per year. Licensees would be permitted to build their own transmitters, not subject to Commission approval.

FCC Vision of Low-Power Broadcasting

The Commission acknowledged that it had some 13,000 inquiries last year from persons wanting to start low-power stations. Supporters of low-power FM broadcasting argue that consolidation has made radio stations too expensive for most individuals, and that because new voices are being priced out of the market, the public is being deprived of diverse, local voices.

The Commission's proposal for low-power FM broadcasting was quite different from that suggested by Leggett and Skinner. The FCC proposed two distinct classes of service: (1) a primary LPFM service class with an ERP limit of 1000 watts (designated "LP1000"); and (2) a secondary class with an ERP limit of 100 watts (designated "LP100"). The Commission also wanted to know if they should establish a very low-power secondary "microradio" service with ERP limit of one to ten watts.

1000 watt Primary Service (LP1000): would operate at a maximum effective radiated power ("ERP") of 1000 watts at an antenna height above average terrain ("HAAT") of 60 meters (197 feet). Depending on population density, terrain, and other relevant factors, such a station could reach a substantial number of listeners. The FCC wants to know if this service should be restricted to noncommercial applicants, open to commercial service, or both.

"We also seek comment on whether the population in these service areas could be large enough to sustain an advertising base. A signal range of more than 8 miles should enable service to mobile listeners and to people living on farms or ranches in the vicinity of small rural communities."

100 watt Secondary Service (LP100): would be intended to meet the demand of people who would like to broadcast affordably to communities of moderate size, whether standing alone in rural areas or as part of a larger urban area. This service would operate as a secondary service at a maximum of 100 watts ERP and a 100 foot antenna. The FCC believes this combination would produce a signal range of about 3.5 miles from the station. LP100 stations would not be permitted to cause interference to other FM broadcast stations, nor would they be protected from interference from these stations.

1–10 watt Secondary "Microradio" Service: would permit an individual or group of people with very limited financial means to construct a broadcast facility to reach listeners within the confines of a very localized setting. This service would

operate with a maximum antenna height of 100 feet with power levels in the range of 1 to 10 watts. These values the FCC believes would produce a coverage area of about 1 to 2 miles.

"Clearly, microstations would offer only very limited coverage, such as for schools, small neighborhoods, subdivisions, or town centers. Construction costs for such a broadcasting apparatus could be quite low, potentially in the hundreds of dollars for some facilities," the NPRM said.

The FCC stated that it could not go along with the Leggett proposal to allow stations to construct their transmitting equipment. "If we adopt a microradio service, we believe there should be an FCC transmitter certification requirement. We are vitally concerned that such stations meet transmitter out-of-channel emission limits and other standards related to interference protection of stations on adjacent channels. We note that uncertified equipment has on numerous occasions caused dangerous interference to aviation frequencies."

The FCC believes that existing broadcasters should not be allowed to own or have any joint sales or marketing agreements with an LPFM station and no one could own more than one LPFM station in the same community. Applications would be filed electronically over the Internet during a "short window" of only a few days.

Groups representing noncommercial and microradio interests cautiously praised the proposal, while the National Association of Broadcasters fumed that LPFM would "devastate" the FM band. The NAB (one of Washington's most powerful lobbying groups), National Public Radio, other radio broadcaster organizations, and a number of individual FM broadcasters oppose the petitions, claiming that existing radio stations are already serving the myriad needs and interests of their communities and must do so in order to remain competitive, thus making low-power radio unnecessary.

Industry groups are also preparing to move U.S. radio broadcasting to a digital format, through an "in-band on-channel" (IBOC) approach. NAB warned that LPFM could harm transition to IBOC.

The FM radio band, 88–108 MHz, is divided into 100 "channels" of 200 kHz each. FCC rules currently restrict the use of FM channels 201–220 (88–92 MHz) to noncommercial educational broadcasting.

The NPRM emphasized that the FCC does not intend to create a low-power radio service on any spectrum beyond that which is currently allocated for FM use. "To allocate spectrum not currently used for broadcasting would force consumers to purchase new equipment . . . which would likely have a substantial dampening effect on its success."

The potential for interference could be further reduced if LPFM stations operated with a reduced bandwidth, creating additional frequency separation to adjacent channels. The FCC wants to know about the effectiveness of reduced bandwidth as an alternative means of interference protection.

FCC Cautions Pirate Radio Factions

Last year also saw intense activity by "pirate" unlicensed "microradio" stations. Former pirates who refused to shut down their stations may not have access to LPFM licenses, FCC staff said, unless the pirates could demonstrate that they had "rehabilitated" themselves.

"Unlicensed radio operators not only violate the longstanding statutory prohibition against unlicensed broadcasting and our present rules on unlicensed broadcasting, but they also use equipment of unknown technical integrity. Such illegal radio transmissions raise a particular concern because of the potential for harmful interference to authorized radio operations, including public safety communications and aircraft frequencies."

The Commission has repeatedly urged all unlicensed radio operators to cease broadcasting. When they have not, the FCC has filed complaints in federal district courts to shut them down by seeking injunctive relief; seizure and forfeiture of the radio station equipment; monetary forfeitures; and/or criminal penalties. In addition, the Commission has issued cease and desist orders to a number of unlicensed broadcasters.

"Nevertheless, despite repeated warnings by Commission officials and the Commission's successes in federal district court litigation, some unlicensed broadcasters have persisted in their unlawful activity. Parties who persist in unlawful operation after the Commission has taken any of these enforcement actions could be deemed *per se* unqualified, and we seek comment as to the eligibility of such parties for a license in any new radio service."

The FCC wants to know under what circumstances previous unlicensed "pirate" FM radio station operators might be considered rehabilitated. "The reliability as licensees of parties who may have illegally operated for a time but have ceased operation after being advised of an enforcement action, however, is not necessarily as suspect."

Both LP1000 and LP100 stations may need to generate revenue in order to remain operational. The FCC asks if these stations should be permitted to sell some form of advertising. " . . . noncommercial licensees might attempt to seek under-

writing funds from neighborhood groups and businesses."

The Commission believes that the very localized nature of LP100 and microradio stations will ensure that they serve the public. Therefore, the FCC feels that it should not require them to comply with specific programming or minimum operating requirements. Proposed was an 18 month construction limit for LP100 stations and a 12 month limit for microradio stations. The NPRM also asked if the FCC should adopt a callsign system that would identify a low-power radio station as such.

Commissioners Issued Separate Statements

Chairman William E. Kennard and Commissioner Gloria Tristani said: "As we've traveled around the country we've talked to lots of people who want to use the airwaves to speak to their communities—churches, community groups, elementary schools, universities, small businesses, and minority groups. They see, as we do, that the airwaves are a great natural resource, and the creation of a low-power radio service could provide an effective way for more people to use this resource. . . . we cannot deny opportunities to those who want to use the airwaves to speak to their communities simply because it might be inconvenient for those who already have these opportunities.

Commissioner Susan Ness: "This Notice of Proposed Rulemaking describes three low-power FM services that could provide a means to give a public voice to individuals and entities currently not able to participate in our broadcasting system. We are seeking comment on whether to authorize any or all of these new services. By doing so, we may enable students, community organizations, and those underrepresented in conventional broadcasting to provide programming of special interest to small and niche populations."

Commissioner Michael K. Powell: "I support issuance of this Notice of Proposed Rulemaking looking toward creation of low-power radio service. Many have called upon us to consider a new low-power class of service as a means of opening opportunities in radio broadcasting for new entrants. Others contend that authorizing low-power services will facilitate 'community radio' designed to serve currently unmet information needs. These are worthy goals and we should consider whether we can authorize such services."

Commissioner Harold W. Furchtgott-Roth dissented: "I am not opposed to the creation of a low-power radio service. Whatever new service can be provided within the range of existing interference regulations would be something worth considering. I do not believe that we should create new stations at the expense of current interference protection standards, however. Were the NPRM limited to consideration of service based on the maintenance of the interference rules now set forth in our regulations, I could thus have supported its issuance. But the NPRM is not so limited.

The public comment period closes on the NPRM on April 12, 1999, and reply comments on or before May 12, 1999. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies. Comments filed through the ECFS can be sent as an electronic file via the Internet to <http://www.fcc.gov/e-file/ecfs.html> [Proceeding number is 99-25]. Parties who choose to file by paper must file an original and four copies of each filing. All filings must be sent to the Commission's Secretary, Magalie Roman Salas, Office of the Secretary, TW-A306, Federal Communications Commission, 445 12th St. S.W., Washington, D.C. 20554.

73, Fred, W5YI

BY GEORGE JACOBS, W3ASK

PROPAGATION

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Sunspot Wildness!

The 23rd sunspot cycle continues to climb towards what appears to be a relatively high peak. However, the sunspot count on a day-to-day basis continues to vary over a very wide range, which is most unusual.

According to the Royal Observatory of Belgium, the mean sunspot count for January 1999 was 62. A high of 121 was recorded on January 19, but the count dipped to a daily low of only 22 on January 30. The January mean level results in a 12-month running smoothed sunspot number of 65 centered on July 1998. This is an increase of three from the previous month. The smoothed number is an average of the mean values for the past 12 months, and it is the basis for measuring solar cycle intensity and progress. A smoothed number on the order of 113 is forecast for May l999.

Solar Flux Values

The Dominion Radio Astrophysical Observatory of Canada, located at Penticton, B.C., reports a mean value of 136 for the January 1999 level of 10.7 cm solar flux. This results in a 12-month running smoothed solar flux level of 122 centered on July 1998. A level on the order of 147 is likely for May 1999. Solar flux levels are directly related to sunspot counts, but are a more accurate and more convenient method for determining solar activity.

May Propagation

During the daytime hours, from just after sunrise and continuing through sunset, expect DX conditions to most areas of the world on the 10, 12, 15, 17, and 20 meter bands. Twenty meters should be optimum for a two to three hour period following sunrise. Fifteen and 17 meters should take over as best DX bands during the late morning and early afternoon hours. During the late afternoon all five bands should be at their best for DX propagation.

From sundown to midnight 20 meters is expected to be the optimum band for DX, with strong signal openings possible to most areas of the world. Good DX conditions are also expected on 15 and 17 meters for openings towards Latin America, the South Pacific, Asia, and the Far East, and on 30, 40, and 80 meters towards Europe, Africa, and Latin America.

11307 Clara Street, Silver Spring, MD 20902
e-mail: <w3ask@cq-amateur-radio.com>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for May 1999

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 1, 8, 14, 18, 28	A	A	B	C
High Normal: 2, 12-13, 15, 17, 19, 22-23, 27, 29	A	B	C	C-D
Low Normal: 4-7, 11, 16, 21, 24-26, 30	B	C-B	C-D	D-E
Below Normal: 3, 9, 20, 31	C	C-D	D-E	E
Disturbed: 10	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 excellent (A) on May 1st, good (B) on the 2nd, fair-to-poor (C-D) on the 3rd, fair-to-good (C-B) from the 4th to the 7th, etc.

From midnight to sunrise DX honors are expected to be shared among 20, 30, and 40 meters, with some good openings also possible on 80 meters. Seasonally higher static levels and the longer hours of daylight are expected to reduce considerably chances for DX openings on the 160 meter band, but some may be possible during the hours of darkness towards the Caribbean and Central American areas.

For specific times of DX openings refer to the DX Propagation Charts which appeared in last month's column. This month's column contains a Short-Skip Propagation Chart valid for both May and June, as well as charts centered on Alaska and Hawaii. The Short-Skip Chart contains propagation forecasts for openings varying in distance between approximately 50 and 2300 miles. For day-to-day variations expected in propagation conditions during May, see the Last-Minute Forecast, which appears at the beginning of this column.

Mailbag

"Hi, George: I have a question for you, and since you are the 'propagation man' in CQ magazine, I hope that you can help me. I try to check WWV info each day so I can keep track of the solar flux, etc. What I wonder is if there is a website where I can check out the numbers not only on a daily basis, but also where I can get a list of the past week or month. This way I can make a comparison of the progress and changes. Any help you can give will be greatly appreciated. Thanks and 73, Tony Dell <kg2eh@aol.com>."

Tony, thanks for the e-mail. Check my webpage at <http://www.gjainc.com> for links to the world's major sources of geomagnetic, solar, and ionospheric propagation data. The source that will give you the specific information that you seek is the Norwegian DX Listeners Club. You can find them as a link on my website or directly at <http://dxdc.com>. On their home page click on "Solar Activity Information." The data is updated daily and contains a graphical view of the past two months of solar flux values, sunspot count, and planetary A indices. Similar data is shown daily for the past 30 days in tabular form. In addition there is information on solar flare and other solar events, and progress of sunspot Cycle 23. Charts of all cycles from Cycle 1 through Cycle 22 are available.

"George: Congratulations on your 48th anniversary writing propagation for CQ. *I have read your column since 1954 and when I* enter the *various DX contests I really study your write-ups. I usually enter single band 20, so every bit of info is a real advantage, especially your column. Thanks for the help over the years. You have always done an outstanding job and the whole ham radio community appreciates it. The very best to you and your family. 73, Lynn Schriner, W5FO <lschriner@esi-dallas.rero.com>"*

Many thanks, Lynn, for the thoughtful e-mail. I was very glad to learn that you have been a reader of this column for 45 of the 48 years that I have been writing it and that it has been so useful to you. I hope to continue bringing propagation info to radio amateurs through this column for as long as I can.—73, George

I want to take this opportunity to thank

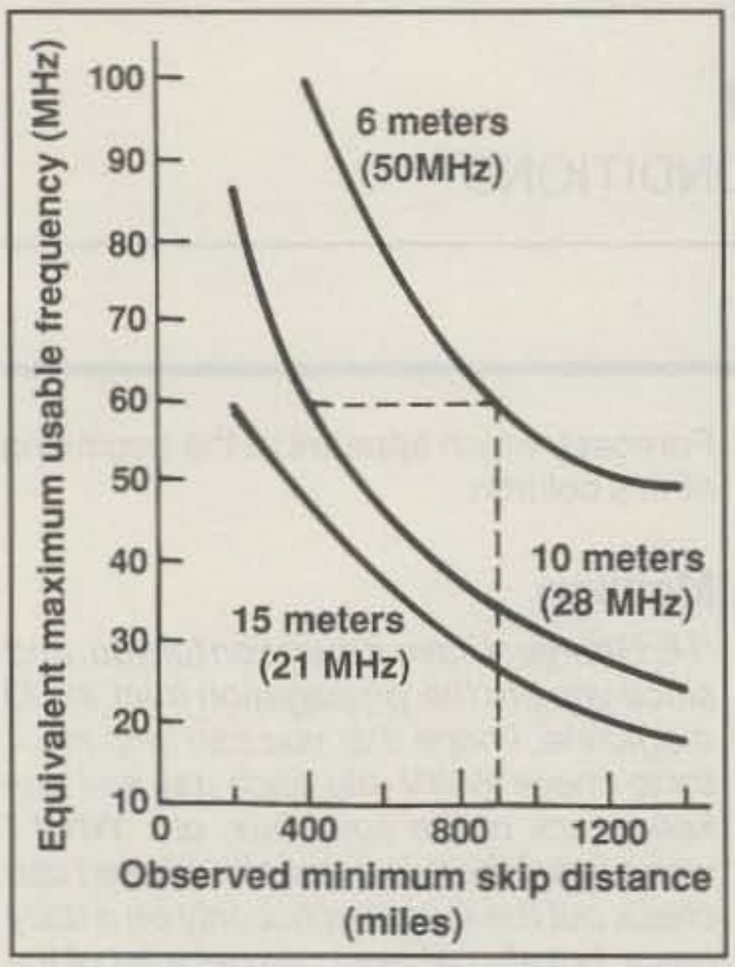


Fig. 1– Diagram describing correlation between sporadic-E openings on the 10 and 15 meter amateur bands and possible 6 meter openings at the same time. The example shows a minimum skip distance of 400 miles observed on 10 meters; from the chart, 6 meters should be open with a skip distance of greater than 900 miles.

the many other readers who sent me mail on the occasion of my 48th year as editor of this column. As I have mentioned many times previously, this is the best reward that a writer can receive.

