QST

Official Journal of ARRL The national association for AMATEUR RADIO

Devoted entirely to **Amateur Radio**

www.arrl.org

July 2008

QST reviews:

FlexRadio Systems FLEX-5000A HF/50 MHz Transceiver

Inside:

Use Window and Ladder Line for Multiband Success

A 15 Meter Portable Yagi

2008 Hamvention Wrapup

Legislative Action Program Update

Summer—The Perfect Time of Year to Take Ham Radio with You!

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D-STAR MOBILES

Dual display

Diversity reception with band scope

Select your favorite display color, adjustable from amber to green

DIGITAL

D-STAR optional

NEW IC-2820H

D-STAR UPGRADEABLE 2m & 70cm

50/15/5W RF Output Levels • Right Band RX: 118-173.99, 375-549.99, 810-999.99MHz*; Left Band RX: 118-549.99MHz* • Analog/Digital Voice with GPS (Optional UT-123) • 500 Alpha-numeric Memories • Diversity Receive Capable

GEE, I WISH MY OWNER WOULD GET ME A...

UT-123

GPS MODULE AND ANTENNA

ID-1

GO DIGITAL ON 1.2GHz

10 Watt • High Speed Digital Data, Digital Voice, Analog Voice (FM) • Wireless Internet/Network Capable • PC Control via USB Port • Digital Callsign & Digital Code Squelch

ID-800H

GO DIGITAL ON 2m & 70cm

55 Watt VHF/50 Watt UHF • Wide RX: 118-173, 230-549, 810.999 MHz* • Analog/Digital Voice & Data • Callsign Squelch • CTCSS & DTCS Encode/Decode w/Tone Scan

D-STAR optional

IC-2200H

DIGITAL UPGRADEABLE FOR 2m

65 Watt • 207 Alphanumeric Memories • Digital Voice & Data w/Optional UT-118 • Optional Callsign Squelch • CTCSS & DTCS Encode/Decode w/Tone Scan • Weather Alert

AMATEUR | AVIONICS | LAND MOBILE | MARINE | RECEIVERS | SYSTEMS

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

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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

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- 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!

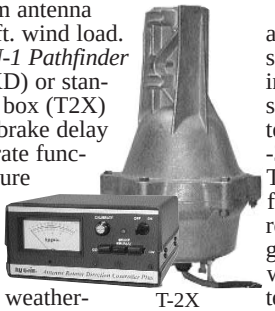
HAM-IV

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



T-2X
$699.95

T-2XD
$1129.95
with DCU-1

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

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

CD-45II

CD-45II
$389.95

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

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

HAM-V

HAM-V
$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

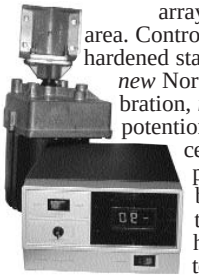
AR-40
$289.95

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
$69.95

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

RBD-5
$29.95

NEW! Automatic Rotator Brake Delay

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

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MINI COOPER SHOWN WITH CP-5M UNIVERSAL LIP MOUNT ON THE DOOR EDGE.

All the mounts attach to van doors, truck side doors, SUV doors, etc... and require no holes. Includes 16' 6" deluxe cable assy w/18" mini RG-1888A/U type coax for weather seal entry.

Choose a mount depending on the antenna size and vehicle mounting location space.

For Small Antennas & Limited Space

MODEL / ANT CONN / COAX CONN

Maldol **EM-5M** SO-239 / PL-259
Footprint: 1.1"x .75"
Max Antenna: 40"

For Medium Size Antennas

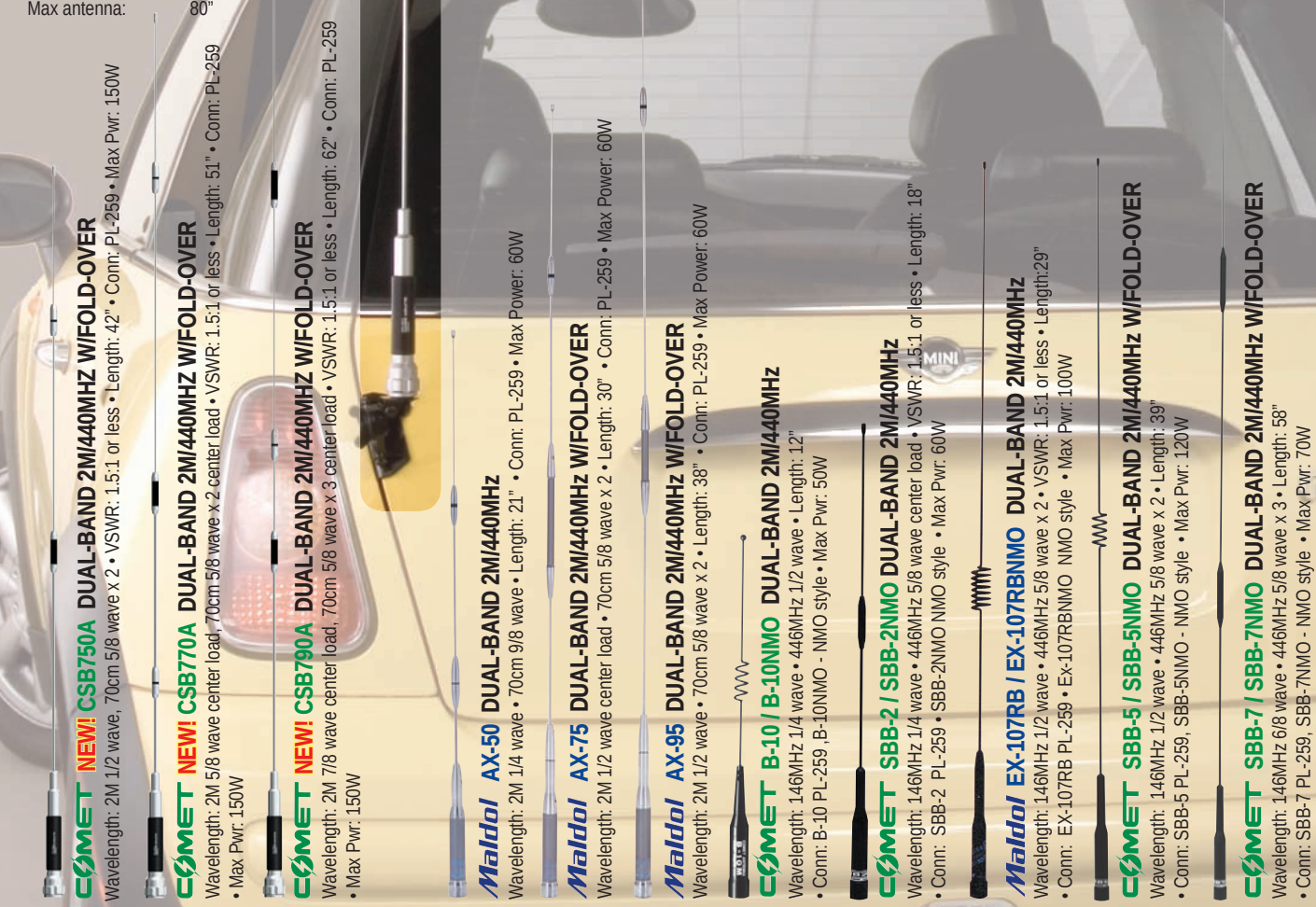
MODEL / ANT CONN / COAX CONN

COMET **CP-5M** SO-239 / PL-259
COMET **CP-5NMO** NMO / PL-259
Footprint: 3.4" x 1.25"
Max Antenna: 60"

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

COMET **HD-5M** SO-239 / PL-259
COMET **HD- 5 3/8-24** 3/8-24 / PL-259
Footprint: 3.75" x 1.1 "
Max antenna: 80"



COMET **BNC-24** **DUAL-BAND 2M/70CM HT ANTENNA** RX range: 100-1200MHz
• Wavelength: 2M 1/4 wave • 440MHz 1/2 wave • Length: 17" • Conn: BNC Super flexible featherweight whip

COMET **SMA-24** **DUAL-BAND 2M/70CM HT ANTENNA** RX range: 100-1200MHz
• Wavelength: 2M 1/4 wave • 440MHz 1/2 wave • Length: 17" • Conn: SMA Super flexible featherweight whip

COMET **SMA-503** **DUAL-BAND 2M/70CM HT ANTENNA** RX range: 100-1200MHz
• Length: 8.75" • Conn: SMA

Maldol **MH-209** *(BNC Conn)* **MH-209SMA** *(SMA Conn)* **2M/70CM DUAL-BAND HT ANTENNAS**
3" length, soft rubber cover. Good performance in a small package!

COMET **NEW! CSB750A** **DUAL-BAND 2M/440MHZ W/FOLD-OVER**
Wavelength: 2M 1/2 wave, 70cm 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 42" • Conn: PL-259 • Max Pwr: 150W

COMET **NEW! CSB770A** **DUAL-BAND 2M/440MHZ W/FOLD-OVER**
Wavelength: 2M 5/8 wave center load, 70cm 5/8 wave x 2 center load • VSWR: 1.5:1 or less • Length: 51" • Conn: PL-259 • Max Pwr: 150W

COMET **NEW! CSB790A** **DUAL-BAND 2M/440MHZ W/FOLD-OVER**
Wavelength: 2M 7/8 wave center load, 70cm 5/8 wave x 3 center load • VSWR: 1.5:1 or less • Length: 62" • Conn: PL-259 • Max Pwr: 150W

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

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

Maldol **AX-95** **DUAL-BAND 2M/440MHz W/FOLD-OVER**
Wavelength: 2M 1/2 wave • 70cm 5/8 wave x 2 • Length: 38" • Conn: PL-259 • Max Power: 60W

COMET **B-10 / B-10NMO** **DUAL-BAND 2M/440MHz**
Wavelength: 146MHz 1/4 wave • 446MHz 1/2 wave • Length: 12"
• Conn: B-10 PL-259 ,B-10NMO - NMO style • Max Pwr: 50W

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

Maldol **EX-107RB / EX-107RBNMO** **DUAL-BAND 2M/440MHz**
Wavelength: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • VSWR: 1.5:1 or less • Length:29"
• Conn: EX-107RB PL-259 • Ex-107RBNMO NMO style • Max Pwr: 100W

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

COMET **SBB-7 / SBB-7NMO** **DUAL-BAND 2M/440MHz W/FOLD-OVER**
Wavelength: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 58"
• Conn: SBB-7 PL-259, SBB-7NMO - NMO style • Max Pwr: 70W

COMET and Maldol Mobile

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This Month in QST

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Technical

News and Features

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QST Workbench

Radiosport

OUR COVER
Summer's the time to head outdoors to do ham radio. Here, Bob Starkenburg, W4TTX, normally of Raleigh, North Carolina, seems right at home at Trappers Lake in the 265,000 acre Flat Tops Wilderness in northwest Colorado. He was taking part in the 2007 Colorado 14er Radio Event, attempting to contact stations atop 14,000 feet ASL (or higher) mountain peaks with his homebrew 2 meter Yagi. Photo by Bob Starkenburg, W4TTX. This year's event will be August 10.

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HF/VHF/UHF Portable Operation Just Got a Lot More Powerful!

FT-897D

TCXO DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

HF/VHF/UHF Multimode Mobile Transceiver, now Including Built-in DSP

FT-857D

DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

Automatic Matching for FT-897/857 Series Transceivers

FC-40

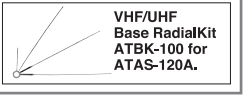
Automatic-Matching 200-Memory Antenna Tuner (160 m ~ 6 m Band)

WATERPROOF

Mobile Auto-Resonating 7~430 MHz for FT-897/857 Series Transceivers

ATAS-120A

Active Tuning Antenna System (no separate tuner required)



VHF/UHF Base RadialKit ATBK-100 for ATAS-120A.

REAL PERFORMANCE, REALLY PORTABLE

FT-817ND

HF/50/144/430 MHz
5 W All Mode Transceiver
(AM 1.5 W)

60 m Band

ATAS-25
Manually-Tuned Portable Antenna

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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 ●Adjustable Main Tuning Dial Torque ●C.S. Switch to recall a favorite Menu Selection directly ●Hand Microphone included ●IMPORTANT FEATURE FOR THE VISUAL IMPAIRED OPERATORS - Digital Voice Announcement of the Frequency, Mode or S-meter reading

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

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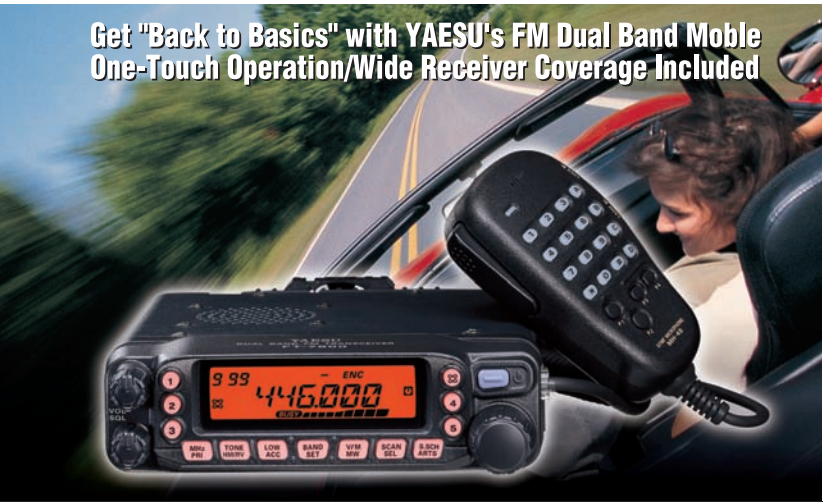
10 W 2 m/70 cm*
Dual Band FM Mobile
FTM-10SR *70 cm 7 W

Great New Features to Support Outdoor Motor Sports Activities Mobile Transceiver... Great Appearance ... Easy to Operate

DUAL BAND

50 W 2 m/70 cm*
Dual Band FM Mobile
FTM-10R *70 cm 40 W

Get "Back to Basics" with YAESU's FM Dual Band Moble One-Touch Operation/Wide Receiver Coverage Included



DUAL BAND

50 W 2 m/70 cm* Dual Band FM Mobile
FT-7800R *70 cm 40 W

50 W 2 m Ultra Rugged VHF FM Mobile
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FT-8900R *70 cm 35 W

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We Win In Court!

"Last year, in the wake of Federal Communications Commission decisions that did not adequately protect licensed radiocommunication services from interference from Broadband Over Power Line (BPL) systems, the ARRL went to court to challenge the FCC."

On Friday, April 25 the United States Court of Appeals for the District of Columbia Circuit confirmed what the ARRL has been saying for years about how the FCC was handling the BPL interference issue: **FCC prejudice tainted the rulemaking process.**

In fact, the FCC's mishandling of the issue was so egregious that the Court took an unusual step: it did not defer to the Commission's presumed expertise on a highly technical issue.

The Court of Appeals found that the FCC violated the Administrative Procedure Act by not disclosing in full the staff studies on which the Commission relied. Writing for the three-judge panel that heard *American Radio Relay League, Incorporated v. FCC and USA*, the ARRL's petition for review of the FCC's Orders in ET Docket No. 04-37, Circuit Judge Judith W. Rogers said: "It would appear to be a fairly obvious proposition that studies upon which an agency relies in promulgating a rule must be made available during the rulemaking in order to afford interested persons meaningful notice and an opportunity for comment…**there is no APA precedent allowing an agency to 'cherry-pick' a study** on which it has chosen to rely in part…. **The League has met its burden to demonstrate prejudice** by showing that it 'ha[s] something useful to say' regarding the unredacted studies…that may allow it to 'mount a credible challenge' if given the opportunity to comment….Under the circumstances, the Commission can point to no authority allowing it to rely on the studies in a rulemaking but hide from the public parts of the studies that may contain contrary evidence, inconvenient qualifications, or relevant explanations of the methodology employed….no precedent sanctions such a 'hide and seek' application of the APA's notice and comment requirements." [Emphasis added.]

In a concurring opinion, Circuit Judge David S. Tatel wrote: "[I]n this very case the Commission redacted *individual lines* [emphasis in original] from certain pages on which it otherwise relied….there is little doubt that **the Commission deliberately attempted to 'exclude[ ] from the record evidence adverse to its position'** [emphasis added]…."

The Court also found that the Commission failed to justify its decision to apply an "extrapolation factor that was designed to accommodate technologies different in scale, signal power, and frequencies used" to Access BPL and that it "summarily dismissed…empirical data that was submitted at its invitation." The Court found that the FCC's Reconsideration Order "…provides neither assurance that the Commission considered the relevant factors nor a discernable path to which the court may defer."

While the Court did not agree with us on every point, it found that the FCC's decision-making process was seriously flawed. The Court concluded, "On remand, the Commission shall afford a reasonable opportunity for public comment on the unredacted studies on which it relied in promulgating the rule, make the studies part of the rulemaking record, and provide a reasoned explanation of its choice of an extrapolation factor for Access BPL systems." In explaining its choice of an extrapolation factor the Commission must either "provide a reasoned justification for retaining an extrapolation factor of 40 dB per decade for Access BPL systems sufficient to indicate that it has grappled with the 2005 studies [three published studies suggesting that an extrapolation factor of 20 dB per decade may be more appropriate — *Ed.*], or adopt another factor and provide a reasoned explanation for it."

You can read the entire decision in *American Radio Relay League, Incorporated v. FCC and USA* at **pacer.cadc.uscourts.gov/common/opinions/200804/06-1343-1112979.pdf**.

The Court's decision is a tremendous victory for radio amateurs and other licensed users of the radio spectrum — indeed, for anyone who cares about the integrity of the federal administrative process. Yet, the remand does not guarantee that the FCC will correct its errors. We face another round of technical arguments. No doubt the FCC's technical staff, many of whom want to do the right thing, will remain under heavy pressure to ignore the laws of physics and give preference to wishful thinking once again. When the FCC reopens the BPL proceeding as the Court has ordered, we must leave no room for these technical issues to be settled on anything other than technical grounds. There's more work to do!

While all this was going on, the ARRL technical staff — principally Ed Hare, W1RFI — was working quietly with the BPL industry, persuading them that it was in their best interest to fix the interference problem. To their credit, the leading companies have taken the problem seriously and have gone beyond what the FCC rules require. But it took great effort, including our frontal assault on the flawed FCC proceedings, to get their attention.

The responsible BPL companies have shown they can do what's necessary to avoid interfering with Amateur Radio. FCC rules requiring all BPL companies to take these steps will protect them from irresponsible competitors.

BPL received another blow on May 1 when it was announced that the largest BPL deployment to date, in Dallas, would not be used to offer Internet service but would be used only to monitor the power distribution network. The Associated Press report began, **"Goodbye, broadband over power lines. We hardly knew you."** Thus the marketplace has added its verdict to that of the Court of Appeals.

This good news notwithstanding, **the ARRL will not rest** until the FCC rules give licensed radiocommunication services the protection they are entitled to under international agreements and federal law.

Even as we celebrate these dual verdicts, we cannot afford to become complacent. Our access to the radio spectrum is much too important to allow us that luxury.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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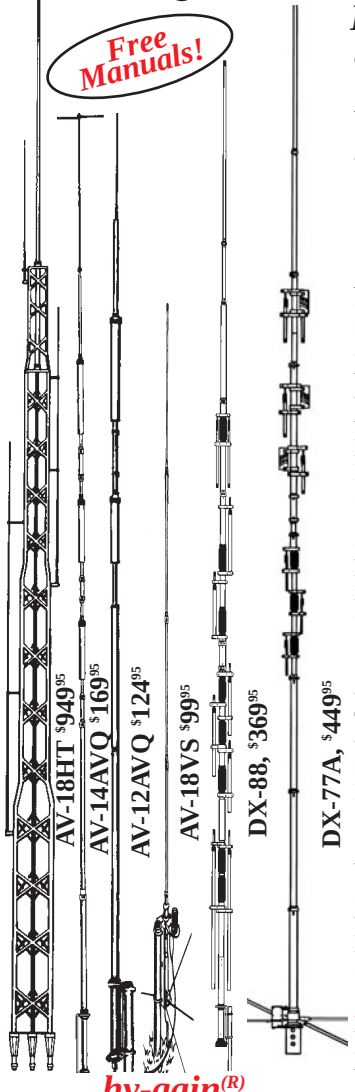

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Standing 53 feet tall, the famous *Hy-Gain HyTower* is the world's best performing vertical! The AV-18HT features automatic band selection achieved through a unique stub-decoupling system which effectively isolates various sections of the antenna so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

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

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

AV-18VS, $99.95. (10,12,15,17,20,30,40,80 Meters). 18 ft., 4 lbs. **High** quality construction and low cost make the AV-18VS an exceptional value. Easily tuned to any band by adjusting feed point at the base loading coil. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

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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
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$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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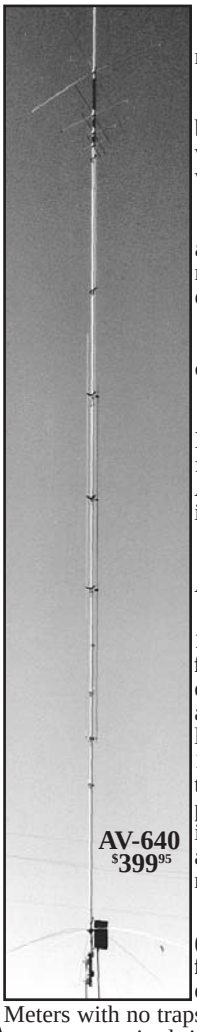

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AV-620, $299.95. (6,10,12,15,17,20 Meters). 22.5 ft., 10.5 lbs. The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

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

Optional, YAESU Exclusive, Fully-Automatic μ -Tuning Preselector System!

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.

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- *New gear, old friends, the seemingly endless flea market:* Dayton Hamvention, featuring ARRL EXPO, was held May 16-18. A wrap-up appears in the article beginning on page 49.
- In late April, the US Court of Appeals for the District of Columbia Circuit decided in the ARRL's favor on two major points in the ARRL's Petition for Review of the FCC's Orders adopting rules governing broadband over power line (BPL) systems. See Happenings beginning on page 57.
- Ham radio was part of the response to the massive May 12 earthquake in Sichuan Province, China.
- Special Event stations for the 2008 Beijing Olympic Games began operating May 18 and will be on the air through September 17.
- Ronald A. Parise, PhD, WA4SIR, passed away May 9 at age 57. He flew as a payload specialist on two space shuttle missions: STS-35 on *Columbia* in December 1990 and STS-67 on *Endeavour* in March 1995.
- In separate decisions, the FCC denied two Petitions for Rulemaking, one having to do with digital spectrum issues and the other concerning additional spectrum for more repeaters, including digital systems.
- The Army, Air Force, Navy, Marine Corps and Coast Guard co-sponsored the annual Military/ Amateur Radio Crossband Communications Test May 10.
- News reports indicate that a potential Dallas-area BPL provider is selling its network to a regulated electric distribution and transmission company that will not be providing BPL service.
- The winner of the *QST* Cover Plaque Award for April is Jim Oberhofer, KN6PE, for his article "Outpost: Packet Radio for Emergency Messaging."
- ARRL DXCC Manager Bill Moore, NC1L, reports that the 2006 and 2007 YA/LY1Y operations in Afghanistan have been approved for DXCC credit.
- Ten satellites reached orbit April 28 aboard an Indian PSLV-C9 rocket carrying six CubeSat research satellites, all of which communicate using Amateur Radio frequencies.
- The following conventions were held during May: Midwest Division, South Sioux City, Nebraska; EMCOMMWEST, Reno, Nevada; South Carolina Section, Spartanburg; Alabama State, Birmingham; Wyoming State, Casper; Atlantic Division, Rochester, and the Northwestern Division, Seaside, Oregon.
- These online course sessions began June 6, 2008: Technician License Course (EC-010); Amateur Radio Emergency Communications Level 1 (EC-001); Radio Frequency Interference (EC-006); Antenna Design and Construction (EC-009); Analog Electronics (EC-012), and Digital Electronics (EC-013)

Media Hits

Allen Pitts, W1AGP

- The Federal Court decision remanding the FCC's rules on BPL is still getting coverage and made the news in many places. Among them were CNN news, CNet News.com, *Ars Technica* (Boston), *RCR Wireless News* (Golden, CO), *Radio World* (Alexandria, VA), *MRT* magazine (Chicago) and more.
- One of the major national hits in the past month had to be John Kanzius, N3TUP, on *60 Minutes* and again on the CBS *Early Show* April 13 and 14. Other media hits emphasizing the technology of Amateur Radio were found in stories of ARISS contacts. Among these were Rob Jennings' article in the Morristown, NJ *Daily Record* and the *Star-Ledger* (Newark, NJ) plus the *Independent Press* (New Providence, NJ) article on astronaut Garrett Reisman contacting Parsippany's Central Middle School.
- Seattle ACS got some great video coverage on the local Seattle channel. It is pretty hard to beat hearing Seattle's Emergency Services Director Barb Graff say "These (hams) are the people I can count on." Meanwhile, Chet Hallberg, KØTCB, got a double hit on KMBC-TV 9 in Kansas City early May discussing Amateur Radio and plans for a SET drill based on a New Madras earthquake. The Ak-Sar-Ben Radio Club in Omaha scored hits on local TV stations, including the WOWT news lead for the day, by aiding in emergency siren testing for the area.
- Lawton, OK hams and the emergency capabilities of the W5KS Club were featured on KSWO-TV while *The Star* (Shelby, NC) reported on Dewey Cook, KJ4BYU, the county's Emergency Management Director, and his use of ham radio. On April 28 the Fort Dodge, IA *Messenger* praised area hams and Chris Lewis, N9RPZ, while the Salon, IA *Gazette* added to the praise of ham weather spotters on May 3 as did the Tasley, VA *Eastern Shore News* on May 3 and the *Record Chronicle* (Denton, TX).
- *The Athens Messenger* (Athens, OH) had a major front page article on Professor John McCutcheon, N8XWO, and Drew McDaniel, W8MHV, while Centereach's "Radio Central" ARC celebrations for Marconi's birthday were noted in the *Times Beacon Record* (LI, NY) and in *Suffolk Life* (Riverhead, NY). The Kishwaukee ARC's Ed Duy, W9QDK, scored a hit in the DeKalb, IL *Daily Chronicle*.
- Three of the best hits for the period were *The Huntsville Times* (Huntsville, AL) coverage of Drake Technical College and President McAlpine's promotion of ham radio as a teaching tool; *The Atlanta Journal* (GA) article May 2 on the ham radio roots of Hewlett-Packard and the multimedia coverage of our own PR guru Bill Morine, N2COP, as the old battleship USS *North Carolina* (decomissioned) made historic radio contact with the "brand new kid on the block," the submarine USS *North Carolina*.

Kansas Passes PRB-1 Law

On April 9, 2008, Kansas Governor Kathleen Sebelius signed House Bill 2805, the Kansas Emergency Communication Preservation Act, into law. PRB-1 or HB 2805 does not set new legal precedent; it simply ensures that Kansas state law reflects the federal rules regarding Amateur Radio stations.

Our thanks go to state Representatives Arlen Siegfreid (R-15) and Jim Morrison (R-121). There's more information at **hamsforkansas.org**. — *JD Spradling, KCØNYS*

OFFICE OF THE GOVERNOR OF KANSAS

Kansas Governor Sebelius signs HB 2805: From the right — Senator Apple; Brian Short, KCØBS; JD Spradling, KCØNYS; Steve Carriger, WAØVRS; Bruce Cassida, WØSPC; Senator McGinn and State Representative Arlen Siegfreid.

Ham Contact Aboard New Sub

The Navy's newest attack submarine, *North Carolina* (SSN 777) was the site of a ham radio contact between Captain Mark E. Davis and Captain (Ret) David Scheu, executive director of Battleship *North Carolina*, which saw action during WWII. The battleship now serves in Wilmington, North Carolina as a memorial for all North Carolinians killed in World War II.

US NAVY PHOTO BY MASS COMMUNICATION SPECIALIST 2ND CLASS ROADELL HICKMAN

Onboard the new sub, from the left: **John Rendelman, WWAY-TV3 reporter; Ricky Tharrington, KD4JRX, Director of Security for the North Carolina State Ports (partially obscured); Ed Redington, W4EBR, president of the Azalea Coast Amateur Radio Club; Captain Davis and Bill Morine, N2COP, a member of the ARRL Public Relations Committee.**

Inside HQ

New Licensing Materials

Education is one of the ARRL's five strategic pillars. Our mission is to develop quality instructional materials that help prospective and existing operators obtain or upgrade their Amateur Radio licenses.

Since the elimination of the code requirement, there has been an increased interest in obtaining General class and Amateur Extra class licenses. Although we currently publish the printed *General Class License Manual*, we have created a new *General Class License course* on a CD-ROM. Educational specialists developed this course and it is quite different from our other online courses.

We deliberately chose to offer this course on CD, rather than online. Through research, feedback from members, and reviewing training techniques used in other industries, Debra Johnson, K1DMJ, Manager of Educational Services and her staff, determined that many of you like to learn at your own pace and time and find even the constraint of a specific online class session too restrictive. We have also learned that online courses with multimedia content are not an option for those members who do not have access to high speed Internet service. A CD-ROM will work on almost every modern computer. We may offer this course online in the future, but for now we are only offering it on a CD.

Our research also told us that we should align the content of these courses with our current license manuals. This CD based course was designed to complement the current *General Class License Manual.* The chapters on the CD course closely track the chapters in the printed manual. If you don't own the current manual, its content is reproduced on the CD in pdf format.

The course is divided into 35 learning units, each with knowledge checks and unit quizzes using questions from the General Class Question Pool. Lesson content includes visual animations, illustrations and audio files that demonstrate fundamental radio principles. There is also a practice test tool that provides randomly generated exams. Based on feedback from users, we have included an easy to use glossary of terms that is similar to the *Hamspeak* column here in *QST*.

If you are interested in obtaining your Amateur Extra class license, we have just published a new *Extra Class License Manual*, written by Ward Silver, NØAX. It contains all 738 questions in the new Extra Class Question Pool. This question pool becomes effective July 1, 2008, and will be in effect until June 30, 2012. At 496 pages, it is the largest licensing manual we have ever produced. Although we believe that most amateurs who upgrade to Extra class study on their own, due to the complexity of material in the Extra class question pool, we do not plan to publish an interactive Extra class license course. However, we are considering an Extra class Web-based study forum where amateurs who are studying on their own can post questions and receive guidance from instructors. Let us know what you think!

73,

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

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The American Radio Relay League, Inc.

The American Radio Relay League, Inc. is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communication in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every three years by the general membership. The officers are elected or appointed by the directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," the ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A *bona fide* interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US.

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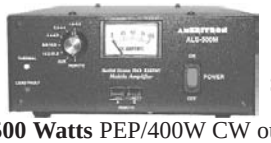

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Up Front in QST

New Ham Radio Station aboard the Coast Guard Cutter *Mackinaw*

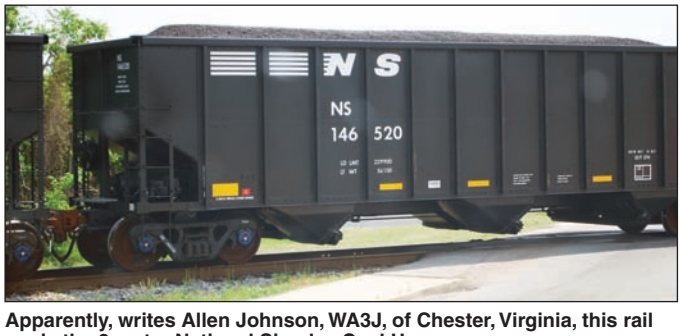
The Charlevoix, Cheboygan, Emmet Counties Public Service Communications Organization (CCECPSCO), a Northern Michigan Amateur Radio emergency communications organization, will be installing a full-time ham radio station aboard the Icebreaker *Mackinaw*, which now serves as a maritime museum in Mackinaw City. In addition to HF, the station will include two repeaters to provide VHF and UHF handheld coverage in the Straits of Mackinaw, a popular Northern Michigan vacation destination.

Launched in 1944, the 290 foot *Mackinaw*, the world's most powerful icebreaker for more than 30 years, joins the *Queen Mary* and Battleship *New Jersey* in a short list of museum ships with active Amateur Radio stations onboard. Members of the CCECPSCO are helping to restore and maintain the ship's communications systems including the two Coast Guard Sunair RT-9000 HF radios with matching vertical antennas and auto-tuners.

The *Mackinaw*'s ham station will operate under the W8AGB call, which was selected to commemorate the ship's WAGB-83 designation. Licensed Amateur Radio operators are invited to visit the Icebreaker *Mackinaw* Maritime Museum and operate the ship's radio station when staffed by a CCECPSCO member. For more information, contact the CCECPSCO at **info@ccecpsco.org**. — *Chuck Scott, N8DNX*

On the plank: **From left to right — John Wilcox, KC8OAZ; Bill Dunstan, KD8CNS; Chuck Brew, N8NXP; Rick Jersey, KC8TU; Bob Still, KD8CYQ; Chuck Scott, N8DNX; Tom Swiger, WA8AA; Ralph Mueller, WB8TBL, and Mike Cleary, W8VPC.**

ALLEN F. JOHNSON, WA3J



Apparently, writes Allen Johnson, WA3J, of Chester, Virginia, this rail car is the 2 meter National Simplex Coal Hopper.

A Window Blind Antenna

Rob Lytle, N3FT

One day I was trying to get into a far away 2 meter repeater and thought that the metal blinds were blocking my signal. Sure enough, they were. I pulled them all the way up and then I was into the repeater full quieting.

But then I thought — why not use these RF nuisances for something useful like an antenna. It was a total shot in the dark, but I found that on 40, 30 and 20 meters the "Window Blind" antenna way outperforms a much larger antenna. After doing some simulation it finally dawned on me what was happening — the small dipole was driving the long cable TV lines a few feet outside my window. *EZNEC* confirmed that it was possible.

Note that the antenna is very close to resonance on 6 meters. The inductor you see, around 6.9 μH, eases tuning.

ROB LYTLE, N3FT

Portland, Oregon electrical engineer Rob Lytle, N3FT, decided to load up his metal blinds — and it worked!

EmComm System Serves Medical Needs in Sri Lanka

Hemantha Gamage, 4S7HG

With funding assistance from the Medical Amateur Radio Council (MARCO — **www.smbs.buffalo.edu/med/marco/**), I have completed an emergency radio communication system for the Gampaha District in Sri Lanka. This system operates with a base station installed at Gampaha regional hospital. Radio communications equipment is provided to ambulances in the hospital and the ambulances of other peripheral hospitals.

This kind of system is especially useful following disasters, when ordinary telephone systems become congested. Our system showed its effectiveness on April 6 following a bomb blast with rapid response from the ambulance team. The hospital authorities appreciated the new system, which helped to save lives.

I wish to expand this program, hopefully as part of the government's disaster management program.

HEMANTHA GAMAGE, 4S7HG

Hemantha Gamage, 4S7HG, of Battaramula, Sri Lanka, has set up an emergency communications system using Amateur Radio that connects a regional hospital with its ambulances and those of other hospitals.

One of the ambulance drivers who can now communicate with his hospital via Amateur Radio. The project was funded by MARCO, a group of US-based physician/hams.

DON KARVONEN, K8MFO

Incoming QSL Cards Cause for Flight

The "G desk" at the 8th Area ARRL Incoming QSL Bureau does not sneeze at innovation. We accept PayPal for purchasing credits and have had people drive to the house to pick up their cards. We recently experienced a first. When Dennis Sokol, WØJX, heard that I had just received a bunch of new cards for W8GD, the Polish White Eagle Radio Club, for which he is trustee, he immediately swung into action. He knew there was a private airstrip 3 miles from my house, so he arranged for me to meet him when he touched down in his Cessna. He was pleased with the cards, several from 5A7A, and most from Poland! — *Don Karvonen, K8MFO*

When Dennis Sokol, WØJX, of Milan, Ohio, heard there were QSL cards for the club he serves as trustee, he flew to the Apple Creek area to pick them up from K8MFO.

JOEY TIRITILLI, N4ZUW

My new Smart car, writes Joey Tiritilli, N4ZUW, of Deerfield Beach, Florida, is equipped with an ICOM ID-800H D-STAR transceiver, Comet antenna and Big Mouth speaker.

JOEY TIRITILLI, N4ZUW

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CORRESPONDENCE

FIFTH PILLAR

♦ Please pass along to the ARRL staff and President Harrison my thanks for adding the 5th Pillar of ARRL you recently announced. We at DZKit are excited about the possibilities it holds for increasing amateur ranks with skilled electronics technicians and engineers and helping to restore US preeminence in technological fields.

BRIAN WOOD, WØDZ
Loveland, Colorado

KEEPING FIT

♦ As a big guy who pegged the scales, I can attest to your keeping fit [Inside HQ, May 2008, p 13]. Down over 100 pounds and in much better shape, I would like to point you in the US to The President's Challenge. See **www.presidentschallenge.org**. This allows individuals and groups — read ham clubs — to join up and keep track of each other's progress in exercise and physical fitness. I am sure one of those clubs trying to get back on the upswing will see this as an opportunity to get fit and hold their meetings combined with a health walk instead of the usual donut and coffee spread. And participants can enter their own personal efforts — it doesn't have to happen together. Take a walk every night with that special someone and put it down as an activity. That is all it takes to get started

Also, if you get involved in the program, this can lead you to other local organizations, and then you find yourself at a local walk-a-thon or marathon setting up a club table. Or cheering on your club as they all do the walk or run wearing ARRL and club T-shirts.

JIM SKAMARAKAS, W1SKA
Bellmawr, New Jersey

FIRST VE EXPERIENCE

♦ I had the opportunity to take the Extra class exam recently at the Mansfield (OH) Mid Winter Hamfest. This was my first experience with the VE process and, since this was an ARRL sponsored exam session, I wanted to provide some feedback. I was not sure what to expect and I've heard a number of people tell of grossly mishandled exam sessions.

Happily, this was not the case here. I had made contact with one of the VEs prior to the session and he informed me what I needed to bring, the location and time. On the day of the exam, there were a fairly large number of people taking tests, so the process of collecting and verifying information went rather slowly. One of the VEs, however, explained what was happening and why.

When this step had been completed, we were taken to a separate room and given the exams. This testing session was closely monitored by the VEs. When I finished, I was taken back to the original room and told to wait until my exam was scored. During this time, I had the opportunity to see how feedback was given to both those who passed and those who failed. Feedback was given in a sensitive but honest way and as those not passing left, words of encouragement were offered. I also observed each exam being scored by three people. On one occasion, the last scorer found a scoring error and sent the exam back through to be scored again.

All in all, I was very impressed with the thoroughness of the process. These folks need to be congratulated for the effort they put into maintaining the integrity of the VE system.

JOHN H. GINDLESBERGER, WA8FNJ
Millersburg, Ohio

GETTING THROUGH

♦ Back in February, my wife and I were traveling from Indianapolis back home to Dayton. Between Greenfield and Knightstown, we noticed a plane flying overhead. We rounded a curve by a rest stop, I put on my turn signal to pass a semi-trailer truck and he did the same and pulled in front of me. I returned to the passing lane to see what was up, perhaps another semi entering the highway from the rest area. As soon as I got back into the left lane I tested my antilock brakes! That Cessna had landed on the highway and was blocking the right shoulder, the right lane and part of the left/passing lane. I immediately backed up since there were no cars behind us, and started flagging traffic over onto the passing lane shoulder. Fortunately, nobody hit the aircraft, which had a load of aviation fuel.

During this event, I tried and tried to call 911, all to no avail. I've become complacent and experience had shown that the phone typically works in this region. But not this time! Had I had my ham radio with me, handheld or 2 meter mobile, I could have contacted somebody. In any case, about 15 minutes later the police and fire department started arriving.

My point? I knew cell phones don't work in some buildings. They don't work in canyons or ravines. They don't work in desolate areas. I never believed the commercials, the sales staff or the TV movies. But here I wasn't carrying even my handheld.

I learned my lesson! And I've been a ham for over 45 years. So those that think cell phones are always better than ham radio, think again.

EVAN ROLEK, K9SQG
ARRL Life Member
Beavercreek, Ohio

EXCITEMENT AND PLEASURE

♦ I don't write very often but I did want to take a moment and express my excitement and pleasure with the publication of your article on "The ARRL Homebrew Challenge" [May 2008, pp 33-37]. I think you got the cost right — most hams don't have a lot of extra money to spend on their hobby. And many hams like the challenge of homebrewing. I hope you'll continue to publish inexpensive homebrew projects like this one — I see this as a growing trend in our society, a willingness to experiment by gearheads and chipheads and self-made inventors. Ham radio operators are no exception.

MICHAEL FORINASH, KBØRIA
Sioux Falls, South Dakota

WHAT'S COOKING?

♦ Delighted to see the article on Field Day cooking [Jun 2008, Field Day insert]. The club I belong to, the Vienna Wireless Society, enters Field Day and does very well in the category of "Calories/QSO." We enter as a 4A station, have a great time, and eat.

DAVE WIESEN, K2VX
Reston, Virginia

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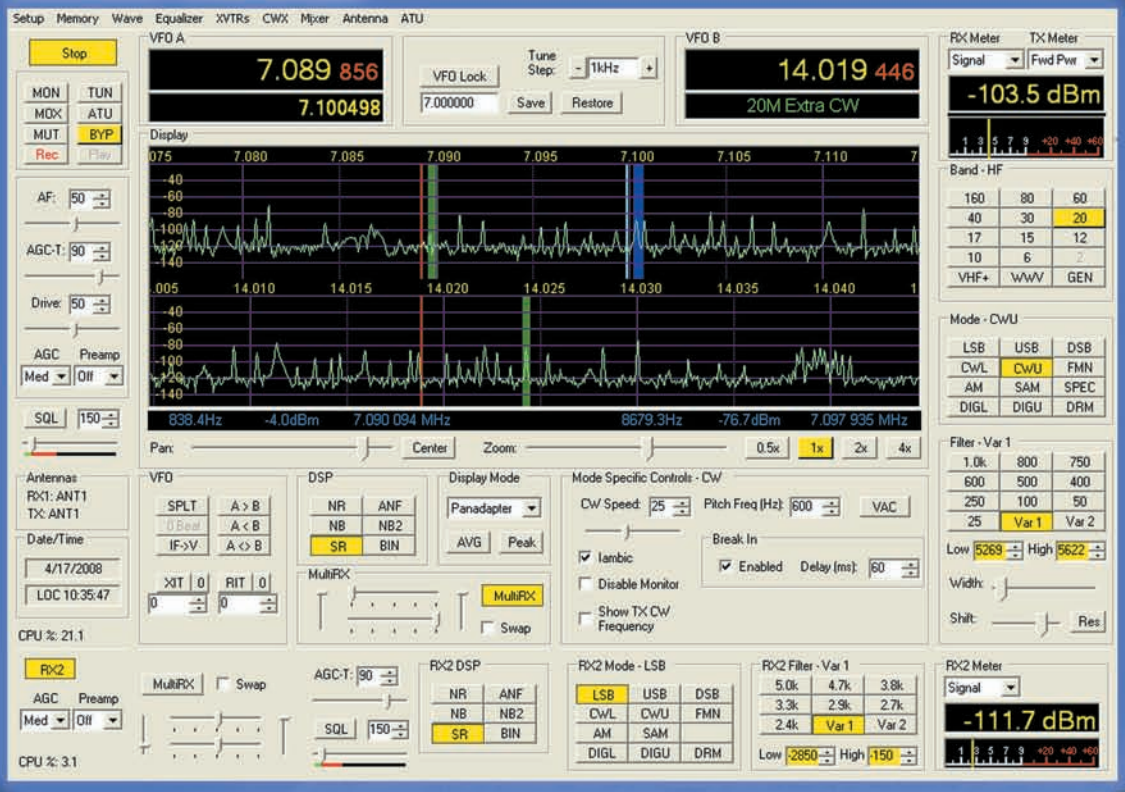

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Mode:
SSB, CW, RTTY
RF Drive:
85W typ. (100W max.)
Output Power:
HF 1kW PEP max.
50MHz 650W PEP max.
Circuit:
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Cooling Method:
Forced Air Cooling

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Mode:
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Output Power:
SSB 750W PEP max.,
CW 650W, RTTY 400W
Circuit:
Class AB parallel push-pull
Cooling Method:
Forced Air Cooling

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Recycling Old Cabinets and Chassis Boxes

Wayne Yoshida, KH6WZ

Figure 1 — A small project made with a "non-traditional" chassis: A small electrical box and blank cover. The price: 99 cents.

