45241

Amateur Radio

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

COMMUNICATIONS & TECHNOLOGY

MAY 2007

CQ

On the Cover: Alexander Younts, KC9CYK, and Ben Cotton, KC9FYX, operate from W9YB, the Purdue Amateur Radio Club, in Lafayette, Indiana. Details on page 84.

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THE RADIO AMATEUR'S JOURNAL

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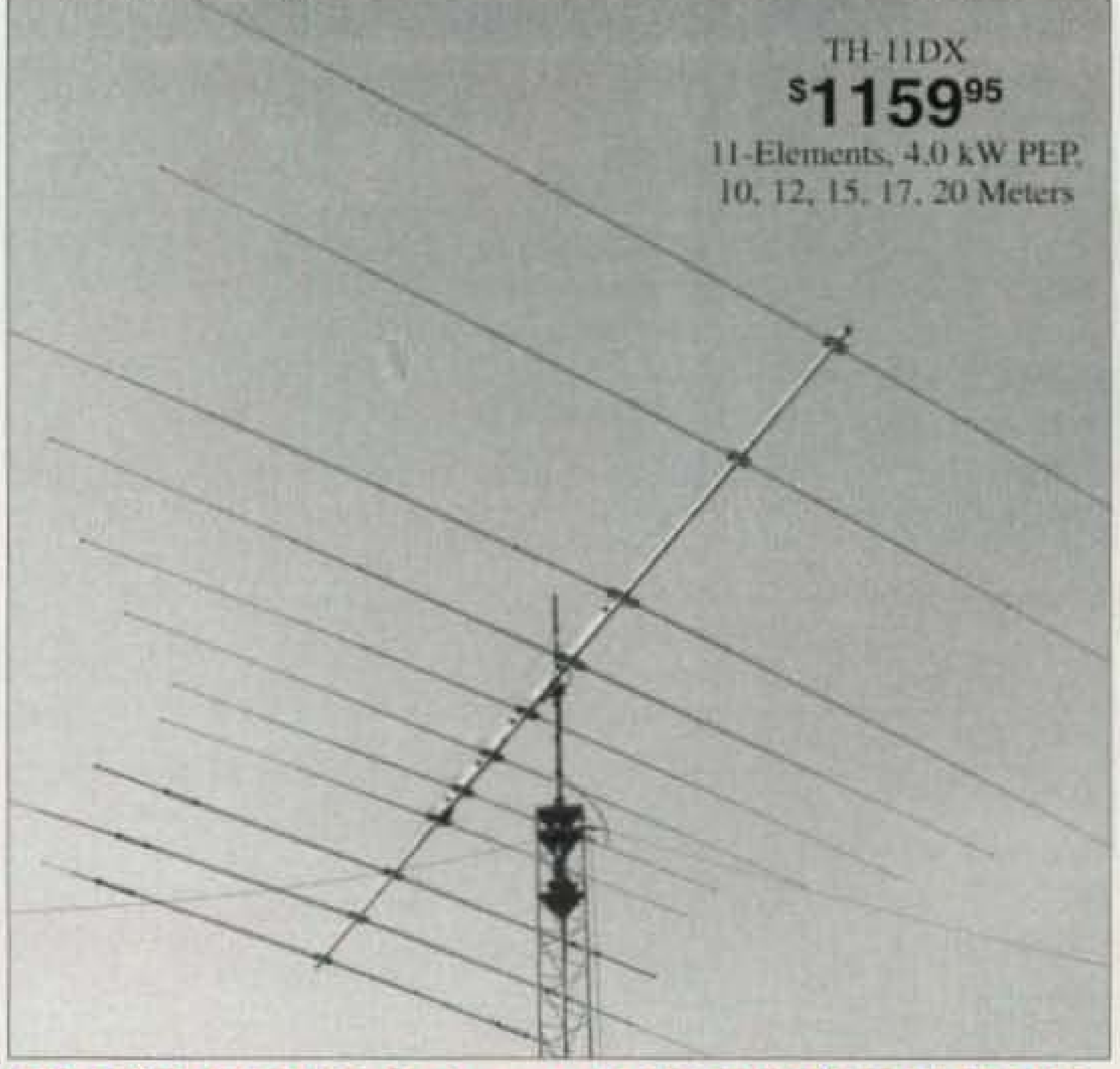
... are stronger, lighter, have less wind surface and last years longer.
Why? Hy-Gain uses durable tooled components -- massive boom-to-mast bracket, heavy gauge element-to-boom clamps, thick-wall swaged tubing -- virtually no failures!



TH-11DX, $1159.95. 11-element, 4.0 kW PEP, 10,12,15,17,20M

The choice of top DXers.

With 11-elements, excellent gain and 5-bands, the super rugged TH-11DX is *the "Big Daddy" of all HF beams!*

Handles 2000 Watts continuous, 4000 Watts PEP.

Every part is selected for durability and ruggedness for years of trouble-free service.

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Stainless steel hardware and clamps are used on all electrical connections.

TH-7DX, $869.95. 7-element, 1.5 kW PEP, 10,15,20 Meters

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Dual driven for broadband operation without compromising gain. SWR less than 2:1 on *all* bands.

Uniquely combining monoband and trapped parasitic elements give you an excellent F/B ratio.

Includes *Hy-Gain's* diecast aluminum, rugged boom-to-mast clamp, heavy gauge element-to-boom brackets, BN-86 balun. For high power, upgrade to BN-4000.

TH-5MK2, $759.95. 5-element, 1.5 kW PEP, 10,15,20 Meters

The broadband *five element* TH5-MK2 gives you outstanding gain.

Separate air dielectric *Hy-Q* traps let you adjust for maximum F/B ratio on each band.

Also standard is *Hy-Gain's* exclusive *BetaMATCH™*, stainless steel hardware and compression clamps and BN-86 balun.

TH-3MK4, $469.95. 3-element, 1.5 kW PEP, 10,15,20 Meters

The super popular TH-3MK4 gives you the *most gain for your money* in a full-power, full-size durable Hy-Gain tri-bander!

You get an impressive average gain and a whopping average front-to-back ratio. Handles a full 1500 Watts PEP. 95 MPH wind survival.

Fits on average size lot with room to spare -- turning radius is just 15.3 feet. Four piece boom is ideal for DXpeditions. Rotates with CD-45II or HAM-IV rotator.

Features *Hy-Gain BetaMatch™* for DC ground, full power *Hy-Q™* traps, rugged boom-to-mast bracket and mounts on standard 2"O.D. mast. Stainless steel hardware. BN-86 balun recommended.

TH-2MK3, $369.95. 2-element, 1.5 kW PEP, 10,15,20 Meters

The 2-element TH-2MK3 is Hy-Gain's *most economical* full power (1.5kW PEP) full size tri-bander.

For just $339.95 you can greatly increase your effective radiated power and hear far better!

Ruggedly constructed, top-performing, compact 6 foot boom, tight 14.3 foot turning radius. Installs almost anywhere. Rotate with CD-45II or HAM-IV. BN-86 balun recommened.

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Revolutionary 4-element compact tri-bander *lets you add 40 or 30 Meters!* Has 14 foot boom and tight 17.25 feet turning radius. Fits on roof tri-pod, mast or medium duty tower.

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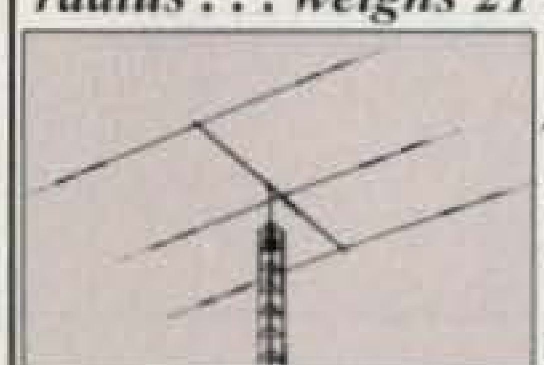
BetaMATCH™ provides DC ground to eliminate static. Includes BN-86 balun. Easily assembled.

***Truly** competitive against giant tri-banders at half the cost!*

QK-710, $179.95. 30/40 Meter option kit for EXP-14.

Compact 3-element 10, 15, 20 Meter Tri-Bander

For limited space . . . Installs anywhere . . . 14.75 ft turning radius . . . weighs 21 lbs . . . Rotate with CD-45II, HAM-IV



Fits on light tower, suitable guyed TV pole, roof tri-pod

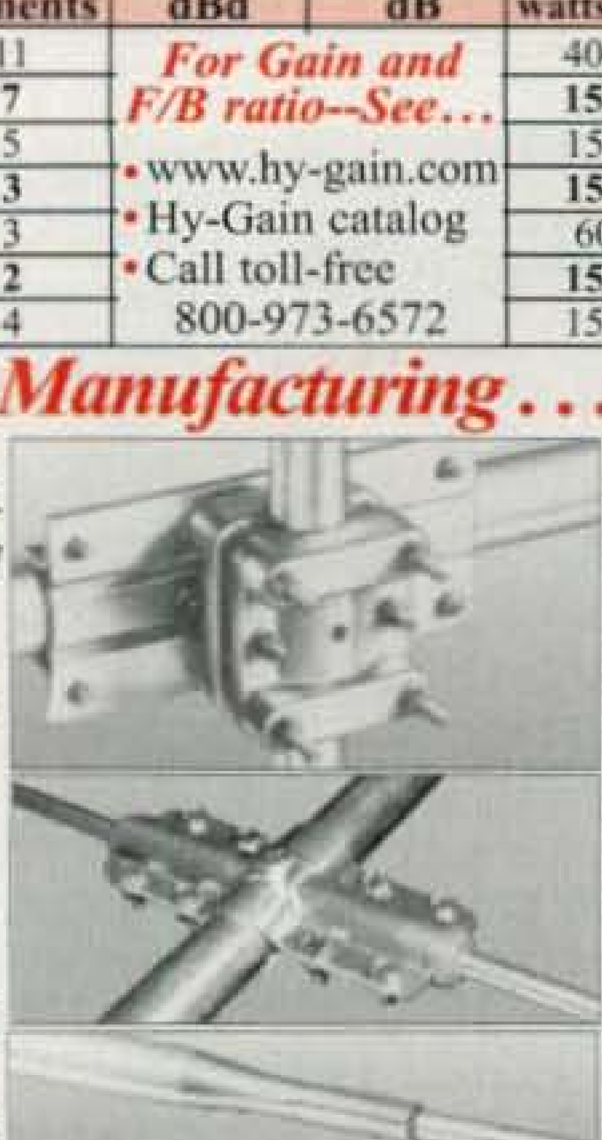
TH-3JRS, $359.95. Hy-Gain's *most popular* 3-element 10, 15, 20 Meter tri-bander fits on most lots! Same top performance as the full power TH3MK4 in a compact 600 watt PEP design.

Excellent gain and F/B ratio let *you* compete with the "big guns".

Tooled manufacturing gives you *Hy-Gain* durability with 80 MPH wind survival.

Model No.	No. of elements	avg gain dBd	avg F/B dB	MaxPwr watts PEP	Bands Covered	Wind sq.ft. area	Wind (mph) Survival	boom feet	Longest Elem. (ft)	Turning radius(ft)	Weight (lbs.)	Mast dia O.D.(in.)	Recom. Rotator	Sugg. Retail
TH-11DX	11	For Gain and F/B ratio--See...		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1159.95
TH-7DX	**7**	• www.hy-gain.com		**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$869.95**
TH-5MK2	5	• Hy-Gain catalog		1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$759.95
TH-3MK4	**3**	• Call toll-free		**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$469.95**
TH-3JRS	3	800-973-6572		600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$359.95
TH-2MK3	**2**			**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$369.95**
EXP-14	4			1500	10,15,20	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$599.95

Tooled Manufacturing . . . Highest Quality Materials



1. **Hy-Gain's** famous super strong *tooled* die cast *Boom-to-Mast Clamp*
2. ***Tooled** Boom-to-Element Clamp*
3. **Thick-wall** *swaged* aluminum tubing

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Die-cast aluminum boom-to-mast bracket and element-to-boom compression clamps are made with specially *tooled* machinery.

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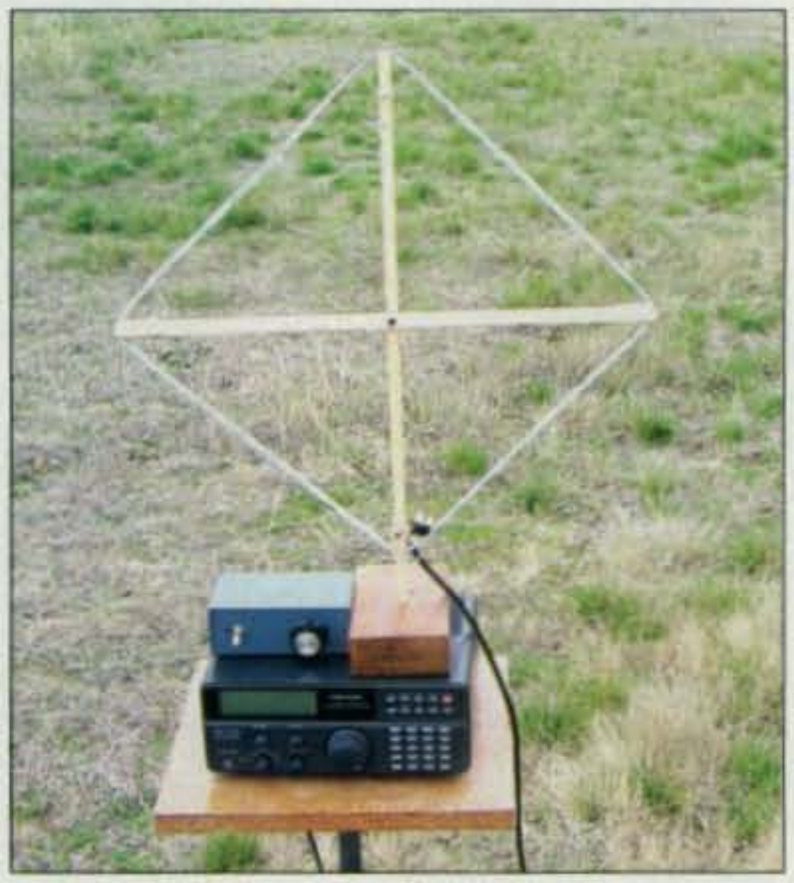

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TOKYO HY-POWER

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

HL-1.5KFX

HF/50MHz Linear Power Amplifier

Auto Band Set

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

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

NEW! All these data cables are included with the amplifier.

Debuting Dayton 2007

HL-1.2KFX
HF amp 750W out*

HL-2.5KFX
HF amp 1500w out*

HC-1.5KAT
HF 1.5KW Auto Tuner*

* These devices have not been authorized as required by the rules of the FCC. These devices are not, and may not be, offered for sale or lease, or sold or leased until authorization is obtained."

See these and more at **Dayton Hamvention™ Booths 511 & 512**

Features

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

Specifications

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

Mode:
SSB, CW, RTTY

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

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

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

Drain Voltage:
53V (when no RF drive)

Drain Current:
40A max.

Input Impedance:
50 OHM (unbalanced)

Output Impedance:
50 OHM (unbalanced)

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

Circuit:
Class AB parallel push-pull

Cooling Method:
Forced Air Cooling

MPU:
PIC 18F452 x 2

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

Input/Output Connectors:
UHF SO-239

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

AC Consumption:
1.9kVA max. when TX

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

Weight:
Approx. 20kgs. or 45.5lbs.

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

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

TOKYO HY-POWER

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zero bias – a CQ editorial

BY RICH MOSESON,* W2VU

The Turning of the Tide

If you've spent much time along the seashore, you probably know that in most cases, the turning of the tide is so gradual as to be imperceptible. There are exceptions, though, such as in the Bay of Fundy, where water levels vary by some 20 feet between high and low tides, and the changing of the tide is announced by an abrupt change in water levels and direction of flow. I believe we are witnessing a changing of the tide in ham radio, and it's much more like being on the shores of the Bay of Fundy than on the (New) Jersey Shore.

It started at the Orlando hamfest in February. Orlando has consistently been a good "show" over the past 10-plus years, one of the few with regularly growing attendance. It routinely draws between 4000 and 5000 people. This year, attendance nearly *doubled*. The aisles were packed and our booth was busy on Saturday until well after 3 p.m. I hadn't seen such crowds outside of Dayton in at least ten years. Was it a fluke? Or was the tide beginning to turn?

Orlando was two weeks before the new licensing rules eliminating code tests became effective. We wondered what would happen at Charlotte (NC), the next hamfest CQ attends, two weeks *after* the new rules took effect. We were particularly curious because Charlotte, though always an excellent show, has been suffering the past few years from reduced attendance.

There was no mad rush when the doors opened on Saturday morning, but within a half hour, all the vendors were busy, and they all stayed that way throughout the morning. The crowds dropped off after noontime, but we were at the start of the college basketball playoff season and an afternoon game was at the top of many attendees' agendas. In addition, more than 100 people disappeared from the hamfest floor between 12 and 12:30 because they were heading to the license exam session. Most candidates were upgrading from Technician to General, we were told, and most passed. At the end of the day, every vendor we talked to reported having a very good day. Clearly, at Charlotte, the tide had turned.

Our friends at W5YI and the ARRL report that sales of license manuals have skyrocketed as have the number of test sessions being scheduled, and the number of tests being requested for each session. Gene Niemiec, K2KJI, who owns KJI Electronics and attends many more hamfests than we do, reported similar experiences at smaller hamfests in Vermont and New Jersey, right after the change in the testing rules—exam sessions were packed and so were the hamfests.

One of the most encouraging things I heard at Charlotte was that several DXing groups were planning to proactively welcome, encourage and recruit new members from among the new upgrades. That's the way to take advantage of the upsurge that we're seeing, and to keep it going.

It seems the changes have even propelled the ARRL into the 21st century! Along with extended operation at W1AW on the weekend of February 23-25, which included getting newly-upgraded staff members on the air themselves, Membership Director Katie Breen, W1KRB, maintained an ongoing "blog" (web log) on the ARRL website, including photos and some received e-mails, plus several videos posted to YouTube. If we want to reach young people, we need to go where they hang out! We are reaching a good number of them, by the way. Despite what you may hear about ham radio's advancing age, there are young people coming into the hobby. Go to just about any hamfest and take some time to look around you -- you'll most likely see a good number of 20-something and 30-something hams, and nearly as many baby strollers as motorized scooters.

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

HF Operator's Survival Guide

A small step that we're taking to help both Technicians and new upgrades get off to a good start on HF is our new *CQ HF Operator's Survival Guide.* This 16-page booklet provides a basic introduction to the HF bands, operating tips, advice on radios and antennas, and a look at the different types of activities one is likely to encounter on the HF ham bands. The booklet is available for $2 per copy (with quantity discounts available) through the CQ Bookstore.

The Revolution is Over, and We Have Won...

"Electronics used to be one of the greatest hobbies ever," writes *electronic design* magazine Communications/Test Editor Louis Frenzel (W5LEF) in a March 5 online article. "There were literally hundreds of thousands, maybe even millions, of people who used to play around with electronics as an avocation or part-time interest and activity... Kids learned electricity and electronics in school. As a result, when they ended up getting the bug, they ended up not only adopting electronics as a hobby, but also made it into a career. You don't see too mach of that going on anymore. So what the devil happened to the electronic hobbyist?"

Frenzel goes on to define traditional electronics hobbyists primarily as builders, and to describe the decline in their numbers, citing as the primary reasons the microminiaturization of components, the growing complexity of circuits and the need for ever-more complex and expensive test equipment to troubleshoot anything you manage to build. He notes that some of these people are still around, particularly among hams, as well as growing numbers of hobbyists building robots and using embedded controllers. Then he talks about a new type of electronics hobbyist, what he calls the "systems hobbyist," which he defines as "people who buy and experiment with every electronic gadget," and who "were probably the first in their neighborhood to get the big screen HDTV, TiVo, satellite TV dish, and all the other related stuff ... These people also do geocaching with their GPS receivers and install 400-W stereo systems in their trucks." He describes these hobbyists as "the non-ham equivalent to an appliance operator. They work strictly at the system level, but still need a general understanding about what goes on inside these devices. They connect stuff together and make it work. They hang around at Best Buy and Circuit City rather than RadioShack. It is fun stuff." Then he comes to a shocking realization: "Yikes, what I just described is all the rest of us. The consumer electronics person." Frenzel concludes, "Electronics has evolved and so, as a result, has the hobbyist. So perhaps the whole electronic hobby thing didn't really go away, it just changed."

That's something we all need to keep in mind as we consider the evolution of ham radio and decry the dearth of builders and the way things were in "the good old days" (defined as whenever each of us first became licensed). It hasn't gone away, it's just changed. And change is not necessarily a bad thing. After all, change is required in order for the tide to turn. 73, W2VU

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

HAM-IV

HAM-IV
$559.95

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

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II

T-2X
$649.95

T-2XD
$1079.95
with DCU-1

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

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II

CD-45II
$389.95

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

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

HAM-V

HAM-V
$949.95
with DCU-1

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

ROTATOR OPTIONS

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

AR-40

AR-40
$289.95

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

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

HDR-300A

HDR-300A
$1379.95

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

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

Digital Automatic Controller

DCU-1
$699.95

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

AR-35 Rotator/Controller

AR-35
$79.95

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

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NEW! Automatic Rotator Brake Delay

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

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144/430 MHz FM DUAL BAND TRANSCEIVER
(144 MHz 50 W/ 430 MHz 40 W)

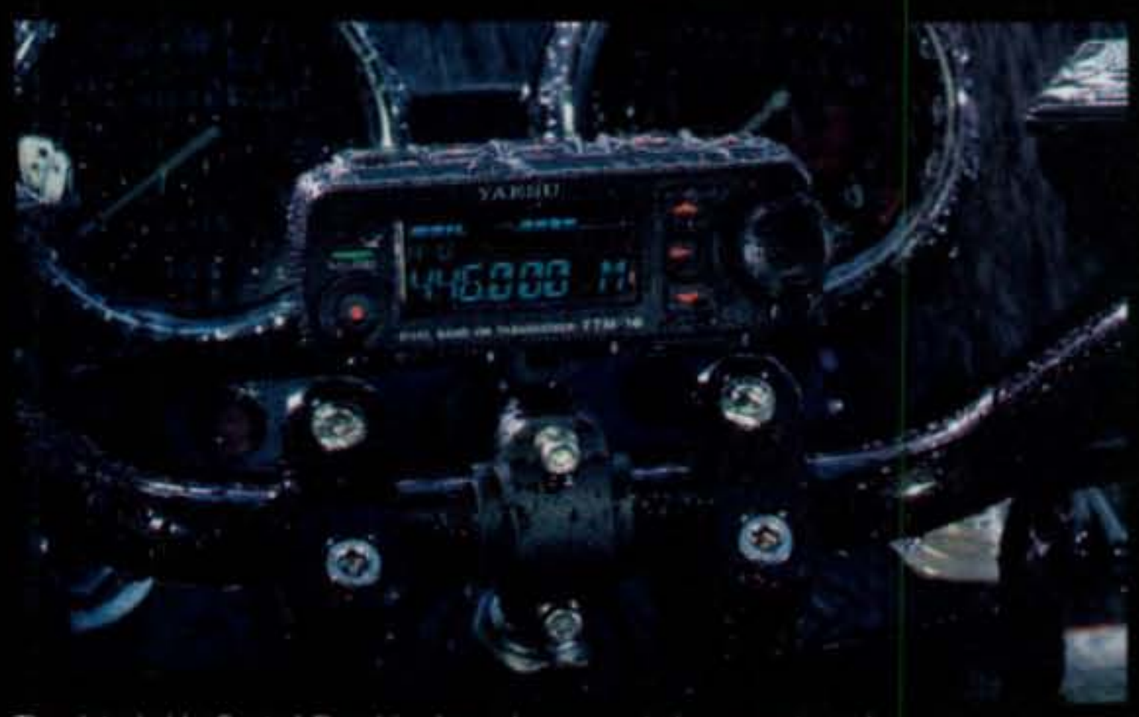
FTM-10R

■ Compact Version (main body and front panel may be separated)
144MHz 10W/ 430MHz 7W

FTM-10RS (available May, 2007)

- The keys and indicators are illuminated with high brightness LEDs. The bright ocean blue negative type LCD display is easy on the eyes and adjustable for day or nighttime viewing.
- The Front panel meets the IP57 standard. (Waterproof at 3 feet for 30 minutes, and protection against dust)
- The main body of FTM-10R is a solid die-cast aluminum sandwich structure. The compact size is: 4.48" W x 1.50" H x 7.12" D, Including the detachable front panel (The Panel is only 1.64" D.)
- The microphone and PTT button are built into the front panel. No external microphone is needed for operation.
- Completely hands free operation is possible using the optional wireless Bluetooth function and a headset.
- It is Equipped with a high power 8-watt audio amplifier and a PA function. When combined with the moisture and dust protected MLS-200-M10 optional loudspeaker, there is plenty of loud audio for a noisy outdoor environment.
- AM/FM radio is built in. Listen to your favorite AM or FM stereo station, and at the same time monitor the amateur band.
- Loaded with many functions for your convenience at outdoor motor sports activities.

●Includes event timer stopwatch, with an interval function ●With the intercom, you can communicate with a fellow passenger ●Tone Control ●Automatic Volume Control can adjust the speaker volume compared to nearby noisy environment ●External audio input is available to connect your iPod® ●Wireless cloning allows transfer of memory information without any cable ●The Control Head may be separated from the main body with the 10 feet cable and attached with a magnetic mount to a flat metal surface. Quickly put the radio in your vehicle or take it out with one touch release ●The simple hanger type bracket may be attached to the top or bottom, and the front may be tilted up or down 20 degrees with an adaptor bracket ●The message function can transmit alphanumeric messages you have entered beforehand ●The VOX function includes automatic audio delay on transmit, so the start of your message is not missing



The detachable Control Panel is shown here mounted on a motorcycle handlebar using the optional MMB-M11 multi-angle bracket.
The body section is not a waterproof structure (FTM10R).
The FTM-10RS compact Version (front panel and body) meets IP57 waterproofing standards.

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

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

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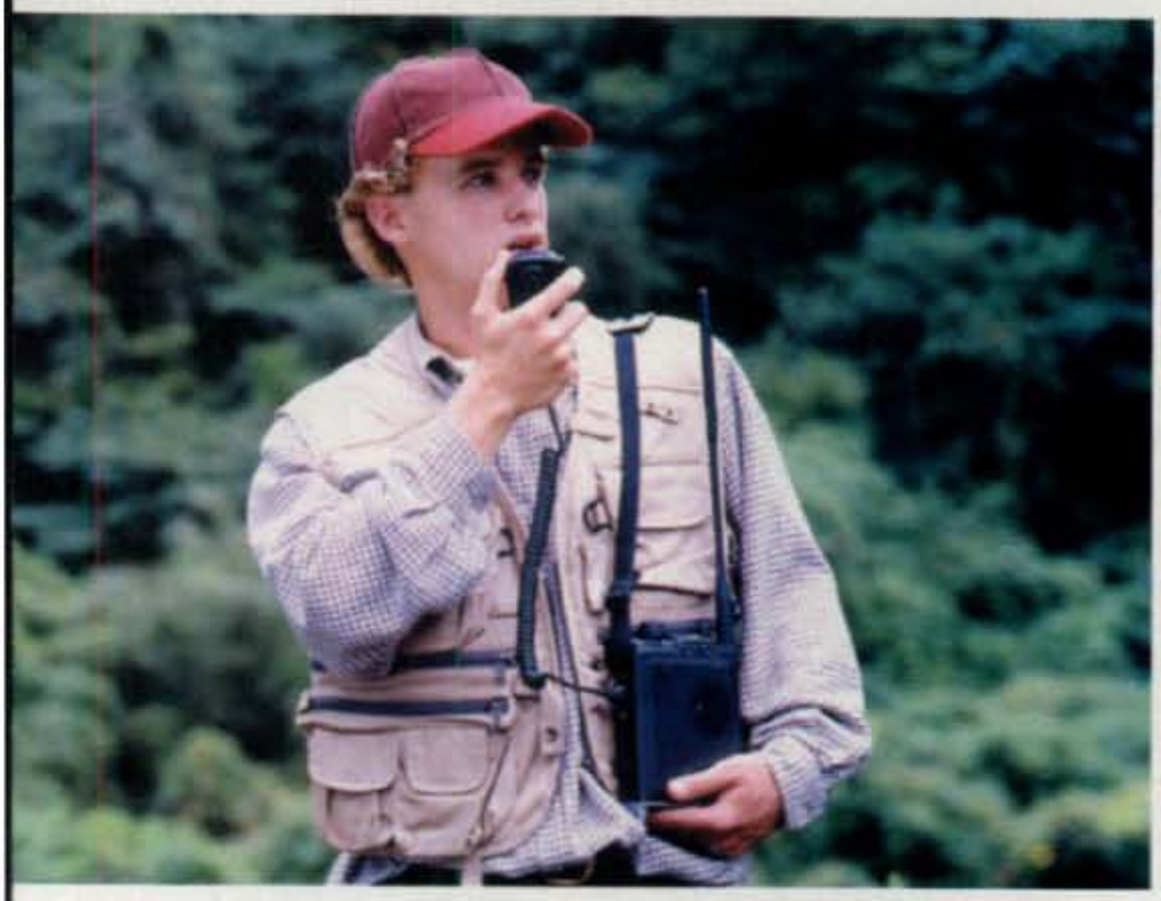

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ham radio news

Ham Radio Suspended in Iraq

The government of Iraq has shut down amateur radio operations in the country until the security situation there improves. Diya Sayah, YI1DZ, President of the Iraq Amateur Radio Society, reported in an e-mail that "all activities of amateur radio in Iraq will be suspended for unknown date or time," and that the shutdown applies both to Iraqi citizens and to foreign hams who have been operating with YI9 callsigns. Sayah told the ARRL he had requested a meeting with Iraqi Prime Minister Nouri al-Maliki to try to clear up any "possible misunderstanding on the part of government officials as to the nature and purpose of Amateur Radio."

Haynie, Hare and Cameron Named Dayton Award Winners

ARRL President Emeritus Jim Haynie, W5JBP; ARRL Laboratory Manager Ed Hare, W1RFI, and IRLP developer David Cameron, VE7LTD, are this year's recipients of the Dayton Hamvention's ® top honors. Haynie, who served as League President from 2000-2006, was named Amateur of the Year for his work in establishing the ARRL's education and technology program, raising the League's profile on emergency communications and leading the fight against interference from Broadband over Power Lines (BPL) systems. Hare, who has been the technical point-person on BPL from the beginning, was honored with the Special Achievement Award, while the Technical Excellence Award went to Cameron for his work on the Internet Radio Linking Project (IRLP), which allows repeaters around the world to link up via the Internet. The awards, sponsored by the Dayton Amateur Radio Association, will be presented at this year's Hamvention on May 18-20.

New Rules Bring in New Hams

The FCC's decision to drop Morse code tests from all classes of amateur licenses is apparently prompting thousands of people to join the amateur service for the first time, even though there has been no code test for the Technician license since 1991. The ARRL reports a huge upsurge in the number of new Technician Class licensees —sometimes 60 or 70 from a single test session, according to the *ARRL Letter*, with large numbers of upgrades as well. The number of exam session is way up as well. The ARRL VEC, which normally sponsors about 450 test sessions a month around the U.S., reported nearly 800 sessions had been scheduled for March, with another 600 on tap for April. And, according to VEC Manager Maria Somma, AB1FM, "it doesn't look like test session activity will be slowing down anytime soon."

FCC Holds Firm on CC&Rs

The FCC has again refused to consider extending the limited protections for amateur antennas that it has imposed on local and state governments to private homeowners' associations. In rejecting a petition from a group known as Hams for Action (HFA) for the Commission to override covenants, conditions and restrictions (CC&Rs) that prevent amateurs from installing antennas, the FCC repeated its stand from a 2001 decision that state and local laws are different from CC&Rs in that the latter are agreed to voluntarily. "We conclude that HFA has not presented grounds for the Commission to revisit this policy," said a letter from Scot Stone, Deputy Chief of the Wireless Telecommunication Bureau's Mobility Division. The letter also reiterated the FCC's stand that if hams are able to persuade Congress to mandate the inclusion of CC&Rs under the limited pre-emption policy commonly known as PRB-1, then the Commission would "expeditiously act to fulfill its obligation thereunder."

States Move on Antenna Rules

The state legislatures in Arizona, Maryland and Oklahoma are considering bills that would incorporate into state law the FCC's "PRB-1" policy of requiring that state and local antenna laws "reasonably accommodate" amateur radio operation. In addition, according to the *ARRL Letter*, the bills in Maryland and Arizona would apply the rule to homeowners' associations as well. The *Arizona Daily Star* reported that the Arizona bill was passed by the full House and sent to the Senate for consideration. So far, 23 states have adopted PRB-1 type legislation.

Laird Technologies Purchases Cushcraft

Cushcraft Antennas has been purchased by Laird Technologies, a manufacturer of antennas, electromagnetic interference shielding products and other related items, for nearly $90 million. Laird, based in the United Kingdom, has its U.S. headquarters in St. Louis, Missouri. A spokeswoman for Laird says the acquisition should have no impact on Cushcraft's line of amateur antennas. "It's a market we actually target," she told *CQ*, adding "We don't see any change in that (area)."

FCC Will Not Require Foreign-Language Ham Tests

The FCC say it will not mandate that amateur radio license exams be prepared in languages other than English, but that there is nothing stopping the National Conference of Volunteer Examiner Coordinators (NCVEC) from doing so if it wishes. The NCVEC's Question Pool Committee (QPC) develops the questions that go into all FCC amateur exams. The Puerto Rico Amateur Radio League had requested an FCC mandate because there is no uniform Spanish-language version of the question pools, but the Commission said its rules do not currently specify any particular language for ham exam questions, and that the request should properly be made to the QPC.

QPC Chairman Tom Fuszard, KF9PU, told "Newsline" that a request from PRARL had been on the agenda for its 2005 meeting but was never discussed due to time constraints. He said he has no objection to putting it back on the agenda for this year's meeting, but noted concern over different dialects of Spanish and determining which, if any, should be designated as "official."

Red Cross Back in Hot Water Over Background Checks

The ARRL says the company that performs background checks for the American Red Cross has not changed its consent forms and that, despite a new policy announced by the Red Cross in February that volunteers would need only to undergo criminal background checks, the forms still grant permission for an "investigative consumer report," which includes credit and "mode of living" checks. See this month's "Public Service" column on page 50 for more details.

FCC Posting Enforcement Letters Online

The FCC has decided to post on its website all letters sent to amateurs that involve warnings or penalties for alleged rules violations. Previously, the letters had been released once or twice a month to the amateur news media. Current letters may be accessed online at <http://www.fcc.gov/eb/AmateurActions/Welcome.html>.

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

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COMET NEW! CSB770A DUAL-BAND 2M/440MHZ W/FOLD-OVER
Gain & Wave: 146MHz 4.4dBi 5/8 wave center load, 446MHz 6.9dBi 5/8 wave x 2 center load • VSWR: 1.5:1 or less • Length: 51" • Conn: PL-259 • Max Pwr: 150W

COMET NEW! CSB790A DUAL-BAND 2M/440MHZ W/FOLD-OVER
Gain & Wave: 146MHz 5.1dBi 7/8 wave center load, 446MHz 7.7dBi 5/8 wave x 3 center load • VSWR: 1.5:1 or less • Length: 62" • Conn: PL-259 • Max Pwr: 150W

Maldol AX-50 DUAL-BAND 2M/440MHz
Gain & Wave: 2M 1/4 wave • 70cm 5.0dBi 9/8 wave • Length: 21" • Conn: PL-259 • Max Power: 60W

Maldol AX-75 DUAL-BAND 2M/440MHz W/FOLD-OVER
Gain & Wave: 2M 1/2 wave center load 3.2dBi • 70cm 5/8 wave x 2 5.7dBi • Length: 30" • Conn: PL-259 • Max Power: 60W

AX-95 DUAL-BAND 2M/440MHz W/FOLD-OVER
Gain & Wave: 2M 1/2 wave center load 3.3dBi • 70cm 5/8 wave x 2 5.8dBi • Length: 38" • Conn: PL-259 • Max Power: 60W

B-10 / B-10NMO DUAL-BAND 2M/440MHz
Gain & Wave: 146MHz 0dBi 1/4 wave • 446MHz 2.15dBi 1/2 wave • Length: 12"
• Conn: B-10 PL-259 ,B-10NMO - NMO style • Max Pwr: 50W

SBB-2 / SBB-2NMO DUAL-BAND 2M/440MHz
Gain & Wave: 146MHz 2.15dBi 1/4 wave • 446MHz 3.8dBi 5/8 wave center load • VSWR: 1.5:1 or less • Length: 18"
• Conn: SBB-2 PL-259 • SBB-2NMO NMO style • Max Pwr: 60W

EX-107RB / EX-107RBNMO DUAL-BAND 2M/440MHz
Gain & Wave: 146MHz 2.6dBi 1/2 wave • 446MHz 4.9dBi 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 29"
• Conn: EX-107RB PL-259 • EX-107RBNMO NMO style • Max Pwr 100W

SBB-5 / SBB-5NMO DUAL-BAND 2M/440MHz W/FOLD-OVER
Gain and wave: 146MHz 3dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39"
• Conn: SBB-5 PL-259, SBB-5NMO - NMO style • Max Pwr: 120W

SBB-7 / SBB-7NMO DUAL-BAND 2M/440MHz W/FOLD-OVER
Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58"
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announcements

Nevada QSO Party – This event will be Saturday May 12 from 0001–2359Z on 160–6 meters (excluding WARC bands), CW, SSB, and RTTY. Suggested frequencies: CW up 15 kHz from the bottom of the General portion of the bands; SSB up 25 kHz from the bottom of the General portion of the bands. Exchange: Nevada stations, county + RS(T); other stations, state, province, or DXCC + RS(T). Scoring: Nevada stations, QSOs × (states + provinces + DXCC); other stations, QSOs × (# different Nevada counties). For more details go to: <http://nv.arrl.org/NQP/>.

• The following special event stations are scheduled for May:

N2M, from air show at "America's First Defense Airport," Millville, New Jersey; Thunderbolts ARC; 1300–2200Z May 26–27 on 145.550, 14.265, 7.265, 14.070 MHz PSK. For certificate send QSL and SASE to KB2OLT – Thunderbolts ARC, 356 Briar Drive, Millville, NJ 08332. (www.thunderboltsarc.com)

W4J, from 400th anniversary of the founding of Jamestown, Williamsburg/Jamestown, Virginia; Williamsburg Area ARC; 1330–2030Z May 12–13 on 7.261, 14.250, 18.150, 21.350 MHz. For certificate send QSL and SASE to Russell Chandler, KU4FP, 132 Druid Drive, Williamsburg, VA. (Certificate for working all three special event stations for WAARC, including Jamestown, Colonial Williamsburg, and Yorktown Battlefield: <www.qsl/net/waarc>.)

W6Y, from Yolo Boy Scout Camporee, Nelson's Grove, near Woodland, California; Yolo District Boy Scouts and Yolo ARS; 0300Z May 5 to 0700Z May 6 on 14.290, 7.190, 3.940 MHz SSB, plus 440.450 MHz, IRLP 5750 or Echolink 107315. For QSL send QSL and SASE to Bill Ragsdale, K6KN, P.O. Box 1500, Woodland, CA 95776. (http://yolobsa.editme.com/W6Y)

W6KA, from 50th anniversary of the Pasadena Radio Club, Pasadena, California; 1600–2200Z May 26 on 28.400, 21.300, 14.270, or 2.270 MHz (whichever has the best opening), plus 145.180– (PL 156.7). For certificate send QSL and SASE to Peter Fogg, KA6RJF, c/o Pasadena Radio Club, P.O. Box 282, Altadena, CA 91103-0282.

W8VP, from Hopalong Cassidy Museum, Cambridge, Ohio; Cambridge ARA; 1400–2200Z May 5 on 7.235 MHz ±5 and 14.260 MHz ±5. QSL to Cambridge ARC, Box 303, Cambridge, OH 43725-0303.

W8YAF, from observance of Memorial Day, Yankee Air Museum Air Park, Belleville, Michigan; 1200–2000Z May 28 on 7.270 MHz. For QSL send QSL and SASE to Frank Nagy, N8BIB, 24315 Waltz Road, New Boston, MI 48164-9167.

• The following hamfests, etc., are slated for May:

May 4–5, **New England Amateur Radio Festival & Fleamarket (NEAR-fest)**, Deerfield Fairgrounds, Deerfield, New Hampshire, celebrating the "Golden Age" of amateur radio. For details go to: <http://near-fest.com/>. (Exams)

May 4–6, **Emcommwest 2007**, Atlantis Resort & Hotel, Reno, Nevada. Contact via e-mail: <info@emcommwest.org>; <http://www.emcommwest.org/>. (Exams Saturday 9 AM to noon)

May 5, **Binghamton ARA (BARA) Hamfest**, Tioga Fairgrounds, Owego, New York. Contact Jim Lawson, KC2JED, e-mail: <jwlawson@stny.rr.com>, phone 607-797-1583; <http://www.wtsn.binghamton.edu/bara/>. (Talk-in 146.760)

May 5, **Ozaukee Radio Club Swapfest**, Circle B Recreation Center, Cedarburg, Wisconsin. Contact Gene Szudrowitz, KBØVJP, phone 262-377-6793; <www.ozaukeeradioclub.org>. (Talk-in 146.97 [PL 127.3])

May 5, **45th Annual Cadillac Swap**, Cadillac Junior High School, Cadillac, Michigan. Contact Alton McConnmell, e-mail: <nu8l@arrl.net>, phone 231-876-1485. (Exams)

May 6, **Lake Maggiore Swapmeet/Tailgate**, Lake Maggiore Park, St. Petersburg, Florida. Contact leslie Johnson, WA4EEZ, e-mail: <wa4eez@verizon.net>; <www.qsl.net/w4gac>. (Talk-in 147.060+)

May 18–20, **Dayton Hamvention®**, Hara Arena, Dayton, Ohio. For more information, call 937-276-6930; <www.hamvention.org>; and see the Hamvention® ad on p. 36 of this issue of *CQ*. The annual SouthWest Ohio DX Assn. sponsored **DX Dinner** will be Friday evening, May 18, at the Crowne Plaza Hotel; for more information, go to: <http://www.swodxa.com>, or e-mail: <k4zle@yahoo.com>. The annual **Contest Dinner** will be Saturday evening, May 19, at the Crowne Plaza Hotel; for more information and tickets go to: <http://www.contestdinner.com>. ***See us at the CQ Booth.***

May 20, **North Hills Radio Club Hamfest**, Bella Vista High School, Sacramento, California. Contact Carl Schultz, WF6J, e-mail: <k6is@arrl.net>, phone 916-366-7408; <http://www.k6is.org>. (Talk-in 145.190– [162.2 Hz])

May 26, **Bergen ARA Spring Hamfest**, Westwood Regional Jr/Sr High School, Washington Township, New Jersey. Contact Jim Joyce, K2ZO, e-mail: <k2zo@arrl.net>, phone 201-664-6725. (Talk-in 146.19/79 [PL 141.3]; exams 8–10 AM)

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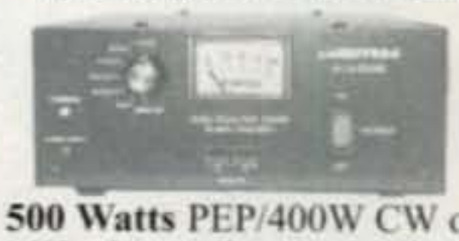

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AL-80B kilowatt output *desktop* linear amplifier doubles your average SSB power output with high level RF processing using our exclusive *Dynamic ALC*™!

You get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias*™ completely turns off the 3-500G tube between words and dots and dashes. Saves hundreds of watts wasted as heat for cooler operation and longer component life.

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1 tube, 1250 W

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Lakshadweep, the second most-wanted DX entity in ham radio, hit the airwaves with a bang late last year and early this year with two major DXpeditions. Here's a first-hand report of the first one, VU7LD.

VU7LD
The First Operation from Lakshadweep in Over 13 Years!

BY GOPAL MADHAVAN,* VU2GMN

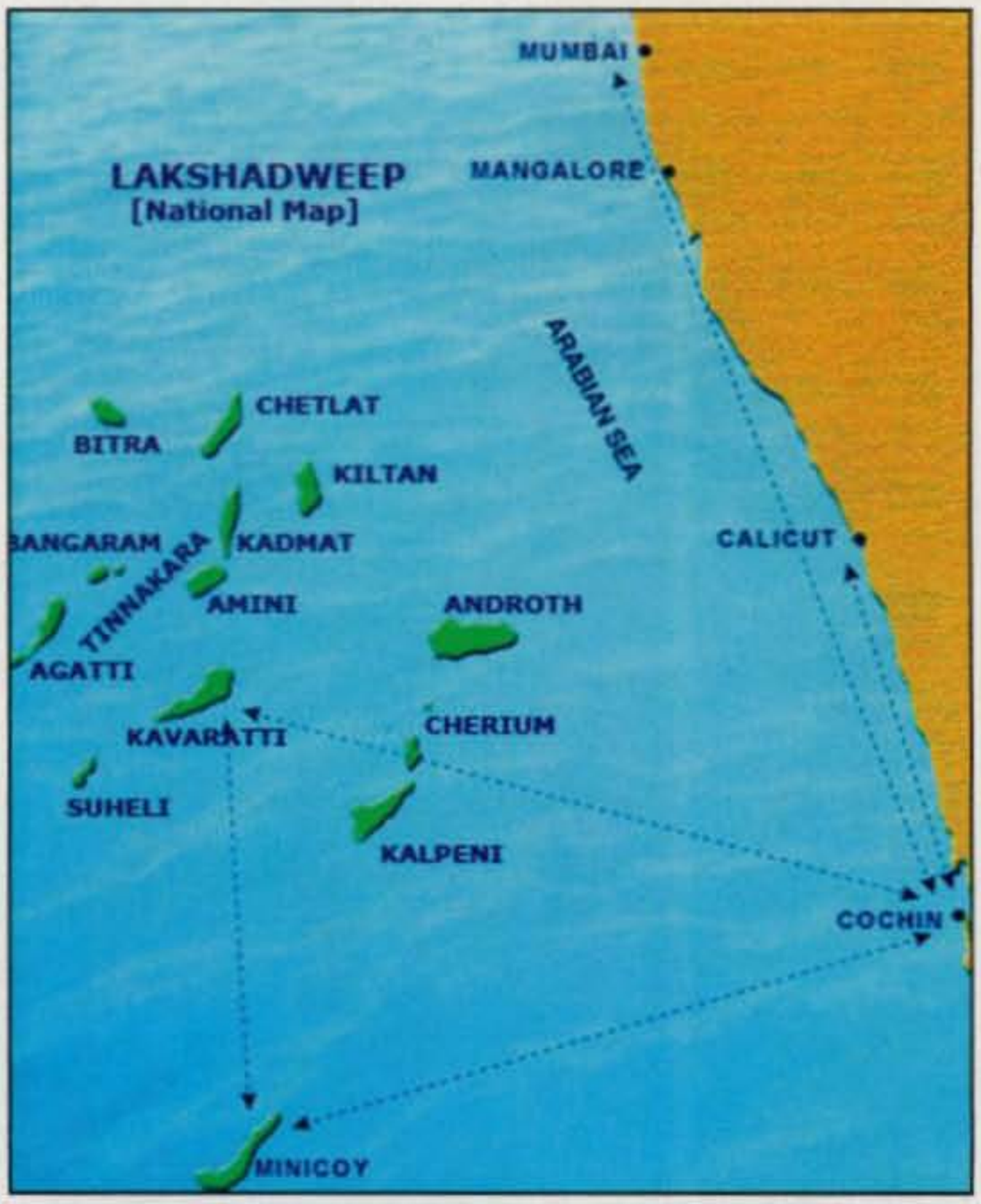
Lakshadweep is an extremely rare gem in the world of amateur radio and had risen to #2 on the DXCC most-wanted list. The last DXpedition from these islands off India's west coast was VU7SF in January 1993.

Many organizations and personnel have tried, and failed, numerous times over the intervening years to activate a major expedition from this exotic DX location. However, the Amateur Radio Society of India (ARSI), through due diligence, received written permission to operate from December 1–31, 2006.

Finding Lakshadweep

Scattered on the clear blue waters of the Arabian Sea off the western coast of India is a group of coral islands of unparalleled beauty known as Lakshadweep (see map). "Lakshadweep," which means *A Hundred Thousand Islands,* is an archipelago consisting of 36 islands, 12 atolls, 3 reefs, and 5 submerged banks. These emerald islands, rich in greenery and fringed by silvery beaches, are overwhelming with their natural beauty. The total population of all of the islands (as per the 2001 census) is approximately 60,595, with the population of Kavaratti, the main island, being just over 10,000.

Prior to being declared a union territory in late 1956, Lakshadweep was a part of the Madras State. The entire group of islands is considered as one District and is divided into four Tahsils, each under the charge of a Tahsildar. The administrative headquarters was transferred to Kavaratti Island in 1964. Kavaratti Island is the most developed, with 52 mosques spread out over the island, the most beautiful being the Ujra mosque, which has elaborate hand carvings adorning the pillars and ceilings (see photo).



Lakshadweep is an archipelago of three dozen islands in the Arabian Sea off the coast of India. (Map courtesy of the Union Territory of Lakshadweep)

Key DX Responsibilities and Island Community Involvement

Being the first operation of this kind to Lakshadweep in more than a decade made on-the-air activities in some ways a second priority. We were very conscious of the fact that everything we did could impact future expeditions. Therefore, we had to take special care that we did not intrude on the islanders' activities or be a burden on their limited resources. Our team also spent time conducting seminars on amateur radio for local officials and getting them interested in the hobby. Our goal was to develop relationships for future support and eventually be in a position to help them set up club stations on various islands in the future. We invested about 20% of our time in developing and maintaining island relationships and establishing communication methods. To put

*President, ARSI
e-mail: <gopalmadhavan@vsnl.com>

VU7LD was the first amateur radio operation from Lakshadweep (the number two entity on the DX most-wanted list) since 1996. (All photos courtesy of the author)

Beautiful hand carvings adorn the pillars and ceilings of the Ujra Mosque in Kavaratti, one of 52 mosques on the island.

it in basic terms, if we failed to conduct the first trip in a sensitive and delicate manner, all future trips might be impacted or not authorized.

Planning the DXpedition

Planning the DXpedition to the second most-wanted entity was exciting, since we had been trying to get the required permissions for several years without success. When our most recent application, made in February 2006, was successful and all permissions were in hand, it became crunch time and planning for the actual expedition started with just a few months. We received permission to operate VU7LD from December 1–31, 2006. ARSI Vice President Sarla Sharma, VU2SWS, did a tremendous job with the applications and the persistent follow-up that in the end bore fruit. Twenty-four VU operators, led by VU2SWS, made up the VU7LD team.

We decided to split the team into smaller groups so that they could take turns being in Lakshadweep, as most of us could not take off for a whole month, and also the facilities on the island could not cope with a large contingent of operators.

Even though Lakshadweep is part of India, there are very stringent restrictions for visitors, and entry permits from several government departments had to be obtained for each operator. We sought permission to operate from three islands, but permission was granted only for Kavaratti, the capital of the island territory, where non-Indians (VUs) are not permitted.

Early in the planning our team discussed and identified additional international skilled contest, SSB, CW, and digital operators whom we hoped would be able to help in the operation. However, this option was not possible, since the operation was limited to Kavaratti. We were unsuccessful in trying to get foreign landing permits for additional operators. The DX community was totally unaware of this effort. Our mission as an all Indian team was truly tested, and I'm proud of how our operators conducted themselves in spite of having little or no prior experience with exotic DXpeditions or high-volume contests. We were at a disadvantage not being

A typical view along the coast of Kavaratti Island. This is Chicken Neck Bay, the location of one of four stations, all signing VU7LD.

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TEN-TEC

Transportation to Kavaratti was by boat, one which offered only the most basic amenities. Note the sleeping bag on the deck!

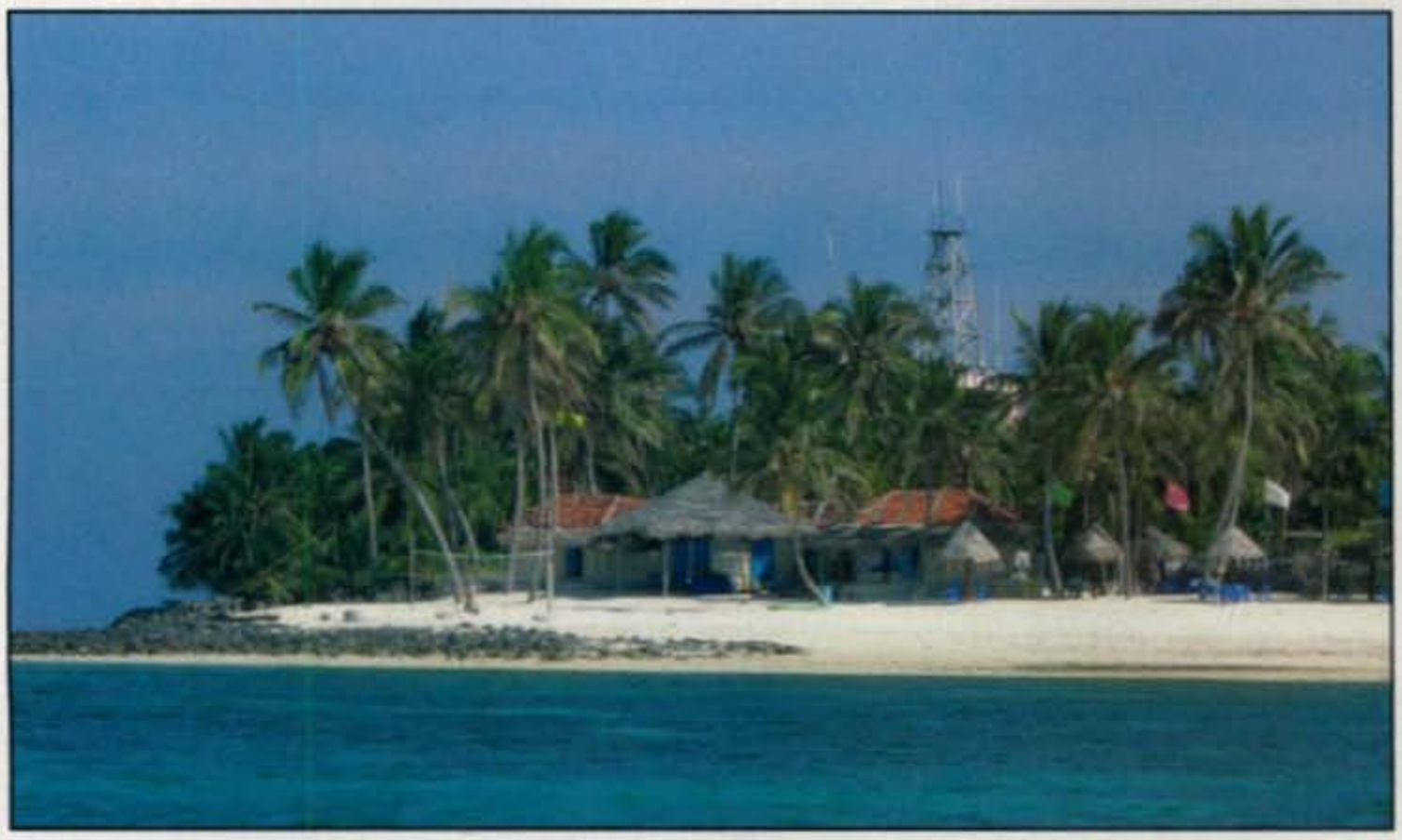
A three-band Fritzel vertical antenna was put up on the beach, providing an excellent salt-water ground plane. If only propagation had been better...

able to select the ultimate team, but we performed in an effective manner with the resources permitted and the propagation conditions.

With little advance notice, ICOM and ACOM stepped up to the plate and agreed to supply seven complete HF stations (IC-746PROs and ACOM-1000s), and SteppIR agreed to provide a sizable discount on the purchase of new antennas. The companies even had begun the packaging and shipping process to get the equipment to our North American contact, when we had to cancel the HF radio and amplifier requests at nearly the last minute. About three weeks before departure we learned that the import tax into India and transportation burden precluded our taking advantage of the offers. We just did not have the extra $11,000 in the budget to make this happen. Our team had a meeting, and we decided to use our own equipment. Without financial sponsors, each of our team members used his own money to pay his own way, with the hope of get funding by sponsors later.

Two members of our group from Mangalore, India with prior knowledge of Lakshadweep, VU2PJP and VU3KKZ, went off to investigate what resources were available and to determine what needed to be brought to the island. They also were able to find regular sailing schedules of small mechanized vessels from Mangalore to Kavaratti, our destination. Therefore, all heavy stuff had to be sent first to Mangalore for onward shipment to Kavaratti. Many members of our team were strict vegetarians, so precooked vegetable foods also had to

The first group of operators arrives on Kavaratti. The team was split into two groups to keep from overburdening the island's resources and so that no one would have to take more than two weeks off from work.



One of the four stations was set up at the Dolphin Dive Station, a great location near the northern tip of the island.

No cherry-pickers here! If you want to put an antenna up in a tree (such as the inverted-V in this tree), the only way up is to climb.

be shipped, as the staple diet there is fish. VU3KKZ, VU2MTT, and VU2RDQ handled all the logistics with help from VU2RCR, who ferried most of the necessities from Bangalore to Mangalore in his car.

Getting on the Air

Four stations were set up, each with two or three radios so that all bands, from 1.8 to 28 MHz, and all modes could be worked simultaneously. Three stations were right on the seashore, with antennas placed on the water line. One was inland and had the advantage of a non-utilized tower to mount the antenna above the coconut tree tops. Rigs at the various stations included an ICOM IC-746-Pro and a 756-Pro, a Kenwood TS-2000, a Yaesu FT-847 and FT-850, and an Elecraft K2. We did use several SteppIR antennas, including two 3-element beams (one with 40 meters); a Fritzel vertical for 10, 15, and 20 meters; and numerous dipoles, inverted-Vs, and long wires for the low bands.

The first team left the port of Kochi by sea on November 29th and arrived at Kavaratti on the 30th. It was quite an

The second group of operators arrived on December 12th for the second half of the operation.

experience shipping out the materials by sea and also traveling in ships that were very basic in terms of amenities and comfort.

The first day was spent in hectic activity setting up the stations, and at exactly 0001 hours IST (India Standard Time; UTC +5.5 hours) on December 1st the first CQ call was made and the first contact was made on 80 meters with VU2TS. From then on there was nonstop activity, with massive pile-ups until we shut down on the 27th. The last members of the team left Kavaratti on December 29th, with VU2RCR, VU2NKS, VU3RSB, and VU3IZO winding up things and shipping back the equipment, etc.

As noted above, most of our operators did not have any real prior DXpedition experience and had not been at the receiving end of the huge pile-ups we experienced. Naturally, they were very nervous about how they would deal with what at times sounded like a swarm of bees! However, most fell into the rhythm very quickly and happily worked stations rapidly and without difficulty.

They were very excited to be working from the second most-wanted DX entity and did their best to give the many stations on frequency their much-needed contacts. They were rather disappointed when propagation was bad and they had to sit idle waiting for things to improve, and they were unhappy when solar flares kept the bands quiet. However, everyone enjoyed themselves immensely and the majority cannot wait for the next big event.

Band openings were very unpredictable, and as we did not have access to the internet on a regular basis, we were unable to take advantage of predictions and cluster information. Messages received on the mainland were passed on to the team by VU2ZAP via mobile phones. He also very efficiently took on the task of sifting through logging data and answering the hundreds of messages that started to pour in after online logs were put out.

With over 57,000 QSOs, the VU7LD DXpedition was very successful! It was so successful in fact that it has changed the overall DXCC most-wanted list ranking for VU7 from number 2 to number 10, and that was before a second operation went on the air in early 2007. We have received numerous letters and e-mails from the international amateur radio community thanking the VU7LD team for a new country and for a job well done!

Even when the band openings were poor, the views were great! This is sunset as seen from the Dolphin Dive Station location.

Our Appreciation

We are very grateful for the spontaneous support from equipment suppliers and encouragement from the DX community, with substantial grants from NCDXF, the Clipperton DX Club, David S. Topp, The Mumbai YL meet, the RSGB and the GDXF, and numerous smaller grants and donations from groups and individuals. All donors have been acknowledged on our webpage.

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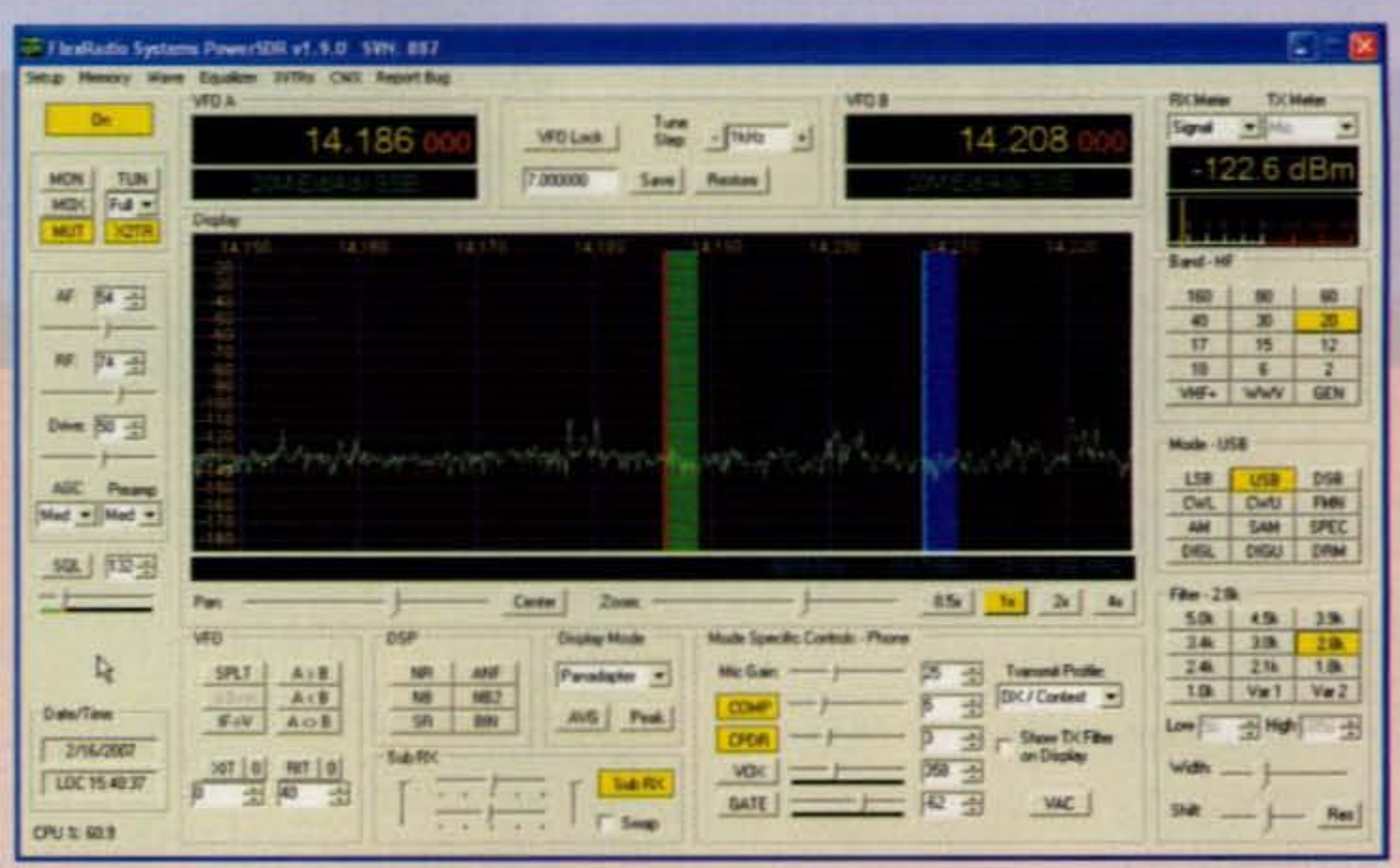

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The RCA-14 comes with a DIN 13 cable, a mini DIN 6 and a mini Din 8. The DIN 13 cable breaks out the functions to RCA jacks 1 - 13, while the mini DIN 6 goes to RCA 1 - 6, and the mini DIN 8 goes to RCA 7 - 14. You can use the DIN 13 or the mini DIN 6 and/or 8, depending on your radio. The RCA-14 is compatible with: Icom 703, 706, 718, 746, 756, 7000 and 7800, Yaesu 817, 857, 897 and 840, Kenwood 480, 570, 2000, Ten Tec Orion and many more radios.

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

Z-11Pro

The Return of a Legend.

The original portable Z-11 was one of LDG's most popular tuners, accompanying adventurous hams to their backyards, or to the ends of the earth. Now meet the Z-11Pro, everything you always wanted in a small, portable tuner designed from the ground up for battery operation.

Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters.

With 8,000 memories in LDG's exclusive "3-D Memory" array, the Z-11Pro uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna.

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No extra cable to buy.

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

The AT-200 features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MH **(including 6 meters)**.

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An Autotuner for use with your amplifier!

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No extra cable to buy.

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AT-100Pro

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

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Results of the 2006 CQ WW RTTY DX Contest

BY GLENN VINSON,* W6OTC, AND PAOLO CORTESE,† I2UIY

The 20th annual CQWW RTTY Contest was held September 23–24, 2006, with another record number of entries, this year totaling 1565 logs (only two of which were paper logs), up more than 200 over last year's record number of submissions. Scores above 20 MHz (and, as a consequence, most all-band, single-op scores) were mostly lower than in 2005, but overall more than 652,000 QSOs (compared to about 615,000 in 2005) were processed. We will have to see what 2007 CQ WPX RTTY Contest produces, but again this year the CQ WW RTTY Contest received more entries than any other RTTY contest in history ,despite solar Cycle 23 inching toward its minimum. This time the solar flux index averaged about 78 during the contest period, slightly lower than 2005. Present predictions from NOAA are that the absolute minimum for this cycle will occur in September 2007 with a predicted SFI of 74.3. Accordingly, we may well see improving conditions on the higher bands—and perhaps 2000 logs—starting with the 2008 contest season, which CQ WW RTTY, occurring at the fall equinox, annually inaugurates.