VHF Ionospheric Openings

May should be a good month for ionospheric openings on the VHF bands resulting from the high level of solar activity, increased sporadic-*E* propagation, meteor showers, trans-equatorial propagation, and auroral activity.

Solar activity is now high enough that some *F*-layer DX openings should be possible on the 6 meter band during the daylight hours. Conditions are best for transcontinental openings, openings between the western states and Hawaii, and openings toward the Caribbean and Central and South America. The best time to look for these openings is during the afternoon hours, particularly when conditions are High Normal or better.

Sporadic-*E* ionization is expected to increase considerably during May, and fairly frequent 6 meter short-skip openings should be possible. These are most likely to occur over distances of approximately 1000 to 1400 miles. Although sporadic-*E* openings can take place at just about any time, the best time to check is between 10 AM and 2 PM, and again between 6 and 10 PM local daylight time.

During periods of intense and widespread sporadic-*E* ionization, two-hop openings considerably beyond 1400 miles should be possible on 6 meters, and short-skip openings between approximately 1200 and 1400 miles may also be possible on 2 meters.

Here is a useful tip for predicting 50 MHz short-skip E_s openings. The geometry of propagation is such that as the skip distance *decreases* on the 21 and 28 MHz bands, the highest frequency that will be reflected by a sporadic-*E* cloud *increases*. By observing the minimum ionospheric skip distance heard on 21 or 28 MHz during an E_s opening, and using the chart shown in fig. 1 it should be possible to tell whether 50 MHz is open and what the skip distance might be.

To demonstrate how this technique works, consider the following example. Suppose the minimum skip distance observed on 28 MHz in a southwesterly direction is 400 miles (it is the distance to the nearest skip station heard that is important). From fig. 1 the intersection between 400 miles and the 28 MHz curve corresponds to an MUF of 60 MHz. This means that 50 MHz short-skip openings in a southwesterly direction are very likely to occur. The minimum skip distance expected on 50 MHz can now be found from fig. 1 by locating the intersection between 60 MHz on the ordinate (vertical scale) and the 50 MHz curve. The resulting distance is found to be 900 miles. A useful rule of thumb to remember is that when skip stations are heard less than 500 miles away on 28 MHz, or less than 250 miles away on 21 MHz, the chances are very good that 50 MHz will open in the same general direction.

From most locations in the continental United States 1300 mile E_s openings should extend into both Canada and Mexico. From the southern third of the country, it should also be possible to work a rather large number of countries in Central America and the West Indies during 15, 10, and 6 meter sporadic-*E* openings. Long-distance (DX) television reception also improves considerably during the summer months as a result of sporadic-*E* ionization. Signals from low-band VHF TV stations (Channels 2–5), which normally cannot be received more than 75 or 100 miles away, suddenly are propagated up to 1300 miles, often with very strong signal levels.

Some trans-equatorial propagation (TE) should be possible during May on 6 meters and perhaps 2 meters as well. TE openings are most likely to occur between 9 and 11 PM local daylight time on long north-south paths which cross the geomagnetic equator at approximately a right angle. TE openings favor locations in the southern states, but openings are also possible to more northern areas.

The *Eta Aquarids*, a major meteor shower, is expected from May 4 to 6. It should peak with a count of approximately 20 meteors an hour during the afternoon of May 5. Meteor activity should be intense enough during this shower to support meteor-burst short-skip openings on the 6 and 2 meter bands.

Some auroral activity may be possible during May, resulting in short-skip auroral-scatter-type openings on VHF. Such activity is most likely to occur during periods of ionospheric storminess. Check the Last-Minute Forecast at the beginning of this column for those days likely to be Below Normal or Disturbed during May.

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 (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates possible 10 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. In the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last-Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. On the Short-Skip Chart appropriate *daylight* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EDT, on a circuit between New York and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones add 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone; and 6 hours in the EDT zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 PM in Los Angeles; 18 or 6 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA subtract 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone; and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
May & June 1999
Local Daylight Time
At Path Midpoint

Band (meters)		*Distance Between Stations (miles)* 50-250	250-750	750-1300	1300-2300
10	Nil		08-10 (0-1) 10-14 (0-2) 14-18 (0-1) 18-22 (0-2) 22-00 (0-1)	08-10 (1-2) 10-14 (2-3) 14-18 (1-2) 18-22 (2) 22-00 (1) 00-08 (0-1)	08-10 (2-0) 10-14 (3-1) 14-16 (2-1) 16-19 (2) 19-22 (2-0) 22-08 (1-0)
15	Nil		07-10 (0-2) 10-14 (0-3) 14-18 (0-2) 18-20 (0-3) 20-00 (0-2) 00-07 (0-1)	07-10 (2) 10-14 (3) 14-18 (2-4) 18-20 (3-4) 20-22 (2-3) 22-00 (2) 00-07 (1)	07-10 (2-1) 10-14 (3-2) 14-16 (4-3) 16-20 (4) 20-23 (3-2) 22-00 (2) 00-07 (1-0)
20	10-13 (0-1) 13-19 (0-2) 19-01 (0-1)		07-10 (0-2) 10-13 (1-3) 13-19 (2-4) 19-21 (1-3) 21-01 (1-2) 01-07 (0-2)	07-10 (2-3) 10-13 (3-4) 13-19 (4) 19-21 (3-4) 21-23 (2-4) 23-01 (2-3) 01-07 (2)	07-10 (3) 10-16 (4-3) 16-23 (4) 23-01 (3-4) 01-03 (2-3) 03-07 (2)
40	07-09 (1-2) 09-12 (2-4) 12-20 (3-4) 20-22 (2-3) 22-01 (1-2) 01-07 (0-1)		07-09 (2-4) 09-10 (4-3) 10-16 (4-2) 16-18 (4-3) 18-22 (4) 22-01 (2-3) 01-07 (1-3)	07-09 (4-3) 09-10 (3) 10-16 (2-1) 16-18 (3-1) 18-20 (4-2) 20-22 (4) 22-07 (3-4)	08-10 (3-1) 10-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-06 (4) 06-07 (4-3) 07-08 (3)
80	08-11 (4) 11-19 (4-3) 19-23 (4) 23-08 (3-4)		08-11 (4-1) 11-17 (3-0) 17-19 (3-1) 19-21 (4-2) 21-06 (4) 06-08 (4-3)	08-09 (1) 09-11 (1-0) 11-17 (0) 17-19 (1-0) 19-21 (2-1) 21-23 (4-3) 23-06 (4) 06-08 (3-2)	08-09 (1-0) 09-19 (0) 19-21 (1-0) 21-23 (3-2) 23-04 (4-3) 04-06 (4-2) 06-08 (2-1)
160	06-09 (4-1) 09-10 (2-0) 10-19 (1-0) 19-21 (3-1) 21-23 (4-2) 23-06 (4-3)		06-09 (1) 09-19 (0) 19-21 (1-0) 21-23 (2-1) 23-01 (3-2) 01-04 (3) 04-06 (3-2)	08-09 (1-0) 09-21 (0) 21-23 (1) 23-01 (2-1) 01-04 (3-2) 04-06 (2) 06-08 (1)	08-21 (0) 21-01 (1) 01-04 (2) 04-06 (2-1) 06-07 (1) 07-08 (1-0)

HAWAII
May & June 1999
Openings Given in Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Eastern USA	15-17 (1)	07-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-15 (1) 15-18 (2) 18-20 (3) 20-22 (4) 22-00 (3) 00-02 (2) 02-04 (3) 04-07 (2)	19-20 (1) 20-23 (3) 23-02 (1) 20-21 (1)* 21-23 (2)* 23-01 (1)*
Central USA	12-15 (1) 15-17 (2) 17-18 (1)	05-07 (1) 07-12 (2) 12-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	08-12 (1) 12-16 (2) 16-18 (2) 18-22 (4) 22-00 (3) 00-02 (2) 02-06 (3) 06-08 (2)	19-20 (1) 20-21 (2) 21-01 (4) 01-02 (2) 02-04 (1) 20-21 (1)* 21-00 (2)* 00-03 (1)*
Western USA	09-12 (1) 12-17 (2) 17-19 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-17 (4) 17-19 (3) 19-22 (2) 22-00 (1)	06-08 (4) 08-16 (3) 16-22 (4) 22-02 (3) 02-06 (2)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-07 (1) 19-20 (1)* 20-21 (2)* 21-03 (3)* 03-04 (2)* 04-05 (1)*

ALASKA
May & June 1999
Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Eastern USA	20-22 (1)	18-20 (1) 22-02 (2) 22-01 (1) 01-03 (2) 03-05 (1)	20-22 (1) 22-02 (2) 02-06 (3) 06-08 (2) 08-10 (1) 10-14 (2) 14-16 (1)	05-10 (1)
Central USA	21-23 (1)	18-21 (1) 21-23 (2) 23-01 (1) 01-04 (1)	02-08 (3) 08-14 (2) 14-22 (1) 22-02 (2)	05-07 (1) 07-10 (2) 10-12 (1)
Western	00-03 (1)	18-20 (1) 20-23 (2) 23-02 (3) 02-05 (2) 05-07 (1)	02-04 (3) 04-08 (4) 08-14 (3) 14-18 (4) 18-20 (3) 20-02 (2)	04-06 (1) 06-08 (2) 18-12 (3) 12-15 (2) 15-16 (1) 08-12 (1)*

#See explanation in "How To Use Short-Skip Charts" in 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.

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

CW RESULTS

QPR/p SECTION

WORLD WIDE

YU1EA	**A**	**703,696**	**813**	**412**
RW4WR	**A**	**692,545**	**770**	**421**
LY2FE	**A**	**664,125**	**878**	**385**
YU1LM	*	616,011	839	363
K1VUT	**A**	**599,508**	**588**	**351**
NØKE	**A**	**548,730**	**560**	**390**
WA2HZR	**A**	**505,648**	**559**	**338**
SM3CCT	**A**	**396,445**	**633**	**329**
VE3KP	**A**	**416,392**	**489**	**292**
N7IR	**A**	**337,488**	**432**	**316**
I3BBK	**A**	**284,004**	**483**	**276**
HA7YS	**A**	**229,490**	**454**	**265**
EA7AAW	**A**	**202,215**	**414**	**255**
7K4QOK	**A**	**207,624**	**345**	**246**
M8O	**A**	**151,984**	**394**	**236**
UA4YJ	*	133,056	361	224
VX7CFD	**A**	**155,750**	**360**	**175**
OK2ZS	**A**	**130,417**	**314**	**217**
PAØADT	**A**	**107,120**	**320**	**206**
W8DN	**A**	**110,400**	**236**	**200**
RV9COI	**A**	**99,774**	**182**	**138**
WA5OJI	**A**	**103,622**	**263**	**197**
F6OIE	**A**	**101,808**	**313**	**202**
KG5U	*	94,760	221	184
YO4AAC	**A**	**83,284**	**275**	**188**
SP5XSB	**A**	**82,236**	**250**	**178**
SM5DQ	*	80,545	232	181
IK5YZT	**A**	**80,538**	**258**	**186**
HB9XY	**A**	**74,700**	**266**	**166**
VK4IU	**A**	**72,237**	**149**	**121**
EA7HCB	*	70,642	221	169
RV6AF	*	69,708	184	148
ON7CC	**A**	**66,256**	**231**	**164**
UR7QL	**A**	**62,156**	**201**	**164**
JA5CDL	*	53,750	202	125
WV3B	**A**	**50,856**	**185**	**156**
K3WWP	*	41,595	166	141
WZ2T	**A**	**41,148**	**138**	**108**
CT1ETT	**A**	**39,300**	**180**	**131**
UR5SFX	*	37,050	182	130
RW6AVQ	*	36,040	187	136
F5VBT	*	34,038	170	122
SP5AGU	*	33,152	120	112
JL3SBE	*	31,200	114	104
DK4CU	**A**	**28,336**	**160**	**112**
K6HRT	**A**	**24,698**	**122**	**106**
OK1AIJ	*	23,005	122	107
DL4GBR	*	21,218	125	103
OK2DU	*	15,326	103	79
DJ5QK	*	15,048	103	88
NØQT	*	13,432	120	92
VE2ABO	**A**	**8,162**	**59**	**53**
DHØJAE	*	6,490	65	59
W9PNE	**A**	**4,760**	**77**	**68**
AF9J	*	3,128	70	68
RWØLKA	**A**	**1,075**	**33**	**25**
K5OI	*	598	27	23
LW3EBJ	**28**	**50,874**	**148**	**122**
4X1VF	**28**	**23,306**	**97**	**86**
HAØGK	**28**	**7,812**	**72**	**62**
LU1VK	*	5,198	50	46
NX5M	**28**	**3,619**	**49**	**47**
W4PJ	**28**	**3,456**	**54**	**48**
WA6FGV	**28**	**2,318**	**42**	**38**
LU6HI	**21**	**453,768**	**527**	**292**
U5MZ	**21**	**76,000**	**252**	**190**
ES1CR	**21**	**37,386**	**172**	**134**
9A3GU	**21**	**29,268**	**148**	**108**
OH2YL	**21**	**22,890**	**137**	**109**
JR1NKN/2	**21**	**22,575**	**127**	**105**
W4DEC	**21**	**19,488**	**126**	**116**
K2CS	**21**	**8,614**	**82**	**73**
RA3FO	**14**	**451,320**	**654**	**390**
OK2PYA	**14**	**203,904**	**420**	**288**
JH1GNU	**14**	**177,840**	**298**	**240**
FM5CW	**14**	**141,934**	**260**	**206**
G3LHJ	**14**	**117,120**	**310**	**244**
W6YJ	**14**	**96,120**	**248**	**216**
RUØAT	**14**	**84,320**	**205**	**160**
DL2KDW	**14**	**38,354**	**176**	**151**
GWØVSW	**14**	**33,033**	**168**	**143**
SM6AHU	**14**	**7,446**	**82**	**73**
JH7XVB	*	3,854	52	47
DL2PY	*	3,150	54	50
N8WS	**14**	**792**	**39**	**36**
KU7Y	**7**	**154,710**	**312**	**191**
N1TM	**7**	**64,256**	**142**	**128**
W8QZA/6	**7**	**30,488**	**112**	**103**
SP4GFG	**3.5**	**159,094**	**351**	**211**
IV3TAN	**3.5**	**25,740**	**126**	**99**
JA1AA	**3.5**	**2,256**	**25**	**24**