Here's a way to make your projects "green" and save some money at the same time. Most of us who build electronic projects know that cabinets and chassis boxes are usually among the most expensive items on a homebrew project materials list. Over the last several years, however, I have done some things to minimize project expenses.

Alternatives to the Electronic Parts Emporiums

If you use some creativity, and go to "non-electronic places" to purchase substitute cabinets, you may find something suitable, and at reasonable cost. In this case, I wanted a very small, battery powered test unit to take with me when shopping for surplus meters.[1] The housing is a small plastic electrical box and a blank cover from the hardware store as shown in Figure 1. The color is nice, the box is strong, and the best part is the price — less than a dollar!

Figure 2 is another example of a project using a nontraditional cabinet. This is an emergency power source based on a large gel-cell storage battery. The box is a sportsmans' "dry box" purchased at a marine hardware and accessory store. Similar weatherproof boxes can be found at sporting goods stores. The power source features a West Mountain Radio RIGrunner dc distribution panel for the output as well as meters to monitor battery condition. The metal wire pull handles are used to protect the meters from damage while the power unit is stowed and transported in my vehicle.

Plastic storage boxes from the office supply and stationery stores are also good alternatives for project housings. One thing to remember, however, is that plastic housings will not provide shielding. If shielding is important, a metal box is needed.

Recycle Some Aluminum

For more complex projects, I use another alternative: Recycling old cabinets from used equipment, as shown in Figure 3. I have no idea what this instrument does, but the box is incredibly nice. An aluminum case like this cannot be "homebrewed," and even if it could, the cost would be prohibitive. The price for the complete test set was $10 at a local ham radio swap meet, and I bought several. I am a little sad, however, that a perfectly working instrument, filled with amazing 1980s technology, is going to be discarded, except for a few components and its housing. Oh well, that is the price of progress, I guess.

Figure 2 — A sportsman's "dry box," found at sporting good shops, is used to house this emergency power source.

Instrument cabinets like this may have to be heavily modified in order to fit your project. If you are extremely lucky, some (or maybe all) existing holes and cutouts may be "recycled" as well. There are several solutions for recycling and customizing panels for the proper holes in used cabinets.

First, and perhaps the easiest, is to replace the panel or panels with new aluminum. The replacement panel can be a thin sheet placed over the old panel. Alternately, an entirely new panel can be made from a sheet of material matching the original panel thickness.

The best place to get aluminum for your projects is your local scrap metal yard, where you can find sheet, bar and other useful shapes of high quality aluminum at good prices. Most useful and common for chassis construction is 3003-H-14 alloy "soft aluminum sheet" in thicknesses ranging from 0.04 (3/64) inch to 0.125 (1/8) inch for relay rack panels. The 0.04 to 0.06 inch thick sheets are suitable for bending while thicker materials may bend once, then break.

I made a replacment panel for a GPS based 10 MHz refer-

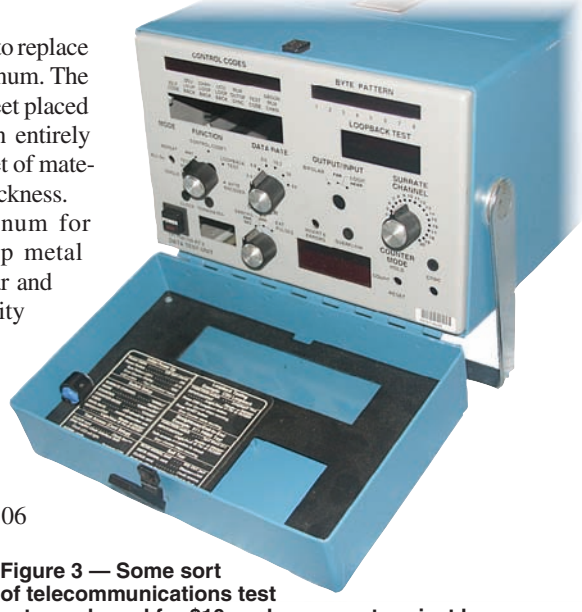

Figure 3 — Some sort of telecommunications test set, purchased for $10, makes a great project box. Some of the parts have already been removed. Too bad most of the components are going to the junk pile.

[1]W. Stanley, W4RDG, "Simple Meter Tester," *QST*, Mar 2000, p 41.

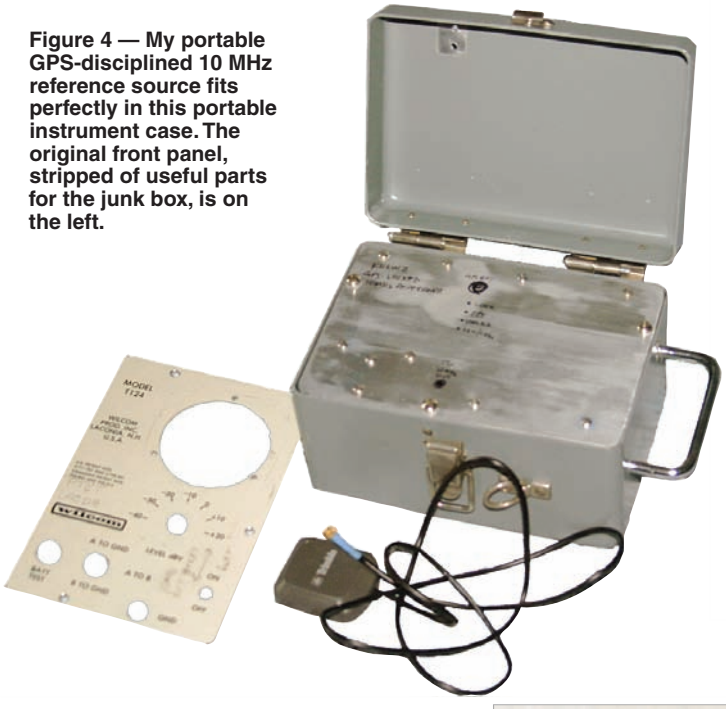

Figure 4 — My portable GPS-disciplined 10 MHz reference source fits perfectly in this portable instrument case. The original front panel, stripped of useful parts for the junk box, is on the left.

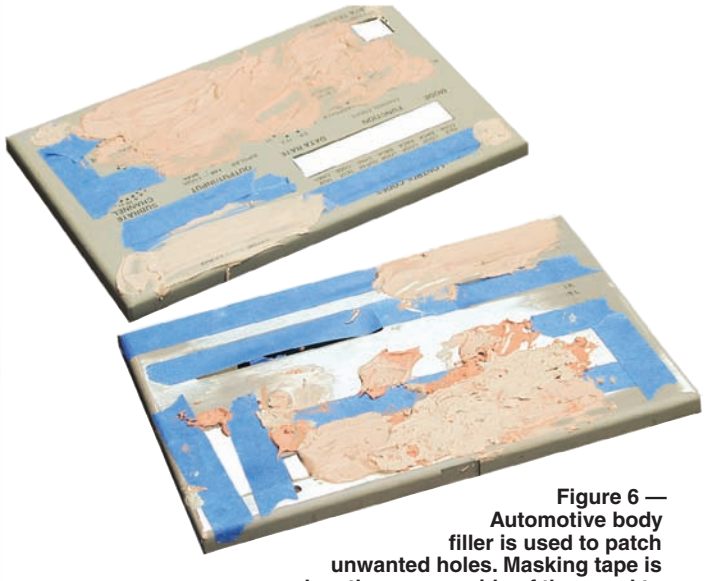

Figure 6 — Automotive body filler is used to patch unwanted holes. Masking tape is used on the reverse side of the panel to minimize "squeeze-out" of excess filler.

Figure 5 — This instrument cabinet has a front panel with a "lip" around the perimeter. This would be very difficult to duplicate, so I decided to recycle the original front panel, and customize it for a new project.

Figure 7 — A random-orbit sander and 80-grit paper grinds away excess filler and old paint efficiently. The swirls make a good surface for maximum paint adhesion.

ence source from 0.125 inch thick stock as shown in Figure 4. The small instrument case is perfect. It includes a removable lid, a carrying handle and D rings for a shoulder strap. I used the original panel as a pattern to guide my drill for the mounting holes, and cut and shaped the new panel to the exact dimensions as the original panel.

As an alternative, the original panel may be used, especially if the cabinet has certain features you want to retain, as does the box in Figure 5. Here the panel has a lip all the way around the front cover. The panel slides inside an outer shell with a carrying handle. A simple flat panel would not work for this case, since the missing lip would create a gap around the case front. I suppose a thin aluminum sheet, cut to fit within a border to keep the lip, could have worked, but I decided to use the original panel, "wrong" holes and all, and patch the unneeded holes.

Anyone Remember Auto Shop Class?

Go to your local auto parts store, and buy a small can of body filler (Bondo is one trade name), a spreader for the filler, some spray primer and paint. You can choose from a wide range of colors and even textures, including gray and white spatter paint intended for trunk interiors. Check the on sale bins, too, since you may find some good bargains on spray paints. I found some very nice General Motors Blue engine enamel at one of the stores. It is a high temperature, ceramic based paint that does not require a primer, and is very hard and durable. It was on sale! Of course, your local hardware and home center are also places to buy spray paints suitable for metal.

Use the automotive body filler to patch the unwanted holes (see Figure 6). Mix the material according to instructions, then apply the mixture to the holes. A friend who does some automotive body work mentioned that the working time for this material can be extended by mixing in less hardener, so you can tool and form the material without rushing. Applying body filler is similar to using drywall compound; thus, you *feather* the patch beyond the holes and other damage to smoothly transition into smooth material.

After the body filler is set, use a random orbit sander and 80 grit sandpaper to grind the body filler flat as shown in Figure 7. The rough grit makes the high spots go away quickly, and also removes old paint efficiently. The random swirls also create a good grabbing surface for the new

Figure 8 — This is what the patched and refinished front panel looks like. Even some of the holes were "recycled."

Figure 9 — The refinished front panel looks almost brand-new. Labels are made with Microsoft *Word* and Avery labels. My call sign on the upper right will be backlit with LEDs: green for transmit and red for receive.

paint. You may have to add another coat of body filler to fix large holes and cutouts.

Once the surfaces are sanded smooth using finer grit paper, apply a coat of primer and several coats of paint in the color of your choice. Use many light "fog coats" of paint by holding the spray can about 18 to 20 inches from the surface. This will prevent drips and also makes a slight texture on the surface. The light coating will also help subsequent layers of paint better adhere to the surface. I usually use one coat of primer and at least three coats of color paint. Once the paint is dry, it becomes difficult to see the defects. See Figure 8 for an example.

The populated front panel is shown in Figure 9. Some imperfections can still be seen, but my body repair skills are improving, and a later version of this same panel is even better. I made panel labels using a word processor and Avery weather resistant shipping labels, number 15516. My call sign on the upper right will be backlit by green LEDs to provide a little bit of show in the dark.

The completed project is a 1 W, 10 GHz transverter for a 144 MHz IF made from surplus components inside and out.

Wayne Yoshida, KH6WZ, is employed by M/A-COM, a Tyco Electronics company in Torrance, California. Licensed since 1976, Wayne is also the "Beginner's Corner" editor for CQ *magazine. Amateur Radio has had a considerable influence on his life and career. He is a past president of the UCLA Amateur Radio Group, W6YRA. His first job out of college was working at ARRL Headquarters as a Public Information Officer. Two years later, he became the regional sales manager for Amateur Radio products at a major communications equipment company. Wayne enjoys HF contesting, DXpeditioning and building microwave rigs. His most memorable ham radio experience was working in the press room at the NASA Johnson Space Center (Mission Control, Houston) during the 1983 Owen Garriott, W5LFL, operation aboard STS-9/SpaceLab-1. You can reach Wayne at 16428 Camino Canada Ln, Huntington Beach, CA 92649 or at* **kh6kine@earthlink.net**. QST

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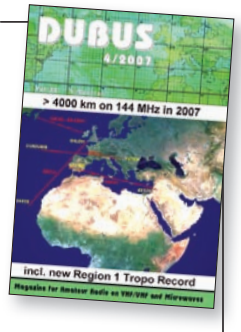


The Beauty of Spectrum Analysis — *Part 2*

Using a spectrum view as an aid to signal reception. Part 2 — Putting it to Work

John O. Stanley, K4ERO

In Part 1, we described the basics behind looking at signals in various ways using hardware and software tools.[1] In this section, we will put the applications to work solving everyday problems encountered by Amateur Radio operators.

Putting it All Together

Two terms have been used historically for understanding the correlation between types of displays. The term *time domain* is used to describe the method of the oscilloscope since it plots the observed signal versus time. *Frequency domain* is the corresponding term for the spectrum analyzer view. I haven't heard an equivalent term for the waterfall, combining as it does both time and frequency information.

Time Domain Analysis

Each method has its strengths and weaknesses. With the time domain analysis using an oscilloscope, we might be able to detect and even decode one strong CW signal if it dominated all others. We might also observe ignition noise or other types of pulses, if they were present. An AM signal would be evident if it were the strongest signal present. For a band full of many signals, one would mainly just see a mish-mash that served only to give some idea of the total energy present in the band.

Frequency Domain Analysis

With the spectrum analyzer approach, much more becomes evident. One can see how many signals are present, the frequency occupied by each and their relative amplitudes. The waterfall is even more revealing, allowing us to observe, for example, many CW signals and even copy them, as many as 40 or 50 at a time, by freezing the screen so we can look at each one separately. One can also see all manner of noise and signals: tuner-uppers, digital transmissions, PSK and RTTY signals, for example. Clear frequencies are also instantly evident.

But Why Not Use Them All

In reality, each of the three display types (oscilloscope, spectrum and waterfall) will be the most useful at some time or other. It is important to know how various signals look on each of the display types so that one can select, as available, the best method or, at least, know how to correlate the different ways of seeing the same signal. One of the most analyzed signals that has traditionally been observed in both the time and frequency domains is found in Figures 1 and 2 of Part 1. These are taken from the Modes and Systems chapter of *The ARRL Handbook for Radio Communication*.[2] Use of both the time domain display and the frequency domain display aid greatly in our understanding of how amplitude modulation works. Only in the frequency domain can one see clearly that the upper and lower sidebands and the carrier are occupying different frequencies. Only in the time domain display can we see that the total signal varies in amplitude so as to trace out the audio as the "envelope" of the wave.

AM signals usually carry complex modulation, not just a single tone as is shown in Part 1. The plot of a slice of the AM broadcast band is seen in Figure 1. This screen shot, taken from *Winrad*, a popular software defined radio (SDR) software, shows several AM stations between 830 and 860 kHz during the morning hours, as received at K4ERO.[3] WHAS in Louisville, Kentucky is one of three strong signals. Its

[1]Notes appear on page 35.

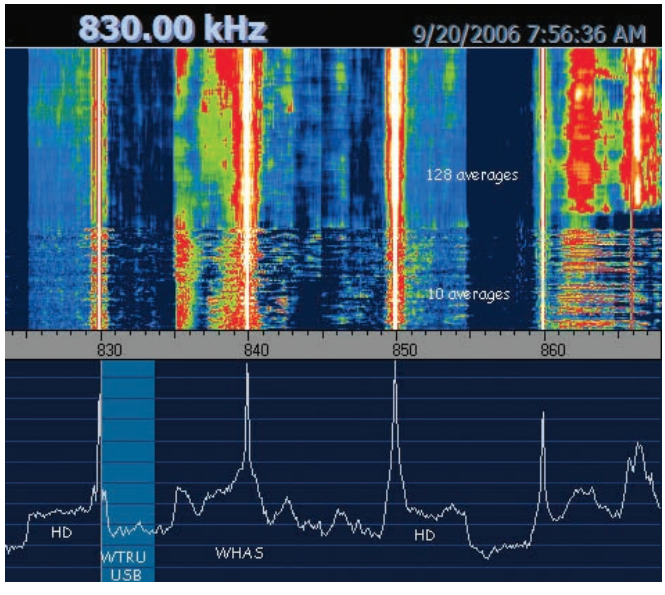


Figure 1 — A slice of the AM broadcast band using Winrad software showing several broadcast stations between 830 and 860 kHz. The waterfall display is shown above the corresponding frequency domain display.

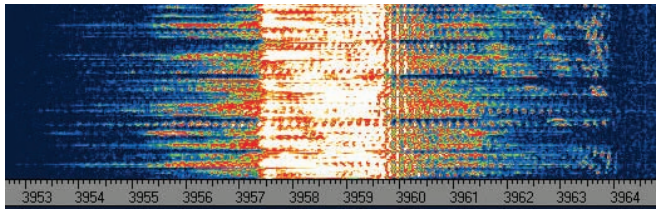


Figure 2 — Spectrum of two stations using the 75 meter band. It is clearly evident that the strong LSB station on 3960 kHz is causing interference to the station on 3964 kHz.

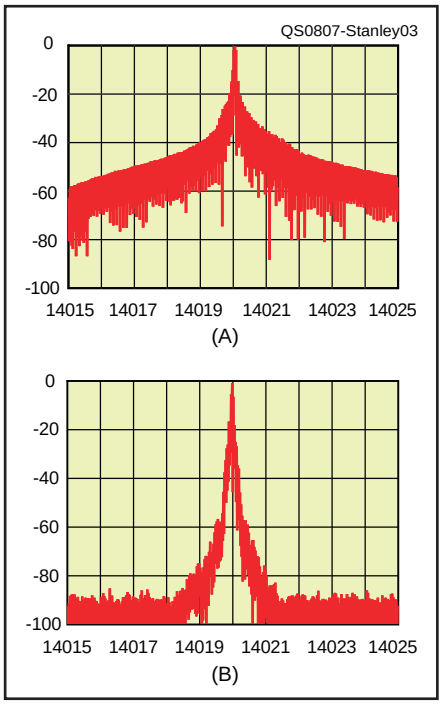


Figure 3 — Keying sideband spectrum plots of two commercial transmitters from the ARRL Lab. The spectrum at B would make a much nicer neighbor!

audio sidebands can be seen either side of the 840 kHz carrier. Especially on the waterfall display, it can also be noted that digital signals extend from 825 to 830 kHz and from 850 to 855 kHz. These are high definition (HD) digital sidebands from WHAS. Note that the stations on 830 and 850 kHz are receiving interference from these digital signals to the point that no reception is possible using an ordinary AM receiver. However, by using a communications receiver with SSB capability, one can receive these stations quite nicely by using only the sideband that is not covered with the digital signal. In this instance, WTRU (830 kHz) is being received via its upper sideband.

We can quickly see how useful such a plot would be in understanding and documenting this potential interference. Stations transmitting with the AM HD system are making use of three AM channels, not just their own. This is why the FCC delayed for some time before allowing the AM version of HD radio to operate at night when usable signals are often separated by only one channel width.

Let's Clean Up our Act

Documenting other problem transmissions is also possible with waterfall and spectrum displays. Figure 2 records the spectrum of two unnamed stations using the 75 meter band. It is clearly evident that the strong station on 3960 kHz LSB is causing interference to the station on 3964 kHz. The interference extends 4 kHz above and below the offending station.

Similar displays are well-known to users of PSK31 and other digital modes since the waterfall displays included in those software programs allow us to quickly see if a station is overdriving the rig and producing wider than normal signals.

CW signals with wide keying (key clicks) are also quickly detected and documented using any of many available software programs. We are coming to the place where those who insist on operating a dirty station will not be able to deny the clear documentary evidence of their misdeeds. Figures 3A and B compare the near-in spectrum of keying sidebands from two commercial transmitters evaluated in the ARRL Lab. The difference is striking.

Check Before You Get Complaints

Ensuring that a signal to be transmitted is clean is best done before going on the air so that criticism from other stations using the latest observing methods is not needed. ARRL has long included a *two tone test* as part of the Product Review evaluation procedure for new transmitters similar to this one. This test quickly allows the evaluation of the linearity of the amplifiers in a transmitter. If two side-by-side tones of equal amplitude are inserted into the audio input of a transmitter and the output displayed on a spectrum analyzer, the departure from linearity will be displayed as the amplitude of *products* on either side of the two main signals.

These are called third or fifth order intermodulation products based on the exact mathematical formulas used to calculate their frequency. A third order product is spaced above the upper tone by an amount equal to the spacing between the two tones. A fifth order product is that much above the third order product. On the lower side, a similar situation exists. The difference in amplitude between the two main tones and these higher order products is a direct measure of the intermodulation distortion (IMD). Homebrewers would do well to check the IMD of any linear amplifier before going on the air with it. An ARRL two-tone IMD spectrum is shown in Figure 4. This data is shown in tabular form on current reviews.

The Pros Do it Too

Similar procedures are used by broadcasters to guarantee that their signals are legal. Figure 5 is an off-air display of the output of a DRM transmitter conducting a six-tone IMD test. This signal is several dB better than the required signal purity as dictated by the International Telecommunication Union *spectrum mask*.[4] All emitters of RF radiation

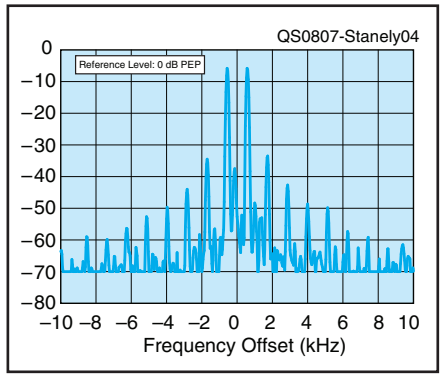


Figure 4 — Two-tone transmitter IMD spectrum plots of a commercial transmitter from the ARRL Lab.

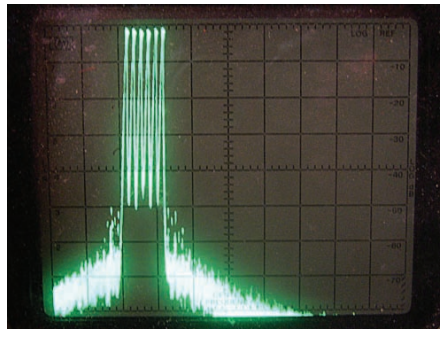


Figure 5 — Off-air spectrum display of the signal from a DRM transmitter performing a six-tone IMD test.

use spectrum analysis to ensure a legal installation and adjustment of their equipment. If the transmitter is mistuned or a tube is weak, a nasty effect known as *spectrum regrowth* can occur, which simply means that the station is allowing what we as hams know as *splatter*. The signal becomes wider than what is necessary to transmit the information.

Helping Identify Signals

The waterfall shown in Figure 6, apart from its beauty as abstract art, is a recording of a DRM signal on 9800 kHz, which is broadcast from Sackville, New Brunswick, Canada. In January/February 2007 *QEX*, I discussed how this signal, along with the *Dream* software, can be used to study selective fading.[5] Even this picture can illustrate selective fading in that the orange stripes in the otherwise white block of signal represent time and frequency combinations in which a deep selective fade occurred. Thus, spectrum analysis can tell us a great deal about the propagation path as well as about the transmitter being used. The white stripe with very sharp edges and very definite 10 kHz bandwidth is the easily spotted signature of a DRM signal. In this graphic there are also several unmodulated carriers of various strengths.

Helping Find Signals

Spectrum analysis is useful in detecting

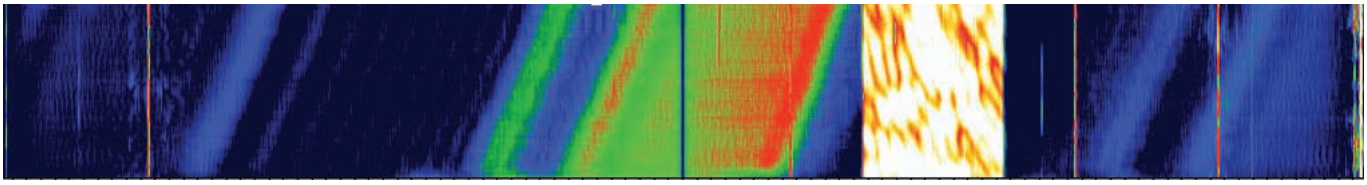
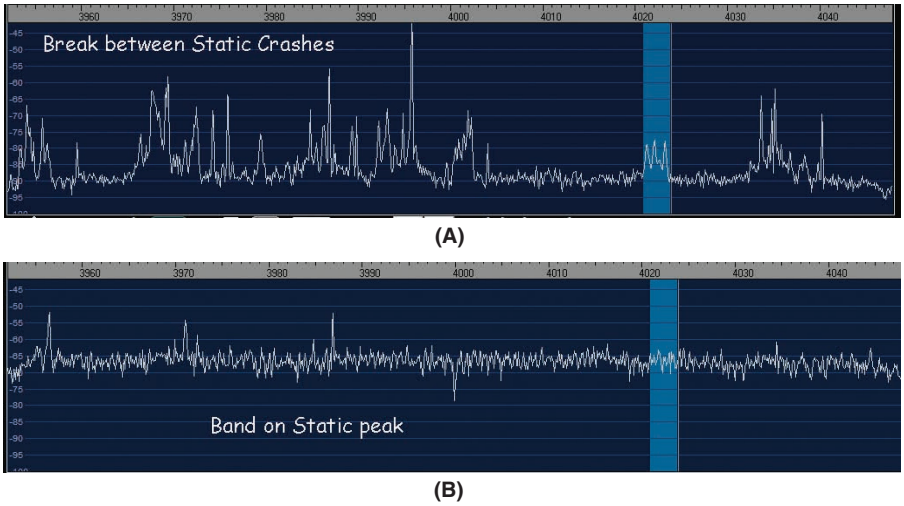


Figure 6 — Waterfall display of a DRM signal on 9800 kHz broadcast from Sackville, Canada. The diagonal stripes are interference from a switching power supply.



(A)

(B)

Figure 7 — Screen captures showing the recorded signal levels on 75 meters between crashes (at A) and at the peak of a crash (at B).

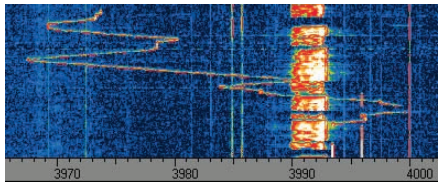


Figure 8 — Signal that can't seem to settle down. It keeps creeping up and down in frequency.

very weak signals. Much moonbounce work now uses spectrum display software with its very narrow filters to extract very weak signals from the noise. This is possible not only because as the filter bandwidth goes down, the sensitivity increases but also because the eye may be better at spotting a very weak signal in noise than the ear is. One technique involves using very slow CW (QRSS), and then reading the code characters by eye from the waterfall display where they have been recorded along with lots of white noise.

Helping Track Down Interference and Noise

The strong diagonal stripes in Figure 6 are interference from a switching power supply. These drifted through the passband while I was observing it. Spectrum analysis is very valuable in tracing the source of various types of interference and has been so used for decades. If there is man-made noise in a receiver location, a very good way of tracking it down is to put the band of interest on a spectrum or waterfall display and then, while observing, turn off various fluorescent lights, switching power supplies and any other suspect electrical equipment. It will be very obvious when you find the culprit. The dB display of the spectrum analyzer and the time recording feature of the waterfall will allow you to clearly see what is causing the problem and by how much your reception is degraded by various noise sources.

The difference between man-made noise and natural static is also very evident on a spectrum display. Lightning static consists of very broad and flat *white noise*. Figures 7A and B are screen captures showing the recorded signal levels on 75 meters between crashes and at the peak of a crash. The two scans were taken only seconds apart. Note that the noise spectrum is virtually flat across the 100 kHz band being observed. Also note that during the crash the noise floor rises to about –65 dB, compared to about –90 dB between crashes. This would indicate that a station, getting through with 100 W without any static, would need to use about 25 kW to have the same communication ability during the crashes.

This may explain why sometimes it is best just to shut down and wait for better conditions. Alternately, you can plan to repeat the words that got taken out during the next break in the static. Of course, you can also check on the strength of static crashes by watching your S-meter, but there is something about the spectrum analyzer view that puts the information on a whole new level.

Man-made noise can be very interesting in both the time and frequency domains. Figure 8 shows a signal that can't seem to settle down. It keeps creeping up and down in frequency. As you can see, it passes several times through an LSB signal, and those using that frequency would hear a swooping sound as it passes through. Sound familiar?

This type of signal possibly is the result of some inconsiderate operator *swishing* his VFO across the band, but more likely it is the result of some unintentional radiator, a piece of electronic equipment that is not supposed to radiate enough to cause interference, but does.

Each type of interference and noise has a characteristic display that we will become more familiar with as time goes by. Our detection and analysis of desired radio signals and our ability to eliminate undesired ones can only improve as we become more and more aware of the beauty of spectrum analysis.

Notes

[1]J. Stanley, K4ERO, "The Beauty of Spectrum Analysis — *Part 1*" *QST*, Jun 2008, pp 35-38.

[2]*The ARRL Handbook for Radio Communications*, 2008 Edition, Figure 9.31. 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/**; **pu bsales@arrl.org**.

[3]*Winrad*, co-developed by WA6KBL and I2PHD, can be accessed at **www.winrad.org**.

[4]S. Ford, WB8IMY, "Digital Radio Mondiale," *QST*, Oct 2003, pp 77-78.

[5]J. Stanley, K4ERO, "Observing Selective Fading in Real Time with *Dream* Software," *QEX*, Jan/Feb 2007, pp 18-22.

John Stanley, K4ERO, holds an Amateur Extra class license and has been licensed for over 50 years. He has worked as a broadcast engineer most of his life. He graduated from MIT in 1962 with a BSEE degree. John is an ARRL Technical Advisor. You can reach John at 524 White Pine Ln, Rising Fawn, GA 30738 or at **jnrstanley@alum.MIT.edu**.

Portable Two Element 15 Meter Yagi

Jack B. Morgan, KF6T

ARRL Field Day 2007 was on the horizon and our local club (MLDXCC) did not have an antenna lined up for 15 meters. We were worried that the band might open up during the event and important opportunities for contacts would be missed. It happened in 2006, and only a few contacts were made using our 40 meter antenna. So we needed a better solution.

Some of the requirements established were that this antenna be compact, light weight, easily assembled, no fancy matching required and it needed to cover the entire band.

Description

I selected a two element design to meet these requirements. I have had experience with this approach in the past and have built similar antennas from 40 to 6 meters with good results.[1] With a small sacrifice in gain and front to back ratio (F/B), you can always achieve a direct 50 Ω match with two elements on a short boom. I used *EZNEC* to confirm the element dimensions and spacing.[2] The elements are isolated from their supports so the clamps have little effect on dimensions or performance.

I was so confident that the computer generated dimensions were correct that I didn't test the antenna until we raised it on Field Day weekend. I was relieved that the VSWR was exactly as predicted (see Figure 1). The new antenna played very well during the 15 meter openings. The main lobe of propagation is at 30° elevation at 20 feet above flat land (see Figure 2) and even lower at our cliff-like location. This provides good propagation over the intermediate distances important to Field Day.

Construction

The most unusual aspect of this antenna is that it uses a boom with a square cross section. I used an 8 foot piece of 1.25 × 1.25 inch 6061-T6 aluminum with ⅛ inch wall thickness. This boom is very strong and offers some interesting advantages. First of all, no U bolts are required except for

[1]Notes appear on page 38.

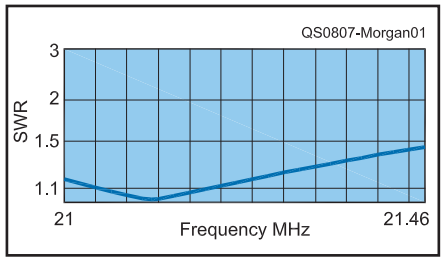


Figure 1 — SWR curve of the 15 meter two element Yagi antenna.

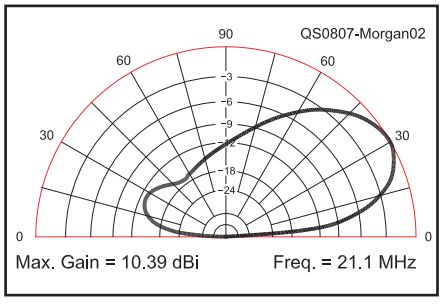
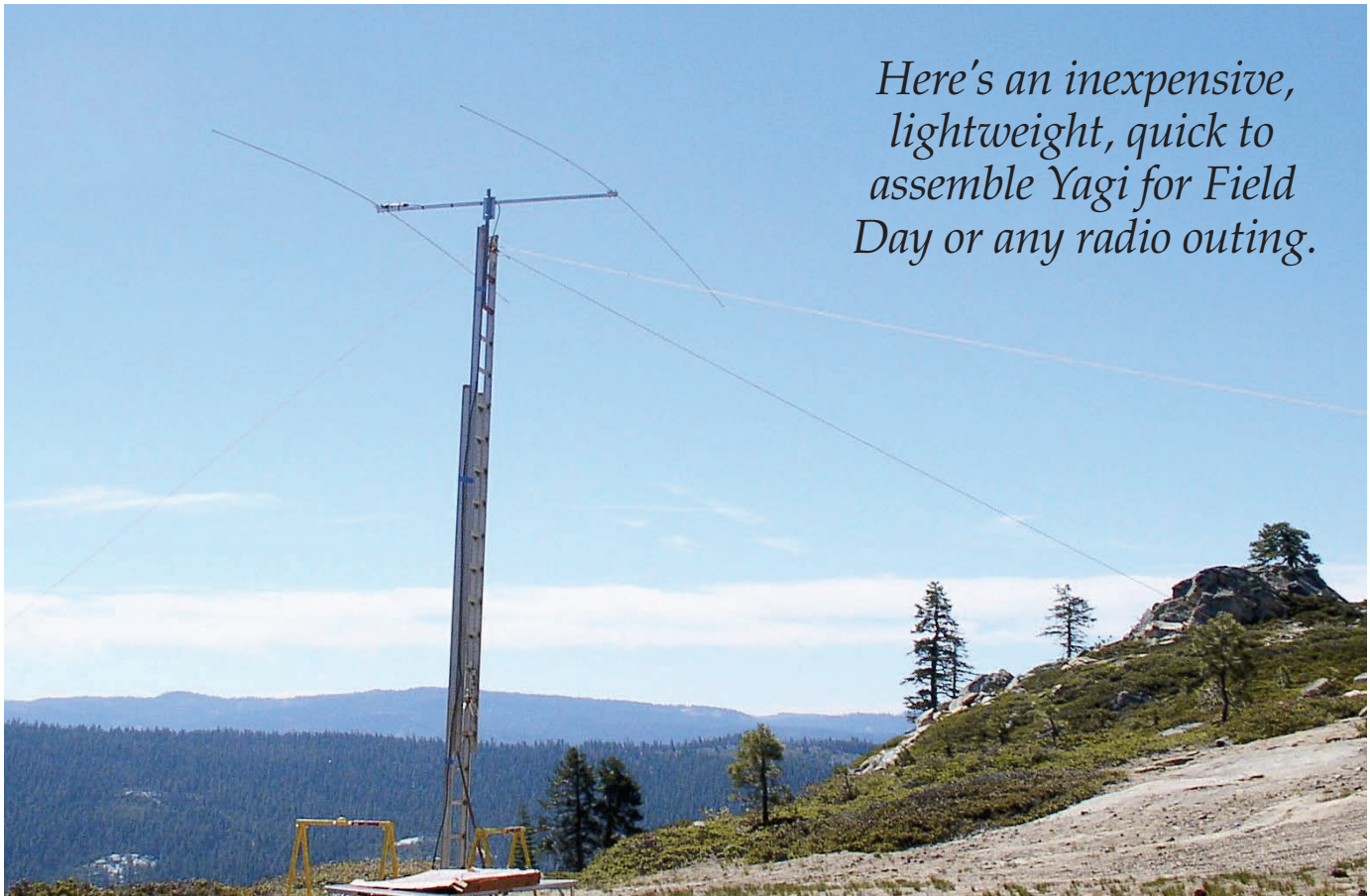


Figure 2 — Elevation plot of the 15 meter antenna at 20 feet, in the peak of the main beam.



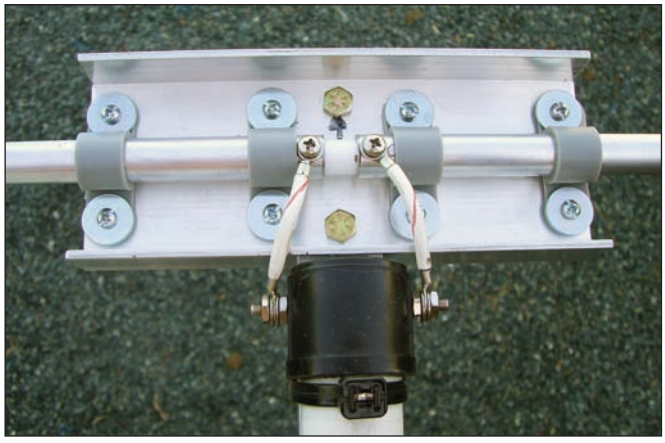


Figure 3 — Driven element assembly.

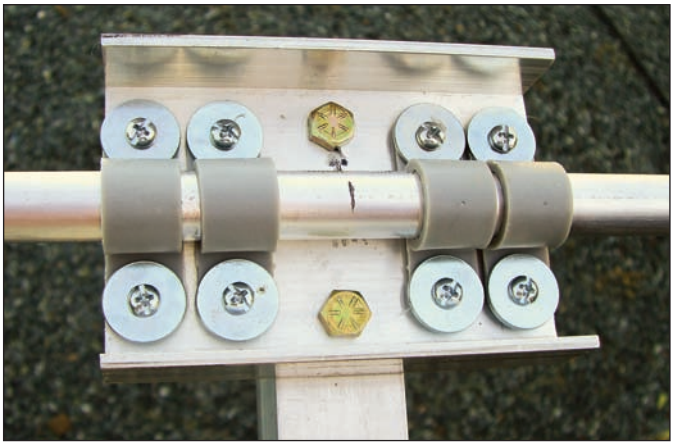


Figure 4 — Reflector assembly.

mast attachment. Everything else just bolts together. Secondly, because the mounting surfaces are square, element to mast alignment is guaranteed! We assembled this antenna in ten minutes at the Field Day site. All components are 8 feet or less, so this antenna is easy to transport or store.

The two elements are made from ⅝ (0.625) and ½ (0.500) inch 6061-T6 aluminum tubing with 0.058 inch wall thickness. These tubes will usually telescope together but sometimes need a little adjustment with fine sandpaper. If the fit is too tight, you can get into a situation in which the elements will gall and disassembly will be difficult. If you use any sort of lubricant, apply it just before assembly to keep it from acting like fly paper to dirt or sand.

The elements are connected together at a 2 inch overlap point using a single 8-32 stainless steel screw and Nyloc lock nut.

The two element clamps are fabricated from a one foot section of 3 × 1 inch aluminum U channel with 0.125 inch wall thickness. The channel is cut, then drilled and tapped as shown in a detailed drawing on the *QST* binaries Web site.[3] Note that the boom attachment holes are initially made smaller as pilot holes. At final assembly the finish drilling is accomplished.

I used three gray polypropylene conduit clamps, as shown in Figures 3, 4 and 5 to support the elements on the boom.[4] These clamps are intended to be used to mount ½ inch electrical conduit to a wall. They work very well in this application. Fender washers (0.75 inch diameter) are used under the 8-32 screws to better support the poly clamps. The U channel plates are tapped to accept these screws and are secured on the far side with stainless steel lock nuts.

The element dimensions are shown in Table 1. I have determined the dimensions for adapting the design to 12, 10 and 6 meters and these are presented in Tables 2 through 4. This dimensions have been verified through modeling, but these versions have not been made and measured.

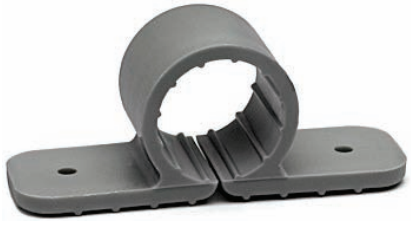


Figure 5 — Oatey 33940 ½ inch EMT clamp used to secure elements.

Figure 6 — Plate installed on square boom.

The driven element has a 0.500 inch wide gap that is filled with a ½ inch diameter insulating rod made of fiberglass, Teflon or Delrin. The 2.5 inch long insulator is inserted 1 inch into each split elements. I drilled and tapped (8-32) holes through the tubing wall and into the center of the insulator. By not drilling all the way through, we prevent an oversized screw from shorting on the far side at the point of balun attachment later. It is a lot easier to drill these holes with the elements and insulator mounted on the support clamp beforehand.

Each element clamp is mounted to the boom using two ¼-28 (UNF fine thread) stainless bolts. I clamped the parts together, got them square, then drilled (0.250 diameter) through the clamp pilot holes continuing through the boom in two places. Mark the mating parts with a permanent marker pen so they will exactly match up at a later time.

A current balun is used to feed the driven element. This keeps the coax from radiating unwanted common mode signals, an important consideration in a Field Day environment. It is mounted as close as possible to the driven element as shown in Figure 3 and held in place with tie wraps. The reflector assembly is shown in Figure 4.

The mast to boom plate is fabricated from a scrap piece of 0.25 inch thick aluminum plate. The suggested mounting dimensions are shown on the binaries Web site. The U bolt hole dimensions will depend on the actual mast diameter selected. This design used 2 inch U bolts and is shown mounted on the square boom in Figure 7. I located this plate at the center of balance of the antenna, with the balun mounted.

Summary

This antenna was mounted on a windy ridge top 7000 feet up in the Sierra Nevadas during the 2007 ARRL Field Day. The small diameter elements shrugged off the wind and displayed an acceptable amount of droop. Analysis using Dave Leeson's spreadsheet program (element strength calculator by W6QHS/W6NL) shows that these elements should survive 72 mile an hour winds.[5] A heavier duty version of this antenna could be made starting with larger diameter aluminum and heftier clamps, but this design fit our needs perfectly.

Table 1

15 Meter Antenna Dimensions

Item	*Overall Length (inches)*	*Cut Length (inches)*	*Notes*
Driven Element	259¼		Check tip to tip dimensions.
2 × ⅝" inner sections	47¾	47¾	Cut from one 8' section.
2 × ½" element tips	81⅝	83⅝	Allows 2" overlap.
Reflector	280¾		Check tip to tip dimensions.
1 × ⅝" center section	96	Not cut	Check stock is 96" long.
2 × ½" element tips	92⅜	94⅜	Allows 2" overlap.
Boom	96	Not cut	Use 8' section of 1.25 × 1.25".
Driven element to reflector spacing	93		Clamps flush at boom ends.

Table 2

12 Meter Antenna Dimensions

Item	*Overall Length (inches)*	*Cut Length (inches)*	*Notes*
Driven Element	220		Check tip to tip dimensions.
2 × ⅝" inner sections	47¾	47¾	Cut from one 8' section
2 × ½" element tips	62	64	Allows 2" overlap.
Reflector	238		Check tip to tip dimensions.
1 × ⅝" center section	96	Not cut	Check stock is 96" long
2 × ½" element tips	71	73	Allows 2" overlap.
Boom	83		Use 8' section of 1.25 × 1.25".
Driven element to reflector spacing	80		Clamps flush at boom ends.

Table 3

10 Meter Antenna Dimensions

Item	*Overall Length (inches)*	*Cut Length (inches)*	*Notes*
Driven Element	194½		Check tip to tip dimensions.
2 × ⅝" inner sections	47¾	47¾	Cut from one 8' section.
2 × ½" element tips	49¼	51¼	Allows 2" overlap.
Reflector	206¼		Check tip to tip dimensions.
1 × ⅝" center section	96	Not cut	Check stock is 96" long.
2 × ½" element tips	55⅛	57⅛	Allows 2" overlap.
Boom	79¾		Use 8' section of 1.25 × 1.25".
Driven element to reflector spacing	76¾		Clamps flush at boom ends.

Table 4

6 Meter Antenna Dimensions

Item	*Overall Length (inches)*	*Cut Length (inches)*	*Notes*
Driven Element	105½		Check tip to tip dimensions.
2 × ⅝" inner sections	47¾	47¾	Cut from one 8' section.
2 × ½" element tips	4¾	6¾	Allows 2" overlap.
Reflector	117		Check tip to tip dimensions.
1 × ⅝" center section	96	Not cut	Check stock is 96 inches long.
2 × ½" element tips	10½	12½	Allows 2" overlap.
Boom	43		Use 4' section of 1.25 × 1.25".
Driven element to reflector spacing	40		Clamps flush at boom ends.

Notes

[1]J. Morgan, W1FEA, "The Building-Supply Yagi," *QST*, Mar 1991, pp 22-24.

[2]Several versions of *EZNEC* antenna modeling software are available from developer Roy Lewallen, W7EL, at **www.eznec.com**.

