QST

Official Journal of ARRL The national association for AMATEUR RADIO

Devoted entirely to **Amateur Radio**

www.arrl.org

August 2008

QST reviews:

mini Radio Solutions miniVNA
Network and Antenna Analyzers

RigExpert AA-200
Antenna Analyzer

A Look at Butane Powered Soldering Tools

Inside:

A Dipole that Switches Bands Pneumatically

Finding a Good Ground

A Pocket Power Meter

Another Homebrew Challenge Winner!

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D-STAR:
CONNECT ACROSS MILES INSTEAD OF METERS!

ANALOG + DIGITAL
All in one!

D-STAR optional

IC-2820H & UT-123

D-STAR UPGRADEABLE 2m & 70cm & GPS MODULE AND ANTENNA

- 50/15/5 Watt Output Power
- RX: 118-173.995, 375-549.995, 810-999.99MHz**
- Analog/Digital Voice with GPS (Optional UT-123)
- 500 Alphanumeric Memory Channels
- Diversity Receive Capable

DIGITAL

D-STAR ready

IC-92AD & HM-175GPS

MILITARY RUGGED AND SUBMERSIBLE

- 5/2.5/0.1 Watt Output Power
- RX: 0.495-999.990MHz**
- Shown with Optional GPS Speaker Mic (HM-175GPS)
- 1304 Alphanumeric Memory Channels
- IPX7 Submersible*

ANALOG + DIGITAL
All in one!

ID-RP2C
REPEATER CONTROLLER

The cornerstone of the D-STAR system. Handles up to four RF modules. Basic in-band or cross-band operation. Linking capabilities through the internet and future 10GHz backbone products.

ID-RP2D
1.2GHZ DATA MODULE

Access point with a data rate of up to 128kbps. Depending on the system setup, set up an email and/or file server for EmComm support. Perfect for web applications or support via internet connection.

ID-RP2V
1.2GHZ DIGITAL VOICE MODULE

ID-RP2000V
2M DIGITAL VOICE MODULE

ID-RP4000V
70CM DIGITAL VOICE MODULE

Finally, commercially available crossband systems! Together, with proper call sign programming in any D-STAR compatible mobile or portable, the Icom D-STAR system will automatically route your signal to any other RF module connected to a common RP2C. With simple system commands, you can direct your communications through any of the RF modules or across the world via the gateway.

Visit your Icom dealer today!

Free literature: 425.450.6088

or www.icomamerica.com

*IP-X7: tested to work after being under 1 meter of water for 30 minutes.
**Frequency coverage may vary. Refer to owner's manual for exact frequency specs.

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Expanding your world of possibilities!

IC-R9500 Icom's Ultimate Wide Band Receiver

0.005 - 3335.000MHz* • USB, LSB, CW, FSK, FM, WFM, AM • 1020 Alphanumeric Memory Channels • P25 (Option UT-122) • Five Roofing Filters • Dual DSP • Digital IF Filter • Multi-function Spectrum Scope • 7-inch TFT LCD Display • Noise Blanker • Noise Reduction • Multi-scan Functions • Voice Synthesizer • Digital Voice Recorder • USB Connector • Receive Assist Functions

Now bundled with RadioCom 4.5

Icom's black box radios now come bundled with Bonito's RadioCom 4.5 software.

PCR1500

THE "BLACK BOX"

- 0.01 ~ 3299.99 MHz*
- AM, FM, WFM, CW, SSB
- Record and Save Audio as .WAV File
- USB Cable Connection
- Optional DSP

PCR2500

DUAL BAND "BLACK BOX"

- 0.01 ~ 3299.99 MHz* (Main) 50 to 1300 MHz* (Sub)
- AM, FM, WFM, CW, SSB
- Optional APCO 25 and D-STAR
- Dual Wideband Receivers
- Dual Watch PC Window
- Optional DSP

IC-R1500

MOBILE OR PC CONTROL

- 0.01 - 3299.99 MHz*
- AM, FM, WFM, USB, LSB, CW
- 1000 Memory Channels
- Fast Scan
- Optional DSP (UT-106)
- PCR Software Included
- Very Compact Design

IC-R2500

2 WIDE BAND RECEIVERS IN ONE

- 0.01 - 3299.99 MHz*
- AM, FM, WFM, SSB, CW (Main)
- AM, FM and WFM (Sub)
- 1000 Memory Channels
- D-STAR Compatible (Option UT-118)
- P25 (Option UT-122)
- Optional DSP

IC-R75

WIDE-BAND RECEIVER

- 0.03 - 60.0 MHz*
- Triple Conversion
- Twin Passband Tuning
- Digital Signal Processing (DSP)

IC-R5 SPORT

COMPACT WIDE-BAND

- 0.5 - 1300.0 MHz*
- AM, FM, WFM
- 1250 Memory Channels
- CTCSS/DTCS Decode
- Weather Alert

IC-R20

ADVANCED WIDE-BAND

- 0.150 - 3304.0 MHz*
- AM, FM, WFM, SSB, CW
- 1000 Memory Channels
- Dual Watch Receiver
- 4 Hour Digital Recorder

*Frequency specs may vary. Refer to owner's manual for exact frequency specs.

ICOM®

hy-gain® ROTATORS

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

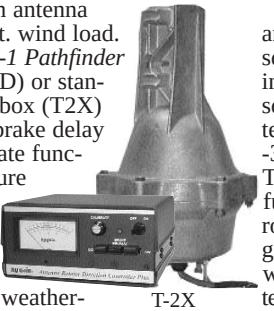
HAM-IV

HAM-IV
$559.95

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

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

TAILTWISTER SERIES II



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

T-2X
$699.95

T-2XD
$1129.95
with DCU-1

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

CD-45II

CD-45II
$389.95

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

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

HAM-V

HAM-V
$1049.95
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

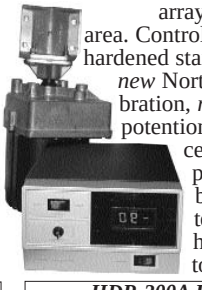
AR-40
$289.95

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
$749.95

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.

http://www.hy-gain.com
Nearest Dealer, Free catalog, To Order . . .
800-973-6572
Voice: 662-323-9538 **Fax:** 662-323-6551

NEW! Automatic Rotator Brake Delay

RBD-5
$29.95

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.

hy-gain®

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308 Industrial Park Road,Starkville, MS 39759, USA

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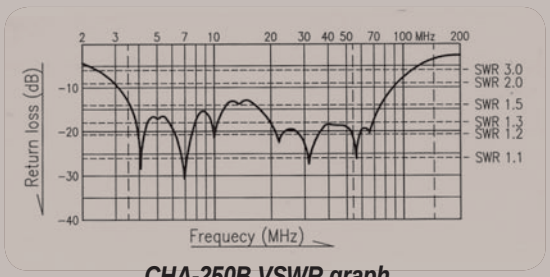
COMET and Maldol

Base Antennas



CHA-250B VSWR graph

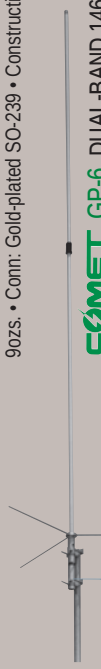
"One person can effortlessly raise the antenna at night when no one can spot it, and take it down before daybreak. This antenna is also a great choice for portable operations, such as quick and easy mini-DXpedition to a campground or a nice tropical island! In short, the Comet CHA-250B is simple to assemble, painless to elevate and is easy on the eyes, while at the same time getting you on 6 meters thru 80 meters without the requirement of an antenna tuner and ground radials. You'll even be able to work some DX while you're at it!" – Dan Dankert N6PEQ

COMET NEW CHA-250B BROADBAND HF/6M GROUND-PLANE ANTENNA
A newly designed broadband vertical with NO GROUND RADIALS. EXTREMELY easy to assemble, requires no tuning or adjustments and VSWRis under 1.5:1 from 3.5-57MHz! • TX: 3.5MHz – 57MHz • RX: 2.0 – 90MHz • VSWR is 1.5:1 or less, continuous • Max Power: 250W SSB/125W FM• Impedance: 50 Ohm • Length: 23' 5" • Weight: 7 lbs. 1 oz. • Conn: SO-239 • Mast Req'd: 1" – 2" dia. • Max wind speed: 67MPH

COMET GP-15 TRI-BAND 52/146/446MHZ BASE REPEATER ANTENNA
Wavelength: 52MHz 5/8 wave • 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 4 • Max Pwr: 150W • Length: 7'11" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239• 2MHz band-width after tuning (6M) • Construction: Single-piece fiberglass

COMET CX-333 TRI-BAND 146/220/446MHZ BASE REPEATER ANTENNA
Wavelength: 146MHz 5/8 wave x 2 • 220MHz 5/8 wave x 3• 446MHz 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 3lbs. 1oz.• Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

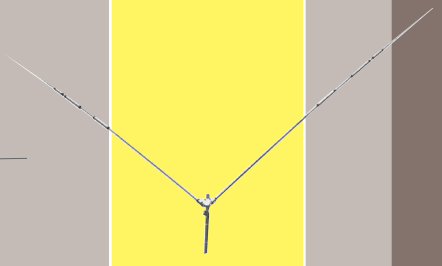
COMET GP-3 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA
Wavelength: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Max Pwr: 200W • Length: 5'11" • Weight: 2lbs. 9ozs. • Conn: Gold-plated SO-239 • Construction: Single-piece fiberglass



COMET GP-6 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA
Wavelength: 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 5 • Max Pwr: 200W • Length: 10'2" • Weight: 3lbs. 8ozs. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

Maldol HVU-8 ULTRA-COMPACT 8 BAND HF/VHF/UHF VERTICAL ANTENNA
80/40/20/15/10/6/2M/70cm Only 1/2 the traditional size and weight of vertical HF antennas, and it includes 2M/70cm! Unique radial system rotates for balcony installations, the radials can all be rotated to one side. • Wavelength: HF and 6M: 1/4 wave • 2M: 1/2 wave • 70cm: Two 5/8waves in phase • Impedance: 50 Ohm • Max Power: HF 200W SSB • 6M–70cm: 150W FM • Conn: SO-239 • Height: Only 8'6" • Weight: 5lbs. 7ozs.

COMET GP-9 / GP-9N DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA
BEST SELLER! • Wavelength: 146MHz 5/8 wave x 3 • 446MHz 5/8 wave x 8 • Max Pwr: 200W• Length: 16' 9"" • Weight: 5lbs. 11ozs. • Conn: GP-9 Gold-plated SO-239 • GP-9N Gold-plated N-type female • Construction: Fiberglass, 3 Sections



COMET NEW H-422 QUAD-BAND HF DIPOLE Compact 40/20/15/10M "V" or Horizontal Dipole • Max power: 1kW SSB • Length "V" Dipole: 24' 3" • Horizontal Dipole: 33' 10" • Shipping length: 79" • Weight: 11 lbs 14 ozs • Wind Load: 3.02 sq feet • Required mast size: 1.5" - 2.5" diameter • CBL-2000 2kW Balun included • Simple installation, band tuning and profile change

COMET and Maldol Antennas

For a complete catalog, call or visit your local dealer.
Or contact NCG Company. 15036 Sierra Bonita Lane, Chino, CA 91710
909-393-6133 • 800-962-2611 • FAX 909-393-6136 • www.natcommgroup.com

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This Month in QST

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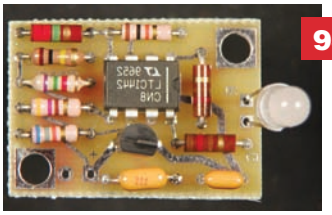
Technical



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*Payment arrangements available. Please write for details.

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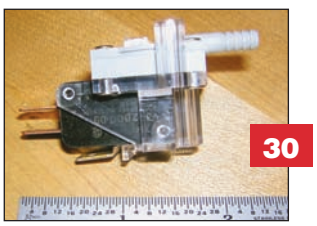
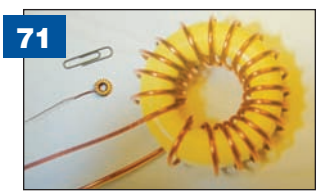
QST Workbench





Radiosport

OUR COVER
The first-ever ARRL Homebrew Challenge proved to be such an overwhelming success that a second category had to be created. Look for Steven Weber's, KD1JV, winning non-PC supported design beginning on page 33.

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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.

■ 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 ●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

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FT-8800R *70 cm 35 W

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- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

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

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

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

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

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

DMU-2000
Data Management Unit (option)

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Public Service

Advocacy

Education

Technology

Membership

"It Seems to Us"

The Fifth Pillar

"At the 2005 ARRL National Convention held in conjunction with the annual Dayton Hamvention® we unveiled ARRL EXPO, a greatly expanded exhibit area in which we highlighted the many facets of the ARRL diamond. ARRL EXPO was such a hit that it has become a recurring feature of the Hamvention and of the ARRL National Convention, wherever the latter is held."

The first ARRL EXPO in 2005 identified four pillars of our association: public service, advocacy, education, and membership. Amateur Radio has a *fundamental mission of public service*, so it is only natural that this be at the top of the list for its national association. To be able to continue serving the public, Amateur Radio needs a *strong advocate* to all levels of government as well as to the general public, both directly and through the media. So that we may better serve the public interest we must *constantly educate ourselves*. Training and learning do not stop with the earning of a license; on the contrary, the license signals the beginning, not the end, of the journey. Finally, there is no better example than the ARRL that its *membership is the most important resource* of any association.

In the January 2006 issue of *QST* we unveiled a new look featuring these four pillars. Your response as members was most gratifying. You recognized that the changes were not merely cosmetic, and that they signaled a desire on our part to more closely reflect the ARRL's mission in the pages of your membership journal.

When the four pillars were conceived, we recognized that they could not be fully descriptive of the scope and breadth of the ARRL as the national association for Amateur Radio. It was also obvious that some basic elements of Amateur Radio are present in more than one pillar. Pillars are not silos; they are there to support the entire structure, not to isolate activities or groups from one another.

Yet as time went on and we gained more experience and feedback it became apparent that one basic element deserved its own pillar: Technology.

Technology is certainly a part of every other pillar. An appreciation for, and curiosity about, science and technology is one of the defining characteristics of our membership community. Much of our educational focus is on gaining a better understanding of telecommunications technology. The role of Amateur Radio as a creative outlet for inquisitive young minds, equipping them to go on to bigger things, is a recurring theme of our advocacy messages. And last but not least, it is through our mastery of technology and our improvisational ability — honed by years of practical, hands-on experience — that we are able to be of service to the public even when nothing else is working.

But the part that technology plays in Amateur Radio is far more than just a supporting role. Technology can be an end in itself, not simply a means to an end. For many among us it is the very essence of Amateur Radio. It is the shared love of radio — and without technology, radio would not exist — that binds us to one another and sets us apart from the rest of the world. This is equally true whether our love of technology is oriented toward the past, the present, or the future — or all three.

Preserving and exploring the history of radio communication, and especially of the many and varied roles played by amateurs in that history, is an essential component of Amateur Radio. Applying today's technology to today's communication problems, whether for our own purposes or to better serve the public and the agencies that rely on us, is what we do every day.

Thinking about how to extend the limits of technology, whether in antenna or electronic hardware design or (increasingly) through software, is how we deliver the "continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art" that is a fundamental purpose of the Amateur Radio Service. Besides, it is a good antidote to ossification! In 2004 the ARRL Board of Directors created the position of Chief Technology Officer to "advise the Executive Vice President and the Board on matters relating to the encouragement and use of new technologies in the amateur services."

The ARRL's support for the advancement of technology spans a wide range of activities. Much of the content of *QST* and virtually all of *QEX*, the bimonthly publication that serves as a forum for communications experimenters, are devoted to this end. We try to facilitate and encourage the cutting-edge efforts of individuals and groups working outside the ARRL as well as within; for example, for many years the ARRL has been publishing the proceedings of VHF/UHF, microwave, space and digital communications conferences. Technical forums are an important part of any ARRL convention and many hamfests. The ARRL Lab keeps abreast of both internal and external trends potentially affecting Amateur Radio, including those external trends that might pose a threat.

Want to take a fresh look at what's happening in Amateur Radio technology and how it benefits the wider world? Visit **www.wedothat-radio.org**, a special Web site developed by the ARRL for that specific purpose. You can reach it via a link from the ARRL home page, **www.arrl.org**. Plan to come back often; we expect the content to grow and change as Amateur Radio itself continues to do the same.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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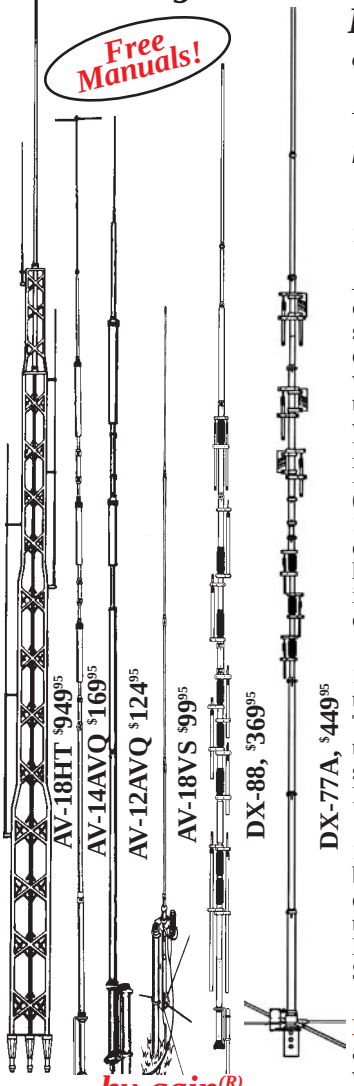

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They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

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Hy-gain verticals go up easily with just hand tools and their cost is surprisingly low.

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

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

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

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

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

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

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

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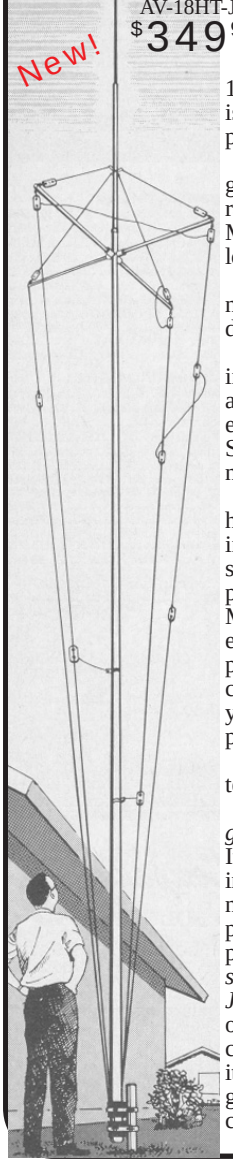

AV-18HT-Jr. $349.95

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

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- Hams took to the hills once again for ARRL Field Day, held June 28-29.
- Ham radio volunteers from Santa Cruz ARES provided a vital layer of communications to support firefighters, law enforcement, Red Cross and even animal control during the Martin fire in the hills above Santa Cruz over Father's Day weekend.
- Amateur Radio operators throughout the United States have reported hearing an intruder signal — dubbed Firedrake — on 20 meters.
- The third ARRL Public Relations campaign — *We Do That!…with Amateur Radio* — celebrates the technology side of ham radio.
- *The ARRL Extra Class License Manual* and *ARRL's Extra Q&A* are available for sale.
- The winner of the *QST* Cover Plaque Award for May is Jim Veatch, WA2EUJ, for his article "The TAK-40 SSB CW Transceiver."
- The ARRL's DXCC Desk announced that Fausto Minardi, I4EAT, is the winner of the 2007 DXCC Challenge DeSoto Cup.
- The ARRL has welcomed Yaesu as the principal sponsor of the Logbook of The World (LoTW) Web site.
- In May, the ARRL Foundation Board of Directors voted unanimously to award the prestigious William R. Goldfarb Memorial Scholarship to Austin Evans Wilmot, KD5QKS, of Dallas, Texas.
- The *ARRL Contest Rate Sheet* newsletter has a new look and name — the *ARRL Contest Update — News and Techniques for the Active Operator*.
- A Russian rocket launched from Plesetsk on May 23 carried a number of payloads to orbit, including a new Amateur Radio satellite named *Yubileiny*, since christened Radio Sputnik 30 (RS-30).
- The first of several ARRL books has been translated and published by Posts and Telecomnunications Press (PTPress) of Beijing, People's Republic of China.
- Colorado ARES District 10 was activated in the wake of a May 22 tornado that caused extensive damage to the town of Windsor.
- In response to requests from ARRL members, Contest Branch Manager Sean Kutzko, KX9X, has started a blog, "Notes from the Contest Branch."
- The 2008 TI9KK DXpedition to Cocos Island has been approved for DXCC credit.
- The following conventions were held during June: Georgia Section, Marietta; West Gulf Division, Plano, Texas, and the Delta Division, Knoxville, Tennessee.
- The June VHF QSO Party was held June 14-16.
- These online course sessions are to begin July 18, 2008: Amateur Radio Emergency Communications Level 2 (EC-002), Amateur Radio Emergency Communications Level 3 (EC-003R2), Antenna Modeling (EC-004), HF Digital Communications (EC-005), VHF/UHF — Life Beyond the Repeater (EC-008) and Radio Frequency Propagation (EC-011).

Media Hits

Allen Pitts, W1AGP

As I write this, Field Day is still more than two weeks away but the media hits about it are already piling up on my desk. I am also aware that ARES units in the central parts of the country are activated due to flooding and there should soon be more media hits coming from that activity. But the biggest hits of all right now are coming from the volunteers and people who have worked to get their state government's recognition.

GOVERNOR ARNOLD SCHWARZENEGGER

American Radio Relay League's Field Day

- Jack Burris, K6JEB, Public Information Coordinator for the East Bay Section, wrote, "I came home from work today and found a large manila envelope in my mail. Inside was a letter from Governor Schwarzenegger in an attractive folder with his seal on it." Not a bad way to end the day, Jack!

STATE OF KANSAS

PROCLAMATION BY THE GOVERNOR

Amateur Radio Week

- Ken Kopp, KKØHF, of ARES/DEC Kansas District 1 happily sent in a similar note along with Governor Sebelius' proclamation for "Amateur Radio Week."

PAUL SAFFO, K3PLS

In April, the San Mateo Board of Supervisors presented a commendation to Amateur Radio operator and Volunteer Examiner Ross Peterson, WB6ZBU (left), for his work in licensing new Amateur Radio operators in San Mateo County and the San Francisco Bay area. Peterson is the founder and head of the Bay Area Educational Amateur Radio Society (http://baears.com/). Since 1998, he and his fellow volunteers have graduated over 2000 new Amateur Radio operators in approximately 50 sessions. –– *K3PLS*

■ Michigan appears to be the first section to score a proclamation this year and congratulations go to Section Manager Dale R. Williams, WA8EFK. We're sure that PIC Jerry A. Baker, KD8AYL, will make good use of it!

■ Governor Strickland of Ohio also issued a proclamation to the delight of SM Joe Phillips, K8QOE, and the Ohio hams who worked to make it possible.

■ North Carolina's hams also got credits and are on the list with a proclamation by Governor Easley.

■ The South is also in there. Just now as I wrote that last paragraph, my news alert system pinged me that the *Montgomery Advertiser* released a news story that the Governor of Alabama signed a proclamation praising hams and Field Day events. Legislative liaison Richard Doll, KU4PY, made that happen.

■ …and then there is Al Cohen, W1FXQ, who earned the right to retire and relax long, long ago. But no, he's still at it and called to let me know he's getting Connecticut onto this listing in a few more days. Excellent, Al!

I am sure there will be more in the coming week, but as every PIO knows, there are deadlines to meet and today is mine. But how nice it is to be holding up the presses because of such good news!

VI SCHOBER

Special thanks to US Power Squadrons members (l-r) Bob Schober, K2CRR, John Graves, WA1JG, (Joe Carcia, NJ1Q, W1AW Station Manager), Carlton Lee, W2PTZ, Ed Summers, KG4SZJ, (Katie Breen, W1KRB, ARRL Membership Manager), Don Stark, N3HOW, and Marjie Stark, N3HOZ, for their operating W1AW on June 7 and 8 as a special event station promoting Safe Boating for the National Safe Boating Council's campaign. They made 736 contacts on 80, 40, 20, 17 and 6 meters (including one satellite QSO on VO-52) using primarily SSB and some PSK31. A blog can be found at www.arrl.org/blog/USPS%20at%20W1AW.

Inside HQ

How *QST* Gets to Your Mailbox

How does *QST* get to you after it is printed? Here's how it works. It takes three weeks to print, bind and mail an issue of *QST*.

After *QST* is printed, it is shipped to a specialized mailing facility where the mailing data is printed on the cover. *QST* is then bundled, placed on skids and sorted within a co-mail pool. The co-mail pool combines and sorts millions of magazines that are distributed together to individual postal addresses. This co-mail pool process takes about a week. We have been using the co-mail pool for approximately three years and this process qualifies *QST* for the lowest available postal rates. The savings that we have achieved using this distribution method has allowed us to absorb some of the major postal increases during the last few years.

After the co-mail process, *QST*, along with other magazines in the pool, are delivered directly to US Postal Service Bulk Mail Centers across the country. This also takes about a week. The US Postal Service then distributes the magazines to local post offices, and their respective mail carriers deliver *QST* to your mailbox. We also send *QST* to members in over 150 countries. An international freight forwarding agent handles *QST*'s overseas distribution. This service places *QST* directly into each country's postal system for delivery to individual members.

Our goal is to have *QST* delivered to mailboxes in the continental US between the 15th and 20th of the month prior to the issue date. For example, we try to have the August issue delivered by July 20. Most international members receive *QST* 10-14 days after its US mailing date. To accomplish this, we need to send the mailing data to the printer in mid-June. This lead time is one of the reasons why we send out your membership renewal notice far in advance of your expiration date. If you do not renew your membership at least a month and a half before it expires, you are likely to miss the *QST* mailing deadline.

When everything works right, *QST* arrives on time! If your membership expired and you did not renew within the mailing data deadline, then we send your issue of *QST* to you via a supplemental mailing directly from the ARRL Warehouse. These issues do not qualify for the savings of a co-mail pool or the efficient delivery of the Bulk Mail Centers. This mailing can delay your *QST* delivery by up to 4 weeks.

We strive to get your issue of *QST* to you on time every month. If you do not receive your copy by the issue date, you should contact our customer service department at **circulation@arrl.org** or call us at 888-277-5289. Amy Hurtado, KB1NXO, our Customer Service Manager, handles these inquiries.

73,

Harold Kramer, WJ1B
ARRL Chief Operating Officer
wj1b@arrl.org

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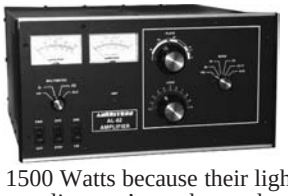

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Building a Budget Semi-Automatic Bug

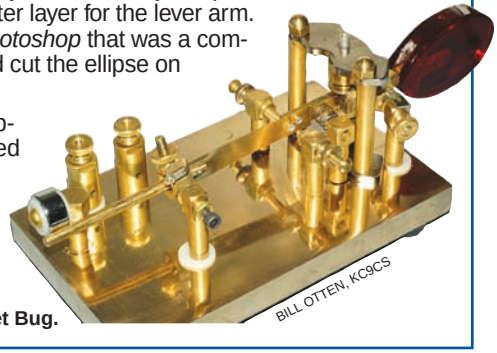
Bill Otten, KC9CS

Recently I was searching online for home-built telegraph keys. Many fine examples were to be seen, but a semi-automatic key by Kees, K5BCQ (**www.qsl.net/k5bcq/KEYS/KEYS.html)** really grabbed my interest. Kees had built several professional looking keys from brass pneumatic fittings and hobby shop brass stock. Inspired by his designs, I began my own "budget bug."

The threaded brass fittings were used at the top of each post where an adjustment screw was needed. I cut some threaded rod to height and covered the threaded rod with brass tubing for appearance. I made a mock-up base and dabbled with the parts placement for proper fitting. From two old hard disk drives I took the precision swing arm bearings and found they fit perfectly into the brass pressure regulators I had. These became the pivot arm bearings. Even the chrome bearing supports from the hard disk drive were used for the pivot arm bracket. Rectangular brass stock made up the lever or pivot arm. Brass strip stock became the reed spring. Silver contacts for the dot and dash came from some reed relays found at a local surplus store.

Once I had the parts placement correct, I used the mock-up as a template to mark out and drill my brass base. The damper was a piece from my junk box that almost looks like a chrome plated toroid. I tapped another brass elbow for a screw, placed a nylon washer on either size of the chrome "toroid" and this became the damper for the reed arm. The aluminum bronze base turned out to be the costliest part of the whole project — $35. It is heavy (the key weighs 4 pounds) and tarnish resistant. For the paddle I used three layers of red acrylic, epoxied together leaving a '"pocket"' in the center layer for the lever arm. I prepared a picture of an ellipse in *Photoshop* that was a comfortable size, taped it to the acrylic and cut the ellipse on my band saw.

The finished result is a very smooth operating semi-automatic bug. I'm amazed at the speed it can achieve, but have adjusted it back to a speed more in line with my 20 WPM CW capabilities. Total cost to build the budget bug was less than $50.



BILL OTTEN, KC9CS

The finished KC9CS Budget Bug.

ANDREW FREEMAN, W0AAA

What do you do with 2541 QSL cards? **Andrew Freeman, WØAAA, of Bemidji, Minnesota, decorated his shack with his collection.**

COURTESY MARIO RUBIO, W6OH

Lance Armstrong meets Ansel Adams: **This past spring, Mario Rubio, W6OH, of Willowbrook, California, celebrated his 60th birthday by riding his 40 year old English 3 speed along the 12 miles of bike path at Yosemite Valley.**

Unique CW and Keys Display Goes On World Tour

Dave Ingram, K4TWJ, and friends have put together a special collection of telegraphic treats, artifacts and CW keys for display at Amateur Radio conventions here and abroad. It contains views and details of Samuel F. B. Morse's first pen-and-canvas type telegraph, H. G. Martin's first semi-automatic key, a recording of how the *Titanic*'s SOS sounded in 1912, books and CDs on keys and CW, plus information on and invitations to join several CW clubs. It also features replicas of Samuel Morse's famed "Correspondent" key, the *Titanic*'s spark key and a 1880s-style Chubbock key, a gold pinstriped 1905-style Vibroplex bug, WB9LPU's new RotoBug, N3ZN's glamorous round-based paddle, a bevy of exotic fingerpieces and much more. A live Webcam link with amateurs supplying items and information in the display is also being planned.

Dave envisioned this traveling display with the purpose of handing down Amateur Radio's proud history, legacies and traditions from generation to generation so they live on throughout the annals of time. He also seeks sponsors to help support the display's travel from country to country. You can contact Dave directly at **k4twj73@gmail.com** and read more about the display at **www.k4twj.blogspot.com**.

DAVE INGRAM, K4TWJ

This display of telegraph keys and CW-related artifacts is designed to be carried and set up easily at hamfests and conventions.

DWAYNE ALLEN, WY7FD

While visiting the Wyoming State Convention in Casper, ARRL Vice Director Dwayne Allen, WY7FD, spotted this traditional western light fixture affixed with a special set of branding irons.

RAY MAKUL, K1XV

All together now…let's stand on our heads: **Ray Makul, K1XV, of Weston, Vermont, received his shiny new call sign license plate, but something about it didn't look quite right...**

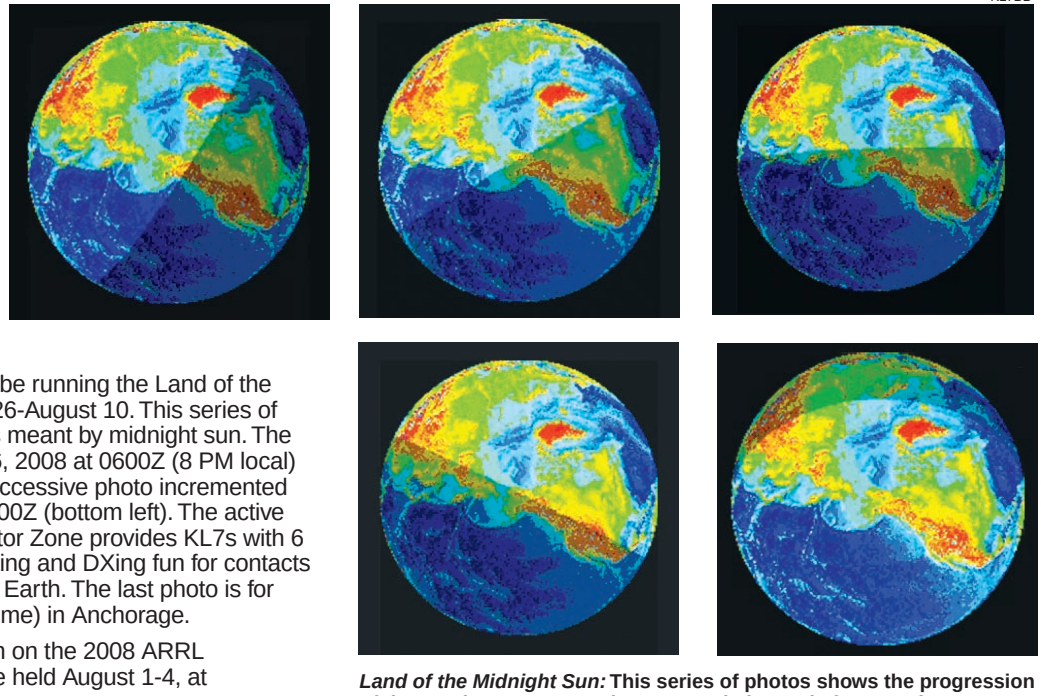
Alaska's Arctic Circle Terminator — Gray Line

Bill Balzarini, KL7BB

From the intersection of 66°33' North and the Dalton Highway, Alaska's 2008 ARRL Convention Special Events station, W1AW/KL7, will be running the Land of the Midnight Sun from July 26-August 10. This series of photos illustrates what is meant by midnight sun. The first photo shows July 26, 2008 at 0600Z (8 PM local) with the time for each successive photo incremented by 2 hours, ending at 1200Z (bottom left). The active Sunrise-Sunset Terminator Zone provides KL7s with 6 to 8-plus hours of operating and DXing fun for contacts with many places on the Earth. The last photo is for 2200Z, high noon (sun-time) in Anchorage.

There's more information on the 2008 ARRL Alaska Convention, to be held August 1-4, at **www.akhamfest.com**.

KL7BB



Land of the Midnight Sun: **This series of photos shows the progression of the sunrise-sunset terminator zone in late July from Anchorage, Alaska. W1AW/KL7 will be active July 26-August 10 to take advantage of the enhanced propagation.**

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CORRESPONDENCE

MORE TO HAM RADIO THAN MEETS THE EAR

One morning around 9:30, my doorbell rang. I went to my front window and saw a man and a small boy on my front stairway. The man asked if I knew who the little boy was. I said no, and then he then told me he found the boy wandering down our road by himself and "something just didn't look right." As it turned out, the boy was looking for a friend's house, but he didn't know where she lived. I asked them to come into the house and tried to gather some more information. We did not get any more info from the child so I called the Suffolk County Police and requested a unit dispatched to my house; two units arrived a few minutes later. We then started walking the area and the boy spotted his house around the corner. The boy was then reunited with his family.

Upon returning to my house with the man that found the boy, I asked him a question: "Out of all the homes on my block that you passed, why did you ring *my* bell?" He said, "I saw the antennas on your car and figured it would be the best choice. They had to be there for something." It just goes to show, life comes at you in many different ways and the fact that I am a ham radio operator makes me feel good that I was able to bring what could have been a horrific situation to a happy ending and it was all because of a few vertical antennas on my car.

JOE ALBERTUS, KB2JOE
Smithtown, New York

THE MAGIC OF HAM RADIO

Thanks go to David Sumner for his thoughts ["It Seems to Us," June 2008, page 9]. I will never forget a contact I had several years ago with a ham who had recently experienced the death of his wife. At the time of our contact, he was still going through the grief process. It seems that the ham radio fraternity gave him the feeling that is was okay to share his grief with another ham. I felt privileged to be able to give him time to talk about his loss. Perhaps the "magic" of ham radio is more than the technical aspects of our hobby.

JIM BRINSON, K4WOP
Mercersburg, Pennsylvania

LET THE SUNSHINE IN

The article by Albert Moreschi II, AG4BV ["Recruiting New Hams," June 2008, pages 69-70], was a very positive article about how things *should* be done. On the other hand, my wife and I had been trying to interest a friend to become a ham. Our efforts seemed to be paying off when we got word from him last summer that he had gotten his Technician license. He asked us where in his area he could get some local help and some hands-on experience, so I looked up the clubs on the ARRL Web site that were in his area and sent him the information.

The report we got from him would likely turn off most new hams showing up at a ham club meeting: His take was that, because he had gotten a license without learning the code, he was blatantly ignored by the older hams — the ones that he had been looking to for help. Since then, with some suggestions from us and lots of encouragement, and with lots of hard work on his part, he has earned his General and Amateur Extra class licenses. If clubs continue to allow their old timers to act this way, we will see a serious decline in the ham radio population. Many of the new hams will just fade off into the sunset.

BOB BINGHAM, K9WMP, ARRL Life Member
Livingston, Texas

LEARNING CURVE

Neil Dittlinger, WØPML wrote, "How about more articles [in *QST*] just a tad off the engineering level?" ["Correspondence," June 2008, page 24]. I strongly disagree with WØPML's comments. If I see one more article on installing PL-259s or building a J-Pole antenna I'll scream. The newcomers need to be exposed to technical articles so that they might learn that there is more to ham radio than being an appliance operator. The "Hands On Radio" series is a wonderful learning base for everyone. While something might be over their heads, if it sparks an interest, they will seek to learn more about it. If they ask at a club meeting or on-the-air for help understanding something, I am sure someone will step up to the plate and assist them. It doesn't take an engineering degree to learn something new, just a bit of curiosity and asking some questions. If you have no interest in learning about Smith charts, fine, but someone else out there does and they might become the antenna guru of the next generation.

NEIL SCHWANITZ, WD8CRT/V73NS
Kwajalein Atoll, Marshall Islands

FIGHTING THE GOOD FIGHT

Congratulations and kudos to the ARRL staff who fought the BPL battle and won. It's great to know my donations to the ARRL are worthwhile. Keep up the good work — we need you.

DENNIS BARTHEL, W7DHB
ARRL Life Member
Missoula, Montana

FIELD DAY IS WHAT YOU MAKE IT

I have been ARRL Field Day chairman for my club since 2000. Field Day is not a contest but it is treated like one. My club does not contest but rather we set up emergency operations and work on our gear so that should an emergency occur, we will be ready. What makes our Field Day fun is that a lot of the older members will come out, not to operate, but to reminisce and ragchew eyeball-to-eyeball. I try to make accommodations for them, such as indoor plumbing and an easy walk to the site. Of course, they are really attracted by the free food and the ambiance of being around ham radio gear and listening to the gray line pass. We usually score somewhere in the lower middle of the pack, but I don't mind because the most important thing to me is to make sure we can get on the air and be effective and to get as many hams to come out, even if they don't get on the air. Field Day is what you make it. I want to make it a time that hams will remember and make them put it on their list for things to do next year.

STEVE BELLNER, W8TER
Toledo, Ohio

HAVING A FIT

Thank you for addressing an observation and "issue" that I've been concerned about during the 28 years I've been a ham ["Inside HQ — Keeping Ourselves Fit," May 2008, page 13]. You addressed the obesity problem of many operators, something that needs to be talked about and hopefully as a group, figure out a way — a healthy way — for our brothers and sisters to manage their weight. The excess weight for many operators is due to overeating, rather than a health condition. There are many possible causes for overeating. The biggest reason for most overweight persons is the gratification they receive from eating; it is perhaps the most pleasing daily experience they have. While I am not the size of many obese ham radio operators, I am working on maintaining my health through eating nutritionally, handling my emotional needs appropriately and exercising. I challenge you and *QST* to follow through with monthly columns and articles to bring out a topic that is seen and hardly ever addressed in ham radio into the open.

BERNIE LAVEZZA, AF3US
ARRL Life Member
Lothian, Maryland

Your opinions count! Send your letters to "Correspondence," ARRL, 225 Main St, Newington, CT 06111. You can also submit letters by fax at 860-594-0259, or via e-mail to: **qst@arrl.org**. We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. Of course, the publishers of *QST* assume no responsibility for statements made by correspondents.

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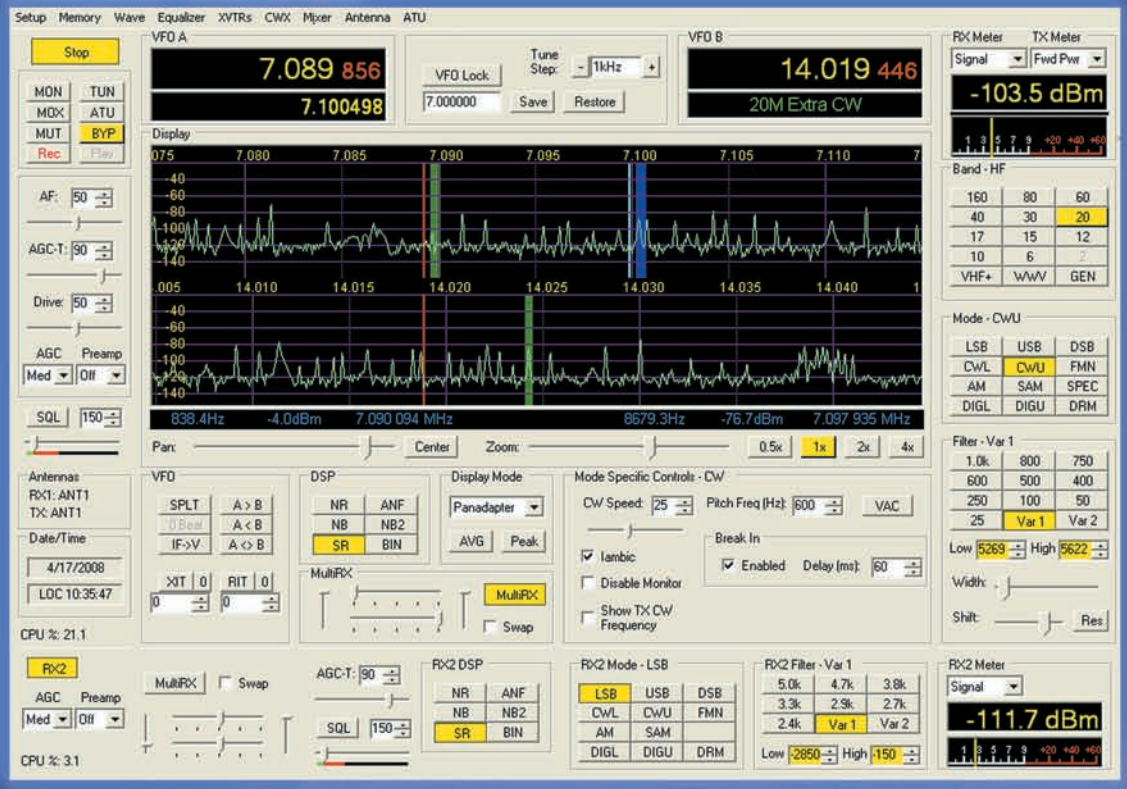

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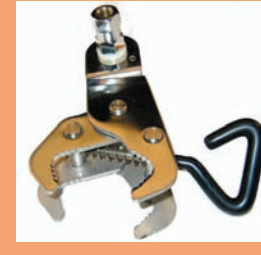

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Specifications
SOLID STATE

Freq Band:
1.8 – 28 MHz,
all HF amateur bands

Operation Mode:
SSB, CW, RTTY

Exciting Power (RF Drive):
100W max. (85W, typical)

Output Power (RF Out):
1.5kW min., SSB/CW
(1.2kW on 28 MHz)
1kW, RTTY
(5 minutes key down)

Auto Band Set:
With most modern
ICOM, Kenwood,
Yaesu HF Transceivers

Antenna Tuner:
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Specifications
SOLID STATE

Freq. Band:
3.5 – 28 MHz
HF Amateur Bands

Operation Mode:
SSB, CW, FM

Exciting Power (RF Drive):
50W

Output Power (RF Out):
400W max., SSB (PEP)/CW
350W typical, 300W minimum

Band Select (or Switch):
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RF Power Transistors:
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Gary S. Kath, N2OT, and Craig Bishop, WB2EPQ

For a number of years we have been experimenting with wire antennas trying to come up with that ideal multiband antenna that is fed with a single length of coaxial cable. Some two band 80 and 40 meter dipole antennas we tried and rejected were:

- *Multiband antenna using paralleled dipoles*. One approach is to cut a dipole for each band and connect the feed points of the two dipoles in parallel and to a single feed line as shown in Figure 1.[1,2] The free ends of the dipoles can be tied to different supports to keep the wires separated or insulators can be used between the wires. When the antenna is operated on a given band, one dipole is resonant having a low feed-point impedance while the other dipole is out of resonance, presenting a high feed-point impedance.

Our experience has shown that interaction between the two dipoles tends to pull the frequency away from the theoretical resonant length described by the usual dipole equation. Tuning the antenna is required by trial and error adjustment of the length of each dipole to get the best standing wave ratio (SWR). The antenna also requires making a number of insulating spacers to ensure the parallel dipoles do not touch one another on windy days.

- *Multiband trap antennas*. A second method to design a multiband antenna is to use *traps*. A trap is simply a parallel resonant circuit consisting of an inductor and capacitor.[3,4] In a two band parallel resonant trap dipole, one end of the traps is connected to the ends of the 40 meter dipole and the opposite ends of the traps are connected to extension wires forming the 80 meter dipole as shown in Figure 2. The trap is designed to resonate on 40 meters. The trap impedance at resonance is very high, electrically disconnecting the 80 meter section of wire while on 40 meters. When the antenna is operated on 80 meters the traps are not resonant. The trap then acts as an inductive reactance electrically extending the length of the extension wire forming the balance of the 80 meter dipole.

Traps are somewhat lossy, more involved to fabricate and can be affected by moisture. The traps also affect the ideal resonant length of the antenna making trial and error adjustment of the wire lengths necessary.

Multiband Antenna Using Switched Wire Segments

The ideal multiband antenna would use remotely controlled low loss switches to extend the length of the antenna for multiband use. On 40 meters the switches are open and on 80 meters the switches are closed.

Wired Relays

Our first thought was to simply put relays at the end of the 40 meter dipole legs to allow remote connection to the 80 meter wire sections. The problem is the control wires oper-

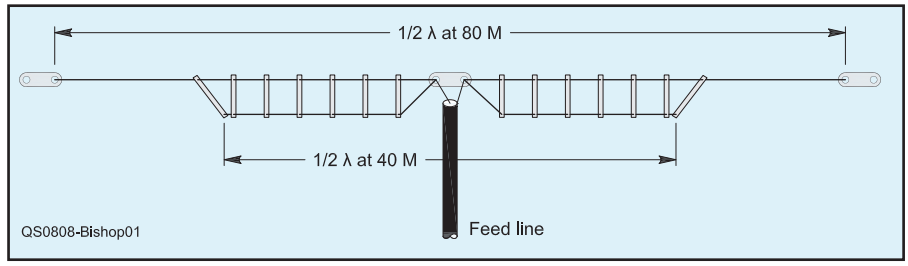


Figure 1 — Configuration of a multiband antenna made from two parallel dipoles.

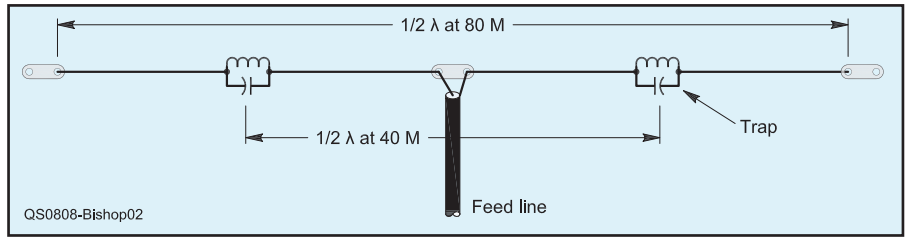


Figure 2 — Configuration of a multiband dipole using traps to separate the segments.

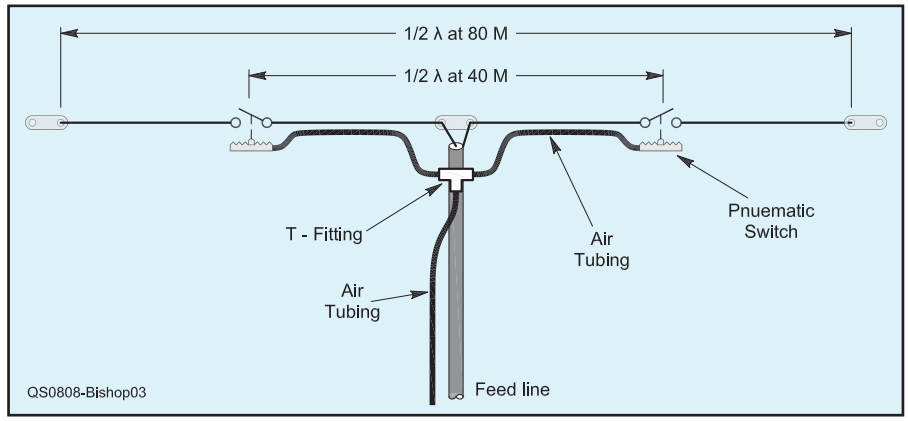


Figure 3 — Diagram of the design of a multiband antenna using pneumatically controlled switches.

[1]Notes appear on page 32.

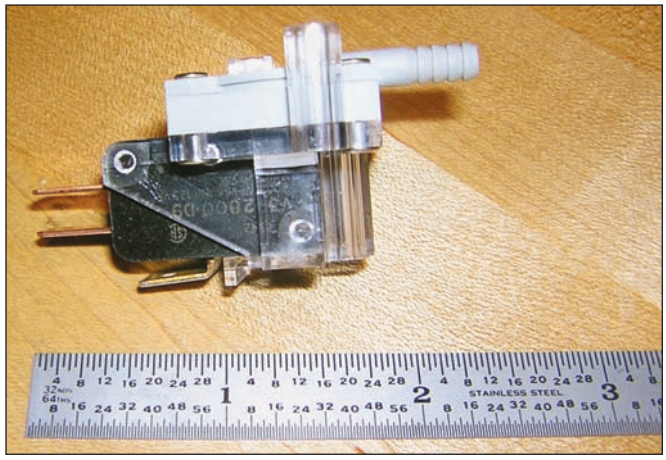


Figure 4 — Surplus Micro Switch snap action switch used for band changing.

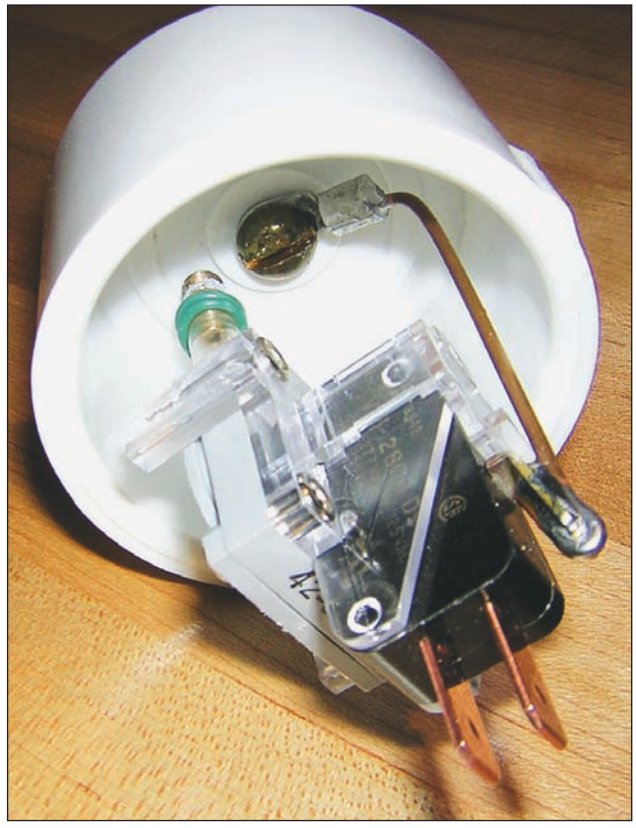


Figure 5 — Interior view of protective switch housing showing electrical and pneumatic connections through one of the PVC end caps.

Figure 6 — Completed and sealed pneumatic switch housing with 80 meter extension wire (left), 40 meter wire (right) and attached pneumatic tubing (right).

ating the relays would be in the RF field of the antenna and interfere with the operation of the antenna.

RF Activated Switch

The next idea was to develop wireless RF activated switches. The idea was to design a circuit that could sense the RF frequency and automatically close the switches when operating on 80 meters and open the switches when on 40 meters. This would require battery powered RF sensing switches mounted at the ends of the 40 meter dipole. Although we did develop a rough prototype of this concept, it is not ready for prime time.

Pneumatically Operated Switches

Finally, we decided to experiment with pneumatically controlled switches. A pneumatic switch has a diaphragm that expands when air pressure is applied. The diaphragm movement then pushes against the actuator button of a snap action switch. A wide variety of pneumatically actuated snap action switches is available with current handling ranges from 3 to 25 A and operating pressures from 0.05 to 45 PSI.[5]

This configuration offers a cleaner looking installation, fast band switching and requires no coaxial switches to flip between antennas.

The advantage of pneumatically operated switches is there are no interfering control wires but only plastic tubing running up along the antenna. The idea was to place a pneumatic switch at the end of each leg of the 40 meter dipole and run pneumatic tubing from the switches into the ham shack as shown in Figure 3. To switch bands from 40 to 80 meters, simply apply air pressure to the tubing causing the remote switch to actuate, thereby extending the length of the dipole.

Construction of the 80 and 40 Meter Pneumatically Switched Dipole

For this application we selected surplus low pressure pneumatic switches having an integrated 20 A, 277 V ac Micro Switch snap action switch as shown in Figure 4.

To protect the pneumatic switch from moisture, it was housed inside an enclosure made up of two 1.5 inch PVC pipe end caps and a short segment of 1.5 inch PVC pipe. The end caps were drilled and tapped for size 12-24 machine screws. Round lugs with extension wires were slipped onto 1 inch long brass size 12-24 screws. The screws were then threaded through the end caps. Caulk was placed around the threads and a nut attached. The wires from the lugs were soldered to the normally open (NO) switch contacts on the pneumatic snap action switch as shown in Figure 5.

To route the air control line into the sealed pneumatic switch, a pneumatic bulkhead feed-through fitting was fabricated from a size 12-24 brass machine screw by cutting off the head, drilling a 1⁄16 inch diameter hole down its length and machining off the threads on the ends. One of the PVC end caps was drilled and tapped for a size 12-24 thread and the fitting was installed, sealed with caulk and locked with nuts. A short length of tubing was connected from the bulkhead fitting to the port on the pneumatic switch. The opposite side of the bulkhead fitting attaches to pneumatic tubing running back to the radio shack. If necessary, the design can be simplified by passing the tubing through a hole drilled in the end-cap eliminating the bulkhead fitting.

To complete the design, the PVC pieces were cemented together with PVC cement, forming a watertight seal as shown in Figure 6. The extending brass screws are attached between the 40 meter and 80 meter wires of the dipole using brass nuts. The dipole segment lengths were determined using the usual 468/f relationship.

The air tube feeding the pneumatic switches was 1⁄8 inch OD, 1⁄16 inch ID clear PVC tubing (McMaster Carr part number 5233 K514). This low cost tubing is trans-

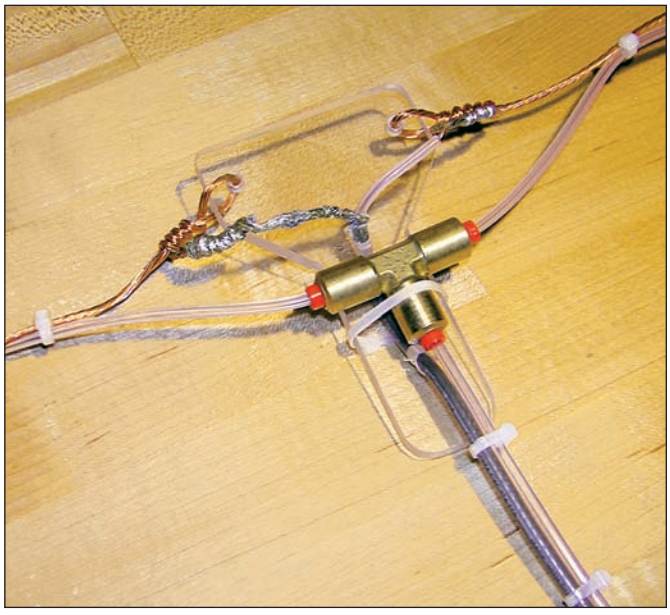


Figure 7 — Coaxial feed line attached to center of dipole. Left and right pneumatic tubing lines attached to T fitting and a single pneumatic line running down to the shack.

parent and has good ultraviolet resistance. A single length of tubing was taped along the coaxial feed line up to the dipole center insulator. A pneumatic T fitting was then used to split off the air line to the left and right segments of the dipole as shown in Figure 7. The tubing was attached along the dipole wires using electrical tape and then attached to the air bulkhead fitting on the pneumatic switch housing.

Low pressure air is required to activate the pneumatic switch from the shack. Low pressure pneumatic switches can even be activated by blowing into the air line. (This is not recommended, especially for SSB, since you will have to hold your breath while operating on 80 meters!) We simply used a small balloon hand pump to activate the switch for 80 meter operation and vented the air line for 40 meter operation. A balloon, bicycle pump, small fish pump and other air pressure providers could also be used as the air source.

Performance

Our dipole was erected between two large oak trees. One hundred feet of coax and pneumatic tubing ran down to the shack. We pulled out our old trusty MFJ Antenna Analyzer and to our surprise found the 40 meter antenna resonated with 1:1 SWR exactly at our design frequency.

We switched over to 80 meters by applying air to our pneumatic line. Checking the SWR again showed a 1:1 SWR on our 80 meter design frequency. There was no interaction between the 80 and 40 meter wires and no further adjustment was required.

On-air testing of the antenna was our next concern. Was the high voltage at the ends of the 40 meter dipole going to flash across our little snap-action switch? We fired up our 100 W transceiver and called CQ on 40 meters. Jack, K9GZK, responded to our call and we talked with no problems and no switch arcing.

Our final concerns were how long the pneumatic connections will last and whether moisture will condense in the tubing? After six months of operation, the only problem was that water entered one of the PVC enclosures via the capillary action along the brass screw threads, due to a poor caulking job. The switch was dried out and silicon caulk was reapplied over the threads. Since then, the antenna has worked fine through a variety of hot and cold weather conditions.

Other Ideas

The successful operation of the pneumatic switches generated other possible uses to explore in the future:

- *Phone/CW broadband dipole* — Use pneumatic switches to slightly extend the length of a dipole allowing broadband operation in both the phone and CW portions of the band. This is particularly suitable for 80 and 75 meter operation.
- *Multiband vertical* — Use pneumatic switches and the PVC housing to make a multiband vertical. Run the control air up the center of the antenna tubing to create a sleeker design.
- *Switching directions of a wire beam* — Use pneumatic switches to change the length of the reflector and driven elements on a three element Yagi or quad to rapidly change antenna direction by 180°.

We will leave it up to our fellow amateurs to explore other uses for low cost pneumatic switches. Meanwhile, work continues on our second generation multiband antenna design using RF activated switches.

Notes

[1]R. D. Straw, Editor, *The ARRL Antenna Book,* 21st Edition, p 7-9. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2]Dipole length in feet = 468/(f_{MHz}).

[3]J. Carr, *Practical Antenna Handbook*, 2nd Edition, TAB Books, 1994, p 141.

[4]See Note 1, p 7-11.

[5]If surplus switches are not available, another source is Air-Logic (**www.air-logic.com**). Their switch number F-4100-50-B80-15A should be suitable. Others may be available from Micro Technologies, SA, Pompano Beach, FL; **www.pressureswitch.com**.

Photos by the authors.

Gary S. Kath, N2OT, was first licensed in 1968 as WN2EPP and currently holds an Amateur Extra class license. He earned a BSEE from Widener University and an MSEE from Carnegie Mellon University. Gary has 28 years of experience as an instrumentation and automation engineering manager. He enjoys DXing, contesting, low power (QRP) operation, circuit design, software development and experimenting with HF wire antennas. Gary can be reached at 2671 Sky Top Dr, Scotch Plains, NJ 07076 or at **njklepper@att.net**.

Craig Bishop, WB2EPQ took his first license exam with Gary in 1968 and was assigned consecutive call WN2EPQ. After earning his Advanced class license, Craig focused primarily on antenna experimentation, DX and contesting. He was also very involved in his high school and college radio clubs. Craig holds a BSEE from Lafayette College and is an information technology executive at a large corporation. You can reach Craig at 28 Black Birch Rd, Scotch Plains, NJ 07076 or at **cbishop@att.net**. QST

New Products

HAMCALC ELECTRONICS UTILITY SOFTWARE

♢ Version 100 of *HAMCALC* software for *Windows* or *MS-DOS* contains more than 300 utility programs for radio amateurs and electronics professionals. Developed by George Murphy, VE3ERP, the software is said to be easy to use for nontechnical hobbyists. *HAMCALC* is available free of charge by download (1.4 MB file) from **www.cq-amateur-radio.com/hamcalcem.html**.

A 40 Meter CW/SSB Transceiver for the Homebrew Challenge

This entry, the non-computer assisted winner, is a great fit to a backpack for portable operation.

Steven Weber, KD1JV

Meeting the $50 price goal for the ARRL Homebrew challenge turned out to be a little challenging. I didn't want to submit a "gutless wonder" that in theory would meet the specifications called for. If you're going to build a rig, it might as well be one that has a chance of actually making contacts. A few years ago I designed a fairly simple SSB rig for 75 meters. A quick "guesstimate" of the parts costs showed it would be a good candidate for this challenge

It took some creative thinking to get the costs down to within the objective and retain a good level of performance. Adding in the CW mode also complicated things a little. In the end, the goals were met and a really nice little SSB/CW QRP rig resulted.

Circuit Description — Overview

This transceiver is based on the classic Phillips SA602 receiver design. It's hard to say who first combined these two chips with a crystal filter to produce a simple HF receiver. For sure, the NE4040 rig of Dave Benson, K1SWL, and subsequent revisions helped popularize the concept.

My primary contribution to this basic design is the addition of an inexpensive CMOS analog multiplex chip to steer the signal flow direction through the crystal filter. This allows a single pair of SA602 mixers to be used as the receiver mixer and product detector while receiving, then as the balanced modulator and transmit mixer during transmit. To this basic transceiver "core," a VFO, audio and RF amplifiers, along with some TR switching was added, to produce a fully functional rig. There is nothing particularly special about these additional circuits.

Circuit Description — Details

Permeability Tuned Oscillator

The permeability tuned oscillator (PTO) uses a J310 JFET in a Hartley configuration. This is one of the simplest oscillator circuits and I found it to be the most stable by far. It isn't quite stable enough, however, to be used with modern digital modes such as RTTY and PSK31.

The frequency of the oscillator is tuned by a brass screw inserted into L1. This inductor is wound on a #6, nylon threaded spacer with 32 gauge wire. This makes a convenient coil form and has the advantage of stabilizing the tuning screw, because it is threaded. In order to limit the turns of wire on the spacer to a reasonable number, an additional inductor wound on a toroid core is used in series to provide the total inductance needed by the oscillator to operate at about 3 MHz.