SINGLE OPERATOR

NORTH AMERICA

UNITED STATES

NB1B	**A**	**3,681,918**	**1851**	**639**
K5ZD	**A**	**3,122,800**	**1645**	**592**
WC1M	**A**	**1,665,024**	**1233**	**512**
W1CU	*	1,207,041	836	463
W1ZS	*	251,196	364	242
K1KU	*	149,946	260	201
W1WFZ	*	144,450	267	214
KA1GJ	*	53,120	150	128
N4XR	*	43,200	108	108
WR1P	*	40,020	136	116
K1MY	*	13,248	71	64
KR1G	**7**	**109,228**	**154**	**142**
K1LZ	**3.5**	**290,864**	**313**	**212**
***WA1LNP**	**A**	**713,388**	**779**	**442**
***K1HT**	**A**	**502,152**	**500**	**294**
*AA1SU	*	158,589	460	263
*AB1BX	*	120,716	255	206
*KD1YN	*	116,280	230	180
*K1WD	*	39,330	138	138
***WA1S**	**14**	**129,168**	**266**	**207**
***KQ1V**	**14**	**129,033**	**274**	**243**
***W1MK**	**3.5**	**110,088**	**194**	**139**
WV2LI	**A**	**1,839,336**	**1381**	**519**
			(Op: N2GA)	
W2TZ	**A**	**498,192**	**502**	**321**
KW2J	**A**	**387,504**	**485**	**312**
WA1KKM	*	311,157	355	231
W2HCA	*	266,616	345	252
NA2Q	*	230,640	334	248
W2FR	*	229,690	258	223
W2EN	*	214,812	315	234
W2EZ	*	16,490	100	85
NN2Y	*	9,843	55	51
N2CU	**14**	**273,340**	**425**	**316**
W2ZI	**14**	**183,910**	**315**	**265**
K2TW	**3.5**	**318,560**	**342**	**220**
N2GC	**3.5**	**104,598**	**198**	**149**
K2ONP	*	51,000	124	102
***N2ED**	**A**	**601,500**	**612**	**375**
***WK2G**	**A**	**584,610**	**704**	**390**
***K2UF**	*	**531,993**	**541**	**329**
*K2QMF	*	471,734	461	298
*W2YK	*	35,600	127	100
*W3EH	*	28,704	135	104
*WA2VQV	*	21,690	100	90
***W2/U5WF**	**14**	**92,736**	**229**	**184**
***N2GM**	**7**	**194,688**	**258**	**208**
KQ2M	**A**	**5,146,608**	**2294**	**716**
KE3Q	**A**	**4,810,784**	**2299**	**692**
K3ZO	**A**	**3,950,100**	**1899**	**665**
AA3B	*	2,494,296	1416	588
W3PP	*	2,397,787	1403	581
W3AZ	*	531,392	510	304
N3II	*	320,952	375	258
W3FQE	*	9,360	60	52
W3KLG	**14**	**37,835**	**120**	**115**
			(Op: K3ND)	
W3BGN	**3.5**	**230,400**	**297**	**192**
***K1HTV**	**A**	**1,830,150**	**1147**	**525**
***WF3M**	**A**	**573,426**	**672**	**369**
*W3CP	*	302,232	371	257
*N1WR	*	245,338	349	241
*W3XG	*	55,875	149	125
*N3NZ	*	33,410	145	130
*KB3AFT	*	28,792	140	118
*N4MO/3	*	20,250	90	81
W4AN	**A**	**4,618,200**	**2065**	**716**
WC4E	**A**	**2,930,794**	**1755**	**643**
KT3Y	**A**	**1,772,659**	**1181**	**511**
NU4Y	*	1,206,252	1159	486
W4PA	*	1,190,259	921	441
NY4A	*	982,422	803	414
K4BAI	*	793,592	778	437
W4IF	*	106,200	225	177
K4LQ	*	62,957	166	157
N4MM	*	39,216	123	114
KF4ARS	*	28,420	118	98
N4UH	*	28,046	82	74
W4OGG	*	22,785	115	93
AE4EI	*	17,266	101	97
W4YDD	*	3,640	54	52
N4BP	**28**	**50,038**	**365**	**197**
K4OAQ	**21**	**269,379**	**455**	**297**
WW4RR	**21**	**187,824**	**544**	**312**
			(Op: N4ZZ)	
KØEJ	**14**	**1,163,954**	**1129**	**554**
W9WI	**14**	**686,868**	**862**	**444**
N4CW	*	609,092	738	436
***KN4T**	**A**	**2,452,140**	**1358**	**570**
***WD4AHZ**	**A**	**1,001,160**	**981**	**486**
***K4RO**	**A**	**991,926**	**892**	**471**
*NW6S	*	842,370	752	430
*W4YE	*	696,340	661	370
*WO4O	*	648,147	680	411
*N4IG	*	405,720	466	315
*N4GJ	*	351,747	504	323
*N8LM	*	307,785	435	289
*K7CMZ	*	227,997	334	231
*N3TG	*	165,690	274	210
*K4UVT	*	155,250	273	230
*K4QPL	*	136,955	267	215
*K4VV	*	80,344	200	166
*W4TYU	*	80,256	214	176
*K4UK	*	64,059	205	163
*AC4JI	*	51,450	162	147
*WB4DNL	*	37,524	134	118
*W4AMA	*	31,280	150	136
*W4VC	*	24,910	123	106
*NA4CW	*	3,969	50	49
***K4EA**	**28**	**20,882**	**131**	**106**
***KN4Y**	**21**	**60,960**	**485**	**240**
***KU4OZ**	**14**	**76,736**	**234**	**218**
***K4WW**	**7**	**14,760**	**60**	**60**
***W4WS**	**3.5**	**3,626**	**38**	**37**
			(Op: N4VHK)	
N3BB	**A**	**2,655,098**	**1752**	**653**
K5YAA	**A**	**1,550,925**	**1103**	**565**
NN5ZZ	*	467,496	583	344
			(Op: N5LZ)	
NN5AA	**28**	**68,800**	**422**	**215**
			(Op: K5NA)	
W5FO	**14**	**46,440**	**273**	**172**
***AA5B**	**A**	**1,629,067**	**1177**	**517**
***WQ5L**	**A**	**1,385,568**	**1183**	**544**
*K5IID	*	360,913	450	329
*N5XUS	*	136,809	316	243
*WQ5W	*	55,874	224	182
*K4NR	*	55,050	172	150
*N5KB	*	6,461	79	71
***KØBCN**	**21**	**9,890**	**98**	**86**
***KB5KYO**	**14**	**72,800**	**216**	**182**
*KN5L	*	54,000	202	180
WR6AAA	**A**	**4,136,148**	**2085**	**684**
			(Op: N6IG)	
K7BV	**A**	**3,082,852**	**1621**	**628**
WK6LA	**A**	**2,439,556**	**1506**	**604**
			(Op: K6LZ)	
AG7W	*	595,443	549	309
			(Op: K6XX)	
WA5VGI	*	431,648	637	376
K6GT	*	311,362	411	302
KI6T	*	282,880	447	320
W6TK	*	227,040	343	264
W6NKR	*	221,238	325	241
WR6WR	*	172,260	363	261
			(Op: K6FO)	
KF6HAN	*	139,324	310	244
K6WG	*	130,448	397	248
KN6Z	*	105,500	258	211
W6MVW	*	76,610	204	163
W6RFF	*	48,087	158	137
AA6W	*	36,771	164	119
N6MU	**21**	**463,272**	**625**	**398**
N6TV	**14**	**1,657,717**	**1372**	**607**
AD6DO	**14**	**1,049,958**	**1112**	**546**
***WN6K**	**A**	**403,588**	**706**	**326**
***W6PLJ**	**A**	**225,225**	**371**	**273**
*N6NF	*	172,315	333	241
*K6UM	*	139,932	275	207
*W3SE	*	122,484	255	177
*AC6BW	*	66,868	231	146
*W6ISO	*	43,354	137	106
*KF6GUH	*	34,125	155	125
*W6SA	*	20,167	89	67
*WD6DX	*	10,605	125	101
*AA6EE	*	9,591	78	69
*NK6F	*	4,712	81	76
***NP4IW/NN6**	**21**	**18,880**	**161**	**118**
***AE6Y**	**14**	**208,772**	**372**	**268**
***KU6T**	**7**	**7,200**	**61**	**60**
WW7OR	**A**	**2,676,432**	**1522**	**592**
			(Op: W7GG)	
K7VS	**A**	**1,212,640**	**1150**	**530**
N6HR	*	**546,345**	**530**	**355**
W8AEF	*	359,478	423	317
W7YS	*	352,026	437	318
W7QN	*	283,140	458	330
W7HS	*	229,770	341	270
K7ABV	*	175,098	283	231
KC7UP	*	172,974	312	254
K5ZM	**14**	**756,884**	**745**	**437**
K7ZZ	**14**	**434,434**	**536**	**403**
KS7T	*	323,745	472	339
W7AYY	*	115,236	234	198
***W7YAQ**	**A**	**501,008**	**514**	**362**
***KN7Y**	**A**	**452,250**	**713**	**375**
*KK7JP	*	123,576	284	228
*AB7II	*	58,310	238	170
*N7IF	*	52,998	225	146
*K7VI	*	51,832	177	152
*KN7T	*	45,318	234	166
*KX7J	*	38,624	174	136
ND5S	**A**	**558,480**	**513**	**358**
N4ZR	**A**	**434,016**	**449**	**288**
K3JT	*	**407,225**	**518**	**325**
K2UOP/8	*	157,504	271	214
W8PN	*	120,198	201	201
W9LT	*	44,388	123	108
KF8TM	**28**	**4,368**	**51**	**48**
W8UMR	**14**	**211,932**	**326**	**261**
K8NO	**14**	**128,454**	**266**	**237**
			(Op: K8KFJ)	
***N8AA**	**A**	**800,800**	**707**	**416**
***W8UPH**	**A**	**170,400**	**304**	**240**
*W8VE	*	18,612	122	94
*W8IDM	*	4,891	67	67
*K8MR	*	0	73	60
***WT8P**	**14**	**51,997**	**200**	**163**
*AF8C	*	8,024	79	68
***WA8WV**	**7**	**354,548**	**456**	**302**
W9IW	**A**	**1,729,954**	**1259**	**578**
			(Op: ES2RR)	
K9AN	**A**	**854,972**	**804**	**422**
W9OP	*	**404,775**	**516**	**315**
WI9WI	*	159,004	404	254
K9BG	*	134,466	289	219
WT9U	*	120,132	300	213
K9UQN	**7**	**288**	**18**	**18**
***WO9S**	**A**	**746,480**	**745**	**434**
***K9MMS**	**A**	**176,155**	**355**	**245**
*K9GY	*	38,985	134	115
*W9HR	*	34,656	123	114
*N9NW	*	1,860	31	30
***NN9K**	**21**	**22,444**	**157**	**124**
***K9QVB**	**14**	**120,064**	**260**	**224**
*KA9IMX	*	2,698	40	38
***N9ENA**	**7**	**28,296**	**125**	**108**
WØGJ	**A**	**1,725,586**	**1255**	**557**
			(Op: AAØBY)	
KMØL	**A**	**941,752**	**1021**	**502**
KGØUA	*	**274,175**	**370**	**275**
WØHW	*	199,752	352	246
WØTT	*	122,421	308	219
KØRY	*	100,744	240	196
KØXQ	*	69,524	205	182
WØAJ	*	540	18	18
WØTM	**14**	**1,056,678**	**980**	**543**
KCØCGS	**14**	**437,409**	**550**	**371**
			(Op: K9WIE)	
***WØUY**	**A**	**136,477**	**306**	**209**
*N1YJD	*	15,390	113	95
*KKØDX	*	11,076	76	71
***KØOAL**	**14**	**23,463**	**106**	**99**

THE BAHAMAS

***C6AKA**	**A**	**2,017,115**	**1377**	**485**
***C6AHR**	**A**	**1,192,638**	**998**	**394**

CUBA

CM2KC	**A**	**1,055,758**	**909**	**407**

MARTINIQUE

FM5BH	**14**	**4,642,866**	**2359**	**762**
TX8A	**A**	**1,063,696**	**860**	**304**

PANAMA

***HO3A**	**A**	**240,012**	**367**	**226**

PUERTO RICO

WP3A	**21**	**3,038,371**	**1836**	**623**
***WP4LNY**	**A**	**4,524**	**44**	**39**

COSTA RICA

TI1C	**7**	**5,403,048**	**1678**	**609**
			(Op: TI2CF)	

CANADA

VE3EJ	**A**	**4,900,449**	**2148**	**667**
VO1MP	**A**	**4,667,488**	**2207**	**622**
VE3CWE	*	111,321	200	171
VA3NR	*	88,517	196	143
VA7A	**14**	**1,876,035**	**1257**	**595**
			(Op: VE7XR)	
CK7U	**3.5**	**223,882**	**310**	**157**
			(Op: VE7WRA)	
***VE7NTT**	**A**	**2,516,520**	**1407**	**536**
***VE6JO**	**A**	**1,533,060**	**1128**	**501**
***VE9DX**	**A**	**1,503,788**	**1020**	**484**
*XO7X	*	1,002,328	971	359
***VO1GO**	**A**	**690,460**	**635**	**316**
***VE3TDG**	**A**	**445,795**	**515**	**271**
*VE3STT	*	242,498	342	226
***VE5SF**	**A**	**224,161**	**388**	**217**
***VE2AWR**	**A**	**192,198**	**332**	**206**
*VE6ZT	*	161,700	300	220
*VE3YGN	*	110,224	231	166
*VE5CMA	*	20,777	102	79
*VE6BMX	*	14,140	95	70
***CY7A**	**14**	**2,328,720**	**1488**	**626**
***VX6BF**	**14**	**42,681**	**127**	**123**
***VA3RJ**	**7**	**43,240**	**104**	**92**
*VA3SP	*	1,880	21	20

MEXICO

XE1VV	**A**	**596,160**	**629**	**345**
***XE1RGL**	**7**	**324,162**	**354**	**207**

TURKS AND CAICOS

VP5Z	**14**	**3,713,040**	**2140**	**720**
			(Op: W5ASP)	

AFRICA

SWAZILAND

3DA5A	**A**	**6,102,345**	**2719**	**645**
			(Op: JM1CAX)	

TUNISIA

3V8BB	**A**	**11,914,111**	**3762**	**803**
			(Op: YT1AD)	

CANARY ISLANDS

EA8ZS	**A**	**9,795,674**	**3333**	**718**
EA8BIE	*	239,660	348	230
***EA8ASJ**	**A**	**1,722,627**	**1123**	**459**
***EA8ADJ**	**28**	**42,328**	**138**	**104**
***EA8ABF**	**21**	**79,534**	**202**	**133**

CUETA & MELILLA

EA9LZ	**14**	**5,708,498**	**2516**	**758**

AFRICAN ITALY

IH9/OL5Y	**1.8**	**341,068**	**325**	**182**

ASIA

AZERBAIJAN

***4K9W**	**A**	**206,080**	**315**	**224**

ISRAEL

4X4DZ	**28**	**658,560**	**759**	**343**
***4Z5AX**	**28**	**218,160**	**385**	**216**
***4Z5FW**	**21**	**1,074,678**	**961**	**418**
***4X/OK1DTP**	**21**	**1,037,686**	**976**	**373**