[3]**www.arrl.org/files/qst-binaries**.

[4]Oatey 33940 ½ inch EMT clamp.

[5]**www.realhamradio.com/Download.htm**. Unzip and use the "element" file.

Jack Morgan, KF6T, was first licensed in 1955 as W1FEA and holds an Amateur Extra class license. Jack started working at the ARRL designing many projects for The ARRL Handbook *while working toward his BS and MSEE degrees. He subsequently worked at Eimac and Varian before starting his own company in Silicon Valley. Retired from that, he started teaching Computer Technology at a local high school. He also pioneered competitive snowboarding as a high school varsity sport in California. He currently coaches a snowboard team and has been a gold medalist at national snowboard competitions. You can reach Jack at 2040 Pheasant Hill Ln, Auburn, CA 95602 or by e-mail at* **jack@racetimesystems.com**. QST

Feedback

◊In the Elecraft K3 Product Review [Apr 2008, pp 41-45], PP5VX points out that discussion of date formats on p 45 is in error. Date formats are not part of the International System of Units (SI). The suggested format is similar to YYYY-MM-DD, described in standard ISO 8601 from the International Organization for Standardization. A good source of more information on the SI is **www.physics.nist.gov/cuu/Units/index.html**.

◊In "Getting on the Air — Selecting Your First HF Transceiver" [May 2008, pp 71-73], in Table 3, the street price of the TS-2000 should have been listed at $1595. Table 4 should have noted that the FlexRadio Flex-5000 also includes a "dual watch" type second receive channel. See the Flex-5000 Product Review in this issue for more information.

◊The topmost photo on the cover of the June 2008 issue was taken by Walter Schoenknecht, WS2Z, father of Dan, who's in the photo.

◊In the 2007 ARRL September VHF QSO Party Results [Mar 2008, p 75], K6MI was incorrectly listed as the overall winner of the Rover category. The correct overall winner in the Rover category was N6MB. The ARRL regrets this error.

◊ The May 2008 "Hands-On Radio" column [p 74] mentions the availability of two programs, *Function Generator* and *Audio Spectrum Analyzer*. The two programs are on the *Software Library for Hams* CD. Although this CD was included in copies of the *2008 ARRL Handbook* that were ordered before October 31, 2007, later copies do not include the CD. The *Software Library* CD is available at **www.arrl.org/shop/**, order no. 9825.

PRODUCT REVIEW

FlexRadio Systems FLEX-5000A HF/50 MHz Transceiver

Reviewed by Rick Lindquist, WW3DE
NCJ Managing Editor

As we said in May 1998 *QST* when reviewing the first commercially available strictly computer controlled Amateur Radio transceiver, the Kachina 505DSP: "The relegation of functionality from hardware to software and firmware opens broad vistas of future capability." *Are we there yet?* Or did our flight to nirvana get canceled? A decade down the road, Kachina is kaput in the amateur market, and the newer software defined radio (SDR) technology remains far from ubiquitous in the modern ham shack. FlexRadio Systems now represents the vanguard of equipment manufacturers prodding the Amateur Radio community into the SDR era.

Let's face it: Most equipment in today's ham stations reflects only incremental improvements in well-established wireless technology, form factor and human user interface. Additionally a "knob mentality" persists, despite Kachina's confidence, expressed 10 years ago, that owners of its milestone radio would embrace mouse-and-keyboard operating to the extent that knobs would become "superfluous." In 2005 FlexRadio Systems nudged things off the dime again with its SDR-1000. The FLEX-5000A raises the software-defined ham radio bar another notch.

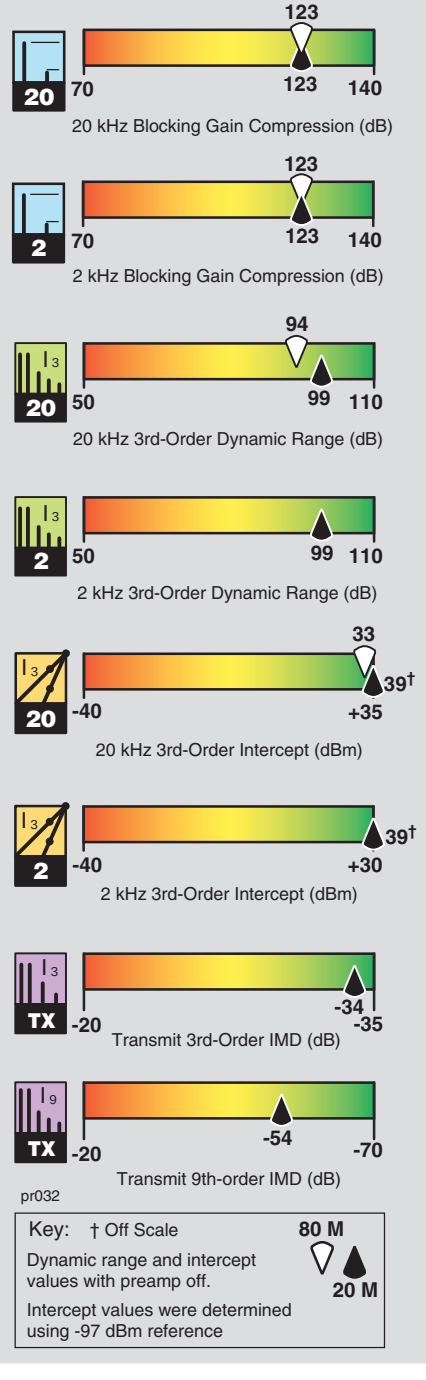
Expanding Your Vocabulary

Just as hams once fretted about grid drive, overmodulation and key clicks, the very nature of SDRs has given rise to a new crop of issues with names like "latency" and "sampling rate." This is *serious* technology, and it's not necessarily for the faint of heart.

In an SDR, analog RF signals are converted to a digital bit stream, and everything happens at that level using digital signal processing (DSP) techniques before conversion back to analog. As FlexRadio explains, its SDR is "essentially a direct-conversion receiver, but the mixing of the LO [local oscillator] to create a 9 kHz IF makes it appear a lot like a dual-conversion receiver." Something called a quadrature sampling detector (QSD) — 0°, 90°, 180° and 270° — is at the heart of all FLEX models. This generates the "I" in-phase composite and "Q" quadrature signals. Are your eyes glazing over yet?

FlexRadio points out that direct-conversion receivers like the SDR-1000 and FLEX-5000A don't require band-pass or roofing filters. Because the QSD doesn't respond to signals below its passband but is susceptible to odd harmonics above its LO

Key Measurements Summary



Bottom Line

The FLEX-5000A builds on the success of the SDR-1000, retaining the top-shelf radio performance and adding features. The package is far less complicated, shedding the many wires, cables, boxes and connectors that characterized the SDR-1000. Be prepared to experiment with the software and settings to get the most from this radio, however.

Mark J. Wilson, K1RO ♦ Product Review Editor ♦ k1ro@arrl.org

frequency, FlexRadio uses a low-pass filter to block signals above its cutoff frequency. The rationale here, the company explains, is that low-pass filters have lower loss and wider component tolerance than band-pass filters.

While indisputably a direct descendant of the SDR-1000, the FLEX-5000A is a new and far slicker model that makes the earlier unit seem more of a beta test product than something ready for shrink wrap. A lot has changed in the intervening years; some has remained essentially the same.

PowerSDR — the Face of the Future?

In Zen terms, the radio is one with its GPL open-source *PowerSDR* software. Well, not *quite*. As FlexRadio Support Staffer Dudley Hurry, WA5QPZ, told me, "80% of the radio is in the computer." Not only does *PowerSDR* serve as the radio's virtual front panel, or *console*, it handles all DSP functions, including modulation, demodulation, metering (digital and analog) and filtering. The black box with its hypnotic bright blue pilot light provides the physical portals — and *many* of them — into and out of the virtual world where the *real* radio resides.

For the benefit of Flex cognoscenti, our unit ran *PowerSDR* version 1.10.4, at the time the latest Official Release, throughout the review process. It is important to keep in mind that any review of a software defined product is a snapshot in time. FlexRadio and their user community are constantly working on enhancements and upgrades to this product. As time marches on, the FLEX-5000A with a later version of the software *will* be different from the radio reviewed here. Many of the concerns and observations we make might be resolved by the time you read this, or at some time in the future. The operation, performance and feature set change regularly in both obvious and subtle ways.

For those who enjoy adventures in software, new *PowerSDR* test versions are available for download on a regular (sometimes daily) basis. To take advantage of the latest version under development you must install and set up *TortoiseSVN*, a program that manages the various files and versions (SVN stands for Subversion). The SVN releases may have solved some of the issues described in this review and can be evaluated by the user community as development progresses. Eventually, after extensive testing, the changes find their way into the next Official Release.

According to FlexRadio, the majority of owners use three versions of *PowerSDR*. They have the current Official Release for backup and benchmarking, their favorite stable SVN release for most operating, and the latest SVN release to play with. More information and a setup guide are available from the FlexRadio Web site.

FlexRadio says *PowerSDR* will continue to be open source, although certain control functions are defined in closed-source firmware in order to meet FCC requirements to restrict transmissions on unauthorized frequencies (the radio provides for MARS and non US band operation).

Ugly Betty

The FLEX-5000A offers more features and flexibility than virtually any other transceiver I've ever seen and possibly any other radio on the market. I was disappointed in *PowerSDR*'s look and feel, however. The latest version of *PowerSDR* is a *Windows 98* implementation in a *Vista* world. Although more feature laden, cosmetically it's very similar to the SDR-1000's "front panel" of an earlier PC epoch.

But even TV's "Ugly Betty" has a boyfriend. It's what lies behind *PowerSDR*'s stodgy, less-than-stylish appearance that

Table 1

FlexRadio FLEX-5000A, serial number 5107-5268

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 0.01-65 MHz; transmit, 1.8-2, 3.5-4, 5.3305, 5.3465, 5.3665, 5.3715, 5.4035, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive, as specified (sensitivity degrades below 0.2 MHz). Transmit, as specified.
Power requirement: 12.4-15.2 V dc; receive, 1.5 A (typical); transmit, 25 A (max).	Receive, 1.6 A; transmit, 17 A; tested at 13.8 V dc.
Modes of operation: SSB, CW, AM, FM, FSK, AFSK.	As specified.
Receiver	***Receiver Dynamic Testing***
CW sensitivity, 500 Hz bandwidth, preamp off/on: –123/–133 dBm.	Noise Floor (MDS), 500 Hz bandwidth: *Preamp* *Off* *On* 1.0 MHz –122 dBm n/a 3.5 MHz –119 dBm –129 dBm 14 MHz –119 dBm –132 dBm 50 MHz n/a –128 dBm
Noise figure: Not specified.	14 MHz, preamp off/on: 28/15 dB.
AM sensitivity: Not specified.	10 dB (S+N)/N, 1 kHz, 30% modulation: *Preamp* *Off* *On* 1.0 MHz 4.4 µV n/a 3.9 MHz 6.3 µV 1.6 µV 50 MHz n/a 3.7 µV
FM sensitivity: Not specified.	For 12 dB SINAD: *Preamp* *Off* *On* 29 MHz n/a 0.64 µV 52 MHz n/a 1.4 µV
Blocking gain compression: Not specified.	Gain compression, 500 Hz bandwidth:[1] *20 kHz offset* *5/2 kHz offset* *Preamp off/on* *Preamp off* 3.5 MHz 123/120 dB 123/123 dB 14 MHz 123/122 dB 123/123 dB 50 MHz n/a/118 dB n/a
Reciprocal Mixing (500 Hz BW): Not specified	20/5/2 kHz offset: –99/–99/–99 dBc.
Third-Order Intercept, 2 kHz offset: +30 dBm	39 dBM.

ARRL Lab Two-Tone IMD Testing

Band/Preamp	*Spacing*	*Input level*	*Measured IMD level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–25 dBm	–119 dBm	94 dB	+22 dBm
		–10 dBm	–97 dBm		+33 dBm
14 MHz/Off	20 kHz	–20 dBm	–119 dBm	99 dB	+30 dBm
		–6 dBm	–97 dBm		+39 dBm
		0 dBm	n/a[2]		
14 MHz/On	20 kHz	–33 dBm	–132 dBm	99 dB	+17 dBm
		–18 dBm	–97 dBm		+21 dBm
14 MHz/Off	5 kHz	–20 dBm	–119 dBm	99 dB	+30 dBm
		–6 dBm	–97 dBm		+39 dBm
14 MHz/Off	2 kHz	–20 dBm	–119 dBm	99 dB	+30 dBm
		–6 dBm	–97 dBm		+39 dBm
50 MHz/On	20 kHz	–33 dBm	–128 dBm	95 dB	+15 dBm
		–22 dBm	–97 dBm		+16 dBm

Second-order intercept: Not specified.	Preamp off/on: +63/+59 dBm.

Manufacturer's Specifications	Measured in the ARRL Lab
FM adjacent channel rejection: Not specified.	20 kHz offset, preamp on: 29 MHz, 59 dB; 52 MHz, 44 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, preamp on: 29 MHz, 59 dB*; 52 MHz, 44 dB*; 10 MHz offset: 52 MHz, n/a.[3]
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 50 μV; preamp on, 50 μV.
Squelch sensitivity: Not specified.	At threshold, preamp on: SSB, 14 MHz, 0.28 μV; FM, 29 MHz, 0.22 μV; 52 MHz, 0.6 μV.
Audio output power: 10 dBV at 600 Ω.	As specified.[4]
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW (500 Hz): 345-856 Hz (511 Hz),** Equivalent Rectangular BW: 499 Hz; USB: 141-2851 Hz (2710 Hz); LSB: 140-2850 Hz (2710 Hz); AM: 71-3293 Hz (3222 Hz).
Image rejection: 70 dB.	First IF rejection, 43 dB[5]; image rejection, 88 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: HF and 50 MHz: SSB, CW, FM, 100 W (high); AM, 25 W (carrier)	HF: CW, SSB, FM, typically 100 W high, <1 W low; AM, typ. 25 W high, <1 W low; 50 MHz: CW, SSB, FM, typ 99 W high, <1 W low; AM, typ. 25 W high, <1 W low.
Spurious and harmonic suppression: HF, >55 dB; VHF, >65 dB	HF, 51 dB; VHF, 61 dB. Meets FCC requirements.
SSB carrier suppression: >55 dB.	HF, 51 dB; VHF, 54 dB.
Undesired sideband suppression: >55 dB.	HF, 61 dB; VHF, 60 dB.
Third-order intermodulation distortion (IMD) products: –33 dB PEP at 100 W on 14 MHz.	3rd/5th/7th/9th order (worst case band): HF, –34/–40/–48/–54 dB PEP; VHF, –21/–32/–39/–40 dB PEP.
CW keyer speed range: Not specified.	1 to 60 WPM.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	29 ms.[6]
Receive-transmit turn-around time (tx delay): Not specified.	25 ms.[6]
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 9 × 9.3 × 12.4 inches; weight, 13 pounds.

Price: FLEX-5000A, $2799; antenna tuner option, $299; RX2 second receiver, $649.

*Measurement was noise-limited at the value indicated.
**Varies with CW pitch setting.
[1]The level indicated is where the sound card's ADC went into overload. Gain compression could not be measured because of this behavior.
[2]An input level of 0 dBm was higher than the ADC overload level, so the test was not performed.
[3]No IMD product could be detected.
[4]Audio output is dependent on external amplified speakers.
[5]Spur near the IF frequency. Note: The IF is in the audio range, so IF rejection will not affect RF performance.
[6]Measurements made with 1.6 GHz dual-core processor. Turnaround time may be faster with higher speed CPU.

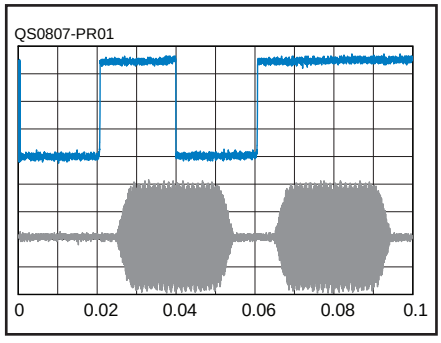


Figure 1 — CW keying waveform for the FLEX-5000A showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on the 14 MHz band.

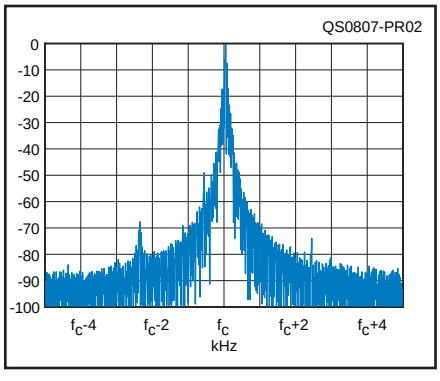


Figure 2 — Spectral display of the FLEX-5000A transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier.

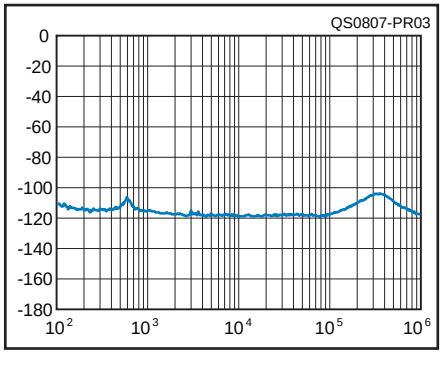


Figure 3 — Spectral display of the FLEX-5000A transmitter output during composite-noise testing. Power output is 100 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier.

really counts. The current maximum sampling rate (more on this topic later) permits viewing 192 kHz of band spectrum, with immediate access to both VFOs as well as to the panoply of major functions, most common, some less so. You access most functions via buttons, sliders, menus and sub-menus or tabs.

"Light Years Ahead"

What the FLEX-5000A brings to the table now is a far less complicated Amateur Radio package that's free of the surfeit of wires, cables, boxes and connectors that characterized the SDR-1000. (Further eliminating the need for wires is *VAC* [virtual audio cable], third-party software that routes signals for digital programs to and from the FLEX-5000A.) As one "Flexer" remarked on the FLEX-5000A Web site, "fit and finish are light years ahead of the SDR-1000" and "it looks like a professional radio."

This ham radio *system* essentially consists

of the FLEX-5000A box and the PC. It offers 100 W (PEP) on all bands 160 through 6 meters, general-coverage receive (0.01-65 MHz, same as the SDR-1000) and lots and lots of features, including several that weren't available on the SDR-1000. For example, the newer model offers substantial improvement in CW operation, VOX capability and other novel and useful amenities, plus some impressive performance statistics (see Table 1).

The close-in two-tone third-order IMD dynamic range of the FLEX-5000A remains comparable with that of the SDR-1000 and of some of the best transceivers on the market. On the SDR-1000, the best IMD DR on 14 MHz at 2 kHz spacing was 99 dB at the medium preamp setting, but as much as 10 dB worse at other preamp settings. On the FLEX-5000A we measured 99 dB on 14 MHz at *all* spacings, with or without the preamp. The FLEX-5000A includes some features that became viable simply because today's average PC is a lot more powerful than the ones common in 2005. By the same token, continued upward mobility of PC technology is bound to further improve the FLEX-5000A down the road, so enhanced performance and additional features remain moving targets. In addition, faster video cards can improve radio performance by offloading of the CPU.

FlexRadio got rid of the gaggle of wires that shackled the SDR-1000 and its associated high-end sound card by using a FireWire (IEEE-1394) interface to handle signals between the black box and the PC. Hurry explained that several essential "threads" travel up and down the FireWire cable, including receive and transmit I and Q signals (essentially the radio's IF) and receive and transmit audio. The FireWire cable may be up to 10 feet long.

The "functional equivalent" of the SDR-1000's sound card and USB control now resides in the FLEX-5000's hardware. These include low-level control and communication functions needed to run the specific hardware. The FLEX-5000A has a device driver just like any other PC peripheral. The user must enter both the desired sampling rate and buffer size into the driver dialog box — which sets up the FireWire connection parameters and something called "operating mode" — as well as in the *PowerSDR* Setup menu (or "form," as FlexRadio calls them).

Our unit had the optional automatic antenna tuner (ATU) installed. It can produce a rather disconcerting symphony of grinding and whirring as it tries to come to terms with whatever load you have attached to one of the three SO-239 connectors on the box's rear apron (Figure 4). The ATU has semi-automatic and automatic settings as well as memory capability. You can set the maximum SWR threshold (up to 3:1). Unless you have the ATU tab open on your screen, however, you may not know right away if the tuner couldn't find a match. Although a tuner fault will not necessarily switch the ATU to bypass mode, a red HIGH SWR warning will flash when you transmit.

The FLEX-5000A's transmit and receive signal paths are completely independent, opening new horizons of opportunity. For example, at press time an optional full-featured second receiver, known as RX2, was poised to provide the potential for SO2R — single-operator, two radio capability — in a single box.

Figure 4 — Rear view of the Flex-5000A. Note the real analog connectors here.

Knobs? We Don't Need No Stinkin' *Knobs*!

Anyone who's ever used a Kachina, Ten-Tec Pegasus or SDR-1000 — or, for that matter, ever controlled a conventional transceiver via computer or Internet — appreciates that the most significant part of the learning curve is getting used to mousing rather than tried-and-true dial twisting and button pushing. FlexRadio's slogan is "Real radios don't *need* knobs!"

Mouse control is an acquired taste. Think of it this way: The front panel of the FLEX-5000A is the graphical user interface of a computer program, and, for better or worse, the mouse has become the *de facto* controller for programs ranging from accounting to word processing. Last time I was in a Best Buy store, the array of computer mice and adjunct control devices was astonishing.

The FLEX-5000A's tuning controls enable all the usual capabilities you'd expect on a conventional Amateur Radio transceiver and more. You can set (or reset) the tuning step anywhere from 1 Hz to 10 MHz with a mouse click, lock the VFO, operate "split," dump the contents of one VFO into the other, equalize VFOs and listen to two frequencies at the same time with the click of a button.

One disappointment was the minimal "scratch memory," a feature I've always found extremely handy in contests. Clicking SAVE retains a frequency, mode and filter, but *only* for a single frequency. Some adept programming that already may be on the drawing board very likely could overcome this minor deficiency.

The FLEX-5000A gives you a number of ways to tune. On the panadapter display — the one you're likely to use the most — the radio lets you put a signal in its crosshairs. Then *click*, you're there, aside from a little fine tuning (FlexRadio calls this "ClickTune"). You can do the same thing with the waterfall display. It's possible to choose a split panadapter/waterfall or any combination of the two, as shown in Figure 5. At the *PowerSDR* window's normal size, the menu to access this feature may not be visible. It's below the main console win-

Switching Computers Midstream

The "right" computer is key to satisfactory operation of the FLEX-5000A. We started out with a high-end HP/Compaq dc7700p, which has an Intel E6300 Core 2 Duo processor (2 MB of L2 cache, 1066 MHz bus) running at 1.8 GHz. It was equipped with 2 GB of memory, a RAID hard drive system and *Windows XP Pro*. After we noted performance that was at odds with FlexRadio's experience, the manufacturer suggested that we try a Compaq Presario SR5310F with an Intel Pentium E2140 Dual-Core processor (1 MB of L2 cache, 800 MHz bus) running at 1.6 GHz. This inexpensive machine came with 1 GB of memory and the *Vista Home Premium* operating system. ARRL installed a FireWire card and removed the fancy video card and all unnecessary applications that might bog down the processor.

Switching to the SR5310F demonstrated that you don't need a blazing-hot, high-end computer to run a FLEX-5000A. On the other hand, there were occasions when it seemed that more computer muscle would have resolved some of the issues we encountered. The FLEX-5000C model has a built-in Intel Core 2 Duo processor computer with 1 GB of RAM and *XP Pro*. — *Rick Lindquist, N1RL*

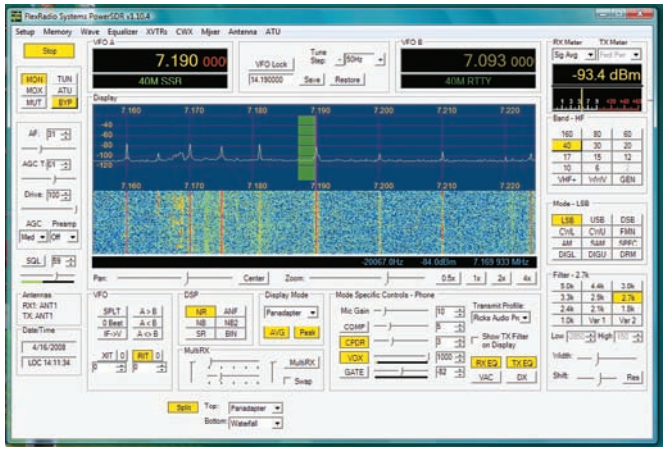


Figure 5 — You can split the *PowerSDR* screen to show any combination of the panadapter and waterfall displays.

Figure 6 — *PowerSDR* offers 3 or 10 band graphic equalizers for both receive and transmit.

dow and seemed tacked on as an afterthought (or maybe they just ran out of space). I liked the combination panadapter/waterfall display, since the waterfall sometimes shows signals not readily visible on the spectrum scope.

Manually tuning with the cursor works like this: Hold down the left button and the cursor becomes a little hand. Then swipe the "hand" across the display horizontally in the desired direction. But there's the rub. I had to swipe in the opposite direction, or sense, from what my aging brain expected. To move up the band, you swipe from right to left, whereas on a conventional transceiver you'd turn the knob from left to right (clockwise). It's logical when you think about it (moving from a lower frequency to the left to a higher one to the right), and I eventually got the hang of it.

If you don't like swiping/sliding to tune, the little mouse scroll wheel does the job quite nicely. This made better sense to my brain too. You scroll up to move up in frequency, down to move down.

You can use the cursor not only to tune but to shift the receive passband and change its bandwidth. FlexRadio calls this feature "FilterSlide." It works very well for custom filtering on the fly, although the preset filters suffice under most circumstances. Filters are not mode-specific and you can winnow the passband down to a lean 25 Hz assuming adequate sampling rate and buffers. You can click and drag the VFO B passband anywhere on the visible display — above or below your operating frequency.

PowerSDR also lets you control various radio functions, including tuning, band switching, mode, filter and RIT/XIT via the keyboard. This includes the ability to directly enter a frequency.

For less pointing and clicking, an optional ShuttlePRO controller is available through FlexRadio. This mouse-like device has 15 programmable buttons and two concentric tuning/control knobs that you can set up for VFO tuning, RIT, filter width, mode and other often-used functions. The optional Griffin Power Mate VFO control knob is also available if you find you can't live without a knob.

Of Buffers and Sampling Rates

The various buffer and sampling rate settings significantly affect how — and how *well* — the FLEX-5000A functions. Reaching equilibrium can be a chore. First you need to set the sampling rate and buffer size for the FLEX-5000A driver, which determines the data rate and buffer size for the FlexWire interface. Once inside *PowerSDR*, you enter the same sampling rate and buffer size under the Setup menu AUDIO tab and set buffers for transmit (TX) and receive (RX) under the DSP tab. These DSP buffer settings significantly impact filter shaping and latency.

FlexRadio suggests setting the driver and the audio buffers as low as the associated computer's processor can handle (lower buffer settings shift the workload to the processor with less latency or delay but broader filter skirts). The "Buffers and Sample Rate" appendix of the *Owner's Manual* advises avoiding a buffer size of 512 for SSB operation "except for casual QSOs and then only at sample rates of 48 kHz and 96 kHz." For those situations where you need steep filters, however, the manual suggests buffer sizes of 2048 or 4096. It's a bit different for CW and digital operation. For these FlexRadio recommends steering clear of buffers of 512 and 1024 and using "only the sample rate of 48 kHz." FlexRadio says that some of these suggested settings are in error and has revised the instructions for proper selection of buffer size.

Operating with our second computer (see sidebar, "Switching Computers Midstream") and using a 192 kHz sampling rate, the FLEX-5000A was more prone to audio dropout — essentially "holes" in the audio — especially when you're working in one of the menus, enabling other radio features such as MULTIRX or using (not just running) another program on the same PC. Lowering the RX buffer seemed to cure this. I went through 2048 to 1024, experiencing far less dropout at the latter and even lower settings.

There's a tradeoff, however. Reducing the size of the RX buffer alters the filters' skirt shape and makes them less effective — "roll-off" filters as opposed to "brick-wall" filters. With a too small buffer you'll find essentially no change in the actual passband below a certain filter selection, depending on mode. On the other hand, latency — a minute but finite lag between the time you key the PTT and the RF signal appears — gets closer to real time with smaller driver and audio tab buffer sizes; the DSP TX buffer also has an effect, however. In short, getting it just right for a particular mode can be a juggling act.

Big and Beautiful SSB

Simply put, this radio can generate a remarkable SSB signal. Within legal limitations your ability to tailor the radio's audio characteristics is extensive. The panadapter displays your SSB/phone waveform, so you can see what's going on. The compander — something not found on most transceivers — yields bigger, louder audio while not being obnoxious. It is possible to engage both the compressor and the compander, but you'll want to avoid extreme settings. Less is more in this case. Stations I worked told me the DX button, which is new with *PowerSDR* v 1.10.4, added another S unit or so to my signal. *How cool is that?* Switching in my headset's DX mic element augmented the effect.

The radio also has a "leveler" — a sort of AGC to compensate for times when the operator changes position with respect to the microphone. A NOISE GATE is available to handle high background noise situations; it operates independently of VOX.

The dual equalizers, one for transmit and one for receive, go far above and beyond the "tone controls" of many hardware transceivers. Both offer a choice of 3 or 10 bands (see Figure 6). The 3 band EQ unit is great for quickly compensating either transmit or receive audio; the 10 band unit allows you to apply additional nuance. You click the MON button to listen to your own audio. Some sampling rates and buffer settings we tried imparted varying degrees of latency, lending an "echo" effect to what you're hearing.

One station judged the FLEX-5000A's SSB audio quality "orders of magnitude better" after I spent a few minutes setting up the 10 band equalizer on transmit. Another fellow said I had "a perfect signal." (When was the last time *you* heard that?) I used the 10 band receive equalizer to compensate for low-end emphasis resulting from the effects of noise reduction, which is excellent by the way.

I assumed (silly me) that the record feature was essentially a digital voice keyer. Not really. It's actually designed to record snippets of off-the-air audio. It does let you record your own messages — lots of 'em — in very high-quality audio. The only way you can transmit them, however, is by manually keying the PTT line and clicking on the message file; initiating the message alone does *not* trip the VOX! I also didn't see any way that you could rename the file (the radio applies a date/time/frequency stamp) to, say, "CQ contest." A little digital rejiggering could make this feature more useful.

To retain various audio-related settings such as transmit or receive equalization you must save the "transmit profile." FlexRadio includes several stock choices or you can create your own. In addition to EQ settings, the transmit profile saves the TX filter high and low, compander and mic gain settings, leveler parameters, RF output power and ALC values. *Very handy!* I only wish the radio had some way of saving various sampling and buffer setting profiles that the operator could access them with the click of the mouse.

CW Choices

New with the FLEX-5000A is a *real* keyer plus provisions for CW keyboarding, CW memories, dot-to-dash ratio and waveform shaping. Even so, CW operation was a somewhat less enjoyable experience than SSB. While the manufacturer claims the FLEX-5000A is capable of full-break-in (QSK) CW, most CW aficionados would call it "near QSK." If another station can't break you with a single *dit* while you're sending, it's not true QSK.

With the first computer, we experienced CW latency — that pesky time lag. With the delay set at 10 ms, the lowest it goes, sending was choppy at a 192 kHz sampling rate and a 2048 RX buffer. Operation with the second computer was much improved. The optimum CW setting seemed to be a buffer setting of 512 at a 48 kHz sampling rate, although filters are less sharp with a buffer that small. The latency problems that plagued us on CW with the SDR-1000 are pretty much gone with the FLEX-5000A, however.

The CWX (keyboard/CW memory) menu accesses nine easily programmable CW memories (just type and play!) and keyboard capability with a substantial type-ahead buffer. I found these especially convenient when using the FLEX-5000A as part of the W1MGY *Titanic* anniversary special event. Opening the CWX menu immediately switches the transceiver to CW mode (and to the last-known CW filter setting).

Using the type-ahead buffer involves first putting the keyboard output on "pause," then activating the keyboard keys to type. To send what you've typed, simply "un-pause" the output stream. It's possible to continue typing at that point, assuming you've still got the keyboard activated. My CW preference was a combination of the CW memories and the keyboard.

A separate "Morse Definition Editor" lets users define or redefine nearly each element in the 64-character set. Send CW in German a lot and want to sound like a native? Program in those inflected letters (ü, for example), *und Du bist ein Berliner*!

The speed setting on the CWX tab is independent of the CW SPEED setting on the main *PowerSDR* console. So are the various timing/delay settings, which, depending on your computer, may need a little diddling to get just right. You may be able to achieve near-QSK on the paddle, but you still have to adjust the keyboard settings to get the same effect. Very tight TR delay settings — near QSK — introduce annoying pops and clicks in the sidetone. In addition, if you're listening on the speakers you'll also hear lots of relay chatter from the FLEX-5000A box.

A Semi-Automatic AGC?

Without judicious use of the AGC-T (AGC threshold) and AF controls, signals can and will block or overload the FLEX-5000A and possibly blow your eardrums. FlexRadio concedes that users have posed "numerous questions" related to the AGC-T control, which essentially acts like an RF gain control. The fact that the AGC-T and AF settings somewhat interact has given rise to considerable explanation in the *Owner's Manual* and the online knowledge base.

Here's the thing: The FLEX-5000A's AGC, which operates at audio frequencies, seems to be something *less* than automatic. The AGC-T control adjusts the AGC gain and, as the *Owner's Manual* explains, "is used to maximize the signal-to-noise ratio based on band conditions (QRN)." FlexRadio recommends reducing the AGC gain until you reach "a sweet spot at which weak signals will appear to 'jump out' of the noise," enhancing weak-signal reception. Dropping the AGC gain also means less AF output, hence the interaction. On the other hand, audio dynamic range improves.

Making volume levels more uniform requires tinkering with the AGC-T and AF controls. The manual advises setting the AGC-T control "as low as possible to comfortably hear the signal of interest" (the default setting is 90) while setting the AF gain to a slightly louder-than-comfortable level. I'm not sure I ever really found that "sweet spot," however.

The separate AGC control lets you set the AGC action to slow, medium, fast, long or custom. You also can turn the AGC off altogether. It's possible to customize the AGC action via the SETUP menu.

Gremlins?

We encountered a few transient gremlins. With the *Vista* computer, the display driver would quit momentarily from time to time — at one point twice in the course of an hour-long QSO. This typically occurred only while using high sampling rates. On numerous occasions I found it necessary to stop and restart *PowerSDR* after it froze up on the first try. Less frequently the radio would not receive after the VOX dropped out. Briefly tripping the PTT got it going again.

Other times I'd see this announcement: "Error communicating with the FLEX-5000. Please reload *PowerSDR* to try again." Starting *PowerSDR* too soon after energizing the radio box can cause this, although that was rarely the case. A further complication: After clicking "OK" on the error dialog box, the program continues to load, then gives you a *second* error message informing you that it could not open the driver.

While the ATU worked well most of the time, sometimes it simply balked, and I had to try again, usually getting a match on a subsequent attempt. Sometimes I'd get an error message saying no RF was detected. Other times I got nothing, although the ATU remained in line, rather than switching to bypass as it's supposed to. Early on, I "lost" the ATU function altogether and had to restart everything from scratch a couple of times to get it back.

A few times the panadapter disappeared or failed to show the spectrum trace. Sampling rate and buffer settings that *seemed* to work okay initially later didn't. Then too, sometimes the driver buffer setting would change mysteriously and without warning. At least once, the FLEX-5000A quit receiving after I'd entered some buffer and sampling rate settings the manufacturer had suggested. FlexRadio attributes gremlins like these to *Vista* and recommends using *Windows XP* unless there is a strong reason to go with *Vista*.

Jots and Tittles (in No Particular Order)

■ The nearly 200 page *Owner's Manual* (updates available online) is comprehensive, but the manual and its several supplements can get highly technical. The book includes some guidelines to set up the radio for that first QSO. In addition, FlexRadio's support staff and the fraternity of Flexers are willing to provide ample wise counsel to help you and your FLEX become fast friends.

■ If you like using memories, you'll love the FLEX-5000A, since you can essentially store as many as you'd like, limited only by the available space on your computer's hard drive. Under a "GRP" choice of AM, FM, SSB or SSTV (there's no CW group), you can store mode, filter, step size, AGC, call sign, frequency and comments. You can input 95 characters to the comments buffer, but only about 50 of them show up upon recall.

■ The ANTENNA SELECTION tab — as do some other menus and tabs — offers "Simple" and "Expert" user levels. At the higher end, you can define not only which antenna to connect but on which band, at what transmitter power level and even at what AGC-T setting.

■ The FLEX-5000A includes built-in test equipment. With the exception of the power/SWR circuitry, the radio can test and calibrate itself. As Youngblood explained, "You can push a button and walk away for 20 minutes. When you come back, the radio will have gone through the full factory test/alignment procedure."

■ The FLEX-5000A's MOSFET output stage is rated at 100 W continuous duty on all modes. This is a recent change that reflects the results of additional testing, as the manual warns against operating continuous carrier modes above 40 W output for longer than 15 seconds. The radio box appears to have adequate cooling, although it did get warm and the fan came on continuously following moderate exercise during a special event operation on CW.

■ The software version we used (v 1.10.4) included some noise reduction (NR) "enhancements." A few Flexers consider these a step backward or, as one said, "a work in progress." FlexRadio support offered some basic numbers to stick into the NR menu (for example, how many "filter taps" are optimal?).

■ The FLEX-5000A offers a huge variety of audio and RF connections and a substantial switching matrix for accommodating outboard transverters. This makes it possible to enjoy the SDR advantage on VHF and UHF.

■ The 0 BEAT button works fine on CW.

■ The FLEX-5000A receiver sounds excellent on the AM broadcast band. You can set up an 8 to 10 kHz passband for great audio fidelity. The automatic notch filter readily dispatched a slight heterodyne I was hearing on one signal.

■ The two adjustable noise blankers are exceptionally effective, and you can enable NB(1), NB2 or both. NB(1) is the more aggressive of the two

■ Clicking the BIN (binaural) button adds an entirely new dimension to SSB audio.

■ The MULTIRX is great! It's sort of a dual-watch feature. Just for starters, while operating split you can keep inserting as much audio from your transmit frequency as you prefer to help stay ahead of the competition.

■ For those contemplating remote operation, say from a deed-restricted home location, the FLEX-5000A may be an ideal solution. It's eminently remotable via the Internet.

■ A rear-apron stereo jack is designed to drive powered computer type speakers, not included. I'm pretty much a headphones guy, but occasionally I'll switch to the speaker. Do this with the FLEX-5000A while operating phone, and you'll also quickly discover there's no anti-VOX.

■ Three band-stacking registers retain frequency, mode, filter, preamp and other important settings.

■ The display ZOOM and PAN controls let you zero in on the particular part of the band you want to see in the display window, and they permit some compensation for the smaller chunk of spectrum visible at lower sampling rates.

■ The preamp is terrific. It neither raises the noise level nor affects the receiver's dynamic range. I wondered, however, why it couldn't just be a button that illuminates when enabled, like the ones on many "hardware" transceivers. What's there now requires selecting "On" or "Off" from a tiny pull-down menu. There is no attenuator.

■ Very handy is the ability to establish a separate low-power output level for the transmitter while the ATU is doing its thing. Once the tuner successfully matched an antenna I expected to see 1:1, but it read 0.0:1.

■ For digital modes, the radio employs AFSK using upper and lower-sideband modes, DIG-U and DIG-L.

So, *Are* We There Yet?

This latest FLEX has come a long, *long* way from what we looked at in 2005. But, is this the radio for which you would forsake all others? In a word, *maybe*. Here's why: The FLEX-5000A requires its owner to engage in what some might consider an excessive amount of tweaking and experimenting to get it working properly with a given PC (think, "high maintenance partner/spouse").

A decision to buy really hinges on whether you're up for the challenge of the FLEX-5000A. Using and, especially, fine tuning the FLEX-5000A for routine or specialized multimode operating can demand a level of technical knowledge and acumen that's a step above that of the average radio amateur, even in 2008 — and that's even excepting the "Expert Level" settings on the transceiver's menu. Perhaps "Flexer" Steve, K5FR, put it best in his posting to the Flex-Radio Web site. "The Flex family of radios has brought a new 'Event Horizon' to Amateur Radio," he said. "These are exciting times to be a ham."

For the most part, I was able to get our FLEX-5000A working to my satisfaction on CW; the narrow, brick-wall filtering is breathtaking, the keyboard and memory implementation is superb and latency issues were very nearly non-existent. To achieve the same level of satisfaction on SSB did require reconfiguring the radio with new sampling rate and buffer settings.

Many happy Flex campers are enjoying their SDR-1000s and FLEX-5000As, and I had a great deal of fun using this radio myself, despite — and possibly because of — the challenge. With an expanding user base and the efforts of the fine folks at FlexRadio, I'm confident it will *get there* in the relatively near future. Better yet, it will *keep on going!*

Manufacturer: FlexRadio Systems, 13091 Pond Springs Rd, Suite 250, Austin, TX 78729; tel 512-535-5266; **www.flex-radio.com**.

Summer Reading List

Check out the April and October 2005 *QST* "Product Review" columns covering the FLEX-SDR-1000 transceiver, available online at **www.arrl.org/members-only/prodrev/**. Those inclined to delve more deeply into this subject should also visit the award-winning series, "A Software Defined Radio for the Masses," by Gerald Youngblood, K5SDR, who's FlexRadio's president. These appear in the July/August and September/October 2002 issues of *QEX* and are available on FlexRadio's Web site. Also, don't miss "The FLEX-5000A as a Contest Radio — A First Look," by Bill Heinzinger Jr, W9OL, in the May/June 2008 issue of *NCJ*. — *Rick Lindquist, N1RL*

TECHNICAL CORRESPONDENCE

LIGHTNING AND THE ELECTRICAL DISTRIBUTION SYSTEM

◊ I read the February 2008 *QST* article about lightning with interest ("Lightning: Understand It or Suffer the Consequences," by Larry Scheff, W4QEJ, pp 40-44).

There are a couple of misstatements and errors in the article with regard to the power distribution system in the US and with National Electrical Code (NEC) requirements. The article says, "It's fairly easy to understand the 60 Hz electrical ground for your house. Typically, the ac power source for a residence is the intentionally ungrounded center-tapped secondary winding of a … power company single-phase transformer. This transformer supplies 120 V_{RMS} line to neutral from both sides of the center tap and 240 V_{RMS} from the entire secondary winding." The statement that this transformer is ungrounded is wrong! Section 250 of the NEC (Grounds) and specifically Section 250.24 (2) Outdoor Transformer says "Where the transformer supplying the service is located outside the building at least one additional grounding connection shall be made from the grounded service conductor (neutral…Section 200 of NEC) to a grounding electrode either at the transformer or elsewhere outside the building."

The next paragraph says there is no additional ground wire in the service cable (service drop or service lateral) so there is no wired ground connection between the secondary winding of the transformer and the load panel. It also says there is no wired ground connection between the transformer secondary winding and its primary winding. Again, this is wrong! See Section 250.24(2) of the NEC again. In a four-wire, three-phase electrical distribution system, the neutral is carried throughout the system and is also tied to the transformer secondary neutral, or center tap. This is called a "common neutral." There is a ground rod at every transformer (single or three phase) to aid should the common neutral become broken or disconnected.

[Figure 1 in this Technical Correspondence column is a revised version of Figure 1 as it appeared in the February *QST* article. The resistances shown in the wires, including the pole ground wire, represent the lightning surge impedance of the wires. — *Ed.*]

What W4QEJ says is true in Delta derived transmission systems. There is no connection between the primary and secondary windings in that case, but this is not true on a Wye derived system, with the common neutral. Part of the country was changed to the four wire Delta system in the early 1950s, and this achieved a 73% capacity increase of the distribution system, and still used existing transformers.

The local power company in my area (Ohio Edison) even taps to the outer conductor in underground primary feeders every 600 feet or so, and buries about 20 feet of bare copper wire in the trench with the underground feeder. This establishes an extensive ground bed.