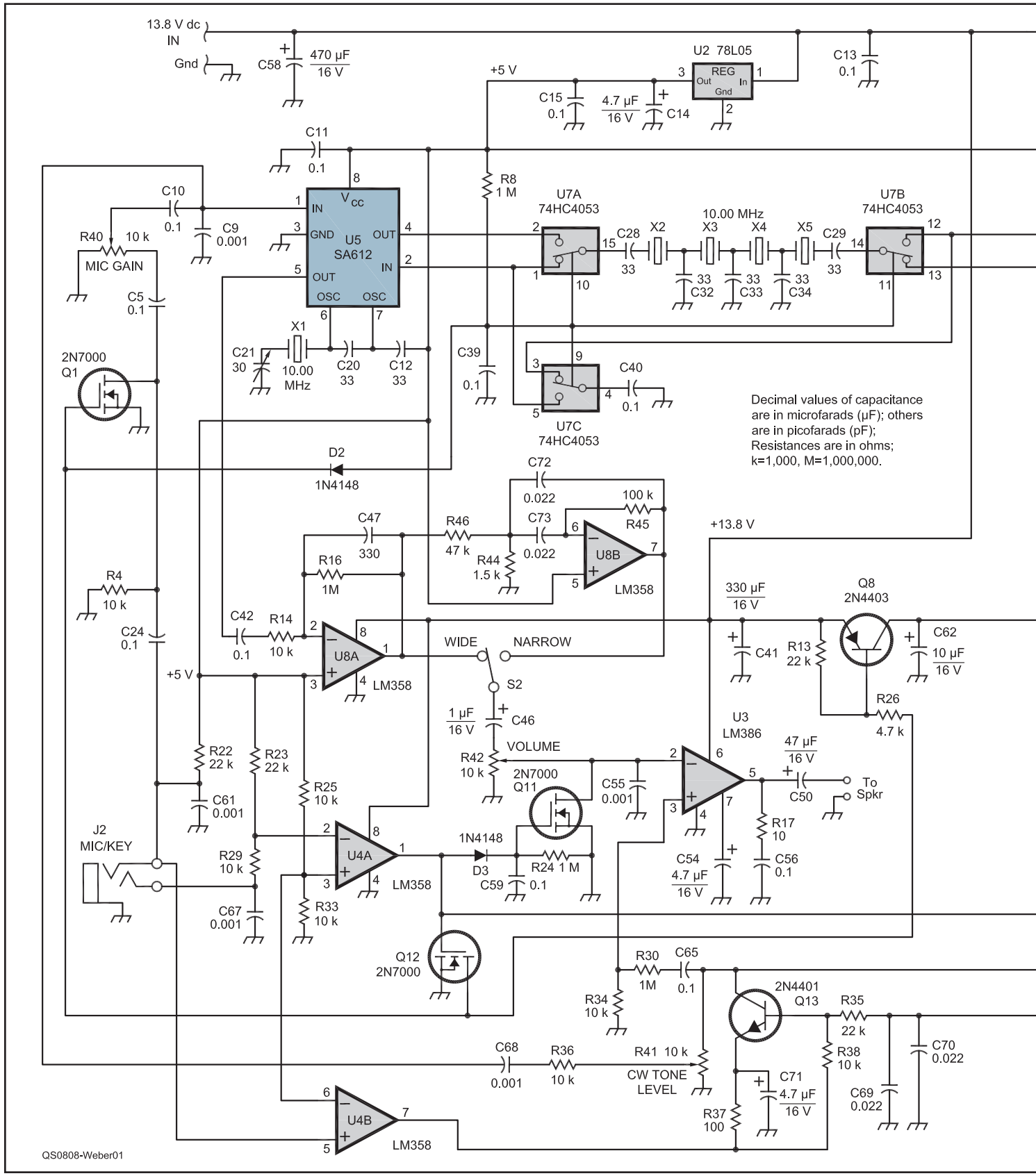
There isn't enough tuning range to cover the complete ITU Region 2 40 meter band, though for those outside the USA, that isn't much of a problem. The PTO has about a 130 kHz tuning range. To get the rig to work down in the US CW portion of the band, C4 is removed from the circuit. This increases the oscillator frequency and hence lowers the operating frequency. If you want to cover the entire 40 meter band, some means of switching the capacitor in and out of the circuit will have to be devised. I used single in-line package (SIP) header pins and a shorting plug. This is labeled BSS (band segment select) on the schematic and board layout.

SSB Detector, Generator and IF Mixer

This section of the circuit is comprised of two SA602 mixers, a crystal filter and a 74HC4053 analog multiplexer to switch the filter between the inputs and outputs of the mixers. The IF signal is routed to the crystal filter through one section of the 74HC4053 analog switch. Another section of the 'HC4053 routes the output of the crystal filter to the input of the product detector mixer, U5. The filtered IF is mixed with the BFO, which uses the internal oscillator section of the mixer, to produce an audio signal.

During transmit, the signal path between the two mixers is reversed. An audio signal is applied to the input of U5, which now acts as a balanced modulator. The output of the mixer is a signal which is the sum and difference of the audio frequency applied to the input and the BFO oscillator. This is double sideband modulation. To produce single sideband modulation, the signal must pass through the crystal filter, which removes one of the sidebands and any residual carrier. In the case of this filter, lower sideband is passed and the upper sideband is removed. The 'HC4053 switches now route the signal from the output of U5, through the crystal filter and into the input of U6. U6 combines the IF with the LO to produce a signal in the 40 meter band.

The third analog switch section of the 'HC4053 is used to switch a bypass capacitor between input pins on U5 and U6, which



need to be at RF ground depending on the direction the mixer is being used for at the time. Two 2N7000 FETs are used for additional bypassing of the mixer inputs. Because Q4 adds capacitance across the tuned input IF transformer, an additional capacitor to resonate the 10.7 MHz IF transformer to 7 MHz is not required. One is shown on the circuit diagram as 0 pF, in case one wants to modify the rig to work on 75 meters.

Audio Stages

During receive, the audio signal produced by U5 is amplified using operational amplifier U4B, by a factor of 100 (40 dB) and feeds the VOLUME control, or optional audio CW fil-

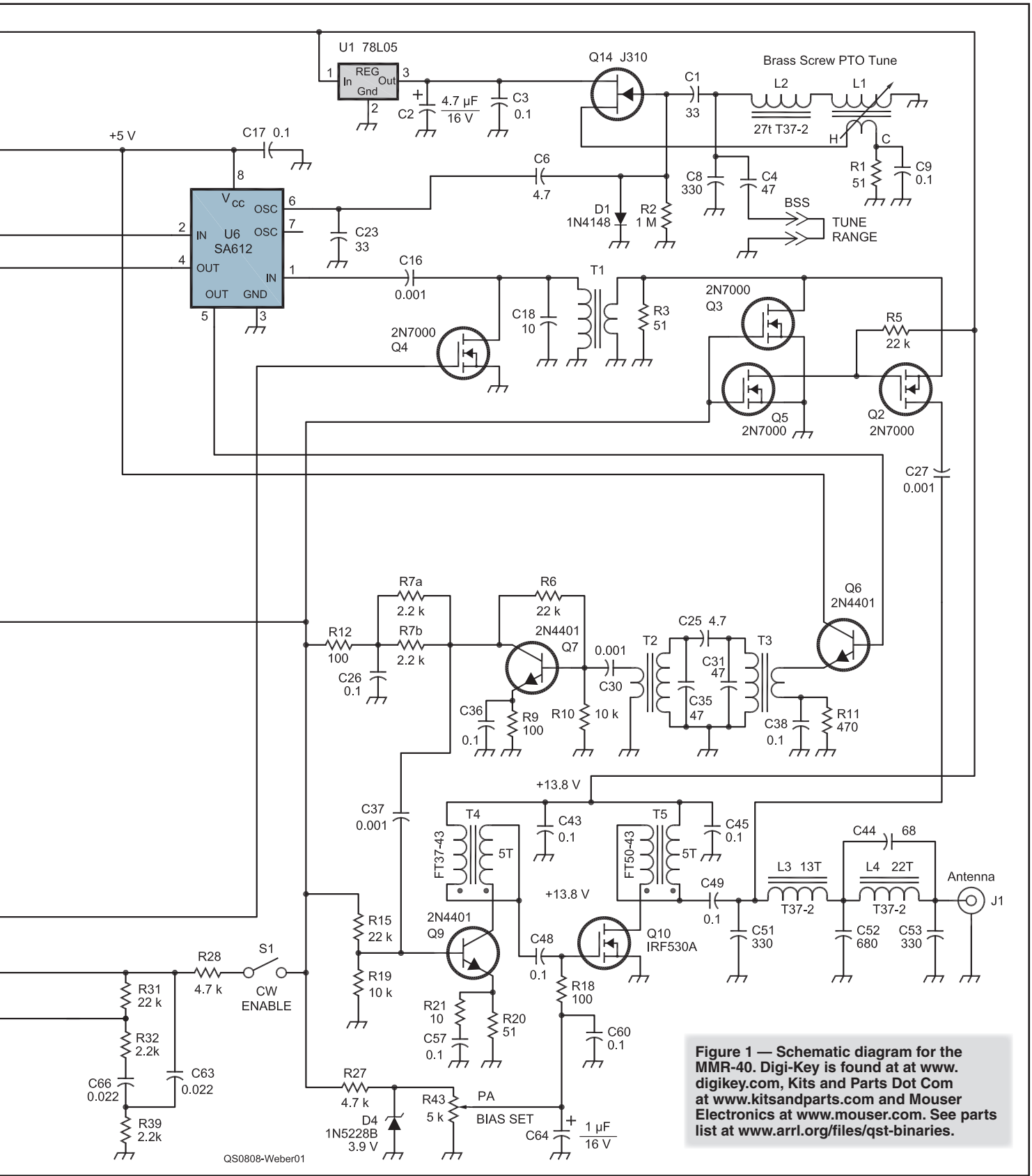


Figure 1 — Schematic diagram for the MMR-40. Digi-Key is found at at www.digikey.com, Kits and Parts Dot Com at www.kitsandparts.com and Mouser Electronics at www.mouser.com. See parts list at www.arrl.org/files/qst-binaries.

ters. U3, an LM386 audio amplifier, provides additional gain and drives the speaker. In CW mode, the CW sidetone is fed into pin 3 of U3, which provides a volume control independent side tone level to the speaker. Audio muting during transmit is performed by a 2N7000 FET, which simply shunts the input of the audio amplifier to ground. An R-C delay on the gate slows down the turn-off time. This allows the transmitter time to fully decay to zero output and gives switching transits time to settle down, which would otherwise result in audio "thumps" and clicks.

During voice transmit, audio from the microphone goes through a simple R-C high

pass filter to reduce or eliminate 60 Hz hum pick up. Trimmer R40 sets the audio level going into the U5 mixer, now being used as the balanced modulator. A common electret capacitor mic is used. The power required to run this mic is supplied by R22.

RF Driver and Power Amplifier

The transmit signal produced by the U6 mixer is buffered by emitter follower Q6 to drive the low input impedance of the IF transformer T3, used as part of the transmit band-pass filter. The output of the band-pass filter is taken from the secondary winding of T2 and then amplified by Q7 and Q9, to provide a signal large enough to drive the gate of the power amplifier, Q10.

The transmit power amplifier (PA) is an IRF530 power MOSFET. For linear operation, it requires a bias voltage of about 3 V. This is produced by a 3.9 V Zener diode for regulation with the exact bias voltage set by trimmer resistor R43. Bias is set so there is about 10 mA of PA current flow with no drive signal present.

The inductance of the two coils used in the LPF are not equal, as is normally the case for this type of filter. The values were optimized to provide some impedance matching between the PA output impedance and the load. This also increases power output and PA efficiency.

TR Switching

TR switching is controlled by operational amplifier U4A. The input to the noninverting input is set to a fixed 3 V by the resistor divider R25 and R33. The inverting input is also connected to a resistor divider, but this time with unequal values and the ground end connected to a PTT or code key. If the PTT or code key is closed, the voltage on the inverting input changes from 5 to near 0 V. The output of U4A now goes from its normally low state to a high state. Q12 is used to invert the polarity of the operational amplifier output, as both normally low and normally high states are needed for control.

Q1 is turned on, shunting audio from the microphone to ground in receive mode. Q4 is turned off, allowing signals from the antenna to pass into the U6 mixer. Q14 is also turned off, allowing audio to pass into the audio amp. Q9 is turned off, so there is no voltage going to the transmitter amplifier stages. Finally, Q2 is on, while Q3 is off, allowing signals from the antenna to pass into the receiver input transformer.

During transmit, the output of U2B changes to high, Q1 is turned off, allowing audio from the microphone to pass into the balanced modulator. Q4 is turned on, bypassing the antenna input of the U8 IF mixer to ground. Q14 is also turned on, muting the audio output. Q2 and Q3 are turned off, isolating the receiver input transformer from the transmitter output signal. Q9 is turned on, supplying power to the transmit amplifiers and PA bias circuit. The PA bias voltage is delayed by the 1 µF capacitor, C64, at the gate input resistor because Q9 is turned on. This provides some wave shaping of the leading edge of a CW signal. When Q8 turns off, C62 continues to supply voltage to the transmitter circuits as it discharges, providing tailing edge wave shaping to a CW signal.

The switch direction control pins for the 74HC4053 are connected to an R-C delay circuit and turned on and off through an isolating diode that is connected back to the output of U2B. When the rig goes into transmit, the control pins are pulled low through the diode. This causes the switches to immediately switch to the transmit configuration. When the rig switches back to receive, C39 in combination with R11, delays the switching back to the receive configuration by a few milliseconds.

CW Generation

The simplest way to make an SSB rig operate CW is to use a tone oscillator connected to the audio input. A single audio tone will produce a single output frequency. Otherwise, the BFO frequency would have to be shifted during transmit. Shifting the BFO can be a little complicated and since we need a tone oscillator for side tone anyway, we might as well use that. The tone oscillator is a *twin T* configuration that produces about a 600 Hz tone with the values shown.

CW operation is enabled by using a panel mounted slide switch to route the transmitter control voltage to the oscillator. To reduce costs, the mic jack is also used for the code key. The mic needs to be removed while using CW, so this works out. The PTT is wired to the tip of the plug, so a CW key with a standard mono plug can work.

Optional CW Audio Filter

Operating CW with only a SSB filter for selectivity can be annoying if there are other stations close by. There was room on the circuit board to squeeze in two audio band-pass filter stages to improve CW selectivity. The parts required for the filters are not included in calculating the cost of the rig, as they are not essential for its operation. It would be worth spending the extra couple of dollars to include these filters if you expect to use the rig much on CW.

KD1JV

Figure 2 — Details of the permeability tuned oscillator (PTO) tuning inductor. The PTO has about a 130 kHz tuning range, so a jumper is provided to move between CW and voice band segments.

A three position slide switch could be added to the front panel to select or bypass the filters. The first filter is relatively wide, with a Q of 3 and with a 600 Hz center frequency. This adds a little extra selectivity and might also be useful in SSB mode. The second filter is narrower with a Q of 5, also centered on 600 Hz for when you need even more selectivity to eliminate interference.

If responding to a CQ, you should try to match the tone received with the side tone frequency produced by the rig. This way, your frequency will match that of the other station. The addition of the CW audio filters help you match the other station's frequency by making the tuning shaper.

Construction and Test

This transceiver has been built using both "ugly construction" and on a PC board (shown in lead photo). Detailed construction, test and alignment instructions are provided on the *QST* binaries Web site.[1]

A complete kit, including a cabinet, is available from Hendricks Kits.[2] The instruction manual for the kit is worth taking a look at, no matter which method you use to build the rig. It is available for download from the Hendricks Web site. The kit manual includes information on interfacing the rig to a PC for digital mode operation.

Working with Low Power

By all definitions, this is a low power (QRP) rig. Five watts can be very effective while using CW mode. With voice, 5 W is a challenge. It's a lot harder for someone to copy a weak SSB signal than a weak CW signal. It helps to have the best antenna you can manage if you expect to work QRP sideband. Mostly, you have to be patient and persistent to make contacts. But that's the fun of it. Using 100 W is way too easy!

[1]**www.arrl.org/files/qst-binaries**.
[2]**www.qrpkits.com**.

Steve Weber, KD1JV, was first licensed in 1968 at the age of 15 and currently holds an Amateur Extra class license. Steve is well known in the low power (QRP) community as a prolific designer of kits and homebrew projects and is a member of the ARCI "QRP Hall of Fame" (2004). Steve can be contacted at 633 Champlain St, Berlin, NH 03570 or **kd1jv@ncia.net**. *He has a Web page at* **kd1jv.qrpradio.com**.

Obtaining Good Ground

First steps in hardening the repeater, emergency or home station.

Ed Sutton Jr, KD7PEI

Since September 11, 2001, there has been a growing concern by professionals and amateurs alike to improve and harden communications sites to survive both man-made and natural disasters. I have had the opportunity to examine many repeater and broadcast sites, as well as answer many grounding questions, and conclude these concerns are valid in many cases. With the information presented here, you or your group can start planning and implementing a better ground for improved site reliability.

Though I focused on repeater site applications many of the techniques and procedures presented here are also applicable to the home station. This article contains the most common, good grounding configuration and practices that are agreed to by most engineers as being adequate for communications sites. Eventually, your site will either experience a near miss or be struck by lightning or other radiated high-energy event. How is it going to handle the strike energy?

Planning Criteria

- Your budget for grounding is finite and must be cost effective.
- You are planning to protect the equipment and personnel that may be in the building at the time of the event.
- The building starts with only a primary power safety ground of a single 10 foot ground rod connected at the power entrance panel.
- The tower has minimal grounding of a single 10 foot ground rod attached to one leg or an *Ufer* ground of connected rebar in the base.[1]

Budgetary cost is always of concern. As you start this process, keep in mind that these improvements can be addressed over a period of time and do not have to be done all at once. Spreading the cost over months or even a few years will still pay back dividends in fewer equipment failures (see Figure 1) and improved safety will accrue with each improvement.

A power line surge, lightning, or heaven forbid, a NEMP (nuclear electro magnetic pulse) event, will result in a tremendous amount of current impacting your site in a very short time. Your efforts should be focused on getting as much of this energy safely into the ground along a predetermined path and directed away from on-site personnel and equipment as rapidly as possible. This is accomplished by creating that "good ground" the old timers talk about.

Figure 1 — Oops! This type N connector had its ratings exceeded.

The *National Electrical Code* recommends a minimum of 25 Ω ground or better be achieved at all electrical installations. Commercial engineers often specify a 5 Ω ground system be obtained at the site to ensure a good ground is present through changing conditions of weather and age.

My objective here is to present a description of how to improve the ground system that is already in place so that your site's survivability under harsh events will be more likely.

I will describe the design of a generic grounding system that is readily adaptable to your needs.

Let's Get Started!

As you read on, take notes of the specific components you will need at your site and subtotal each step. This will help you to understand what needs to be budgeted as you plan your site improvements. Remember that while it is great if you can do the entire project at once, it may be beyond the purse of many groups. If so, break it up into manageable improvements. Each step will build on the strengths of the previous steps.

Grounding to protect buildings and metallic structures such as towers, emergency generators, fuel tanks and buildings, is accomplished in a number of ways. Buried electrodes, ground rods, counterpoise system (buried radial dissipation wires) and even underground mats are in common service at sites designed for high reliability. The specific methods are dependent largely on the local soil and rock conditions at your site.

Making it Work

The effectiveness of your system will depend on soil conductivity and the type and size of your system. A basic understanding of grounding requires that we briefly examine lightning current on its way to ground.[2] For any given soil conditions, a lightning current entering a ground rod will radiate outward. The passage of this current through resistive soil will establish a voltage gradient that decreases with distance from its ground entry point.

If we install a number of ground rods at a reasonable distance apart, the total effectiveness increases due to a division of currents between the rods. The larger the distance between these rods, the less the overlap of their individual gradients will be. Dividing individual currents and dissipating them effectively in the soil through the use of ground rods and radial wires will result in an effective ground system.

Step 1, the Ground Ring

The first upgrade to consider is to construct and install a copper ring in the ground around the building. This is one of the few applications in which a complete ring has definite purpose and is cost effective. The ring is bonded to the primary safety power ground rod that is generally located directly beneath the ac power entrance panel. The purpose of the ring is to improve the safety of on-site personnel by ensuring that the electrical footprint of the entire building will rise and fall together, with a minimum of potential difference between any points inside the ring area during a transient event.

Why a Ring?

Current only flows if there exists a difference of potential between two points. When opposite sides of the ring are essentially at the same potential, no current will flow between them. The strike current will dissipate in downward and outward directions away from the building's ring. This action will minimize the potential drop inside the area surrounded by the ring and reduce harmful effects to equipment and personnel within that area.

[1]Notes appear on page 40.

I have seen rings and radials made of 10 gauge wires. While this approach may be better than not having a dissipation system at all, the small wires may melt when exposed to the high currents associated with a typical direct strike. I suggest that you consider making yours of 2 gauge or even larger bare copper wire if your budget can afford it. Some engineers like to use 1.5 to 3 inch wide copper strap for this purpose.

Thicker is Better

It is common in installations at large buildings to make the ring out of 3 or 6 inch copper strap. All conductors have inductance that is related to surface area (skin effect at high frequencies in free space). The larger the surface area, the lower the inductance. The use of copper strap with its larger surface area is desirable but as applied to the small footprint repeater site building, the less expensive wire is a more economical choice.

Once the copper is in the ground, the effective inductance and circuit Q is reduced due to the parallel loss resistance to the ground, so easy to work round wire is good for this purpose. The choice of materials to use is yours. Remember that this component of your ground system may have to dissipate tens of thousands of amps in a few milliseconds, so try to make it as heavy as your budget permits.

Making Connections

I favor exothermic welding (Cadweld or equivalent) of all underground connections but an effective ring can be made using clamped connections. Exothermic tools, fixtures and charges are available at most major mining and electrical supply houses at a reasonable cost. The exothermic process has advantages in that it creates a robust connection that has a very long underground life. Either method may be used to connect the ring to the entrance power safety ground rod.

Figure 2 — Tower leg grounding pigtail attachment. All hardware must be rated for dissimilar metal application. Ox-Gard is applied to the exposed copper wire connections every two years to minimize oxidation.

Wrap all underground clamped connections with a good quality electrical rubber tape such as Scotch 2228 and then cover it with a protective layer of a good vinyl electrical tape before burying. Silicon grease on the connection is helpful in reducing the wicking action of stranded wire at these underground clamped connections and is therefore recommended. The goal in making these connections is to ensure that they remain clean and tight. Moisture wicking is not a problem with welded connections.

This ring should be buried to a depth between 8 and 24 inches deep. The ring depth is determined by the level of mechanical protection that you desire and the local electrical code that applies to your site. Install and bond a 10 foot ground rod at each corner of the ring at the points where it turns around your building.

In a like manner, attach the nearest tower leg to the new ground ring using 2 gauge or larger bare copper wire and an appropriate tongue compression connector attached to a leg bolt as low on the leg as possible (see Figure 2). You should avoid drilling into the tower leg. That will reduce tower structural integrity and, on a galvanized tower, present a point of corrosion.

Select the connector based on the metals used in the wire and tower so that long-term galvanic erosion is minimal. Special alloy connectors are available for use on both galvanized steel and aluminum. You should ask questions when purchasing them. Stainless steel leg straps also work in this application. If your connectors are made of copper, then replace the mounting bolt and hardware with stainless steel. For longest service life, make sure that the bare copper ground wire does not contact the tower directly.

Step 2, Buried Dissipation Radials

You now should design and construct a buried radial system to drain the pulse energy away from the building and tower. Starting from each corner of the building, attach 2 gauge or larger bare copper radial wires to the ground ring using exothermic welding or split bolt connectors. Run these wires outward from the building for a distance of 50 feet or greater. Sometimes it is not possible to have a run 50 feet long. In that case, make the run as long as you can. Attach the outer-most end of the radials to 10 foot ground rods. The 10 foot ground rods should be spaced on each radial at intervals not closer than 20 feet apart. Additional ground rods should be used if your runs are longer. The magic figure for minimum ground rod spacing is twice the single ground rod length. Two 10 foot rods should thus be spaced 20 feet apart. Closer spacing will work but with reduced effectiveness.

Take that Current Away

Next, in a similar manner, add underground radials to the tower. These should also be 2 gauge or larger and should be installed diverging as they extend outward from the tower a minimum of 50 feet or as long as is practical. A rule of thumb suggests that these radial lines should not be shorter than ⅓ the height of the tower and longer if possible. You should consider two radials per tower leg as a minimum. Install more if your budget and space permits. The more radial lines you install the more effective they will be at removing the energy from the tower, building and electronics housed inside.

Because tower current, possibly as high as 200,000 A, will be divided among these lines, each line will handle a fraction of the total tower current. You can save some money on additional radials by using smaller diameter wire but keep them as heavy as you can afford. The additional radials should be at least 6 gauge or larger.

Attach a single short 2 gauge wire as a pigtail to the radial wires underground, associated with each tower leg. These pigtails may be made of insulated or uninsulated wire and are then connected to the bottom of each tower leg. Keep the runs as straight as possible and avoid sharp bends. You can use the same connection technique that you used to connect the tower to the ground ring.

Avoid overlapping radial lines between the tower and building ring radials, when you are laying out your ground system. Overlapping will reduce effectiveness. If you find that any tower radial lines cross the building ground ring radials, electrically bond the affected lines at the overlapping points.

If your tower is guyed, connect the lower point of each guy line to the nearest ground radial with a drop wire. This drop must be connected at the bottom of all the guy lines and is taken off before any turnbuckle so that strike current will be directed to the ground system via the pigtail and not through the turnbuckle. It is common to ground each guy line with a single ground rod. Your improvements should weld or clamp your new buried tower radials to these guy line ground rods so that they are electrically connected together. The tower ground radials should now extend well beyond the guy point.

If you are fortunate enough to have an on-site emergency generator, ground it and its fuel tank with a single 10 foot ground rod and 2 gauge wire (see Figure 3). Then bond these to the nearest ground radial and building ground ring.

Step 3, Controlling and Directing Strike Energy

As you think about strike energy, give

thought to the directions that it comes from and which way you want it to go. We now turn our efforts toward keeping any remaining tower strike energy outside of the building. This is done by properly grounding the antenna transmission lines. The outer shield of all transmission lines should be bonded at the top of the vertical run to the tower using weatherproof grounding kits designed for the specific cable. It is best to not rely on the RF connector at the antenna as the only path to handle strike energy to the tower, so ground your shield using a proper grounding kit (offered by Andrew, PolyPhasor and others). The parallel combination will have a much higher chance of surviving a strike. The vertical cable runs should also be grounded at the bottom as it exits the tower using the same type of grounding kits. If the vertical runs are in excess of 75 feet, bond them to the tower in the middle as well. Really long runs should be bonded to the tower every 50 to 75 feet on the vertical run.

Keep Connections Near Ground

I have been to many sites that are constructed with the antenna lines exiting the tower 8 to 10 feet above the ground and run horizontal to the building. While this looks clean and offers some protection from vandalism, it is not very effective in reducing lightning strike energy from entering your building. There is a better way to help minimize shield current and its associated voltage drop before it enters the building.

Above ground, inductance plays a major role in the performance of the system. Any conductor used for lightning protection or bonding should be as heavy as practicable. Here is an example supporting the technique of bringing the transmission lines down to ground level on the tower, bonding them and then entering the building as low as is practical. In this example, a single ground line is attached to the coaxial shield as it enters the building and drops straight down to the ground ring of the building.

Figure 3 — The generator grounding point after a few years of service. These connections have since been cleaned with a wire brush drill attachment, reattached and painted to reduce future corrosion.

Let's Run the Numbers

The inductance of a straight circular cross section wire is approximately 1 to 1.5 µH/m. It does not change appreciably with conductor size. High energy pulse events such as lightning have a very short rise-time and, as such, the inductance is responsible for most of the voltage drop in that line. This is easily seen in here.

The voltage drop through the conductor is given by the formula:

$$E = I \times R + L\ (di/dt)$$

where:

I = current in amperes
R = conductor dc resistance in ohms
L = conductor inductance in henrys
di/dt = change of current in amperes per unit time in seconds (rise-time)

For this example I will assume these conditions:

Conductor length = 2 meters (line entrance to the building about 6 feet high and the coax is grounded to the tower at an elevation of about 2 meters)

Conductor size = 6 gauge (typical wire used at many sites)

DC resistance = 0.0026 Ω

Total inductance = 2 µH

Current = 1000 A (estimate proportion of current on the shield as it exits the tower)

Rise-time = 1 µs

$E = (1000\ A \times 0.0026\ \Omega) + 0.000002\ H \times (1000\ A/0.000001\ s)$

$E = (2.6) + (2000)$

$E = 2002.6\ V$

A drop of 2000 V is contributed by the inductance in the wire while only 2.6 V is as a result of the wire resistance. An outer conductor potential of 2 kV as it enters the building is not very good. Ideally, each coaxial line should run vertically to the bottom of the tower base where it is connected with a grounding kit to the lowest point on the tower leg and begin its horizontal run to the building at ground level. This will ensure that the coaxial shield is at or very near ground voltage potential (a few tens of volts) and that very little strike energy remains on it.

If you chose to, you could route the coax across or underground and back up the side of the building to enter at a higher elevation. If you followed the math in the above example, I think you will agree that the case is made for bringing the coax to the base of the tower and grounding it there. This will go a long way toward keeping excess energy from entering your building.

Take the Bus

A copper entrance ground bus should be installed on the outside of the building, a few inches below where the coaxial lines enter. You should bond all transmission lines to the bus. This bus should be connected to the ground ring from step 1 using two or more 1.5 or 3 inch copper ground straps. Since this component of the system is above ground, the inductance of the strap is very important. The use of copper ground straps here is especially important if your coaxial lines exit the tower at a height of a few meters above the tower base. Each 1.5 inch strap will have approximately 75% of the inductance of a 6 gauge wire and result in approximately 25% reduction of the voltage in the example above.

If copper straps are not available then use several heavy wires for this purpose. Parallel conductors will result in a lower total inductance and its associated voltage drop. The 6 gauge used as in the example above, resulted in the lines being 2000 V above ground. Using two 1.5 inch copper ground straps instead of a single 6 gauge wire would split the current in half on each strap and with the lower inductance will result in less than 800 V on the shield at the point of entry to the building. If you do not use copper strap anywhere else, consider using it on this entrance bus. You should ground each transmission line to the bus using weatherproof grounding kits and keep the leads as short and direct as practicable.

Hold Back the Coax Current

Some engineers like to add series inductance to the coaxial run just before it enters the building. The thought here is to impede lightning current on the coaxial feeds going into the building. This will impede the lightning pulse from entering the building via this path and help ensure that the majority of strike current goes to ground via the entrance ground bus and the tower grounding system.

The concept is sound and it does work, provided a transformer coupling effect does not exist with the tower. The inductor may consist of a coil made of a couple of turns of the coax or a ferrite coaxial isolator on each line. There are pros and cons for each. If you chose to add either of these inductors, they should be located inside the building so that the lightning will have a favored path to ground outside the building.

If typical ferrite isolators are used, make sure that your coaxial lines exit the tower at ground level. Otherwise, exiting the tower at a couple of meters height, the strike current on the line will most likely be sufficient to catastrophically saturate the ferrite material. When this happens the ferrite will heat and explosively break apart. If your lines exit the tower at the base for your run, only a few amps will be present and the ferrite isolators should be fine. Air coils generally will not saturate at these current levels but take up quite a bit of room inside the building. Depending on coil orientation, they may actually inductively couple strike energy from the tower and result

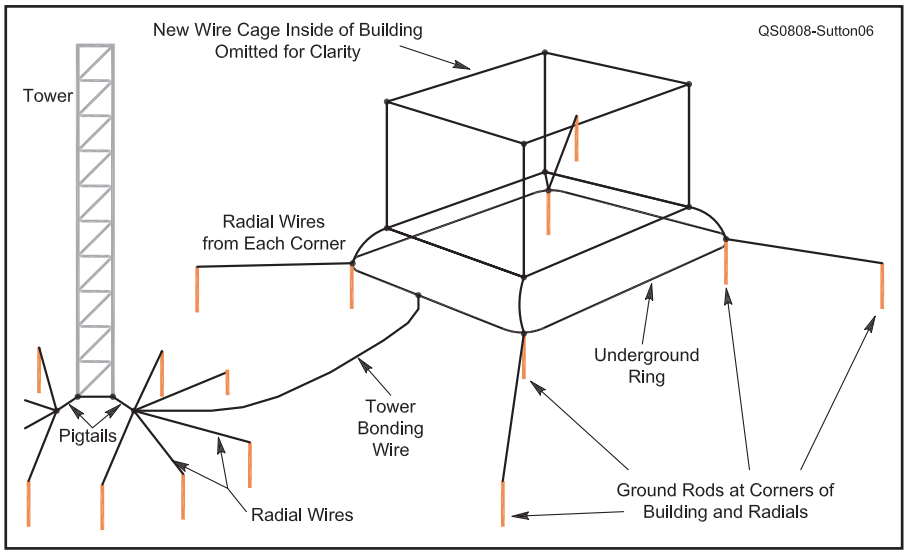


Figure 4 — X-ray schematic of the basic "good ground" system.

in more current applied to the equipment. It is your choice whether or not you employ either of these on your system.

Step 4, the Cage

We will now address the grounding inside your building. Continuing with the transmission lines, install coaxial transient suppressors on each line at the point at which it enters the building. These should be mounted on a grounded bulkhead plate designed for this class of service. These are available from many sources. These suppressors limit the center conductor to shield voltage and are selected based on frequency and power level of the associate transmitter. The better devices use gas tube or spark gap technology and have a dc blocked center conductor. The dc block forms a simple high pass filter to help reduce the throughput energy of the lightning strike. Most of the lightning energy is found at about 1 MHz so it is possible to reduce that energy in a communications system that operates at a much higher frequency. I will address where to ground the bulkhead plate in a moment.

Keep the Sharks Out of the Cage

Next you need to fabricate an electrical protection cage inside the building. This will reduce any touch voltages that are associated with a strike and improve the safety of any on-site personnel and help protect equipment from side flash. Much like a Faraday cage, this is easily constructed using 4 to 6 gauge insulated wire. Form two loops of your chosen material around the inside perimeter of the ceiling and floor. Temporarily remove the door threshold and route the lower loop under it. Secure these wires in the corners and at approximately 18 to 24 inch intervals with suitable electrical tongue C clamps screwed to the top of the wall.

Next, bond vertical runs of 6 gauge wire to the corners of the top loop. Run these down and connect them to the bottom loop using appropriate split bolt connectors. Dress the runs next to the wall and secure them with C clamps.

Metal doors and door jambs should also be bonded to this new cage. Bond the top and bottom of the door jamb to the top and bottom of the cage rings using 6 gauge wire. Metal doors should then be bonded to the lower ring only with a short jumper. You should use a wire brush or a hand drill to remove any paint at the points of connection. Any wall penetrations such as air-conditioning units or a cable entrance bulkhead plate should be bonded with a wire going down to the floor ring.

Bring the Cage Down to Earth

Next, drill a hole near each of the four bottom corners of the building. Then connect each bottom corner of the cage to the underground building ring using 6 gauge or larger insulated wires. Weather seal each hole. This completes the installation of the protection cage.

Finally, bond the coaxial transient protectors to the ground ring on the floor using your choice of 3 inch copper strap, two 1.5 inch copper straps or two 4 gauge copper wires. All equipment racks should be grounded to the bottom of the cage ring via the most direct path wherever possible. Avoid grounding the racks to the top of the cage. The bottom of the ring is your lowest potential ground point.

Related to the survivability of the site and as separate projects, two coaxial transient protectors should be used on each transmission line. These are located at both the antenna end and at the point of entry to the building. AC power should have transient protectors installed at the entrance panel and so should any telephone, cable TV and generator control lines that enter the building.

Wrapping Up

I have described here what most broadcast engineers agree to as a minimum station ground system. The complete system is shown in Figure 4. This process can be divided up into manageable and affordable improvements that any serious repeater club or emergency services group can achieve in a reasonable time frame. The benefits of this type of grounding system become evident every time we experience severe weather, natural or man-made disaster, in more reliable systems to assist in our efforts in reliable emergency communications.

I wish to thank the many engineers who contributed their knowledge to me over these years. Additional sources included various publications from ARRL, particularly *The ARRL Handbook*, General Electric, RCA, PolyPhasor and many, many others.[3] In all candor, memory being what it is, I do not recall all the names but you do have my gratitude. It is my dream that the reader will be inspired and build on this collective knowledge.

Notes

[1]An Ufer ground, named after the inventor, is a grounding solution for locations with minimal water table or rainfall. It makes use of the properties of concrete with reinforcing bars (rebar).See **www.psihq.com/iread/ufergrnd.htm** for more information.

[2]L. Scheff, W4QEJ, "Lightning: Understand it or Suffer the Consequences — *Part 1*," *QST*, Feb 2008, pp 40-44; Part 2 — Apr 2008, pp 30-34.

[3]*The ARRL Handbook for Radio Communications*, 2008 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1018. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

Photos by the author.

Ed Sutton Jr is a product of Arizona State University and has held an FCC First Class Commercial Radiotelephone license with radar endorsement since the mid '70s. He holds an Amateur Extra class license and is an ARRL member. Ed has over 30 years of commercial broadcasting and 7 years of industrial radio communications experience. He retired as Director of Engineering from KPHO TV-KPHO DT (the CBS affiliate in Phoenix) in May 2006. Among his duties were the design, construction, licensing, operation and maintenance of high power VHF and UHF television transmitters, translators and microwave and control systems at multiple mountain top sites in Arizona. Ed can be reached at 3523 West Shangri La Rd, Phoenix, AZ 85029 or at **ed.sutton.jr@cox.net**.

Down Periscope — The Remote Mobile Antenna Lowering System

Get your mobile antenna and your vehicle in the garage at the same time.

Bob Booher, K8JPM

If you are an HF mobile enthusiast as I am, you may have the same problem that I do. I cannot pull my vehicle, a 2005 Ford F150, into my garage without first getting out and lowering my SGC vertical whip (see Figure 1). While not a big deal in good weather, it becomes a pain in the neck in inclement weather. After putting up with this inconvenience for 18 years of HF mobiling, covering several vehicles and two locations, I had a brain flash (or is that "flush"). While I don't claim to have invented anything, I had a vision of a potential solution to the antenna lowering dilemma. How about mounting a small, inexpensive rotator horizontally and using it to raise and lower the antenna!

With that thought in mind, I set out to find a rotator. At the 2007 Dayton Hamvention I found one for $20. I learned my first lesson about rotators: Some can perform when mounted horizontally, while others cannot. Let me just say that my first endeavor was with a rotator that clearly was not designed to operate in the horizontal position. After only one day of operation, the rotator stopped raising the antenna due to disengagement of the drive gears because there was no weight in the vertical axis of the rotator to keep the gears fully engaged.

During a morning contact on 40 meters, my good friend Fred, K5FA, suggested that I use an Alliance rotator. That rotator uses a worm gear drive and will operate very reliably in the horizontal position. Although no longer manufactured, they are fairly easy to find from sources such as QTH.com or Norm's Rotator Service (just to name a couple) and vary in price depending upon condition. I found one for $50. When the rotator arrived, I confirmed that it worked and soon was busy mounting it on my Ford F150. A 1 inch galvanized pipe nipple, a galvanized pipe flange, and a 4 × 7 inch long piece of ⅜ inch thick aluminum bar stock along with the necessary stainless steel fasteners were all it took to put me in business (see Figure 2). I drilled an ⅛ inch hole through the pipe nipple and flange into which I put a ⅛ inch roll pin to prevent thread rotation.

With the mechanical stuff done, I plugged the Alliance rotator control box into a 115 V ac outlet and verified that the rotator would actually raise and lower the antenna. It did so with ease. Success! By the way, the worm gear drive of the Alliance rotator also prevents creep, which was a problem I had on my first try. Wind loading would rotate the antenna backward, and the weight of the antenna in the down position would cause it to continue to creep downward. Not so with the Alliance rotator; it stays where you put it.

Figure 1 — The problem — 12 foot high antenna, 7 foot high door!

Next step was to insert an inverter to con-

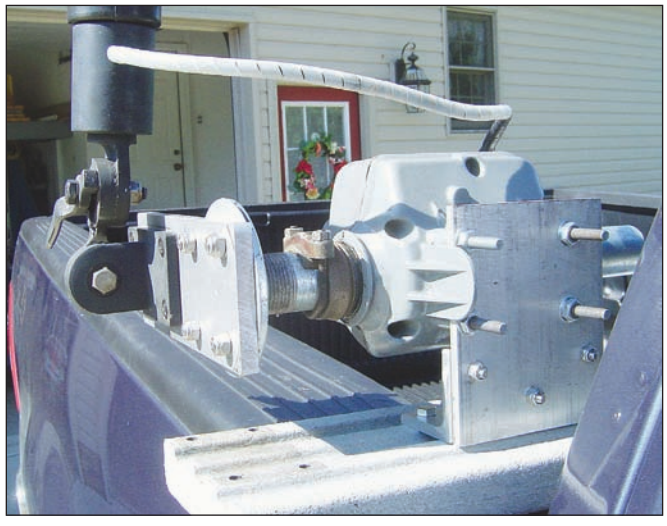


Figure 2 — Alliance rotator in place with SGC antenna.

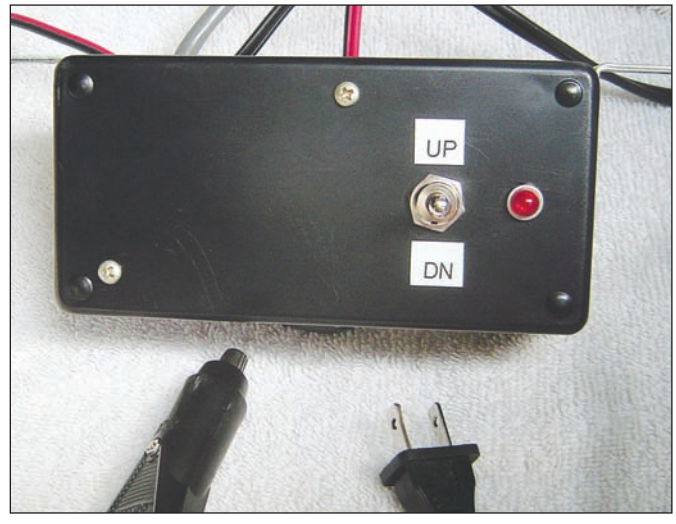


Figure 3 — Completed replacement control box.

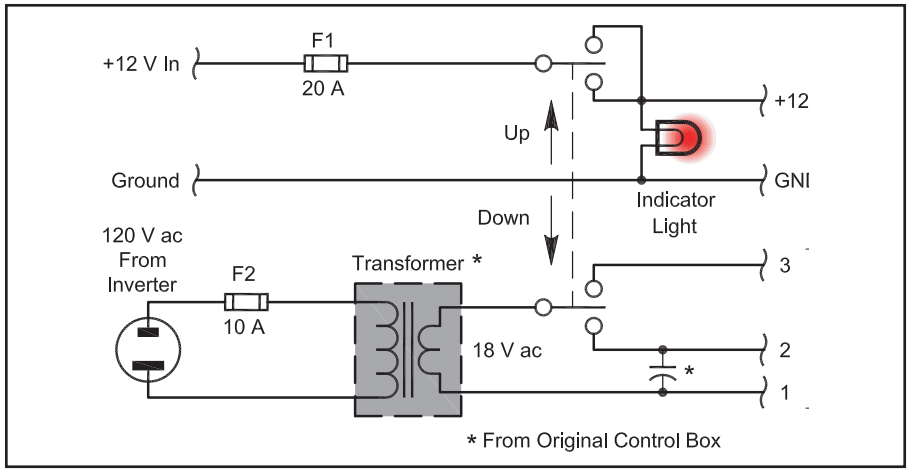


Figure 4 — Schematic diagram of final control box.

Figure 5 — Antenna shown in stowed position (leaving enough room to open passenger door).

vert the nominal auto power source of 12 V dc to the 120 V ac that the rotator requires. I found an inexpensive 400 W inverter at Harbor Freight (**www.harborfreight.com**, on sale for $20). I wired it in and tested it. Success again!

The last obstacle was the control box. While it is possible to use the Alliance control box as is, it was not convenient for me because it was too large and too hard to mount in my mobile installation. Therefore, I disassembled the control box, salvaging only the power transformer and capacitor. I assembled a new control box using the salvaged parts and an ON-OFF-ON DPDT switch from my junk box and an inexpensive plastic project box available at RadioShack. The finished product is shown in Figure 3. The control schematic is shown in Figure 4. Only three wires are required to go to the rotator, since no direction indication is required. If rotation is backwards, interchange wires going to rotator terminals 1 and 2. The control is easy to use: Push the switch UP to raise the antenna, DN to lower the antenna, and center is OFF. The inverter powers up only while the switch is in the UP or DN position. Simple!

Adjust the rotator so that it reaches end of rotation in the vertical position. That way you can hold the switch in the UP position until the rotator stalls (a few seconds of stall does not hurt the rotator) and the antenna is in the correct vertical position. Figure 5 shows the stowed position of the antenna.

The rotator has been in use for about a month and has worked flawlessly. My installation is not pretty due to the fact that I did not want to drill any holes into my F-150. Therefore I laid a piece of composite deck board across the bed and have it anchored into the stake holes of the bed. The rotator and antenna are mounted on the deck board. This part of the installation is pretty much up to the individual.

Well, that is the end of the story. It is not a detailed construction article because everyone has a slightly different antenna mounting situation. For me, it works great and now I don't have to get out of my truck to lower or raise the antenna anymore. Is that lazy or what?

Photos by the author.

Bob Booher, K8JPM, has been a ham for 50 years and currently holds an Amateur Extra class license. Bob is a Life Member of the ARRL. He has BSEE and MBA degrees and spent 40 years designing aircraft antiskid systems. He is now retired. A CW ragchewer, he can usually be found on the low end of 40 or 80 meters operating from his fixed or mobile stations. Bob and his wife, Peggy, WB8ZPW, a General class licensee, can be reached at 11155 Immel Ave NE, Hartville, OH 44632 or at **k8jpm@neo.rr.com**.

New Products

WESTINGHOUSE — DVD FROM INECOM ENTERTAINMENT

◊ *Westinghouse* is a feature-length documentary about the life and times of George Westinghouse, his companies, legacy, personality and achievements. His victory over Thomas Edison during the Battle of the Currents set the stage for the future of electric power, and the Westinghouse air brake is considered one of the most important inventions in history. Automobile shock absorbers, railroad signaling and the modern day weekend are said to owe their existence to this man. His spirit lived on for decades when his former companies created the golden age of American-made appliances, machines and technologies. *Westinghouse* was filmed in cooperation with the George Westinghouse Museum and features rare and never before seen footage, industrial films and photos previously buried deep within the Westinghouse archives. Filmed in high definition, the DVD includes an interview with Edward J. Reis, Executive Director of the George Westinghouse Museum. Price: $24.95. Available from Amazon.com and other retailers. For more information, visit **www.inecom.com**.

PRODUCT REVIEW

Two More Antenna System Measurement Devices

Reviewed by Joel R. Hallas, W1ZR
QST Technical Editor

Antenna system measurement devices are one of the most popular categories of auxiliary amateur station equipment. This should not be a surprise, since antenna systems are one of the major areas of amateur construction, experimentation and repair. Having a device that can characterize an antenna in one step is a great help in all of these pursuits. Amateurs have a wide range of choices, many of which have been reviewed or described in *QST* or *QEX* in recent years.[1-8]

This time we have two different types of units. One is a computer controlled device that can perform both antenna and network analyzer tasks, as well as serve as an accurate signal source. The other can be used as a handheld meter, but also can provide computer displayed data and serve as a signal source. You may want to look over the earlier reviews and articles as part of your assessment of these units to decide which type best fits your requirements. We describe each below — in alphabetical order.

mini Radio Solutions miniVNA NETWORK AND ANTENNA ANALYZER

This capable device can fit into a shirt pocket. It can measure the usual antenna parameters across frequencies ranging from 0.1 to 180 MHz in whatever size slice you want. It can also do much more, as we will discuss. To do anything, however, it needs to be connected to a computer, so we're talking about a shirt pocket and a backpack, or perhaps another pocket, for the PC. Bluetooth operation is also possible for remote measurement.

What's it Do?

The unit has three connectors — a data connector to hook to a PC USB port, a DUT (device under test) BNC connector and a DET (detector) BNC connector. There is no power connector because the unit derives power from the computer's USB port, although you will have to rig a dc source if you use it with a Bluetooth device. Specifications are provided in Table 1.

Antenna Analyzer Mode

In antenna analyzer mode, the left tab on top of the PC display screen, the DET port is left unused and the antenna system is connected to the DUT port. Figure 1 shows the resulting output, and it looks a bit overwhelming until you decide to select only the parameters of interest. Once you deselect the parameters you don't want to look at, it becomes very manageable. For example, for antenna tuning you may wish to just view SWR. In addition to the plotted data, a click to move either "marker" to any frequency will provide you with the tabular data for the two marker frequencies shown below the plot.

The frequency sweep range can be set manually, or you can select either the HF BANDS or VHF BANDS box and it will give a choice of a frequency range that includes each amateur band, with considerable overlap. The outputs are pretty straightforward, once you decide what they mean (they aren't described in the docu-

Bottom Line

A very useful device for both antenna and lab measurements — if you can figure out for yourself how to use it and what all the buttons mean. A promised effort by the manufacturer and distributor should resolve this fairly quickly.

Table 1
miniVNA Antenna Impedance Meter

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency range: 0.1 to 180 MHz.	As specified.
Frequency accuracy: Not specified.	54.4 ppm.
Impedance range: Not specified.	Tested from 5-1000 Ω.
Impedance accuracy: Not specified	See Table 3.
Drift: 30 ppm.	N/A
Output power: 1.0 mW max, load not specified.	0.6 mW into 50 Ω.
Power requirements: USB connection.	
Size (height, width, depth): 1 × 2.25 × 5 inches.	
Price: $399.	

[1]J. Hallas, W1ZR, "A Look at Some High-End Antenna Analyzers," Product Review, *QST*, May 2005, pp 65-69. *QST* Product reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.
[2]J. Hallas, W1ZR, "Antenna Analyzers with a Different View," Product Review, *QST*, Nov 2006, pp 70-74.
[3]M. Wilson, K1RO, "Array Solutions PowerMaster Wattmeter," Product Review, *QST*, Jan 2006, pp 70-72.
[4]J. Carcia, NJ1Q, "Alpha Power 4510 Wattmeter," Product Review, *QST*, Jul 2006, pp 62-64.
[5]J. Hallas, W1ZR, "Three More Antenna System Measurement Devices," Product Review, *QST*, Aug 2007, pp 67-73.
[6]B. Clunn, W5BIG, "An Antenna Impedance Meter for the High Frequency Bands," *QST*, Nov 2006, pp 28-32.
[7]L. Phipps, N8LP, "The LP-100 Wattmeter," *QEX*, Jan/Feb 2006, pp 3-13.
[8]J. Hallas, W1ZR, "WaveNode WN-1 Station Monitoring System," Product Review, *QST*, Oct 2004, pp 71-74.

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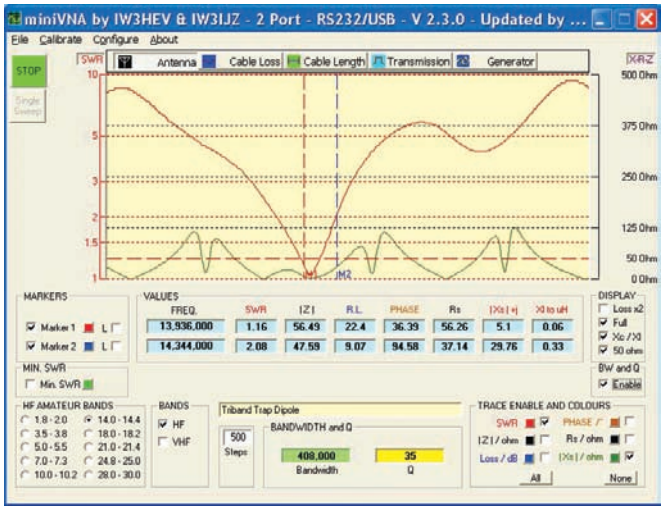

Figure 1 — The miniVNA output in antenna analyzer mode. The multiple displays can be reduced if unneeded to show only desired data.

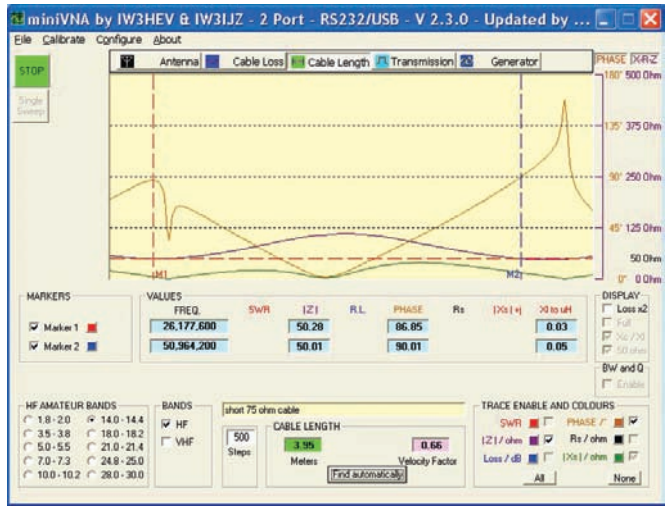

Figure 2 — The miniVNA display while in automatic cable length measuring mode.

mentation, see below). As with most, but not all, such units, the plotted phase is provided on a 0 to 180° basis without an indication of sign. There is a choice of an additional display parameter, XL/XC, that appears to change depending on whether it thinks the reactance is capacitive or inductive. The associated L or C value is provided.

Vector Network Analyzer Modes

By selecting any of the next three tabs, you are in vector network analyzer (VNA) mode. In this case, rather than examining the impedance of a two-terminal device, the internal generator signal from the DET port is passed through the device under test with its output connected to the DUT port. In this mode, cables may be tested for insertion loss or their length estimated. Filters and other selective devices may be measured over a wide frequency range.

Figure 2 shows a cable loss measurement, while Figure 3 is the throughput of an old R. L. Drake low pass filter that I found in a corner of the basement. I put one marker on the top of its passband and the other just into the lower edge of TV channel 2. As noted, after many years of sitting on a shelf, the filter still passes 10 meters and attenuates signals in the TV band. While the display only indicates a 30 dB range, the actual dynamic range is specified at 50 to 55 dB, borne out in the tabular data. Offsets can be entered to shift the position of the 30 dB of graphical display range, or you can check the LOSS X2 box and expand the scale to 60 dB. While this is not quite up to the capabilities of the more serious VNAs on the market, it may be just what an amateur needs at a fraction of the usual cost.

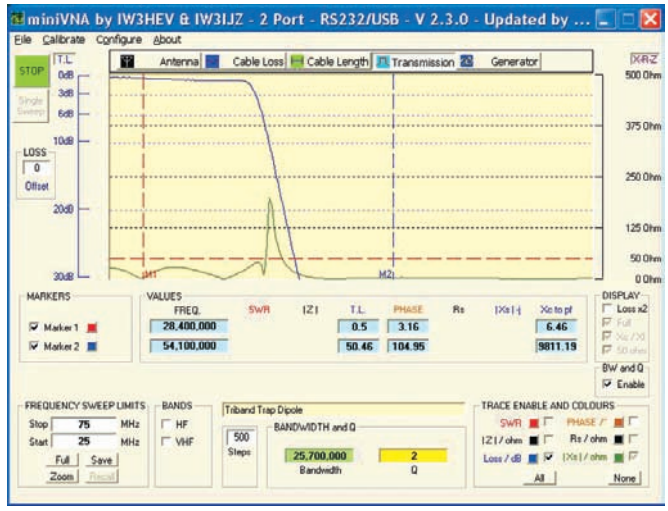

Figure 3 — Using the network analyzer mode of the miniVNA to measure the characteristics of a low pass filter.

Documentation

This may be the weakest link of this otherwise innovative product, and hopefully one that will be corrected fairly soon. Packed with the device is a single 8½ × 11 inch sheet with German on one side and English on the other. It is called a *Quick Installation Reference Manual*, and while it was certainly quick, I didn't find it very helpful for installation, or much else. The included CD and installation program ran fine, after I found the .exe file, but there was a requirement to find a manufacturer's driver file for the internal USB device. I did find that on the Internet, but the files referenced in the *Quick Start* were nowhere to be found. It did finally set up using the autodetect function, although it first detected other ports connected to my PC and keyed up my transceiver! Its operational instructions just said "press RUN to start measuring." Some may like a bit more guidance on what and how to measure!

I went to the mRS Web site and was pleased to find an eight page *Reference Manual*. This was better, but still didn't quite help me find the files they wanted me to modify to set the COM port. This manual includes a hardware description, with indication of where to connect dc if you use a different kind of device, such as the Bluetooth transceiver. Each mode is described in about half a page with a screen shot, but they seem to assume that the screen, and operation, are self explanatory.

I found a glimmer of hope on the Web page of their US distributor, W4RT. Here was a link to different seven page document called the *Software Manual*. This started with a description of the CALIBRATE function, not mentioned elsewhere and then provided a thoughtful description of how to use the device in some representative applications. A thoroughly revised set of documentation, along with expanded software is promised around the time you read this.

Manufacturer: mini Radio Solutions, **www.miniradiosolutions.com**; US distributor: W4RT Electronics, 3077-K Leeman Ferry Rd, Huntsville, AL 35801; **www.w4rt.com**.

RIGEXPERT AA-200 ANTENNA ANALYZER

The AA-200 consists of a rugged appearing handheld device with a UHF connector on top for connection to an antenna or other device to be tested, a data connector for connection to a PC USB port (see below), power switch and charger socket on the bottom. Operator interaction is provided through a custom keypad and monochrome LCD screen. A nice feature is that rechargeable batteries are included. Also included is a handy carrying case with shoulder strap and clear window for controls and display, a charger, data cable and software CD.

As with most antenna analyzers, this unit has a single connector for a "two-port" device. The AA-200 is menu driven (see Figure 4) and can provide bar type graphs or numerical SWR or Z data at one or more frequencies. It can also provide swept frequency data. In operation, I found the bar graphs best for making adjustments, since the display updates rapidly, while the swept data is most useful for a summary of results across a band following adjustment or repair. The specifications are shown in Table 2.

Measuring SWR

Standing wave ratio (SWR) is the meat and potatoes of such a device. Set for a single frequency, the LCD shows a nice-to-tune-with calibrated bar graph, a large font SWR readout to three digits, and the selected frequency, lest you forget. See Figure 5.

Selecting SHOW ALL on the menu provides the details of the impedance being measured. This provides the measurement frequency, the SWR and also your choice of a series or parallel equivalent model of R and X, including sign and even the calculated equivalent capacitance or inductance value. See Figure 6. This is much more useful data than just SWR if you wish to design a network to match the load, for example.

A plot of SWR (Figure 7) or $R \pm jX$ (Figure 8) versus frequency can be easily arranged, again in either series or parallel equivalent model. Unlike many devices, the sign of the reactance is shown, as well as its value.

Bottom Line

The AA-200 is a very competent and easy to use analyzer providing single or multi-frequency point or plotted data on a useful LCD display.

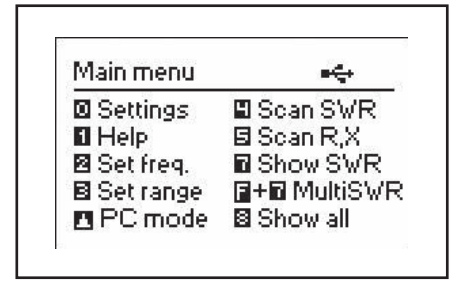

Figure 4 — Main menu screen of AA-200.

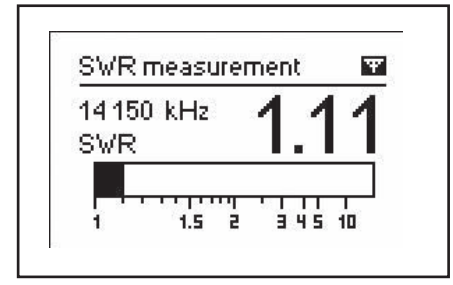

Figure 5 — Calibrated bar graph display in single frequency mode.

MultiSWR Mode

A nice feature I haven't seen before is that data on multiple distinct frequencies can be observed simultaneously. This can be very useful while making adjustments on multiband antennas. In this case the display shows the frequency and a relative bar graph for each frequency (Figure 9) or the actual numerical SWR value. Without this feature, one often has to cycle through the interacting bands multiple times to get them all right. With the AA-200, you can observe the effects on up to five bands while you make adjustments.

SWR2Air Mode

Another unique feature, in my experience, is the "SWR2Air" mode. In spite of the fancy carry case, this allows you to leave the meter at the station while you are up the tower making adjustments. If you bring along your VHF handheld, or even a portable HF radio, you can cause an aural indication of SWR to appear in your portable radio — perhaps less costly than the AA-200 if dropped from the tower. I didn't find the documentation too clear on what to listen for, but I set it up to output on a 2 meter simplex frequency and sure enough, as I adjusted the antenna tuner on my 20 meter antenna, the pulse repetition frequency increased rapidly as the SWR approached 1:1. It is probably easier to use than describe.

Table 2

RigExpert AA-200 Antenna Impedance Meter, serial number 058

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency range: 0.1 to 200 MHz.	As specified.
Frequency accuracy: Not specified.	36.7 ppm (after warmup).
Impedance range: Not specified.	Tested from 5-1000 Ω.
Impedance accuracy: Not specified.	See Table 3.
Drift: Not specified.	1.3 ppm in 30 min.
Output power: 10 mW max, load not specified.	10 mW 50 Ω (14 MHz). 6.2 mW 50 Ω (144 MHz).

Power requirements: 9-14 V, 200 mA charger.
Size (height, width, depth): 9 × 4 × 2 inches; weight, 1.4 pounds.
Price: $500.

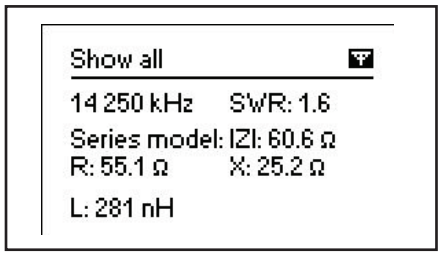

Figure 6 — Screen shot of SHOW ALL display in series equivalent mode. A parallel equivalent circuit model may also be selected. Note that the sign of the reactance is provided.

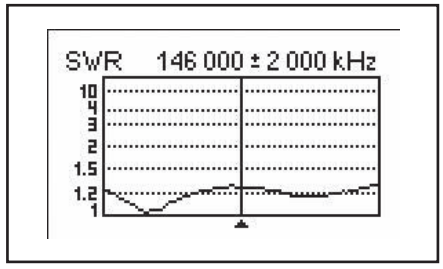

Figure 7 — Plot of SWR versus frequency.

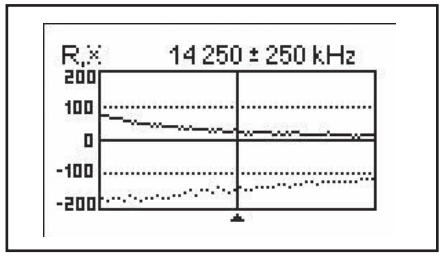

Figure 8 — Plot of R ± *j*X versus frequency.