CYPRUS

C46A	**A**	**10,044,034**	**3732**	**754**
			(Op: 5B4ADA)	
C4W	**A**	**7,353,213**	**3220**	**719**
			(Op: 5B4WN)	
H24LP	**7**	**2,815,230**	**1119**	**449**
			(Op: 5B4LP)	
***5B4/T97M**	**A**	**4,339,200**	**2300**	**600**
***5B4/T93Y**	**14**	**2,556,718**	**1570**	**586**

KUWAIT

9K2ZZ	**28**	**240,195**	**368**	**239**

WEST MALAYSIA

***9M2TO**	**A**	**1,004,640**	**964**	**416**

SINGAPORE

9V1YC	**A**	**3,793,320**	**2274**	**615**

OMAN

A45XR	**A**	**6,930,768**	**3296**	**696**
			(Op: SP5EXA)	

CHINA

***BA4TB**	**A**	**94,051**	**319**	**163**

TAIWAN

BV7FF	**21**	**330,483**	**459**	**279**
***BV/JH3GCN**	**28**	**1,066**	**34**	**26**

KYRGYZSTAN

***EX8MZ**	**28**	**63,525**	**311**	**97**

KOREA

***HL5AP**	**A**	**154,760**	**432**	**212**

THAILAND

HSØ/SM3DYU	**21**	**178,835**	**353**	**235**
***HS1NIV**	**A**	**108,410**	**281**	**185**
***HSØGBI/2**	**14**	**101,115**	**232**	**189**

SAUDI ARABIA

7Z5OO	**A**	**2,949,174**	**1950**	**531**
			(Op: K3UOC)	
HZ1HZ	**A**	**1,728,500**	**1153**	**500**

JAPAN

JH4UYB	**A**	**3,737,818**	**1969**	**602**
JA1YNE	**A**	**2,056,864**	**1413**	**544**
JH7WKQ	**A**	**1,832,412**	**1202**	**491**
JH7XGN	*	1,630,035	1091	495
JN2AMD	*	1,396,073	1003	497
JAØQWO	*	876,783	872	393
JH2NWP	*	465,045	532	301
JA1HP	*	278,166	442	259
JA1DD	*	229,950	359	219
JA3ARM	*	226,754	379	242
JR1LEV	*	222,684	359	241
JA2QVP	*	94,864	207	154
JA2AXB	*	60,878	174	122
JA5IP	*	55,552	180	128
7J6AAK/2	*	44,892	230	174

JO1QZI	*	15,336	56	54
JA5AIQ	*	14,060	80	74
JH3BIL	*	3,880	45	40
JR6CF	*	1,357	23	23
JH8COB	*	1,122	17	17
JH1FSF	**28**	**6,768**	**95**	**72**
JH6SQI	*	616	23	22
JR6GKT	**21**	**838,726**	**817**	**431**
JS1KQQ	*	13,176	75	72
JA1BE	*	1	1	1
JA7XBG	**14**	**1,674,768**	**1127**	**552**
JA5APU	**14**	**810,306**	**753**	**413**
JH1AZO	*	358,583	502	311
JH1YHS	*	45,895	154	137
JK1LUY	*	23,056	100	88
JR3XEX	*	1,876	30	28
JH1AEP	**3.5**	**22,440**	**82**	**68**
JA1QZC	*	3,660	30	30
***7M1MCT**	**A**	**2,050,722**	**1398**	**531**
***JA6UBK**	**A**	**1,119,312**	**843**	**432**
***JA2BY**	**A**	**563,616**	**587**	**342**
*JK1KNB	*	535,054	564	338
*JA6WFM	*	502,044	599	321
*JN1NOP	*	449,372	597	308
*JRØBQD	*	399,434	512	277
*JA2CUS	*	312,156	458	261
*JK3GWT	*	302,225	419	275
*JA2IU	*	300,911	388	293
*JHØGHZ	*	218,763	333	223
*JK1ATT	*	211,030	371	235
*JF3BTR	*	198,688	313	224
*JA2OJ	*	191,770	282	254
*JA8JCR	*	145,140	285	205
*JH6TYD	*	142,978	277	194
*JA4BAA	*	137,632	272	187
*7J1ABD	*	127,095	273	185
*7L4IOU	*	116,622	252	171
*JA3UWB	*	115,920	260	184
*JI1RXQ	*	113,472	253	192
*JI7OED	*	103,775	240	175
*JR5EHB	*	96,425	245	175
*JA1XUY	*	73,032	193	136
*JA1AB	*	67,710	200	122
*JP1SRG	*	53,820	160	117
*JH1DYV	*	47,847	143	123
*JH1JGZ	*	45,952	151	128
*JA1WHG	*	40,572	135	98
*JK2RCP/1	*	38,192	150	112
*JA8AJE	*	37,534	138	98
*JF1LAU	*	29,963	114	83
*JR5HXU	*	27,552	99	96
*JA4AQR	*	24,570	100	91
*JA6JVY	*	21,791	73	77
*JN7OJA	*	20,867	85	77
*JA1MXY	*	13,747	73	59
*JH8MWW	*	9,690	63	51
*JA1YEW	*	8,778	85	66
*JK6ISK	*	8,424	60	54
*JH1UES	*	7,923	62	57
*JK2VOC	*	7,085	99	65
*JE1KUP	*	5,588	50	44
*JA5FP	*	3,168	35	33
*JA1MQS	*	2,070	30	30
*JA6QDU	*	1,368	27	24
***JS1PWV**	**28**	**4,950**	**107**	**66**
***JG2MLI**	**28**	**2,856**	**79**	**56**
*JA1AAT	*	320	19	16
*JA7AXP	*	234	17	13
***JH3CCT**	**21**	**70,400**	**211**	**176**
***JA1KI**	**21**	**57,750**	**183**	**154**
*JA6BIF	*	44,352	150	132
*JJ1GQH	*	42,051	152	131
*JHØEPI	*	23,520	125	105
*JL1MWI	*	15,857	126	101
*JP6GQN	*	14,516	85	76
*JJ1JRH	*	6,579	56	51
*JI1RCB	*	1,664	29	26
*JA6IP	*	361	24	19
***JF1SQC**	**14**	**1,247,816**	**947**	**488**
***JR4GPA**	**14**	**707,840**	**703**	**395**
***JH3AIU**	**"**	**641,410**	**646**	**374**
*JA2XI	"	523,226	530	374
*JH6QIL	"	286,104	413	273
*JF3GKE	"	268,830	398	290
*JE1REU	"	214,760	353	260
*JA1CP	"	65,408	178	146
*JA5TXA	"	35,417	118	107
*7K1EQG	*	30,525	132	111
*JJ1BJB/6	*	26,866	115	101
*JA1XPU	*	1,575	29	25
*JG1FGL	*	288	12	12
*JM3LWR	*	192	8	8
*JA3HPD	*	100	7	7
***JF3IYW/3**	**7**	**13,108**	**65**	**58**
*JI4HKA	*	638	11	11
*JA1AAV	*	98	7	7

MONGOLIA

***JT1CJ**	**A**	**63,220**	**252**	**145**

LEBANON

***OD5PL**	**A**	**222,835**	**371**	**205**

TURKEY

YM2ZW	**14**	**3,090,750**	**1761**	**634**
		(Op: OK2ZW)		
***TA4/DK5IM**	**A**	**1,972,355**	**1418**	**385**
*TA3BN	*	11,988	63	54
***TA3D**	**28**	**148,104**	**297**	**187**

ASIATIC RUSSIA

RN9AO	**A**	**5,413,320**	**2344**	**660**
RN9XA	**A**	**4,624,144**	**2110**	**656**
UA9KJ	**A**	**1,674,112**	**1131**	**464**
UA9XEN	*	81,740	185	134
UA9OS	*	17,286	69	67
UA9OSV	*	3,240	37	36
RA9JP	**14**	**1,231,248**	**1020**	**454**
UA9AOL	*	218,040	373	276
UA9MMD	*	126,765	516	135
***UA9KDZ**	**A**	**922,780**	**703**	**370**
***UA9KM**	**A**	**242,400**	**371**	**240**
*RW9QA	*	179,707	307	187
*RA9AUH	*	178,200	312	216
***RZ9OU**	**21**	**281,162**	**417**	**266**
***RJ9J**	**14**	**1,797,458**	**1269**	**538**
*RU3HD/9	*	249,165	352	245
RNØA	**A**	**2,803,990**	**1561**	**574**
		(Op: UAØAGI)		
RAØFW	**A**	**1,391,886**	**1168**	**477**
UAØJDD	*	142,952	339	214
***RSØF**	**A**	**1,685,690**	**1409**	**505**
***RAØFU**	**A**	**1,336,014**	**1167**	**486**
***RAØFF**	**A**	**1,230,445**	**1049**	**485**
*RUØLL	*	1,163,358	1259	441
***UAØSAD**	**14**	**273,800**	**368**	**296**
*UAØYAY	*	75,650	190	170

KAZAKHSTAN

UPØL	**A**	**4,406,898**	**2266**	**551**
		(Op: UN9LW)		
UN6T	**21**	**838,764**	**888**	**414**
UP4L	**14**	**1,884,528**	**1285**	**552**
		(Op: UN7LZ)		
UN8RA	**14**	**741,844**	**745**	**382**
UN7LG	**7**	**1,311,552**	**686**	**368**
UN7LT	**3.5**	**380,418**	**325**	**213**
***UP6F**	**A**	**45,650**	**147**	**110**

VIETNAM

***XV7SW**	**21**	**1,324,078**	**1162**	**458**

HONG KONG

VR98BG	**21**	**763,830**	**906**	**410**
***VR98/F5PRH**	**A**	**425,448**	**843**	**311**

MACAU

*XX9TSS	21	1	1	1

EUROPE

CROATIA

9A2AJ	**A**	**1,547,731**	**1680**	**503**
9A5Y	**21**	**1,882,494**	**1420**	**639**
9A3MA	**14**	**2,485,378**	**1749**	**686**
9A4D	**1.8**	**152,250**	**350**	**203**
***9A9R**	**A**	**1,317,353**	**1155**	**491**
***9A2TN**	**A**	**778,505**	**876**	**413**
*9A3CY	"	594,404	801	362
*9A5J	"	542,082	747	334
*9A3SM	"	113,088	300	228
*9A4P	"	9,177	62	57
		(Op: 9A9AU)		
***9A7P**	**28**	**49,572**	**233**	**153**
*9A4KA	"	6,420	68	60
***9A3B**	**21**	**642,108**	**766**	**438**
***9A2WJ**	**7**	**63,616**	**162**	**142**
***9AØCW**	**3.5**	**5,814**	**54**	**51**
		(Op: 9A3SM)		
***9A2OO**	**1.8**	**104,492**	**289**	**173**

MALTA

9HØA	**28**	**498,108**	**920**	**372**

PORTUGAL

***CT1ELP**	**28**	**130,810**	**470**	**206**

GERMANY

DL6FBL	**A**	**4,711,728**	**2301**	**758**
DK9IP	**A**	**2,132,284**	**1542**	**602**
DL2JRM	**A**	**1,085,535**	**1130**	**459**
DL8UAT/P	"	924,455	934	433
DL1JF	"	792,060	798	430
DL4VAD	"	740,532	823	404
DLØHRO	"	655,278	784	403
		(Op: DL3KUD)		
DL6AG	"	585,056	763	376
DL3BQD	"	429,436	606	343
DL1TH	"	412,490	610	334
DL5BUT	"	408,606	510	302
DF5BM	"	174,464	339	232
DL8UFO	"	98,532	272	207
DF5RF	"	77,562	252	186
DL5ST	"	70,794	222	162
DK9KW	"	3,145	40	37
DK3KD	**21**	**151,976**	**337**	**242**
DL1EMH	"	86,524	231	194
DL7IO	**14**	**959,910**	**963**	**490**
DL5AUJ	"	846	19	18
DL5AWI	**7**	**1,896,948**	**1104**	**522**
DK3WW	**7**	**1,286,860**	**930**	**470**
DK7XS	"	669,000	671	375
DL8WN	**3.5**	**425,156**	**606**	**314**
***DL3JAN**	**A**	**1,089,384**	**1109**	**456**
***DL3JAW**	**A**	**1,089,384**	**1109**	**456**
***DL2NWK**	**A**	**1,017,520**	**1025**	**460**
*DL2HQ	"	795,240	849	423
*DL4BQE	"	790,800	945	400
*DL8SUB	"	536,471	735	377
*DK7FP	"	381,276	515	306
*DJ5GG	"	298,566	480	291
*DL5SVB	"	260,764	514	268
*DL1AQB	"	226,575	431	265
*DJ3XK	"	164,193	365	229
*DL5ZB	"	152,656	280	203
*DL3KWR	"	127,008	307	224
*DL3ZAI	"	117,165	353	219
*DL4JYT	"	105,592	286	197
*DH2UL	"	83,304	218	156
*DF5WN	"	81,770	282	185
*DL2YAK	"	68,780	242	181
*DK5ZX	"	68,456	216	172
*DL1SAN	"	67,252	248	172
*DL5PW	"	59,348	182	148
*DL3KWF	"	50,550	200	150
*DK2GZ	"	39,270	104	85
*DJ8EW	"	38,784	167	128
*DF1ZN	"	37,180	155	130
*DL6AXI	"	24,450	100	75
*DF6LQ	"	21,400	117	100
*DL7AXM	"	4,416	48	48
*DL5CX	"	1,794	23	23
*DL5ANS	"	187	11	11
***DF4SA**	**21**	**47,121**	**157**	**139**
*DL3BRA	"	11,152	70	68
***DL9NEI/P**	**14**	**56,445**	**204**	**159**
*DL6UBF	"	7,104	53	48
***DF8AE**	**7**	**190,344**	**400**	**231**
*DJ2YE	"	105,252	235	179

SPAIN

EA7KN	**A**	**1,510,932**	**1521**	**498**
EA3GCV	**21**	**463,335**	**713**	**391**
EA1JO	**21**	**138,320**	**290**	**247**
EA4ND	"	60,164	237	169
EA7IL	**14**	**967,434**	**1046**	**471**
***EA7GTF**	**A**	**1,588,248**	**1495**	**516**
***EA3ALV**	**A**	**822,296**	**945**	**436**
***EA7AGW**	**A**	**606,400**	**806**	**379**
*EA2BNU	"	487,900	717	350
*EA4DRV	"	226,576	512	289
*EC5AEB	"	203,046	470	258
*EA7MT	"	179,596	370	236
*EA4NK	"	102,108	298	201
*EA1BAE	"	94,770	292	195
*EA1EXE	"	85,070	320	181
*EA1FBJ	"	82,971	259	189
*EA7GXX	"	78,200	227	170
*EA7TG	"	55,624	175	136
*EA1AAA	"	20,188	116	98
*EA7ALO	"	18,240	99	96
*EA2CR	"	16,625	100	95
*EA7CWA	"	9,600	67	60
*EA4BNQ	"	2,193	53	43
***EA7AKJ**	**28**	**17,927**	**121**	**91**
***EA3BIM**	**28**	**15,752**	**112**	**88**
*EA2CAR	"	3,382	43	38
*EA4AOR	"	630	29	21
***EA1AK/7**	**21**	**103,739**	**280**	**227**
***EC5CFQ**	**21**	**52,488**	**285**	**162**
*EA4BGM	"	46,050	208	150
*EC7ADS	"	11,248	113	94
*EA1BHR	"	7,076	58	58
*EA5AFH	"	585	16	15
***EA3AR**	**14**	**970,717**	**1046**	**496**
*EA2BDS	"	157,360	396	280
*EA1ND	"	95,976	261	186

BALEARIC IS.