In Figure 2, the article states that the grounding electrode is improperly installed, and also indicates something called "Ultimate Ground." What is the definition of a properly installed "made electrode"? My definition is what complies with Section 250 of the NEC. What is the definition of "Ultimate Ground"? My engineering handbooks make no mention of this term.— *Robert D. Spann, WA3QZK, 161 State Line Rd, E Palestine, OH 44413*; **wa3qzk@yahoo.com**

W4QEJ Responds:

After Part 1 of my article was published in the February 2008 *QST*, and before Part 2 was published in the April 2008 *QST*, several readers commented that the power company's pole-mounted lightning arrestor, and/or pole "grounding conductor" were not shown or mentioned in the article. Their concern about that "omission" suggests two things to me; that many people believe that an arrestor offers a lot more surge protection to a residence than it really does; and they apparently think the pole "grounding conductor" which provides a good 60 Hz ground also provides an effective ground for lightning surges, but it does not.

Part 1 of my article was not intended to tell the whole story. Parts 1 and 2 have to be examined together to even begin to do that. And there's a lot more to the overall subject than can be covered in any magazine article. The main "target" reader of the article is the typical ham who probably couldn't care less about the details of things they can't do anything about, but they should be vitally concerned about learning what they (not the power company) can and should do to reduce the vulnerability of their residence and the equipment inside to lightning-related damage.

Since the typical ham may live in a purely residential neighborhood, or in a mixed-use area (residential, commercial, apartment buildings, and so on), or in some other type area, that might be served by any of several different types of power company distribution lines, the representation of the power line in Figure 1 of Part 1 was intended to be as generic as practical, not representing any narrowly specific power line arrangement.

After digesting both parts of the article, readers should be aware that it does not rely on theoretical or hypothetical concepts to help the typical reader determine what can be done inside a home and on property to protect equipment from lightning-related

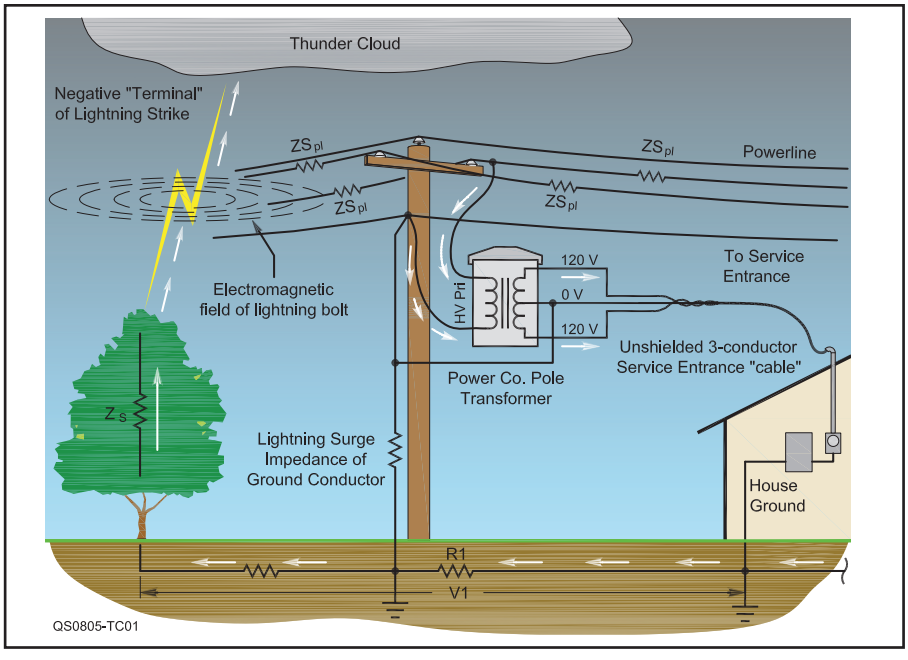


Figure 1 — This modified version of Figure 1 from "Lightning: Understand It or Suffer the Consequences," in the February 2008 issue of *QST* shows the corrected electrical power distribution system. Sometimes in rural areas, only one phase of the distribution power, with the neutral ground wire is run to a small group of houses. Other groups of houses are fed from the other two phase lines, to maintain the load balance.

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damage. Part 2 presents empirically derived data from the real world. The data shown and/or quoted in Part 2 of the article is a small but representative portion of the data and information used by manufacturers to design, develop and test surge protectors that typical *QST* readers can purchase for use in their residences. That information is intended to help typical readers better understand those manufactured surge protection devices so they can choose the right ones to purchase and install in their residence.

That empirical data on surge levels that actually occur inside residential wiring should make it very clear that one should not assume that the power company's lightning arrestor will adequately protect from damaging surges that might enter a residence "from the power company." That's why I considered the power company's lightning arrestor to be virtually irrelevant to the scope of the article, and why it wasn't shown in Figure 1 of Part 1. If I had shown that lightning arrestor, I would have had to explain both what it should do and what it cannot do, but there simply wasn't enough space allocated for such an explanation.

The surge waveform shown in Figure 3 of Part 2 is an empirically derived ANSI/IEEE waveform that represents the combined effects (in and near the residence load center panel) of surges that "get through" that power company arrestor, pass through the residence service entrance cable and combine with the simultaneous "lightning ground surges" that enter the load center panel via the panel earth grounding conductor. Does a 3,000 A surge (as shown in Part 2, Figure 3) in your load center panel make you think the power company's pole-mounted lightning arrestor is adequately protecting you? I don't think so.

The power line that serves your residence is designed to efficiently distribute 60 Hz ac power to your home and to neighboring residences. But if lightning strikes the power line, or strikes close enough to electromagnetically induce significant traveling wave surges into it, then the power line becomes not just a 60 Hz power distribution system — during the strike (an almost infinitesimal period of time compared to one 60 Hz cycle) it also simultaneously becomes a "lightning surge distribution system." So that power line is distributing both 60 Hz ac power and lightning surges at the same time. And that's an entirely different, dangerous ball game.

Such a "lightning surge distribution system" (including pole-mounted lightning arrestors, transformers, pole equipment "grounding," and also residence service entrance conductors, KWH meter current coils and potential coils, load center panels, and load center grounding) was illustrated in a figure titled, "Simplified Example Showing Direct Lightning Strike on Typical Electrical Utility Load Branch Circuit Feeding Residential Area" in the original nine-part version of the article that I submitted to *QST* for publication. I was asked to reduce that version to only two parts, and the article published in the February and April issues of *QST* is the result of that request. Obviously, a lot of information (including that figure) was sacrificed to reduce the article to only two parts.

That sacrificed figure was very different from a typical schematic diagram in that it showed the transformer windings, power line conductors, grounding electrodes, grounding conductors, and other equipment as surge impedances rather than using the usual standard device symbols. That was done to emphasize the fact that, during a lightning strike, those devices act far, far, far more like significant surge impedances than like "normal circuit components."

A Ground or Not a Ground

Apparently, many people, even many 60 Hz oriented engineers and technicians, assume that the "ground wire" that runs down a power pole, "connecting" the lightning arrestor, the "grounded neutral" side of that transformer's primary winding, and the center tap of the transformer's secondary winding, to an earth grounding electrode at the bottom of the pole serves as a good grounding conductor when lightning strikes the power line. That's a very mistaken assumption! That "ground wire" should provide a good 60 Hz "safety ground," but it becomes dangerous when lightning strikes because a tremendous instantaneous surge difference of potential may be developed across that "ground wire" during a lightning strike. Why? The resistance of that "ground wire" is the same for ac and for lightning surges, but even a simple straight wire has inductance. The inductance of that "ground wire" may be negligible at 60 Hz, but it becomes very, very significant when extremely instantaneous lightning-induced surges are present.

When the current in any wire or inductor is changing, the magnetic flux created in that inductance causes a voltage to be induced across that inductance. That induced voltage is proportional to the time rate-of-change if the permeability is constant. The constant of proportionality is called the self-inductance or the inductance of the wire or inductor. This relationship is often expressed mathematically as $v = L\,(\mathrm{d}i/\mathrm{d}t)$, where v is in volts, $\mathrm{d}i/\mathrm{d}t$ (often called the rate-of-rise) is in amperes/second, and L is in henrys.[1, 2] Here it's important to realize that the smaller the diameter of a straight wire, the greater will be the inductance of that wire, so the smaller the diameter of a straight wire, the greater will be the surge voltage generated across that wire.

During a direct lightning strike to the power line, that "pole-ground wire" performs a function that's very similar to that of a "downcomer" used to connect a lightning rod system to an earth grounding electrode system. So, let's examine the results of an example calculation made by experts at Georgia Tech, showing that a typical lightning current of 20,000 A passing through a 0.894 cm (0.357 inch) diameter downcomer 30 m (98.43 feet) long and reaching its peak current in just one microsecond will develop a tremendous voltage drop of one million, fifty thousand volts across that "grounding" conductor.[3] That's a voltage drop of about 10,667 V per linear foot of downcomer. But the maximum rate-of-rise of a lightning stroke is taken to be 210,000 A/ms. So if you compare that maximum possible rate-of-rise to the mere 20,000A/μs rate-of-rise in the Georgia Tech calculation, you'll realize that the worst-case surge voltage at the top of such a "pole grounding wire" might be even more potentially devastating.

With that in mind, take a good look at the "pole grounding wire" on the power company pole that provides power to your house and compare its length and diameter to that lightning rod system "downcomer." Then try to imagine how dangerously high the surge voltage developed across that "ground wire" might get during a nearby lightning strike or, even worse, during a direct strike to that power line. During some lightning strikes, you should expect the surge voltage drop across that "grounding conductor" to be tens of thousands of volts. And when that happens, everything connected together at the top of that "ground wire" may actually be tens of thousands of volts above "ground."

Now let's realize the profound difference between 60 Hz safety thinking and "surge impedance circuit thinking" relative to the wiring and equipment on that power pole. When no surges are present, the impedance of the pole's 60 Hz grounding conductor/lightning surge "downcomer" is very, very low — virtually ignorable. So the outer surface of the transformer tank and everything else that's connected to the top of that conductor is "60 Hz safety grounded." And the transformer is behaving normally, merely acting as a power transformer.

[1]Further explanation of this relationship can be found in most any textbook on the basics of electrical engineering.

[2]Equations to calculate the inductance of a straight wire can be found on page 4.24 of the 2008 edition of *The ARRL Handbook*. ISBN: 0-87259-101-8, ARRL Order no. 1018. ARRL publications are available from your local ARRL dealer, or from the ARRL Bookstore. Telephone toll-free in the US 888-277-5289, or call 860-594-0355, fax 860-594-0303; **www.arrl.org/shop**; **pubsales@arrl.org**.

[3]H. Denny, L. Holland, S. Robinette and J. Woody, *Grounding, Bonding, and Shielding Practices and Procedures for Electronic Equipments and Facilities*, *Volume 1 — Fundamental Considerations*, US Department of Transportation, Federal Aviation Administration Systems Research and Development Service, by the Engineering Experiment Station of the Georgia Institute of Technology, Atlanta, Georgia as US Department of Commerce, National Technical Information Service publication AD-A022 332. pp 2-1 to 2-4.

But when lightning strikes, everything changes — drastically! During a lightning-induced surge, each affected coil or transformer winding in that "lightning surge distribution system" has much higher inductance than any straight wire, so the surge voltage generated across it will be much higher than that developed across a straight wire. So, a very profound, very momentary functional change occurs inside the transformer. During a lightning surge, the transformer windings act far more like a weird capacitor and not much at all like a transformer. The transformer is designed to "step down" the 60 Hz voltage applied to its primary winding to the secondary voltage, 120-0-120 V. It's designed to perform its intended electromagnetic "transformer action" very efficiently at 60 Hz. When a lightning-derived surge, having a rise-time somewhere between a minimum of less than a microsecond and a maximum of only 30 microseconds, arrives at the transformer primary winding, then the resulting very high surge impedance of that winding will severely limit the electromagnetic energy that the surge can "pump" into the primary winding during the extremely fast rise-time of the surge. So, very little surge energy can be electromagnetically coupled from the transformer primary winding to its secondary winding.

But when lightning surges are present, the surface areas of the primary and secondary windings that "face each other" inside the transformer act like a capacitor.[4] The potential difference, v, across a capacitor is proportional to the charge on the capacitor. The constant of proportionality, C, is called the capacitance of the capacitor. The current through the capacitor, i, may be determined by the equation, $i = C\ (\mathrm{d}v/\mathrm{d}t)$, where C is in farads and $\mathrm{d}v/\mathrm{d}t$ (often called the rate-of-rise) is in volts/second. So the bigger that "capacitor" is, and the faster the rate-of-rise, the greater will be the surge energy that can be capacitively coupled from the primary winding to the secondary winding, and from there through the surge impedances of the service entrance conductors and the relatively high surge impedances of the current coils inside the KWH meter, and from there into the load center panel inside the residence that is served by the transformer.

Lightning Surge Paths

From the pole that "feeds" ac power to your house, during a direct lightning strike to that pole, there are typically four different surge paths to "surge ground" (the "ultimate ground" of the lightning strike) from the common surge-elevated "grounded neutral" connections up on that pole. Three of those "ground" paths involve the power company lines, the power company equipment, and the other residences "fed" by those power lines. Those four paths are:

1) "Upstream" via the lightning surge impedances of the line and neutral conductors of the power line toward the power company transformer (or transformer bank) that's supplying the high voltage ac power to the power line. Surges traveling in this direction will be attenuated as they travel, because of the surge impedances of all the upstream line, neutral, and "grounding" conductors involved, and by the passage of surge currents into the earth at the bottom of each pole.
2) "Downstream" via the lightning surge impedances of the line, neutral, and "grounding" conductors of the power line toward the last residence at the end of the line. Surges traveling in this direction will similarly be attenuated as they travel in a manner similar to what happens "upstream."
3) Down through the very high lightning surge impedance of the "pole downcomer" and into the earth at the bottom of the most affected pole (creating a very high voltage drop across that "pole downcomer."
4) The "ground" path that affects your house the most starts at the power company pole that "feeds" your house, runs through the lightning surge impedances of the neutral conductor in your service entrance cable and the KWH meter to the neutral and ground buses inside your load center panel; exposing those buses and the ac wiring inside your house to lightning surges from the power company; and then from there through lightning surge impedance of the load center grounding conductor to your service entrance grounding electrode system.

The power company's pole-mounted lightning arrestor has no effect at all until the surge voltage across it reaches or exceeds its "breakdown voltage" when, in effect; it becomes a "short circuit" across the primary winding of the pole-mounted transformer. That "short circuit" exposes the top of that pole's "ground wire" to the full unattenuated brunt of the lightning strike. Since the power pole end of the neutral conductor in the service entrance cable that "feeds" your house is also connected to that very highly "above ground" lightning surge voltage at the top of that pole "ground wire," that pole-mounted lightning arrestor can do little, if anything, to keep above-ground causative "power line surges" out of your load center panel. So obviously, that lightning arrestor should protect the pole-mounted transformer, but it cannot adequately protect your load center panel or what's inside your house.

Apparently many people, even many 60 Hz oriented engineers and technicians, simply don't understand the different ways that earth grounding and earth ground currents affect the surges that can occur inside a residence. The power source for the 60 Hz power distribution system that "feeds" your neighborhood is a secondary winding in a power company transformer or transformer bank having a corresponding primary winding that's connected into the power company system. And the neutral side of that transformer secondary winding is typically connected to an earth-grounding electrode that comprises the single 60 Hz source "ultimate ground" for the entire 60 Hz power distribution system that "feeds" your house. There are many "non-ultimate" power pole grounds within your neighborhood's 60 Hz power distribution system. But the "ultimate ground" for that entire "lightning surge distribution system" is the "ultimate ground" of the lightning strike that's explained and described in Part 1 of my article. Those two "ultimate grounds" (the one for the 60 Hz source and the one for the lightning strike) are not the same. And during a lightning strike to or near the pole that "feeds" your house, there's a significant lightning surge difference of potential between your service entrance grounding electrode system and the power company 60 Hz "grounding electrode" at the base of that pole. And that significant below-ground causative lightning surge difference of potential contributes to the resultant surge (Figure 3 in Part 2 of my article) that appears in and near your load center panel.

There are two related errors (my errors) in Part 1 of my article in February 2008 *QST*. In the last paragraph on page 40, the words "intentionally ungrounded" should not have been included in describing the secondary winding of the transformer. In the first full paragraph on page 41 the text that reads: "There's no wired connection between the transformer's secondary winding and its primary winding." was my goof, not a misprint. The sentence on page 41 should have read "There's no true lightning surge ground at either the transformer's secondary winding or its primary winding." I apologize for any confusion caused by that error. — *Larry Scheff, W4QEJ, 679 Creek View Dr, Lawrenceville, GA 30044*

[4]Since the plates of a "normal" capacitor typically have smooth surfaces and the surface areas of the primary and secondary windings that "face each other" are actually partially exposed turns of insulated wire of a single layer on the primary winding and on the secondary winding, one would expect the "capacitor action" inside the transformer to be much more difficult to analyze than what happens in a "normal capacitor."

Dayton Hamvention 2008:

Wow, What a Show!

S. Khrystyne Keane, K1SFA

With still a couple of hours to go until officials opened the doors to Hara Arena on Friday morning, lines of hams snaked around the building waiting for the "magic hour" — 9 AM — on the first day of the 2008 Dayton Hamvention. When the doors finally opened, the influx of hams surged through the doors — some picking up the program and flipping to the map to see who and what was at Hamvention, others with a planned route through the maze that is Hara Arena already mapped out in their mind.

Like small migrating herds, groups of hams roamed Hara in search of *the* bargain, be it a new antenna, a radio or the various and sundry small parts, such as coax, resistors and PL-259s, that go hand-in-hand with being an Amateur Radio operator. Even though rain and winds threatened over the weekend, thousands of hams made the pilgrimage to the largest hamfest in the world, and the weather cooperated beautifully.

More Than a Hamfest

There is more to the Dayton Hamvention than just a hamfest. With the hamfest proper beginning on Friday, May 16, some related activities started a few days early. On Wednesday, QRP Amateur Radio Club International's Four Days in May began in earnest. With more than 400 participants, the event is an occasion to meet many of the originators of QRP theory, products, literature, high scores and, of course, the tall tales.

On Thursday, more than 200 students gathered at the Crowne Plaza Hotel to attend the second annual Contest University. This year's CTU built on last year's program, and included a "graduate" level offered to returning students.

Of course, there are the various organizational banquets that go on during Dayton. This year boasted the AMSAT/TAPR Banquet, the ATN/ATV Dinner, the Southwest Ohio DX Association's 23rd Annual DX Dinner and the QCWA 2008 Hamvention Banquet on Friday; the 16th Annual Contest Dinner, hosted by the North Coast Contesters, was on Saturday and saw the induction of two hams — Randy Thompson, K5ZD, and Paolo Cortese, I2UIY — into the CQ Contest Hall of Fame.

It's All Happening at the ARRL EXPO!

The ARRL EXPO was definitely the place to be at Hamvention. The ARRL again offered a wireless Internet Café for Hamvention attendees to surf the Web or check e-mail — and this year (as opposed to last year) the Internet connection worked! For the first time, a movie room was part of the EXPO; movies were scheduled throughout each of the three days of Hamvention. Also for the first time, those who joined or renewed their ARRL membership at Hamvention received an eco-friendly shopping bag. "These bags went like hotcakes!" said ARRL Membership Manager and ARRL EXPO Coordinator Katie Breen, W1KRB.

The fourth-ever Dayton ARRL EXPO was in its usual place at Hara, the Ballarena. Breen said: "We've added even more programs to our exhibit at Hamvention, such as Logbook of The World, ARRL Education Services and a larger lounge for youth. The ARRL Youth Lounge is a great place for new and experienced young hams — and kids who are interested in ham radio but are not yet licensed — to learn more about Amateur Radio and how fun it can be."

Another new feature in this year's ARRL EXPO was the popular "The Doctor is IN" booth. *QEX* Editor Larry Wolfgang, WR1B, *QST* Technical Editor Joel Hallas, W1ZR, and ARRL Laboratory Engineer Mike Gruber, W1MG, were on-hand to answer technical questions. *QST* Editor Steve Ford, WB8IMY, and ARRL News Editor S. Khrystyne Keane, K1SFA, were also at the booth to answer general questions regarding *QST* and ARRL publications.

The ARRL contingent consisted of both staff and volunteers.

Recognizing Those Who Give

On Thursday evening, just prior to the start of Hamvention, Chief Development Officer Mary Hobart, K1MMH, hosted a reception for those ARRL members who have donated more than $1000 this past year. "This year's Donor Reception really shone — thanks in large part to the work of Development Associate Maryann Macdonald," Hobart said. "Everyone was in a celebratory mood and ready to kick off another great Hamvention weekend with great food, a delightful venue and a gathering of wonderful friends of ARRL."

This annual event, now in its seventh year, featured Olof Lundberg, GØCKV/SMØCKV, founding Director General and Chief Executive Officer of Inmarsat, a global satellite network that offers mobile satellite communications services for users in the maritime, land and aeronautical sectors. Lundberg said that since Inmarsat was founded during the Cold War by those on both sides of the conflict, a high level of "technical diplomacy" was required.

ARRL Chief Executive Officer David Sumner, K1ZZ, said he had "the good fortune to meet Olof when we were both rather young and it has been my continuing good fortune that our paths have crossed repeatedly in the ensuing years. His passion for Amateur Radio is clearly as strong today as when he was a student in Gothenburg, Sweden more than 40 years ago."

Hobart concurred: "We enjoyed Olof's comments, whose remarks segued perfectly into those of ARRL President Joel Harrison, W5ZN, and the ARRL focus on the importance of new technology in Amateur Radio, as we honored new members to the ARRL Maxim Society, a tradition at the Donor Reception. All in all, it was a fabulous evening!"

S. KHRYSTYNE KEANE, K1SFA

ARRL President Joel Harrison, W5ZN, presents the newest member of the ARRL Maxim Society Bob Locher, W9KNI, with a framed portrait of ARRL Founder Hiram Percy Maxim, W1AW.

Olof Lundberg, GØCKV/SMØCKV, was the keynote speaker at the ARRL Donor Recognition Reception.

S. KHRYSTYNE KEANE, K1SFA

There are 47 members of the ARRL Maxim Society. The new ARRL Maxim Society members for May 2007-May 2008 include Bruce Butler, W6OSP; Bob Locher, W9KNI; Herbert L. Schuler, K2HPV, and Claudia Schuler; Dr Beurt SerVaas, W9WVO, and Roger A. Strauch, KD6UO. Michael D. Valentine, W8MM, is the first Maxim Society member to reach the Fellow level.

Ford posted the live Web blog — including pictures and videos — (check it out at **www.arrl.org/blog**) from Dayton and Keane prepared and posted news stories to the ARRL Web site.

ARRL's Fifth Pillar: Technology

Technology

ARRL President Joel Harrison, W5ZN, announced on Saturday in the ARRL Technology Forum that the League is expanding its identity program to include greater emphasis on technology. Harrison explained that "Ham radio operators, and particularly ARRL members, closely identify with current and emerging radio technology," and named 'technology' as ARRL's new fifth pillar. ARRL's other four pillars, the underpinnings of the organization, are Public Service, Advocacy, Education and Membership. "For hams, expanding the four pillars to include technology will reinforce one of the organization's guiding principles — that ham radio is state-of-the-art, innovative and relevant," he said.

"Radio amateurs have entered a new era. More than a dozen Amateur Radio satellites are presently in orbit with more to come. Software is expanding the capabilities of their radio hardware and communication by digital voice and data is expanding rapidly among hams," Harrison said.

In addition to the new fifth pillar, the ARRL has launched a year-long ham radio recruitment campaign emphasizing the Amateur Radio Service as a scientific national resource. The campaign invites newcomers to discover ham radio in the 21st Century — where hams are using science, technology and experimen-

S. KHRYSTYNE KEANE, K1SFA

ARRL CEO David Sumner, K1ZZ, accepts a check from DARA President Jim Simpson, WB8QZZ, for $20,000 to go to the ARRL Teachers Institute. From left: ARRL Education Project Coordinator Mark Spencer, WA8SME; ARRL First Vice President Kay Craigie, N3KN; Sumner; Simpson, and three other DARA officials — Jon Theurmer, KB8SRQ; Ed Collins, N8NUY, and Jerry Miller, WD8QAI.

What's New at Dayton 2008?

Joel R. Hallas, W1ZR

In 2007 we had a bumper crop of five 100 W or more powerful HF transceivers to describe. I knew we couldn't keep that up — confirmed by having just one new one this year. A more comprehensive summary appears on the ARRLWeb.

HF Transceivers

ICOM

ICOM displayed their new IC-7200 HF and 6 meter transceiver. This transceiver is designed as a rugged unit suitable for field operation, but is usable from home as well. It includes the spray intrusion protection of their marine equipment, installed around controls and between sections of the heavy outer shell. With a package about the size of their entry level IC-718, this radio adds the IF DSP processor of some of their more recent models to provide multiple selectivity and noise abatement choices. **www.icomamerica.com**

Elecraft

Elecraft showed off the second receiver for the K3 HF and 6 meter transceiver they announced last year. This receiver allows simultaneous receive on two frequencies with audio mixed or sent to separate speakers or sides of the headphones. **www.elecraft.com**

FlexRadio

FlexRadio Systems, well known for their line of high-performance software defined radios, introduced the RX2 second receiver for the Flex-5000 HF and 6 meter transceiver reviewed in this issue. **www.flex-radio.com**

Ten-Tec

Ten-Tec has given the venerable Jupiter HF transceiver a facelift. A new black front panel and cabinet complement a new easier to view blue display screen. These are available on new radios or as an upgrade to earlier models from Ten-Tec. **www.ten-tec.com**

TAPR

Tucson Amateur Packet Radio Corporation (TAPR) has announced additional modules to allow advanced users to assemble a fully functional software defined radio (SDR) using elements from their High Performance SDR (HPSDR) development project. So far the project includes a backplane and six plug-in modules sufficient to form an SDR receiver and transceiver with an output of ½ W. **www.tapr.org**

HF Power Amplifiers

Alpha Radio Products

Alpha Radio Products unveiled their new Alpha 8410 full power HF linear. This manually tuned amplifier uses a pair of 4CX1000 power tetrodes, available from multiple sources, thus avoiding sourcing problem difficulties that have plagued users of some tubes recently. **www.alpharadioproducts.com**

Dishtronix

Dishtronix displayed their Prometheus DX2400L1 HF legal limit 100% duty cycle linear. The amplifier includes impressive automatic control circuitry and a massive heavy duty power supply. **www.dishtronix.com**

Tokyo Hy-Power

Tokyo Hy-Power followed last year's Dayton debut of with some new products. The most novel, in my view, is a compact 45 W output linear amplifier. The HL-45B HF and 6 meter amplifier is especially designed to operate with the popular 5 W output Yaesu FT-817 portable transceiver. They also showed the new HL-1.1KFX, a 600 W output HF linear designed especially for portable applications such as DXpeditions.

Also shown was a new 13.8 V, 60 A switching power supply designed to supply power to dc operated 500 W class linear amplifiers or 200 W transceivers. **www.thp.co.jp**

VHF Transceivers

Yaesu announced their VX-8R handheld transceiver. This is a slimmer version of the VX-7R that includes Bluetooth capability, a special remote mic with GPS receiver that supports the amateur position reporting system (APRS) and provides 1.5 W operation on the 222 MHz band. **www.yaesu.com**

Antennas

SteppIR

SteppIR introduced the Dream Beam 36, a 60 percent of full size 40 meter antenna (49 foot long driven element) that operates as a 3 element Yagi on 40 and 30 meters, a 4 element on higher bands, and can be equipped with an element that serves as a shortened rotatable dipole on 80 and 60 meters, and all frequencies in between. **www.steppir.com**

ZeroFive Antennas

ZeroFive, marketed through Array Solutions, offers a selection of very heavy duty vertical antennas including some that can serve dual duty as flagpoles. **www.zerofive-antennas.com**

Accessories

Heil Sound

Heil Sound introduced a new microphone, the PR 781. It is based on the PR 780 that was designed for the ICOM IC-7800 with 35 to 40 dB of rearward rejection to eliminate fan noise or reflections from behind. It can be used with virtually all modern transmitters, or even early AM radios with the Heil XT-1 matching transformer.

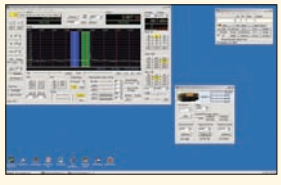
They also displayed the new PR 35 microphone, essentially their studio quality PR 30 mic mounted in a handheld enclosure. **www.heilsound.com**

Palstar

Palstar showed their new 160 through 6 meter 450 W manual tuner. This compact unit is designed for the medium power operator. **www.palstar.com**

TelePost

QST author Larry Phipps, N8LP, was displaying his LP-PAN software defined panadapter designed for use with the Elecraft K3. This compact device connects to the IF output port of a K3 and the audio connections to the PC. The resulting display, using freely available *Powersdr* or other SDR software, allows a spectrum view of signals across the band segment — tunable via "point and click." The device's PC software provides a bridging function that allows other systems, perhaps logging or contest software, to be run at the same time without complication, as shown in the photo. **www.telepostinc.com**.



S. KHRYSTYNE KEANE, K1SFA

Frankie Perez, KB1NQR (right), of the ARRL Membership and Volunteer Programs Department, assists a ham with his DXCC application.

S. KHRYSTYNE KEANE, K1SFA

Bob Allphin, K4UEE (standing) and members of the Peter I DXpedition, 3Y0X, watch the video of their DXpedition on the ARRL Movie Room located inside ARRL EXPO. The Movie Room was a new feature at the ARRL EXPO this year.

tation to explore the radio spectrum.

"For more than 90 years, the ARRL has been at the forefront of technology, encouraging experimentation and education through its license training resources, publications and periodicals. ARRL provides its members with top-notch technical information services, trusted product reviews and radio spectrum advocacy," Harrison said. "The ARRL Laboratory is a centerpiece of ham radio technology, contributing to radio electronics experimentation, spectrum development and advocacy, and radio frequency engineering."

Harrison also noted that many hams attribute their affinity to "Amateur" Radio as launching their professional careers in radio engineering, satellite communications, computer science and wireless communications.

"This is less about defining a new course for Amateur Radio, but simply recognizing a course that has always been a precept of radio amateurs and the ARRL," he said. Referring to the federal rules and regulations for Amateur Radio, Harrison explained that one of the defining principles of the Service's very creation by the government is the amateur's proven ability to contribute to the advancement of the radio art. Harrison remarked, "Today's technology is nothing new to ham radio!"

American Red Cross Responds to ARRL Concerns Regarding Background Checks

At the ARRL ARES forum at the Dayton Hamvention, ARRL Emergency Preparedness and Response Manager Dennis Dura, K2DCD, announced that the American Red Cross (ARC) has finally moved to resolve the issue of background checks for ARES volunteers.

In November 2007, ARRL President Joel Harrison, W5ZN, wrote to the ARC regarding concerns voiced by ARRL volunteers. In 2006, the Red Cross stated it would implement background checks that included, among other things, a credit check and a "mode of living" check for its staff and volunteers, including ARES volunteers providing services to the Red Cross during disasters. ARRL saw these portions of the background check as unneeded and inappropriate for ARES service.

In a letter dated May 8 of this year, Armond T. Mascelli, ARC Vice President for Disaster Response Services, replied to President Harrison: "I can now report back to you that [these] actions have been completed and changes have been instituted which I trust resolves the concerns detailed in your letter. This effort took considerably more time and attention than originally envisioned, but I believe the results will now benefit our respective organizations."

With the background check issue apparently resolved, the ARRL will be working with the ARC in the negotiation and creation of a draft for a new *Memorandum of Understanding* (*MOU*) or similar document to replace the one that expired last year; Dura and Keith Robertory of the ARC will be leading the effort. When complete, the draft of the MOU will be presented to the leadership of both organizations for approval.

"The ARRL is very pleased that the American Red Cross has responded appropriately to our concerns about the background check issue," said ARRL Chief Executive Officer David Sumner, K1ZZ. "We believe it now will be possible to go forward to negotiate a statement of understanding between the two organizations. We look forward to renewing and expanding the relationship with the Red Cross."

DARA Funds Dayton Teachers Institute

The Dayton Amateur Radio Association (DARA), the host of the Dayton Hamvention, donated $20,000 to the ARRL Teachers Institute on Saturday. ARRL Chief Development Officer Mary Hobart, K1MMH, said, "We have six Institutes running this year, with one in Dayton. These funds will go to support that session of the Institute."

The ARRL Teachers Institute offers 72 teachers the opportunity to explore and experience wireless technology basics, teaching of basic electronics concepts integral to microcontrollers and robotics, bringing space technology into the classroom, radio astronomy basics, building a radio telescope, building and programming a robot and more.

See You Next Year!

Please join the ARRL at the 2009 Hamvention on May 15, 16 and 17. If you have never been to a Dayton Hamvention, make 2009 your year to experience all the fun and excitement. If you are a Dayton regular, remember what brings you back year after year. Next year promises to be even better than 2008 — come be a part of it!

S. Khrystyne Keane, K1SFA, is the ARRL News Editor. She can be reached at **k1sfa@arrl.org**.

ARRL Legislative Action Program — Working to Promote and Protect Amateur Radio

An update on ARRL efforts in the 110th Congress.

Dan Henderson, N1ND

"It is obviously of importance to the safety of a democracy that in time of real peril it should be able to command the service of every one among its citizens in the precise position where the service rendered will be most valuable." ~ Theodore Roosevelt, 1913

The words of Theodore Roosevelt, the 26th President of the United States, serve as a reminder that in our democratic system it is the responsibility of each citizen to be an active participant in the processes that affect their lives. This call to serve extends to those of us privileged to be active licensees and participants in the Amateur Radio Service.

The ARRL encourages its members to exercise their individual responsibility to become actively involved in addressing the issues that confront our service by being directly involved in serving the local community's needs. But at times the challenges and opportunities our members must address go beyond local interests and affairs. The ARRL Legislative Action Program (LAP) is designed to coordinate activities to promote our legislative interests, starting from the grassroots level.

The LAP makes it possible for ARRL members to promote and protect Amateur Radio through coordinated, legitimate political action at the national level. The success of this program comes from our ability to "rally the troops." Put simply, federal legislators frequently support issues when they determine that it is important to their constituents. The LAP is designed to communicate with *you* — the individual constituent — at times to ask you to contact your member of Congress or Senator to express support of legislation that would benefit the Amateur Radio Service and, on occasion, to oppose legislation contrary to our interest.

Sponsors and Current Cosponsors

HR 462
Rep Mike Ross, AR-4, Sponsor
Rep John Barrow, GA-12
Rep Roscoe Bartlett, MD-6
Rep Baron Hill, IN-9
Rep Steve Israel, NY-2
Rep Ron Lewis, KY-2
Rep Michael McNulty, NY-21
Rep Tim Murphy, PA-18
Rep Sue Wilkins Myrick, NC-9
Rep Ron Paul, TX-14
Rep Collin Peterson, MN-7
Rep David Price, NC-4
Rep Bart Stupak, MI-1
Rep Timothy Walberg, MI-7

S 1629
Sen Mark Pryor, AR, Sponsor
Sen Mike Crapo, ID

The ARRL was successful in its recent lawsuit with the FCC on how the Commission handled the adoption of rules for Broadband over Power Lines (BPL) systems. While this is an important win for the Amateur Radio Service, it doesn't mean we can sit back and relax. In fact now more than ever licensed radio communication services, including public safety and Amateur Radio, still need the help of Congress to make sure that the FCC actually corrects its errors in dealing with BPL. To secure that help, the ARRL is promoting two pieces of legislation in the 110th Congress.

HR 462 and S 1629

In the US House of Representatives, Representative Mike Ross of Arkansas, WD5DVR, has introduced and sponsored the HR 462, "the Emergency Amateur Radio Interference Protection Act." A similar bill, S 1629, has been introduced and sponsored in the US Senate by Senator Mark Pryor, also of Arkansas. These bills direct the Federal Communications Commission to report to the House Committee on Energy and Commerce and the Senate Committee

Congressman Mike Ross, WD5DVR (AR-4th).

Helpful Links

US House of Representatives

Text — HR 462: **http://thomas.loc.gov/cgi-bin/query/D?c110:1:./temp/~c110Fez843::**
House Committee on Energy and Commerce: **http://energycommerce.house.gov/membios/110fullmship.shtml**

US Senate

Text — S 1629: **http://thomas.loc.gov/cgi-bin/query/D?c110:1:./temp/~c110Gn3wSl::**
Senate Committee on Commerce, Science and Transportation
http://commerce.senate.gov/public/index.cfm?FuseAction=About.Members

on Commerce, Science and Transportation respecting the interference potential to licensed radio services from systems that transmit broadband Internet services over power lines.

The late Speaker of the House Thomas "Tip" O'Neill once said "All politics is local" and his focus is correct. Working from the *grassroots* level the ARRL membership can put themselves in positions that will cause the legislators to take notice. To make this happen, the ARRL's Congressional relations firm — Chwat and Co — meets with members of Congress and their staff members to identify potential cosponsors for S 1629 and HR 462. (See sidebar for the up-to-date list of cosponsors for HR 462 and S 1629.)

Citizen Involvement

Based on the initial contact provided by Chwat and Co, when a potential cosponsor to HR 462 or S 1629 is identified, the ARRL, through its Division Legislative Action Coordinators (DLAC), swings into action. The ARRL gets in touch with the appropriate DLAC and provides contact details on the potential cosponsor. The DLAC passes this information to the ARRL members in the appropriate Congressional district or state through Legislative Action Coordinators (LAC) in each state and Legislation Action Assistants (LAA), in each congressional district. The members are asked to begin a letter writing campaign directly to their legislator urging them to become a cosponsor of the bill.

Without a doubt, the local letter-writing campaign is a key component to the Legislative Action Program. One form letter to a member of Congress doesn't give them a good read on the mindset of their constituents. The more *individualized* letters a legislator receives, the more likely they are to seriously consider the position presented. As the adage goes — *there is strength in numbers!*

A couple of notes on letter-writing: First, "hard copy" letters are far more effective than e-mailed comments, so when you make the commitment to become involved please consider mailing your letter rather than e-mailing it. Second, make your letter clear and to the point. A concise one-page letter is more effective than a rambling multiple page tome. Be sure to correctly cite the bill number and title in your comments. Finally, after stating your position, remember to thank them for their consideration and encourage them to become a cosponsor to the appropriate bill. A link to generic sample letters is on the main Members-Only page on the ARRLWeb for you to use as a guide. Remember, personalize your letter — it has more impact. And when you do contact your members of Congress, please e-mail a copy of your letter to **arrl@chwatco.com** for our records.

It is important to note that the ARRL (as do other tax-exempt, non-profit groups) has some limitations in our efforts. The ARRL as an organization is allowed to promote or work against specific policy issues, such as seeking federal legislation to control excessive interference from BPL, to protect Amateur Radio frequencies, or to essentially ensure all amateurs are allowed to install an antenna. What the ARRL cannot do is directly or indirectly participate in or intervene in any political campaign on behalf of or in opposition to any candidate for elective public office. This includes all campaigns, whether federal, state or local. Because of our status as a 501(c)(3) organization we also are limited in the amount of effort we can devote to nonmembers regarding legislative affairs. Your membership in ARRL allows you to become a key component in the ARRL Legislative Action Program.

Our Challenge

The Amateur Radio Service exists in an exciting new environment where we are under constant scrutiny from those who see the Amateur Radio spectrum as a possible area in which they could meet their own commercial needs for new spectrum. The radio spectrum is a finite resource. The ARRL Legislative Action Program plays a primary role in protecting our spectrum. And *you* — the ARRL member — have a vital role to play in our grassroots efforts.

When you are contacted by the ARRL Legislative Action Assistant (LAA) for your Congressional district, please respond quickly to their request. If you haven't been contacted individually requesting your assistance, you can still play an important role. You will find the contact information for your members of the US House and Senate prominently displayed when you log on to the *Members-Only* area of the ARRLWeb at **www.arrl.org**. While the ARRL Legislative Action Program is targeting members of the key Congressional committees that will consider S 1629 and HR 462, we encourage you to contact your legislators urging them to consider becoming cosponsors for these two important pieces of legislation.

The ARRL DLACs, LACs and LAAs are appointed by their ARRL Division Director. For complete information on the ARRL LAP visit **www.arrl.org/govrelations/laprog-faq.html**. These volunteers are at the heart of the ARRL overall effort, because it is through their efforts that we are able to quickly and efficiently contact ARRL members. If you have an interest in helping with this important effort, contact your ARRL Division Director (listed on page 15 of every *QST*) to volunteer your time and talents.

The Legislative Action Program is an important part of the ARRL's "pillar" of advocacy. The implementation can't be left to just the elected Board of Directors, Headquarters staff or a few volunteers. The promotion and protection of Amateur Radio is an important job for every ARRL member. ARRL members step forward and accept the challenges presented when disaster strikes and when all else fails. Our on-the-air efforts for public service are a vital, vibrant part of our hobby. Now is the time to step forward and accept the challenge of doing your part in advocating on behalf of the Amateur Radio Service.

Dan Henderson, N1ND, is ARRL Regulatory Information Manager. He can be reached at **reginfo@arrl.org**.

Summer E-skip and the Magic Band

Some Magic Band sleight of hand — catch it while you can.

Gene Zimmerman, W3ZZ

Those who work 6 meters call it the "Magic Band" because of the amazing places they can work. The magicians are all the unusual and unexpected modes of propagation found there. The most popular of all is sporadic E or E-skip (E_s). It can turn a dead band into a wonderland of stations near and far.

What is E-skip?

E_s is the sporadic and localized intensifying of the E layer that occurs roughly between 15-50°N or S latitude. This area encompasses the US and the nearby Caribbean. It is called "sporadic" because it tends to come and go in an irregular fashion.

The E layer is one of three layers in the ionosphere that can reflect and/or absorb radio signals (Figure 1). The F layer is responsible for long distance communication on the HF bands. The D layer mainly absorbs low band HF signals during the daylight hours.

The E layer is composed of oxygen, nitrogen and some metal ions distributed in broad irregular patterns. E_s is a densely ionized patch within the E layer that reflects radio signals with very little loss; such a formation is often called an E cloud. Such a cloud is usually found at an altitude of about 60 miles covering an area of 6 to 60 miles.

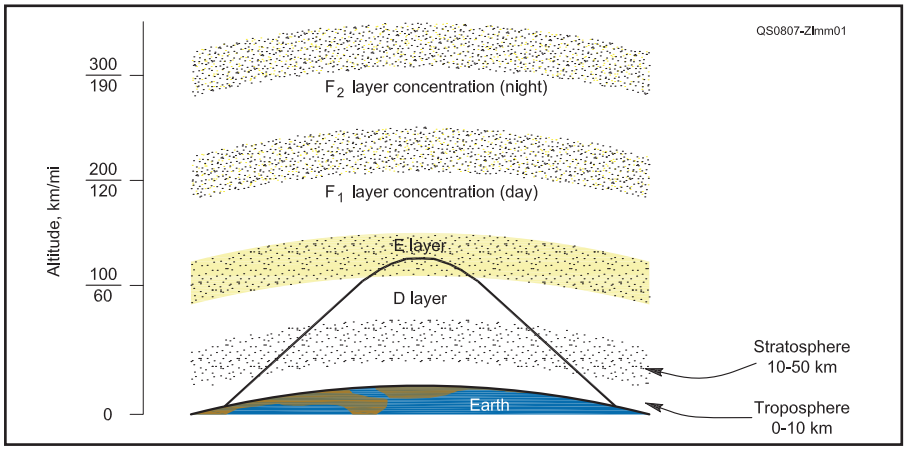


Figure 1 — Regions of the atmosphere and propagation by sporadic E.

Table 1

Midlatitude E_s Characteristics and Factors Affecting E_s

Characteristics	
Latitude	15-50°N or S; more common at lower latitudes
Height of reflection	55-70 miles
Single hop distance	500-1400 miles
Movement of E cloud	SE→NW
Power needed	Low power, even <10 W, and a modest antenna
Patterns	Strong E_s for a few days, then little or no E_s for a few days
Modulating Factors	
Time of year (major)	May-July
Time of day (peaks)	*Local* noon; *local* late afternoon/early evening
Solar activity	Very little correlation with solar cycle or solar flux

What to Expect

Table 1 provides a snapshot of E_s and the factors that affect it. Even low power and a simple dipole work well when E_s is strong. Note the distances that can be covered by a single hop. Multiple hop contacts are regularly made between the US and Europe, the Caribbean and northern South America. Occasionally longer contacts are made between the US and Japan and Hawaii. Even contacts between the West Coast and Europe and the East Coast and JA/KH6 have occurred. Though these are very rare, they are among the most exciting things you will ever experience when they happen.