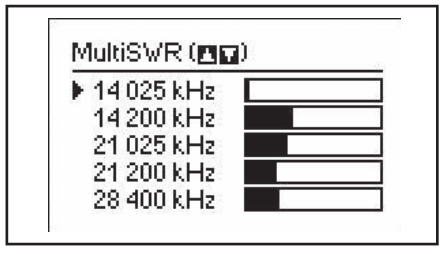

Figure 9 — Multi-frequency SWR plot with relative bar graph display. The five frequencies can be anywhere within the meter's range. Very handy for adjusting multiband antennas.

Table 3

Impedance and SWR Measurements

Load	*Frequency*	*MiniVNA*	*AA-200*	*Agilent 4291B (Reference)**
50 Ω (1:1 SWR)	3.5 MHz	51.2+*j*0.2 Ω, (1.0:1)	50.1–*j*0.1 Ω, (1.0:1)	50+*j*0 Ω**
	14 MHz	51.1+*j*0.3 Ω, (1.0:1)	50.1+*j*0.1 Ω, (1.0:1)	50+*j*0 Ω
	28 MHz	51.2+*j*0.3 Ω, (1.0:1)	49.9+*j*0.2 Ω, (1.0:1)	50+*j*0 Ω
	50 MHz	51.2+*j*0.3 Ω, (1.0:1)	49.8–*j*0.4 Ω, (1.0:1)	50+*j*0 Ω
	144 MHz	50.7+*j*0.7 Ω, (1.0:1)	49.0–*j*1.5 Ω, (1.0:1)	50+*j*0 Ω
5.0 Ω (10:1 SWR)	3.5 MHz	2.3+*j*0.1 Ω, (21.7:1)	5.0+*j*0.2 Ω, (9.9:1)	5.1+*j*0.0 Ω
	14 MHz	2.1+*j*0.4 Ω, (23.8:1)	5.0+*j*0.6 Ω, (9.9:1)	5.1+*j*0.2 Ω
	28 MHz	2.0+*j*2.6 Ω, (25.1:1)	4.9+*j*1.1 Ω, (10:1)	5.1+*j*0.4 Ω
	50 MHz	1.5+*j*6.3 Ω, (33.9:1)	4.7+*j*2.2 Ω, (10.6:1)	5.2+*j*0.7 Ω
	144 MHz	1.0+*j*23.5 Ω, (61.1:1)	3.2+*j*5.1 Ω, (15.6:1)	5.2+*j*1.9 Ω
25 Ω (2:1 SWR)	3.5 MHz	24.3+*j*0.1 Ω, (2.1:1)	25.1–*j*0.1 Ω, (2.0:1)	25.1+*j*0 Ω
	14 MHz	24.0+*j*0.2 Ω, (2.1:1)	25.0+*j*0.6 Ω, (2.0:1)	25.1+*j*0.2 Ω
	28 MHz	23.8+*j*2.1 Ω, (2.1:1)	25.1+*j*1.0 Ω, (2.0:1)	25.1+*j*0.4 Ω
	50 MHz	23.9+*j*4.9 Ω, (2.1:1)	25.2+*j*1.9 Ω, (2.0:1)	25.1+*j*0.7 Ω
	144 MHz	26.0+*j*17.7 Ω, (2.2:1)	24.2+*j*5.0 Ω, (2.1:1)	25.2+*j*2.0 Ω
100 Ω (2:1 SWR)	3.5 MHz	101.4+*j*2.4 Ω, (2.0:1)	98.9–*j*1.7 Ω, (2.0:1)	100–*j*0.2 Ω
	14 MHz	101.8+*j*4.6 Ω, (2.0:1)	101–*j*3.8 Ω, (2.0:1)	100–*j*0.9 Ω
	28 MHz	101.3+*j*10.2 Ω, (2.1:1)	99.0–*j*5.4 Ω, (2.0:1)	100–*j*1.8 Ω
	50 MHz	98.0+*j*19.5 Ω, (2.1:1)	97.3–*j*11.4 Ω, (2.0:1)	99.9–*j*3.1 Ω
	144 MHz	68.0+*j*40.7 Ω, (2.1:1)	88.8–*j*30.5 Ω, (2.1:1)	99–*j*8.9 Ω
200 Ω (4:1 SWR)	3.5 MHz	202.0+*j*10.6 Ω, (4.1:1)	198–*j*6.8 Ω, (4.0:1)	201–*j*1.2 Ω
	14 MHz	199.9+*j*22.1 Ω, (4.1:1)	198–*j*17.6 Ω, (4.0:1)	201–*j*4.8 Ω
	28 MHz	194.2+*j*50.5 Ω, (4.2:1)	195–*j*30.0 Ω, (4.0:1)	200–*j*9.4 Ω
	50 MHz	165.1+*j*83.7 Ω, (4.2:1)	180–*j*50.6 Ω, (3.9:1)	199–*j*16 Ω
	144 MHz	57.4+*j*87.3 Ω, (4.5:1)	114–*j*100 Ω, (4.2:1)	189–*j*45 Ω
1000 Ω (20:1 SWR)	3.5 MHz	917+*j*314 Ω, (20.2:1)	894–*j*106 Ω , (18:1)	998–*j*33 Ω
	14 MHz	755+*j*449 Ω, (20.2:1)	685–*j*222 Ω, (15.1:1)	981–*j*127 Ω
	28 MHz	352+*j*484 Ω, (20.2:1)	501–*j*376 Ω, (15.7:1)	935–*j*239 Ω
	50 MHz	130+*j*337 Ω, (20.2:1)	299–*j*358 Ω, (14.7:1)	825–*j*373 Ω
	144 MHz	12.1+*j*119.7 Ω, (28:1)	33.8–*j*203 Ω, (26.5:1)	373–*j*476 Ω
50 – *j*50 Ω (2.62:1 SWR)	3.5 MHz	50.8–*j*49.1 Ω, (2.6:1)	46.3–*j*46.4 Ω, (2.5:1)	50–*j*47 Ω
	14 MHz	44.8–*j*52.9 Ω, (2.9:1)	44.5–*j*52.7 Ω, (2.9:1)	48–*j*52 Ω
	28 MHz	44.1–*j*47.0 Ω, (2.6:1)	60.4+*j*53.8 Ω, (2.6:1)	51–*j*48 Ω
50 + *j*50 Ω (2.62:1 SWR)	3.5 MHz	54.5+*j*52.7 Ω, (2.6:1)	48.3+*j*49.7 Ω, (2.6:1)	52+*j*50 Ω
	14 MHz	59.1+*j*52.4 Ω, (2.6:1)	49.4+*j*47.4 Ω, (2.5:1)	53+*j*48 Ω
	28 MHz	61.4+*j*56.0 Ω, (2.7:1)	60.4+*j*53.8 Ω, (2.6:1)	65+*j*51 Ω

*The SWR test loads constructed in the ARRL Lab were measured on an Agilent 4291B Impedance Analyzer by ARRL TA John Grebenkemper, KI6WX.

**An HP 11593A precision termination was used for the 50 Ω tests. This termination is accurate over a wide frequency range.

Computer Connection

The AA-200 also provides displayed data as screen shots on a USB connected computer. This is particularly handy, especially to provide a record of plots of antenna data for historical comparison. Although the provided CD self-started nicely and indicated that everything went smoothly, including the USB port device driver, it took an e-mail to Rig Expert to get a seven page *Software Manual* that identified the easy keystrokes to do this. This is how the figures shown were generated.

Documentation

The AA-200 is provided with an 18 page *User's Manual*, also available on their Web site if you want to look it over before you buy. With the exception of the description of the computer connection, the manual does a good job of describing the basic functions of the device. In addition, the last eight pages are devoted to using the AA-200 in various applications. This starts with antennas, but moves through measuring characteristics of cables, lumped inductors and capacitors and even provides a word about using the AA-200 as a +10 dBm signal generator.

The *Software Manual* may be on the Rig Expert Web page as you read this. It provides a much better description of how to use the software than the *User's Manual*, but could be even more helpful. An auxiliary program, *AntScope*, is provided to generate

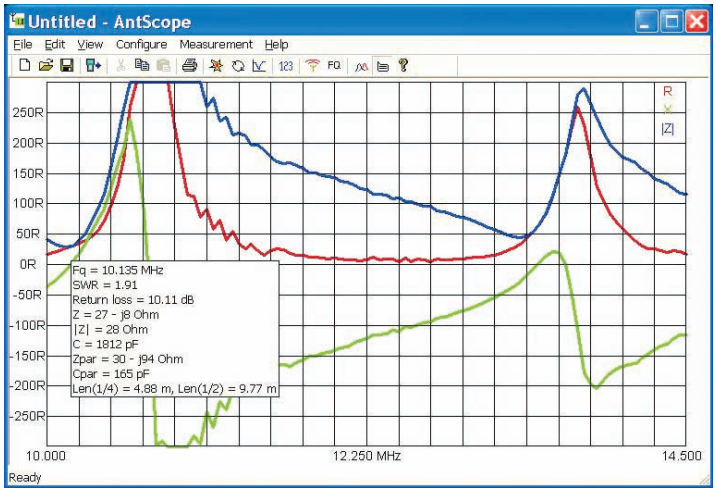

Figure 10 — Screen shot of HF antenna data taken with AA-200 and displayed on *Antenna Scope*.

full screen color plots of the recoded data, a sample shown as Figure 10. These plots can be generated from selections made on the computer, or can be made from recorded data taken from the AA-200. They provide a much higher resolution with detailed data shown as the cursor is moved along the plot, as shown in the figure. It would have been even more useful if I could have found a way to change the scale of the impedance axis.

Manufacturer: Rig Expert Ukraine Ltd, **www.rigexpert.com**. *North American distributor:* Rig Expert Canada, **www.rigexpert.net**. *US distributor:* The Digital Ham, 537 Stone Creek Dr, Lexington, KY 40503; **thedigitalham.com**.

A Look at Butane Powered Soldering Tools

Reviewed by Geoff Haines, N1GY
Technical Coordinator, ARRL West Central Florida Section

Last year, *QST* looked at battery powered soldering tools to see if these devices had any real use in Amateur Radio, and if the hype surrounding certain brands was justified.[9] The results of that evaluation surprised me in a number of ways. Within the limitations of their power capabilities, some of the devices were quite acceptable for light duty soldering. After that review was published, a number of readers suggested that we try their butane gas powered cousins.

The six tools tested here represent a sampling of the many choices available. Some models can perform the functions of a soldering iron and a small blowtorch; most can also function as a hot knife and as a heat source for working with heat shrink insulating material. In some cases you can get just the soldering tool; in others it's a kit that includes multiple tips. All of them use standard butane of the type used to refill cigarette lighters, available from hobby stores and other retailers.

Performance Tests

This evaluation considers soldering performance for some typical Amateur Radio tasks. The tests are similar to those used for the battery powered irons last year. I attempted to solder wire-to-wire connections on a series of 10 and 16 gauge wires, as well as large and small wire component leads.

For the units that have a blowtorch or open flame capability, I attempted to solder copper tubing components of a size appropriate to antenna construction. I also attempted to assemble UHF connectors to coax cable in an outdoor environment. In fact all of the tests were performed in an outdoor environment, since one of the basic purposes of a cordless soldering iron is to be able to use it in places where a 120 V ac corded iron or soldering gun is not available.

One observation: Although the tools offer tips that can be changed from soldering to hot air for heat shrink tubing, you need to wait until the tip is cool enough to change. If you plan on doing both jobs in sequence, you may want two irons — one set up for soldering and the other for hot air generation. I find that a standard disposable lighter does a fine job of heat shrinking insulation in the field, and setup takes a lot less time.

Wire-to-Wire Tests

As shown in Table 4 (on the next page), all of the tools tested made good solder joints in all four wire soldering tests. They performed very well on the component leads, with swift solder flow resulting in a good joint. The 16 gauge wire test was more demanding, requiring a bit more time to achieve good solder flow.

All of the units required repositioning to one degree or another when it came to the toughest test in this category, soldering together two pieces of 10 gauge stranded wire using the setup shown in Figure 11. The Master Appliance EI-20K achieved good solder flow resulting in a good joint in about 10 to 15 seconds. It required some repositioning of the tip to achieve full solder penetration. The heat setting isn't adjustable. The more expensive UT-100Si achieved a good solder joint in about 10 seconds (medium heat setting) with some repositioning of tip required to achieve full solder penetration. Set for medium heat, Steinel's TS-500K gave good solder flow and a good joint with only slight repositioning of the tip needed to achieve full solder penetration. Both Weller units achieved good solder flow and penetration with slight tip repositioning, again on medium heat settings.

More tip repositioning than the other irons was required with the Solderpro 120, but I was able to make a good joint. Increas-

Figure 11 — A sample test setup, this one for 10 gauge wire connections for the six units tested.

[9]G. Haines, N1GY, "A Look at Battery Powered Soldering Tools," Product Review, *QST*, Jun 2007, pp 69-71.

Bottom Line

Any of the butane soldering tools tested here would be a useful addition to your tool box. They'll help you make those difficult solder connections outdoors, up the tower or anywhere power is not conveniently available.

Table 4

Soldering Test Results — Wire and Component Leads

Tool	*#10 Wire*	*#16 Wire*	*Heavy Lead*	*Light Lead*
Master Appliance EconoIron EI-20K	2	3	4	4
Master Appliance UltraTorch UT-100Si	2	3	4	4
Steinel ThermaSolder 500 K	2	3	4	4
Wahl Iso-Tip Solderpro 120	1	2	4	4
Weller Portasol P2KC	2	3	4	4
Weller Portasol PSI-100K	2	3	4	4

Key
1 — Good solder flow with good joint, significant tip repositioning required.
2 — Good solder flow with good joint, some tip repositioning required.
3 — Good solder flow with good joint, no tip repositioning required.
4 — Excellent swift solder flow with good joint.

ing the heat to maximum on the Solderpro 120 and the other units with adjustable settings improved solder flow in most cases, but tip repositioning was still required.

For soldering tasks involving wire or component leads, any of these units would do the job. I was surprised that the most expensive of the units tested, the UT-100Si, appeared to perform as well as the other units tested. For that kind of outlay, I expected it to be the star of the field, not just average in a very satisfactory group.

The Blowtorch Group

Of the six units tested, all but the UT-100Si also had the ability to be configured as mini blowtorches. To test these units in the blowtorch mode, each was converted to the proper tip configuration and tested for proper flame pattern. All performed satisfactorily, but there was some divergence in the size of the flame. Then I attempted to solder copper tubing. This job is normally done with a full size blowtorch, so attempting it with a group of mini torches should be an extreme test.

I selected ½ inch diameter copper tubing and end caps, as this is a size that could be used to build a popular design for a VHF J-pole antenna sometimes called "The Copper Cactus." I got a short length of tubing and end caps from a local store and divided the tubing into five equal pieces. Then I placed an end cap on each piece after polishing the end of the tubing and the interior of the cap. Next I applied a suitable quantity of flux to each connection and attempted to solder the cap to the tubing using solid core solder and standard plumbing techniques.

Figure 12 shows some of the results. The Master Appliance EI-20K took 3 minutes and 45 seconds to heat the connection sufficiently to achieve good solder flow and make a good connection. The Steinel TS-500K took 2 minutes 30 seconds, with good solder flow and a good connection. The Solder-Pro 120 took 3 minutes 10 seconds, with good solder flow and a good connection (results not available for photo). Weller's Portasol P2KC had a more difficult time, taking 3 minutes 25 seconds to heat the tubing enough for only fair solder flow. The integrity of the soldered connection was good, however. The more powerful Portasol PSI-100K took only 2 minutes to heat the material enough for good solder flow and a good connection.

All solder connections were made outside using a hobby work table with a built in wooden vise to hold the tubing in place while the work was accomplished. Times were recorded by repeatedly touching the solder to the copper at the joint and noting when the solder melted. Integrity of the joint was determined by attempting to remove the cap

Master Appliance EconoIron EI-20K

Wattage equivalency	10 - 60 W.
Fuel capacity	Not stated.
Working time (maximum)	60 min.
Soldering tip temperature	395 - 789 °F.
Flameless heat temperature	Up to 932 °F.
Blowtorch temperature	Up to 2370 °F.
Ignition mode	Flint striker in cap.
Price as purchased	$34.

Contents of kit: EI-20K iron; tips: soldering, flameless hot air, torch, hot knife; solder; cleaning sponge/tray; tool rest; cap; instruction manual (brief but adequate)

Wahl Iso-Tip Solderpro 120

Wattage equivalency	30 - 125 W.
Fuel capacity	38 ml.
Working time (maximum)	200 min (mid heat).
Soldering tip temperature	485 - 1000 °F.
Flameless heat temperature	Optional.
Blowtorch temperature	2400 °F.
Ignition mode	Piezoelectric; button on iron.
Price as purchased	$72.

Contents of kit: Solderpro 120 iron; tips: soldering, torch; PS-14 orifice assembly; cap; scant instructions printed on back of packaging.

Master Appliance UltraTorch UT-100Si

Wattage equivalency	20 - 80 W.
Fuel capacity	28 ml.
Working time (maximum)	120 min.
Soldering tip temperature	480 - 930 °F.
Flameless heat temperature	1200 °F.
Blowtorch temperature	No blowtorch.
Ignition mode	Piezoelectric; button on iron.
Price as purchased	$105.

Contents of kit: UT-100Si iron; tips: soldering, flameless hot air, heat shrink reflector; cap; tip wrench; instruction manual.

Figure 12 — Those units that included blowtorch tips worked acceptably for soldering ½ inch copper tubing that might be used to build a J-pole antenna.

Steinel ThermaSolder 500 K

Wattage equivalency	25 - 80 W.
Fuel capacity	20 ml.
Working time (maximum)	120 min.
Soldering tip temperature	410 - 850 °F.
Flameless heat temperature	1400 °F.
Blowtorch temperature	2500 °F.
Ignition mode	Flint striker in cap.
Price as purchased:	$57.

Contents of kit: TS-500 iron; tips: soldering, flameless hot air, blowtorch, heat shrink reflector, hot knife; cleaning sponge/tray; cap; solder; instruction manual.

from the tubing using appropriate hand tools without reheating the connection.

I was somewhat surprised to see how well, comparatively, all of these units did in this phase of the evaluation. Although there are differences in the time it took to heat the copper tubing to a temperature suitable for soldering, all of the tested devices made an acceptable solder joint with the standard paste flux and solid core solder normally used for this type of work. Any of these tools is fine for an occasional project using small diameter tubing.

PL-259 Connector Tests

A vexing task for many hams is soldering the shield of coaxial cable to the connector body of a PL-259 connector, especially in the field. I wanted to see if the blowtorch function could make this job any easier.

The same units tested against copper tubing were used to attempt to install a PL-259 silver-plated connector with a Teflon insulator on a piece of RG-213 coax. I cut and trimmed short lengths of RG-213 in accordance with the guidelines found in the *ARRL Handbook*. I placed a PL-259 body onto each piece with the shield braid visible through the four holes in the connector body. Using rosin core solder, I attempted to solder the cable shield braid to the connector body using the tools in the blowtorch mode.

Unfortunately, while all of the units tested in the blowtorch mode were able to make a soldered connection from the connector body to the cable braid, the side effects were severe enough for me to abandon this line of testing. Common problems were a melted jacket on the coax, swelling of the shield braid behind the connector, failure to fill the solder holes on the connector body, and significant discoloration of the silver plating on the connector. See Figure 13.

Each connection was checked for electrical continuity between the other end of the coax shield and the connector body, and for no continuity between the center conductor and the outer shield. While all tested units checked out after soldering, I got a better result with the soldering gun I normally use to solder these connectors. Perhaps in more skilled hands, the mini torches would produce a better result, but an operator with that type of skill probably could do the job with a box of kitchen matches!

Next I tried soldering PL-259 connectors to RG-8 coax, this time using the soldering iron mode (as opposed to the blowtorch mode). After preparation, I attempted to solder the shield braid to the body of the connector in the usual manner, and also to solder the center conductor of the coax to the connector center. Surprise! Without exception, all of the tools did a very satisfactory job. They all produced an excellent joint at the shield and center conductor connections (Figure 14). The Solderpro 120 and two Weller units were the easiest to use. The RG-8 tested has a solid dielectric; the results shouldn't be extended to foam dielectric cable without further investigation.

Weller Portasol P2KC

Wattage equivalency	25 - 75 W.
Fuel capacity	Not stated.
Working time (maximum)	60 min.
Soldering tip temperature	1076 °F.
Flameless heat temperature	1150 °F.
Blowtorch temperature	2372 °F.
Ignition mode	Piezoelectric; button on iron.
Price as purchased	$59.

Contents of kit: Portasol Professional iron; tips: soldering, flameless hot air, torch, hot knife, heat shrink reflector; cleaning sponge/tray; cap, instruction manual.

Figure 13 — The blowtorch mode was not as successful for soldering PL-259s.

Figure 14 — A typical example of the very neat soldering possible with a butane powered iron on a PL-259 attached to RG-8 coaxial cable. The braid shield was tinned using the same iron before the final connection.

Weller Portasol PSI-100K

Wattage equivalency	Up to 125 W.
Fuel capacity	Not stated.
Working time (maximum)	60 min.
Soldering tip temperature	Up to 1075 °F.
Flameless heat temperature	1157 °F.
Blowtorch temperature	2372 °F.
Ignition mode	Piezoelectric; button on iron.
Price as purchased	$90.

Contents of kit: Portasol Super Pro iron; tips: soldering (2.4 and 4.8 mm), flameless hot air, heat shrink reflector, hot knife; cleaning sponge/tray; cap, instruction manual.

Summary

In general, all of the butane soldering irons tested were able to perform the soldering tasks demanded of them. The most difficult tasks, such as 10 gauge or larger wire, are probably best left to heavier duty tools specifically designed for those jobs. Even then, with a little patience you can make a good solder joint with the butane irons tested here.

For light to medium soldering tasks in the field, away from electrical power, all of the tools tested would be more than adequate. Indeed, the results obtained during the coax connector portion of the testing would lead me to choose a butane powered iron at almost any time, even in my home workshop. Just bear in mind that used in the blowtorch mode for soldering PL-259s, the results were pretty horrible. For that task, the soldering iron mode makes all the difference in the world.

The tool manufacturers indicated the availability of spare parts and extensive lists of optional tips. The only malfunction I encountered was a leak in the fill valve in the Solderpro 120. The vendor sent a replacement unit, which worked just fine.

You could do worse than vote with the pocketbook as to which unit is best overall. Individual tastes as to design style, the convenience of piezo-electric ignition, and the number of optional tips included with each kit package are probably more to the point. All of the units tested were able to satisfactorily complete the tasks, and no one unit was a head and shoulders winner either in performance or ease of use. QST

Homebrew High Adventure, 1955 Style

Out of Afghanistan…

Glenn Brown, NN8G

Designing and constructing a state-of-the-art tube type double conversion amateur receiver in the mid-1950s was a challenge! It required planning, ordering and assembling parts, documentation, troubleshooting knowledge, and a great deal of time and money.

Hugh Pettis, K3EC, took on this task in a foreign country with only a few hand tools and a parts supply house thousands of miles away.[1] Here is his story.

Into Afghanistan

In 1955 Hugh was assigned to the American Embassy in Kabul, Afghanistan as its communications officer. At age 28, with his wife Colleen and a six month old child, he made the trip to Kabul via the Khyber Pass in the middle of winter. They would spend the next two years in this most remote outpost of the US Foreign Service. The country had no reciprocal licensing and the United States was not considered the country's best ally.

A World without Ham Radio? Never!

Hugh decided if he could not participate in Amateur Radio communications, he would design and build a "really useful CW, traffic-handling, brasspounder's receiver" to cover 80 and 40 meter CW once he returned to the US.

Since Hugh had owned six radio receivers prior to 1955, he decided to base his design on some of the better features found in those previous sets. They included a Hallicrafters S-20R, SX-24, ARR-7 (an airborne SX-28A), a Hammarlund BC-779 (Super Pro 400), S-40 and an RME 69. His design was named the "XSR-7" for "Experimental Station Receiver #7."

The Logistics of Accomplishing the Impossible

The first problem was getting parts to Afghanistan. Everything would have to be ordered from Allied Radio in Chicago and these parts would have to come via the diplomatic pouch, as personal mail was a very slow process! Hugh decided it would be necessary to send one fully complete order to Allied. In order to plan the layout, coils, capacitors, transformers and other major components would have to be selected based on their dimensions given in the catalogue. No dimensions, no order.

Can you imagine the number of parts required for a 12 tube superheterodyne receiver? While Hugh's original parts list is not included in the documentation, it was noted that a subsequent two-tube converter designed and built to accompany this radio required over 35 separate parts in its circuit alone.

The circuit design was based on existing 1955 radios. These included the Hammarlund SP-600-JX, Hallicrafters SX-28A and SX-71, and the Collins 51-J4 radios. The circuit for the second detector and AVC/first audio stages came from the ARRL *Amateur Radio Handbook* (1952 through 1956 Editions) as described in the chapters on receivers. The Q-multiplier circuit was taken from an article in the January 1955 issue of *CQ Magazine*.[2]

Top quality components — silver mica capacitors, Millen and National hardware and so on — were selected. The final cost was almost $250, the financial ceiling Hugh and Colleen had agreed upon for this project. Soon the order was ready and it was sent to Allied Radio.

As Hugh explains it: "In 1956 the goodies came in the pouch (trucked up from Peshawar, Pakistan) and the XYL and I sat down to drill, cut, solder, affix, wind, screw and mount what had been so carefully planned and laid out mentally five months earlier. And it all came together! *Our only tools were a B&D electric drill, VOM, and a Heathkit Grid-dip meter.*"

The Receiver that Could!

Hugh returned to the United States in 1957 and the receiver served him well on the CW traffic nets of 40 and 80 meters. He operated as W3QCW on the MDD traffic circuits running a 30 W 807 transmitter along with the XSR-7 receiver. The receiver

[1]Notes appear on page 51.

Figure 1 — A close-up of the front of the receiver after some clean-up.

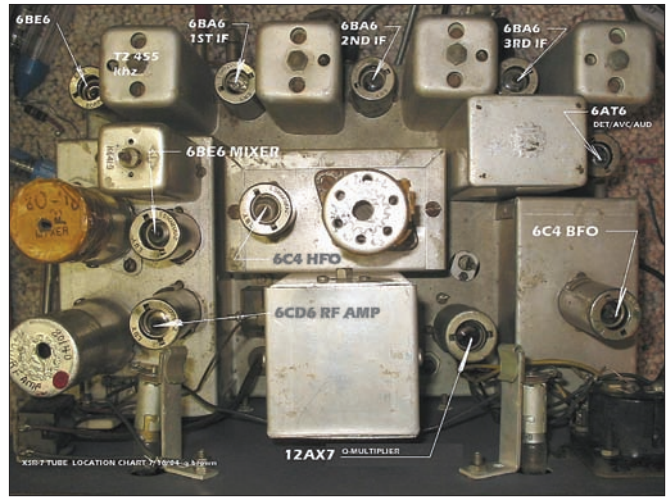

Figure 2 — Interior of the XSR7 homebrew receiver with labels showing tube locations.

Figure 3 — The embedded caption in this photo was added for Hugh for a talk he gave to his local radio club.

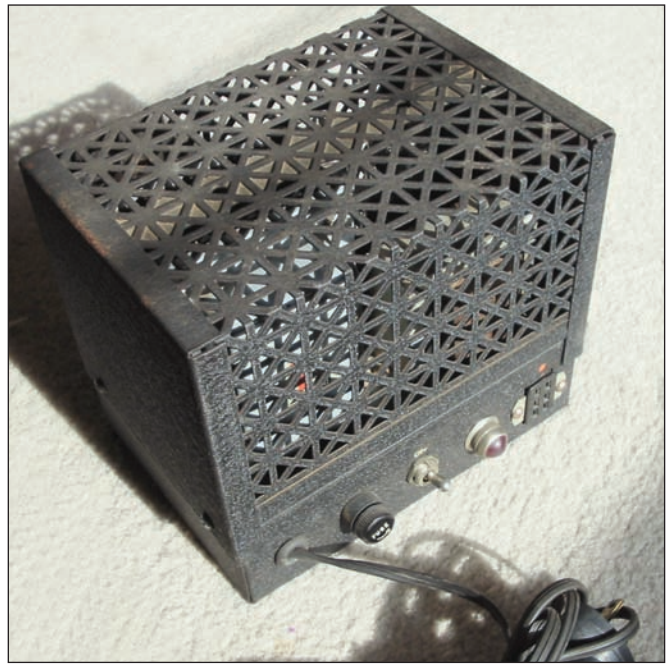

Figure 5 — Photo of the power supply in daylight.

was sensitive, selective (with the built-in Q multiplier circuit) and stable after a 10 minute warm-up. Later, back in the USA, he designed and built a 20 and 15 meter converter as a "DX band" adjunct to the receiver.

During 1957-1959 Hugh operated this combination from his home near Washington, DC. Later the rig followed Hugh to Greece (as SVØWF, 1959-1963), back to the Washington area (1964 and 1965), and then on to England (as G5AFO) in 1966-1968.

A Hallicrafters SX-117 was purchased in 1969 and became the main station receiver.

Hugh began using SSB, and CW operations were pretty much shelved along with the XSR-7, as Hugh completed graduate school in 1970.

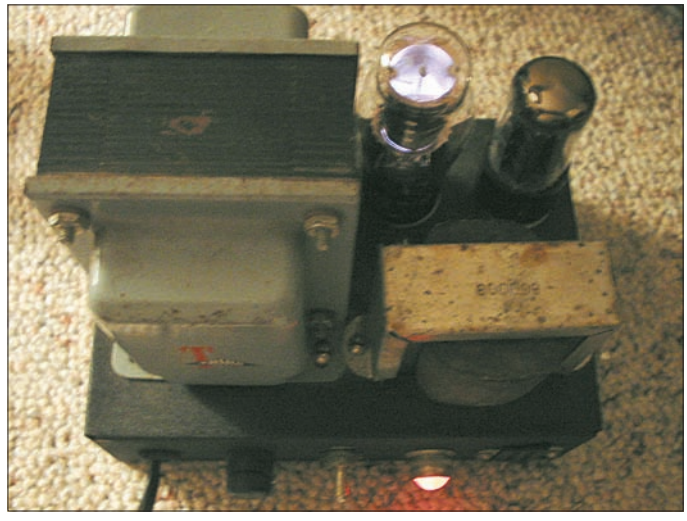

Figure 4 — The power supply repaired and fired up after 50 years.

Restoration of the XSR-7

Restoration of the receiver began in 2004 as a part-time project. Knowing Hugh from on-the-air nets, I became very interested in his story. Hugh offered me the radio for possible restoration. I remember the ham radio days of the 1950s, and shared Hugh's interests in CW operation and homebrew radio. While restoration remains an ongoing project, the radio now is showing signs of the great sensitivity and selectivity on the CW signals it was designed to receive.

Documentation

Along with the radio, Hugh gave us all kinds of original documentation for this radio. Included in this collection is a 16 page typewritten "Instruction Manual" (with many of the pages printed both sides), schematic and parts list for the 20/15 meter converter, many detailed photographs, original dial templates, and dial calibration curves, and many sketches of the radio layout and schematic diagrams.

The Story Goes On

Hugh recently gave a speech at his local ham radio club concerning his career and the homebrew receiver. While Hugh does not participate in CW nets anymore, he is on the radio almost daily with the very latest in solid state radios. Interest in vacuum tube technology and home-built equipment is high among newer amateurs as well of those of us who were old enough to have participated. We hope this interest continues.

Notes

[1]Hugh retired from Federal Service in 1977, going on to subsequent association with the Smithsonian Institution and University of Maryland. He is now an adjunct Professor at Eastern Mennonite University in Harrisonburg, Virginia. His communications career began as an Associated Press wire operator (1943-45); he earned his first amateur license (W7MVA) in 1948. Hugh passed his Amateur Extra class exam in 1965 (W3QCW). You can contact Hugh Pettis, K3EC, at 300 Marion Pl, Staunton, VA 24401.

[2]W. Scherer, W2AEF,' "Q Multiplier," *CQ* Magazine, Jan 1955.

Glenn Brown was first licensed in 1952 as Novice W8JZI. Glenn earned his General class license the following year, and has been active ever since. He upgraded to Amateur Extra class recently and changed his call to NN8G. Glenn has an electronics background and built his first crystal set at age 10. Glenn continues to be an active amateur, and enjoys restoration, home building and article writing. Glenn can be reached at **nn8g@arrl.net**. QST

Integrating *EchoLink* into a Single Sideband Net

Ray Jacob, W2RJJ

VoIP helps a net fill the propagation gap.

Practically everything in our lives today is tied to the Internet. Our hunger for its benefits is so powerful that Internet-operability has become almost a standard for all of today's technologies. As hams, we are fortunate that *VoIP* (Voice over Internet Protocol) solutions like *EchoLink* (**www.echolink.org**) and *IRLP* (**www.irlp.net**) are here to provide Internet-operability to Amateur Radio.

So when Gary, W2GJW, suggested EchoLink as a way to enhance participation in our weekly SSB net, it made good sense to us. When we studied EchoLink more closely, we tuned in to its simplicity and popularity. We imagined it could do two things for us:

- With the right advertising, worldwide participation was possible.
- Hams on the fringe of the net's RF propagation horizon would have an alternate way of participating when conditions weren't favorable.

MING YEH

Ray Jacob, W2RJJ, operating EchoLink during a sideband net. The PC microphone allows him to speak to both RF and EchoLink check-ins.

A Net to Promote 6 Meter Activity

The Six Meter Millennium Net (**www.theneton6.net**) is an SSB net, based in northern New Jersey, that meets one evening a week on 50 MHz. Our goal is to promote local use of the 6 meter band and we do so by providing a 2 hour forum for discussing a variety of topics not necessarily related to radios and computers, although these topics come up most often. We're a good net to check into if you want opinions on your audio, or to check the effectiveness of your new antenna. We started 7 years ago, not as a net, but as a casual gathering for hams who enjoy using the band between the Sporadic E seasons. Six is wonderfully uncongested for most of the year, and you wonder why contacts aren't popping up there all the time.

Our chat group "formalized" into a net pretty early on when we realized the benefit of having a net control station (NCS), mainly to pause the discussion every few minutes and invite listeners to join in. During our seven years on the air we've had many dozens of hams from New York, Connecticut, New Jersey and Pennsylvania check in and contribute their comments. A few even told us that our net was their first opportunity for a contact on 6 meters. But despite good local support, the check-in count can be quite low on some evenings with just a few of the regulars in attendance. On one such evening we began tossing around ideas for increasing the net's weekly numbers, and Gary's EchoLink pitch seemed like a good solution. We did, however, wonder how it would work with SSB since we were familiar only with its application for linking FM repeater sites.

Starting Up on *EchoLink*

To get things started we required a link node (the link node bridges RF to the Internet). Within the Millennium Net core group, Gary had the only EchoLink experience so he got the task of building it. Mike, NJ2BA, and I, who alternate as net control, used this time to get familiar with basic EchoLink operation. We went through the usual ritual to install the freeware, make audio adjustments on the EchoLink test server and get comfortable with the user interface. When Mike made the first contacts from his PC through a local 2 meter FM repeater, I monitored on a scanner. We wanted to experience how EchoLink contacts differed from those conducted over 100% RF, but we found no difference. I was also impressed with the clarity of Mike's audio; his VoIP stream sounded great on my scanner, and Mike was similarly pleased with the audio he was hearing through his PC speaker.

A few hours of play convinced us that EchoLink creates a marriage between RF and the Internet that is practically transparent. This is what we were looking for. Keeping the net focused on the check-ins and their comments, rather than on the technology, was an important objective for us; here we gained confidence that we could integrate EchoLink into the Millennium Net without compromising the smooth roundtable vibe we shoot for. We were wowed by EchoLink's performance on FM; would it work as well with sideband?

Two weeks after Gary first pitched EchoLink to the group, his link node, built using a West Mountain Radio Nomic sound card interface (**www.westmountainradio.com**), was ready for testing. We started running "practice nets" on 50.135 MHz, USB.

These tests had to show that SSB emissions were intelligible over VoIP when band noise like RFI and static are present at moderate to high levels. We hoped that even without FM's capture effect and inherent immunity to noise, SSB audio quality wouldn't be compromised too severely. Could we really adjust for intelligibility problems in a net context? We had to find out. For these tests, Mike operated SSB while I connected my EchoLink PC to Gary's new link node. With just a little tweaking, Mike's SSB signal and my EchoLink audio were joined in a contiguous circuit through W2GJW-L. Even as Gary made adjustments to the link, we could hear that the EchoLink/SSB combination worked well when signals were strong. With each subsequent test we eliminated a technical glitch or operational question. High noise and weak stations would present a longer-term challenge.

Learning Some Lessons

The practice runs were revealing. First, we learned that diligent receiver tweaking at the link node was going to be key for presenting good audio to the EchoLink check-ins. That meant that for the duration of each net session the link operator would be making adjustments, particularly to filter and Receiver Incremental Tuning (RIT) controls for dealing with noise and/or slightly detuned SSB stations. We also became aware of the key-up/key-down delays associated with VoIP, and the necessity for all stations to pause between transmissions — something net control would have to enforce. Further, since VoIP stations can't easily "drop-in" their call sign (because of the key-down delay) we needed to find a way to equitably manage the check-in process. We decided that the NCS, while operating a sideband radio, would also connect his/her PC to the Net's link node and *watch* (versus "listen") for EchoLink stations waiting to be recognized. VoIP operators wouldn't be required to shout their call sign; simply connecting to W2GJW-L would check you in.

After several practice nets we felt prepared to debut EchoLink as a feature of the Millennium Net. Announcements posted on our Web site and in the Yahoo EchoLink Radio Group (**groups.yahoo.com/group/ECHOLINK-RADIO/**) helped get the word out. The first few weeks of our VoIP-enabled net weren't without problems. Long-windedness, mostly from the sideband stations, triggered time-outs at W2GJW-L and to repeaters whose operators had linked to us. We struggled with intermittent connection dropouts when there were more stations linked than our Internet bandwidth could handle.

In Cooperation There are Solutions

These were simple to overcome. Those checking-in, about half of whom were VoIP, were patient and helpful — reflective, perhaps, of when EchoLink was new to them. It took just occasional reminders from the net control to get everyone comfortable with limiting their talk-time; we asked for 3 minutes or less transmit time, and the time-outs decreased dramatically as a result. The frequency of dropped connections also diminished after Gary upgraded the link's Internet pipe. Soon we were listening to comfortable, trouble-free exchanges between SSB and EchoLink operators, and as we welcomed all the new stations from ham cyberspace, we could finally award ourselves a measure of success. In a few weeks, my own net control skills would adapt. I got better at fielding stations calling me on the radio while acknowledging EchoLink stations appearing on the PC. That juggling act seemed, at first, a little overwhelming. It's easier now.

RAY JACOB, W2RJJ

The author's 6 meter radio, connected to a popular sound card interface, is used for SSB/EchoLink operation.

Our Millennium Net has been EchoLink-enabled for a year now, so it's a good time to reflect on what we've gained. The obvious benefit is the Net's reach to a wider audience. EchoLink has brought us check-ins from all corners of the USA and that's added value to our net experience. Certain topics, like weather emergency nets and 6 meter DXing, lend themselves particularly well to regional perspectives.

We've seen the local benefit, too. Some of our sideband regulars now use EchoLink as an alternative when television interference (TVI) or poor band conditions make checking in by radio difficult or impossible.

The biggest gain, though, may be personal. This project exposed us to a new dimension for operating. In the last several years, it's been hard not to notice the growing number of articles and online forums (there's at least one dedicated book[1]) that discuss VoIP in Amateur Radio terms. Like all technologies today, ours has been adapted to live, at least partially, in the Internet space. And once again, our ham tickets gave us a unique privilege to play with this cool stuff on our own terms.

Look for us Wednesday nights, 9 PM Eastern Time (0200Z, Thursday), on 50.135 MHz. Or visit our Web site for node details.

[1]J. Taylor, K1RFD, *VoIP: Internet Linking for Radio Amateurs* (Newington: ARRL, 2004). Available from your local ARRL dealer, or from the ARRL Bookstore, ARRL order no. 9264. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

Ray Jacob, W2RJJ, was first licensed in 1996 and holds a General class ticket. An avid key collector and CW enthusiast, he also enjoys the integration of Amateur Radio and computers and has written on the subject several times for Popular Communications *and* CQ *magazines. Ray works for the City of New York as an Information Technology Manager, where he oversees network design and administration for a large agency. He is a member of the ARRL. You may write to him at 633 Johnson Ct, Teaneck, NJ 07666-4218 or e-mail him at* **w2rjj@arrl.net.**

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Hams Across the Nation Respond to Calls for Assistance

Springtime, best known for sunshine, flowers and maybe a rain shower or two, brought more to the table in 2008: Fires, tornadoes and flooding. From Florida to Wisconsin, severe weather raged across the country and Amateur Radio operators were quick to respond to the calls for help.

Fires in Florida

Amateur Radio operators in Brevard County, Florida responded in a support role during a recent spate of wildfires that ravaged the towns of Palm Bay and Malabar. The fires, all of which were deemed suspicious by fire authorities, began on May 11. Dubbed the "Mother's Day Fires," they burned close to 13,000 acres in southern Brevard County. Located about 25 miles east of Orlando, Brevard County is home to Kennedy Space Center, site of NASA's space shuttle launch area.

John Weatherly, AB4ET, and Clayton Bennett, KA4NHW, manned a 2 meter station in a shelter set up by the American Red Cross. Additionally, the Brevard Emergency Amateur Radio Services (BEARS) donated the use of their mobile command center to public safety agencies. The command vehicle, dubbed BEARS-I, was obtained through a $100,000 grant from the State of Florida. The interior was designed and built by a group of Amateur Radio operators from local Brevard County clubs that are members of BEARS. BEARS-I is outfitted with Brevard County 800 MHz public safety radios and amateur equipment.

BEARS-I was used as a command post in the weeklong operation. The Palm Bay Fire Department, the Palm Bay Police Department, ARES and Florida Power and Light manned the four operating positions. The unit was put in place at Bayside High School when the fires started; it was relocated the next day to the US Air Force tracking station that became the new command center, as well as the staging area for trucks and teams from other counties. BEARS-I was used as a self-contained command center around the clock for over five days

According to official sources, the Mother's Day fires destroyed more than 30 homes with an estimated value of $5.6 million, and damaged almost 250 residences. A man is in custody on three counts of intentional burning of lands after witnesses reported seeing him light several small fires one night that were quickly extinguished. According to authorities, the investigation continues into whether the suspect set all the fires, or if others were involved. — *Some information provided by Jan Heise, K4QD, and Dan Fisher, AI4GK*

DAN FISHER, AI4GK

Amateurs and members of the Palm Bay fire and police departments, as well as staffers from Florida Power and Light, man the command post in side BEARS-I, the Brevard Emergency Amateur Radio Services mobile command vehicle.

Tornadoes in Colorado

On May 22 at approximately noon MDT, a large tornado touched down in northern Colorado near the town of Windsor. Windsor, with a population of nearly 19,000, is located approximately 10 miles southeast of Fort Collins and 50 miles north of Denver. According to ARRL Colorado Section Manager Jeff Ryan, KØRM, initial reports indicated that there was the possibility of extensive damage. Ryan said that Colorado ARES District 10 was activated and David Markham, WØCBI, the Colorado Section Emergency Coordinator, monitored the situation.

COURTESY OF *THE DENVER POST*

Roofs were blown off and some buildings were leveled by a tornado in Windsor, Colorado on May 22.

The funnel cloud, accompanied by golf-ball sized hail, blackened the skies over Windsor as it knocked down power lines, shredded crops in fields outside the city and blasted whole neighborhoods; the southeast side of town was hit the worst by the storm. "It will be a long time before the town recovers from this," Windsor Mayor John Vasquez said.

Ryan said reports indicated the Windsor tornado was just one of several that swept across northern Colorado and part of Wyoming: "The storm resulted in one fatality, and more than 100 people were treated on the scene for some type of injury with another 18 people treated at area hospitals. Damage is widespread and includes homes and business in Weld and Larimer Counties. We also received damage reports from the smaller towns of Gilcrest and Platteville."

The Weld County Sheriff's Office reported that the lone fatality, Oscar Manchester, 52, a US Marine and Vietnam veteran, was killed in a recreational vehicle that was destroyed in the storm at a campground west of Greeley, about 60 miles north of Denver.

Colorado ARES District 10 Emergency Coordinator Randy Long, WØAVV, reported that 31 operators provided communications service to the Emergency Operations Center and Fire Department in Windsor, the Weld

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County Emergency Operations Center, the Larimer County Emergency Operations Center, the City of Loveland Emergency Operations Center, the Loveland Mobile Command post and two Red Cross shelters.

"On the day after the storm, the town was still without power and remained so until local utilities completed a survey of electrical transmission lines in the affected area. This took a couple of days," Ryan said. "A mandatory evacuation for sections of Windsor was in effect due to gas leaks and downed power lines. The National Guard was on duty and was responsible for escorting emergency responders in and out of the area."

Colorado Governor Bill Ritter ordered the National Guard to aid rescue and cleanup efforts. He visited the town Thursday evening, saying the number of homes damaged was "significant" and declared a state of emergency for Weld County. Representatives from FEMA were on the scene conducting damage assessments.

One day after the storm, Markham placed an additional 15 Amateur Radio operators in Larimer and Weld County on standby in anticipation of an overnight shift; he also requested adjacent districts to prepare in support of the ongoing operations if necessary.

Windsor, Fort Collins and Loveland lie in the shadow of the Rocky Mountains, where the Great Plains give way to steep hills. "It's very unusual to see [a tornado like] this by a mountain range. It's kind of a freak thing," said Captain Steve Fleming of the Poudre Fire Authority.

Ryan said that at the peak of the ARES operation, "Colorado ARES District 10 had 55 operators supporting emergency response and relief efforts in the aftermath of the tornado that touched down near Windsor."

Flooding in the Midwest

When severe thunderstorms started to threaten the Midwestern United States with tornadoes, hail, severe lightning and rain starting on June 4, state agencies were quick to call on Amateur Radio operators for assistance.

The Indiana Department of Homeland Security (IDHS) activated ARES members to help out with communication efforts, providing radios for those amateurs who offered to help. ARRL Indiana Section Emergency Coordinator Tony Langer, W9AL, said hams were instrumental in many ways, including assisting in Emergency Operations Centers, sand bagging, helping out in shelters and even aiding in rescue efforts. This storm brought 12 confirmed tornadoes to 11 Indiana counties, with some communities reporting up to 11 inches of water, Langer said. Four people perished in the storms.

In a call put out to Amateur Radio operators on June 8, IDHS said, "The flood waters have impacted several counties here in Indiana severely. Ham Radio operators have been operating continuously since activated and are growing weary. Some counties do not have a vast amount of active hams to relieve these tired operators." Specific areas needing amateur assistance were overnight relief operators at the Bartholomew County EOC, as well as the EOC and three shelters in Columbus County.

Marion County (Indiana) Emergency Coordinator Mike Palmer, N9FEB, called on ARES members in his area to help out. "People might think, 'Why not just use telephones or cell phones?' Well, many phones are not working down there at this time. With the high waters, electric transformers are out all over; even those servicing cell towers are out. Even with today's technology, we find ourselves looking at ham radio to assist. If you can spare a few hours or an entire evening, please consider helping."

Indiana Governor Mitch Daniels called in the United States Coast Guard to assist in evacuations and rescues. The Coast Guard responded by sending two helicopters to the state along with boats and personnel. The Indiana National Guard was called out to assist in evacuation and direct traffic and enforce road blocks on the many flooded roads.

Torrents of rain also brought flooding to Wisconsin. On June 9, five counties had requested aid from Amateur Radio operators, ranging from backup communications to disaster assessment and flooding communications. One county called on ARES members to provide patrols of the flooded areas overnight during the latter part of the week. ARRL Wisconsin Section Emergency Coordinator Bill Niemuth, KB9ENO, said about 80 ARES members were activated and another 500 hams provided weather spotting information to the National Weather Service. — *Information provided by ARRL Indiana Section Emergency Coordinator Tony Langer, W9AL, and ARRL Wisconsin Section Manager Don Michalski, W9IXG*

HAMS HEAD INTO SPACE

On Saturday, May 31, the space shuttle *Discovery* launched into the heavens carrying a crew of one Japanese and six American astronauts to the International Space Station (ISS); of the seven crew members, two are Amateur Radio operators. NASA's Greg Chamitoff, KD5PKZ, is the ISS Flight Engineer and Science Officer on Expedition 17 and will spend six months living and working onboard the ISS, returning home on *Endeavour* (STS-126), currently targeted for November 10. Japan Aerospace Exploration Agency's (JAXA) Akihiko Hoshide, KE5DNI, is a mission specialist.

Chamitoff will replace Garrett Reisman, KE5HAE, who arrived on the ISS in March; Reisman returned to Earth with *Discovery*. It is expected that this ISS Crew — Commander Sergei Volkov, RU3DIS; Flight Engineer Oleg Kononenko, RN3DX, and Chamitoff — will conduct Amateur Radio on the International Space Station (ARISS) contacts while on the ISS.

This mission, STS-124 — the 123rd space shuttle flight and 26th shuttle flight to the ISS — docked with the ISS on June 2. *Discovery* carries with it the second component of JAXA's Kibo laboratory, the Japanese Pressurized Module (JPM). The 37 foot, 32,000 pound JPM will be attached to the left side of the Harmony connecting node by shuttle and station crew members during a series of three spacewalks. The JPM will join the first component of Kibo,

NASA

Greg Chamitoff, KD5PKZ

NASA

Garrett Reisman, KE5HAE

the Japanese Logistics Module, which was launched on the last shuttle flight, STS-123 on *Endeavour*, in March.

Kibo (which means hope in Japanese) is so heavy that only its primary set of avionics systems can be launched inside it. The second set was launched in the logistics module delivered on STS-123 so that it will be available, if needed, when Kibo is activated. "Kibo is just a beautiful piece of work," said lead shuttle flight director Matt Abbott. "I know the Japanese space agency had an element installed on STS-123, but this is really their pride and joy. This module is amazing."

In addition to Kelly, Hoshide and Chamitoff, members of the STS-124 crew included Pilot Ken Ham and Mission Specialists Karen Nyberg, Ron Garan and Mike Fossum. *Discovery* returned to Earth on Saturday, June 14.

NATIONAL HURRICANE CENTER DIRECTOR JOINS WX4NHC ANNUAL TEST

On May 31, WX4NHC (**www.wx4nhc.org**) — the Amateur Radio station at the National Hurricane Center (NHC) — held their annual Communications Test from 1300-2100 UTC. According to WX4NHC Assistant Coordinator Julio Ripoll, WD4R, this annual test has two purposes: To verify that ham radio equipment will not interfere with any equipment at the NHC, and to ensure proper performance of Amateur Radio equipment at the NHC.

During the test, NHC Director Bill Read, KB5FYA, addressed the Amateur Radio community on the VoIP Hurricane Net and on the Hurricane Watch Net. Read spoke about the importance of Amateur Radio in hurricane-related disasters and thanked Amateur Radio operators for their support in past hurricanes. He encouraged hams to continue to provide that strong support as WX4NHC enters its 28th year of service and the 2008 Atlantic hurricane season begins. Read made several contacts with Amateur Radio operators during the test.

JULIO RIPOLL, WD4R

Bill Read, KB5FYA, Director of the National Hurricane Center, addresses the Amateur Radio community during the WX4NHC Annual Station Test.

"We all know how important it is to maintain communications during a hurricane to relay our hurricane warnings to those in the affected area which may have no other means to receive this vital information," Read said. "We are also very appreciative for the surface reports from those in the storm which add to our database and help our forecasters better visualize what is actually happening at the ground level in real time. As our own ham radio station, WX4NHC, celebrates its 28th year of volunteer service at the National Hurricane Center, we extend our thanks to all ham radio operators that continue to support our mission to help save lives."

Ripoll, calling the annual test "very successful," thanked all the amateurs involved and called on them for their support as the hurricane season starts up. During the test Ripoll and his crew also completed antenna work in preparation for the season.

Ripoll said that the WX4NHC Annual Station Test started very early on Saturday with three of the operators replacing the main HF dipole. "The dipole runs from the 100 foot tower to the top of the Hurricane Center Building and was reinstalled with a better orientation so that the main effective lobes run southeast and northwest," he said. "This will improve reception to the Caribbean, as well as the US Gulf area. It took three hours of bringing the dipole up and down to fine tune the SWR down to 1:1.2, but it was worth the effort. Stations monitoring our antenna tests reported improvements of 3 to 6 dB at their locations. We are very happy with the results of this new antenna installation."

It was good timing for the test as the 2008 Atlantic hurricane season started on the same day, albeit one day earlier than it was scheduled: Tropical Storm Arthur formed from the remnants of Pacific Tropical Storm Alma over Central America. Arthur did weaken, but was responsible for very heavy rains and flooding over portions Guatemala, Honduras, Belize and Mexico. This is the second straight year in which a tropical system formed prior to the start of the Atlantic hurricane season.

WX4NHC made 346 contacts during this event: 291 on HF and 55 on EchoLink/IRLP. They heard from 23 states and US territories, as well as such foreign locales as Bermuda, Curacao, Jamaica, Cuba, Honduras, Estonia and Canada.

"The WX4NHC Coordinators and Operators extend their thanks to all ham radio operators that participated in our Annual Station Test," Ripoll said, "and look forward to your continued support during the hurricane season.'

NEW NAME, LOOK, FOR ARRL CONTEST E-LETTER

The *ARRL Contest Rate Sheet* got a new look and name in June. Now known as the *ARRL Contest Update — News and Techniques for the Active Operator*, the biweekly e-letter offers a useful source of timely information for both the active and casual contester. The *Contest Update* includes information about events during the following two-week period, time-sensitive news items, upcoming deadlines, and other news of interest to contesters.

The *Contest Update* will be sent out in a combined HTML and text-only format (readers who prefer text-only will still be able to read it that way using most e-mail clients). The HTML format will present a more attractive newsletter that is easier to read, and photos and graphics will also be included for the first time. According to *Contest Update* Editor H. Ward Silver, NØAX, "We're going to start slow with a limited amount of HTML snazziness and a few photos. Please bear with us during the growing pain period and soon the HTML version will seem like the old friend that the text-only version has become."

To subscribe to the *Contest Update*, ARRL members first must register on the Members Only portion of the ARRL Web site. During registration, members will have an opportunity to sign up for e-mail delivery of various ARRL e-newsletters, such as *The ARRL Letter* and the *Contest Update*, as well as W1AW bulletins, and other material. ARRL members may subscribe to the *Contest Update* by going to the Member Data Page. You must be logged in to the site to access this page. Scroll down to the section "Which of the following would you like to receive automatically via email from ARRL?" Check the box for "*ARRL Contest Update* (biweekly contest newsletter)" and you're all set. ARRL e-letters are free for ARRL members.

ARRL WELCOMES YAESU AS PRINCIPAL SPONSOR OF LOGBOOK OF THE WORLD WEB SITE

The ARRL welcomes Yaesu as the principal sponsor of the Logbook of The World (LoTW) Web site. LoTW is a repository of log records submitted by users from around the world; when both participants in a QSO submit matching QSO records to LoTW, the result is a QSL that can be used for ARRL award credit. With almost 21,000 amateurs registered on LoTW,

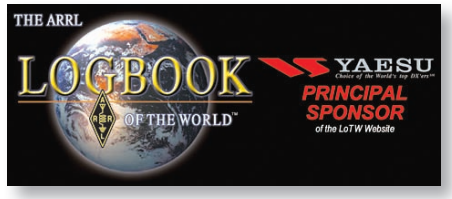
In Brief

• **New Section Managers in Place July 1**: In the only contested Section Manager race this spring, Paul Eakin, KJ4G, was elected as the ARRL Northern Florida Section Manager with 430 votes. Dale Sewell, W4NBF, received 385 votes, and Carl Zelich, AA4MI, received 370 votes. Ballots were counted May 20 at ARRL Headquarters. Eakin's two-year term begins on July 1; he will be stepping into the office that has been held by Rudy Hubbard, WA4PUP, since 1990. Hubbard has served nine continuous terms of office. A Life Member of ARRL, Eakin is from the Tallahassee area and he has been a licensed radio amateur since 1969. He has a strong background in Emergency Communications and many years of emergency service experience. The ARRL Northern New Jersey Section is getting a new Section Manager starting on July 1, as well: Richard Krohn, N2SMV, of Manalapan, will be taking over the reins from Bill Hudzik, W2UDT, who has served as Section Manager since 2001. The following incumbent ARRL Section Managers did not face opposition and were declared elected for the next two year terms of office beginning July 1: Tom Ciciora, KA9QPN (Illinois); Bill Woodhead, N1KAT (Maine); Bonnie Altus, AB7ZQ (Oregon); Bill Dale, N2RHV (Santa Clara Valley); Paul Gayet, AA1SU (Vermont), and Don Michalski, W9IXG (Wisconsin). Nominations for the Indiana Section Manager position have been resolicited for an 18-month term of office beginning in January 2009. Please see the SM Nomination Notice for information.

• **First ARRL Book Published in China**: The first of several ARRL books has been translated and published by Posts and Telecommunications Press (PTPress) of Beijing, People's Republic of China. *Getting Started with Ham Radio* by *QST* Editor Steve Ford, WB8IMY, will be available for purchase in China next month. Other ARRL books to be translated and published in the PRC include *The ARRL Handbook*, *ARRL Antenna Book*, *Experimental Methods in RF Design*, *Understanding Basic Electronics* and *Ham Radio on the Move*. Posts and Telecommunications Press is one of the largest Chinese print and electronic media publishers. It is a specialized publishing house operating under the management of the Ministry of Information Industry. At present, PTPress annually publishes 3600 book titles in 10 categories such as communications, computers, electronic and electrical engineering technology. *Getting Started with Ham Radio* was translated and adapted for its Chinese audience by Zhang Hong, BG1FPX.

more than 170 million QSL records have been entered into the five year old system, resulting in more than 13.4 million QSL records.

"Yaesu is absolutely delighted to be the Principal Sponsor supporting the extremely popular ARRL Logbook of The World Web site," said Yaesu's Executive Vice President for Amateur Radio Sales and Marketing Dennis Motschenbacher, K7BV. "It provides Yaesu with an opportunity to serve the Amateur Radio community. We hope LoTW users will note our support and judge this action for what it is intended to be — a 'Thank You' to the thousands of avid DXers and other active operators worldwide." In return for its sponsorship of the LoTW Web site, Yaesu will receive promotional consideration in *QST* and on the LoTW Web site.



Motschenbacher said he understands that hams have felt the "pain" of postal price increases around the world: "I am certain that a huge number of hams have had to give up their dream of having prestigious ARRL certificates and plaques on their wall simply because they could no longer afford the postage costs associated with exchanging QSL cards to verify contacts. Those QSO verifications are, however, absolutely essential for maintaining the integrity of ARRL's DXCC and other awards. LoTW, with its global acceptance, now allows nearly everyone interested in the excitement that goes along with chasing DX and awards to provide most if not all of the required all-important QSO verifications without burdensome postage expenses. LoTW provides a very valuable service for both the individual users and ARRL."

ARRL Chief Operating Officer Harold Kramer, WJ1B, thanked Yaesu for their ongoing support of the ARRL. "We look forward to working with them on the Logbook of The World Web site," he said.

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Eastern Massachusetts, Missouri, Nebraska, New York City-Long Island, Northern New York, South Carolina, Southern New Jersey, West Central Florida and Western Pennsylvania Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. A sample nomination form is available on the ARRL Web site, **www.arrl.org/FandES/field/org/smterms.html#sample**.

We suggest the following format:

(Place and Date)

Membership and Volunteer Programs Manager
ARRL
225 Main St
Newington, CT 06111

We, the undersigned full members of the _____ ARRL Section of the _____ Division, hereby nominate _____ as candidate for Section Manager of this section for the next two-year term of office.

(Signature___ Call Sign____ City___ ZIP___)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on September 5, 2008. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before October 1, 2008, to full members of record as of September 5, 2008, which is the closing date for nominations. Returns will be counted November 18, 2008. Section Managers elected as a result of the above procedure will take office January 1, 2009.

If only one petition is received from a Section, that nominee shall be declared elected without opposition for a two-year term beginning January 1, 2009. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the January 2009 *QST*. A Section Manager elected through resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Membership and Volunteer Programs Manager. — *David Patton, NN1N, Membership and Volunteer Programs Manager*

SM Nomination Resolicitation

Since no nomination petitions were received for the Indiana Section Manager election by the nomination deadline of March 7, 2008, nominations are hereby resolicited. See above for details on how to nominate. QST

Nominees Sought for ARRL Board of Directors

If you're a full ARRL member in one of the following five divisions and are interested in playing a part in the League's democratic organization, here's the opportunity. Nominations are open for the offices of director and vice director for the 2009-2011 term in the Atlantic, Dakota, Delta, Great Lakes and Midwest divisions.

ARRL Divisions

The policies of the League are established by 15 directors who are elected to the Board on a geographical basis to represent their divisions and constituents (see page 15 of any recent *QST* for a list of the divisions, directors and vice directors). These 15 directors serve for three-year terms, with five standing for election each year.

Just as in national or state politics, ARRL voters/members have the privilege and responsibility to decide that they like the actions of their incumbent representatives and support them actively for reelection or to decide that other representatives could do a better job, and to work for the election of those persons. Vice directors, who succeed to director in the event of a midterm vacancy and serve as director at any Board meeting the director is unable to attend, are elected at the same time.

How to Nominate

1. *Obtain official nominating petition forms*. This package consists of a cover letter; a reprint of this election announcement; blank Official Nominating Petition forms and Candidate's Questionnaires for the offices of director and vice director; a copy of the ARRL Articles of Association and Bylaws; and an informational pamphlet for candidates.

Any full member residing in a division where there is an election may request an official nominating petition package. You don't need to be a candidate to request the forms. Your request for forms must be received by the Secretary *no later than noon Eastern Time on Friday, August 8, 2008*. There are separate forms for director and vice director nominations.

2. *Submit petition with statement of eligibility and willingness to serve*. Official forms bearing the *signatures of 10 full members of the division* and naming a full member of the division as a candidate for director or vice director, must be submitted, with a statement *signed by the candidate* attesting to his or her eligibility, willingness to run and willingness to assume the office if elected. These documents must be filed with the secretary *no later than noon Eastern Time on Friday, August 15, 2008*. Only original documents can be accepted; *no facsimiles of any kind are acceptable*. On Monday, August 18, 2008, the secretary will notify each candidate of the names and call signs of each other candidate for the same office. Candidates will then have until Friday, August 29, 2008, to submit 300-word statements and photographs, if they desire these to accompany the ballot, in accordance with instructions that will be supplied.

3. *Ethics and Elections Committee to certify eligibility*. In accordance with the Bylaws, an Ethics and Elections Committee, composed of three directors not subject to election this year, is responsible for the conduct of the election. This year, the Ethics and Elections Committee consists of Coy Day, N5OK — Chair, Frank Fallon, N2FF and Greg Sarratt, W4OZK.

Call for Nominations

Nominations are open for director and vice director in the five divisions mentioned above for the three-year term beginning at noon January 1, 2009.

The nominee must be at least 21 years of age and have been licensed and a full member of the League for a continuous term of at least four years immediately preceding nomination. No person is eligible whose business connections are of such nature that his or her influence in the affairs of the League could be used for his or her private benefit or would materially conflict with the activities or affairs of the League. The primary test of eligibility under this portion of the Article shall be full compliance with the Articles, Bylaws and Rules and Regulations of the League relating to ethics, elections and conflicts of interest.