Although 20 and 15 meters again provided the largest number of contacts, 40 meters was remarkably close behind, with numbers almost equaling those on 15 meters. Fifteen years ago, 40-meter and 80-meter RTTY activity was concentrated in Europe. Today, we see that activity spread virtually worldwide, with large stations routinely working more than 1000 contacts on 40 meters and more than 700 on 80 meters.

Given this incredible increase in RTTY contesting activity, we see the major bands being filled more and more outside of the traditional 15–30 kHz spread on each band. On 80 meters, activity now seems to gravitate around 3570–3600 kHz, with excursions down to 3520–3525 to accommodate the JA band plan. On 40 meters, activity now ranges from 7025 (remember the JA band plan at 7025–7030 kHz) to 7080 kHz or up to 7100 kHz in North America. On 20 meters, activity ranges all the way from 14055 to at least 14125 kHz. The spreads on 15 and 10 meters recently have not been as wide because the solar flux has been low, but one can expect to see 200-kHz spreads on those bands as the solar flux rises in Cycle 24. While these are great and inevitable reflections of annually increasing RTTY contesting activity, we should be mindful of the activities that are fixed on certain frequencies on each band and try to avoid those frequencies. A prime example is the NCDXF/IARU beacons that are located worldwide on 14100. These beacons are, in fact, a good tool for you to know what areas are open to your location at any time of the day—and particularly what areas may just be opening but not yet recognized by local operators. The beacons operate at low power and are easily overwhelmed by any RTTY operation on frequency. For details look at <www.ncdxf.org/beacons.html>. The NCDXF/IARU beacons on 15 meters and 10 meters are located at 21150 kHz and 28200 kHz, relatively higher in each band, but still potentially within the portion of each band where RTTY contesting occurs.

Other frequencies worth avoiding to maintain good relations with our fellow hams are the QRP calling frequencies, located at 14060, 21060, and 28060 kHz. Again, the low-power nature of these operations make competition with RTTY signals very difficult.

Single Operator

Single-Op All-Band High Power. A European again snagged the Single Operator, All band, High Power championship, but North American stations did relatively better within the top 5. The world champion this year was a Ukrainian operating from Moldova, ER4DX (op: UT5UDX), scoring 3,328,864 points (2,626 QSOs, 539 mults). You international soccer fans may know UT5UDX as Sergey Rebrov, a very famous soccer player on the Ukrainian national team at the last World Cup held in Germany. Close behind was veteran U.S. contester Tyler, K3MM, who scored 3,107,952 points (2,402 QSOs, 573 mults). SN7Q was world third, with 2,675,139 points (2,181 QSOs, 499 mults). World fourth was VE3DZ who scored 2,584,008 points (2,037 QSOs, 504 mults). Zone 17, in far West Asia, was again represented in the top 5, with UA9CLB scoring 2,531,192 points (2,094 QSOs, 428 mults).

The Ukrainian 2006 World Cup Soccer Team. Number 11 is Sergey Rebrov, ER4DX (UT5UDX), World Single Op All Band High Power CQ WW RTTY champion.

Single-Op Assisted All Band. As was the case last year, Europeans dominated the top ranks of Single-Op Assisted. IK4MGP won the category with a score of 3,094,938 points (2,050 QSOs, 609 mults). LZ8A was in second place, scoring 2,733,056 points (2,170 QSOs, 544 mults). Coming in as world third was F5CWU, who scored 2,363,935 points (2,042 QSOs, 493 mults).

Single-Op All Band Low Power. SOL scores, like SOH and SOA, decreased somewhat compared to 2005. Repeating as world champion was Wanderley, ZX2B (PY2MNL), with a score of 2,897,208 points (1,857 QSOs, 526 mults). Nick, P40KM (W4GKM) won second place this time, scoring 2,159,111 points (1,777 QSOs, 409 mults). Last year's world second, CN8KD, dropped to world third, with a score of 1,805,552 points (1,540 QSOs, 392 mults).

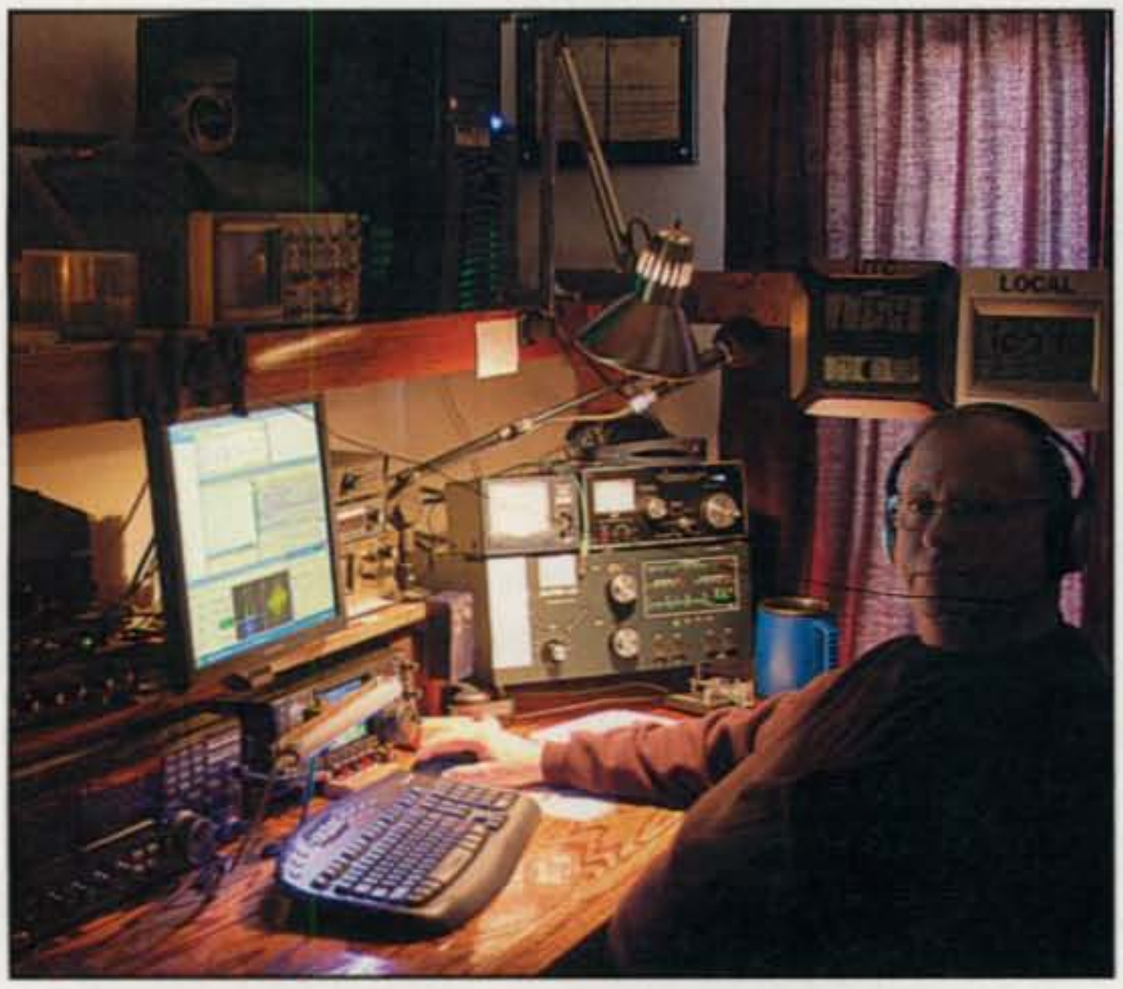
Single-Op 10M. Continuing as world 10-meter champ, John, LU1HF, scored 156,500 points (1,252 QSOs, 125 mults). LW1HDJ was in second place with 15,732 points, while CT1FJK scored 5,338 points for third.

Single-Op 15M. Unlike 2004 and 2005, 15 meters produced no new records in 2006 as worldwide MUF continued to decrease for most of the daytime. This year CT3EN won SO-21 with 576,462 points (1,111 QSOs, 174 mults). In world second was AY8A,

*e-mail> <w6otc@garlic.com
†e-mail: <i2uiy@cqww.com>

scoring 487,859 points. L44DX won world third with a score of 388,056 points.

Single-Op 20M. Unlike the higher frequencies, 20-meter scores continued to increase in 2006. For the third year in a row, a new world record was established, with the top three finishers this time all exceeding the world record set just the prior year by CT3IA. The winner, and new world record holder, was 9A5W who scored 868,020 points (1,672 QSOs, 204 mults). CT3KY scored 856,560 points (1664 QSOs, 172 mults), while 7XØRY scored 812,175 points (1,551 QSOs, 175 mults), a new Africa SO-14 record. World fourth, and almost equaling last year's world record, was EF8A (op: EA8AUW), scoring 749,784 points.



Dave, NJ4F, Single Op All Band High Power entrant, burning the midnight oil during the contest.

Single-Op 40M. Continuing with a trend begun in 2003, scores on 40 meters moved significantly higher with many old records falling around the world. As on 20 meters, the top three finishers all beat the 2005 world record set by 7XØRY. On top with the new world record was S57AW who scored 573,522 points (1,307 QSOs, 183 mults). Close behind in world second was I4IKW with a score of 514,230 points (1,158 QSOs, 183 mults). Close behind in third place was another Italian, IY4W (op: IK4MHB), scoring 498,575 points (1,235 QSOs, 175 mults). CT3EE, in world fourth, almost reached the 2005 world record with a score of 488,130 points. We expect 40 meters will continue to be hotly contested in 2007, with a new world record again likely to be set.

Single-Op 80M. As on 20 meters and 40 meters, the top three finishers on 80 meters all broke the 2005 world record. This time the new world record was set by the existing record holder and multi-year 80-meter champion, Tone, S54E, who scored 185,832 points (737 QSOs, 116 mults). In second place was fellow Slovenian, S50A, with a score of 173,715 points (729 QSOs, 111 mults). IQ1RY (op: IK1HXN) repeated as world third with 163,632 points (688 QSOs, 112 mults). Note the close results both in QSOs and multipliers. As on 40 meters, the 2007 contest looks likely to produce more good competition and another new world record.

Multi-Operator

Multi-Op Multi-Transmitter. This time the MOM class grew to nine entries with one new record. The overall winner was YT6A (ops: IV3TMV, IV3YWT, S50XX, S50YL, S52X, YT6A, YT6Y) with a score of 5,757,143 points (3,885 QSOs, 623 mults). In world second was 2005's Multi-Single High Power winner UU7J (ops: UUØJM, UU1AZ, UU4JDD, UU4JMG, UU8JK, UT4ZX, UT5UGR, UR5FEO, UTØFT, UTØFF, UT9FJ, UR5FEL, UU5MAF) which made a score of 5,555,443 points (3,588 QSOs, 667 mults). The new record was set in Oceania, where KH7X (ops: KH6YY, KH6ND, KH7U, AH6RH,

AH6OZ) beat the 1998 KH6R Oceania record by more than 50%, scoring 4,444,470 points (2,696 QSOs, 558 mults).

Multi-Op Two Transmitter. The M2 class winner continues to be the highest scoring station in CQ WW RTTY, and this year the competition for top place was close indeed. Knocking HC8N out of first place, EA8AH (ops: RD3AF, RX3DU, RZ3AZ) won world M2 with a score of 9,491,300 points (4,537 QSOs, 700 mults). This is a great result from the Canary Islands. The HC8N crew (K6AW, W6OTC, XE1KK, WK6I) was second at 9,271,164 points (4,433 QSOs, 703 mults). World third was Z37M (ops: Z31GX, Z31MM, Z32ID, Z35T, Z36W) which scored 3,569,682 points (2,835 QSOs, 543 mults).

Multi-Op Single Transmitter All Band High Power. The unique rules of the RTTY Multi-Operator Single Transmitter class continue to produce a large number of entries every year, particularly from European stations. This time the players were somewhat different than in 2005 and the scores were not quite as high. The winner was OM8A (ops: OM2KW, OM2VL, OM3BH, OM3NA, OM3RM, OM7JG) which scored 4,277,004 points (2,665 QSOs, 642 mults). In world second was HG1S (ops: HA1TJ, HA1DAI, HA1DAC, HA1DAE), scoring 4,063,760 points (2,606 QSOs, 632 mults). RU1A (ops: RK1AM, UA1AKC, RW1AC, UA1ARX, Yuri) came in third with a score of 3,413,797 points (2,402 QSOs 613 mults). As we mention annually, the 1999 KH7R Oceania (2.8mm points) and 1996 TY1RY Africa (2.7mm points) MOH records continue to survive without serious challenge.

Multi-Single All Band Low Power. As in MOH, the MOL results were not as good as in 2005. The winner, moving up from second in 2005, was UT3HWW which competed with only two operators (UT4HZ, UZ7HO) and scored 1,260,280 points (1,473 QSOs, 392 mults). Moving up from world third in 2005 and improving its score from last year was second place winner, KP2D (ops: NP2W, NP2DZ, KP2VI, NP2DJ), with a score of 1,143,325 points (1,107 QSOs, 415 mults). In third place was UN8LF (ops: UN9LEZ, UN7-034L, UN9LCN), scoring 825,360 points.

Clubs

This time, thanks to the efforts of Mike, K4GMH, the Potomac Valley Radio Club agreed to sponsor a new category of plaque for CQ WW RTTY (as well as for CW WPX RTTY): Club Competition. Many people designated their clubs in the Cabrillo header, but one club, the

2006 CQ WW RTTY CONTEST PLAQUE SPONSORS AND WINNERS

Single Operator High Power

World: Sponsored by John (Bob) Orton, WA6BOB. **Winner: ER4DX (Op: Sergey Rebrov, UT5UDX)**
N.A.: Sponsored by Wayne King, N2WK. **Winner: Tyler Stewart, K3MM**
USA: Sponsored by Joseph Young, W6RLL. **Winner: Terry Gerdes, AB5K**
Oceania: Sponsored by Steve (Sid) Ceasar, NH7C. **Winner: John Plenderleith, 9M6XRO**
Europe: Sponsored by Andrei Stchislenok, EW1AR-NP3D (in Memory of EU1MM). **Winner: SN7Q (Op: Krzysztof Sobon, SP7GIQ)**
S.A.: Sponsored by Radio Club Cordoba, LU4HH, and Juan Fedelich, LU3HY. **Winner: Rene Giorda, LU7HN**
Asia: Sponsored by Darrell Penrod, K9MUG. **Winner: Vadim Ovsyannikov, UA9CLB**

Single Operator Low Power

World: Sponsored by Don Hill, AA5AU. **Winner: ZX2B (Op: Wanderley Ferreira Gomes, PY2MNL)**
N.A.: Joseph Young, W6RLL. **Winner: Alfredo Velez, WP3C**
USA: Sponsored by George Johnson, W1ZT. **Winner: Michael McAmis, W1ECT**
S.A.: Sponsored by Trey Garlough, N5KO. **Winner: Nick Smith, P4ØKM**
Europe: Sponsored by George Johnson, W1ZT. **Winner: Vladimir I. Postnikov, UA3BS**
Asia: Sponsored by Jim Reisert, AD1C. **Winner: Paul Gross, 4X2Z**

Single Operator Assisted

World: Sponsored by Mike Sims, K4GMH. **Winner: Fulivio Tumidei, IK4MGP**
N.A.: George Marsloff, K4GM. **Winner: Mike Sims, K4GMH**

Single Operator Single Band

World 28 MHz: Sponsored by Steve Hodgson, ZC4LI. **Winner: John Morandi, LU1HF**
World 21 MHz: Sponsored by Charles Anderson, KK5OQ. **Winner: Antonio Duarte Gomes, CT3EN**
World 14 MHz: Sponsored by Dean St. Hill, 8P6SH. **Winner: Nikola Percin, 9A5W**
World 7 MHz: Sponsored by Neal Campbell, K3NC. **Winner: Robert Bajuk, S57AW**
World 3.5 MHz: Sponsored by Glenn Vinson, W6OTC. **Winner: Tone Crv, S54E**

Multi-Op Single Transmitter Low Power

World: Sponsored by David Robbins, K1TTT. **Winner: UT3HWW (Ops: UT4HZ, UZ7HO)**

Multi-Op Two Transmitter

World: Sponsored by *CQ* magazine. **Winner: EA8AH (Ops: RD3AF, RX3DU, RZ3AZ)**
N.A.: Steve Marchant, K6AW. **Winner: K1TTT (Ops: K1MK, K1TTT, KB1JZU, KM1P, N1MGO, W1TO)**

Multi-Op Multi-Transmitter

World: Sponsored by KA4RRU RTTY Team. **Winner: YT6A (Ops: IV3TMV, IV3YWT, S5ØXX, S5ØYL, S52X, YT6A, YT6Y)**

Club Competition

World: Sponsored by the Potomac Valley Radio Club. **Winner: Bavarian Contest Club (DL)**

TOP SCORES

Single Op High Power

ER4DX (Op: UT5UDX)	3,328,864	VE3DZ	2,584,008
K3MM	3,107,952	UA9CLB	2,531,192
SN7Q	2,675,139		

Single Op Low Power

ZX2B (Op: PY2MNL)	2,897,208	4X2Z	1,800,324
P4ØKM	2,159,111	WP3C	1,320,044
CN8KD	1,805,552		

Single Op Assisted

IK4MGP	3,094,938	EN9M	2,345,300
LZ8A	2,733,056	UR5QU	2,155,257
F5CWU	2,363,935		

Multi-Op Single Transmitter High Power

OM8A	4,277,004	TM6A	3,127,086
HG1S	4,063,760	EI7M	2,192,996
RU1A	3,413,797		

Multi-Op Single Transmitter Low Power

UT3HWW	1,260,280	9A7T	712,756
KP2D	1,143,325S	P9KDA	698,060
UN8LF	825,360		

Multi-Op Two Transmitter

EA8AH	9,491,300	K1TTT	3,346,576
HC8N	9,271,164	DQ4W	3,298,778
Z37M	3,569,682		

Multi-Op Multi-Transmitter

YT6A	5,757,143	RK2FWA	4,090,600
UU7J	5,555,443	RKØAXX	2,787,456
KH7X	4,444,470		

Single Operator

3.5 MHz

S54E	185,832	SP4MPG	127,504
S5ØA	173,715	YLØA (Op: YL2KA)	122,764
IQ1RY (Op: IK1HXN)	163,632		

7.0 MHz

S57AW	573,522	CT3EE	488,130
I4IKW	514,230	EO6F (Op: UXØFF)	323,595
IY4W (Op: IK4MHB)	498,575		

14 MHz

9A5W	868,020	EF8A (Op: EA8AUW)	749,784
CT3KY	856,560	EO5M (Op: URØMC)	605,280
7XØRY	812,175		

21 MHz

CT3EN	576,462	9A7R	339,040
AY8A	487,859	F5MOO	315,129
L44DX	388,056		

28 MHz

LU1HF	156,500	RU6CQ	4,930
LW1HDJ	15,732	LW6DDS	2,460
CT1FJK	5,338		

Bavarian Contest Club, was the decisive winner with 11,233,414 points. The results for the next five clubs were fairly close, as follows: Northern California Contest Club (9,408,223 points), Potomac Valley Radio Club (8,865,046), Contest Club Ontario (8,611,929), Yankee Clipper Contest Club (8,598,093), Ukraniane Contest Club (8,512,841). ***Note:*** Those of you who are eligible and who choose to designate a club affiliation should write the ***full name of the club*** on the appropriate line of your Cabrillo header.

Summary

As CQ WW RTTY completed its 20th year, Mike, K4GMH, joined our team as head of the plaque program. Please communicate with him (k4gmh@arrl.net) regarding any plaque questions, particularly sponsorship. Paolo, I2UIY, again tabulated the most popular logging programs for this contest as follows: N1MM Logger (424), WriteLog (318 logs), MixW (223 logs), and RCKRtty Logger (80 logs). Those of us still using RTTY by WF1B do not show up in the statistics because these logs require conversion by some other utility to Cabrillo format. While all of these programs and others allow one to submit a log very quickly after the contest, they do not necessarily do the conversion equally easily and accurately. Accordingly, you will usually find it worthwhile to review your log to correct obvious errors—*and* to refer to Paolo's www site for his tips on preparing your log: <www.i2uiy.it/cqww.html>.

To check all-time CQ WW RTTY Records, look at <www.rttycontesting.com>, maintained by Don, AA5AU. For comments by participants, see the QRM below. Additional QRM and a list of the station operators can be found on the CQ website: <www.cq-amateur-radio.com>. Go to the contest section, to the 2006 CQ WW RTTY DX Contest Expanded Results.

We have generally succeeded in converting RTTY contesters to submitting their logs electronically, with virtually all logs (this year all but two!) now submitted via e-mail to <rtty@cqww.com>. However, because the participation in this contest continues to grow so rapidly, some newer participants neglect to note that *the rules for this contest require recording the received state/province and zone information and submitting the log in proper Cabrillo format.* If the submitted log does not include all of the critical exchange data (including zones, states, provinces) from the raw log, the log-checkers can do little to salvage the log. Accordingly, please carefully follow the instructions in your logging software (or your Cabrillo-conversion program) to be sure that all of the required fields have been included in your final log before submitting it to the robot. *Also remember to read carefully any error message from the robot. The required language in the headers is precise and noted in each category as shown above—not simply anything you or your logging program decide to put there.* Those errors are the most prevalent in the logs that required some editing by I2UIY, N5KO, and I2EOW. In addition, Paulo and I2EOW converted many non-Cabrillo logs to Cabrillo format prior to their being submitted into the master log-checking process. As in prior years, we received a large number of check logs which were very helpful for log-checking. Thanks to all who submitted these logs.

The 2007 CQ WW RTTY DX Contest

The 21st annual CQ WW RTTY DX Contest will be run on September 29–30, 2007. Please note that *Cabrillo*-format logs are *highly encouraged for all entrants with e-logs required from all potential high scoring entrants in any category. Also, any computer-generated log with more than 100 contacts must be submitted via e-mail or on a 3.5" diskette via snail mail.* For those who submit diskettes, please remember to send the diskettes in a protective envelope. E-mail is clearly the most reliable and easiest mode for log submissions, but we welcome all logs, including (subject to the restrictions described above) paper logs, no matter how they may be sent. Finally, *the deadline for log submissions is October 26, 2007.* The full text of the 2007 rules will be published in the July issue of *CQ* and on the *CQ* website at <www.cq-amateur-radio.com>. *Please read the rules carefully prior to the contest,* and please note that *all* logs submitted via e-mail go to <rtty@cqww.com>.

73, Glenn, W6OTC, and Paolo, I2UIY

QRM

2EØTGS: Using IC-706IIG 50 watts and homebrew multiband vertical antenna. This was my first RTTY contest and enjoyed it very much. Looking forward to the next one. **7N2UQC:** I was able to enjoy this contest. Tnx for a fine contest again. Rig: IC-706, antenna dipole. **8P2K:** Missed four states—WY, ID, ND, and SD. Propagation wasn't bad, but it certainly was not great! Thanks to all who stopped by on 20m. **9A5W:** Worse condx on Sunday prevented me to achieve score higher than one milion points. Anyway score is higher than existing world record. Excellent activity. **9M6XRO:** Yaesu FT-1000MP transceiver and Quadra linear. Power 400W. Lightning Bolt 2-ele quad, Butternut HF2V vertertical both up 27m. Variable band conditions over the 48 hours but always interesting. Very difficult to get states for multipliers from 9M6 at this point in the sunspot cycle. **AA5AU:** Excellent condx on 40m. It was nice to finally get some RTTY seat time! **BA4RF:** It was my first ever RTTY contest. Quit the contest 11 hours before contest end due to XYL QRM, hi. Thank you very much to all the guys who QSOed with me. **CT3EN:** First of all my thanks to the Madeira team members for helping me to assemble and prepare our contest QTH for this event. The contest went the way I planned. Pity that I found less participation than in previous years on this band. **CU2JT:** Came home from a trip late Saturday evening so no chance to participate with any serious intent. I just had some fun giving some of my friends the CU multiplier and also worked some new ones. Next year I will plan the itinerary better and participate with full strength. **DF7JC:**

Great contest with a lot of activity. Real fun all the time. **DK7UM:** Participating was fun again. Tnx to all who spent time and effort for our benefit. **DM6DL:** Only 75W and wire antenna, so tnx to all who were kind enough they worked my little station. **EA3NY:** Configurating my station from 12:00 Saturday to 14:00 next day. I was exhausted. I bought another software at 05:00 AM local time during the contest :-). 14 hours after the contest began I was more or less prepared. **EA8ARG:** This was my first RTTY contest! With only 100W output it was very difficult to be heard. Thanks to everyone who worked me and sorry about those who tried but couldn't copy me. 73 and see you in next RTTY contest. **EI7M:** Great contest and good result seeing it was our first semi-serious attempt at an RTTY contest. Thanks to all who called us. **F5CWU:** First entry with SO2R system. Really amazing how the 2-radio improves the fun during the contest even from France. Thanks to F6FYA who let me use his antennas during the weekend. **GØBRC:** Another great contest but conditions did not seems as good as in 2005. We had the usual spate of problems: water in antenna feeders, computer crashes, but all in all those who took part are ready to do it all over again in 2007. Equipment used FT-1000MP MKV and linear for 400W, 4-element beam and wire dipole 80m. **GØPSE:** I'm not a 48-hour contest man. I went to bed both nights, stopped for meals and to watch my favourite TV programmes, yet I still met my target of 100,000 points. **GM3SEK:** Spent most of the weekend helping with a Foundation licence class. Pleased to report that my wife aced the exam! **GUØSUP:** Great fun! And good conditions for the first day too, which helped, but could have done with the same on Sunday. Some nice DX about and got some in the log. Thanks to all for sponsoring the contest and to the log-checkers, too. **HB9LF:** Our first M/S action from our club station HB9LF. In the beginning we faced problems with the filter settings of our IC-756PRO II using MMTTY as contest logging program. Effectively we ran 200 watts HF into our FB706 beam. See you all next year again with a much stronger signal. **HK3SGP:** Great contest again. Many DX stations on 40. Many thanks to all the stations that worked me. So many signals, so little time. See you next year only on 80m. **IT9BLB:** Won the MSC (Most Stupid Contester) plaque! I seriously worked the contest on 20m using the packet cluster, too, being sure to join the SO20-Assisted category that doesn't exist in the RTTY leg of CQ WWs. Anyway, super fun! **JM1NKT:** Good conditions so that I could enjoy the wonderful contest. **KØBX:** For the bottom of the cycle there sure was a lot of activity. Conditions not the best but 40 meters was a real zoo! **K3MJW:** This was the first operation in this contest from our club site. We all had a great time. We combined a family picnic at the club on Saturday afternoon. **K4UTE:** Big surprise to have ZD8I call me with 2 minutes left in the contest for new zone and country! **K7RE/Ø:** Conditions not the best but I still had lots of fun. Activity every year increases by leaps and bounds. **KCØNKW:** First time in CQ WW RTTY. Thanks to KU1CW for all the help. I love RTTY! **KH7X:** Bottom of the cycle conditions and a new Oceania M/M record (KH6ND). **LZ8A:** Thanks to sponsors and all participants for this nice contest (LZ2BE). **MØUNI:** Had great fun. Got some good DX calls and everything worked fine too. Just wish I could have run for more hours. **N4CBK:** My first real effort. Fantastic contest. Saw lots of friends. Made new ones. **NG1G:** Lots of activity and good DX! My favorite moment was when my good friend N1HRA and I both answered my brother WE1H's CQ on 40m at the same time. The resulting round robin of exchanges that ensued left me smiling for the rest of the contest. **NO2T:** Getting too old for 48 hours. Only was able to last for 28 hours this year. Had fun and that is what counts. **OH3OJ:** Main effort on 40m but unfortunately was not having time to run last 9 hours of the contest. See you next year again and hope 15/10m starts to be more of use also. **ON5SV:** A lot of pleasure spent at the keyboard! **PI4COM:** No top honors this year, but taking all part-time operators together we came up with 17 hours of RTTY fun. Thanks for yet another enjoyable contest experience. CU next time. **RU1A:** Great activity! Poor condx on 40 m. **S50R:** Started on 20m but on Sunday noon burned the balloon and I continued on 21 MHz. Saturday the conditions were OK, but Sunday zero! Anyway I enjoyed the contest in the mountains in nice weather. **S54E:** Good run first night but bad propo second one. Anyway I managed to overcome last year's score and claimed new word record on 80m SOSB! **SV5DKL:** Had forgotten how much fun RTTY can give you! Participated mainly for promotion of SV5 in RTTY. I wish I could spend more time on it! **VA3PC:** Nice to have antennas back in the air. Thanks to those who answered my attempts at running. See you in the next one. **VK4EJ:** Had a ball in this contest. Got some all-time new DXCC entities for RTTY. Plenty of activity but hard work on low power from VK. **VU2PTT:** Back on air after 8 years. My first RTTY contest and enjoyed it! Wired up an interface from IC-746 to N1MM Logger on the day of contest. Managed less than 4 hours intermittent operation. More next time. **WØGJ:** No DX worked second night. I watched an incredible auroa borealis display cover the entire sky for hours! Nice, but not nice! **WA1FCN:** Two power failures cost me some lost QSOs. Ah, lesson learned: Save often. Also first RTTY contest with this rig. I need another filter. **WN1GIV:** Closest I've come to a full-time effort in a 48-hour contest and waited until age 66 to try it. I need my sleep! **YM125ATA/4:** For the memory of Ataturk's 125th birthday. **ZS2EZ:** Poor conditions compounded by 20m antenna failing on Sunday. Had to finish contest using my 40m dipole on 20! 80m a washout due to poor antenna. Nothing heard on 10m either. Still a better score than last year!

(Continued on page 109)

Important On-Line Resources

To prepare for the 2007 contest, please refer to the following on-line resources:

Contest rules: <www.cq-amateur-radio.com>
Contest records: <www.rttycontesting.com>
Cabrillo specifications: <www.kkn.net/~trey/cabrillo/spec.html>
Cabrillo template for this contest: <www.kkn.net/~trey/cabrillo/cqww-rtty.txt>
Log preparation tips: <www.i2uiy.it/cqww.html>
Log submissions: <rtty@cqww.com>

Gather your loops, beams, and Doppler sets. Then get together with fellow club members for fun on the highways and in the woods this spring.

Announcing:

The Tenth Annual CQ WW Foxhunting Weekend May 12–13, 2007

plus

Results of the 2006 CQ National Foxhunting Weekend

BY JOE MOELL,* KØOV

Joe Loughlin, KE6PHB, displays the well-camouflaged antenna for T #1 of the 2006 April Fool's foxhunt in San Diego. (Photo courtesy of Mike Rienzo, KI6ACI)

What ham radio activity combines ingenuity, intrigue, and suspense? Hidden transmitter hunts—which are called by many other names, including foxhunts and bunny hunts—have it all and more. Get your share of foxhunting adventures by participating in this year's CQ World-Wide Foxhunting Weekend, May 12–13.

*ARRL ARDF Coordinator, P.O. Box 2508, Fullerton, CA 92837
e-mail: <homingin@aol.com>
web: <www.homingin.com>

The idea is simple: Find the transmitter (or transmitters) that your fellow hams have put on the air. Depending on local preferences, the hunt can be in daytime or darkness, on foot or in cars, covering a small park or a big state. Rather than trying to list all the possibilities, I'll share some reports from 2006 that show the usual and unusual ways that hams had fun with radio direction finding (RDF).

In southern California, where I live, no weekend goes by without a 2-meter mobile transmitter hunt. (We call them "T-hunts.") In other places, one or two competitive mobile hunts per year are sufficient. Several clubs, such as the Xerox Amateur Radio Club of Rochester, New York have their annual spring hunt on *CQ*'s Foxhunting Weekend. Jon Dickason, N2JAC, sent a report for the 2006 XARC event, which was a basic mobile hunt with one transmitter to find. John hid it and Fred Miller, WO2P, was first to bag it.

Fred likes to build little transmitters, so he put one out just before the mobile hunt for everyone to track down on foot. Judy Stonehill, N2KXS, got there first. Simple one-fox-at-a-time hunts are excellent for encouraging newcomers, especially if the huntmaster is willing to give some clues as the hunt progresses. Make sure that everyone eventually has success.

Two T's = Double Difficulty

As foxhunters become more experienced, it takes more sophistication to keep them at bay. In places such as Albuquerque and San Diego, where regular hunts have taken place for many years, the level of cunning and intrigue has become very high. Scott Stevenson, KC5VVB, of Duke City, used technical trickery on his fellow hunters during a mobile hunt last spring.

"I set up two transmitters with the same ID, frequency, and interval," Scott wrote. "I made up a sync cable so that both

2007 CQ WW Foxhunting Weekend May 12–13

We've changed the name of this event from the National Foxhunting Weekend to the CQ World-Wide Foxhunting Weekend because transmitter hunting is a source of fun for hams all over the world.

CQ doesn't impose any rules or offer any certificates for its Worldwide Foxhunting Weekend. It's all up to you and the hams in your hometown. You don't even have to schedule your hunt on May 12–13. Any weekend in the spring will be fine! For many clubs, Foxhunting Weekend kicks off a season of regular transmitter hunts. For others, it's a special once-a-year event, like Field Day.

Some hams prefer formal transmitter hunts with carefully crafted boundaries, specifications for signal parameters, time limits, and so forth. Others are completely content just by having one or more signals to hunt—no need for any more regulations, they say.

Whatever your club's RDF contesting style, be sure to keep safety in mind. Don't put transmitters where someone might get hurt getting to them. Always be mindful of your physical limitations as well, and never take chances behind the wheel.

Afterwards, write up the results and send them to me. The list of information in a complete CQ WW FW report is posted at my website: <www.homingin.com>. Besides the details of date, location, hiders, and winners, readers also want to know what was unique about your hunt and what lessons (positive and negative) you learned from it.

transmitters would be perfectly synchronized. They sent exactly the same audio at exactly the same time. My goal was to make it appear as if there were only one transmitter."

For the site, Scott chose Bear Canyon Arroyo retention basin, a 10-acre dry lake with a dam on the west side. This location is shielded by hills from the starting point, allowing him to bounce the 2-meter signals off the Sandia Mountains at the start, giving confusing initial bearings. "The transmitters were separated by about 150 meters," Scott explained. "One was 6 feet above ground in the vee of a cottonwood and the other was in the bottom of a small arroyo, about 3 feet below grade.

"The hidden signal at the Albuquerque start point was weak and presented an extremely wide initial bearing," Scott continued. "The dual transmitters seemed to mix and gave the impression of a week signal, even as the hunters grew near. There were the usual reports of varied bearings and hot and cold

spots that we see on bounce hunts. A couple of teams took excursions around town following misleading bearings.

"When they got to the end of the nearest road, on-foot 'sniffing' was a challenge. All immediately homed in on the closer transmitter as they arrived, the one in the arroyo. About half had realized that there was more than one fox on the air. A clue was that synchronization of the foxes had become about a tenth of a second off after 2 hours.

"It was impossible to home in on the second transmitter while standing near the first. Between the two foxes was a region of high apparent intermodulation. There was a null about half way between them where several hunters took off on a perpendicular bearing, but this was short-lived. After some questions about my heritage, all eventually found their way into the influence of the second fox, some by search pattern, others by wondering around."

The mobile T-hunters of San Diego love tricky hunts, too. Like their counterparts in Albuquerque, when they're not hunting, they're exchanging e-mails about past and future hunts on the local e-mail list. What better time for a hider to play tricks on the hunters than April Fool's Day, and the team led by Tony Boegeman, WA6ZMZ, was up to the task. Tony told everyone that there would be two transmitters to find this time.

One team member, Joe Loughlin, KE6PHB, arrived at the starting point with the other hunters. He fibbed to everyone that he was testing a new RDF system, so he would be hunting alone. After the hunt for the first transmitter began, he high-tailed to the ending point, where Tony and Mike Rienzo, KI6ACI, had placed transmitter #1 up in a tree. Its antenna was cleverly concealed in the branches. Just to keep the hunters on their toes, they had placed a decoy non-transmitting foxbox and a squawking handheld nearby.

Arriving before the other hunters, KE6PHB was ready for the big deception. WA6ZMZ picks up the story: "We helped Joe set up transmitter #2 in his coat pocket, with the wire down his sleeve to his sniffing Yagi. His sniffer receiver was disconnected, but that wasn't apparent. Soon the other teams were there.

"After about 20 minutes, T #1 in the tree was found. Now it was time to find T #2, which was Joe. When hunters went the wrong way, Joe would point the beam at them and the signal would go up, making them continue going the wrong way. When they came toward

It's always green in Seattle. Enjoying a foxhunting weekend stroll through the verdant lawns of the University of Washington Campus are (left to right) Graylan Vincent, KC7YVN, Amar and Gordon (no calls), Jamie Green, N7KCE, and Art Jury, KF7GD. (Photo courtesy of Art Jury, KF7GD)

him, he would point his beam away and down. When they looked at a bush, Joe would go to the other side of the bush and point into it. Then there would be this do-si-do around the bush with hunters saying, 'It's in here!'

"After one bush was beaten to a pulp, Joe would move to the next bush. This went on for a number of bushes and about 45 minutes. Then we increased the transmission rate of the Joe-T to 15 seconds every 30 seconds. That did not help the hunters much, as Joe was warming up to the game. A number of bushes will not be a fire threat next year.

"Finally, Joe moved in to the middle of the hunters and pointed his beam at them. Marty Herlihy, K6KTP, looked at him and said, 'Joe you're an 8 on the attenuator; are you the T?' At last, it was over. April Fool's!"

Most San Diego T-hunters are willing to experiment with unusual hunt rules. In July they were required to find a mov-

Foxhunt participants at Antennas In The Park in southern California ranged in age from pre-teen to senior citizen. Travis Wood, AE6GA, is helping his son Garrick get bearings with an antenna system that's as big he is. (Photo by Joe Moell, KØOV)

ing transmitter, without being told what kind of vehicle it was in. The mobile T stayed off the freeways and all the hunters were able to catch up in about an hour and a half.

In his report on that hunt, Joe Corones, N6SZO, wrote: "I think everyone was pleasantly surprised at the outcome of something that seemed so overwhelming at the beginning. It ended up being lots of fun and certainly not as impossible as was first thought. This was close to what we all may have to do someday in a real life situation, but without any rules!"

The San Diego T-hunters have a website where you can read hunt reports and see some clever videos[1] of their adventures.

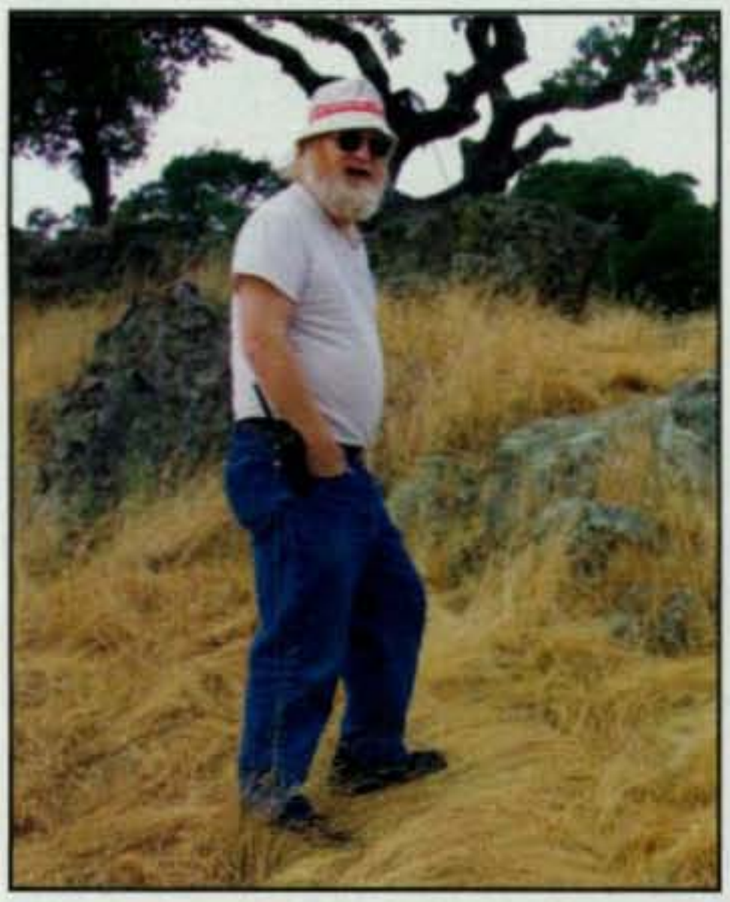
Of course, the best laid plans of transmitter hiders sometimes go astray. "The road to success was paved by Murphy," wrote Bob Ledford, WA4IDI, in his report about a spring hunt in the Daytona Beach, Florida area. "Every team was using basically the same setup—a Doppler scanning system, back-up receiver on a separate antenna, and a mobile radio. No two Dopplers were the same.

"Richard Cook, W2RAC, made his first fox transmission," Bob continued. "Nobody could hear him at the starting point. He came back and made another test, and it must have been a fluke, as everyone heard him. He immediately launched into the bunny-hunt mode. We called him back on the repeater and told him that we could no longer hear him at all. He gave us directions on the repeater to go south. Everybody found a route that would go south and headed out.

"During our trip, the most my team heard him was perhaps five seconds total. We tried to raise him several times on the repeater, to no avail. We were communicating with other hunters, all experiencing the same difficulty. We exchanged locations back and forth several times and soon we all were in the same neighborhood."

Eventually, one hunter heard the very weak signal reliably and was able to close in. The hunters then headed for Steak and Shake to compare notes. "All of us except the bunny, that is," wrote WA4IDI. "He couldn't hear the directions."

Paul Gruettner, WB9ODQ, has done a good job of building up foxhunting in the Milwaukee, Wisconsin area. Activity is increasing and hunts are taking place in all kinds of weather. Paul wrote about a recent hunt: "Charles Bucci, N9CFK, started all of the hunters from a heated shed in the middle of RC Flying Field Park in Franklin. This consists of several square miles of marsh to the east



Rich Harrington, KN6FW, stands near his hidden transmitter for the Pleasanton T-hunt in May 2006. He doesn't realize that a rattlesnake is in those rocks by his left foot. (Courtesy of Jim Sakane, KD6DX)

After finding radio foxes at Antennas In The Park 2006, it's time to enjoy the traditional Foxhunting Weekend cake, supplied by April Moell, WA6OPS. Last year the icing had edible photos from the USA ARDF Championships that took place in the previous month. (Photo by Joe Moell, KØOV)

of the shed and thick woods followed by a farmer's field to the west.

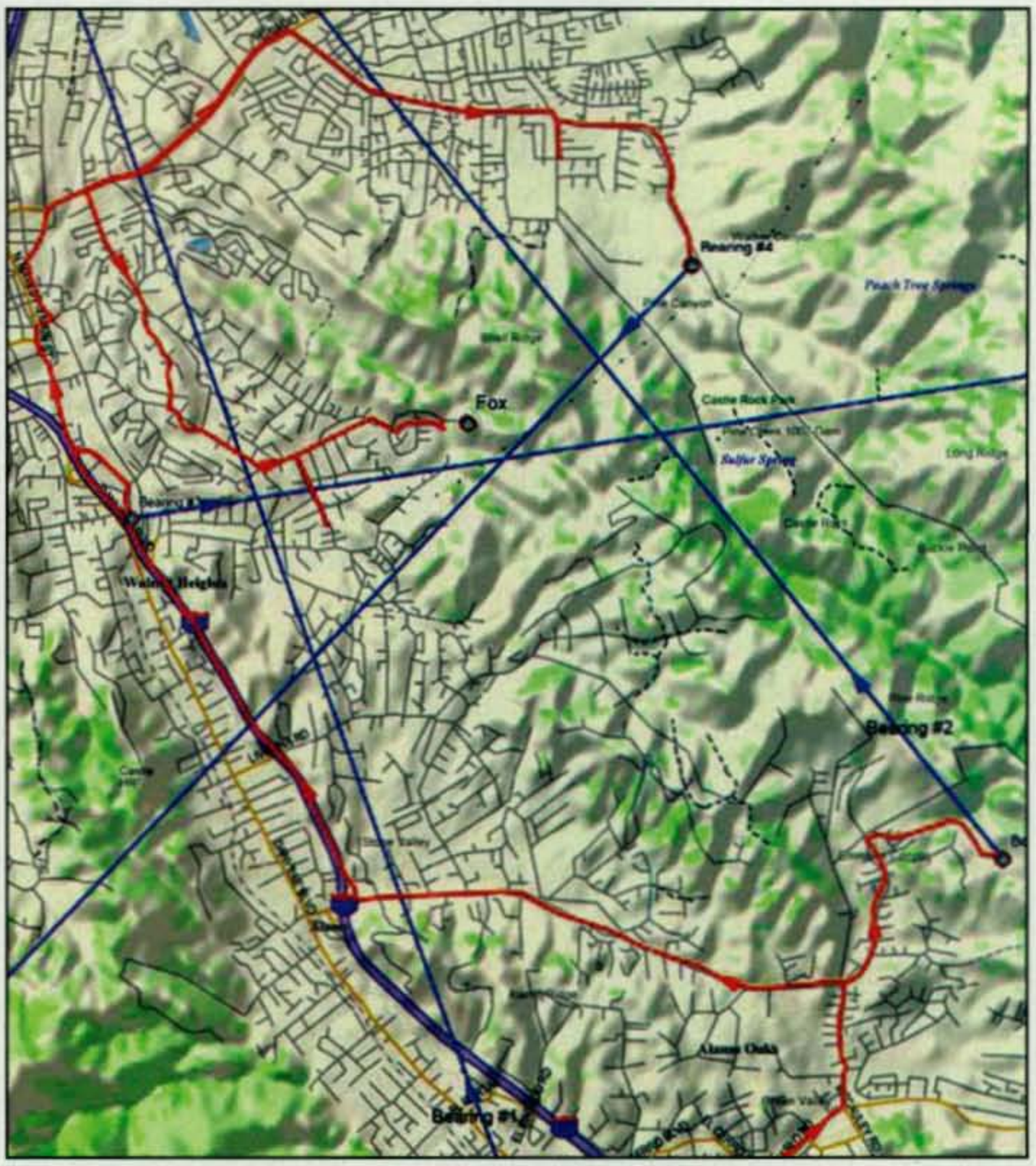
"With the recent snow storm, both the marsh and the field were transformed into a winter wonderland of ice and snow. The temperature was only 16 degrees. With the wind blowing across the marsh, Charles was the only one who stayed warm in the shed. He had set two transmitters, and at the start of the hunt he sent half of the hunters towards one and the other half towards the other.

"Transmitter #1 was hidden at the far end of the park, across the marsh, stuck in a snow bank along a creek. Transmitter #2 was to the far west in the farmer's field, buried under a small patch of snow. The team of KC9GMW and KC9ITP showed everyone just how easy fox hunting is, finding #1 in only 11 minutes and #2 in 22 minutes. The rest of the hunters ended up spending a lot more time in the cold. After the hunt everyone met at a restaurant to thaw out and enjoy some good food and conversation."

Fun by the Van-Full

When I hide a transmitter in a place that I think will be difficult to find, I wonder what it would be like to ride silently along with hunters as they try to find it. That's sometimes the way they do it near Portland, Oregon, as I learned in a report from Dale Hunt, WB6BYU.

The Yamhill County Amateur Radio Emergency Service has monthly mobile training hunts that usually include two



The track of Jim Sakane, KD6DX, in the May 2006 Pleasanton T-hunt shows the effect of reflections on his bearings. His 37.5-mile route was the shortest in the hunt, but he made two incorrect forays into the hills. This happens to the best of T-hunters. (Courtesy of Jim Sakane, KD6DX)

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transmitters, one on 2 meters and the other on the practice frequency for aircraft Emergency Locator Transmitter (ELT) tracking. Dale and his wife Kuon, KB7WRG, are regular participants, and they like to fill their van with newcomer ridealongs.

Before last May's hunt, Dale hid the 2-meter foxbox and Kuon set out the ELT beacon. Then they both took off from the county parking lot start point in their van, with a ridealong helping, to find each other's transmitters. The ELT could not be heard, so Kuon took bearings and tried to guide Dale toward his 2-meter transmitter. Along the way, she mused about the possibility of it being hidden in a construction porta-potty. Eventually, bearings led to an area of new construction, with streets not on the map, and indeed the box was behind a portable outhouse.

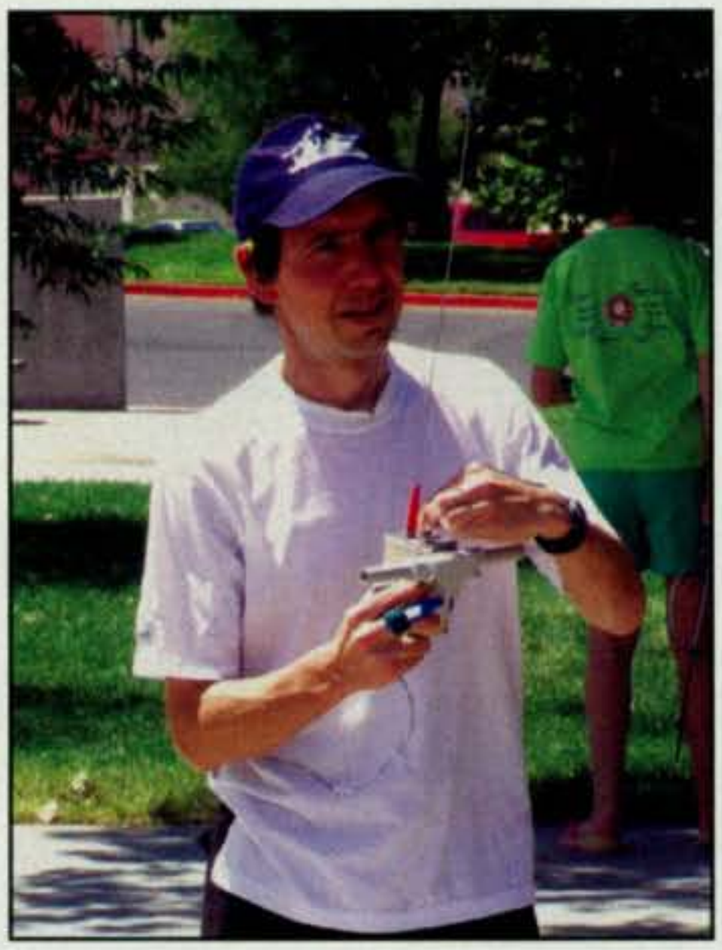
They still couldn't hear the 50-milliwatt practice ELT at that point, so Dale headed to Fox Ridge Road to gain some altitude. "On the way, we were stopped by a policeman who had been called to investigate a suspicious car in the construction sites north of town with a funny thing on the roof," Dale wrote.

A weak bearing from Fox Ridge led them to go southwest. It got stronger as they went that way, then just as they thought they were closing in, it got weaker again. Eventually they found the beacon on a nearby dirt road. What had caused the signal to get weaker as they approached?

"The lesson to learn this time was terrain shielding," Dale concluded. "The ELT location had a view of the highway, but with the hills around it, the strongest radiation was down the creek valley. Also, some of our bearings pointed to metal buildings along the road that were in the strongest part of the radiated pattern from the ELT antenna, which had fallen over in the tall grass."

Another place where terrain shielding and VHF reflections abound is Utah. It was good to get a 2006 report from the Salt Lake Valley, sent in by Larry Jacobs, WA7ZBO, of the Ophir State Wireless, DX and Toaster Repair Society. (Is that the real name, Larry, or did you make it up just for me?)

WA7ZBO set out two transmitters and the hunters started out from the Taylorsville area to look for them. "The main T ran 10 watts into a 6-dB gain omni antenna overlooking the valley," Larry wrote. "Signal reports came in from 50 miles in both directions. The second foxbox ran 200 milliwatts from a sprinkler valve box in the ground about 100 yards away from the main fox."



Bryan Ackerly, VK3YNG, was on the winning team of the Victorian Foxhunting Championships in May 2006. It is always fun when Bryan and fellow hunters from down under come to the USA to participate and share stories. In this photo Bryan is testing an 80-meter set prior to the 2005 USA ARDF Championships in Albuquerque. (Photo by Joe Moell, KØOV)

This was a hunt-when-you-can event that lasted for the entire Foxhunting Weekend. Larry reports that both transmitters went on the air at 4 PM Friday and stayed on until 11 PM Sunday. He didn't say how the winners were determined, but he declared that they were Johnny Biggs, N7CN, and Clint Turner, KA7OEI.

Foxhunting has had an up-and-down history in Washington State. Back in 1991, members of the Northwest ELT Tracking Team took top honors at the Friendship Radiosport Games foxhunt in Portland. Later in the decade, there were regular mobile T-hunts. Since then, most of those hunters have dropped out or moved away. However, activity is picking up again. One of today's prime movers is Art Jury, KG7FD, who got involved in on-foot radiosports when living in southern California about five years ago.

Art teamed up with Jamie Green, N7KCE, to arrange a walking foxhunt on May 21 within the University of Washington campus. So that all could enjoy the fun of hunting, everyone took turns hiding the two transmitters. "Weather forecasts were all over the map," Art reported. "But the morning of the hunt proved to be perfect, with enough sun to make a beautiful day and enough clouds to keep us from overheating.

"We were able to run several rounds," Art continued. "It was interesting to see how devious people could be when hiding transmitters. One was placed in the light well of a public bulletin board. The board reflected the signal in such a way that the hunters got a strong heading as they approached it, but if they moved behind it, the signal would drop to nothing.

"Perhaps the trickiest hunt was instigated by newcomer Gordon. He placed my transmitter in a vent at the bottom of a utility stairwell in the back of a building on the quad. It gave us fits, and we never did find a good signal. We were stymied

More Foxhunting Opportunities

As you pack for your trip to the Dayton Hamvention® in May, don't forget the direction-finding gear. The almost-annual Foxhunt Forum is scheduled for Saturday, May 19 in Room 5 of Hara Arena from 11:45 AM to 1 PM. Then on Sunday, this country's first formal ARDF event for the blind will take place at Sinclair Park, about 2 miles southwest of the arena. It will be patterned after similar competitions that take place in Europe. That hunt will be on the 80-meter band, with loaner equipment available for all competitors who need it. A practice session will be scheduled beforehand for all who are new to the sport of ARDF and 80 meters. Pre-registration is important for planning purposes. More information is at <www.ardfusa.com>.

Watch the web for other special RDF events in 2007. For instance, you can enjoy good food and hunt transmitters at Antennas In The Park in Placentia, California on May 12. What will the Foxhunting Weekend cake look like this year? Directions and details are at <www.homingin.com>.

The WA7ARC Radio Club is planning its first annual foxhunt with valuable prizes on June 16, 2007 in Hoquiam, Washington. Mobile and on-foot RDF skills will be necessary to win this one. Details are at <www.wa7arc.org>.

The biggest foxhunting event of 2007 will be the Seventh USA ARDF Championships, combined with the Fourth IARU Region 2 ARDF Championships, September 14–16 near south Lake Tahoe, in the Sierra Mountains, near the border between California and Nevada. The championship hunts are all on foot; no vehicular T-hunting is involved. Competitors are divided into age/gender categories as they compete individually for medals and places on USA's team to the next World Championships. Everyone is welcome. The latest information is at <www.homingin.com>.

by 'ghost' reflections from the other transmitter on a nearby frequency. With heavy hearts, we finally gave up and Gordon went to retrieve the transmitter. He discovered that he'd forgotten to turn it on. To be fair to him, the power switch my transmitter was unmarked, a point which has since been corrected."

In southern California, Foxhunting Weekend is an opportunity to invite newcomers to join the active ARDF community. The traditional venue is Antennas In The Park, an annual cookout and mini-Field Day hosted by the Fullerton Radio Club, with invitations for other clubs in the Orange County area to join in. The site is Tri-City Park, located in Placentia near three other cities: Fullerton, Brea, and Yorba Linda.

As usual, on-foot hidden transmitter hunting was the most popular activity at AITP-2006 on May 13. As one group of hams tested a monster 15-meter beam on a portable crank-up tower, others set out to find nine radio foxes around the lake. Three of them were just for the newcomers, all within 100 yards of the picnic area. Once a hunter mastered the technique by finding these 2-meter boxes, he or she was ready to try a short five-fox course with international-standards timing.

ARDF on 80 meters is still a novelty to most hams, so one 80-meter fox was in the park to be found. There was plenty of RDF gear for both bands to loan out to those who didn't have their own.

Play It Safe

In last month's invitation to participate in the 2007 CQ World-Wide Foxhunting Weekend, I reminded readers that safety must be a prime consideration on every foxhunt. Hiders must be sure that hunters can safely approach the hidden transmitters. However, sometimes the hazards are unexpected, as they were when Scott Stevenson, KC5VVB, and Jerry Boyd, WB8WFK, of Albuquerque practiced ARDF at Cienega Canyon in Sandia Park, on the road to the Sandia Peak ski area.

"Each of us took a transmitter into the field," Jerry wrote. "After placing it, we hunted the transmitter that the other person had placed. Upon finding a transmitter we would turn it off, relocate it, and place it back on the air, then wait for the other transmitter to come back on and hunt again. Multipath in this canyon is very bad and offered lots of practice in getting bearings in it.

"I was getting ready to place a transmitter when Scott called me on the radio and informed me that we had to evacuate the area because an aggressive bear had just attacked the picnic grounds. Apparently it had run off with someone's cooler. I was above that site on a ridge about 40 minutes before the attack and heard something big crashing through the woods below my location. That was the end of our practice session, as the New Mexico Department of Game and Fish had to come and remove the bear."

Fortunately, there aren't any bears where I live, but I have encountered rattlesnakes on two occasions when hiding transmitters. A rattler also showed up for the Pleasanton T-hunt last May, as reported by Jim Sakane, KD6DX, of the San Francisco Bay T-hunters. Rich Harrington, KN6FW, had chained his ammunition-box transmitter to a tree on a rural hilltop in the Walnut Creek area, not knowing that the critter was in the rocks nearby. Fortunately, the rattles warned everyone in time as they approached.

There were fewer reports from outside the U.S. last year, but I know that there was lots of foxhunting activity, especially radio-orienteering. Over two dozen nations were preparing their teams for the ARDF World Championships in Bulgaria.[2]

A news story in *The Hindu* newspaper from India tells of the growing popularity of amateur radio there, mentioning a former Prime Minister and a Congress leader who are hams and how foxhunting is an important part of the hobby. The Quilon Amateur Radio League organized a foxhunting event in the town of Kochi, India, which was well attended.

The largest Foxhunt Weekend event outside the USA had to be the Victorian Foxhunting Championships in Australia. This annual event brings together the best transmitter hunters in that country for a day and a long evening of strenuous competitions. This time these hunters needed both mobile and on-foot RDF gear for the 3.5, 28, 50, 144, 430, and 1296 MHz bands.

The starting point was in Blackwood. Ian Holland, VK3YQN, and his regular team members—Bruce Paterson, VK3TJN, and Roger Lewis, VK3HRL—were in charge, which meant that they arranged all 17 hunts as well as food for the hunters, which came from a local pub. The winning team was Bryan Ackerly, VK3YNG, Adam Scammell, VK3YDF, and three others.

With all these bands and hunts, there is no room for a full report here, but you can read all about it at the Victorian ARDF Group's website.[3] Look in the News Archive under Events.

What Will Your Club Do?

As you can see, last year was a great one for all kinds of radio foxhunting. This year promises to be even better. Now is the time for your club to make plans for 2007. If there has never been a hunt in your area, or if it has been a while, make it simple to get maximum interest and participation. If RDF is already a regular activity, try something new and encourage members who have not participated before.

Be sure to get together after the event to share stories with fellow hunters. Then gather the results and everyone's photos and send them to me for the report in *CQ* magazine next year. Report forms and more information can be found at my website: <www.homingin.com>. Happy hunting!

Notes

1. http://www.sdthunters.com/video2.html
2. http://members.aol.com/homingin/farsnews.html#bulgaria
3. http://www.ardf.org.au/

MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English!

Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . .
High-Performance Modem . . . Computer Interface . . . Battery Saver . . .

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Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you mis-copy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

MFJ-461
$89.95

Automatic Speed Tracking

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW.

Four Display Modes

1. Bottom line scrolls and fills with text, then that entire line is displayed on top line until bottom line refills -- makes reading text extra easy! Automatically displays speed in WPM.

2. Same as **1**, without speed display -- gives you maximum text display.

3. Top line scrolls, bottom line displays speed in Words-Per-Minute.

4. Both top and bottom lines scroll.

Two-line LCD display has 32 large 1/4 inch high-contrast characters.

MFJ Instant Replay

The last 140 characters can be instantly replayed. This lets you re-read or check your copy if you're copying along side the MFJ-461.

High Performance Modem

Consistently get solid copy from MFJ's high performance *PLL* (*phase-lock loop*) modem. Digs out weak signals. Even tracks slightly drifting signals.

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

Computer Interface

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

More Features

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable.

Battery saving feature puts MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery (not included).

True Pocket Size

Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 in. 5½ ounces.

No Instruction Manual needed!

Super easy-to-use! Just turn it on -- it starts copying instantly!

Accessories

MFJ-26B, $9.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $14.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $7.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ-5163, $10.95. Cable lets you use external speaker when MFJ-461 is plugged into radio speaker jack. 3.5 mm.

MFJ *Pocket* Morse Tutor

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$89.95

Learn Morse code anywhere with this tiny *MFJ Pocket-sized Morse Code Tutor*™! Practice copying letters, numbers, prosigns, punctuations or any combination or words or QSOs. Follows ARRL/VEC format. Start at zero code speed and end up as a high speed *CW Pro!* LCD, built-in speaker.

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MFJ-403P
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Built-in Iambic Paddle. Thumbwheel speed control. Adjustable weight. Adjustable sidetone with speaker. Iambic modes A or B. Fully automatic or semi-auto "bug" mode. Reversable paddle. Tune mode. RF-proof. Battery Saver. Tiny 2¼Wx3¼H x1D inches.

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MFJ-561, $24.95. 1¾Wx1¾Dx¾H in. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

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the weekender

BY PHIL SALAS,* AD5X

Dummy Load/Peak Detector

Last month we looked at some applications of Caddock and Ohmite non-inductive power resistors. This month we'll use these resistors to build an inexpensive HF-UHF 30-watt dummy load and peak detector.

While many hams don't have a dummy load, most have an external SWR/power meter, as well as an SWR/power meter included inside their HF transceivers. However, this metering capability often is not provided in VHF/UHF transceivers. Also, even in many HF transceivers the power/SWR metering has questionable accuracy, especially when not transmitting into a perfect 50-ohm load. As it turns out, you can easily build a dummy load/peak detector that will provide very accurate peak voltage detection through 6 meters and can even have reasonable accuracy through 450 MHz.

How do we do this? All we really need to do is add a voltage peak detector to a 50-ohm precision dummy load. As discussed last month, the Caddock thick film power resistors are accurate to within 1%, and they have typically less than 10 nHy of package/lead inductance. This makes them excellent for dummy loads into the VHF and even the UHF range when mounted properly. A simple peak detector circuit is shown in fig. 1. I used the Schottky 1N5711 detector diode, which works well into the low microwave frequencies when mounted with minimal lead lengths. This diode has a typical voltage drop of 100 millivolts when measured with a digital voltmeter—i.e., the peak voltage measured will be about 0.1 volt lower than it really is. This means that even at QRP power levels you can get a very accurate voltage, and hence power reading. Power is easily determined as follows:

$$\text{Power (watts)} = V_{rms} \times V_{rms}/R$$

However, we are measuring *peak* voltage. Since:

$$V_{rms} = V_{pk}/\sqrt{2}$$

then:

$$\text{Power (watts)} = V_{pk} \times V_{pk}/2R, \text{ or}$$

$$\text{Power} = V_{pk} \times V_{pk}/100$$

when using a 50-ohm load.

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

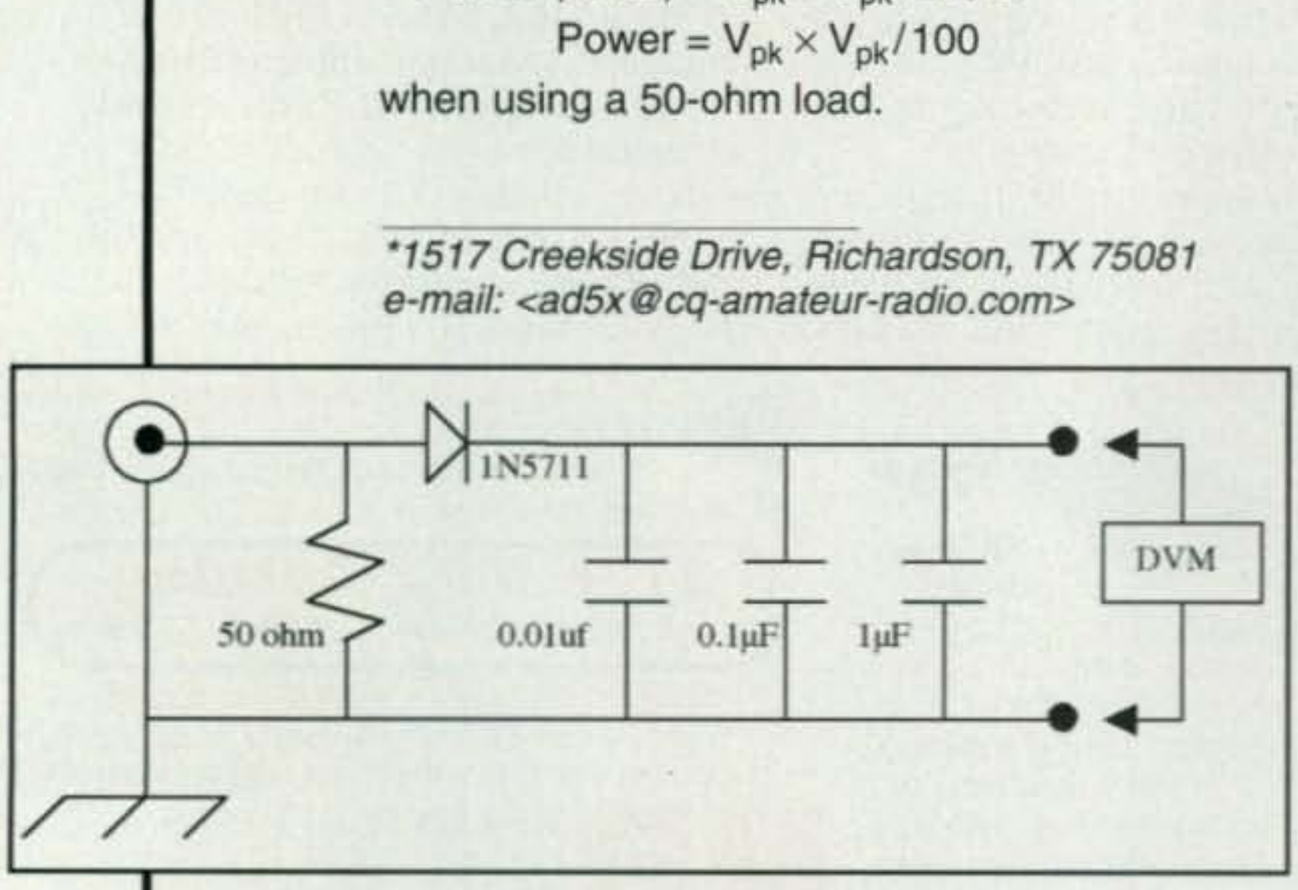


Fig. 1– A simple peak detector circuit.