***EA6YW**	**A**	**30,690**	**130**	**110**
*EA6ACC	"	9,230	81	65
***EA6GP**	**21**	**9,230**	**81**	**71**

IRELAND

***EI8GP**	**14**	**309,756**	**517**	**332**

MOLDOVIA

ER5AA	**21**	**440,406**	**641**	**387**
ER1OA	"	165,312	408	252
***ER1CW**	**A**	**306,571**	**555**	**281**

ESTONIA

***ES1AW**	**A**	**113,360**	**323**	**218**

BELARUS

EU1FC	**A**	**1,525,341**	**1502**	**519**
EU4AA	**A**	**1,089,030**	**1100**	**465**
EU1DM	"	774,944	1002	397
EU3FT	**3.5**	**526,490**	**718**	**323**
EW3AC	**3.5**	**142,086**	**334**	**199**
***EU1AZ**	**A**	**1,506,600**	**1393**	**558**
***EU1SA**	**A**	**511,056**	**720**	**378**
*EW8DX	"	117,230	300	190
*EW3CW	"	79,119	210	177
***EU1CL**	**3.5**	**325,314**	**523**	**279**
***EV6M**	**3.5**	**141,768**	**335**	**198**
*EU6AA	"	55,552	190	128
***EU6DX**	**1.8**	**30,528**	**130**	**106**
*EW4AB	"	15,010	95	79

FRANCE

TM8R	**A**	**1,860,672**	**1442**	**528**
		(Op: F6FGZ)		
F6HWU	**A**	**862,596**	**922**	**441**
F6IRA	**"**	**712,236**	**921**	**417**
F5POJ	"	260,300	503	274
F5JQH	"	115,360	321	224
F5OIH	**21**	**90,095**	**245**	**185**
F6KPQ/P	**14**	**1,830,997**	**1551**	**623**
		(Op: F5PHW)		
F6CWA	**1.8**	**31,240**	**133**	**110**
***F5JBR**	**A**	**658,902**	**814**	**386**
***FB1CMF**	**A**	**282,133**	**505**	**307**
*TM6ACO	"	231,574	460	278
*F6HHR	"	213,570	466	270
*F5TNI	"	172,890	300	255
*F6FTB	"	159,460	309	238
*F6CAV	"	150,092	310	239
*F5JGA	"	103,600	265	200
*FB1PDR	"	85,120	336	140
*F6GQO	"	41,307	189	147
*F5TRB/P	"	15,229	100	97
*FBC2FX	"	5,520	70	48
*F5JDG	"	5,500	60	55
***F5EQ**	**21**	**41,144**	**152**	**148**
***F5NLY**	**14**	**502,018**	**650**	**418**
***F/OK1EE**	**7**	**632,968**	**752**	**356**
***F5RZJ**	**1.8**	**44,392**	**183**	**124**

ENGLAND

M8C	**A**	**3,834,583**	**2527**	**667**
		(Op: G4TSH)		
M8T	**A**	**3,754,854**	**2334**	**674**
		(Op: G4PIQ)		
GX4WSM	"	713,592	1022	396
		(Op: GØJQN)		
G3KKQ	"	283,101	425	273
GS2MP	**14**	**2,534,115**	**2035**	**701**
		(Op: G4FAM)		
G8G	**7**	**1,334,700**	**1110**	**450**
***M8M**	**A**	**380,254**	**645**	**346**
		(Op: G3SXW)		
***G3RSD**	**A**	**355,366**	**600**	**319**
*G3OOU	"	352,137	622	321
*G3JJZ	"	125,430	301	222
*G3HZL	"	112,236	300	199
*G6QQ	"	48,339	185	131
*M/NQ7X	"	5,304	72	68
*G4OTY	28	90	7	6
***G3ESF**	**21**	**82,644**	**250**	**194**
***GØMTN**	**14**	**400,751**	**724**	**377**
***G5MY**	**7**	**48,576**	**214**	**69**

SCOTLAND

***GM3CFS**	**14**	**301,252**	**535**	**371**

WALES

GW8K	**A**	**863,615**	**1108**	**415**
***GW3KJN**	**7**	**7,080**	**94**	**30**

HUNGARY

HA2SX	**A**	**2,790,511**	**1888**	**647**
HA3LI	**A**	**1,764,490**	**1443**	**554**
HG3O	**14**	**3,000,387**	**1907**	**719**
		(Op: HA3UU)		
HAØIT	**14**	**1,001,718**	**1056**	**522**
HA3OU	**3.5**	**52,644**	**200**	**132**
***HA8MD**	**A**	**1,578,864**	**1439**	**518**
***HA4YF**	**A**	**639,804**	**736**	**393**
*HA8YU	"	141,603	302	231
*HA9PB	"	98,610	231	190
*HA5OFN	"	18,240	102	96
*HA3FUK	"	9,920	72	62
***HA8MT**	**28**	**6,384**	**63**	**57**
***HA5CCC**	**14**	**30,875**	**155**	**125**
***HA4FV**	**3.5**	**336,582**	**589**	**271**
***HA8BE**	**1.8**	**120,960**	**303**	**180**

SWITZERLAND

HB9FBS	**A**	**581,316**	**761**	**386**
HB9KC	"	55,094	168	163
***HB9ARF**	**A**	**459,680**	**662**	**340**
*HB9HQX	"	104,532	300	186
*HB9CVO	"	9,324	80	74

ITALY

IR4T	**A**	**4,900,392**	**2457**	**756**
		(Op: IK2QEI)		
IQ6T	**A**	**1,777,113**	**1487**	**549**
		(Op: IK6SNQ)		
IØZUT	*	855,333	835	401
IK4WMB	*	840,048	922	407
II3T	**21**	**1,059,355**	**1042**	**515**
		(Op: IV3SHF)		
IK2ULV	**14**	**20,976**	**139**	**114**
***IK4MTF**	**A**	**1,016,052**	**952**	**454**
***IKØYVV**	**A**	**884,709**	**920**	**453**
*IIØN	*	107,996	302	203
*IK3SCB	*	104,690	271	190
*IZ1ASP	*	82,248	257	184
*IK1ZVK	*	51,744	197	154
*IZØANC	*	41,134	166	131
*IK2NCF	*	41,097	152	133
*IK4GNK	*	10,152	72	72
*IV3KSE	*	792	18	18
***IK41WL**	**21**	**295,488**	**494**	**324**
***IZ3BQT**	**14**	**102,765**	**286**	**221**
***IV3UHL**	**7**	**127,062**	**287**	**181**
*IK3QAR	*	77,724	213	153

SARDINIA

***ISØHQJ**	**A**	**150,804**	**390**	**213**
*ISØUWX	*	55,566	211	189

SICILY

IQ9L	**A**	**4,232,102**	**2826**	**707**
		(Op: I2VXJ)		
***IQ9A**	**A**	**161,644**	**340**	**251**
*IT9ORA	*	60,214	206	161
***IT9AF**	**21**	**441,126**	**670**	**378**

NORWAY

LA7MFA	**A**	**1,327,816**	**1354**	**524**
LA6PB	**"**	**208,772**	**428**	**268**
LA9HW	**14**	**1,680,258**	**1360**	**579**
***LA9HFA**	**A**	**479,682**	**730**	**378**
***LA2HFA**	**A**	**443,232**	**676**	**342**
***LA4XFA**	**1.8**	**2,448**	**36**	**34**

LUXEMBOURG

***LX1JH**	**A**	**7,611**	**69**	**59**

LITHUANIA

LY6M	**A**	**3,267,150**	**1918**	**690**
		(Op: LY1DS)		
LY5W	**A**	**2,270,898**	**1730**	**603**
LY2OX	**A**	**2,198,010**	**1651**	**615**
LY2BM	"	2,053,772	1616	574
LY1CX	"	763,371	931	441
LY2KM	"	520,785	722	355
LY2PAQ	"	455,499	618	321
LY2DX	"	201,840	376	232
LY/AC6WL	"	20,070	105	90
LY2GV	**21**	**185,460**	**409**	**281**
LY3BA	**14**	**2,040,507**	**1615**	**661**
LY2BN	"	486,000	656	405
LY3IW	**3.5**	**141,688**	**327**	**199**
LY6K	**1.8**	**177,650**	**387**	**209**
***LY2FN**	**A**	**655,131**	**525**	**393**
***LY2BNZ**	**A**	**414,000**	**589**	**345**
*LY1FM	*	278,070	509	310
*LY3CW	*	103,523	259	161
***LY1DD**	**14**	**463,896**	**634**	**408**
***LY1BW**	**14**	**408,975**	**585**	**399**
*LY3GJ	*	9,920	125	155
***LY3JY**	**7**	**536,452**	**651**	**343**
*LY2BLQ	*	364,780	474	299

BULGARIA

LZ1BJ	**A**	**959,420**	**1134**	**445**
LZ1QZ	**A**	**211,167**	**419**	**243**
LZ1PJ	*	1,416	27	24
LZ8A	**21**	**976,140**	**1071**	**495**
LZ5XQ	**14**	**816,624**	**1040**	**428**
LZ/OK1DF	*	421,940	715	365
***LZ4BU**	**A**	**29,786**	**132**	**106**
*LZ1IA	*	14,820	90	78
***LZ1GU**	**28**	**51,900**	**217**	**150**
***LZ4CA**	**28**	**38,376**	**158**	**117**
*LZ2GS	*	34,272	142	112
***LZ1ZU**	**21**	**15,556**	**101**	**86**
***LZ1ZM**	**14**	**499,800**	**844**	**408**
*LZ1OF	*	104,918	290	209
***LZ2CJ**	**1.8**	**61,272**	**203**	**138**

AUSTRIA

***OE5OHO**	**A**	**262,367**	**497**	**259**
*OE1WEU	*	76,368	228	172

FINLAND

OH1NOR	**A**	**3,653,310**	**2247**	**705**
OH5NQ	**A**	**3,599,953**	**2282**	**721**
		(Op: OH6EI)		
OH9DX	**A**	**2,558,370**	**1912**	**642**
OH6RX	*	2,317,935	1850	615
OH6YF	*	2,308,800	1888	624
OH2OT	*	959,907	788	489
OH6NJ	*	919,664	1135	458
OH7WW	*	730,098	948	423
OH3MMH	*	450,560	635	352
OH9MM	*	126,063	356	203
OH5NBJ	*	18,612	117	99
OH1EB	*	7,320	66	61
OH3BU	**28**	**18,025**	**142**	**103**

OH3WW	**21**	**550,924**	**767**	**418**
OH6NIO	**14**	**1,613,685**	**1408**	**601**
OH3NE	**3.5**	**313,600**	**510**	**280**
OH4MFA	**1.8**	**54,000**	**201**	**135**
OH5VT	*	33,390	143	105
***OH4YR**	**A**	**876,960**	**1067**	**420**
***OH8BQT**	**A**	**801,801**	**996**	**429**
*OH2BF/1	*	529,408	724	376
*OH6FW	*	80,668	256	172
*OH6RC	*	24,735	106	97
*OH5PA	28	35	5	5
***OH6MRA**	**21**	**176,612**	**409**	**268**
*OH1UP	*	4,032	50	48
***OH3MIG**	**14**	**196,840**	**447**	**280**
*OH3NM	*	76,179	223	201
***OH2BSQ**	**7**	**114,000**	**254**	**190**

CZECH REPUBLIC

OK2ZU	**A**	**1,443,705**	**1236**	**545**
OK7DX	**A**	**1,202,981**	**1225**	**481**
OK1FDY	**A**	**1,105,338**	**1069**	**481**
OK2BU	*	1,015,105	1011	455
OL4M	*	887,358	1034	426
OK2EQ	*	421,824	608	338
OK1IE	**7**	**159,644**	**264**	**214**
***OK1DSZ**	**A**	**1,078,704**	**1040**	**454**
***OK1JOC**	**A**	**1,063,268**	**1050**	**454**
***OK1HX**	**A**	**909,932**	**925**	**436**
*OK2EC	*	889,100	925	425
*OK1DOL	*	687,375	815	375
*OK1FKV	*	533,888	777	344
*OK1ZP	*	518,848	690	352
*OK2HI	*	505,008	659	334
*OK2BND	*	385,155	620	317
*OK2PHC	*	368,088	547	313
*OK1AYY	*	276,332	506	278
*OK2TBC	*	242,764	450	274
*OK1KUW	*	168,630	328	231
*OK2PBG	*	159,213	305	219
*OK2HIJ	*	146,848	300	208
*OK2SWD	*	135,160	333	218
*OK2PAD	*	134,470	307	226
*OK1KZ	*	101,370	242	186
*OK2VWB	*	98,091	250	189
*OK1JEF	*	86,021	238	169
*OK2BCZ	*	72,975	254	175
*OK2BNC	*	33,330	142	110
*OK2BHE	*	5,032	46	37
***OK1XW**	**28**	**18,333**	**122**	**87**
***OK1XC**	**28**	**18,050**	**111**	**95**
***OL2S**	**21**	**184,009**	**350**	**271**
		(Op: OK2SAT)		
***OK1AES**	**21**	**128,150**	**280**	**233**
*OK2PTZ	*	54,194	188	158
*OK2QX	*	49,300	170	145
***OK2XTE**	**7**	**601,146**	**654**	**367**
*OK1FOU/P	*	33,136	120	109
*OK2BOB	*	22,304	126	82
***OK1SI**	**3.5**	**231,072**	**436**	**249**

SLOVAKIA

OM5AW	**A**	**2,122,932**	**1673**	**597**
OM3OM	**A**	**1,391,500**	**1239**	**500**
OM3IAG	*	591,500	748	364
OM8FF	*	566,840	764	370
OM1ADM	*	215,880	346	257
OM7M	**21**	**56,744**	**218**	**164**
		(Op: OM5RW)		
OM6TY	**7**	**450,262**	**551**	**323**
***OM4DN**	**A**	**548,912**	**788**	**364**
***OM4WW**	**A**	**439,360**	**607**	**320**
*OM3GB	*	358,730	517	290
*OM3CDZ	*	253,178	539	277
*OM1AF	*	133,522	343	202
*OM7YC	*	101,332	275	188
*OM7AT	*	23,861	135	107
***OM3KTR**	**14**	**149,094**	**353**	**251**
*OM2AW	*	36,835	169	139
*OM2TB	*	25,441	123	103
*OM3TU	*	21,840	153	105
***OM3CDN**	**7**	**101,682**	**245**	**189**
***OM1AW**	**3.5**	**71,260**	**180**	**132**

BELGIUM

OT8T	**A**	**6,187,308**	**2795**	**796**
		(Op: DL2CC)		
ON4XG	A	414,612	618	349
OT8L	**28**	**11,840**	**100**	**80**
ON/PA3EBT	*	8,468	88	73
ON4LIR	**21**	**910,224**	**918**	**504**
ON5LL	**3.5**	**27,740**	**123**	**98**
***ON6TJ**	**A**	**387,300**	**552**	**300**
***ON4CAS**	**A**	**377,520**	**601**	**330**
*ON4KRO	*	146,102	335	229
*ON7SS	*	56,274	213	166

DENMARK

OZ8SW	**A**	**125,620**	**337**	**220**
OZ9Y	**14**	**208,080**	**408**	**240**
***OZ1HQG**	**A**	**106,050**	**300**	**202**
*OZ5UR	*	85,500	250	180
***OZ1APA**	**7**	**3,552**	**37**	**37**