Balloting Will Follow

If there is only one eligible candidate for an office, he or she will be declared elected by the Ethics and Elections Committee. Otherwise, ballots will be sent to all full members of the League in that division who are in good standing as of September 10, 2008. (You must be a licensed radio amateur to be a full member.) The ballots will be mailed not later than October 1, 2008 and, to be valid, must be received at HQ by noon Eastern Time on Friday, November 21, 2008. A group of nominators can name a candidate for director or vice director, or both, but there are no "slates," as such. Each candidate appears on the ballot in alphabetical order. If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he or she wishes. Because all the powers of the director are transferred to the vice director in the event of the director's death, resignation, recall, removal outside the division or inability to serve, careful selection of candidates for vice director is just as important as for director.

Absentee Ballots

All ARRL members licensed by the FCC, but temporarily residing outside the US, are eligible for full membership. Members overseas who arrange to be listed as full members in an appropriate division prior to September 10, 2008, will be able to vote this year where elections are being held. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses. Even within the US, full members temporarily living outside the ARRL division they consider home may have voting privileges by notifying the Secretary prior to September 10, 2008, giving their current *QST* address and the reason that another division is considered home. If your home is in the Atlantic, Dakota, Delta, Great Lakes and Midwest divisions but your *QST* goes elsewhere, let the ARRL Secretary know as soon as possible, but no later than September 10, 2008, so you can receive a ballot from your home division.

The Incumbents

These people presently hold the offices of director and vice director, respectively, in the divisions conducting elections this year:

Atlantic — Bill Edgar, N3LLR and Tom Abernethy, W3TOM

Dakota — Jay Bellows, KØQB and Greg Widin, KØGW

Delta — Henry Leggette, WD4Q and Karl Bullock, WA5TMC

Great Lakes — Jim Weaver, K8JE and Gary Johnston, KI4LA

Midwest — Bruce Frahm, KØBJ and Cliff Ahrens, KØCA

For the Board of Directors:

May 19, 2008

David Sumner, K1ZZ
Secretary

The Jalapeño 100 Bike Ride

Jim Cook, W8WKE, **w8wke@arrl.net** *and Carolyn Ross, KE5HRP,* **carolynross1212@sbcglogal.net**

Located in San Benito at the very tip of Texas, the Fun-N-Sun Senior RV Resort is home to the Fun-N-Sun Amateur Radio Club. During the winter months, the club is highly active because of the influx of "Winter Texans," retirees from the northern states and Canada who travel south to escape the biting cold temperatures and enjoy the mild tropical temperatures of the Rio Grande Valley. Many of the club members are relatively new hams who received their license after they retired. The club meets once a week during the winter months.

The club provides technical and emergency expertise to the Fun-N-Sun Resort and the community at large. The club's members teach Amateur Radio classes and certified members administer tests to those applying for licenses. They installed a radio and antenna at the park to establish a system for communicating vital information in the event of severe weather conditions. Many club members are trained as SKYWARN spotters and are certified for all types of emergencies.

A Traditional Public Service Event

Five years ago, the club was asked to provide communications for the Annual Jalapeño 100 Bike Ride in Harlingen, Texas. This would require members to provide instant emergency contact by radio during the entire 100 miles of the ride. Proceeds from the event benefit the Harlingen Boys and Girls Clubs and other worthy local programs. The club discussed the request and voted to support the event. Many of the club members had never participated in an event like this or had even checked into a net. Immediately, a weekly net was initiated to train club members in proper net operation.

The sponsors of the local STARS repeater system offered the use of their repeater system for the event. The usual users of this repeater were highly cooperative and refrained from using it during the bike ride.

This popular bike ride is now in its 18th year. The Jalapeño 100 Bike Ride consists of a 12, 25, 50, 62.5 and 100 mile rides. The course for the February 16, 2008 event routed all riders north until they arrived at the designated turnaround point for their particular ride and then turned them south back to the starting point. Riders eagerly took advantage of the 10 rest stops along the route where local volunteer groups provided tables with water, fruit and sandwiches. There were a total of 535 riders in the 2008 ride.

One or two hams were stationed at each rest stop and a net control station was at the start/finish point. In addition, hams rode in three SAG (Safety and Gear) vehicles and one ham acted as "tail-end Charlie" to follow the last riders to signal when to shut down the rest stops. One ham operator served as backup for any rest stop or net control.

Kelly Roberts (Event Coordinator) coordinated the rest stops and SAG vehicles from her SAG vehicle as she viewed first hand exactly what was happening in the field. She used a combination of cell phone and Amateur Radio for communications. This proved to be an excellent blend that worked extremely well.

Usually the radio communications were routine, such as the check-in when hams were in position and confirming that all volunteers had arrived at their stations. The radios were used for general information and were required at all points on the route. Occasionally, there were calls about equipment problems or riders needing air in their tires. Toward the end of the ride, there were calls requesting a SAG vehicle to take bikes and their riders back to the starting point.

Windy Conditions for 2008

The morning of the 2008 ride began with mild weather and with some wind out of the south. Winds are common at this time of the year in southern Texas. As the riders turned south for the return trip, the wind started to increase. It was later learned that 44 mi/h sustained winds with gusts up to 52 mi/h were recorded in the ride area.

The SAG vehicles found many of the riders pushing their bikes because the wind was too strong for them to ride. Many wanted transportation back to the start/finish line. There were more riders than could be accommodated in only three SAG vehicles and Kelly did not want all of the vehicles off the route at the same time. Since most of the rest areas with tired riders were 20-30 miles from the start/finish point, she directed the SAG vehicles to start hauling bikes and riders to the nearest rest stop while she tried to arrange for additional vehicles to move them to the start/finish point. The radio operators at each rest stop reported the number of riders needing a ride and updated the count when it changed.

Kelly used her cell phone to arrange for several Harlingen Parks and Recreation Department pickup trucks to haul bikes and riders from the rest areas. Trucks were directed to the rest areas needing pickups based on current reports from the hams.

BOB ROSS, KE5TRN

The Fun-N-Sun Amateur Radio Club gathers to celebrate after a successful Jalapeño Bike Ride.

Steve Ewald, WV1X ♦ Public Service Specialist ♦ sewald@arrl.org

When the winds became severe, volunteers at the rest areas had to take down their dining flies and tables. Some of them left before all the riders had passed their rest stop.

The ARC hams remained steadfast at their posts during the severe winds, many being located near farm fields and being blasted by blowing sand. The club's net control continued to operate when their dining fly had to be taken down to keep it from blowing away. By following acceptable communications practices and techniques, they were able to assure riders they would be picked up, that transportation was on the way. All radio operators remained at their stations until all riders had passed or were picked up.

The Fun-N-Sun ARC has tripled in size over the past few years, and continues to add new members each winter season. Members say club membership provides the fellowship of those interested in the hobby as well as the camaraderie of a great group dedicated to making the club grow and prosper.

The following Amateur Radio operators are club members or have provided support for one or more of the rides: Ted Berquam, KCØVTW; Louis Chmielowiec, WB9BXE; Jim Cook, W8WKE; Sharon Cook, KC8TFN; Liz Cunningham, KD5RPA; Tom Cunningham, KD5ROZ; Don Dolin, KC9DIB; Lee Drake, W8QIL; Ed Fleck, KCØMPH (SK); Jack Hoard, KC9DHZ; Earl Holmes, VE3HEG; Sylvia Holmes, VE3HJN; Ron Hoopman, KBØVLI; Jodie Law, ABØEG; Steve Lepki, KD5GWV; Ron Maeder, KC2JGP; Dolores Maeder, KC2KYN; Kaye Matousek, NØTMZ; Ed McCurdy, KD8BBX; Ron Morton, AC9RM; Bonnie Morton, KD5VMD; Richard "Doc" Orr, KDØDOC; Bob Pace, WA5CJG; Grant Pearce, W8GEP; Don Pratt, K5OKB; Bill Rauschenberg, KC9FRA; Harold Root, W9HLR; Bob Ross, KE5TRN; Carolyn Ross, KE5HRP; Pat Stotler, KBØTFK; Ralph Waddups, WA9IES, and Dee Waddups, KE5LSY.

What is the VIP Red Flag Patrol?

Paul Rios, KC6QLS
kc6qls@cox.net

I had the privilege to interview Roxanne Provaznik, Fire Prevention Specialist II with the California Department of Forestry and Fire Protection (CDF), also known as CAL FIRE. She is the person that activates the VIP Red Flag Patrols through Rich Beisigl, N6NKJ, Amateur Radio Liaison to CAL FIRE. He then gathers Amateur Radio volunteers to conduct the duties of Red Flag Patrol.

VIP Red Flag Patrol is short for Volunteers In Prevention Red Flag Patrol. A Volunteer In Prevention can be an Amateur Radio operator who drives around and provides additional eyes and ears for CAL FIRE. The volunteers report back to CAL FIRE by way of Amateur Radio. This has been going on since the start of the program. In 1976, a few years after the 1970 Laguna Fire, Battalion Chief Doug Allen approached Art Smith, W6INI, about helping with Red Flag Patrols. These two men created the pilot program, which is now used statewide. They were the fathers of supplemental communications who created the entire program by using private civilians/radio operators cooperating with CDF. Also, they started the animal rescue program and both programs are now used state wide.

Roxanne has been with CDF 27 years. She runs the Volunteer Prevention Program.

Question: What is the origin of Amateur Radio in Red Flag Patrol?

"During holiday patrols like the 4th of July or Labor Day where a lot of people with days off gather, the potential for fires is greater and so we patrol. There are three types of patrols that we have and the law enforcement patrol is very low key. We put you out there in civilian clothes being our eyes and ears in key locations to write down personal descriptions, vehicle descriptions and gather as much information as you can in a very inconspicuous way. When people are off work and fire potential is high, we have a 'high visibility' and 'see and be seen' type of thing called our Holiday Patrols — such as the 4th of July. The Red Flag Patrol is sort of a weather driven event — wind driven. Typically, we get our high winds from September through April and we get winds with high temperatures with low humidity, so the slightest spark can start a fire. So if we can have the radio operators out there in the back country and spot the fires quickly, we can respond to them and send everything we have but the kitchen sink and stop them before we get another Cedar Fire. The goal is to get the fire spotted and responded to at an early stage, and this is where Amateur Radio operators fit in.

"We have eight baskets for Amateur Radio operators. In the baskets are binoculars so we can look for smoke and behaviors that may start fires. We have handheld Kestrel Weather Meters so we can check the weather conditions and log them. We have first aid kits, if anyone does happen to get injured. We also have ice chests so they can have ice and cold water. We have compasses so they can figure out where they are and where the smoke is relative to their position. We have forms so they can answer all the questions that I am going to be asking them as far as how big the fire is, what color is the smoke, so they can get all those questions answered when they get on the air so we can get the resources out to them quickly."

Question: Do you have a story about Amateur Radio?

"We have been very fortunate that we have had very quiet patrols, which is exactly what we want. We did have an F14 [jet] crash west of Highway 67, and I believe it was one of the Amateur Radio operators that called it in. So we were able to get our resources out there, the Navy was able to get their resources out there to the scene, and that is the whole idea — to identify what is happening and get resources out there to respond quickly."

Question: When a fire is in progress, what jobs do Amateur Radio operators do?

"An Amateur Radio operator's job is to help with communications. In the good old days, CDF only had one or two frequencies and they were overtaxed. We used Amateur Radio operators in various positions to help with the

PAUL RIOS, KC6QLS

An exhibit at the California Fire Media Center shows the equipment that firefighters use.

overload. Due to better cell phones and better radios, we have better communications. But what we do now is have supplemental communication but just on the information side of it. So basically at base camp, we put an operator with the team information officer and an operator with every single field information officer and they can communicate back quickly. So when I have a rumor or a question I can get a hold of them and so when we are getting a whole lot of questions at the information center and a header coming up, we can get answers. Amateurs help us focus on communications back to base and give timely accurate information. Cell phones don't always work, but radios are effective. Also, because what you do is listen to radios, there are people available listening whereas with cell phones we could end up having to leave voice mails, and so we don't have that quick effective communication like the radios have."

Question: *So how does the callout work?*

"When winds are blowing county wide, temperatures are up, humidity is low and conditions are right for a fire that is when we know we need it. I will call Rich Beisigl, N6NKJ, because he is the Red Flag Patrol VIP Coordinator and then it is out of my hands. He will make the phone calls. It's a one stop shopping. I make one phone call and Rich coordinates all the operators to work together. I call Rich and he makes everything happen. Then all we simply do is just get people where we need them, resources where we need them, etc. So it works out very nicely. You guys handle the radios. Ken Tagami, WA6BCC, did it before Rich, and we are extremely happy with all of the good service we have gotten over the years."

Celebrating 50 Years on the Air

Jim Baughman, WB4DLD, South Carolina SSB Net Manager

On April 7, 2008, the South Carolina Single Sideband net celebrated the 50th anniversary of the net. What a great milestone to be reached indeed. Surely those first organizing the net back in 1958 did not consider the possibility of it continuing 50 years. And, a great debt of gratitude and thanks are owed to all of those over the years that have kept it going.

Many friendships have been formed over the course of these 50 years. The service to the National Traffic System has been an important one. The first Session was called on April 7, 1958, with a total of eight stations checking in. This was an exciting start for a group of amateurs embarking on a new mode of operation, single sideband. These eight amateurs would never dream of 200 stations checking into the same net 50 years later.

And to make this Session of the SC SSB Net even more special, this 50th Anniversary net was called into session by Net Control Station Randy Collins, KG4KO, from Ladson, South Carolina. And why would this session be special? Well, Randy is blind. Many stations would be expected to check in on this special occasion, but Jim Baughman, WB4DLD, Net Manager, never doubted Randy's ability to log each and every station calling in. The net began at 7 PM on 3.915 MHz. Two hours later, Randy had logged 200 stations. Wow, what a tribute to Amateur Radio as having been demonstrated by Randy.

Congratulations to the South Carolina Single Sideband Net and thanks for a great 50 years. It is a milestone to be proud of.

Field Organization Reports

Public Service Honor Roll
May 2008

This listing is to recognize radio amateurs whose public service performance during the month indicated qualifies for 70 or more total points in the following 6 categories (as reported to their Section Managers). Please note the maximum points for each category:

1) Participating in a public service net, using any mode. —1 point per net session; maximum 40.

2) Handling formal messages (radiograms) via any mode. —1 point for each message handled; maximum 40.

3) Serving in an ARRL-sponsored volunteer position: ARRL Field Organization appointee or Section Manager, NTS Net Manager, TCC Director, TCC member, NTS official or appointee above the Section level. —10 points for each position; maximum 30.

4) Participation in scheduled short-term public service events such as walk-a-thons, bike-a-thons, parades, simulated emergency tests and related practice events. This includes off-the-air meetings and coordination efforts with related emergency groups and served agencies. — 5 points per hour (or any portion thereof) of time spent in either coordinating and/or operating in the public service event; no limit.

5) Participation in an unplanned emergency response when the Amateur Radio operator is on the scene. This also includes unplanned incident requests by public or served agencies for Amateur Radio participation. — 5 points per hour (or any portion thereof) of time spent directly involved in the emergency operation; no limit.

6) Providing and maintaining a) an automated digital system that handles ARRL radiogram-formatted messages; b) a Web page or e-mail list server oriented toward Amateur Radio public service —10 points per item.

Amateur Radio stations that qualify for PSHR 12 consecutive months, or 18 out of a 24-month period, will be awarded a certificate from Headquarters upon written notification of qualifying months to the Public Service Branch of the Membership and Volunteer Programs Department at ARRL HQ.

520 W7TVA
475 WW6CC
460 KB5ILY
445 KI4GWC
364 W2MTA
363 KI4GEM
354 KD1SM
334 KI4KWR
319 KT5SR
305 WB7WOW
285 KB9KEG
264 K4SFM
260 KB2RTZ
255 K7EAJ
250 KØIBS
242 WB8RCR
238 AC8AL
237 KC8NTE
232 W2KFV
229 WA4UJC
224 WD9FLJ
223 K2HJ
221 K4GK
220 N7CM
205 KA8ZGY
201 K4DND WD8USA
200 WA2WMJ
196 NY3H
186 K4GR
180 N5KWB
176 KK1X
175 W4CAC K8RDN
170 WA2BSS

167 KC2NXC
165 KE5HYW WC5M
161 W7JSW
160 KD1LE N1UMJ KGØGG
155 W1PLW
154 K2RRM
152 W2DWR W2SFD
150 W5ESE K9LGU WB5ZED
149 KØBLR
148 WB2WAK
145 W4DNA
144 N5NVP
142 K7BC
140 K7BFL KK3F
137 N9DGK
136 WB2KNS KI4QAU
135 NN7H AA3SB W3YVQ WB9JSR
130 W4FAL N2QZ K8MFK
127 K4JRU
125 N8IO N2GJ KB2EV AC8AR
123 W4ZJY
121 WØSJS W5PY
120 W7IG K4IWW W8UL N1LKJ W1GMF KW1U K1YCQ W1CAR KK5GY KA4FZI KC5OZT KJ6T WØLAW AG9G
116 W2DSX
115 N2RQ WD8JAW
112 KD4NS
111 KD5ITA
110 N7XG N7YSS W2EAG N1IQI N4ABM W7QM W7GB W6DOB W5DY KC2ODN K2UL
109 W6SX
108 WF2T W2CC
107 KC2CHA
106 N8NMA
105 W4TTO W8IM KD5TXD W5XX
104 KF7GC
103 K2YYD
102 N3RB N2VC
101 AD4BL W3ZQN K5MC
100 K2TV KB2KLH N2RDB N8OD N2GS N9MN NR2F WB4GHU NØMEA WB6UZX N5OUJ NN7D KC7ZZ W3TWV W5HUD KM1N WB4FDT K4SCL N7IE N4MEH
98 K8AE
97 KB5KKT
95 WG8Z KE4CB WB6OTS
94 WB2LEZ
93 N1CKM
92 KM5VM KS3Z W3CB
91 W5GKH
90 KI4YV WD8Q N8DD WB8SIQ N1JX NG1A K1JPG KF4WIJ KI4JQB WB8OIF KA8WNO WD8DHC KB8NDS K3IN N3ZOC WB4BIK
89 AL7N W5CU K2GW
88 K2BRG N5MEL
87 N7EIE W8CPG
86 KA4LRM KØBXF
84 KBØDTI
85 W1REP AA4BN K4BG W4JER
81 KK7TN W7VSE K6RAU
80 WA2TWS W1SGC K7MQF KE7DVV KE5DKV WDØGUF KB3LNM AB8SY K8KV
79 WB2HPI KJ7NO
78 WA2WKV
77 NA7G
75 W9RSX K8GA K8VFZ
74 KØLQB
73 KC2QXM KA3NZR K4BEH KO4OL
72 WA2LKJ WJ3P
70 W2MGT K2VX WØADZ NØDUW NØDUX KAØFUI AAØLD NØMHJ KØRXC NØUKO KØVVX N3SW WA1JVV

The following station qualified for PSHR in previous months but were not recognized in this column: (Apr) W2MTA 319, N9GDK 232, KQ4M 188, K4IGH 152, WB8ZGM 126, KJ4CTP 121, N9II 120, N4MEH 100, KI4MXY 79, KA4LRM 85.

Section Traffic Manager Reports
May 2008

The following ARRL Section Traffic Managers reported: AK, AL, AR, AZ, CO, EB, EMA, ENY, EPA, EWA, GA, IL, KS, KY, LA, MI, MN, MO, MS, NC, NH, NNJ, NFL, NTX, OH, OK, OR, SC, SD, SFL, SJV, SNJ, STX, TN, UT, VA, WCF, WI, WMA, WTX, WV, WY.

Section Emergency Coordinator Reports
May 2008

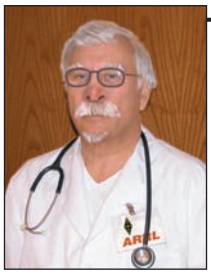
The following ARRL Section Emergency Coordinators reported: AL, AZ, CT, EMA, EWA, KS, KY, GA, IN, MI, ME, MO, NC, NNJ, NM, NTX, NV, OH, OR, SFL, SJV, SV, TN, VA, WPA, WTX, WV.

Brass Pounders League
May 2008

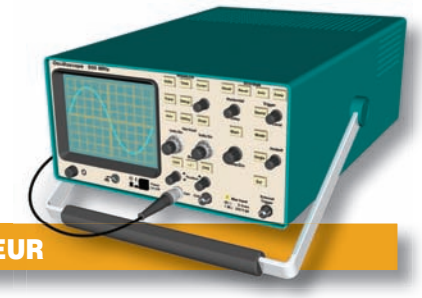
The BPL is open to all amateurs in the US, Canada and US-possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
WB5ZED	22	1507	1420	65	3014
WB5NKD	16	133	1323	0	1472
KA9EKG	39	705	690	38	1472
KK3F	14	674	634	40	1362
N1IQI	0	237	1076	0	1313
K7BDU	8	550	720	2	1280
W4ZJY	0	639	591	0	1230
W8UL	0	558	506	2	1066
WB5NKC	54	96	853	19	1022
W1GMF	0	150	551	0	701
WX4H	4	311	371	4	690
N1UMJ	0	322	329	8	681
KW1U	0	389	289	0	678
WB9JSR	0	311	310	8	629
N8IXF	0	297	269	2	568

The following station achieved BPL with originations plus deliveries: K8LJG 119.



The Doctor is IN



PROJECTS AND INFORMATION FOR THE ACTIVE AMATEUR

Q Mel, K8MIW, asks: I have a question about feeding a folded dipole, spaced about 5 inches between wires. What would be the difference between feeding it with the usual 300 Ω twin lead and using the popular 450 Ω window line as a feed line? I operate mostly on 75 meters. Years ago I used a folded dipole and found it to be an effective and wide band antenna.

I have heavy duty window line on hand, but would have to buy the twin lead and the only line I can find is light duty line. Would the mismatch with the 450 Ω line cause any problems?

A The most significant difference would be the level of mismatch at the transmitter end. If you are using an antenna tuner, I doubt that you will notice any difference at all.

There will actually be slightly less loss with the 450 Ω (usually closer to 400 Ω in my experience) line. Let's see, if the antenna is about 0.25 λ high, the actual feed impedance will be closer to 200 Ω than to the free space value of 300 Ω. With 300 Ω line that results in a 1.5:1 SWR at resonance, or 2:1 with 400 Ω line.

I would go ahead and use the window line. It should be less bothered by rain and will probably last longer. If your tuner has a problem at any frequency you operate at, try changing the feed line length by 20 feet or so and see what happens — you are likely to find a length that works across the band. Just don't roll up any excess. In my cellar shack, I usually put any excess window line between the overhead floor joists, away from other wires and secured with TV standoff insulators.

That should be a great antenna! You may even be able to tune it on other bands, if you have a wide range tuner — especially 30 meters. On that band, the window line will make even more of an improvement.

Q Ed, KC2QFB, asks: Would stainless steel instead of copper rods work as ground rods? I have 1 inch diameter stainless steel pipes that I could use as ground rods. Also, can insulated copper wire be used instead of bare copper wire for ground radials?

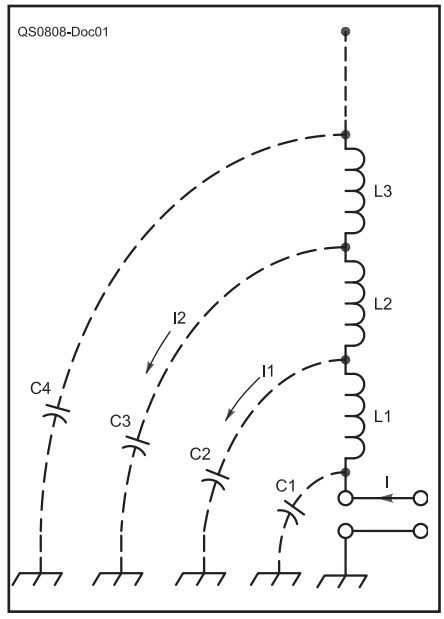


Figure 1 — Equivalent circuit of a monopole over a ground radial. The antenna current will return through the effective capacitance between the vertical element and the ground radial. Adapted from *The ARRL Antenna Book*.[1]

A As a practical matter, I don't think either would make very much difference, especially as far as service as an RF ground under a vertical antenna, for example. In the case of a lightning protection ground, it may be a very different story.

Let's start with the ground rods. Unless the soil is extremely conductive, ground rods don't do very much as an RF ground compared to radials. They can help with the lower frequency components of lightning, however. Ground rods work best having the minimum possible resistance to ground. Stainless has more resistance than copper, or copper plated steel; hence, copper is officially "better." Still, the copper corrodes with time, so at some point stainless may actually be more effective. The other issue is that connections of copper wire to the stainless will be tougher to make as long term connections and may suffer from electrolytic corrosion over time.

Radials are intended to make distributed contact with the soil. If they are insulated, they can't do that and thus will be much less effective as lightning protection grounds. As an RF ground for an antenna, the insulation won't make much difference. Figure 1 shows the equivalent circuit of a vertical monopole fed against a single ground radial. With multiple radials, the currents through the capacitance would divide among the radials to return via the parallel connections.

The insulation will make very little difference, perhaps a slight increase in the capacitance of the path. The current will mostly return through the radial wires since the earth will have a much higher resistance.

In summary, the answer to your question depends very much on whether you are looking for an RF ground for an antenna or a lightning protection ground. On the other hand, the bare wires will work well for either.

Q Ray, AD6AF, asks: I was happy to read the article in April 2008 *QST* about type N connectors as it gave me information that I hope to use soon.[2] The article mentions using BNC connectors for RG-58 and 8X. Due to the convenient size I use mostly RG-8X. I was thinking of converting these to BNC except I do not see a source for lightning protection devices with BNC connectors as are available for both the UHF and Type N connectors. Do you know of a source for use with the BNC?

Near the end of the article you mention using a UHF to Type N adapter to a radio. Wouldn't the addition of more connectors result in additional loss? If this is not significant, would adding a UHF to BNC connector also be a good idea for radios and antennas that come equipped with UHF connectors?

A BNC connectors are great and very suitable through 1 GHz up to the

[1]R. D. Straw, Editor, *The ARRL Antenna Book*, 21st Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2]J. Hallas, W1ZR, "Those Type N Connectors" *QST*, Apr 2008, p 69.

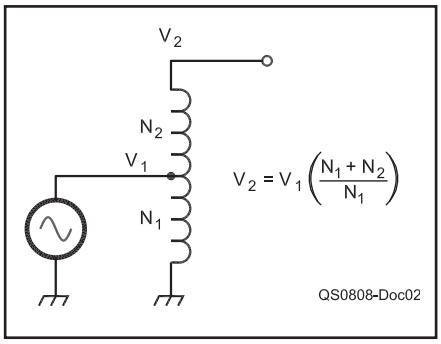


Figure 2 — Illustration of the autotransformer effect in a tapped coil. N1 represents the number of turns in the portion of coil used, while N2 represents the turns in the unused portion. The voltage at V2 will be a multiple of that at V1 as shown.

500 W level. I prefer BNCs for the smaller cable and Type N for larger cable of the RG-213 size. It is possible to obtain BNC connectors for larger cables, and Type N for smaller; however, if within power ratings I prefer them matched to cable size. BNC connectors intended for RG-59 coax will also fit your RG-8X quite nicely.

If you can't get lightning arrestors with BNC connectors, I would get arrestors with type N connectors and use N to BNC adapters, rather than going with UHF. At least one manufacturer, Industrial Communications Engineers (**www.iceradioproducts.com**) lists an HF arrestor rated at 1 kW with BNC connectors. ICE products are available through Array Solutions (**www.arraysolutions.com**).

The thing about the UHF to N adapter is that a new UHF socket on a radio is not usually too bad the first few times it's used. After they have been repeatedly used, the fingers in the socket of all but the best types loosen. Then you can have poor center conductor contact. By putting in the adapter while the UHF connector is fairly new and never removing it, the problem is avoided. The loss of such an arrangement through 70 cm should be insignificant.

Q Hans, AE9G, asks: What is the optimum configuration for unused turns on a tapped loading coil? The choices I'm aware of are to leave them open or short them.

A Shorting the turns results in high current in that segment of the coil, which will result in some loss of efficiency and reduction of inductor Q. All things being equal, it is thus best to leave the unused portion open.

There is a potentially serious downside of an open coil, however. The tapped coil acts like an autotransformer with the result that the RF voltage on the open end will be higher than that on the used portion of the coil as shown in Figure 2. This can result in insulation breakdown — particularly in the case of a parallel resonant tank that will have high voltage on the used portion of the coil and even higher on the dangling end. There is an associated safety issue as well, if the coil is exposed.

Q Bob, KD3JK, asks: Now that Anderson Powerpole connectors are a standard for many ARES organizations, what are some good ways to make sure that the connections don't pull apart during use?

A I have been using Powerpole connectors for some time at home and on mobile systems both on the boat and auto and haven't had the problem. I posed the question to one of the people I believe most responsible for popularizing Powerpoles among amateurs, Del Schier, K1UHF, of West Mountain Radio. Del wrote a comprehensive *QST* article about how to assemble Powerpoles.[3] He points out that there are probably a dozen ways to incorrectly assemble Powerpoles so they do not mate properly. Some are as follows:

- The contacts have solder on the outside and they are jammed in the housing.
- The contacts were crimped with the wrong crimp tool or done incorrectly and are jammed in the housing.
- The contacts were bent up or down while they were crimped.
- The insulation is too large to allow them to float freely in the housings.
- The paired wire was cut unevenly causing the housings not to stay aligned (quick drying adhesive between the housings fixes this, roll pins fall out — sometimes into your radio, causing smoke).

The important test is that the contacts "float" in the housings, the two housings are aligned and you cannot pull the wire or contact out of the housing with 30 to 50 pounds of force. Properly assembled it should take about 5 pounds to separate a pair of connectors.

As Del notes, the roll pins can cause problems. If you have them properly assembled, and each set of red/black pairs are tight or glued together and expect severe vibration or more than 5 pounds of force acting on the connectors, a tie wrap of about 1/16 inch holding the mating pins together, as shown in Figure 3, should keep them from coming apart.

[3]D. Schier, K1UHF, "More Power to You," *QST*, Mar 2006, pp 31-33.

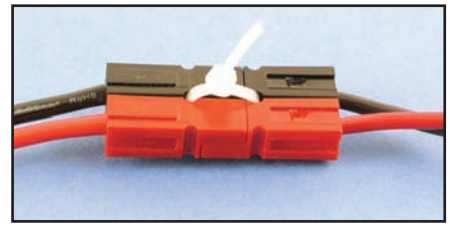


Figure 3 — Your Doctor's prescription for keeping highly stressed Powerpoles together.

Q Fred, WA2VJL, asks: I have a commercial multiband trap vertical mounted on my garage roof, with two radials cut at λ/4 for each band. I experience very strong noise on 40 meters. If I increase the 40 meter radials by two or more, will it help my receive signal-to-noise ratio?

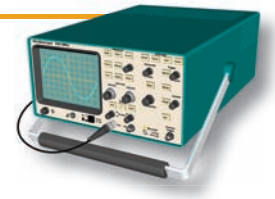
A Adding two additional radials to your vertical will provide a slight (less than 0.5 dB) improvement in both received and transmitted signal strength and provide a more uniform pattern. Adding two more will smooth out your pattern to omnidirectional. Any more than that won't make much difference with elevated radials — and four elevated radials will work as well as many more buried ones.

Unfortunately, this won't do much for noise. About all you can do is try some kind of noise canceller or digital signal processing (DSP) noise reduction circuitry. If you operate CW you can also decrease the bandwidth to perhaps 200 Hz. That will give you about 10 dB improvement in S/N than listening to CW with an SSB filter. Unfortunately, you can't go very far with that on SSB without destroying the signal as well.

Another solution to consider would be to use a specialized low noise directional receive antenna. There are a number of effective antennas in that category; however, for tight space a K9AY Loop antenna is hard to beat.[4] You would use that for reception with your vertical for transmission. The loop will provide a directional low noise receive capability on 160, 80 and 40 and only requires one support, I think 27 feet high, perhaps a tree branch. This is easy to do if you have a separate receive antenna port on your transceiver. You can do it with an external relay if you don't have one.

[4]G. Breed, K9AY, "The K9AY Terminated Loop — A Compact, Directional Receiving Antenna," *QST*, Sep 1997, pp 43-45.

Do you have a question or a problem? Ask the Doctor! Send your questions (no telephone calls, please) to "The Doctor," ARRL, 225 Main St, Newington, CT 06111; doctor@arrl.org; www.arrl.org/tis/. QST



Amateur Radio//Video News
Digital Voice for Amateur Radio

The wild popularity of YouTube has inspired more hams than ever to pick up video cameras and create their own versions of Amateur Radio cinema. In the right hands, video can be a powerful medium, especially for education. You can talk for hours about how something is done, but *showing it* communicates the idea in minutes.

Unfortunately, much of the Amateur Radio video you'll find these days is… well…*amateurish*. It often ranges from mediocre to embarrassing. Sample the offerings and you'll find an astonishing array of cringe-worthy creations with poor audio, bad lighting, bizarre editing and narrators with underwhelming (to put it charitably) on-camera personas.

When a ham video comes along that breaks through the mediocrity barrier and soars to professional heights, it's worthy of attention. *Digital Voice for Amateur Radio* is one of those rare creations.

ARRL Southeastern Division Director Greg Sarratt, W4OZK, with a D-STAR repeater in Huntsville, Alabama.

Host-producer Gary Pearce, KN4AQ.

High Production Standards

Digital Voice for Amateur Radio is the creation of Amateur Radio//Video News, a company founded by Gary Pearce, KN4AQ. Gary is a video professional with more than 30 years experience. His credentials are manifest the moment you start the DVD.

Gary is the program narrator, although his actual on-camera time is sparse. When he does appear, it's obvious that he is not a stranger to the unblinking gaze of the lens. His voice is "well miked," as they say, and perfectly clear. More than that, however, Gary projects the persona of someone who is speaking directly *to you*, not "at" you. His delivery is casual, yet smooth and never rambling.

The video takes you to a number of locations, each showcasing a particular aspect of digital voice communications. Once again, all of the location shots are well lighted and the equipment displays are fully visible. (Anyone who works with video will tell you that capturing computer monitors and transceiver displays can be particularly challenging.) The video is produced in NTSC Standard Definition, but it looked quite good on my widescreen HD television.

Educational and Objective

The 25-minute HF portion of the DVD discusses AOR voice modems, WinDRM, DRMDV and the relatively new FDMDV technology. On the VHF+ side, the DVD spends 35 minutes on D-STAR and APCO-25. The various modes are described from the user standpoint with plenty of on-air examples. You'll see close-ups of equipment in action and hear real on-air signals.

One thing that struck me immediately was Gary's objectivity. *Digital Voice for Amateur Radio* is not a cheerleader for digital voice per se. Many of the individuals shown in the video are proponents of their favorite technologies, as you would expect, but Gary is quick to stress that the technological roses have a few thorns.

Mel Whitten, KØPFX, demonstrates HF digital voice.

When explaining the WinDRM HF digital voice technology, for example, he points out that you need a reasonably strong signal to carry on a conversation without disruption. Strong signals on the HF bands are in short supply at the moment. Gary also asks Mel Whitten, KØPFX, one of the most active hams in the HF digital voice community, if he believes digital voice will ever replace analog SSB. Mel smiles and replies, "I don't see that anywhere in the near future."

The video even touches on the "cultural" impact of digital voice technology. The camera shows up at a hamfest and asks for opinions of amateur digital voice modes. One gentleman barks, "It's just more noise on the bands!"

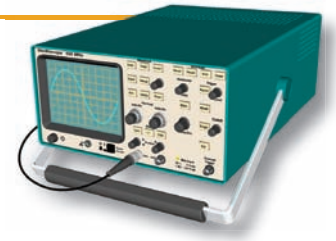
Ideal for Clubs

Digital Voice for Amateur Radio is excellent for individual viewing, but it is especially well suited for clubs. With nothing more than a TV and a DVD player, a club can offer a presentation that members will long remember.

Manufacturer: Amateur Radio//Video News, 508 Spencer Crest Ct, Cary, NC 27513; tel 919-380-9944; **www.ARVideoNews.com/**. *$22 plus $3 shipping and handling.* QST

Steve Ford, WB8IMY ♦ *QST* Editor ♦ sford@arrl.org

Pocket dBm RF Power Meter



This little but accurate RF power meter may be just what your workbench needs.

Steve Whiteside, N2PON

This is one of the most useful projects I have built. It is a simple, RF power meter that accurately measures in 0.1 dBm increments. This meter measures from +10.0 dBm to –70.0 dBm over the frequency range of 0.01 to 500 MHz. The heart of this meter is the Analog Devices AD8307AN Logarithmic Amplifier.[1] This 8-pin IC converts RF into a 25 mV dc/dB output over the frequency range of dc to 500 MHz. This chip is combined with a 200.0 mV digital panel meter module to accurately display digital dBm. Gain and offset have been thermally stabilized in this circuit from 40 to 80° F.

Where it Came From

I built the first meter in June 2001 after studying the *QST* article "Simple RF-Power Measurement" by Hayward and Larkin.[2] Then I decided to build a second meter in January 2006. An inside view of both meters is shown in Figure 1. The second meter has a volume control on the audio output.

All of the references have some good information. I especially like K3NHI's 20 dB input attenuator, and G8KBB goes through a thorough accuracy analysis.[3,4] The AD8307 circuit is taken from Hayward and Larkin article except that I added a switch to provide a 50 or a 1000 Ω input. The 1000 Ω setting enables in-circuit parallel (line-tap) measurements with less VSWR change. Also in this small package, I got flatter frequency response by using two turns for L1. Probably some of the inductance is cancelled by the shielding. With calibration at 120 MHz, my overall frequency response varied from –2.2 dB at 10 kHz, –1.0 dB at 15 kHz, +0.6 dB around 30 MHz to –1 dB at 500 MHz.

How it's Made

The Digital Panel Meter used is a 3½ digit LCD meter model PM-128 or PM-200. They operate from 9 to 12 V dc and measure 200.0 mV dc. The decimal point is selectable by wire jumper. The input impedance is greater than 100 MΩ and the digits are 13 mm high. A black plastic bezel is supplied with the PM-128 meter, but I chose to simply cover the box cutout with a piece of 0.040 inch clear plastic from the local hobby shop. The second meter uses the PM-200 and I also decided to add a clear plastic cover to it. RTV or superglue was used to attach the clear plastic. The Digital Panel Meter modules are about $12 from All Electronics (800-826-5432). Notice that you could just bring out two terminals and use any 200.0 mV DVM as the display.

The schematic and parts list are provided in Figure 2. The AD8307 pin 4 output is scaled to 1 mV/dB by the 10 kΩ pot and associated 100 kΩ resistors. The 1 kΩ NTC thermistor paralleled with R10, a 698 Ω resistor, provides about +0.7 dB gain correction at 40°F for the chosen 50 dBm calibration span (–10.0 and –60.0). Install the thermistor with sleeving to prevent air currents from causing drift in the output.

The negative input to the panel meter is adjusted to about 88 mV by the 1 kΩ pot. This causes the meter to read about –77 dBm with no RF input. This offset is thermally stabilized by selecting R4 and R6. If the 1 kΩ pot were connected directly to the LED, the offset goes about 1.3 dB negative at 40° F. If the 1 kΩ pot were connected directly to the voltage regulator then there is a positive 1.1dB shift with a temperature change from 80°F to 40°F.

My first circuit used a 5 V regulator and it gave similar thermal performance. I changed to the 4 V regulator to achieve maximum battery life from four alkaline cells.

These thermal corrections are for the complete circuit. If you are very particular,

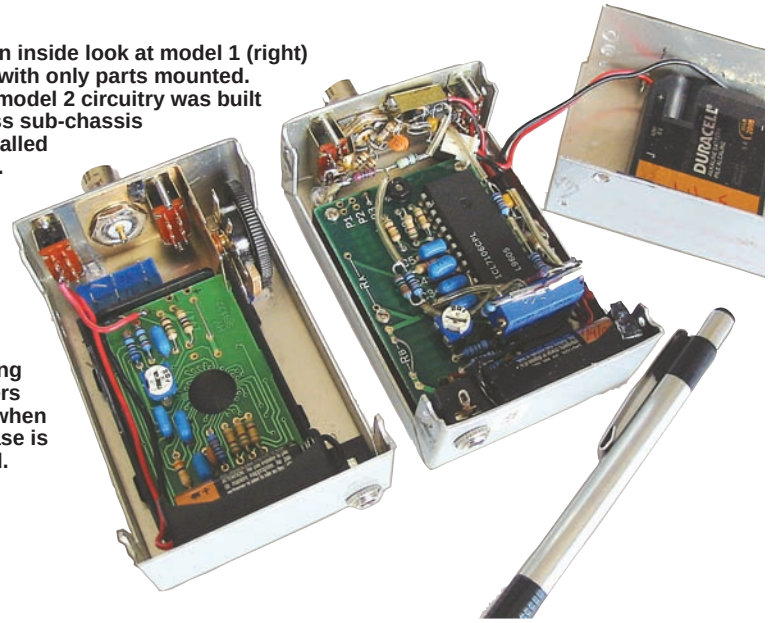


Figure 1 — An inside look at model 1 (right) and model 2 with only parts mounted. Some of the model 2 circuitry was built onto the brass sub-chassis and then installed into the case. Note two turns on L1 to the right of the BNC connector. On Model 2 access holes for gain and offset trimming potentiometers are covered when the rear of case is fully installed.

[1]Notes appear on page 67.

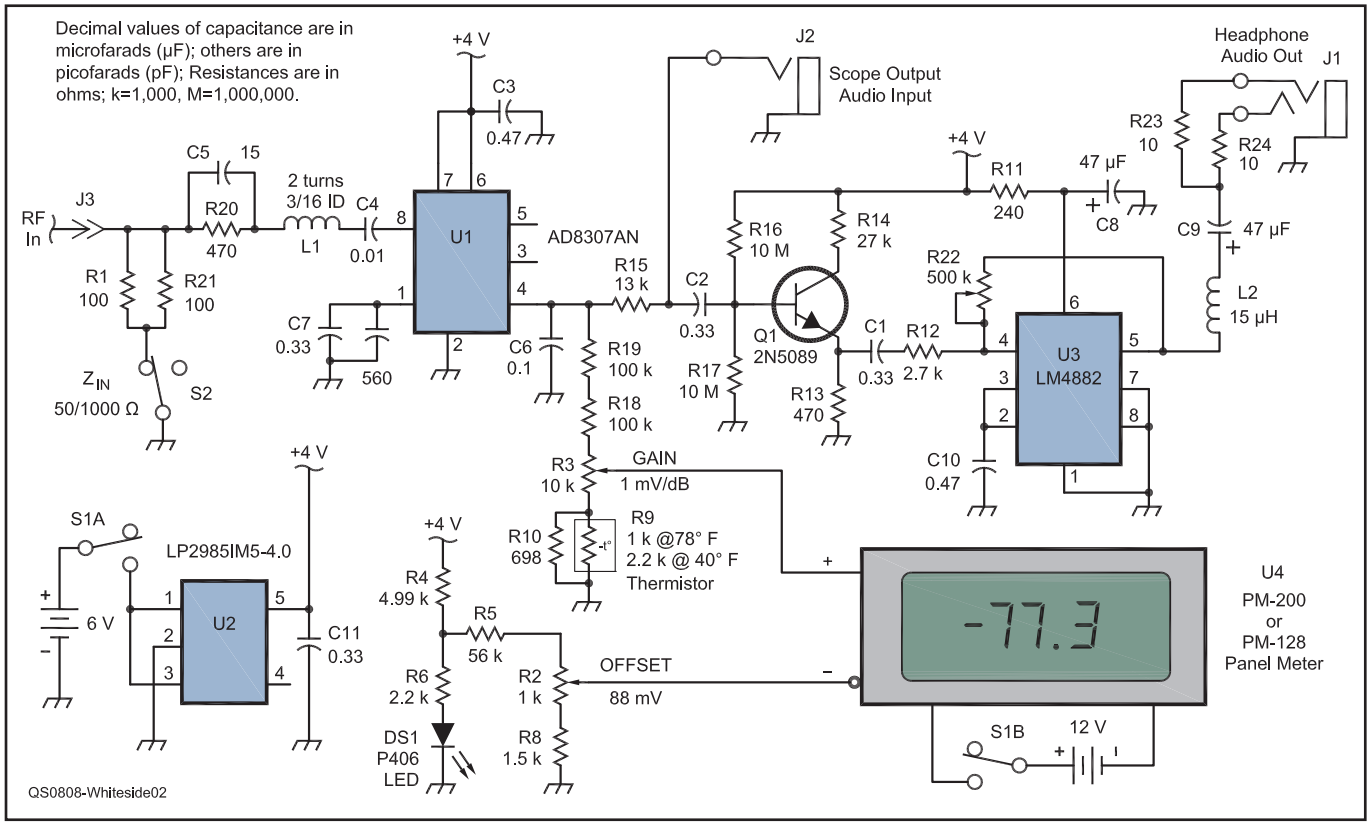


Figure 2 — Schematic of the pocket dBm RF power meter. All resistors are ¼, 1% metal film, most from RadioShack assortment 271-309. The audio amplifier section uses 5% resistors. All Electronics is found at www.allelectronics.com, Chaney Electronics at www.chaneyelectronics.com and Digi-Key at www.digikey.com.

C1-C2, C11 — 0.33 µF, 25 V capacitor.
C3, C4 — 0.01 µF, 25 V capacitor.
C5 — 15 pF, 25 V capacitor.
C6 — 0.1 µF, 25 V capacitor.
C7 — 0.33 µF, 25 V capacitor in parallel with 560 pF, 25 V capacitor.
C8, C9 — 47 µF, 25 V electrolytic capacitor.
C10 — 0.47 µF, 25 V capacitor.
DS1 — P406-ND high brightness LED. Available from Digi-Key.
J1 — ⅛ inch stereo headphone jack.
J2 — 3/32 inch mono jack.
J3 — BNC panel connector.
L1 — 2 turns, 3/16 ID wound on C4 lead.
L2 — 10 to 15 µH inductor.
R1, R21 — 100 Ω, ¼ W resistor.
R2 — 1 kΩ, 15 turn, trimming potentiometer.
R3 — 10 kΩ, 15 turn, trimming potentiometer.
R4 — 4.99 kΩ, ¼ W resistor.
R5 — 56 kΩ, ¼ W resistor.
R6 — 2.2 kΩ, ¼ W resistor.
R8 — 1.5 kΩ, ¼ W resistor.
R9 — Thermistor, 1 kΩ at 78°F, G14610. Available from Chaney Electronics.
R10 — 698 Ω, ¼ W resistor.
R11 — 240 Ω, ¼ W resistor
R12 — 2.7 kΩ, ¼ W resistor.
R13, R20 — 470 Ω, ¼ W resistor.
R14 — 27 kΩ, ¼ W resistor.
R15 — 13 kΩ, ¼ W resistor.
R16, R17 — 10 MΩ, ¼ W resistor.
R18, R19 — 100 kΩ, ¼ W resistor.
R20 — 470 Ω, ¼ W resistor.
R22 — 500 kΩ trimming potentiometer.
R23, R24 — 10 Ω, ¼ W resistor.
S1,S2 — DPDT slide switch, RadioShack 275-407.
U1 — AD8307AN (Digi-Key).
U2 — LP2985IM5-4.0 low dropout 4 V regulator. Available from Digi-Key.
U3 — LM4882 audio amplifier (Digi-Key).
U4 — Digital Panel Meter, PM-128 or PM-200. Available from All Electronics.
Box — Bud-CU-2101-B.

you may choose to tweak the values of R4 and R10 for your complete assembly. This circuit was calibrated at 80°F, 120 MHz, –10.0 and –60.0 dBm (HP8640B). Then after 15 minutes in the refrigerator at 40°F, the meter read –9.9 and –60.0 dBm. I was delighted with that. The dBm meter tracks the HP8640B attenuator output to within about ±0.2 dB. For best accuracy, calibrate at the frequency you use most. I have not determined whether the difference is in the attenuator output or in the dBm meter.

The AD8307 demodulates AM signals so the audio amplifier allows you to verify what signal you are measuring. A signal of 1 kHz, 30% AM modulation gives a nearly constant 5 mV_{rms} of 1 kHz ac at pin 4 independent of signal power. The 2N5089 audio preamp provides low noise at low current. So we get a 350 kΩ input impedance and 17 dB gain without a lot of noise. The LM4882 adds more gain while only drawing about 2 mA. The overall audio gain is about 93 dB. The audio section allows listening to 900 MHz data bursts from my cordless phone and with a ¼ inch loop picks up the 2.4 GHz microwave oven leakage (modulated by an internal stirring fan) at 8 feet. The digital section does not respond to those high frequencies.

A short whip allows listening to the local FM stations with whip orientation selecting the station. (Their signal is not purely FM.) Notice that the AD8307 is a voltage responding log amp and will not give accurate level readings with AM signals. A –30 dBm carrier that is 100% modulated with 1 kHz gives a reading of –34.9 dBm rather than the correct –28.2 dBm (+1.76 dB). 50% modulation read –30.7 when the correct value is –29.5 dBm (+0.5 dB). FM modulated signals read correctly.

Building the Box

Using tin snips, I cut the 2.125 × 3.25 × 1.625 inch aluminum box down from 1.625 to 1.1 inches in depth. This makes the box pocket size. Some of the circuit was built on a brass sub-chassis and then installed in the box. The batteries are an MN21 12 V and a 7K67 6 V in the first model and I built a custom battery holder using 0.026 inch thick PCB to fit 4 AAA cells in model 2. Battery springs (Mouser #534-211) just fit the positive terminal of AAA cells. Then a loop of bus wire soldered to the opposite PCB helps capture the negative end of

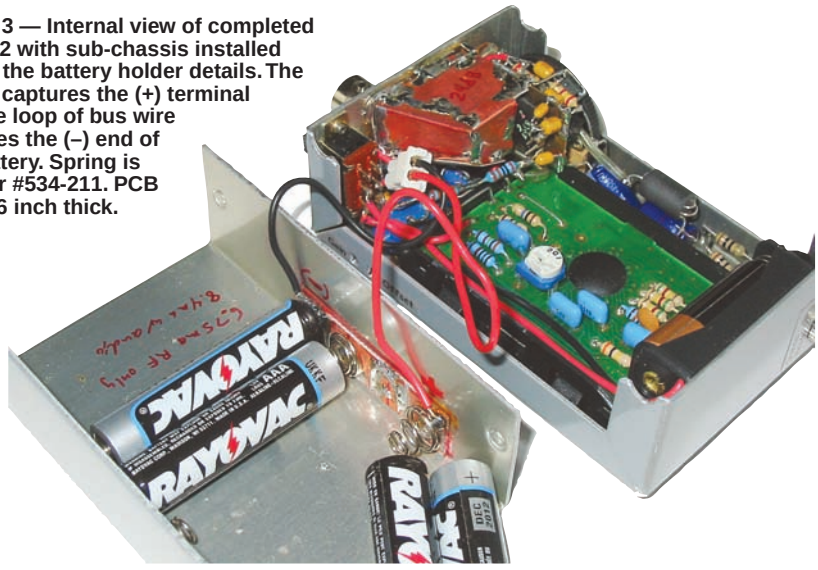


Figure 3 — Internal view of completed model 2 with sub-chassis installed shows the battery holder details. The spring captures the (+) terminal and the loop of bus wire captures the (–) end of the battery. Spring is Mouser #534-211. PCB is 0.026 inch thick.

the cells and a tiny piece of smaller buss wire was soldered in the center of the loop for a contact. The box was just the right length to install all this crosswise by gluing the PCB to the sides. The AAA batteries are installed "backwards" to normal battery holders. See Figure 3. The 12 V supplies about 1 mA to the panel meter and the 6 V supplies about 8 mA to the RF and audio circuits. Originally, I used rechargeables, but I find the alkaline cells work better for my occasional usage. Batteries last about 2 years.

Keeping Out Strays

External RF can be a problem with such a sensitive meter. On model 1 I added a small brass tab to connect across the box slot at the RF end. With that the meter changed less than 0.5 dB while the 2 meter handheld transceiver transmits 100 mW from 9 inches away. On model 2 I built a shield box from copper foil tape to partially surround the AD8307 input circuitry. This shield box reduced 120 MHz pickup by 24 dB. I used a 1 inch loop driven by the signal generator to find the most sensitive spot, which is at the box seam near the BNC fitting. The DPM with shorted inputs did not react to RF there at the 100 mW level. So the DPM is well filtered. If your local field levels are a lot higher than this you may have to use extra care to avoid unwanted pickup. Even coax shielding begins to leak at about 70 dB. The RF ON/OFF switch of my HP8640B leaks at about 60 dB. That is, with the signal generator set to 0 dBm output, switching off the RF still leaves me with about a –60 dBm reading on the pocket dBm meter. Try wrapping two turns of aluminum foil around your box if you suspect RF pickup. Rubber bands are useful to hold the foil tightly in place.

More than Just a Meter

Since this meter circuit also serves as a broadband AM demodulator, you can use it at your local airport without having to tune to find the correct frequency. Of course, you will probably hear more than one conversation at a time. Sitting on the ground at Oshkosh, Wisconsin with a flexible rubber antenna, I could faintly hear the air traffic departure information (ATIS) and at the same time I very clearly heard an aircraft on instruments talking to Chicago Center as he climbed through 3000 feet. The local airport weather transmission is clearly audible at a distance of about ½ mile. An aircraft band receiver is much better, of course, but the RF power meter works well enough for casual local reception without tuning. Signals at 120 MHz AM modulated 30% with 1 kHz are just audible in the headphones at about the –95 dBm level.

Notes

[1]**www.analog.com/en/**.

[2]W. Hayward, W7ZOI, and R. Larkin, W7PUA, "Simple RF-Power Measurement," *QST*, Jun 2001, pp 38-43.

[3]D. Roberts, G8KBB, "A Simple Digital Power Meter," *RSGB Technical Compendium* (RadCom 1999), pp 97-104.

[4]R. Kopski, K3NHI, "An Advanced VHF Wattmeter," *QEX*, May/Jun 2002, pp 3-8.

[5]R. Kopski, K3NHI, "A Simple RF Power Calibrator," *QEX*, Jan/Feb 2004, pp 51-54.

[6]R. Hayward, KA7EXM, "A PIC-based HF/VHF Power Meter," *QEX*, May/Jun 2005, pp 3-10.

Steve Whiteside, N2PON, holds a Technician class liscence and is an ARRL Member. He is a retired EE, pilot and aircraft owner. His primary interests are RDF antenna design, RF measurements and aircraft. You can reach Steve at RR 1 box 138 Liberty, KS 67351 or at **stevewh2@cs.com.**

In The July/August 2008 Issue:

■ John Post, KA5GSQ, describes a crystal controlled 145 MHz oscillator in "VHF Frequency Multiplication Using the SA602 IC."

■ Wes Hayward, W7ZOI, returns to the pages of *QEX* with an article about "Oscillator Noise Evaluation with a Crystal Notch Filter."

■ Al Christman, K3LC, expands on the investigations in his July/August 2005 *QEX* article with "Ground System Configurations for Phased Vertical Arrays."

■ Jack Smith, K8ZOA, presents some "Observations on Ferrite Rod Antennas" with data he collected while measuring the inductance and performance of various ferrite materials to make these antennas.

■ James Koehler, VE5FP, shares "Some Thoughts on Crystal Parameter Measurements" as he describes an automated system he built using a new DDS signal generator and microcontroller circuit to make the measurements and perform calculations.

■ Ulrich Rohde, N1UL, takes us on a tour of early RF oscillators in "From Spark Generators to Modern VHF/UHF/SHF Voltage Controlled Oscillators."

■ Eric Nichols, KL7AJ, describes an unconventional 2 element 40 m Yagi he is considering building. He describes his "Goofy Foot Yagi" in this "Tech Notes" column.

■ Contributing Editor L.B. Cebik, W4RNL (SK) looks at the characteristics of 1 λ loops in "Antenna Options."

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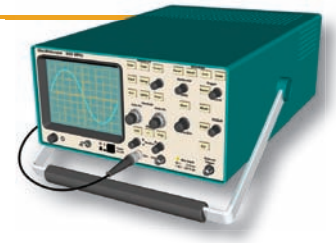
Keeping Your HF Signal Where it Belongs



Being on the "right" frequency takes more than reading that radio dial — you need to know why!

Joel R. Hallas, W1ZR

Amateur Radio operators with a General class license are authorized to operate SSB on parts of all amateur phone bands. It's a great opportunity to explore worldwide HF communication, but it carries with it a responsibility to keep your signal in its authorized segment of each band.

This article was prompted by a question from a new General class operator, authorized to operate from 3800 to 4000 kHz on 75 meters. He was told while he was operating LSB at a dial frequency of 3800 kHz that he was operating out of his authorized band segment. If he needed to know, perhaps others do as well.

The higher class licensees who (I hope politely) told him about this were absolutely right. There are two issues here and we'll cover both.

The Transmitted Signal Spectrum

The FCC rules are very clear on this point. Section 97.307, Emission Standards states: *(b) Emissions resulting from modulation must be confined to the band or segment available to the control operator. Emissions outside the necessary bandwidth must not cause splatter or keyclick interference to operations on adjacent frequencies.* This means that what is important is not the (suppressed) carrier frequency indicated on your radio display, but rather the frequency of your sideband components. If your carrier frequency is at 3800 kHz, your LSB signal extends below that, typically 4 to 6 kHz, to let's say 3794 kHz, depending on the characteristics of your sideband filter as shown in Figure 1. With that filter you will need to set your carrier at least as high as 3804 kHz to be operating within the limits of your license.

The FCC does not specifically say how far down the slope of your filter you must have the edge to be legal. In other sections, however, they require that spurious response be at least 43 dB below the peak level, so that might represent good engineering standards. Many manufacturers specify their filter bandwidth at the 6 and 60 dB points, so the bandwidth at the 60 dB level would represent a reasonable level that I would be comfortable with. Since the carrier frequency is usually set at about the 20 dB point on the (upper for LSB) slope of the curve, that should cover both ends with a bit of safety margin. Check your radio specifications for the 60 dB bandwidth of the sideband filter you are transmitting through and that should be a good number to use.

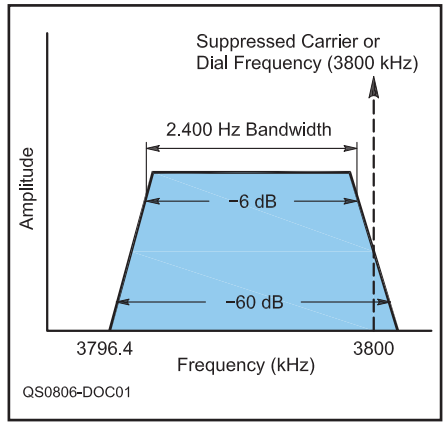


Figure 1 — Spectrum of typical 3800 kHz LSB signal. Note the components below the indicated dial frequency.

At the other end of the filter spectrum, you might find a 2.7 kHz wide filter with a shape factor of 3:1. This would call for staying at least 8.1 kHz from the band edge. Note that for the bands above 40 meters using USB, one needs to leave same amount of space *above* the indicated dial frequency. This situation is potentially even more critical, since instead of just interfering with higher class amateur licensees, you will be interfering with other services — perhaps other governments.

What About Display Accuracy?

All the preceding assumes that your dial calibration is right on. I promised to discuss two aspects of this question — the second has to do with how accurate your frequency readout is. The frequency display on modern transceivers can often read to a single Hz, as in 3800.000 kHz. That is an indication of *precision*, not *accuracy*. The accuracy depends largely on the initial calibration at a factory in which a technician (hopefully) carefully adjusts a trimmer capacitor to make your internal reference clock *almost* exactly line up with their (hopefully recently calibrated) factory frequency standard.

That event probably happened at least 10,000 miles from your current location, was likely followed by an ocean voyage and perhaps five years of crystal and circuit aging. Unless you have recalibrated your internal reference lately, or had it aligned professionally in a standards laboratory, I would allow an additional few kHz at any band or segment edge.

Depending on your receiver architecture, you may be able to get a guess at how close your calibration is by listening to WWV (at 5, 10, 15, 20 or 25 MHz) on both upper and lower sideband. This works only for a radio with a frequency synthesizer that covers the whole range, since other types may have different circuits in play on different bands. Let the radio get up to operating temperature, perhaps for 30 minutes. Now tune the radio carefully to a WWV signal that is strong in your location until the beat note vanishes and the voice sounds natural. Note the frequency on the display. Any difference between, for example, 15,000.000 kHz and the displayed frequency is an indication of possible error in your reference oscillator. I would add at least twice that difference to the allowance for the sideband components described above.

Joel R. Hallas, W1ZR, is QST Technical Editor. He can be reached at **jhallas@arrl.org**. QST

NØAX

HANDS-ON RADIO

Experiment #67 — The Return of the Kit

While happily ambling the aisles of Hara Arena and plodding the pathways of the outside flea market of the Dayton Hamvention, I realized that a renaissance had occurred — the return of the kit. Vendors of kits or sellers of radio stuff built from kits were everywhere! This certainly runs counter to the perception that "hams aren't building." To my eye, there have never been more kits available in such variety. Hands-On Radio readers can feast on that cornucopia!

Before we start, I must report that the *Dual Function Generator* and *Spectrum View* software used in the past few experiments are *not* free with *The 2008 ARRL Handbook* as I indicated. They were included as part of a special introductory offer. Nevertheless, those programs remain available as part of the *Software Library for Hams 2.0* CD from the ARRL — still a bargain at $20, but not quite free as reported.[1]

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Figure 1 — FAR Circuits, shown here in their Dayton Hamvention tent, stocks printed-circuit boards for many of the projects described in *QST* and other amateur magazines.

Kit History

Hams who were licensed before the mid-1980s will recall the kit vendor that dominated amateur building for 30 years: Heathkit (**www.heathkit.com**) is still in business, providing education and training for a variety of technologies. It is the familiar green and gray cabinets of amateur rigs, test equipment and home electronics that had the biggest impact on hams, however. A quick browse through Heathkit Museum Web site (**www.heathkit-museum.com**) will provide glimpses of the colorfully named gear that was the core of many ham stations. How could you not be proud and confident as the owner of a *Marauder* transmitter? Many Heathkit rigs, amplifiers and accessories are still making contacts today. When they need service, a Heathkit meter or generator may even be used to set them right again. But enough nostalgia — what about today's kits?

Kit Building Today

Heathkits were known for their detailed, lavishly illustrated, step-by-step instruction manuals. In fact, the Heath motto was, "We won't let you fail!" Their customer service was exceptional. However, that level of support became commercially unsustainable and today's kit builder shouldn't expect it. Nevertheless, the manuals that come with current kits are usually sufficient for the homebrewer to be successful.

Kits available today for ham radio range from electronic gadgets that cost a few dollars to sophisticated transceivers. The Elecraft K2 HF transceiver (**www.elecraft.com**) is the most sophisticated amateur kit ever. (The Elecraft K3 is a modular, no-solder kit and actually requires less assembly than the K2.) In between lies a profusion of kits for test equipment, accessories and radios. Let's start with the simplest form and work our way up.

Kits from Magazine Articles

Construction articles in ARRL publications such as *QST* and in other magazines are often based on a printed-circuit board (PCB). Most kit builders are not equipped to make their own PCBs and would have to resort to other less-suitable building techniques if the PCB were not available for purchase. Enter FAR Circuits (**www.farcircuits.net**). About half of their traveling inventory can be seen in Figure 1, taken in the Hamvention flea market area. These aren't complete kits, which would have all of the electronic parts and an enclosure. What you get from FAR is a copy of the original article and a single or double-sided PCB. You add your own parts to complete the kit. This is a very cost-effective way to build something you've seen in a magazine if you have a stock of parts or are willing to order them.

If FAR doesn't carry a circuit-board for the article, it's possible that the author has a small stock. Check the notes at the end of the article to see if kits of parts or a PCB is available. Unless the kit is very popular, however, the author is unlikely to maintain a stock of PCBs for long and once sold out they are rarely available.