How to Find the Openings

Look particularly hard during the peak times of day and times of year. In the Northern Hemisphere it is most common in May, June and July with lesser occurrences during December and January. During these months, E_s most often occurs between 9 AM and noon and/or between 5 PM and 8 PM, local time.

Also use electronic aids. Best of all look for domestic beacons from 50.060-50.080. DX beacons can be found anywhere between 50.000 and 50.080. See G3USFs list at **www.keele.ac.uk/depts/por/50.htm**. Look for skip stations coming in on 10 meters or even the Citizens Band just below it. Follow the propagation reflectors at **dxworld.com/50prop.html** covering the US and DX Summit at **oh2aq.kolumbus.com/dxs/**, which is more Eurocentric.

There still is no substitute for your own ears and your own receiver tuning the band. Above all be alert — E_s is, as we've explained, sporadic, and openings can come and go rapidly.

Want to Know More?

This primer only scratches the surface about E_s. I have covered it in more detail in two previous "The World Above 50 MHz" columns in May 2005 and April 2006. The former contains other valuable information about 6 meters including some useful references to 6 meter E_s that can be found on the Internet. The latter touches on the rare but exciting subject of 2 meter E_s and provides some maps of what can be worked in a large E_s opening on 6 meters.

E_s is the gift that keeps giving. Unaffected by lack of sunspots, it reappears to one extent or another in the Northern Hemisphere every summer. Active 6 meter stations in the US with big antennas and high power have worked in excess of 80 countries in a single summer. For almost everyone, even with a compact multimode radio and a small antenna, E_s can be a mountain of fun. Give a listen and enjoy yourself!

Gene Zimmerman, W3ZZ, is the VHF Editor for QST *and has written "The World Above 50 MHz" since December 2002. He is an active HF contester and DXer as well as a serious VHF operator and founder of the Grid Pirates. He has 6 meter DXCC, 6 meter WAC and VUCC on six bands, 50-1296 MHz. At home he is active on all bands from 160 meters through 10 GHz. He can be contacted at* **w3zz@arrl.org.**

Create? Invent? Modify?

Yes! We Do That with Amateur Radio!

The third Public Relations (PR) Campaign of the ARRL trilogy will celebrate the technological side of ham radio.

Allen Pitts, W1AGP

"The tenets of Amateur Radio can be summed up in the three distinctly separate campaign themes developed by the ARRL Public Relations Committee. These three legs form the solid foundation on which Amateur Radio was founded and continues to flourish in the 21st century — Fellowship, Public Service and Technology." — *Bill Morine, N2COP, PR Committee Chairman*

What is it about Amateur Radio that arouses the interest of people? If you ask it of *non*-hams, the responses usually fall into one of three categories:

1. The fun, friendship and hobby side
2. The emergency service side
3. The technology and creative side

There's something about hams that makes them want to open the plastic box and see what's inside every gizmo they encounter. What makes it work? How can we make it better or even use it in a whole new way? It is this inquisitive and creative streak that is the third component in the trilogy of the ARRL Public Relations campaigns.

Unwrapped at the Dayton Hamvention, the new coordinated PR effort shows the world the technological activities and creative imaginations that Amateur Radio's people love. Once again, this is a campaign with several interlocking parts.

Public Service Announcements

There are PSAs for radio station play on the **www.arrl.org/pio** Web page and more will be coming out as the year unfolds. These *mp3* files are easily downloaded and can be taken to your local radio stations.

Brochures

An attractive brochure celebrating ham technology is available from **www.arrl.org/brochures**. It shows hams doing many exciting activities, from "Green" Radio to SETI (Search for Extraterrestrial Intelligence), through time and space itself.

WeDoThat-Radio.org

A new, special Web site has been created just for this campaign. The Web site **wedothat-radio.org** uses some of the newer technologies that allow easy topic additions and changes and even allows visitors to ask questions.

Stickers

Let's admit it, hams and kids like free things and stickers are fun. So we made up a bunch to share. They are "free while the supply lasts."

Talk on a Disk

What began as an experiment in 2007 became a major success as the ARRL's "Talk on a Disk" was quickly snatched up and used by people making presentations to groups. This CD contains all the materials you need to make a good *PowerPoint* presentation before a non-ham group. For 2008, a brand new "Talk on a Disk" has been created highlighting the technology campaign and coordinated with the brochures. It can make almost anyone look good in front of a group. Just follow the script! If you have a presentation to make and want to talk about the technology of ham radio, contact **apitts@arrl.org**.

Swiss Army Knife for PIOs

The *Knife* is actually a computer CD with all the basic forms and information a Public Information Officer (PIO) should need in one place. With audio and video files, documents in computer format that you can modify to meet local needs and hundreds of pointers and ideas, the *Swiss Army Knife for PIOs* has become a mainstay for PR work.

Every Ham is a PIO

There is a saying that all news is local — and it is true. If there is not a local or personal "hook" to a story it does not make it into the news. Public Information Officers' actions in taking these materials and modifying them for local situations affect everything from antenna regulations to club membership levels. But it is not just up to the PIOs to achieve positive publicity for hams. There is another saying: "Every ham is a PIO." When people become curious about Amateur Radio they turn to the first ham operator they find. All the brochures and news stories are of no benefit if that initial conversation with a potential recruit is not positive. It is up to *every* ham to take the time to make the initial one-on-one contact a positive experience. In the end, "It takes a ham to make a ham."

Need Help?

A wealth of materials are available for anyone to use on **www.arrl.org/pio**. Here you can find information handouts for media, helpful files and tips. Each month ideas, information and timely materials are published in the special e-zine *CONTACT!*, which you can find at **www.arrl.org/pio/contact**. The ARRL Public Relations Committee is also able to aid groups facing unusual problems or situations. There is a public relations e-mail reflector to share their problems, ideas and successes with other PIOs.

It's Up to You

The energies you as an individual put into positive PR work will pay off in many ways. Go show them "It's not just your grandfather's radio anymore."

Allen Pitts, W1AGP, is ARRL Media and Public Relations Manager. He can be reached at **apitts@arrl.org,**

"Much of the public still think that hams only tinker in their basements or garages. With the merger of computer and communications technologies through software defined radios (SDR), today's hams are more likely to be creating tomorrow's technologies on their laptops in their living rooms." — *Bill Morine, N2COP*

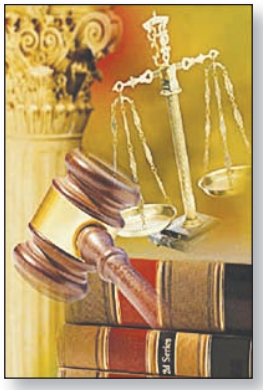
Court Finds FCC Violated Administrative Procedure Act in BPL Decision

On April 25, the US Court of Appeals for the District of Columbia Circuit released its decision on the ARRL's Petition for Review of the FCC's Orders adopting rules governing broadband over power line (BPL) systems. The Court agreed with the ARRL on two major points and remanded the rules to the Commission. Writing for the three-judge panel of Circuit Judges Rogers, Tatel and Kavanaugh, Judge Rogers summarized: "The Commission failed to satisfy the notice and comment requirements of the Administrative Procedure Act ('APA') by redacting studies on which it relied in promulgating the rule and failed to provide a reasoned explanation for its choice of the extrapolation factor for measuring Access BPL emissions."

The Court agreed with the ARRL that the FCC had failed to comply with the APA by not fully disclosing for public comment the staff studies on which it relied. The Court also agreed with the ARRL that the Commission erred in not providing a reasoned justification for its choice of an extrapolation factor of 40 dB per decade for Access BPL systems and in offering "no reasoned explanation for its dismissal of empirical data that was submitted at its invitation." The Court was not persuaded by the ARRL's arguments on two other points, on which it found that the Commission had acted within its discretion.

The conclusion that the FCC violated the APA hinges on case law. "It would appear to be a fairly obvious proposition that studies upon which an agency relies in promulgating a rule must be made available during the rulemaking in order to afford interested persons meaningful notice and an opportunity for comment," the Court said, adding that "there is no APA precedent allowing an agency to cherry-pick a study on which it has chosen to rely in part."

The Court continued, "The League has met its burden to demonstrate prejudice by showing that it 'ha[s] something useful to say' regarding the unredacted studies [citation omitted] that may allow it to 'mount a credible challenge' if given the opportunity to comment." Information withheld by the Commission included material under the headings "New Information Arguing for Caution on HF BPL" and "BPL Spectrum Tradeoffs." The Court concluded that "no precedent sanctions such a 'hide and seek' application of the APA's notice and comment requirements."



With regard to the extrapolation factor, the Court ordered: "On remand, the Commission shall either provide a reasoned justification for retaining an extrapolation factor of 40 dB per decade for Access BPL systems sufficient to indicate that it has grappled with the 2005 studies, or adopt another factor and provide a reasoned explanation for it." The studies in question were conducted by the Office of Communications, the FCC's counterpart in the United Kingdom, and were submitted by the ARRL, along with the League's own analysis showing that an extrapolation factor closer to 20 dB per decade was more appropriate, as part of the record in its petition for reconsideration of the FCC's BPL Order. The Court said that the FCC "summarily dismissed" this data in a manner that "cannot substitute for a reasoned explanation." The Court also noted that the record in the FCC proceeding included a study by the National Telecommunications and Information Administration that "itself casts doubt on the Commission's decision."

The briefs for the ARRL were prepared by a team of attorneys at WilmerHale, a firm with extensive appellate experience, with assistance from ARRL General Counsel Christopher D. Imlay, W3KD. Oral argument for the ARRL was conducted by Jonathan J. Frankel of WilmerHale. Oral argument was heard on October 23, 2007; the Court's decision was released more than six months later.

After reading the decision, General Counsel Imlay observed, "The decision of the Court of Appeals, though long in coming, was well worth the wait. It is obvious that the FCC was overzealous in its advocacy of BPL, and that resulted in a rather blatant cover-up of the technical facts surrounding its interference potential. Both BPL and Amateur Radio would be better off had the FCC dealt with the interference potential in an honest and forthright manner at the outset. Now there is an opportunity to finally establish some rules that will allow BPL to proceed, if it can in configurations that don't expose licensed radio services to preclusive interference in the HF bands."

ARRL Chief Executive Officer David Sumner, K1ZZ, added: "We are gratified that the Court decided to hold the FCC's feet to the fire on such a technical issue as the 40 dB per decade extrapolation factor. It is also gratifying to read the Court's strong support for the principles underlying the Administrative Procedure Act. Now that the Commission has been ordered to do what it should have done in the first place, we look forward to participating in the proceedings on remand, and to helping to craft rules that will provide licensed radio services with the interference protection they are entitled to under law."

ARRL President Joel Harrison, W5ZN, concluded: "I am very pleased that the Court saw through the FCC's smoke screen and its withholding of valid engineering data that may contradict their position that the interference potential of BPL to Amateur Radio and public safety communications is minimal. The remand back to the FCC regarding their use of an inappropriate extrapolation factor validates the technical competence of Amateur Radio operators and especially of the ARRL Lab under the direction of Ed Hare, W1RFI. We are grateful for the work of our legal team and especially for the unflagging support of the ARRL membership as we fought the odds in pursuing this appeal."

S. Khrystyne Keane, K1SFA ♦ ARRL News Editor ♦ k1sfa@arrl.org

FCC News

♦ **FCC Looks to Raise Vanity Call Sign Fees**: The FCC released a *Notice of Proposed Rulemaking and Order* (*NPRM*) on May 8 seeking to raise fees for Amateur Radio vanity call signs. Currently, a vanity call sign costs $11.70 and is good for 10 years; the new fee, if the FCC plan goes through, the fee will go up to $12.30 for 10 years, an increase of 60 cents. The FCC is authorized by the Communications Act of 1934 (as amended) to collect vanity call sign fees to recover the costs associated with that program. The vanity call sign fee has fluctuated over the 12 years of the current program — from a low of $11.70 to a high of $50. The FCC says it anticipates some 15,000 Amateur Radio vanity call sign "payment units" or applications during the next fiscal year, collecting $184,500 in fees from the program. The vanity call sign regulatory fee is payable not only when applying for a new vanity call sign, but also upon renewing a vanity call sign for a new term. For instructions on how to comment on this NPRM, please visit the FCC Web site at **www.fcc.gov/cgb/consumerfacts/howtocomment.html**.

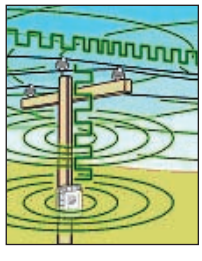
♦ **FCC Denies Two Petitions for Rule Making**: On May 7, the FCC denied two separate Petitions for Rule Making (PRM) dealing with digital issues. Mark Miller, N5RFX, of Arlington, Texas, sought three points: to delete the FCC's 2006 addition to how it defines data, to amend the rules to prohibit automatically controlled stations from transmitting on frequency segments other than those specified in Section 97.221(b), and to replace the symbol rate limits in Section 97.307(f) with bandwidth limitations. The FCC denied all three parts of Miller's PRM, saying he "did not set forth sufficient reasons for the Commission" to approve his petition and that "should future experience substantiate Miller's concerns, he may file a new, factually supported petition for rulemaking."

Ken Chafin, W6CPA, of La Crescenta, California, and Leon Brown, KC6JAR, of Los Angeles, California, also filed a PRM concerning additional spectrum for more repeaters, including digital systems, requesting that the FCC "propose to expand the frequencies on which an amateur station operating as a repeater (repeater station) may operate." Chafin and Brown argued that additional spectrum is needed for repeater stations "because some amateur repeater stations have begun using digital communications protocols" and "digital voice operation is incompatible with existing analog operations [because d]igital voice users are unable to determine if the desired frequency is in use by analog users and can inadvertently cause harmful interference to those users." The men pointed out that coordinating groups have been unable to separate analog and digital voice repeater operations to avoid harmful interference because the available repeater spectrum in the 2 meter band is "fully occupied by existing analog users in most metropolitan areas." The FCC, after considering the PRM, concluded that it did not present grounds for the Commission to amend its rules: "Repeater stations are authorized to transmit on any frequency in the 2 meter band except the 144.0-144.5 MHz and 145.5-146.0 MHz frequency segments. These two segments were excluded to minimize the possibility of harmful interference to other amateur service stations and operating activities, including 'weak signal' operations. Allocating an additional three hundred kilohertz of the 2 meter band to repeater operation would not be consistent with that concern. Rather, it would likely result in increased interference to non-repeater stations."

NEWSPAPER REPORTS "BPL PLAN IS DEAD IN DALLAS"

The *Dallas Morning News* reported on May 2 that "an ambitious plan for using power lines to deliver fast Internet service to 2 million Dallas-area homes collapsed" May 1. Current Group, LLC has announced plans to sell its Dallas BPL network to Oncor, a regulated electric distribution and transmission business, for $90 million. Oncor reportedly has no plans to offer Internet service, but will use the network to detect distribution network issues. While Current originally touted the network as a way to offer Internet service to consumers and had entered into a marketing arrangement with DirecTV, the *Houston Chronicle* quotes Oncor spokesman Chris Schein as confirming that Oncor will use the network only for monitoring the power grid: "Our business is delivering electricity, not being an Internet provider or a television provider."

ARRL Chief Executive Officer David Sumner, K1ZZ, observed that "This announcement underscores yet again that the Bush Administration made a fundamental error in judgment when it erroneously identified BPL as a potential 'third wire' delivering broadband to consumers. As the Court of Appeals for the DC Circuit determined in April 25, the FCC then compounded the error by 'cherry-picking' from its staff studies and ignoring other studies that proved the FCC was underestimating the interference potential of BPL systems. One can only hope that this latest marketplace failure of BPL will send a clear message that the answer to expanding consumer broadband access lies with other, more promising technologies that do not have such a potential to pollute the radio spectrum."



ARRL Laboratory Manager Ed Hare, W1RFI, was quick to point out that BPL was not going away in Dallas. According to Oncor Vice President Jim Greer, Oncor will use the BPL network to spot grid problems to detect large power outages before they affect customers. Oncor will not offer Internet service through the system as Current had originally planned when they built it. DirecTV customers who get Internet service through Current's network will probably lose service when the deal goes through. "Oncor is not in the telecommunications business, and it has no plans to get into the telecommunications business," said Schein.

The ARRL has no issues with BPL as long as it does not cause harmful interference to the amateur bands. Current's Dallas system is a good example of that, Hare said, as it is "notched" so as not to interfere with the Amateur Radio Service: "The Current system in Dallas is probably not causing interference to ham radio. Their equipment doesn't use the ham bands. It is also quiet except when in use. For meter reading and other utility applications, nearby modems may make the occasional short burst of noise, but not the cacophony of sound we hear with some other systems. You would probably be able to tell that BPL is there if you tune outside the ham bands. From an EMC perspective, what is needed now to complete this progress are regulations and standards that match BPL's most successful models."

FCC DENIES UTAH MOTORSPORT PARK USE OF AMATEUR RADIO FREQUENCIES

On April 24, ARRL General Counsel Chris Imlay, W3KD, filed an *Informal Objection* with the FCC regarding a pending application for a Special Temporary Authority (STA) filed by Miller Motorsports Park in Tooele, Utah. One day after the *Objection* was filed, the FCC agreed with the ARRL, saying, "Due to the possibility of interference to Amateur operators and also the race teams utilizing the proposed frequencies, we feel that it is not in the public interest to grant [Miller Motorsports Park's] request."

The FCC also advised Miller Motorsports that if they "wish[ed] to pursue other frequencies, [they] should coordinate with the ARRL and National Telecommunications and Information Administration (NTIA)."

Miller Motorsports requested the use of frequencies 448.525, 448.650, 448.060, 448.290 and 448.610 MHz at 4 W ERP. They proposed to use 100 mobile units on each of these and other channels at or above 450 MHz for a race event scheduled May 26-June 1, 2008. The application filed by Miller Motorsports stated that the radios would be used for "security, medical and maintenance for the entire event" and that communications service is "vital to the life and safety of the spectators and drivers of this race event." Miller Motorsports also implied that the NTIA had approved the use of the 448 MHz channels.

The League's *Informal Objection* pointed out that "Amateur Radio Service licensees make extremely heavy use of the band 420-450 MHz, and especially the segment 440-450 MHz for FM voice repeaters. There are repeater stations in Salt Lake City, of which Tooele is a close-in suburb, using frequencies throughout the 448 MHz range for outputs, including 448.525, 448.625, 448.050 and 448.075 MHz. In addition, there are repeater outputs in other areas of the greater Salt Lake City area which are in regular operation at all times of the day or night, and radio amateurs using mobile stations would be predictably interfered with by operation as proposed in the STA."

The *Objection* also stated that there was the possibility that some of the spectators to the event at Miller Motorsports Park, or otherwise in the area, might be Amateur Radio operators who might be operating using their portable transceivers "on the precise channels sought by the STA."

The ARRL called Miller Motorsports Park's choice of channels "completely inappropriate. The radio amateurs who are licensed to use these frequencies are under no obligation to either tolerate interference or to cease their own operation, regardless of the interference that might be suffered at any time" by Miller Motorsports.

While the FCC has issued STAs on the amateur allocations from time to time, the ARRL wrote, "many, perhaps a majority, are of no concern to the ARRL due to the choice of frequency band, duty cycle or power level proposed." But what Miller Motorsports is requesting is "a completely incompatible and inappropriate use of Amateur Radio allocations." Citing "harmful interference to and from the Amateur Radio Service on channels in the 448 MHz band," the ARRL requested that the FCC deny Miller Motorsports Park's STA application.

EIGHT TORNADOES RAVAGE EASTERN VIRGINIA

When tornadoes swept across the state of Virginia on April 28, local Amateur Radio operators responded to the call for assistance. According to Ken Murphy, KI4GEM, Assistant Emergency Coordinator for Portsmouth, an EF3 tornado touched down in Suffolk around 4 PM local time, plowing its way east into Norfolk, damaging scores of homes, stores and cars and downing dozens of trees and power lines; Suffolk is about 20 miles from Norfolk. Soon after the tornadoes touched down, Virginia Governor Timothy M. Kaine declared a State of Emergency and directed state agencies to take all necessary actions to aid in the response to widespread damage from the severe weather. About 140 homes were destroyed, damaged or deemed uninhabitable.

The National Weather Service (NWS) confirmed eight tornadoes in Virginia: City of Suffolk (strong EF3), City of Colonial Heights (EF1), Brunswick County (EF1), Gloucester County (EF0), Mathews County (EF0), Halifax County (EF1), Surry County (EF1) and Isle of Wight County (EF1).

"The tornado produced severe damage to many structures, downed large trees, and destroyed power lines. Approximately 200 injuries were reported and several homes and businesses were destroyed. There were no fatalities," Murphy said. Upon spotting the tornado, Murphy called placed a call on the Portsmouth repeater, asking for someone to notify the National Weather Service and the local EMS. A SKYWARN net was activated on another repeater; Portsmouth Emergency Coordinator Dave Livingston, K5SFM, and Bill Farmer, KI4GWC, served as Net control.

"This was an unusual activation in that an ARES AEC from one locality — Portsmouth — would not normally be on the scene of a tornado touching down in another locality — Suffolk," said ARRL Virginia Section Manager Carl Clements, W4CAC. "Murphy requested that NWS be notified of the tornado and that the fire department and emergency teams be notified so they could respond. The Deputy Fire Chief of the Driver Volunteer Fire Department (who was the on-scene commander at the time) was concerned about the number of onlookers entering the disaster area. There were many power lines down and trees in the roadway and on buildings, as well as damaged natural gas mains. Some buildings were gone leaving a massive debris field."

The Driver VFD Chief requested that ARES activate in order to assist the local teams; 10 members of the Portsmouth ARES group responded. "The Chief had Murphy assign hams to the roadblocks at the major intersections to assist the police on the scene with traffic and crowd control. We also kept the Chief informed of the locations of other reported funnel clouds. At one point, the Fire Chief on the scene was advised that one of the team members was tracking the rapidly moving weather still in the area with the help of APRS," Clements said.

RONALD A. PARISE, WA4SIR (SK)

Dr Ronald A. Parise, PhD, WA4SIR, passed away Friday May 9, 2008 after a very long and courageous battle with cancer. He was 57. Parise flew as a payload specialist on two space shuttle missions: STS-35 on *Columbia* in December 1990 and STS-67 on the *Endeavour* in March 1995. These two missions, ASTRO-1 and ASTRO-2, respectively, carried out ultraviolet and x-ray astronomical observations, logging more than 614 hours and 10.6 million miles in space. Parise was one of the first astronomers to operate a telescope from space, making hundreds of observations during the mission. Amateur Radio on the International Space Station (ARISS) Chairman Frank H. Bauer, KA3HDO, said Parise's personal contributions to these two missions provided scientists with "an unprecedented view of our universe, expanding our understanding of the birth, life and death of stars and galaxies."

First licensed when he was 11, Parise kept Amateur Radio at the forefront of everything he did, including his operations from space. During his two shuttle flights, he spoke with hundreds of hams on the ground. He was instrumental in guiding the development of a simple

COURTESY OF NASA

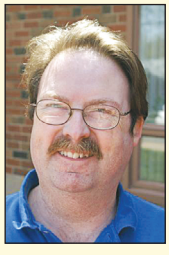
Ron A. Parise, WA4SIR (SK)

ham radio system that could be used in multiple configurations on the space shuttle; as a result, his first flight on *Columbia* ushered in what Bauer called the "frequent flyer era" of the Shuttle Amateur Radio Experiment (SAREX) payload. He was the first ham in space to operate packet radio. "His flight pioneered the telebridge ground station concept to enable more schools to talk to shuttle crew members despite time and orbit constraints," Bauer said. "In his two shuttle flights, he inspired countless students to seek technical careers and he created memories at the schools and communities that will never be forgotten. Ron was also the ultimate ham radio operator — in space and on the ground."

ARRL ARISS Program Manager Rosalie White, K1STO, said, "Ron was the first astronaut I ever worked with, and he was wonderful to 'guide me in the ways of NASA.' He was 'a ham's ham' and loved Amateur Radio in space. Ron had the respect of the entire ARISS international team and the love of the ARISS USA Team because he was a true team member. He was fun loving and serious about ham operations, ham technical topics and using SAREX and ARISS as an educational tool. Simply put, he will be missed terribly by hundreds and hundreds of hams."

In Brief

● **ARRL Lab Test Engineer Leaves HQ Staff**: After more than 17 years at ARRL, Laboratory Test Engineer Mike Tracy, KC1SX, has left the HQ Family and moved to New Jersey to take on a position with Synergy Microwave, a company owned by Dr Ulrich Rohde, N1UL. ARRL Lab Manager Ed Hare, W1RFI, said, "Mike's shoes are hard to fill, but we have hired Bob Allison, WB1GCM, to do just that." Allison, a ham for almost 35 years, most recently worked for a Hartford television station for the past 28 years. Over those years, he has done a lot of things at the station, from testing the television transmitter to day-to-day maintenance of the studio facilities. Allison, an ARRL member, has served as a volunteer tour guide at ARRL, offering members a friendly and informative tour of HQ that they will remember for a long time to come.



Mike Tracy, KC1SX

Together with his wife, ARRL Logbook of The World Specialist Kathy, KA1RWY, Allison resides in Coventry, Connecticut. Allison said, "I have been active on the air since I was first licensed as WN1TDN in 1974, where I enjoy operating, experimenting and meeting people from around the world. While I enjoy restoring old radios, I very much enjoy the new ones and digital modes such as PSK31. I am honored and humbled to be part of the ARRL Laboratory Staff and I'm looking forward to serving our members and testing some really cool, new radios!"

Bob Allison, WB1GCM

● **New Section Manager Appointed in New Hampshire**: Al Shuman, K1AKS, of New Boston, New Hampshire, has been appointed Section Manager of the New Hampshire Section, effective April 21. ARRL Membership and Volunteer Programs Manager Dave Patton, NN1N, in consultation with New England Division Director Tom Frenaye, K1KI, announced the appointment after Sterling Eanes, AK1K, of Hollis, Section Manager since July 2005, decided to step down due to mounting work responsibilities and other commitments. Shuman served as New Hampshire Section Manager for two previous terms: December 1992-June 1999 and October 2000-June 2005. His term of office continues through June 30, 2009.

● **2008 ARRL/TAPR Digital Communications Conference Issues Call for Papers**: Technical papers are solicited for presentation at the 27th annual ARRL/TAPR Digital Communications Conference (DCC), Friday-Sunday, September 26-28, in Chicago, Illinois. Papers will also be published in the Conference *Proceedings*. Authors do not need to attend the conference to have their papers included in the *Proceedings*. The submission deadline is July 31. The ARRL/TAPR Digital Communications Conference is an international forum for technically minded radio amateurs to meet and present new ideas and techniques. Paper/presentation topic areas include — but are not limited to — software defined radio (SDR), digital voice, digital satellite communication, digital signal processing (DSP), HF digital modes, adapting IEEE 802.11 systems for Amateur Radio, Global Positioning System (GPS), Automatic Position Reporting System (APRS), Linux in Amateur Radio, AX.25 updates and Internet operability with Amateur Radio networks. Submit papers by July 31 to Maty Weinberg, KB1EIB, ARRL, 225 Main St, Newington, CT 06111 or via e-mail at **maty@arrl.org**. Papers will be published exactly as submitted, and authors will retain all rights.

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

PUBLIC SERVICE

2007 Simulated Emergency Test Results

Just before press time for this article in early May, ARRL Montana Section Manager Doug Dunn, K7YD, shared the following message that he had received via Bill Tarrant, W7ROE, EC of Silver Bow County. Radio amateurs in Butte, Lincoln and Dillon had recently activated to handle a communications emergency in Dillon, Montana, when their 911 system was out of service.

In praise of this emergency service, Roger Ebner, of the Homeland Security and Emergency Management office in Butte, wrote to Bill:

"Please accept my congratulations on behalf of everyone involved in the rapid response to the 911 outage. This is precisely the active involvement and quick command and communication establishment we anticipate from the entire response community.

"You have demonstrated an exceptional ability during emergencies to be ready to provide the essential communication capability we may need.

"Could I expect any less from such a dedicated group of people?

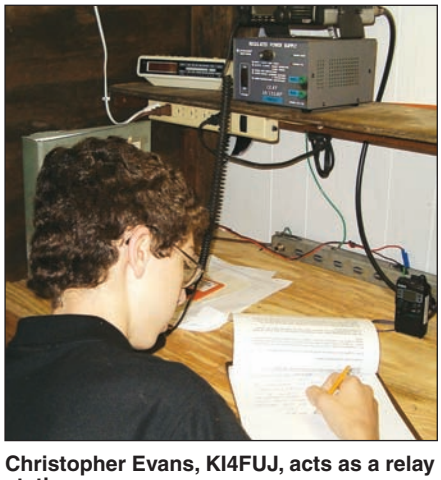
"Thanks again for your assistance.

"Roger"

In response to this note, Montana Section Manager Doug Dunn wrote, "Nice pat on the back." Indeed it is! This is just one example of the many types of emergency responses that Amateur Radio operators had prepared for when they took part in the 2007 ARRL Simulated Emergency Test on the weekend of October 6-7 or during another scheduled exercise period during the fall season.

The following representative stories and the many reported Simulated Emergency Test results help illustrate the readiness of Amateur Radio across the country to respond whenever and wherever needed. Thanks for participating in the SET!

Doug DeLorme, KI4NRY, operates from the Red Cross station, KI4ENN.



Christopher Evans, KI4FUJ, acts as a relay station.

Scenario Tests Townes County's (Georgia) Emergency Response

Alton N. Higgins, W4VFZ
Townes County ARRL Emergency Coordinator

The SET scenario began with the report, over police radio bands, that a vehicle with two heavily armed, suspected terrorists ran through a police roadblock north of Townes County and were headed our way. Gunfire was exchanged between police at the roadblock and the occupants of the vehicle.

Townes County became involved when a 911 call is received from a passing motorist who observed a crashed vehicle with smoke coming from the engine compartment. The passing motorist, upon approaching the vehicle, noticed that the occupants were unconscious, injured and heavily armed. She also noticed "suspicious" powder spilled on the suspects and around the vehicle. As a result of this report, the 911 operator contacted the sheriff's office, fire department and emergency medical services. The 911 center also alerted Amateur Radio Emergency Coordinator Alton Higgins, W4VFZ.

As the agencies responded to the simulated emergency scene, colored cards at the site gave additional information on what would happen next. To continue the scenario, the hospital staff determined that the "suspicious material" was toxic when inhaled. This information was relayed by Amateur Radio to the ARRL EC who, in turn, radioed the Homeland Security Office. The Homeland Security Office acknowledged receipt of the message and a simulated hazardous material team was dispatched to the site. All participants acted as though this was a real emergency and everyone took necessary precautions.

The suspects were taken, under guard, to the hospital for simulated treatment. Once the suspects were removed and the scene cleared of any "suspicious" material, even the responders were "hosed down" to remove any possible contamination. During the drill, Amateur Radio operators were dispatched to specific locations to handle traffic and report on the status. Some were operating on the net as mobile stations while driving to their assigned locations.

Photos courtesy of Al Higgins, W4VFZ.

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

2007 SET Top Ten

Section	*Points*
ARES Activity	
Michigan	7,698
Virginia	5,241
Connecticut	3,439
Wisconsin	3,144
North Carolina	1,930
Western Washington	1,893
Ohio	1,865
Georgia	1,518
Illinois	1,343
North Texas	1,265
Section/Local Nets	
Wisconsin	1,729
Connecticut	1,219
North Carolina	829
Michigan	812
Western New York	609
Ohio	569
New Hampshire	460
Maine	393
Virginia	354
Southern New Jersey	261

St Charles County (Missouri) SET

William Grimsbo, NØPNP
St Charles County ARRL Emergency Coordinator

A simulated earthquake of 8.0 on the Richter scale with an epicenter at New Madrid, Missouri, caused moderate damage to large structures and infrastructures. Pipeline ruptures, road damage and water main damage also was reported in this October 6 exercise. ARES was activated by the St Charles County Division of Emergency Management to assist in providing communications at two staging areas in St Charles.

Amateur Radio communications were established from McNair Park on the north side of the Interstate 70 dividing line and at Wapplehorst Park on the south side. The activations page was sent out at 7:30 AM to request communications in support of damage assessment activities by Emergency Management. Both sites were on the air with viable communications capability between 8 and 8:30 AM. The SET was intended to test these six exercise objectives:

1) Capability to respond under a National Incident Management System (NIMS)-specified Incident Command System (ICS)

2) Readiness of the field response units

3) Emergency Operations Center (EOC) activation protocol

4) Rapid Response Team (RRT) activation protocols

5) Response times

6) Communications with SEMA (State Emergency Management)

Each of these objectives was tested to varying degrees of success and lessons were learned regarding weaknesses and strengths of the system. This exercise was beneficial and will help in future preparedness planning for St Charles County ARES and the County Division of Emergency Management.

SET Scorecard

The points for ARES activity were awarded in the following manner:

Category	*Points*	
A)	Number of amateurs participating	2 (each)
B)	Number of new amateurs (licensed since 2003)	3 (each)
C)	Number of formal third party messages originated on behalf of served agencies	1 (each)
D)	Tactical communication conducted for served agencies: (<0.5 hour 5 points, 0.5-1 hour 10 points, >1 hour 20 points)	
E)	Number of stations on emergency power during test	2 (each)
F)	Number of emergency-powered repeaters used in test	10 (each)
G)	Dual membership in ARES and RACES is encouraged	10
H)	Liaison was maintained with an NTS section/local net	10
I)	Digital modes were used during test	10
J)	Number of different agencies for which communication was provided.	5 (each)
K)	Number of communities in which agencies were contacted	10 (each)
L)	Press release was submitted	10

The points for net activity were awarded in the following manner:

A)	Total number of messages handled.	1 (each)
B)	Number of different stations participating	2 (each)
C)	Number of different stations checking-in on emergency power	2 (each)
D)	Number of new amateurs (licensed since 2003) in test	3 (each)
E)	Number of net control stations	5 (each)
F)	Number of different stations performing NTS liaison	5 (each)

HAZMAT Team removes first suspect from vehicle in Townes County, Georgia.

2008 SET on the Schedule

October 4-5, 2008, is the main weekend to focus on for this year's SET. Please contact your local ARRL Field Organization leaders to find out specific dates, times and potential plans for the Simulated Emergency Test in your area. Thank you!

ARES Activity

Area	Reporter	Points	Section Points
Atlantic Division			
Eastern Pennsylvania			**967**
District 2	WB3W	360	
Bucks Co	N3QGO	265	
Berks Co	WA1ELA	136	
Monroe Co	N3SEI	103	
Lehigh Co	WB3W	103	
Maryland-DC			**265**
Allegany	K3UEZ	93	
Kent Co	KB3ENU	68	
St Mary's	KB3FWW	64	
Section wide	KB3HER	40	
Southern New Jersey			**916**
Cape May Co	N2EWT	373	
Ocean Co	WX2NJ	253	
Mercer Co	KB2EGI	129	
Cumberland Co	N2MHO	124	
Salem Co	AA2WN	37	
Western New York			**891**
Wyoming Co	KC2MVC	280	
Onondaga Co	WA2PUU	240	
Oneida-Madison Co	AB2QZ	157	
Monroe Co	WY7Q	144	
Steuben Co	KB3DRL	70	
Western Pennsylvania			**273**
Huntingdon Co	N3OGT	121	
Blair Co	KA3EJV	82	
South 1	KB3JOF	70	
Central Division			
Illinois			**1343**
Wabash Co	AI9H	355	
Williamson	WA9APQ	196	
Dekalb Co	W9ICU	190	
Kane Co	KC9FQV	184	
Sangamon Co	K9CNP	114	
Ford/Iroquois Co	KA9MZJ	83	
Cook Co	N9NL	81	
Champaign Co	N9XDC	78	
Bureau Co	K9ML	62	
Indiana			**1201**
Whitley Co	WB9UNL	223	
Kosciusko Co	N1LL	206	
Vanderburgh Co	WB9EFH	203	
Steuben Co	KB9NNR	146	
Jasper Co	KC9EJL	118	
Starke Co	W9AL	109	
Orange Co	WB9FHP	103	
Jefferson Co	N9UNM	48	
Harrison Co	KB9JLF	45	
Wisconsin			**3144**
Racine, Kenosha	KB9MMA	390	
Dunn Co	KB9ULF	310	
Sauk Co	N9ROY	210	
East Central #1	KC9ESN	177	
Walworth Co	N9ZXP	175	
Brown Co	N8KQS	158	
Manitowoc Co	N9NCU	156	
Fon Du Lac Co	W9GPI	154	
Ozaukee Co	KB9RHZ	148	
Burnett Co	AAØKU	143	
Calumet Co	N9VPZ	114	
Marathon Co	AB9PJ	109	
Milwaukee Co	N9ASA	100	
East Central #3	N9JKX	79	
Jefferson Co	KC9IKI	77	
NE Wisconsin	KC9AMX	76	
Adams Co	N9OEW	71	
Manitowoc Co	N9NCU	70	
Sawyer Co	N9VAO	65	
Polk Co	KC9GHQ	63	
Portage Co	WX9M	61	
East Central #2	N9JKX	55	
Winnebago Co	K9NL	51	
Langlade Co	W9DMS	49	
Green Co	KC9YI	45	
Oconto Co	KC9IPS	38	
Dakota Division			
Minnesota			**82**
Nobles-Murray Co	KDØASX	82	
South Dakota			**112**
Codington Co	WØLPG	112	
Delta Division			
Arkansas			**340**
Washington Co	WC5AR	174	
Cross Co	W5WPN	166	
Louisiana			**903**
St Tammany Parish	N5PSL	320	
Vernon Parish	W5JZQ	227	
Calcasieu Parish	KC5FGO	219	
Vermilion Parish	KE5JXC	79	
St Mary	KA5LMZ	34	
Terrebonne Parish	AD5XJ	24	
Mississippi			**869**
West Central District	AB5WF	242	
Lamar Co	KC5TYL	157	
Tishomingo/ Prentiss Co	WX5N	104	
Lauderdale, Clarke Co	KD5GWM	87	
Union Co	W5LMW	76	
Warren Co	K5ZRD	66	
Pearl River Co	KC5EAK	65	
SW Mississippi	N5ZNT	58	
Alcorn Co	WB5CON	14	
Tennessee			**1226**
Cocke Co	KI4KBS	259	
Shelby Co	KE4BUU	249	
Loudon Co	KM4H	107	
Sevier Co	KG4OAT	103	
Great Lakes Division			
Kentucky			**273**
District 7	NB4K	273	
Michigan			**7698**
Calhoun Co	KC8COT	1853	
Kent Co	N8JSN	1647	
Alcona Co	W8SZ	657	
Kalamazoo	NK8X	997	
Branch Co	WB8R	254	
Manistee Co	WB8DRM	220	
Benzie Co	K8BTE	213	
Houghton Co	N8WAV	200	
Montmorency Co	WA8SCO	177	
Allegan Co	AB8SF	172	
Barry Co	K8LHM	143	
Franklin Co	W4BOT	126	
Menominee Co	NS8V	117	
Hillsdale Co	KC8RYF	115	
Saginaw Co	KC8YVF	115	
Livingston Co	N8WWX	112	
Mecosta Co	KB8TYJ	106	
Osceola Co	N8NJA	100	
Ontonagon	KC8OCK	78	
Otsego Co	KC8NTE	76	
Guernsey Co	KC8SSB	75	
Montcalm Co	KC8ZMO	73	
Washtenaw Co	N8ZLR	72	
Ohio			**1865**
Franklin Co	AA8DN	371	
Greene Co	W8LLY	313	
Erie Co	K8HLH	294	
Southeast Ohio	KA8AUZ	198	
Clark Co	N8NSD	197	
Shelby	N8KZL	168	
Seneca Co	KC8BUJ	167	
Miami Co	W8ILC	157	
Hudson Division			
Eastern New York			**351**
Dutchess Co	KC2DAA	351	
New York City/Long Island			**470**
Nassau Co	W2KFV	271	
Township of Southold	N2QHV	159	
Richmond Co	N2TEE	40	
Town of Huntington	WB2LUA		Narrative
Northern New Jersey			**524**
SATERN	N3DV	179	
Hunterdon Co	WB2AZE	168	
Bergen Co	WA2MWT	114	
Englewood	W2CC	63	
Midwest Division			
Iowa			**487**
Marion Co	KAØUKA	149	
Carroll	WAØGUD	118	
Lee Co	WBØVYG	115	
Henry, Des Moines Co	NØFRQ	105	
Missouri			**456**
Jackson Co	KØUAA	294	
St Charles Co	NØPNP	162	
Nebraska			**261**
Lancaster Co	KØGND	195	
Buffalo Co	KAØDBK	66	
New England Division			
Connecticut			**3439**
Region 4 South	K1VSC	444	
Troop L Region 5 EOC	K1DAV	349	
Region 3	AB1GL	321	
Danbury	KB1ILY	317	
Area 1, Zone 2	W1GIG	286	
Region 5 Ridgefield	W1JMA	214	
Region 1, Zone 3	KA1EOU	209	
Region 4 North	KB1JDX	147	
Region 1	NN1H	137	
Region 2	AF1HS	134	
Brookfield	W1QK	112	
Bethel	KD1YV	104	
Region 1, Zone 1	K1FC	103	
New Haven Co SKYWARN	N1HAW	87	
Region 2- Milford	KA1DCL	87	
Windham Co SKYWARN	KB1DGY	70	
Zone 2	KB1MFV	54	
Region 5 Waterbury	N1CHP	49	
Maine			**641**
Sagadahoc	WA1SCS	272	
Kennebec Co	NT1N	210	
Washington Co	K1PAR	159	
New Hampshire			**799**
Central NH	N1RCQ	204	
S Grafton Co	AA1KL	190	
Hillsborough Co	WD4JZO	150	
Greater Manchester	KB1LSQ	132	
West Rockingham Co	KA1UVH	215	
Mt Washington	KB1IIR	123	
Vermont			**41**
District 2	K3BRJ	41	
Section wide	WA1LIE		Narrative
Northwestern Division			
Idaho			**35**
Kootenai Co	NI7W	35	
Oregon			**166**
Tillamook Co	KA5YDJ	166	
Western Washington			**1893**
Pacific Co	N7CVW	427	
Whatcom Co	W7RE	384	
Kitsap Co	AB7Y	305	
Thurston Co	KA4VVA	231	
Clallam Co	N7BV	141	
Lewis Co	AC7SR	138	
Island Co	K7ACT	119	
Grays Harbor Co	N7UJK	106	
San Juan Co	WA7ZTT	42	
Pacific Division			
East Bay			**265**
Oakland	N6RCG	265	
Nevada			**130**
South Nye Co	KC6ILH	130	
Pacific			**137**
Maui Co	KH6H	137	
Santa Clara Valley			**307**
Santa Cruz Co	KA6AFE	174	
Cupertino	KN6PE	133	
Roanoke Division			
North Carolina			**1930**
District 13	WD4PIC	436	
Mecklenburg Co	K4RLD	325	
Moore Co	N4YYL	290	
Eastern Branch	W9EF	231	
Cabarrus Co	W4LN	174	
York Co	WB4UHC	144	
Orange Co	N6LUZ	127	
Stanly Co	KC4TDC	124	
Union	W4MLE	79	
South Carolina			**229**
Anderson Co	N4SZ	128	
Greenville Co	W4JWA	101	
Virginia			**5241**
Carroll-Grayson Co #2	KI4ONE	740	
Twin Co, Galax	KI4TSK	558	
District 14	KI4TSK	548	
Statewide	W4ZA	427	
District 13	KF4JRV	349	
Roanoke Staging	W4BOT	309	
Albemarle Co	AD6JV	282	
Carroll-Grayson Co #1	W4GHS	279	
Wythe Co	KF4JRV	277	
Virginia Beach	WA4TCJ	160	
Fairfax Co	AI4IO	152	
Franklin Co	W4BOT	126	
Buckingham/ Cumberland	WW4GW	110	
Powhatan Co	KI4PXU	107	
Washington Co	KD4CZE	107	
Montgomery Co	KS4XO	99	
Spotsylvania Co	KI4AFE	82	
3 Rivers Health Dist	AD4RG	75	
New Kent Co	K2QIJ	69	
Wise, Lee Co	N4AUD	68	
Clarke Co	N3MG	60	
District 12	WA4RTS	54	
Norfolk	W4NMH	48	
Dickenson Co	KB4KTH	42	
King George Co	KD4KNR	35	
Falls Church	KC1AD	30	
Lancaster Co	AA4HQ	24	
Northumberland Co	AD4RG	24	
Rocky Mountain Division			
Colorado			**169**
Douglas, Ebert Co	KCØMHT	169	
New Mexico			**346**
Sandoval Co #2	K5SCA	209	
Sandoval Co #1	K5SCA	137	
Utah			**100**
Davis Co	KK7EF	100	
Southeastern Division			
Alabama			**269**
Mobile Co	KD4DLJ	269	
Section wide	KA4KUN		Narrative
Georgia			**1518**
Rockdale Co	KC4ELV	297	
Gwinnett Co	WB4QDX	255	
North Fulton Co	W4UOC	246	
Newton Co	WA4UJC	172	
Camden Co	WD8LQT	143	
Cherokee Co	WA6IKS	109	
Townes Co	W4VFZ	109	
Thomas Co	KE4FGF	132	
Georgia Em Mgmt	KM4Z	55	
Northern Florida			**66**
Clay Co	W4NEK	66	
Southern Florida			**132**
Lee Co	WA4GUK	132	
West Central Florida			**270**
Hillsborough Co	KD8AQ	190	
Sarasota Co	WD4AHZ	80	
Southwestern Division			
Arizona			**1156**
Section wide	W7STS	896	
Cochise Co	N7INK	260	
Orange			**168**
Mission Viejo	WA6RUZ	168	
West Gulf Division			
North Texas			**1265**
Wichita Co	KC5EOM	401	
Smith Co	N9JN	256	
Carrollton	N5ZW	251	
Erath Co	K5IIY	249	
Lamar Co	N5FVN	108	
South Texas			**388**
Burnet, Llano Co	K5RIK	157	
Hays Co	K5WWT	135	
Brazos Co	KB5N	96	
West Texas			**549**
Taylor Co	KJ5DX	280	
Midland	W5ZOX	269	

Section/Local Nets

Area/Net Name	Reporter	Points	Section Points
Atlantic Division			
Eastern Pennsylvania			**186**
BCARES	K3FSB	186	
Maryland-DC			**47**
Kent Co	KB3ENU	47	
Southern New Jersey			**261**
Cape May Co	N2EWT	200	
NJ Phone	W2CC	61	
Western New York			**609**
Wyoming Co	KBØSWS	271	
OCTEN	KA2ZNZ	188	
CNYTN	WA2PUU	150	
Western Pennsylvania			**37**
Blair ARES	KA3EJV	37	
Central Division			
Illinois			**238**
RADIO	AB9NH	238	
Indiana			**200**
Steuben Co	KB9NNR	79	
Whitley Co	WB9UNL	73	
Harrison Co	KB9JLF	48	
Wisconsin			**1729**
Badger Emergency	KE9VU	208	
Racine, Kenosha	KB9MMA	199	
WI ARES/RACES	N9VAO	199	
Sauk Co	N9ROY	100	
Walworth Co	N9ZXP	93	
Marathon Co	AB9PJ	90	
Manitowoc Co	KB9VLS	83	
Milwaukee/ Waukesha	N9ASA	76	
NW WI ARES/ RACES	KB9KJE	76	
Dunn Co	KB9ULF	71	
CARC	KA9OJN	73	
Brown Co	N8KQS	69	
E Central	KC9ESN	67	
NE WI Dist	KS8O	66	
Jeffcares	KC9IKI	62	
Green Co	KC9YI	43	
Kewaunee Co	KB9VXJ	41	
Manitowoc Co	N9NCU	41	
Adams Co	N9OEW	31	
Langlade Co	W9DMS	24	
Portage Co	WX9M	17	
Delta Division			
Arkansas			**91**
Cross Co	W5WPN	91	
Tennessee			**58**
Cocke Co	KI4KBS	58	
Great Lakes Division			
Michigan			**812**
Alcona Co	W8SZ	290	
West MI Traffic	KC8WSE	119	
SE MI Traffic	K8AMR	87	
Benzie Co	K8BTE	78	
Menominee Co	NS8V	78	
Saginaw Valley	KC8YVF	75	
MACS	W8RNQ	46	
Montcalm Co	KC8ZMO	39	
Ohio			**569**
NW OH ARES	N8TNV	191	
Central OH Traffic	KC8VWO	143	
FARA	N8FMJ	118	
Shelby Co	KC6NLX	117	
Hudson Division			
Eastern New York			**121**
Hudson Valley	N2JBA	121	
Northern New Jersey			**61**
NJ Phone	W2CC	61	
Midwest Division			
Kansas			**188**
KS SSB/Phone	NØKFS	188	
Missouri			**119**
Jackson Co	KØUAA	119	
Nebraska			**110**
E Nebr 2 Meter	KBØMTT	110	
New England Davison			
Connecticut			**1291**
Region 4 South	W1OEM	254	
Region 3 East	AB1GL	215	
CT Phone	AB1CR	158	
Region 1	W1GIG	126	
Nutmeg VHF	K1HEJ	119	
WESCONN	KA1GWE	100	
Region 4 North	KB1JDX	87	
Greater Bridgeport	KA1EOU	66	
SARA	N1EOF	54	
Region 2 Resource	N1HAX	52	
New Haven SKYWARN	N1HAW	41	
Hartford SKYWARN	K1PZS	19	
Maine			**393**
MECN	K1HZU	219	
Washington Co	N1DP	94	
Kennebec Co	NT1N	50	
Waldo Co	KB1GBD	30	
New Hampshire			**460**
W Rockingham	KB1FEM	130	
Central NH	N1RCQ	123	
Greater Manchester	KB1LSQ	78	
Hillsboro Co	WD4JZO	75	
SGARES	AA1KL	54	
Vermont			**19**
NE Vermont	K3BRJ	19	
Roanoke Division			
North Carolina			**829**
Tar Heel	KE4JHJ	281	
Metrolina 2 Meter	WB2NHQ	216	
Lincoln Co	WD4PIC	210	
Stanly Co	KC4TDC	74	
Union Co	KI4RBB	48	
Virginia			**354**
ODEN	K3EP	230	
Virginia Beach	WA4TCJ	110	
Norfolk	N4NMH	14	
West Gulf Division			
North Texas			**210**
DFW Metroplex	KE5HYW	210	
South Texas			**37**
Texas Slow Net	W5ESE	37	
West Texas			**182**
Midland Co	W5ZOX	182	

Field Organization Reports

Public Service Honor Roll
April 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.