THE NETHERLANDS

PA3FDO	**A**	**282,300**	**500**	**300**
PAØMIR	**3.5**	**50,320**	**168**	**136**
***PAØJR**	**A**	**340,065**	**466**	**297**
***PAØCOE**	**A**	**227,610**	**459**	**270**
*PAØUV	*	51,405	205	149
*PA6F	*	35,816	173	148
*PA3BUD	*	4,300	50	50
*PA3GFH	*	1,887	37	37
***PAØJED**	**28**	**4,171**	**50**	**43**
***PA3AAV**	**7**	**613,888**	**611**	**352**

SLOVENIA

S56MM	**A**	**4,660,040**	**2210**	**748**
		(Op: S5ØA)		
S58A	**A**	**3,976,450**	**2133**	**670**
S53R	**A**	**3,130,818**	**1856**	**633**
S52FB	*	1,681,160	1380	530
S58MC	*	1,252,977	1016	473
S55A	*	247,698	468	278
S53O	**28**	**203,136**	**516**	**276**
S52OT	*	67,462	260	178
S57O	**21**	**1,254,075**	**1116**	**575**
		(Op: S59A)		
S5ØC	**1.8**	**152,000**	**356**	**200**
		(Op: S53MM)		
S57M	**1.8**	**135,660**	**346**	**190**
S5ØR	**7**	**1,394,492**	**972**	**451**
***S57DX**	**A**	**2,112,078**	**1552**	**582**
***S59AA**	**A**	**1,993,522**	**1397**	**578**
***S57J**	**A**	**1,861,738**	**1450**	**578**
*S51F	*	1,640,448	1347	534
*S57AL	*	839,160	888	420
*S54X	*	820,344	915	399
***S51Z**	**28**	**63,640**	**253**	**172**
***S58J**	**28**	**45,900**	**198**	**150**
*S51W	*	26,814	152	109
***S58AL**	**14**	**1,448,568**	**1271**	**558**
***S54A**	**7**	**1,045,068**	**874**	**438**
*S53F	*	429,444	555	302
*S58AM	*	357,000	486	300

SWEDEN

SM2DMU	**A**	**2,190,750**	**1899**	**575**
SK6HD	**A**	**336,336**	**532**	**308**
		(Op: SM6FKF)		
SK6TY	*	281,430	486	295
SM7EH	*	139,974	303	246
SM3AF	*	58,200	225	150
SM4VMS	*	23,154	135	102
SMØKV	**21**	**11,088**	**84**	**72**
***SM4SX**	**A**	**304,290**	**508**	**322**
***SMØBDS**	**A**	**207,200**	**401**	**259**
*SM3CVM	*	131,793	325	223
*SM7ATL	*	30,520	149	109
*SM5RE	*	18,528	127	96
*SM7CIL	*	9,352	63	56
***SM6BSK**	**21**	**51,408**	**180**	**153**
***SMØBVQ**	**14**	**33,345**	**160**	**135**
*SM3DXC	*	28,698	144	142
*SK2IV	*	27,690	160	130
		(Op: SM2CDF)		

POLAND

SP4Z	**A**	**2,727,039**	**1720**	**651**
		(Op: SP4EEZ)		
SP3SLA	**A**	**1,602,480**	**1381**	**528**
SP8FHK	"	800,028	843	426
SP1MHV	"	35,310	121	107
SP9LAS	"	1,045	21	19
SP5DIR	**28**	**44,700**	**209**	**149**
SP9W	**21**	**308,100**	**554**	**325**
SP7ELQ	*	80,971	230	187
SP2FAX	**14**	**2,789,352**	**1894**	**684**
SP9EMV	*	23,432	122	116
SP3CW	**3.5**	**305,046**	**501**	**269**
SN3A	**1.8**	**186,588**	**381**	**219**
***SP9XCN**	**A**	**1,574,620**	**1308**	**524**
***SQ1EIK**	**A**	**689,436**	**703**	**396**
***SP6CPF**	**A**	**622,863**	**761**	**391**
*SP1AEN	*	608,908	726	382
*SP6LV	*	185,952	373	312
*SP3MGP	*	177,660	348	252
*SP6FZA	*	163,954	371	239
*SP3XR	*	159,468	305	274
*SP6BEN	*	101,920	560	182
*SP6CDP	*	37,211	154	127
*SP2QVS	*	24,320	120	95
*SQ9DXN	*	20,661	101	97
*SP8FHJ	*	20,175	139	75
*SP6EII	*	15,060	139	60
*SP3BGL	*	7,611	65	59
***SP3AOT**	**28**	**480**	**20**	**20**
***SP3AAI**	**21**	**7,788**	**114**	**44**
*SP2IHG	*	448	26	14
***SP8BAB**	**14**	**194,600**	**328**	**280**
***SP5CGN**	**14**	**101,810**	**282**	**224**
*SP6CXH	*	72,512	235	176
*SP3ASN	*	68,730	220	174
*SP6ESD	*	51,678	196	162
*SP3MY	*	49,407	201	129
***SP5CNA**	**7**	**317,520**	**447**	**280**
*SP5MBA	*	86,184	210	171
*SP2SCH/P	*	180	10	10
***SP5GH**	**1.8**	**18,249**	**78**	**77**

GREECE

SV2BBJ	**21**	**14,720**	**85**	**80**
***SV1DKL**	**A**	**851,760**	**1032**	**455**
***SV1DNW**	**28**	**6,440**	**59**	**56**
***SV1DZB**	**21**	**1,830**	**30**	**30**
***SV2BFL**	**14**	**208,494**	**431**	**286**

DODECANESE

J45KLN	**A**	**787,674**	**1309**	**426**

CRETE

***J49IL**	**3.5**	**240,960**	**446**	**240**
		(Op: DJ5IL)		

BOSNIA

TK5NN	**28**	**249,387**	**556**	**291**
T91DNO	**3.5**	**386,104**	**590**	**289**
***T99T**	**28**	**38,192**	**186**	**124**
***T95A**	**7**	**583,820**	**671**	**311**
*T94YM	*	114,070	250	187

EUROPEAN RUSSIA

RN6BY	**A**	**4,574,112**	**2734**	**848**
RZ3AZ	**A**	**2,589,600**	**2062**	**664**
RX3DCX	**A**	**2,571,373**	**1748**	**679**
RZ3FA	*	1,737,347	1600	577
UA4HTT	*	1,289,860	1354	484
UA1OMS	*	1,159,131	1230	471
UX3ZW	*	660,944	821	404
RZ3AV	*	546,816	800	384
RX3QFM	*	336,908	532	286
RW4LE	*	145,410	283	185
RK3AD	*	35,420	144	110
UA3XBB	*	18,612	111	94
RV6ASY	*	1,440	24	24
RU4PL	**21**	**677,700**	**844**	**450**
RA6LW	**21**	**266,684**	**569**	**319**
RV6YB	*	49,364	211	164
UA4WA	**14**	**1,330,142**	**1325**	**587**
UA3DJY	**14**	**316,592**	**546**	**376**
UA1OSS	*	100,092	279	228
RA1OJ	*	3,300	38	33
UA1OZ	**3.5**	**265,740**	**454**	**258**
UA3TJW	**3.5**	**260,580**	**454**	**258**
UA4CJJ	*	228,092	451	254
***UA3ABJ**	**A**	**1,345,680**	**1327**	**504**
***RV6BW**	**A**	**817,492**	**1043**	**398**
***RW1AI**	**A**	**746,720**	**862**	**416**
*RK3BY	*	620,542	804	377
*UA4PA	*	563,155	702	415
*UA4WAN	*	537,782	916	359
*RX6AY	*	447,794	672	362
*RA3UAG	*	404,950	662	325
*RU3AQY	*	286,638	610	303
*RV1CC	*	226,305	387	235
*RW4YA	*	113,511	307	241
*UA1OMX	*	53,298	200	162
*UA6AGK	*	24,924	102	93
***UA6BS**	**28**	**23,643**	**137**	**111**
***UA4LM**	**21**	**503,070**	**711**	**409**
***RZ6HX**	**21**	**389,844**	**694**	**357**
*RU4WE	*	355,995	599	293
***RO3A**	**14**	**1,671,268**	**1567**	**604**
		(Op: RV3ACA)		
***RZ1AWD**	**14**	**508,260**	**781**	**430**
*RU4HP	*	494,092	730	404
*RV3VF	*	334,884	600	354
*RU3HD	*	240,000	535	300
*RA1ZZ	*	222,054	547	311
*RU4HH	*	209,952	418	324
*RA3UC	*	149,436	332	252
*RA1ACJ	*	126,000	341	252
*UA1ANA	*	120,454	300	229
*UA6ATG	*	53,631	216	177
***RW3WV**	**7**	**345,000**	**459**	**300**
*RA4AV	*	6,466	55	53
***RV3LO**	**3.5**	**272,938**	**520**	**239**
*RA3XA	*	54,520	192	145
*UA6AKD	*	73,944	233	158
***RA4NW**	**1.8**	**39,000**	**130**	**103**

KALININGRAD

***UA2FT**	**7**	**44,408**	**151**	**122**

UKRAINE

EM4U	**A**	**3,398,720**	**2460**	**688**
		(Op: UT4UZ)		
EO3U	**A**	**2,274,625**	**2023**	**587**
		(Op: UT3UZ)		
UX1UA	**A**	**1,836,104**	**1602**	**566**
UTØU	*	1,525,104	1424	534
UY1HY	*	1,524,967	1408	521
UR5U	*	1,121,428	1166	484
		(Op: UR5UW)		
UU2JZ	*	915,728	950	473
UT2UB	*	674,781	888	393
UR5EDX	*	443,190	750	330
UT4EK	*	304,732	544	284
UY5ZZ	*	219,480	450	248
UY3QW	*	113,000	315	200
UT5DL	*	38,402	132	91
UR4EYT	*	6,572	82	62
UT8IM	**28**	**167,739**	**464**	**253**
UT5UGR	**28**	**134,925**	**417**	**257**
UT1IA	**21**	**703,404**	**921**	**468**
UT5HP	**21**	**355,623**	**604**	**367**
US9PA	*	3,444	44	42
UT7I	**14**	**1,784,930**	**1664**	**602**
		(Op: UT2IO)		
US1E	**14**	**1,687,064**	**1549**	**623**
		(Op: UT7EZ)		
UY5QQ	**14**	**1,548,120**	**1397**	**582**
US6UN	*	1,296,350	1400	550
UT7L	*	1,032,112	1128	514
		(Op: UR4LSB)		
UX5VK	*	78,540	260	204
UX6F	**7**	**782,952**	**802**	**404**
		(Op: UX3FW)		
US9QA	*	211,928	363	236
EN1I	**3.5**	**351,568**	**568**	**292**
		(Op: US1ITU)		
UYØZG	**3.5**	**311,850**	**521**	**275**
US2IZ	*	240,350	437	253
UX1VT	*	103,040	288	161
UR4E	**1.8**	**58,984**	**208**	**146**
		(Op: UR5ECW)		
***UT5UN**	**A**	**1,011,148**	**1110**	**449**
***US3IZ**	**A**	**774,900**	**993**	**410**
***UX8IX**	**A**	**682,641**	**1010**	**393**
*UY5VA	*	567,324	557	412
*UR7QM	*	468,756	780	348
*UY5TE	*	415,736	692	314
*UX5EF	*	377,916	606	308
*UT5HA	*	330,086	550	302
*UX7QQ	*	319,176	406	279
*UR3IOB	*	275,000	527	275
*UT8IT	*	253,376	424	296
*UU4JXM	*	207,279	470	243
		(Op: UU4JMF)		
*UT5UJY	*	112,998	357	222
*UT4XU	*	95,128	281	184
*UT5UGQ	*	88,320	235	192
*UT5PX	*	39,300	154	131
*UR5EIT	*	11,952	88	83
*UR5ZRK	*	11,288	80	68
***UR6EA**	**21**	**190,371**	**418**	**267**
*UXØHA	*	23,128	180	118
***UY8W**	**14**	**297,297**	**507**	**351**
***UT2UZ**	**14**	**252,850**	**477**	**325**
*UR5EPV	*	241,800	474	312
*UT7EG	*	202,086	460	309
*UR5SBM	*	53,618	223	166
***UR3PDT**	**7**	**544,992**	**660**	**336**
***UY8IF**	**7**	**517,132**	**599**	**322**
*UX3M	*	407,696	517	307
		(Op: UR3MP)		
*UT8AS	*	245,532	413	259
***UY5WA**	**3.5**	**95,524**	**255**	**167**
*UT3WWJ	*	71,760	255	156
		(Op: UY5MW)		
*UR5MTA	*	62,930	181	145
*US5ELM	*	62,930	180	145

LATVIA

YL3DW	**A**	**2,663,892**	**1919**	**651**
YL2KO	**A**	**1,744,408**	**1442**	**584**
YL2MR	**A**	**1,410,981**	**1365**	**507**
YL2IP	*	119,544	275	204
YL2GN	**7**	**746,136**	**758**	**387**
YL2UZ	**14**	**315,700**	**513**	**350**
***YL2KA**	**A**	**579,860**	**805**	**367**
*YL2KF	*	47,872	189	136
***YL3FW**	**14**	**226,708**	**510**	**314**
*YL2PP	*	15,664	88	88

ROMANIA

YR2R	**21**	**350,889**	**635**	**343**
		(Op: YO2DFA)		
YR9P	**14**	**444,106**	**719**	**377**
		(Op: YO9HP)		
YOØHD	*	129,786	302	223
YO5BRZ	**7**	**201,238**	**339**	**239**
***YO6BHN**	**A**	**430,572**	**532**	**318**
***YO8FR**	**A**	**237,864**	**422**	**264**
*YO5DAS	*	191,678	410	239
*YO9FJW	*	177,288	408	356
*YO2CJX	*	173,020	379	211
*YO3RK	*	36,530	142	130
***YO2AQB**	**28**	**2,414**	**35**	**34**
***YO4GDP**	**21**	**62,650**	**266**	**175**
***YO3CTK**	**14**	**222,000**	**413**	**296**
*YO4ATW	*	128,856	300	236
*YO4BBH	*	74,074	240	173

YUGOSLAVIA

4N9BW	**A**	**4,108,721**	**2242**	**751**
YU1OL	**A**	**2,282,457**	**1602**	**593**
YU7SF	*	435,870	632	334
YU7BDI	*	36,168	149	132
YT1R	**28**	**254,264**	**567**	**296**
YZ9W	**21**	**1,366,964**	**1231**	**563**
		(Op: YZ1AU)		
4N1N	*	304,920	523	330
		(Op: 4N1LB)		
YZ9A	**14**	**2,879,807**	**1929**	**713**
		(Op: YU1NW)		
YT7A	**14**	**2,049,767**	**1549**	**653**
YU7NU	**7**	**1,789,854**	**1133**	**517**
YU7CF	*	381,312	552	288
***YU7AL**	**A**	**998,049**	**1050**	**471**
***YT7TY**	**A**	**942,480**	**1014**	**440**
*YU1HA	*	722,844	819	414
*YU7AM	*	694,710	848	415
*YU1BO	*	473,020	578	335
*YU7YZ	*	111,724	274	212
***YU7KM**	**28**	**21,755**	**121**	**95**
***YU1RE**	**14**	**215,136**	**403**	**288**
***YZ1V**	**7**	**631,176**	**649**	**364**
		(Op: YU1AAV)		