Test Equipment Kits

Building one's own test equipment is a great way both to learn about electronics and to save a lot of money compared to purchasing lab-quality gear. For example, a used commercial function generator will

[1]*Dual Function Generator* and *SpectrumView* are part of the *ARRL Software Library for Hams, Vol 2.0*. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9825. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

H. Ward Silver, NØAX ♦ PO Box 927, Vashon, WA 98070 ♦ n0ax@arrl.org

cost a minimum of $100 from a dealer (plus shipping), but the simple sine-square wave generator kit from Ocean State Electronics (**www.oselectronics.com**) will only set you back $40 and you get to practice surface-mount soldering, too.

You will find that kits are available for many mid level test and measurement functions. Don't expect to find voltmeter kits, since fully assembled meters are available for under $20. Nor will you find expensive high performance oscilloscopes or signal generators in kit form. But there are plenty of kits for power supplies, voltage regulators, component testers, frequency counters and others at reasonable prices.

Several vendors also sell training kits for soldering and surface-mount techniques. This is a great way for a beginner or student to get started. For example, the Elenco AK-100 "Learn to Solder" kit, available from many vendors, costs less than $20, and comes with solder, soldering iron and wire cutters that can be used to build other kits.

Transceiver Kits

The thrill of building your own radio and making contacts with something built yourself is unmatched in Amateur Radio. Your editor's first radio was a Heathkit HW-16, painstakingly assembled at his bedroom workbench and helpfully troubleshot by WBØDYU. Today, there are dozens of receiver, transmitter and transceiver kits.

For your first attempt at building your own radio, it's best to start with a simple CW QRP transceiver kit. The Ten-Tec 1340 (**radio.tentec.com/kits/transceivers/1300**) comes with an extensive instruction book and a customer service department for help. As you become more skilled at building, you may want to try your hand at building a radio from separate receiver and transmitter modules. A PCB for the *QST* classic Tuna Tin 2 transmitter by the late Doug DeMaw, W1FB, is available from FAR Circuits and a complete kit (along with several amusing variations) from the Maine QRP Club (**www.qrpme.com**).[2]

Advanced builders will be comfortable tackling one of the Hendricks QRP Kits transceivers as shown in Figure 2 (**www.qrpkits.com**), a Northern California QRP Club (**www.norcalqrp.org**) design, or one of the Elecraft kits mentioned previously. You will find the QRP clubs to be hotbeds of building activity — probably the most active builders in Amateur Radio!

Kit Building

Your kit building adventures will be successful if you are careful and follow instructions. You also need to have the basic skills needed for the kit. For your first few kits, try one that uses *through-hole components* with leads that are inserted into PCB holes rather than surface mount devices (SMDs). These are easy to build, with large components and soldering surfaces. A regular soldering iron of 25 to 50 W and 60-40 0.032 inch diameter rosin-core solder will do nicely. For tools you'll only need a small pair of needle-nosed pliers and wire cutters.

KØNEB

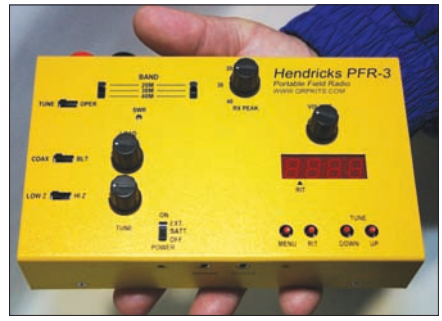

Figure 2 — Advanced kit builders can take on projects such as this 40-30-20 meter, 5 W, QRP CW rig from Hendricks QRP Kits.

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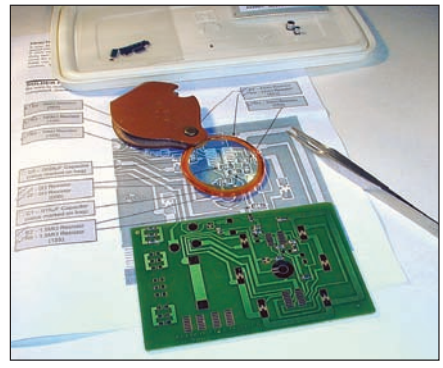


Figure 3 — The Elenco SM200K Surface-Mount Soldering Kit is a good introduction to SMT building techniques. A magnifying glass and a pair of tweezers are the only special tools required.

If you haven't had any experience with *surface-mount technology* (SMT) in which the components are soldered directly to the PCB pads without leads, you should try a training kit. The Elenco SM200K "Learn Surface-Mount Soldering" kit shown in Figure 3 is widely available. You will need some kind of magnifier, especially if your vision isn't sharp. Lightweight, head-mounted magnifiers are available at sewing and craft stores for much less than at electronics and tool outlets. Make sure your work surface is brightly illuminated, too.

Once you're ready to build your kit, start by doing a complete check of the parts against the kit's part list. This is the time to find out that you have extra or missing components! Building a kit is a perfect time to start learning the resistor color code and parts marking conventions. (*The ARRL Handbook* has a section on component marking.[3]) Sort the parts out into groups so that you can find them easily. Egg cartons and muffin tins are simple and inexpensive for use as parts holders.

Most kits will have step-by-step instructions and it can't be emphasized too much that it is important to follow them. Read through the whole manual first to get a feel for how the project will go. Check off each completed step so that if you're interrupted you won't forget where you stopped. (It's not always obvious.) If the instruction doesn't seem to correspond with the kit's layout or available components, stop! Don't proceed until you have figured it out. Troubleshooting is a lot harder than doing it right the first time.

As you build the kit, make notes in your electronics notebook. You do keep a notebook, don't you? A simple, spiral-bound notebook should be your constant companion at the workbench. Record assembly notes, test results, any discrepancies between the instructions and the kit, and any good ideas that occur to you as you build. If you have to repair or decide to modify the kit later, your notes may prove invaluable.

Finding Kits

An excellent way to find kit vendors is to use the ARRL Technical Information Service (**www.arrl.org/tis**). Click TISFIND and then enter "kits" into the SEARCH ON-LINE FOR: window. You'll find dozens of kit vendors. Paper catalogs are available from vendors such as Ramsey Electronics (**www.ramsey-electronics.com**), Jameco (**www.jameco.com**) and Vectronics (**www.vectronics.com**). If you are looking for a specific type of kit, an Internet search engine is probably a better method.

Recommended Reading

Your job is to use the ARRL TIS and browse through some of the kit vendor Web sites. Take a look at the gear in your shack and on your workbench, then review the Web sites to see if any kits might fill one of those smaller holes.

Next Month

We'll return to poring over the workbench next month as we start a multi-part experiment featuring phase-locked loops (PLLs). Ready, aim, lock!

[2]D. DeMaw, W1CER, "Build A Tuna Tin 2," *QST*, May 1976, pp 14-16.

[3]*The ARRL Handbook for Radio Communications,* 2008 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1018. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**. QST

HINTS & KINKS

COUNTING TURNS ON VERY SMALL TOROIDS MADE EASY!

◊ I was faced with this task while building a FireFly 30 meter software defined radio kit (**www.qrpkits.com/firefly.html**). I tried to count the 56 turns on a ⅜ inch diameter toroid using a magnifying bench light. I couldn't get an accurate count. I decided to take a picture of the coil using the macro mode of my digital camera. I printed it out and was able to easily and accurately count the number of turns on the much enlarged toroid picture (see Figure 1). Also, I was able to keep track of my "place" with a pencil mark. Figure 2 shows 57 turns, I removed the extra turn. *— 73, John G. Olson, W9JGO, 2707 18th Ave, Rockford, IL 61108,* **johng_olson_186@comcast.net**

JOHN OLSON, W9JGO

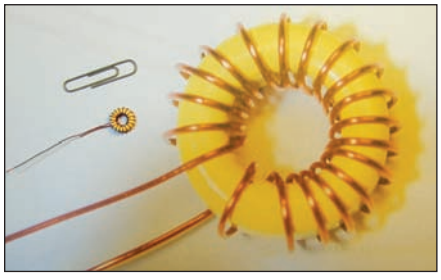


Figure 1 — The actual toroid and its magnified view with a paper clip for perspective.

JOHN OLSON, W9JGO

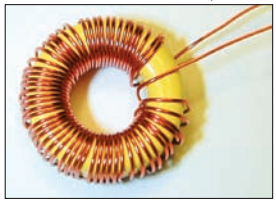


Figure 2 — The completed toroid digitally magnified.

SOLDERING RG-8X TO A PL-259

◊ I am a wire antenna experimenter. Tuning antennas that are in trees can be a challenge. At first, I was using the four hole solder method for assembling the PL-259 connector. I was always fighting broken cable sleeve connections (which can even get you going on a trimming wild goose chase). Then I remembered the method I used as a Novice. Let's call it the Threaded Sleeve Method for RG-8X coax:

1) Put coupling ring and adapter (UG-176) on the cable.

2) Tin one of the holes and surrounding outside area of the connector body; remove excess solder and let cool.

3) Strip the insulation back about 2½ inches being careful not to cut the shield (Figure 3).

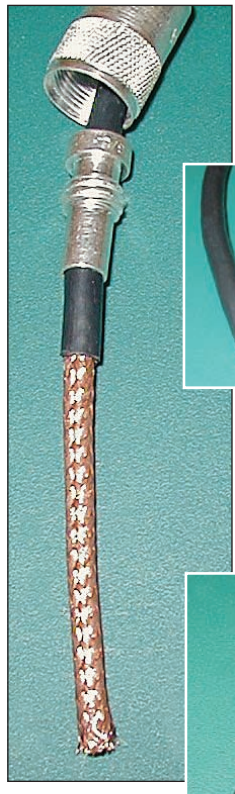


Figure 3 — Strip off 2½ inches of outer insulation.

Figure 4 — Separate shield braid to reveal center conductor.

Figure 5 — Pull center conductor out of the shield braid.

Figure 6 — Pull the shield tight around the center conductor.

Figure 7 — Strip center conductor down to within ⅛ inch of the braid.

4) Bend the end tight near the end of the outer insulation and open the shield without breaking any shield strands. If you break any strands, or pull any single strands loose, start over (Figure 4).

5) Pull the center conductor out through the hole in the braid (be careful not to let the center conductor spring out and cause single stray strands) (Figure 5).

6) Stretch the braid back tight around the center conductor. They should both be about 2⅜ inches long (Figure 6).

7) Strip the center conductor to within ⅛ inch of the braid and twist all the strands together tight (Figure 7).

8) Remove 1 inch off the shield, cutting at an angle so the shield forms a point. Then bend the end of the shield to form a 90° angle about ⅜ inch long, positioned next to the center conductor (Figure 8).

9) Insert the center conductor into the center pin of connector. Start the shield through the hole with a pair of needle nose pliers; ensure all the shield wires come through the hole as you insert the center conductor (Figure 9).

10) Firmly seat cable into the PL-259 body and pull the shield tight through the hole in the connector (make sure cable does not twist). About 1 inch of shield should be sticking through the hole in the connector body (Figure 10).

11) Slowly tighten the adapter, keeping shield end taut. The shield should retract back through the hole a little during tightening. There should be no gap between the end of the connector and the adapter (Figure 11).

12) Check connector continuity. If open continue, if not, tear apart and start over.

13) Trim the excess shield off flush at the hole edge.

14) Solder the shield in the hole using a 100-140 W soldering iron until hole is filled. Do not overheat or the coax will short. Let cool (Figure 12).

15) Check shield to center conductor continuity; if open when wiggled, trim the excess center conductor flush and solder. Let cool.

16) Check shield to center conductor continuity.

I think this method makes a much more rugged connector. Since I started using it, I have not had any broken or intermittent shields at the connectors. Also, if the antenna SWR is low, this method handles medium power just fine (my amp delivers 500-600 W output).

Network analyzer measurements (I used

Steve Sant Andrea, WB2GYK ♦ Assistant Editor ♦ h&k@arrl.org

Figure 8 — Trim and bend the shield to get it ready for insertion into the connector.

Figure 9 — Insert the cable into connector.

Figure 10 — Pull shield out through the prepared hole.

an Agilent 8753) of insertion loss, return loss and time domain discontinuities shows the threaded sleeve method outperforms the molded connectors on purchased jumper cables and is just as good as the four hole solder method. It looks like the molded crimped connectors have a lot more variability in them. Out of the four advertised low loss jumper cables that I bought, only one came close to performing like the ones that I soldered. The losses were still minimal (below 50 MHz).

This technique is only for the smaller diameter cables that use an adapter. It will work for RG-58 and RG-59 cables, too, but you have to strip off a ⅛ inch piece of center conductor insulation from RG-8X cable to be used as a bead on the center conductor of these cables. Otherwise, the smaller center conductor insulation will slide into the pin of the connector allowing the shield to contact the center pin and short out the connector. *— 73, Kurk Radford, K6RAD, 19471 Moon Ridge Rd, Hidden Valley Lake, CA 95467. Figures 3-12 by K6RAD. He can be reached at* **k6rad@arrl.net**.

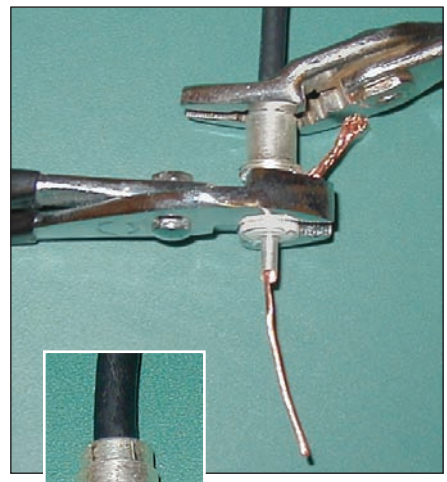


Figure 11 — Tighten up the adapter until there is no gap between it and the connector body.

Figure 12 — Solder the shield onto the connector body being careful not to overheat the coax.

RF COMPUTER HASH SOLVED

♢ My problem started with the full-size tower PC in use at my station for many years. There was no detectable interference even though the radios, cabling and coax were close to one another. I was operating on 80, 40 and 20 meters and noticed the noise floor was much higher than normal, strong enough to wipe out weak signals. Also, there were birdies every 50 or 60 kHz up and down the band.

Using separate receivers and antennas, I concluded something in my station was causing the rise in the noise floor. First, I turned off every power-consuming device in the station, but this had no effect. Next, I shut down the computer, which eliminated the noise. Therefore, it was coming from the computer and I figured it was due to the proximity of the computer to the radio equipment and cabling.

Separating the cables and moving the antenna lead-in wire away from the equipment did not help. I then methodically unplugged one cable at a time from the back of the running computer until only the power cord was attached. No change! I then surmised the noise was coming down the power cord into the common power connection or radiating directly from the cable. I brought in an extension cord and plugged the computer into an outlet on a different circuit breaker. This reduced the hash somewhat but it was still there and very strong.

I then put ferrite slugs on the power line, but this had no effect either. At this point, I became somewhat resigned to the fact that I would have to put up with this situation by either shutting the computer off or locating it somewhere else. I also considered using a wireless hub, but I knew there had to be an easier way to solve this problem.

I sat back and thought, what has changed in the station in the past few months, when I did not have this problem? I remembered that the computer had failed and it needed a new power supply. Thinking the repair shop gave me a bad or dirty power supply, I decided to either return it to them or just change it on my own. Then during my attempts to move the computer, I accidentally bumped it hard and, lo and behold, the noise went away! Investigating further, I found that by tapping ever so slightly on the case of the computer the noise would disappear, but quickly come back. I said to myself: "Got cha!" I took the computer offline, opened it up and turned it on without the case. Noticing the noise or hash was still there, I started to poke around with an insulated tool and found that when I poked the power supply, the hash either resumed or disappeared. Unplugging the computer from the outlet, I pulled the power supply from the computer case, loosened four screws and opened it up.

What I found was interesting and satisfying at the same time. The ground lug from the power cord receptacle was very loose under one of the power supply circuit board screws. I also found the other three screws holding the circuit board to the case somewhat loose and tightened them as well. Replacing the supply back in the computer, I found the noise completely gone, no EMI at all, not an S meter flicker. While I still had the computer covers removed, I tightened every available grounding screw I could find including those on the computer mother board of which a few were also loose.

So if you are experiencing a sudden or unexplained raised noise floor, check out the switching power supply in your computer, it could be the culprit and it's an easy fix. Safety first though, unplug it. *— 73, Bill Gerhold, K2WH, 63 Goldfinch Ln, Hewitt, NJ 07421,* **k2wh@optonline.net**

Hints and Kinks items have not been tested by *QST* or the ARRL unless otherwise stated. Although we can't guarantee that a given hint will work for your situation, we make every effort to screen out harmful information. Send technical questions directly to the hint's author.

QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters, 225 Main St, Newington, CT 06111, or via e-mail to **h&k@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing an item, please send the author(s) a copy of your comments. QST

This Month in Contesting

Sean Kutzko, KX9X
ARRL Contest Branch Manager, kx9x@arrl.org

OFF THE BEATEN PATH

Part of the fun of Radiosport is trying new events and exploring new territory. You will always encounter hams that really enjoy something you may not have tried before. You owe it to yourself to listen and see what it is they enjoy about their interest; you may find you've been missing out on something. The ARRL has two events in August that are worthy of exploration: The UHF Contest and the 10 GHz and Up Contest.

432's For You: The August UHF Contest

This event runs from 1800Z Saturday, August 2 until 1800Z Sunday, August 3. It's only 24 hours long, so that gives you plenty of time on the weekend to do other things, too. As the name implies, this event uses the UHF bands; the lowest band you can operate on is 222 MHz; however, the main focus of activity is 432 MHz. There is also activity on 1.2 GHz and higher. Most contest operations will be on SSB/CW, but there is quite a bit of FM activity for this event, especially if you live near an area with a large population.

The contest exchange information is your Maidenhead grid square. I've discussed grid squares in my June column, but be sure to check out **www.arrl.org/locate/gridinfo.html** if you need a refresher on grid squares.

For SSB and CW, monitor the calling frequencies 222.1 MHz, 432.1 MHz and 1296.1 MHz. Horizontally polarized antennas should be used if attempting to make QSOs on SSB/CW. If you're trying your hand at FM, monitor the FM Simplex calling frequencies of 223.5 MHz, 446.00 MHz and 1294.5 MHz. Vertically polarized antennas are the norm for FM QSOs. Many contesters listen for FM stations, especially on 223.5 MHz, as many newcomers to UHF operating have only FM capability. While there are no contest restrictions placed on the FM calling frequencies on 222 MHz and above, be mindful that non-contesters may want to use those frequencies, too. Check for your area's regional band plan to find alternate FM frequencies to use.

The August UHF Contest is an excellent event to operate as a portable station; antennas are small and are easy to raise. Find a high hill in a campground, a utility road or other elevated location, set up your antennas, and start making QSOs!

How far can you communicate on UHF? If conditions are good, QSOs several hundred miles away can be made via troposcatter or tropospheric ducting. For more information on tropospheric propagation, visit William Hepburn's excellent site at **www.dxinfocentre.com/propagation/tr-modes.htm**. As is standard on VHF/UHF frequencies, the higher you can get your antennas up in the air and over anything that could block them (such as trees or buildings), the better.

The main thing, of course, is to simply get on the air and give it a try, regardless of what equipment you have. Contesters will be happy to try and pull your signal out, so don't be afraid to try, even if all you have is a handheld transceiver and a J-pole.

Challenge Yourself: 10 GHz and Up

If you enjoy the technical side of Amateur Radio and being on the cutting edge, you might want to take a look at the microwave bands. While this contest is beyond the reach of the average new ham (you're not likely to have 10 GHz gear just lying around), the challenges the microwave bands offer can be very rewarding.

There are two weekends of activity: August 16 and 17, and again on September 20 and 21. The contest period for both weekends starts at 6am local time Saturday and runs until Midnight local time Sunday. QSO points are awarded based on the distance of a QSO, and operating from several locations during the contest period is encouraged. SSB is the mode commonly used, although there is some CW used as well. Power levels are relatively low compared to HF; most stations run several hundred milliwatts; a station running a few watts is considered a "Big Gun." Antennas are usually dishes, like those used for receiving satellite TV.

Many QSOs are completed on the microwave bands by bouncing signals off other objects, such as mountains, buildings, even raindrops! You can also get lucky and catch a good tropo opening; in the 2007 contest, a QSO of 907.2 miles was made on 10 GHz on the west coast between California and Mexico.

If you have a person in your area that is interested in the microwave bands, ask if you can tag along and observe. If you live in an area that has a microwave club, such as the North Texas Microwave Society, find out what their members are doing for the contest. Elmering is a big part of the microwave groups and they are only too happy to introduce their fun to you.

Exploring different facets of Amateur Radio, and contesting in particular, gives you the opportunity to see what others enjoy and why they enjoy it. Maybe the microwave bands aren't your thing… then again, if you never try, how will you know? You might be missing out on something you would really enjoy. Think outside of the box and try something new!

In the July/August "Contesting 101"

Kirk Pickering, K4RO, talks about the importance of calling CQ in contests, and also takes a look at operator assistance for the contest newcomer. "Contesting 101" can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

Operating Tip of the Month

*"**LCRs Are Your Friend.** Many contest sponsors offer Log Checking Reports after the results are officially published. These reports show how your log was scored and how accurate your data was. Remember: It's not just about making QSOs; it's about reporting contest exchanges accurately. More accuracy means fewer penalties, which means a higher score. Review your LCRs and learn from them."*

CONTEST CORRAL

in association with the *National Contest Journal*

AUGUST 2008

Start & Finish	HF	VHF+	Contest Title	SSB	CW	Dig	Exchange	Sponsor's Web Site
Aug 2 0000Z - Aug 4 2400Z	160-28	50	TARA Grid Dip Contest			✘	Name and grid square	www.n2ty.org/seasons/tara_grid_rules.html
Aug 2 0001Z - Aug 3 2359Z	1.8-28		Nat'l Lighthouse-Lightship Wkend	✘	✘	✘	Serial or ARLHS mbr/light nr, name, S/P/C	arlhs.com
Aug 2 0001Z - Aug 3 2359Z	28		10-10 Summer Phone QSO Party	✘			Call, name, 10-10 number, S/P/C	www.ten-ten.org
Aug 2 1200Z - Aug 2 2359Z	1.8-28		European HF Championship	✘	✘		RS(T), last two digits of 1st year licensed	lea.hamradio.si/~scc/euhfc.html
Aug 2 1800Z - Aug 3 1800Z		222+	ARRL UHF Contest	✘	✘	✘	Grid square	arrl.org/contest
Aug 2 1800Z - Aug 3 0600Z	1.8-28		North American QSO Party		✘		Name and state	ncjweb.com
Aug 3 1300Z - Aug 3 1630Z	3.5-14		SARL HF DX Contest	✘			RS and serial	www.sarl.org.za
Aug 9 0000Z - Aug 10 2359Z	3.5-28		Worked All Europe		✘		RST and serial (see Web for QTC rules)	www.waedc.de
Aug 9 1600Z - Aug 10 2359Z	1.8-28	50-440	Maryland-DC QSO Party	✘	✘	✘	Maryland County/City or S/P/C	www.w3cwc.org/funcontest.htm
Aug 16 6 AM - Aug 17 12 AM		10G+	ARRL 10 GHz and Up Contest	✘	✘	✘	6-character grid locator	arrl.org/contest
Aug 16 0000Z - Aug 17 1600Z	3.5-28		SARTG WW RTTY Contest			✘	RST and serial	www.sartg.com
Aug 16 1200Z - Aug 17 1200Z	1.8-28	50	Keymen's Club of Japan Contest		✘		RST and JA pref/dist or continent	www.jarl.com/kcj
Aug 16 0800Z - Aug 17 0800Z	1.8-28		Russian District Award Contest	✘	✘		RS(T), serial or Russian district	rdaward.org/rdac1.htm
Aug 16 1500Z - Aug 16 1800Z	1.8-28		Silent Key Memorial Sprint		✘		RST, S/P/C, QRP ARCI member nr or power	qrparci.org
Aug 16 1800Z - Aug 17 0600Z	1.8-28		North American QSO Party	✘			Name and state	ncjweb.com
Aug 16 2000Z - Aug 18 0200Z	1.8-28	50,144	New Jersey QSO Party	✘	✘		Serial and NJ county or S/P/C	www.qsl.net/w2rj
Aug 23 0700Z - Aug 24 2200Z	1.8-28		Hawaii QSO Party	✘	✘	✘	RS(T), S/P/C or maritime regn or HI county	www.karc.us/hi_qso_party.html
Aug 30 1200Z - Aug 31 1200Z	3.5-28		YO DX Contest	✘	✘		RS(T), serial	www.radioamator.ro
Aug 23 1600Z - Aug 24 0400Z	3.5-28		Ohio QSO Party	✘	✘		Serial and S/P or "DX"	www.oqp.us
Aug 30 0600Z - Aug 31 1159Z	3.5-28		ALARA Contest	✘	✘		RS(T), serial, ALARA nr, name	alara.org.au
Aug 30 1200Z - Aug 31 1159Z	3.5-28		SCC RTTY Championship			✘	RST, 4-digit year first licensed	lea.hamradio.si/~scc/rtty.html

All dates refer to UTC and may be different than calendar date in North America. No contest activity occurs on 30, 17, 12 meters.

Refer to the contest Web sites for full rules, scoring information, operating periods or time limits, and log submission information.

Serial — Sequential number of the contact. S/P/C — State, Province, DXCC Entity

Publication deadline for Contest Corral listings is the first of the second month prior to publication.

Check for updates and a downloadable PDF version online at www.arrl.org/contests

Sean's Picks

- **State QSO Parties this month:** Hawaii, Maryland-DC, New Jersey, Ohio.
- **10-10 Summer Phone QSO Party (August 2-3):** Sponsored by 10-10 International, the focus is on 10 meters when summer sporadic-E propagation occurs. See how many different 10-10 member numbers you can collect. If you can get 10 of them, you can apply for your own number!
- **Worked All Europe CW Contest (August 9-10):** Europe's most interesting contest. QSOs are between Europeans and non-Europeans. Get bonus points for exchanging *QTC,* or a list of other stations you've worked in the contest.
- **Russian District Award Contest (August 16 -17):** Russia takes center stage in this event. W/VE's send signal report and sequential serial number, Russian stations send their alpha-numeric District abbreviation. How many different Russian Districts can you work? There are a lot of them!
- **SARTG Worldwide RTTY Contest (August 16 -17):** One of the premier RTTY contests. Work the world and still get some sleep, thanks to mandatory "off times" during the contest.

August 2008 QUALIFYING RUNS

♦ W1AW Qualifying Runs are 10 PM EDT Wednesday, August 6 (0200Z August 7) and 4 PM EDT (2000Z) Thursday, August 21. The West Coast Qualifying Run will be transmitted on 3590 and 7047.5 kHz by station K9JM at 9 PM PDT Wednesday, August 13 (0400Z August 14). Unless otherwise indicated, code speeds are from 10-35 WPM.

2008 ARRL DX CW Results

"Some folks trust to reason, others trust to might…"
— *Robert Hunter*

Scott Robbins, W4PA
w4pa@yahoo.com

Every ARRL DX CW contest is different because every year the competitors are different, expeditions are different, band conditions are different — motivation is different. Yes, if you've followed the results closely over the past decade or so, it seems like the same call signs appear over and over. In some categories that may be the case — W/VE Multi-Multi, without question. Others, not so much. One thing we can say about this year is, depressingly, that band conditions were, as usual, not very good. Work with me, I'm trying to be kind here. It pains me to say "as usual," but it's been that way for the last four years. Some operators in the various categories reported not hearing Europeans even on 20 meters at the usual peak morning openings across the pond. European scores in particular are down on average over the 2006 and 2007 editions. The average score in the W/VE 10 and 15 meter single band categories are down by an astounding 90% and 75%, respectively, over 2007! Nevertheless, important axioms of contesting are that everyone suffers the bad band conditions and a victory is a victory, regardless of the circumstances. It doesn't matter if you made 100 or 3000 QSOs in your category if you stuck out the time on the bands and no one else topped you. A win is a win!

One small bright spot: The year over year decline in raw QSO numbers that started in 2005 has stabilized and the total number of contacts made from both the W/VE and DX sides increased ever so incrementally in 2008 over 2007 — around the 1% range for both. The QSO totals peaked in 2002 — as sunspots abound, so does contest activity.

As noted, familiar call signs appear at the top of many races. Recognition up front is accorded to winners who repeated their 2007 wins in 2008: N1UR W/VE Low Power, W1MU W/VE 20 meters, W1MK W/VE 80 meters, W3LPL W/VE Multi-Multi and LU1HF DX 10 meters.

This year was not without its surprises. The DX High Power top 10 is generally dominated by US and Canadian operators who have gone offshore to the Caribbean; this year V47KP was the only Caribbean station to appear in the top 10 list and no fewer than three (!) KH6 stations made the box. To put this in perspective, the contest has been won from the Pacific only twice in the last 37 years. KH6 entries took both the number 2 and number 3 positions, quite an accomplishment from that far west.

COURTESY SCOTT ROBBINS, W4PA

Playin' On The Bands: Barry, W5GN, operated EI/W5GN from Ireland to a number 1 European finish in the Single Operator, Low Power category.

We had a log checking battle in the W/VE High Power category with three stations (K1KI, K3CR and K1ZM) finishing within 1% of each other for the top spot and the overall number 1 entrant was a first-time ever winner. Expeditions to Belize (V3) captured the top spots in DX High Power and DX Multi-Single categories. The V31TP win in the DX Multioperator Single Transmitter category proves that sometimes all it takes is determination, as they operated Field Day-style using a single tribander and wire antennas on the low bands. N4GG, W4OC, N5OT and W9RE returned to Bonaire to operate PJ4O for their third DX Multi-Two victory in the past 4 years of ARRL DX CW. The Caribbean Contesting Consortium station PJ2T on Curacao has notched another DX Multi-Multi win, their third overall, and their fifth consecutive win in either the Multi-Two or Multi-Multi categories for WØCG and crew.

Regional Coverage

It was a horse race in the West Coast region for the top five spots in the High Power category. Denis, K7GK (OR), held off Bob, N6TV (SCV), by a margin of only 29k points. Both had almost the same number of QSOs but K7GK's extra seven multipliers were enough to take the top spot. Low Power was won by Tom, N6NF (SCV), topping James, W3CP (OR). West Coast top QRP finisher Gary, N7IR (OR), would have also topped the Low Power category with his fine 205k point effort and also finished number 5 nationally. Coming in a close second (and almost beating the top Low Power entrant as well) was Frank, W6JTI (SF), at 191k.

Another close race in the Midwest Region was in place for the top High Power spot with two battle-seasoned contest operators finishing number 1 and number 2. Rich, K5NA (STX), squeaked by Jim, N3BB (STX), by a less than a 2% difference in scores, again with multipliers making the difference. N3BB led by more than 150 QSOs but K5NA's extra 37 multipliers was enough to overcome the lead. Top "Black Hole" High Power score, including the W9 Central Division as well, was had by number 4 Midwest Region finisher Steve, KØSR (MN), at 1.039 million points. Low Power was led by repeat national top 10 finisher Marvin, N5AW (STX), who finished with a commanding lead over second place Jim, WØUO (NTX). Both N5AW and WØUO finished in the national top 10 at number 6 and number 8, respectively. Midwest Region

US

Single Operator, High Power

Call	Score
K1KI	3,593,274
K3CR (LZ4AX, op)	3,557,358
K1ZM	3,501,762
N2NT	3,381,240
AA1K	2,985,831
K1ZZ	2,851,785
VC3E (VE3AT, op)	2,802,618
WC1M	2,515,032
N2LT	2,277,330
K3ZO	2,209,920

Single Operator, Low Power

Call	Score
N1UR	1,613,496
K1BX	1,598,352
W3EF	1,326,699
K2PS	1,149,744
N4TZ	1,134,798
N5AW	1,076,124
WK2G	672,192
WØUO	642,843
K1HT	622,566
N2WN	600,456

Single Operator, QRP

Call	Score
K2DM	426,384
KR2Q	361,800
K3PH	336,978
K4CIA	285,012
N7IR	205,842
N1TM	200,979
W6JTI	191,022
W9WI	180,180
K4ORD	121,401
K3TW	106,074

Single Operator, 10 Meters

Call	Score
K4WI	552
WO2N	126
W7VS	3
KN4JN	3

Single Operator, 15 Meters

Call	Score
NR5M (NM5M, op)	47,712
K4EA	27,264
W6YA	23,829
K4FJ	23,616
KC7V	16,080
WB4TDH	14,490
N5DO	11,988
NK6A	5,760
KIØF	3,675
NG2T	2,706

Single Operator, 20 Meters

Call	Score
W1MU	447,432
W7WA	354,480
VE2FWW	323,820
VE6WQ	273,420
N4ZZ	256,680
W4TAA	151,029
WA1FCN	126,420
W8TWA	121,626
WA3NKO	107,529
K2MFY	85,800

Single Operator, 40 Meters

Call	Score
K1ZZI	392,805
N2MF	350,436
N2IC	332,946
AI6V (K6RC, op)	194,820
K7AO	118,041
K8CW	85,086
AA4VV	69,402
WØZA	68,508
N6MA	65,142
VE3MM	56,304

Single Operator, 80 Meters

Call	Score
W1MK	250,821
KT1V	231,588
K9DX	215,004
KVØQ	90,771
W6NV	65,925
K9AY	50,820
K1GU	48,441
NT2A	32,232
K8BN	27,264
NA4CW	27,027

Single Operator, 160 Meters

Call	Score
W4ZV	67,266
W3GH	17,820
W2VO	11,040
K5RX	10,434
W4GD	7,611
AA9D	4,950
W2MF	3,663
VE3CUI	3,420
VO1MP	2,958
W7RH	2,907

Single Operator, Assisted

Call	Score
K3WW	3,573,960
NN3W (@N3HBX)	3,124,200
AA3B	2,790,672
N1EU	2,073,945
N1IW	2,058,615
K1FWE	1,855,740
K5YA	1,778,028
KQ3F	1,750,308
N2MM	1,609,239
W2UP	1,432,275

Multioperator, Single Transmitter

Call	Score
W3BGN	3,990,987
K1IR	3,609,255
K9RS	3,527,469
KT3Y	3,477,240
K8AZ	3,199,920
K2QMF	2,719,500
W2XL	1,757,538
K9SD	1,411,488
W2ZQ	1,331,100
W3GQ	1,328,250

Multioperator, Two Transmitters

Call	Score
K1AR	5,639,340
WE3C	5,325,576
N3RS	5,111,892
NY4A	4,861,047
N2RM	3,565,608
KB1H	3,491,541
KØTV	3,159,720
W4RM	2,942,802
NE3F	2,260,854
W2CG	2,199,960

Multioperator, Unlimited Transmitters

Call	Score
W3LPL	7,224,282
KC1XX	7,143,240
K3LR	6,901,344
K1XM	6,710,451
NQ4I	5,350,419
W2FU	5,218,521
NR4M	5,064,336
K1TTT	4,645,803
K5GO	4,029,948
K1RX	3,912,672

QRP was won by Douglas, N4IJ (OK), ahead of Dale, KG5U (STX).

The Central Region featured wins by large margins in all three power categories in 2008. Ron, VE3AT, operating as VC3E (ON), came in at seventh place nationally to also take the top Region spot with a score of just over 2.8 million points. Second place went to Greg, K8GL (MI). Low Power winner also finishing number 5 national was Terry, N4TZ (IN), with a substantial lead over second place entrant Charles, N9CO (IL). Dan, N8IE (OH), took QRP top honors over Jim, WB8RTJ (OH).

Down south, the Southeast Region High Power category was topped by Peter, K3ZM (VA), at 1.9 million points, followed by Pete, N4ZR (WV), at 1.45 million. Low Power top honors went to Mel, WK2G (WCF), followed closely by Julius, N2WN (TN), both topping the 600k mark. Two national top 10 finishers, Bill, K4CIA (NC), and Doug, W9WI (TN), were the numbers 1 and 2 Region leaders for QRP.

The Northeast Region was a duplicate of the national top finishes, with Tom, K1KI (CT), and Alex, LZ4AX, operating from K3CR (WPA), finishing number 1 and number 2 High Power; Ed, N1UR (VT), and Art, K1BX (NH), Low Power; George, K2DM (NNJ), and Doug, KR2Q (NNJ), QRP.

Overall W/VE Single Op Categories

Often the most geographically diverse of the single op categories, we saw no less than 6 US call areas represented in this year's top 10. 2008's winner is current second call area record holder George, K2DM (NNJ), who squeezed to the top of the pile with 658 QSOs for a score of 426,384. Right on George's heels were 2007 winner Doug, KR2Q (NNJ), and 2006 winner Bob, K3PH (EPA). W9WI (TN) continued the longest running streak of top 10 finishes with his seventh consecutive box appearance. Top score from west of the Mississippi was Gary, N7IR, who finished number 5.

A hat trick in the W/VE Low Power category goes to Ed, N1UR (VT), who barely held off a strong challenge from Art, K1BX (NH), to take his third consecutive win. K1BX led the QSO total column by 59, 1876 to 1817, but 'UR came up with 12 extra multipliers to take home a plaque. Third place went to Maryland's Maury, W3EF, and top scorers from west of the Mississippi were Marvin, N5AW (STX), at number 6 and Jim, WØUO (NTX), at number 8.

After years of entering the multioperator categories, Tom, K1KI (CT), kept it all to himself this time to finish number 1 in the W/VE High Power category, narrowly edging out strong challenges from Alex, LZ4AX, operating at K3CR (EPA) and K1ZM (ENY). Only 1% of score separated the top three positions. This is Tom's first High Power CW win — congratulations.

DX

Single Operator, High Power

Call	Score
V31UZ (VE3DZ, op)	4,276,632
KH7X (KH6ND, op)	3,397,698
KH6NF (KH6SH, op)	2,714,796
EA8EA (OH2MM, op)	2,550,999
CT1JLZ (OK1RF, op)	2,037,570
CX5BW	2,003,883
V47KP	1,993,176
OK5R (OK1RI, op)	1,780,056
KP2/K3MD	1,713,978
KH7Y	1,675,656

Single Operator, Low Power

Call	Score
VP5DF (WJ2O, op)	2,930,400
WP3C	2,863,659
H7/K9GY	2,831,292
VP9/W6PH	2,724,840
V49A (KØEJ, op)	1,454,985
PT7AG (PY8AZT, op)	1,395,135
CO8LY	1,382,880
J39BS	900,354
ZS6AA	723,723
VE4GV/6Y5	468,684

Single Operator, QRP

Call	Score
TI5N (W8QZA, op)	1,435,614
HB9BMY	86,154
ON6NL	81,396
LZ2RS	38,808
JR4DAH	35,256
I1BAY	34,752
JK1OPL	26,928
JH1APZ	23,652
G4DBW	21,726
HA5BA	19,431

Single Operator, 10 Meters

Call	Score
LU1HF	31,440
PP5NW	14,322
XE1NW	2,010

Single Operator, 15 Meters

Call	Score
PT5T (AI6V, op)	270,456
D4C (YL7A, op)	239,598
PY1KN	162,855
LW5EE	115,335
CE3DNP	94,554
PY4CEL	93,333
LU5OM	87,828
A35RK	57,528
PS7DX	23,976
PY2SRB	14,364

Single Operator, 20 Meters

Call	Score
EA8/OH6L (OH2BYS, op)	310,860
OM3NA	242,460
LY8O	225,144
MDØCCE	209,322
XE1CT	201,666
SN8W (SP8GWI, op)	199,557
T99W	192,270
E7/DK6XZ	186,354
G3RAU	180,063
HG8R	176,610

Single Operator, 40 Meters

Call	Score
C6AKU (K9VV, op)	322,140
KH7B	294,351
F6ARC	266,739
ZM3A (ZL3WW, op)	248,820
C6AWL (RA3CO, op)	219,588
HB9FAP	218,064
KH6/VE7AHA	210,888
OM5ZW	196,272
S52AW	195,576
YU1LA	179,892

Single Operator, 80 Meters

Call	Score
ZF1A (W5ASP, op)	260,013
C6APG (K4PG, op)	236,814
M5X (G4TSH, op)	157,410
SN7Q	134,232
HA8DU	112,413
DL1AUZ	109,980
HG3DX	108,438
SN3A (SP3RBR, op)	106,080
XE2WWW	84,078
HB9CIP	83,202

Single Operator, 160 Meters

Call	Score
C6AKQ (N4BP, op)	122,304
SP3BQ	39,852
ISØ/K7QB	23,310
S53O (S57UN, op)	18,216
DJ3TF	7,575
RU4HP	7,200
JA3YBK (JG3MRT, op)	7,128
OH2BO	6,900
LZ1RGM	5,796
GW8IZR	5,751

Single Operator, Assisted

Call	Score
V26G (N2ED, op)	2,586,726
DD2D (DK8ZB, op)	1,196,775
DK3GI	893,376
PY5FB	761,292
S50R	745,476
PY2WC	721,926
RL3FT	653,184
UU4JMG	648,294
OK2ZI	640,965
YO9HP	607,392

Multioperator, Single Transmitter

Call	Score
V31TP	3,847,746
PZ5WW	3,340,170
LT1F	2,737,152
CT9L	2,734,020
C6AGU	2,659,293
LR2F	2,297,841
TM6M	2,244,918
T32OU	2,170,248
EE5E	2,017,164
EA8ZS	1,928,667

Multioperator, Two Transmitters

Call	Score
PJ4O	6,879,492
KP2M	5,020,158
KH6LC	4,488,840
HBØ/NØMX	2,059,344
9A7A	2,052,603
LX7I	1,785,000
4U1UN	1,587,720
T93J	1,537,800
ZM1A	1,440,663
JR1CBC	611,934

Multioperator, Unlimited Transmitters

Call	Score
PJ2T	6,851,964
J7DX	5,905,440
VP6DX	5,559,153
9A1A	2,473,317
KL7RA	2,234,673
GM7V	1,211,565
YR7M	1,141,536
JA1YPA	507,780
LY7A	430,416

W/VE Region Leaders

Tables list call sign, score and power (A = QRP, B = Low Power, C = High Power).

Northeast Region
(New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)

K1KI	3,593,274	C
K3CR (LZ4AX, op)	3,557,358	C
K1ZM	3,501,762	C
N2NT	3,381,240	C
AA1K	2,985,831	C
N1UR	1,613,496	B
K1BX	1,598,352	B
W3EF	1,326,699	B
K2PS	1,149,744	B
K1HT	622,566	B
K2DM	426,384	A
KR2Q	361,800	A
K3PH	336,978	A
N1TM	200,979	A
K3TW	106,074	A

Southeast Region
(Delta, Roanoke and Southeastern Divisions)

K3ZM	1,903,851	C
N4ZR	1,450,251	C
WJ9B	1,400,490	C
AA4S	1,086,960	C
W4NZ	919,149	C
WK2G	672,192	B
N2WN	600,456	B
N4YDU	580,635	B
N4IG	505,575	B
WA4DOU	455,700	B
K4CIA	285,012	A
W9WI	180,180	A
K4ORD	121,401	A
N4JF	99,441	A
NU4B	69,174	A

Central Region
(Central and Great Lakes Divisions; Ontario Section)

VC3E (VE3AT, op)	2,802,618	C
K8GL	1,145,664	C
VE3RM (DL7FER, op)	1,030,776	C
N9CK	809,172	C
N8AA	727,662	C
N4TZ	1,134,798	B
N9CO	494,406	B
K9QVB	420,288	B
KV8Q	319,734	B
WB8JUI	300,192	B
N8IE	104,517	A
WB8RTJ	48,060	A
KØCD	14,760	A
KA6SGT	7,938	A
KT8K	4,743	A

Midwest Region
(Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)

K5NA	1,690,164	C
N3BB	1,662,792	C
WXØB (AD5Q, op)	1,146,366	C
KØSR	1,039,722	C
NØKE	681,894	C
N5AW	1,076,124	B
WØUO	642,843	B
K5FP	273,978	B
KØRC	262,548	B
WØETT	249,795	B
N4IJ	92,493	A
KG5U	47,940	A
K5ZE	36,990	A
NDØC	27,888	A
WF4U	22,968	A

West Coast Region
(Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)

K7GK	1,289,400	C
N6TV	1,260,441	C
K7RL	1,174,932	C
W6YI (K6AM, op)	1,164,828	C
KO7AA	1,098,336	C
N6NF	197,925	B
W3CP	171,390	B
KM6Z	169,335	B
N7ZG	138,852	B
NW7E	119,232	B
N7IR	205,842	A
W6JTI	191,022	A
KD4HXT	37,620	A

Outside the US east coast, VE3AT operating VC3E (ON) had the high score at number 7. Perennial Texas contest entrants Richard, K5NA (STX), and Jim, N3BB (STX), led from the western states finishing at number 13 and number 14 respectively.

Chas, K3WW (EPA), has rocketed back to the top of the pack to win his sixth Assisted title, ahead of Rich, NN3W, who was operating from the big N3HBX station in Maryland. Bud, AA3B (EPA), was a close third. Top score from outside the Northeast was Dennis, K5YA (STX), coming in at position number 7.

In the single band categories, longtime 160 meter DX contest entrant Bill, W4ZV (NC), coasted to a comfortable win on Top Band. Repeating his 80 meter 2007 win was Robye, W1MK (EMA), in a close finish with Ted, KT1V (NH), coming in second. Georgia's Ralph, K1ZZI, took top honors on 40 meters with another close finish over 2007 40 meter winner Brian, N2MF (WNY).

Mike, W1MU (ME), repeated his 2007 20 meter single band win over second place Dan, W7WA (WWA). Even with band conditions as miserable as they were, Dan was able to pull out more than 1000 QSOs on 20 from very far west — a great effort. 15 meter and 10 meter scores were down considerably from 2007, with NR5M (Eric, NM5M, op) and Cort, K4WI, taking first place on each band respectively.

Overall W/VE Multioperator Categories

The three-man team of W3BGN, K2TW and W2GD took top honors in the multioperator, single transmitter category from W3BGN (EPA) with a winning score of 3,990,987. Second place went to K1IR, K1TWF, K1VR, W1VE and WØ1N operating from K1IR (EMA) at 3,609,255. Central Division leader K9RS with AA5B and N3DXX also topped the three million mark to place third.

Multi-Two had three seasoned teams of contest operators all top the 5 million point mark, with K1AR (at K1EA, EMA) and K1EA, K1GQ, K6NA and KM3T at the top of the points race. WE3C (EPA) with W3FV, NN3Q, KF3B and WB3FIZ finished second; and N3RS (EPA) with N3RD, N3ED, N3NA, N2SR and W8FJ coming in third.

W3LPL (MD) has repeated their 2007 win with a second consecutive victory in the Multi-Multi category. Operators W3LPL, NI1N, WX3B, N3KS, AI3M, N3OC, K3RA, K3RV, WR3Z, KD4D, K4ZA, K4ZW and AC6WI narrowly topped strong challenges in the number 2 through number 4 spots from KC1XX (with K1TR, K6AW, KA1R, N1KWF, W1FV, W2RQ and WA1Z), K3LR (with K3UA, K8CX, KL9A, NØAX, N2NC, N3GJ, N3SD, N6MJ, VE3EJ and VE3NE) and K1XM (with K2TJ, KT1D, W1FJ, W1KM and W1UE).

DX Single Op Categories

"Not even close" is our opening thought for the DX single op categories as current DX QRP single op record holder Bill, W8QZA, returned for a repeat performance in Costa Rica from TI5N. Bill's winning score of 1.4 million points was the widest margin of victory in any single op category from DX or W/VE in the 2008 running of the contest. Nice job! Second place, and European continental winner, was Peter, HB9BMY. Asia was topped by number 5 finisher Izuno, JR4DAH.

Shifting gears backward to "boy, *that* was close!" is the DX Low Power category that featured a race between three operators who would all ultimately end up within a few percentage points of each other at the top. Our 2008 winner is Dave, WJ2O, who operated VP5DF to the number 1 position over strong challenges from Alfredo, WP3C, and Eric, K9GY, operating from Nicaragua as H7/K9GY. Top South American score was number 6 finisher Luc, PY8AZT at PT7AG. Top Africa was number 10 finisher Andrew, ZS6AA. Europe was led by Barry, W5GN, operating from Ireland as EI/W5GN (and who just missed the top 10, finishing number 12). Top Asian score was Masa, JI1RXQ.

Rare is a year when the ARRL DX CW contest DX High Power category is not won from the Caribbean. Yuri, VE3DZ, was in the right place at the right time to take the 2008 victory operating V31UZ from Belize. This is his first ARRL DX CW win. The next two spots went to Pacific stations in Hawaii, with Mike, KH6ND, operating KH7X to a strong second place finish and John, KH6SH, operating KH6NF, third. Best score from Africa was fourth place finisher Ville, OH2MM, operating from EA8EA. Top European and number 5 overall was Jiri, OK1RF, operating from CT1JLZ. The continental parade continued with number 6 overall Pedro, CX5BW as top South American and Masa, JH4UYB, as leading scorer from Asia.

Current DX Single Op Assisted North America continental record holder Ed, N2ED, has notched yet another win in the category after keying V26G to a 4 million plus point score from Antigua. This is Ed's fourth DX Assisted category win. Second place and the top European score was Barney, DK8ZB, operating DD2D. The number 1 South American was number 4 finisher Wesley, PY5FB. Top Asian score was submitted by Mac, JO7KMB.

In the Single Band categories, US operators going offshore won all three of the low band spots. On 160 meters, Bob, N4BP, made 728 contacts to operate C6AKQ to victory from the Bahamas. A close finish on 80 meters had Joe, W5ASP, operating ZF1A in the Caymans to a score of over 260,000 points, followed by K4PG at C6APG in the Bahamas finishing second. That 2 element 80 meter beam at ZF1A sure is producing results! On 40 meters, again the Bahamas took the top spot with Fred, K9VV, operating C6AKU to the number 1 spot over Bill, KH7XS, operating from KH7B. Leppala, OH2BYS, traveled to the Canary Islands to operate EA8/OH6L to the top 20 meter single band spot, followed closely by Jozef, OM3NA, who placed second. PT5T, oper-

Continental Leaders

Category Name	Call	Score
Africa		
Single Operator High Power	EA8EA (OH2MM, op)	2,550,999
Single Operator Low Power	ZS6AA	723,723
Single Operator 20 Meters	EA8/OH6L (OH2BYS, op)	310,860
Single Operator 15 Meters	D4C (YL7A, op)	239,598
Multioperator Single Transmitter	CT9L	2,734,020
Antarctica		
Single Operator High Power	DPØGVN (DL5XL, op)	114,390
Asia		
Single Operator High Power	JH4UYB	795,372
Single Operator Low Power	JI1RXQ	161,190
Single Operator QRP	JR4DAH	35,256
Single Operator 160 Meters	JA3YBK (JG3MRT, op)	7,128
Single Operator 80 Meters	JM1UWB	7,524
Single Operator 40 Meters	7J1AAI (W1NN, op)	62,874
Single Operator 20 Meters	JH7XMO	110,664
Single Operator 15 Meters	JA9CWJ	420
Single Operator Assisted	JF2QNM	189,300
Multioperator Single Transmitter	JAØQNJ	603,003
Multioperator Two Transmitters	JR1CBC	611,934
Multioperator Multi Transmitter	JA1YPA	507,780
Europe		
Single Operator High Power	CT1JLZ (OK1RF, op)	2,037,570
Single Operator Low Power	EI/W5GN	429,000
Single Operator QRP	HB9BMY	86,154
Single Operator 160 Meters	SP3BQ	39,852
Single Operator 80 Meters	M5X (G4TSH, op)	157,410
Single Operator 40 Meters	F6ARC	266,739
Single Operator 20 Meters	OM3NA	242,460
Single Operator 15 Meters	T96Q	6,798
Single Operator Assisted	DD2D (DK8ZB, op)	1,196,775
Multioperator Single Transmitter	TM6M	2,244,918
Multioperator Two Transmitters	HBØ/NØMX	2,059,344
Multioperator Multi Transmitter	9A1A	2,473,317

Category Name	Call	Score
North America		
Single Operator High Power	V31UZ (VE3DZ, op)	4,276,632
Single Operator Low Power	VP5DF (WJ2O, op)	2,930,400
Single Operator QRP	TI5N (W8QZA, op)	1,435,614
Single Operator 160 Meters	C6AKQ (N4BP, op)	122,304
Single Operator 80 Meters	ZF1A (W5ASP, op)	260,013
Single Operator 40 Meters	C6AKU (K9VV, op)	322,140
Single Operator 20 Meters	XE1CT	201,666
Single Operator 15 Meters	XE3WAO	8,652
Single Operator 10 Meters	XE1NW	2,010
Single Operator Assisted	V26G (N2ED, op)	2,586,726
Multioperator Single Transmitter	V31TP	3,847,746
Multioperator Two Transmitters	KP2M	5,020,158
Multioperator Multi Transmitter	J7DX	5,905,440
Oceania		
Single Operator High Power	KH7X (KH6ND, op)	3,397,698
Single Operator Low Power	ZL4PW	141,732
Single Operator 40 Meters	KH7B	294,351
Single Operator 20 Meters	KH6/N7ON	11,844
Single Operator 15 Meters	A35RK	57,528
Single Operator Assisted	KH6/AA4V	60,945
Multioperator Single Transmitter	T32OU	2,170,248
Multioperator Two Transmitters	KH6LC	4,488,840
Multioperator Multi Transmitter	VP6DX	5,559,153
South America		
Single Operator High Power	CX5BW	2,003,883
Single Operator Low Power	PT7AG (PY8AZT, op)	1,395,135
Single Operator 80 Meters	PR7AR	21,762
Single Operator 40 Meters	4M5IR (YV5KG, op)	128,688
Single Operator 20 Meters	PY1NB	120,792
Single Operator 15 Meters	PT5T (AI6V, op)	270,456
Single Operator 10 Meters	LU1HF	31,440
Single Operator Assisted	PY5FB	761,292
Multioperator Single Transmitter	PZ5WW	3,340,170
Multioperator Two Transmitters	PJ4O	6,879,492
Multioperator Multi Transmitter	PJ2T	6,851,964

2008 DX CW Sponsored Plaque Winners

Thanks to the generous sponsorship of numerous clubs and individuals, we are pleased to announce the winners of a sponsored ARRL DX CW plaque. The ARRL wishes to thank the plaque sponsors for their continued commitment to the ARRL Plaque Program. Without their support and dedication, the Plaque Program would not be possible.

Plaque Category	Winner	Sponsor
Asia Multioperator Single Transmitter	JAØQNJ	Yankee Clipper Contest Club
Canada Single Operator Low Power	VE2XAA	Contest Club Ontario
Europe Single Operator High Power	CT1JLZ (OK1RF, op)	Jim George, N3BB
Hudson Division Single Operator High Power	N2NT	HVCDX and AARA — John Naberezny, WE2F Memorial
Japan Single Operator Low Power	JI1RXQ	Western Washington DX Club
North America Single Operator High Power	V31UZ (VE3DZ, op)	Potomac Valley Radio Club
Pacific Division Single Operator Low Power	N6NF	Central California DX Club, Inc W6MEL
W/VE 1.8 MHz	W4ZV	Jerry Rosalius, WB9Z
W/VE 3.5 MHz	W1MK	SM3DMP — W7ACN
W/VE 14 MHz	W1MU	The QSLMAN — W4MPY
W/VE 21 MHz	NR5M (NM5M, op)	Carl Luetzelschwab, K9LA
W/VE 28 MHz	K4WI	Green River Valley, IL ARS
W/VE Multioperator Single Transmitter	W3BGN	Northern Illinois DX Association
W/VE Single Operator Assisted	K3WW	Harold Ritchey, W3WPG Memorial
W/VE Single Operator High Power	K1KI	Frankford Radio Club
W/VE Single Operator Low Power	N1UR	Andy Faber, AE6Y
W/VE Single Operator QRP	K2DM	Tod Olson, KØTO
World 1.8 MHz	C6AKQ (N4BP, op)	Fred Race, W8FR, In Memory of DL1FF
World 14 MHz	EA8/OH6L (OH2BYS, op)	Jeff Hartley, N8II
World 21 MHz	PT5T (AI6V, op)	Caribbean Contesting Consortium PJ2T
World Multioperator Single Transmitter	V31TP	DX Publishing
World Multioperator Two Transmitters	PJ4O	Tom De Meiss K2TD Memorial
World Multioperator Unlimited	PJ2T	H. Stephen Miller NØSM
World Single Operator High Power	V31UZ (VE3DZ, op)	North Jersey DX Association
World Single Operator Low Power	VP5DF (WJ2O, op)	Jim Stevens, K4MA
World Single Operator QRP	TI5N (W8QZA, op)	Jerry Griffin, K6MD/YI9MD

Unsponsored plaques may be purchased by the plaque winner. If you wish to purchase an unsponsored plaque or order a duplicate plaque, contact ARRL Contest Branch Manager Sean Kutzko, KX9X, at 860-594-0232 or by e-mail at **kx9x@arrl.org**. The cost for plaques is $67 (includes shipping).

ated by Carl, AI6V, was the top 15 meter single band entry, with Yuris, YL7A, at D4C finishing a close second. On 10 meters there was sparse single band activity due to band conditions and Juan, LU1HF, repeated his 2007 win on the band.

DX Multioperator Categories

Belize was the scene of the victories in both the Single Operator High Power and DX Multioperator Single Transmitter categories in 2008. WCØW and K5PI set up Field Day style at the Cahal Pech hotel with a TA-33, modified Butternut vertical, 40/80 dipole and a 400 foot long receive antenna. Operating V31TP to 3.8 million points, they won M/S by a comfortable margin over second place entrants AC8W, K8DD, KB8TXZ and W5JAY who operated from PZ5WW in Suriname. Third place went to perennial contest entrants LT1F, with LU1AEE, LU1FAM, LU1FKR, LU1FT, LU5DX and LU7ACW as operators.

A famous Amateur Radio pundit from the past always headed his columns "Never Say Die" and that moniker is applicable to the top DX Multioperator Two Transmitter category for this year. After a close loss in the category operating from HP1XX in 2007, N4GG, W9RE, N5OT and W4OC returned to Bonaire to operate PJ4O to a solid victory in the category, besting second place KP2M (K3TEJ, K3CT operators) by nearly 2 million points. Third place went to Hawaii's KH6LC, AH6RE, N6GQ, N6KB and SMØDRD who operated KH6LC to a score of 4.48 million.

PJ2T is the most logged call sign in radio contesting, with more raw QSOs made than anyone else over the past eight years. Numerous victories in various ARRL, CQ and other contests have come in the wake of the resurrection of W1BIH's old Curacao QTH by WØCG and his wife Cindy. Operators N1ZZ, W9VA, WØNB, W8TK, NØYY, W8AV and WØCG have taken first place in the DX Multi-Multi category for 2008. The CCC crew decides categories usually based on the number of operators and the fun factor involved, and that has served them well. This is a fifth consecutive Multi-Two or Multi-Multi victory for PJ2T and their third overall in the Multi-Multi category.

Coda

"Standing on a tower, world at my command…" Bob Weir sang this standing on a stage rather than at the top of a tower, but the analogy for radio contesting rings true. We are on the verge — no, really, I mean it — of the next sunspot cycle going on the upswing and it can only get better from here. There is no ARRL contest event that tops ARRL DX in yearly interest or sheer QSOs made, even at the lull of the sunspot cycle. The 2009 running of the ARRL DX CW Contest will be held on February 21 and 22. Until next year — see you on the bands! QST

2008 ARRL 10 GHz and Up Contest

DAN BUBKE, K6NKC

August 16-17 (first weekend) and
September 20-21 (second weekend)
6 AM Local Saturday through 12 Midnight Local Sunday

■ Do you like the more technical side of Amateur Radio? The 10 GHz contest is one of the more challenging radiosport events. Use the microwave bands and make QSOs hundreds of miles away! Build your own gear, get your dish high in the air and use some exotic techniques to make contacts, such as bouncing your signal off of buildings, mountains, even rain storms!

■ Two weekends of fun and experimentation! Operate a maximum of 24 hours during each contest weekend. Complete rules can be found at **www.arrl.org/contests**.

MARC FRANCO, N2UO

DAVID GLENN, N6TEB

www.arrl.org/contests **www.arrl.org/contests**

2008 ARRL EME Contest

J VAN MUYLWYK, PA3FXB

September 20-21
(2.3 GHz and Up weekend)

October 18-19
50-1296 MHz (first weekend)

November 15-16
50-1296 MHz
(second weekend)
0000 UTC Saturday through 2400 UTC Sunday, each weekend

"Somewhere there's signals
How faint the tune
Somewhere there's QSOs
How high the moon..."

MICHAEL AGSTEN, W8TXT

■ The Ultimate DX. Use VHF, UHF and SHF frequencies to work stations around the world by aiming your antennas at the "Lunar Reflector"! It's not as far out of reach as you may think!

■ Use CW, WSJT or a combination of both!

■ Three weekends of activity. Many entry categories to choose from. Certificates awarded to every station that makes at least one QSO and submits a log!