638 WW6CC
443 KI4KWR
275 KB9KEG
232 KK1X
185 N7CM K8MFK
627 KI4GEM
362 WB8RCR
270 KB2RTZ
211 W7JSW
180 KE5HYW
618 KG4TND
346 KB5ILY
267 K5SFM
210 W1PLW
176 WA2BSS
550 W7TVA
326 KC8NTE
250 K1KY
205 KB1NMO
175 KI4BSL
540 KI4GWC
302 W4CAC
245 K7EAJ
200 WA2WMJ
K4CM K9LGU KM5VM
520 W2LTB
296 KD1SM
225 KØIBS
198 K4DND
KT5SR N4EJF
170 WB7WOW
126 N2GJ W2KFV
165 KD4F W4DNA
125 AG9G W7IG N5NVP N5KWB
161 WD9FLJ
157 K2HJ
124 WB2LEZ W1CAR
155 KA8ZGY K7BC N1UMJ
122 KC2DOY
151 K4CJE
121 W2SJS
150 W5DY WB5ZED
120 NN7H KA4FZI KK5GY
145 K3CSX KB2EV
N3RB WØLAW N1LKJ W1GMF
144 K8AMR
KW1U W8UL K4IWW
143 KC2ODN W2DWR
118 KD5TXD K6JT
140 K7BFL KK3F
117 WB2KNS
139 K2GW
115 W5HUD KD1LE
135 W3YVQ KØBLR
WX4H
131 WD8USA
114 KF7GC K8RDN
130 KC5OZT N2QZ W4FAL
112 W4ZJY
110 K6RAU W6DOB W5ESE
127 KI4AQU
W7GB W2CC NX1Q N7XG N7YSS W2DSX W5PY WB8OIF N4ABM K2VX K1YCQ N1IQI WB4GHU N8IO W2EAG AC8AR AC8AL WB9JSR
N9MN NR2F N8OD
99 W4TY
97 AB1AV
96 AD4BL KJ7NO WA4UJC WA1JVV
95 KE4CB NY3H
109 N2VC
106 KI4NLH
105 KG4JSR W4TTO
104 KD5OTH
103 N8NMA
100 NØMEA WB6UZX WB6OTS NN7D N5OUJ N2GS N7IE K4GK K2TV WB2KLH KM1N WB4FDT AA3SB KB3LFG K4SCL K2UL W3TWV K5MC KBØDTI WV8RG
92 N7EIE
90 KB5KKT N1JX KA1RMV KA1GWE WB4BIK K8GA K3IN N3ZOC W3ZQN N5MEL KA8WNO WD8DHC KI4JQB NG1A KF4WIJ K1JPG W8IM WD8Q N8DD WB8SIQ
KI4YV
89 AA4BN
88 K4ING
87 W5CU WA2CUW KØBXF
86 W5GKH
84 W7VSE
80 K7MQF KE7DVV KE5DKV N3SW WDØGUF K8KV AB8SY
79 KK7TN K4JRU N2VQA
77 NA7G W5XX
75 W4QAT
74 WJ3P
73 KØLQB K8VFZ
72 KG4YNM
71 K4MCD W9RSX W2MGT
70 K4BG

The following stations qualified for PSHR in previous months but were not recognized in this column: (Mar) KT5SR 176, N4MEH 100, WA2ZCM 80, KA4LRM 73. (Feb) W2MTA 338, KT5SR 95.

Section Traffic Manager Reports
April 2008

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

Section Emergency Coordinator Reports
April 2008

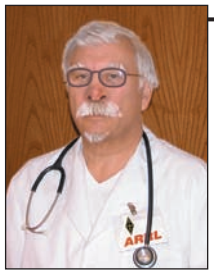
The following ARRL Section Emergency Coordinators reported: AZ, CO, CT, GA, IL, IN, KS, KY, LA, ME, MI, MO, NC, NM, NTX, NV, OH, OK, SFL, SJV, STX, SV, TN, VA, WPA, WTX, WV.

Brass Pounders League
April 2008

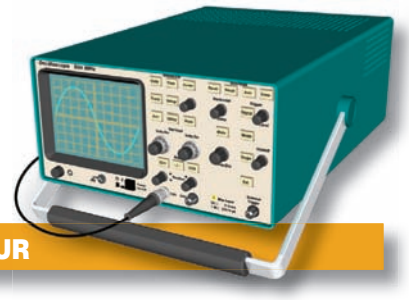
The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram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

Call	Orig	Rcvd	Sent	Dlvd	Total
WB5ZED	22	1277	1380	55	2734
KK3F	15	1840	1815	40	3710
N1IQI	0	412	1493	0	1905
W4ZJY	0	967	914	0	1881
K7BDU	11	799	815	4	1629
W1GMF	0	450	1027	0	1477
KA9EKG	47	702	681	34	1464
WB5NKD	7	272	1098	0	1377
W8UL	0	653	601	2	1256
WB5NKC	0	72	898	16	1043
WB9JSR	3	496	511	13	1023
KW1U	0	513	427	3	943
N1UMJ	24	448	451	12	935
N8IXF	0	310	300	2	601
WX4H	0	218	306	21	545

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



The Doctor is IN



PROJECTS AND INFORMATION FOR THE ACTIVE AMATEUR

The discussion in the May 2008 Doctor column about the required bandwidth of different voice modes resulted in some interesting comments about different aspects of the question.[1] The discussion started based on some reports of double sideband, full carrier AM signals being "30 kHz wide." I went from there into a discussion of how wide SSB and DSB signals need to be and how wide they generally are. It was pointed out that some discussion of the validity of the reports themselves would have also been helpful.

First, Steve, WD8DAS, pointed out that a common error in making such observations is that the apparent bandwidth, as observed on a receiver, is actually the sum of the transmitted bandwidth and the bandwidth of the receiver making the observation. Thus a "perfect" 6 kHz wide DSB signal observed by an AM receiver with a "perfect" 6 kHz bandwidth would appear to be 12 kHz wide. If the receiver is not perfect and has filter skirts that range from 6 kHz at –6 dB to 12 kHz at –60 dB, a quite respectable analog filter, and the observed signal is quite strong, the reported bandwidth of the 6 kHz transmitted signal could easily be 18 kHz — quite a difference. The effect is shown in Figure 1.

As noted in the excellent article about spectrum analysis by John Stanley, K4ERO, in this issue, a spectrum analyzer avoids this issue by using a very narrow filter so it can separate the different frequency components.

The other point was made by Charlie, W4MEC, who quite correctly observed that the same kind of splatter that can broaden a signal due to overdriving or overmodulating an amplifier can occur in a receiver as well. This will occur if the received signal is strong enough to drive an amplifier into nonlinear territory. It is always good to insert some attenuation into the front end of the receiver while making such measurements. If the bandwidth seems to stay the same, chances are you are operating in the linear region.

In summary, while it is possible to encounter signals with more than needed bandwidth, be sure you understand exactly what it is you are measuring before you announce a conclusion.

Q Larry, KØLWV, asks: Do I have line noise or is it something else? Much of the time during dry weather during daylight I hear a buzzing noise that will reach S9 on my receiver S-meter. At night time if will drop to S4. It is worse on the higher bands from 14 to 30 MHz. 160 meters at night is completely unaffected and is quickly becoming a favorite band.

For some reason the noise will completely disappear for perhaps a week. After the week has passed, suddenly the noise will return with a vengeance of S7 to S9 and stay for weeks. Sometimes I hear a loud crackling noise that sounds like a spark gap. Many times the noise will die down or even disappear when it's raining.

I have tried different products such as audio DSP speakers and noise cancelers and they didn't help. Any ideas?

A It sounds like you have a serious problem and I hope you can remedy it. Before you can, you will need to find out what its source is and how the noise signal is getting to your radio.

Let's start with the second item, since it's quickest. If you have a solid dummy load, disconnect your antenna and replace it with the dummy load. If the noise disappears (most likely) it means that it is being picked up by your antenna. If it is still there, it means it is coming in some other way — probably via your power line.

If it does happen to be coming in your power line, a filter/surge suppressor such as the Industrial Communication Engineers ICE Model 475-3 AC Line Filter, is likely to help.[2] Alternately, you can wind multiple turns of your power leads through a ferrite toroid and that may help. The usual computer type power strip/arrestor likely won't help.

If it is coming from the antenna, it may well be originating in a noisy electrical appliance in your home. To find out, first shut off all potentially power critical devices such as computers and see if there is a change in noise. If not, make an arrangement so you can hear your radio's speaker from the location of your fuse box and turn off each breaker for at least 30 sec and see if the noise disappears. At my station, my radio is supplied by a storage battery and charger so I can turn off its circuit as well. If your radio doesn't have battery backup, use an extension cord to another power circuit to test the radio's circuit. If you find a breaker that changes the noise, find and temporarily disable the device and repeat the test, since there may be more than one source.

If it is not happening from something in

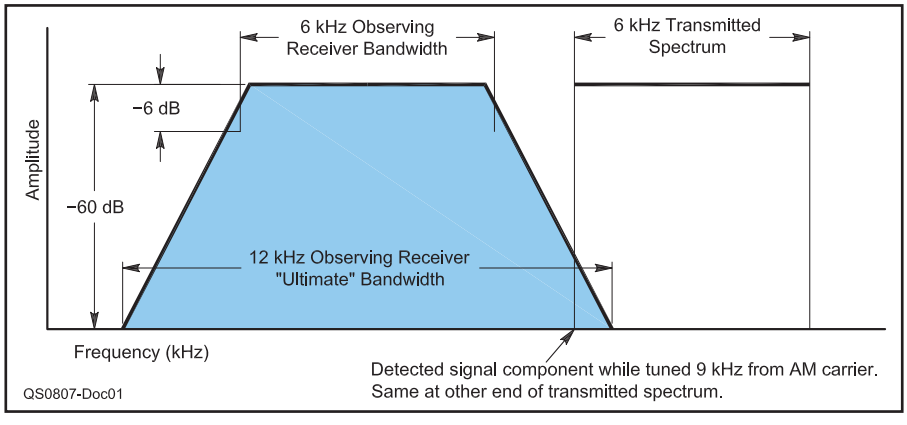


Figure 1 — Illustration of the difficulty in measuring signal bandwidth with a wideband receiver.

[1]"The Doctor is IN," *QST*, May 2008, pp 64-65.

[2]S.Ford, WB8IMY, "Short Takes — ICE Model 475-3 AC Line Filter," *QST*, Mar 2005, p 48.

your house, the detective work gets harder — you need to find out where it is originating from. Perhaps you can get a clue by the time of day, temperature or even day of the week — if there's a pattern. If you have rotatable antennas, you may be able to find a direction and that may give you a clue. If not, a mobile HF setup can be used to scour the neighborhood and then a handheld shortwave receiver can be used to get closer. Be careful to avoid trespassing and possible buckshot in this process!

The fact that this is less severe during rain may point to a leaky power line insulator or other device.

If you narrow down to a particular property, you may be successful at obtaining help from the owner in determining what is causing the problem. Under FCC Part 15, the owner of the device is required to eliminate "harmful interference" from licensed radio services. Unfortunately the FCC does not have many staff members dedicated to doing the detective work. If you are certain of the source and get no cooperation, however, they may be able to assist.

It is also possible to address the problem in other ways, at least until it's resolved. There are a number of receiving antennas that have a sharp null that can be used to reject signals from a particular location. There are also active noise canceling devices, such as the MFJ 1026, that receive a sample of the noise signal and then can cancel it out at the receiver.

Q Jan, K6FM, asks: I have recently restored a vintage 1938 Hallicrafters Sky Buddy communications receiver and would like to match its high impedance input circuit to my 50 Ω coax feed line. How can I obtain or make a 4:1 or higher balanced to unbalanced transformer suitable for reception?

A There was an article in June 2008 *QST* on simple-to-make low power HF baluns.[3] I made the ones in the photos in about 10 minutes, once I had the cores. Another great way to do it is to get a cable TV to 300 Ω balun from RadioShack, or perhaps your cable company. They sometimes come with TV sets and are often discarded. A cable ready TV needs to go down to 10 MHz and well up into the UHF region, so the transformers are quite broadband and useful throughout that range for receiving or other low power applications. In my experience they will not degrade sensitivity even at the broadcast band, but work even better in the upper regions where they make more difference.

If you get one with wire leads intended for the "TV set," those connections can go on the balanced pair of the receiver input with the ground jumper hanging free. Also get the adapters needed to go from the TV type F connector to whatever kind of coax jack you need.

[3]R. Arnold, AF8X, "Baluns — What's the Story?" *QST*, Jun 2008, p 76.

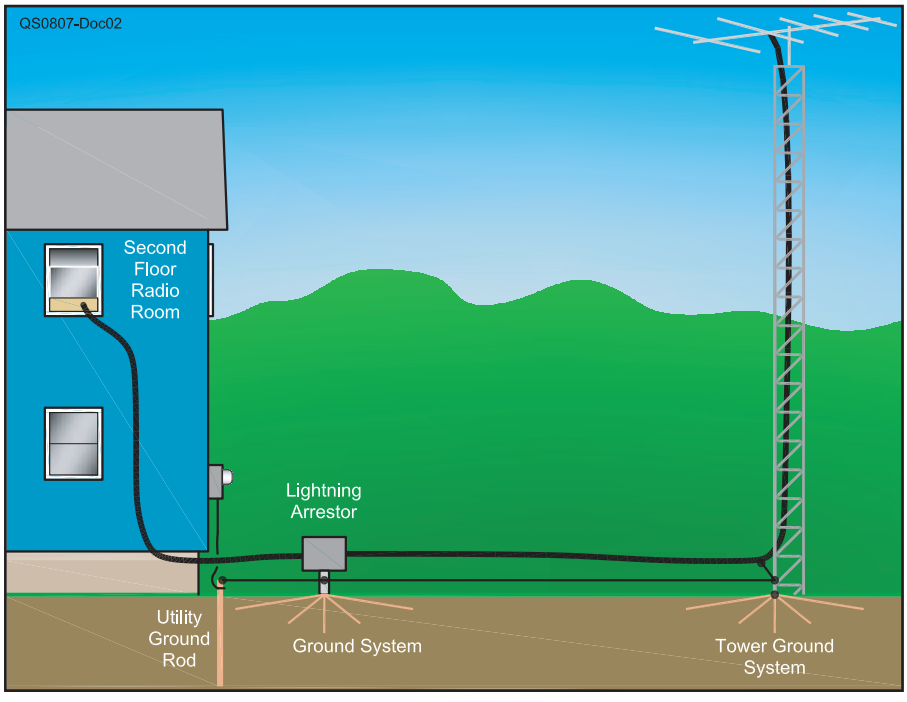


Figure 2 — Suggested configuration of antenna leads for best lightning protection of elevated station.

Q Shawn, KD5HLM, asks: I recently moved to a new residence and had to relocate my station to a second story loft. What is the optimum solution to grounding my station?

A The safest antenna connection arrangement, in terms of lightning protection, is to bring the feeders down to ground level first. Ground the shields there. Then run back up to the station with the up and down runs spaced so there is minimum coupling between them. Lightning arrestors at that ground point will be most effective. If that point can be near the power system ground, that's the best. If not, putting another ground system at the antenna ground point and tying the two together through as short a run as possible will be almost as good. The arrangement is shown in Figure 2. Note that the tower, RF and utility grounds are all bonded together.

It is difficult to get a good traditional RF ground connection to the second floor. If you are lucky, the connection via the power system ground may be enough, especially if you have a good RF ground connection outside at ground level. It is still possible to pick up RF from your antenna directly onto the section of your feed line from the arrestor to the radio room. If so, another "ground" wire from the second floor to the RF ground is not likely to help. Insulated wires λ/4 long at each of your operating frequencies connected to your radio ground post and run radially out from the radio should provide a low impedance path for RF on the chassis. Alternately, there are commercial tunable "artificial grounds" that can serve the same purpose.

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

Strays

HAM TO HIKE PACIFIC CREST TRAIL

◊ ARRL Technical Advisor Bruce Prior, N7RR, is looking for hams to sign his guest book and send words of encouragement as he hikes the Pacific Crest Trail from April 19 through late September or early October. The trek will cover some 2650 miles, from the Mexican border to Manning Park, British Columbia. I will be acting as his PR manager, journal scribe and regular contact during his venture. His journal is at **www.n7rr.com**. — *James R. Johnson, VE7HJ*

QSL Maker

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Highland Park, IL 60035
w9ph@arrl.net

As the saying goes, a QSL card is more than a simple receipt of contact; it's the final courtesy of a QSO. Even in the age of electronic QSLing, most hams still prefer paper cards, so it is a good idea to keep a supply on hand. You can order a batch of cards from any one of several QSL printers, but once you have, say, 100 cards in your desk drawer, you are locked into that card design for as long as it takes to deplete your stock. The alternative is to make your own cards, changing the design and text whenever you desire. I've tried many different ways to make custom QSL cards and *QSL Maker* for *Windows* by John McDonough, WB8RCR, is the best solution I've found. This software tool makes beautiful, inexpensive cards that will give you a sense of pride and accomplishment. Believe it or not, sending a unique, attractive QSL card also increases the odds of receiving the other station's card in return.

The *QSL Maker* Difference

QSL Maker is easy to install and the software includes comprehensive instructions along with a card-making tutorial. You'll find that *QSL Maker* is quite user friendly; you'll be printing cards within minutes after you download the program. With *QSL Maker* I only print the cards I need, when I need them. Best of all, I can add a new vanity call sign, address, radio or antenna at any time. I can insert a new picture, drawing, logo or award at a moment's notice.

QSL Maker doesn't lock you into a single card design. You can use the software to create and save several different cards. You might have a DX card, a digital mode card, a ragchew card and a card for a specific contest or net.

Using *QSL Maker*

Once you enter your name, call and address you can start printing QSL cards that look like commercial versions, but the real fun begins when you customize your cards. The program places a "main image" of your choice on the front. This image can be anything from a digital photo of you at your station, a photo of your family or whatever. I use the *Paint* application in *Windows* to merge other graphics into the image (such as the ARRL logo) to create a special combined image. You don't have to do this — I just enjoy being creative. *QSL Maker* provides six lines of customizable text for things like 10-10 number, grid square, county, awards, radio, antenna, etc. There are standard blocks (fields) for the other station's call sign, QSO date, time, mode, power and RST. There is a customizable greeting that includes a text message to request the other station's QSL, or thank him for sending his card. The color, font and position of the text are customizable. *QSL Maker* prints on standard 8.5 × 11 inch paper and produces four QSL cards per page in landscape orientation.

Import your Logbook

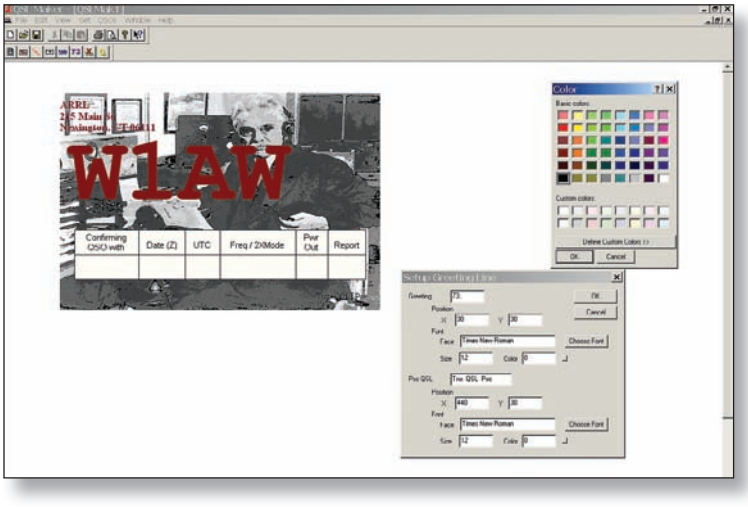
You can print cards leaving the QSO data blank (like a commercial card) and later add the data by hand.

If you prefer to send batches of QSLs, you can print labels from your logging program (if it supports that function) and attach them to the cards. *QSL Maker* provides an easier solution, though. I import the QSO data from my electronic logbook directly into *QSL Maker* and let it create cards for each contact! The results are remarkably clean and professional.

File importing and printing is much easier than it seems. The first step is to export the data from your logging program in ADIF format (almost all logging programs will do this). Then, click on QSOS in the *QSL Maker* toolbar and select IMPORT, then "Import ADIFfile." Choose "any," click OK and then browse to your exported file, highlight, open and click DISMISS. You will now see a preview image of your cards from each QSO with the call sign, UTC time, UTC date (the month is printed with letters instead of numbers to avoid international date confusion), frequency, mode, power and RST.

You can print your cards on any paper. My multicolor cards are less expensive than most commercial cards, but the cost depends on your design. If you use a lot of color ink and/or an expensive paper, the cost will increase. I like the microperforated card stock in the QSL kit offered by W7NN at **www.hamstuff.com**. The paper feels like a commercial QSL card. Folding along the microperforations easily separates the cards without paper cutters or scissors. The cards are 3.5 × 5.5 inches. The paper comes in white or ivory and you can order a mix to try both colors. You can easily set the *QSL Maker* software margins to fit this specialty paper, or any other paper for that matter.

Figure 1 — Using *QSL Maker* to create a W1AW QSL.



Try a Free Copy

It is remarkable that WB8RCR has provided *QSL Maker* free of charge. It offers features and capabilities for which you'd expect to pay tens of dollars at least. Download a copy and see where your creativity takes you! You'll find it on the Web at **www.hfradio.org/wb8rcr**. An alternative site is at **www.qsl.net/wb8rcr/hamradio.html**. QST

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

W1ZR

GETTING ON THE AIR

Your Second HF Antenna

In *QST* for January and March 2008, we presented some ideas for a *first* HF antenna.[1,2] Both horizontal and vertical antennas were presented since different situations may make one or the other more desirable. In both articles, the antennas presented were fed using convenient coaxial cable. Most were designed for efficient operation on a single amateur band.

Why Coaxial Cable?

Coaxial cable is a very popular transmission line for a number of very good reasons:

- Most current radios are designed to drive power into 50 Ω coaxial cable.
- Coaxial cable can be coiled or run adjacent to other metal structures without interfering with the signals inside.
- Many antennas are designed to connect directly to coaxial cable.
- If the antenna has an impedance of near 50 Ω, the impedance at the radio will also be near 50 Ω.

So What's Wrong with this Picture?

Not a thing! Coax cable works very well for such an application — connecting to an antenna that matches its characteristic impedance (Z_0). All things being equal, coax cable does have more loss than some other types of transmission line. For any application with a reasonably matched antenna, however, a type of coax can usually be found that will have low enough attenuation to be satisfactory. Table 1 lists the attenuation at various amateur bands for 100 feet of popular types of coax *if* matched to their Z_0. For different lengths the results scale directly, so 50 feet of matched LMR-400 on 14 MHz would have a loss of 0.23 dB or 5%.

Problems start under the condition that the coax isn't matched. This typically happens if an antenna that is matched on one frequency is operated on another. The results of a mismatch, an SWR of greater than 1:1, are twofold:

- The impedance seen by the radio will no longer be 50 Ω.
- The loss in the coax will be higher than that for the matched case.

A small mismatch, such as occurs on the edges of a band or segment, usually isn't too much of a problem. Most radios will work into an SWR of 2:1 without a problem and the losses do not go up very much at that SWR. Figure 1 is the *EZNEC* predicted SWR of a 30 foot high 40 meter dipole across the band.[3] Figure 2 (from *The ARRL Antenna Book*) shows the increase in loss as a function of matched loss and SWR.[4]

Assuming your 40 meter dipole is tuned for mid band as in Figure 1, the SWR at the edges will be just 2:1. If we use 100 feet of RG-8X, with a matched loss of 0.83 dB, we see from Figure 2 that the additional loss will be about 0.2 dB. Our cable loss will go from 17% to about 21% — not a big deal for most applications.

Suppose we want to chase some DX on 20 meters. A 40 meter λ/2 dipole becomes "two half waves in phase" on 20 meters — an effective antenna with a nice pattern and a bit of gain in the broadside directions — but will it work? The short answer is: *only if we can get power to it*.

Two Half Waves in Phase — Not Coax Friendly!

This same, nicely behaved 40 meter dipole has an impedance near 5000 Ω on 20 meters. The actual predicted SWR is 93:1 — off the chart on Figure 2. The predicted transmission line loss with the RG-8X is almost 15 dB or 97%. That means that if you can get your transmitter to talk to it, only 3 of your 100 W will actually radiate. You could make a matching network to be installed at the antenna, but that would only work on 20 meters, not 40.

[1]J. Hallas, W1ZR, "Getting on the Air — Your First HF or 6 Meter antenna," *QST*, Jan 2008, pp 65-66.

[2]R.D. Straw, N6BV, "I Just GOt My General License and a Used HF Tranceiver — Now What?" QST, Mar 2008, pp 39-42

[3]Several versions of *EZNEC* software are available from Roy Lewallen, W7EL, at **www.eznec.com**.

[4]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**.

Table 1

Attenuation in Decibels (Loss %) of 100 Feet of Popular Transmission Line Matched to Z_0

Frequency (MHz)	*3.5*	*7*	*14*	*28*	*50*
RG-58	0.84 (18)	1.26 (25)	1.88 (35)	2.81 (48)	3.93 (60)
RG-8X	0.56 (12)	0.83 (17)	1.24 (25)	1.85 (35)	2.58 (45)
RG-213	0.36 (8.0)	0.53 (11)	0.78 (16)	1.14 (23)	1.57 (30)
LMR-400	0.22 (4.9)	0.32 (7.1)	0.46 (10)	0.66 (14)	0.89 (19)
450 Ω Window	0.05 (1.1)	0.07 (1.6)	0.10 (2.3)	0.15 (3.4)	0.20 (4.5)

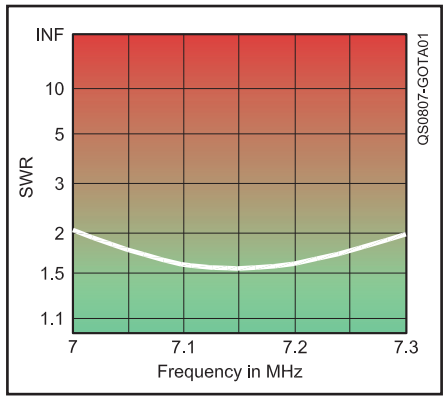


Figure 1 — *EZNEC*-predicted 50 Ω SWR of a 50 foot high 40 meter dipole across the band.

Joel R. Hallas, W1ZR ♦ *QST* Technical Editor ♦ jhallas@arrl.org

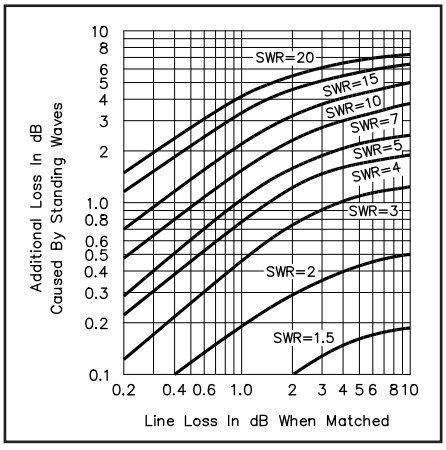


Figure 2 — Increase in transmission line loss as a function of matched loss and SWR.

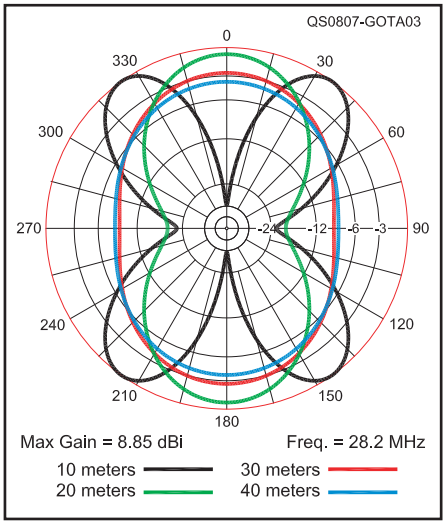


Figure 3 — Azimuth pattern of the antenna on four bands in peak of elevation lobe. 40 meters is blue, 30 meters is red, 20 meters is green and 10 meters is black.

The Good News Is...

We have a very good alternative available. By replacing the coax with the low loss window line we solve almost all of our problems. Note that the window line (typically with an actual Z_0 closer to 400 than 450 Ω) does not match the antenna or the transmitter on any band. It does have a manageable SWR on both bands, in fact on any bands — 40 meters and up. On 40 meters the SWR will be 5:1 and on 20, 11.5:1. Look at the matched loss and add in the mismatch loss from Figure 1. On 40 meters it is so low you can't quite make it out. *TLW* predicts a loss of less than 0.6 dB, about like matched RG-213.[5] On 20 meters it will have a loss of about 1 dB with the 11.5:1 SWR.

As noted, this antenna will work well on 40 meters and all higher bands. The pattern changes with the band, as shown in Figure 3, putting maximum power into different regions on each band. This can be a mixed blessing, but one argument is that it is easier to change bands to work toward a particular direction than to turn a 66 foot antenna.

[5] *TLW, Transmission Line for Windows* software is provided with recent editions of *The ARRL Antenna Book*.

Table 2

SWR, Attenuation (dB) and Loss (%) of 100 feet of "450 Ω" Window Line Connected to 66 foot Dipole.

Frequency (MHz)	*SWR*	*Attenuation (dB)*	*Loss (%)*
7.15	5.2:1	0.19	4.3
10.125	6.4:1	0.24	5.4
14.2	11.5:1	0.52	11
18.125	17.2:1	0.88	18
21.15	5.9:1	0.372	8.2
24.95	5.8:1	0.39	8.6
28.3	9:1	0.61	13

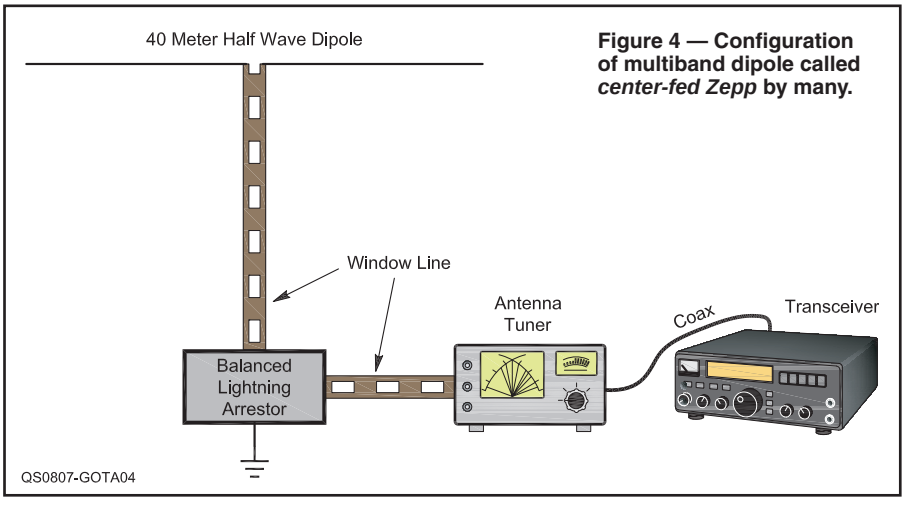


Figure 4 — Configuration of multiband dipole called *center-fed Zepp* by many.

So What's Not to Like?

The one hurdle with this antenna is that the impedance at the bottom of the window line is not a good match to the radio on any band. If we can get power from the transmitter to the transmission line, there will be little loss, but first we have to get the transmitter to put power into the bottom of the line. Table 2 shows the line loss and 50 Ω SWR at the bottom of a 100 foot transmission line on each band. The impedance will be different with different lengths of line, but this should be representative of what we're up against. Fortunately, this is a problem that has been solved many times with a device sometimes called an *antenna tuner* or *transmatch*.

Enter the Antenna Tuner

An antenna tuner is nothing more than an adjustable impedance matching device. It generally consists of a combination of adjustable inductors and capacitors. The adjustments can be set to translate the impedance of a load, in this case the impedance at the bottom of the feed line, to the 50 Ω load that the radio wants to see. The other transformation that is required is to change the balanced configuration of the feed line to the unbalanced (one side grounded) coaxial termination your transmitter wants to see. Some are special configurations designed to do exactly that, while the more common are really designed to work with unbalanced systems and then are connected through a balun to the feed line.[6,7]

So What Have We Got?

We have taken our simple dipole *first antenna*, changed the transmission line, added a piece of equipment and now have a very competent antenna that will work well on all bands above its half-wave resonant frequency. By the way, the tuner needs to be a wide range unit, not the type in some radios that are designed to feed coax antennas with an SWR of up to 3:1. Still there are many choices, both manual and automatic, starting at around $100 for a 100 W rated unit.

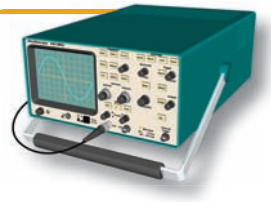
There's nothing magic about the 66 foot dipole, either. If you have 130 feet, you can have an antenna that will work well from 80 through 6 meters.

[6] J. Hallas, W1ZR, "Product Review — A New Generation of Balanced Antenna Tuners," *QST*, Sep 2004, pp 60-66. Available on the ARRLWeb at **www.arrl.org/members-only/prodrev/**.

[7] J. Hallas, W1ZR, "Product Review — Automatic Antenna Tuners — a Sample of the Field" *QST*, May 2004, pp 71-76. Available on the ARRLWeb at **www.arrl.org/members-only/prodrev/**.

N0AX

HANDS-ON RADIO



Experiment #66 — Mixer Basics

The *heterodyne principle*, invented by Fessenden, describes how signals of two frequencies can produce *products*, signals at the sum and difference of the two original signal frequencies. The circuit that makes a superheterodyne (or *superhet*) receiver possible — the most common type of receiver for the past 90 years — is the *mixer*.

You may be more familiar with the microphone mixers used in audio systems — an unfortunate overlap of terms. Those pieces of equipment combine the audio signals, producing an output in which the input signals are present with altered levels. Microphone mixers do not change the frequencies of the input signals, however. Even so, a combiner is a good place to start our study of how mixers work.

Combiners

In Experiment #3, Figure 4 is the schematic of a two channel *summing amplifier*.[1] This circuit adds the two input signals together into a single composite output signal. The ratio of R_F to the input resistor R_1 or R_2 determines the amplitude of the signal contribution from each input in the output signal.

Figure 1 of this experiment shows a very simple *passive resistive combiner.* This circuit is suitable for use with PC sound card inputs and outputs. In this experiment we'll make use of PC based function generator and audio analyzer programs to generate and analyze input and output signals.

Build the passive combiner circuit. The resistor values are not critical — any close value will do. The values of the input resistors should be relatively close if same-value resistors are not available. The value of the load resistor can be any value from 4.7 kΩ to 27 kΩ.

Two sine wave input signals are required: 500 Hz and 800 Hz. If you are using the *Dual Function Generator* program described last month, set both channels to FUNC, SINE, and an output level of 60.[2] Set one channel LEFT-RIGHT control to full-left and the other to full-right. (If you are using standalone function generators, output levels of about 0.5 to 1 V_{P-P} will do.)

Connect the input of the PC sound card to the junction of all three resistors as shown and run an audio spectrum analyzer program. If you are using the *SpectrumView* program, the sample rate should be 44.1 ksps, the transform size should be 8192 samples, and the horizontal display axis set to display frequencies from 0 to 1600 Hz.[3] All other settings may remain at their default values. You should see a pair of signals at 500 Hz and 800 Hz, with a value between –20 and –30 dB on the vertical amplitude scale. (If your levels seem low, open your computer's VOLUME CONTROL settings, assuming a *Windows* based system, and be sure that the WAVE and VOLUME levels are set to maximum.)

[3]See Note 2.

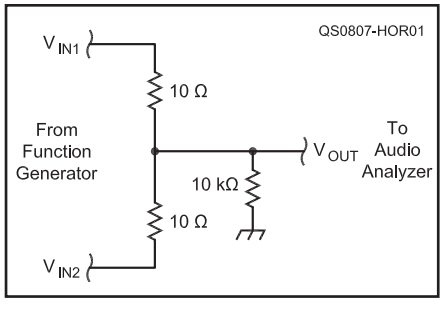


Figure 1 — A passive resistive combiner adds the input signals together into a single composite output. The input signal frequencies are unchanged.

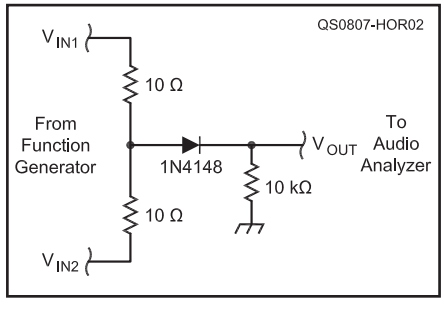


Figure 2 — Adding a diode turns the resistive combiner into a passive diode mixer.

Change the levels and frequencies of the input signals to observe the effect on the displayed output signal. (You may see some signals at low frequencies from hum or signal processing artifacts; these may be ignored for this experiment.) The signal input voltages and frequencies can be changed independently because this is a *linear* circuit. The output signal is a scale replica of the input signals and is composed of the same frequencies as the input signals.

Multiplying Mixers

Instead of adding the signals together as in our combiner, what if the signals were multiplied together instead? Let's assume that each signal is a sine wave; A sin(2πft), where A is the peak amplitude and f is the signal's frequency. Multiplying two sine waves of different amplitudes and frequencies results in the output signal:

$$A \sin(2\pi f_A t) \times B \sin(2\pi f_B t) = \tfrac{1}{2} A \times B [\cos(2\pi[f_A - f_B] t) - \cos(2\pi[f_A + f_B] t)]$$

That's a hefty equation, but the important thing to note is what is inside the square brackets of the cosine terms: $[f_A - f_B]$ and $[f_A + f_B]$. These are output signals at the difference and sum of the input frequencies. Note that there are no signals present with the original frequencies, f_A and f_B — they have been converted to *mixing products* with the new frequencies. (If the difference frequency is negative, use its absolute magnitude.)

Let's try an example to see how the math works out. If both input signals have an amplitude of 3 V, signal A's frequency is 1 kHz, and signal B's frequency is 1.5 kHz, what are the mixing products? The output signal amplitudes are ½ the product of the input amplitudes — in this case, ½ × 3 × 3 = 4.5 V. The complex output signal is made up of two components: 4.5 cos (2π 500 t) and 4.5 cos (2π 2500 t). Therefore, the output signal frequencies are 0.5 kHz and 2.5 kHz.