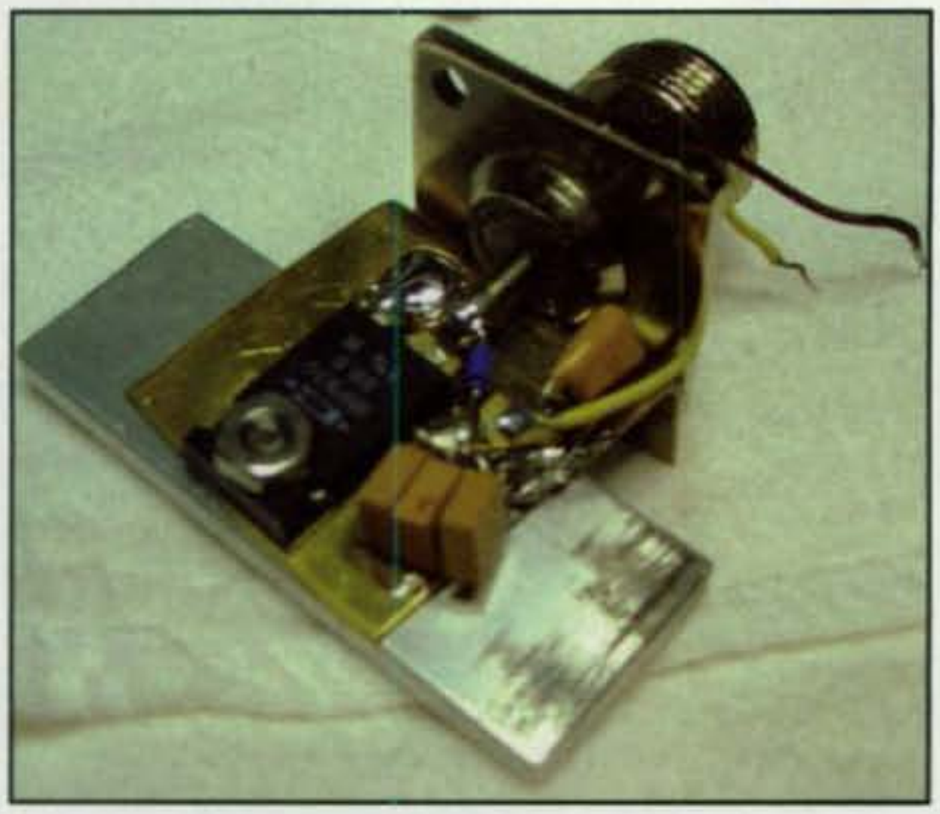


Photo A– Interior view of circuit before mounting in the project box.

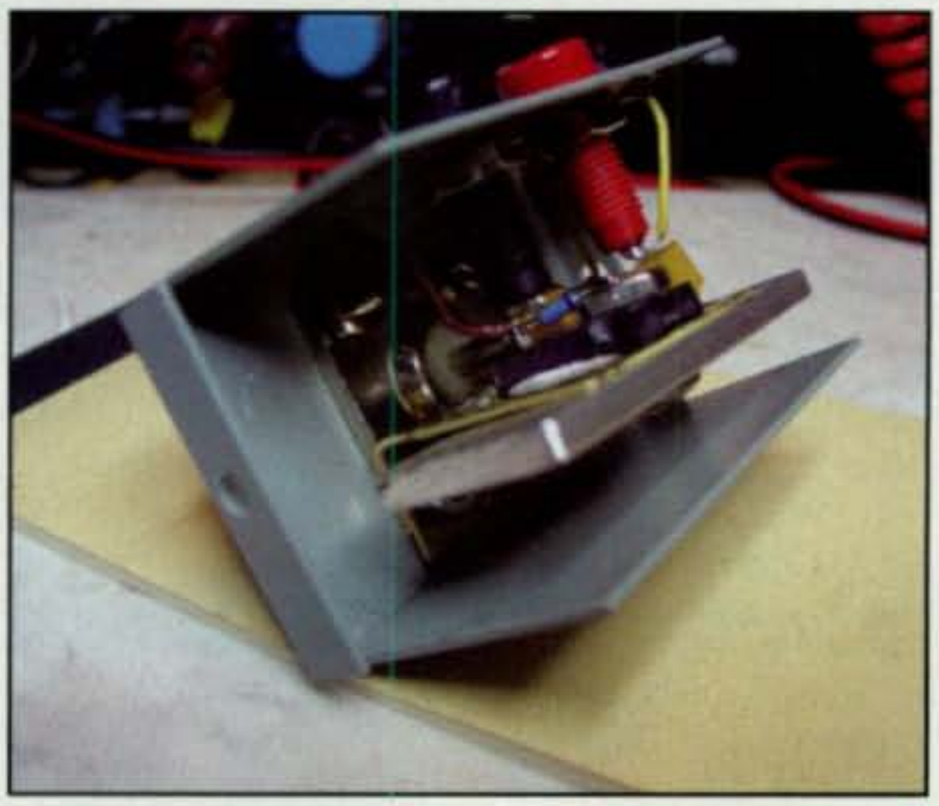


Photo B– The assembly mounted in the 5/8-inch diameter connector mounting hole in the front of the project box.

Photo C– The completed unit.

The HF-450-MHz dummy load/peak detector utilizes a 30-watt 50-ohm Caddock resistor. I used the same brass mounting plate I described in last month's "Weekender" column. The mounting-plate dimensions are repeated in fig. 2. I added a 2-inch length piece of 1/8" × 3/4" aluminum bar stock to help dissipate your transmit power. Drill a #4 clearance hole (1/8-inch diameter) in the center of the bar stock, and mount it and the resistor to the brass plate. Since this unit will operate to 450 MHz, I used an N-connector rather than an SO-239. Solder the 1N5711 anode directly to the 50-ohm resistor lead and support the cathode (banded) end of the diode on the bypass capacitors soldered to the brass plate, making sure you minimize all lead lengths. Photo A show the parts after assembly. The entire assembly is mounted in the 5/8-inch diameter connector mounting hole in the front of the project box as shown in Photo B. Photo C shows the completed unit.

Parts List: 30-watt HF 450-MHz 50-ohm Detector

Qty.	Description	Source/Part Number	Price ea.
1	50-ohm 30-watt resistor	Mouser 684-MP930-50	$3.62
1	2.25" × 1.5" × 1.38" box	Mouser 537-M00-P	$3.99
1	N Chassis Mount	Mouser 530-CP-AD801	$6.44
1	1N5711 Schottky	Mouser 511-1N5711	$0.10
1	0.01 µF 100V cap.	Mouser 581-SR151C103KAR	$0.14
1	0.10 µF 100V cap.	Mouser 581-SR201C104KAR	$0.18
1	1.0 µF 100V cap.	Mouser 581-SR301E105MAR	$0.63
1	Red tip jack	Mouser 530-105-0802-1	$0.66
1	Black tip jack	Mouser 530-105-0803-1	$0.66
1	0.032" brass sheet	ACE Hardware	
1	3/4" × 1/8" × 2" AL bar	ACE Hardware	

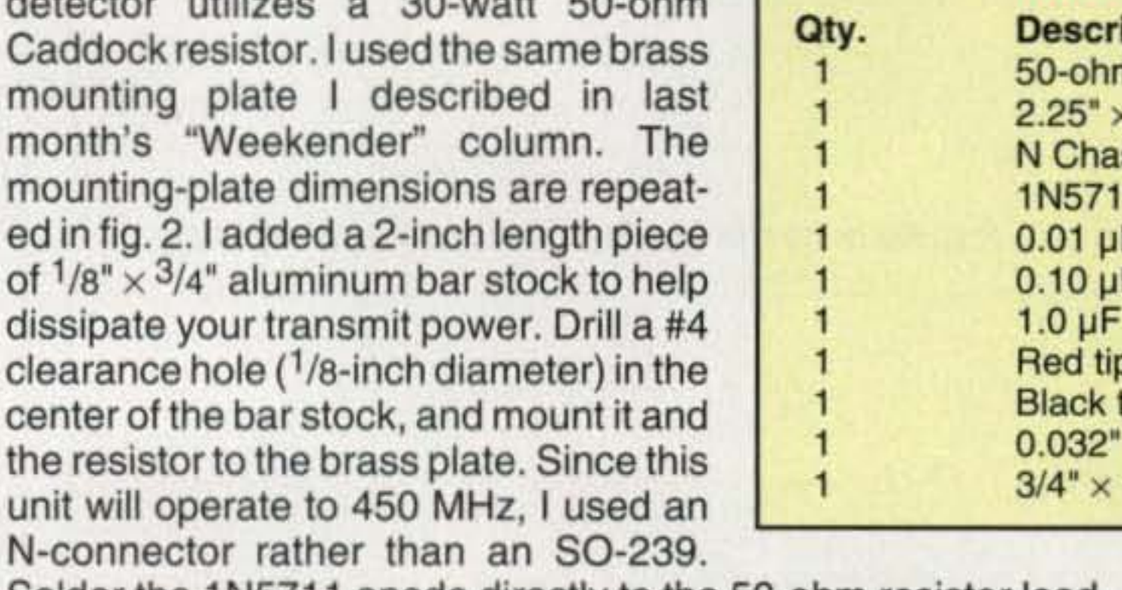
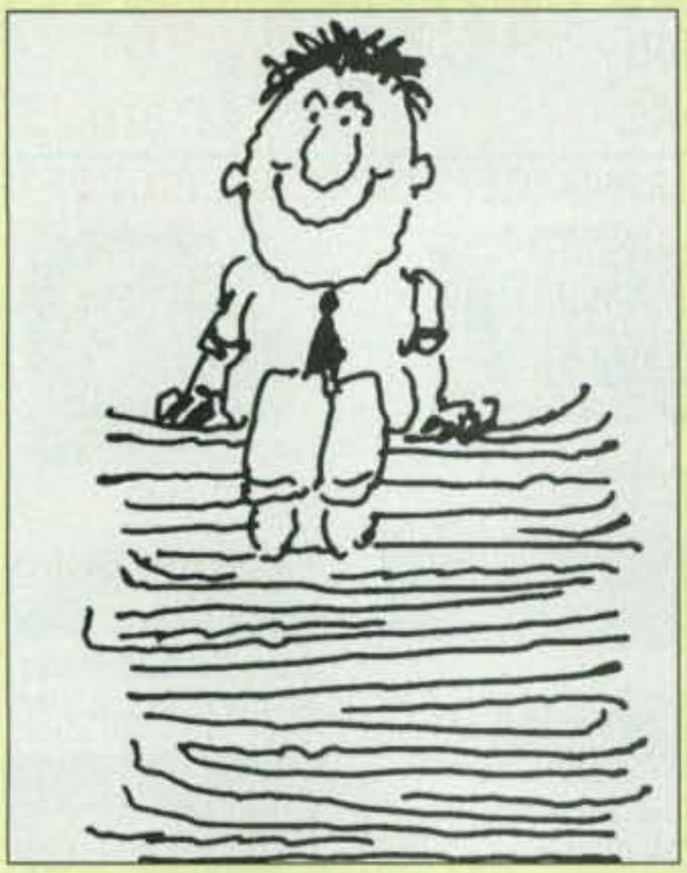


Fig. 2– Brass mounting plate dimensions.

How well does this unit work? I measured the actual SWR as 1:1 through 6 meters, 1.2:1 at 2 meters, and 1.3:1 on 450 MHz. I used an MFJ-259B, an Array Solutions AIM4170, and an MFJ-219B antenna analyzer to measure SWR. I verified accuracy by connecting 3-dB and 10-dB precision Weinschel shorted attenuators to the antenna analyzers (3:1 SWR for 6 dB return loss, and 1.2 SWR for 20 dB return loss). Since $V_{pk} \times V_{pk}$ is directly proportional to SWR, and power is directly proportional to $V_{pk} \times V_{pk}$, your power calculation could be off as much as 20% on 2 meters and 30% on 450 MHz, assuming your radio puts out constant power into these slightly mismatched loads. On 6 meters and below, however, the accuracy will be very good.

That will do it for this month. Next time we'll build a 200-watt precision dummy load and peak detector for 1.8-54 MHz, with a total cost below $40. 73, Phil, AD5X



What You've Told Us...

Our February survey asked some questions to see just how much you know about Morse code. We were glad to see that 93% of you know that the official name of the code we hams use on the air is the International Morse Code. Three per cent each said it was the Continental Morse Code or the Morris Code, while just 1% said it's the American Morse Code.

Next, 82% of you said—incorrectly—that the system of dots and dashes we know as Morse code was developed by Samuel F.B. Morse. The dot-and-dash code was developed by Morse's assistant, Alfred Vail (the choice of 13% of you). You were back on track as a group for the next question, with 91% knowing correctly that the abbreviation "CW" stands for "continuous wave;" and 72% of you knew that in well-balanced sending, a "dah" (dash) is three times longer than a dit (dot) (20% thought a dah was twice as long as a dit).

On the next question, 99% of you knew that no special circuitry was needed in order to send code over the radio with a hand key, and 98% knew that was also true for a "bug," or semi-automatic key. Just over half of you (51%) knew that you *do* need special circuitry in order to send code with a computer keyboard and 18% knew the same applied to iambic keyer paddles. But 20% of you thought *all* of these devices required special circuitry, while 9% thought none of them did.

Finally, we asked which amateur radio digital mode can be sent and received without using a computer or other interface device, and 89% of you that the only correct answer was Morse code (although some claim to be able to decode Baudot RTTY by ear–it's *really* hard to *send* it without a keyboard, though).

This month's free subscription winner is Richard Singer, K6KSG, of Howard, Colorado.

Reader Survey May 2007

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

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

This month, as a lot of hams start looking seriously at HF operating for the first time, we thought we'd get an idea from those of you with HF experience of your favorite bands, modes and activities.

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

1. How long have you been active on the HF ham bands?
- Not active on HF 1
- Less than 1 year 2
- 1-5 years 3
- 5-15 years 4
- More than 15 years 5

2. Which HF bands do you enjoy using? (Choose all that apply)
- 160m 6
- 80/75m 7
- 60m 8
- 40m 9
- 30m 10
- 20m 11
- 17m 12
- 15m 13
- 12m 14
- 10m 15
- Not active on HF 16

3. What mode(s) do you regularly use on HF? (Choose all that apply)
- AM 17
- CW 18
- Digital Voice 19
- FM 20
- Keyboard modes (RTTY, etc.) 21
- SSB 22
- SSTV 23
- Other 24
- Not active on HF 25

4. What are your favorite on-air activities on HF? (Choose all that apply)
- Award chasing 26
- Contesting 27
- County-hunting 28
- DXing 29
- Net operation 30
- Rag-chewing 31
- SSTV 32
- Technical experimentation 33
- Other 34
- Not active on HF 35

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

Enjoy HF even more with HF Digital!

AOR offers new HF licensees a CLEAR difference with the amazing audio clarity of HF digital. The ARD9000 Mk2 and ARD9800 are both great ways to join in the fun because there's "no assembly required".

Add a whole new mode to your HF operation with a couple of quick connections and be part of the digital voice excitement that's sweeping the SSB bands. Once you hear the audio quality, you'll be a believer! Whenever these digital voice modems are demonstrated, looks of amazement pass through the crowds.

Using the open G4GUO protocol, the ARD9000 Mk2 or ARD9800 allows any ham to convert any existing HF analog transceiver to work digital voice in one easy step! The unit automatically detects digital signals and decodes them, but you also maintain full analog capabilities. Whether a contact comes in as digital or analog, the ARD9000 Mk2 and ARD9800 can handle it.

It's a real breakthrough in communications technology that uses the same audio frequencies (300 Hz ~ 2500 Hz) as microphone audio to transmit digital SSB voice signals.

Enjoy the clean, clear audio that makes HF digital so much fun!

- NO transceiver modifications necessary
- Digital voice communications using existing analog transceivers
- Works on Single Side Band (SSB) mode.
- Automatic digital receive
- Optional interface cables for most popular transceivers
- Built-in high grade Vocoder (AMBE)
- Built-in FEC protocol
- Compact unit. Easy to operate.
- Utilizes a uniquely designed high performance DSP engine
- Uses the established G4GUO open protocol
- ARD9800 can also be used for digital slow scan TV and data transmissions (images require optional memory board)

Be sure to check the website at www.aorusa.com for FAQs, links to user groups and more!

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Keys 2007: Amateur Radio's Work of Art, Part I

BY DAVE INGRAM,* K4TWJ

Rejoice, friends and CW enthusiasts. We are back with another special feature on amateur radio's all-time favorite accessories: keys, bugs, and paddles (see glossary). Yes, and the popularity of these little gems just keeps growing. Indeed, more and more craftsmen are producing keys, and the demand for their handiwork continues to exceed their supply.

What is behind this insatiable love affair with keys? Possibly it is a spin-off of the new relaxed licensing requirements regarding Morse code (often things are more appealing when they aren't mandatory), but I feel keys represent the fine-art side of amateur radio—sculptures in brass we enjoy studying and using for a special on-the-air treat. I also understand that some folks like hand keys and slower speed CW, some ops prefer bugs or paddles and high-speed CW, some focus on new keys, and some revel in the pleasures of collecting and using golden oldies. It is the mix that makes the match, and that's where these key columns enter the picture. They support your interest by presenting views and details of keys of all types, plus timely "what's happening on CW" notes to keep you informed of life in the CW lane. What kind of notes? Read on.

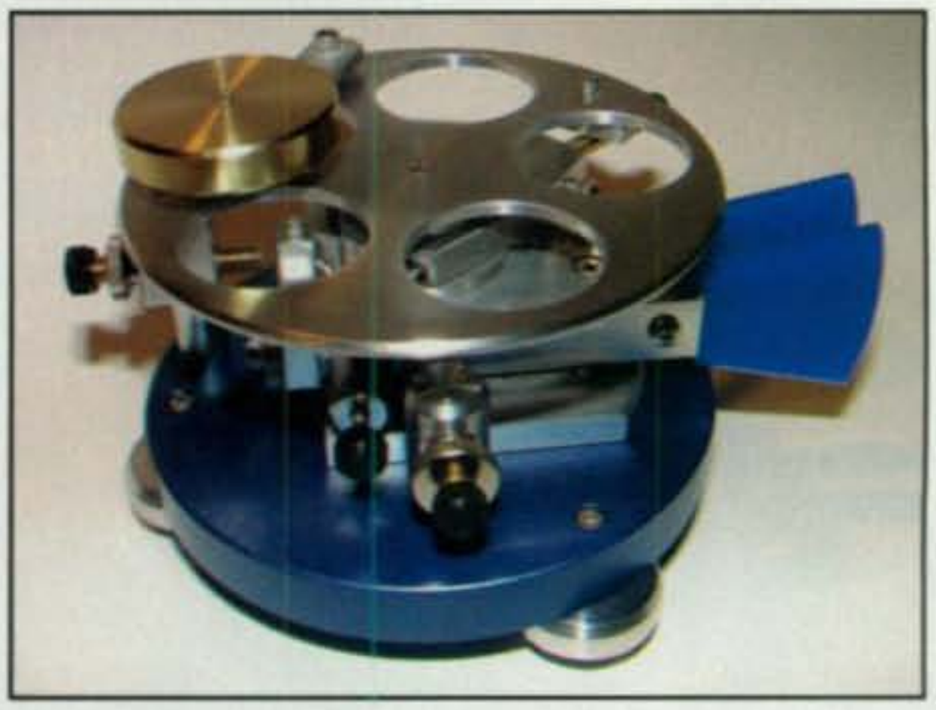


Photo 1– Left-side view of the incredible RotoBug designed and made by Richard Meiss, WB9LPU. Three-tier design consists of a 3-inch diameter steel base, aluminum center mechanism, and top-mounted rotor that oscillates back and forth within a magnetic field to produce dots. Speed is adjusted by the arm with the weight near the rim of the rotor. (Photo by WB9LPU)

An Overview

Are you new to CW and keys? Well, then you are in for some fascinating experiences, and the FISTS CW Club can help you get started. A number of amateurs have learned and become proficient in Morse code, for example, using a W7QO Code Course CD available by sending a self-addressed and stamped mailer large enough to hold a CD to FISTS Club's U.S. Leader, Nancy Kott, WZ8C, at P.O. Box 47, Hadley, MI 48440. The FISTS Club's "Code Buddy" or tutor program is also superb for helping new CW ops make their first on-the-air QSOs. (Do some of you remember that fumblesome event? Did you get too nervous to finish the QSO?) The club also conducts "Get Your Feet Wet" contests and Sprints to increase your enjoyment of CW, plus publishes a "Keynote" newsletter to help you along the way, and more. Listen for FISTS activity on 1.808, 3.558, 7.058, 10.118, 14.058, 18.085, 21.058, 24.918, and 28.058 MHz and check out the club on the web at <www.fists.org>. It is a good group of CW enthusiasts, and the membership is growing like crazy.

Like many readers, we enjoy operating CW mobile—not while dodging lane swappers and bumper riders, but when riding with the XYL or when stopped in a mall parking lot. That's when the following happened to us. A youngster passing by came to us and curiously asked what were those strange sounds emanating from our car? Morse code coming in by shortwave (ham) radio, I explained. Morse code, like Boy Scouts learn for merit badges? Yes! It's also like text messaging except different—and faster. Geez, tell me more he said! I continued to explain that Morse code was the first form of data communications. It has been used for years for passing important messages over radio, for last communications via hammer taps on sunken submarine hulls, to communicate via straw sips or eye blinks by the severely handicapped and prisoners of war, and much more. Many radio amateurs even carry Medic Alert cards showing the Morse code and explaining that if they are severely injured but able to move a body part, they can communicate via Morse code. Simply stated, Morse code and CW promise to live forever! The onlooker was hooked—on amateur radio and CW. Yes, friends, the power of Morse code continues to be alive and thriving!

Glossary

For those of you who are new to the world of keys and code, a few definitions are in order:

Bug—A semiautomatic key which sends dits (dots) repeatedly and dahs (dashes) individually.

CW—Abbreviation for Continuous Wave, used today as an abbreviation for Morse code.

Key—Any device used for producing Morse code characters. A key with which all functions are performed manually is known as a "hand key."

Paddles—Individual levers, or the assembly containing them, used to send Morse code with an "electronic keyer" in which both dits and dahs are formed automatically.

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

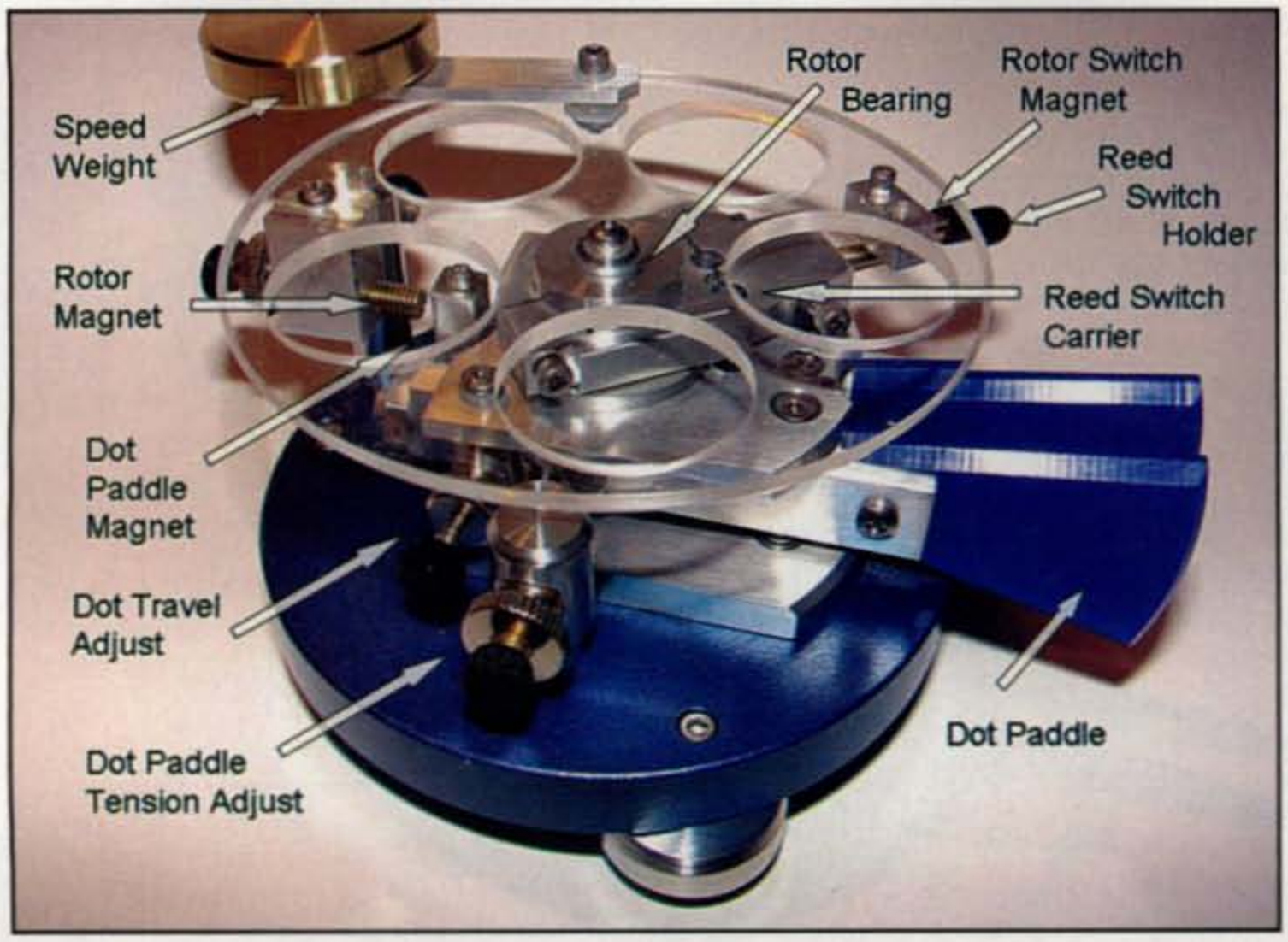


Photo 2– As a means of clarification, Richard replaced the RotoBug's aluminum rotor with a clear plastic counterpart and inserted labels for parts and adjustments in this photo. (Photo by WB9LPU)

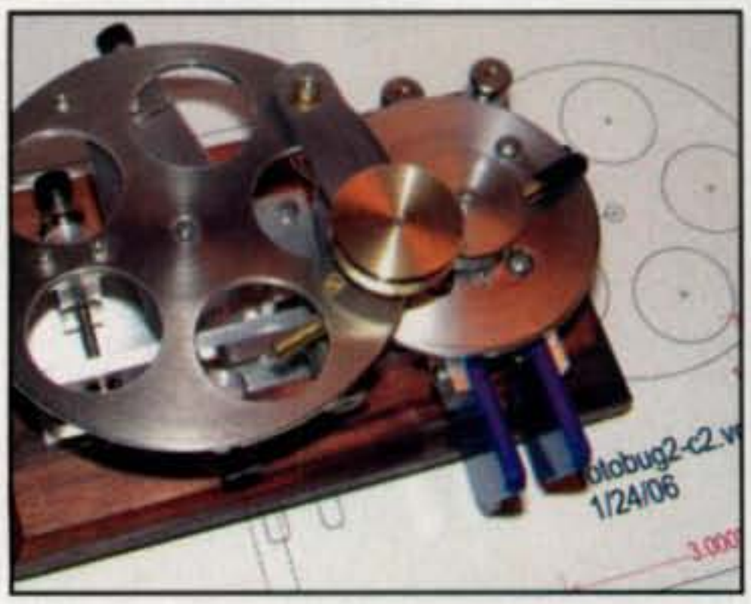


Photo 3– During its evolution WB9LPU built this unbelievable right-angle version RotoBug. It works just like the 3-tier model, but has a lowboy design and is probably the most revolutionary design in bugs in 50 or 100 years. (Photo via WB9LPU)

Photo 4– This eye-catching gem is an iambic touch paddle Doug Fabian, N8EPE, built around a pre-assembled PC board from <www.cwtouchkeyer.com> and installed in a D-104 microphone head. The attached FT-243 crystal case with metal plates on both sides serves as the fingerpieces. Suggestions for quick-brewing a similar paddle are in the text.

A captivating array of keys awaits explanation, so let's thank this month's contributors— WB9LPU, WA1JOS, N8ESE, K4VIZ, VK2DLF, K8CRC, VE6SL, GØEML, and PEØDWM—and turn our attention to the goodies!

Next Generation Bug

The artistic beauty of bugs continues to capture our attention and boost our interest in CW, but few can compare to the incredible new RotoBug designed and made by Richard Meiss, WB9LPU (photos 1, 2, and 3). Richard says the RotoBug is an outgrowth of his previous magnetically operated bug designs, but the traditional rod-type pendulum and speed-controlling weight is replaced with a round rotor sporting a moveable arm at its rim. The rotor oscillates within a magnetic field with its position determined by a pair of permanent magnets—one fixed and one mounted on the rotor. Pressing the dot paddle releases the rotor so it is free to oscillate back and forth within the magnetic field and in doing so periodically trip a magnetic reed switch to transmit dots. A wired *and* logic circuit is included in the bug's mechanism, so releasing the dot paddle interrupts dot production

← *Photo 5– Vertical bugs are attention grabbers of the best kind, and this available-right-now delight from Tom DeSaulniers, K4VIZ, is a shining example of that fact. It is solid brass with stainless-steel springs and silver contacts, and it handles well and adds real pizzazz to any CW setup. For more details go to: <www.k4viz.com>.*

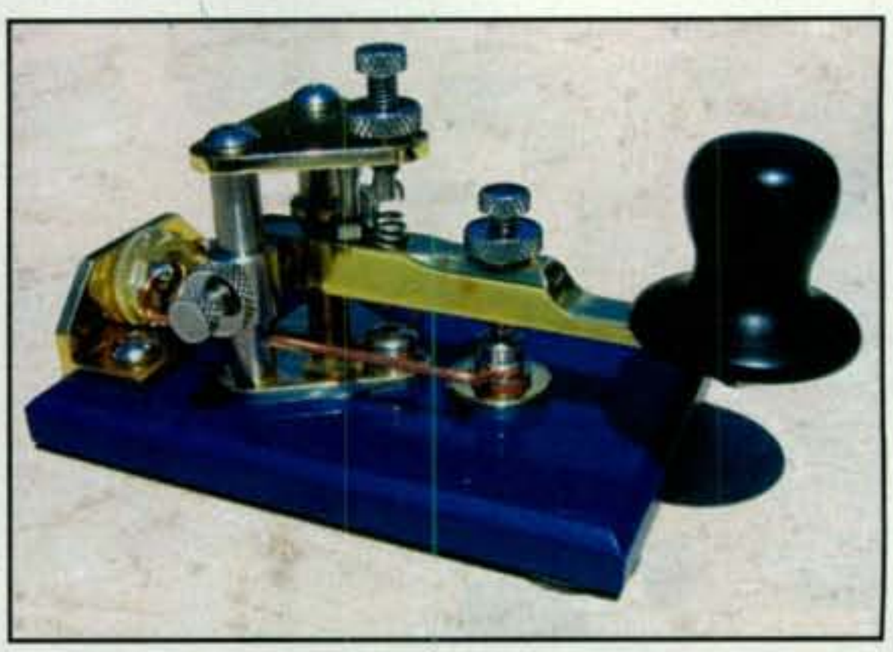


Photo 8– It may resemble a bug, but it is actually a rear-pivoting hand key with a captivating design, classy blue base, and unique-shape knob. This work of art is also produced by George, VK2DLF.

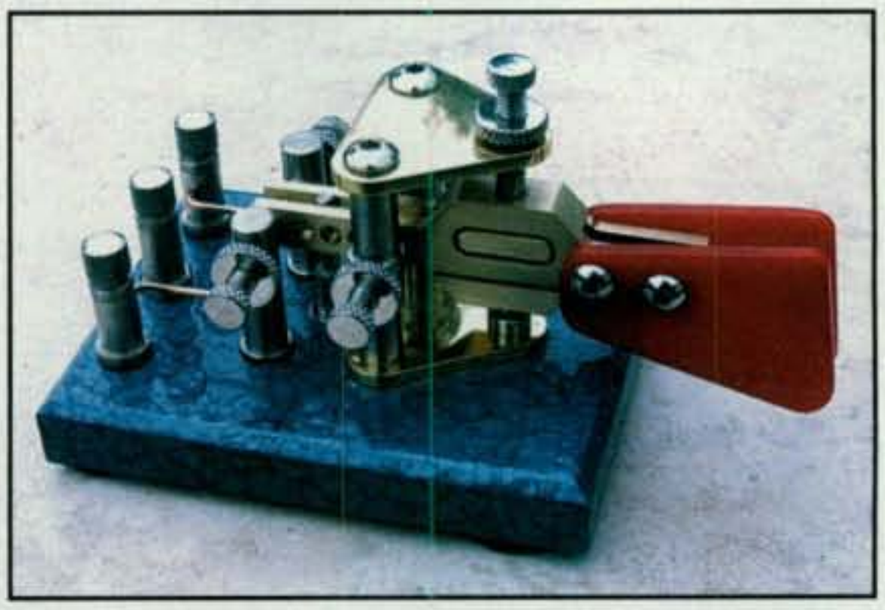


Photo 9– This third VK2DLF-produced item is a smart-looking paddle also sporting a tripod-type mainframe, a high-gloss metallic blue base, and red fingerpieces. Like other VK2DLF keys, it is also available with solid brass base and black fingerpieces for folks preferring the conservative look.

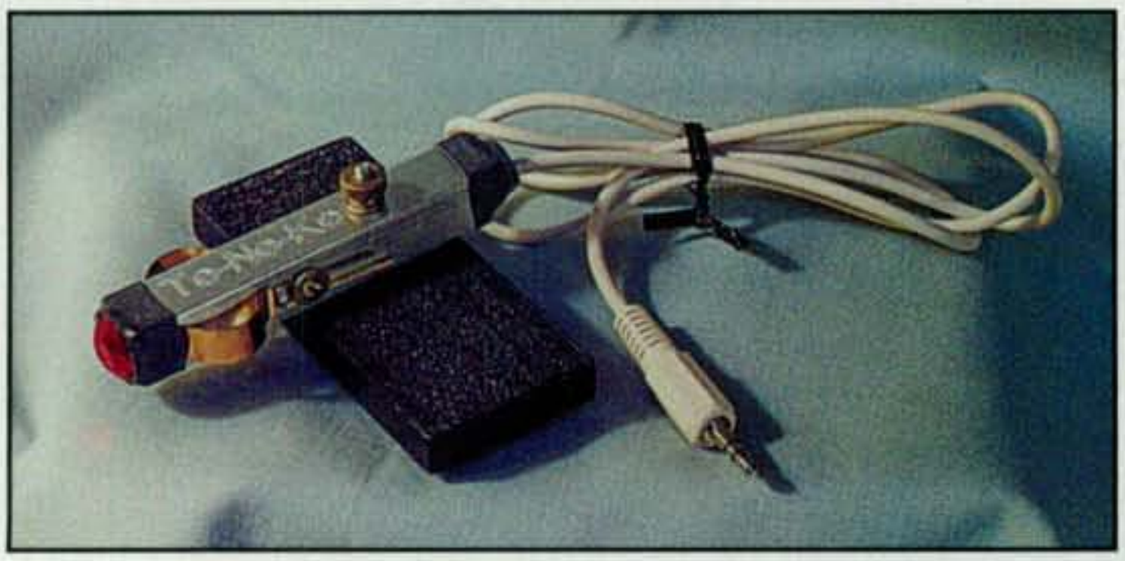


Photo 6– This intriguing item is an iambic paddle called the NeKe. Spring brass strips on each side of the center aluminum channel function as fingerpieces. Sensitivity is adjusted by screws mounted forward of the brass strips. Loosening the top nut allows the mechanism to swivel in-line with the base for carrying or attaching to an optional knee mount. NeKes are available from K8CRC.

Photo 7– This little beauty is called the "OZ BUG"; it is handmade by George Gorge, VK2DLF, in Australia and comes with your name and call inscribed on the nameplate. Notice the pendulum is equipped with several sections that can be changed for a custom feel. It is also perfectly balanced and can send a string of dots for over 30 seconds at a selected speed. (Photo courtesy of VK2DLF)

without requiring a metal damper like a regular bug. Dashes are made conventional style with the dash lever.

Does it work well? Absolutely! Rare-earth magnets give the RotoBug a responsive and positive feel with a touch of tactile feedback to the fingers that can't be beat. Watching the top-mounted rotor oscillate during operation is more captivating than watching rig meters swing, and using the bug's independently operating dual levers keeps you continuously striving to send beautiful CW. There is nothing else like it.

This remarkable key definitely places Richard's name in the book of telegraphic history! Richard continues to perfect his RotoBug's design and none are presently available for sale, but I am sure that situation will change after Richard settles on a perfect final design. If you wish to compliment Richard on his RotoBug or get the latest news on availability, you can e-mail him at: <wb9lpu@earthlink.net>.

Buy 'em Newbies

What is that unusual item in photo 4? It is an iambic touch paddle that Doug Fabian, N8ESE, built into a D-104 microphone head, and you can make one like it or add your own creative ideas to the design as desired. Inside the mic case is a 1.5-inch-square touch-key circuit board (plus 9-volt battery) obtained from Sumner Eagerman, WA1JOS (e-mail <cwtouchkeyer@aol.com>). Almost anything metal can be

Photo 10– Max Farmer, VE6SL, discovered this beautifully preserved gem snuggled in its own mahogany box at a flea market in Calgary, Canada. The nameplate is inscribed "The Autoplex Mfd by R.W. Steele. No. 644." It truly is a rare piece of telegraphic history any radio amateur would be proud to own! (Photo via VE6SL)

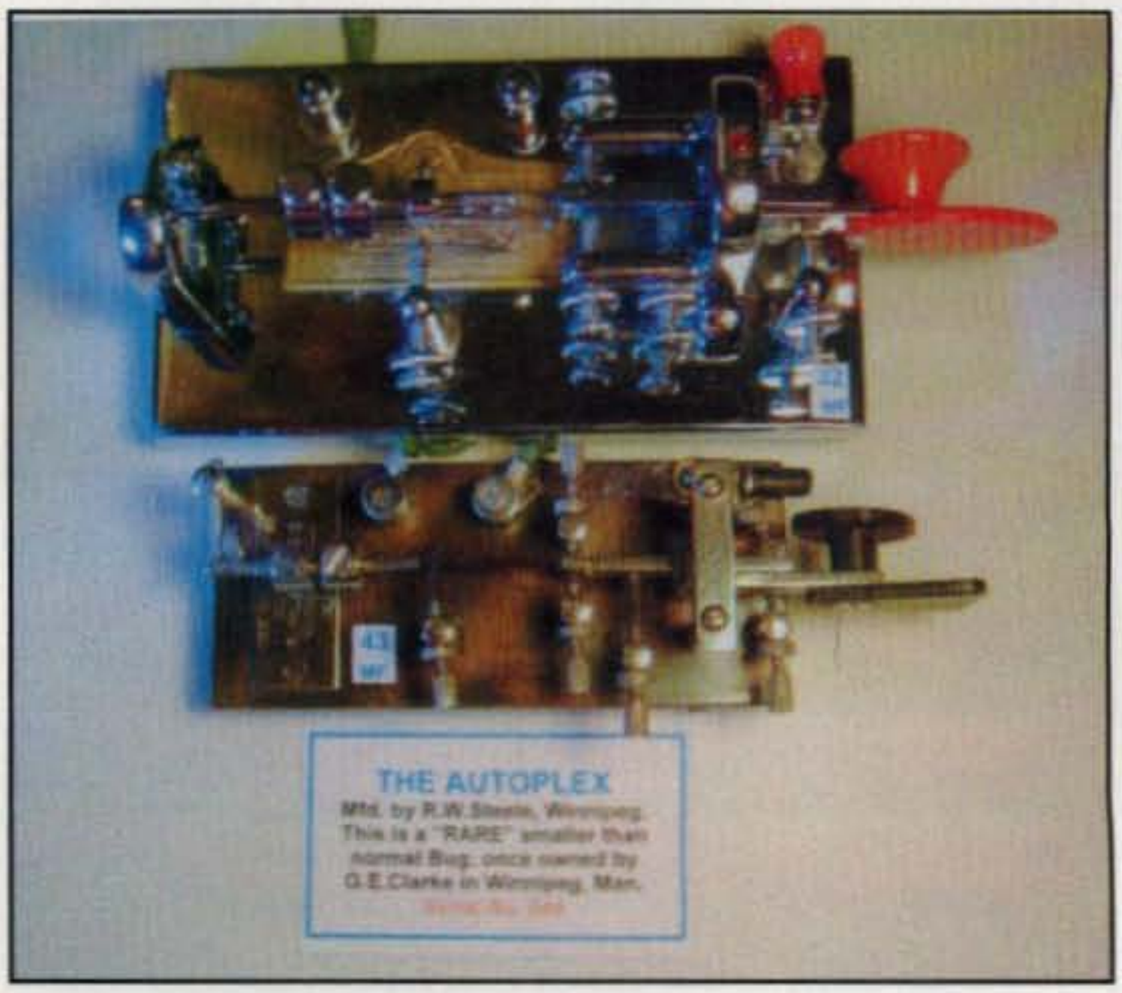


Photo 11– The Autoplex small, 2.5-inch footprint becomes quite apparent when placed beside a standard-size Vibroplex "Presentation" model bug. It is a heartthrob! (Photo courtesy of VE6SL)

used for the touch paddles—dimes, wire strips, metal spheres, or as we see here, metal covers (one standard, one added) for a plastic crystal case.

There are no adjustments to make, no gaps to corrode, and a touch key is ideal for stealth hamming because it is as quiet as a church mouse. A touch key is also perfect for CW mobiling because you cannot always attain a good working angle with a straight-horizontal paddle, but touching a metal plate or ball is easy. A few minutes of practice is required to use a touch key (keep your fingers off fingerpieces after sending characters), and then it works fine. Check <www.cwtouchkeyer.com> for more details on kits, assembled PC boards, and complete, ready-to-use touch paddles.

If you are one of the many CW devotees diligently hunting for a vertical bug (oh, the glamour!), check the new and available right now offering from Tom, K4VIZ, shown in photo 5. This little beauty measures 7.25 inches tall and 3.25 inches wide, weighs 2.5 pounds, and has a speed range of approximately 8–35 wpm. It is solid brass with silver contacts, nine adjustment points for a "just right" feel, rear binding posts, plus cable with plug, and it is reasonably priced to boot. Tom's right-angle bug and iambic paddle highlighted in our previous columns, incidentally, continue to be available. More details are at <www.vizkey.com>.

Several readers asked us to revisit the unusual-style NeKe paddle featured a few years ago in this column, so a desk ver-

Photo 12– This sharp-looking and smooth-handling Jones paddle is an all-time favorite item, and proud owner Ray Bullock, GØEML, says it gets plenty of enjoyable use in his shack every day. (Photo courtesy of GØEML)

Photo 13– Wim de Morree, PEØWDM, passed along this view of a turn-of-the-century Russian pump key. Although somewhat battered from use, its classic lines, stocky arm, and knob mark it as a genuine classic. It, too, is an important piece of telegraphic history!

Photo 14– Do you like studying keys and telegraphic instruments of all types new and old? Check out my new World of Keys, *which is available in printed book or computer CD form. Both are loaded with views and details of keys few people have ever seen. Details at <http://k4twj.blogspot.com>.*

sion with swing-out mechanism is shown in photo 6. The paddle's main section is U-channel aluminum fitted with spring brass strips for fingerpieces. A protective cover with red jewel is attached to one end of the channel, and an output cable emerges from a cover on the opposite end. It's wild, but it works surprisingly well. NeKes were originally made (in various styles, shapes, and sizes) by Boyd Mason, NE8KE, and Dennis Foster, KK5PY. They now have passed the operation over to the North Ottawa Amateur Radio Club of Michigan, and more information is available by contacting Craig Christilaw, K8CRC, 1800 Gladys Avenue, Grand Haven, MI 49417.

Delights from Down Under

The trio of blue-based keys in photos 7, 8, and 9 is made to order and on a time-available basis by George Gorge, VK2DLF, and the closer you look, the more you appreciate their fine workmanship. The bugs' triangular-shaped mainframe is similar to a Vibroplex Champion or Lightning Bug, but its pendulum is round with different sections that can be swapped for different feels and different speeds.

The hand key employs a similar-style mainframe, but includes some clever screw and spring changes supporting a rear pivoting arm. If you are looking for something a bit different in a key, this one may be the answer. The paddle's design is equally interesting, as inner and outer sections of its arm near fingerpiece pivot when making dots and dashes. These keys, incidentally, are only a few of the VK2DLF collection. You can check out all of them at <www.ozkeys.morsekeys.com>. If you have any questions, e-mail George at <vk2dlf@yahoo.com.au>.

Golden Oldies

From the dark corners of eras past and the home of Max Farmer, VE6SL, in Alberta, Canada come views of a beautiful 2-inch by 5-inch bug with the same name as Horace G. Martin's very first semi-automatic key, the Autoplex (photos 10 and 11). Max found the key at a flea market, discovered the original owner's name inscribed on the box lid, then researched the nameplate's listed manufacturer (R. W. Steele), and found he was a telegraph line operator in Winnipeg in the past. Our compliments to VE6SL on preserving this fine piece of telegraphic history.

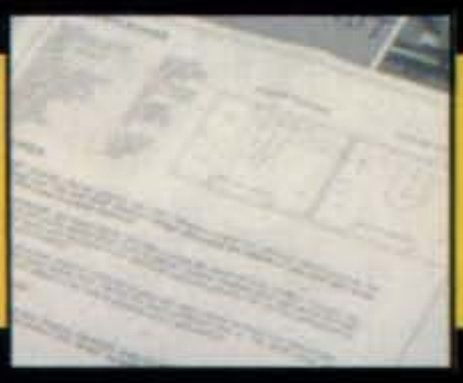
Remember the famous Jones paddle many amateurs considered "top banana" for its time (photo 12)? Ray Bullock, GØEML, recently acquired one of the red-based beauties and enthusiastically acknowledges that even now it still handles great. That makes sense to us, as its mechanism is well protected from abuse while ensuring long life. Nice!

This month's column winds down with a view of a classic Russian pump key used during the early 20th century and submitted by Wim de Morree, PEØWDM (photo 13). The Russian design influence is apparent when you look at the stout arm with "matter of fact" knob, wood base with two springs, and metal straps supporting replaceable contacts. It is yet another historically significant key worthy of preservation.

That overflows space for this time, but watch for another dazzling display of delightful Morse manipulators coming in part two next month. Meanwhile, I invite you to continue the tour with my all-new *World of Keys* book or *World of Keys* CD. Do not confuse this new *World of Keys* with my previous *Keys II: The Emporium* book. It is quite different and filled with photos plus information on keys, bugs, and paddles few people have ever seen. For details go to: <http://k4twj.blogspot.com>.

73, Dave, K4TWJ

Attention New and Seasoned Ham Operators...

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New licensed Hams will find these low cost, medium performance antennas, to be a great choice for a starter antenna without compromising quality. And when it's time to move up to a more tailored antenna, M2 will be there to help them make the best choice from our High Performance models.

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Quality Construction: A medium performance Gamma Match feed with no balun. Giving you the capability of adjustments for best match. A single heavy duty mounting cradle and stainless steel hardware, give you the confidence of quality construction you have come to expect from M2.

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* **2 Meter 3 Element**
* **1.25 Meter 4 Element**
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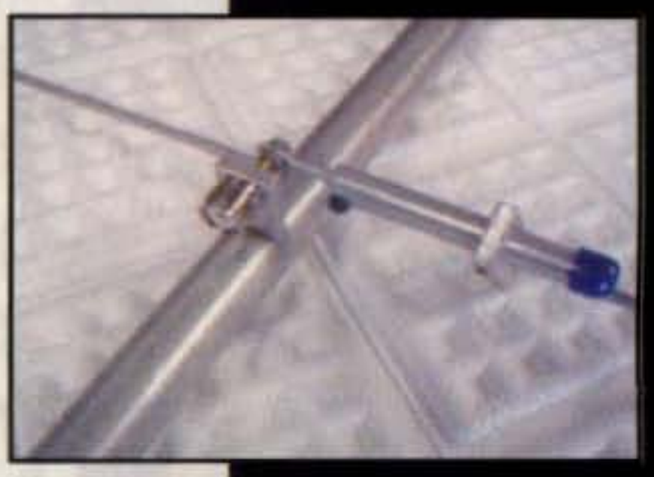
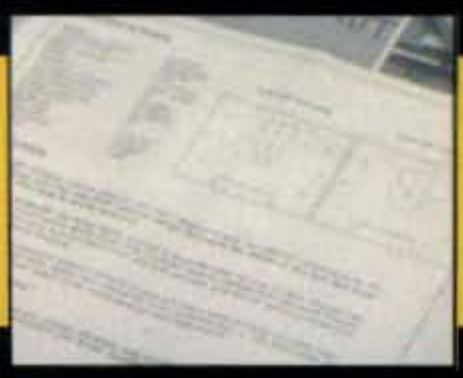


Attention 2.4 GHz antenna users...

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Two Models to choose from

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BY BOB JOSUWEIT,* WA3PZO

Standardization and Training

Last month we examined the ARRL report on Emergency Communications. "For many years, Amateur Radio has longed to be taken seriously by governmental authorities as a professional-quality resource in disaster response," said Committee Chairman Kay Craigie, N3KN. "Amateur Radio's service during 9/11 and the major hurricane disasters of the 21st century has brought us a new level of respect and new opportunities at the national level." Those opportunities exist at state and local levels as well. Along with the opportunities being presented to the amateur radio community are also challenges in terms of an individual's personal time to take training and learn more about modern emergency-management skills. This month we'll take a look at several developments where government agencies are recognizing the value of amateur radio operators.

Maine State Rep. Stan Gerzofsky, Chairman of the House Standing Committee on Criminal Justice and Public Safety, introduced a controversial bill to require credentials for amateur radio emergency communications volunteers in the state. (Photo courtesy of Maine House of Representatives)

Maine Ham Recognition . . . and Controversy

A bill to recognize amateur radio emergency volunteers was introduced in the Maine House of Representatives. Its aim is to register and provide credentials for amateurs assisting the Maine Emergency Management Agency. However, many Maine hams are unhappy with it. The bill creates "a definition for emergency communications volunteer" that requires volunteers to meet certain requirements before they can receive a valid identification card from the agency. This bill also directs the Director of the Maine Emergency Management Agency to implement a statewide Radio Amateur Civil Emergency Service (RACES) plan.

According to the bill, "the director shall adopt rules to implement a state radio amateur civil emergency services plan, in accordance with Federal Communications Commission and Federal Emergency Management Agency guidelines, to support back-up communications between state and local emergency operations centers; back-up communications for E-9-1-1 centers, fire departments ,and police departments; emergency communications for shelters; and other emergency support as needed." The bill also sets registration levels, which include certifications from relevant training courses provided by the Federal Emergency Management Agency and the American Radio Relay League, and procedures for local authorized officials to perform criminal history and driving-record background checks during the registration process. Finally, the bill would provide worker's compensation and liability insurance coverage for registered participants.

According to the Merrymeeting Amateur Radio Association (MARA) newsletter, "Squelch Tales," some Maine amateur radio operators were shocked at the bill proposed by Brunswick State Representative Stan Gerzofsky which "would have Amateur Radio communication volunteers be registered and credentialed." Many questioned which amateur radio operators had provided input as to the bill's contents. As it turns out, Sagadahoc County Assistant Emergency Coordinator John Goran, K1JJS, provided input to help Rep. Gerzofsky draft the bill, but Goran says a lot of his recommendations were left out. At our press deadline in mid-March the bill had been referred to the Criminal Justice and Public Safety Committee and was scheduled to be considered in a Committee Work Session. Goran indicated that the bill had been given an "ought not to pass" recommendation. He said that there were so many changes to the proposed bill, most of which were incorrectly applied, that the bill became useless, "almost a burden." He said, "The ham community would not support it in its current form."

Virginia Hams are OEM Graduates

Earlier this year, 25 members of the Arlington County (VA) RACES completed a year-long course of weekly radio communications exercises and now stand ready to assist local government officials with crisis communications and response. According to the county, these volunteers are qualified to help in emergency situations such as weather catastrophes and terrorist attacks.

Each graduate passed a county-authorized character/background check, attended emergency communications classes developed specifically for Arlington County volunteers, and participated in regular weekly radio communications exercises managed by the Office of Emergency Management Emergency Support Function team. After more than 50 weeks of exercises, the group chieved the first level of competence required. Additional training and exercises are required to maintain active Arlington RACES affiliation.

According to Ed Harris, KE4SKY, Virginia RACES Deputy State Emergency Radio Officer for

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

Virginia hams show off their diplomas after completing a year-long training and certification course sponsored by Arlington County. (Photo courtesy of Dave Jordan, WA3GIN)

Training and Safety, "for those of us in the amateur radio hobby who choose EmCom, it is 'more than a hobby,' but also a commitment to service. If you are not adequately trained, you cannot do your job competently or safely. It is therefore incumbent upon all of us to mentor, watch out for, and help each other. As individuals we must learn, practice, and refresh skills which may have become rusty from lack of use."

Arlington's Office of Emergency Management (OEM) initiated the program as an all-volunteer auxiliary communications service to support the government's need for public-safety radio communications during emergencies, in case the county's public-safety radio communications system is damaged or inoperative. This program, northern Virginia's first and only government OEM-led radio amateur volunteer group, serves as a model of public-private emergency communications cooperation.

David Jordan, WA3GIN, says that when a RACES officer is a municipal employee, there is better accountability to government officials. (Photo courtesy of Ed Harris, KE4SKY)

"There is a great benefit to having a government employee head up your volunteer efforts," says David Jordan, WA3GIN, Arlington County RACES Officer. "Without doing so, the municipal government risks having volunteers with no real accountability. OEM then never really knows whether the volunteers are well trained, practiced, drilled, etc." He continued, "When you empower a municipal employee to act as a RACES officer who reports to OEM and is responsible to the local government, all of a sudden you have accountability and a focus point. The FEMA RACES format described in the Civil Preparedness Guide 1-15 works, because it was designed to fit comfortably into how local governments operate." According to Jordan, "RACES is a straightforward method for any local government to embrace radio volunteers with a more formal requirement for background checks, specific skill sets, and mandatory training, exercises, and drills."

Freshman Congressman Learns about Ham Radio

Members of the Delaware County (PA) Amateur Radio Emergency Service (ARES) recently demonstrated to U.S. Representative Joe Sestak (D-07) that amateur radio operators can use their own radio equipment to provide critical communications services, and can provide valuable backup communications in case of normal communications failure. ARRL District Emergency Coordinator Bob Famiglio, K3RF, said, "amateur radio communication networks could be established at fire houses, Red Cross shelters, and the 911 Emergency Communications Center in Lima." Famiglio is responsible for the five-county Philadelphia area. He explained

Bob Wilson, W3BIG, demonstrates to Rep. Joe Sestak (D-PA) the use of a compact battery-powered ham radio unit to establish communication with other ham radio emergency stations in southeastern Pennsylvania. (Photo courtesy of Bob Famiglio, K3RF)

Army MARS Chief Stuart S. Carter says, "The challenges we face are new and more demanding than those we've prepared for in the past." (Courtesy of Army MARS)

to the congressman that each of the group's members is licensed by the Federal Communications Commission and has received disaster response training from the Federal Emergency Management Agency.

As part of the demonstration, Bob Wilson, W3BIG, used a compact, battery-powered ham radio unit to establish communication with other ham radio emergency stations in southeastern Pennsylvania. Roger Jordan, W4RFJ, demonstrated amateur radio's capability of providing e-mail service in case the internet went down or was not available. He also showed the congressman how amateur radio operators were able to combine a Global Positioning System (GPS) unit with amateur radio equipment to track search-and-rescue efforts or emergency units. The information collected via the specially equipped amateur radio station can show these units on a map so that coordinators in an emergency operations center can see where their resource units are.

Amateur radio operators across Pennsylvania were activated by the state Emergency Management Agency to provide backup communications should it be needed during the February 25th winter storm. Amateur radio operators participating in Skywarn provided snow depth measurements to the National Weather Service to allow forecasters to update their information. Several reports appeared in various Weather Service bulletins.

New Army MARS Chief Sets New Course

After an 18-month review of operations during Hurricane Katrina, the new Chief of the Army Military Affiliate Radio System (MARS) has shifted the organization's priorities and procedures. Two areas will receive particular attention. They are the retraining of all MARS members and the building of tighter bonds with the federal and state agencies that MARS is designed to interconnect in an emergency.

"The challenges we face are new and more demanding than those we've prepared for in the past," Army MARS Chief Stuart S. Carter told his membership of volunteer amateur radio operators.

"We need to know that all of our members are well-trained, ready, capable, and willing to meet those challenges," Carter continued. "We also have to tell the nation that the 2600 trained and dedicated members of Army MARS, along with our Air Force and Navy-Marine Corps partners, bring a huge and agile readiness to the front lines of emergency response. No other resource at America's disposal is positioned to or capable of providing this kind of support."

At Carter's direction, MARS training requirements now include NIMS (National Incident Management System) courses as well as the doubling of the on-air drill requirement in state and regional HF radio nets. The length of on-air requirements met with some opposition. Indications are that the minimum number of hours required per month was being scaled back, but they are still more than the previously mandated four hours per month. Those training requirements will now include regular service as net

Army MARS member Skip Gracon, K3GNZ/AAT2BF, serves as a net control station at the Fort Monmouth, NJ, MARS station, supporting an Air Force MARS exercise during this winter's USAF "Operation Deep Freeze. (Photo by Mark Emmanuele, N2CBO)

control by all Army MARS members rather than the traditional roster of experienced operators.

Carter has also begun planning for an aggressive informational campaign within the federal establishment. He wants to enhance the amateur community's overall emergency readiness while minimizing duplication of effort. MARS sees its own long-distance HF capability as a natural fit with the strong local and state operations of the ARRL-sponsored Amateur Radio Emergency Service.

A retired Air Force lieutenant colonel with 30 years' uniformed service in communications and information technology, Carter assumed command last December. He is based at Fort Huachuca, Arizona as a civilian operations executive for NETCOM/9th Signal Command (Army), of which Army MARS is a part. The Chicago-born Carter replaced Robert Sutton, who retired at age 65 after 16 years in the chief's post. Two other people held interim positions between Sutton and Carter.

MARS regional command will now be based on the ten FEMA districts, but MARS will be deployed wherever needed. Carter said, "We will be seeking volunteers from among you to mobilize to disaster areas along with Army/DHS/TSA/FEMA." Collaboration between the Army, Air Force, and Navy-Marine Corps MARS organizations will continue to be emphasized, with long-range planning and cooperation on new technology receiving particular focus.

Carter foresees a significant part of his time being devoted to coordination across the federal landscape. Already Army MARS has partnered with the Transportation Security Administration to provide emergency response teams to airports in need of emergency communications support, and with Army Northern Command (ARNORTH) for emergency response. ARNORTH operations officers at Fort Sam Houston, Texas were briefed by Carter on the new readiness measures in late February.

"In the months ahead," he said, "I'll be working with the TSA, Department of Homeland Security, State Department, Army National Guard HQ, Civil Air Patrol, and others to establish Memorandums of Understanding with each, to articulate how we will support them, and what we can expect from them."

"The mission assigned to MARS is very important to our national security and presents challenges and many opportunities for Army MARS," Carter said in his first message to the membership. "I intend to make Army MARS relevant to the 21st century, to the nation I swore an oath to defend, and to the national agencies we must support to accomplish that goal. You are critically needed."

Armed Forces Day Comm Test

The Army, Air Force, Navy, Marine Corps, and Coast Guard are co-sponsoring the annual military/amateur radio communications tests in celebration of the 57th Armed Forces Day (AFD). Although the actual Armed Forces Day is celebrated on Saturday, May 19, 2007, the AFD Military/Amateur Cross-band Communications Test will be conducted on May 12 to prevent conflict with the Dayton Hamvention® (held May 18–20).

The annual celebration features traditional military to amateur cross-band

HAMNET members David, ZS1DDK, and Tony, ZS1TQ, staff the net control station after hams in South Africa were put on standby to provide backup communications for the evacuation of a severely injured member of a German Antarctic expedition. (Photo courtesy of HAMNET)

communications SSB voice tests and copying a special message from the Secretary of Defense via digital modes. These tests give amateur radio operators and shortwave listeners (SWLs) an opportunity to demonstrate their individual technical skills, and to receive recognition from the Secretary of Defense and/or the appropriate military radio station for their proven expertise. QSL cards will be provided to those stations making contact with the military stations. Special commemorative certificates will be awarded to anyone who receives and copies the digital Armed Forces Day message from the Secretary of Defense. Further information should be available at <http://www.netcom.army.mil/MARS>.

Hams Receive Antarctica Alert

South African amateur radio operators were alerted in late January to assist with HF communications from Cape Town to the German Antarctic base camp. A German expedition member had been run over by a 30-ton snow tractor and was in critical condition. Pierre Tromp, ZS1HF, a member of HAMNET Western Cape, was contacted to provide a radio link between Metro Air Rescue and the medical team that was to fly and rescue the patient. HAMNET is the South African equivalent of ARES or the United Kingdom's Raynet. A communications plan was prepared, with various HAMNET members being placed on standby to provide HF communications. The South African Air Force's Radio Room, at Silvermine, was also requested to provide standby communications. HAMNET National Director Francois Botha, ZS6BUU, provided permission for HAMNET Western Cape to conduct HF communication with the rescue jet and medical team if they required it. Early the next morning HAMNET was able to secure its operations as an aircraft, with an Iridium Satellite phone, and completed the rescue. The patient was receiving medical treatment in South Africa.

Botha told *CQ* that HAMNET is "presently getting ... geared up for the coming World Cup Soccer in 2010 and already various disaster-management meetings are being attended by HAMNET to get prepared for any eventuality during the World Cup."

This Month

This month we looked at training requirements for hams being established at various levels of government. It's clear that if amateur radio is going to be a vital resource to the emergency management community, we must train with them and be familiar with their terms. As communication specialists, we are no different from the volunteer fire fighter or emergency medical technician. Each person goes through training to be allowed to do what they enjoy doing. Until next month . . .73, Bob, WA3PZO

Red Cross—Still Crossed!

Although the Red Cross issued a position paper on February 6 announcing that only a criminal background check would be required of its staff and volunteers (including hams working through ARES, the Amateur Radio Emergency Service), the Red Cross's investigation contractor's website, <mybackgroundcheck.com>, still includes a consent form which includes permission for the agency to conduct an "investigative consumer report." The Federal Trade Commission defines an investigative consumer report as "a consumer report or portion thereof in which information on a consumer's character, general reputation, personal characteristics, or mode of living is obtained through personal interviews with neighbors, friends, or associates of the consumer reported on or with others with whom he is acquainted or who may have knowledge concerning any such item of information."

By agreeing to the information on the Consent Form you will be giving permission for a background check *and* a mode of living check.

The ARRL issued a statement on March 9 saying it "will not attempt to advise members what organizations they should or should not support, or the extent to which they should comply with policies that such an organization requires in order for them to accept volunteer Amateur Radio communication services. However, we feel compelled to caution ARRL members to read *very carefully* any request for, or consent to the collection or disclosure of, personal, normally private information from a served agency. ARRL members should carefully consider what is being requested; for what purpose the information is needed; to what use the information will be put; and to whom it will be disclosed."

The ARRL and the American Red Cross have had a Statement of Understanding since 1940. In September 2007 the current Statement of Understanding ends unless it is renewed. According to the statement, "six months prior to termination, the parties shall meet to review the progress and success of the SOU and determine whether it shall be extended for an additional five years." The six-month clock has begun towards the deadline.

The ARRL and the Red Cross have begun discussions about the application of the Red Cross policy to amateur radio operators providing emergency communications. Some amateur radio emergency communication groups have said they report to one agency, such as local emergency management, and will staff shelters or other locations if assigned by the local emergency management office.

With the National Oceanic and Atmospheric Administration predicting that the 2007 hurricane season will see between thirteen and sixteen named storms and four to six of those becoming major hurricanes, everyone is hoping this issue is resolved.

We'll continue to follow this story.