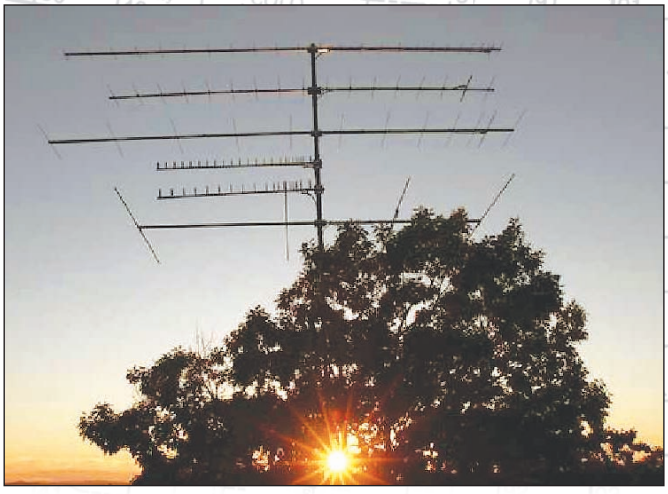
■ Complete rules can be found at: **www.arrl.org/contests**

2008 September VHF QSO Party

1800 UTC Saturday, September 13 to 0300 UTC Monday, September 15

BRUCE KRIPTON, KG6IYN

CHRISTOPHER MERCHANT, KA1LMR



- How far can your signal go on VHF+?
- Summer's fading fast — time to cash in on the end of the Sporadic-E season and maybe catch a good tropo opening as well.
- Operate from home, while on a camping trip, or as a "rover," driving throughout your area. Smaller antennas make VHF+ operating an excellent portable operating activity. Lots of fun for everyone! Complete rules are at **www.arrl.org/contests**

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Jul 4-Sep 14, 2359Z-2359Z, Serres, Greece. Radio Amateur Association of Serres, SY7ISDE. Special Event Station for the International Six Days Enduro. 14.225 3.797. QSL. Radio Amateur Association of Serres, SZ7SER, PO Box 1063, Serres 62110, GREECE. **sy7isde.blogspot.com**

Jul 12-Jul 26, 1400Z-2200Z (Saturdays only), Azle, TX. Tri-County Amateur Radio Club, W5G. First Opening of Greer Island. 21.250 14.250 7.250. QSL. W5G Greer Island Project, c/o TriCounty ARC WC5C, 820 Wood Ln, Azle, TX 76020. **usislands.org**, **kb5ylg@yahoo.com** or **www.wc5c.org**

Jul 19-Jul 21, 1600Z-0400Z, South Manitou Island, MI. BSA Scout's Venture Crew 9050, W8M. South Manitou Island National Park and Lighthouse Activation. 18.160 14.247 14.040 7.250. Certificate. Dan Mills, 1817 Mills Ave, North Muskegon, MI 49445. **dan@n8ppq.net** or **www.n8ppq.net**

Jul 29-Aug 3, 0000Z-2359Z, Isabela, PR. Federation Radio Amateur of Puerto Rico, K4S. Guillermo M. Schwarz, KP3S Memorial Dedication. 18.145 14.230 7.178 3.880. QSL. Carlos R. Rodriguez, KP3S, RR 5 Box 73A, Isabela, PR 00662-4509. **kp3s.50megs.com/memory.htm**

Jul 31-Aug 3, 1400Z-2200Z, Oshkosh, WI. Fox Cities Amateur Radio Club Inc, W9ZL. Experimental Aircraft Association's Airventure 2008. 14.270 7.250. Certificate. FCARC/Airventure, PO Box 2346, Appleton, WI 54912. **www.fcarc.us**

Jul 31-Aug 3, 1700Z-2300Z, Litchfield, MN. Meeker County Amateur Radio Club, KØMCR. First time Amateur Radio is on display at our fair. 14.260 7.260 7.060 3.840. Certificate. Jim Westrup, 524S Holcombe, Litchfield, MN 55355. **ka0csw@yahoo.com**

Aug 1-Aug 4, 1300Z-2359Z, Canton, OH. Canton Amateur Radio Club, W8AL. Annual Pro Football Hall of Fame Festival. 28.365 21.365 14.265 7.265. Certificate. Donald E. Perry, 968 Culverne Ave NW, Massillon, OH 44647. **www.w8al.org**

Aug 2, 1300Z-2200Z, Dillon, MT. Beaverhead National Forest, W7B. Beaverhead Forest 100th Anniversary — 75th Anniversary of the CCCs. 14.200 7.280 3.880. Certificate. Bill Kolar, W7AVG, 955 East Parkview, Dillon, MT 59725. **cbkolar@bmt.net**

Aug 2-Aug 3, 0000Z-2359Z, Pittsburgh, PA. Pittsburgh area Amateur Radio clubs, various call signs. 250th Anniversary of the City of Pittsburgh. 28.350 21.350 14.250 7.250 3.850 and elsewhere. Certificate.* Edward K. Oelschlager, N3ZNI, 60 Carl Ave B2, Eighty Four, PA 15330. **www.pittsburgh250ham.org**

Aug 2-Aug 3, 1200Z-2000Z, Groton, CT. Submarine Base Amateur Radio Club, N9N. 50th anniversary of USS *Nautilus*'s trip to North Pole, 1958. 14.343 14.243 7.279. QSL. Don Keith, N4KC, 40 Red Stick Rd, Indian Springs Village, AL 35124. **n4kc@bellsouth.net**

Aug 2-Aug 3, 1400Z-2200Z, Alexandria, VA. The Mount Vernon Amateur Radio Club, K4CG. The 218th Birthday of the United States Coast Guard. 14.250 10.110 7.270. QSL. US Coast Guard TISCOM, 7323 Telegraph Rd, Alexandria, VA 22310. **k4us@mvarc.com**

Aug 2-Aug 4, 1700Z-0100Z, Anchorage, AK. Anchorage Amateur Radio Club, KL7AA. 2008 Alaska ARRL Convention. 14.929. QSL. Alaska QSL Bureau, PO Box 520343, Big Lake, AK 99652. **www.kl7aa.com**

Aug 7-Aug 17, 1400Z-0000Z, daily, Des Moines, IA. Madison County DX Club, WØISF.

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

The annual running of the great Iowa State Fair. 146.535 14.250 7.250. QSL. Mark Mease, 2989 Truro Rd, Truro, IA 50257. *Operating times will vary throughout the Fair*. **mmease@netins.net**

Aug 9, 1200Z-2200Z, Stow, MA. Central Massachusetts Amateur Radio Association, W1BIM. Smokey Bear's 64th Birthday. 28.450 14.265. QSL. Ray Doucette, KB1OUW, 2 Dawes Rd, Stow, MA 01775. **www.cmara.org**

Aug 9, 1300Z-2200Z, Oil Springs, ON, Canada. Lambton County Radio Club, VA3OIL. 150th anniversary of the 1st commercial oil well in North America. 14.240 7.240 3.840. QSL. KB1SF, 3560 Pine Grove #488, Port Huron, MI 48060. (Canadians QSL VA3KSF, 377 Bentinck St, PO Box 33, Corunna, ON N0N 1G0 Canada.) **www.ve3sar.org**

Aug 9, 1300Z-1900Z, Van Wert, OH. Van Wert Amateur Radio Club, W8FY. US 127/ US 30 Garage Sales Crossover Point. SSB 14.304 7.204 CW 7.044 FM 146.850 EchoLink 315705. Certificate. Van Wert Amateur Radio Club, PO Box 602, Van Wert, OH 45891. **www.w8fy.org**

Aug 9-Aug 10, 1800Z-1800Z, Mt Sunflower, KS. Trojan and Sand Hills Amateur Radio Clubs, K4S. Highest point in Kansas. Part of Colorado 14er Event. 14.260 14.060 7.260 147.42. QSL. K4S, 1553 County Road T, Colby, KS 67701. **www.14er.org**

Aug 10, 1200Z-1600Z, Uncompahgre Mountain, CO. Old Goats QRPexpedition Team, NØB. N7UN/NØTU/KØUIF to climb/ activate the summit for 14er event. 18.157 14.342 14.060 7.060. QSL. NØB — Guy Hamblen, 16 Dongan Ln, Newfoundland, NJ 07435. *Colorado 14er Event.* **n0b-14er.blogspot.com** or **www.14er.org**

Aug 14-Aug 17, 1400Z-0000Z daily Window Rock, AZ. Navajo Amateur Radio Club, N7C. The Navajo Code Talkers. 14.265 7.265. QSL. Herb Goodluck, N7HG, PO Box 3611, Window Rock, AZ 86516. **n7hg@citlink.net**

Aug 15-Aug 24, 1400Z-2359Z, Marshfield, MA. Whitman Amateur Radio Club, NN1MF. 141st Annual Marshfield Fair. 18.160 14.260 7.260 3.860. Certificate. Whitman ARC, PO Box 48, Whitman, MA 02382. **www.wa1npo.org**

Aug 16, 1400Z-2200Z, Alliance, OH. Alliance Amateur Radio Club, W8LKY. Birthplace of the Scarlet Carnation, Ohio's state flower. 7.240 7.050. Certificate. Alliance Amateur Radio Club, PO Box 3344, Alliance, OH 44601. **www.w8lky.org**

Aug 16, 1400Z-2000Z, Huntington, NY. Peconic Amateur Radio Club, W2AMC International Lighthouse/Lightship Weekend. 14.270 7.270. Certificate. Peconic ARC, PO Box 113, Peconic, NY 11958. **www.peconic-arc.com**

Aug 16, 1400Z-2300Z, Litchfield, MN. Meeker County Amateur Radio Club, KØMCR. History of farming/equipment used in the early 1900s. 14.260 7.260 7.060 3.840. Certificate. Jim Westrup, 524 S Holcombe, Litchfield, MN 55355. **ka0csw@yahoo.com**

Aug 16, 1400Z-2000Z, Van Buren, IN. Grant County Amateur Radio Club, W9EBN. 36th Annual Popcorn Festival from the Popcorn Capital of the World. 146.79 14.260 7.260. Certificate. Bart Bartholomew, WA9SPT, 6981 N E00 W, Marion, IN 46952. **www.grantarc.com**

Aug 16-Aug 17, 0000Z-2359Z, Dunkirk Lighthouse, Lake Erie, NY. Lancaster Amateur Radio Club, W2SO. Dunkirk Lighthouse. 14.250 7.240 3.900 operating all modes. QSL. Lancaster Amateur Radio Club, 525 Pavement Rd, Lancaster, NY 14086. **dunkirklighthouse.com** or **larc.hamgate.net**

Aug 16-Aug 17, 0000Z-2359Z, Eagle Harbor, MI. International Lighthouse/Lightship Weekend, K8E. Eagle Harbor Lighthouse, plus two range lights upon request. 14.275 14.030 7.275 7.030. QSL. N8MR, 14071 Fairway, Livonia, MI 48154. **www.kc8nah.com/Interests/EagleHarbor/illw08.htm**

Aug 16-Aug 17, 0100Z-2359Z, Merchantville, NJ, Worldwide. International Lighthouse-Lightship Weekend Organization, KC2HOU. Honoring the world's maritime light beacons and the keepers. 28.370 21.370 14.270 7.270. QSL. ARLHS Hdq, 114 Woodbine Ave, Merchantville, NJ 08109. **illw.org**

Aug 16-Aug 17, 1300Z-2100Z, Sea Girt Lighthouse, NJ. North America DX Association/ Neptune Amateur Radio Club, NA2DX. Celebrating International Lighthouse/Lightship Weekend. 14.260 7.260. QSL. North America DX Association, PO Box 357, Bradley Beach, NJ 07720. **kc2q@arrl.net**

Aug 16-Aug 17, 1400Z-1900Z, North Canton, OH. Airwaves Radio Club, N8AIR. Presenting the *Wings of Freedom Tour*. 14.260 14.270 7.260. Certificate. MAPS Air Museum, 2260 International Pkwy, North Canton, OH 44720. **www.mapsairmuseum.org**

Aug 16-Aug 30, 1400Z-2200Z (Saturdays only), Azle, TX. Tri-County Amateur Radio Club, W5P. Activation of Pelican Island TX050L. 21.250 14.250 7.250. QSL. W5P Pelican Island, c/o WC5C Tri-County ARC, 820 Wood Ln, Azle, TX 76020. **www.wc5c.org**

Aug 17, 1300Z-2100Z, Brooklyn, NY. New York City Transit-Amateur Radio Club, K2IRT. *Barefoot in the Park* — Marine Park Nature Center Celebration. 14.265 7.270. Certificate. Robert W. Lobenstein, WA2AXZ, 1958 East 36 St, Brooklyn, NY 11234. *PSK-SSTV and satellite communications demonstrations.* **wa2axz@arrl.net**

Aug 17, 1400Z-2000Z, Southold, NY. Peconic Amateur Radio Club, W2AMC. International Lighthouse/Lightship Weekend. 14.270 7.270. Certificate. Peconic ARC, PO Box 113, Peconic, NY 11958. **www.peconic-arc.com**

Aug 19-20, 1500Z-1700Z and **Aug 21 1500Z-1700Z**, Detroit, MI. Motor City Radio Club, W8MRM. 2008 Institute of Electrical and Electronic Engineers International Symposium on Electromagnetic Compatibility. 14.240 14.040 7.240 7.040. QSL. Motor City Radio Club, 7869 Huron, Taylor, MI 48180-2608. **www.emc2008.org** or **www.w8mrm.org**

Aug 20-Aug 24, 2200Z-0200Z, Ringoes, NJ. Cherryville Repeater Association II, W4H. Hunterdon County (NJ) 4H Fair. 14.280 7.280. QSL. Cherryville Repeater Association II, Inc — W2CRA, PO Box 308, Quakertown, NJ 08868. **www.qsl.net/w2cra**

Aug 21-Aug 24, 1300Z-2359Z, Hannibal, MO. Hannibal Amateur Radio Club, KØS. WW2-LST 325 Ship in Hannibal, Missouri. 14.265 7.265. Certificate.* Hannibal Amateur Radio Club, PO Box 1522, Hannibal, MO 63401. **w0kem.com**

Aug 23-Aug 24, 1300Z-0100Z, Jackson's Mill/Weston, WV. Stonewall Jackson Amateur Radio Association, W8V. 50th West Virginia State ARRL Convention. 14.270 7.200. Certificate. SJARA, PO Box 752, Clarksburg, WV 26301-0752. **k8dfsjara@aol.com** or **www.sjara.org**

Aug 24, 1400Z-2100Z, Hanover, KS. Crown Amateur Radio Association, KØASA. Hollenberg Pony Express Station Festival. 14.240 14.040 7.040 3.540. Certificate. Crown Amateur Radio Association, 11551 W 176th Terr, Olathe, KS 66062.

Aug 27-Sep 1, 1600Z-0100Z, Canfield, OH. 20 over 9 Amateur Radio Club, W8F. 163rd Canfield Fair. 28.385 14.285 7.285 3.885. Certificate. 20/9 Amateur Radio Club Inc, 4939 E Radio Rd, Austintown, OH 44515. **www.qsl.net/20over9**

Aug 30, 1200Z-2000Z, Manassas, VA. Ole Virginia Hams, W4OVH. Civil War Battle of 2nd Manassas (Bull Run). 146.970 21.362 14.262 7.262. QSL. Ole Virginia Hams, PO Box 1255, Manassas, VA 20108. **aldugaw@juno.com** or **www.w4ovh.net**

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

***Note:** Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's Web site.

Special Events Announcements: For items to be listed in this column, you must be an Amateur Radio club, and use the ARRL Special Events Listing Form, at **www.arrl.org/contests/spevform.html**, or if you prefer, forms are available via the Internet (**info@arrl.org**), or for an SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Events Form" in the lower left-hand corner). Off-line completed forms may be mailed, faxed or e-mailed to ARRL, Attn: Special Events. Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; that is, a special event listing for **Oct** *QST* would have to be received by **Aug 1**. In addition to being listed in *QST*, your event will be listed on the ARRLWeb Special Event page. QST

Strays

NORTHROP GRUMMAN/DOUG SCHMENNER

In February, the Northrop Grumman Corporation Electronics Systems Sector awarded Roland (Rol) Anders, K3RA (left), an ARRL Life Member, their Lifetime Achievement Award for Excellence in Engineering and Technology for his significant accomplishments in space electro-optical technology. The award was presented by James F. Pitts, Corporate VP and President of the Sector. Rol is a Chief Scientist at Northrop Grumman.

DXCC Honor Roll

Bill Moore, NC1L
DXCC Branch Manager

The DXCC Honor Roll is earned by DX Century Club members who submit confirmation for contacts reached within the numerical top 10 of the overall number of entities on The ARRL DXCC List. There were 337 entities on the DXCC list for the period with 328 being required for the Honor Roll. The period for this list is from January 1, 2007 through December 31, 2007. The **boldface** number indicates the total current DXCC credits. The number next to the callsign represents an individual's overall total.

MIXED
337
Top of Honor Roll
4X1FJG/377
4X4DK/388
4X6UO/343
9A8A/343
AA1V/350
AA4H/348
AA4S/360
AA6G/351
AA7A/350
AB0X/350
AB8K/354
AD5A/342
AF2C/347
AI9Y/342
AJ6V/348
CT1BH/365
CT1BOH/343
CT1EEB/341
CT1ZW/356
CX4CR/357
DF3CB/344
DF9ZP/344
DJ5JK/356
DJ6RX/365
DJ8NK/359
DJ9ZB/359
DU9RG/344
EA6NB/343
EA8AKN/343
EA8ZS/343
ES1AR/380
ES1RA/350
F2VX/359
F3AT/382
F6ANA/343
F6AOI/361
F6EXV/348
F9RM/379
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G3GIQ/370
G3HTA/365
G3KMA/372
G3NDC/352
G3NLY/369
G4IUF/345
G4SOZ/337
GM3YTS/344
GW3CDP/349
HA0DU/354
HB9BGV/344
HB9BZA/344
HB9CIP/344
HL3IUA/342
I2PEI/350
I2PJA/354
I4EAT/350
I4IKW/343
I4IZZ/342
I4MKN/363
I5FLN/361
I7RIZ/351
I8ACB/351
I8KNT/350
IK0AZG/343
IK1GPG/343
IK4NQL/342
IK5BAF/343
IK6DLK/343
IK8HJC/339
JA0CRG/344
JA0DWY/351
JA0HXV/345
JA0LXP/351
JA0SC/353
JA0UH/350
JA0UUA/343
JA1AAT/365
JA1BK/376
JA1BLC/367
JA1BNL/346
JA1BRK/374
JA1BWA/370
JA1CNM/348
JA1CZI/353
JA1FGB/351
JA1FNA/357
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JA1HEE/344
JA1IFP/365
JA1JAN/362
JA1MOH/354
JA1OND/354
JA1PCY/353
JA1QXY/357
JA1RWI/351
JA1SGU/351
JA1SHE/342
JA1SVP/352
JA1TRL/354
JA1UQP/362
JA1VLK/350
JA2ADY/345
JA2AH/362
JA2AHH/346
JA2AXB/350
JA2BAY/353
JA2BY/371
JA2CXH/351
JA2DLM/348
JA2DSY/359
JA2EWE/345
JA2JRG/343
JA2KVD/353
JA2QPY/344
JA2VPO/349
JA2WYN/344
JA3AZD/364
JA3EMU/357
JA3FYC/355
JA3GM/358
JA3GN/347
JA3LDH/343
JA3NTE/354
JA4AFT/362
JA4DEN/346
JA4DLP/357
JA4DND/354
JA4IYL/346
JA4JBZ/347
JA4LKB/346
JA4UQY/346
JA4XZR/343
JA4ZA/370
JA5BEN/345
JA5IU/354
JA6BDB/346
JA6BZI/362
JA6CBG/345
JA6LCJ/351
JA6MWW/342
JA6VQA/344
JA6VU/346
JA7AQR/355
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JA7EMH/346
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JA7IC/345
JA7JH/361
JA7JM/357
JA7MA/364
JA7MFL/343
JA7MSQ/343
JA7PL/353
JA7ZF/357
JA7ZP/349
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JA8MS/361
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JA9BEK/345
JA9LSZ/337
JD1AMA/343
JE1GMM/352
JE2LUN/346
JE8BKW/343
JF2MBF/343
JF7XKY/349
JH1AFD/345
JH1HGC/353
JH1JNR/342
JH1LMG/348
JH1XYR/344
JH2RMU/343
JH2UVL/350
JH4IFF/348
JH4UYB/344
JH5BHP/343
JH5FTY/343
JH7FMJ/349
JH8MXH/345
JH8UQJ/342
JI1DHY/342
JI1MNT/343
JI1UHZ/342
JJ1TEA/343
JK1OPL/358
JM1VRW/343
JO1WKO/342
JP1NWZ/344
JR1BLX/352
JR1MLU/352
JR1TNE/355
JR1XIS/345
JR2KDN/343
JR4VMS/342
JR5VHU/342
JR6EXN/343
JR7BDQ/348
JR9LKE/338
K0CA/343
K0CS/351
K0CX/346
K0EOU/348
K0EPE/366
K0EU/348
K0FF/351
K0GX/338
K0IEA/358
K0JUH/344
K0QQ/358
K1AC/345
K1BW/359
K1EU/343
K1KI/357
K1LD/345
K1MO/350
K1NY/352
K1RM/365
K2CL/365
K2PLF/348
K2TQC/376
K2XF/345
K3BEQ/349
K3PH/349
K3UA/352
K3VN/344
K3ZO/353
K4AU/343
K4CN/346
K4FJ/371
K4IQJ/346
K4MQG/373
K4MZU/372
K4PI/356
K4TEA/368
K4XO/363
K4XP/351
K4YYL/370
K5AQ/364
K5AT/343
K5CON/345
K5DU/343
K5EJ/355
K5GH/358
K5GZ/350
K5JP/343
K5JW/363
K5LP/355
K5NA/367
K5OVC/362
K5PC/345
K5RC/366
K5UR/364
K5VRX/348
K5XX/358
K6AAW/356
K6AM/345
K6ANP/358
K6DT/372
K6FG/350
K6FM/354
K6GAK/363
K6GXO/349
K6KII/381
K6KLY/343
K6RIM/361
K6RQ/380
K6SQL/348
K6TA/371
K6YRA/371
K6ZO/393
K7ABV/367
K7AR/345
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K7XB/357
K7ZD/343
K8AJR/342
K8CX/350
K8DR/380
K8DYZ/370
K8EJ/369
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K8MC/347
K8MFO/367
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KL7J/344
KL7RA/351
KM1R/345
KN4F/345
KP4BJD/354
KR5C/349
KU4J/348
KY7M/346
KZ2P/346
LA7QI/351
LU2NI/343
LU3MCJ/345
N0XA/348
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N4XM/351
N4XO/376
N4XR/379
N5AR/372
N5LZ/344
N5MT/344
N5NR/347
N5ZM/345
N6FF/343
N6FX/376
N6HR/362
N6JV/354
N6OJ/354
N6VR/356
N7BK/343
N7EF/348
N7HN/347
N7KH/347
N7NG/366
N7RT/361
N7UT/350
N8GZ/387
N8TR/345
N9AB/362
N9AF/366
NA0Y/380
NB8B/345
NE8Z/358
NO2R/347
NR1R/353
NS6C/354
NW7O/346
OE3WWB/360
OH2BH/371
OH2BN/351
OH2BNY/344
OH2DW/348
OH2EA/359
OH2KI/360
OH2LU/361
OH2RI/357
OH2XF/374
OH3YI/366
OH4NS/370
OH4OJ/343
OH5NZ/368
OH5WW/341
OH8KN/352
OK1ADM/374
OK2SK/344
ON4AAC/343
ON4ADN/343
ON4AOI/342
ON4IQ/341
ON4IZ/374
ON4UN/366
ON6HE/348
ON7EM/347
OZ1BTE/343
OZ1FAO/345
OZ1LO/367
OZ7YY/357
OZ8BZ/362
PA0CLN/347
PA0LOU/381
PA3FQA/342
PY2OMS/349
PY2XB/344
PY2YP/347
RA6AR/348
S50A/363
S57J/343
SK7AX/349
SL0ZG/343
SM0AJU/381
SM0FWW/341
SM3CXS/365
SM3EVR/351
SM3GSK/345
SM4CTT/352
SM4DHF/358
SM5API/366
SM5BFJ/361
SM5CZY/373
SM5FUG/344
SM5KNV/343
SM6CVX/363
SM6DHU/365
SM7CRW/357
SM7FIG/341
SM7HCW/348
SP3E/346
SP3FAR/342
SP4KM/343
SP5CJQ/343
SP5EWY/355
SP6CZ/344
SP7GXK/343
SP7HT/368
SP9AI/360
SV1IW/350
SV1LK/343
T77C/348
TG9NX/349
UA0CW/345
UA1MU/359
UA3AB/344
UA3AKO/342
UA3BS/347
UA4CC/346
UA6AF/345
UX0UN/360
VA3DX/348
VE1DX/342
VE3EJ/349
VE3XN/364
VE7AHA/351
VE7BD/359
VE7IU/342
VE7JO/340
VE7ON/341
VE7SZ/343
VE7VF/342
VK3DYL/343
VK3QI/351
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W3UR

HOW'S DX?

2007 ARRL DeSoto Cup Winner

FAUSTO MINARDI, I4EAT

Fausto Minardi, I4EAT, won the 2007 DXCC DeSoto Cup Challenge. He passed Bob Eshleman, W4DR, who has held the cup since the inauguration of the award.

The ARRL has announced that Fausto Minardi, I4EAT, has won the 2007 DXCC DeSoto Cup Challenge with an amazing 3129 entities confirmed. The Cup is given to the DXer at the top of the ARRL DXCC Challenge (total countries confirmed on 1.8 through 50 MHz). Fausto passed Bob Eshleman, W4DR, who had 3124 confirmed, in late December and held on to his number one position overthrowing W4DR. Bob has won the Cup since its inception in 2000. Not far behind was Leif Ottosen, OZ1LO, with 3119 countries checked by the ARRL DXCC Desk. To date, 19 DXers have passed the 3000 mark. The top 19 listings can be found at **www.arrl.org/awards/dxcc/listings/desoto-cup.html**.

4O — MONTENEGRO

Milos, 4O/YT3M, will be QRV from Montenegro between August 1 and August 20. He'll be operating from various locations along the Adriatic coast. It may be possible for an IOTA operation from EU-163.

5X — UGANDA

Nick, G3RWF, is once again heading back to Fort Portal, in western Uganda where he will be QRV as 5X1NH until August 15. QSL via G3RWF.

BY — CHINA

Starting May 18 the 2008 Beijing Olympic Games Special Event Amateur Radio stations will begin activity. Five special calls, representing the five rings of the Olympic flag, will be QRV. The calls will be BT1OB, BT1OJ, BT1OH, BT1OY and BT1ON. The last letter of the call sign corresponds to the color of each of the rings of the Olympic flag — Beibei (Blue), Jingjing (Black), Huanhuan (Red), Yingying (Yellow) and Nini (Green). BA4EG will be the QSL manager for all stations. QSLs can be sent either direct or via the bureau and will begin to be answered in October. There is a Web site set up at **www.bj2008ses.com.cn**. The Web site includes an online log search, QSL card receive and sent status, award criteria, along with other information. Look for these five Olympic special event stations to be QRV through September 17.

EZ — TURKMENISTAN

Turkmenistan's Ministry of Communications halted Amateur Radio activities in the summer of 2006. Despite the standstill, club station EZ7V has been reported occasionally on the Amateur Radio bands. Turkmenistan's Amateur Radio League, Liga Radiolyubiteley Turkmenistana (LRT), has written a letter to the President of the country requesting to reestablish Amateur Radio in EZ. Authorization is expected for all by the end of this year.

FH — MAYOTTE

Alain, F6BFH, is taking a trip to Mayotte to visit Alain, FH1LE. The plan is to arrive in Mamoudzou on July 9 and to stay for 1 month. Alain will operate as FH/F6BFH. He'll take an MA160V vertical for 160 meters as well as dipoles for 3.5 to 28 MHz. Alain will be on all bands on CW and SSB; however, he will be concentrating on CW on 160, 80, 40 and 30 meters. Alain prefers that you QSL via his home call through the REF QSL bureau.

FK — NEW CALEDONIA

Look for Jean-Louis, F5NHJ, to be operating as FK/F5NHJ from Grande Terre (OC-032), New Caledonia from August 12 to 29. Activity will be mostly on CW and the digital modes on 30 meters. While there he will also try to activate one or more other New Caledonian islands. He plans to upload his logs to LoTW and will have a log search at **www.f5nhj.fr/logsearch**. QSL via operator's instructions.

HR — HONDURAS

This year the Radio Club de Honduras (RCH) celebrates its 50th anniversary and will be operating special call HQ50RCH starting June 21 until the end of 2008. QSL via HR2RCH, PO Box 273, San Pedro Sula, Cortes, Honduras. Include 2 IRCs or 2 green stamps.

JD1/O — OGASAWARA ISLANDS

JD1BLX and JD1BLY will be on from Ogasawara, aka "Chichijima," IOTA AS-031, August 10-16. Operators Toru, JI5USJ, and Makoto, JI5RPT, will be on 160-6 meters, satellite, CW, SSB and digital. QSL to their home calls. **www.ji5rpt.com/jd1/**

JX — JAN MAYEN

As reported last month Svein, LA9JKA, began activity on Jan Mayen (EU-022) as JX9JKA in early April, shortly after his late March arrival. He is on a work assignment on this arctic volcanic island until early October. Unfortunately, there was a small setback to his operation from this semi-rare one. Geir, LA4XGA, reports that Svein cannot operate at this time because of RFI into the fire alarm system. He did take a day trip to another location on the island in late May for a few hours of activity as JX9JKA. This location is not easy to get to. Let's all hope Svein can quickly solve the problem at his main location.

YU8 — KOSOVO

Jose Matos, CT1FKN (4W6FK, T98FKN), has received permission to operate Amateur Radio in Kosovo as YU8/CT1FKN from May 20 to September 20, 2008. He will be QRV on HF only. Jose is in the Portuguese Army on a work assignment with the Kosovo International Military Force (KFOR). QSL via CT1FKN either direct or via the CT bureau.

Boyan, YU8/LZ1BJ, who is a police officer in Kosovo, plans to be there for the next few months. He has been on 40 and 20 RTTY and PSK and 10 SSB and plans to be on all the bands 40-10, CW, SSB, PSK31 and RTTY. QSL via the LZ bureau.

OJØ — MARKET REEF

Eric, SM1TDE, reports the Swedish team heading to Market Reef has canceled their plans for early June on OJØ. Plans are now to operate in mid-August. Watch your favorite DX newsletter for updates on this one.

PJ — NETHERLAND ANTILLES

The status change of the Netherland Antilles, which was scheduled to take place on December 15, 2008, has been pushed back again. Originally it was expected on July 7, 2007. No definite date has been scheduled but it is thought that Curacao (PJ2) and St.

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Maarten (PJ7) will now achieve their desired status change before January 1, 2010. Complete details can be found at **http://tinyurl.com/3wtbsh**.

TT — CHAD

Duarte, TT9/CT1CPP, reportedly plans to be on from Chad until May 2009. He will have a TS-50 and dipoles. Normally, operations from Chad use TT8** call signs. All operations from Chad require paperwork at the DXCC Desk. There have been past operations from Chad with TT8/home call that have counted for DXCC. TT8/N7DF is one that comes to mind. Duarte has operated from S92UN in the past and that operation did count for DXCC. The use of the TT9 prefix would be a possible first. QSL TT9/CT**1**CPP via CT**1**CPP direct only. The address is on **QRZ.com**. QSLs must contain a self-addressed envelope and either an IRC, 2 USD or 2 Euros. Portuguese stations can send just a self-addressed stamped envelope.

VU4 and VU7 — ANDAMAN, NICOBAR and LAKSHADWEEP ISLANDS

India's National Institute of Amateur Radio's (NIAR), *Ham News* has some details of the prospective VU4/VU7 operations for October 24 to November 3. To register to participate, go to **www.niar.org/sj/form.html**. But first, the silver jubilee celebration is October 18-20 in Hyderabad. It appears attending this part on the mainland may be a helpful prerequisite. The 119,000 QSOs made in connection with "Hamfest 2007" and the VU7RG/VU7MY operations of January 2007, were cited as contributing to increasing awareness of "ham tourism" in India.

THOMAS ROSCOE, K8CX

National Institute of Amateur Radio (NIAR) members Mohan Suri, VU2MYH, and Sadineni Yamini, VU2YAM, were present at the Dayton Hamvention in May. In late October and early November NIAR is sponsoring an Amateur Radio activity in VU4 and VU7.

WAE60 MARATHON and AWARD

The DARC has announced the WAE60 (Worked All Europe) Marathon, which will take place from August 9 until September 14. This marks the 60th anniversary of the WAE Award that was developed by the legendary DXer DL7AA and first earned by another legend, W2IOP, in 1948. Complete details can be found at **http://wae60.de**.

YI — IRAQ

Kitch, WD6V, is now QRV as YI9WV from Iraq. He is operating from near Fallujah. Kitch plans to operate as much as he can in his free time. QSL YI9WV via NI5DX, good in **QRZ.com**.

ZD9 — TRISTAN DA CUNHA and GOUGH ISLANDS

By the time you read this Tom, KCØW (ZD7X), should be QRV from Tristan da Cunha. He has already obtained his ZD9X call sign and expects to be QRV for 4 to 6 months, or longer. While on Tristan da Cunha he hopes to figure out a way to Bouvet Island (3Y/B). Also he is tentatively going to South Georgia (VP8/G), South Orkney (VP8/O) and South Sandwich (VP8/S). Watch the DX rags for more on this one.

WRAP UP

That's all for this month. A special thanks to 4O3A, BA1RB, BD5RV, CT1END, CT1FKN, DL2VFR, EZ8CW, F6BFH, HR2PAC, KCØW, NI5DX, NIAR, SM1TDE and *The Daily DX* for help with this month's column. Don't forget to keep your editor up to date on any DX news. E-mail details to **bernie@dailydx.com**. Until next month, see you in the pileups! — *Bernie, W3UR*

QST

VHF/UHF Century Club Awards

Compiled by Sharon Taratula
Administrative Manager

The ARRL VUCC numbered certificate is earned by amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid locators (indicated in italics) for each band listing. The numbers preceding call signs indicate total grid locators claimed. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from April 5, 2008 to May 15, 2008.

The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the VUCC Web site at **www.arrl.org/awards/vucc**. An SASE to ARRL is required if you cannot download these forms. Send questions relating to VUCC to **vucc@arrl.org**.

50 MHz
100

1628	WYØV
1629	KC9FQD
1630	KT5RR
1631	N3JDQ
K3MSB	125
NN4RR	250

144 MHz
100

685	WYØV
AA9MY	400

222 MHz
50

138	W9RPM
NØLL	110

2.3 GHz
10

WW2R	30

Satellite
100

WA8SME	200

QST

Feedback

◊ In Hamspeak [Jul 2008, p 101], the items relating to "The Pileup Buster" were included in error. That article will be in an upcoming issue.

◊ Gail A. Edwards, AE4II, was listed incorrectly as a silent key in the June 2008 issue.

◊ In the 2008 January VHF Sweepstakes Contest results [July 2008, p 84], N6ZE/R was omitted from the Top 10 Box in the Limited Rover category. N6ZE placed 8th in the Limited Rover Category.

◊ In Feedback [Jul 2008, p 38], N6MB was incorrectly listed as the winner of the Rover category in the 2007 ARRL September VHF QSO Party. The correct winner was N6NB (+ N6MU).

◊ The following is a corrected list of the 2007 ARRL EME Contest category winners:

2007 ARRL International EME Competition Category Winners

Single-Operator

Category	*Mode*	*Call*	*Score*
50 MHz	Digital	PE1BTX	48,600
50 MHz	Mixed	JR6EXN	30,400
144 MHz	Analog	LZ2US	284,900
144 MHz	Digital	KB8RQ	1,245,600
144 MHz	Mixed	RU1AA	2,618,700
144 MHz	Assisted	K9DX	1,339,600
432 MHz	Analog	DL9KR	230,400
432 MHz	Digital	JHØTOG	100
432 MHz	Mixed	OK1TEH	2,000
432 MHz	Assisted	KE2N	52,800
1296 MHz	Analog	K9SLQ	356,000
1296 MHz	Mixed Ass'd	G4CCH	514,800
1296 MHz	Mixed Unasd	PA3FXB	20,400
5.7 GHz		OK1CA	3,600
50-1296 MHz	Analog	OZ4MM	1,224,500
50-1296 MHz	Digital	EB5EEO	475,200
50-1296 MHz	Mixed	UA4AQL	82,800
2.3 GHz and Up		F2TU	193,800
All band	Analog	RW1AW	1,513,200

Multi-Operator

Category	*Mode*	*Call*	*Score*
144 MHz	Mixed	YO9FRJ	881,600
144 MHz	Assisted	IK1UWL	1,724,800
432 MHz	Mixed	OH2PO	360,400
1296 MHz	Analog	IZ1BPN	207,700
1296 MHz	Assisted	RD3DA	183,000
2.3 GHz		HB9Q	37,800
50-1296 MHz	Analog	SP6JLW	460,600
50-1296 MHz	Mixed	K4EME	428,600
2.3 GHz and Up		OK1KIR	127,100
All band	Mixed	K1JT	4,253,400

◊ In the 2008 ARRL RTTY Roundup results [July 2008, pp 79-80], HI3T (HI3TEJ, op) was accidentally left out of the Top 10 table. HI3T was the winner of the Single Operator, Low Power DX category.

◊ In the 2007 ARRL 160 Meter Contest results [June 2008, pp 85-86], CM6RCR was erroneously listed as the winner of the Rocky Mountain Division in the Single Operator, QRP category. The correct winner was KT5E.

◊ In the 2007 IARU HF Championships results [Mar 2008, pp 81-84], the score of Spanish Headquarters station AMxHQ was listed as 10,444,098. Their correct score was 13,254,636, placing them 8th among Headquarters stations.

◊ In the 2007 Phone Sweepstakes results [Jun 2008, pp 87-90], WX3B is incorrectly listed in the "B" class; he should have been in "U" class. The following changes are in order:

- The winner of the Single Operator, High Power category in the Atlantic Division is KD4D.
- K3MIM moves into 5th place in the Single Operator, High Power, Northeast Region.
- WX3B is awarded 4th place in the Single Operator Unlimited class in the Northeast region.

W3ZZ

THE WORLD ABOVE 50 MHz

Ethical Principles on the Bands Above 50 MHz

I was recently an instructor at the Contest University held immediately before the beginning of the Dayton Hamvention. The first presentation to both the basic and advanced courses was a discussion of radio contesting ethics given by 2008 CQ Contest Hall of Fame inductee Randy Thompson, K5ZD. It struck me that although we have touched upon various aspects of ethics in the column, we've never discussed it in general terms. This month we will talk about ethics in the VHF+ world and look at some aspects of the subject in both our general operating and in contesting as examples. In doing so I will call upon some of the examples that Randy and his coauthor Ken Adams, K5KA, described in their presentation where these are applicable to VHF and I am indebted to them for making their presentation available to me.

Ground Rules

First this is a discussion. Many books have been written about ethics and I will touch only the surface. Ethical principles do not exist as rules set in stone. The Merriam-Webster dictionary calls ethics "the discipline dealing with what is good and bad and with moral duty and obligation" and further goes on to define it as "a set of moral principles: a theory or system of moral values; the principles of conduct governing an individual; and a guiding philosophy." Thus, ethics are practices that an entire civilization develops to deal with right and wrong actions and morals are the limits for setting the guidelines for practicing these actions. Randy correctly indicates that ethics are what you do when no one is looking.

Secondly there seems to be the pervasive idea that VHF practices somehow are different from what else happens in all other parts of Amateur Radio. I would like to disabuse you of this notion. The concepts of right and wrong are no different for VHFers than they are for anyone else in the hobby. No matter what frequency we use, be it 160 meters, 20 meters or 13 cm, as operators we are all still trying to make contact with the station at the other end whether our challenge is being detected through a pileup of interference or to generate a signal strong enough to be heard at all.

General Practices

Most of the defined rules in VHF operating are regulatory in nature. In the US, you are limited to a maximum total output power of 1500 W. Even here the rules-pushers have tried to interpret this to mean 1500 W to every antenna being excited so that if you have three antennas you could have three 1500 W amplifiers, one feeding each antenna. Not only is this illegal but it is unethical. Besides segments of 6 and 2 meters where voice operation is forbidden, there are band segments on 6 meters (50.100-50.125 MHz) reserved by gentlemen's agreement for intercontinental DX contacts and certain segments similarly used for EME (for example, below ~144.125 on 2 meters). These are usually observed; interlopers are often operators who do not know the common usage and usually move when it is explained to them. Certain frequencies on most of the bands are used as calling frequencies for both CW/SSB and digital contacts; after contacts are made the participants are supposed to leave the frequency and, outside of contests, they usually do.

But what about the more difficult cases? We have previously discussed (March 2006) what a contact is — the exchange of call signs, a unique piece of additional information often a signal report or a grid square and confirmation that all this information has been exchanged. This has existed without exception since time immemorial on VHF. The functional rule is that all information must be exchanged over the air on the frequency where the contact is occurring.

This Month

August 2-3	ARRL UHF Contest
August 16-17	ARRL 10 GHz and Up Contest
*August 17	Moderate EME Conditions
*August 24	Moderate EME Conditions

*Moon data from W5LUU

The penalty for talking about the contact on some other frequency or on the telephone or on the Internet is that you must start all over again from the beginning with an exchange of calls. As far as I can see this ancient practice still exists on CW and SSB.

The situation with digital contacts has been somewhat different, however. Given that the process is necessarily more complex — detection is via machine so one cannot depend on one's ears to determine whether the process is proceeding properly. Thus it is considered acceptable for educational purposes to "talk" a neophyte through the process the first time or two usually by Internet chat net. One can see examples of this occurring on sites like **Ping Jockey**. Such an exchange is not a contact, however. Information has been exchanged in media other than the frequency of the contact. The process must be repeated successfully without coaching for a contact to be considered legitimate.

All too often in the relatively recent past, some operators (and not neophytes), doing digital EME and/or digital MS can be observed exchanging information on the Internet. This is an unethical practice and the contact should not be claimed by either station. The fault is not with either the author of the software, K1JT, who has repeatedly warned against this practice except for educational purposes, or with the operators of the Internet sites who all remind users that discussion of the progress of a contact while the contact is ongoing is strictly forbidden. They can provide the means for making digital contacts but they cannot legislate ethics.

Consider coaching on some radio frequency other than the one on which the contact is taking place. This is a common practice on 70 cm for microwave contacts. I discussed this in that March 2006 column and not one person commented on what I said. I think most people would say it is unethical to say anything about the microwave contact on 70 cm once the contact process has begun, that is, the exchange of calls. But what about using 70 cm to determine when one station can hear another on a microwave band? Or worse, following that by confirming on 70 cm that the other station can hear

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the first station on the microwave band? Is that ethical? Wait, you say. Unless we use a liaison frequency the microwave contacts will be nearly impossible. Not so fast. Even in the intervening 2 years since I first mentioned this, SDR receiver software has become much more available and any transverter IF strip with an IF in the 8 MHz range can now act as the basis of an SDR receiver with relatively minor modification using something like a SoftRock (**www.amqrp.org**) or N8LP-PAN (**www.telepostinc.com**) interface. If you have ever worked anyone like W3SZ using an SDR-1000 or SDR-5000 (**www.flex-radio.com**) and its spectrum Panadaptor, you know he can find you without using a liaison frequency. At the current state-of-the-art, is using a liaison frequency to locate a microwave signal an ethical practice?

VHF Contests as an Example

Because all contests do contain rules, contests provide a specific example of an endeavor that deals with both written rules and unwritten rules. The former are relatively straightforward while the latter deal with less well-defined interpreted norms and gray areas that we associate with ethics.

Let's look at some of the examples Randy mentioned that are germane to VHF contests. In terms of written rules, single operator classes may not use DX spotting networks either by packet or Internet; multiops (that means limited and unlimited multis and rovers of all three classes) may only derive passive information from such spotting networks and no self-spotting is allowed for any class. No information may be derived or exchanged via nonamateur means, for example, cell phones and Internet chat nets.

Now the ARRL has ruled that APRS is allowed for rovers because it does not provide frequency information although it does provide call sign and exact location. Given that almost all rovers who are expending any significant effort publish their itineraries and 2 meter listening frequencies *in advance of* the contest, how does this differ from self-spotting?

Let's consider unwritten rules (see Table 1). The APRS discussion falls under the second bullet. What about changing your log after the contest ends? Most but certainly not all operators feel that correcting obvious typos is an ethically acceptable practice — things like a zero for the letter "O," the number one for the letter "l," forgetting to hit the space bar yielding a call like K1TEOFN31. But then what about K9MS instead of K9NS; *n* and *m* are next to each other on the keyboard but did you really mistype one for the other or did you miscopy the call? Even if this were a stupid mistake, most operators would leave it as is. You don't know whether it was a typo or you miscopied the call. What about less difficult choices like checking each call against *Super Check Partial* (**www.k5zd.com**) *after* the contest or looking up the calls on **QRZ.com** to see if you got their grids correct? Here no one would consider this either legal or ethical yet I know of a few cases in the past where this has been done.

Table 1

Contesting as an Example: The Unwritten Rules of Ethics in Contesting

After Randy Thompson, K5ZD, and Ken Adams, K5KA, "Radio Contesting Ethics… pursuing victory with honor." Contest University, Dayton, OH 2008.

- Keep the contest on the radio and within the contest period
- Just because it's not specified in the written rules doesn't mean you can do it!
- Don't do anything you would not want to be made public

Randy lists a group of practices germane to VHF contesting as well that essentially all HF contesters consider unethical (Table 2). We've discussed some of these above but what about the rest? The most controversial for the VHFer is making schedules in advance of the contest. Almost everyone would agree that contacting a station in a rare grid, reminding him that a contest is coming up and urging him to get on the air is a great way to increase activity. Making schedules for weak signal digital modes is probably the only way to work stations at this point in the development of that software although K1JT's recent *MAP-65* (**http://physics.princeton.edu/pulsar/K1JT/**) software may make this not the case for *JT65* EME work. But making schedules on CW or SSB? Only on VHF is this considered an acceptable practice. Perhaps we need to think further about the ethics of this practice. What about asking friends to work you and only you, or club members working only club members? VHF contest specific rule 2.3.5: "All Rovers are encouraged to adopt operating practices that allow as many stations as possible to contact them." is designed to eliminate captive rovers who work only one station. This is a rule that only "encourages" such ethical behavior — there are no consequences for being a captive rover. A single one-point 6 meter contact might satisfy the literal rule but at what point does a rover satisfy the ethical considerations and intent of this rule?

Table 2

Unethical Practices in VHF Contests Before, During and After the Contest

After Thompson and Adams, *ibid.*

Pre-contest
Making prearranged schedules
Asking friends to work you — only
Club members working members — only

During the contest
Calling multipliers on the telephone
Asking for the frequency of a multiplier
"Have you heard WA2FGK lately?"

Post-contest
Log editing
"Research" using **QRZ.com**, Callbook, Spot history
Asking others who they worked
Taping the contest and replaying for accuracy

This is a difficult subject to address. There are no absolutes but essentially all human civilizations, both Eastern and Western, have converged toward similar behaviors in this respect. We know this in the Western world as variants of the Golden Rule and its derivatives, but similar rules govern groups of people throughout the world. There are aberrations but most people recognize them as aberrations. Ethical conduct can only be encouraged by each one of us in the VHF community leading by example, doing his/her best to do the "right" thing as we see it and for the community as a whole to apply peer pressure as needed to encourage ethical behavior.

But just as we need to be reminded at times of what a contact is, so do we need to think about the ethics of what we do. As Table 1 states: don't do anything you would not want to be made public.

ON THE BANDS

This month's highlights are a seminal achievement on 432 MHz and a strong E_s opening on 2 meters. Thanks to my correspondents including W2BVH, K6LMN and N7DB not otherwise mentioned.

First 432 MHz DXCC. Via Al, K2UYH, comes a message from Jan Bruinier, DL9KR: "Zdenek at Z3/OK1DFC had asked me to give him a beacon and when pausing to listen to my echoes, he suddenly appeared with a 549 signal thus giving me DXCC entity 100 after more than 30 active years of CW, rpt CW, EME on 432 MHz. A huge thanks to OK1DFC and OK3RM!!!" Thus on June 6, Jan became the first operator to complete 432 MHz EME. This was all done on CW. K2UYH notes that HB9Q is close behind and that he, Al, is at 87. I am aware that K5JL is currently at 97.

2 Meter E_s. Very short E_s on 6 meters as reported on May 25 by Rick, WØRT (EM27) and Chip, K7JA (DM03) often means 2 meter E_s is possible — but not this time. The first 2 meter E_s event of the year ran from about 2330Z May 29 to 0016Z

May 30. The center appeared to begin over central WV and drifted west into eastern KY. Contacts were reported from MD, NY, New England, VE2, 3 and Ohio to the north; SC, FL, AL, LA to the south; and MI, western TN and southern IL to the west. I got reports from Dave, K1WHS (FN43mj), 12 Qs with an ODX to K5EMP (EM30mx) of 2143km/1477mi; Ron, WZ1V (FN31mp), 12 Qs with an ODX to K5EMP of 2173km/1331mi; John, K1OR (FN42ir) 6 Qs with an ODX of 2320km/1441mi; Dave, K1RZ (FM19jh) 12 Qs the longest to EM32; Ken, AC4TO (EM70xl) 9 Qs the longest to VE3KKL (FN25) of 1840km/1144mi and Dave, K2TZV (FN20ms) 7 Qs longest to EM54. The **dxworld.com** reflector showed contacts additionally from the Gulf coast EM60 to northern NY and Canada and from FL EL98 into EN91 and EN84.

Tropospheric ducting. Todd, N4QWZ (EM66) reports an opening to the southeast to EL99, 98 on 2 meters and EL98 and EM92 on 432 on the 25th.

6 meters. The E_s season got off to a late start with no E_s to speak of until after mid-month including decent activity but very poor conditions during the 6 meter Sprint. Once the band opened, it remained open essentially every day after the 15th. Six meter highlights were persistent openings to the west: the Pacific Northwest heard the JE7YNQ beacon on the 16th and worked JA and KL7 on the 23rd (thanks N7DB). KØGU (DN70) in CO also worked both JA and KL7 on the 23rd. On the 31st Jon, NØJK (EM17) heard VE8BY/B (FP52), KØHA (EN10) heard KL7/KGØVL/B and KBØCIM (EN37) worked AL7RT. Owen, K3CB (FM28) heard the AH2G beacon weakly on May 22 perhaps via an auroral E-chordal E hop. Hawaii, particularly Al, KH7Y (BK29), worked many areas in the US. On May 19 KH7Y worked widely into the west coast W6/7, CO, NE, IA and IL and was heard in KS and OK. On the 23rd Al and KH6FI were into the Midwest (IA). On the 29th the KH6 opening extended to John, WZ8D (EM89), Al, K3TKJ (FM28) and Dave, N3DB (FM18); Steve, W5KI (EM36) worked KH7Y on the 30th. Openings to Europe from the US were less vigorous. K3CB worked EA6 and reports New England into CT, CU and EA on the May 22. Terry, K4RX (EM70) worked EA, CT and CU and Al, K3TKJ, worked CT and EA6 on the 25th. On May 27 K1TOL and W1JJ worked DL and on the 28th AC4TO was into CU and W5OZI (EM00) into DL. By contrast Julio, NP3CW, reports almost daily openings to Europe at the end of the month. Ken, DA2KW (JN59) and Ken, KE2N (FM18) report outstanding E_s conditions in Europe on May 24-25. Contacts throughout the Caribbean were quite common including ones with St Barts (FJ), a new country for all (thanks to WZ8D and K7XC for details). East/west double hop contacts were well in evidence on May 13, 16, 24, 25, 30, 31 (thanks to K3CB, K7ICW, K7JA, WZ8D and NØJK for their reports). Finally I'd like to note that stations both new and small are coming on 6 meters every day. This month, congratulations to Louis, KD5GM (EL29) and Rick, KAØCXN (EM16) who have been enjoying contacts with stations at both ends of the country.

Microwaves. How many 24 GHz grids can you work from a home station? Mike, KMØT (EN13vc) records his 20th grid, all terrestrial, by working Gene, NØDQS/m in EN20hx on a partially rain scatter path. Congratulations to both! According to WZ1V and K1IIG both FN31, the Microwave Sprint had flat conditions but reasonably good activity.

HERE AND THERE

August UHF Contest. This 222 MHz and up contest starts 1800Z August 2 and runs until 1800Z August 3. Remember that we almost lost this contest due to inactivity so please submit your log. Rules are located at **www.arrl.org/contests/rules/2008/uhf.html**.

ARRL 10 GHz and Up Contest. The first of two weekends of this popular microwave contest begins 0600 local time Saturday, August 16 and ends midnight local time Sunday, August 17. Operate any 24 hours. Liaison frequency is usually 144.260 MHz. Rules may be found at **www.arrl.org/contests/rules/2008/10-GHz.html**.

Northern Nevada Microwave Society. Tim, K7XC, announces the formation of the Northern Nevada Microwave Society. Further details are at **http://k7xc.tripod.com/nnms/**.

DJ9BV SK. We are all saddened to learn of the passing of Ranier, DJ9BV, long-time editor of *DUBUS*, legendary EMEer, master of antenna and LNA design and most of all, friend and mentor to many. We have all been enriched by his presence and will be diminished by his loss.

222 MHz Standings

Published 222 MHz standings include call sign district leaders as of June 1, 2008. For a complete listing, check the Standings Boxes on The World Above 50 MHz Web pages at **www.arrl.org/qst/worldabove/**. To ensure that the Standings Boxes reflect current activity, submit reports at least every 2 years by e-mail to **standings@arrl.org**. Printed forms are available by sending a request with an SASE to Steve Ford, WB8IMY, Standings, ARRL, 225 Main St, Newington, CT 06111.

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
1					
K1TEO	CT	28	2	118	2,420
W1AIM	VT	20	2	54	2,021
AA1YN	NH	8	2	18	496
2					
K1JT	NJ	21	2	56	1,727
W2CNS	NY	12	3	29	626
K2OVS	NY	3	1	3	250
3					
W3ZZ	MD	36	2	105	1,871
K1RZ	MD	27	2	90	1,633
WA2FGK	PA	27	2	77	—
4					
K4RF	GA	37	2	105	1,968
K4QI	NC	34	2	95	—
AA4ZZ	NC	32	2	101	1,478
W4WA	GA	29	1	87	—
AA4H	TN	27	2	80	1,737
K4XR	AL	22	2	73	1,550
K4RTS	VA	17	2	65	1,337
KØVXM	FL	9	1	35	1,747
W4SW	VA	9	1	23	641
KE4WBO	FL	2	1	8	1,013

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
5					
W5LUA *	TX	50	—	—	—
W5RCI	MS	38	2	139	1,970
W5ZN	AR	26	2	84	2,250
W5UWB	TX	23	2	63	2,197
W3UUM	TX	14	1	64	1,619
WD5AGO	OK	12	2	30	1,975
AA5AM	TX	7	1	24	1,100
AA5JG	OK	2	1	5	101
6					
KC6ZWT	CA	9	2	51	1,371
KR7O	CA	8	3	39	1,638
K6QXY	CA	4	3	30	3,794
N6ZE	CA	1	1	12	583.5
7					
K7XC	NV	7	1	44	1,049
W7MEM	ID	7	1	20	1,476
KI7JA	OR	5	2	24	1,300
8					
WA8RJF	OH	28	2	91	1,733
K2YAZ	MI	23	2	76	2,167
KB8O	OH	12	2	22	816
N8PUM	MI	3	2	16	1,390

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
9					
KA9UVY	IL	27	1	61	1,536
AA9MY	IL	25	2	64	1,751
K9SM	IL	22	2	59	1,096
W9RPM	WI	16	2	53	1,400
KB9TLV	WI	6	1	25	577
Ø					
WØSD *	SD	50	6	89	7,345
KØALL	ND	30	2	—	—
NØLL	KS	25	2	109	1,900
KØAWU	MN	23	2	70	2,008
KBØPE	MO	20	1	55	1,033
KØFF	MO	18	1	52	1,174
KØRZ	CO	16	2	55	2,002
KØGU	CO	10	1	18	1,913
KØCJ	MN	7	1	26	710
Canada					
VE3KH	ON	15	2	51	1,093
VE2PIJ	PQ	9	2	33	694

* Includes EME contacts
— Not given

WB8IMY

ECLECTIC TECHNOLOGY

Electron Filmed for First Time

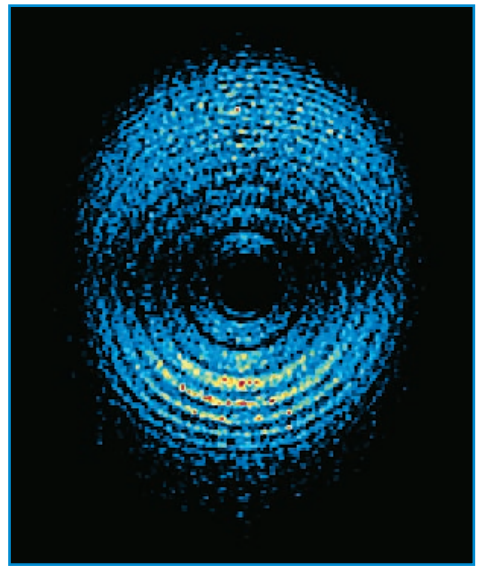
Electrons are the lifeblood of Amateur Radio. Our technology has been bending these little servants to our will for about a century, but no one has ever seen an electron in action—until now. Go to **www.arrl.org/files/qst-binaries/** and download **electron.mpg**. The movie, created by scientists at Sweden's Lund University, shows how an electron rides on a light wave after just having been pulled away from an atom's nucleus.

How did they do it? The trick involved a laser capable of firing *attosecond*-length pulses of light. An attosecond is 10^{-18} seconds. Putting this into perspective, it takes 150 attoseconds for an electron to orbit the nucleus of an atom, a span of time only somewhat shorter than the interval between QRZ? and the moment everyone else in a DX pileup begins transmitting. By firing the laser at the appropriate times, the scientists were able to glimpse the energy distribution pattern that was created as the electron moved. You're not really seeing the electron itself (some argue that electrons do not possess an objective reality as we know it), but something analogous to the wake left behind as a boat slices through the water.

NBEMS in Mississippi

In my April 2008 column I introduced you to the Narrow Band Emergency Messaging System (NBEMS), a software suite that allows you to set up digital messaging networks on the fly with nothing more than a radio and a sound card equipped computer (see **www.w1hkj.com/NBEMS/**). It didn't take long for hams to begin experimenting with NBEMS. The South Mississippi Emergency Repeater Group has already conducted successful tests using NBEMS through a linked repeater system. That's a novel idea when you consider the fact that NBEMS was originally designed for simplex point-to-point communication. Kirby Heathcock, KB5AAB, explains…

"In the wake of hurricane Katrina, our area established a reliable analog voice repeater system based on hardened equipment with emergency power sources. We were curious to see if this same system could also support digital communication using NBEMS. We have tested NBEMS over a wide area with excellent results by operating ARQ in the PSK250 mode. Our operators were able to easily exchange sizeable text files through the repeaters with 100% accuracy. Some didn't have sound card interfaces; they simply used the microphones in their laptops to receive the data signals and transmitted by holding their transceiver microphones up to the laptop speakers!"



The first glimpse of an electron in motion. You can download and view the movie (electron.mpg) at www.arrl.org/files/qst-binaries/.

A Different Approach to Improved Repeater Coverage

Pedro Wyns, ON7WP/AA9HX, along with other Belgian and Dutch amateurs, has been pursuing a unique approach to enhancing FM repeater coverage.

As most know, you can improve the receive coverage of a repeater by setting up receivers at remote sites to fill in the coverage "holes." The audio from the remote receivers is then sent to the main transmitter site using UHF or microwave links. You can further improve coverage by adding more transmitters. According to Pedro, UHF and microwave links are problematic in many areas of Europe because of interference and cost issues. As an alternative, his group is experimenting with Internet links for remote repeater receivers and transmitters, arranging an elaborate system that provides diversity reception and synchronized transmission. They refer to their brainchild as *DRoIP* — Diversity Repeater over IP.

The group welcomes any assistance with their project, even if it only amounts to sharing ideas. You can contact Pedro directly at **Pedro.wyns@telenet.be**. There is an online discussion forum at **http://repeatertechniek.on4aob.be/**, but you'll need to be conversant in Dutch to participate.

If RST Doesn't Cut It, How About RSQ?

We're all familiar with the RST system for signal reporting: Readability, Strength and Tone. It has served us well for decades, but in the digital era it's showing its age. "Tone," in particular, doesn't quite apply to a digital signal when you're trying to give the other station an idea of its overall quality. Simply stating that one's signal is "broad as a barn" doesn't make the grade either.

Some amateurs are promoting the idea of a new RSQ system for digital signal reporting with a focus on PSK in particular. RSQ stands for Readability, Strength and Quality. The reporting information can be seen in Table 1. The key developers of RSQ are Bob Sampson, K6MBY; Skip Teller, KH6TY; Ian Moore, GM4KLN; Milton Cram, W8NUE, and Graeme Harris, VK3BGH. There is a nicely crafted Web site at **www.rsq-info.net/** that explains the RSQ approach. QST

Table 1

Readability

R5	95%+	Perfectly readable
R4	80%	Practically no difficulty; occasional missed characters
R3	40%	Considerable difficulty; many missed characters
R2	20%	Occasional words distinguishable
R1	0%	Undecipherable

Strength

S9	Very strong trace
S7	Strong trace
S5	Moderate trace
S3	Weak trace
S1	Barely perceptible trace

Quality

Q9	Clean signal — no visible side traces
Q7	One barely visible pair of side traces
Q5	One easily visible pair of side traces
Q3	Multiple side traces
Q1	Splatter over much of the spectrum

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W1GHZ

MICROWAVELENGTHS

Summer — Microwave Season

Summer is the time for portable microwave operation, when mountaintops and seacoasts are warm and accessible, so we will discuss operating this month and get back to microwave equipment and components in future Microwavelengths.

Much of the microwave activity is centered around the contests, the ARRL VHF QSO Parties in June and September, the ARRL UHF Contest in August and particularly the ARRL 10 GHz & Up Contest in August and September. There are also Microwave Activity Days — Bill Seabreeze, W3IY (SK), promoted the first Saturday of each month as an activity day and many microwavers continue this tradition.

An activity day, or just a pre-arranged test, is a good time to get out and operate, especially on the higher microwave bands, where contacts can be difficult and time-consuming. The dishes for 47 and 78 GHz in Figure 1 have optical-quality surfaces needed for very short wavelengths and are so sharp that a rifle scope is needed for aiming. Operation during a contest can be hectic at times — Figure 2 shows some of the operators on Mt Wachusett in Massachusetts, a popular spot for microwaves and for hawk watching (the folks in the background in both pictures). When these two activities coincide in September, the summit gets pretty crowded. Invariably, several rovers will show up at the same time at sites in different directions and all want a contact. Operating several microwave bands from 10 GHz up is hard enough, but adding as many as nine lower bands in a VHF contest can get pretty crazy.

On the other hand, there are inevitably slow periods as well — Figure 3 shows how KB1VC and W1AIM prevent boredom.

When the site is crowded, the wind is blowing, dogs are barking and a fleet of motorcycles arrives, it gets pretty hard to hear the radio. Good headphones are essential for concentrating on the signals — WA1MBA, kneeling in the center of Figure 2, is digging out a weak one on 78 GHz.

Essentials

I try to do at least one portable operation early each summer, before contests, because something always gets forgotten on the first trip. I take along a pad to write down items forgotten and other ideas. Some of the things on my checklist, based on things I have forgotten or seen others arrive without:

- ✔ Battery — well charged
- ✔ Compass
- ✔ Headphones
- ✔ Key
- ✔ Log and pencil
- ✔ Liaison antenna and mast
- ✔ Coax and adapters
- ✔ GPS
- ✔ Power cable for each piece of equipment
- ✔ Powerpole distribution box
- ✔ Spare power cables
- ✔ Spare coax
- ✔ 5/16 inch (SMA) wrench
- ✔ Fuses
- ✔ Hat
- ✔ Sunscreen
- ✔ Raincoat
- ✔ Insect repellent
- ✔ Water
- ✔ Chair
- ✔ Duct tape
- ✔ Swiss Army knife

The last two are the emergency repair kit. If you can't fix it with those two items, it's a major repair and shouldn't be attempted in the field! A final thing is large clear plastic bags — useful as equipment covers, raincoats and even trash bags.

Power

Many microwavers have told me that the hardest part of portable operation is power — just maintaining a good 12 V to the equipment. My own experience certainly confirms this. This assumes battery operation — generators have their own problems and may not be allowed in some public locations.

First, never use the car battery for oper-

W1FKF

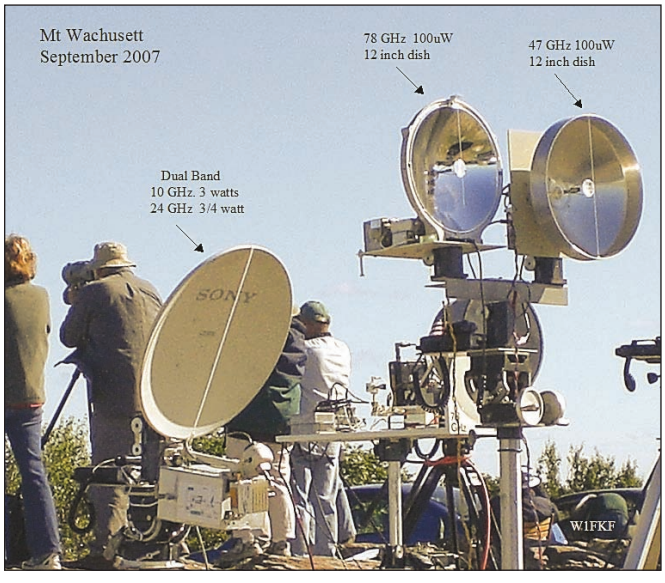


Figure 1 –– W1FKF microwave setup on Mt Wachusett, hawk watchers in background.

W1FKF

Figure 2 –– WA1MBA (kneeling) operating 78 GHz on crowded Mt Wachusett.