Why not use a multiplier circuit as a mixer? That would certainly work, but a true multiplier circuit suitable for use in a communications receiver is not easy to construct. The alternative is to use circuits whose output signal consists partly of the input signals multiplied together and partly

[1]All previous Hands-On Radio experiments are available online to ARRL members at **www.arrl.org/tis/info/HTML/Hands-On-Radio**.

[2]*Dual Function Generator* and *SpectrumView* are part of the *ARRL Software Library for Hams,* Vol 2.0 CD package, available for $19.95 from the ARRL at **www.arrl.org/shop**.

H. Ward Silver, N0AX ♦ PO Box 927, Vashon, WA 98070 ♦ n0ax@arrl.org

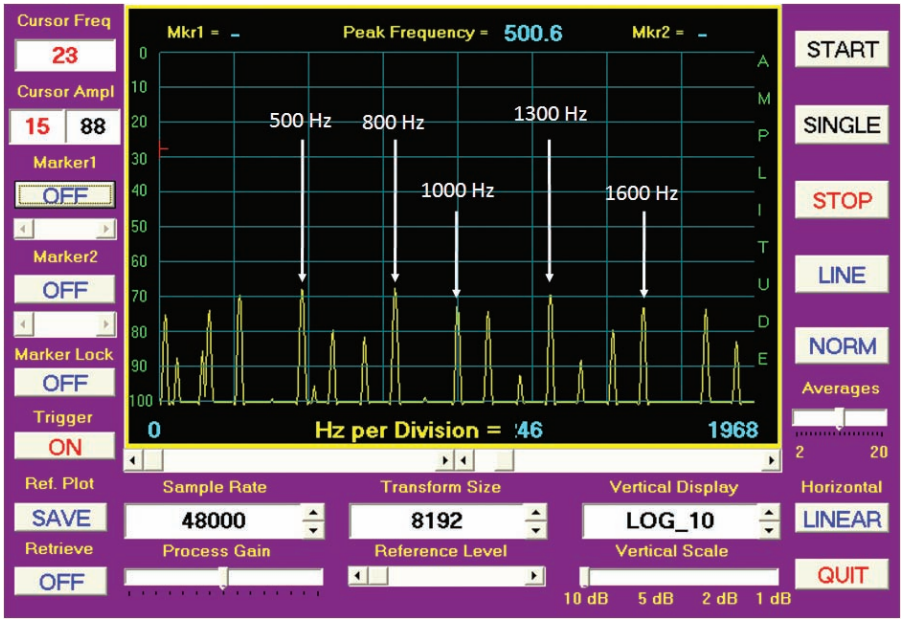


Figure 3 — The output spectrum from the passive diode mixer with input sine waves of 500 and 800 Hz.

of other combinations and products.

Surprise — It's A Mixer!

Taking two signals, multiplying them together and getting a completely different pair of signals out might remind you of some other process. What if the input signals were an audio tone (perhaps 2000 Hz) and an RF carrier (perhaps 14,300 kHz)? The output signals would have frequencies of 14,302 and 14,298 kHz. In other words, multiplying created a double sideband, suppressed carrier signal! Remove one of the sidebands with a filter and, *voila*, your SSB signal appears. So a *balanced-modulator* is really a type of multiplying mixer!

Non-Linear Mixers

Another way for two signals to combine in such a way that signals at different frequencies are created is to use a *non-linear* circuit. That is, the output is not a scaled replica of the input — it is distorted. You saw in the previous experiment how changing the makeup of the components of a complex signal changed the waveform's shape. A similar process is at work in a non-linear circuit by which distortion of the input signal creates a complex output signal with components not present in the input signal.

Figure 2 shows a very simple non-linear passive mixer. Adding the diode forces the current from each input to flow through the diode's junction. The relationship between the current through a diode and the voltage across it is an exponential equation called the *diode equation*. Even if the voltages from the input signals combine linearly, the current through the diode will be non-linear. This means that the voltage across the load resistor will also be a non-linear reproduction of the input signals.

The non-linear behavior of the diode not only creates signals at the sum and difference of the input frequencies, but at all of the *linear combinations* of the frequencies. That means there will be signals at $nf_1 \pm mf_2$ where n and m can take on any integer value from 0 to infinity. Any component for which either n or m are 0 (but not both) is the fundamental or a harmonic of one of the input signals.

Don't the unwanted products overwhelm or interfere with the desired products at the sum or difference frequencies? Luckily, the higher the values of n and m (the sum of n and m is the called the product's *order*) the less energy is present in that component, so nearly all of them can be ignored.

Try it! Add the diode to your circuit and take a look at what happens to the circuit's output, keeping the input signal frequencies the same (500 and 800 Hz). As you can see in Figure 3, many components will be visible. (Temporarily short out the diode with a wire jumper to see the original input signals.) Your display may not look exactly like that of Figure 3, but it is the frequencies of the components that are important.

Start by identifying the components corresponding to the original signals. Then find the 300 Hz (800 – 500) and 1300 Hz (500 + 800) components. Can you identify the input signal harmonics? Make a table of the nine linear combinations of the input frequencies for n and m = 1, 2, and 3. See if you can identify the components that correspond to those combinations.

This stew of components is typical of what happens when signals are combined in a non-linear device. The diode is a particularly good example. You might also consider what happens if strong transmitted signals from broadcast or commercial stations are present at non-linear junctions, such as rusty fences or gutters! The many mixing products they generate can also be radiated (inefficiently, thank goodness) by the same fences and gutters, bedeviling the amateur operator!

Parts List

- 2 each 10 Ω, ¼ W resistors.
- 10 kΩ, ¼ W resistor.
- 1N4148 diode.

Recommended Reading

Reginald Fessenden and Edwin Armstrong are two very important names in radio. Reading up on both and the superheterodyne receiver would be a good way to learn the history of the mixer and its use in radio. All are well-represented in Wikipedia at **www.wikipedia.org**.

Next Month

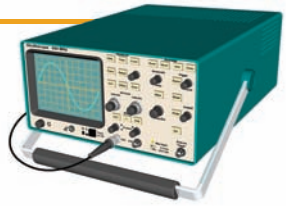
I'll be taking in the Dayton Hamvention before I write the next column. I'll be looking for some interesting and novel new bit of electronics to show you! QST

New Products

TWO RADIO ACCESSORY SWITCH FROM MFJ

◊ The MFJ-643 SO2R Accessory lets you switch accessories such as microphones, headphones, keyers, and sound card interfaces between two radios. The front panel has ¼ inch and 3.5 mm jacks for stereo headphones and a switch to select RADIO 1, RADIO 2, one radio in each ear, or a mixture of both. A 3.5 mm microphone jack is switched between the two radios with a front panel switch. The rear panel has connections for switching a keyer between the radios, and an auxiliary input can be used for switching a sound card or other device. Requires 12 V dc. The MFJ-644 is similar but includes MFJ's UniversalMic interface and three microphone input jacks — RJ45 modular, 8 pin round, and a programmable 3.5 mm jack for use with popular headsets. Price: MFJ-643, $139.95; MFJ-644, $159.95. To order, or for your nearest dealer, call 800-647-1800 or see **www.mfjenterprises.com**.

HINTS & KINKS



YAESU VX-5R TIPS AND TRICKS

◊ The Yaesu VX-5R is the most configurable radio I've owned. The user can assign icons and names to each memory channel, change the display size, turn the key beep on or off, scan modes and much, much more.

The radio gives you control over many features that gobble up precious battery power, such as the backlight duration, Busy/TX LED enable/disable, timeout timer and battery save modes.

It can be configured using the keypad (although time-consuming), or with a PC using a simple interface. I prefer the latter, for several reasons. For one thing, nothing beats a full-size keyboard when typing all of your favorite frequencies, CTCSS tones / DCS codes, memory names, call signs, etc. You can then save this configuration to disk or CD for later use. You'll be glad you did, should the radio ever need a CPU reset or other reprogramming.

The file can be shared with a friend or club members, or add it to the ever growing list of files available on the VX5 Web groups. These files allow a user to instantly load all area frequencies (including CTCSS/DCS) into their rig with just a few mouse clicks. At least two free software packages are widely available on the Internet (*EVE* and *VX5 Commander*).

For example, if you're planning a trip to Chicago, simply program the radio with the Chicago file and you instantly have all of the area repeaters loaded into your rig. Once you get back home, reprogram the rig and you're right back to normal operation.

There are two schematics on my Web site if you'd like to build your own interface. This is an easy and inexpensive project. You might even find (as I did) that this type of interface works to control other radios in your shack. Visit **yokshs.fortunecity.com** and click on the SCHEMATICS tab.

Recently, I discovered that even the S meter display characters are definable. The default character is a double greater-than symbol (>>), which can be tough to read from an arm's length and I find double characters to be less than intuitive.

You may choose from several choices in the S meter set menu, or you may even create your own using the Custom setting. Note that each segment can be a different character when using the Custom setting.

I set up the display using the numbers one through eight for the S meter and now the display is much easier to read, especially at an arm's length. — *73, Kyle Yoksh, KØKN, 125 N Chambery Dr, Olathe, KS 66061, AMSAT #35249, VUCC Satellite #150,* **k0kn@amsat.org**

MORE ON DATA SWITCHES

◊ I have connected a data transfer switch to my ICOM IC-7800. This enables me to use my computer monitor when I am working RTTY. This means that I do not need an extra monitor on my operating desk as mentioned in the Product Review of the IC-7800 (Mar 2007, p 62). A further advantage of this switch is that I can quickly view the spectrum over 3 kHz when the monitor is switched to the computer.

VGA monitor extension cables will be required to connect the 15-pin T switch and gender changers may be needed. The pole of the switch connects to the monitor and the computer. The video output from the IC-7800 connects to the switch outputs. Figure 1 shows the switch to the right of the RIGblaster Pro in the Display position. — *73, Frank E. Wyer, G8RY, 23 Sheriffs Ct, Burrough Green Newmarket, Suffolk CB8 9NJ, United Kingdom,* **frank@wyerg8ry.freeserve.co.uk**

FRANK E. WYER, G8RY

Figure 1 — Using a data switch to interface a flat-screen monitor to the ICOM IC-7800.

BATTERY PACK VOLTAGE CONTROL

◊ Portable operation has become quite popular and with the new, almost pocket size rigs, you can carry your entire station in a very small container. It would be ridiculous to carry a small bantamweight rig and use a home shack type key and a heavyweight automotive battery.

My preference for a paddle is the Palm Mini Paddle (**www.mtechnologies.com/palm**), but there are a number of other small lightweight paddles on the market. As for power, I prefer to use either NiCd or NiMH battery packs, both types rated at 1.2 V per cell and rechargeable.

I have made up battery packs using 10 cells of each type as well as a 10 cell alkaline pack. Both the NiCd and the NiMH packs measure a little over 15 V straight off the charger. A set of new alkalines measures about the same.

The low power rigs that I use specify operating voltages of 9-15 (Elecraft K1), 7-14 (Elecraft KX-1) and 12-14 (MFJ QRP-Cub). Since the voltage of fresh 10 cell packs exceeds the upper limit of all these rigs, I needed to reduce the voltage until the pack was partially discharged, then add more voltage to keep it at optimum.

I discussed this problem with Paul, WØRW, a well-known pedestrian mobile operator in Colorado. Paul's solution is to use two silicon power diodes in series to drop the voltage (0.7 V for each diode) and a switch to bypass the diodes as the voltage comes down. He uses the low voltage alarm in the KX-1 to let him know when to switch out one of the diodes.

With the switch in the center off position, voltage is reduced through both diodes (1.4 V). In position "A" the first diode is shorted out and in position "B" both diodes are bypassed allowing voltage direct from battery.

My own solution was to make up a couple of *dummy batteries* out of ½ inch wooden

RICHARD ARNOLD, AF8X

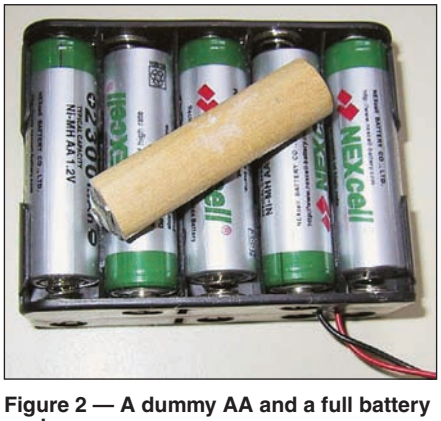


Figure 2 — A dummy AA and a full battery pack.

dowels cut to the length of AA cells. These are then drilled through lengthwise and fitted with a long 6-32 bolt and nut to act as a conductor. See Figure 2. Placing two of these dummy cells in the pack reduces the voltage to 12.4 V. One cell at a time is added to restore the voltage as the pack is exhausted. See Figure 3. — *73, Richard Arnold, AF8X, 22901 Schafer, Clinton Twp, MI, 48035,* **af8x@comcast.net**

RICHARD ARNOLD, AF8X

Figure 3 — A dummy cell voltage reducer at work.

AUXILIARY 9.6 V BATTERY FOR THE YAESU FT-50

◊ If you're like me, you want to extend the service life of your equipment to its maximum. My old Yaesu FT-50 (**www.yaesu.com**) handheld transceiver still works fine but the design is obviously becoming rather dated when compared to Yaesu's latest products.

My friend, Tom, K4TCH, was anxious to show me his new FT-60s features and I must say it made me a bit envious. The overall shape and size of the FT-60 is much more convenient. The dual-tone multifrequency (DTMF) buttons are backlighted and the battery is a NiMH 1400 mAh unit that is more than double the power available in my radio.

Still, I can't justify discarding my FT-50 since it still works as well today as it did the day I bought it, so I began trying to think of ways to increase its utility. The number one discrepancy that I sought to address was the limitation imposed by my old NiCd 600 mAh battery packs. Besides being prone to "memory," they require frequent charging. The short battery capacity has caused me to "ration" my transmitting time, which has a major effect on my operating style. Often, I'm tempted to elaborate on some topic, but with the limited battery capacity always in the back of my mind, I usually try to not say much more than is necessary.

A few weeks ago, I discovered a dozen 9.6 V, NiMH, 1600 mAh battery packs in an eBay auction for $1.99 each. They were designed for remote control toy cars and were sold under the brand name, West Coast Choppers. I bought the lot of them and decided to hot-glue two together to form a single 3200 mAh pack with a 3 foot lead to my handheld transceiver.

The first task in making this happen was to remove the existing NiCd cells from one of my expired FT-41 Yaesu battery packs. To open the pack (which is glued securely together at the factory) I placed it into the freezer overnight to assure that it was quite cold and brittle. Even at these low temperatures, the plastic is much more durable than the glue that holds the pack together. I simply removed it from the freezer and, while it was still cold, smacked it smartly with a mallet on all four sides. The pack popped apart at the seams without damage.

Next, I removed the cells and the contact plates from the pack. (I would have reused the contact plates but they are made of stainless steel and the contacts are spot welded, rendering any solder connections to them difficult, if not impossible.) I then cut two new contact plates for the positive and negative poles of the battery pack, using a material that would readily accept solder. (In this case, a square cut from the side of a tuna can.)

I soldered one each to the stripped conductors on one end of a 3 foot piece of red and black zip cord. The contact plates (with wires attached) were then glued into their respective positions inside the empty FT-41 battery pack. To verify the proper polarity, I tested the voltage present on the contacts of a good FT-41 battery pack for comparison. The zip cord was routed out of a hole drilled at the side of the pack, which still allows the radio to stand in an upright position.

Finally, the empty FT-41 pack was glued back together with super glue and the trailing zip cord was connected to the new West Coast Choppers pack with a pair of polarized Anderson Powerpoles. See Figure 4 for a view of the completed battery system.

Now when I leave the house, I have the choice of two options. I can use one of my standard FT-41 packs with its 600 mAh NiCd cells or if I plan to be out for a while, I can just snap on my modified, empty pack and drop my new, oversized battery into a pocket.

While the connecting wire can be a nuisance when performing some physical activities, it is an acceptable compromise when extended operating time is required. If it becomes too much of an inconvenience I'll probably buy a new Yaesu FT-60 like Tom's! For now at least, I can enjoy a normal QSO without having to ration my transmit time and I'm no longer particularly concerned when I need to switch to the full 5 W output to reach a distant receiver. Now if I could just figure a simple way to make those DTMF buttons light up! — *73, Johnny Angel, W4XKE, 120 Rhododendron Circle, Crossville, TN, 38555,* **w4xke@arrl.net**

JOHNNY ANGEL, W4XKE

Figure 4 — The complete system: charger, battery packs and FT-50.

A SOLID, WELL-GROUNDED HF ANTENNA MOUNT

◊ I recently lost my Yaesu ATAS-120 (**www.yaesu.com**) due to metal fatigue in a portion of the antenna mount.

I decided to follow several of my ham friends in purchasing a High Sierra Sidekick antenna (**www.cq73.com/index.php**). Naturally I wanted to mount it more securely. The owner's manual of the Sidekick emphasizes the need for a very solid ground connection to the car body, so my design had to keep that in mind. I discarded the idea of strengthening and modifying my original mount. In studying the rear of my 1998 Camry, I noticed that the gap between the trunk lid and the trunk opening was wide enough (just over ⅛ inch) to accommodate a piece of sheet metal without interfering with the opening and closing of the trunk. The construction of the car's body provides a convenient flat, strong area

at that point to attach a mounting bracket.

I determined the shape and dimensions of the bracket and used a tool called an "Angle Devisor" to measure the offset from vertical to match the angle of the edge of the trunk opening. With dimensions and angle determined, I made a full size mock-up of the bracket out of thin cardboard.

The next step was finding a willing welder who would do the welding for a reasonable fee. Luckily, a fellow employee stepped up after hearing me talk about trying to find a welder. I found a piece of ⅛ inch cold rolled steel and gave him the mock-up. Several days later he had the bracket tacked together. We held it in place to check the angle and agreed a slight tweak would get it just right. Final welding included the two angle braces. My cost was a case of beer.

The next steps were mine. I bought three ¼-20 × 1 inch stainless steel oval-head screws with washers and lock washers. I drilled three ¼ inch holes and one ½ inch hole in the bracket. Then I marked and center punched the hole locations on the car. To assure a good ground, I drilled and tapped for the ¼ -20 screws. You need a number 7 drill bit and a ¼-20 tap. This provides a very solid attachment and a very good ground.

The antenna itself is mounted on an SO-239 with ⅜-24 thread coax connector. The ½ inch hole accommodates the nylon step washer that is positioned between the bottom of the Sidekick and the top of the bracket. Apply a bead of Permatex Clear RTV Silicone Adhesive Sealant to the base of the antenna and the mounting plate. When the antenna is mounted to the base, the two beads combine to form a firm waterproof seal for the antenna. Figure 5 shows a view of the completed mount.

The mounting bracket is so solid that one can grasp it and move the whole car. The ground is highly effective, in that I've been able to tune the antenna to less than 1.5:1 on all bands between 6 meters and 40 meters. *— 73, Jim Augusteijn, K9LDX, 1542 Mellow Ln, Simi Valley, CA 93065*, **k9ldx@arrl.net**

JIM AUGUSTEIJN, K9LDX

Figure 5 — View of the completed mount.

FERRITE CORE RESOURCE

◊ With today's proliferation of RF generating devices, often times it is advantageous to use ferrite cores to help eliminate interference in radio receivers. These ferrite cores are available commercially, but it is often confusing to determine the correct core mix to use. You may have to purchase an assortment to find the right one. Even then it may not solve your individual problem and you will have invested several dollars to no avail. I have found an alternate source for such cores.

Computer cables often have a ferrite core at the plug end. I have found these to be very effective. I take old cables that are not usable or have specially terminated ends and carefully remove the encapsulated ferrite core that is part of that cable. I can then use the retrieved core on my amateur cables.

Shown in Figure 5 are two different sizes taken from monitor cables. The plastic used to encapsulate these cores is tough, but with a sharp utility knife and patience you can remove the plastic covering and pull the multi-conductor cable out. The hole size inside the core is almost perfect for RG-8X sized or smaller coaxial cables, multiple wire cables or dual wire cables. In the case of the latter, several turns of the dual wire cable can be wound about the core to make it more effective.

While these cores may not meet every need, they do help a great deal and the cost is right. I find old computer cables at the local recycling center and at computer stores, which toss out unusable computer devices. There has been no cost associated with the recovery of these cables and in many cases my sources have been glad to have someone interested in taking them. *— 73, Robert Brock, K9OSC, 6041 6th St NE, Fridley, MN 55432,* **k9osccw@yahoo.com**

WEATHERPROOF SHRINK TUBING

◊ A few weeks ago, I was replacing the entire electrical system on my utility trailer. This trailer is parked outside, so all of the electrical connections needed to be weatherproof. I was going to use commercially made weatherproof crimp connectors that consist of a connector and shrink tube impregnated with hot melt glue, but they were expensive!

It occurred to me that I could duplicate this connector very cheaply by using hot melt glue and regular shrink tube. I also realized I could reduce the cost even more by soldering the wires and eliminating the crimp connector.

Here's how to do it: Solder the wires together and let them cool. Apply a bead of hot melt glue along the connection, almost the entire length of the piece of shrink tube. Let it cool before installing the shrink tubing. Next, evenly apply heat to all sides of the shrink tube — this shrinks the tubing down and remelts the glue allowing it to flow around the solder joint, rendering it weatherproof. Some glue will ooze out the end of the shrink tubing. The ooze is proof that the hot melt glue has been melted and is flowing around the joint.

To show that the glue does flow around the joint, I cut out a strip to view the inside of the connection. To my surprise, when I went to rip off the strip of heat shrink, I pulled off the insulation from the wire! The glue indeed penetrates the whole interior of the joint.

So far, I've had no electrical problems with the trailer. *— 73, Benjamin Hall, KD5BYB, 102 Stoney Point Dr, Harvest, AL 35749,* **kd5byb@kd5byb.net**

REPAIRING 3-RING BINDER MANUAL PAGES

◊ Many service manuals are made up of loose pages in a three-ring binder. Over the years the pages may get torn from the binder, especially foldout schematics.

3M makes a tape known as Gentle Paper First Aid Tape ideal for repairing the pages. Simply put a length of this tough, transparent tape over both sides of the torn hole(s) and repunch the holes. The repair is almost invisible and the page is virtually impossible to tear again.

I found this tape at the local drug store in the first aid section. The cost was $1.99 for an 8 yard roll. Definitely better than those old donuts. I have used this tape to repair a very worn Collins KWM-380 manual using the above technique and it really works! *— 73, Lee Craner, WB6SSW, PO Box 976, Agoura Hills, CA 91376,* **leeCraner@aol.com**

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.

AB1FM

EXAM INFO

Extra Pool Update — Activity Update — VE Manual Update

New Extra Question Pool to Take Effect July 1

Effective *July 1, 2008* a new Element 4 Extra class question pool takes effect for examinations. VECs and VEs will have new test designs available for use at exam sessions effective that date.

The newly revised pool released on December 21, 2007 (updated February 20, 2008) by the Question Pool Committee (QPC) of the National Conference of Volunteer Examiner Coordinators (NCVEC) must be in use starting July 1. There are 738 questions in this pool and there are 12 graphics required for this pool.

With the Extra class exam questions changing *July 1*, new test designs must be used effective that day. Previous ARRL VEC-supplied Extra class test booklet versions (2002 series) and computer generated Extra class tests created from the 2002 question pool are only valid until midnight June 30, 2007. At that time VE Team leaders may destroy the old versions of the Extra exams.

The NCVEC QPC welcomes comments and suggestions for new questions or changes to the topic areas for any of the pools. Please send your input to the QPC using the following e-mail address: **qpcinput@ncvec.org**. You can help shape the next pool!

All current question pools can be found on our Web page **www.arrl.org/arrlvec/pools.html**.

New and Upgraded FCC License Activity

It's been a little over a year since the FCC eliminated the Morse code exam as a test requirement on February 23, 2007. There remains a heightened interest in ham radio and elevated demand for VEC test sessions.

The number of new Amateur Radio license applications continue to swell under the new rules. Table 1 chronicles all VEC activity over the last few years. Also on the rise are the number of General and Extra class upgrades and new club station licenses.

The upsurge in activity levels has kept the ARRL Volunteer Examiner Coordinator (VEC) staff very busy. Should this upward trend become the norm, it will be important to expand and strengthen our current group of active accredited VEs to meet the needs of the public.

Table 1
New Amateur Totals
2006 through April 2008

Month	*2006*	*2007*	*2008*
Jan	1,274	1,647	1,755
Feb	1,605	2,435	2,998
Mar	2,531	3,478*	2,816
Apr	1,728	2,673	3,090
May	2,283	2,607	
Jun	1,967	2,281	
Jul	1,401	1,786	
Aug	1,623	2,183	
Sep	1,357	1,462	
Oct	1,781	2,109	
Nov	1,993	2,132	
Dec	1,569	1,935	
Totals:	21,112	26,728	10,659

*Effective February 23, 2007 the FCC changed the Amateur Radio Service Rules and no longer requires applicants to pass a Morse code exam. This has created a spike in the number of individuals seeking a new license.

New ARRL Volunteer Examiner Manual

The *ARRL/VEC Volunteer Examiner (VE) Manual,* ninth edition, written by Rick Palm, K1CE, and myself, is full of new and timely information. We're really excited about the new manual, which was released in February. More than 80 percent of the book's content has been revised, taking into account the licensing rule changes that went into effect last year. We've put a lot of work into it to help guide amateurs effortlessly through the VEC program. It's very comprehensive, yet easy to understand.

One of the most exciting changes to the new manual is the addition of VE "real life experiences" sprinkled throughout the book. Taking wisdom and observations from Volunteer Examiners from all over the United States, these "real life experience" sections will help current and future VEs be able to deal with situations that may pop up in the examination process. It's really a complete reference guide on the Amateur Radio Volunteer Examiner Program.

VEs can view the new ARRL VE manual on the Web at **www.arrl.org/arrlvec/vemanual/**. If you're not a VE and you enjoy giving back to the Amateur Radio community, become one! See **www.arrl.org/arrlvec/become-a-ve.html**.

Question Pool Schedule

- Technician class (Element 2) Pool effective July 1, 2006 is valid until June 30, 2010.
- General class (Element 3) Pool effective July 1, 2007 is valid until June 30, 2011.
- Extra class (Element 4) Pool released December 2007 (updated February 20, 2008) will become effective July 1, 2008. The 2002 Extra class Pool will expire June 30, 2008.

2008 ARRL National Exam Day Weekends

ARRL sponsored national exam day weekends are held annually on the last full weekends of April and September.

- Fall national exam day weekend is September 27-28, 2008. We thank you for your support of these events. QST

Maria Somma, AB1FM ♦ ARRL VEC Manager ♦ msomma@arrl.org

This Month in Contesting

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

OFF-SEASON STATION IMPROVEMENTS

It's summer! The sun is shining, the weather is warmer, and we are enjoying things other than radio. Unless you're a VHFer, there aren't a lot of big contests going on right now (the IARU HF Championships on July 12-13 notwithstanding). So what's a contester to do with their time? Other than trying your hand at a VHF+ contest (see last month's column for tips on that) or the occasional QSO Party, summer is an excellent time for contesters to look at all aspects of their station and make improvements.

Many successful contest efforts begin months ahead of time. When there are a lot of events going on in the fall and winter months, you want to spend your time operating, not correcting problems. Taking the time to review your station's performance during the summer lull can translate to noticeable improvements in your next contest. Let's take a look at some things you can check to keep your contest station running at peak performance.

Antennas and Feed Lines

There's an old adage that the colder the temperature when you put up an antenna, the better it will perform. That may or may not be true, but I know that I prefer to be outside in warmer months! Summer is the perfect time to double-check your antenna situation. Are any of your existing antennas showing signs of wear and tear? Did you put up a dipole that could have used some pruning, saying you'll "get to it later"? Now is the time.

Do you have room to put up any additional antennas? For example, if you have a 40 meter dipole that is broadband to the east/west, consider putting up a second that is broadside north/south. Having two antennas to choose from on the same band can help pull in those weaker stations you're working off the side of your current antenna. Another possibility is to put up another antenna for bands you currently aren't on, such as 80 meters. *The ARRL Antenna Book* offers a wealth of information on all kinds of antennas you can make yourself for all bands. The more bands you can operate on, the more QSO potential you have.

Another good thing to do is to check the quality of your antenna's feed line. Water can get into poorly protected coax over time, which can reduce the performance of your antenna (not to mention cause high SWR, TVI and a host of other problems). Replace old coax with fresh runs and take care to waterproof all connections.

The Station

Examine your gear and see if there is anything that could be improved within reason. Yes, we'd all like to go out and buy a new rig! For some, that may not be practical, but let's take a look at what *is* practical.

Are you logging your contest QSOs with a computer? Computer logging is highly encouraged by most contest sponsors, as it makes the scoring process much easier. Several contest logging programs are available; go to your favorite search engine and look for "contest logging software" and examine your choices.

If you are already doing computer logging, and you're an SSB operator, look into a boom headset. The mike is keyed with a footswitch, which frees up both your hands for typing. If you've ever typed with a mike in your hand, you know how frustrating this can be.

A digital voice keyer is another great station accessory for the SSB contester. You can pre-record your CQ messages and other exchanges for SSB contests, such as the long exchange in the ARRL Sweepstakes, and play them at the push of a button. This saves untold wear and tear on your voice over a long contest weekend.

If you have more than one antenna, do you have a good antenna switch? Being able to quickly switch antennas during an event is critical, especially if you have more than one antenna on the same band (see above).

Ergonomics

This is perhaps one of the easiest improvements you can make, yet it's often overlooked. If you are going to be spending a lot of time in a contest, make your station as easy to operate as possible. This can reduce fatigue during those weekend-long events.

Take a look at your operating desk. Is it easy to tune your rig or make other adjustments to it? Do you have to tilt your head at an odd angle to view your PC screen? How easily can you reach your other station accessories, such as your coax switch or antenna rotator? Do you have room for all these things on your desk? If you find yourself tired or having to strain to reach any accessories in your operating area, perhaps a re-organization of your operating table is in order. If you don't have room for all the accessories you need, it may be time to get a new operating desk.

Lastly, one thing that often gets overlooked in the operating area is your chair. Do you have a chair that is comfortable enough to sit in over an entire contest weekend? A good chair is worth the money; it saves stress on your legs and back, which equates to more "chair time," which means larger scores. Get online and take a look at some photos of the big contest operations. Notice the station layout and the chairs. Learn from them.

Obviously, not all of us can afford big changes to our station, but even minor adjustments can make a big difference in the enjoyment of your on-air time. A little investment of time, effort and money now can pay big dividends during the contest season.

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

Narrow Your Focus. Operate a major contest as a single-band entrant. This allows you to learn the ins and outs of how that one band works, such as when openings to certain parts of the world occur. It also gives you some free time to do other things outside of the contest.

Do you have a contest tip you'd like to share? E-mail it to me at **kx9x@arrl.org**.

CONTEST CORRAL

in association with the *National Contest Journal*

JULY 2008

Start & Finish	HF	VHF+	Contest Title	SSB	CW	Dig	Exchange	Sponsor's Web Site
Jul 1 0000Z - Jul 1 2359Z	1.8-28	50-144	Canada Day Contest	✘	✘		RS(T), Province/Territory or serial	www.rac.ca/service/contesting
Jul 4 2300Z - Jul 5 0300Z	1.8-28	50	MI QRP July 4th Sprint		✘		RST, S/P/C, and QRPMI number or power	www.miqrp.org
Jul 5 0000Z - Jul 6 2400Z	1.8-28		Venezuelan Indep Day Contest	✘	✘		RS(T) and serial	www.radioclubvenezolano.org/concurso.htm
Jul 5 1100Z - Jul 6 1059Z	3.5-28		DL DX RTTY Contest			✘	RST and serial	www.drcg.de
Jul 6 1100Z - Jul 6 1700Z	28		DARC 10-Meter Digital Corona			✘	RST and serial	www.darc.de/ukw-funksport
Jul 11 2000Z - Jul 11 2400Z	3.5-28		FISTS Summer Sprint		✘		RST, S/P/C, name, FISTS number or pwr	www.fists.org
Jul 12 1200Z - Jul 13 1200Z	1.8-28		IARU HF World Championship	✘	✘		RST and IARU zone	www.arrl.org/contests
Jul 12 1200Z - Jul 13 1200Z	1.8-28		West Coast Regional Challenge	✘	✘		see IARU HF rules	sccc.contesting.com
Jul 13 2000Z - Jul 13 2400Z	1.8-28		QRP ARCI Summer Homebrew		✘		RST, S/P/C, QRP number or power	www.qrparci.org
Jul 19 1200Z - Jul 20 1200Z	3.5-28		DMC RTTY Contest			✘	RST and serial	www.digital-modes-club.org
Jul 19 1500Z - Jul 19 1700Z	1.8-28		Feld-Hell Monthly Sprint			✘	RST, S/P/C, Feld-Hell member nr or age	www.wa6l.com/contests
Jul 19 1800Z - Jul 20 0600Z	3.5-28		NA RTTY QSO Party			✘	Name and S/P/C	www.ncjweb.com
Jul 19 1800Z - Jul 20 2100Z		50,144	CQ WW VHF Contest	✘	✘	✘	4-digit grid square	www.cqww-vhf.com
Jul 20 2000Z - Jul 20 2159Z	14		CQC Great Colorado Gold Rush		✘		RST, serial, category, CQC member nr	www.cqc.org/contests/gold2008.htm
Jul 26 1200Z - Jul 27 1200Z	3.5-28		IOTA Contest	✘	✘		RS(T), serial, IOTA number if island	www.rsgbhfcc.org
Jul 27 1700Z - Jul 27 2100Z	7-28		Flight of the Bumblebees		✘		RST, S/P/C, Bumblebee nr or power	arsqrp.pbwiki.com

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

- **Canada Day Contest (July 1):** Help our neighbors to the north celebrate their birthday. Non-Canadian stations work Canadians, Canadians work everybody. US stations send a signal report and a sequential serial number.
- **DL DX RTTY Contest (July 5-6):** Work the world in this RTTY contest sponsored by the DL-DX RTTY Contest Group.
- **IARU HF World Championship (July 12-13):** A 24-hour event with lots of fun! Everybody works everybody on SSB, CW, or a mix of both. Be sure to listen for IARU HQ stations or members of the IARU Administrative Council, handing out extra multipliers.
- **CQ WW VHF Contest (July 19-20):** Big fun on 6 and 2 meters during the Sporadic-E season. Exchange is simply your Grid Square. This is always a lot of fun and a great introduction to using SSB/CW on the VHF bands.
- **IOTA Contest (July 26-27):** Sponsored by the Radio Society of Great Britain, stations will be setting up on islands all around the world. Work as many different islands as you can! A great event.

JULY 2008 QUALIFYING RUNS

♦ W1AW Qualifying Runs are 10 PM EDT Wednesday, July 9 (0200Z July 10) and 9 AM EDT (1300Z) Friday, July 25 (35-10 WPM). The West Coast Qualifying Run will be transmitted on 3590 kHz by station W6SX at 9 PM PDT Wednesday, July 16 (0400Z July 17) (10-40 WPM). Unless otherwise indicated, code speeds are from 10-35 WPM.

www.arrl.org/contests

20 Years of Digital Radiosporting — 2008 ARRL RTTY Roundup Results

"Live each season as it passes; breathe the air, drink the drink, taste the fruit, and resign yourself to the influences of each."
— Henry David Thoreau

Jay Townsend, WS7I
ws7i@arrl.net

RTTY Roundup — it's all in the name. Roundup is not a DX contest and it's not Sweepstakes. Roundup promotes RTTY contacts with RTTY stations and it's mostly just fun. You won't smell teletype oil and you won't hear the clank of the machinery as in the past, but the bands *will* be full of wall-to-wall "diddles." Roundup grabs the best of the past and blends it with the future of Radiosport, and it's a blast!

Hook up your computer and sound card with a simple interface, obtain some excellent (often free) software and start RTTY Radiosporting. This is your chance to work some states, work a little DX, have some fun and make new friends. RTTY is the fastest growing contest mode. Check out the detailed ARRLWeb version of this article at **www.arrl.org/contests** for information about joining the fun yourself!

Change is inevitable; in fact it's the only constant in our lives. As participants in the great radio game known as Radiosport we are expected to create certainty from uncertainty. The biggest uncertainty is always solar conditions for the contest. Contest preparation begins at least one day before the contest. The wise participant studies propagation in the hours leading up to the contest.

This year the digital battle got started a day early on Friday with the start of the next Solar Cycle; the first new sunspot appeared on January 4. Cycle 24 has started! Conditions will now rise until the peak in 2011 or 2012.

Kickoff time was 1800Z so the WWV reports for the hours prior to the event indicated and hinted at possible strategy for some stations. My RTTY Roundup experiences of nearly two complete solar cycles teach several lessons. For stations located above latitude 42°N, solar conditions regulate Radiosporting by polar signal absorption as measured by the K and A indexes, as opposed to the MUF as determined by the Solar Flux Index (SFI). They know that this means they have to get European multipliers as quickly as possible.

The RTTY Roundup emphasizes high rate contacts but awards multiplier credit only once, *not once per each band*. Maximizing multipliers is always a very important part of contest strategy. Speed is essential, yet accuracy wins.

When the A index pops up it is very likely that the K index will rise quickly over the next few hours and ionospheric absorption will take away the European

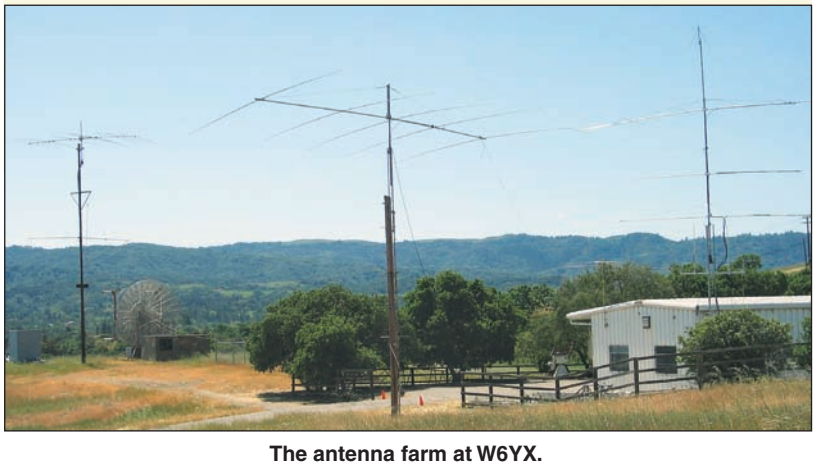
Plaque Winners

Thanks to the generous sponsorship of numerous clubs and individuals, we are pleased to list the winners of the sponsored plaques listed below:

Category	*Winner*	*Sponsor*
Overall Winners		
W/VE Single Operator Low Power - NM7M Memorial	AA5AU	Jim Reisert, AD1C
W/VE Multi-Single High Power	K5NZ	John Lockhart, W0DC
DX Single Operator High Power	P49X (W0YK, op)	Gary Belcher, KH6GMP
DX Multi-Single High Power	CT9M	Larry L. Lindblom, W0ETC, Memorial by the Tennessee Contest Group
ARRL Division Winners		
Single Operator Low Power		
Dakota Division Single Operator Low Power	N0AT	W2JGR Memorial by Don Hill, AA5AU
Midwest Division Single Operator Low Power	NT0F	In Memoriam of Larry Lindblom, W0ETC, by Bob Ruvolo, KI6DY
New England Division Single Operator Low Power	W1ECT	CTRI Contest Group
Roanoke Division Single Operator Low Power	KA4RRU	Mike Sims, K4GMH
Single Operator High Power		
Central Division Single Operator High Power	AI9T	Don Hill, AA5AU
Delta Division Single Operator High Power	N4ZZ	Roland Guidry, NA5Q
Great Lakes Division Single Operator High Power	K4WW	Southwest Ohio DX Association
Pacific Division Single Operator High Power	WK6I	Northern California Contest Club
Northwestern Division Single Operator High Score	W7LD	Pat Shinners, W7GTO

Unsponsored plaques are available for purchase by the winners. To inquire about purchasing an unsponsored plaque, or for information on plaque sponsorship, please contact Sean Kutzko, KX9X, ARRL Contest Branch Manager, at **kx9x@arrl.org**. Plaques cost $67, which includes shipping.

W6YX



The antenna farm at W6YX.

path. This will also limit the propagation on 15 or 10 meters. By paying close attention to the solar numbers you can help level the playing field.

Many stations normally start on the highest band open; at this point in the solar cycle, 15 meters. Usually the rate meter spins during the first hour. Great QSO rates can reach over a hundred per hour and may be sustained for many hours. With the K index going to 3 right at the start of this year's contest, 15 meters was practically useless on Saturday for everyone, so the action moved to 20 meters. West Coast stations were able to work Europeans right at the start of the contest. The most astute operators went not for rate, but for the multipliers they knew they might not get on Sunday if conditions didn't improve.

Change is like rate and it can be exciting, even invigorating, seducing us to wild abandon. In order to be prepared for change, we must never forget certain principles, such as that West Coast stations need to work Japan and the Pacific on Saturday — they won't be there on Sunday. Good operators improve through planning, learning about propagation and knowing how their antenna systems get out band-by-band. They also learn how to use their receivers, sound cards and software to maximize their score. They work hard during the contest and above all else they have fun.

When should you take your off time? Usually my recommendation is to just take it in one six-hour piece. This worked out well this year if you left at 0600 and returned at 1200 because the conditions took a nice upswing at that time. The East Coast got an opening to Europe at sunrise, while the West Coast had nice 80 and 40 meter runs. Some stations pushed the low-band activity and took split time this year. That worked for some and punished others by making them either miss the great 40 meter run at the end of the contest or take a nap on Sunday!

Sometimes it takes good publicity to really bring out participation. In a recent survey conducted by Don, AA5AU, the ARRL RTTY Roundup was voted the best in its contest class. As a result, the operators came out in force and set a new record for the number of logs submitted for the Roundup. A total of 1246 logs including check logs were sent in for checking for the 2008 contest. Little Pistols and new RTTY operators dominate the Roundup and have for years. Shelby, K4WW, reported more than 10% of his contacts were with stations "never before worked on RTTY." That means you can join in and be part of the fun with many others that will be new as well.

Special Performances and Records

"Dreams are the touchstones of our character." — Henry David Thoreau

Single Operator

W/VE — Low Power

AA5AU	199,578
N9CK	137,488
KA4RRU	131,230
N0AT	117,178
W1ECT	115,010
VE1OP	110,288
N2WK	105,117
AB4GG	102,510
KE5OG	99,827
VA2UP	99,110

W/VE — High Power

W1UE	256,060
K4GMH	243,908
W5AP	174,420
WW4LL	170,520
K6LL	170,226
AI9T	169,740
W3MF	152,600
N4ZZ	148,512
K1ZZI	147,545
VA1CHP	146,490

DX — Low Power

CN8KD	126,458
F5BEG	78,416
US0MM	75,905
J39BS	74,676
KP4KE	72,474
4M5RY (YV5KAJ, op)	63,828
YT2RX	61,512
LV5V (LU5VV, op)	60,424
SP3GXH	59,520
IV3JCC	58,311

DX — High Power

P49X (W0YK, op)	338,198
9A5W	171,044
G6PZ (M0SDX, op)	168,069
ZX2B (PY2MNL, op)	162,316
MI0LLL	151,920
UW8I (UT2IZ, op)	142,267
UX0FF	119,910
KH6ZM	117,860
SO4M (SP4MPG, op)	107,892
ZC4LI	106,894

Multioperator

W/VE — Low Power

N5ZM	122,760
N0NI	108,737
W2RTY	100,716
W5VZF	89,862
WD4LBR	71,346
N9LAH	70,380
WZ8P	66,033
N8LRG	62,519
K4XD	61,248
KK6T	58,238

W/VE — High Power

K5NZ	186,473
W0SD	178,416
AB0RX	172,323
K4TD	165,770
W4RM	164,619
W6YX	140,392
K4PX	137,865
W7WW	130,848
ND2T	113,932
WA1PMA	113,430

DX — Low Power

UT3HWW	75,795
LZ9R	49,062
OM3KWZ	40,248
G0MTN	38,252
RZ4HZW	33,756
MM0BQI	25,270
EA5DKU	20,670
YL1YI	17,700
UA3QJJ	14,630
RK3SWS	13,182

DX — High Power

CT9M	205,056
OL6X	130,384
UZ4E	94,248
JA6ZPR	61,974
UX4E	39,192
YT3H	37,932
AL1G	15,696
UU2JQ	11,218
DL4RCK	11,160
7L4IOU	8,729

Affiliated Club Competition

Club	*Entries*	*Score*
Medium		
Potomac Valley Radio Club	35	1,401,272
Alabama Contest Group	10	917,941
Minnesota Wireless Assn	29	890,549
Yankee Clipper Contest Club	16	859,061
Tennessee Contest Group	23	844,182
Northern California Contest Club	19	837,174
Society of Midwest Contesters	20	834,075
Florida Contest Group	15	675,941
Frankford Radio Club	9	411,545
Grand Mesa Contesters of Colorado	12	365,722
Contest Club Ontario	17	353,611
Central Texas DX and Contest Club	6	286,730
Southern California Contest Club	9	277,429
Western Washington DX Club	8	274,670
Order of Boiled Owls of New York	3	173,568
Rochester (NY) DX Assn	5	168,929
Contest Club Du Quebec	3	166,305
Kentucky Contest Group	4	148,515
Willamette Valley DX Club	4	122,602
Mad River Radio Club	3	84,256
Carolina DX Assn	3	56,100
Hudson Valley Contesters and DXers	3	23,907
Local		
Maritime Contest Club	4	287,611
Spokane DX Association	4	278,804
Boeing Employees ARS - St. Louis	5	183,801
Dominion DX Group	7	149,609
Midland ARC	4	100,002
Redmond Top Key Contest Club	4	89,970
Dauberville DX Assn	3	63,597
Low Country Contest Club	3	56,868
Colony Mountain Contest Club	3	53,984
Bergen ARA	3	40,906

A complete set of the ARRL RTTY Roundup records are available on the ARRL Contest Web site at **www.arrl.org/contests**.