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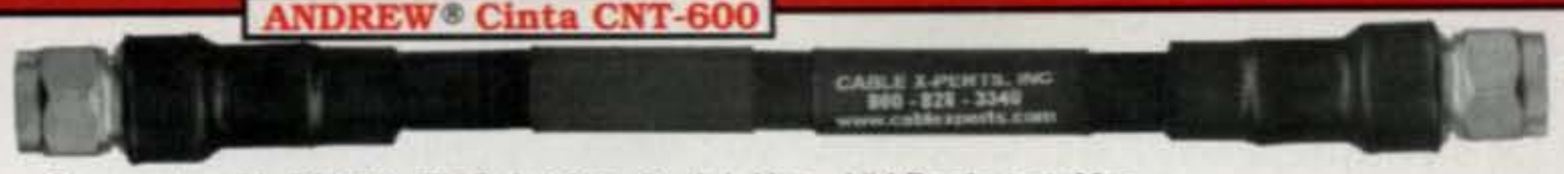

HALF INCH SIZE SHOWN

Connector: **N, PL259, TNC & 7/16,** Burial: **Yes**, UV Resistant: **Yes**.
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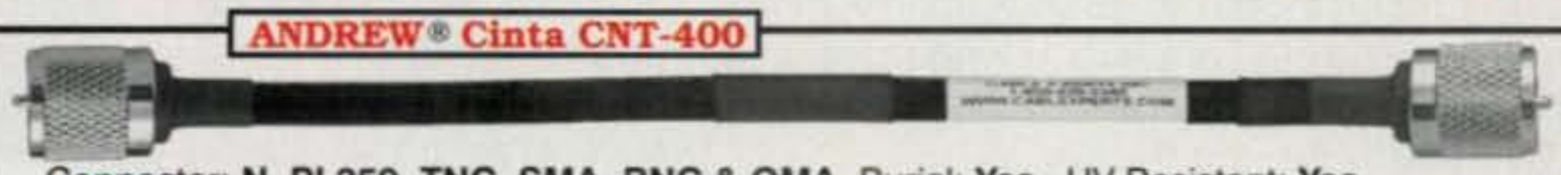

RG8U SIZE SHOWN

Connector: **N, PL259, TNC, SMA, BNC & QMA,** Burial: **Yes**, UV Resistant: **Yes**.
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400C50	50 ft	$ 45.49
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400C6	6 ft	$ 14.95
400C3	3 ft	$ 11.95

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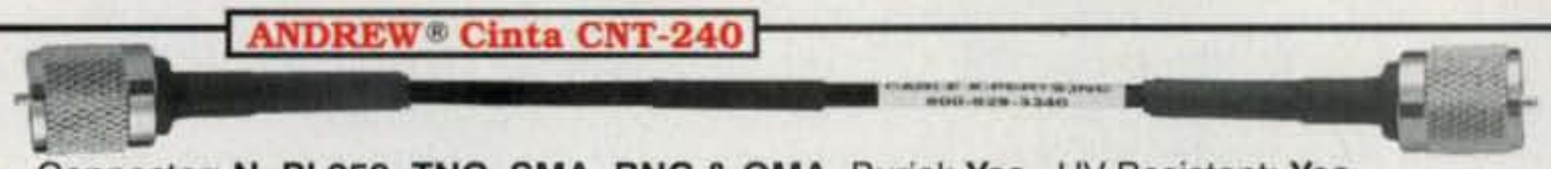

RG8X SIZE SHOWN

Connector: **N, PL259, TNC, SMA, BNC & QMA,** Burial: **Yes**, UV Resistant: **Yes**.
Shields: **2** (100% bonded foil +90% TC Braid) **VP 84%,** Attenuation 3.0dB @ 150 MHz at 100ft.
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BY FREDERICK O. MAIA,* W5YI

Volunteer Examining in the Amateur Radio Service:

How It All Started and Why

Today, taking an exam for a ham radio license is an easy process. Many areas have monthly exam sessions; some have even more. However, it wasn't always that way. With two exceptions, prior to 1984 all amateur radio license examinations were administered by Federal Communications Commission agents. The examinations were conducted by the FCC's Field Operations Bureau at 23 district offices scattered around the country. Sometimes the FCC would travel to outlying cities to administer exams.

One of the exceptions was the Novice exam, which was conducted by a single volunteer radio amateur who wrote to the FCC for the exam questions. To qualify for a Novice license, a candidate had to pass a 5 words-per-minute Morse code test (send and receive) and a 25-question multiple-choice exam. The FCC graded the written test and issued the Novice license once the exam papers were returned to it.

The second allowed exception was for candidates who were physically unable to travel or who lived more than 75 miles from an FCC testing point. These applicants could have the test proctored by two hams with General (or higher) Class licenses, who would send the completed exam back to the FCC for grading. Successful examinees were given Conditional licenses, which conferred the same privileges as the General Class. The FCC retained the right to require Conditional licensees to come to an FCC office for retesting. The Conditional license class was abolished in 1977 and existing licenses were converted to the General Class.

The current Volunteer Examiner program evolved from the Novice and Conditional license testing procedure, which allowed unpaid senior-level radio amateurs to conduct license examinations. The Volunteer Examiner program as we know it today is primarily a result of dwindling FCC "resource and personnel" due to budget cutbacks. Beginning in the late 1970s, amateur examinations were only available once a year in many areas of the United States due to a shortage of FCC personnel. The Commission was also forced to close several Field Operations Bureau offices and to release office space formerly used as examination rooms. There were huge reductions in the frequency of amateur radio examinations and in the number of remote points at which they were given.

In the early 1980s, the federal government was pretty much forced to remove itself from the administration of radio license examinations. It was a very expensive program for the Commission. They figured it cost the government nearly $8 to examine an applicant. To add fuel to the fire as well, the FCC's exams were being compromised. The questions and answers were becoming widely known, thanks to the efforts of Dick Bash, KL7IHP, who published them. He said the "IHP" suffix stood for "I help people," and that he did.

The "Bash books" contained the actual questions and multiple-choice answers to the General, Advanced, and Extra Class tests verbatim. He called them "The Final Exam" and all but guaranteed you'd pass. Bash got the questions and answers simply by appearing at FCC examination points and questioning applicants as they left the exam room. Later, applicants would mail him the exam questions and answers by using a "feedback card" that he stitched into the back of his manuals. He had the best study material around and they sold like hotcakes! Dick Bash, an airline pilot, claimed his operation was legal and reminded everyone that the FAA's written exam questions and answers were also published. The FCC did not like it but was powerless to do anything about it. It simply did not have the personnel to frequently revise and update the exams.

Volunteer License Testing Legislation

In 1981 a bill was introduced into Congress by Senator Barry Goldwater, K7UGA. It amended the Communications Act of 1934 to provide the legal basis for the Volunteer Examiner program to get going by allowing the FCC to accept the uncompensated volunteer services of amateur radio operators to prepare and administer license exams.

The amendment—a new paragraph inserted into the Act—provided that volunteer examiners had to "...hold a higher license class than the license class for which the examination is being prepared or administered. In the case of examinations for the highest class of amateur station operator license, the Commission may accept and employ such services of any individual who holds such class of license." Amateurs who had a commercial interest in ham radio were declared ineligible to participate in the new volunteer program.

President Reagan signed the legislation into law on September 13, 1982. A month later the American Radio Relay League petitioned the FCC, suggesting that only national-in-scope, non-profit educational organizations be allowed to accredit Volunteer Examiners. It proposed that teams of three VEs, one of whom had to be an Extra Class licensee, would conduct the examinations. It was pretty much clear to everyone that the ARRL planned to be the only exam coordinator.

Consistent with the legislation accepting "voluntary and uncompensated assistance" from the amateur community, the FCC issued a Notice of Proposed Rulemaking (NPRM, PR Docket 83-27)

*1020 Byron Lane, Arlington, TX 76012
e-mail: <w5yi@cq-amateur-radio.com>

on January 20, 1983, basically proposing the ARRL plan. The FCC proposed to create national-in-scope Volunteer Examiner Coordinators as "...umbrella entities to coordinate and lend consistency to the efforts of amateur volunteers nationwide."

VECs would eliminate the necessity for the FCC to have "day-to-day dealings with hundreds or thousands of volunteer examiners nationally." The Commission said that if the new program was successful, it would consider adding the Novice program, which was already administered by volunteers. It denied an ARRL request that it be allowed to issue interim amateur permits so examinees could immediately go on the air while awaiting receipt of their first license from the FCC. The Commission did, however, propose "temporary authority" to already licensed amateurs who upgraded.

The FCC said it would not accept as an examiner anyone "who owns a significant interest in, or is an employee of, any company engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur station operator licenses."

VECs (like the ARRL, which had an interest in license preparation publishing and distribution) could coordinate exams, but the actual testing would be conducted by their Volunteer Examiners. VECs were required to make a "persuasive showing" that preventative measures had been taken to preclude any possible conflict of interest. This was accomplished by the construction of a so-called "Chinese wall" between the VECs' license preparation and license examination divisions. (In 1996, the FCC adopted rules eliminating this required separation.)

The FCC proposed accepting suggested questions from the amateur community for the various classes of license exams. The FCC would then review them and issue lists of approved questions. The General Class (Element 3) questions were contained in PR Bulletin 1035-B, Advanced Class (Element 4A) in 1035-C, and Extra Class (Element 4B) in 1035-D. These PR Bulletins contained the exact question, but not the answer, which was to be supplied by the volunteer examining community. The feeling was that since the VEs themselves had passed the examinations, they understood the material. This would cause problems down the road.

At first, the Commission proposed that the FCC would design the written examinations by selecting approved questions from nine topics. It would be up to the VECs to assemble, print, and distribute the actual written examinations to their Volunteer Examiners.

"We expect that VECs will have some method of keeping track of who has passed any given examinations," FCC said, "and of certifying successful completion of an examination to the applicant." New rules required successful applications to be submitted by the VEs to their VECs, who would screen them and forward them to the FCC, which would issue the license.

On September 22, 1983, the FCC adopted a Report and Order in PR Docket 83-27 and established a program effective December 1, 1983 basically, as proposed, to accept the services of volunteers to prepare and administer amateur operator examinations above the Novice Class level.

On reconsideration, the FCC agreed that the VECs (rather than the FCC) should design the examinations, and after a two-year transition period this function could also be accomplished by VE teams. The formula for selecting questions would be by choosing a specified number of questions from the various examination topics. The FCC also denied a request that passing a telegraphy examination could only be accomplished by sending or receiving telegraphy for one continuous minute at a prescribed speed.

Expense Reimbursement

By late 1983 the regulatory stage was set for volunteer examinations in the Amateur Radio Service to begin. The overwhelming opinion was that the American Radio Relay League would be the sole VEC. Surprisingly, however, it did not apply to become the only national VEC. The League feared financial ruin unless the volunteer examining community was permitted to recoup out-of-pocket expenses.

The FCC had assumed that the amateur community would absorb any out-of-pocket expenses, just as it had with the Novice program. Also, there had been no discussion about "expense reimbursement" until the last minute. The enabling legislation clearly said that amateur radio license testing services must be provided on a "voluntary and uncompensated" basis.

The FCC ruled that reimbursement of expenses did not comport with the law that specified "no compensation" peri-

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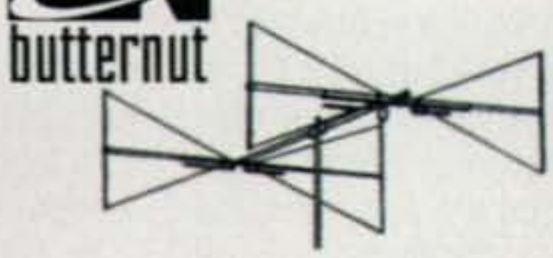

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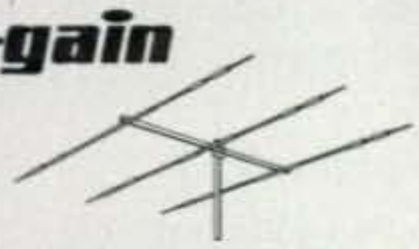

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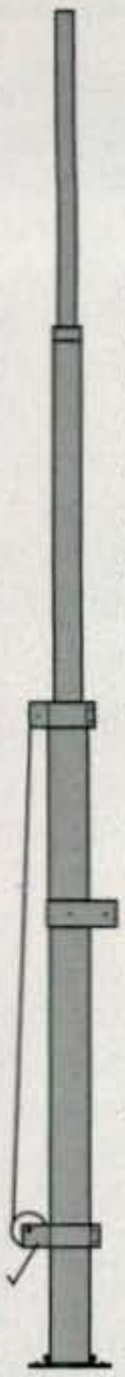

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od. Since the ARRL was perceived as the only "national-in-scope" applicant eligible to be a nationwide coordinator, the FCC's Chief of the Private Radio Bureau, James C. McKinney, changed the ground rules. If the ARRL would not handle ham exams, he thought smaller groups would.

Instead of requiring that VECs be national in scope, the FCC would now accept VECs on a "regional" basis. VECs could coordinate license examinations in one or more of the 13 regions—radio district Ø through 9, plus Alaska, the Pacific (e.g., Hawaii), and the Caribbean areas (e.g., Puerto Rico).

Senator Barry Goldwater, K7UGA, had been instrumental in transitioning amateur license testing from the FCC to the ham community. Addressing the ARRL's latest concerns, he introduced a bill into Congress that provided for exam out-of-pocket expenses in connection with preparing, processing, and administering examinations. He suggested a beginning reimbursement of $4.00, which could be increased annually based on inflation.

On March 6, 1984 the FCC issued a Notice of Proposed Rulemaking proposing to reimburse Volunteer Examiners and Coordinators. Still to be decided was how the expense money would be distributed. The public comment date ended on May 7, 1984. Meanwhile, the FCC announced that 1984 would be the last year in which it would administer any amateur radio operator license examinations, and then only on a quarterly basis. It began to look as if ham exams would be in short supply and possibly non-existent in the future.

The FCC appointed the Anchorage Amateur Radio Club as its first VEC on February 27, 1984. It agreed to handle all ham exams in Alaska, FCC's Region 11. The Anchorage club was followed by the Dayton Amateur Radio Association and a number of other VEC applicants. Most of them are no longer exam coordinators. The W5YI Group applied, and was approved, to become a VEC on June 12, 1984.

On June 18, 1984 the FCC sent out its first "Instructions to Volunteer-Examiner Coordinators." It covered recruiting and accrediting Volunteer Examiners, coordinating examination sessions, application forms and handling, providing test materials, examination grading, record keeping, question evaluation, and examination integrity. The opening instructions only provided for the accreditation of Advanced and Extra Class Volunteer Examiners.

Coordinating VECs were to screen all collected information, resolve any discrepancies, and send successful FCC Form 610 documents to the FCC, which would key in the application data and issue the appropriate license. It was a very time-consuming, labor-intensive job for the FCC, and it frequently took weeks—and sometimes months—for a license to be issued by the Commission.

Once the FCC's Universal Licensing System came on line in 1999, VECs were required to forward the application data to the FCC electronically in "batch files." This drastically speeded up the receipt of licenses by applicants—from months to just a few days.

The instructions to VECs were updated annually by the FCC. In the early 1990s, the responsibility for maintaining the VEC instructions was turned over to the National Conference of Volunteer Examiner Coordinators. Formed in 1985, the NCVEC is an organization consisting of representatives of all VECs. They meet annually with the FCC to discuss areas of interest to the examining community and to standardize testing procedures among the VECs.

On July 20, 1984 the FCC released a Report and Order authorizing reimbursement of out-of-pocket expenses. Part 97 was amended to provide a maximum of $4.00 reimbursement for 1984, which would be adjusted annually each January 1st for changes in the Department of Labor's Consumer Price Index.

VEs and VECs were required to keep disbursement records (since abolished) and to certify annually that "...all expenses for which reimbursement was obtained were necessarily and prudently incurred." Expense records had to be retained for three years. (Record keeping requirements also have been abolished.) Once a provision for expense reimbursement was in place, the ARRL applied for and was certified as a Volunteer Examiner Coordinator for all 13 FCC-defined regions.

Volunteer Examinations

One of the problems that soon became apparent was that the FCC rules governing examinations referred to questions and question pools. Nothing was said about standardized answers. It was up to the VEC or VE to supply the answer.

The opening (June 18, 1984) instructions provided that the Commission would select the questions to be asked from the PR Bulletin 1035 series. However, it was up to the VEC to determine the answer and choose the answer format to be used. Essay, single-answer, fill-in-the-blank, multiple-choice, and even true-false answer formats all were specifically approved.

Volunteer Examiners were authorized to provide the Morse code testing materials, although they also could be provided by the VEC. The only instructions VECs were given was that "The form of the examination should be such as to prove the candidate's ability to transmit correctly by hand and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed." The FCC said, "...it has been our experience that a receiving test is adequate proof of both sending and receiving capability."

The first Conference of VECs was held in 1985, and representatives of most VEC organizations attended. It was at this meeting that the VECs took the first steps toward standardizing amateur license examinations.

In 1986 maintenance of the question pools was turned over to the VECs, who were asked to "...cooperate with other VECs in maintaining one question pool for each written examination element." However, the answers and answer formats were still the responsibility of the Volunteer Examiners.

With so many different answers and answer formats to the questions, it is little wonder that applicants began "shopping" for the easiest examinations. Particularly popular were examinations with true-false formats that a few VECs used.

The last "Instructions to VECs" document was prepared by the FCC on February 29, 1990. All further instructions would be prepared by the VECs themselves. The first version was completed in 1991 under the chairmanship of R. C. Smith, W6RZA, who headed up the Greater Los Angeles Amateur Radio Group, and submitted to the FCC for approval. These instructions provided that each VEC would use the same multiple-choice-format written questions, and code tests could only be passed by copying text for one solid minute without an error. On November 30, 1992 the FCC's Special Services Division Chief (Robert H. McNamara) distributed copies to each of the VECs and urged that each comply with them.

There you have it—how volunteer license examining in the U.S. Amateur Radio Service got going. Today there are 13 separate VEC organizations and approximately 30,000 Volunteer Examiners who report to them, making test sessions available frequently and relatively nearby in most cases.

73, Fred, W5YI

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The MFJ-974HB tunes any balanced lines including 600 Ohm open wire line, 450/300 Ohm ladder lines, 300/72 Ohm twin lead - - shielded or unshielded.

Superb current balance minimizes feedline radiation that can cause troublesome TVI /RFI, painful RF bites, mysterious RF feedback problems and radiation pattern distortion.

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The MFJ-974HB is a *fully balanced* wide range T-Network. *Four* 1000 Volt air variable capacitors are gear driven. A high-Q air wound tapped inductor is used for 80-10 Meters with separate inductors for 6 and 160 Meters. The tuning components are mounted symmetrically to insure electrical balance.

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A 1:1 *current* balun is placed on the low impedance 50 Ohm input side to convert the balanced T-Net-work to un-balanced operation. An efficient balun is made of 50 ferrite beads on RG-303 *Teflon*™ coax to give very high isolation. It stays cool even at max power.

Balanced Line = Extremely Low Loss

Balanced lines give extremely low loss.

Doublet, horizontal loop, vertical loop, quad, double extended Zepp, Lazy H, W8JK antennas all give efficient multi-band operation when fed with balanced lines.

6-80 Meter Balanced Line Tuner

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MFJ-974B, $179.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $49.95. 102 feet doublet antenna covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for 450 Ohm ladder line (100 feet included). Authentic *glazed ceramic* end insulators. Handles 1500 Watts.

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Choose super versatile 5-way binding posts AND/OR Anderson PowerPole® connectors

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math's notes

BY IRWIN MATH,* WA2NDM

SWR Bridges and Measurements

Now that the weather is becoming mild again, it is about time to begin working on resurrecting the station antenna from the ravages of winter (at least in the northern climates). One indispensable tool for this endeavor is an SWR bridge, and this month we will look at how to build two fairly simple versions at very little cost. While both may not be as accurate as commercial or laboratory types, they nevertheless should be adequate for most routine amateur applications.

SWR Bridge No. 1

The first SWR bridge is designed for measurement purposes only and is not intended to stay in the line continuously, as it dissipates a good amount of the power applied. It just is used to take measurements and will only handle a maximum of a couple of watts. Fig. 1 shows the schematic diagram of this version. As you can see, the transmitter (or signal source) is connected to the top of a bridge made up of two 50-ohm resistors in one leg and a 50-ohm resistor and the antenna in the other leg. When the antenna impedance is exactly equal to 50 ohms, the voltage at the mid-point of each leg is equal; no current flows through diode D1 and the reflected power meter therefore reads zero (which is equal to an SWR of 1:1). When the antenna is anything other than 50 ohms, there is unequal voltage across the bridge and the reflected power meter reads a voltage that relates to an SWR of more than 1:1. We will see how to calibrate this bridge shortly.

Also present is D2, which is connected directly to the midpoint of the resistor leg to detect forward power. The two 50K pots are used to calibrate the bridge, and the total power-handling capability of this circuit is equal to the wattage of the 50-ohm resistors. If you use two 1/2-watt 100-ohm resistors in parallel for each 50-ohm resistor, the bridge will work with up to 2 watts of RF. In addition, for best results the values of the bridge resistors should be as close to 50 ohms as possible, so don't hesitate to use your ohmmeter.

To calibrate the bridge, connect the input connector to a signal source (or transmitter) with an output that can be reduced to 1 watt. Also connect a 50-ohm resistor to the antenna connector as a dummy load. Carefully study the circuit, and you will see that the total load impedance presented to the signal source is 50 ohms. Now adjust the signal level to exactly 1 watt. You will know when the input is correct when the RF voltage across the input connector (not the load resistor) is equal to 7.07 volts rms. An RF voltmeter or oscilloscope is handy for making this measurement. If you do use a scope, you will measure peak-to-peak (pp) voltage and should convert the reading to rms by multiplying the pp value you see by 0.35355 (1 watt will be equal to 2.83 volts pp). Next set the forward-voltage-meter-adjustment-pot to obtain a reading of exactly full scale. This point should be marked as 1 watt on the meter dial. After making this adjustment, it is a good idea to put a drop of nail polish on the pot adjustment screw so it will not move. You can now vary the transmitter power from 1 watt down to 0.1 watt, marking the forward power meter scale in accordance with Table I.

It should be noted that since this bridge is essentially resistive, you can calibrate it with any sine-wave signal source (instead of a transmitter) as long as it can be adjusted to produce at least 1 watt. You can also choose any convenient frequency above about a MHz or so and the results should be accurate to within at least 10% over the entire HF range, which should be fine for most applications.

Once the forward meter is calibrated, you can proceed to calibrate the reflected power meter directly in SWR as follows:

1. Set the signal source to 1 watt (exactly 7.07 Vrms) again.
2. Remove the 50-ohm antenna resistor.

*c/o CQ magazine

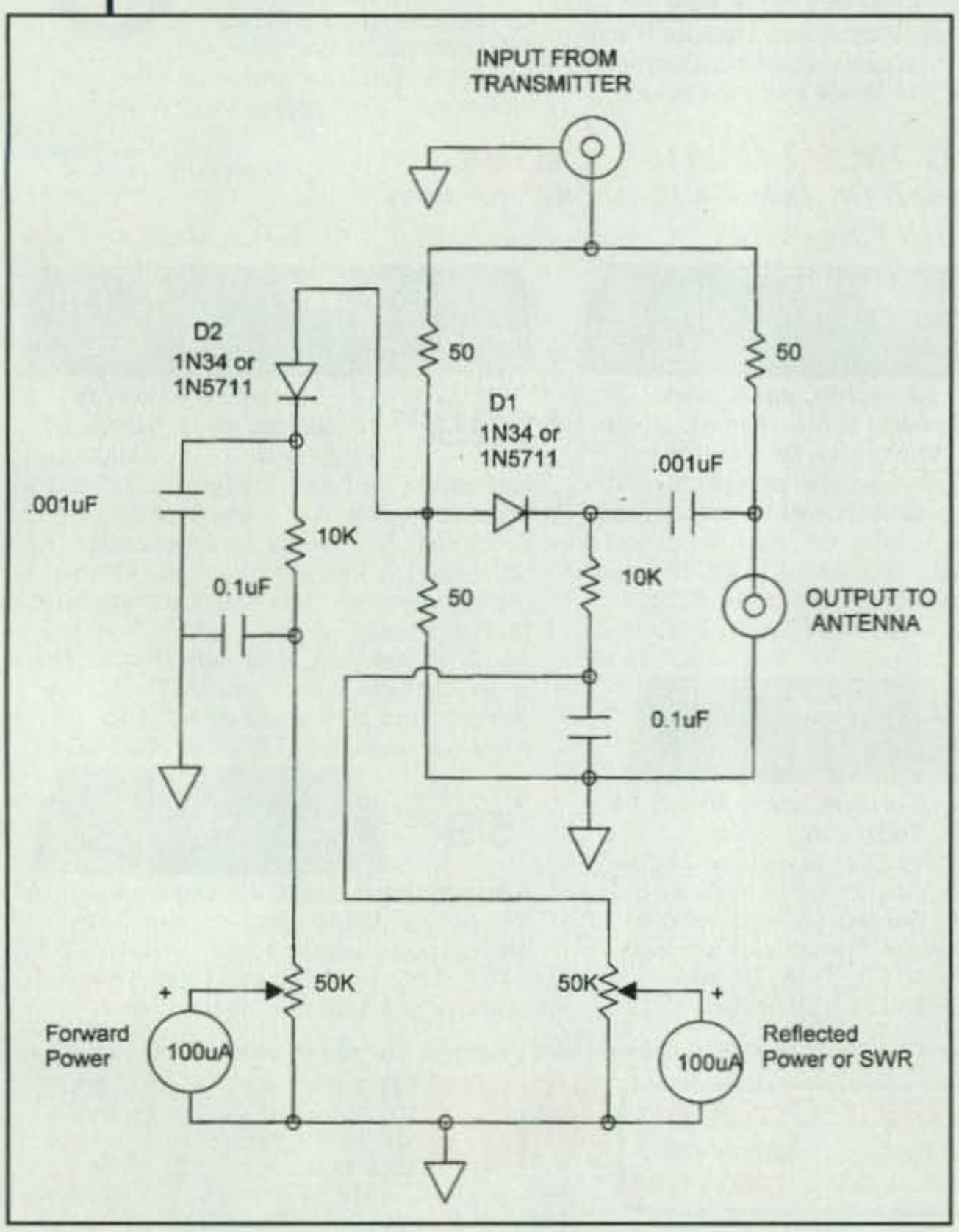

Fig. 1– Resistive SWR bridge.

3. Adjust the reflected-power-adjustment-pot so the meter reads full scale.
4. On the reflected power meter dial mark the full scale position as infinite.
5. Remove the signal.
6. Mark the 50% point on the scale as 3:1
7. Mark the 33% point on the scale as 2:1.
8. Mark the 20% point on the scale as 1.5:1.
9. Mark the 0 point on the scale as 1:1.

Again put a drop of nail polish on the pot shaft to prevent movement. Now connect your antenna and "see" what the SWR in the line actually is. Remember, do not apply more than 1 watt of power or you will damage the circuit, and also don't forget to remove the bridge from the circuit after your measurement.

Watts	Volts RMS	Volts PP	Watts	Volts RMS	Volts PP
1	7.07	2.82	0.5	5.00	1.42
0.9	6.70	2.55	0.4	4.47	1.13
0.8	6.32	2.26	0.3	3.87	0.85
0.7	5.91	1.98	0.2	3.16	0.56
0.6	5.47	1.69	0.1	2.23	0.28

Table I– SWR bridge No. 1: Vary the transmitter power from 1 watt down to 0.1 watt, marking the forward power meter scale in accordance with this table.

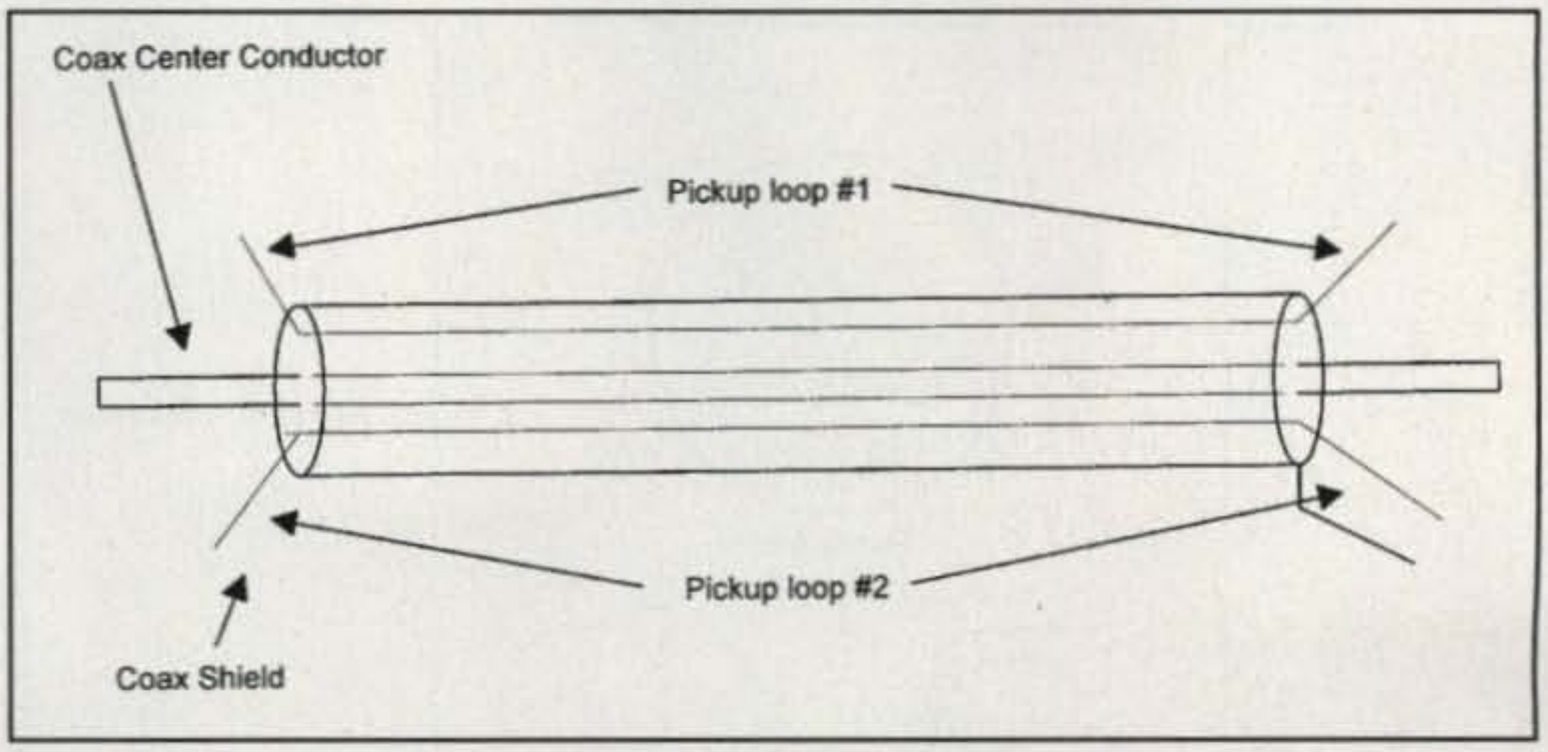

Fig. 2– Details of the pickup assembly.

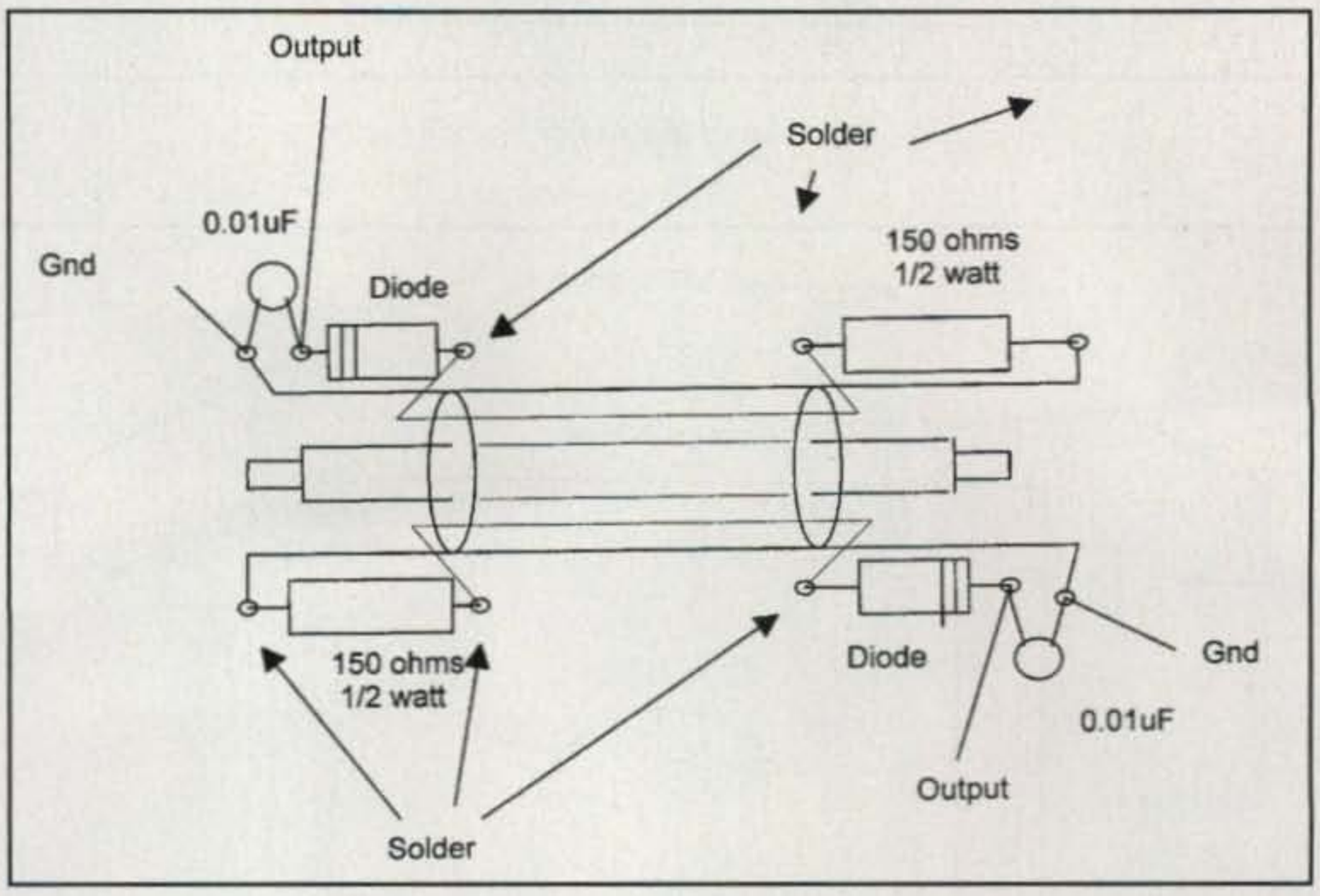

Fig. 3– Wiring of the pickup assembly.

SWR Bridge No. 2

Unlike the first unit, the second SWR bridge is designed to handle much more power and is also intended to stay in the line (between the transmitter and antenna) continuously. It is based on a design produced by the Heath Company many years ago in its popular HM-11 SWR bridge and will require a minimum of about 20 to 25 watts at 3.5 MHz, dropping to 5 watts or so at 30 MHz for proper operation. For this version the pickup assembly must not only carry higher power, but must not drop any significant amount of RF between the transmitter and antenna. Often (these days) this assembly is made of a toroid core wound with several turns of wire and placed over the HF coax going from the transmitter to the antenna. There is another way, however (as used in the older equipment), and it doesn't require any special ferrite core. Fig. 2 is a diagram of a pickup assembly made in this manner from a 10-inch length of RG-8 coaxial cable, which you might have "floating around" in your junk box.

To build this assembly, first carefully remove the outer jacket of the coax with a single-edge razor blade. Use the blade gently and only cut deep enough to remove the jacket. Try not to cut or nick the braid (or your fingers, for that matter). Next cut the braid so that about 1 inch of center conductor extends on each end. Push the braid toward the center from each end so it "bunches up" and leaves some space between it and the center conductor. Now slide two 12-inch lengths of #20 enameled wire between the braid and center conductor until they poke out of both ends. Next arrange the wires so that they are on the opposite side of the center conductor and as straight as possible (as shown in the drawing). Smooth the braid back into the original position and check each wire to be sure that it is not shorting to the braid. Finally, carefully tape the assembly in place with black vinyl electrical tape. For best results try to make everything as symmetrical as possible.

Next wire the pickup assembly as shown in fig. 3. The capacitors should be common 0.01-µF ceramic types, and the diodes can be either 1N34 germanium or IN5712 Schottky devices. If you can, try to select diodes that are similar by measuring the forward resistance with an ohmmeter and using devices that match as closely as possible. Carefully solder each component using only enough heat to make the joint. Be careful to not damage the center conductor of the coax or the vinyl tape insulation. When you are done, the assembly should be neat and fairly rugged and should look something like fig. 3.

Now obtain an aluminum mini-box or

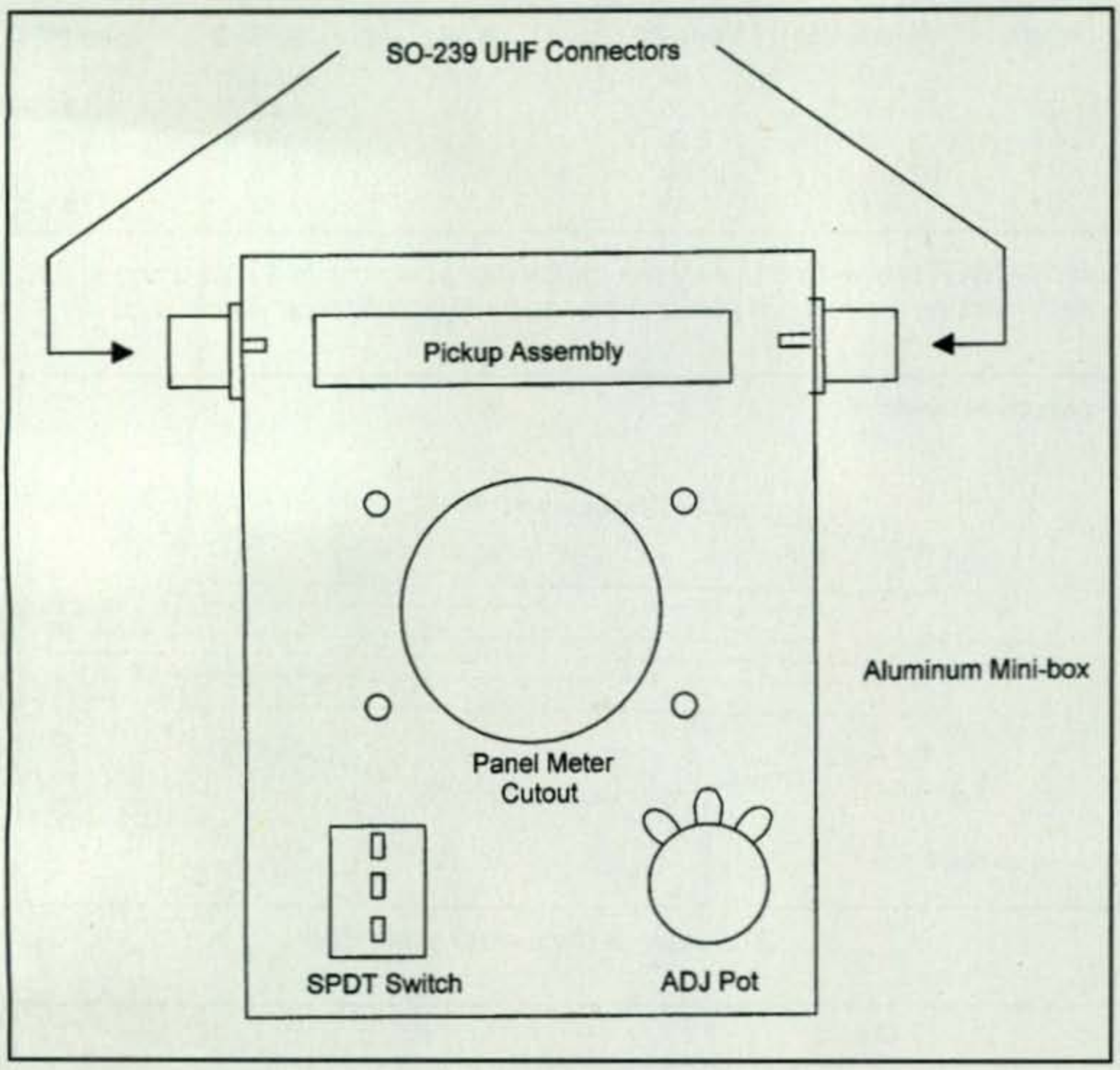

Fig. 4– Location of the major components.

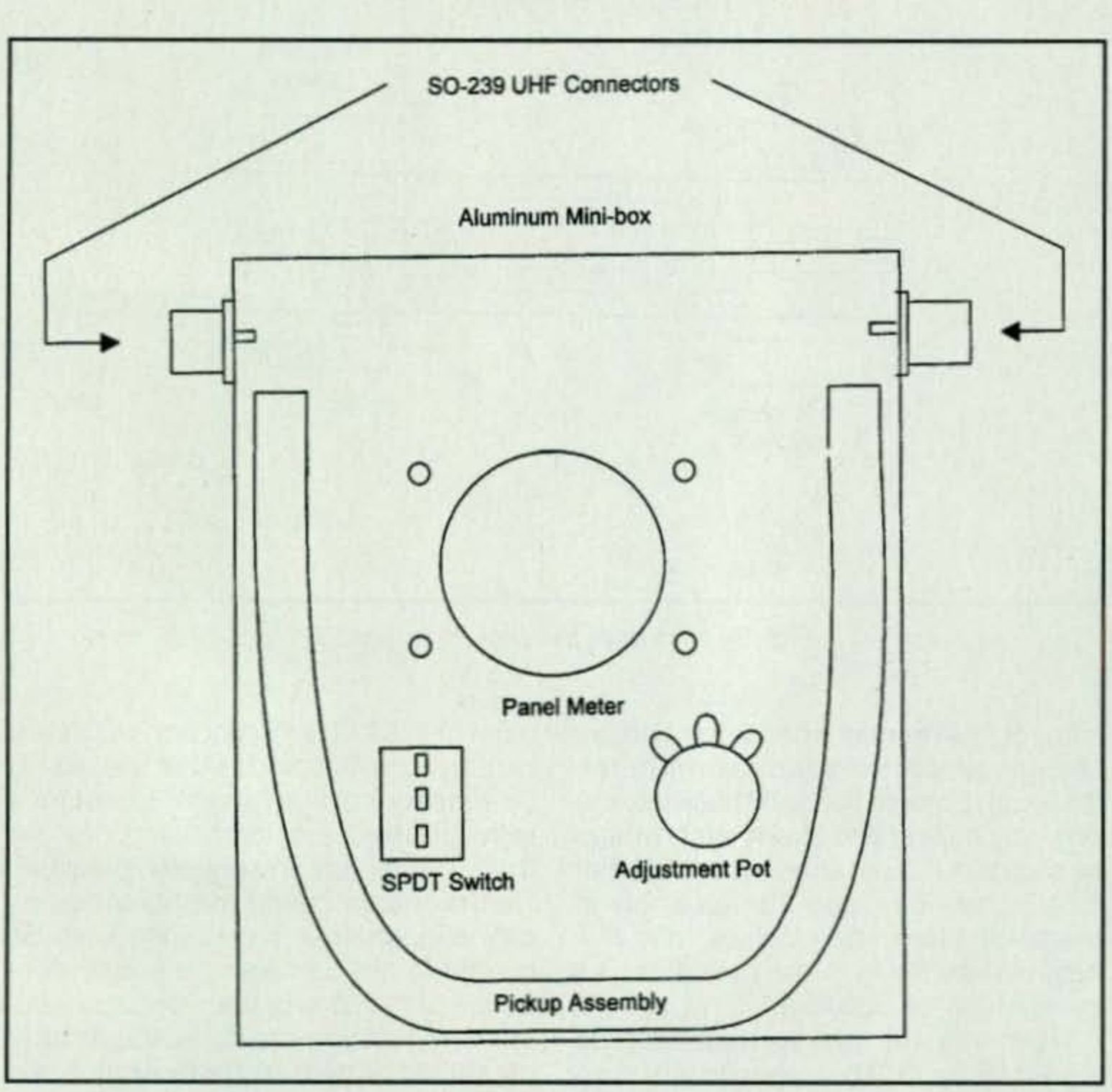

Fig. 5– Alternate location of the pickup assembly.

chassis that is large enough to hold the pickup assembly you have just built and mount two SO-239 coaxial connectors, the meter, switch, and ADJ pot as shown in fig. 4. The location of the pickup assembly is also shown for reference. Note that if you do not wish to use a very large mini-box, the pickup assembly can be bent in a loop as shown in fig. 5. If you choose this layout, be sure to bend the loop carefully and smoothly, keeping the pickup wires properly oriented. Finally, wire the circuit shown in fig. 6. The meter can be any panel meter with a sensitivity of 100 microamperes (full scale) to 1 milliampere. The more sensitive the meter, the less power needed for operation of the final bridge.

To calibrate this SWR bridge connect your transmitter (set to CW) to the input, and a high-power 50-ohm dummy load to the output. Set the REV CAL 10K trim pot to the middle of its rotation and the CAL switch to the FWD position. Apply the maximum amount of power you wish to pass through the unit, but be sure not to exceed the rating of your dummy load. Now adjust the 50K ADJ pot to exactly full scale. Reverse the connections to the transmitter and dummy load, set the CAL switch to SWR, and check that the meter still reads full scale. Do not touch the setting of the 50K ADJ pot at this time. If the meter does not read exactly full scale, vary the 10K REV CAL pot until it does. You can now reverse the transmitter and dummy-load position again and calibrate both the power and SWR scales on the meter as per the method used for the first SWR bridge. Now, however, the power markings will be greater (in accordance with the formula $P = E^2/R$). For example, 10 watts will produce 22.3 volts rms and 100 watts will produce 70.7 watts rms. However, the SWR scale markings will be in the same ratio as the procedure previously given. Note that it is not important to calibrate the power readings on the meter unless you really want to, but the SWR scale is, of course, what this is all about.

In actual operation, connect your transmitter and antenna to be adjusted to the appropriate connectors. Set the switch to FWD, turn on the transmitter, and quickly adjust the ADJ pot for exactly full scale. Now switch to the SWR position and read the SWR. Then make your adjustments!

Summary

Once again I wish to say that these bridges are not laboratory instruments. They are only intended to give you a

reasonable indication of the condition of your antenna. A precision SWR bridge requires careful matching of the pickup assembly, diodes, components, and overall symmetry of the circuit and is beyond the scope of these simple approaches.

I hope the above is not too involved, but if you want to give it a try please do so. There are no really dangerous AC or DC voltages to worry about, only RF, so as long as your transmitter is not being keyed, there is not much risk to you. *Be careful, however, as you can get a nasty RF burn if you key the transmitter while touching any of the internal components (especially at higher power).* Have fun and please let me know of your successes, failures, or interesting modifications that you come up with, and I will be glad to pass along the more interesting stories I receive.

In closing, I would like to direct those nostalgia buffs to a website I have found that should stir up many memories: <http://www.heirloomradio.com/>. John Lovering, KC1XG, presents many photos of vintage equipment, old radio programs, and all sorts of information just too numerous to mention. Look at the website and I am sure you will not be disappointed. 73, Irwin, WA2NDM

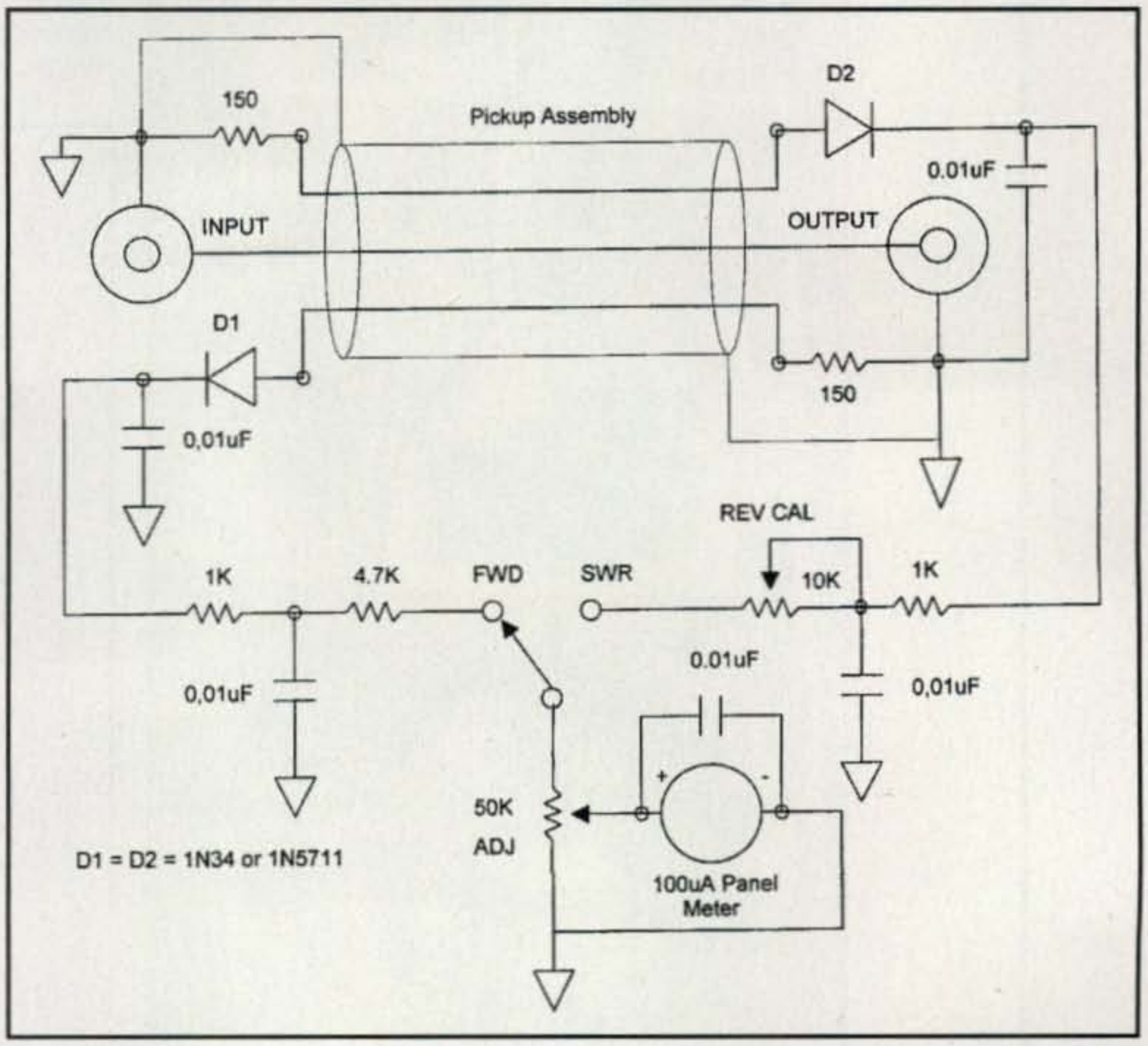

Fig. 6– SWR bridge version two.

antennas

BY KENT BRITAIN,* WA5VJB

More on Small Loop Antennas

As we covered in the March issue in this column, a lot has been written about the low noise, or noise reducing, characteristics of small loop antennas. Loop antennas pick up the magnetic portion of the electromagnetic spectrum, or radio waves. Thus, loop antennas tend to reject local noise, which typically is radiated in the electrical, or E, field.

A lot of this E-field noise comes from AC power lines. Therefore, it is best to position your loop antenna away from power lines in the house. Sometimes moving a loop just a few feet can really drop the noise floor. If you can, try different spots around your QTH.

All small loops have a figure-8 pattern, as shown in fig. 1, with the nulls in the direction of the broad side of the loop. These nulls can be very handy. By turning the loops, you can often put a noise source in the null. The null can also be very effective to null out strong QRM stations. Also, if the loop is small enough, you would hardly be the first ham to just set it on top of the rig so yu can quickly twist the antenna to a null. I have never tried putting a loop on a small TV rotator, but that is certainly one way to do it. Simply twist the rotator for best reception.

Just connect your receive loop to your HF receiver and start looking for those weak signals. The first thing you are going to notice is that signals are three or four S-units down from what you are used to. This lower signal level is typical, but have you noticed that the noise floor is down five S-units? Try a few different locations, rotate the loop in a few different directions, and you probably can bring that noise floor down even more.

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

A Simple Loop to Build

Here is a simple low-noise loop antenna you can build easily (photo A, figs. 2 and 3). Also, by sending some DC power back up the coax, you can tweak the tuning for your favorite part of the band.

I took advantage of a spectrum analyzer with a tracking generator into a resistive bridge to tune up this loop. However, if you build it close to the dimensions given in the figures, just find a good steady signal and peak on it. If you have a trimmer capacitor in the 150–300 pF maximum range, it makes a good tweaker across the diodes.

Photo A– The loop antenna and the diode bias supply.

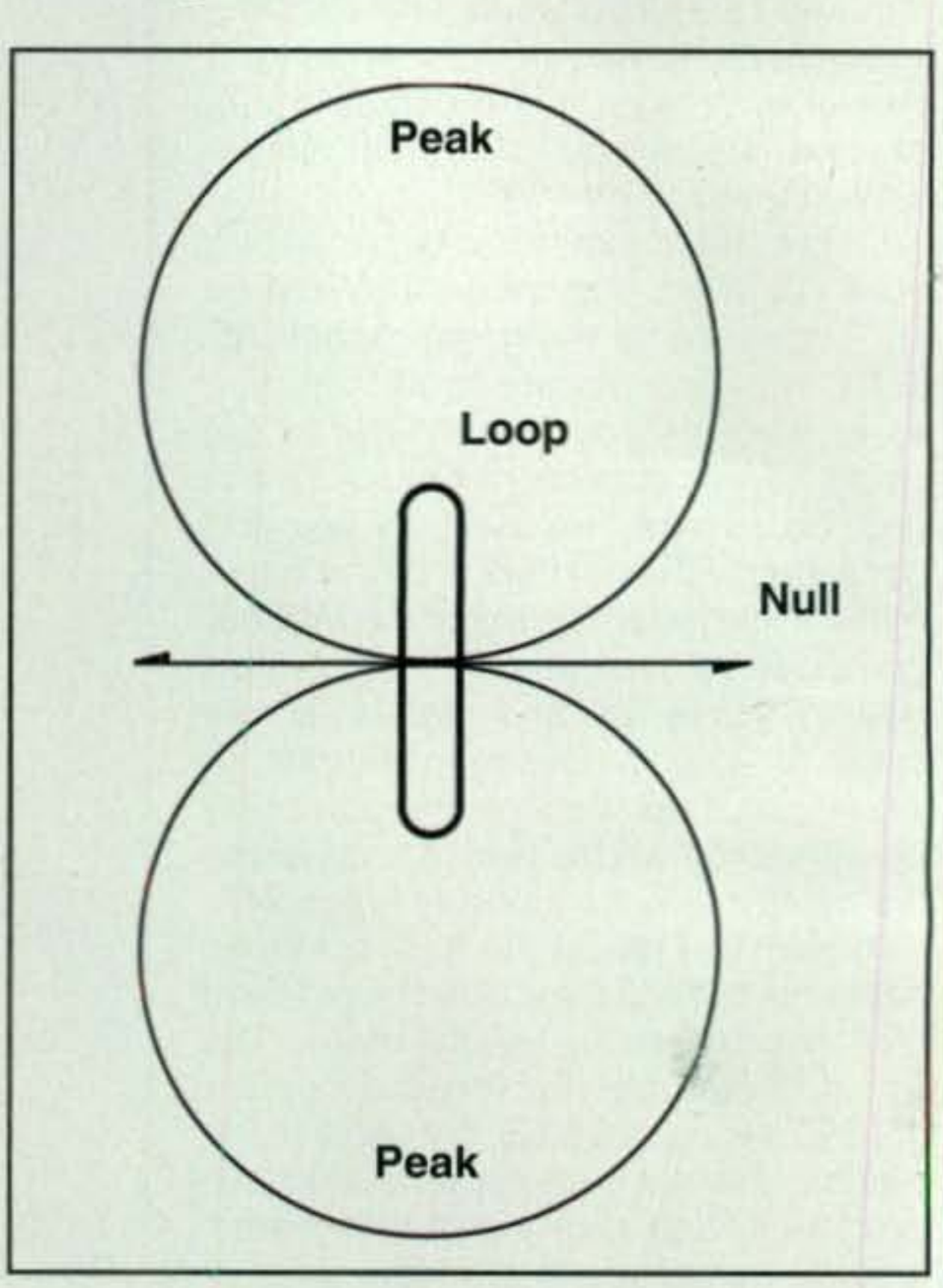

Fig. 1– The small loop antenna and its figure-8 pattern.

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SS-12	10	12	1⅛ x 6 x 9	3.4
SS-18	15	18	1⅛ x 6 x 9	3.6
SS-25	20	25	2¾ x 7 x 9⅝	4.2
SS-30	25	30	3¾ x 7 x 9⅝	5.0

MODEL SS-25M

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2¾ x 7 x 9⅝	4.2
SS-30M*	25	30	3¾ x 7 x 9⅝	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

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

WITH SEPARATE VOLT & AMP METERS

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

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

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

WITH SEPARATE VOLT & AMP METERS

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

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ICOM IC-F11020 & IC-F2020
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KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
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SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

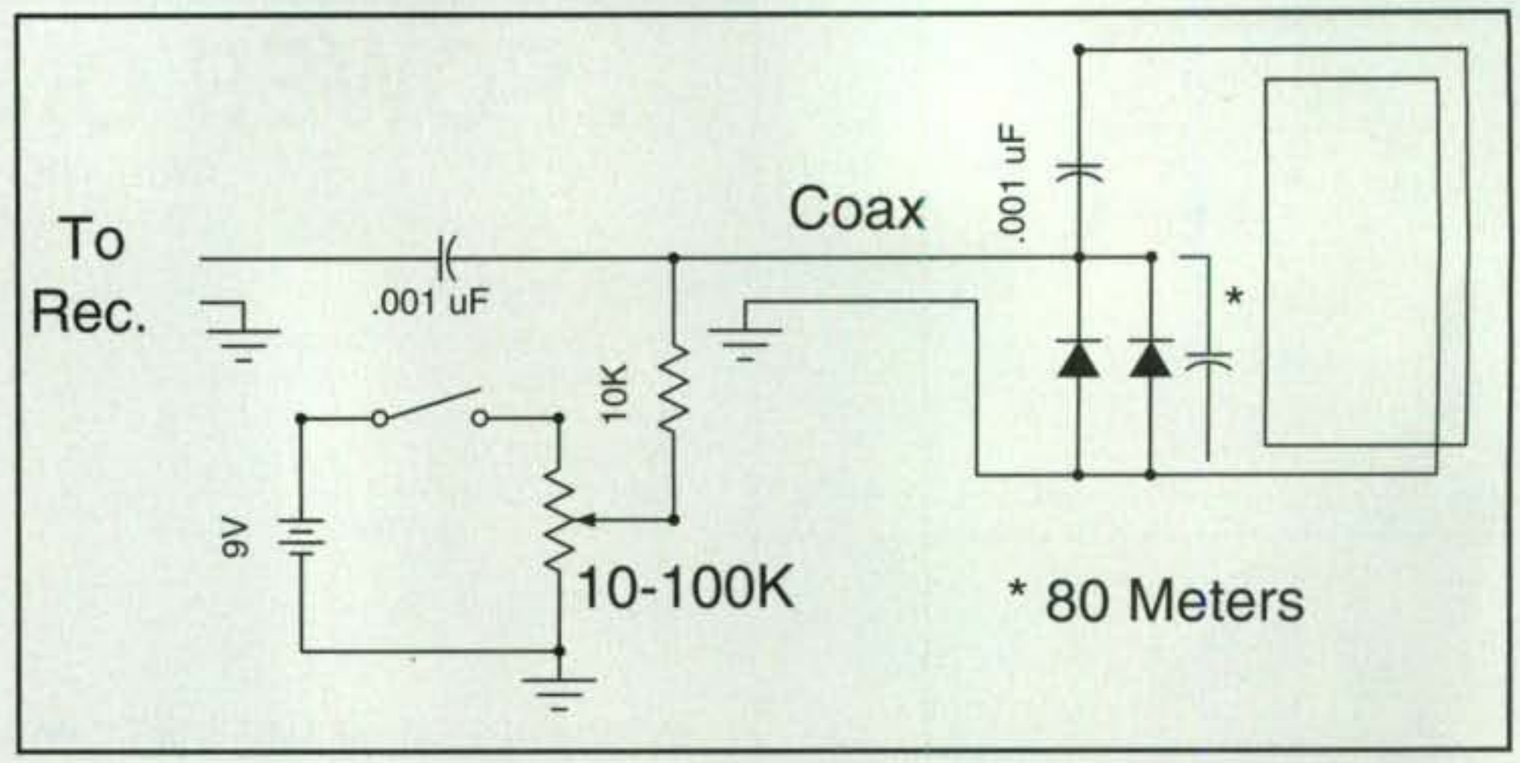

Fig. 2 Schematic of the loop and its diode bias supply.

Parts List

Diodes: 1N4001–1N4007
Capacitors: .001 µF (two)
Potentiometer: 10–100 K ohms
22-gauge wire was required

40 Meters
Five turns, three diodes

60 Meters
Five turns, three diodes, 47 pF across the three diodes

80 Meters
Eight turns, four diodes, 100 pF across the four diodes

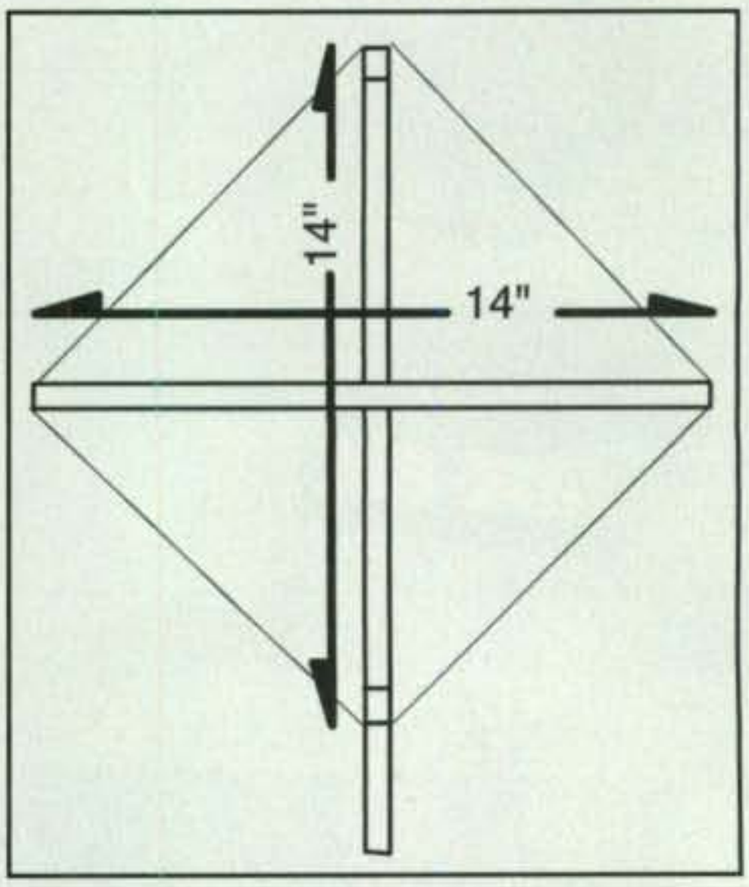

Fig. 3–Dimensions for all three versions (40, 60, and 80 meters) of the loop antenna. Yes, all three are the same.

There are a lot of ways to use your loop antenna. For years I had mine fixed in the attic. I cranked up the volume on the rig pretty high so I could hear the noise, went up into the attic, and rotated the loop for lowest noise. It stayed in that position for the next 10 years.

Power

The power supply shown in photo B is quite simple. I ran my tuner off a single 9-volt battery, but there are several advantage to increasing the voltage to, say, 18 volts using two 9-volt batteries. However, try to avoid using an AC power supply. The whole idea is to get away from power lines and their noise, and now you want to connect the AC power line directly to your antenna?

For the coupling capacitors you want to use something between 10,000 pF and .001 µF. For those of you who are into nano-Farads, that would be between 10 nF and 100 nF. The coupling capacitor is not critical for the tuning, but when using very very high values for the tuning potentiometer, it took a while for a .1-µF cap to charge and discharge. Thus, I turned the pot, but it took a while for the antenna to change frequency as the two coupling caps charged and discharged. Another learning experience: More capacitance for a lower impedance is not necessary a good idea. You want just enough to do the job, and a good old .001-µF cap works fine. The tuning pot can be most any value from 5 to 500K. For my first version I used a 500K-ohm pot and didn't even install a power switch. The theoretical life of an alkaline battery in that circuit is well over a year. Heck, I'll probably forget and leave it on anyway.

The diodes in photo C can be most any diode in the 1N400X family. There are many variable caps available in the 50-pF range. Three seemed to work best on 40 and 60 meters, but an extra one helped down on the 80-meter band.

What Next?

This is a simple project, but there are also many ways to improve a loop

antenna. Building the loop with a Faraday shield will reduce noise pickup even more. Winding the coils in a more spread-out manner, using bigger wire, improved impedance matching, and high-impedance preamps will also improve the Q (quality factor) of this antenna. The efficiency of the loop as an antenna is directly related to its Q, as is the loop's ability to help filter out nearby strong signals. We will see what kind of feedback we get from you, our readers, on your interest in reading about more advanced loop antennas.