Paul Wade, W1GHZ ♦ 161 Center Rd, Shirley, MA 01464 ♦ w1ghz@arrl.org

W1GHZ

Figure 3 –– W1AIM and KB1VC coping with a dry spell during a 10 GHz contest.

W1GHZ

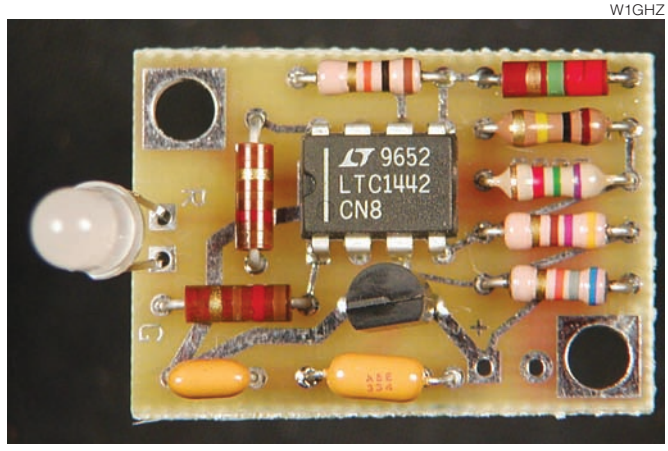


Figure 5 –– The LED voltage monitor.

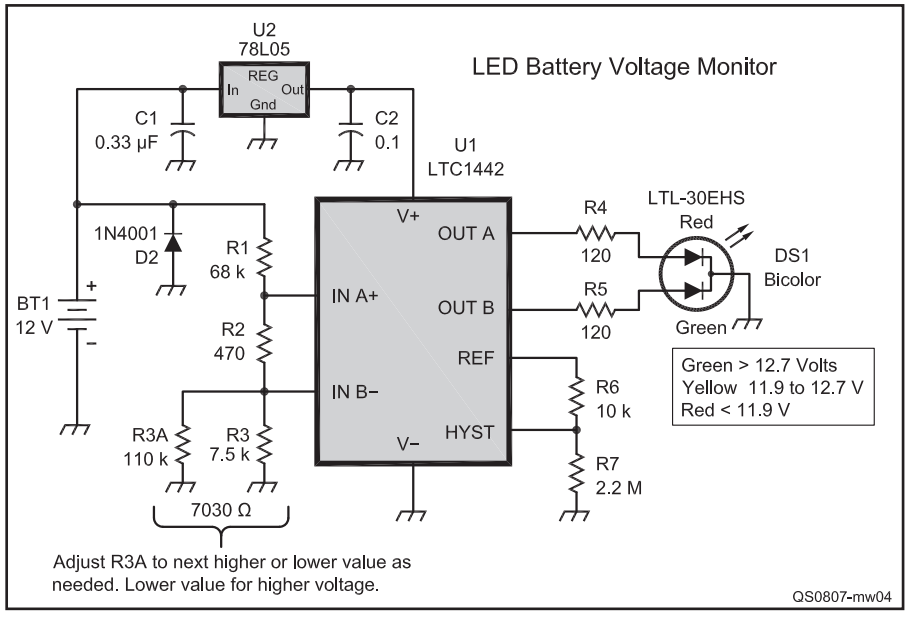


Figure 4 –– Schematic diagram of the LED voltage monitor.

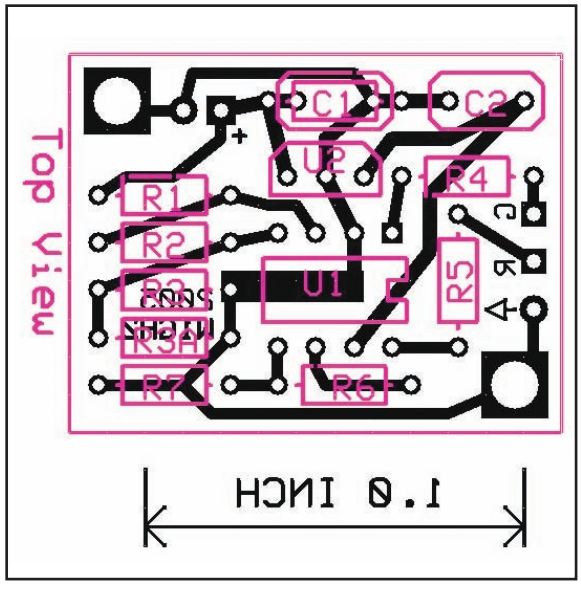


Figure 6 –– PC layout for the LED voltage monitor, viewed from component side of the board.

ating — you need it to get home! Also, automotive batteries are not designed for this type of use. Deep-cycle marine batteries or large gel cells are better choices. Whatever you use, charge it well with a good charger before you leave home. I've heard "It was charged last time I used it…" too many times.

Good power cables are essential. Most of us use the robust and reliable Anderson Powerpole connectors, wired according to the ARES/RACES standard (**www.cvrc.net/powerpole.html**) for emergency communications. The connectors and heavy red/black zip cord are available from several *QST* advertisers. In addition to the standard 30 A model, I prefer the larger 75 A and 125 A versions for batteries and high-power amplifiers to reduce voltage drop.

As a battery is discharged by use, the voltage will drop. Symptoms include distorted audio, keying chirp, drift and finally, oscillator dropout. Since these occur first at high current, while transmitting, they aren't immediately apparent. Sometimes they aren't apparent at all, except that you aren't making any contacts.

As a simple way to keep track of battery voltage, I made up a simple LED voltage monitor using a bicolor LED driven by a comparator chip with built-in voltage reference. It glows green with good battery voltage, yellow when marginal and red if the battery is low. After a period of operation, the LED will start to blink yellow on voice peaks or key down, reminding me to keep an eye on the battery. If it blinks red, then it is time to change batteries before any problems occur.

A schematic diagram of the LED voltage monitor is shown in Figure 4 and a complete unit in Figure 5. The circuit is simple enough to build dead-bug style, but a printed-circuit board is more robust. Figure 6 shows a layout for a single-sided board that you could make in the sink. More details are available at **www.w1ghz.org/small_proj/small_proj.htm** and kits are available from WA3IAC (**chuckwa3iac@yahoo.com**).

Ham Radio Ambassadors

When you are operating portable in a public place, you are also Amateur Radio on display. Be a good ambassador and do public relations. Smile, answer questions and have a handout sheet explaining what you are doing. It helps to have several operators at a spot, so they may take turns doing PR. Good public relations will help to make hams welcome next time. QST

K2TQN

OLD RADIO

Where in the World is the *Bowdoin*?

Well, it had to happen sooner or later. Figuring that AARP says you become a senior citizen at age 50 now that I'm 66 my wife says I'm acting a little funny. I don't think so, but I do admit that my interests are changing some.

It all started when I was about 13. My dad bought an old 12 foot sailboat from someone he was doing carpentry work for. It leaked and needed work, but I suppose it was inexpensive. Dad fixed it up as good as new, put it in the lake next to our home and I learned to sail. I quickly found the sailboat was a chick magnet when the local girls wanted a ride in it.

A few years later, when I was about 18 or 19 I bought an old 16 foot Town Class sailboat that needed some TLC. Working on it in my spare time I shortly had it fixed up and sailing in the local bay. The bigger boat was more challenging and fun to sail and now that I was driving I could take my dates sailing. It was a great summer.

After a year or two I decided that I wanted to get married so I sold the "Townie" to a friend and used the money to buy an engagement ring. It turned out to be a good deal as she's a wonderful mother and partner and lets me buy my old radios most of the time.

But the desire has always been there to buy another Town Class sailboat and start sailing again. Mixing my love for radios, history and sailing; I started reading about our early wireless operators and their sea adventures. This only fortified my desires about sailing. I'm told that once you are a sailor you never get it out of your system. So I started looking for a good sailing story I could write about and found an outstanding one.

Mixing Sparks with Ice

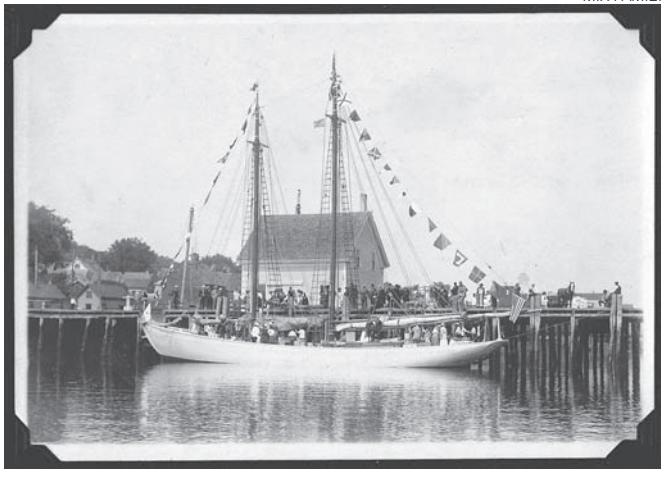
In 1923, *QST* started writing about a 15 month expedition to the Arctic and an explorer named Donald MacMillan. He wanted to take a ham radio operator with him. The search was on and one Connecticut operator, Don Mix, 1TS, signed up for the task. He was a good radio operator and was well-known to

The *Bowdoin* at the Maine Maritime Academy pier.

Schooner *Bowdoin*'s 1923 Arctic voyage departure day hustle and bustle.

MIX FAMILY

MIX FAMILY



***Bowdoin* at Wiscasset, Maine, ready to depart for the Arctic in 1923.**

MIX FAMILY

Don Mix with Zenith Radio equipment in cabin.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

Don Mix's cabin as it looks today.

K2TQN on *Bowdoin*. Maine Maritime Academy's Training Ship, *State of Maine,* is in the background.

the ARRL staff. Donald MacMillan was very experienced in the Arctic, having first gone with Peary in 1909 when he discovered the North Pole. He insisted on a personal interview with Don Mix to insure he would fit in with the expedition and the rest of the crew. He did, and was accepted immediately.

MacMillan's boat was his own, built to his specifications based on his knowledge of the Arctic. He named it after his college alma mater, *Bowdoin*. ARRL helped MacMillan get set up with radios through the (then new) Zenith Corporation and Eugene MacDonald. Zenith manufactured the radios and sent them to Wiscasset, Maine, to be installed on the Schooner *Bowdoin*. This was to be the beginning of a long relationship between MacMillan and MacDonald and the *Bowdoin*. Zenith would supply the radios for the *Bowdoin* to travel to the Arctic many times over the succeeding years. MacDonald even went with MacMillan and Richard E. Byrd on the 1925 expedition, which used aircraft to survey the Arctic for the first time.

She's Still Sailing to the Arctic

The one constant in all of this is the Schooner *Bowdoin*. She has survived several disasters along the way, always bounced back and always brought the crew home. This is a testimony to her original design and construction. In 1959, after 26 trips to the Arctic, MacMillan retired from the sea. Since then the *Bowdoin* has had several owners. The first was the Mystic Seaport. After the *Bowdoin* sat without any maintenance she was removed from there by the Schooner Bowdoin Association and brought back to Maine. Eventually she became the property of the Maine Maritime Academy (MMA) in Castine, where she sails today as part of the college's curriculum and provides hands-on training in seamanship. This summer she's going to the Arctic again and you can (sort of) go along with her, via the Internet.

The Maine Maritime Academy has a special Web page, **bowdoin.mma.edu/arcticcruise/**, with a daily calendar and photos of activities. (Click on the graphic-logo "Schooner *Bowdoin* Arctic Voyage" to access the Web page. On the Arctic Voyage Web page, click on any date that is red and underlined to see photos taken on that day.) I'll have several links on my Web page for your convenience, **www.k2tqn.com/**. There is also a link from the MMA Web page to where you can track the *Bowdoin*'s 2 month trip to the Arctic, which started on June 1, 2008 on **www.iBoatTrack.com/cruising.html**.

"iBoatTrack" is an interesting Internet system for tracking positions of ocean going cruises. Each boat is provided with a satellite tracker: a small, self-contained unit that includes a GPS receiver integrated with a satellite modem. The boat position data comes through the satellite receiving system directly into servers located at **iBoatTrack.com**, thus providing real time monitoring and cruise tracking. The *Bowdoin* connects with **iBoatTrack.com**'s database every 2 hours and allows visitors to the Web site to track the location of the Arctic schooner in real time.

The Maine Maritime Academy

The Maine Maritime Academy is a Maine public college where more than 800 students from throughout the world pursue associate's, bachelor's and master's degrees. The college specializes in ocean- and marine-oriented programs at the undergraduate and graduate levels, with emphasis on engineering, transportation, management and ocean sciences, as well as preparing officers for the US Merchant Marine and the uniformed services of the United States.

The college was established in 1941 by an act of the Maine Legislature. During World War II, nearly 400 graduates served at sea in the Merchant Marine, Navy and Coast Guard. In Korea, Vietnam and the Persian Gulf, thousands more served as seagoing officers.

Today, the college is internationally recognized for its leadership and innovation in maritime education. The college has substantially diversified since its founding to award AS, BS and MS degrees in a variety of maritime related subject areas.

The traditional undergraduate program leads to a BS degree and a license as a third mate or third assistant engineer in the US Merchant Marine. Midshipmen train at sea for at least 60 days each year, either aboard the Training Ship (TS) *State of Maine* or on commercial vessels worldwide.

Students looking for an exciting career and college might want to consider Maine Maritime Academy, **www.mainemaritime.edu.** The ham club's call there is W1MMA. Listen for them maritime mobile.

Future *Bowdoin* and Don Mix Stories

I'm working on the exciting story and daily account of Don Mix, 1TS, and his 15 month DXpedition and polar adventure on the *Bowdoin*. To better prepare for this story I recently took a trip to Maine. My first stop was Bowdoin College where the Peary-MacMillan Museum and Library are located, to research the original MacMillan documents. Then I went on to the Maine Maritime Academy for "*Bowdoin* Day." This is the day they uncover the *Bowdoin* from her winter wrap and start to clean her up and make her ready for the sailing season. You can see from the photos that she is still a beauty.

Yes, it's true. I fell in love with the *Bowdoin*. So far I've purchased a hat and coffee mug and several *Bowdoin* related books, both old and new. I'm thinking of purchasing a model kit of her from **www.BlueJacketInc.com**. And someday, one day, I hope to sail on her. (The emphasis is on "one day" as I'm a long way past wanting to sail to the Arctic for the winter. But if I were 21 again, well maybe?) — *K2TQN*

COMING CONVENTIONS

NEW MEXICO STATE CONVENTION

August 15-16, Albuquerque
F D V S

The New Mexico State Convention ("Duke City Hamfest"), sponsored by the New Mexico Hamvention Committee, will be held at the Sandia Baptist Church, 9429 Constitution Ave NE. Doors are open Friday 5-9 PM, Saturday 8 AM-4 PM. Features include the buying, selling, and trading of Ham Radio gear, electronics and computers; commercial vendors; free tailgating (Saturday only; reserve space); many excellent technical and non-technical forums; special guest from ARRL HQ Dennis Dura, K2DCD, Emergency Preparedness and Response Manager; New Mexico Ham Club displays; Special Event Station N5M; VE sessions; banquet (Saturday, 7 PM); RV parking (dry camping only; no hookups). Talk-in on 145.33, 444.0 (both 100 Hz). Admission is free. Tables are $20 (without power), $30 (with power); register in advance. Contact Mike Langner, K5MGR, 929 Alameda Rd NW, Albuquerque, NM 87114; 505-898-3212 or 505-238-8810 (cell); **k5mgr@arrl.net**; **www.dukecityhamfest.org**.

SOUTHEASTERN DIVISION CONVENTION

August 16-17, Huntsville, Alabama
F D V S

The Southeastern Division Convention, sponsored by the Huntsville ARC and the Huntsville Hamfest Assn, will be held at the Von Braun Center (South Hall), 700 Monroe St. Doors are open Saturday 9 AM-4:30 PM, Sunday 9 AM-2:30 PM. Features include all indoor, air-conditioned event with giant new dealer/manufacturer show (Charlie Emerson, N4OKL, 256-882-9137; **charlieemerson@hamfest.org**); huge flea market (Dave Givens, K5RSI, 256-883-2760; **k5rsi@davidgivens.net**); exhibitors; vendors; wide selection of forums (Johnny Winter, KR4F, 256-534-6785; or Chuck Lewis, N4NM, 256-539-8950); DX banquet (Saturday eve, 6:30 PM, $35; contact Jason Amos, **kd4bjw@bellsouth.net**, by Aug 12); DXCC card checking; VE sessions (10 AM sharp, both days; $10 test fee); Hospitality Rooms (Friday and Saturday eves at the Holiday Inn, located next to the VBC); convenient parking ($4); RV parking (limited; first-come, first-served). Talk-in on 146.94, 147.3. Admission is $7 (under 12 free). Tables are $30 (8-ft table and 1 chair). Contact Charlie Emerson, N4OKL, 8003 Craigmont Rd, Huntsville, AL 35802; 256-882-9137; **charlieemerson@hamfest.org**; **www.hamfest.org**.

KANSAS STATE CONVENTION

August 17, Salina
F D V S

The Kansas State Convention, sponsored by the Central Kansas ARC, will be held at the Salina Bicentennial Center, 800 The Midway. Doors are open 8 AM-4 PM. Features include large indoor air-conditioned flea market; major vendors; forums; meetings; VE sessions (8:30-10 AM); DXCC, WAS, and VUCC card checking; refreshments. Talk-in on 147.03, 443.9. Admission is $5. Tables are $15 (commercial or flea market; includes electricity if requested, and 1 admission ticket per table). Contact Ron Tremblay, WAØPSF, 112 N Douglas Dr, Salina, KS 67401; 785-827-8149; **rtremblay@cox.net**; **www.centralksarc.com**.

July 15-20
OMIK, Baton Rouge, LA*

July 18-19
Oklahoma State, Oklahoma City*

July 18-20
Montana State, Essex*

July 24-26
Central States VHF, Wichita, KS*

August 1-2
Texas State, Austin*

August 1-3
Pacific Northwest DX, Portland, OR*
3.905 Century Club Eyeball, Hanover, PA*

August 1-4
Alaska State, Anchorage*

August 3
Illinois State, Bolingbrook*

August 8-10
Dakota Division, Rochester, MN*

September 12-14
Southwestern Division, Mesa, AZ

September 19-20
W9DXCC, Elk Grove Village, IL

September 20
EMCOMM East, Rochester, NY
South Dakota Section, Sioux Falls

September 20-21
Virginia Section, Virginia Beach

September 26-27
San Francisco Section, Ferndale, CA

October 3-5
Pacific Northwest VHF, Moses Lake, WA

October 5
Western New York Section, West Seneca

*See July *QST* for details.

NEW ENGLAND DIVISION CONVENTION

August 22-24, Boxboro, Massachusetts
F D H V S

The New England Division Convention, sponsored by FEMARA, will be held at the Holiday Inn Boxboro Woods, 242 Adams Pl. Doors are open Friday afternoon, all day Saturday, and Sunday until 3 PM. Features include flea market; exhibitors; dealers; vendors; forums and seminars; demos and workshops; ARRL HQ Emergency Preparedness and Response Manager Dennis Dura, K2DCD; DXCC card checking; VE sessions; Special Event Station W1A; DXCC Banquet (Friday eve, $35); Saturday eve banquet with special guest speaker ARRL First Vice President Kay Craigie, N3KN ($40); Wouff Hong ceremony; RV parking; handicapped accessible. Talk-in on 147.27 (146.2 Hz), 224.88 (103.5 Hz), 449.925 (88.5 Hz), 53.81 (71.9 Hz). Admission is $15 (covers all 3 days); under 16 free. Tables are $10. Contact Mike Raisbeck, K1TWF, 85 High St, Chelmsford, MA 01824; 978-250-1235; fax 978-250-0432; **k1twf@arrl.org**; **www.boxboro.org**.

ROANOKE DIVISION CONVENTION

August 23-24, Weston, West Virginia
F D V S

The Roanoke Division Convention (50th Year Celebration of WV ARRL Convention), sponsored by the West Virginia State Amateur Radio Council, will be held at the WVU Convention Center – Jackson's Mill 4-H Conference Center, Jackson's Mill Rd. Doors are open Saturday 8 AM-midnight; Sunday 8 AM-noon. Features include President's Reception (Friday, Aug 22, 7:30 PM; Jackson Lodge Basement); flea market; vendors; auction; forums; educational programs and demonstrations; guest speakers; Special Event Station; MARS, QCWA, Net, and Council Meetings; VE sessions; Wouff Hong ceremony. Talk-in on 145.39, 147.33 (103.5 Hz). Admission is $8. Tables are $5. Contact Patrick Shea, N8MIN, 28 Jackson St, Weston, WV 26452; 304-269-3468; fax 304-472-2187; **pshea@citynet.net**; **www.qsl.net/wvsarc/**.

WESTERN PENNSYLVANIA SECTION CONVENTION

August 24, New Kensington
F

The Western Pennsylvania Section Convention, sponsored by the Skyview Radio Society, will be held at the Skyview Radio Society Clubhouse, 2335 Turkey Ridge Rd. Doors are

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be filled out online at **www.arrl.org/FandES/field/hamfests/regform.html**.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

open 8 AM-2 PM. Features include 48th Annual Swap 'n Shop; tailgating ($5 per space); special guest from ARRL HQ Katie Breen, W1KRB, Membership Manager; breakfast and lunch served; "Skyview Jam" (musicians bring your instruments). Talk-in on 146.64 (131.8 Hz). Admission is $3. Tables are $5. Contact Bob Boehmer, KG3F, 1240 Hulton Rd, Oakmont, PA 15139, **SkyviewHamfest2008@verizon.net**; **www.skyviewradio.net**.

ARKANSAS STATE CONVENTION

September 5-6, Mena

F D V

The Arkansas State Convention, sponsored by the Queen Wilhelmina Hamfest Assn, will be held at the Queen Wilhelmina State Park, 3877 Hwy 88 W. Doors are open Friday 8 AM-4 PM, Saturday 8 AM. Features include 39th Annual Event, flea market, vendors, tailgate area, Arkansas Repeater Council Meeting, VE sessions, Friday night BBQ under tent, Saturday eve banquet in lodge (special guest speaker, come see who it is), plenty of RV and tent camping. Talk-in on 146.79 (100 Hz). Admission is free. Space under tent is $10 (bring your own tables); $5 for space outside tent. Contact Randy Baggett, KG5NE, Box 188, Mansfield, AR 72944; 479-928-5845; **kg5ne@arrl.net** or **kg5ne@centurytel.net**; **www.qwha.org**.

HAMFEST CALENDAR

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **August 1** to be listed in the **October** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For detailed directions to the event, see the event Web site or contact sponsor. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *Tl* = Talk-in frequency, *Adm* = Admission.)

Alabama (Huntsville)—Aug 16-17, Southeastern Division Convention. See "Coming Conventions."

Arkansas (Mena)—Sep 5-6, Arkansas State Convention. See "Coming Conventions."

California (Lincoln/Sacramento)—Sep 6

F D H V

7 AM-noon. *Sprs:* Western Placer, River City, North Hills, Yuba-Sutter, and Sierra Foothills ARCs. Lincoln High School, 790 J St. Ham Swap, flea market, dealers, VE sessions, handicapped accessible, free parking, refreshments. *Tl:* 145.25 (162.2 Hz). *Adm:* Free. Tables: $10. Steve Harding, KT6Z, Box 395A, S Hwy 65, PMB #162, Lincoln, CA 95648; 916-434-2878; **kt6z@arrl.net**; **www.wparc.org**.

Colorado (Golden)—Aug 17 V S

8:30 AM-2 PM. *Spr:* Denver Radio Club. Jefferson County Fairgrounds, 15200 W 6th Ave. Technical sessions, VE sessions. *Tl:* 145.49, 448.625 (both 100 Hz). *Adm:* $5. Tables: $15. Bryan Steinberg, KCØCUA, 1011 S Foothill Dr, Lakewood, CO 80228; 303-987-9596; **drcfest@comcast.net**; **www.w0tx.org**.

Florida (Tampa)—Aug 23 V

8 AM-1 PM. *Spr:* Tampa ARC. Tampa ARC Clubhouse, 7801 N 22nd St. Indoor and outdoor (under trees) tables, VE sessions. *Tl:* 147.105 (146.2 Hz). *Adm:* $2. Tables: $3. William Bode, N4WEB, 14302 Capitol Dr, Tampa, FL 33613; 813-382-9262; fax 813-878-7954; **n4web@arrl.net**; **www.hamclub.org**.

Illinois (Danville)—Aug 24 F V S

8 AM-2 PM. *Spr:* Vermilion County ARA. Vermilion County Fairgrounds, Martin Luther King Dr and Main St (US Rte 150). Outdoor flea market, ARES forum, VE sessions. *Tl:* 146.82 (88.5 Hz). *Adm:* $5. Tables: $10. Josh Kittle, N9WEW, 2403 N Jackson St, Danville, IL 61832; 217-442-0578; fax 217-477-7134; **n9wew@arrl.net; www.vcara-hamfest.info**.

Indiana (Lafayette)—Aug 17 F V

8 AM-2 PM. *Spr:* Tippecanoe ARA. Tippecanoe Fairgrounds, Home Ec Bldg, 1401 Teal Rd (SR 25). 38th Annual Hamfest, VE sessions. *Tl:* 147.135 (88.5 Hz). *Adm:* $5. John Parker, AB9LE, 30 Guinevere Ct, Lafayette, IN 47905; 765-446-7747; fax 509-694-0973; **ab9le@arrl.net**; **w9reg.org/hamfest/index.htm**.

Indiana (Osgood)—Aug 23 F V

Set up 7 AM; public 8 AM-4 PM. *Spr:* Ripley County ARC. Ripley County 4-H Fairgrounds, 524 Beech St. 1st Annual Tailgaters Hamfest, VE sessions (11 AM). *Tl:* 441.775, 147.54. *Adm:* $3. Tables: $3. Delbert Felix, WY9L, 114 Harlan St, Osgood, IN 47037; 812-689-3161; **wy9l.thebigdog@gmail.com**; **www.441775.com**.

Indiana (Spencer)—Aug 23 F V S

7 AM to 2 PM. *Sprs:* Owen County ARA and Bloomington ARC. Owen County Fairgrounds, 300 S East St. Flea market, tailgating (free space), vendors, forums, foxhunt, VE sessions (1 PM), refreshments. *Tl:* 146.985 (136.5 Hz). *Adm:* $5. Tables: $5. Katie Smith, K9INU, 2961 Magnus Rd, Poland, IN 47868; 812-829-2140; **k9inu@arrl.net**; or John Maassen, K9FK, 812-336-2311; **k9fk@arrl.net**; **www.bloomingtonradio.org**.

Kansas (Salina)—Aug 17, Kansas State Convention. See "Coming Conventions."

Kentucky (Shepherdsville)—Sep 6 V S

8 AM-2 PM. *Spr:* Greater Louisville Hamfest Assn. Paroquet Springs Conference Centre, 395 Paroquet Springs Dr. Forums (ARRL, EmComm), VE sessions. *Tl:* 146.7 (79.7 Hz). *Adm:* advance $6, door $7. Tables: $10. Greater Louisville Hamfest Assn, Box 34444, Louisville, KY 40232-4444; **GLHA08@LouisvilleHamfest.com**; **LouisvilleHamfest.com**.

Manitoba (Winnipeg)—Aug 8-10. VE4WSC, **hamfest2008@mts.net**; **www.mts.net/~warc/hamfest/**.

Maryland (Westminster)—Aug 17 F

8 AM-1 PM. *Spr:* Carroll County ARC. Carroll County Agricultural Center, 700 Agriculture Center Dr. 9th Annual Tailgate Fest (outdoor tailgating only - spaces included in admission donation). *Tl:* 145.41. *Adm:* $5. Bill Mellema, N3WM, 2230 Ridgemont Dr, Finksburg, MD 21048; 410-861-9366; fax 410-583-4149; **mellema@qis.net**; **www.qis.net/~k3pzn**.

Massachusetts (Adams)—Aug 17 V

8 AM-2 PM. *Spr:* Northern Berkshire ARC. Adams Agricultural Fairgrounds, Old Columbia St. VE sessions, plenty of parking, refreshments. *Tl:* 146.91 (162.2 Hz). *Adm:* $5. Tables: $15 (with 1 admission). Alan Vigiard, K1SAV, 15 Pearl St, Adams, MA 01220; 413-358-8428; **k1sav@yahoo.com**; **www.nobarc.org**.

Massachusetts (Boxboro)—Aug 22-24, New England Division Convention. See "Coming Conventions."

Massachusetts (Cambridge)—Aug 17. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Grand Rapids/Lowell)—Sep 6 V S

8 AM-1 PM. *Spr:* Grand Rapids ARA. Kent County Fairgrounds, 225 S Hudson St. Forums, VE sessions. *Tl:* 147.26 (94.8 Hz). *Adm:* $6. Tables: $10. Jack Amelar, NY8D, Box 3282, Grand Rapids, MI 49501-3282; 616-897-6885; **grahamfest08@w8dc.org**; **www.grahamfest.org**.

Minnesota (Rush City)—Sep 6

9 AM-noon. *Spr:* East Central Minnesota ARC. Rush City High School, 51001 Fairfield Ave. 16th Annual Rush City Radio Rendezvous, free ARES and ARRL information, refreshments. *Tl:* 145.33. *Adm:* Free. Tables: Free. Larry Jilek, KAØMEN, 51835 Belle Isle Dr, Rush City, MN 55069; 320-358-4205; fax 320-358-4713; **lj@ecenet.com**; **www.ecmarc.us**.

Missouri (Joplin)—Aug 22-23 V S

Friday 4-9 PM; Saturday 8 AM-2 PM. *Spr:* Joplin ARC. John Q. Hammons Convention Center, 3535 Hammons Blvd. Large air-conditioned facility, forums, Friday night cookout, VE sessions. *Tl:* 147.21, 145.35. *Adm:* advance $5, door $6. Tables: $10. Jim Johannes, NØZSQ, c/o JARC, Box 2983, Joplin, MO 64803-2983; 417-781-2211; fax 417-781-2234; **jimjohannes@sbcglobal.net**; **www.joplin-arc.org**.

New Jersey (Oakland)—Aug 16 F D

Set up 6 AM; public 8 AM-noon. *Spr:* Ramapo Mountain ARC. American Legion Hall, 65 Oak St. 32nd Annual Ham Radio and Computer Flea Market, vendors, tailgating ($10). *Tl:* 146.49, 446.175 (both 107.2 Hz). *Adm:* $5 (nonham spouses and children free). Tables: $12 (inside). Robert Kogan, KB2KQO, 9 Locust Ln, Ringwood, NJ 07456; 973-896-3909; **kb2kqo@gmail.com**; **www.qsl.net/rmarc**.

New Jersey (Toms River)—Aug 17 F D V

Set up 6 AM; public 8 AM. *Spr:* Jersey Shore ARS. Riverwood Recreation Center, Riverwood Dr and Whitesville Rd. "Hamfest by the Shore," indoor and outdoor spaces, tailgating, vendors, VE sessions. *Tl:* 146.91 (127.3 Hz). *Adm:* $5. Tables: $15. Don McGlaughlin, KC2HCW, c/o JSARS, Box 295, Toms River, NJ 08754; 732-237-9448; **jsars910@gmail.com**; **www.jsars.org**.

New Mexico (Albuquerque)—Aug 15-16, New Mexico State Convention ("Duke City Hamfest"). See "Coming Conventions."

New York (Westmoreland)—Aug 16 F

8 AM. *Spr:* Rome RC. Westmoreland VFD Fireman Field, Station Rd. Flea market, "Junk Box" area, refreshments (free coffee). *Tl:* 146.88. *Adm:* $5. Tables: $5 (indoor only). Tony LoVaglio, WA2GBE, 134 Glen Rd S, Rome, NY 13440; 315-337-2293; **lovaglio@localnet.com**; **pages.prodigy.net/romeradioclub**.

North Carolina (Dallas)—Aug 30-31

F D H V S

Saturday 8 AM-3 PM; Sunday 8 AM-2 PM. *Spr:* Shelby ARC. Biggerstaff Park (Gaston County), 1303 Dallas-Cherryville Hwy. 52nd Shelby Hamfest, flea market, new equipment dealers, tailgating, forums, QSL card checking at ARRL booth, VE sessions (both days; walk-ins only), plenty of free parking outside the grounds, handicapped parking, overnight camping with power and water, refreshments. *Tl:* 146.88. *Adm:* advance $5, door $7 (good both days; under 13 free). Tables: $35. Robby Hamrick, WA4RH, Box 1408, Ellenboro, NC 28040;

828-453-9121 (phone and fax); **wa4rh@bellsouth.net**; **www.shelbyhamfest.com**.

North Carolina (Waynesville)—Jul 26 V S
8 AM-4 PM. *Spr:* Western Carolina ARS. Haywood County Fairgrounds, NC Route 209 (Lake Junaluska). ARRL forum, VE sessions. *TI:* 146.91, 146.76, 147.39. *Adm:* advance $5, door $6. Tables: $10. F. M. Thornal, KE4KZS, Box 1488, Asheville, NC 28802-1488; 828-577-1336; **ke4kzs@arrl.net**; **wcars.org/hamfest.html**.

Nova Scotia (Halifax)—Aug 21-24. Helen MacRae, VE1HMR, 902-422-7119; **ve1hmr@rac.ca**; **www.HARC75.org**.

Ohio (Cambridge)—Aug 24 F H V
Set up 7 AM; public 8 AM-2 PM. *Spr:* Cambridge ARA. Pritchard Laughlin Civic Center, 7033 Glenn Hwy Rd. Hamfest and Computer Show, flea market, free tailgating with paid admission, VE sessions (noon; all classes), handicapped accessible, refreshments. *TI:* 146.85 (91.5 Hz). *Adm:* $5. Tables: $10. Russ Ellis, N8MWK, 5855 Sherrard Rd, Cambridge, OH 43725; 740-439-6610; **n8mwk@arrl.net**; **w8vp.org**.

Ohio (Columbus)—Aug 2 V S
8 AM-1 PM. *Spr:* Voice of Aladdin ARC. Aladdin Shrine Center, 3850 Stelzer Rd. Lectures, VE sessions. *TI:* 147.24. *Adm:* advance $4, door $5. Tables: Free. James Morton, KB8KPJ, 6070 Northgap Dr, Columbus, OH 43229; 614-846-7790; fax 614-846-2074; **kb8kpj@arrl.net**; **aladdinshrine.org/hamfest.htm**.

Ohio (Cortland)—Aug 17 F D H V
6 AM-2 PM. *Spr:* Warren ARA. Trumbull County Fairgrounds, 899 Everett Hull Rd. 51st Annual Hamfest, all indoor vendors, VE sessions, handicapped parking. *TI:* 146.97. *Adm:* $6. Tables: $10. Emily Wells, KC8RAL, Box 809, Warren, OH 44483; 330-394-3560; **kc8ral@yahoo.com**; **kc8pvb.com**.

Ohio (Findlay)—Sep 7 F
Set up 6:30 AM; public 8 AM. *Spr:* Findlay Radio Club. Hancock County Fairgrounds, 1017 E Sandusky St. 66th Annual Hamfest. *TI:* 147.15. *Adm:* $6. Tables: $15/$20. Bill Gaines, AD8P, Box 587, Findlay, OH 45839; 419-369-4400; **hamfest@findlayradioclub.org**; **www.findlaywireless.com**.

Oregon (Pendleton)—Aug 16 F
9 AM-3 PM. *Spr:* Pendleton ARC. Hawthorne School Multipurpose Room, SW 13th St and SW Emigrant Ave. Swapmeet. *TI:* 146.52. *Adm:* Free. Tables: $5. Denton Sprague, WB7TDG, Box 563, Pendleton, OR 97801; 541-276-8319; **denton@oregontrail.net**; **www.w7pl.com/W7PL_2008_Swapmeet_Flyer_B.pdf**.

Pennsylvania (Butler)—Sep 7 F
8 AM-3 PM. *Spr:* Butler County ARA. Unionville Volunteer Firehall, 102 Mahood Rd. 1st Annual Swapfest, free tailgating. *TI:* 147.36 (131.8 Hz). *Adm:* $5. Tables: $15. Dave Zibrat, W3VXT, 105 Seminole Tr, Butler, PA 16001; 724-282-9077; **dzibrat@zoominternet.net**; **w3udx.org**.

Pennsylvania (Matamoras)—Aug 10
Sellers 7 AM; buyers 8 AM. *Spr:* Tri-State ARA. Matamoras Airport Park, 9th St Extension. *TI:* 145.35 (100 Hz). *Adm:* $5. Tables: $15. Tom Olver, W2TAO, Box 292, Matamoras, PA 18336; 800-614-7508; **tristateara@gmail.com**; **www.k3tsa.com**.

Pennsylvania (New Kensington)—Aug 24, Western Pennsylvania Section Convention. See "Coming Conventions."

Pennsylvania (Stroudsburg)—Sep 6 F D H V S
8 AM-3 PM. *Sprs:* Eastern Pennsylvania ARA and Pocono ARK. Stroudsburg Jr High School, 1198 Chipperfield Dr. 8th Annual Hamfest, indoor and outdoor vendors, computers, Special Event Station (N3IS), guest speakers, NVIS Antenna Clinic, VE sessions, handicapped accessible, refreshments. *TI:* 147.045 (131.8 Hz). *Adm:* $5. Tables: $6 and $10. Jerry Truax, N3SEI, 139 Merry Hill Rd, Bartonsville, PA 18321; 570-620-9080; fax 570-620-1089; **cameras@ptd.net**; **www.qsl.net/n3is/Hamfest2008/index.htm**.

South Carolina (Moncks Corner)—Aug 16 F
9 AM-3 PM. *Spr:* Trident ARC. Moncks Corner Fraternal Order of Police, Lodge 19, 1310 S Live Oak Dr. 2nd Annual Tailgate Party, equipment test station with power and antennas. *TI:* 147.15. *Adm:* $1. Tables: $3. Dennis Zabawa, KG4RUL, 307 Pine Cone Ct, Ladson, SC 29456; 843-572-4053 (after noon only); **kg4rul@comcast.net**; **www.tridenthams.org**.

Tennessee (Gladeville)—Aug 23 F D V
8 AM. *Spr:* Short Mountain Repeater Club. Gladeville Community Center, 95 McCreary Rd. Indoor vendors, large outdoor tailgate area, VE sessions (10:30 AM), free parking, refreshments. *TI:* 146.91. *Adm:* $5. Tables: $10. Roger Songer, W4GKP, 207 Church St, Eagleville, TN 37060; 615-542-6309; **w4gkp@yahoo.com**; **www.shortmountain.org**.

Texas (Gainesville)—Aug 23 F D V
7 AM-3 PM. *Spr:* Cooke County ARC. Gainesville Civic Center, 311 S Weaver St. 16th Annual Hamfest, indoor/outdoor flea market, commercial vendors, tailgating ($6; first-come, first-served), VE sessions, RV parking with full hookup adjacent to Civic Center ($15; 940-668-4530), free parking, free coffee and donuts while supply lasts. *TI:* 147.34, 442.775 (both 100 Hz). *Adm:* advance $6 (by Aug 16), $8 (after Aug 16). Tables: advance $8 (by Aug 16), $10 (after Aug 16); electrical hookup $5 extra. James Floyd, N5ZPU, 1704 E California St, Gainesville, TX 76240; 940-668-7511; **jfloyd54@swbell.net**; **www.gainesvillehamfest.org**.

Vermont (Swanton)—Aug 15-16 F V
Friday 6 AM-Saturday 5 PM. *Spr:* St Albans ARC. Franklin County Field Day site, Airport Rd. Outdoor tailgating ($5 per day), VE sessions, overnight camping lots with power and water. *TI:* 145.23 (100 Hz). *Adm:* $5 per person per day. Tables: $5 per day (inside space). Arnold Benjamin, N1ARN, 1420 Rice Hill Rd, Franklin, VT 05457; 802-285-6457; **n1arn@yahoo.com**; **www.starc.org**.

West Virginia (Huntington)—Aug 9 F V
8:30 AM-1 PM. *Spr:* Tri-State ARA. Veterans Memorial Fieldhouse, 2590 5th Ave. Hamfest and Computer Show, VE sessions (10:30 AM, Garry Ritchie, W8OI, 304-733-1300; **w8oi@aol.com**). *TI:* 146.76 (131.8 Hz). *Adm:* $6. Tables: $10. Benny Crittendon, KC8RRH, 2615 Rte 75, Kenova, WV 25530; 304-453-2931 (phone and fax) or cell 304-633-8255; **bcritter@aol.com**; **www.qsl.net/tara**.

West Virginia (Weston)—Aug 23-24, Roanoke Division Convention. See "Coming Conventions."

Wisconsin (Baraboo)—Aug 9 F V
8 AM-1 PM. *Spr:* Yellow Thunder ARC. Sauk County Fairgrounds, 8th Ave. 12th Annual Circus City Swapfest, VE sessions. *TI:* 147.315 (123 Hz). *Adm:* $5. Tables: $5. Steve Schulze, N9UDO, 1120 City View Rd, Baraboo, WI 53913; 608-356-2313; **n9udo@yellowthunder.org**; **www.yellowthunder.org**.

Wisconsin (Cedarburg)—Sep 6 F
Set up 6 AM; public 8 AM-1 PM. *Spr:* Ozaukee RC. Fireman's Park, W65 N796 Washington Ave. Ham and Hobby Outdoor Swapfest (barn available in the event of rain), free coffee. *TI:* 146.97 (127.3 Hz). *Adm:* $5. Tables: None to buy (sell from your vehicle). Gabe Chido, WI9GC, W58 N985 Essex Dr, Cedarburg, WI 53012; 262-377-2784; **gabe@uwm.edu**; **www.ozaukeeradioclub.org**.

Wisconsin (Chippewa Falls)—Aug 23 F
8 AM-noon. *Spr:* Chippewa Valley ARC. Lake Hallie Eagles Club, 2588 Hwy 53. Tailgate Swapfest. *TI:* 147.375 (110.9 Hz). *Adm:* $5. Tables: $5. Ronald Anderson, W9RMA, 8121 163rd St, Chippewa Falls, WI 54729; 715-723-1729; **w9rma@charter.net**; **www.w9cva.org**.

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

Attention All Hamfest Committees!

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It's easy to become sanctioned. Contact the Convention and Hamfest Branch at ARRL Headquarters, 225 Main St, Newington, CT 06111, 860-594-0262, or send e-mail to **giannone@arrl.org**. The application form can be filled out online at **www.arrl.org/FandES/field/hamfests/regform.html**.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRL Web* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

Strays

A QRP RECORD?

◊ Bob Moody, K7IRK, of Tillamook, Oregon, has submitted QSLs for WAS/QRP at 2.1 mW. He wonders if this is the WAS/QRP record. "Most of these contacts were made on 10 meters when the propagation was hot," he said, "but the impossible states on 10 meters were filled-in with a few contacts on other bands. It wouldn't surprise me for someone to complete WAS/QRP under 1 mW when the propagation improves this sunspot cycle."

RECORD BALLOON FLIGHT INCLUDES AMATEUR RADIO GEAR

◊ On May 20, a team at Lockheed Martin broke the world amateur high altitude balloon record in a "near space" flight that exceeded 125,000 feet. The early career engineers at Lockheed Martin Systems Integration in Owego, New York broke the record while executing Project Blue Horizon, part of the employees' graduate studies in engineering at Cornell University.

The flight broke the previous amateur high altitude record by nearly 5000 feet. A national database of Amateur Radio High Altitude Balloon (ARHAB) flight records catalogues more than 40 teams currently competing in categories that include Highest Altitude, Highest Ascent Rate, Longest Distance, and Longest Flight Time. Independently verified Global Positioning System (GPS) flight data is required for any team to earn a record in the ARHAB database.

Onboard GPS and Amateur Radio technology allow monitoring of the balloon's launch, ascent into "near space," descent and recovery. High resolution images from 20 miles above the earth's surface also have been taken, where a black sky, the curvature of the earth and the "blue horizon" of the earth's atmosphere can clearly be seen. —*Lockheed Martin news release*

OP-ED

We Must Lead to Advance!

Joshua Long, KD8BVB
jdlong0624@aol.com

Have you noticed of late that the large majority of us continue to define Amateur Radio by what it was rather than what it is or can be? The Amateur Radio Service has, for decades, prided itself on being the advancing force of communications. With many technological breakthroughs derived from the efforts of hams, we are now in a time when we put so much effort into outdated, yet fun, technology that we are slow to adapt.

Rearview Mirror Community

Although the HF bands and modes like Morse code still hold an important place in the fabric of Amateur Radio, we tend to put our stake in the ground and justify our existence from them. Despite the fact that never have truer words been spoken about Amateur Radio than the phrase "When all else fails," our systems are failing. No matter how concrete the older technologies are, our systems are failing today because we are ignoring the human spirit to change, adapt and progress. Without advancement ham radio will fail. It will die from lack of interest. It will fail because the newer technologies that are becoming the "primary" systems of communication will be over the head of the larger population of aging, uninterested Amateur Radio operators.

Elmering Toward Future Technologies

We need to insure we are continuing to grow by developing younger hams and building new technologies. We need to insure that we are bridging the gap between new and old. The term "Elmer" needs to mean to foster, train and promote growth of new hams. Elmers do not have to understand the future, but they shouldn't hold new hams in the past. For ham radio to progress, Elmers need to "pass on" knowledge and experience.

They need to help new hams have their own new experiences, not hold them back to repeat the same experiences. We will get nowhere. Interest in ham radio will die before we have an opportunity to advance.

We cannot ridicule new or upgrading hams for their passion and enthusiasm to adapt to new advancements. We cannot condemn them for not wanting to spend all their time learning older technologies; just as we cannot condemn many older hams for their passion for HF or code. Through them we keep the history alive. Respect their accomplishments, because it is they who fought to keep the service here for us to enjoy. However, we need to continue to build a bridge so that the old remains the foundation while providing new technologies to break through and lead in the future of communications.

Acknowledge the Past — Look to the Future

I can bet that computer and software companies do not spend the first few years of a new engineer's time forcing them to learn older programs or platforms. They put them in the driver's seat to discover new things and advance the culture as a whole. Should we force people to drive "crank start" cars for the experience? Would you go back and use an outhouse for the smell of it, if you had indoor plumbing? We should respect those who endured those times, who pushed on knowing things could be better, and thank them for the advancements that allow us to avoid having to live through it again. We should thank them for allowing us to live better through their breakthroughs and take our seat in preparing a cutting edge hobby for generations to come.

Things of old die and pass away making room for the new. Good and bad things come from it and yes, some traditions are lost as new ones are formed. As Amateur Radio operators we cannot break that cycle. We cannot hold back the human spirit to push on, to advance and better ourselves; even if we make mistakes on the way! One thing is for sure in life — it will change! Does Amateur Radio want to lead or be left in the dust of progress?

Joshua Long was licensed in 2004 and holds a Technician license. As a member of the ARRL, ARES, The Dayton Amateur Radio Association and President of his town's Amateur Radio club (XWARN), he enjoys Amateur Radio as both a public service and hobby. When not taking part in local public service events or SKYWARN activities, he enjoys the magic of the 6 meter band. Joshua has been a Manufacturing Engineer for over 10 years and attended college at Sinclair Community College in Dayton, Ohio. He and his family enjoy living in Xenia, Ohio where Joshua is active in not only Amateur Radio but in city government and community development.

QST Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions may be up to 900 words in length.

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111 or via e-mail to **qst@arrl.org** (subject line Op-Ed).

Strays

I would like to get in touch with...

◊ anyone who can provide QSL cards (or copies) of The University of Pennsylvania Amateur Radio Club for contacts prior to 2004 with our club call signs W3ABT or N3KZ. Our plan is to place images of many of these old QSL cards on our club Web site. Unfortunately, our entire QSL card collection prior to 2004 was destroyed after the on-campus Club station became inactive and was dismantled in the years following the late 1960s. Original cards will be scanned and returned. Please send them to Russell Miller, WA3FRP, President, University of Pennsylvania Amateur Radio Club, 1507 Wilson Ln, West Chester, PA 19380. — *Jan Carman, K5MA*

◊ anyone associated with the joint Australian-US Navy Radio station located near Port Moresby during WWII, call sign VHZ. Also Coast-Watch Station VIGØ located at Wonga. — *John Healy, KH6GRV, 772 Pauoa St, Lahaina, HI 96761*

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

K1AMG **Sidla**, Anthony J., Cumberland, RI
N1CNC **Hill**, Justin E. Jr, Brewster, MA
KC1F **Santelmann**, Stuart R., Milford, NH
W1FPF **Clymer**, Richard A., Vero Beach, FL
WA1GMN **Chizinski**, Paul M., New Ipswich, NH
KA1IQ **Palazzini**, Art, Torrington, CT
N1NAP **Cassarino**, Santo J., Wethersfield, CT
W1NWA **Clark**, Lester A., Stony Point, NY
K1PJW **Lucas**, Ludger A., Chelmsford, MA
W1RYW **Gilmore**, Arnold R., Framingham, MA
W2ATQ **Grosselfinger**, W. H., Jackson, NJ
WA2ATV **Hilsinger**, Richard B., Spencerport, NY
N2BEL **Freeberg**, Keith F. Jr, Elmira, NY
N2BNW **Condon**, Stephen F., Mohnton, PA
N2CLX **Shontz**, Mary L., Monson, ME
N2CMB **Bargman**, Max, Buffalo, NY
W2DYY **Schroeder**, Russell G. II, Rochester, NY
K2EWA **Wagman**, Gerald H., E Brunswick, NJ
W2GIM **Kesel**, Robert E., Port Orange, FL
N2HOH **Wilkinson**, William C., Princeton, NJ
N2HS **Cataldi**, Leonard J., Kendall, NY
W2IGX **Stockwell**, John I. Jr, Succasunna, NJ
KA2IXW **Weber**, John W., New York, NY
W2SEG **Covey**, Bruce M., Rochester, NY
W2WJC **Gourley**, Robinson B. Sr, Skaneateles, NY
♦ K2XK **Cizin**, Frank J., Massapequa Park, NY
NO2Z **Eeckhout**, Michael, Spencerport, NY
K3BL **Maxwell**, Richard F. Jr, Baltimore, MD
W3DMM **Yeich**, Donald E., Reading, PA
WB3GPY **Winkler**, John T., Wellsboro, PA
AA3TE **Vargo**, David G., Erie, PA
N3TJO **Showalter**, Elmer J., Reading, PA
WA4AAI **Samuel**, Charles G., Florence, KY
KJ4ARL **Davis**, Charles W., Fort Lauderdale, FL
AG4DO **Lucas**, Richard E., Roanoke, VA
WA4EWZ **Dye**, Willard L., Chattanooga, TN
N4FWA **Hvatum**, Hein, Charlottesville, VA
KF4HAX **Berry**, Scott, Lafayette, IN
W4JQA **Snider**, W. A., Norfolk, VA
K4JXA **Morrell**, James D. Sr, Fall Branch, TN
K4KNZ **Fordham**, John W., Palmetto, FL
W4LHH **Howard**, Lewis N., Loganville, GA
W4LLF **Dickinson**, James O., Richmond, VA
W4MFG **Milton**, Bill J., Louisville, KY
W4MLR **Swafford**, Luther Jr, Silver Spring, MD
KD4NRE **Green**, Allen E., Charlottesville, VA
KC4NUX **Di Salvo**, Aldo A., Pt Charlotte, FL
K4OFD **Rockwell**, Richard F., White Stone, VA
WA4QFD **Thompson**, Ben W., Salisbury, NC
KD4QPT **Bowman**, James M., Parsons, TN
W4SEC **Axson**, William Y., Citra, FL
K4SHR **McVey**, James O., Jonesboro, GA
W4WBL **Winterberger**, Harlan P., Louisville, KY
W4WRT **Plemons**, Warren H., Riceville, TN
WA4YON **Price**, Raymond E., Knoxville, TN
AB5FK **Hinkle**, Frank, San Antonio, TX
W5FLY **Cutright**, Langdon C., Dallas, TX
♦ N5HB **Dillon**, Harley L. Jr, San Antonio, TX
WD5JAJ **Norris**, Robert E., Demorest, GA
N5JLA **Oakes**, Jacob E. Jr, Richardson, TX
N5LZW **Bortner**, Mabel F., Zapata, TX
W5QVS **Ingram**, A. J., MIdwest City, OK
K5QXH **Edwards**, Ethelbert, Starkville, MS
♦ W5UFD **Daily**, Pat O. MD, San Diego, CA
K5YIN **Kelly**, Irvin L. Jr, Biloxi, MS
W6AGZ **McGregor**, Arch D., Bell Canyon, CA
♦♦ W6CPK **Andrews**, Clarence A. Jr, Sunnyvale, CA
♦ WB6DHH **Parker**, Paul J., Walnut Creek, CA
WA6DQK **Goodearl**, Jack R., Carpinteria, CA
K6DQL **Hertzberg**, Lee B., Walnut Creek, CA
N6EJU **Koester**, Dolores J., Antioch, CA
KG6FCJ **Cameron**, Valdon (Val) M., Bishop, CA
W6IK **Coomes**, Clarence S., Placerville, CA
KD6MF **Carpenter**, Russell W., Costa Mesa, CA
N6OM **Gibson**, John G., Sunnyvale, CA
W6PTH **Terheun**, Phelps K., Ridgecrest, CA
W6QI **Bauregger**, Frank N., Mountain View, CA
W6WXA **Murray**, James R., Rancho Palos Verdes, CA
W6ZEK **Agee**, Ralph F., Morro Bay, CA
W6ZHZ **Dunn**, Hubert A., Carmichael, CA
N7ADL **Pfleeger**, William L., Tularosa, NM
W7FGQ **Knaack**, Rudolph H. Jr, Burien, WA
W7IV **Hyder**, Harry R., Tempe, AZ
KA7LAO **Greely**, Paul W., Ephrata, WA
N7LWQ **Marriott**, Everett M. Jr, Astoria, OR
KD7PD **Small**, Marvin L., Winnemucca, NV
W7PMN **Milligan**, Robert K., Columbus, MT
W7PYD **Turner**, Colin D., Culver, OR
♦ KY7Q **Walker**, Edwin J., Sedro Wooley, WA
KK7RR **McCandless**, Paul W., Cathlamet, WA
W7RTI **Stinger**, Allen W., Carson City, NV
KD7SXV **Jeschke**, Jon C., Randle, WA
N7WF **Greenwood**, Jack W., Wolf Point, MT
WQ7Y **Curry**, Irma M., Colville, WA
W8AHC **Campau**, Philip F., Jackson, MI
K8BPQ **Russell**, Vera W., Grand Blanc, MI
W8CEE **Smiley**, Charles A., Dayton, OH
W8FLA **Polityka**, Alex A., Allegan, MI
K8KSN **Foote**, James F., Uhrichsville, OH
WA8LFZ **Wilkin**, Frank D., S Charleston, WV
K8RED **Cline**, James C., Beverly, OH
♦ W8STX **Haungs**, John P., Cincinnati, OH
WA8TCH **Smith**, Catherine L., Temperance, MI
KC8UXD **Kinzel**, David L., Westlake, OH
KB8WBJ **Frederick**, Todd A., Columbus, OH
W8WNT **Anderson**, Roy S., Marquette, MI
WK8X **Wittmann**, John W., Boynton Beach, FL
W9IBL **Dailey**, Richard E. Sr, Fort Atkinson, WI
KC9IVY **Martin**, Elwin, Bruce, WI
N9MUX **Marcheschi**, Gene R., Orland Park, IL
K9PXU **Blick**, Wayne J., Milan, IL
K9RCN **Kaiser**, Ronald R., Chicago, IL
W9SFU **Ballard**, Eugene T., Brownsburg, IN
NØBVK **Friday**, Robert E., Shawnee Mission, KS
WAØFGV **Mower**, Arthur M., Hot Springs, SD
NØIQS **Prall**, John L., Hot Springs, SD
NØKJ **Miller**, Elden E., Pittsburg, KS
♦ WØLI **Swearengen**, Mark T., Monroe City, MO
KØRFL **Lund**, Raymond F., McPherson, KS
KØSJU **Reed**, Francis L., McPherson, KS
WØTVB **Haley**, Neil J., Denver, CO
NØWU **Unruh**, Wesley P., Lawrence, KS
♦ VE3KYR **Harrigan**, James A., Niagara Falls, ON Canada
NZ7X **Foss**, Martin P., Guinayangan, Philippines
VP9KG **Trimingham**, Thomas, Paget, Bermuda

♦ Life Member, ARRL
♦♦ = Charter Life Member

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend's or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Amy Hurtado, KB1NXO ♦ Silent Keys Administrator ♦ sk@arrl.org

Strays

COAST GUARD CW OPS REUNION

◊ The Coast Guard CW Operators Association 10th annual reunion will be held in Mobile, Alabama September 17-21. The weekly "CW ZUT" Net (ZUT= Zeta Upsilon Tau "CW" Forever) will be held Saturday, September 21 at 1600 UTC on 14,052 kHz. K7LF will be net control using the Association's club call sign NR4DL.

Active, retired or anyone that has served as a US Coast Guard CW operator, either shore or ship station, or has service as a CW operator in any other US military service, or as a commercial telegraph/CW operator, is encouraged and welcome to check in with Net Control. No formal exchange is required. NR4DL QSL/Certificates will be issued to all who participate via self-addressed, stamped envelope to KL7IBT. — *Andy Scharf, NØDLO*

NOVEL SHOWS HAM RADIO CAPABILITIES

◊ The latest WWII novel by Newt Gingrich and William R. Forstchen (an alternative history, or, as they call it, "active history"), *Days of Infamy*, includes some good publicity for ham radio. The story involves the complete destruction of communications ability for the military after the Japanese attack of December 7, 1941. Ham radio operators step up and provide the gear and expertise to reestablish radio links with surviving navy ships operating at sea and later with the Presidio Army base in San Francisco. — *Jim Mulholland, KCØHVE, Denver, Colorado*

QST congratulates...

◊ Frederick H. (Fritz) Raab, W1FR, of Burlington, Vermont, who was presented with the DeForest Audion Gold Medal at a banquet of the Veteran Wireless Operators Association in April. At the same event, John Curtis, K6KU, of Granite Bay, California, was presented with the Marconi Memorial Award Plaque for "his lifetime efforts of perfecting electronic circuits to generate Morse code as exemplified by the development of the Curtis Keyers."

◊ ARRL member George Kirkpatrick, AB2UO, of N Syracuse, New York, who received the IEEE Aerospace and Electronics Systems Pioneer Award at an international conference held in Edinburgh, Scotland. He received the award for his development of monopulse techniques for radar systems.

75, 50, AND 25 YEARS AGO

August 1933

- The cover photo shows the tuned circuit of a simple 1750 Kc. rig, described in this issue.
- The editorial reports on the large consortium of Chicago-area ham clubs that has put together and is manning a ham radio exhibit as part of the World's Fair, A Century of Progress. It also announces that new licensing regulations coming soon will preclude the need for a second, separate call sign for portable operation! Furthermore, it is expected that operator and station licenses will be combined in a single document.
- George Grammer, in "A Simple 1750-Kc. Auxiliary Transmitter," describes a self-controlled rig using push-pull '45 tubes.
- H. B. Allen, W3BJM, tells us how to use "New Pentagrid Tubes and Coil-Switching in the Amateur-Band Superhet."
- In "'Five-and-Ten' Oscillator-Amplifier Transmitters," D. A. Griffin, W2AOE, describes a push-pull TNT oscillator driving a push-pull amplifier — with two pair of type '10 tubes.
- Managing Editor Clark Rodimon reports "Ten-Meter Band Hot!" as the 28.0 to 28.5 Mc. band is officially opened to all.
- Thomas Leonard, W1AUJ, and Cal Hadlock, W1CTW, describe "The Tool-Box 56-Mc. Transceiver," a hand-portable station with a new type of antenna system.
- E. and C. Seiler, W8PK-W2EB, discuss "Automatic Overload Protection and Push Button Control."
- A "Strays" item announces the wedding of ARRL's Assistant Communications Manager Ev Battey, W1UE, and Miss Louise Hyneck. Congratulations to the newlyweds!

August 1958

- The cover shows a cathode ray facsimile display at W4JP, the University of Kentucky club station in Lexington.
- The editorial discusses League elections and the upcoming 10th ARRL National Convention, to be held in Washington, DC.
- Copthorne MacDonald, W4ZII/2, presents "A New Narrow-Band Image Transmission System," with Part I discussing the principles of slow-scan picture reproduction.
- Using the newly developed receiving tubes that operate with 12 volts on the plate, Bill LaFarra, W5ZCC, describes his "Mobile Converter — No B Plus."
- Because quite a few of our Novices have been getting FCC "pink slips" for harmonic radiation, Lew McCoy, W1ICP, talks about "80-Meter Loading without Harmonics."
- Dave Geiser, W2ANU, discusses "Filtering and Shielding the Station Receiver."
- Lew Abraham, W6FHR, tells about his "Safe Tower for a City Lot," a 60-foot self-supporting tower.
- R. A. Thompson, W4SUD, puts the excellent and inexpensive WW II surplus 813 tube to work in "An All-Purpose 813 Amplifier."

August 1983

- The cover photo shows Astronaut W5LFL, with the caption "How to work the first ham in space — page 50."
- The editorial, "A Star is Born," reports on the successful launch of AMSAT-OSCAR 10 — Phase IIIB has reached orbit!
- George Steber, WB9LVI, presents his thoughts on "High-Resolution SSTV."
- In "The Boom-Excited Beam Antenna," Ed Pienkowski, W8BEB, tells how he gamma-matched his HyGain 204BA tribander's boom (and the beam's first director and reflector) to result in 10 MHz coverage — a novel approach!
- Jerry Pittenger, K8RA, tells us how to organize our homebrew projects, in "A Structured Engineering Approach to the Design and Construction of Electronic Equipment."
- Elmer Wingfield, W5FD, presents "New and Improved Formulas for the Design of Pi and Pi–L Networks," with special attention to the circuit Q.
- Doug DeMaw, W1FB, takes "A Beginner's Look at RF-Power Measurement."
- "Space Shuttle Columbia calling All Radio Amateurs," by Bernie Glassmeyer, W9KDR; Peter O'Dell, KB1N, and Roy Neal, K6DUE, give us tips on how to contact W5LFL during his STS-9 flight.
- Steve Place, WB1EYI, reports on the "Birth of an Era — AMSAT-OSCAR 10."
- A "Strays" photo made by W1YL shows the three young sons of Grover Conde, WA7USI, who secretly prepared for and passed their Novice exams as a surprise for Dad! The three new hams are Wally, KA7OMP; Andy, KA7OGQ, and "CQ," KA7OGR.

Al Brogdon, W1AB ♦ Contributing Editor

W1AW SCHEDULE

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US Time + 4 hours. For the rest of the year, UTC = Eastern US Time + 5 hours.

♦ **Morse code transmissions:** Frequencies are 1.8175, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code bulletins are sent at 18 WPM.

♦ **W1AW Qualifying Runs** are sent on the same frequencies as the Morse code transmissions. West Coast Qualifying Runs are also transmitted monthly. See "This Month in Contesting" in this issue for further details on the Qualifying Runs. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. The initial certificate is available for a $10 fee. Subsequent endorsement stickers are available for a $7.50 fee.

♦ **Digital transmissions:** Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

♦ **Voice transmissions:** Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ **Notes:** On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

During 2008, Headquarters and W1AW are closed on New Year's Eve Day and New Year's Day (Dec 31 and Jan 1), Presidents Day (Feb 18), Good Friday (Mar 21), Memorial Day (May 26), Independence Day (Jul 4), Labor Day (Sep 1), Thanksgiving and the following day (Nov 27 and 28) and Christmas (Dec 25).

For more information, see **www.arrl.org/w1aw.html**.