MACEDONIA

Z37FCA	**14**	**576**	**16**	**16**

MARITIME MOBILE

***SP1LJP/MM**	**14**	**591,763**	**837**	**431**

OCEANIA

THE PHILIPPINES

DU1ODX	**21**	**33,212**	**128**	**92**
***DU1/DL5ZAH**	**A**	**845,875**	**769**	**335**

NEW CALEDONIA

***FK8VHN**	**A**	**213,195**	**320**	**183**

MICRONESIA

T88X	**7**	**1,570,284**	**841**	**318**
		(Op: JA6VZB)		

SAIPAN

WHØAAV	**A**	**380,742**	**479**	**186**

GUAM

KH2D	**14**	**1,650,340**	**1111**	**505**
***N2NL/WH2**	**A**	**518,365**	**615**	**215**

AUSTRALIA

VK5GN	**A**	**1,703,312**	**1045**	**431**
VK4XY	**3.5**	**43,428**	**108**	**77**
***VK2AYD**	**A**	**1,231,259**	**870**	**391**
***VK4ICU**	**A**	**116,058**	**201**	**174**
*VI4IV	*	60,434	152	134
***VK4BCW**	**21**	**148,070**	**303**	**170**
***VK2APK**	**14**	**1,927,042**	**1201**	**541**
*VK4TT	14	850	18	17

INDONESIA

YCØLOW	**1.8**	**96**	**4**	**4**
***YBØECT**	**21**	**1,245,308**	**973**	**433**
***YB3ZBZ**	**21**	**835,989**	**786**	**363**

NEW ZEALAND

ZM1A	**7**	**5,144,480**	**1480**	**592**
		(Op: F2CW)		

SOUTH AMERICA

CHILE

***CE8GLQ**	**21**	**189,604**	**304**	**214**
***XQ3N**	**14**	**129,747**	**245**	**183**
		(Op: XQ3IDY)		

BOLIVIA

***CP6AA**	**21**	**2,637,560**	**1581**	**566**

URUGUAY

CX5X	**28**	**372,325**	**480**	**265**
		(Op: CX6VM)		
***CX9AU**	**A**	**1,185,009**	**653**	**511**

ECUADOR

HC1OT	**A**	**11,566,273**	**3528**	**809**
		(Op: N5KO)		

ARGENTINA

LT1F	**A**	**10,407,848**	**3543**	**808**
		(Op: LU5CW)		
LU8DW	**28**	**985,920**	**872**	**390**
LU3VED	**14**	**148,005**	**265**	**195**
***L36E**	**A**	**1,737,996**	**1114**	**507**
		(Op: LU7EE)		
***LU1EWL**	**A**	**958,732**	**781**	**391**
*LU3DSI	*	8,250	57	55
***LU2DW**	**28**	**229,724**	**358**	**227**
***LU5HT**	**21**	**168,800**	**283**	**211**
*LU3D	*	27,734	109	98
		(Op: LW3HAQ)		
***L5ØI**	**14**	**1,840,893**	**1209**	**519**
		(Op: LU1ICX)		
***LU1FNH**	**7**	**66,000**	**120**	**100**

ARUBA

P49V	**A**	**7,891,364**	**3025**	**754**
		(Op: AI6V)		

BRAZIL

PY1ARS/4	**A**	**194,194**	**281**	**194**
PY2OZF	*	7,854	56	51
PR5W	**28**	**1,421,775**	**1088**	**445**
PY2SP	**14**	**180,225**	**278**	**225**
PY1BLL	*	8,352	80	58
***PY1KS**	**A**	**548,366**	**577**	**322**
***ZV8O**	**A**	**424,320**	**525**	**272**
		(Op: PV8ONU)		
*ZW7C	*	240,870	321	222
		(Op: PP7CI)		
*ZW3J	*	165,787	228	193
		(Op: PY3JRG)		
*ZW2Z	*	129,600	250	180
*ZV7C	*	117,568	243	167
		(Op: PP7CW)		
***PU2RUX**	**28**	**660,652**	**676**	**334**
***PU1KDR**	**28**	**472,230**	**541**	**297**
*PY2IQ	*	14,688	76	68
*PY2KTT	*	1,950	26	26
*PY2TI	*	675	15	15
***PU2WIF**	**21**	**790,229**	**741**	**361**
***PR2W**	**14**	**59,280**	**170**	**130**
		(Op: PT2AW)		
*PY7OJ	*	32,860	106	106
***PY1SL**	**3.5**	**1,368**	**20**	**18**

VENEZUELA

YV7QP	**28**	**34,176**	**126**	**96**
***YY4GLD**	**21**	**500,536**	**581**	**296**

TRIBANDER/ SINGLE ELEMENT

UNITED STATES

WV2LI	**A**	**1,839,336**	**1381**	**519**
		(Op: N2GA)		
W9IW	**A**	**1,729,954**	**1259**	**578**
		(Op: ES2RR)		
K7VS	**A**	**1,212,640**	**1150**	**530**
W1CU	**A**	**1,207,041**	**836**	**463**
NU4Y	**A**	**1,206,252**	**1159**	**486**
NY4A	*	982,422	803	414
		(Op: K2AV)		
KMØL	**A**	**941,752**	**1021**	**502**
K4BAI	*	793,592	778	437
ND5S	**A**	**558,480**	**513**	**358**
KW2J	*	387,504	485	312
N3II	**A**	**320,952**	**375**	**258**
W7QN	**"**	**283,140**	**458**	**330**
KGØUA	*	274,175	370	275
NA2Q	*	230,640	334	248
W6TK	**A**	**227,040**	**343**	**264**
W1WFZ	*	144,450	267	214
WT9U	*	120,132	300	213
KN6Z	*	105,500	258	211
W6RFF	*	48,087	158	137
WR1P	*	40,020	136	116
KF4ARS	*	28,420	118	98
K1MY	*	13,248	71	64
K8NO	**14**	**128,454**	**266**	**237**
		(Op: K8KFJ)		

DX

3V8BB	**A**	**11,914,111**	**3762**	**803**
		(Op: YT1AD)		
C4W	**A**	**7,353,213**	**3220**	**719**
		(Op: 5B4WN)		
3DA5A	**A**	**6,102,345**	**2719**	**645**
		(Op: JM1CAX)		
RN6BY	**A**	**4,574,112**	**2734**	**848**
4N9BW	**A**	**4,108,721**	**2242**	**751**
		(Op: YU7BW)		
EM4U	**A**	**3,398,720**	**2460**	**688**
		(Op: UT4UZ)		
S53R	**A**	**3,130,818**	**1856**	**633**
7Z5OO	**A**	**2,949,174**	**1950**	**531**
		(Op: K3UOC)		
HA2SX	**A**	**2,790,511**	**1888**	**647**
YL3DW	**A**	**2,663,892**	**1919**	**651**
LY5W	**A**	**2,270,898**	**1730**	**603**
		(Op: LY1DR)		
LY2OX	*	2,198,010	1651	615
DK9IP	**A**	**2,132,284**	**1542**	**602**
JA1YNE	**A**	**2,056,864**	**1413**	**544**
		(Op: JP1OGL)		
UX1UA	*	1,836,104	1602	566
S52FB	*	1,681,160	1380	530
EU1FC	**A**	**1,525,341**	**1502**	**519**
UY1HY	*	1,524,967	1408	521
EA7KN	**A**	**1,510,932**	**1521**	**498**
OH2OT	**A**	**959,907**	**788**	**489**
DL8UAT/P	*	924,455	934	433
OH6NJ	*	919,664	1135	458
GW8K	**A**	**863,615**	**1108**	**415**
		(Op: GW4BVJ)		
F6HWU	**A**	**862,596**	**922**	**441**
IØZUT	**A**	**855,333**	**835**	**401**
J45KLN	**A**	**787,674**	**1309**	**426**
		(Op: SMØCMH)		
JH2NWP	*	465,045	532	301
S55A	*	247,698	468	278
OH9MM	*	126,063	356	203
UA9OS	**A**	**17,286**	**69**	**67**
G8G	**7**	**1,334,700**	**1110**	**450**
		(Op: GØNUP)		

LOW POWER

UNITED STATES

WD4AHZ	**A**	**1,001,160**	**981**	**486**
NW6S	*	842,370	752	430
N8AA	**A**	**800,800**	**707**	**416**
W4YE	*	696,340	661	370
N2ED	**A**	**601,500**	**612**	**375**
K2QMF	*	471,734	461	298
WN6K	**A**	**403,588**	**706**	**326**
N1WR	**A**	**245,338**	**349**	**241**
N6NF	*	172,315	333	241
K6UM	*	139,932	275	207
K4QPL	*	136,955	267	215
W3SE	**A**	**122,484**	**255**	**177**
W4TYU	*	80,256	214	176
WB4DNL	*	37,524	134	118
K8MR	**"**	**0**	**73**	**60**
NN9K	**21**	**22,444**	**157**	**124**

DX

***5B4/T97M**	**A**	**4,339,200**	**2300**	**600**
***7M1MCT**	**A**	**2,050,722**	**1398**	**531**
***S51F**	**A**	**1,640,448**	**1347**	**534**
***9A9R**	**A**	**1,317,353**	**1155**	**491**
***RAØFF**	**A**	**1,230,445**	**1049**	**485**
***C6AHR**	**A**	**1,192,638**	**998**	**394**
***YU7AL**	**A**	**998,049**	**1050**	**471**
***IKØYVV**	**A**	**884,709**	**920**	**453**
*S57AL	*	839,160	888	420
***EA3ALV**	**A**	**822,296**	**945**	**436**
***UA4PA**	**A**	**563,155**	**702**	**415**
*JA6WFM	*	502,044	599	321
*EA2BNU	*	487,900	717	350
***ON6TJ**	**A**	**387,300**	**552**	**300**
*ON4CAS	*	377,520	601	330
***VE3STT**	**A**	**242,498**	**342**	**226**
***TM6ACO**	**A**	**231,574**	**460**	**278**
*F6HHR	*	213,570	466	270
***FK8VHN**	**A**	**213,195**	**320**	**183**
*JK1ATT	*	211,030	371	235
*JF3BTR	*	198,688	313	224
*JA2OJ	*	191,770	282	254
***SM3CVM**	**A**	**131,793**	**325**	**223**
*FB1PDR	*	85,120	336	140
*DL2YAK	A	68,780	242	181
***IT9ORA**	**A**	**60,214**	**206**	**161**
*JH1DYV	*	47,847	143	123
***PA6F**	**A**	**35,816**	**173**	**148**
***LZ4BU**	**A**	**29,786**	**132**	**106**
*JA4AQR	*	24,570	100	91
*JA1YEW	*	8,778	85	66
*PA3GFH	*	1,887	37	37
***PY2IQ**	**28**	**14,688**	**76**	**68**
***RA1ACJ**	**14**	**126,000**	**341**	**252**

BAND RESTRICTED

***FB1CMF**	**A**	**282,133**	**505**	**307**
***EC5AEB**	**A**	**203,046**	**470**	**258**
***JR5EHB**	**A**	**96,425**	**245**	**175**

ROOKIE

UNITED STATES

***AA1SU**	**A**	**158,589**	**460**	**263**
*AB1BX	A	120,716	255	206
KØXQ	**A**	**69,524**	**205**	**182**
***KF6GUH**	**A**	**34,125**	**155**	**125**

DX

***PY1KS**	**A**	**548,366**	**577**	**322**
***IIØN**	**A**	**107,996**	**302**	**203**
		(Op: IZØAEH)		
***UT5UGO**	**A**	**88,320**	**235**	**192**
*IZØANC	A	41,134	166	131
***PU1KDR**	**28**	**472,230**	**541**	**297**
***PU2WIF**	**21**	**790,229**	**741**	**361**
***RZ1AWD**	**14**	**508,260**	**781**	**430**
***EA2BDS**	**14**	**157,360**	**396**	**280**

ASSISTED

UNITED STATES

K3MM	**A**	**4,196,887**	**1975**	**701**
W8AV	**A**	**1,930,120**	**1191**	**584**
AB2E	**A**	**1,740,291**	**1138**	**553**
K1TO	**A**	**1,633,887**	**1221**	**531**
KT4W	*	1,125,222	909	438
N5JR	**A**	**644,184**	**613**	**414**
W1NG	A	509,754	585	371
KC1F	"	353,158	489	289
K4PB	"	209,716	312	218
K6JG	**A**	**152,024**	**267**	**248**
AD4PU	"	147,424	450	271
NZ1Q	*	121,589	236	199
K3WW	*	88,400	166	136
K6III	**21**	**81,450**	**252**	**181**
KC6ETY	**14**	**260,820**	**435**	**276**
***WD3A**	**A**	**42,880**	**150**	**134**
***NN5Z**	**14**	**17,200**	**111**	**100**

DX

GIØKOW	**A**	**5,413,376**	**2945**	**776**
		(Op: GIØNWG)		
DK3GI	**A**	**3,518,361**	**1951**	**693**
DL1IAO	*	3,318,798	2109	651
ED5FV	**A**	**3,039,456**	**2320**	**672**
IKØHBN	**A**	**1,808,282**	**1270**	**569**
JG3KIV	**A**	**1,770,516**	**1253**	**526**
DK7YY	*	1,471,008	1192	528
JA9CWJ	*	1,268,960	1025	440
FBC5NBX	**A**	**1,228,500**	**1273**	**500**
SP7NMW	**A**	**907,120**	**917**	**464**
OH5BM	**A**	**789,960**	**1012**	**454**
RX3ARI	**A**	**611,104**	**807**	**416**
IK4WMH	*	565,407	742	387
JK1GKG	*	552,500	660	340
JH4NMT	*	340,656	447	282
IK5TSS	*	315,445	500	299
OK1DXW	**A**	**251,104**	**436**	**266**
EU1EU	**A**	**28,672**	**128**	**112**
EA7DPU	**21**	**431,200**	**701**	**400**
JA9XBW	**21**	**111,888**	**237**	**189**
JQ1NGT	*	62,592	236	163
DL5YM	**14**	**259,780**	**516**	**310**
Z39Z	**7**	**1,192,324**	**968**	**439**
DL6RDE	**"**	**131,712**	**307**	**196**
YU1UA	**1.8**	**874**	**20**	**19**
***S56A**	**A**	**1,031,016**	**937**	**476**
*S57XX	*	621,233	736	389
*S57AW	*	594,048	700	364
*VE6JY	A	418	12	11
***4N1A**	**7**	**561,132**	**625**	**327**
*YU1AAX	*	360,844	436	278
***9A1CHP**	**7**	**56,170**	**193**	**137**
***YU1RA**	**1.8**	**56,170**	**194**	**137**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

KW2O	**3,383,680**	**1719**	**640**
KVØQ	**3,263,377**	**1937**	**673**
WU3V/5	**2,918,496**	**1811**	**688**

WO8CC	**2,616,128**	**1615**	**656**
KC7V	**2,554,398**	**1801**	**627**
KO7X	2,157,265	1525	643
N7TT	1,722,042	1280	553
AB5SE	954,666	1049	498
WG9L	**700,557**	**971**	**429**
WYØB	300,456	437	321
N7TX	259,408	342	248
KJØG	258,888	457	268
K4VUD	132,240	346	240
WO1N	**110,565**	**268**	**195**
W8VM	1,484	28	28