Increasing the Q

After the last column, I received an excellent e-mail from G3RZP. Peter went into some of the more exotic ways of

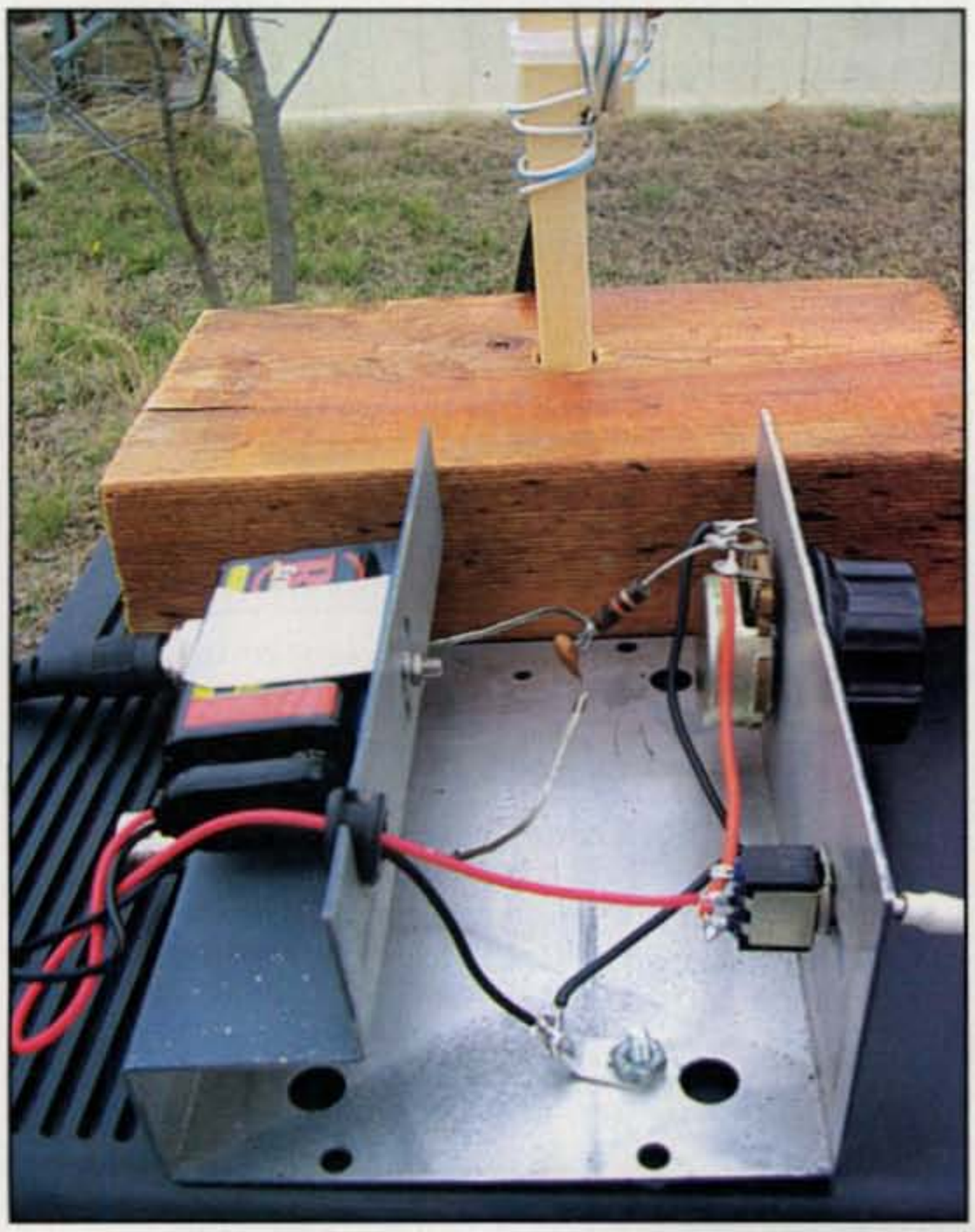

Photo B– The HF loop diode bias power supply.

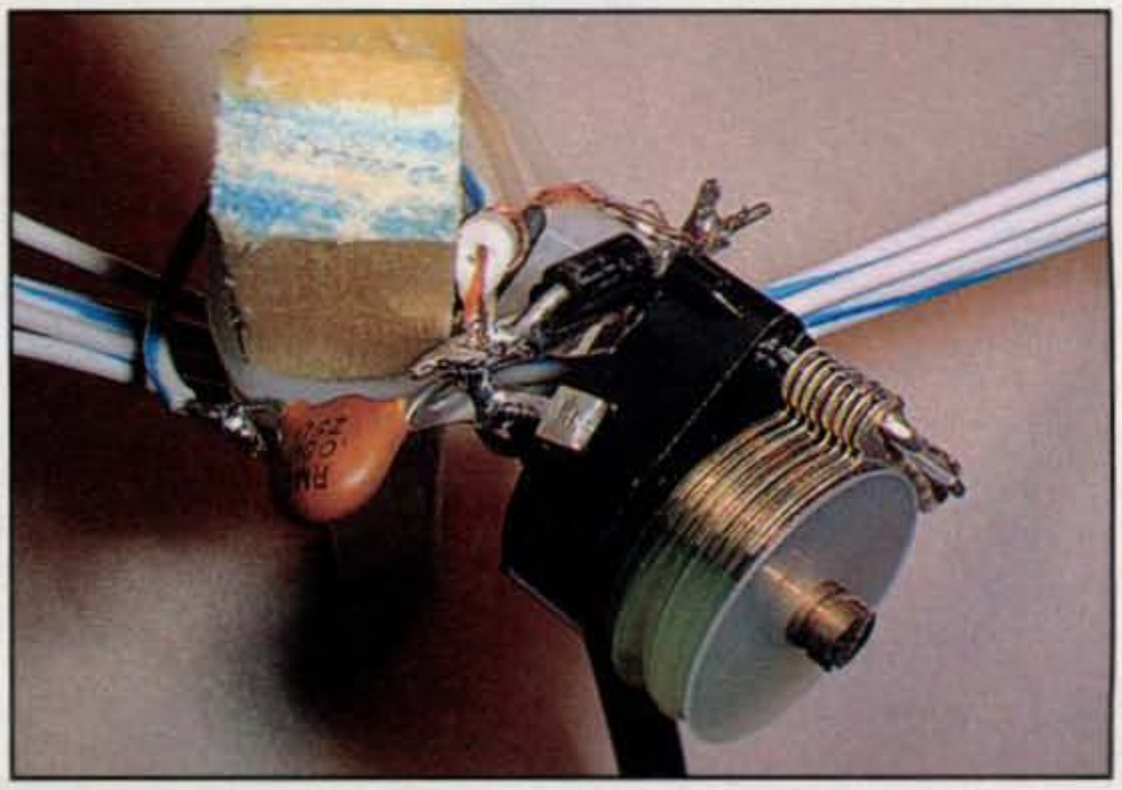

Photo C– The HF diodes and trimmer capacitor.

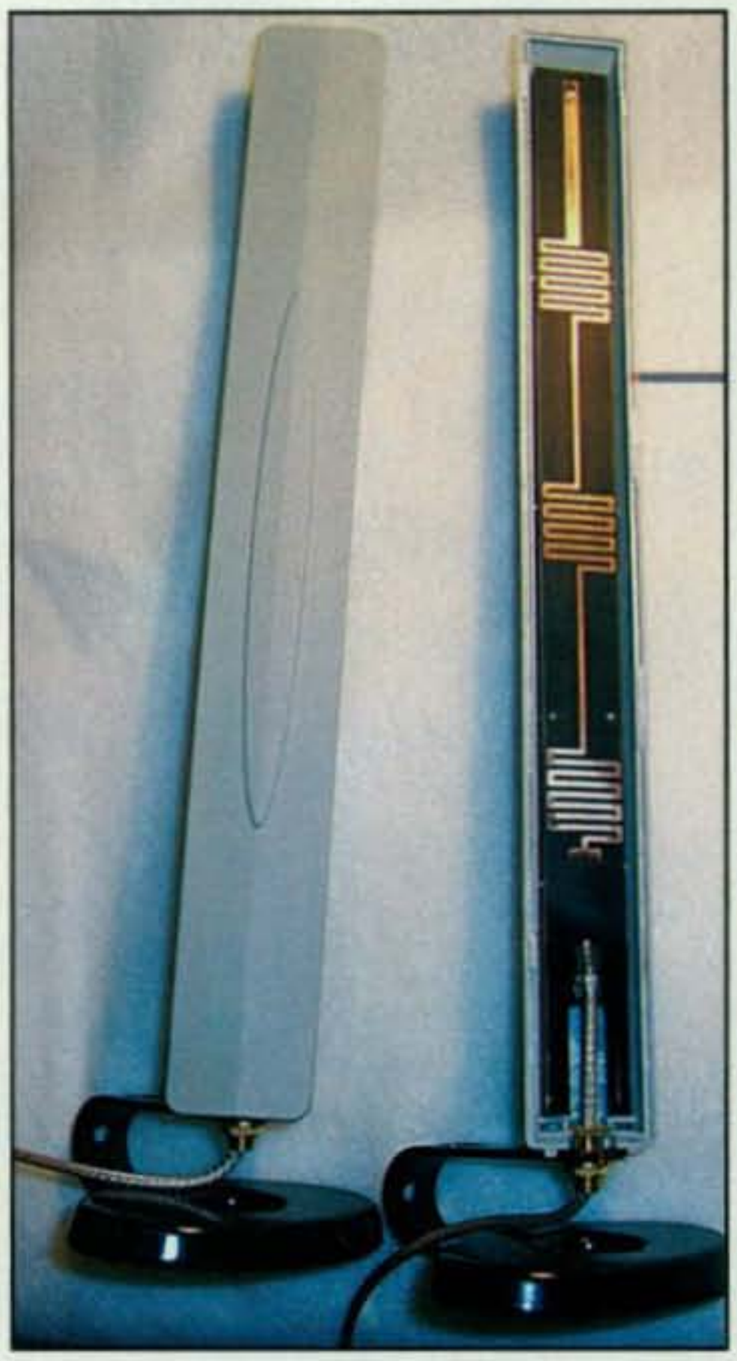

Photo D– the inside of a WiFi vertical collinear antenna.

increasing the Q of a loop antenna. One was by using a 6922 valve, or as we say in the U.S., a vacuum-tube preamp. The 6922 is an excellent high-impedance, low-noise tube used in thousands and thousands of Tektronix oscilloscopes as the probe preamps. However, I'm a little reluctant to recommend tube circuits these days. On the other hand, the high input impedance of a tube will greatly increase the Q of the antenna, and tubes will easily withstand high voltages from nearby transmitters.

Peter also uses a small electric motor to remotely drive his trimmer caps. Mechanical capacitors have a much higher Q factor than the varactor capacitors I used in this project.

WiFi Antennas

Now for something quite different. Ever wonder what is in some of those WiFi antennas? Photo D shows a vertical collinear antenna for 2.4 GHz etched on PC board. The antenna had two layers of black solder mask on the board to hide the antenna pattern, but 20 minutes with light sandpaper brought out the traces.

The straight-line sections are 1/2 wave long. The meandering line delay sections are almost, but not quite, 1 1/2 wavelengths in length and physically 1/4 wavelength from top to bottom. This forms a vertical collinear antenna not unlike the Cushcraft Ringo Rangers for many of the common mobile wire verticals such as the one shown in photo E.

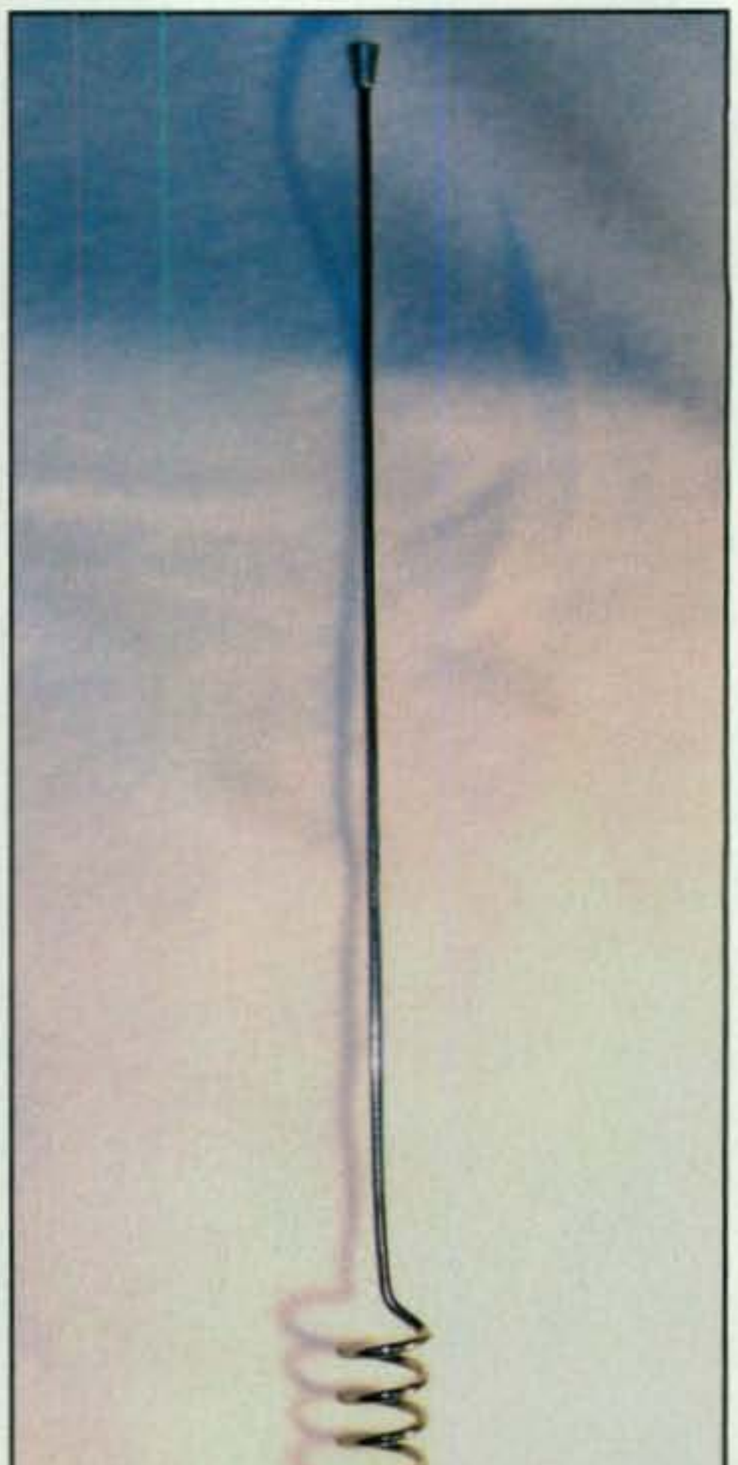

Photo E– The common wire vertical collinear antenna.

The Dayton Hamvention® is later this month, so if you make it out to the Hara Arena, I hope to see you there. I'll be at slot #915 in the fleamarket and also at the CQ booth. Now to get some more antennas in the air!

73, Kent, WA5VJB

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beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

Antenna Tuners: The Good, The Bad, and The Ugly

A most useful accessory for any "low bands" (the high frequency [HF] bands below 30 MHz) ham station is an antenna tuner. Looking at the ads in *CQ* can attest to this. There are many antenna tuners available today, including automatic units and tuners that are built-in "options" on new transceivers. In addition, hundreds more are out there on the used-equipment shelves and at swap meets and flea markets.

With all this hardware available, one must wonder whether an antenna tuner is a ham shack "necessity" or a frivolous add-on. I suppose we can say it is a little bit of both, so this column will explore the various aspects of the modern (and not so modern) antenna tuners.

An antenna system consists of the antenna elements and the feedline, usually coax cable. There are also "open wire feeders," but to keep things simple, let's limit this column to the use of coaxial cable. The feedline is an important part of the antenna system, since it not only connects the radio to the antenna, but it is also a component that contributes to the overall impedance of the system.

All currently available ham gear, and most radio equipment in general, has antenna input ports that are optimized for a 50-ohm antenna system. If your antenna system is anything other than 50 ohms, there will be some sacrifice in transferring power from the transmitter, along the feedline, and out to the antenna. This mismatch is called *reflected power*. When the transmitter and antenna system are mismatched, some of the RF power is reflected from the antenna, along the feedline, and back into the transmitter. These voltages can be quite high and may represent a safety hazard, depending on how much power is being transmitted. Reflected power is usually represented as standing-wave ratio, or SWR, with a 1:1 SWR being the best possible arrangement, as no power is being reflected. A little bit of reflected power is okay, but today's solid-state transceivers can be damaged when the SWR is 3:1 or greater. At minimum, most of your transmitted signal ends up heating the transmitter and feedline, creating inefficiency (and thus, not many contacts), and at worst damage to your rig can result, even though the radio's protection circuit starts "kicking in" and reduces power output. Remember that all that wasted (reflected) energy is going *backward* and not out into the air!

By the way, when SWR goes up (a bad condition), power goes down, and vice-versa. This is why most SWR meters also include a power function.

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

An Antenna Tuner: Yes or No?

Since many of us have restrictions on our ham radio budgets, we should consider whether or not we really need an antenna tuner in our station lineup. This may be a complex question to answer, but here are some general guidelines.

You may not need an antenna tuner if you have a nice, store-bought antenna system such as a beam or vertical, which is optimized for a good match when it is properly assembled and adjusted. Examples of these antennas are advertised in *CQ* and other venues. These are pretty much "assemble, install, adjust, and play" and represent good value, since all of the design work and all the parts are included. However, if you are in an "experimental" or "trial" stage of HF operating, or if you have limited space, a simple and cheaper antenna made of wire can be built and used. In this case, it is likely that you will make good use of an antenna tuner of some sort.

An antenna tuner can expand the frequency bandwidth of antennas, especially under field conditions or emergency situations. For example, if your antenna is tuned for the low end of a particular band and you desire operation on the high end of the phone band, your rig most likely will need a little help in matching your operating frequency to the antenna capability. In other words, let's say that you built and installed a 40-meter dipole cut for the middle of the band, because you are studying for the General class license and you want to operate both CW and phone. By using an antenna tuner, you should be able to make the antenna usable over the entire band. This way you can use most of your hamming time operating rather than building another antenna.

It should be noted that an antenna tuner does not actually tune the antenna. It tunes the antenna *system* by adding capacitive and/or inductive reactance to make the transmitter "see" an overall impedance of close to 50 ohms. This maximizes power transfer and gets more signal out to the antenna, but it does not change the resonant frequency of the antenna.

One thing to mention is that although an antenna tuner can be thought of as a "magic box" that can "transform" a bad antenna into a good one, there may be some cases when the tuner may not be able to fix a very badly matched antenna to the rig. While it is true that ham radio stories are full of examples of incredible compromise antennas used to make contacts, ultimately this will depend on the capability of the tuner and how much it has to work to get a proper match. Speaking of incredible antennas, Patty Winter, N6BIS, has made

contacts with over 100 countries using her aluminum motor-home awning as an antenna. Of course, the only way to turn an awning into an antenna is to use an antenna tuner.

Therefore, an antenna tuner seems to be a very handy accessory, even though you may have a "perfect" antenna system. This is the good part of having an antenna tuner in your station.

What Do They Look Like and Which One Should I Get?

All antenna tuners, regardless of brand or model, consist of adjustable coils and capacitors (see fig. 1). Other doodads may be added to the antenna tuner, such as meters and antenna selection switches. In addition, there are fully automatic, microprocessor-controlled versions that interface with your brand of transceiver. These days many rigs even have an automatic antenna tuner built into the radio.

With all these choices, it is easy to become confused. However, you may want to consider at least three things when you go shopping for a suitable tuner for your shack:

Power rating. Even though your rig is probably rated for about 100 or 200 watts, it may be a good idea to get a tuner with a more robust power rating. This is because if you have a very high SWR, chances are good that a "lightweight" tuner will arc-over, and possibly be damaged. Remember, reflected power is bad energy (high voltage) going back to the radio, and the RF energy jumps across the components inside the tuner, usually making scary buzzing or crackling noises and sparks. I recommend the higher rated tuners (1.5 KW or more) over the smaller ones, unless you are running a QRP (low power, usually 5 watts or less) station.

A built-in SWR meter. These days many rigs have a power and/or SWR meter built-in, so this may not be necessary. However, if your rig does not, you must have some way of "seeing" what the SWR (or power) is, and the only way to do this is with a meter.

A "roller inductor." This is an adjustable coil that uses a little metal wheel that follows the wire coil as a means to tune it. Many tuners have coils with fixed points that are adjusted with a multi-position switch. These are fine and easier to use, but the roller inductor can go "in-between" the fixed settings in switched inductors. This is similar to stereos that are equipped with "stepped" volume (or other) controls, versus a sliding or rotating knob.

Of course, price is a factor, too. Used units often are available, and if they are clean and are not damaged by arcing, they can be among the best buys in the used-equipment market. Ask your dealer or your fellow club members to see if you can get a good deal.

Let's Hook It Up

Fig. 2 is a diagram of a station with an external antenna tuner and separate SWR meter. More complete details can be found in your transceiver or antenna-tuner operating manual. The RF connections between the rig and the SWR meter, as well as the cable between the meter and the antenna tuner, are 50-ohm coax. Most dealers sell short jumper cables just for this purpose. You can build these cables yourself if you are handy with a soldering iron.

This is a good time to suggest that the coax jumpers should be as short as possible, and you should avoid "elbow adapters" as much as possible. These

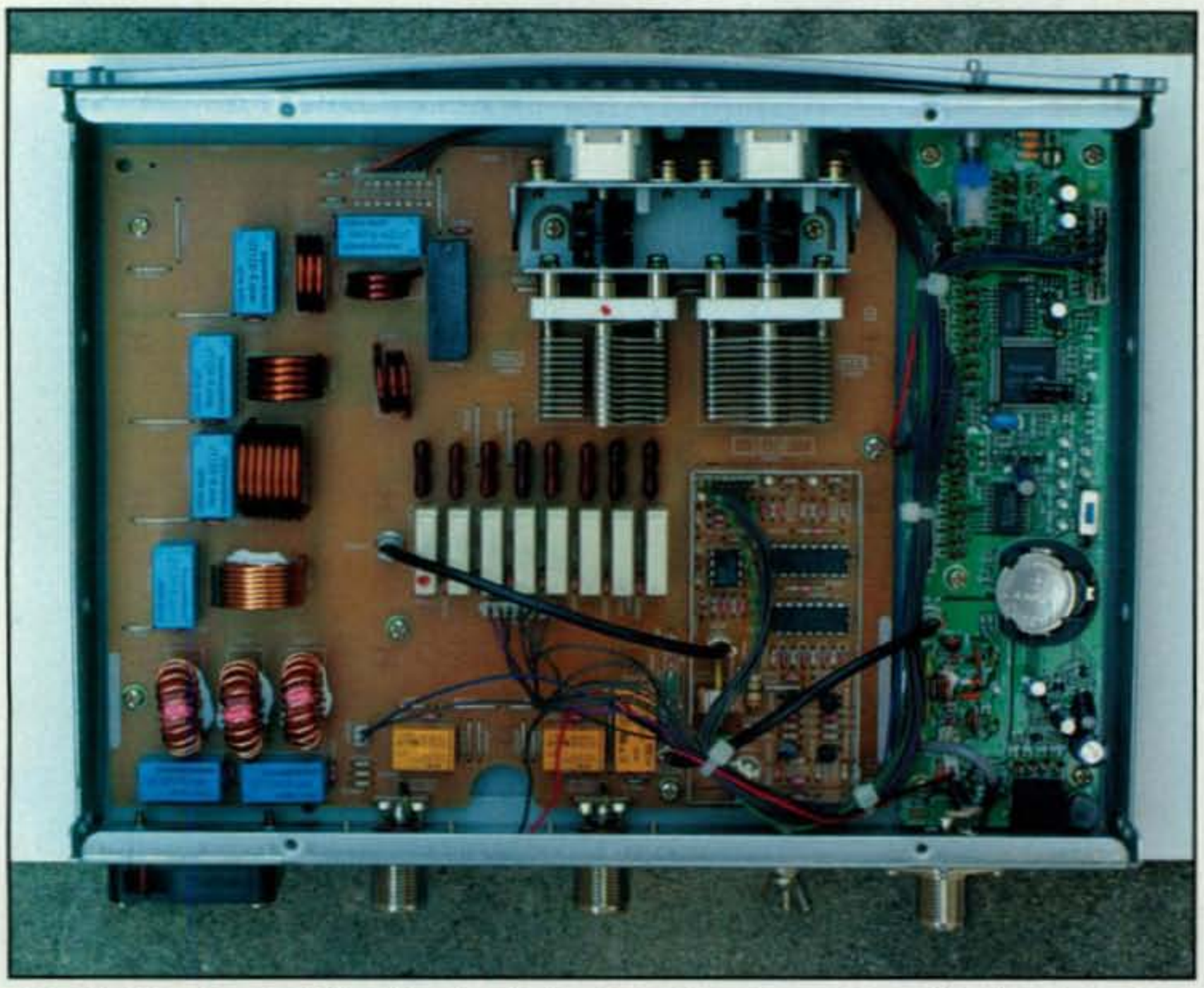

Fig. 1– Here's a look inside a typical automatic antenna tuner. Various inductors (coils of wire) and capacitors are switched in and out with relays and microprocessor controls in the radio to find a "perfect match" between the antenna system and the rig. The entire tuning process takes only a few seconds. Manual tuners are very similar, but a control knob and hands replace electric motors to turn the controls.

little connectors add losses to the system, and even though small, over time these extra parts can be an additional source of failure.

In addition, all of the units should be connected to an earth ground with heavy wires. Make sure the connections come to a single point, as shown in the diagram. You can either connect to a cold-water pipe (as long as your plumbing is galvanized steel or copper, and not plastic) or a ground rod near your station.

Tuning the Tuner

Okay, so now we have a very efficient station, because the antenna tuner can optimize power transfer from the rig to the antenna. Let's put it on the air. In this example, we are using a "manual" antenna tuner.

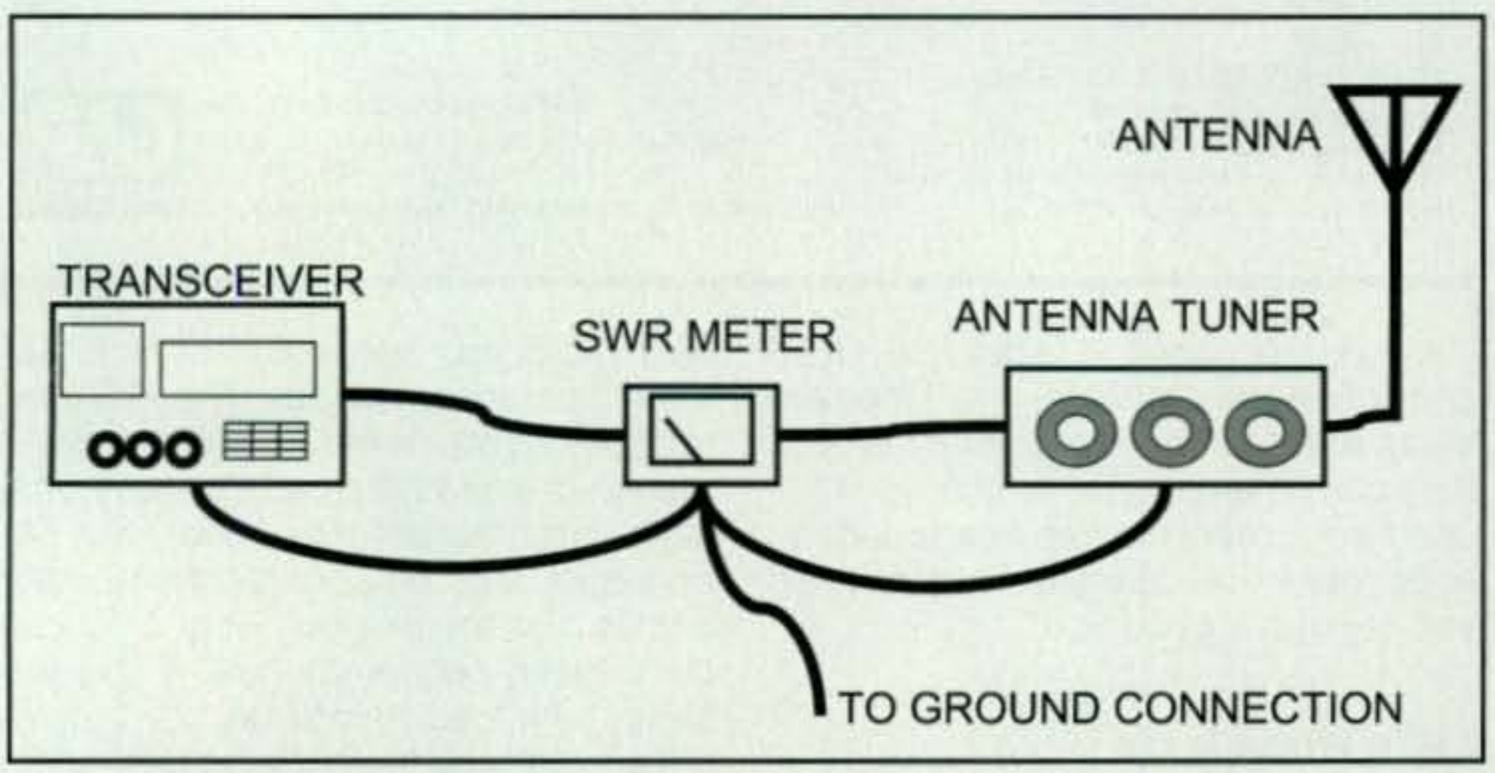

Fig. 2– Here is the proper station setup with an antenna tuner and SWR meter. Inter-connecting cables should be kept as short as possible and heavy wires should be used for proper grounding.

First, turn on the rig and select your operating frequency. While listening (not transmitting yet), adjust the tuner controls for maximum noise coming from the receiver. This can be either background static or other stations talking. By doing this, we are "peaking" the receiver and getting the tuner close to the operating frequency.

Next make sure your selected frequency is clear. This means that if you heard people talking, then you must tune to another frequency so you will not cause interference. Double-check to make sure you are within your operating privileges and that you are in the proper mode segment. Turn the power output control on your rig to the lowest power setting. Put the rig into CW mode and transmit a signal. Adjust the power output control so that the SWR meter moves to the right—but make sure you are not transmitting at full power!

Now adjust the tuner controls so the SWR meter indicates as close to 1:1 as possible. If you have a power meter, you should see the power output go up as the SWR goes down, and vice-versa. You also may tune for maximum power output. Remember, when you are doing all this tuning up, you are transmitting a radio signal, so do this in short bursts and as quickly as possible to minimize interference.

Finally, move the power output control to full power and re-tune. Since you have already done this at low power, only slight adjustments, if any, should be required. Remember to identify your station as you finish this tune-up procedure.

Now you are all set to go! It may be a good idea to mark the front-panel controls with a grease pencil or masking tape so you can quickly reset the controls the next time you operate the station.

Remember that the antenna tuner is a station "accessory," and as such, you may or may not need a tuner. If your antenna is properly matched and presents a low SWR to your rig, save your money for another station accessory. However, if you want to extend your capability, or if you have a non-optimized antenna system, adding a good antenna tuner is a sensible idea.

One more thing: Building your own antenna tuner can be an enjoyable project. Many construction articles on building antenna tuners have been published over the years, and one of these might be a great project to try. Also, for inspiration take a look at the *CQ* Bookstore for some good material on antennas and antenna systems.

73, Wayne, KH6WZ

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mobiling

BY JEFF REINHARDT,* AA6JR

Vacation Mobiling

As the warm-weather season comes upon us, thoughts of vacations and mobile operations cross the minds of many ham radio operators. Never being the type to walk away from a challenge, several times I have taken on the cause of combining two of my favorite pastimes, ham radio and vacationing. Of course, there's not much challenge when taking a vacation on the road with your own well-equipped mobile setup. However, what if there's an airplane ride between you, your destination, and the mobile from which you intend to operate? Now there's the challenge!

Fun on VHF and UHF

Let's presume you're headed for a nice vacation spot and you want to include mobile ham operations as part of your getaway. Before you travel, decide what bands you want to work. If it's VHF/UHF, things should be pretty easy. Your travel checklist should include a multiband HT, a small magnetic-mount mobile antenna, and a means of charging the battery in your HT; ideally the latter would be 12-VDC "cigar lighter" power cord for your transceiver. You don't have to take a large, elaborate antenna, one of my favorites for travel is the little "gumdrop" antenna, so-named for its small but powerful magnet that's about the size of a chocolate candy "kiss." I've seen them at ham conventions for as little as $10 and they work acceptably on VHF and UHF. You won't get a lot of gain, but compared to the duckie antenna on your HT, it's far better in terms of getting signal out of the car and off to the repeater. Best of all, it fits easily in a suitcase or airplane carry-on bag. You'll also want to have a copy of the *ARRL Repeater Directory* or some similar publication. If you *really* plan in advance, search the web for repeater information pertaining to your destination. You may be able to load your HT's memories in advance or from the notebook computer you thoughtfully brought along. A nice, but not necessary option would be a speaker-mic for the HT.

It's fun to listen in on repeater conversations in cities away from home. While there are many similarities, there are subtle differences and each repeater seems to take on its own personality traits. A good operating tip is to listen for a while before speaking and then drop in your call. Start by mentioning that you've been listening and enjoying the conversation and introduce yourself as a visitor. More often than not, you'll be welcomed into the group. You also may get timely assistance with directions or guidance for a good local restaurant.

*5904 Lake Lindero Drive, Agoura Hills, CA 91301
e-mail: <aa6jr@cq-amateur-radio.com>

ICOM's new IC-7000 is typical of today's compact mobile rigs that let you operate HF, VHF, or UHF while on the road. (Photo courtesy of ICOM America)

Traveling with HF

I've taken an HF setup on several trips and enjoyed making contacts from interesting locations. For instance, while HF mobiling on Kauai, Hawaii, I was the subject of a pile-up! Granted, I wasn't "rare" DX, but I felt like I was and I passed out a lot of needed contacts to county hunters and Worked All States paper chasers.

These days it's relatively easy to take along an HF rig with a mobile antenna setup. I'm very fond of the Diamond K-400-3/8C swivel antenna mount. I've used it as a trunk or hatch mount on several different vehicles.

My HF antenna of choice is the Outbacker Tri-Split, which breaks down into three pieces that slide into a small travel bag that fits in most suitcases. It's rugged and believe me, I have abused mine, only to be surprised at its durability. Its main advantage is multiband capability, but it can be a bit tricky to tune for a good match. Other choices might include a "stick"-type antenna for a specific band, many of which can be purchased for about $20. There are other choices; check out the ads in *CQ* and at ham radio dealer websites. Again, plan ahead for the bands you think you'll work. On one trip I even took along a dipole antenna, strung it between two palm trees on the beach, and enjoyed making HF contacts. While not "mobile" in the strictest definition of the term, it did allow me to enjoy my hobby as a "portable" operation.

There is a wide array of rigs to choose from. ICOM, Alinco, Kenwood, and Yaesu all make compact, reliable mobile rigs. Bear in mind that if you plan to use cigar-lighter power for your rig, it's wise to run less than 100 watts output. Peak power could cause a fuse malfunction, and unless you have extras it's "game over." Trust me; I found out the hard way.

I added to the flexibility of powering my HF transceiver by putting heavy current quick connectors on the rig's power cable. I can then quickly choose from a variety of cable terminations appropriate to

The Alinco DX-70 covers HF plus 6 meters and includes a detachable control head (as do many other rigs), permitting you to mount the transceiver itself in the trunk or other inconspicuous spot. (Photo courtesy of Alinco)

Kenwood's TS-50 was one of the first compact mobile HF rigs to hit the market. (Photo courtesy of Kenwood USA)

the power source best suited to my needs: cigar-lighter power plug, or clamps that connect directly to battery terminals or to the matching connectors I have on a light-weight switching power supply that also travels in my "go kit," equipped with output wires with the same quick connectors.

Also keep in mind that HF operations while mobile are likely to be marginal. My best experiences occurred while I was parked with the vehicle's engine off. A truly worthy HF mobile setup takes time invested in a good installation, including attention to grounding and eliminating sources of vehicle noise. Vacations don't often allow for such considerations, and sometimes what you get is, well, what you get. I've had vehicles that are electrically noisy and others that emitted

Yaesu's FT-857 also covers the HF, VHF, and UHF ham bands as well as wide-coverage receive. It is said to be the world's smallest HF/VHF/UHF mobile transceiver. (Photo courtesy of Vertex-Standard)

barely an electrical whisper. Without a lot of advance planning, it's purely "luck of the draw."

Some Ground Rules

I have traveled extensively over the last several years and have never had a problem bringing an HT aboard a commercial flight in the USA or Canada. It simply hasn't been raised as an issue at the many security checkpoints I have encountered.

I also have packed my HF transceiver, mobile antenna, and other accessories in a suitcase and shipped those items as checked baggage and never had a mishap. Just be sure your radio is well packed, and the original shipping box is a good place to start.

Also, before investing all your confidence in a magnetic-mount antenna, bear in mind that many cars have non-ferrous surfaces. I was surprised to find that even some traditional "large" cars such as the Ford Crown Victoria and Mercury Grand Marquis have aluminum hood and trunk lids. Several other cars have plastic or fiberglass body parts. Always have a "plan B" when such circumstances present themselves.

Finally, be sure you have a copy of your FCC license with you (which is required per the rules). On a few occasions it has helped explain my presence to curious law-enforcement officials. If you're traveling outside the USA, check ahead to see what licensing requirements there may be at your destination. International operating requirements can be found at <www.arrl.org/FandES/field/regulations/io/>. In these days of heightened security, you don't want to be explaining your radio operations to suspicious officials. Also, use some common sense. Avoid operations near potentially sensitive locations.

Additional Benefits

There is added value to having a travel kit for your HF communications. You will also have "package" of gear that's easy to use for Field Day, camping trips, or emergency communications. Whenever you use your portable gear you also will be learning tips and tricks on what works (and what doesn't).

Dayton Calls!

Hopefully as you read this you're making final plans for a trip to the Dayton Hamvention® for the annual gathering that celebrates our "geekiness," (a term I wear with pride!). With the recent changes in FCC licensing requirements, I suspect the Dayton gathering will see keen competition among retailers for the many new HF licensees looking to bring home a new radio. See this as your opportunity to also pick up a rig that can double as a mobile or maybe even purchase that second "mobile" rig that allows you to join the many new hams on the bands. Dayton is also a great place to check out mobile installations, especially the many ways antennas can be mounted on vehicles.

Here's a warm welcome to the many hams with new HF privileges. We hope to hear you on the bands, and there's much enjoyment to be gained from operating HF mobile. Hope to see you at Dayton!

Travel Kit Basics

Here are some suggested basics off-the-shelf items to take along in order to enjoy mobile operations away from home.

VHF/UHF
- Multiband HT
- Battery charger
- Cigar-lighter power plug
- Small magnetic-mount antenna
- Repeater guide
- Original or copy of your license

HF
- Compact HF transceiver with microphone and/or key
- Multiple power cable attachments (cigar lighter, battery clamps, ring connectors)
- Mobile antenna
- Antenna mount and tool for securing such
- Antenna cable
- Short run of wire for grounding rig
- Short run of coax
- Small tool kit (wire cutters, adjustable wrench, pliers, flat and Phillips-head screwdrivers)
- List of band privileges
- Logbook
- Watch/clock that keeps UTC time
- Original or copy of license
- Copy of authority to operate if outside USA

Options
- Small antenna tuner
- SWR meter
- Switching power supply (20 amps or more output suggested). If traveling outside the USA, be sure the power available at your destination matches the input of your power supply.
- Wire dipole antenna
- Computer for logging

Legislation

There is growing concern about "distracted driver" accidents largely rising from the popularity of cellular telephones. I recently saw a proposal to ban cell-phone use by pedestrians crossing the street! Unfortunately, several states are responding with broad legislative proposals that could also result in a ban of mobile amateur radio communications while a vehicle is motion.

Of course, it's never a good idea to engage in communications that result in distracted driving and I'm not proposing that. However, I see a profound difference in mobile ham radio operations in that they don't require continually holding a device to your ear. You only speak sporadically and you may be participating in a public-service activity such as Skywarn, or a similar endeavor. Also, when it's necessary for me to give complete focus to driving, I put the mic down.

If your state is among those considering such measures, be sure to communicate with your elected state representative, asking for an exemption that applies to licensed amateur radio operators, highlighting the many beneficial services we provide, such as motorist aid, emergency response, ARES/RACES, etc.

We Need Your Photos!

Help! I'm out of mobile photos. Please send to my e-mail address (on the first page of this column) high-resolution digital photos of your mobile setup so we can show the world your great ideas! Also include a few lines of what you have and how you did it, plus anything else you think would be of interest to readers of this column. Thanks, and happy mobiling! 73, Jeff, AA6JR

how it works

A Behind-the-Dials Look at Transmitters

BY DAVE INGRAM,* K4TWJ

Approximately two years ago in this column I featured a three-part behind-the-dials study of shortwave receivers and how they work. However, I never followed up (until now) with a similar study of transmitters and their circuit switching arrangements as used in transceivers. I must emphasize that the following discussion is presented "plain-language style" to help budding newcomers.

Let's begin this study with a brief look at the very first transmitters (those incredible spark rigs), continue on to CW transmitters (including those sweet little one-tubers many still enjoy homebrewing), and then progress to AM, FM, and SSB. Taking this route, lets begin at the beginning, so to speak, and build on your existing knowledge, just as technology has progressed up to the present time. A fair number of questions on license exams also relate to transmitters—their basic circuits, block diagrams, and associated waveforms like those displayed on an oscilloscope, so we will bring in those points along the way.

Photo A– The way we were! Mac Neill, W8ZNX, homebrewed this beautiful self-excited transmitter a couple of years ago, and he occasionally uses it on the air during vintage-radio parties just for fun. Ignore the small grid coil on right side, and the little delight looks just like a 1930-style Hartley transmitter. Oh those simple times of eras past! (Photo courtesy of W8ZNX)

Spark Transmitters

Radio began during the early 1900s as wireless telegraphy using spark-gap transmitters and crystal-set receivers. The transmitter was built around a high-voltage transformer, Tesla coil, or automobile ignition coil and complemented with resonating coils and capacitors. It was keyed in its low-voltage/input circuit and produced raspy, static-like signals that could be heard simultaneously over a fairly large part of the HF spectrum. In many ways, it could be compared to transmitting Morse code by touching a long (and well-insulated!) wire to a spark plug in an idling automobile engine. *Don't even think about experimenting with such a lash-up today; it is both dangerous and illegal.* Knowing the basic concept of spark transmission (and the Morse code!) can be quite beneficial, however, if you are ever involved in a serious emergency situation and transmitting any form of SOS message is the last resort. Folks probably will hunt you down if for no other reason than to present you with an FCC citation for widespread interference to AM and FM radio, television, PA systems, and more.

Early CW Transmitters

Radio grew out of the Stone Age (spark-gap transmitters and galena-nugget receivers, to be precise), and the first evolution was self-excited oscillator-type transmitters of the Hartley, Colpitts, Armstrong, and Tuned plate Non Tuned grid (TNT) varieties. A heartwarming peek at one of these classic transmitters, built a couple of years ago by Mac Neill, W8ZNX, is shown in photo A. With the exception of its small (TNT-type) grid coil, it looks identical to a Hartley transmitter. The ability to recognize a Hartley by its tapped plate coil is always helpful when studying for license exams, so the circuit diagram of a comparable Hartley is included in fig. 1. Returning to photo A, notice the beautifully finished baseboard (which was used prior to metal chassis), tall 1930-vintage 50-watt tube (as big as a modern 811A or 572B!), and twin open-frame tuning capacitors. It is a genuine showpiece for sure!

Why two tuning capacitors? Although simple in design, self-excited transmitters cover a wide frequency range and tuning is touchy. By connecting two tuning capacitors in parallel, however, the one with multiple plates (the left one) can set the approximate frequency range, and the one with only a few plates (the right one) can act as "band-spread" for fine-tuning frequencies.

Crystal Control Emerges

Self-excited oscillators were prone to drift, and they also could transmit on any frequency within the range of their tuned circuit—inside or outside a ham band. Receivers of the era were also poorly calibrated, so knowing precisely what frequency one was using involved a slight amount of guesswork. A more reliable and frequency-stable solution known as *crystal control* was the next evolution.

A frequency-determining quartz crystal consists of a thin (and fragile) slab of quartz sandwiched

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

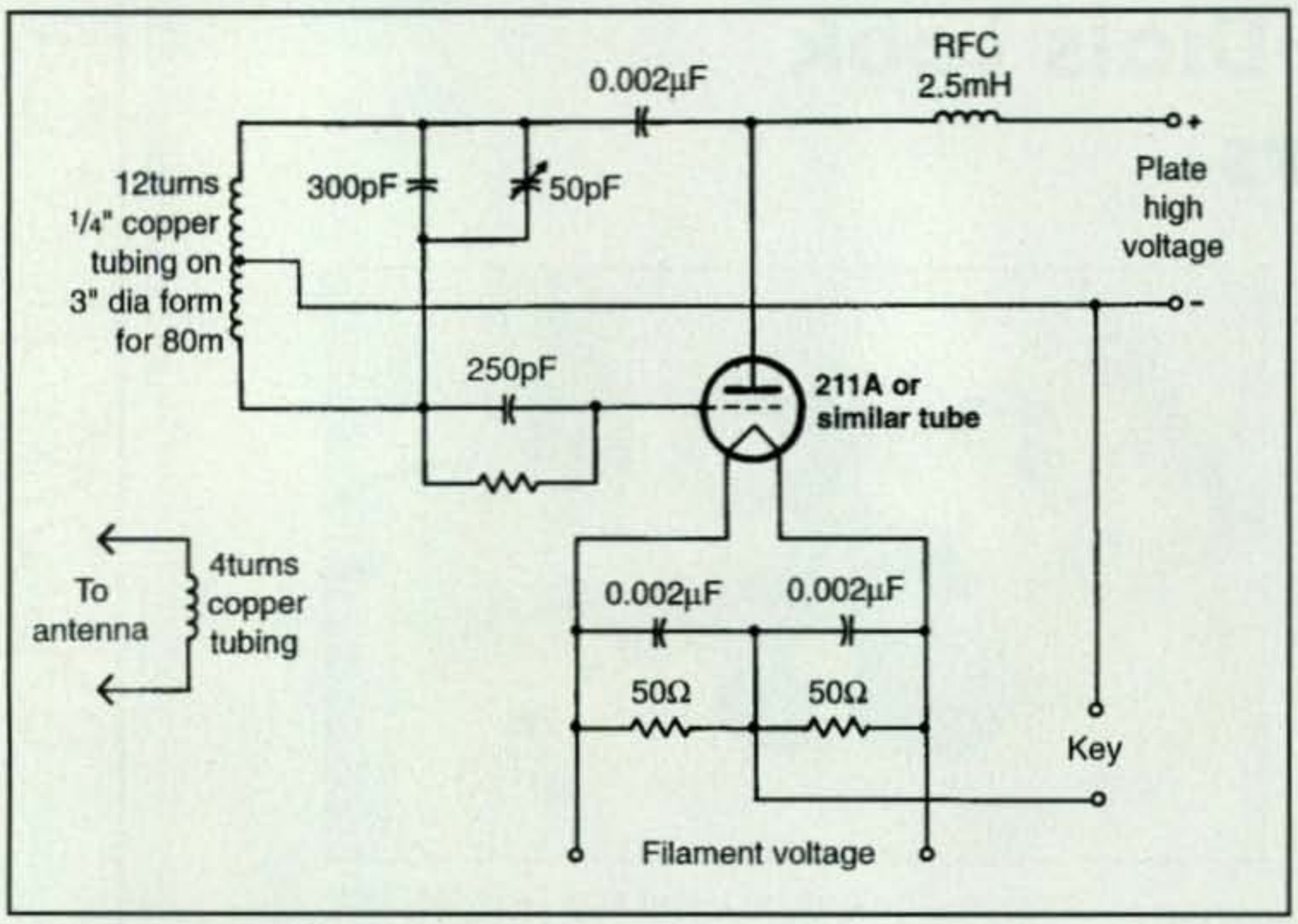


Fig. 1–Circuit diagram of a classic Hartley oscillator-type transmitter such as used during the 1930s. (Discussion in text.)

between two metal plates within its plastic holder or metal can. Applying a small voltage to the crystal causes its quartz slab to vibrate ever so slightly and thus generate a stable and fixed frequency, which is then amplified and applied to a tuned output circuit. Once again supporting the show-and-tell concept, a classic crystal-oscillator-type transmitter, also recently homebrewed by Mac Neill, W8ZNX, is shown in photo B and its circuit diagram is included in fig. 2. The circuit is easily recognized as a crystal oscillator because it is a single stage with one tube and has, well, a quartz crystal in its grid circuit! Incidentally, I highlighted a vacuum-tube circuit here because tubes were (and still are!) popular among homebrewers interested in vintage gear. A comparable (but lower power) equivalent in a transistor circuit is a Pierce oscillator, which is easily recognized by a quartz crystal connected between its collector and base (or drain and gate, if an FET is used).

Designs Become Sophisticated

Crystal control was a credible step forward in technology, but it limited the power of a one-stage transmitter, because quartz slabs are fragile and easily fractured when used in oscillator circuits producing more than 5 or 10 watts of power output. They thus were followed by two-stage (master oscillator/power amplifier) transmitters capable of running 50, 100, or more watts output. Keying the power amplifier proved noticeably superior to keying the master oscillator, but it still introduced a varying load on the oscillator and caused a mild frequency shift (the first glimpse of FM!).

The design was soon upgraded to a three-stage (oscillator, buffer/driver, power amplifier) transmitter (see fig. 3). The added intermediate stage served two important functions: It isolated the master oscillator from the power amplifier to yield more frequency-stable operation, and it boosted the oscillator signal to more effectively drive the power amplifier (more license-exam-related information worth remembering!).

The Evolution of AM and FM

We are now approaching the time in history when AM and FM were developed, but let's briefly backtrack for an entertaining look at the very first means of superimposing voice on transmitted signals—an almost forgotten technique known as *loop modulation*.

Simply described, loop modulation involves connecting a carbon-element microphone, such as found in home telephones, to a two- or three-turn loop of insulated wire dangled inside an oscillator's plate coil (or a power amplifier's plate coil, if multi stages are used). Most of the transmitter's output signal is coupled to the antenna, but a small amount is coupled into the loop and absorbed or dissipated by the microphone (the original "hot mic"!). Since the (carbon) mic's

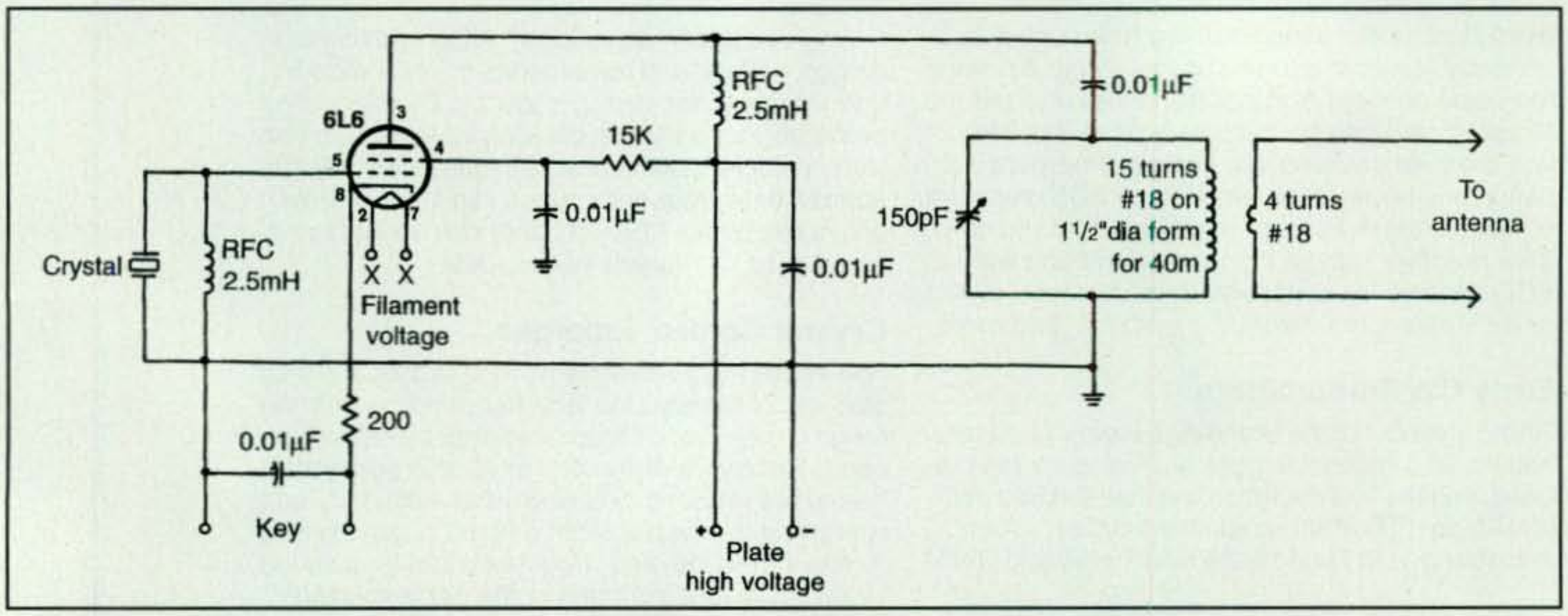


Fig. 2 Circuit diagram of the crystal-oscillator-type transmitter shown in photo B. (Discussion in text.)

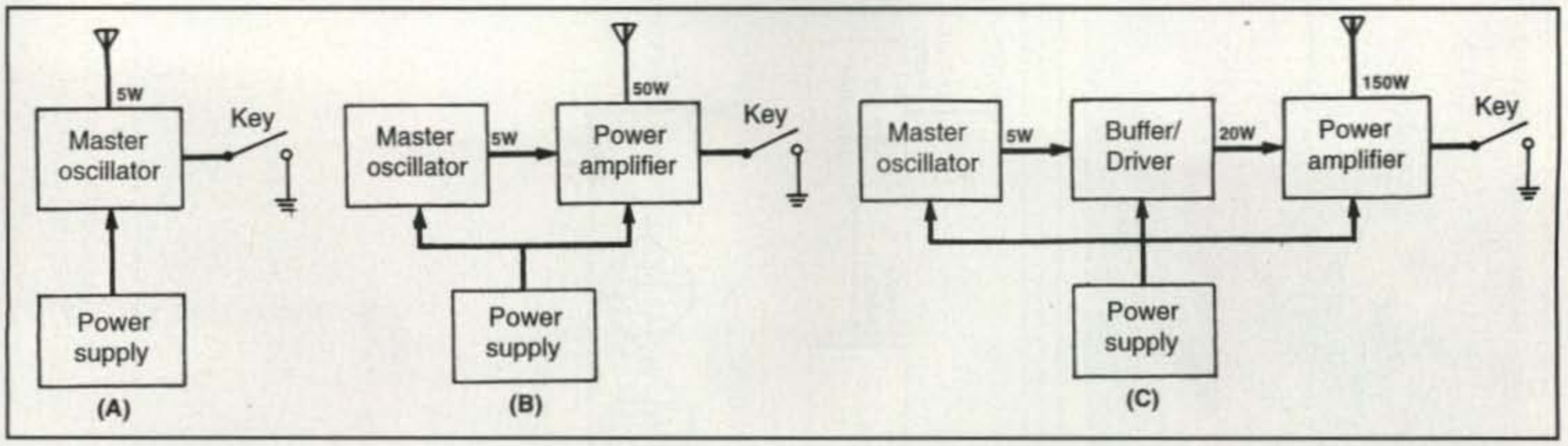


Fig. 3– Block diagrams showing the evolution of designs of early transmitters. Output power of the basic oscillator as shown in (A) was limited, and the transmitter was prone to frequency shifts if output was over-coupled to antenna. Both shortcomings were overcome with the master oscillator/power amplifier (MOPA) design in (B), but some frequency shift was still noted. Addition of buffer/driver stage in (C) minimized instability by isolating the oscillator while boosting its output to a fully drive power amplifier.

resistance varies with speech, the amount of RF energy dissipated by it varies accordingly. As a result, the amount of output power available for coupling to the antenna varies slightly (10 or 20 percent) with modulation.

Loop modulation was somewhat of a novelty, as it shifted an oscillator's frequency almost as much as it modulated its amplitude. However, it inspired additional thinking and dinking that eventually became—you guessed it—AM and FM.

Building on acquired knowledge, experimenters found that applying a small amount of audio modulation directly to an oscillator's sensitive frequency-controlling components while holding its RF output level steady produced good (well, reasonable) quality FM. This concept has been refined over the years, and today a small and special type of diode called a *varicap* is the heart of modulators used in our popular VHF/UHF handheld FM transceivers. They operate on frequencies higher than a crystal oscillator's frequency, so multiplier stages are used to raise output frequencies. A simplified version of FM signal generation is included in fig. 4A, and we will discuss FM further in a future column.

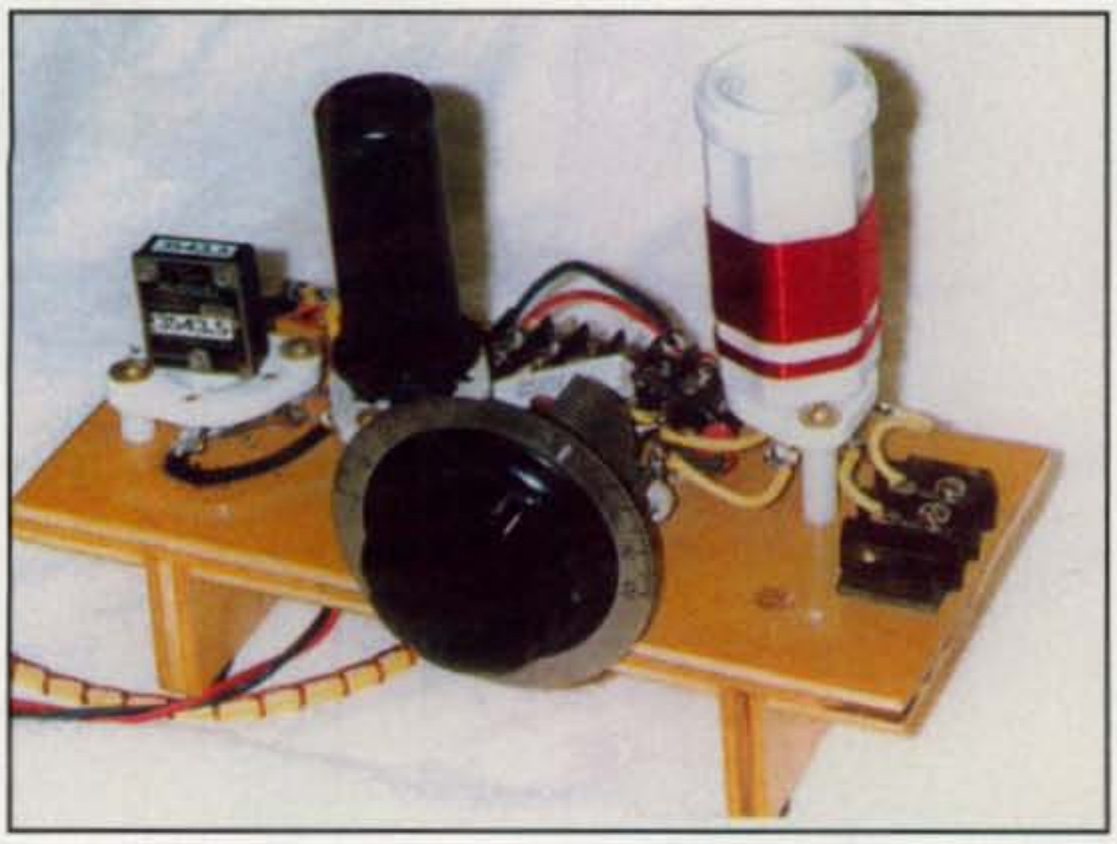


Photo B– A still popular homebrew transmitter from those golden days of yesteryear is this crystal-controlled 6L6 beauty built on a wood frame. The open-air design with fully exposed high voltage is a bit dangerous, but oh so much fun to use on the air today. The transmitter built (in 2001) by Mac Neil, W8ZNX.

The production of AM might be considered more "brute force" in nature, as it requires varying the actual voltage and current applied to a transmitter's power amplifier stage at an audio rate. Using the popular method of plate modulation, the secondary winding of a large transformer is series connected between the power supply and power amplifier. Audio or speech is then amplified to approximately half of the transmitter's output level (such as 50 watts of audio for a 100 -watt transmitter) and applied to the transformer's secondary winding. The audio then aids or bucks transformer action to vary the transmitter's RF output. Another form of AM using low-

On the Cover

Alex Younts, KC9CYK (in the blue shirt), and Ben Cotton, KC9FYX (in the yellow shirt), operate W9YB, the ham station at Purdue University in Lafayette, Indiana, where ham radio's past and future converge. The club has been active since 1920 when it was initially licensed as 9YB. According to Ben, who served as President from 2004-2006, it is the oldest currently active student organization on the Purdue campus, and has had a big resurgence in membership over the past few years. Ben graduated last year with a B.A. in meteorology, and is currently working for the university's Department of Earth and Atmospheric Sciences. He's active in weather nets and in storm-chasing and holds a General Class license.

Alex is presently a "non-degree-seeking pre-freshman" at Purdue, but will be entering the class of 2011 next year as a computer science major. A ham since 2002, Alex holds a General Class license and enjoys working digital modes on HF. He is also Vice President of the Tippecanoe Amateur Radio Association, a local radio club in Lafayette (Ben is Secretary). Outside of ham radio, Alex is involved with robotics as a member of a FIRST robotics team, and works with the supercomputing group at the Rosen Center at Purdue.

W9YB is located in the West Tower of the Purdue Memorial Union, its home since 1963. Current equipment includes a Ten-Tec Omni V and a Yaesu FT-920 used for HF work, plus a Kenwood 2-meter rig for packet. The 20-meter beam seen in the cover photo is just one of many antennas on the roof, covering all bands from 160 to 2 meters. In addition, the club operates repeaters on 6 meters, 2 meters, 1.35 meters and 70 centimeters. *(Cover photo by Larry Mulvehill, WB2ZPI)*

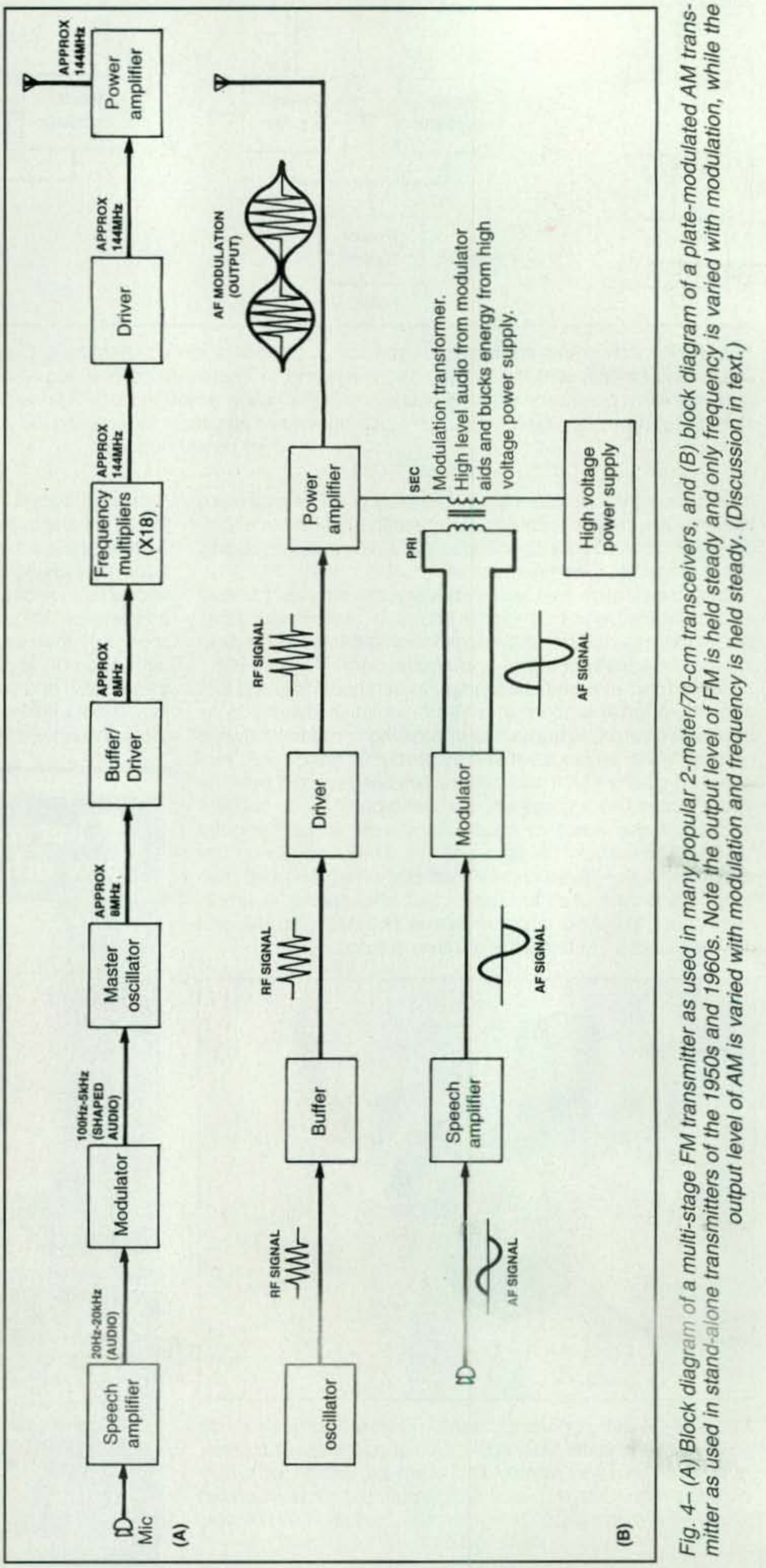


Fig. 4– (A) Block diagram of a multi-stage FM transmitter as used in many popular 2-meter/70-cm transceivers, and (B) block diagram of a plate-modulated AM transmitter as used in stand-alone transmitters of the 1950s and 1960s. Note the output level of FM is held steady and only frequency is varied with modulation, while the output level of AM is varied with modulation and frequency is held steady. (Discussion in text.)

level modulation is also possible, but space precludes a full description of it at this point.

As a convenient means of clarification on AM concepts, the block diagram of an AM transmitter is included in fig. 4B, and sketches illustrating how a CW signal, a 10- or 15-percent modulated AM signal, and an AM signal modulated at 100 percent are shown in fig. 5. The oscilloscope's single horizontal trace line, indicating no sensed signal, is included for reference in fig. 5A. Assuming the oscilloscope's trace is set slow and Morse code is sent fast (so both dot and dash can be displayed simultaneously), the letter "A" can be observed (fig. 5B). The oscilloscope's middle/base line indicates no transmitted signal during "key up time" and a steady 100-percent RF output level during "key down time"; actually, this is a "perfect case" or "pure theory" example. In reality, the leading and trailing edges of each dot and dash usually exhibit some rounding or abnormal areas due to rise and fall times consistent with keying. That's because some transmitters exhibit a one- or two-microsecond delay in starting and stopping output of code when keyed, and the resultant oscilloscope display looks more like different-length bullets than different-length blocks. You may have seen such waveforms included in reviews of new rigs. Now you may better understand what they indicate.