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	DIGITAL BULLETIN				
6^{45} PM	7^{45} PM	8^{45} PM	9^{45} PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

HAMSPEAK

The following are brief descriptions of Amateur Radio related terms found in this month's issue of *QST*. More information on most can be found in *The ARRL Handbook*, or other specialized ARRL publications.[1] See also **www.arrl.org/qst/glossary.html**.

A 40 Meter CW/SSB Transceiver for the Homebrew Challenge

ARRL Homebrew Challenge — Competitive design exercise sponsored by the ARRL. Announced in *QST* for August 2006. Entrants had a year to design and construct a homemade voice and telegraph transceiver using generally available parts that could be purchased for $50.

Balanced modulator — Circuit used to amplitude modulate a carrier, usually with an audio signal. The balanced configuration provides the resultant sidebands, but eliminates or attenuates the carrier from the output.

Bandwidth — The difference between the highest and lowest frequency component of a signal waveform.

Break-In (QSK) — A method of CW keying in which the system switches between transmit and receive between each code element.

Chips — Vernacular for integrated circuits. Derived from the fact that ICs are constructed on "chips" or wafers of silicon.

CMOS — Complementary metal oxide semiconductor. An integrated circuit logic family with particularly low power requirements.

Crystal filter — Circuit composed of one or more resonant piezoelectric crystals, usually of quartz, that are used to form a frequency selective structure.

Electret capacitor mic — Miniature microphone consisting of an integrated condenser element and amplifier circuit in a package the size of a kernel of corn.

Hartley configuration — Oscillator circuit with frequency established by parallel tuned circuit and feedback by a tap on the coil.

Junk box — Term used to describe an amateur's collection of surplus parts generally saved for some future project. Junk is in the eye of the beholder.

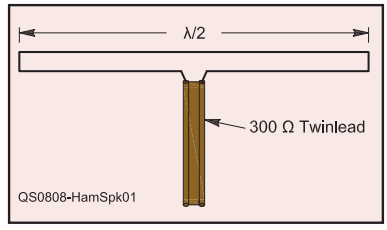
Output spurs — Term describing spurious off frequency signals emitted by a transmitter.

Permeability tuned oscillator (PTO) — Variable frequency oscillator in which the operating frequency is adjusted by changing the inductance of the frequency determining tuned circuit. This is generally accomplished by a metal slug that moves in and out of a coil by the action of a lead screw. The change in frequency with rotation can be much more linear than with most capacitor tuned oscillators.

The Doctor is IN

BNC connector — A type of coaxial cable connector that is a good size for cables of the RG-58 size (in the ¼ inch diameter range). It is characterized by similar, but smaller, mating surfaces to the type N, and a bayonet type locking ring.

Folded dipole — Multiple wire antenna in which the transmission line is connected to the center of one wire and the other wires are interconnected at the ends. The input impedance of the antenna goes up with the square of the number of wires. Thus a two-wire folded dipole in free space (see Figure) would have an impedance of 72 × 2^2 = 288 Ω a close match to 300 Ω TV type twinlead.



Ground rod — Usually steel with copper plating rod, typically 6 to 8 feet long, driven into the soil to provide a ground connection.

Lightning arrestor — Device generally connected to a transmission line that is designed to arc in the presence of abnormally high voltages. The arc reduces the resulting line voltage (hopefully) reducing damage to the connected equipment.

Loading coil — An inductor inserted into an antenna to make it electrically longer.

Radials — Wires or rods that extend out from a central hub. They are often used as either a ground system, by burying them under ground, or as an elevated electrical ground by making them resonant, typically at ¼ λ length each.

RF ground — Connection arrangement intended to provide a low impedance to radio frequency signals to avoid RF voltage on equipment chassis and cabinets. Often a connection to Earth ground, but other arrangements are possible.

Type N connectors — Constant impedance coaxial connector similar in size to the so-called UHF series. The type N provides a waterproof connection, is usable into the microwave region and provides a shield connection not dependent on coupling ring tightness.

Vertical antenna — Antenna in which the electric field is perpendicular to the Earth. Typically, the antenna elements are also vertical.

Down Periscope — The Remote Mobile Antenna Lowering System

Dayton Hamvention — Amateur Radio operator gathering in Dayton, Ohio occurring on the third weekend in May each year. Considered the largest such gathering, it draws participants and vendors from around the world. See **www.hamvention.org** for more information.

Inverter — Device for converting dc power to ac. Early inverters used dc motors to drive rotary ac generators. Modern invertors use the dc to drive a solid state oscillator circuit.

Keeping Your HF Signal Where It Belongs

Carrier frequency — The nominal frequency of a transmitted signal. In most applications it is modulated to add information, resulting in sidebands. For SSB, the carrier is eliminated at the transmitter and reinserted at the receiver.

Key click — Spurious transmitted signal resulting from keying a CW transmitter with too fast a pulse rise or fall time. The sharp transitions result in unneeded extra wide bandwidth that can interfere with other users.

Modulation — The process by which information content is applied to radio carrier by varying the amplitude, frequency or phase of the signal.

Splatter — Similar to key clicks but for voice transmission. Excessive modulation can result in distortion that produces additional sidebands that are outside the normal channel.

WWV — Time and frequency standard radio station operated by the US National Institute of Standards and Technology (NIST). WWV broadcasts in the shortwave spectrum at 5, 10, 15, 20 or 25 MHz. See **tf.nist.gov/stations/www.html** for more information.

Obtaining Good Ground

Counterpoise system — Structure of wires or rods, often buried, designed to provide a low impedance ground.

Exothermic welding — A highly effective and easy to implement method of joining copper or copper and steel grounding conductors using a chemical reaction to weld the pieces together. See **www.erico.com** for more information.

Ground rod — Usually steel with copper plating rod, typically 6 to 8 feet long, driven into the soil to provide a ground connection.

National Electrical Code — A standards document owned by the National Fire Protection Association describing recommendations for safe electrical wiring. The NEC does not in itself have the force of law; however, adherence is a requirement of many municipal and state building codes. See **www.nfpa.org** for more information.

NEMP (nuclear electro magnetic pulse) — High energy (typically 50 kV/m peak field intensity), fast rise time signal that results from a nuclear detonation above the atmosphere. There are few of the lower altitude nuclear effects; however, unprotected electronic equipment over a whole continent are subject to destruction due to the resulting signals picked up on wiring.

Voltage gradient — Change in voltage with distance. The magnitude of the change determines the potential difference between points along the gradient.

Pocket dBm RF Power Meter

Aircraft band — In this context, refers to air to air and air to ground VHF voice radios operating in the range of 118 to 137 MHz. 760 channels of 25 kHz bandwidth are defined for use with AM voice modulation.

dBm — Decibels with respect to a milliwatt reference. 0 dBm is 1 mW, and 30 dBm is 1000 mW or 1 W.

[1] *The ARRL Handbook for Radio Communications,* 2008 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1018. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

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- EchoLink® Sysop mode for node terminal ops
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*816-901.995 MHz blocked; unblocked versions available to FCC approved users. FM video range for the IC-R3 is 900-1300 MHz & 2250-2450 MHz

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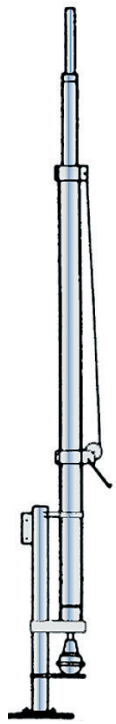
• Mounts easily on wall. Size: 34 1/2" x 22 1/2"

USI TOWER



Shown with Optional Rotor Base

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Handles 10 sq.ft. at 50mph
Pleases neighbors with tubular streamlined look

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DXE-60VA-1P $349.50
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DXE-363-SST	Bulkhead Grounded Cable Connector	$6.95
DXE-BAL050-H10-AT	5kW/10kW SSB Balun	$114.95
DXE-VFCC-BRKT	Insulated Balun Mount	$14.95
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TIG-SL-USB $86.95

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- Easiest installation and setup—Macintosh or PC
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TIG-SL-CAB8R	8-pin round mic connector	$14.95
TIG-SL-CABRJ1	RJ-11 mic connector	$14.95
TIG-SL-CABRJ4	RJ-45 mic connector	$14.95
TIG-SL-CAB5PD	5-pin DIN	$14.95
TIG-SL-CAB8PD	8-pin DIN	$14.95
TIG-SL-CAB13I	13-pin DIN Icom	$19.95
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Ground Strap Assemblies

- Three widths available in various lengths
- Ground your rig for RFI and lightning protection
- Ideal for vehicle noise reduction with mobile systems, ground radial plate or balun to antenna
- Preassembled with lugs for both #10 and 1/4" bolt sizes

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DXE-TCB05-RT05	#10 ring lugs, 5'	$7.95
DXE-TCB05-RT10	#10 ring lugs, 10'	$9.95
DXE-TCB05-RT18I	1/4" ring lugs, 18"	$8.40
DXE-TCB05-RT24I	1/4" ring lugs, 2'	$8.75
DXE-TCB05-RT36I	1/4" ring lugs, 3'	$9.35

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DXE-TCB075-RT18I	1/4" ring lugs, 18"	$9.10
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DXE-TCB075-RT03	1/4" ring lugs, 3'	$10.05

1" Wide Assemblies

DXE-TCB10-RT01	1/4" ring lugs, 1'	$10.49
DXE-TCB10-RT18I	1/4" ring lugs, 18"	$9.75
DXE-TCB10-RT24I	1/4" ring lugs, 2'	$10.55
DXE-TCB10-RT03	1/4" ring lugs, 3'	$11.69
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- High strength Type 6063-T832 drawn aluminum tubing
- Sections with 0.058 inch wall thickness are perfect for telescoping antenna elements
- Most sizes are pre-slit on one end for element clamps
- Available in 3 and 6 foot lengths

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Part Number	Diameter/End Type	Price	Cost/Foot
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DXE-AT1241	0.500", one end slit	$3.30	$1.10
DXE-AT1242	0.625", one end slit	$3.60	$1.20
DXE-AT1243	0.750", one end slit	$3.90	$1.30
DXE-AT1244	0.875", one end slit	$4.20	$1.40
DXE-AT1245	1.000", one end slit	$4.50	$1.50
DXE-AT1246	1.125", one end slit	$4.95	$1.65
DXE-AT1247	1.250", one end slit	$5.55	$1.85
DXE-AT1248	1.375", one end slit	$6.15	$2.05
DXE-AT1249	1.500", one end slit	$6.75	$2.25
DXE-AT1250	1.625", one end slit	$7.65	$2.55
DXE-AT1251	1.750", one end slit	$8.40	$2.80
DXE-AT1252	1.875", one end slit	$9.15	$3.05
DXE-AT1253	2.000", one end slit	$9.90	$3.30
DXE-AT1254	2.125", one end slit	$11.40	$3.80

Aluminum Tubing, 0.058" Wall, 6 Foot Length

Part Number	Diameter/End Type	Price	Cost/Foot
DXE-AT1189	0.375", no slit	$5.40	$0.90
DXE-AT1205	0.500", one end slit	$6.60	$1.10
DXE-AT1206	0.625", one end slit	$7.20	$1.20
DXE-AT1207	0.750", one end slit	$7.80	$1.30
DXE-AT1208	0.875", one end slit	$8.40	$1.40
DXE-AT1209	1.000", one end slit	$9.00	$1.50
DXE-AT1210	1.125", one end slit	$9.90	$1.65
DXE-AT1211	1.250", one end slit	$11.10	$1.85
DXE-AT1212	1.375", one end slit	$12.30	$2.05
DXE-AT1213	1.500", one end slit	$13.50	$2.25
DXE-AT1214	1.625", one end slit	$15.30	$2.55
DXE-AT1215	1.750", one end slit	$16.80	$2.80
DXE-AT1216	1.875", one end slit	$18.30	$3.05
DXE-AT1217	2.000", one end slit	$19.80	$3.30
DXE-AT1218	2.125", one end slit	$22.80	$3.80

Aluminum Tubing, 2.000" Diameter, 0.125" Heavy Wall

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DXE-AT1255	3', no slit	$14.85	$4.95
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DXE-ECL-20SS	0.810" to 1.750"	$1.40
DXE-ECL-24SS	1.060" to 2.000"	$1.49
DXE-ECL-32SS	1.560" to 2.500"	$1.49
DXE-ECL-44SS	2.310" to 3.250"	$1.95

Telescopic Aluminum Mast

- 64 ft. slow taper from 2" O.D. base to 3/4" O.D. top

DXE-AT-MAST $194.50

Insulated Vertical Base Assemblies for 2" O.D. Antenna Masts

New!

Standard Base

- Tilt Base optional
- Two DXE-CAVS-1P mounting clamps required to attach base to mounting post

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DXE-TB-3P	Tilt Base Assembly	$62.50

Heavy Duty Base

- Tilt Base included
- Two DXE-CAVS-2P mounting clamps required to attach base to mounting post

DXE-VA-BASE $149.50

DXE-CAVS-2P	V-Saddle Clamp	$10.95

Low Loss Coax Cable Assemblies

- All connectors are soldered, not crimped
- Connectors have silver plated body and barrel with center Teflon® dielectric
- Highest quality Belden coaxial cable is used
- All cable assemblies are high voltage tested to handle full rated power
- Watertight seal between connectors and coax
- Call to order custom cable/connector assemblies

See DXEngineering.com for complete information!

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- Can be installed in most back yards—only 9 ft. tall

DXE-AAPS-1P Active Antenna Phasing System with Controller **$995.00**

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Combine two identical receiving antennas to create a directional pattern—enables you to adjust the antenna pattern as if you were moving your antennas

Special Features

- Exceptional dynamic range—nearly 1000 times (30dB) better than nearest competitor
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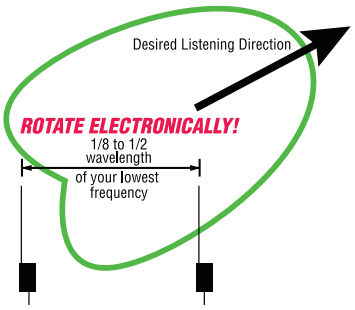

HAM-SWL

Active Receive Antenna

- Now available with relay protection from transmitter overload when used with TVSU-1
- Weak signal sensitivity rivals full size antenna
- Operates from 100 kHz to 30 MHz
- Excellent strong signal handling with +30 dBm output third order intercept
- Easy installation
- Available in vertical or dipole configuration

DXE-ARAH-1P Horizontal Configuration **$259.00**
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Time Variable Sequencer Unit

- Protect receiver front end, preamplifiers, linear amplifiers, or other sensitive equipment from damage due to improper switching during the receive/transmit transition
- Five outputs tied to the CW keying or push-to-talk (PTT) lines each have adjustable delay from 0-30 ms in 2 ms increments
- Side-tone generator follows input of keyer, not transmitter
- Supports full CW break-in
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DXE-TVSU-1 Time Variable Sequencer Unit **$159.95**

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DX Engineering now stocks replacement parts for all BTV antennas

Easiest assembly and tuning of any multi-band vertical!

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Current Baluns and Feedline Current Chokes

- 5, 10 and 10 kW+ Baluns and Current Chokes
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- All standard ratios available

Feedline Current Chokes

- Reduce RFI and pattern distortion

Starting at just $69.95 for FCC050-H05-A

STAINLESS STEEL—WON'T DISSOLVE LIKE ALUMINUM!

Stainless Radial Plate with Coax Attachment

Makes radial attachment a snap!

- Fits 2" pipe, 4x4 and 6x6 posts
- 0.125" thick 304 stainless steel
- Accommodates up to 120 radials
- Patented high current coax connection to radials

DXE-RADP-1P	Complete with 20 stainless bolt sets	**$54.50**
DXE-RADP-1HWK	20 sets of 1/4" stainless hardware	**$7.50**
DXE-CAVS-2P	Stainless Saddle Clamp for attachment to round tube 1.0" to 2.0" O.D.	**$10.95**
DXE-363-SST	Silver/Teflon® bulkhead connector	**$6.95**
DXE-VFCC-H05-A	Vertical Feedline Current Choke	**$94.95**

NEW—Biodegradable Anchor Pins

DXE-RADW-500KBD	Radial Wire Kit, 500 feet of wire, 20 lugs, 100 anchor pins	**$61.90**
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Thick, Laser Cut Stainless Steel Tilt Base

- Patent pending cam action allows you to easily raise or lower DX Engineering, Hustler, Hy-Gain, or Butternut for tuning, weather or CC&R accommodation.

DXE-TB-3P For Hustler BTV verticals **$62.50**
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17m Add-On Kit

New!

- Full band under 1.5:1 SWR
- Minor adjustments for other bands
- Simple installation
- 850W SSB/CW power rating

Patent Pending

DXE-A0K-17M 17m add-on kit for BTV **$49.95**

60m Add-on Kit

- 60m coverage for Hustler BTV series antennas
- Operates across the complete 60m band
- SWR of 1.5:1 or less
- Includes new capacitive compensator
- Retains all bands at peak performance

DXE-A0K-60M 60m Add-on Kit for Hustler BTV **$69.95**

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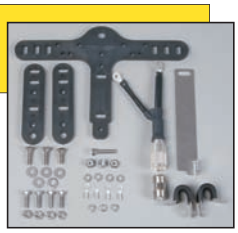
Universal Wire Antenna Hardware Kit



- Multi-purpose center-T and end insulators to create many types of wire antennas
- Create single band, multi-band, multi-frequency and folded dipole antennas
- Easy solder-free construction
- Works with DX Engineering's 300 Ω ladder line for both the feed and elements
- Use with doublet, inverted-V, off-center fed, Zepp, long wire, rhombic, V-beam, and loop antenna configurations
- Kits available for coax or ladder line feed
- Center-T attaches to all DX Engineering baluns, including the new lightweight DXE-BAL050-H05-A
- All connections are visible for increased reliability

DXE-UWA-KIT	Universal Wire Antenna Hardware Kit, no Coax Adapter	**$17.95**
DXE-UWA8X-KIT	Universal Wire Antenna Hardware Kit with coax attachment and strain relief for use with RG-8X	**$29.95**
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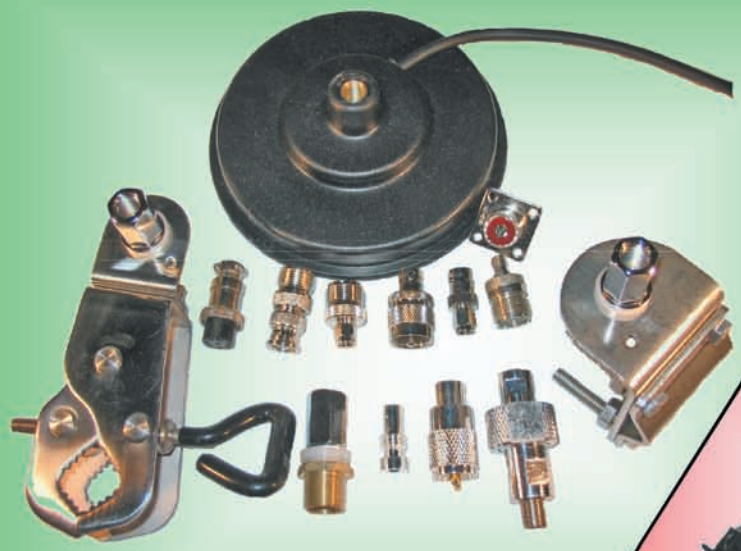

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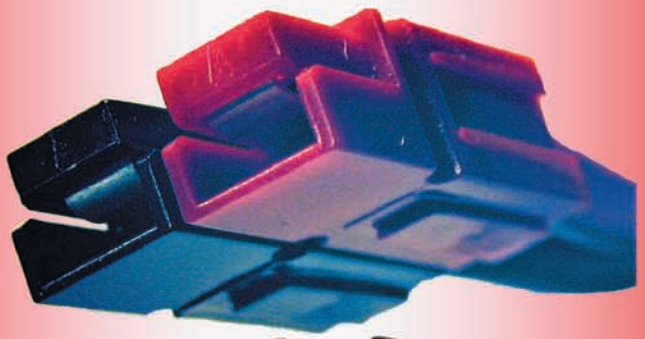

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- 2 Antenna connections
- Tunes from 1.8 to 54.0 MHz (inc. 6 meters)
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- 2000 memories.
- All cables included.

Suggested Price $599

Z-11Pro

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.

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radio not included

AT-7000

The AT-7000 is the ideal tuner for IC-7000 & other Icom Radios: Covers all frequencies from 1.8–54 MHz (including 6 meters), and will automatically match your antenna. Requires just 0.1W for operation, but will handle up to 125W (100 W on 6 m), making it suitable for everything from QRP (IC- 703 Plus) to a typical 100 W Icom transceiver. All cables included. ***Suggested Price $169***

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AT-897 for the Yaesu FT-897

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AT-100Pro

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AT-200Pro

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- Built-in TNC for APRS (needs GPS) • Cross-band repeat
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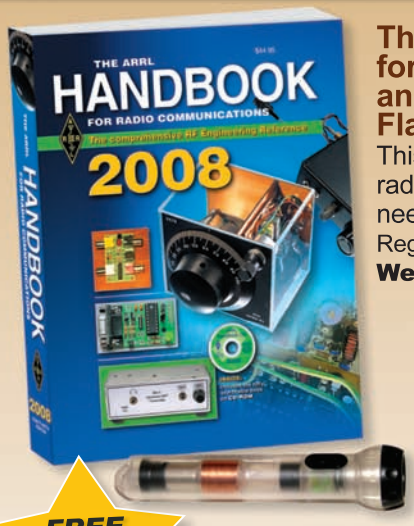

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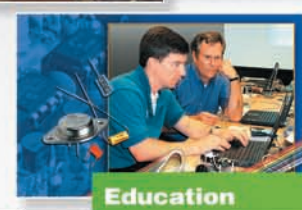

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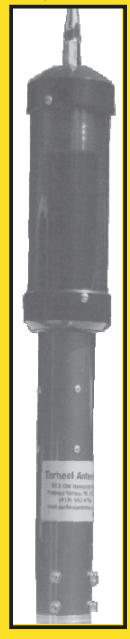

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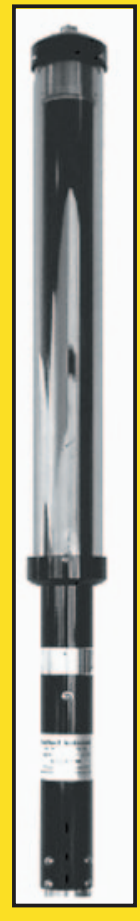

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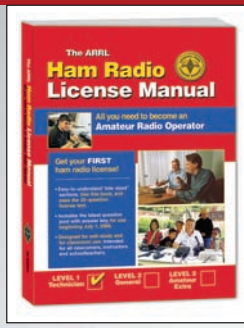

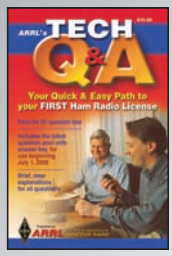

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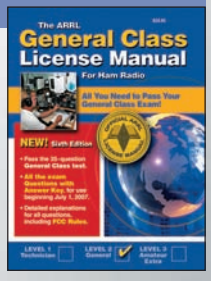

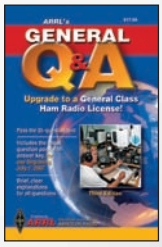

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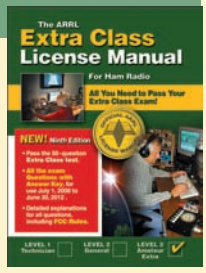

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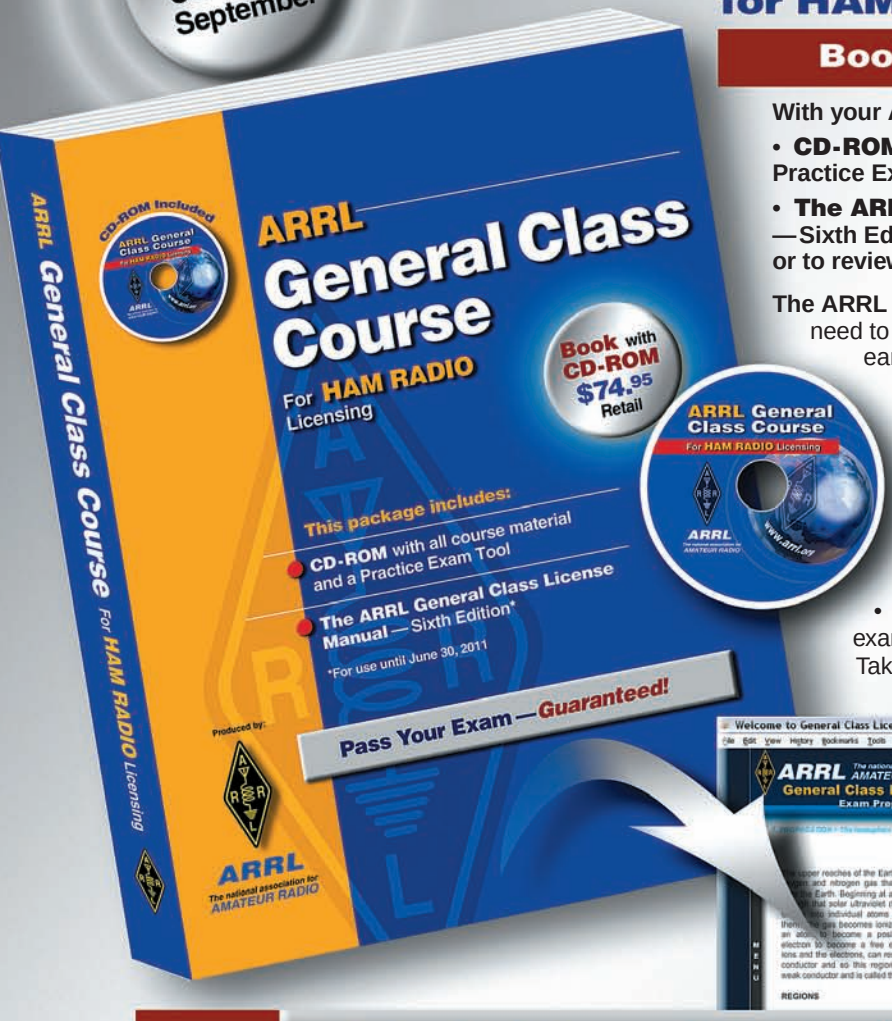

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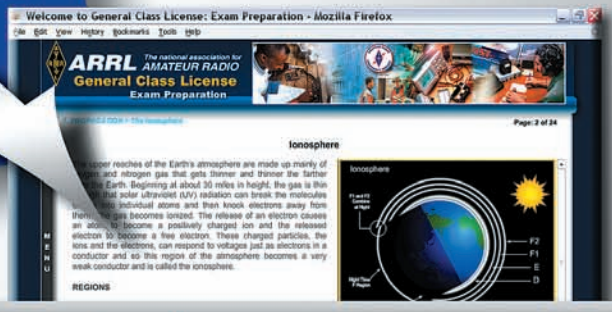

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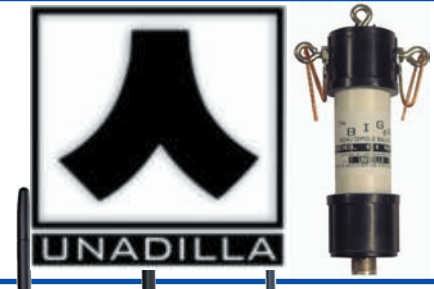

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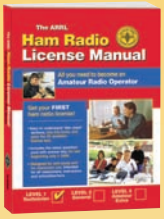

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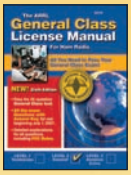

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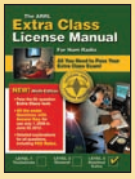

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PM-30UVN, $99.95, N connectors.
PM-30UVB, $99.95, BNC connectors.

1.5 kW *dry* Dummy Load

DL-650M, $79.95 100 Watts continuous 1500 W/10 seconds to 650 MHz. *Ceramic* resistor. SWR less than 1.3. SO-239s. **DL-650MN, $84.95** has N connectors.

Low Pass TVI Filter

LP-30, $89.95 Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. 1.5 kW.

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The MIRAGE B-5018-G gives you 160 Watts output for 50 Watts input on all modes -- FM, SSB, or CW!

Ideal for 25-50 Watt 2 Meter mobile or base. Weak signals pop out with its low noise *GaAsFET* preamp and its excellent 0.6 dB noise figure. Selectable 5, 8 or 14 dB preamp gain.

Exclusive MIRAGE *ActiveBias*™ circuit gives *crystal clear SSB* without splatter or distortion.

B-5018-G is legendary for its ruggedness and is fully protected -- high SWR or excessive input power automatically bypasses the B-5018-G to prevent damage.

Heavy-duty heatsink spans entire length of cabinet. Power transistors protected by MIRAGE's *Therm-O-Guard*™. Has adjustable delay *RF sense* Transmit/Receive switch *and* remote external keying. 16-20 Amps at 13.8 VDC.12x3x5½ in.

B-5018-G
$329

B-1018-G, $409. MIRAGE's most popular *dual purpose* HT/mobile/base amp. 160 Watts out/10W in. For 0.25-10W rigs.

B-2518-G, $329. Like B-5018-G but for 10-25 Watt mobile/base. 160W out/25W in.

RC-2, $49. Remote Control. On/Off, preamp On/Off, selects SSB/FM. 25 ft. cable.

***Power Curve** -- typical output power in Watts*

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	160	160
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

FCC Type Accepted

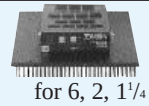
6 Meter Amplifier

A-1015-G, $389, *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 Watts out/10W in. For 1-15 W transceivers. 20 dB GaAsFET preamp.

300 Watts on 2-Meters, $739

3 models: 300 Watts out for 10, 25, or 50 Watts in. FM/SSB/CW. 15/20 dB gain, *GaAsFET* preamp.

Repeater Amps



11 models: *continuous* duty FM/SSB/CW *Repeater* Amps for 6, 2, 1¼ Meters, 70 cm, 450 MHz, ATV.

Commercial Amps, $159 to $429

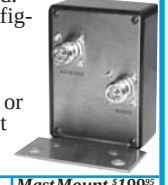
Commercial Amps for 150-174, 450-470 MHz, VHF marine bands, 70-130 Watts out.

70 cm Amplifiers (420-450 MHz)

D-3010-N, $389 -- 100 W out/30W in. For 5-45 Watt *mobile/base*. **D-1010-N, $419**, 100W out/10W in. *Dual purpose* -- for handhelds or mobile/ base. **D-26-N, $299**, 60W out/2W in, for *handhelds*.

Low Noise GaAsFET preamps

High gain ultra low noise *GaAsFET* preamps for receiving weak signals. Selectable 15-22 dB gain prevents intermod. < 0.8 dB noise figure, auto RF switching to 160W.



In-shack or Mast-Mount models.

Frequency, MHz	*In Shack, $149.95*	*MastMount, $199.95*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

Amateur TV Amps

Industry standard ATV amps: **D-1010-ATVN, $439**, 82 W PEP out/10W in. **D-100-ATVN, $449**, 82W PEP out/2W in. (without sync compression).

Accurate SWR/Wattmeters

Read SWR directly and Forward/ Reflected, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

1¼ Meter Amps (223-225 MHz)

10 models -- 20-220 Watts out for 2-50W in, $169-$739.

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1.8-170 MHz *plus* 415-470 MHz
MFJ HF/VHF/UHF Antenna Analyzer

All-in-one handheld antenna test lab lets you quickly check and tune HF, VHF, UHF antennas anywhere. Covers 1.8-170 MHz and 415-470 MHz

Measures: SWR…Return Loss…Reflection Coefficient…Antenna Resistance(R), Reactance(X), Impedance(Z) and Phase Angle(degrees) . . . Coax cable loss(dB) . . . Coax cable length . . . Distance to short or open in coax … Inductance . . . Capacitance . . . Resonant Frequency . . . Bandwidth . . . Q . . . Velocity Factor . . . Attenuation . . . Has: LCD readout . . . frequency counter . . . side-by-side meters . . . Ni-MH/Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . One year No Matter What™ warranty . . .

MFJ-269
$389.95

You can instantly get a complete picture, check and tune any antenna from 1.8 to 170 MHz and 415 to 470 MHz -- an MFJ-269 exclusive -- with this rugged easy-to-use hand-held antenna test lab! You can measure virtually every antenna parameter.

You won't believe its capability and versatility. This rugged handheld unit literally replaces a workbench full of expensive delicate test equipment.

SWR Analyzer

You can read SWR, return loss, reflection coefficient and match efficiency at any frequency simultaneously at a single glance.

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

Coax Analyzer

You can determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

CoaxCalculator™ lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and loss of coax with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Inductance/Capacitance Meter

Measures inductance in uH and capacitance in pF at RF frequencies, 1.8-170 MHz.

Frequency Counter/Signal Source

You can also use it as a handy frequency counter up to 170 MHz and as a signal source for testing and alignment.

Digital and Analog displays

A high contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

415 to 470 MHz Range features

Just plug in your UHF antenna coax, set frequency and read SWR, return loss and reflection coefficient simultaneously. You can read coax cable loss in dB and match efficiency.

You can adjust UHF dipoles, verticals,

yagis, quads and others and determine their SWR, resonant frequency and bandwidth.

You can test and tune stubs and coax lines. You can manually determine velocity factor and impedances of transmission lines.

You can adjust/test RF matching networks and RF amplifiers without applying power.

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Much Better Accuracy

New 12-bit A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Super Easy-to-Use

Select a band and mode. Set frequency. Your measurements are instantly displayed! Smooth reduction drive tuning makes setting frequency easy.

Take it anywhere

Take it anywhere - to remote sites, up towers, in cramp places. Fully portable -- battery operated, compact 4Wx2Dx6¾ in., weighs 2 lbs. *Free* "N" to SO-239 adapter.

Has battery saver, low battery warning and built-in charging circuit for rechargeables.

Use 10 AA Ni-MH or Ni-Cad or alkaline batteries (not incl.) or 110VAC with MFJ-1312D, $15.95.

MFJ SWR Analyzer Accessories

MFJ-39C, $24.95.
Tote your MFJ-269 anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric, the MFJ-39C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm. Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends. Has clear protective window for frequency display and cutouts for knobs and connectors.

MFJ-66, $24.95.
Plug these MFJ dip meter coupling coils into your MFJ *SWR Analyzer™* and turn it into a sensitive and accurate *band switched* dip meter. Set of two coils cover 1.8-170 MHz depending on your MFJ-269 *SWR Analyzer™*.

MFJ-99C, $40.90.
SWR** Analyzer Power Pack.* 10 Pack MFJ *SuperCell™* Ni-MH batteries, and power supply for SWR analyzers. ***Save $5!

MFJ-98, $60.85.
MFJ-269** Accessory Pack.* MFJ-39C *custom* Carrying Pouch, MFJ-66 dip coils, power supply for MFJ-269. ***Save $5!

MFJ-98B, $88.90.
MFJ-269** Deluxe Accessory Pack.* Complete accessory pack! MFJ-39C Pouch, 10 Ni-MH batteries, dip coils, power supply. ***Save $7!

MFJ-269*PRO™* Analyzer

MFJ-269*PRO*
$419.95
NEW!

Like MFJ-269, but has extended coverage in UHF range ***(430 to 520 MHz)*** and ruggedized cabinet that protects LCD display, knobs, meters and connectors from damage.

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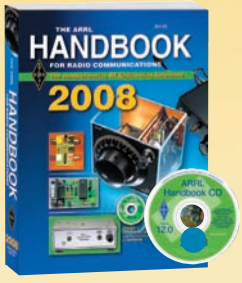

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Automatically tunes unbalanced/balanced antennas . . .Ultra fast . . . New 20,000 memories . . . Antenna Switch . . . Efficient L-network . . . Select 300 Watts (6-1600 Ohms) or 150 Watts (6-3200 Ohms) . . . 1.8-30 MHz . . . 4:1 current balun . . . Cross-Needle and Digital SWR/ Wattmeter . . . Audio SWR meter . . . Backlit LCD . . . Remote control port . . . Radio interface . . .

MFJ-993B
$259.95 New!

World's First dual power level 300/150 Watts SSB/CW Tuner --

Select 300 Watt SSB/CW power level and match 6-1600 Ohm antennas ***Or . . .*** select **150 Watt** SSB/CW power level and match *extra wide-range* 6-3200 Ohms!

The MFJ-993B *IntelliTuner*™ lets you tune any antenna *automatically* balanced or unbalanced -- *ultra fast*.

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *InstantRecall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

You get a highly efficient L-network, 6-1600 ohm matching at 300 Watts SSB/CW or *extra-wide* 6-3200 Ohm matching at 150 Watts SSB/CW, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

It learns while you're having fun

As you're ragchewing, contesting or DXing, *your MFJ-993B is learning!*

When you transmit, the MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!*

MFJ's new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 antenna connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total.

Intelligent ultra fast tuning

MFJ's *InstantRecall*™ first checks its memory to see if you have operated this frequency before. If so, tuning is instantaneous and you're ready to operate.

If not, MFJ's *IntelliTuner*™ algorithm -- based on MFJ's famous SWR Analyzer technology - - kicks in. It *measures* the complex impedance of your antenna. Next, it *calculates* the components it needs and instantly *snaps* them in. Then, it fine tunes to minimize SWR -- you're ready to operate. It's all done in a *fraction* of a second.

When the impedance is within its measurement range, the MFJ-993B is the *fastest automatic antenna tuner in the world.*

If it can't accurately determine impedance, MFJ's *AdaptiveSearch*™ algorithm goes into action. Frequency is measured and relevant components values are determined. Only those values are searched for ultra-fast tuning.

For even faster searches, you can set the target SWR to 2 (settable 1.0-2.0).

You can manually tune when you can't transmit (for listening out of ham bands).

Cross Needle and Digital SWR/Watt Meters

Lighted Cross-Needle and *digital* meters lets you accurately read SWR, forward and reflected power at a glance.

An *audio* SWR meter lets you *hear* the tuned SWR when you can't see/read meters.

Turn on a highly visible, instant response SWR LCD bargraph when you need it.

Backlit LCD Display

An easy-to-read *backlit* LCD displays SWR, forward/reflected power, frequency, antenna 1 or 2, L/C tuner values, on/off indicators and other information.

The MFJ-993B is a compact 10Wx2¾ Hx9D inches. Use 12 to 15 VDC at 1 amp or 110 VAC with **MFJ-1316, $21.95**.

Tune any Antenna

You can tune any antenna -- dipoles, verticals, beams, phased arrays, inverted vees, quads, random wires, mobile antennas, compact limited space antennas.

A 4:1 *true* current balun lets you tune any balanced antenna - - horizontal loops, vertical loops, multi-band doublets, quads, folded dipoles, Zepps.

Remote Control

Plug in the **MFJ-993RC, $39.95**, remote control and use your tuner elsewhere remotely.

MFJ-993B Interface Pre-wired Cables

Allows automatic tuning of your MFJ-991B/993B/994B *IntelliTuner*™ through radio.

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

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

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

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

Dual 300/150 Watt Auto Tuner

World's First dual power level Tuner

MFJ-991B
$219.95 New!

-- Select **300 Watt** SSB/CW and match 6-1600 Ohm antennas ***Or*** select **150 Watt** SSB/CW and match *extra wide-range* 6-3200 Ohms. New 10,000 *VirtualAntenna*™ Memories. Like MFJ-993B, less digital SWR/Wattmeter/ LCD display, audio SWR meter/audio feedback, antenna switch or 4:1 current balun.

MFJ Weather-sealed Automatic Antenna Tuner, 1.8-30 MHz

MFJ-926, $399.95. Weather-sealed for outdoor/marine use. *Heavy duty* custom plastic enclosure has inner rubber gasket that seals interior electronics. Stainless steel mounting bracket. Handles 200 Watts PEP. Tunes wire in less than .2 seconds from memory (200 memories). Requires 13.8 VDC, 1.5A. Compact 9¼Wx14¼Hx3D inches, 4 lbs.

600 Watt MFJ Automatic Tuner

MFJ-994B
$359.95 New!

MFJ-994B, *600 Watt IntelliTuner*™! automatic antenna tuner with new 10,000 *VirtualAntenna*™ Memories. Like MFJ-993B but handles 600 Watts SSB/300 Watts CW, matches 12-800 Ohms. Does not have digital SWR/Wattmeter/LCD display, audio SWR meter/audio feedback, antenna switch or 4:1 current balun.

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MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

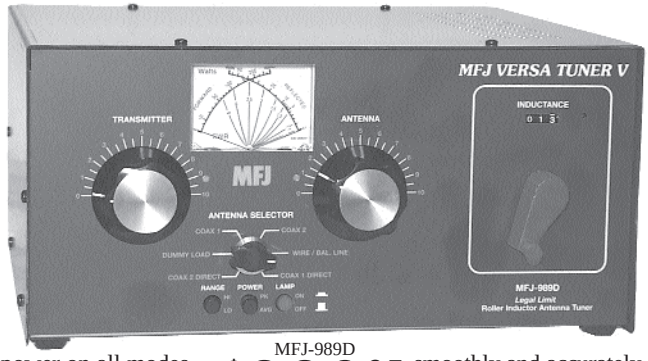
World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

***New TrueActive*™** peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.



MFJ-989D
$389.95

New high voltage *current balun* lets you tune balanced lines at high power with no worries.

New crank knob lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™

MFJ-986
$349.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D
$299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$x$10^{7}/_{8}$ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969
$219.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E
$179.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3^{1}/_{2}$Hx$10^{5}/_{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E
$139.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E
$129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971
$119.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny $6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B *smallest* Versa Tuner

MFJ-901B
$99.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 *Tiny Travel* Tuner

MFJ-902
$99.95

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire. **MFJ-904H, $149.95.** Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 *random wire* Tuner

MFJ-16010
$69.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906
$99.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921/924 $89.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 *artificial* RF Ground

MFJ-931
$109.95

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

Dealer/Catalog/Manuals
Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

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300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
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MFJ 2500 Watts *ContinuousCarrier*™ Tuner

Silver plated Edge-Wound Roller Inductor . . .1000/500 pF Variable Capacitors . . . Antenna Switch . . . 4-Core Balun . . . true Peak Cross-Needle SWR/Wattmeter . . . Dummy Load . . . Extremely Wide Matching Range . . . Patent Pending . . .

New!

MFJ-9982

$699.95

***The** MFJ-9982 ContinuousCarrier™ antenna tuner handles 2500 Watts continuous carrier output on all modes and all HF bands into most unbalanced antennas -- even on 160 Meters where even the best antenna tuners fail!*

The MFJ-9982 gives you every feature you'll ever want in a high power tuner -- wide matching range, 1.8 to 30 MHz coverage, 6-position antenna switch, 4-core balun, dummy load, true peak/average lighted SWR/Wattmeter, 6:1 reduction drives with detailed logging scales, 3-digit turns counter, extra large knobs.

New Components, New Technologies

The *Heart and Soul* of the MFJ-9982 is its roller inductor and variable capacitors.

MFJ's high power, high-Q *continuous current AirCore*™ roller inductor is no ordinary roller inductor! It's edge wound from thick .06-inch *silver-plated* solid copper strap.

It can carry huge circulating RF currents and withstand tremendous heat that'll melt or burn up ordinary roller inductors.

Self-insulating construction reduces stray capacitance -- keeps self-resonant frequencies high and out-of-the-way. Dual, *silver-plated* compression wheels give ultra low-resistance contacts. New fast-tune crank knob.

High-current, *high-capacitance* 1000 pF and 500 pF air variable capacitors have low minimum capacitance and are self-insulating.

These newly developed air variable capacitors give you *very high efficiency* on 160/80 Meters *and* MFJ's patent pending innovation gives you *extremely wide matching range* on 10/12/15 Meters at 2500 Watts -- a feat *only* the MFJ-9982 has achieved.

Hi-Voltage/Current Antenna Switch

The antenna switch is completely isolated to handle high-voltage, high impedance antennas. High-current, low impedance antennas are handled by parallel sets of high-current contacts of *two* ceramic switches.

New 4-Core Balun

Powerful balun -- Four 2½ inch cores, 12-gauge *Teflon*™ wire. Run balanced lines at full 2500 Watts SSB/CW continuous, 24/7.

New Balanced Line Feed-Thru Insulator

Allows massive transmitter currents to flow directly to the antenna without passing through lossy screws or bolts.

TrueActive™ *Peak Reading Circuit*

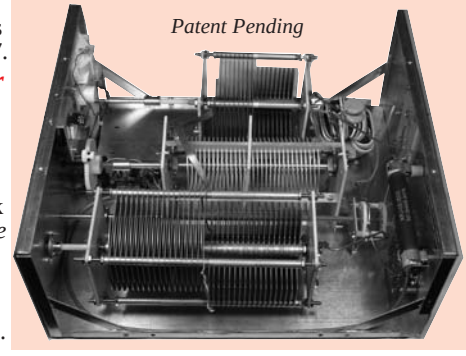
***New** TrueActive*™ circuit reads *true* peak or average power on all modes. *Cross-Needle* meter reads SWR/forward/reflected power.

1500 Watt Dummy Load

1500 Watt air-cooled non-inductive 50 Ohm resistor. 100W/10 min., 1.5kW/10 sec.

New Cabinet maintains high Q

***New** roomy cabinet maintains high Q. Vent holes. Heavy gauge, .08 inch aluminum braced chassis. Vinyl cover, non-stripping PEM nuts, heavy 10-gauge and copper strap wiring throughout. 13¾Wx7Dx16¼D inches. 15 pounds.*



MFJ 1500 Watt *Fully Balanced* Antenna Tuner

Fully balanced MFJ-976 handles 1500 Watts legal limit . . . Extra-wide 12-2000 Ohms matching range . . . continuous 1.8 to 30 MHz coverage including all WARC bands . . . Four separate 500 pF in two gangs gives you a total of 2000 pF capacitance . . . Heavy duty 1:1 current balun . . . more!

New!

MFJ-976

$499.95

The MFJ-976 is a 1500Watt full Legal Limit *fully balanced* antenna tuner.

You get *superb* current balance, very wide matching range (12-2000 Ohms) and *continuous* 1.8-30 MHz coverage including all WARC bands. Handles *full* 1500 Watts SSB *and* CW.

You can tune *any* balanced lines including 600 Ohm open wire line, 450/ 300 Ohm ladder lines, 300/72 Ohm twin lead -- shielded or unshielded. Also tunes random wires and coax fed antennas.

MFJ's *fully balanced* extremely wide-range T-network gives you simple, fast three knob tuning. No complicated switching between high and low impedance and switching in additional capacitance of L-networks.

Four separate 500 pF in two gangs gives you a total of 2000 pF for highly efficient low loss operation on 160 Meters.

You get excellent 10 Meter performance because of MFJ's low minimum capacitance and exclusive *Self-Resonance Killer*™ high-Q *AirCore*™ roller inductor with silver plated contacts.

Heavy duty 1:1 current balun gives you *superb balance* and stays cool even at 1.5kW.

True *active* peak reading lighted Cross-Needle SWR/Wattmeter lets you read SWR, *true peak* or average forward and reflected power all at a glance on 300/ 3000 Watt ranges. 12Wx6Hx15¾D inches.

Dealer/Catalog/Manuals

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

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MFJ . . . The World Leader in Ham Radio Accessories

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna

Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives high efficiency for more power radiated. Results? Stronger signals and more Q-5 QSOs.

Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

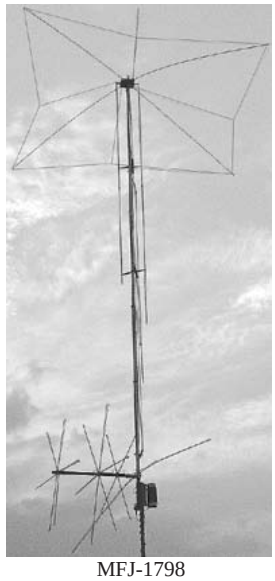
Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.



MFJ-1798
$299.95
Ship Code F

Separate Full Size Radiators

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.

This forms a very large equivalent radiator and gives you incredible bandwidths.

Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$419.95

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes.

Enjoy both DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto-tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- not a lossy thin flat-strip -- *gives you highest possible efficiency*.

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning.

Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

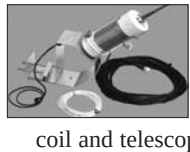
MFJ-1788, $469.95. Same as MFJ-1786 but covers 40 Meters-15 Meters continuous. Includes super remote control.

MFJ-1782, $379.95. Like MFJ-1786 but control has only fast/slow tune buttons.

MFJ-1780, $299.95. *Box Fan* Portable Loop is about the same size (2x2 foot) as a box fan, complete with handle. Covers 14-30 MHz. Control has fast/slow tunes.

MFJ Apartment Antenna

MFJ-1622 $99.95



Covers 40 thru 2 Meters. Mounts outdoor to windows, balconies, railings. Works great indoors mounted to desks, tables, bookshelves. Highly efficient air wound *bug catcher* loading coil and telescoping 5½ foot radiator lets you really get out! Radiator collapses to 2½ feet for easy storage/carrying. Includes coax RF choke balun, coax feed line, counterpoise wire, safety rope. 200 Watts PEP.

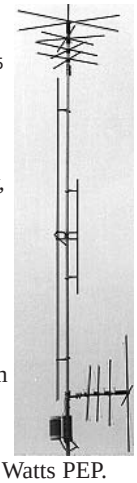
MFJ's G5RV Antenna

MFJ-1778
$44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 feet long, shorter than 80 Meter dipole. Use as inverted vee or sloper to be more compact. Use on 160 Meters as Marconi with tuner and ground. Handles full legal limit power. Add coax feedline and some rope or other nonconductor and you're *on the air!*

MFJ halfwave vertical

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed



MFJ-1796
$229.95

Only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments,small lots, trailers. Perfect for vacations, field day, DXpedition, camping.

Efficient end-loading, no lossy traps. Entire length is always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting 1 band has minimum effect on others.

MFJ-1792, $189.95. Full size 1/4 wave radiator for 40 Meters. 33 feet, handles 1500 Watts PEP. Requires guying and radials.

MFJ-1793, $209.95. Like MFJ-1792 but has full size 20 Meter ¼ wave also.

Free MFJ Catalog

and Nearest Dealer . . . 800-647-1800

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Huntsville Hamfest and ARRL Southeastern Division Convention

August 16-17, 2008
At the Von Braun Center in Huntsville, Alabama

Program Highlights

- **Huntsville Hamfest** – Featuring equipment dealers, manufacturers, forums and more!
- **Young Ladies Radio League (YLRL) 2008 Convention** – August 14-17.
- **DX Banquet** (sponsored by the North Alabama DX Club) featuring Ann Santos, WA1S speaking on the TX5C Clipperton DXpedition.
- **DXCC Card Checking**
- **ARRL Program Representatives**
- **Youth Activities**
- **W1AW/4 Special Event Station** – Bring a copy of your license to operate.

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Holiday Inn
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Reservations: **1-877-465-4329** or **1-256-553-1400 ext. 670**.
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Embassy Suites Hotels
Group/Convention code: HAM.
Reservations: **1-800-362-2779** or **1-256-539-7573** or
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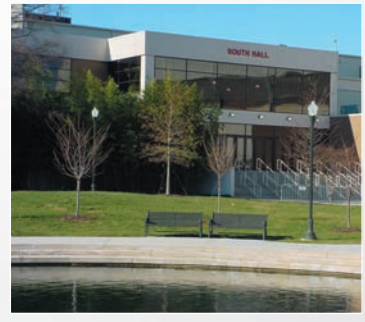

Nearby Points of Interest

- ✓ U.S. Space & Rocket Center and U.S. Space Camp
- ✓ NASA Marshall Space Flight Center Tour
- ✓ Bridge Street Centre – Upscale Shopping Mall **NEW!**
- ✓ Huntsville Botanical Garden
- ✓ Huntsville Museum of Art
- ✓ Cathedral Caverns State Park
- ✓ Historic Huntsville Depot Museum and Alabama's Constitution Village

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The World's Friendliest Hamfest
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MFJ *giant* SWR/Wattmeter

World's *largest HF SWR/Wattmeter has* ***giant*** ***6½ inch meter!***

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually examining the scale.

New!

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

MFJ-868 $149.95

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5¹/2Hx5D in. SO-239 connectors.

New!

***Giant** 144/220/440 MHz SWR/Wattmeter*

MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but for 144/220/440 MHz.

MFJ *Weather-Proof* Antenna *Feedthrough* Panel

Bring three coax-fed HF/VHF/UHF antennas, balanced line, random wire and ground into your hamshack without drilling through walls . . . ***New!*** MFJ-4602 $69.95

MFJ's Weather-proof *Antenna Feedthrough Panel* mounts in your window sill. Lets you feed three coax-fed antennas, balanced line, random wire and ground without drilling through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. High-quality pressure-treated wood with excellent 3/4 inch thick insulating properties is painted with heavy coat of white outdoor enamel paint. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Gives years of trouble-free service. ³/₄Dx3¹/₂Hx48W in.

Inside/outside stainless steel plates bond all coax shields to ground. Stainless steel ground post brings outside ground connection inside. Three *Teflon*® SO-239 coax connectors, *ceramic* balanced line/randomwire feedthru insulators.


Stainless Steel Bonding Plate


Indoor View


Outdoor View

6-Band ***Rotatable*** mini-Dipole for 40,20,15,10,6,2 M

Low profile 14 ft . . . 7 ft. turning radius . . . 1.5 kW . . . Directivity focuses signal, reduces QRM/noise . . .

You can hardly see this mini 14 foot rotatable dipole from across the street!

Tiny 7-foot turning radius fits the smallest roof -- perfect for houses, apartments/condos.

The low-profile MFJ-1775 is not much bigger than a TV antenna and nicely blends into the sky. It's easily turned by a lightweight TV rotator.

It's no Wimp! Its *directivity* reduces QRM/noise and lets you *focus* your signal in the direction that you want -- so you can work some *real* DX.

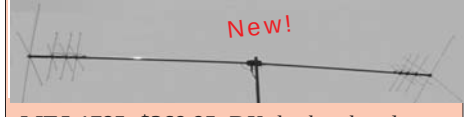
Operate 6 bands -- 40, 20, 15, 10, 6 and 2 meters. Run *full 1500 Watts* SSB/CW on all HF bands!

Its entire length radiates. Each HF band uses a separate, highly-efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire with capacitance hats at each end (no lossy traps). 6 and 2 meters are *full-length* halfwave dipoles.

Built-to-last -- incredibly strong solid rod fiberglass center insulator and 6063 T-6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

MFJ-1775W, $249.95. WARC band version for 12, 17, 30, 60 Meters only.

80/40/20 Meter Rotatable Dipole



MFJ-1785, $369.95. DX the *low bands* on 80, 40, and 20 Meters with an efficient full 33 foot *rotatable* dipole! Handles a full 1500 Watts. Balun included. 6063 T-6 aircraft strength aluminum tubing with a solid center fiberglass insulator. Requires a medium-duty rotator such as Hy-gain's AR-40.

Compact SWR/Wattmeter

MFJ-822
MFJ-842
$59.95
New!

Compact SWR/Wattmeter has huge 3 inch *lighted* Cross-Needle Meter, easily viewable from across shack. Read forward/reflected power, SWR *simultaneously*. 3¹/₄Wx3¹/₄Hx3¹/₄D in.

MFJ-822 for 1.8-200 MHz, 30/300 Watts.
MFJ-842 for 140-525 MHz, 15/150 Watts.

2-Position *Remote* Ant. Switch

MFJ-4712 $79.95

Switch any two antennas remotely! *Single* coax feeds two antennas, DC power, control signals -- *no extra cable needed.* Use 1.8-150 MHz antennas. 1500 Watts. 50-75 Ohms. 4W x2⁵/₈Hx1¹/₂D in. fully enclosed, *weather protected* outside switch box has stainless steel bracket for 1¹/₂ in. mast. 3 *Teflon*® SO-239s.

16-Element 2.4 GHz WiFi Yagi

MFJ-1800 $29.95

16-element WiFi Yagi antenna greatly extends range of 2.4 GHz, 802.11b/g WiFi signals. Turns slow/no connection into fast, solid connection. Highly directional -- minimizes interference. N-female connector. Tripod screw-mount. Wall/desk/shelf mounts. Use vertically or horizontally. 18Wx2³/₄Hx 1¹/₄D in. 2.9 oz.

MFJ-5606SR, $24.95. Cable connects MFJ-1800/WiFi antennas to computer. Reverse-SMA male to N-male, 6 ft. RG-174.

MFJ-5606TR, $24.95. Same as MFJ-5606SR but Reverse-TNC male to N-male.

Glazed Ceramic Insulators

MFJ-16C06, $4.56, package of 6 authentic *glazed ceramic* antenna insulators. Extra-strong -- long antennas will not break, will not arc over or melt under full legal power. Extra-long ridges prevent high-voltage breakdown. Smooth wire holes prevent wire damage.

Dealer/Catalog/Manuals

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Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's new adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them in the palm of your hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

MFJ's 25 Amp *MightyLite*™ weighs just 3.7 lbs. -- that's *5 times lighter* than an equivalent conventional power supply. MFJ's 45 Amp is even more dramatic -- *8 times lighter* and weighs just 5.5 pounds!

No RF hash!

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either!

Some competing switching power supplies generate objectionable RF hash in your transmitted and received signal.

These super clean MFJ *MightyLites*™ meet all FCC Class B regulations.

Low Ripple . . . Highly Regulated

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

Fully Protected

You won't burn up our power supplies!

← MFJ-4225MV
25 Amp
$149.95 plus s&h

MFJ-4245MV →
45 Amp
$199.95 plus s&h

No RF Hash!

They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

MightyLites™ . . . Mighty Features

Front-panel control lets you vary output from 9 to 15 Volts DC.

Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

Brightly illuminated 3 inch meters let you monitor load voltage and current.

A whisper quiet internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D in.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¾Hx9D in.

New! **MFJ-4175, $359.95.** 75 Amps *continuous*. 13.8-14.2 VDC. 7.8 pounds. 6½Wx3½Hx10D inches.108-132 VAC. *No RF hash!*

NEW! 25 Amp *MightyLite*™

MFJ-4125
25 Amp
$109.95 plus s&h

Super light, super compact switching power supply delivers 25 Amps maximum/22 Amps continuous at 13.8 Volts DC. Low ripple, highly regulated. ***No RF Hash!*** Five-way binding posts for high current. Quick connects for accessories. Over voltage/current protection. 110 or 220 VAC operation. Meets FCC Class B regs. 2.86 lbs. 5¾Wx3Hx5¾D inches.

MFJ 35/30 Amp Adjustable Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

MFJ's heavy duty conventional power supply is excellent for powering HF or 2 Meter/440 MHz transceiver/accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

MFJ-4035MV
$149.95

You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for accessories and a covered cigarette lighter socket for mobile accessories.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾D inches.

MFJ *High Current* Multiple DC Power Outlets

Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

MFJ-1118
$84.95 plus s&h

six or more accessories from your transceiver's main 12 VDC supply.

MFJ-1116
$59.95 plus s&h

Two pairs of super heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total.Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator.

MFJ-1112
$44.95 plus s&h

Built-in 0-25 VDC voltmeter. Six feet super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs. Heavy duty aluminum construction. 12½x2¾x2½ in.

MFJ-1117
$64.95 plus s&h

MFJ-1118, $84.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet.* Lets you power two HF and/or VHF transceivers and

MFJ-1116, $59.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $44.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

MFJ-1117, $64.95. For powering four HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. Tiny 8x2x3 inches.

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MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"What did you say?" ***Can you hear but . . . just can't always understand everything people are saying?***

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

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Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$199.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null ***wipes out*** noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ ***tunable*** Super DSP filter

MFJ-784B
$279.95

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You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

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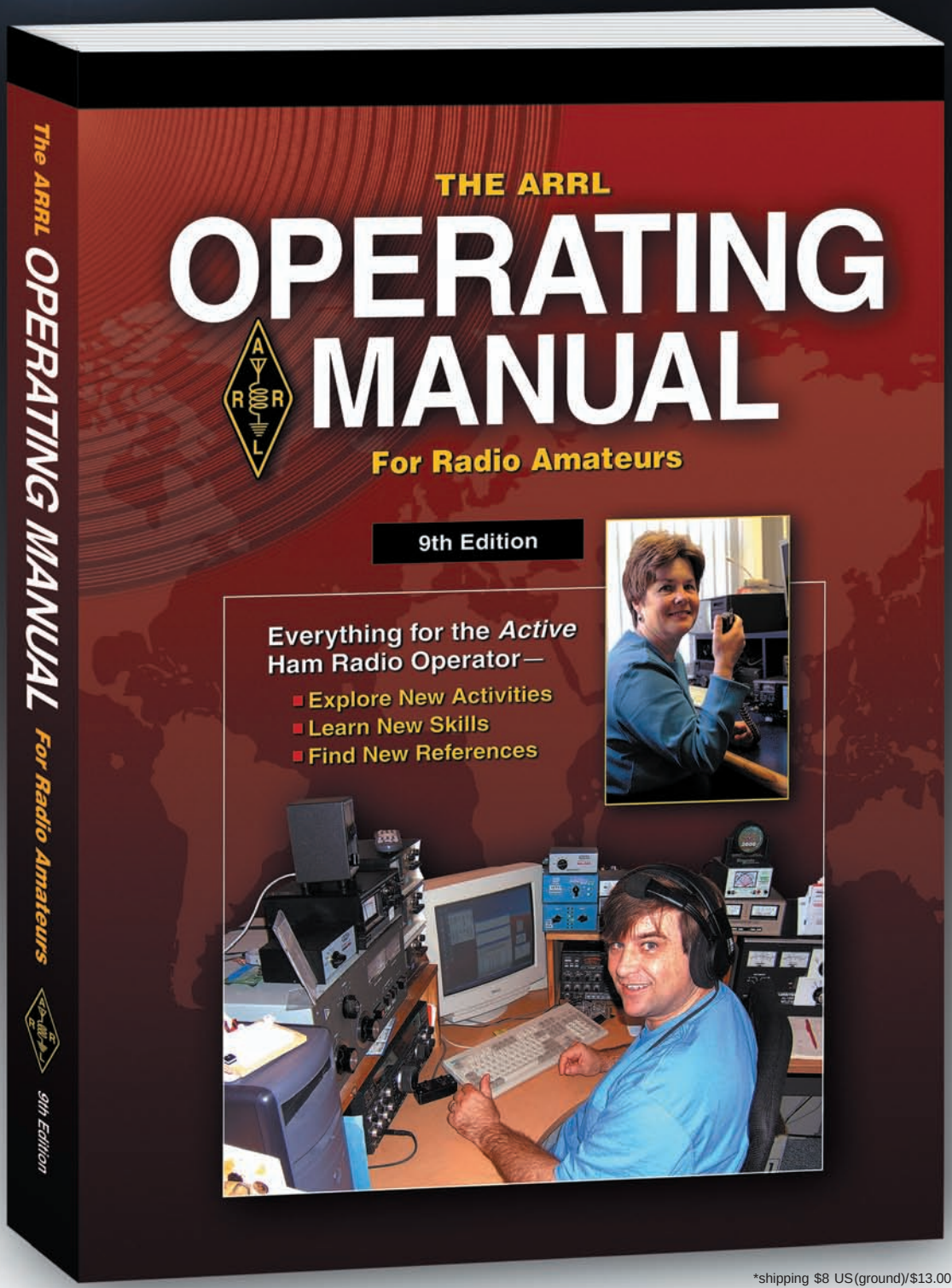

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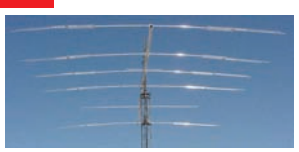

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