NORTH AMERICA

NP4Z	**12,343,763**	**3944**	**853**
V26TT	**9,283,920**	**3409**	**766**
6Y6A	**7,735,565**	**3227**	**761**
VE7ZZZ	**3,171,168**	**1543**	**624**
VP2VDX	**2,720,602**	**1698**	**514**

AFRICA

IH9/OK5DX	**11,205,534**	**3770**	**778**

ASIA

H2ØA	**13,729,156**	**4763**	**868**
JY8B	**8,388,198**	**3491**	**702**
RK9CWW	**6,004,944**	**2457**	**669**
JN4FEU	**5,020,562**	**2385**	**701**
RK9CWA	4,860,480	2200	610
RK9AWN	4,504,875	2086	615
JT1X	**3,666,016**	**2351**	**586**
BY1QH	**3,396,360**	**2174**	**620**
4K8ØADR	**3,267,519**	**1323**	**809**
RXØLWC	**1,513,446**	**1696**	**506**
JA2ZJW	1,149,440	1008	449
JA6ZLI	999,552	865	456
JE2YHS	669,504	623	352
JU1T	348,460	1074	262

EUROPE

HG1S	**8,346,044**	**3890**	**859**
UD6M	**6,630,816**	**3746**	**867**
RM6A	6,422,717	3886	841
9A7A	**6,358,744**	**3170**	**838**
TM9C	**6,076,427**	**3149**	**787**
OG5F	**5,779,997**	**3260**	**811**
OHØW	**5,647,740**	**3347**	**791**
OH1AF	5,167,164	3155	786
RU1A	5,125,032	3049	792
OM5M	**5,033,821**	**2634**	**767**
DL1AUZ	**5,013,072**	**2554**	**744**
LZ9A	**4,974,247**	**2881**	**757**
SK3GW	**4,820,256**	**2829**	**797**
DJ7AA	4,704,112	2290	776
DJ5CL	4,574,680	2422	740
Z3ØM	**4,539,766**	**2813**	**719**
SP6YAQ	**4,003,872**	**2174**	**699**
ES5Q	**3,947,148**	**2485**	**747**
EA5BY	**3,901,872**	**2610**	**676**
OL5Q	**3,754,416**	**2261**	**688**
OM3RKA	3,452,902	2055	674
RK3AWL	3,443,180	2415	697
OL5T	3,395,490	2173	690
PI4CC	**3,239,730**	**1992**	**702**
RN3R	3,024,216	2502	648
S53BM	2,951,187	2086	631
S57W	2,650,336	1816	598
HA3KNA	2,560,955	1924	635
HA/N9NC	2,535,840	1843	587
YP3A	**2,447,055**	**2053**	**585**
RK3AWE	2,408,490	1967	630
DH9EO	2,387,935	1762	605
DJ7TO	2,287,150	1664	614
S59UAR	2,251,440	1667	590
RZ1AWO	2,215,092	1778	582
J41W	**2,120,298**	**1794**	**579**
ED3MM	2,097,144	1733	584
ZB2/DL5JAN	**2,057,814**	**2547**	**547**
HA1KRR	2,017,615	1704	565
UR4PWC	1,750,320	1540	520
OH6WZ	1,624,051	1500	533
TM2S	1,594,781	1553	521
PI4ZLD	1,184,160	1278	480
DFØFS	1,112,938	1159	482
OK1KIR	1,054,920	1067	447
OK2KOD	1,037,897	1002	469
F6KAR	997,497	1055	483
SP9KRT	859,320	1007	420
EA5YU	829,730	929	397
TM2X	759,605	1009	385
YR8A	624,884	862	394
DA/S57NW	581,350	700	385
DL2HYH	509,292	696	387
OM7F	483,327	717	351
UY4WWA	436,752	781	337
IO2L	405,802	628	362
DLØKB	386,561	601	343
F6KRK	384,444	388	236
IYØTC	251,160	504	280
EW1WN	177,639	298	231
UR4MWU	162,960	434	240
OE1W	**109,746**	**267**	**201**
OK1KCF	20,706	100	87
OK5SAZ	720	20	20

OCEANIA

9M6AAT	**7,431,753**	**2915**	**681**
KH7R	**6,328,278**	**2499**	**682**

SOUTH AMERICA

ZX5J	**11,738,740**	**3792**	**845**
L5ØV	**3,913,088**	**1790**	**608**

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

WT2Q	**6,856,659**	**3025**	**829**
KO6N	**6,281,738**	**2892**	**799**
NJ4F	**5,571,475**	**2702**	**775**
W4MYA	4,559,348	2175	706
AJ4Y	3,265,152	1939	704
WR3L	**3,118,262**	**1789**	**677**
K2SX	558,684	606	378

NORTH AMERICA

WL7E	**9,579,008**	**3398**	**848**

ASIA

P3A	**30,666,240**	**8709**	**1,056**
JH5ZJS	**7,896,595**	**3248**	**835**
UØJE	**3,864,894**	**2526**	**682**
JA1YPA	2,084,352	1409	512

EUROPE

9A1A	**14,340,387**	**5678**	**1,019**
RW2F	**11,981,844**	**5398**	**972**
EA4ML	**11,524,560**	**5303**	**930**
LY5A	**10,408,477**	**5043**	**947**
LY7A	6,737,976	3894	812
PA6WPX	6,197,749	3421	809
OZ5WQ	**3,153,072**	**2232**	**652**
OK1OKE	**2,922,990**	**2098**	**651**
YU1HFG	**957,415**	**1049**	**457**

SOUTH AMERICA

AZ4F	**18,473,378**	**5395**	**973**
PY1GCW	2,619	33	27

CHECK LOGS

The following logs were used for cross checking. SWL and check logs are always appreciated: 3ZØAU, DJØSH, DJ8RS, DL1DWT, DL2HWI, DL2MIH, DL3ARX, DL3NEO, DL3VTL, DL4HOF, DL5AMF, DL5CD, DL7AQT, DL7VAF, DL7VOX, DL7VRG, EA4BSC, EA5AL, EW2EG, G4UOL, G8PW, HA8XX, K3SWZ, K7ZX/MM, LZ1YW, LZ4TX, OH2RL, OH3VX, OH6CK, OK1DMP, OK2PSA, ON5ØOSA, OZ6TL, PA3DUS, PA3EXI, PQ5L, PU2WMW, PY1BLL, PY3ARL, PY3CEM, PY3CJI, PY3FBI, PY3UEB, PY4MBJ, PY7OJ, RA3UC, RN3AM, RU9CZ, RV6A8, RW6AVP, RX3MX, RX9CAP, RZØSB, SMØBNK, SMØNJO, SM3CBR, SM5BUH, SM7BVO, SP2GUC, SP2KFQ/P, SP2QCH, SP2QCH, SP4HHI, SP5FLB, SP7BDS, SP7FGA, SP8JMA, SP9GFI, SP9MDY, SQ9CAQ, UAØZC, UAØZDA/6, UA1OMO, UA3WI, UA3XGY, UA3YJU, UA3YJU, UA4AO, UA6JY, UA9JMM, UA9XK, UT2XX, UT5JAJ, UU2JQ, VE3KLM, YL2UZ, YO3FF, YO5ALI, YO6MK, YO6UO, YO8AXP/P, YO9BGV, YU4SO, YV7QP, ZW2F.

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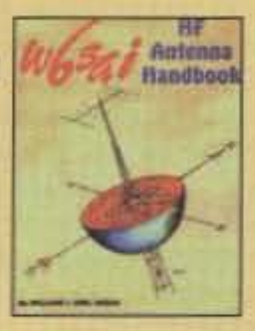

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PHASED ARRAY NETWORKS by COMTEK SYSTEMS deliver gain and front to back. Call 704-542-4808; fax 704-542-9652. COMTEK SYSTEMS, P.O. Box 470565, Charlotte, NC 28247.

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SX88 Hallicrafters receiver wanted. Jim, W6OU, 714-528-5652.

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.**

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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.

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>.

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ANTENNA HARDWARE – S.S. "U" bolts, Aluminum Saddles, Element and Boom Plates, S.S. Hose Clamps. Write for list to HARBACH ELECTRONICS – WA4DRU, 2318 S. Country Club Road, Melbourne, FL 32901-5809 (http://www.harbach.com).

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>.

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ATTENTION SB-200 & SB-220 OWNERS: Restore and up-grade your tired old amplifier with our parts and kits. Power supply boards, soft keys, soft starts, new fans & motors, many more items. Write for details—**Please specify the model**. Harbach Electronics—WA4DRU, 2318 S. Country Club Rd., Melbourne, FL 32901-5809 (http://www.harbach.com).

Advertiser's Index

(continued on page 107)

ARIZONA STATE CONVENTION AND HAMFEST: Largest FREE ADMISSION hamfest in the Southwest. July 23, 24, and 25, 1999. I-17 exit 337 (Ft. Tuthill), Flagstaff, AZ. Our 48th consecutive year. Manufacturers, Dealers, Exhibits, Seminars, VE Testing, Huge Swap, Camping, and more. Gordon West, WB6NOA, will present two of his famous seminars. Contact Amateur radio Council of Arizona, POB 42003-312, Phoenix, AZ 85080-2003; or e-mail: <arcathill@aol.com>; web site: <http://www.hamsrus.com>. Enjoy cool weather and the pines.

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DP-9 MULTIBAND DIPOLE ANTENNA has 9 full-size antennas for 160–10, 240 ft. $189, DP-9S, 130 ft. $210. DP-8 for 80–10, 124 ft. $139, DP-8S, 70 ft. $159. DP-7 for 40–10, 65 ft. $110, DP160-80, 245 ft. $85, DP160-80S, 130 ft. $105. Add $8 shipping. Other antennas in our Free Ham and Shareware Catalog. Dynamic Electronics, Box 896, Hartselle, AL 35650; 256-773-2758; fax 773-7295; <dei@whnt19.com>, <http://www.hsv.tis.net/~dei>.

THE 59(9) DX REPORT: Weekly DX and Contest bulletin. SASE for sample. P.O. Box 73, Spring Brook, NY 14140.

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. ARTIFAX BOOKS, Box 88, Maynard, MA 01754.

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TESLA. WIZARD by Marc Seifer. Citadel Press. Definitive biography. "UTTERLY ABSORBING," Nexus. **www.netsense.net/tesla**

RAINBOW AMATEUR RADIO Association, the gay/lesbian club. Active HF nets, newsletter, uncensored listserv, web page: <www.rara.org>. Privacy respected. E-mail: <rara@en.com> or Dept. A, P.O. Box 191, Chesterland, OH 44026-0191.

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Join the LAMBDA AMATEUR RADIO CLUB (LARC) since 1975, the only open and visible public-service oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, internet listserv and IRC, hamfest meetings, chapters, DXpeditions. Write LARC, P.O. Box 56069, Philadelphia, PA 19130-6069 or e-mail <lambda-arc@geocities.com>; <http://www.geocities.com/WestHollywood/1686>.

WEATHER SATELLITE and MIR/Shuttle 2M antennas. Woodhouse Communication, P.O. Box 73, Plainwell, MI 49080. Voice 616-226-8873; fax 616-226-9073; e-mail <www.view2earth.com>.

FREE Ham Gospel Tracts, SASE. KW3A, 265 West Ave., Springfield, PA 19064.

RF TRANSISTORS AND TUBES: MRF454, MRF455, MRF422, SD1446, 2SC2879, 2SC2312, 2SC2166, 2SC1969, 2SC2904, 2SB754, SAV17, TA7222AP. 3-500ZG, 3CX3000A7, 4CX250B, 572B, 6146W. WESTGATE 800-213-4563.

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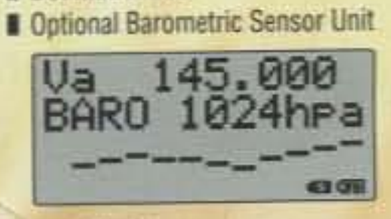

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IC-707

IC-746

IC-756

IC-775DSP

IC-781

• Optional equipment required. **This device has not been approved by the FCC. This device may not be offered for sale or lease, or be sold or leased, until approval of the FCC has been obtained. †Reception guaranteed on ham bands only. ††MIL STD 810 C/D/E for shock/vibration. ©1999 ICOM America, Inc. 2380 116th Ave NE, Bellevue, WA 98004 • 425-454-8155. The ICOM logo is a registered trademark of ICOM, Inc. All specifications are subject to change without notice or obligation. Questions? Contact your authorized ICOM dealer, or contact ICOM America Tech Support on CompuServe's® HamNet forum at 75540,525, or send e-mail to <75540.525@compuserve.com>. CompuServe is a registered trademark of CompuServe, Inc. DAYTON399Y

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Yaesu, Choice of the World's top DX'ers

FIELD COMMANDER

Over 40 years of experience in HF transceiver design has firmly established Yaesu as the choice of the world's top DX'ers. The knowledge that produced unequaled RF technology and design that is found in the State of the Art FT-1000MP can also be found in the miniature FT-100. The FT-I00 while small in size 6.3" × 2.1" × 8.1"(160 W × 54 H × 205 D mm :w/o knob) is large in features and performance. This is accomplished by using the most advanced manufacturing techniques and component mounting technology. High Dynamic range RF front-end technology and Advanced Digital technology such as DSP sets a new standard of receiver performance for miniature HF transceivers. The single piece die cast frame, dual cooling fan system and revolutionary RF high power design technique keeps the FT-I00 running cool and smooth in the most adverse operating environments. (TX Power output=100W HF, 50W VHF/20W UHF) The TX Equalizer offers crisp, clear and clean TX audio reproduction that until now was only found in top of the line HF base stations. The optional ATAS-I00 (active tuning antenna system) ushers in a new age of mobile and field day operation (from HF to UHF frequencies). Add the optional ATBK-I00 base kit (Good for limited space, simple setup.) and you've got a base station that ranks among the best in the world.

Features

- Frequency coverage:
  RX : 100 kHz-961 MHz (cellular blocked)
  TX : 160-6 m/144-148 MHz/430-450 MHz
- Power output : 100 W (160-6 m), 50 W (144 MHz), 20 W (430 MHz)
- DSP Bandpass Filter, Notch Filter, Noise Reduction, and Equalizer
- IF Noise Blanker
- SSB, CW, AM, FM, AFSK, Packet (1200/9600 bps) operation
- Detachable Front Panel
- Two Antenna Jacks (HF/50 and 144/430)
- IF Shift
- VOX
- Dual VFOs
- Available IF bandwidths of 6 kHz, 2.4 kHz, 500 Hz, and 300 Hz (6 kHz, 500 Hz, 300 Hz filters optional)
- Built-in Electronic Memory Keyer
- Speech Processor
- Built-in CTCSS and DCS for FM operation
- Automatic Repeater Shift and Auto-Range Transponder System
- Smart Search™ Automatic Memory Channel Loading System
- 300 memory Channels
- Quick Memory Bank (QMB)
- Bright LCD with multi-function display
- Optional FC-20 External Antenna Tuner
- Compatible with ATAS-100 Active-Tuning Antenna System. Add the optional ATBK-100 base kit

FIELD COMMANDER

FT-100

Ultra-Compact HF/VHF/UHF Transceiver

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For the latest news, hottest products:
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Specifications subject to change without notice. Specifications guaranteed only within Amateur bands.Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.