The waveform in fig. 5C indicates a lightly modulated AM signal, and 5D indicates a 100-percent modulated AM signal. Incidentally, these perfectly shaped waveforms result from use of a pure tone rather than complex speech for modulation. The oscilloscope's horizontal sweep is set to display only two of an endless number of (modulating) sine waves and externally triggered so they do not move right or left during viewing. Looking closer, the "inside" of the waveforms are sine waves at the transmitter's frequency; the "outer" waves comprising the envelope are audio superimposed on the transmitted (RF) signal.

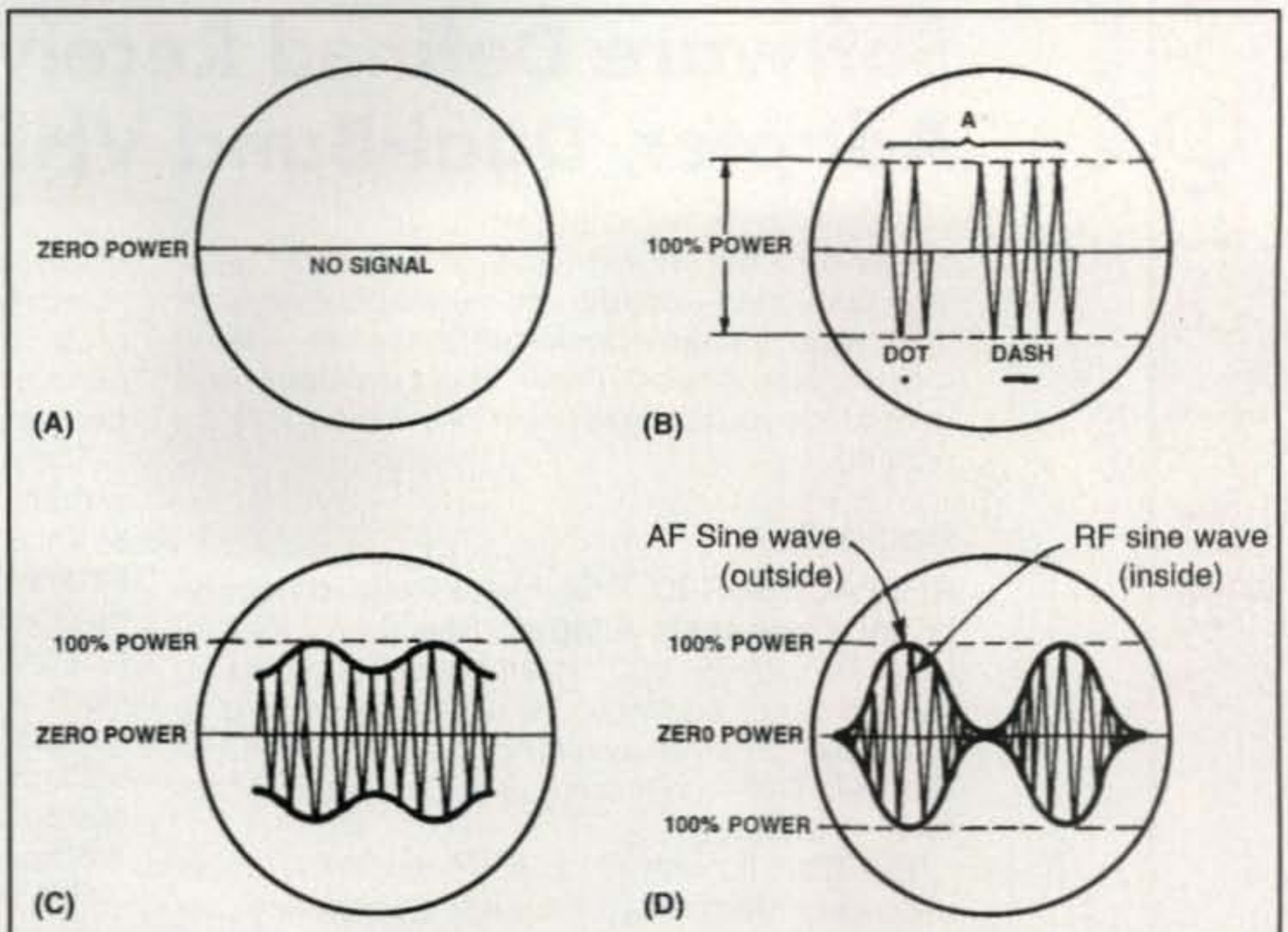


Fig. 5– Outline of how no signal (A), a CW signal (B), a lightly modulated AM signal (C), and a fully/100-percent modulated AM signal (D) typically would appear on an oscilloscope. The display is obtained by capacitively coupling the RF signal to the oscilloscope's vertical plate and external trigger, and setting the oscilloscope's internal sweep rate to twice the (AM) modulating frequency. (Discussion in text.)

Conclusion

That brings us to the closing wire for this time, and it also prepares us for the next "How It Works" column, in which we will discuss generation of single sideband, SSB transmitters, SSB transceivers, their receiver-shared circuits, and more. Stay with us as the best is straight ahead!

73, Dave, K4TWJ

what's new

BY KARL T. THURBER, JR.,* W8FX

Software Defined Receiver & Panoramic Adapter, Dual-Band VHF/UHF Yagi, etc.

This month we will focus on new radio gear, antennas, portable and mobile goodies, software, the radio bookshelf, and more—taking a close look at "what's new" in our amateur radio hobby. Are you ready to begin? Well, then, let's dig right in.

Radio Gear

RFSPACE SDR-IQ™ Software Defined Receiver and Panoramic Adapter. SpectraVue Galleries at RFSPACE, Inc. has introduced what is said to be the most advanced "all digital, all mode, plug and play" receiver available. It's the SDR-IQ™ Software Defined Receiver and Panoramic Adapter (see photo A).

The SDR-IQ with RF DSP™ reportedly offers unprecedented performance with a frequency coverage of 500 Hz to 30 MHz in 1-Hz steps, for what is said to be the fastest and highest resolution plug-and-play spectrum display available. The SDR-IQ comes with the latest version of SpectraVue™ software. It supports AM, WFM, USB, LSB, N-FM, DSB, and CW modes with fully adjustable DSP filter bandwidths and FFT sizes.

The many uses include very high-performance HF receiver functionality, with a 190-kHz real-time panoramic adapter; ultrasound experimentation; IR (infrared) subcarrier detection and communications; recording up to 190 kHz of spectrum to hard drive for later playback and demodulation; panoramic adapter for comm receivers; very-low-frequency (VLF) studies; and more.

The myriad features include the smallest SDR with RF DSP™ which samples the whole HF band at once; a high-performance Analog Devices 14-bit analog to digital converter; USB powered, so no power supply is required; very small size; high-resolution spectrum display and speed; RF preselection filters for great IMD performance; serial ports; 50-ohm RF input; open-source ActiveX control and ActiveX sample program for easy software customization; and considerably more. The price is about $450.

For more information or to place an order, contact SpectraVue Galleries at RFSPACE, Inc., P.O. Box 191231, Atlanta, GA 31119 (fax 404-745-0460; e-mail: <info@rfspace.com>; web: <http://www.rfspace.com/gallery.html>). SpectraVue software is downloadable at: <http://www.moetronix.com/spectravue.htm>.

Antennas and Antenna Accessories

MFJ Dual Band 144/440-MHz Yagi Antenna and More. The new MFJ-1760, priced at $79.95 (photo B), reportedly gives a whopping 8 dBi gain on 2 meters and 6 dBi gain on 440 MHz. The MFJ-1760 has three elements on 440 MHz and five elements on 440 MHz, and it requires only one feedline for true dual-band performance.

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

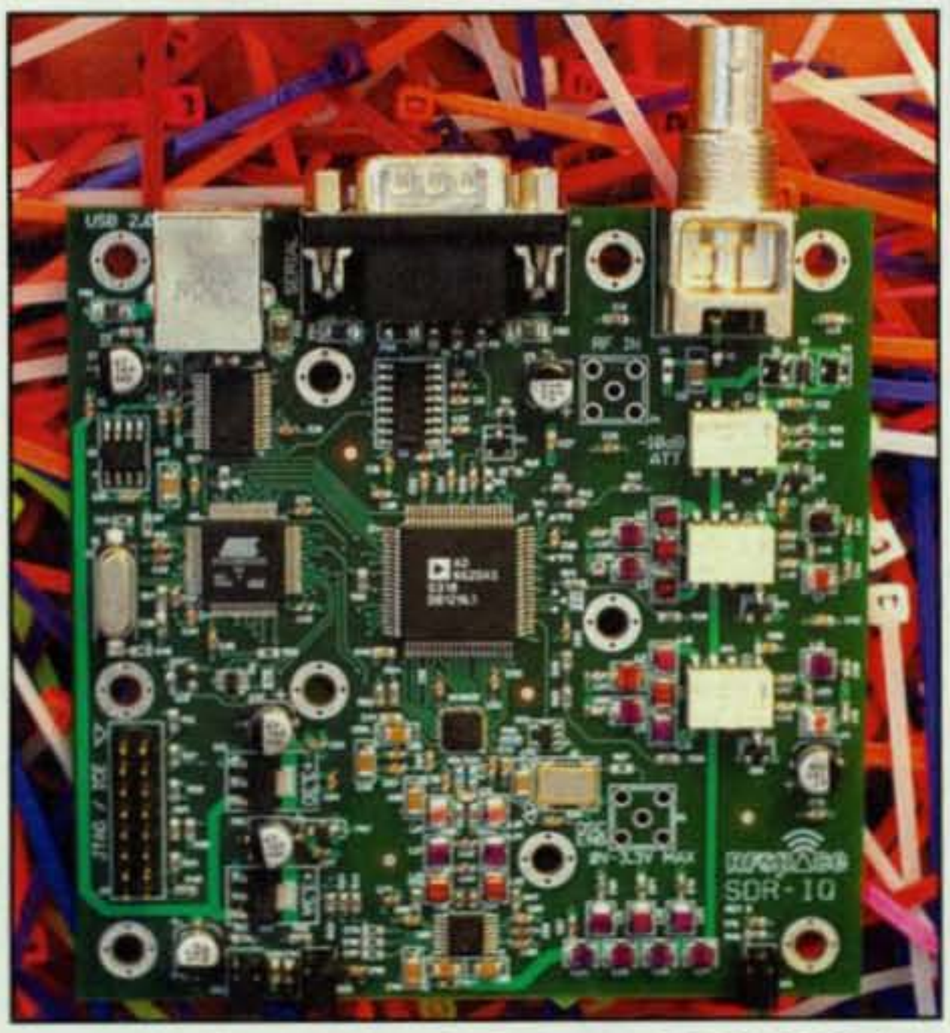


Photo A– SpectraVue Galleries at RFSPACE, Inc. has introduced what is said to be the most advanced "all digital, all mode, plug and play" receiver, the SDR-IQ™ Software Defined Receiver and Panoramic Adapter. Check out this month's column for details. (Photo courtesy ofRFSpace)

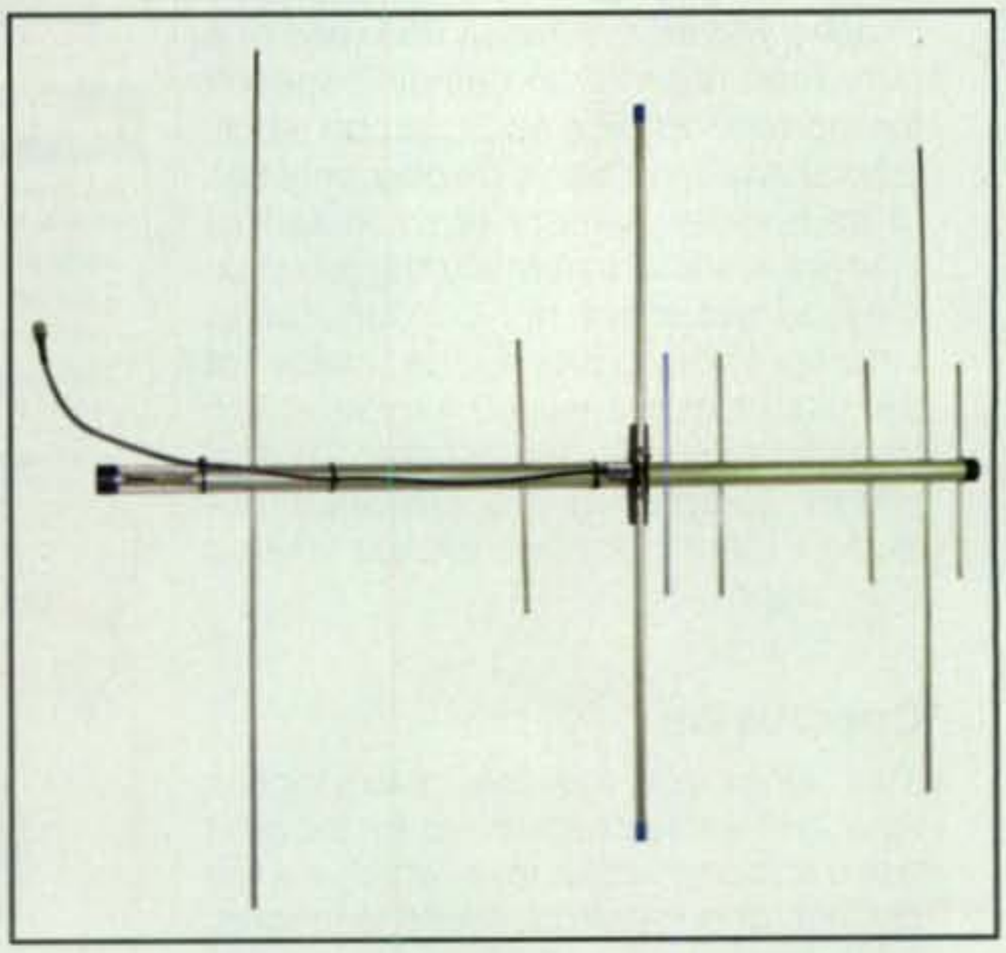


Photo B– The new MFJ-1760 Dual Band 144/440-MHz Yagi Antenna reportedly gives a whopping 8 dBi gain on 2 meters and 6 dBi gain on 440 MHz. The antenna requires only one feedline for true dual-band performance. (Photo courtesy of MFJ)

The MFJ-1760 has a 17-dB front-to-back (F/B) ratio on 2 meters and 10 dB on 440 MHz, and it handles 500 watts. The longest element is 40.5 inches, the boom is 45 inches, and the mast diameter is 1.5 inches—with all this weighing in at just two pounds. A similar product also is available from MFJ's Hy-Gain® line, the DB-2345, which is priced at $89.95.

Also offered but not pictured here is the new MFJ 80/40/20-meter Rotatable Dipole, at $359.95. With it you can DX the low bands on 80, 40, and 20 meters with a full 33-foot rotatable dipole that is said to "blend in with the sky." The MFJ-1785 Rotatable Dipole handles 1500 watts SSB/CW, and a balun is included with the antenna.

Manufactured of 6063 T-6 aircraft-strength aluminum tubing with a solid center fiberglass insulator, the MFJ-1785 requires a medium-duty rotator, such as Hy-Gain's AR-40. The 80- and 40-meter end-loading coils are wound on fiberglass forms with Teflon® wire and resonated with capacitance hats to ensure an extremely low-loss structure. The entire antenna length is used on all three bands.

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

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

Portable and Mobile Goodies

Personal Utility Pouch (PUP) from Newco Enterprises. Purses and backpacks sometimes just don't cut it. Now there's a new and innovative way to carry all your tech gadgets hands-free. The new PUP, or Personal Utility Pouch, is said to be the first unisex-designed wearable organizer—think "fashionable fanny pack" with a 2007 dateline. Reportedly, the old expression "Necessity is the Mother of Invention" couldn't be truer in the case of Newco Enterprises' new PUP. Newco, it seems, was formed by Florida real estate brokers Jean and Jim Newell, who found they were both having the same problem: too many business essentials to carry around and no convenient place to keep them organized.

Photo C– Measuring 7" × 9", the Personal Utility Pouch (PUP) consists of four open pouches, ideal for cell phones, pens, glasses, and business cards; there also are two large zippered security pockets for items such as wallets, passports, and cameras. The 54-inch adjustable strap alters the PUP to be worn three different ways. (Photo courtesy of Newco Enterprises)

Photo D– Rissler Research and Development (RR&D) has developed the Mobile Office Extension (MOE) to help make an office environment in a rented vehicle friendlier. The MOE securely mounts a laptop or other electronics into a vehicle, while still being easily removable. See the column for details. (Photo courtesy of RR&D)

They quickly discovered there wasn't any product currently available that met their requirements. Purses were out of the question and briefcases were too bulky. Realizing other business people were having the same problem keeping track of their cell phones, pens, notebooks, Palm Pilots, reading glasses, etc., this enterprising group decided to design its own wearable organizer, and so the PUP was born.

Measuring 7" × 9", the PUP (photo C) consists of four open pouches, ideal for cell phones, pens, glasses, and business cards; there also are two large zippered security pockets for items such as wallets, passports, and cameras. Available in six colors, the 54-inch adjustable strap alters the PUP to be worn three different ways—around the waist, over the shoulder, or across the chest.

Although originally intended for business use, the PUP crosses all age barriers and applications, and it's not hard to see a number of amateur radio applications. A professional organizer during the week, the unisex design quickly converts into a tool belt for weekend chores or a travel accessory for vacationers.

For more information or to order, contact Newco Enterprises (1-800-257-8244; use "Pin 44" at the prompt and ask for Newco Operator 101, or dial 321-952-8771; on the web: <http://lovemypup.iwebservicesinc.com>). Product, telephone ordering, and online ordering information all are available on the website.

Mobile Office Now a Reality for High-Pressure Commuters. While originally designed for business-oriented "mobile office" users, it's not much of a stretch to picture some busy, on-the-go amateur radio operators in this or a similar "mobile office" picture (photo D).

The reality of the mobile office often is experienced while precariously balancing a laptop inside a rented midsize vehicle—not the mobile office dream that technology has promised. Rissler Research and Development (RR&D) has developed the Mobile Office Extension (MOE) to help make the reality a little friendlier.

The MOE, as depicted in photo D, is said to securely mount a laptop or other electronics into a vehicle, while still being easily removable. Many companies and professionals rely on leased or personal vehicles, and most leasing plans do not allow installation and mounting of hardware.

The MOE eliminates such problems by installing and removing without hardware and the need for tools. The MOE quickly transports between vehicles and stows easily in a laptop bag. The MOE and laptop combination can bring along all the functionality of your office workstation, while having the added benefit of adding GPS/entertainment systems and other electronics to almost any vehicle. The MOE can also be used as a lap-table while on a plane, van, or car-pool, to provide a stable and insulated work surface.

Many professionals now rely on laptops while away from the office, and RR&D is focused on improving the ergonomics with which the current mobile office operates. The MOE is designed to help make time in the car as productive and efficient as possible. It consists of a cradle that securely holds a laptop and a base-plate that attaches to the interior of a vehicle. The base-plate allows for a very flexible attachment system that accommodates a multitude of vehicle layouts while being easily removable. The cradle is configurable for most common laptop brands with screens ranging from 12 to 21 inches.

The cradle/laptop combo is easily removed from the vehicle as a unit; there are provisions for the use of standard security cables to prevent theft. Various accessories allow for height and offset adjustment that can be used to suit almost any preference or position. The MOE disassembles easily and stores flat-pack style within the size of a standard laptop carrying case.

Travel and ease of airline check-in were major design considerations. The MOE can easily be carried in travel luggage, and all of the components are built of non-metallic materials.

Many other pieces of electronic equipment besides laptops are suitable for mounting with the MOE. Accessories include a multiple laptop extension, portable printer enclosure, writing desk insert, utility/storage box, sun/ glare/privacy screen, and a screen stabilizer bar. The MOE has been adopted as an

important tool for jobs that range from sales to life-saving endeavors.

***CQ* editorial note:** Be sure to bear in mind that whether you're a busy business user or an on-the-go ham radio operator, good vehicular safety practices dictate that you should use mobile radio, computer, and other potentially distracting equipment of any sort prudently while in your vehicle—preferably while safely stopped and parked.

Contact Larry Rissler at Rissler RR&D, 17816 26th St. Ct. E., Lake Tapps, WA 98391-6448 (253-862-8795; e-mail: <larry@rissler-rd.com>; <http://www.rissler-rd.com>).

Software and Computers

WinCAP Wizard 5 from Taborsoft. The popular Kangaroo Tabor Software website is sponsored by Jim Tabor, KU5S. It features many useful software programs, especially some unique "HamTools" designed for radio amateurs, shortwave listeners (SWLs), and others interested in communications analysis. For these useful software tools, be sure to check out Jim's website (see below).

Recently, Jim released WinCAP Wizard 5, representing the latest generation of his popular HF propagation prediction engine interface. WinCAP Wizard 5 combines enhanced versions of the best features from CAPMan and previous versions of WinCAP Wizard (see fig. 1).

According to Jim, WinCAP Wizard is said to be the most powerful HF communications analysis prediction package ever developed. WinCAP Wizard manages an enormous amount of data with a state-of-the-art database and provides numerous unique and innovative "views" of VOACAP propagation prediction information.

Jim notes that all of his software now defaults to freeware and provides basic functionality, sufficient for many users. The default WinCAP Wizard download is thus provided as what he calls "QSL-ware," which basically means freeware. Jim says that he appreciates e-mailed acknowledgements and comments, hence the term *QSL-ware*. The QSL-ware version provides unlimited point-to-point and NCDXF beacon predictions.

The software's features are considerable. The extensive "DX Gazetteer" provides a prefix search and two-way integration with the SmartMap-Geographic View along with other useful information. The unique "Beacon SmartChart" and the SmartMap-Geographic View are in this basic feature set. There are two point-to point charts and three beacon charts, each with numerous options, four point-to point reports, and four beacon reports—all for free.

The registered version of the program adds additional tools and functionality. The "Coverage-Analysis View" is an elaborate map with the ability to plot any of seven parameters, for up to nine frequencies and all 24 hours. You can view any hour and frequency for each predicted parameter with a mouse click. Also, a powerful prefix/call search and DX-List plot are provided. The Coverage-Analysis View provides numerous unique features.

For more information, contact Kangaroo Tabor Software, 1203 County Road

Fig. 1– WinCAP Wizard 5 represents the latest generation of the popular Taborsoft HF propagation prediction engine interface. The "Beacon SmartChart" depicted here is a new and innovative view of the associated VOACAP prediction data. You'll find details and contact information in this month's column. (Image from the Taborsoft website)

5, Farwell, TX 79325-3611 (fax 806-225-4006; e-mail: <jim@taborsoft.com>; web: <http://www.taborsoft.com> or <http://www.hamtools.com>). A fully functional WinCAP Wizard 5 trial is downloadable at <http://www.taborsoft.com/wwizard>.

From the Bookshelf

ARRL Book: Low Profile Amateur Radio, Second Edition. More and more ham radio operators are faced with installing equipment and antennas amid a flurry of modern-day limitations. The need to operate a low-profile amateur radio station may be imposed by the confines of a small home or apartment. Other hams are restricted by deeds or leases that regulate the size of the antenna they can install.

The new ARRL book *Low Profile Amateur Radio, Second Edition,* includes the information you need to operate your station under many types of restrictive situations. In the book (fig. 2), you can follow the easygoing discussions of author Al Brogdon, W1AB, as he provides details for many real-life examples and techniques for a variety of low-profile circumstances.

The 57-page book's contents include material on covenants, conditions, and restrictions (CC&Rs); low-profile HF antennas; disguised antennas; indoor antennas; operating modes and tips; interference; antenna tuners; transmitter output power; low-profile VHF/UHF antennas; mobile operating; and more. The book is priced at $19.95 plus s/h.

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

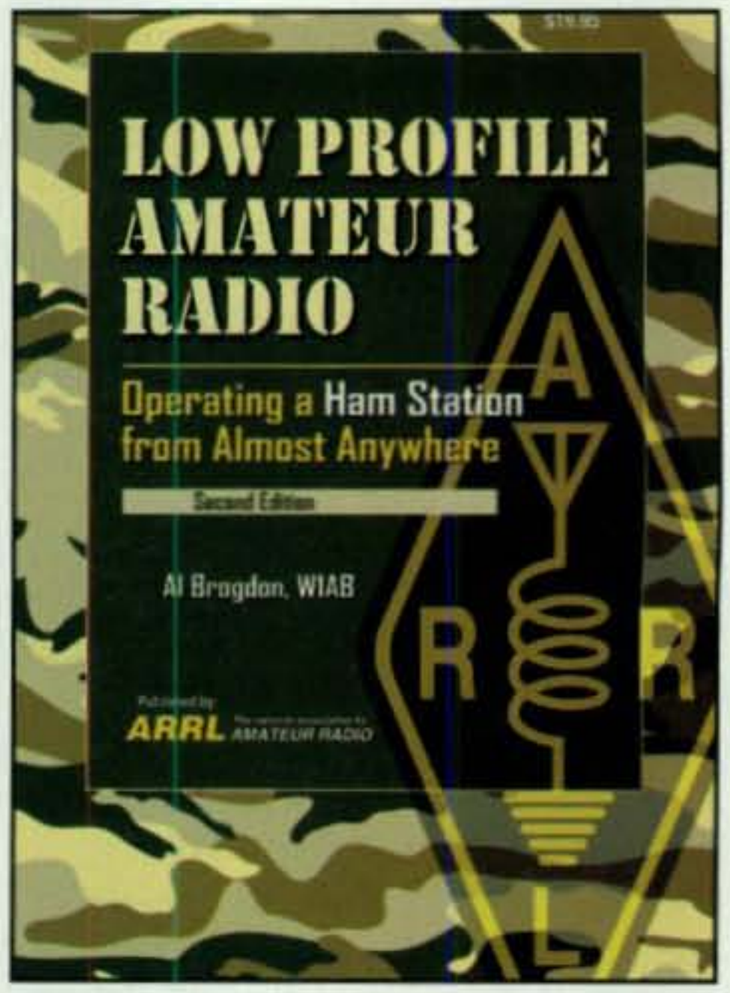


Fig. 2– The ARRL book Low Profile Amateur Radio, Second Edition *helps you to operate your station under many types of restrictive situations. Follow the discussions of Al Brogdon, W1AB, as he provides details for many real-life examples and techniques for a variety of low-profile operating circumstances. (Image courtesy of the ARRL)*

Short Bursts

CQ Advertisers and Column Contributors. Please take note: Are you a *CQ* advertiser who is trying to get your advertising budget to stretch just a little further, particularly by way of some free advertising? Or perhaps you are a reader of this column who is about to market a new product you would really like to tell us about, but don't know how to do it.

Whether you're an advertiser or a reader with a new product to offer, we encourage you to let the "What's New" column and our many readers know what you're up to. The good news is that the products mentioned in this monthly column are inserted free of charge, with the expectation that they will help you promote and sell your new product and hopefully become a regular *CQ* advertiser.

While a professionally prepared new product announcement or a formal press release would certainly be welcome, one isn't necessary for an announcement of your product to appear in this column. We can help you along the way. You can contact the "What's New" column by e-mailing your columnist at <w8fx@cq-amateur-radio.com>. Contact us, and we'll help. Just be sure to carefully note our disclaimer, which you'll find at the end of this and every column, just after the "Wrap- Up." The disclaimer tells you that the column listings are not product reviews and don't constitute a product endorsement by *CQ* or your column editor. Thus, we typically report on new products, but we don't review them in the column.

It's especially important this time of year to let us know of any new gear, accessories, or software that you will introduce at the 2007 Dayton Hamvention® and at other popular hamfests. Send us a writeup and photo, if appropriate, as soon as possible so that we hopefully can promote your new product in the "What's New" column—for free, of course.

Also, if you think your new product might be a good candidate for a display advertisement in *CQ,* be sure to contact *CQ*'s Advertising Manager, Don Allen, W9CW. It's easy to advertise in *CQ,* and Don can help you develop a successful ad for your product. Contact Don by telephone 217-344-4570, fax 217-344-4575, or e-mail <ads@cq-amateur-radio.com>.

Wrap-Up

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

Overheard: It's true that an hour spent with good friends is worth more than ten hours spent with strangers

73, Karl, W8FX

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

BY TED MELINOSKY,* K1BV

It's Not Over When You Finish . . .

It's not over when you finish! Huh? The big day comes and you work that last county for USA-CA All Counties. There's an immediate sense of relief, and you get to bask in the sunshine of congratulatory net comments and glowing mention on the internet bulletin boards. Now what? You've gotten pretty good at this county hunting business and made many friends along the way.

In addition to *CQ*'s USA-CA All Counties, which is basically a one-time achievement, the Mobile Amateur Radio Club (MARAC) offers dozens of other awards for county hunters. These awards will keep you active in county hunting for as long as you care to participate. Full details are available at <http://www.marac.org> or you can send a blank/empty e-mail to <info@marac.org>. You'll get an information package outlining the complete program. It's a great way to continue county hunting.

Submitting a USA-CA Application

Although *CQ*'s *USA-CA Record Book* doesn't say so (it hasn't been reprinted in a long time), it is perfectly acceptable to submit applications using any form of word-processing, spreadsheet or data-base application. The list of counties should be in alphabetical order by state and by county within the state and must include the call of the station worked, the city/town (or indication of "mobile"), the band, and the mode. Anything else you include is OK, but not required. You must also include your signed certification and the one from your witnesses. A sample is available at <http://www.dxawards.com/>, and you can print it yourself or you may request a copy by sending me an SASE.

Awards Program of the Danish National Society

The awards program of the Danish National Society, Eksperimenterende Danske Radioamatorer (EDR), is well-balanced, providing a series of simply designed and handsome certificates. It includes, as so many countries' amateur radio groups have done in the past few years, awards for contacting the islands and lighthouses that dot the long Danish coastline.

General Requirements: The fee is shown for each award, respectively. They are also available to SWLs. Send a GCR list and appropriate fee as shown in each award's rules to Award Manager, Allis Andersen, OZ1ACB, Kagsaavej 34, DK-2730 Herlev, Denmark.

Copenhagen Award. This award commemorates the 800th anniversary of Copenhagen, the capital city of Denmark. Contact stations in the Copenhagen area. Scandinavian stations need 15 contacts, other Europeans need 10, and all others need 2. On VHF, requirements are 10/5/2 and on UHF 5/3/1, respectively. It is available for CW, phone, or mixed, all bands. Send GCR list and fee of 5 IRCs or $US3.

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

USA-CA Special Honor Roll

Mark McMullin, KM6HB
USA-CA All Counties #1149
February 10, 2007

USA-CA Honor Roll

500

W9KB 3398
KM6HB 3399

1000

KM6HB 1727

1500

KM6HB 1448

2000

KM6HB 1341

2500

KM6HB 1261

3000

KM6HB 1172

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

Sponsored by the Danish National Society, EDR, this award commemorates the 800th anniversary of Copenhagen, the capital city of Denmark.

Cross Country Award. Contact OZ and OX prefix stations after April 1, 1970. This award is available for all CW or all phone. Point requirements are as follows:
Stations in Scandinavia
Class 1 = 70 points in all communities plus OX3.
Class 2 = 50 points in at least 10 counties.
Other Europeans = 50 points.
All others = 40 points.

Points are earned as follows:

1. Scandinavian: 80- to 2-meter contacts = 1 pt; 432-MHz contacts = 2 pts.

Three stations must be contacted in each county on 80 and 40.

Four stations must be contacted in each county on 20, 15, 10, and 2.

Five stations must be contacted in each county on 70 cm.

The Danish Underground Award given for contacts with OZ5MAY, the commemorative station located in Denmark's Fight For Freedom Museum 1940–1945.

The OZ Locator Award is issued for contacting Locator Squares in Denmark.

Danish Underground Award. This one is awarded for contacts with OZ5MAY, the commemorative station located in Denmark's Fight For Freedom Museum 1940–1945. This station is on the air using WW II clandestine radio sets exclusively. The sets were partly built in Denmark from parts supplied by parachute drop. A contact credit is given if you visit the museum.

OZ stations: contact OZ5MAY on three different bands or on three different days on two different bands.

Other Europeans: contact the station on two bands or on the same band on two different days.

DX: one contact with OZ5MAY.

OZ Locator Award. For the basic award, contact at least ten of the Locator Squares in Denmark after January 1, 1985. Denmark is comprised of the following squares: JO44, JO45, JO46, JO47, JO54, JO55, JO56, JO57, JO64, JO65, JO66, JO74, and JO75. Contacts via active repeaters do not count, nor do crossband and cross-mode contacts. Phone or CW contacts accepted. QSLs must be submitted when applying. There are endorsements for each additional three squares and for phone, CW, EME, meteor scatter, and satellite by band. Send QSLs and fee of 20 DKK, $US4, or 5 IRCs.

OZ Prefix Award. Work or hear OZ stations as follows:

Danish amateurs must work three

Work stations with prefixes OZ1–9 to earn the OZ Prefix Award.

stations with each OZ prefix (OZ1–9).

Other Europeans need two of each prefix.

The rest of the world needs one of each prefix.

A QSL card from club station OZ5EDR may be used to replace any missing card. Any band or mode is allowed and special mode/band endorsements will be given on request. Fee is 10 IRCs.

Looking for some help in publicizing your group or club's award? *CQ* magazine can help. Please send all details and samples to me for review.

73,Ted, K1BV

dx

BY CARL SMITH,* N4AA

DX Happenings

By the time you read this, we will have had the opportunity to work two of the most wanted countries in the world—Swains Island and Scarborough Reef. I can only hope we will have the propagation to allow all those who need them to make at least one contact. I won't even guess how many hundreds of us need only BS7H (Scarborough Reef) to achieve the top of the Honor Roll. It seems almost everyone I talk to needs it. There are a fortunate few who did manage a QSO, but there aren't many. If you have not made a donation to this DXpedition, please consider doing so. Transportation was expensive, and anything you could contribute will help defray that expense. How much do you spend on "frills" for your ham shack? Surely you could spare a little of that "frill" money to help bring the most wanted country in the world on the air.

The Carolina DX Association DX Dinner at the Charlotte, NC Hamfest on March 10, 2007. Here we see Jerry, N4JR; John, K8YC; Lesley, S9YL; Charles, S9SS/KY4P; and Ted, W4VHF (President of CDXA). (Photo courtesy of David, K4PZT)

At the Carolina DX Association DX Dinner at the Charlotte, NC Hamfest, Dennis, K7BV, presents the prize Yaesu FT-857 to Beverly Boyd, XYL of Ken, K4DXA. (Photo courtesy of David, K4PZT)

Liechtenstein – HBØ

Liechtenstein, HBØ, will see action by two Germans and one American at the end of May. Michael, DO1ARS, and David, DL1GDS, along with Edward, KD4SFW/DK4SFW, will be active on 160–10 meters. They plan to run three stations and use full power on some bands. Look for them May 27–30. Michael says they will QSL 100%.

60 Meters

Until fairly recently 60 meters saw little action. However, a group of dedicated people has been steadily increasing interest among DXers to be active on these five "channels" just above 5 MHz. Tom, K4MM, has set up a website for 60 meters which provides a lot of valuable information on activity on these frequencies. I don't see that anyone is offering a Worked All States or other awards for 60 meters. Actually, from what I see there are not enough countries active or authorized to make a DXCC award available. I'm not even sure a Worked All Continents is possible at this point in time. However, there is a lot of DX available if you are willing to compete for it. Power is limited, USB is the only mode authorized, and you must be on one of the "channelized" frequencies. Still, it offers an interesting challenge for those looking for another one. Want more information? Check the website: <http://www.60meters.info>.

The Charlotte Hamfest Report

The Charlotte, North Carolina Hamfest in March had a great program by Joe, AA4NN, and Bob, K4UEE, on the VU7RG DXpedition to Lakshadweep. The event also gave me the opportunity to join with a large group of DXers for an outstanding dinner gathering sponsored by the Carolina DX Association. Nearly 80 DXers, with their YLs/XYLs, enjoyed a great meal and fellowship for hours. The group included ham radio celebrities such as Dennis, K7BV, from Yaesu (Vertex Standard); Rich, W2VU, from *CQ* magazine; Mary, K1MMH, from the ARRL; and DXpeditioners Bob, K4UEE, Joe, AA4NN, and Dave, K4SV, just to mention a few.

Dennis provided a brand new Yaesu FT-857 for the dinner group prize drawing. The CDXA does a great job of supporting DXpeditions, reporting a donation to the Scarborough Reef that is approaching $4,000. Now that's support by a very active DX club!

Bob, K4UEE unveiled a series of DVDs from some memorable DXpeditions: XT2DX, K5K, VP8THU\VP8GEO, five DXpeditions of the Year—"The Untold Story," and of course the latest one, 3YØX, Peter I. I've personally seen these and they are great, either for your own private collection or for club programs. For the price and to order, con-

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

The operating crew at K3LR for the 2007 ARRL CW Contest (left to right): N3SD, K1AR, K1EA, VE7ZO, N3GI, VE3EJ, K3LR, N6MJ, K3UA, N2NC, and N2NL. Side note: VE7ZO & VE3EJ won the gold medal at WRTC (World Radio Team Championships) 2006 in Brazil. N6MJ and N2NL won the silver medal at the same event. K1AR is CQ magazine's "Contesting" column editor, a first-class CW operator, and was part of the team that won the gold medal at WRTC 1999 in Seattle. K1EA wrote the famous CT software. K1AR, K1EA, and K3LR are CQ Contest Hall of Fame members. (Photo courtesy of Tim, K3LR)

tact Bob Allphin, K4UEE, by e-mail at: <Bob@k4uee.com>.

Dayton Just Around the Corner

A lot of you will be at Dayton for Hamvention® later this month. It's always a lot of fun for DXers, with many activities from which to choose.

The annual SWODXA (Southwest Ohio DX Association) DX Dinner is one of the places to be Friday evening, May 18th. Check the following website for more information: <http://www.swodxa.com>. Then there are always the many hospitality rooms throughout the Crowne Plaza Hotel in downtown Dayton at 5th and Jefferson Streets (next to the Downtown Convention Center), each with their individual programs.

The Contest Dinner will be held Saturday, May 19th at 6:30 PM at the Crowne Plaza Hotel in the Van Cleve Ballroom. The cash bar opens at 5:30

How's your CW? Here's a guy who copied 75.2 wpm way back in 1939—Ted McElroy. Neal McEwen, K5RW, has a great story about McElroy and a lot more on his website: <http://www.telegraph-office.com>. (Photo provided with permission of Neal, K5RW)

The WPX Program

SSB

2971 .....IZØBTV

MIXED

1980.....JA5IU 1981 .....RWØBM

SSB: 1250 AE9DX. 1850 DL8AAV.
Mixed: 1400 W2FKF. 2250 WZ4P. 4050 HA5DA. 4100 N9AF.

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MDD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GO, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, WB8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8UB, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IK4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBF, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, I7PXV, S53EO, DF7GK, S57J, EA5BM, DL1EY, DJ1YH, KUØA, VE2UW, 9A9R, UAØFZ, DJ3JSW, OE6CLE, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX, WB9IHH, CT1EEN, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, KT2C, UA9CGL, AE5B, DKØPM, SV1EOS, UAØFAI, N4GG, UA4RZ.

160 Meter Endorsements: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8ILC, K9BG, W1CU, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, DJ1YH, KUØA, VR2UW, UAØFZ, DJ3JSW, OE6CLD, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, CT4NH, EA7TV, LY3BA, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, DL6ATM, W2OO, RU3DX, WB9IHH, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, UA9CGL, SM6DHU, KØDEQ, DKØPM, SV1EOS, N4GG, UA4RZ.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 355, New Carlisle, OH 45344 USA. Note: WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means. *Please Note: The price of the 160 meter bar for the Award of Excellence is $6.50.

PM. The North Coast Contesters are pleased to host the 15th Annual Dayton Contest Dinner. Tickets are ready and on sale now! Go to <http:///www.contestdinner.com> for more information and to purchase tickets. *There will be no Contest Dinner tickets for purchase at the door.*

Top-band enthusiasts will gather at the Barnsider Restaurant on Friday, May 18th at 6:15 PM. George, K8GG, is handling the arrangements for this one (k8gg@arrl.net).

Tim, K3LR, has started something called Contest University, Dayton 2007. From the website: "Contest University will be held on Thursday May 17, 2007, from 8:30 AM to 5:30 PM, at the Crowne Plaza Hotel in Dayton, Ohio. This is the day before the Dayton Hamvention® officially opens. Don't miss this rare opportunity to gain knowledge that may take you years of practice, trial-and-error, or lost time to learn otherwise. Get the edge to improve your scores and put your station in the winner's circle today!

"It will be a full day of training and knowledge enhancement. The program will include the following for both beginners and advanced contesters, and will be taught by veteran contesters. The "Contest Professors" will be: Jim, K8MR; Dean, N6BV; Randy, K5ZD; Dick, N6AA; Dave, W9ZRX; Andy, N2NT; Jeff, N5TJI; Mark, N5OT; Doug, K1DG; and Mark, MØDXR. Breakfast and lunch will be included on site for your convenience."

Is my message about operating habits being heard out there? After the March issue of *CQ* came out, I started getting e-mail about my "Shame on Us" item. It would appear that the word is finally circulating out there that a lot of us are just about fed up with all of the dumb things being done on the air. One e-mailer offered a suggestion that when you hear one of the "offenders," you should start a "little black book" and in future contests, etc., resolve not to work that station. This may not seem like a big deal, but then

5 Band WAZ

As of March 1, 2007, 713 stations have attained the 200 zone level and 1532 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
N6JV

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
IK1AOD, 199 (1)
DF3CB, 199 (1)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W3NO, 199 (26)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
N3UN, 199 (18)
OH2VZ, 199 (31)
W1JZ, 199 (24)
W1FZ, 199 (26)
SM7BIP, 199 (31)
SP5DVP, 199 (31 on 40)
N4NX, 199 (26)
N4MM, 199 (26)
EA7GF, 199 (1)
N6HR/7, 199 (37)
JA5IU, 199 (2)
CT3DL, 199 (26)
NØIJ, 199 (21)
RU3DX, 199 (6)
N4XR, 199 (27)
WØPGI, 199 (26)
HA5AGS, 199 (1)
EA8AYV, 199 (27)
VE3XN, 199 (26)
K7BG, 199 (22)
YU7GMN, 199 (10)
W6XK, 198 (17, 34)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
F5NBU, 198 (19, 31)
OE2LCM, 198 (1, 31)
HA1RW, 198 (1, 31)
WK3N, 198 (23, 24)
W9XY, 198 (22, 26)
KZ2I, 198 (24, 26)
WA5VGI, 198 (34)
W7VJ, 198 (34, 37)
WØCP, 198 (18, 40)
K9MIE (18, 21)
WB8ZRL, 198 (18, 26)

The following have qualified for the basic 5 Band WAZ Award:

UA9SC (191 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $100 ($120 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

The WAZ Program

20 Meter SSB

1157 ..... WC6DX

20 Meter CW

570 ..... N4BAA

30 Meter CW

76 ..... K6YUI

40 Meter CW

252 ..... K6YR

All Band WAZ

Mixed

8446 ..... SQ7FPD
8447 ..... RWØBM
8448 ..... NØFP
8449 ..... N2ZN
8450 ..... AK6DV

SSB

5026 ..... UAØAPV
5027 ..... WØVHF
5028 ..... VE3CR
5029 ..... K6DY

CW

500 ..... UAØABB
501 ..... WØVHF
502 ..... UA9YC
503 ..... JJ3GPJ
504 ..... IT9ELD
505 ..... JK1VMC

RTTY

171 ..... N4BAA

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 337 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K9BWQ 336	NØFW 335	PA5PQ 334	K7LAY 334	K5RT 332	N5HB 329	YV5ANT 324	W6YQ 314	G3DPX 284
N7FU 336	WB4UBD 335	K3UA 334	K4JLD 334	YU1AB 332	K1HDO 329	KE3A 323	UA9SG 310	DJ1YH 281
N4JF 336	F3TH 335	DL3DXX 334	N4AH 334	HB9DDZ 332	K7JS 329	KF8UN 323	W9IL 309	XE1MD 280
K4IQJ 336	W4OEL 335	K2ENT 334	K9OW 334	K3JGJ 332	W6OUL 329	F6HMJ 323	EA3ALV 309	WD9DZV 277
K2TQC 336	N4CH 335	NC9T 334	K4CEB 333	VE3XN 331	W7IIT 328	IKØTUG 321	YU7FW 306	W2JLK 277
K2FL 336	WØJLC 335	W2VJN 334	WØHZ 333	K2JF 331	KA3S 328	W3II 320	LU3DSI 302	
N4MM 336	OK1MP 335	G4BWP 334	N5FG 333	WA8DXA 331	SM5HV/HK7 327	IKØADY 320	N1KC 302	
K4MQG 336	K9MM 334	W1JR 334	K4CN 333	N6AW 331	K6CU 326	WG5G/QRPp 320	WA4DOU 301	
N7RO 336	K2JLA 334	I4LCK 334	W4MPY 333	W2UE 330	W4LI 325	F5OIU 320	RA1AOB 300	
W7OM 336	F3AT 334	PY2YP 334	K5UO 333	N5ZM 330	N4OT 325	PY4WS 320	VE7KDU 300	
K2OWE 336	WA4IUM 334	W7CNL 334	KA7T 333	W4UW 329	K1FK 324	OZ5UR 319	KT2C 300	
W8XD 335	EA2IA 334	K9IW 334	K8LJG 332	G3KMQ 329	N7WO 325	YT1AT 317	K4IE 291	

SSB

K6YRA 337	OZ5EV 336	PY4OY 335	WDØBNC 334	VE1YX 333	CT1AHU 331	NI5D 327	XE2NLD 315	KW1DX 295
IK1GPG 337	K9BWQ 336	VE3XN 335	WØYDB 334	W2JZK 333	EA3JL 331	K7TCL 326	VE7SMP 315	W4EJG 295
K5TVC 337	WB4UBD 336	IØZV 335	W4NKI 334	K8LJG 333	K1HDO 331	HB9DDZ 326	IZ6CST 314	XE1MW 293
NØFW 337	K2FL 336	EA2IA 335	W4UNP 334	VE4ACY 333	N7WR 331	YV4VN 326	W6NW 314	K7ZM 292
KZ2P 337	W8AXI 336	IN3DEI 335	VE2GHZ 334	VE2WY 333	ZL1BOQ 331	WR5Y 325	WØROB 313	K1RB 292
K4MZU 337	K4JLD 336	EA4DO 335	OE2EGL 334	WB3DNA 333	AE5DX 330	KC4MJ 325	W7GAX 312	K7SAM 292
N4JF 337	VE2PJ 336	PA5PQ 335	WA4IUM 334	K9PP 333	KB2MY 330	PY2DBU 325	KA1LMR 312	W9ACE 291
W4WX 337	W3AZD 336	XE1VIC 335	K5RT 334	DL3DXX 333	K3PT 330	YT1AT 325	WA5MLT 310	KU4BP 291
K2TQC 337	OK1MP 336	K2ENT 335	W6SHY 334	EA3EQT 333	WS9V 329	KE4SCY 325	RW9SG 310	W5PVE 288
K5OVC 337	EA3BMT 336	IK6GPZ 335	W5RUK 334	YV1KZ 333	W9OKL 329	K6GFJ 324	XE1RBV 310	KKØDX 285
W6BCQ 337	K9HQM 336	NC9T 335	K4CN 334	KE3A 333	W2FGY 329	W6WI 323	KK4TR 306	VE7HAM 285
DJ9ZB 337	W9SS 336	KØKG 335	EA3KB 334	W7BJN 333	CT1CFH 329	EA3CYM 323	WB2AQC 305	N8LIQ 284
W6EUF 337	K2JLA 335	K1UO 335	K3UA 334	YV1AJ 332	EA1JG 329	WA4ZZ 322	K3BYV 303	WØIKD 283
K4MQG 337	K9MM 335	I8KCI 335	N5ZM 334	KSØZ 332	W9IL 329	WN9NBT 322	JR4NUN 303	KBØRNC 282
N7BK 337	XE1AE 335	I8LEL 335	AA4S 334	LU4DXU 332	F6HMJ 329	W6OUL 322	VE7KDU 302	IK8TMI 281
N4MM 337	IK8CNT 335	DU9RG 335	CT3DL 334	VE4ROY 332	KF8UN 328	KD5ZD 322	W5GZI 302	F5INJ 279
XE1L 337	VK4LC 335	DU1KT 335	VE7WJ 334	W7FP 332	WØULU 328	CT1ESO 321	W4PGC 302	WD9DZV 278
4Z4DX 337	OE7SEL 335	CT1EEB 335	YZ7AA 334	CT1EEN 332	K1EY 328	KD2GC 321	EA8AYV 302	W5GT 276
W6DPD 337	VE3MR 335	W1JR 335	CT3BM 334	N2VW 332	K3LC 328	N1KC 320	YV2FEQ 301	HSØ/EA4BKA 276
N4CH 337	VE3MRS 335	I4LCK 335	N6AW 334	K5UO 332	K4DXA 328	W5GZI 320	AC6WO 301	K9DXR 275
N7RO 337	ZL3NS 335	PY2YP 335	WS9V 334	DL9OH 331	LU5DV 328	SV3AQR 320	4X6DK 301	XE1MEX 275
K7LAY 337	OZ3SK 335	ZL1HY 335	W2CC 334	YV1JV 331	XE1MD 327	KD2GC 320	N5WYR 300	
W7OM 337	K7JS 335	W4UW 335	K9IW 334	WA4WTG 331	DK5WQ 327	LU3HBO 317	K4IE 300	
OE3WWB 337	YU1AB 335	K3JGJ 335	AB4IQ 334	K3JGJ 331	KE5K 327	WB4GMR 317	RA1AOB 300	
K9OW 337	N5FG 335	W2FKF 335	4N7ZZ 333	N5ORT 331	CP2DL 327	N8SHZ 316	WA1ECF 295	

RTTY

WB4UBD 334	K3UA 328	N5FG 325	G4BWP 325	OK1MP 323	N5ZM 321	EA5FKI 320	PA5PQ 311	W4EEU 297
K2ENT 333	NI4H 325							

you never know. If enough folks use a "black book," the offenders just might start wondering why they can't seem to work all those people. I have offered other suggestions in the past, and I'm sure you can find one that suits you and the particular situation. In any event, I am pleased to see/hear that my message is being heard and taken seriously.

It's starting to warm up a bit now after a long, cold winter. I'm looking forward to it myself. Lots of stuff needs to be done outside and now perhaps I can get to mine. How about you?

Until next time, enjoy the chase, good luck with Swains and Scarborough, and Have Fun!

73, Carl, N4AA

CQ DX Awards Program

SSB Endorsements

330	K7LAY/337	330	W2FKF/335
330	K3JGJ/335	250	AE9DX/264

CW Endorsements

330	K2OWE/336	330	K3JGJ/332
330	K4JLD/334	320	WA4DOU/301
330	N4AH/334		

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 337 active countries. Please make all checks payable to the award manager.

QSL Information

T32Z via K3PD
T6EE via KE6GFF
T8ØB via WB6Z
T8ØW via JM1LJS
T88JW via JH3JWW
T88ST via JR3STX
TAØ/OK1XV via OK1XV
TAØ/OK3AA via OK3AA
TGØAA via TG9ANF
TI8M via TI2KAC
TK/EA3CUU via EA4BT
TK/EA4BT via EA4BT
TK/EA7AAW via EA4BT
TK/EA7JB via EA4BT
TK/EA7LS via EA4BT
TK/EB4EPJ via EA4BT
TK1KJ via F1JKJ
TK9Z via EA4BT
TM3NV via F2WS
TM5HV via F8KFZ
TP2ØCE via F5LGF
TX6A via F6AML
V26B via KA2AEV
V26BZR via W2BZR
V26G via N2ED
V26MH via HB9OCR
V26OC via N3OC
V26R via KA2AEV
V31HK via DL7BC
V5/DF6QP via DF6QP
V5/DJ8VC via DJ8VC
V5/DL8JS via DL8JS
V5/G3RWF via G3RWF
V51/DF6QP via DF6QP
V51/DL8JS via DL8JS
V63JQ via JA1KJW
VAØXN/P via VE3XN
VB4MWA via NØHJZ
VE3XN/125 via VE3XN
VK1CC via DL8YR
VK8AA via VK2CZ
VK9CGG via WØYG
VP2MDY via WA7NB
VP2MHX via W4WX
VP2MQD via K4QD
VP2MSR via G3USR
VP2V/AH6HY via AH6HY
VP5T via N2VW
VP8CMH via GMØHCQ
VP8ROT via GMØHCQ
VP8SGK via GMØHCQ
VP9/K1XM via KQ1F
VP9I via KQ1F

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," 106 Dogwood Dr., Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

contesting

BY JOHN DORR,* K1AR

Remembering Phil Goetz, N6ZZ

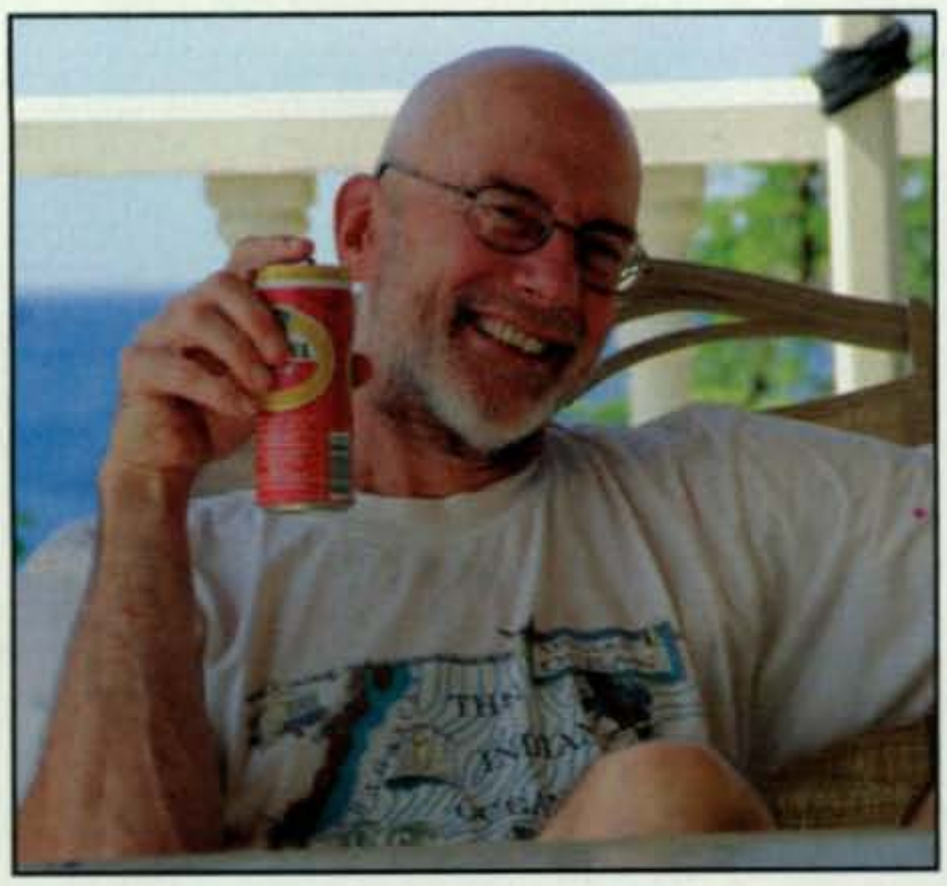
May's Contest Tip

How well do you really understand propagation? It's incredibly useful to check out band conditions prior to a contest. Try to gather data such as the times bands open, when signals are peaking to key parts of the world, times bands start to close, etc. Having that information in your back pocket is a great tool to help you make important operating decisions. It's just one example of how successful contesters sweat the details in making great scores!

Whether it's the at the Dayton Hamvention®, or a local club meeting, or participating in a multi contest effort, the socialization aspect of contesting has been and will continue to be a key driver of our future. Let's face it: As contesters, we're like fisherman when we socially interact. The conversation ranges from how we bagged the big one to why the big one got away. Also, for me, many of my contest friends have become my lifelong friends, not just to talk about contesting and ham radio, but to discuss career and life's issues in general. Without that aspect of contesting, my ham radio experience would be dramatically diminished.

As I think about all of my contesting friends, I can't help but remember the ones who are no longer with us. Sadly, it's becoming a longer and longer list that includes many friends with whom I personally operated and many more whom I had never met in person. The common denominator that we all shared was this thing called *contest camaraderie.* Our relationships were special, whether they were with the ham next door or on the other side of the globe.

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



Phil, N6ZZ (SK), enjoying life at PJ2T. Phil's smile and energy made the world better for everyone who knew him. (Photo thanks to K8ND)

Calendar of Events

All year	**CQ DX Marathon**
Apr. 28–29	SP DX RTTY Contest
Apr. 28–29	Helvetia Contest
Apr. 28–29	Florida QSO Party
Apr. 28–29	Nebraska QSO Party
Apr. 28–29	Old Old Timer's Club QSO Party
May 5–6	MARAC County Hunter's CW Contest
May 5–6	Indiana QSO Party
May 5–6	7th Call Area QSO Party
May 5–6	ARI Int'l DX Contest
May 5–6	New England QSO Party
May 12–13	Volta RTTY DX Contest
May 12–13	CQ-M Int'l DX Contest
May 12–13	Mid-Atlantic QSO Party
May 19–20	King of Spain CW Contest
May 19–20	Baltic DX Contest
May 26–27	**CQ WW WPX CW Contest**
June 2–3	SEANET Contest
June 2–3	Alabama QSO Party
June 16	Kid's Day Contest
June 16–17	All Asian CW DX Contest
June 23–24	ARRL Field Day

This month's column is a particular burden for me, as I have the sad task to report on the loss of one of our great ones, Phil Goetz, N6ZZ, who succumbed to a brain hemorrhage on February 27, 2007 at the young age of 64. As a tribute to Phil, I want to dedicate this month's column to his legacy. It just doesn't seem right this time around to discuss the perils of packet or the latest logging software.

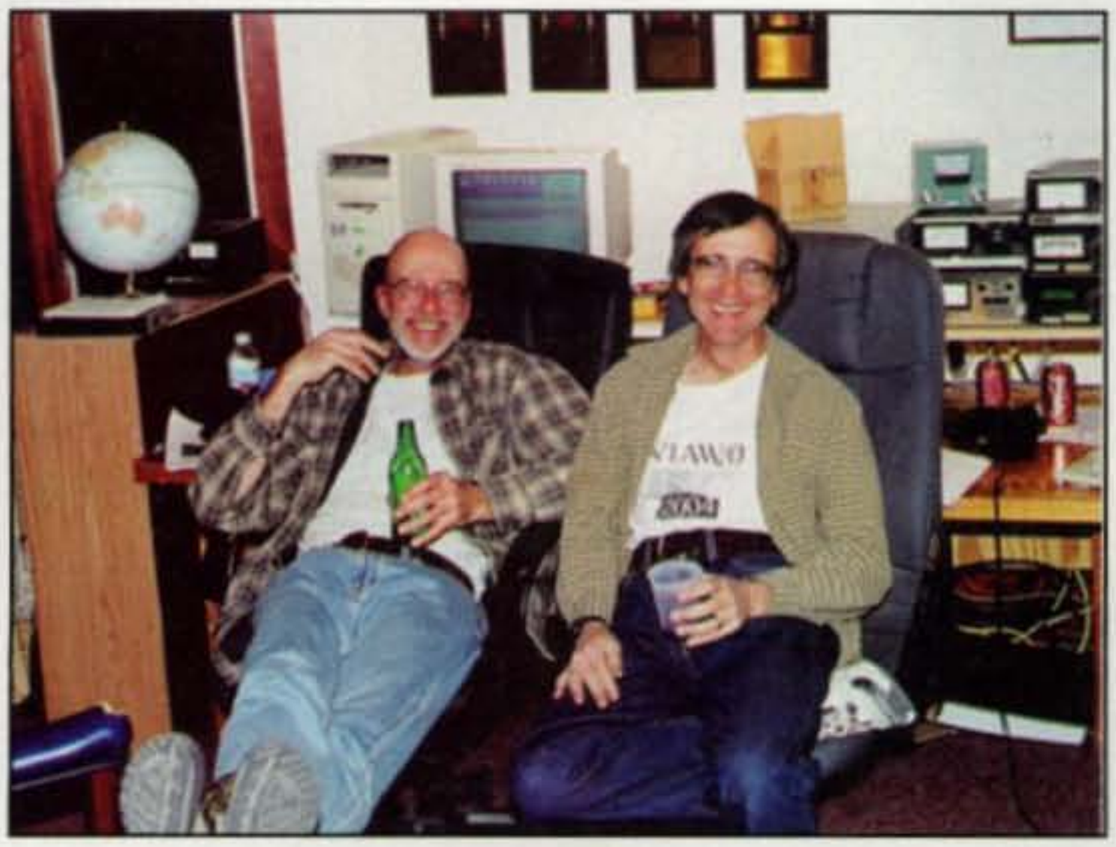
A Little About Phil

For those of you who didn't know Phil, the man can be best described as a friendly soul who quietly accomplished much and asked for very little. Having had his own personal challenges in life, Phil always had a smile on his face and gave back to contesting more than he ever took from it. It was a privilege to call Phil my friend. Even though he's physically gone, his legacy and contributions will be with us for years to come.

One of Phil's best friends was Tree, N6TR. I thought it to be appropriate to let Tree tell his story about N6ZZ in his own words:

Phil had been a major part of my life ever since we met on the Southern California Net back in 1968. I looked up to him when starting out my contesting career in the old ARRL CD Parties. More recently, Phil was the person on the other end of the internet during the WRTC 2006 event in Brazil. He was my eyes, ears, and advisor during the log-checking process. Instead of spending time playing tourist, Phil invested hours of his time helping me test the code for the log-checking program. With the pressure of impossible deadlines and no sleep, Phil was able to keep everyone together and accomplish the task.

When it came to contesting itself, Phil was an animal. I don't think anyone could ever forget seeing him write with one hand and send with the other. There is a drawing inspired by his operating technique at <http://n6tr.jzap.com/w6dqx.jpg>.



Phil and Steve, N2IC, enjoying a good laugh at Steve's fine New Mexico QTH. It's hard to find a picture of N6ZZ in which he does not have a big smile on his face. (Photo via AA5B)

In more recent times, Phil had lost his second wife to cancer and was busy starting a new life, recently married and building a new house and station. He had always enjoyed playing racquetball, and so he died doing something he enjoyed.

Phil had the ability to turn almost any situation into a funny event. Once, at the station of K6AC (Alex Connolly), we were out in the "shack" and he found a box labeled "nuts." Inside the box was a collection of large nuts used to bolt together the tower, but also included were some walnuts. This prompted Phil to go off into a routine that had everyone rolling on the floor laughing.

When operating a field-day-style multi-multi at XE2SI during a DX phone contest, I was standing outside the trailer in which Phil was operating when I heard this: "CQ Contest XE2 Sierra Italy. The W8 again? Sorry W8 again? Okay, there are two W8s in there; only *one* of you go ahead. Roger—W8XYZ 59 6 QSL?" Gee, I wonder how the other guy knew he was the one who was supposed to standby?

Rest in peace, my good friend. If I could imagine what Phil would want us to remember about him, I'm sure it would be something like "Live life to its fullest and never give up on your dreams.

73, Tree, N6TR

If you're interested, donations in Phil's memory can be made to the Ruidoso Public Library, 107 Kansas City Road, Ruidoso, NM 88345.

There's Just Something About that CQ WW DX Contest

Many of you know that Phil was one of only two contesters who have operated from all 40 CQ Zones (his notable peer is Dick Norton, N6AA). Overall, Phil operated in 75 CQ WW DX Contests, generating a combined 648M points from his various single-op and multi-op efforts. That's an average score of 8.64M, or somewhere in the 300–400K cumulative QSO range! A summary of all of his operations can be found in Table I, including his 40th zone of operation in 2004 from K1ZZ.

Final Comments

If I'm reminded of anything this month, it is to be sure to celebrate contesting and life in general with those of us who are still here. I'm looking forward to seeing many of you at the Dayton Hamvention® this month and doing just that!

73, John, K1AR

Year	Mode	Callsign	CQ Zone	Category	Score
1960	Phone	W9YT	4	MS	8,568
1961	CW	W9YT	4	MS	208,302
1963	CW	W9EWC	4	SOAB	300,045
1965	CW	W6RW	3	MM	1,196,211
1966	CW	W6RW	3	MM	1,366,992
1967	CW	W6RW	3	MM	1,804,168
1968	CW	W6GP	3	MM	2,180,864
1969	Phone	W6UUI	3	MM	1,103,376
1969	CW	W6DQX/6	3	SOAB	707,952
1970	Phone	HH9DL	8	MS	3,302,640
1970	CW	W6DQX	3	SOAB	4,312,30
1971	CW	W6DQX	3	SOAB	347,130
1972	Phone	W6DQX	3	SOAB	598,400
1972	CW	W6DQX	3	SOAB	666,398
1973	Phone	KH6RS	31	SOAB	4,173,519
1973	CW	W6ANN	3	SOAB	929,556
1974	Phone	KH6RS	31	SOAB	3,337,005
1974	CW	W6DQX	3	SOAB	315,768
1975	Phone	6D2MX	6	MS	404,135
1975	CW	W6ANN	3	SOAB	682,158
1976	Phone	6Y5BF	8	SOAB	1,290,415
1977	Phone	XE2MX	6	MS	1,627,817
1978	Phone	VP2VER	8	MM	9,188,191
1979	CW	VP2VEQ	8	MM	4,173,519
1980	Phone	KP2A	8	SOAB	5,254,080
1980	CW	XE2MX	6	MS	1,511,190
1981	CW	N6ZZ	3	SOAB	809,723
1983	Phone	XE2SI	6	MM	13,478,670
1983	CW	XE2SI	6	MM	7,878,600
1984	Phone	TI1C	7	MM	22,157,695
1984	CW	XE2MX	6	SOAB	1,465,671
1985	Phone	VP2VCW	8	MM	19,846,800
1985	CW	N6ZZ	3	SOAB	234,696
1986	Phone	JY7Z	20	MM	14,388,986
1986	CW	W6MKB	3	SOAB	953,200
1987	Phone	HC8DX	10	MM	33,663,000
1987	CW	5B4TI	20	SOAB	5,816,907
1988	Phone	KL7Y	1	MM	1,4502,200
1988	CW	CT2NH	14	SOAB	4,683,508
1989	Phone	ZW5B	11	MM	35,830,544
1989	CW	SU1RR	34	SOAB	5,218,467
1990	Phone	5W1JJ	32	MM	22,285,168
1990	CW	HC5Z	10	SOAB	6,749,244
1991	Phone	LU4FM	13	MM	19,218,348
1991	CW	7Q7TT	37	SOAB	5,704,403
1992	Phone	CEØY	12	MM	23,095,515
1992	CW	EA9LZ	33	SOAB	7,901,415
1993	Phone	VK9LI	30	MM	10,881,894
1993	CW	4S7/N6ZZ	22	SOAB	4,575,420
1994	Phone	3DAØZ	38	MM	10,465,564
1994	CW	PZ5JR	9	SOAB	8,301,917
1995	Phone	JT1Z	23	MM	4,447,872
1995	CW	3B8/N6ZZ	39	SOAB	6,881,690
1996	Phone	HS1AZ	26	MM	5,658,598
1996	CW	3C5A	36	MS	7,550,220
1997	Phone	P29AS	28	MM	15,379,068
1997	CW	VK6BAT	29	SOAB	5,034,769
1998	Phone	XX9X	24	MM	10,890,408
1998	CW	VE2/N6ZZ	2	SOAB	7,023,425
1999	Phone	R1MVZ	16	MM	14,151,288
1999	CW	A61AJ	21	MM	38,789,751
2000	Phone	EY2A	17	MM	7,138,208
2000	CW	OX/N6ZZ	40	SOAB	4,252,419
2001	Phone	T88CC	27	MM	17,593,920
2001	CW	RIØF	19	SOAB	3,077,857
2002	Phone	TK4Z	15	MM	15,476,732
2002	CW	RW9OWD	18	SOAB	3,096,240
2003	Phone	C5Z	35	MM	33,764,550
2003	CW	JA1ELY	25	SOAB	3,042,568
2004	Phone	HC8L	10	MM	3,8782,625
2004	**CW**	**K1ZZ**	**5**	**SOAB**	**3,940,670**
2005	Phone	6Y2Z	8	MM	18,564,588
2005	CW	9G5GJ	35	SOAB	6,509,657
2006	Phone	PJ2T	9	MM	18,608,676
2006	CW	PZ5ZY	9	SOAB	11,469,330

Table I– N6ZZ's CQ WW DX Contest operations, activity from all 40 CQ Zones!

vhf plus

BY JOE LYNCH,* N6CL

Tapping into the Space Grant Consortia

Are you or is your organization involved with your local or regional NASA-sponsored Space Grant Consortium? If not, you might want to consider what is happening in Oregon with the Oregon Space Grant Consortium (OSGC). Its website at <http://spacegrant.oregonstate.edu/balloon.html#GOALS> has information on the growing interest in ballooning. Such interest has also contributed to college professors recently becoming licensed amateur radio operators. Among them are Peter Wu, KE7ERK, of Southern Oregon University; Mark Weislogel, KE7HVE, of Portland State University; Kevin Carr, KE7KVT, of George Fox University; and Jamie Zipay, KE7BQM, of Oregon Institute of Technology.

Kevin tells the story of his journey to becoming licensed in the Spring 2007 issue of *CQ VHF* magazine. Here is a brief excerpt from his article:

> Why did I finally get my ham license at the age of 42? My path through the back door into amateur radio started two years ago. The school where I teach physics, George Fox University, is an affiliate member of the NASA Oregon Space Grant Consortium (OSGC), an organization of Oregon research institutions, science museums, and colleges that do work associated with NASA's aerospace mission. Through OSGC I first heard about "Balloon Satellites," or Balloon SATs for short. Balloon SATs are small instrument packages that are carried as payload by helium balloons to altitudes in excess of 100,000 feet—the "edge of space"!
>
> Think of a Balloon SAT as a poor-man's space satellite; they don't quite reach space, but at $300 or so they are quite a bit cheaper! At 100,000 feet—just beyond the tropopause at the lower edge of the stratosphere—atmospheric pressure is less than 1% of sea level, a better vacuum than can be produced in a lab. Temperatures there hover at –70° C and instruments are exposed to high levels of cosmic and UV radiation. Balloon SATs therefore serve as an excellent educational design platform, introducing students to the fundamental challenges faced by NASA and other space agencies in designing operational instrumentation for use in space.

As you can see from Kevin's testimony, his entry into our hobby came by way of a NASA-sponsored program: the OSGC. It is through the OSGC that about a half-dozen Oregon colleges and universities are participating in Launch Oregon, a ballooning program that includes the development of amateur radio payloads. From the OSGC website is the following information on Launch Oregon:

> Launch Oregon provides a cost-effective way to expose students of all ages to hands-on science, engineering, and math activities in a near-space environment. Practical team-building skills are developed as students prepare for the next generation workforce in aerospace, science, engineering, and technology.
>
> Program Goals. The program goals include the following: Expose students to the design of space hardware. Provide a platform for students to fly their designs in engineering and science. Develop team-building skills. An inexpensive way to get students involved with and excited about NASA.

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

VHF Plus Calendar

May 2	Full Moon
May 5	*Eta Aquarids* Meteor Shower Peak; Microwave Spring Sprint; 2 GHz and Up WW Club Contest (See text for details.)
May 6	Very poor EME conditions.
May 10	Last Quarter Moon
May 12–13	50 MHz Spring Sprint (See text for details.)
May 13	Good EME conditions
May 15	Moon Perigee
May 16	New Moon
May 18–20	Dayton Hamvention® (See text for details.)
May 19–20	Fourth weekend of the European WW EME Contest (See text for details.)
May 20	Moderate EME conditions
May 23	First Quarter Moon
May 27	Moon Apogee; Poor EME conditions

—EME conditions courtesy W5LUU.

Program Outline. The program outline is as follows: Students design and create payloads that carry experiments and data-collection tools. Participating universities provide a launch platform to successfully launch the payloads. "Chase teams" follow the path of the balloon, tracked by Global Positioning System (GPS) to recover payloads. Students analyze the recovered data.

Why a balloon? Weather balloons provide an inexpensive method of transportation, carrying payloads to high altitudes (50~100,000 ft.) to provide an experience with a near-space environment. Designing and implementing a balloon payload in a team environment can offer a unique educational experience. It is one of the few opportunities where students can become involved in all aspects of a scientific experiment.

Relatively short development time allows students to have hands-on experience building the payload, flying it, and analyzing the data that is gathered, while developing team-building skills. Instruments such as GPS and cameras placed on balloons are recovered approximately 90% of the time after the completion of the flight. This means that the same instrument can be used multiple times, lending itself to a cost-effective program.

Among the higher education institutions participating in Launch Oregon are: George Fox University (GFU), Oregon Institute of Technology (OIT), Oregon State University (OSU), Portland State University (PSU), Southern Oregon University (SOU), and Western Oregon University (WOU). Each of these institutions has varying levels of involvement in the Launch Oregon program. If you are interested in what is happening in a particular school, then check the OSGC website for information and a possible link to that school. Among the more active schools is SOU, which even has a Yahoo group at: <http://tech.groups.yahoo.com/group/BalloonSat/>.

Last year's balloon flights include the following dates, the purpose of the flight, and the sponsoring university:

April 7: Mars Lego rover dropped from a tethered balloon for The SMILE Program Middle School Challenge (OSU).

May 20: Journey to the Edge of Space course at OIT with 5th grade teachers from Ferguson and Shasta Elementary Schools, as well as high school and college students (OIT).

May 21: Inaugural launch from OIT Campus (SOU/Science Works).

May 25: Joint launch with PSU; 4th and 5th grade science experiments from Faulconer-Chapman Explorer School in Sheridan, OR (OSU/PSU).

June 7: 6th grade science experiments from Faulconer-Chapman Explorer School launched from Camp Cascade (OSU).

June 15: Lunar periscope on a polyethylene balloon launched from Millican, OR (PSU).

June 28: Joint launch with GFU. K-12 educator workshop from Millican, OR (PSU).

June 28: Chautauqua Short Course Workshop with college engineering and science instructors from across the country and high school and elementary science teachers from Oregon (OIT).

August 7: OIT Pre-College Program, Graduation Really Achieves Dreams (GRAD) for 10th and 12th graders (OIT).

August 17: Joint launch with Oregon Museum of Science and Industry (OMSI); high school student science camp at Camp Hancock (PSU).

November 29: Nuclear science experiment student design challenge (OSU).

Incidentally, Kevin Carr covers the joint launch with GFU and PSU in his article in the Spring 2007 issue of *CQ VHF* magazine. He also covers plans for a launch this summer.

For more information about your local or regional Space Grant Consortium, go to the following URL and click on your state or region: <http://calspace.ucsd.edu/spacegrant/webmap/sg_homepages.html>. You will be linked with the space grant consortium in your area. From there you can locate contact people with whom you can explore the possibilities of amateur radio involvement in their programs. If you develop a successful contact, please let me know so that I can publicize it in this column and *CQ VHF* magazine.

10th Grade Student's Voice To be on South African Satellite

The following is from the AMSAT South Africa website (http://www.amsatsa.org.za) as well as from the Southgate Amateur Radio Club website (http://www.southgatearc.org):

Kimberley's Learner To Speak from Space

When South Africa's second satellite, named SumbandilaSat, is launched in June, it will be the voice of Anton Coetzee, a grade 10 learner at the Technical High School in Kimberley, that will be heard from space with a very special message:

"This is ZSOSUM in space. I am the voice of the South African youth. We are knocking on the door of opportunity, marking our place in the orbit of space research and communication. Hear us! Listen to us!"

Anton read in the local paper about a competition for a voice message to be recorded and broadcast from SumbandilaSat and set out to write what turned out to be the winning message. The competition was the brainchild of SA AMSAT (Southern Africa Amateur Radio Satellite Association) and supported by the South African Amateur Radio Development Trust, which spotted the opportunity to leverage the competition to focus attention of the youth on the exciting world of ham radio.

Anton set to work researching the information about South Africa's second satellite on the SA AMSAT website and came up with the winning message.

"We are very excited about the message. It is powerful and conveys what SumbandilaSat is all about," SA AMSAT President Hans van de Groenendaal said. SumbandilaSat is a project of the Department of Science and Technology and was built by SunSpace in cooperation with the University of Stellenbosch. The satellite's main function is remote sensing. Experiments from several universities are included alongside the amateur radio equipment.

The amateur radio system on SumbandilaSat is comprised of a voice beacon, a transponder, and a parrot repeater.

The FM transponder will facilitate radio amateurs on the African continent to make contact with each other using inexpensive hand-held transceivers (transmitter and receiver) and easily home-constructed antennas. The transponder will operate on a 2-meter uplink and a 70-cm downlink.

The parrot repeater is a novel instrument that will record a short period of audio and then transmit it back to Earth. It is similar to the one on South Africa's first satellite SunSat. SunSat was popular among radio amateurs worldwide and was often used in schools to demonstrate amateur radio and the science of satellite communication. "We are planning to do the same with SumbandilaSat," said Hans, ZS6AKV.

The audio beacon announces the presence of SumbandilaSat as it orbits in space. Anton Coetzee's message will be the first, spoken in his own voice. The audio beacon is programmable by the ground-control station and the message will be changed from time to time to support other youth activity involving the satellite.

Anton Coetzee was presented with a state-of-the-art Compaq laptop computer, complete with Vista operating software and Windows® Office Student Edition, at a recent assembly at the Kimberley Technical High School.

More information on SumbandilaSat can be found in the Spring 2007 issue of *CQ VHF* magazine.

Dick Esneault, W4IJC, SK

Dick Esneault, W4IJC, became a Silent Key on February 4, 2007 at Tut Fann Veterans Home after a long struggle with Alzheimer's disease. He is survived by his wife of 58 years, Marie, KF4FGN; four sons, Rick, Jim, Bob, KF4EMP, and John; and eight grandchildren. Dick was part of the OSCAR satellite team in 1960–1961. For an extensive obituary please see the *Huntsville Times* story at : <http://www. al.com/news/huntsvilletimes/index.ssf?/base/news/117179376861630.xml&coll=1&thispage=1>.

Current Contests

European Worldwide EME Contest 2007: Sponsored by *DUBUS* and REF, the EU WW EME contest is intended to encourage worldwide activity on moonbounce. Multipliers are DXCC countries plus all W/VK/VE states.

The fourth weekend of the contest will be May 19–20, 0000–2400 UTC, 1296 MHz CW/SSB. For further information contact: <info@dubus.de>. Complete rules can be found at: <http://www.marsport.demon.co.uk/EMEcont2007.pdf>.

Spring Sprints: These short-duration (usually four hours) VHF+ contests are held on various dates (for each band) during the months of April and May. This year's dates and times were not available at press time. It is assumed, based on last year's dates, that they will be as follows: Microwave, May 5, from 6 AM to 1PM local time; and 50 MHz, May 12–13, from 2300 UTC Saturday until 0300 UTC Sunday. Logs and summary sheets should be e-mailed or snail-mailed to the below addresses. Logs should be submitted within 30 days of the end of each contest. Contact information: Jeff Baker, WU4O, 2012 Hinds Creek Road, Heiskell, TN 37754 (e-mail: <springsprints @etdxa.org>. Sponsored by the East Tennessee Valley DX Association, the up-to-date information on these contests can be found on the association's website at <http://www.etdxa.org>. At this URL, click on the VHF/UHF link to get to the contest information.

2 GHz and Up World Wide Club Contest: The following is unofficial and is developed from assumptions based on last year's contest. Sponsored by the San Bernardino Microwave Society, the contest should run from 6 AM on May 5 to 11 midnight on May 6 (36 hours). The object is for worldwide club groups of amateurs to work as many amateur stations in as many different locations in the world as possible on bands from 2 GHz through Light. Rules are available at the following URL: <http://www.ham-radio.com/sbms>.

Convention and Conference Announcements

Dayton Hamvention®: The Dayton Hamvention® will be held as usual at the Hara Arena in Dayton, Ohio, May 18–20, 2007. For more information, go to: <http://www.hamvention.org>.

AMSAT/TAPR Banquet at the Hamvention®: The following is from the AMSAT-NA website (http://www.amsat.org):

The first AMSAT/TAPR Banquet will be held Friday evening May 18, 2007 at the Air Force Museum in Dayton, OH in conjunction with the 2007 Dayton Hamvention®. The two groups share many members and this gives everyone the opportunity to attend both dinners. The "Dinner Under the Wings" festivities will begin at 18:00 with a cash bar and appetizers in the Air Power Gallery (World War II). The buffet dinner will be served at 19:00 in the Cold War area. Following a few AMSAT and TAPR announcements, after dinner you will be free to roam the museum. The price for the dinner is $35.00 per person and includes appetizers, salad, meal, dessert, coffee, iced tea, tax, and gratuity. Vegetarian meals are available if selected when you purchase your ticket. See the National Museum of the Air Force for information about the museum. The museum will close at 22:00.

Reservations are required. These can be purchased online at the AMSAT Store (http://www.amsat.org). There will be no banquet ticket sales at the AMSAT booth this year. We expect this to be a very popular event, so reserve your tickets early. Reservations will close this year on Monday night, May 14, to allow us to give the museum a count on Tuesday.

There will be a special showing of the IMAX movie "Space Station" at 5:00 PM prior to the banquet. There will be no banquet speaker this year, to give everyone a chance to view the exhibits.

Central States VHF Society Conference: The organizers have asked for advance publicity for their conference because of their concern about the hotel being filled very quickly. Accordingly, here is the official announcement:

The 41st annual Central States VHF Society Conference will be held at the Omni San Antonio in San Antonio, TX, Thursday, July 26 through Sunday, July 29. As in past years, this gathering of VHF, UHF, and microwave hams will feature talks and demonstrations applicable to the bands above 50 MHz. An antenna range will be available to check gains of arrays from 2 meters through 24 GHz, and noise-figure measuring equipment will be on hand as well. A new feature this year will be passive-device testing, so you can check out those filters, connectors, relays, etc. The Friday evening flea market is always popular for the myriad of components and gear for the VHF, UHF, and microwave bands offered for sale.

The featured speaker at the Friday luncheon will be ARRL President Joel Harrison, W5ZN.

A special session will be held for those who might not yet be operational on the VHF and higher bands, but who are interested in delving into this exciting facet of amateur radio. So tell your non-VHF friends to come along and learn what we do, how we do it ,and how much fun it is.

As is always the case with Central States VHF Society Conferences, families are not forgotten. The San Antonio area provides many interesting attractions and activities for the ladies and kids, and special tours and events are being planed to take advantage of what the Alamo City and its environs have to offer.

The Omni has agreed to a very low room rate during the conference and for three nights before and after the conference dates. For further information and a conference registration form, go to <www.csvhfs.org/conference>. The site also provides information on hotel reservations. The rooms at the super low conference rate are going fast, so those planning to attend are urged to make their reservations soon.

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings,* or both. For more information, questions about format, media, hardcopy, e-mail, etc., please contact the person listed with the announcement. The following organizations or conference organizers have announced calls for papers:

Central States VHF Society Conference: The Central States VHF Society is soliciting papers, presentations, and poster/table-top displays for the 40th Annual CSVHFS Conference to be held in San Antonio, Texas on July 26–28, 2007. Papers, presentations, and posters on all aspects of weak-signal VHF and above amateur radio are requested.

Deadline for Submissions: For the *Proceedings* is May 7; for presentations at the conference and for notifying them that you will have a poster to be displayed at the conference the deadline is July 2. (Bring your poster with you on the 26th of July!)

Further Information is available at the CSVHFS website: <http://www.csvhfs.org/conference/callforpapers.html>. Contacts: Lloyd Crawford, N5GDB, e-mail: <N5GDB@austin.rr.net>. Alternate: Thomas Visel, NX1N, e-mail: <Thomas@neuric.com>. Snail-mail: RMG, P.O. Box 91058, Austin, TX 78709-1058.

ARRL and TAPR Digital Communications Conference: Technical papers are solicited for presentation at the 26th Annual ARRL and TAPR Digital Communications Conference to be held September 28–30, 2007 in Hartford, Connecticut. These papers will also be published in the conference *Proceedings* (you do *not* need to attend the conference to have your paper included in the *Proceedings*). The submission deadline is July 31. Please send papers to: Maty Weinberg, ARRL, 225 Main St., Newington, CT 06111; or you can make your submission via e-mail to: <maty@arrl.org>. Papers will be published exactly as submitted and authors will retain all rights.

Microwave Update 2007: Technical papers are solicited for presentation at the 2007 Microwave Update to be held October 18–20, 2007 in historic Valley Forge, Philadelphia, Pennsylvania. Any topics related to microwave theory, construction, communication, deployment, propagation, antennas, activity, transmitters, receivers, components, amplifiers, communication modes, LASER and practical experiences are welcome. Abstracts should be submitted by June 1 and completed papers and articles by August 15. Submit your papers, articles, and abstracts to Paul Drexler, W2PED, at <pdrexler@hotmail.com>, or Marc Franco, N2UO, at <lu6dw@yahoo.com> in MSWord® format or as a pdf file. Diagrams, photos, and illustrations are preferred in black and white (color accepted). Hard copies may be mailed to: Paul E. Drexler, 28 West Squan Rd., Clarksburg NJ 08510.

Meteor Showers

May minor showers include the following and their possible radio peaks: *ε-Arietids,* May 9, 2000 UTC; May *Arietids,* May 16, 2100 UTC; and σ-*Cetids,* May 20, 2000 UTC.

For more information on the above meteor shower predictions see Tomas Hood, NW7US's Propagation column elsewhere in this issue. Also visit the International Meteor Organization's website: <http://www.imo.net>.

And Finally . . .

On February 4, 2007 *Aviation Week and Space Technology* published a dire warning concerning our future "brain drain." What follows are excerpts from that warning:

Baby Boomer Retirements Could Trigger A&D Engineering Crisis

By Joseph C. Anselmo

Dire warnings of an aerospace brain drain have been issued for so many years that it's easy to tune them out. Four years ago, a presidential commission predicted a "devastating loss of skill, experience, and intellectual capital." Across the U.S., CEOs say the industry is not attracting nearly enough young engineers to replace the baby boomers that will start retiring in large numbers in the next few years. This magazine sounded the alarm in 1999, then 2000, and again in 2003.

The alarming truth is that the A&D industry is not attracting nearly enough skilled workers, particularly engineers, to replace those getting ready to retire. The looming shortfall, underscored in two workforce studies undertaken for *Aviation Week & Space Technology* by Bain & Co. and Deloitte Consulting threatens to sap the industry's vitality and could make it harder for the U.S. military to maintain its enviable technological edge over the long run.

The implications for the nation's future are huge. In 2005, U.S. universities awarded 70,000 Bachelor's degrees in engineering and 41,000 Master's and Ph.D.s, according to the Education Dept. While most of the Bachelor's degrees went to Americans, just over half of the advanced degrees were earned by citizens of other countries. A growing number of those graduates are taking their brainpower back home. Meanwhile, the number of engineers being minted overseas is soaring. Some oft-cited estimates say China is turning out 600,000 engineers a year and India 350,000. While critics have challenged those estimates as inflated, there is no question of the trend. Raytheon Chairman/CEO William H. Swanson uses a more conservative estimate of 400,000 Chinese graduates. "Cut it in half, it's still a huge number," he says.

If current trends hold, the industry will be able to replace only about half of the 57,000–68,000 military engineers that are expected to retire by 2010. And that doesn't take into account the additional engineers who will be needed to accommodate even modest growth in U.S. military spending. The bottom line: a potential shortfall of 41,000–87,000 defense engineers by 2010. "The concern is there is an imminent talent gap," says Lori Flees, a Bain partner who focuses on human capital issues. "It could hit pretty quickly. It definitely will hit in the next five years."

This editorial speaks directly to us as the graying cadre of amateur radio operators. Many of us who work the VHF-plus ham bands are also numbered among the soon to be retiring engineers.

What can we do about the situation? We need to become more involved with young people who are joining our ranks, or who have the potential to join our ranks. This means that we need to volunteer at our local high schools and middle schools. We also need to look for any opportunity we can to be a mentor to a young amateur radio operator who has the potential and interest in pursuing an engineering or electronics career.

The beginning of this column focused on opportunities on college campuses in Oregon. Other opportunities are highlighted in the Spring 2007 issue of *CQ VHF* magazine. I urge you to look into opportunities in your local area and send your reports on them to me so that I can publicize them in future issues of this column and *CQ VHF* magazine. It is by way of this networking that we may succeed in turning around this present negative trend. I look forward to hearing from you outlining your efforts to help solve the problems affecting both our hobby and our careers.

Until next month... 73 de Joe, N6CL

BY TOMAS HOOD,* NW7US

Basics of Space Weather and Radio, Part I

A Quick Look at Current Cycle 23 Conditions
(Data rounded to nearest whole number)

Sunspots
Observed Monthly, February 2007: 11
Twelve-month smoothed, August 2006: 16

10.7 cm Flux
Observed Monthly, February 2007: 78
Twelve-month smoothed, August 2006: 80

***Ap* Index**
Observed Monthly, February 2007: 6
Twelve-month smoothed, August 2006: 9

Last month we took a look at the basics of operating in the high-frequency (HF) spectrum, keeping in mind the new amateur radio privileges granted to licensed operators in the U.S. by the Federal Communications Commission (FCC). This month we're going to start looking at the terms and concepts used when discussing space weather and radio-signal propagation.

As you remember from studying the exam materials for your amateur radio license test, the propagation of HF radio signals is affected by the ionosphere. When we consider the radio propagation path between two points when those two points are farther apart than the distance of line-of-sight, we want to factor in the role of the ionosphere. The ionosphere plays an essential role in "bouncing" a signal between the surface of the Earth and the sky when we are trying to have our signal reach a remote station.

Radio-wave propagation on Earth takes place between two boundary layers—the Earth's surface and the ionosphere. In attempting to explain how such propagation mechanisms work, ionospheric physicists and other scientists have created mathematical models that allow us to predict, or simulate, what we see in the real world.

However, the real-world propagation mechanism is much more complex. Consider radio waves emitted from an antenna somewhere above the Earth's surface. The antenna radiates energy in an infinite number of directions, which excites a nearly unlimited number of propagation modes that then travel (propagate) through the area between the boundaries. Such modes do not travel in isolation, but interact whenever they come together to create other modes that are different from the original excitation energies. This process is called *mode combining*.

When the radio waves travel through uniform boundaries, such as over uninterrupted lengths of seawater under an all-daytime ionosphere, the combined modes are propagated with little change.

*P.O. Box 213, Brinnon, WA 98320-0213
e-mail: <nw7us@hfradio.org>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for May 2007

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 2-5, 9-19, 23-26, 29-31	A	A	B	C
High Normal: 1, 6-8, 20, 22, 27-28	A	B	C	C-D
Low Normal: 21	B	C-B	C-D	D-E
Below Normal: None	C	C-D	D-E	E
Disturbed: None	C-D	D	E	E

Where expected signal quality is:
A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing in *The New Shortwave Propagation Handbook* by George Jacobs, W3ASK; Theodore J. Cohen, N4XX; and Robert B. Rose, K6GKU.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 2 will be Fair on May 1st, Good on May 2nd through the 5th, etc.

3. As an alternative, the Last-Minute Forecast may be used as a general guide to space weather and geomagnetic conditions through the month. When conditions are Above Normal, for example, the geomagnetic field should be quiet and space weather should be mild. On the other hand, days marked as Disturbed will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the path is ionospherically supported.

However, when an abrupt boundary change is encountered, such as a seacoast or a day-to-night change in the ionosphere, previously stable modes interact, mode combining again takes place, and a new set of modes is launched, different in all directions.

Thus, when the real-world environment is considered—one in which complex water and ground terrain changes occur, as well as where the already unstable ionosphere is continually perturbed by the day-night terminator sweeping through the area—it is easy to see that the propagation medium is indeed so complex that any mathematical models conceived to simulate it must, in fact, be simplifications.

Scientists have studied and measured radio-wave propagation for many years, but the resulting knowledge still doesn't permit us to exactly simulate the natural process. Nevertheless, for distances greater than a wavelength, where near-field distortions can be neglected, emerging theory considers two mechanisms: *ground-wave* propagation and *sky-wave* propagation. The total field can be considered to consist of ground-wave plus sky-wave energy, and that energy is best explained

as being a number of interacting modes in which the total electromagnetic energy is propagated.

Ground-wave propagation is easier to understand. The mechanism is one in which energy is propagated along a spherical Earth that is devoid of a surrounding ionosphere. As distance from the emitting device increases, the far-field energy decreases because of the spreading of energy, loss due to diffraction from objects, and absorption at the Earth's surface which varies with surface conductivity. Ground wave is especially efficient in the low-frequency (LF), or long-wave (LW), bands and below, and is somewhat useful in the medium-frequency (MF), or medium wave (MW), bands, where domestic AM broadcast stations operate.

Skywave propagation describes how a radio signal that radiates up and away from an antenna is reflected or refracted by the ionosphere back toward the Earth at the opposite angle from where it came, causing the radio wave to reach very distant areas. A simple way to visualize this ionospheric bounce is to think of the reflection of a beam of light from a flashlight. When you stand off to the side of a mirror and shine the flashlight at an angle toward the mirror, the beam will be reflected at the same, but opposite, angle toward a distant spot. When shortwave radio signals spread out away from their source and reach the ionosphere, they may be reflected back toward the Earth. They might make such "hops" more than once, bounced back toward the ionosphere by the Earth, repeating this skip several times or more. In this way, skywave propagation allows a signal to reach around the world.

Skywave energy is infinitely more difficult to model accurately. Two techniques have been devised after many decades of work: (1) a ray-trace theory, where the principal propagation modes are consider to reflect (or refract) back and forth between the Earth's surface and the surrounding ionosphere, and (2) waveguide theory, where electromagnetic energy is considered to be guided between reflecting boundaries. Of the two, waveguide theory is thought to be more accurate.

It must be understood, however, that ray theory and waveguide theory inevitably lead to models that yield only approximations. Both are simply mathematical constructs in which certain assumptions based on measurement and experimentation have been made.

While one would prefer to use rigorous waveguide-theory models for all propagation simulations in all bands, they become unsuitable for HF propagation. The alternative is ray theory modeling. Of all HF ray-theory models, the one that has been the most highly developed and is considered the most accurate is VOACAP. (Many times in past issues, I've touched on VOACAP and one program that uses VOACAP as its core engine—the ACE-HF software for both SWL and ham radio operators <http://hfradio.org/ace-hf/>) Yet one must again recognize that all such HF models are merely mathematical constructs. They are the best tools we have for simulating real-world propagation, but inevitably the results are approximations of how complex radio waves really behave.

Since skywave depends completely on the condition of the ionosphere, space weather has been taken into account in the models we now depend upon. One of the key influences on the ionosphere is solar radiation. When the ultraviolet radiation from the sun is weak, the ionosphere is weakly ionized, while intense radiation from the sun creates a strongly energized ionosphere. This cause-and-effect interaction between the sun and the ionosphere has been modeled and empirically confirmed by years of study and daily observations.

The historical record of our observations of the sun and the ionosphere tells us of daily, seasonal, yearly, and even longer term cycles in solar activity and the resulting ionospheric properties. One of the most well-known ways to track these cycles is the *Smoothed Sunspot Number* (SSN). The propagation models in use today use the SSN as a key factor in simulating real-world propagation.

As you might have guessed, since the ionosphere depends on solar radiation for its existence, and since radio waves are refracted by a strongly energized ionosphere, the level of activity on the sun is tied to radio-signal propagation. Each month this column contains a report on the smoothed sunspot number for the current sunspot cycle. What are these spots? Why do we keep watching the sun for them, and how do they affect radio propagation?

Sunspots

Sunspots are magnetic regions on the sun with magnetic-field strengths thousands of times stronger than the Earth's magnetic field. Plasma flows in these magnetic-field lines of the sun. Sunspots appear as dark spots on the surface of the sun. Temperatures in the dark centers of sunspots (the *umbra*) drop to about 3700 K, compared to 5700 K for the surrounding photosphere. This difference in temperatures makes the spots appear darker than elsewhere. Sunspots typically last for several days, although very large ones may live for

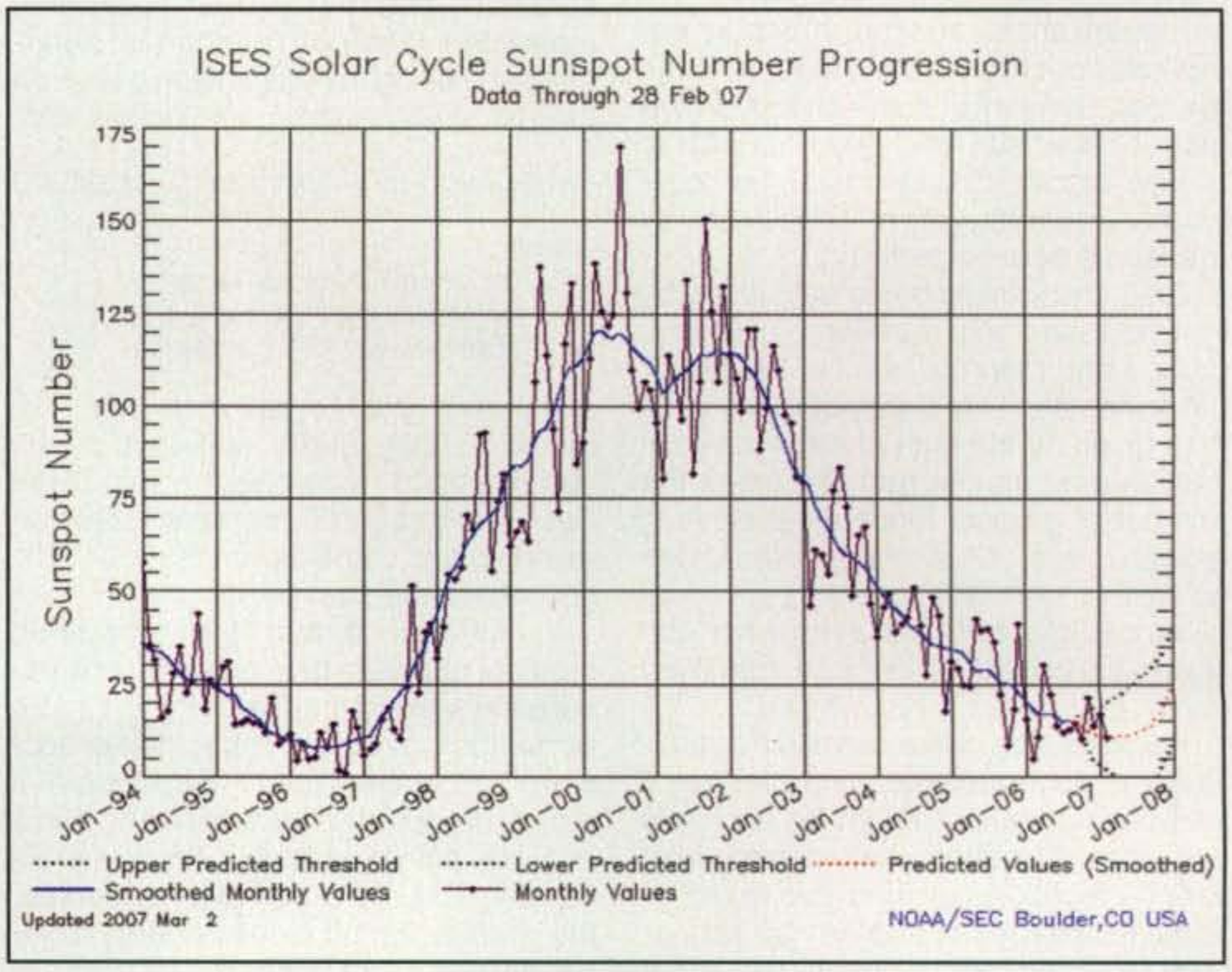


Fig. 1– Solar Cycle 23 (as of March 2007). Many think that we have seen the end of Cycle 23 and that Cycle 24 has now begun. (Source: NOAA/SEC)

several weeks. They are seen to rotate around the sun, since they are on the surface, and the sun rotates fully every 27.5 days.

Sunspots usually form in groups containing two sets of spots. One set will have a positive, or north, magnetic field while the other set will have a negative, or south, magnetic field. The magnetic field is strongest in the darker parts of the sunspot. The field is weaker and more horizontal in the lighter part (the *penumbra*).

Since the time of Galileo Galilea, who made the first European observations of sunspots in 1610, observers and scientists have discovered a great deal about the sun and its influence on the Earth and our atmosphere. The Chinese and many other early civilizations were the first to discover sunspots. Daily sunspot observations were started at the Zurich Observatory in 1749. By 1849 continuous sunspot observations were recorded. Over time, cycles in solar activity were revealed. The sun's sunspot activity has a cycle that lasts for an approximate 11-year period (see fig. 1 for the current cycle, Cycle 23). The cycle starts with very quiet solar activity with very few sunspots, then peaks about three to five years later with a very high number of daily sunspots, and then decreases in sunspot activity until the end of the solar cycle.

In 1848, Swiss astronomer Johann Rudolph Wolf introduced a daily measurement of the sunspot number. His method, which is still used today, counts the total number of spots visible on the face of the sun and the number of groups into which they cluster, because neither quantity alone satisfactorily measures sunspot activity.

The sunspot number is calculated by first counting the number of sunspot groups and then the number of individual sunspots. The "sunspot number" is then given by the sum of the number of individual sunspots and ten times the number of groups. Since most sunspot groups have, on average, about ten spots, this formula for counting sunspots gives reliable numbers even when the observing conditions are less than ideal and small spots are hard to see.

Because one observer may have difficulty in accurately counting the day's sunspot number (it might be a cloudy day, after all), observations are made at various locations around the world. In addition, images are taken by spacecraft far above our atmosphere.

To compensate for the many limitations of observing the sun at various

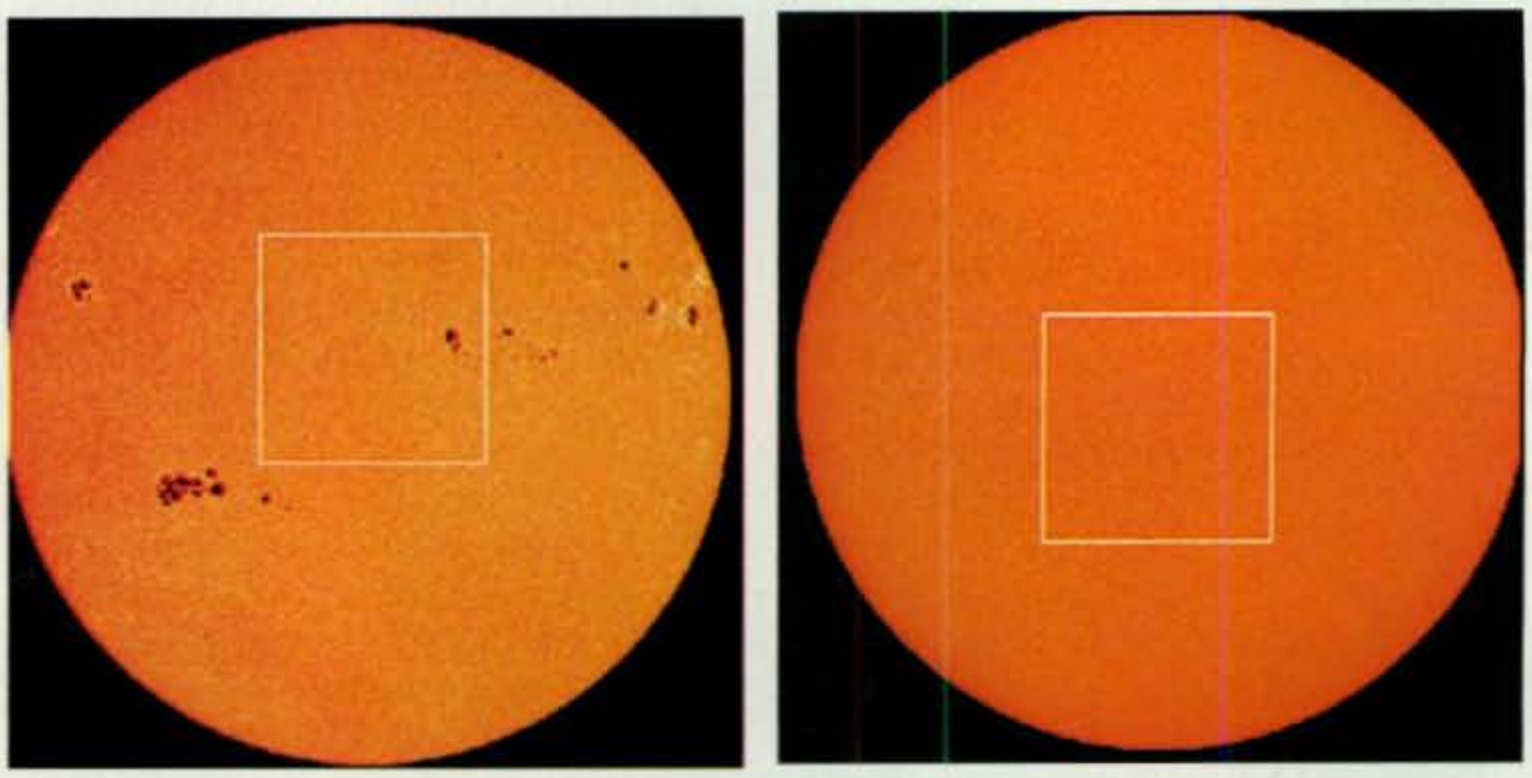


Fig. 2– Solar and Heliospheric Observatory (SOHO) Michelson Doppler Imager (MDI) intensitygrams showing the brightness of the sun's photosphere in visible light. The dark areas are sunspots. The white box indicates the region covered by a high-resolution imager. The image on the left was taken on November 15, 1999. the image on the right was taken on February 20, 2006. (Source: NOAA/SEC)

places, each daily international number is computed as a weighted average of measurements made from a network of cooperating observatories.

Smoothed Sunspot Number

The daily sunspot number has little, if any, relationship to ionospheric variability. However, the most widely used ionospheric index, R12, is derived from the daily sunspot numbers. The R12 index is a 12-month smoothed relative sunspot number. This 12-month smoothed sunspot number is determined by using the calculation based on the Lincoln-McNish smoothing function:

$$[(n1/2)+(n2+n3+....n11+n12)+(n13/2)]/12$$

where:
n1 = 1st Month/YYYY in Series,
n7 = 7th Month/YYYY in Series, and
n13 = 13th Month/YYYY in Series

For example, to calculate the R12 index for July 2005, add half of the January 2005 value plus the sum of the February through December 2005 values plus half of the January 2006 value and divide the sum by 12.

In general terms, the smoothed sunspot numbers give us a way to measure the sun's overall activity; the more active the sun is, the higher the sunspot count. Scientists have discovered a direct correlation between the sun's sunspot activity and our ionosphere's activity. The more sunspots observed, the greater the ultraviolet energy bombarding the Earth. Since the ionosphere is formed by the ultraviolet energy from the sun, the more sunspots on the sun, the more energized the ionosphere becomes.

You can hear the day's SSN by listening to the hourly space weather and geophysical reports broadcast by the National Oceanic and Atmospheric Administration (NOAA). NOAA uses the radio stations WWV and WWVH to issue geophysical alert messages that provide information about solar terrestrial conditions. Geophysical alerts are broadcast from WWV at 18 minutes after the hour and from WWVH at 45 minutes after the hour. The messages are less than 45 seconds in length and are updated every three hours (typically at 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 UTC). More frequent updates are made when necessary. WWV radiates 10,000 watts on 5, 10, and 15 MHz, and 2,500 watts on 2.5 and 20 MHz. WWVH radiates 10,000 watts on 5, 10, and 15 MHz, and 5,000 watts on 2.5 MHz. Each frequency is broadcast from a separate transmitter. Although each frequency carries the same information, multiple frequencies are used because the quality of HF reception depends on many factors, such as location, time of year, time of day, the frequency being used, and atmospheric and ionospheric propagation conditions. The various frequencies make it likely that at least one frequency will be usable at all times. You can read the details about WWV and WWVH at <http://www.boulder.nist.gov/timefreq/stations/wwv.html>. You can access these alerts on the internet (see <http://www.sec.noaa.gov/ftpdir/latest/wwv.txt>).

Historical records of the SSN are found at various internet pages. I've provided links and information about this at my web page, <http://prop.hfradio.org/>.

Next month we'll look at a related measurement of solar activity that more closely correlates with the energy level of the ionosphere. This measurement is the 10.7-cm solar flux reading.

HF Propagation in May

It's spring, and as we move closer to summer, DX signals on the higher bands become weaker and openings more sparse, especially now that solar Cycle 23 is at its end. Long-distance *F*-layer propagation on 10 meters through 15 meters will continue to suffer due to the lower maximum usable frequencies (MUF) caused by an only moderately active sun. Optimum frequencies for DX propagation are lower during most of the daylight hours, but higher during the late afternoon, early evening, and nighttime hours, than were observed during the winter months. However, during May occasional sporadic-*E* propagation may be possible on the highest HF bands and even on 6 meters. Seasonal static increases during May, but perhaps not enough yet to overly degrade the lowest HF bands.

The following is an overall picture of high-frequency amateur band openings expected during May 2007. For day-to-day propagation conditions expected during the month, see the "Last-Minute Forecast," which appears on the first page of this column.

10, 12 Meters: Except for an occasional daytime opening to some southern or tropical areas, not many DX openings are forecast for these bands during May. The afternoon hours are the best time to check for DX openings. Frequent short-skip openings between distances of approximately 750 and 1400 miles, however, should be possible.

15 Meters: A seasonal decrease in DX openings is normal for May. Some fairly good openings still are possible towards the south during the late afternoon and evening. Numerous short-skip openings, between about 600 and 2300 miles, should be possible almost daily.

17, 20 Meters: These should be the best bands for DX during May. Opening shortly after sunrise, good DX conditions are expected to one area or another through the evening hours. These bands may also remain open to southern and tropical areas through much of the nighttime hours as well. DX conditions should peak during the late afternoon and early evening, with openings possible to almost all areas of the world. Very frequent short-skip openings are also forecast for distances between about 350 and 2300 miles. Quite often, especially during the late afternoon, optimum conditions may exist for both the short and long skip, and stations a few hundred miles away will be heard at the same time as DX stations from several thousand miles away, causing considerable QRM.

30 Meters: This band will often play a major role in DX propagation, with somewhat better nighttime propagation than 40 meters, and solid daytime propagation into many areas of the world. Exotic DX can be found here on CW and other digital modes. Check this band often during the course of the day.

40 Meters: Fewer DX openings are expected because of the shorter hours of darkness and the higher level of static. Fairly good openings still should be possible, however, to several areas of the world from shortly before sunset, through the hours of darkness, until shortly after sunrise. Good daytime short-skip openings can be expected

over distances of between approximately 150 and 750 miles, with nighttime openings extending up to the one-hop limit of 2300 miles.

60, 80 Meters: Fewer hours of darkness and higher static levels are also expected to reduce DX openings on this band, but a few fairly good ones should still be possible. Check during the hours of darkness. Excellent short-skip openings are forecast for the daylight hours over distances ranging between 50 and 250 miles. During the hours of darkness, the short-skip range should increase up to approximately 2300 miles.

160 Meters: Propagation conditions on this band have passed their seasonal peak and should decline until the early fall. Openings up to a distance of 1000 miles or so should be possible this month during the hours of darkness. An occasional opening well beyond this range may also be possible when static levels are exceptionally low.

VHF Conditions

May should see an increase in sporadic-*E*, with some continued trans-equatorial propagation. Solar activity is not expected to be high enough to support *F*-layer DX on 6 meters.

Sporadic-*E* ionization is expected to increase moderately during May, so look for short-skip openings, 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. Short-skip openings between about 1200 and 1400 miles may also be possible on 2 meters.

A seasonal decline in trans-equatorial (TE) propagation is expected during May. An occasional opening may still be possible on 6 meters toward South America from the southern tier states and the Caribbean area. The best time to check for 6-meter TE openings is between 9 and 11 PM local daylight time. These TE openings will be north-south paths that cross the geomagnetic equator at an approximate right angle.

Auroral activity is generally lower than in March and April due to the change in the orientation and position of the Earth and magnetosphere in relation to the solar wind. This year very little aurora can be expected during May. Watch for *Kp* values above 6, which occur on days of Below Normal and Disturbed HF conditions. No days are expected to experience such stormy conditions, though. If, however, an unexpected geomagnetic storm occurs and triggers aurora, point your antenna northward. You will find that CW is the modulation and mode of choice, as the signals you will hear on aurora will be raspy and distorted.

Current Solar Cycle Progress

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 77.8 for February 2007, down from January's 83.5. The 12-month smoothed 10.7-cm flux centered on August 2006 is 80.3, the same as for July. The predicted smoothed 10.7-cm solar flux for May 2007 is 75, give or take about 15 points.

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for February 2007 is 10.6, down quite a bit from January's 16.9. The lowest daily sunspot value recorded was zero (0) on February 11 through February 16. The highest daily sunspot count was 22 on February 1 and February 2. The 12-month running smoothed sunspot number centered on August 2006 is 15.6. A smoothed sunspot count of 11, give or take 11 points lower to 12 points higher, is expected for May 2007.

Solar Cycle	Began	Ended
1	March 1755	June 1766
2	June 1766	June 1775
3	June 1775	September 1784
4	September 1784	May 1798
5	May 1798	December 1810
6	December 1810	May 1823
7	May 1823	November 1833
8	November 1833	July 1843
9	July 1843	December 1855
10	December 1855	March 1867
11	March 1867	December 1878
12	December 1878	March 1890
13	March 1890	February 1902
14	February 1902	August 1913
15	August 1913	August 1923
16	August 1923	September 1933
17	September 1933	February 1944
18	February 1944	April 1954
19	April 1954	October 1964
20	October 1964	June 1976
21	June 1976	September 1986
22	September 1986	May 1996
23	May 1996	*Circa* 2007
24	*Circa* 2007	*Circa* 2018

Table I– Solar cycles, lasting on average about 11 years each, have been officially recorded since the 1700s. There have been 23 cycles since then. Solar Cycle 24 is just now beginning.

Since we are right at the end of a solar cycle, space weather and solar scientists are frequently adjusting their predictions for the solar minimum. Currently they predict a solar minimum for March and April 2007. Some disagree and put it at May 2007, while the Australian government has the solar minimum centered on September 2007. (See <http://www.ips.gov.au/pipermail/ips-ssn-predictions/2007-March/000080.html>.

You can see a page of all the 20th century sunspot cycles at <http://wm7d.net/hamradio/solar/historical.shtml>.

The observed monthly mean planetary *A*-index (*Ap*) for February 2007 is 6. January's *Ap* was adjusted up from 5 to 6. The 12-month smoothed *Ap*-index centered on August 2006 is 8.7. Expect the overall geomagnetic activity to vary greatly between quiet to disturbed during most days in May.

Signing Off...

Please take a look at what's new at my propagation site, <http://propagation.hfradio.org/>. Included on the website is an up-to-the-day Last-Minute Forecast for you to use to get the very latest forecast for the month. If you have a cell phone with internet capabilities, try <http://wap.hfradio.org/ >.

Drop me an e-mail or send me a letter if you have questions or topics you would like to see me explore in this column. Also, I'd love to hear any feedback you might have on what I have written. Until next month . . .

73, de Tomas, NW7US

Number groups after callsigns denote the following: QSOs, Points, Zones, Countries, US/VE, Final Score. Certificate winners are listed in boldface.

2006 CQ WW RTTY DX CONTEST

Single Operator Assisted

IK4MGP	2050	5082	117	348	144	3,094,938
LZ8A	2170	5024	104	335	105	2,733,056
F5CWU	2042	4795	92	273	128	2,363,935
EN9M	2072	4700	111	319	69	2,345,300
UR5QU	1827	4251	105	317	85	2,155,257
EA1AKS	1701	4005	85	252	128	1,862,325
K4GMH	1673	3676	80	238	162	1,764,480
KU1CW	1763	3250	96	220	182	1,618,500
JS3CTQ	1352	3676	102	235	66	1,481,428
DKØEE	1374	3261	88	265	101	1,480,494
W3FV	1413	3321	84	223	136	1,471,203
SV1DPI	1379	3091	90	262	74	1,316,766
KI1G	1205	2969	81	230	131	1,312,298
VA1CHP	1196	2884	73	214	129	1,199,744
AI9T	1261	2532	84	205	161	1,139,400
YU7AM	1071	2519	89	257	77	1,065,537
NP3D	1262	2619	78	187	140	1,060,695
W3OA	1049	2312	78	191	144	954,856
NO2T	986	2342	69	181	100	819,700
IT9BLB	1478	3625	34	108	52	703,250
W1AJT/VE3	870	1849	68	187	125	702,620
RD4WA	983	2179	74	237	11	701,638
RN3BD	1032	2209	69	207	31	678,163
VE3HG	790	1985	62	169	101	659,020
JM1XCW	758	1949	89	150	67	596,394
GM4FDM	879	1936	57	183	40	542,080
VR2XLN	806	1987	76	176	16	532,516
W1BYH	716	1378	75	182	128	530,530
US4LPY	962	2072	49	172	34	528,360
ABØTA	762	1350	64	147	119	445,500
N4ZZ	824	1569	50	105	120	431,475
NA2M	599	1164	71	175	123	429,516
W7CT	793	1273	69	106	154	418,817
ABØRX	783	1267	69	114	142	411,775
F6FJE	604	1349	57	192	41	391,210
K6HGF	810	1227	69	97	149	386,505
S51CK	912	2222	30	91	49	377,740
YO3BL	726	1585	57	161	16	371,358
VA3PC	501	1239	58	148	92	369,222
W4CU	669	1227	56	137	99	358,284
N2FF	545	1206	57	149	86	352,152
OM5XX	950	2193	30	91	39	350,880
N6WS	666	1097	65	116	132	343,361
VE9NC	521	1326	49	130	69	328,848
VE3ESH	484	1076	59	116	113	309,888
K3WW	499	1242	56	127	65	308,016
RM9RZ	498	1336	56	169	3	304,608
EA5RM	492	1197	54	135	65	304,038
PR7AF	424	1238	41	89	109	295,882
DL9NDV	471	1073	56	168	46	289,710
BD1DRJ	559	1338	66	142	4	283,656
DG7RO	557	1176	50	159	27	277,536
RX3ZX	573	1229	52	166	7	276,525
K1FWE	394	958	67	158	63	275,904
N2TU	707	1619	27	93	50	275,230
K4CZ	505	1014	56	114	97	270,738
AK6DV	592	995	62	97	108	265,665
HA8IE	483	1093	52	143	33	249,204
N6CY	394	827	61	130	84	227,425
W4VIC	383	878	51	133	73	225,646
VE7KET	371	878	55	93	103	220,378
F5OAM	451	1001	46	134	38	218,218
KØBX	418	926	50	112	65	210,202
K1KO	355	866	54	132	54	207,840
WZ7I	317	809	57	150	47	205,486
K7BTW	554	947	48	82	86	204,552
AA3B	444	994	43	87	66	194,824
AC7ZG	415	735	60	96	103	190,365
JG1GGU	350	880	70	110	34	188,320
N2OPW	339	721	48	112	82	174,482
KE1F	403	770	53	102	70	173,250
N4GN	390	718	52	78	100	165,140
SV1BDO	374	819	44	134	15	158,067
IK3SSJ	341	785	44	124	33	157,785
JR1NHD	325	828	56	108	24	155,664
DL4KW	318	741	50	125	35	155,610
N6EE	295	593	64	116	75	151,215
OK2CLW	302	751	51	112	30	144,943
KE3D/5	330	596	58	87	96	143,636
JA1XRH	308	725	66	98	30	140,650
PY2BRZ	255	722	40	82	57	129,238
KSØT	354	613	41	78	91	128,730
NG1G	305	582	45	97	77	127,458
9K2HN	354	1041	27	84	8	123,879
W3UTD	267	562	46	104	67	121,954
S58P	295	656	42	114	27	120,048
K6TA	281	597	54	77	63	115,818
RAØSF	353	862	40	93	0	114,646
CT2GRF	295	675	34	104	31	114,075
AA9RR	248	555	44	93	64	111,555
7L4IOU	271	662	47	92	23	107,244
G3UHU	310	673	30	109	16	104,315
K8AC	272	545	44	86	61	104,095
W6OAT	289	491	50	73	83	101,146
LZ2UZ	291	646	42	104	8	99,484
K9DJ	308	548	28	67	86	99,188
VA6XDX	252	551	38	53	83	95,874
JP1QDH	303	804	26	62	27	92,460
RW4WZ	265	563	39	115	9	91,769
AL1G	383	855	22	24	57	88,065
JA1XUY	221	535	57	88	15	85,600
SM7CIL	283	646	30	88	12	83,980
UT5SA	428	893	18	66	5	79,477
IK7AFM	223	556	30	77	34	78,396
N6MZ	198	423	51	79	53	77,409
K6XT	248	406	42	54	88	74,704
JA2KCY	203	485	56	81	17	74,690
OK6DJ	193	473	36	82	38	73,788
GW8IZR	330	736	18	60	21	72,864
DL4PY	219	562	28	58	37	69,126
AD5VJ	261	373	43	48	91	67,886
VE3WDM	201	469	28	63	53	67,536
K7VIT	234	376	42	49	84	65,800
N6VH	246	398	42	43	80	65,670
RA3QH	248	549	28	88	0	63,684
DB9EX	193	452	33	88	17	62,376
JS1KQQ	165	417	53	87	8	61,716
TF3YH	201	471	31	76	24	61,701
WB1EDI	184	346	41	66	71	61,588
AA4VV	224	511	20	65	35	61,320
LU2EVA	171	489	29	50	46	61,125
K3WC	256	528	20	56	38	60,192
AJ1M	234	364	33	55	73	58,604
K7ZD	245	465	28	52	44	57,660
TA1DX	198	464	31	76	17	57,536
SM7BHM	328	691	16	60	7	57,353
KØFJ	325	506	23	33	56	56,672
W2QQ	205	358	33	58	60	54,058
W1NR	162	359	35	72	42	53,491
PA5O	154	374	33	76	32	52,734
K5HDU	212	329	34	44	68	48,034
JA1BWA	161	358	53	61	13	45,466
MØDDT	164	357	32	82	11	44,625
MMØBQI	155	340	27	78	19	42,160
W7WHY	195	300	34	38	68	42,000
SP6CZ	276	559	12	51	9	40,248
UXØSX	177	387	23	69	6	37,926
BD4SI	192	459	24	51	7	37,638
K7EG	167	333	28	44	39	36,963
K9OSH	218	298	28	33	60	36,058
AD1C	139	251	32	55	51	34,638
JA1IZZ	130	300	45	60	10	34,500
IK1SOW	136	324	28	72	5	34,020
IZ2GIU	164	382	16	53	13	31,324
WØ1N	110	238	35	58	30	29,274
IV3IPS	146	379	16	30	30	28,804
WA1ZYX	120	273	20	51	31	27,846
IK6VXO	124	281	21	63	14	27,538
JA5FNX	145	281	41	45	4	25,290
JA1ETN	117	299	24	50	10	25,116
NE1I	99	215	28	55	23	22,790
KB1IKD	114	219	23	43	37	22,557
JL7IFR	112	264	35	45	5	22,440
K5WW	167	230	22	27	45	21,620
W3AG	80	211	31	52	13	20,256
SM6WET	93	216	24	56	11	19,656
NØUX	105	188	26	36	42	19,552
W2PWE	107	185	26	35	39	18,500
KD3TB	85	234	19	47	9	17,550
DKØIU	80	191	22	47	6	14,325
F8PMO	89	216	11	40	15	14,256
9M2CCO	81	198	27	43	0	13,860
K6JEB	91	143	20	18	46	12,012
YO3JW	72	174	25	44	0	12,006
PA5A	108	223	9	30	5	9,812
9A5CW	91	185	10	43	0	9,805
LA1YE	82	185	10	34	5	9,065
K4GM	64	108	22	27	27	8,208
W9YQ	63	114	18	26	15	6,726
NE1F	47	86	22	24	26	6,192
YU5A	42	95	19	35	4	5,510
W3GQ	46	88	17	24	21	5,456
RA4HL	80	165	8	25	0	5,445
W6RK	64	89	14	12	35	5,429
N6TV	44	81	24	22	18	5,184
DL9NEI	47	102	15	32	3	5,100
6W7RV	40	115	11	23	5	4,485
VE3TTN	35	84	13	20	13	3,864
UU2JQ	27	72	20	23	0	3,096
RA3VR	32	74	9	23	0	2,368
OM7YC	31	72	9	18	0	1,944
HI8ROX	20	53	7	15	4	1,378
ON5ZO	22	44	6	16	0	968
WA7RR	13	34	11	13	3	918
SA1A	10	22	6	8	0	308
UA1CAK	8	12	7	7	0	168

Single Operator All Band Low Power

ZX2B	1857	5508	98	253	175	2,897,208
P4ØKM	1777	5279	69	168	172	2,159,111
CN8KD	1540	4606	69	197	126	1,805,552
4X2Z	1589	4652	83	248	56	1,800,324
WP3C	1370	3158	70	166	182	1,320,044
PX2T	1036	3070	65	149	115	1,010,030
UA3BS	1116	2507	99	266	32	995,279
IW1ARB	1041	2520	77	209	96	962,640
OK2SFP	1189	2662	76	216	61	939,686
W1ECT	1118	2530	60	175	119	895,620
YO3APJ	973	2288	70	230	67	839,696
LZ9R	1030	2338	75	212	67	827,652
GØMTN	1078	2383	61	212	69	814,986
ED5FL	1226	2757	53	150	84	791,259
H2E	972	2832	60	187	28	778,800
SV1CER	986	2230	66	200	54	713,600
VE3XD	840	2024	56	156	109	649,704
4L1QX	834	2372	55	192	16	623,836
EA3EYD	779	1807	73	200	65	610,766
SQ9C	923	2040	56	192	50	607,920
WA1Z	826	1600	69	182	127	604,800
WA1EHK	712	1639	73	190	93	583,484
IZ1AVA	817	1892	58	186	60	575,168
SP3GXH	734	1692	73	208	57	571,896
MWØCRI	848	1890	59	179	51	546,210
DL6JZ	753	1688	68	208	42	536,784
F6HRP	712	1661	53	177	76	508,266
HK6PSG	548	1601	62	136	119	507,517
LY6A	771	1737	63	198	30	505,467
JS2LGN	641	1638	84	174	48	501,228
EA7OT	652	1546	62	193	69	500,904
IK2DKX	700	1665	56	169	70	491,175
E21YDP	776	2024	66	171	5	489,808
WB2RHM	723	1435	67	149	124	487,900
YV5AAX	638	1895	41	106	108	483,225
GUØSUP	725	1625	56	195	46	482,625
YL2TB	869	1867	55	179	20	474,218
RL9A	676	1877	61	185	2	465,496
PA3DBS	694	1571	55	185	53	460,303
UA9AFS	779	2202	47	162	0	460,218
HA5LZ	680	1544	68	192	37	458,568
OZ9GA	776	1682	54	180	29	442,366
EA7AJR	734	1652	53	156	58	441,084
F6FTB	636	1454	53	188	55	430,384
ER5DX	715	1609	61	204	1	427,994
FM5JC	566	1320	61	127	125	413,160
IZØEHL	594	1357	63	185	49	403,029
YL2NN	674	1513	61	176	28	400,945
NP4BM	624	1381	51	101	138	400,490
OE2GEN	657	1577	48	132	71	395,827
ABØLR	881	1372	60	95	131	392,392
VE3GSI	565	1343	56	129	107	392,156
OK1FDY	554	1314	67	182	47	388,944
VE3KF	627	1423	50	114	107	385,633
DM2RG	617	1384	59	171	46	381,984
YL3DQ	704	1545	60	167	12	369,255
UA4ALI	610	1360	67	183	14	359,040
W4UEF	577	1126	64	135	118	356,942
F8BNN	588	1318	49	169	48	350,588
W1EQ	599	1230	50	129	104	348,090
RA3QN	563	1258	67	185	14	334,628
OK2LC	474	1163	68	176	42	332,618
SP4DM	499	1191	64	181	33	331,098
JA7EMH	509	1294	74	145	35	328,676
UA3WHF	616	1390	56	164	15	326,650
DM3HZN	597	1315	52	161	31	320,860
W8UL	559	1171	47	133	94	320,854
UT5UML	601	1316	53	151	33	311,892
WD4GBW	542	1433	40	128	48	309,528
K3SV	448	1098	56	154	71	308,538
KØRC	574	1038	59	123	111	304,134
W2JU	477	970	60	150	100	300,700
RX6LD	638	1430	41	143	21	293,150
HB9DCM	440	1065	56	167	50	290,745
N2QT	522	1038	57	139	82	288,564
WA1LWS	570	1036	49	118	111	288,008
IH9/IK2FIL	448	1327	39	139	35	282,651
RV3LO	547	1181	53	171	14	281,078
PT7AZ	443	1282	43	100	74	278,194
RV3QX	529	1148	52	170	19	276,668
RX3AGD	519	1139	60	173	9	275,638
F2AR	531	1170	40	162	32	273,780
UA9FFV	495	1396	39	145	12	273,616
UW8SM	547	1185	50	152	27	271,365
AB4GG	499	956	54	113	105	260,032
DL1ARJ	533	1155	48	153	22	257,565
HB9TOC	442	1035	47	153	42	250,470
KE5K	464	906	57	122	97	250,056
SV1BJW	569	1231	38	132	33	249,893
OM6RK	581	1249	46	153	0	248,551
UA3PW	528	1234	48	132	21	248,034
OS1Q	497	1070	45	152	33	246,100
YO9CWY	498	1110	53	151	14	241,980
VE3JAQ	433	1070	49	99	77	240,750
DL6KO	388	932	52	161	44	239,524
S57AM	431	986	53	152	37	238,612
VU2LBW	491	1329	50	126	2	236,562
IV3ARJ	375	931	51	147	55	235,543
RN6DR	413	934	63	178	10	234,434
UT5ST	601	1246	40	137	9	231,756
4Z4TL	336	957	59	167	14	229,680
DV1JM	502	1477	50	96	9	228,935
WN6K	592	921	53	61	134	228,408
KA3PVA	448	901	50	104	98	227,052
VE2AXO	401	993	45	100	83	226,404
HZ1IK	477	1380	34	110	20	226,320
KA1C	454	964	43	116	71	221,720
TI2KAC	424	949	45	75	112	220,168
JS1OYN	433	1023	68	123	24	219,945
RNØSS	475	1209	52	118	11	218,829
SVØXAW	503	1087	40	140	21	218,487
UA4HJ	495	1057	50	154	1	216,685
XE2AUB	470	999	47	52	117	215,784
DF4WC	376	913	48	139	47	213,642
UTØSE	483	1007	48	155	8	212,477
RX9DJ	495	1346	34	119	4	211,322
SP9AUV	449	982	47	145	22	210,148
G4FKA	449	961	46	149	23	209,498
PA3EBP	436	945	42	159	19	207,900
JH6QFJ	355	935	67	132	23	207,570
SP3HC	432	961	47	145	22	205,654
OZ2JP	472	1048	40	130	26	205,408
UA9WIK	407	1113	46	129	5	200,340
EA1BAF	440	995	37	130	34	199,995
RX1CQ	522	1070	41	135	8	196,880
OK2BMC	426	936	48	147	15	196,560
UK7F	433	1138	50	119	3	195,736
UA4FX	451	1038	46	139	0	192,030
YO2MAX	374	868	50	143	28	191,828
K6UFO	477	784	54	82	108	191,296
W3DQN	389	789	51	111	78	189,360
YO2MFA	393	877	52	146	17	188,555
W3WKR	417	747	51	104	97	188,244
YC3MM	385	1118	46	104	14	183,352
OK1DKO	400	914	46	134	20	182,800
G3VPS	405	900	37	136	30	182,700
ON4QX	432	940	43	117	32	180,480
NA5U	464	770	51	84	96	177,870
JA7LMZ	318	854	64	111	27	172,508
OH5VG	341	776	52	153	17	172,272
RW6BN	404	858	44	154	1	170,742
RA9CB	348	995	37	132	2	170,145
M1SMH	391	847	37	134	29	169,400
WA4PGM	376	741	46	99	82	168,207
JH3CUL	354	824	68	107	28	167,272
RX9JM	392	1111	37	110	1	164,428
UN8PIM	442	1206	38	95	3	164,016
F5RD	351	781	45	138	26	163,229
DH2PL	341	766	45	146	21	162,392
JA5SUD	294	798	63	118	22	161,994
W3KB	318	669	55	113	72	160,560
DM6DL	392	868	38	126	20	159,712
UR7EQ	405	892	40	138	1	159,668
OM7AG	448	949	31	121	16	159,432
SP2MKZ	355	809	45	124	24	156,137
N4NX	338	645	53	104	85	156,090
W6ZL	502	718	44	58	114	155,088
GW4MVA	330	757	40	129	33	152,914
EA2BNU	317	723	38	121	49	150,384
N9ADG	399	616	53	71	118	149,072
SP8EEX	357	784	43	125	21	148,176
RU3WR	405	876	38	131	0	148,044
DJ6BQ	389	862	37	119	15	147,402
EA5XC	348	823	36	103	39	146,494
OK2SPD	356	816	35	114	30	146,064
EA5EM	397	864	36	109	24	146,016
W4HJ	281	703	50	113	44	145,521
SP4CJA	388	859	38	118	13	145,171
3Z8Z	305	719	49	127	25	144,519
RA9UN	359	956	43	108	0	144,356
W4TIJ	351	627	53	99	77	143,583
N2KX	310	661	45	97	75	143,437
CT3HF	320	951	37	105	8	142,650
LZ5XQ	371	799	43	135	0	142,222
SP2IW	333	750	43	122	23	141,000
OK1AZK	349	793	36	109	32	140,361
RA9XF	335	916	36	115	2	140,148
N9CK	321	587	55	96	85	138,532
N1HRA	356	659	46	88	75	137,731
K4DLI	282	637	52	106	58	137,592
RA6XE	398	893	38	96	19	136,629
DL4JYT	362	784	37	122	11	133,280
GØCER	312	704	42	120	26	132,352
OZØF	405	862	33	115	5	131,886
JA1BHK	325	746	55	97	23	130,550
RU3BU	341	731	43	132	2	129,387
RW6AH	421	881	36	107	1	126,864
F5UMP	312	679	38	121	27	126,294
7N2UQC	299	688	63	91	26	123,840
RA4ST	378	791	33	120	3	123,396
VE1DHD	283	693	35	90	53	123,354
SQ8LEC	307	709	38	115	20	122,657
HB9AWS	293	658	38	121	27	122,388
G3KNU	273	608	44	130	27	122,208
DH3RB	309	682	37	123	18	121,396
VE3FH	271	624	40	79	75	121,056
IV3JCC	265	655	42	95	47	120,520
AB1FY	259	555	49	95	72	119,880
JH7QXJ	280	694	59	94	19	119,368
MØCFV	298	678	36	106	34	119,328
YZ1ZX	308	696	40	116	15	119,016
EA7BGR	297	661	41	118	21	118,980
WA3KYY	295	635	35	93	59	118,745
G6FOP	304	670	35	121	21	118,590
DF3IS	280	655	41	102	33	115,280
SQ7B	334	720	35	119	6	115,200
RW3XB	342	734	32	121	0	112,302
DC9ZP	318	683	33	131	0	112,012
IZ1ANZ	267	612	35	111	35	110,772
M5AEX	297	634	34	124	16	110,316
UXØFY	278	691	39	97	23	109,869
PA3CDN	276	609	37	126	17	109,620
DGØETE	292	628	36	125	13	109,272
W7KB	418	603	37	50	92	107,937
RA4LBS	324	714	36	114	0	107,100
DL5DIG	355	742	31	102	11	106,848
RU3XB	321	688	34	119	0	105,264
OM1AVK	351	758	32	104	2	104,604
JHØNEC	253	622	60	89	19	104,496
DJ6TK	261	596	41	122	9	102,512
WØRAA	394	576	38	58	81	101,952
GØUGO	285	613	31	112	23	101,758
DF7JC	270	581	39	119	17	101,675
ZL3TE	253	722	43	44	53	101,080
DD5A	251	559	45	118	16	100,061
N5XUS	365	541	37	53	92	98,462
EA1DZL	266	580	32	114	23	98,020
PAØLOU	237	550	44	115	19	97,900
BD7JLR	297	719	48	85	2	97,065
SP7FBQ	267	588	36	113	15	96,432
GØPSE	276	610	30	101	26	95,770
DL5JBW	254	573	38	115	12	94,545
KC4SAW	245	504	41	84	62	94,248
EA3DEN	278	632	29	93	27	94,168
NX4W	292	495	40	82	67	93,555
VK3KE	202	569	51	85	28	93,316
JN1BMX	224	576	58	83	20	92,736
EW7EW	272	615	35	99	16	92,250
K2YG	248	545	35	82	52	92,105
YBØEIN	305	889	27	76	0	91,567
TK/DF6ZY	290	638	29	88	25	90,596
OZ4EL	302	656	32	99	7	90,528
N6PC	347	484	36	43	107	90,024
OM4XA	273	643	30	86	24	90,020
VE6AX	244	541	34	53	79	89,806
SP7QJB	289	609	32	109	5	88,914
IWØUWE	231	549	39	99	23	88,389
K9TA	263	496	39	67	72	88,288
W3/NH7C	251	416	47	75	89	87,776
W9NWR	245	519	34	81	52	86,673
UN7CN	262	722	30	90	0	86,640
DGØDG	258	579	34	103	12	86,271
UR2ML	313	669	29	99	0	85,632
UA9CR	229	624	36	101	0	85,488
G7TMU	262	579	32	95	20	85,113
US1IV	253	551	36	112	4	83,752
DL5KUR	252	588	38	86	18	83,496
SP3DOF	240	549	41	109	1	82,899
KA4H	199	482	47	88	36	82,422
RU2FL	253	549	35	102	12	81,801
SN7ØØDR	222	523	41	101	14	81,588
K4AQ	238	460	40	70	66	80,960
VA3PL	218	537	36	68	46	80,550
KCØNKW	348	485	31	47	88	80,510
K7JE	239	438	43	65	72	78,840
ON6AT	257	555	28	93	21	78,810
IZ1DXS	209	508	38	96	21	78,740
DL6RBH	223	498	35	106	17	78,684
RV3LQ	276	589	28	97	8	78,337
OH8MWD	298	638	25	89	8	77,836
W6/VK2IMM	281	431	44	43	93	77,580
PH3BDJ	262	605	29	76	23	77,440
DK3GI	208	493	41	101	14	76,908
G3RSD	234	510	29	101	20	76,500
TI2JCY	223	481	37	44	78	76,479
WØZW	259	457	36	65	66	76,319
DGØKS	261	565	30	97	8	76,275
W6AEA	287	489	31	54	70	75,795
OK2PAD	245	526	31	105	7	75,218
LU5FF	188	537	34	47	59	75,180
N4CBK	238	452	38	66	62	75,032
OM3TLE	245	528	33	100	9	74,976
RV3WD	227	495	35	108	8	74,745
SP5GMM	207	467	43	106	11	74,720
DL1THB	270	590	25	90	10	73,750
W9HLY	208	452	38	81	44	73,676
AE4Y	235	393	44	61	80	72,705
DJ2IA	193	444	40	99	24	72,698
IV3KSE	202	478	32	93	27	72,656
WD9FTZ	204	380	50	74	66	72,200
UN5J	157	425	53	99	15	70,975
YL2KF	216	475	39	105	5	70,775
G4DBX	242	555	23	76	27	69,930
EA8AG	266	793	12	47	29	69,784
SMØEPO	257	542	27	98	3	69,376
N9LYE	268	409	36	52	81	69,121
G4DBW	238	509	28	94	13	68,715
IZ7EUB	158	413	44	94	28	68,558
WA8SDA	217	404	39	69	61	68,276
EA1AHA	201	454	34	92	24	68,100
S57AJ	279	566	23	91	6	67,920
VK2BAA	191	539	36	49	41	67,914
WD4LBR	207	424	34	71	55	67,840
KF2XF	226	428	32	66	58	66,768
DL3EBX	266	528	22	101	2	66,000
RA3TYL	221	502	35	94	0	64,758
WA2LXE	247	412	33	56	66	63,860
KW7N	261	388	39	37	87	63,244
IK2WFN	203	464	29	84	23	63,104
G3VQO	219	456	28	106	4	62,928
SP9CQ	167	399	36	104	16	62,244
DU7/G4DUM	221	653	36	57	2	62,035
WN1X	206	441	28	65	47	61,740
K4BX	199	369	35	63	67	60,885
VE3RER	187	432	28	59	53	60,480
PY2IQ	147	398	43	69	39	60,098
PAØMIR	199	426	33	95	12	59,640
DK7UM	203	439	31	102	2	59,265
WY3X	195	364	34	63	64	58,604
YO4CVV	211	460	29	98	0	58,420
VA7KOJ	177	381	38	40	74	57,912
RZ3ATE	199	445	33	97	0	57,850
LZ2DF	185	403	37	96	9	57,226
UX8ZA	200	438	29	91	9	56,502
N2WQ	226	388	22	52	69	55,484
N7DQ	264	360	36	35	83	55,440
W3MEL	203	601	24	68	0	55,292
NJ1H	210	372	36	55	57	55,056
G4AIU	183	406	29	92	13	54,404

KSØM	168	374	38	66	40	53,856
WA4OSD	214	337	31	47	81	53,583
EA5DYB	224	474	21	77	15	53,562
IT9JOF	157	388	34	81	23	53,544
W5JE	221	425	29	54	42	53,125
W7TMT	207	327	39	46	77	52,974
F1TIM	174	411	27	75	26	52,608
VA7CAB	198	423	28	35	61	52,452
SM6GKT	188	407	27	93	7	51,689
AA9DY	200	342	37	61	53	51,642
EA4AFP	147	360	35	85	22	51,120
DH7YAX	195	415	26	90	7	51,045
W1HY	160	393	28	77	24	50,697
EC1DAV	178	386	28	93	10	50,566
F5CQ	155	368	36	77	22	49,680
EA7EYQ	149	361	35	87	15	49,457
VE2LX	179	424	20	47	49	49,184
KØRY	186	361	33	56	47	49,096
SP8FHJ	192	430	30	82	1	48,590
KB9DVC	190	337	31	52	61	48,528
F5VBT	210	439	22	88	0	48,290
WG4M	170	326	35	58	55	48,248
LA5YW	**174**	**370**	**28**	**95**	**5**	**47,360**
IK5FKF	178	401	29	89	0	47,318
K9WX	202	308	34	47	71	46,816
N1NQX	149	321	29	69	47	46,545
PP5JD	166	484	18	40	38	46,464
G6CSY	174	382	22	76	23	46,222
JA9LX	150	389	41	65	12	45,902
RU3VD	135	337	35	88	13	45,832
DK3PM	198	406	27	85	0	45,472
PY2KP	124	336	35	63	37	45,360
HA5VZ	148	361	31	74	20	45,125
F5LCU	161	358	32	86	8	45,108
AD7BN	198	349	28	43	58	45,021
AK9F	191	302	33	44	72	44,998
KI3O	163	301	34	56	58	44,548
YO7ARY	179	386	28	85	2	44,390
YCØMJY	162	452	30	65	3	44,296
WØPC	189	295	33	39	78	44,250
IKØXBX	145	345	32	81	15	44,160
DL6UAM	191	397	23	82	6	44,067
EA1AOH	137	324	34	80	21	43,740
SP2HXY	186	393	25	80	5	43,230
N4PSE	163	265	43	52	68	43,195
VE2OWL	169	366	20	41	57	43,188
SP6EIY	174	385	28	79	5	43,120
N9GGO	181	318	32	51	51	42,612
HA1ZH	187	454	19	54	20	42,222
KM4RK	154	282	38	61	49	41,736
EA3ANE	138	321	31	79	20	41,730
TA1EE	**267**	**610**	**15**	**49**	**4**	**41,480**
OK1CRM	165	361	23	83	8	41,154
N4ZY	130	366	32	73	7	40,992
9V1UV	**180**	**435**	**34**	**58**	**2**	**40,890**
W7MRC	203	285	35	31	77	40,755
BD3AEK	196	443	35	56	0	40,313
UN7PV	129	349	34	80	1	40,135
PA3CWQ	155	340	31	85	2	40,120
RU9AZ/9	166	444	25	65	0	39,960
PA3EWG	156	347	29	79	6	39,558
ON6OM	145	320	30	75	16	38,720
W5MEJ	180	262	33	38	76	38,514
LY2FN	**141**	**313**	**36**	**86**	**0**	**38,186**
I1/K7GQ	196	403	19	70	5	37,882
US5EEK	169	357	27	74	4	37,485
N2ZN	138	288	30	58	42	37,440
IZ2GMT	132	298	26	73	26	37,250
UAØQBD	208	443	33	50	1	37,212
JA1XPU	156	331	46	56	7	36,079
DL8UFO	162	343	22	69	13	35,672
EC7AKV	144	331	27	66	14	35,417
JG5DHX/5	131	326	37	67	1	34,230
N4WO	158	276	26	48	50	34,224
SV9/DL3HQN	**161**	**364**	**19**	**58**	**16**	**33,852**
K4ADR	115	241	40	61	38	33,499
AB9KZ	142	270	28	52	44	33,480
SV1/HB9IOB	149	324	27	70	6	33,372
OH2HUH	159	344	22	71	4	33,368
ER3ZZ	**164**	**389**	**26**	**59**	**0**	**33,065**
RW4NN	135	302	31	78	0	32,918
DL3SCN	149	310	24	82	0	32,860
JA1RRA	142	294	50	57	4	32,634
K9HCK	145	276	27	45	46	32,568
JA1EMQ	116	304	37	61	9	32,528
GØKDS	165	338	18	78	0	32,448
TF3KX	128	279	25	78	13	32,364
ON5HY	117	288	27	66	19	32,256
RX4HX	145	332	27	70	0	32,204
UT5UKY	130	298	29	71	8	32,184
KS4S	130	251	32	49	45	31,626
IK1ZVJ	148	326	24	72	0	31,296
F5INJ	150	309	23	75	3	31,209
F1IWH	127	283	23	74	13	31,130
AA8EN	178	248	25	29	71	31,000
KH6/NØCO	**116**	**329**	**32**	**39**	**23**	**30,926**
RA3ZH	131	304	34	67	0	30,704
IK8SEU	135	298	26	70	7	30,694
K4WNW	115	259	31	58	29	30,562
VE2FFE	133	291	25	38	42	30,555
WB2OQQ	113	290	25	66	14	30,450
IZ5HQB	137	307	25	64	10	30,393
UR5EIT	128	293	27	76	0	30,179
IQ3ME	146	311	27	64	6	30,167
JA1CPZ	96	270	31	56	23	29,700
WØLM	152	232	29	36	63	29,696
WN3C	111	245	28	58	35	29,645
KAØEIC	168	251	28	31	58	29,367
VE7JMN	151	321	22	19	50	29,211
KB3KXX	134	266	29	44	34	28,462
YO3FOM	100	261	36	62	11	28,449
UA9APA	104	280	29	68	3	28,000
OZ7AEI	151	316	20	62	6	27,808
N9LAH	172	244	25	29	59	27,572
NØIBT	144	241	29	36	49	27,474
W3OFD	135	236	29	43	42	26,904
VE7HBS	141	280	22	20	54	26,880
N3UA	108	216	38	51	32	26,136
W9THD	107	262	27	55	16	25,676
KV1J	128	213	30	39	51	25,560
M5AAV	163	344	16	51	7	25,456
KTØP	115	231	26	43	39	24,948
KK1X	134	215	24	35	57	24,940
SQ9ANS	107	254	30	55	12	24,638
LA8AW	134	289	20	64	1	24,565
K6GEP	155	227	25	22	61	24,516
UA1AFZ	125	265	23	69	0	24,380
AI4ME	119	209	30	44	41	24,035
VK2GR	87	240	36	42	20	23,520
K2DI	134	200	30	31	55	23,200
NJ2DX	107	226	26	47	29	23,052

IWØDGJ	93	241	31	49	15	22,895
MØZAK	137	280	16	65	0	22,680
BD4SO	137	294	33	41	0	21,756
VE3XAT	97	232	25	41	27	21,576
GØMRH	112	242	20	65	4	21,538
UA9OV	109	288	24	50	0	21,312
PA1PAT	119	263	18	51	12	21,303
UA1OMS	114	264	23	56	1	21,120
PA7KAT	133	276	16	60	0	20,976
RW4LQ	75	216	33	55	8	20,736
K1MSH	110	211	24	37	37	20,678
W8TK	99	218	22	40	32	20,492
JH4GLG	107	239	32	44	8	20,076
MØCOP	127	270	16	51	7	19,980
AD6ZJ	120	186	26	24	57	19,902
PA4A	106	226	18	62	8	19,888
IWØRLC	101	244	15	45	21	19,764
JA2QVP	98	222	38	49	2	19,758
N8IW	101	177	28	35	46	19,293
F4EUN	91	208	28	58	6	19,136
W3FQE	98	245	18	47	13	19,110
K6UM	126	202	25	23	46	18,988
F6CZV	86	209	26	48	16	18,810
W3CRZ	113	187	21	36	42	18,513
KA5EYH	142	185	18	20	62	18,500
SP9IVD	107	237	23	55	0	18,486
W9FFC	115	186	21	30	48	18,414
K3OK	105	191	23	38	35	18,336
UN8P	105	280	21	43	0	17,920
DG3RCE	119	241	14	58	1	17,593
RA4LE	86	203	24	62	0	17,458
N3XL	93	161	29	37	42	17,388
JA1IWP	69	185	39	52	2	17,205
PT8CWA	73	192	28	40	21	17,088
DK3WN	100	211	14	61	5	16,880
W6SJ	105	174	28	29	40	16,878
JA1BFN	88	228	25	43	6	16,872
JA1BJI	109	241	27	38	5	16,870
W1LZ	89	254	16	46	4	16,764
N9CX	98	172	21	33	39	15,996
OK2BJI	97	219	14	47	11	15,768
CO2ZK	67	191	27	54	0	15,471
KA2KON	81	182	26	40	19	15,470
VK3FM	79	223	22	44	3	15,387
ON4BG	101	217	15	51	4	15,190
HB9ODC	90	205	16	42	15	14,965
RV3BQ	83	189	26	53	0	14,931
W4BCG	97	160	21	28	43	14,720
SV3/OH1YM/P	91	204	17	51	4	14,688
RA9OBG	84	212	23	46	0	14,628
RAØAN	96	238	21	40	0	14,518
JA1IZ	68	176	34	41	7	14,432
W3BUI	84	159	24	35	31	14,310
VE6EPK	86	186	20	20	36	14,136
RU3AT	65	173	29	39	12	13,840
F6BUL	90	192	18	52	2	13,824
DJ3NG	97	197	17	52	1	13,790
VK2AR	68	196	21	32	17	13,720
OZ1DGQ	84	190	17	41	14	13,680
DL3DRN	89	198	18	51	0	13,662
DL1JB	88	186	16	55	2	13,578
W9VQ	88	171	18	32	29	13,509
DL5SWB	98	201	16	51	0	13,467
RW3DY	93	203	17	47	2	13,398
KX7YT	97	143	24	22	47	13,299
EA5RD	78	176	20	55	0	13,200
KA7KUZ	99	139	23	19	52	13,066
W7GTO	114	148	19	16	53	13,024
N5MOC	99	147	21	21	46	12,936
AA7FK	87	153	25	23	36	12,852
DL5MBY	66	168	25	46	5	12,768
IK2EBP	77	166	19	57	0	12,616
PAØWRS	77	174	23	49	0	12,528
IK2IKW	83	183	18	50	0	12,444
DL6ABB	93	191	14	51	0	12,415
DK1AUP	74	170	20	47	5	12,240
JK2KNR	73	191	29	30	5	12,224
ON3AD	84	170	18	49	1	11,560
EA3BHK	57	145	27	37	13	11,165
WP3GW	60	154	22	34	16	11,088
OH5UFO	67	147	22	53	0	11,025
G3KMQ	69	172	14	32	18	11,008
JE2ILG	64	160	27	36	5	10,880
KC4HW	64	136	22	37	20	10,744
SM7BJW	70	160	19	46	0	10,400
HB9HQX	82	175	15	44	0	10,325
PA1LK	81	169	12	49	0	10,309
JA1IE	65	140	32	34	6	10,080
DL7UFN	55	147	23	31	13	9,849
RAØANO	67	156	25	37	0	9,672
NS1Z	95	154	12	23	26	9,394
VA7RY	62	134	20	17	33	9,380
NA6G	81	115	18	17	46	9,315
K6BIR	86	124	18	16	41	9,300
W5ZH	103	142	12	13	40	9,230
IK3ASM	51	135	26	39	2	9,045
JJ1WWL/1	65	148	25	28	7	8,880
EA7MT	55	142	18	33	11	8,804
SM7BUN	67	145	15	42	0	8,265
SP3JIA	54	136	23	36	0	8,024
JA3MIB	60	140	26	28	3	7,980
YO5TP	48	113	23	41	5	7,797
VU2PTT	54	137	23	32	0	7,535
SP4IRS	64	138	15	38	1	7,452
F1TRE	55	121	19	36	5	7,260
N6QEK	63	108	21	18	27	7,128
EA4DQX	52	118	20	40	0	7,080
DL5JWL	66	135	12	38	0	6,750
JQ1AHZ/6	49	118	26	28	3	6,726
2EØTGS	63	136	12	32	4	6,528
JJ2PUG	59	125	19	30	1	6,250
EA7CWA	48	108	18	32	6	6,048
NV6V	60	90	18	15	30	5,670
KA6GDT	50	92	19	17	24	5,520
WS7WS	65	104	14	13	26	5,512
AE4EC	54	90	18	20	23	5,490
AF9J	58	83	14	14	38	5,478
KE5DHY	61	96	13	16	28	5,472
W6ZZZ	62	84	17	13	34	5,376
AD4YQ	53	84	15	17	27	4,956
IK2NVE	38	93	16	29	4	4,557
BD1FJP	62	142	14	18	0	4,544
UY5QZ	33	84	24	30	0	4,536
WA2MCR	43	86	13	21	17	4,386
SM5OSZ	43	102	17	26	0	4,386
DL2BUP	37	95	16	25	5	4,370
GW3YVC	45	97	12	32	1	4,365
N4YLC	45	78	18	14	22	4,212
KØYR	44	73	19	17	21	4,161
N3CZ	36	83	17	23	10	4,150
N6KW	47	71	16	14	27	4,047

PY3OG	34	94	13	21	9	4,042
Z32PT	32	71	19	29	0	3,408
NC6P	39	60	14	11	27	3,120
AB8ND	27	72	14	22	6	3,024
RZ1OM	30	79	10	16	12	3,002
JR1UMO	27	68	18	19	7	2,992
RA6AAW	26	71	19	21	2	2,982
RV3IC	40	96	11	19	1	2,976
N2YRJ	53	63	8	6	31	2,835
WA2OQE	44	58	11	10	25	2,668
UT5UGQ	28	56	14	25	0	2,184
K6OWL	28	52	9	12	13	1,768
DL1DQJ	26	57	9	22	0	1,767
N8GU	23	52	14	12	5	1,612
KB1CJ	20	50	13	14	5	1,600
K6MI	28	46	10	10	13	1,518
DLØDG	26	54	8	19	0	1,458
UT5URW	21	42	13	17	1	1,302
KI6ASK	26	37	9	8	17	1,258
NJ3C	17	45	10	16	1	1,215
K2PAL	19	37	10	12	9	1,147
W1NK	16	38	10	13	5	1,064
ON8VM	21	44	6	18	0	1,056
9A5YY	17	37	9	16	2	999
OH2LZI	21	48	8	12	0	960
EI9ES	16	36	7	11	2	720
VE7CVS/K6	18	36	2	2	12	576
N3RDV	13	20	8	7	9	480
EA2AVM	13	26	4	9	0	338
EW1NA	9	13	8	9	0	221
UA9LBQ	6	14	5	6	0	154
VE4LR	3	7	3	3	1	49
SP4JCP	1	2	1	1	0	2

Single Operator All Band High Power

ER4DX	**2626**	**6176**	**106**	**318**	**115**	**3,328,864**
K3MM	**2402**	**5424**	**101**	**280**	**192**	**3,107,952**
SN7Q	**2181**	**5361**	**94**	**274**	**131**	**2,675,139**
VE3DZ	**2037**	**5127**	**88**	**258**	**158**	**2,584,008**
UA9CLB	**2094**	**5914**	**93**	**281**	**54**	**2,531,192**
UW8I	**1977**	**4591**	**111**	**314**	**98**	**2,401,093**
YO9HP	**2024**	**4712**	**103**	**313**	**81**	**2,341,864**
LB8IB	**1846**	**4222**	**89**	**278**	**81**	**1,891,456**
LU7HN	**1384**	**4088**	**90**	**216**	**153**	**1,876,392**
AB5K	**2006**	**3481**	**95**	**194**	**195**	**1,684,804**
KI5XP	**1893**	**3451**	**86**	**212**	**182**	**1,656,480**
LTØH	1390	4112	79	167	153	1,640,688
UT2UZ	1361	3221	103	305	88	1,597,616
WB9Z	**1388**	**3072**	**93**	**224**	**155**	**1,449,984**
UP6P	**1366**	**3764**	**96**	**258**	**30**	**1,445,376**
ZX7A	**1166**	**3441**	**72**	**207**	**132**	**1,414,251**
HA3LI	**1293**	**3095**	**85**	**244**	**86**	**1,284,425**
JA6GCE	**1168**	**3194**	**95**	**214**	**56**	**1,165,810**
W4PK	**1165**	**2883**	**73**	**209**	**120**	**1,158,966**
SV9CVY	**1351**	**3238**	**67**	**195**	**91**	**1,143,014**
S56A	**1147**	**2678**	**83**	**252**	**81**	**1,114,048**
EU1AZ	**1267**	**2850**	**83**	**246**	**51**	**1,083,000**
UA3QDX	**1314**	**2946**	**79**	**242**	**42**	**1,069,398**
WN1GIV	**1523**	**2570**	**71**	**167**	**163**	**1,030,570**
YL9T	**1286**	**2824**	**78**	**233**	**45**	**1,005,344**
F2JD	**1023**	**2478**	**78**	**230**	**91**	**988,722**
OH2BP	**1123**	**2568**	**83**	**245**	**44**	**955,296**
IW7EFC	**1005**	**2365**	**85**	**254**	**64**	**953,095**
DJ6QT	**989**	**2366**	**82**	**224**	**85**	**925,106**
K5ZD/1	1038	2372	68	191	129	920,336
9M6XRO	**1057**	**3112**	**84**	**184**	**26**	**914,928**
VQ9LA	**919**	**2733**	**85**	**203**	**19**	**839,031**
ZL2AMI	**880**	**2600**	**70**	**124**	**127**	**834,600**
PG3N	**1113**	**2420**	**62**	**201**	**68**	**801,020**
6W1SE	**778**	**2317**	**62**	**191**	**90**	**794,731**
EA3NY	**1062**	**2501**	**59**	**180**	**75**	**785,314**
OK1EP	**935**	**2297**	**71**	**192**	**69**	**762,604**
VE2FBD	925	2276	59	161	112	755,632
W3MF	**991**	**2250**	**60**	**151**	**111**	**724,500**
JF1PJK	875	2357	80	167	57	716,528
IK2SND	927	2143	62	192	80	715,762
VK4AN	**825**	**2392**	**80**	**160**	**59**	**715,208**
RU9TO	967	2716	57	196	8	708,876
KR7X	**1206**	**2105**	**68**	**115**	**144**	**688,335**
UA3LEO	1001	2198	68	206	36	681,380
VR2BG	**936**	**2248**	**95**	**181**	**24**	**674,400**
JO1WKO	728	1907	100	206	46	671,264
I2UIY	964	2297	49	147	88	652,348
PV8DX	720	2131	55	138	108	641,431
W2YE	**832**	**1826**	**68**	**161**	**121**	**639,100**
RA6DE	916	2023	66	205	33	614,992
K7QQ	913	1600	78	133	149	576,000
K4RO	**849**	**1634**	**66**	**143**	**131**	**555,560**
OH7LND	905	2001	45	168	33	492,246
W3PT	581	1381	70	187	91	480,588
KØFX	**747**	**1468**	**68**	**140**	**114**	**472,696**
OH3OJ	835	1791	55	183	17	456,705
F6CXJ	760	1788	46	137	69	450,576
W6IHG	**625**	**1325**	**60**	**151**	**115**	**431,950**
KTØR	810	1405	55	119	132	429,930
DD1JN	674	1485	57	175	40	403,920
F6AUS	632	1499	49	157	53	388,241
ON6LEO	**565**	**1283**	**62**	**190**	**44**	**379,768**
SV1JMO	**755**	**1647**	**44**	**143**	**43**	**378,810**
VE2FK	621	1551	39	115	89	376,893
K7AGE	**679**	**1205**	**66**	**115**	**127**	**371,140**
AH7C	**579**	**1710**	**53**	**71**	**91**	**367,650**
K8AJS	**527**	**1212**	**61**	**150**	**87**	**361,176**
N5TY	**727**	**1189**	**60**	**109**	**134**	**360,267**
EA4EJP	635	1433	48	151	51	358,250
JR3NZC	521	1388	72	137	45	352,552
VA3DX	446	1126	65	149	92	344,556
UA9SP	467	1304	65	193	3	340,344
MØWLF	**744**	**1652**	**30**	**111**	**65**	**340,312**
UN6G	534	1439	57	175	0	333,848
W3BP	535	1351	45	128	72	330,995
W4UK	676	1095	57	109	122	315,360
OK2SG	411	984	79	203	33	309,960
JT1CO	**674**	**1657**	**58**	**123**	**2**	**303,231**
RAØQD	608	1467	59	125	22	302,202
W4BQF	514	990	67	123	105	292,050
IZ8EDL	459	1046	61	177	38	288,696
W4RK	616	1005	62	112	110	285,420
K9MUG	558	1034	54	107	113	283,316
VK4UC	443	1282	61	100	53	274,348
AG4W	527	950	56	119	106	266,950
KH6GMP	487	1433	47	60	74	259,373
KØJJR	555	932	55	103	119	258,164
N6AR	412	968	61	135	67	254,584
HB9AAA	**428**	**976**	**65**	**178**	**11**	**247,904**
RW6CR	465	1169	53	118	39	245,490
WØJPL	464	883	60	111	101	240,176
NØAT	574	1010	41	83	113	239,370
CX7BF	**576**	**1704**	**22**	**67**	**48**	**233,448**
N5ER	459	863	54	107	109	233,010
K4HMB	441	856	50	117	95	224,272

JA1AYO	394	1035	67	113	35	222,525
N7BF	562	862	51	81	122	218,948
K6XX	420	892	63	89	86	212,296
WA2ETU	483	940	40	87	96	209,620
NJ4F	377	812	53	117	84	206,248
VE7CF	**466**	**1069**	**35**	**72**	**83**	**203,110**
ZS2EZ	**317**	**929**	**57**	**118**	**43**	**202,522**
UAØFGZ	444	1077	61	98	28	201,399
W7DPW	436	780	55	84	113	196,560
3W9JR	**491**	**1257**	**47**	**109**	**0**	**196,092**
SN5N	474	1046	40	113	32	193,510
DK8EY	392	861	47	133	44	192,864
YB0IR	**386**	**1118**	**49**	**119**	**4**	**192,296**
SP9FT	417	951	41	125	36	192,102
UA3TCJ	473	1216	40	87	29	189,696
W7SYJ	436	756	53	82	108	183,708
KH6FI	349	1021	51	58	69	181,738
W6OQI	477	776	49	68	101	169,168
RA3BB	374	840	50	120	29	167,160
YB4IR	407	1201	43	96	0	166,939
EI4DW	**330**	**790**	**45**	**114**	**51**	**165,900**
RN3ZC	495	1065	39	108	7	164,010
FR5GS	**396**	**1185**	**36**	**98**	**4**	**163,530**
LA9TY	391	841	38	133	20	160,631
PA9DD	377	841	37	126	27	159,790
N8TDL	423	763	37	80	91	158,704
JH4BTI	289	751	65	115	22	151,702
VE9FX	**306**	**782**	**33**	**97**	**62**	**150,144**
N6CK	390	714	50	71	89	149,940
IK2YSJ	332	728	40	129	25	141,232
IK8URC	448	956	32	103	6	134,796
UR7EU	338	754	43	119	14	132,704
W9WI	345	601	44	75	89	125,008
RU6YJ	310	672	44	138	3	124,320
XQ1KY	**357**	**1043**	**27**	**30**	**62**	**124,117**
K4XG	291	621	44	94	59	122,337
DJ1TU	282	654	41	117	25	119,682
K4HAL	323	633	41	73	75	119,637
UA4SAW	334	724	43	119	3	119,460
UY2UQ	333	742	40	112	7	117,978
VA6MM	289	658	37	62	80	117,782
EA3AGZ	292	668	34	104	35	115,564
NJ2F	265	522	52	92	75	114,318
IK1ZFO	277	691	38	86	40	113,324
HL3AMO	**270**	**687**	**56**	**95**	**13**	**112,668**
K4ZTL	257	596	38	99	50	111,452
K4LQ	244	544	49	93	61	110,432
OH1MA	243	594	46	110	24	106,920
NK7Z	318	527	50	62	88	105,400
W7QF	232	525	50	98	50	103,950
W2LE	248	628	36	94	31	101,108
RA3BT	218	519	52	120	18	98,610
HR2/LU1DY	**258**	**586**	**39**	**56**	**68**	**95,518**
EA5DFV	272	615	29	91	33	94,095
YB5AQB	212	600	54	98	4	93,600
NI5F	223	465	53	84	64	93,465
DJ4KW	266	584	36	117	6	92,856
IK1DFH	249	565	38	113	12	92,095
DK1BX	196	486	48	106	32	90,396
N9AKR	237	538	40	87	41	90,384
RA3BZ	244	564	38	115	6	89,676
N1UZ	246	500	37	79	58	87,000
DC3HB	240	536	42	104	15	86,296
JA7IC	228	621	42	75	21	85,698
UV5U	226	512	46	112	9	85,504
JA7ZP	219	553	51	84	19	85,162
NA8W	249	477	40	71	67	84,906
AH8LG	**205**	**594**	**36**	**48**	**58**	**84,348**
K3KO	208	543	35	83	31	80,907
WOML	241	513	30	67	59	80,028
DL4ME	301	600	29	100	1	78,000
DL5MEV	210	511	35	83	33	77,161
UAØYAY	310	787	27	68	1	75,552
VK6HZ	229	654	40	56	15	72,594
F6BUM	209	477	43	108	0	72,027
N4CW/1	236	471	29	66	54	70,179
DJ9MH	196	436	44	99	9	66,272
VK2NU	180	520	34	68	22	64,480
KI8U	199	423	33	66	53	64,296
GM3SEK	**304**	**626**	**16**	**77**	**7**	**62,600**
YO7BGA	197	463	34	86	13	61,579
UU2JG	215	474	34	94	0	60,672
UA9BS	174	491	30	90	0	58,920
OZ6EI	189	453	35	80	15	58,890
WB2JEP	190	388	33	68	49	58,200
LA7JKA	221	468	21	97	6	58,032
G3SNU	197	420	30	101	5	57,120
KO6LU	239	391	32	42	64	53,958
WW7OR	273	527	21	39	41	53,227
WA9IVH	205	343	33	52	70	53,165
AB5C	199	359	33	54	61	53,132
SM3Q	215	461	29	79	4	51,632
W1ZT	140	339	39	81	31	51,189
VA3GGF	176	395	30	49	49	50,560
DJ8ES	143	332	33	102	15	49,800
CT3BD	**130**	**382**	**37**	**76**	**17**	**49,660**
WA6BOB	261	376	29	27	76	49,632
JE1LFX	175	425	41	46	29	49,300
RA3TT	194	453	31	77	0	48,924
DL1DTC	165	395	36	73	12	47,795
I2SVA	154	386	33	62	24	45,934
UA9OG	242	652	18	50	0	44,336
UT5ECZ	178	395	26	85	0	43,845
W4STB	185	355	25	56	42	43,665
KD5JAA	160	310	39	50	51	43,400
DJ4PI	140	332	37	73	15	41,500
EC7ABV	176	393	23	69	13	41,265
YO4RDN	187	435	23	53	10	37,410
DL5YM	150	335	25	82	4	37,185
EA5FIV	185	401	22	70	0	36,892
JA9CWJ	134	372	29	65	5	36,828
DG3FA	170	346	25	80	0	36,330
LY6M	**189**	**402**	**22**	**63**	**0**	**34,170**
N2SQW	148	255	33	44	53	33,150
JH3EQP	114	296	39	59	12	32,560
KG6ZHC	180	277	27	26	63	32,132
W3GG	141	388	15	52	14	31,428
K2NV	134	368	20	52	13	31,280
MUØFAL	**184**	**382**	**13**	**55**	**11**	**30,178**
K5NZ	134	264	27	43	44	30,096
DJ5MW	122	287	24	55	18	27,839
RK3QS	153	307	20	65	1	26,402
UY5ZZ	115	261	29	68	1	25,578
DK6CQ	106	258	24	56	13	23,994
W7AFR	129	216	27	29	54	23,760
SP6CIK	121	257	27	64	1	23,644
OE1TKW	107	240	22	66	8	23,040
R3AA	126	308	23	50	0	22,484
KØKT	96	193	35	44	35	22,002
N5RN	203	235	15	14	63	21,620
K4NNX	78	197	38	58	13	21,473

N3NZ	132	258	13	37	33	21,414
RW0LQ	96	243	32	47	3	19,926
RV1CC	106	231	22	62	2	19,866
W5JAY	132	185	27	27	52	19,610
K4XD	84	203	27	48	16	18,473
WØTY	96	189	26	41	30	18,333
9V1YC	99	252	24	45	0	17,388
WB6JJJ	95	175	26	30	39	16,625
K3GP	106	171	26	27	43	16,416
CO2GL	87	246	18	43	1	15,252
ABØYM	109	155	21	21	45	13,485
LZ2PG	55	156	35	46	5	13,416
JF2FIU	60	153	30	40	5	11,475
KV6O/Ø	103	150	16	16	42	11,100
NC5O	60	124	24	30	23	9,548
NA5Q	59	129	24	28	20	9,288
RX6LDB	82	181	12	37	0	8,869
N4ZR	77	117	18	17	39	8,658
HB9BNK	50	116	19	42	3	7,424
OO9O	52	110	13	33	2	5,280
W4DKB	35	90	19	28	7	4,860
W5KI	51	83	14	16	25	4,565
4Z5KZ	24	71	10	15	0	1,775
DJ9RR	29	59	6	18	0	1,416
AJ3M	26	37	9	8	16	1,221
SP6BSL	20	47	9	16	0	1,175
W4MOD	16	41	9	15	0	984
SP2DKI	15	33	7	14	3	792
K6KO	16	36	8	8	5	756
N6BXO	15	33	8	9	5	726
RWØAR	11	26	9	9	0	468

Single Operator 80 Meters

S54E	737	1602	23	65	28	185,832
S5ØA	729	1565	21	64	26	173,715
IQ1RY	688	1461	21	65	26	163,632
SP4MPG	590	1226	24	64	16	127,504
YLØA	623	1306	20	61	13	122,764
4N1A	610	1269	14	56	14	106,596
HA8BE	559	1158	16	56	12	97,272
S52OP	537	1098	16	60	11	95,526
DJ3IW	497	947	13	53	12	73,866
OHØZ	463	958	15	54	3	68,976
USØZZ	413	830	11	52	6	57,270
DM5TI	362	694	13	55	10	54,132
UT2II	351	717	16	53	5	53,058
UX1UX	361	713	12	49	5	47,058
VE3NZ	266	529	12	20	50	43,378
SP9H	343	668	9	44	2	36,740
KH6ZM	194	574	12	12	40	36,736
SP9DSD	238	466	9	39	1	22,834
UT8AL	226	439	9	41	0	21,950
SP3VSE	231	455	8	40	0	21,840
KØHW	266	307	10	10	47	20,569
NA3M	156	240	12	25	44	19,440
RA3UAG	196	375	8	39	0	17,625
EW1CQ	197	407	7	33	0	16,280
SV1XV	117	241	9	37	2	11,568
SQ9JKS	131	259	7	35	1	11,137
4K6DI	90	253	7	30	0	9,361
KEØL	144	164	4	3	38	7,380
K4SV	77	109	8	13	27	5,232
UT5ZA	79	146	7	22	0	4,234
UT3N	72	134	5	25	0	4,020
SQ8GRY	65	128	4	27	0	3,968
NQ4K	85	99	4	4	29	3,663
JA7MJ	28	44	9	8	1	792

Single Operator 40 Meters

S57AW	1307	3134	35	102	46	573,522
I4IKW	1158	2810	34	100	49	514,230
IY4W	1235	2849	32	98	45	498,575
CT3EE	1027	3070	28	83	48	488,130
EO6F	953	2115	29	94	30	323,595
ZC4LI	832	2421	27	80	26	321,993
ON5KQ	863	1946	28	89	31	288,008
IV3ZXQ	892	1993	28	80	36	286,992
K4UTE	800	1654	28	81	53	267,948
OHØI	874	1891	31	84	16	247,721
F4JRC	759	1680	25	79	32	228,480
AA5AU	792	1352	31	81	54	224,432
VK1AA	495	1445	27	63	45	195,075
I2NKR	604	1393	22	72	39	185,269
WW4LL	719	1243	25	68	54	182,721
N5ZM	714	1177	26	72	55	180,081
YU1RH	633	1378	25	75	19	163,982
DP9N	485	1078	23	74	27	133,672
W1TY	557	884	24	62	53	122,876
UA3SAQ	497	1045	26	74	9	113,905
SP5OXJ	452	966	24	72	12	104,328
9A5MT	443	951	19	67	17	97,953
OK1DIB	506	1047	19	69	1	93,183
OK2BZ	380	830	22	71	16	90,470
WD4DDU	419	753	20	52	47	89,607
RA6AFB	424	881	23	66	6	83,695
AB8K	430	645	22	45	52	76,755
UT5EPP	411	861	17	61	11	76,629
RU9CK	330	886	19	62	0	71,766
UU2CW	362	772	18	64	10	71,024
WØGJ	364	597	22	45	48	68,655
S57YX	425	885	12	52	13	68,145
4M5RY	218	635	20	50	36	67,310
YM125ATA/4	427	891	13	57	5	66,825
RW6CF	336	700	22	62	8	64,400
WØBR/3	333	537	20	43	50	60,681
JA1OVD	279	651	26	45	17	57,288
W8WEJ	311	503	17	46	50	56,839
KY7M	339	580	20	28	45	53,940
SM6BSK	344	714	15	56	4	53,550
OH9RI	269	578	22	59	8	51,442
USØHZ	305	645	17	58	2	49,665
YO6CFB	338	698	13	57	0	48,860
DF1IAQ	268	576	17	52	15	48,384
SP9EMI	256	552	15	59	10	46,368
WØNA/4	237	463	16	40	44	46,300
UA3SBW	250	526	19	61	1	42,606
HK3SGP	149	441	13	38	38	39,249
IK3QAR	200	445	15	51	20	38,270
LZ2ZG	238	509	14	53	8	38,175
DJ2YE	223	470	13	54	12	37,130
LA2IJ	257	535	13	55	0	36,380
WA1FCN	251	385	19	28	47	36,190
RU4SS	201	432	18	55	7	34,560
K4WW	218	340	18	36	47	34,340
IKØLNN	159	372	17	52	20	33,108
CT3KN	127	376	13	47	19	29,704
TG9SM	148	341	14	32	35	27,621
G3LHJ	156	326	10	46	8	20,864
UT2QQ	154	322	11	46	3	19,320
ES4MM	145	315	14	45	0	18,585
JH1APZ	107	276	19	38	8	17,940
DL5KUD	147	298	12	45	2	17,582
W8AKR	168	222	12	17	46	16,650
LY2WN	159	329	8	39	0	15,463
HAØGK	148	310	7	42	0	15,190
VE2QIP	112	242	12	16	34	15,004
SP9CXN	104	224	9	40	6	12,320
GØVOK	91	192	8	32	4	8,448
VE3RCN	71	144	9	9	32	7,200
YO2LOJ	90	185	7	28	0	6,475
UA9DD	53	149	10	32	0	6,258
EA4CRP	55	124	7	26	11	5,456
YY5OFX	33	93	11	19	12	3,906
YO4UQ	44	100	8	28	3	3,900
K5MQ	35	80	14	16	10	3,200
UR5LY	41	87	8	27	0	3,045
JL3SBE	36	94	12	15	1	2,632
KI7T	48	65	9	8	22	2,535
JI4JGD	17	33	9	11	1	693

Single Operator 20 Meters

9A5W	1672	4255	36	114	54	868,020
CT3KY	1664	4980	28	92	52	856,560
7XØRY	1551	4641	30	101	44	812,175
EF8A	1491	4463	28	88	52	749,784
EO5M	1290	3104	34	116	45	605,280
IV3SKB	1107	2818	33	114	52	560,782
OK3R	1004	2575	35	114	52	517,575
VE2RYY	1038	2675	29	98	49	470,800
UV8M	1070	2503	32	106	44	455,546
UT4ZG	1075	2579	31	92	47	438,430
8P2K	1049	2621	28	86	53	437,707
SP4TXI	934	2328	32	104	48	428,352
N2XD	984	2312	28	88	54	393,040
LY1R	940	2300	28	86	44	363,400
IT9STX	992	2385	25	74	51	357,750
OHØM	912	2216	26	77	49	336,832
RW4PL	861	1954	32	104	33	330,226
4L1DA	925	2620	23	71	29	322,260
JH7XGN	694	1941	32	86	44	314,442
EA7HBP	941	2145	25	73	40	296,010
YU1NR	707	1702	29	91	47	284,234
UQ1D	799	2194	27	78	19	272,056
EY8MM	654	1842	28	81	29	254,196
7Z1SJ	691	1983	24	75	29	253,824
CN8LI	652	1953	20	62	45	248,031
EU8RZ	659	1547	27	86	35	228,956
RW6ATJ	696	1567	28	84	34	228,782
4N15ØAE	687	1626	26	75	37	224,388
4Z5ML	783	2246	25	74	0	222,354
SV2BFN	721	1632	27	78	29	218,688
PY2NY	555	1652	25	58	46	213,108
UN7JX	605	1643	29	86	13	210,304
UN7GCE	610	1692	28	83	13	209,808
F5ODA	579	1353	27	84	35	197,538
K3MQ	612	1342	25	78	42	194,590
4A7L	649	1390	25	60	53	191,820
YO6BHN	520	1245	29	87	38	191,730
RA9AU	622	1773	25	76	6	189,711
JA6WFM	523	1400	27	73	26	176,400
RVØAL	565	1518	22	71	17	166,980
HA1ZN	525	1239	24	66	39	159,831
N6QQ	534	991	29	78	51	156,578
F1JKJ	469	1131	26	70	41	154,947
YT2B	587	1337	21	59	33	151,081
UA4LU	524	1164	22	77	22	140,844
CX4AAJ	363	1069	25	65	37	135,763
OM5TX	479	1124	21	67	32	134,880
UAØQBR	387	1004	24	71	31	126,504
7K4QOK	363	958	27	69	35	125,498
W4LC	395	906	24	75	38	124,122
KP4AH	454	1027	16	50	54	123,240
UY5L/A	390	925	27	82	20	119,325
EA2RY	404	934	24	74	28	117,684
TG9ANF	483	1054	19	44	48	116,994
RUØSN	352	922	29	77	19	115,250
XW1A	469	1213	24	69	1	114,022
BA4RF	412	992	28	69	15	111,104
VA7ST	364	827	24	56	43	101,721
DL4CF	308	783	19	57	42	92,394
SV3EXU	402	896	18	55	28	90,496
WW3S	333	737	24	71	27	89,914
DL5JS	366	814	20	62	28	89,540
JH1RFM	293	777	26	65	24	89,355
UT2FA	373	834	19	68	20	89,238
K7RE/Ø	409	693	21	50	45	80,388
WNØL	296	613	26	66	39	80,303
W9ILY	295	658	22	68	28	77,644
YB2ECG	316	923	20	62	2	77,532
S58L	297	693	22	61	26	75,537
JK1IQK	278	701	25	57	23	73,605
N4GI	293	610	21	55	41	71,370
DL4NN	275	660	20	65	22	70,620
CU2AF	468	957	13	60	0	69,861
OK2PCL	278	668	23	67	14	69,472
DJ2XC	284	668	23	59	21	68,804
EC8ABQ	251	746	15	56	18	66,394
UT7ZB	285	649	18	65	13	62,304
LQ5H	230	680	17	33	39	60,520
MØUNI	262	596	19	55	22	57,216
JM1NKT	217	551	25	58	18	55,651
UR8QR	271	632	19	64	3	54,352
K7GS	226	482	23	49	40	53,984
SV1JG	245	592	19	44	26	52,688
UA3YCC	249	547	19	61	15	51,965
LY3UV	272	596	17	55	14	51,256
W6FFH	318	503	19	35	47	50,803
YO3VU	252	583	19	50	18	50,721
UR5ZMK	275	621	17	52	11	49,680
SP9CTS	230	548	17	52	20	48,772
VK4EJ	173	494	25	63	5	45,942
IT9RBW	266	583	18	59	0	44,891
VE3FJ	181	452	17	51	27	42,940
G3WW	230	511	14	54	16	42,924
SP5ECC	216	501	20	55	10	42,585
K5PAX	286	434	19	34	45	42,532
CM2KY	237	504	14	25	44	41,832
OH2K	209	482	19	49	15	40,006
IT9IAS	218	491	16	55	10	39,771
LZ2CE	227	511	17	50	10	39,347
F4EZC	168	399	19	55	19	37,107
OM5MX	186	447	16	45	22	37,101
EA3CS	203	458	16	53	12	37,098
ON5SV	202	445	18	53	12	36,935
EA3ALV	154	368	18	59	20	35,696
ON5SD	196	440	17	49	15	35,640
IZØCIV	159	378	21	61	12	35,532
ON6UF	197	436	15	53	12	34,880
SV5DKL	237	507	13	47	8	34,476
YU1RP	174	408	19	48	17	34,272
JR1BAS	141	375	26	49	14	33,375
JR1BASA	141	375	26	49	14	33,375
BG4SGP	199	461	21	47	3	32,731
DJ2TH	197	436	16	50	8	32,264
VR2XMT	212	488	21	38	6	31,720
UA1NFA	174	393	22	50	4	29,868
OK2PMS	168	399	16	43	13	28,728
RA9AFZ	166	436	14	46	1	26,596
SP8ONZ	131	347	20	34	17	24,637
ES4RD	126	330	22	49	2	24,090
N4PJ	175	339	12	31	28	24,069
UXØZL	163	372	15	48	1	23,808
KC7V	144	299	21	26	32	23,621
AD6G	151	265	16	37	34	23,055
RW6FZ	220	459	10	40	0	22,950
UYØZG	137	337	14	31	22	22,579
SM2EKN	184	402	12	42	0	21,708
BD4SQ	138	338	16	48	0	21,632
IN3OWY/2	134	315	11	37	15	19,845
KØCOP	97	224	18	43	21	18,368
JA8UON	111	291	17	35	11	18,333
BG1CAL	141	321	18	37	2	18,297
WB4MSG	137	276	12	25	28	17,940
9G5A	134	399	9	35	0	17,556
RZ9AP	128	344	12	39	0	17,544
DU1RB	138	406	15	28	0	17,458
IKØWRB	105	248	14	46	10	17,360
WA3AAN	121	242	16	33	22	17,182
IT9ESW	144	302	10	40	4	16,308
JH3WKE	99	249	20	35	10	16,185
UT5KO	118	277	12	35	10	15,789
RK6CK	135	294	11	42	0	15,582
YO5BYV	123	283	12	43	0	15,565
OE5REO	138	291	10	43	0	15,423
DL1DWL	113	252	12	42	0	13,608
YB1YG	116	333	13	23	1	12,321
PS7DX	76	219	14	40	0	11,826
YO5CBX	93	212	14	38	3	11,660
ON3DSG	101	219	9	38	5	11,388
UT3FM	88	202	13	33	5	10,302
AD4EB	99	165	9	20	31	9,900
IØKHP	75	193	10	21	17	9,264
SP9IHP	51	146	17	25	11	7,738
VA7ALK	79	161	10	9	28	7,567
K4JAF	70	136	18	18	16	7,072
EA8ARG	54	157	8	33	3	6,908
IZ8DWH	63	154	13	26	4	6,622
RZ3FQ	67	147	10	32	0	6,174
EC4AMQ	80	162	7	30	1	6,156
JA2KPV	56	139	17	27	0	6,116
RA4LK	43	112	17	35	0	5,824
ABØOX	41	109	12	31	5	5,232
SV4BHA	58	126	9	22	6	4,662
RW3AI	54	120	8	28	0	4,320
KCØRET	60	87	11	11	21	3,741
DK9ETM	38	89	10	26	5	3,649
N5PU	59	93	7	12	19	3,534
RV4LS	29	79	15	25	0	3,160
JK1LUY	39	100	10	21	0	3,100
JA1BUS	38	88	13	18	0	2,728
EA3FHP	38	78	6	24	1	2,418
I1NHR	31	72	8	20	1	2,088
W6FO/4	29	65	9	15	8	2,080
DL4DAE	34	68	5	16	0	1,428
FO5PS	28	74	6	8	0	1,036

Single Operator 15 Meters

CT3EN	1111	3313	31	96	47	576,462
AY8A	1014	2993	26	84	53	487,859
L44DX	865	2553	23	78	51	388,056
9A7R	826	2080	32	91	40	339,040
F5MOO	779	1887	31	91	45	315,129
HC1JQ	578	1707	24	59	50	227,031
9A4R	562	1417	29	89	37	219,635
LU3CT	518	1523	21	62	50	202,559
LW9ETQ	439	1291	20	61	46	163,957
S5ØR	470	1147	25	76	36	157,139
YU7NW	477	1163	27	78	26	152,353
EO1I	475	1121	28	81	17	141,246
LU1BJW	361	1054	20	49	41	115,940
CT1AOZ	285	735	25	72	31	94,080
PT8DX	257	728	18	42	40	72,800
J49XB	285	669	26	69	8	68,907
IV3AVQ	239	597	24	66	24	68,058
DL1LH	250	600	25	73	15	67,800
4X6UO	287	839	16	54	1	59,569
YC1UGK	226	650	23	66	0	57,850
SV3FUP	258	600	22	59	9	54,000
LR1F	207	615	13	28	37	47,970
IWØFFK	202	509	17	39	26	41,738
9G5OO	223	666	9	47	0	37,296
LR6H	156	458	16	28	35	36,182
SV1UT	163	395	23	47	15	33,575
JK3GWT	156	396	25	55	1	32,076
DL1DTL	128	326	20	43	15	25,428
UAØSR	186	419	17	40	0	23,883
YC8EXL	147	417	21	36	0	23,769
OM1AXO	149	347	15	39	14	23,596
JH7RTQ	110	300	28	46	3	23,100
JR3RIY	119	308	25	46	2	22,484
IW1QN	130	307	17	49	6	22,104
EA1AAA	129	305	18	46	7	21,655
UN4PG	148	366	18	40	0	21,228
UR8IDX	101	247	21	45	8	18,278
YO9BXC	95	239	19	40	8	16,013
UR5FFC	109	263	17	40	0	14,991
SP6DMI	116	272	18	37	0	14,960
UU9B	109	239	15	38	6	14,101
BD4SX	106	267	17	35	0	13,884
JA3EVZ	85	222	23	34	2	13,098
UA9FGJ	94	265	12	34	0	12,190
IKØEIE	68	180	17	37	3	10,260
EA4BGM	82	179	9	28	7	7,876
KO1H	58	154	14	28	5	7,238
UZ2HZ	52	138	11	21	10	5,796
JH9BWC	47	119	16	23	0	4,641
S5ØDX	40	100	11	21	2	3,400
OM7PY	38	91	11	21	0	2,912
LZ1MC	14	39	9	13	0	858
DJ6XB	15	40	6	9	4	760
SP6IHE	16	35	4	8	0	420
YC5OUB	9	23	6	8	0	322

Single Operator 10 Meters

LU1HF	422	1252	20	61	44	156,500
LW1HDJ	93	276	11	20	26	15,732
CT1FJK	68	157	10	24	0	5,338
RU6CQ	71	145	8	26	0	4,930
LW6DDS	28	82	8	7	15	2,460
IKØPEA	31	68	8	21	0	1,972
UA6ADC	28	59	9	22	0	1,829
SQ6ELV	26	54	6	14	0	1,080
K4WI	21	43	7	7	6	860
SP9UOP	25	48	3	9	0	576
JE2SOY	9	22	5	5	0	220
SP4DC	8	17	4	6	0	170

Multi-Op Single Transmitter Low Power

UT3HWW	1473	3215	84	265	43	1,260,280
KP2D	1107	2755	69	199	147	1,143,325
UN8LF	1031	2896	68	202	15	825,360
9A7T	760	1837	85	224	79	712,756
SP9KDA	904	2090	72	198	64	698,060
OM3KWZ	800	1799	61	201	54	568,484
OM3RJB	869	1963	53	169	64	561,418
YBØZZ	719	2085	72	167	8	514,995
RZ4HZW	830	1759	60	186	3	437,991
HAØKLL	668	1510	62	181	31	413,740
OK1KMG	720	1526	46	153	33	354,032
DKØCU	656	1387	50	170	30	346,750
J7R	511	1146	38	68	125	264,726
IZ5DIY	463	1063	50	155	34	254,057
EA2APH/P	440	943	47	145	24	203,688
SP3KCL	399	878	46	146	13	179,990
LU1EY	334	948	39	89	58	176,328
DDØDRK	441	917	31	132	12	160,475
VE7OGO	422	928	34	61	66	149,408
OL2U	338	712	30	98	11	98,968
VE7BSM	257	549	34	41	80	85,095
BY1AA	344	791	22	48	1	56,161
YO9KRW	163	389	32	81	19	51,348
IKØMIB	135	301	28	64	0	27,692
W3DSX	83	208	25	49	20	19,552
RKØLWW	39	89	19	26	0	4,005

Multi Op Single Transmitter High Power

OM8A	2665	6662	118	373	151	4,277,004
HG1S	2606	6430	117	369	146	4,063,760
RU1A	2402	5569	126	372	115	3,413,797
TM6A	2262	5373	110	356	116	3,127,086
EI7M	2047	4706	92	269	105	2,192,996
VE3RM	1552	3913	90	255	155	1,956,500
DR5N	1538	3604	96	319	99	1,852,456
HBØ/DL1ZBO	1592	3919	77	248	123	1,755,712
RT9W	1626	4608	87	262	17	1,686,528
YZ9A	1640	3866	84	243	102	1,658,514
ES1A	1464	3461	93	257	61	1,422,471
RK3DXW	1516	3342	88	279	50	1,393,614
W6YX	1519	2916	95	189	180	1,353,024
WØLSD	1442	2613	94	211	173	1,249,014
CXØTTY	1109	3280	76	171	132	1,243,120
OL3A	1326	3059	79	227	78	1,174,656
RU9UZM	1241	3364	82	213	20	1,059,660
DLØDX	1203	2685	72	231	77	1,020,300
DP4P	1280	3010	64	186	82	999,320
OL3Z	1234	2927	71	196	69	983,472
W2YC	1086	2228	75	209	152	971,408
RK9JWR	1238	3350	69	213	5	961,450
OK1KSL	996	2328	83	238	80	933,528
SY8GE	1357	2929	61	193	61	922,635
KØSR	1170	2161	83	184	151	903,298
GØBRC	1149	2639	62	195	72	868,231
OL5Q	983	2397	80	176	91	831,759
K3MJW	1022	2325	73	165	118	827,700
VE7UF	1092	2496	65	117	138	798,720
G2F	985	2302	59	183	81	743,546
N2BJ	1007	1986	69	160	132	716,946
N4RI	1017	1867	65	154	132	655,317
DLØCS	816	1906	69	193	52	598,484
YE1ZAT	897	2640	54	163	4	583,440
IV3RAV	748	1721	79	205	43	562,767
JF2SKV	659	1680	80	151	46	465,360
LU8XW	622	1790	51	146	52	445,710
K3DI	625	1354	65	146	101	422,448
PFØX	681	1548	54	154	48	396,288
JA6ZPR	793	2241	29	79	40	331,668
UX4E	451	981	46	141	14	197,181
IQ5FI	313	744	43	119	30	142,848
W2VQ	325	636	47	96	70	135,468
HB9LF	300	690	37	120	24	124,890
RZ1AWF	263	598	25	80	23	76,544
BD1PTA	276	613	49	68	3	73,560
KP4JRS	204	494	27	53	54	66,196
RK9AWN	170	464	31	75	3	50,576
UU5A	88	216	25	48	0	15,768
UT4UXW	15	28	10	11	2	644

Multi-Op Two Transmitter

EA8AH	4537	13559	120	398	182	9,491,300
HC8N	4433	13188	121	337	245	9,271,164
Z37M	2835	6574	103	325	115	3,569,682
K1TTT	2604	5653	97	293	202	3,346,576
DQ4W	2419	5747	108	329	137	3,298,778
PI4CC	1951	4519	82	280	96	2,069,702
K4EA	1374	2832	96	250	189	1,515,120
OH2ET	1628	3558	81	251	52	1,366,272
VE7SV	1423	3148	76	132	152	1,133,280
N2WK	1156	2631	76	218	127	1,107,651
W7LR	1188	1962	77	134	159	725,940
PI4COM	891	2100	55	168	40	552,300
VE5RI	712	1537	48	70	115	3581,21
DL4R	400	894	42	118	38	177,012

Multi-Op Multi-Transmitter

YT6A	3885	9241	112	378	133	5,757,143
UU7J	3588	8329	132	405	130	5,555,443
KH7X	2696	7965	126	224	208	4,444,470
RK2FWA	3096	7240	112	349	104	4,090,600
RKØAXX	2315	6222	105	291	52	2,787,456
KA4RRU	1962	4004	88	245	183	2,066,064
OH6R	2167	4874	84	259	73	2,027,584
SP6KCN	418	936	41	116	16	161,928
IKØIZW	229	560	37	81	32	84,000

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In the article "Want to Spice Up your QSOs? Go Video!" by Pete Kemp, KZ1Z, March *CQ* page 46, the simple radio-computer interface shown in figure 3, consisting of patch cables and an isolation transformer, is an illustration from a tutorial posted on the Buxcomm website. It is not a product offered for sale by Buxcomm, and it should not be confused in any way with the Buxcomm Rascal GLX, which is a full-featured radio-computer interface. We apologize for any confusion that may have resulted.

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- WIRES Capability
- Wideband Receiver (Cell Blocked)

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FT-2000 HF + 6M tcvr

- 100 W w/ auto tuner • built-in Power supply
- DSP filters / Voice memory recorder
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- 10M/6M/2M/70CM • Wires capable
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NEW COMPACT HF TRANSCEIVER WITH IF DSP

A superb, compact HF/50 MHz radio with state-of-the-art IF DSP technology configured to provide YAESU World-Class Performance in an easy to operate package.
New licensees, casual operators, DX chasers, contesters, portable/field enthusiasts, and emergency service providers - *YAESU FT-450...This Radio is for YOU!*

HF/50 MHz 100 W All Mode Transceiver

FT-450 Automatic Antenna Tuner ATU-450 optional

■ FT-450AT With Built-in ATU-450 Automatic Antenna Tuner

Compact size : 9" X 3.3" x 8.5" and Light weight : 7.9 lb

■ Large informative Front Panel Display, convenient Control knobs and Switches

■ The IF DSP guarantees quiet and enjoyable highperformance HF/50 MHz operation

Handy Front Panel Control of Important Features including:

- **CONTOUR Control Operation**
  The Contour filtering system provides a gentle shaping of the filter passband.
- **Manual NOTCH**
  Highly-effective system that can remove an interfering beat tone/signal.
- **Digital Noise Reduction (DNR)**
  Dramatically reduces random noise found on the HF and 50 MHz bands.
- **IF WIDTH**
  The DSP IF WIDTH tuning system provides selectable IF passband width to fight QRM.
  SSB - 1.8/2.4/3.0 kHz , CW - 0.5/1.8/2.4 kHz
- **Digital Microphone Equalizer**
  Custom set your rig to match your voice characteristics for maximum power and punch on the band.
- **Fast IF SHIFT Control**
  Vary the IF SHIFT higher or lower for effective interference reduction / elimination.

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■ The rugged FT-450 aluminum die-cast chassis, with its quiet, thermostatically controlled cooling fan provides a solid foundation for the power amplifier during long hours of field or home contesting use.

MOS FET RD100HHF1

The rugged aluminum die-cast chassis with cooling fan

■ Operate anywhere using optional internal or external antenna tuning systems

Internal Automatic Antenna Tuner ATU-450
Covering 160 m to 6 m Amateur Bands Dipole or Yagi antennas
(The ATU-450 Antenna Tuner is included in the FT-450AT)

External Automatic Antenna Tuner FC-40
Covering 160 m to 6 m Amateur Bands (with 65+ ft end fed wire)

Active Tuning Antenna System ATAS-120A
Covering 40 m to 6 m Amateur Bands
(For mobile)

More features to support your HF operation

●10 kHz Roofing filter ●20 dB ATT / IPO ●Built-in TCXO for incredible ±1 ppm/hour (@+77 °F, after warmup) stability ●CAT System (D-sub 9 pin): Computer programming and Cloning capability ●Large, Easy-to-See digital S meter with peak hold function ●Speech Processor ●QUICK SPLIT to automatically Offset transmit frequency (+5 kHz default) ●TXW to monitor the transmit frequency when split frequency operation is engaged ●Clarifier ●Built-In Electronic Keyer ●CW Beacon (Up to 118 characters using the CW message keyer's 3 memory banks) ●CW Pitch Adjustment (between 400 to 800 Hz, in 100 Hz steps) ●CW Spotting (Zero-Beating) ●CW Training Feature ●CW Keying using the Up/Down keys on the optional microphone ●Two Voice Memories (SSB/AM/FM), store up to 10 seconds each ●20 seconds Digital Voice Recorder ●Dedicated Data Jack for FSK-RTTY operation ●Versatile Memory System, up to 500 memory channels that may be separated into as many as 13 Memory Groups ●CTCSS Operation (FM) ●My Band / My Mode functions, to recall your favorite operating set-ups ●Lock Function ●Adjustable Main Tuning Dial Torque ●C.S. Switch to recall a favorite Menu Selection directly ●Hand Microphone included ●IMPORTANT FEATURE FOR THE VISUAL IMPAIRED OPERATORS - Digital Voice Announcement of the Frequency, Mode or S-meter reading

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

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