Dennis, W1UE, operating at W1KM set a new Single Operator High Power all-time record for W/VE this year. Dennis also set a new high QSO total for SOHP W/VE of 2065.

For the Low Power Single Operator crowd it was business as usual with Don, AA5AU, notching his 14th straight World victory. Will it ever end? Pulling off a three-peat were Earl, N5ZM, and his partner Glenn, N5RN. They are the Low Power Multioperator champs.

There were also 12 new Division records set in 2008, including three of the four categories in the Southwestern Division. We had 50 new section records (16% of all section records) set during the 2008 RTTY Roundup.

Five new continental records were set for DX stations this year. Mohamed, CN8KD, set a new African record in the Single Operator Low Power category.

Also setting a new Africa record was the Madeira Group, CT9M, in Multi-Single High Power. Steve, ZC4LI, set the new Asian All-time Single Operator High Power record and Nikola, 9A5W, set the new European All-time Single Operator High Power Record. A new Multi-Single Low Power record for Europe All-time was set by station UT3HWW. P49X piloted by Ed, W0YX, won for the 3rd straight year but he had 10% less than last year's record score. Ed did set a new record for QSO total by SOHP DX of 2842. (For a list of operators at all stations, refer to the online results.)

RTTY Wrap-up

This year we single out Sue, AI6YL, for a special salute. Sue joined in on the Roundup for the first time and it sounded like it was a fun first contesting experience. Anyone who can poke fun at themselves about getting on the "no ears" list on the spotting network must be welcomed to the RTTY group. Everyone talks to their screen, laughs at their own mistakes, and plays fast and loose with their own goals. As KØEU stated, "So many contests, so little time!" The Web version of this article includes interesting personal looks at the contest by GUØSUP, K4GMH, KK5OQ, W6YX, ND2T and WA1PMA, as well!

We all have to start RTTY contesting somewhere; some will learn how to play to their best advantage and others will not. Some will fall by the wayside, and some will go on to become serious RTTY contesters. The key is to start and each year more and more will join in on the excitement. In every loss there is a gain, as in every gain there is loss. You can join us for the next ARRL RTTY Roundup on January 3 and 4, 2009. QST

End of a Solar Cycle? 2007 ARRL 10 Meter Contest Results

Another bump in the solar flux helped, but conditions were again challenging.

Ken Harker, WM5R
wm5r@arrl.net

No HF band is more sensitive to the ups and downs of the solar cycle than 10 meters. At the peak of the cycle, when the number of sunspots is high, and the solar flux is creating high levels of ionization in the F layer, life is good. With 5 W and a dipole, you can work the world. A few years later, when the cycle bottoms out, when there are no sunspots at all for days at a time, operating on 28-28.5 MHz takes real dedication. Even stations with stacked Yagis and high power amplifiers struggle to make contacts.

Fortuitously, the 2007 ARRL 10 Meter Contest caught the leading edge of a two-week bump in the solar flux. Remarkably, this is the fifth year in a row in which the solar flux on the days of the contest has been between 84 and 91. A total of 1586 logs were entered in the 2007 ARRL 10 Meter Contest, down 277 logs, or 15%, from 2006. There were 159 fewer logs submitted by Europeans, but only 96 fewer submitted by stations in North America. With many fewer Japanese stations participating, only 60 logs total were submitted by stations from Asia this year, representing 15.6% of the DX logs and just 3.8% of the total number for the contest as a whole. Relatively speaking, this was the lowest level of activity from Asia in the ARRL 10 Meter Contest since 1977.

Affiliated Club Competition

	Score	Entries
Unlimited Category		
Potomac Valley Radio Club	1,725,518	76
Medium Category		
Central Texas DX and Contest Club	2,021,354	19
Florida Contest Group	1,509,834	50
Society of Midwest Contesters	1,103,248	31
Minnesota Wireless Assn	806,516	42
Tennessee Contest Group	727,430	37
Frankford Radio Club	677,456	11
South East Contest Club	622,150	12
Alabama Contest Group	603,504	13
Yankee Clipper Contest Club	568,702	32
North Texas Contest Club	461,796	4
Texas DX Society	426,378	6
Grand Mesa Contesters of Colorado	394,774	12
Central Arizona DX Assn	268,188	10
Central Virginia Contest Club	240,002	11
Mad River Radio Club	202,230	12
Oklahoma DX Assn	161,196	4
Low Country Contest Club	145,270	12
Contest Club Ontario	140,334	19
Southern California Contest Club	104,926	16
Western New York DX Assn	102,072	3
Northern California Contest Club	101,600	38
Utah DX Assn	90,200	5
Hudson Valley Contesters and DXers	74,542	12
Western Washington DX Club	65,364	6
West Park Radiops	21,526	4
Carolina DX Assn	13,554	7
Six Meter Club of Chicago	12,898	7
Kentucky Contest Group	10,114	3
Motor City Radio Club	9,150	4
Willamette Valley DX Club	8,398	3
Order of Boiled Owls of New York	7,230	3
East Coast Canada Contest Club	5,276	3
Contest Club Du Quebec	1,332	4
Local Category		
Midland ARC	162,544	3
Lincoln ARC	58,982	3
Metro DX Club	53,494	4
Sussex County ARC	43,362	5
West Allis RAC	30,122	7
Hampden County Radio Assn	19,544	9
Granite State ARA	12,276	5
Athens County ARA	12,090	4
Redmond Top Key Contest Club	8,634	3
CTRI Contest Group	3,760	3
Heartland DX Association	3,190	3
Mother Lode DX/Contest Club	2,372	3
Portage County Amateur Radio Service	1,078	3

DX Categories

Single Operator Mixed Mode

In addition to setting a new Oceania record for the Single Operator Mixed-Mode QRP category, 12 year old Foundation licensee Raj Deyoung, VK4FRAJ, of Queensland, Australia also took the overall DX victory in the category. Raj was one of only two DX entrants in the category to make more than 100 contacts. Second place went to Vitor La Santos, PY2NY, operating from the town of Jaboticabal about 350 km northwest of Sao Paulo, Brazil. Ymanol Yoseva, YV5YMA, took third place, operating with his contest call sign 4M2L from Venezuela.

In the Single Operator Mixed-Mode Low Power category, Alex Cozzi, LU5WW, took the victory from Argentina with 130,192 points. Second place went to Marco Soto, XE2S, operating from the Sonoran Desert in northern Mexico. Alfredo Ramos, WP3C, using the Atlantic Contest Club call sign WP4I, took third place from the island of Puerto Rico.

Pulling off a rare category victory for a South African, Vidi LaGrange, ZS1EL, won the Single Operator Mixed-Mode High Power category from his station east of Cape Town. Second place went to Vaso Nastasic, YT1XX, using his contest call sign YT5T from Serbia. Third place came from Andre Sampaio, PYØFF, operating from Fernando de Noronha off the coast of Brazil.

Single Operator Phone Only

Operators in the Single Operator Phone-Only QRP category are members of a dedicated group. In 2007, the winner made just 87 QSOs. Sebastian Potenzo, LW3DC, took the victory, operating as LV6D from Argentina. Just 10 contacts behind was Carlos Alfaro, TI2KAC, as TE2M from Costa Rica. Third place went to last year's victor, Ted Jiminez, HI3TEJ, who was operating with his contest call sign HI3T from the Dominican Republic.

Nine of the top 10 scores in the Single-Operator Phone-Only Low Power category came from just Argentina and Brazil. Winning the category this year was Alan Laure Santamaria, PU2LSM, operating from PY2DM in Sao Paulo, Brazil. In second place was Mauricio Pitorri, PY2CX, also from Sao Paulo. Victor Fabian Olmos, LU3HS, using his contest call sign LQ5H, came in third from Cordoba, Argentina.

In the Single Operator Phone-Only High Power category, the victory went to Juan Manuel Morandi, LU1HF, from Cordoba, Argentina. Juan made 440 contacts, about 1600 fewer than last year's category winner. Second place went to Rhynhardt Louw, ZS6DXB, making just shy of 40,000 points. Third place went to Miguel Carlos Peres

Top Ten, W/VE

Mixed Mode, QRP

NØNI	48,690
W2MF	24,860
KA1LMR	18,700
WA8ZBT	18,348
W5GAI	12,480
K4CIA	7,050
AC5AA	6,496
K3TW	5,632
N2TM	4,228
NA4BW	3,808

Mixed Mode, Low Power

WD5K	348,480
N5DO	115,080
K2PS	98,356
N4IG	91,542
W5ZL	79,532
ACØW	74,694
WQ5L	72,900
W3EP	72,704
W5WP	70,858
KØTT	67,980

Mixed Mode, High Power

WØAIH (NE9U, op)	304,774
N4PN	281,008
WB9Z	265,000
WE3C	230,690
K8LEE	196,992
N4UU	179,850
K4ZGB	179,252
N8II	176,610
N4WW	170,694
W4NZ	160,064

Phone Only, QRP

W1KLM	5,750
KBØOLA	2,844
W7YA	1,248
KØHW	1,204
N8MWK	1,110
N9FRY	1,078
WWØWB	900
WD9FTZ	740
NDØC	560
W6QU (W8QZA, op)	264

Phone Only, Low Power

K5LBU	45,448
WW5TT	36,648
AC5O	29,760
W5TMC	27,436
K5KDX (KE5QKA, op)	24,168
KAØFSP	23,160
WB5R	20,976
W4GKF	18,496
K3TD	16,456
N5KGY	15,488

Phone Only, High Power

W5PR	213,440
K5TR (WM5R, op)	176,176
WØSD	103,456
NA5TR	83,136
K8CC (N8NX, op)	64,032
W3LL	44,772
N2EOC	41,082
N8RA	40,700
KØRH	40,128
KR5DX	40,080

CW Only, QRP

KG5U	63,672
N4JF	45,900
KC5R	33,792
N8AP	12,096
AE8M	11,336
W7JI	11,252
W5ESE	8,740
AA1CA	7,728
N4AU	7,476
N9SF	6,552

CW Only, Low Power

WA1FCN	93,400
N5CHA	67,404
WK2G	65,700
WØVX	54,432
K5EWJ	53,424
K5SM	52,560
W2RR	50,760
WB4TDH	45,600
N1BAA	45,232
WF4W	42,000

CW Only, High Power

K5NA	309,760
K1TO	217,744
K9BGL	132,632
WJ9B	103,040
N5NA	98,992
N5ZK (W5ASP, op)	98,560
NY3A	91,160
W4FDA	72,420
W9WI	71,148
K5HP	68,544

Multioperator

NX5M	671,830
NR5M	480,962
W5YAA	306,160
N4ARR	188,640
K4SO	148,918
AA1JD	147,264
N4RV	131,740
K4FJ	126,828
KDØS	126,344
W9IU	124,024

Top Ten, DX

Mixed Mode, QRP

VK4FRAJ	9,576
PY2NY	7,752
4M2L (YV5YMA, op)	4,320
VK5MAV	944
JK1TCV	380
JH7RTQ	168
PY1WW	80
9A2EY	66

Mixed Mode, Low Power

LU5WW	130,192
XE2S	24,108
WP4I (WP3C, op)	18,216
LU8EOT	17,700
LW4HBR	16,376
PY2SRB	13,020
LW6DW	9,472
XQ4CW	7,920
WH2D (K3UOC, op)	6,292
PP2RON	6,072

Mixed Mode, High Power

ZS1EL	47,838
YT5T	34,692
PY0FF	19,734
F8AOF	12,084
CE3BFZ	11,880
DL4WA	7,840
UR5IEE	7,830
JH4UTP	7,160
9M6XRO	5,472
JH3PRR	4,968

Phone Only, QRP

LV6D (LW3DC, op)	4,698
TE2M (TI2KAC, op)	2,250
HI3T (HI3TEJ, op)	1,452
PY2BN	1,110
I5KAP	792
JAZDLM	400
EA8AJO	322
VK4ATH	312
EA3FF	260
VP5UB (KB7UB,op)	180

Phone Only, Low Power

PU2LSM	20,094
PY2CX	16,512
LQ5H	14,400
PY2ZY	12,880
LU4WG	11,360
PU5AOS	11,340
PU1KGG	8,640
LU2NI	7,688
HI3C	7,560
LU5CAB	7,140

Phone Only, High Power

LU1HF	84,196
ZS6DXB	39,888
PY5HOT	34,404
DL2ARD	17,864
VK8AA (VK2CZ, op)	13,770
PP5JR	10,804
XE2WWW	10,746
DL5L (DG0OKW, op)	6,248
DD5FZ	4,120
F4DXW	3,002

CW Only, QRP

VP5E (KØOK, op)	1,980
VU2UR	288
JD1AHC	280
JR1NKN	208
DL2TM	144
US5VX	96
JF3WNO	64
UX8ZA	16
RV9AZ	4
PAØFAW	4

CW Only, Low Power

PJ2T (WØCG, op)	30,240
CW2C (IK1PMR, op)	27,800
LW1E	21,328
D2NX (JM1CAX, op)	9,472
HP1AC	7,300
ZL1TM	5,984
NP2L	5,192
XE1CT	4,032
PY3YD	3,936
ZL3TE (W3SE, op)	3,016

CW Only, High Power

PY2WC	45,540
S57DX	13,312
OL5M (OK1GI, op)	12,432
EA3KU	10,912
HP1WW	10,788
OH6QU	5,888
DL2OM	5,796
ZM1K (ZL1AIH, op)	5,720
LA9VDA	4,536
6W1SE	4,416

Multioperator

LR2F	305,920
CX5BW	264,300
ZW5B	227,080
LR4E	214,420
CV5K	198,528
AY8A	188,928
HD2A	84,800
LU2EE	77,608
LS2D	73,710
PP5ABG	55,250

Marcal, PY5HOT, operating from Parana state in southern Brazil.

Single Operator CW Only

Some of the best results for Asian competitors in 2007 came in the Single Operator CW-Only QRP category, where half of the top 10 scores were made by Asian stations. Overall DX victory in the category, however, went to Bob Novak, KØOK, operating VP5E. Bob won the category with just 34 QSOs and 15 multipliers. Second place went to Manohar Arasu, VU2UR, operating from Bangalore, India. Third place went to Masaaki Saito, JD1AHC, who set a new record from the Japanese island of Ogasawara.

Only three DX stations in the Single Operator CW-Only Low Power category made over 10,000 points. First place went to Geoffrey Howard, WØCG, who operated PJ2T on the island of Curaçao. Operating from Uruguay, Andrea Panati, IK1PMR, using the contest call sign CW2C, took second place with 140 contacts. Third place went to Hugo Jorge Salmoyraghi, LU1EWL, operating LW1E from Buenos Aires, Argentina.

In the Single Operator CW-Only High Power category, Waldir Soares, PY2WC, earned 45,540 points from 170 QSOs and 69 multipliers. In the best result for a European station in 2007, Slavko Celarc, S57DX, took second place in the category from Slovenia, making exactly 100 contacts. Vojtech Novotny, OK1GI, operated OL5M to third place overall from the Czech Republic.

Multioperator Single Transmitter

In the DX Multi-operator category, all of the top 10 scores came from South America. Winning the contest in 2007 was the two-man team at LR2F in Rosario, Santa Fe, Argentina. Roberto Marinesco, LU2FA, and Jorge Alberto Villa, LU5FF, together made 305,920 points from their location 475 km northwest of Buenos Aires. Last year's winning team took second place this year; six operators at CX5BW combined to make 264,300 points from Uruguay. A multinational team of seven operators used the Auracaria DX Group's call sign, ZW5B to earn third place.

W/VE Categories

Single Operator Mixed Mode

The top two W/VE scores in the Single Operator Mixed Mode QRP category set section records. Toni Radebaugh, NØNI, set a new Iowa section record and took first place with a score almost twice that of Manuel Fonseca, W2MF, in Northern New Jersey. Manuel also set a section record with 196 QSOs. Last year's second place finisher, Chris Merchant, KA1LMR, in New Hampshire, took third place this year.

In the Single Operator Mixed Mode Low Power category, a pair of Texans took the first two places in the W/VE competition. Tom Johnson, WD5K, made just shy of 1200 QSOs and 100 multipliers from North Texas to win the category. Dave Cockrum, N5DO, in West Texas, took second place. Third place went to Pete Stafford, K2PS, of Southern New Jersey.

Scott Jasper, NE9U, operating the well-known WØAIH contest station in Wisconsin, just edged out the competition in the Single Operator, Mixed-Mode High Power category. Paul Newberry Jr, N4PN, in Georgia took second place. Paul had seven more multipliers in his log, but Scott made more QSOs — 132 more — to take the victory. Jerry Rosalius, WB9Z, in Illinois came in a close third place.

Single Operator Phone Only

Only 18 W/VE logs were received in the Single Operator, Phone-Only QRP category this year, the fewest of any category. Winning the category was Kevin Matheny, W1KLM, from Arkansas. Kevin was the only entrant in the category to make over 100 contacts. Michael Statom, KBØOLA, of Alabama came in second place with 79 contacts. Larry Tucker, W7YA, came in third place.

In 2007, the top three spots in the Single Operator, Phone-Only Low Power category

all went to stations in the fifth call district. Charles Frost, K5LBU, won the category from South Texas with over 600 contacts in the log. Terry Wright, WW5TT, from Oklahoma took second place with over 500 QSOs. In third, Jeff Guidry, AC5O, of Louisiana was just short of 500 contacts.

In the Single Operator Phone-Only High Power category, Chuck Dietz, W5PR, returned to first place after several years of top five finishes. Ken Harker, WM5R, operating at the K5TR station in South Texas, took second place for the second year in a row. Ed Gray, WØSD, of South Dakota came in third this year.

Single Operator CW Only

Winning the Single Operator CW-Only QRP category for the fourth year in a row, Dale Martin KG5U of South Texas made over 100 more QSOs in 2007 than he did in 2006. Second place went to Jerome Fiore, N4JF, of Alabama, while Al Sinopoli, KC5R, of Louisiana set a new Louisiana section record with a score of 33,792 points.

In the Single Operator CW-Only Low Power category, first place went to Bob Beaudoin, WA1FCN, of Alabama. Bob was just shy of 500 contacts this year. Todd Dewberry N5CHA of North Texas took second place with 67,404 points. In a close third place finish, Merril Brown, WK2G, of West Central Florida finished with 65,700 points, a difference of just 2.5%.

In the W/VE Single Operator CW-Only High Power category, Richard King, K5NA, came out on top from South Texas. Dan Street, K1TO, operating from West Central Florida, came in second this year. While Dan was competitive with Richard in multipliers again this year, Dan finished more than 300 contacts behind. Third place went to Karl Bretz, K9BGL, of Illinois.

Multioperator Single Transmitter

South Texas dominated the W/VE Multioperator category in 2007. The five-operator team at NX5M earned its third consecutive victory in the category. Earning the second place spot was a two person team at NR5M. George DeMontrong III got help from Eric Silverthorn, NM5M, this year. Third place went to W5YAA, the husband-and-wife team of Sharon Mowers, W5YAA, and Dennis Mowers, K5YA.

ZS6DXB

Rhy, ZS6DXB, and Daniel, ZS6JR, make final adjustments to their beam for their portable 10 Meter Contest operation in South Africa, 40 km from the border with Botswana.

Complete Online Results

For complete scores, including regional and divisional rundowns, scores by country and many other breakdowns, check out the online results at **www.arrl.org/contests/results**.

Sixteen year old Michael McCarty, KE5RJJ, of Abilene, Texas jumped into the 10 Meter contest just three weeks after getting licensed. He managed 177 QSOs and 10,034 points.

ARRL Affiliated Clubs Competition

The ARRL affiliated Club Competition continues to be popular, and a reason many cited for getting on a challenging 10 meter band at the bottom of the solar cycle. Forty-seven clubs qualified for the competition this year, one more than qualified in 2006 or 2005.

The top score in the Local Club category this year went to the Midland Amateur Radio Club of Midland, Texas. Second place went to the Lincoln Amateur Radio Club of Lincoln, Nebraska, while third place went to the Metro DX Club of Oak Lawn, Illinois.

The most competitive club competition category in 2007 was the Medium Club category. Winning the club competition for the first time was the Central Texas DX and Contest Club. The 19 logs from CTDXCC members combined for 2,021,354 points, over 106,000 points per log on average. The Florida Contest Group came in second, with exactly 50 logs (the limit for the Medium category) and 1,509,834 points. The Society of Midwest Contesters came in third with 1,103,248 points from 31 logs.

The only club to motivate over 50 members to send in entries on its behalf this year was the Potomac Valley Radio Club. Seventy-six logs from PVRC members combined for 1,725,518 points and a solid victory.

Are You Ready for Next Year?

The ARRL 10 Meter Contest has long been one of the easiest and most approachable contests. If you are new to HF, there's no easier HF band on which to get a station operating. Antennas for 10 meters can be reasonably small, inexpensive, and can have excellent performance at lower heights above ground. An event like the 10 Meter Contest is one of the best ways to get your feet wet in HF contesting.

By December, we will almost certainly be at the leading edge of Solar Cycle 24. On December 13-14, 2008, thousands of Amateur Radio operators around the world will bring the 10 meter band to life once again and behold the first year of a new solar cycle... "CQ Contest"! QST

2008 ARRL January VHF Sweepstakes Results

A typical January VHF SS event: A 6 meter E-skip opening created some excitement; cold winter weather throughout most of North America; NFL playoff distractions.

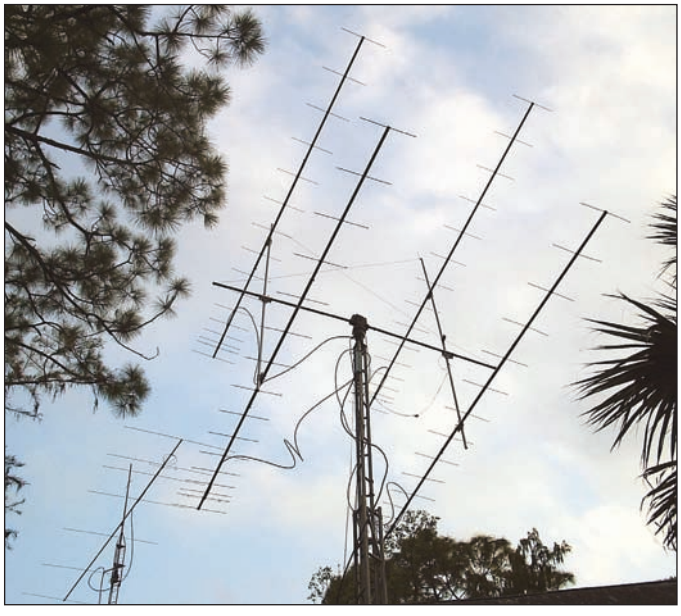
Jan Carman, K5MA
jcarman@capecod.net

As in previous editions of the January VHF SS competition, the combination of typically cold weather in the northern parts of North America along with the usual distractions caused by television coverage of NFL football playoff games interferes with contest participation. The 2008 running is no exception to this general observation. As Phil Miguelez, WA3NUF, of Warminster, Pennsylvania noted, "Sunday football games really kept the bands quiet late afternoon into the evening."

With the exception of some southern and western states, typical winter weather conditions were the order of the day for the 2008 running of the January VHF Sweepstakes competition. Rovers, in particular, had to deal with the cold weather conditions. Roger Sanderson, VE3RKS/R of Waterloo, Ontario ran a Limited Rover operation, and he was so cold that the only comment he could write was "BRRRRRRRRRR"! Joe Shupienis II, W3BC, from Moon, Pennsylvania said he made a very half-hearted effort due to the cold weather but that he still had a lot of fun. Not every participant faced cold weather, as was noted by Robin Whiting, W6DWI, of Davis, California who had nice weather near Pacific Ridge at 4500 feet elevation.

With the exception of the Single Operator Low Power category, scores were lower than those reported for the 2007 VHF SS competition. Every other entry category for 2008 had a lower top score than the previous year. I made a similar statement regarding score levels in the 2007 event in which reported scores were generally lower than those reported in the 2006 January VHF SS competition. This is not a good trend!

KE4WBO



The impressive VHF/UHF antennas of Graham Huls, KE4WBO, of Jupiter, Florida, helped him work 101 QSOs this year.

Another measure of participation is the number of logs submitted for the competition. These are the figures for logs submitted in the January VHF SS for the past four years: 2008–701 logs, 2007–684 logs, 2006–793 logs, 2005–718 logs.

It is good to see an increase in log submissions in this year's competition, but it is also true that log submissions were substantially larger in 2006, and somewhat larger in 2005. I hope the upward trend continues. Since participation and score levels in VHF/UHF competitions are not as significantly influenced by the solar cycle as are the results of competitions on the HF amateur bands, we certainly can't blame low sunspot numbers for low participation levels in VHF/UHF competitions!

Propagation

Many participants indicated that conditions were generally poor. Ellen Rugowski, AF9J, of Greenfield, Wisconsin said "conditions were the worst I've ever seen in a VHF SS." Dave Petke, K1RZ, of Damascus, Maryland said "activity high, but the weather was too cold for good conditions, which showed in the results." Fred Spaulding, K1YQP, of Shingle Springs, California indicated that conditions were not good, and said "thank goodness for hardworking rovers!" The view from Florida was a bit different as Florida 6 meter stations enjoyed very good E-skip event on Saturday. Ray Czyzewski, K2DEL, of Interlachen, Florida (Knight Riders VHF Club station) indicated that on Saturday the 6 meter band was wide open, but that on Sunday the bands were dead.

Participant comments on the two key negative issues of this year's event were virtually unanimous: winter propagation conditions are difficult and the NFL playoff games are intrusive! Nearly everyone who had a soapbox comment on the subject suggested that the January VHF SS event be moved back to the weekend prior to the Super Bowl football game. Joe Mancini, N2GCZ, of Hawthorne, New York commented, "Despite the distraction of the playoffs, we were able to post our best score yet. A big 'thank you' to all the stations who operated during the playoffs."

The National Scene

Although the total number of logs submit-

Single Operator, Low Power

K2DRH	163,009
WA3NUF	158,464
W3SZ	127,864
N1DPM	88,375
AF1T	63,800
WB2SIH	57,728
WB5ZDP	53,489
N2LIV	48,280
WA3GFZ	46,464
WA3QPX	34,554

Single Operator, High Power

K1TEO	431,100
WA2FGK (K2LNS, op)	257,108
K3TUF	247,828
K1RZ	203,196
K1JT	121,075
WZ1V	119,190
WB2RVX	87,668
K3DNE	82,296
WA3DRC	77,440
W0RSJ	62,244

QRP Portable

W6DWI	6,048
NN4AA	3,068
KQ6EE	1,664
K3EGE	576
KA1LMR	350
WA7MLD	168
KB2AYU	162
N3EXA	156
N2NRD	132
N0JK	56

Limited Multioperator

W3SO	213,696
K9NS	190,491
KW1AM	48,555
KB1DFB	46,123
KA2LIM	37,345
W1QK	36,600
W3HZU	24,765
N8ZM	24,564
KI4SNY	12,446
N1JEZ	11,570

Multioperator

N3NGE	545,160
K5QE	402,651
K8GP	351,260
N2PA	170,460
K3EOD	96,138
N8KOL	35,496
KB0HH	33,015
N2BJ	28,329
AG4V	23,760
N2GCZ	23,360

Rover

W6XD/R	185,790
K1DS/R	136,224
N6MU/R	124,432
N5AC/R	120,120
WB6IDK/R	104,858
WD0ACD/R	99,144
K2TER/R	91,476
K2QO/R	90,090
N1XKT/R	44,720
VE3OIL/R	36,792

Limited Rover

K6NC/R	31,257
KC6SEH/R	27,022
NN3Q/R (K3WGR, op)	10,368
K4GUN/R	7,335
VE3RKS/R	3,380
N2SLN/R	2,139
KC2QZF/R	1,558
K9JK/R	1,458
W3STU/R	1,122
K6MI/R	1,003

Unlimited Rover

KB7DQH/R	17,064

Affiliated Club Competition

Club Name	*Score*	*Entries*
Unlimited		
Mt Airy VHF Radio Club	2,163,226	63
Medium		
North East Weak Signal Group	1,059,914	23
Potomac Valley Radio Club	985,655	29
North Texas Microwave Society	667,421	11
Rochester VHF Group	445,391	20
Murgas ARC	284,425	5
Society of Midwest Contesters	253,707	26
Northern Lights Radio Society	141,993	17
Roadrunners Microwave Group	127,673	5
Contest Club Ontario	69,967	13
Yankee Clipper Contest Club	56,954	11
Pacific Northwest VHF Society	51,197	12
Frankford Radio Club	24,663	4
Northern California Contest Club	24,299	7
Six Meter Club of Chicago	20,129	11
Mad River Radio Club	19,172	3
Grand Mesa Contesters of Colorado	17,381	3
Local		
Mt Frank Contesters	214,306	4
Connecticut AM Society	97,036	3
Florida Weak Signal Society	83,066	7
Badger Contesters	77,970	9
Chippewa Valley VHF Contesters	51,222	3
Crawford County ARC	37,378	3
Nacogdoches ARC	20,371	4
Bergen ARA	19,999	7
Granite State ARC	17,669	6
Raritan Bay Radio Amateurs	16,750	7
Eastern Connecticut ARA	8,972	5
Dauberville DX Assn	8,299	4
Maui ARC	7,490	3
CTRI Contest Group	5,664	3
West Park Radiops	4,781	3
Eastern Panhandle ARC	3,442	3
10-70 Repeater Assn	2,455	3
Mobile Sixers Radio Club	1,767	4
Burlington County Radio Club	1,130	3
Portage County Amateur Radio Service	642	3

ted this year (701) compared to 2007 (684) was up slightly, the total number of reported contacts was down from that in 2007 by over 14,000, or about 16%. One possible reason for the downturn in contact totals may be that there were fewer sporadic E openings than occurred during the 2007 event. When the only mechanisms for propagation of VHF/UHF signals are by means of ground wave or troposcatter, the opportunities for contacts beyond about 400 miles are limited, unless you have EME capability. Also, those who live in low population density regions and those who live along the coastline where opportunities for contacts out in the ocean are extremely limited will experience fewer opportunities for achieving high scores. Your author fully understands that problem!

Single Operator

Bob Striegl, K2DRH of Albany, Illinois returned to the top spot in the Single Operator, Low Power category after a year's absence with 163,009 points. This score is up by 7% from the top SOLP score last year. Bob achieved the victory operating on the bottom eight bands with 476 contacts and 203 multipliers. Phil Miguelez, WA3NUF, moved up from the fifth spot last year to second place in the SOLP category with 158,464 points. Third place goes to Roger Rehr, W3SZ from Reading, Pennsylvania with 127,864 points, down from his first place finish last year. It is interesting to note that the top two SOLP scores this year are both higher than the top score last year. There were a total of 431 entries in the SOLP category for 2008.

The Single Operator High Power winner is Jeff Klein, K1TEO from Trumbull, Connecticut, who finished with 431,100 points, up from this second place finish in this category last year. Jeff's 10 band score is up by 35k points from last year, with a total of 994 QSOs. The second place position was taken by WA2FGK in Wilkes-Barre, Pennsylvania operated by Herb Krumich Jr, K2LNS, with 257,108 points on 8 bands. Third place is claimed by Philip Theis Jr, K3TUF, Ephrata, Pennsylvania with 247,828 points on 10 bands. The total number of SOHP entries was 134.

Multioperator

The Limited Multioperator category fielded a total of 32 entries for 2008. Entrants in this category can only operate on a maximum of four bands. The top scoring entry in the LM category is the W3SO club station, the Wopsononock Mountaintop Operators from Altoona, Pennsylvania with a score of 213,696 points on the bottom four VHF/UHF bands. They made a total of 850 QSOs in 192 grids. A close second in the LM category is the Mount Frank Contesters club station, K9NS, from Hampshire, Illinois with a score of 190,491 points. Third place

Division Leaders

Single Operator Low Power

Atlantic	WA3NUF	158,464
Canada	VE3SMA	8,888
Central	K2DRH	163,009
Dakota	N0KP	25,690
Delta	N4QWZ	31,500
Great Lakes	WZ8T	18,075
Hudson	WB2SIH	57,728
Midwest	WB0NQD	10,653
New England	N1DPM	88,375
Northwestern	W7DHC	3,125
Pacific	WE6T	15,288
Roanoke	W4SHG	25,125
Rocky Mountain	NJ7A	1,848
Southeastern	K2DEL (WA2SEI, op)	16,359
Southwestern	K6TSK	7,140
West Gulf	WB5ZDP	53,489

Single Operator High Power

Atlantic	WA2FGK (K2LNS, op)	257,108
Canada	VE3ZV	27,753
Central	KB9TLV	41,310
Dakota	W0ZQ	42,432
Delta	W5MRB	9,834
Great Lakes	K8MD	45,360
Hudson	N2GHR	49,544
Midwest	KM0T	1
New England	K1TEO	431,100
Northwestern	N7EPD	16,027
Pacific	KC6ZWT	19,604
Roanoke	K4QI	50,304
Rocky Mountain	N0KE	230
Southeastern	K0VXM	45,720
Southwestern	N6KN	16,254
West Gulf	K9MK	42,930

Limited Multioperator

Atlantic	W3SO	213,696
Central	K9NS	190,491
Dakota	W0MR	1,184
Delta	WD4OAR	11,183
Great Lakes	N8ZM	24,564
Hudson	WA2VUN	2,800
New England	KW1AM	48,555
Pacific	KR7O	10,478
Roanoke	KI4SNY	12,446
Rocky Mountain	KE7DCJ	209
Southeastern	K4NGA	3,038
West Gulf	AB5GU	2,449

Multioperator

Atlantic	N3NGE	545,160
Canada	VE3LCA	5,952
Central	N2BJ	28,329
Delta	AG4V	23,760
Great Lakes	N8KOL	35,496
Hudson	N2GCZ	23,360
New England	W1AIM	9,300
Pacific	K6LRG	15,708
Pacific	KI6MPQ	2,700
Rocky Mountain	W0EEA	15,333
West Gulf	K5QE	402,651

Single Operator QRP Portable

Atlantic	K3EGE	576
Canada	VE2PIJ	1
Delta	N3AWS	1
Hudson	KC2JRQ	48
Midwest	N0JK	56
New England	KA1LMR	350
Northwestern	WA7MLD	168
Pacific	W6DWI	6,048
Roanoke	WA4A	15
Southeastern	NN4AA	3,068
Southwestern	KQ6EE	1,664

Rover

Atlantic	K1DS/R	136,224
Canada	VE3OIL/R	36,792
Central	W9FZ/R	25,324
Delta	W4RXR/R	1554
Great Lakes	NE8I/R	7416
Hudson	KJ1K/R	23,980
New England	WW1M/R	1600
Pacific	W6XD/R	185,790
Roanoke	KC3WD/R	16,008
Rocky Mountain	NK5W/R	120
Southeastern	WA2IID/R	15,648
Southwestern	N4TZH/R	253
West Gulf	N5AC/R	120,120

Limited Rover

Atlantic	NN3Q/R	10,368
Canada	VE3RKS/R	3,380
Central	K9JK/R	1,458
Hudson	K2DSL/R	60
Northwestern	N6ZE/R	1,554
Pacific	K6NC/R	31,257
Roanoke	K4GUN/R	7,335
Rocky Mountain	KK6MC/R	392
Southeastern	WA4JA/R	798
Southwestern	W6KA/R	480
West Gulf	K6LMN/R	864

Unlimited Rover

Northwestern	KB7DQH/R	17,064

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)		
WA3NUF	158,464	A	N4QWZ	31,500	A	K2DRH	163,009	A	WB5ZDP	53,489	A	WE6T	15,288	A
W3SZ	127,864	A	W4SHG	25,125	A	WZ8T	18,075	A	NØKP	25,690	A	W6OMF	14,640	A
N1DPM	88,375	A	K2DEL	16,359	A	N8BI	15,525	A	NØVZJ	16,461	A	K6TSK	7,140	A
AF1T	63,800	A	(WA2SEI, op)			WA9FIH	10,038	A	NG0R	12,508	A	KE6GLA	5,696	A
WB2SIH	57,728	A	WD4MGB	12,597	A	WO9S	9,945	A	WB0NQD	10,653	A	W7DHC	3,125	A
			K4FJW	8,536	A									
K1TEO	431,100	B	K4QI	50,304	B	K8MD	45,360	B	K9MK	42,930	B	KC6ZWT	19,604	B
WA2FGK	257,108	B	KE2N	47,328	B	KB9TLV	41,310	B	WØZQ	42,432	B	N6KN	16,254	B
(K2LNS, op)			KØVXM	45,720	B	KB8U	28,310	B	KA5BOU	32,452	B	N7EPD	16,027	B
K3TUF	247,828	B	W4WA	40,595	B	K9EA	28,300	B	K5LLL	23,217	B	NU6S	9,810	B
K1RZ	203,196	B	W4ZRZ	38,223	B	VE3ZV	27,753	B	WA5TKU	8,424	B	KI7JA	8,862	B
K1JT	121,075	B												
K3EGE	576	Q	NN4AA	3,068	Q				NØJK	56	Q	W6DWI	6,048	Q
KA1LMR	350	Q	WA4A	15	Q							KQ6EE	1,664	Q
KB2AYU	162	Q	WA1ZMS	8	Q							WA7MLD	168	Q
N3EXA	156	Q	N3AWS	1	Q							K6RM	1	Q
N2NRD	132	Q												
W3SO	213,696	L	KI4SNY	12,446	L	K9NS	190,491	L	AB5GU	2,449	L	KR7O	10,478	L
KW1AM	48,555	L	WD4OAR	11,183	L	N8ZM	24,564	L	WØMR	1,184	L	K6TWT	3,925	L
KB1DFB	46,123	L	K4NGA	3,038	L	AB8XG	544	L	KE7DCJ	209	L	K7XC	1,364	L
KA2LIM	37,345	L	W5SCR	595	L									
W1QK	36,600	L												
N3NGE	545,160	M	AG4V	23,760	M	N8KOL	35,496	M	K5QE	402,651	M	K6LRG	15,708	M
K8GP	351,260	M	N4JQQ	13,454	M	N2BJ	28,329	M	KBØHH	33,015	M	W6YX	9,594	M
N2PA	170,460	M				W9RM	22,327	M	WØEEA	15,333	M	KI6MPQ	2,700	M
K3EOD	96,138	M				K8ZIZ	9,964	M	W5LCC	1,056	M	VE6AO	210	M
N2GCZ	23,360	M				VE3LCA	5,952	M						
K1DS/R	136,224	R	KC3WD/R	16,008	R	VE3OIL/R	36,792	R	N5AC/R	120,120	R	W6XD/R	185,790	R
K2TER/R	91,476	R	WA2IID/R	15,648	R	W9FZ/R	35,420	R	WDØACD/R	99,144	R	N6MU/R	124,432	R
K2QO/R	90,090	R	W4RXR/R	1,554	R	NE8I/R	7,416	R	KCØIYT/R	25,324	R	WB6IDK/R	104,858	R
N1XKT/R	44,720	R	KD4NOQ/R	352	R	K9TMS/R	2,603	R	AE5BN/R	15,686	R	K6JRA/R	4,020	R
KJ1K/R	23,980	R	N4TZH/R	253	R	WB2AIV/R	285	R	KE5EXX/R	5,840	R	W6GMT/R	2,304	R
NN3Q/R	10,368	RL	K4GUN/R	7,335	RL	VE3RKS/R	3,380	RL	K5MRA/R	522	RL	K6NC/R	31,257	RL
N2SLN/R	2,139	RL				K9JK/R	1,458	RL	KK6MC/R	392	RL	KC6SEH/R	27,022	RL
KC2QZF/R	1,558	RL				N9YH/R	32	RL	K5ZSJ/R	375	RL	K6MI/R	1,003	RL
W3STU/R	1.122	RL							KD5IKG/R	360	RL	W6KA/R	480	RL
K2DSL/R	60	RL							KD5TDP/R	288	RL			
												KB7DQH/R	17,064	RU

was claimed by the Connecticut AM Society club station, KW1AM, from Danielson, Connecticut with 48,555 points. All top three LM category stations operated only on the bottom four bands.

The Multioperator category includes a total of 27 entries for 2008. Stations in this category are not limited to any specific number of bands. The top scoring station in the M category for 2008 is N3NGE, operated by Leonard Martin of Morgantown, PA with a score of 545,160 points and a total of 1324 QSOs and 220 grid squares on 11 different bands. Second place in the M category is claimed by Marshall Williams, K5QE of Hemphill, Texas with 402,651 points, followed by the K8GP station, owned by the Delmarva VHF and Microwave Society of Washington, DC in third place with 351,260 points.

QRP Portable

The QRP Portable category produced a total of 18 entrants this year. It's quite amazing what can be done with low power equipment, even on the VHF/UHF bands if you can find a good location from which to operate. The QRP portable participants keep pounding away every year and are to be commended for their dedication to the sport!

The leading score producer in the QRP Portable category for 2008 is Robin Whiting, W6DWI of Davis, California with a total of 6,048 points, which nearly doubled his score from last year. Second place in QRP Portable goes to NN4AA, James Hagan of Malabar, Florida with a total of 3068 points. Hon Chu, KQ6EE of Arcadia, California is awarded the third position with 1664 points.

Rover

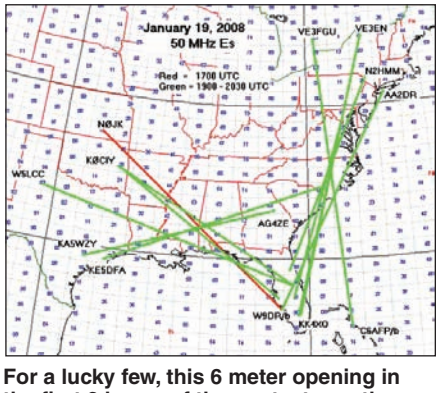
There are three Rover categories for the 2008 January VHF SS competition. The three categories are Rover (R) with 34 entries; Limited Rover (RL) with 24 entries and Unlimited Rover (RU) with only one entry.

In the Rover (R) category, no more than two operators are permitted, but operation on all bands is allowed. The top scoring operator in the (R) category is Art Goddard, W6XD/R of Costa Mesa, California with a score of 185,790 points. The second place spot goes to Richard Rosen, K1DS/R of Blue Bell, Pennsylvania with 136,224 points. John Desloge

KK6MC

Not everybody suffered in the cold rain and snow! James Duffey, KK6MC/R, wisely took a southern route. Here he is setting up in DM61 in southern New Mexico.

NØJK



For a lucky few, this 6 meter opening in the first 2 hours of the contest was the only decent propagation to be had all weekend.

Jr, N6MU/R of Cypress, California took the third position with 124,432 points.

Operators in the Limited Rover (RL) category may use no more than four bands of their choosing. The top entry in the RL category this year is Michael West, K6NC/R of Wilton, California with a score of 31,257 points. The second RL position goes to John Collins, KC6SEH/R of Broderick, California with 27,022 points. Russell Lamm, NN3Q/R with operator Al Zimmerman, K3WGR of Wernersville, Pennsylvania took third place with 10,368 points.

There was only one entry in the Unlimited Rover (RU) category, which allows more than two operators. Eric Smith, KB7DQH/R of Port Orchard, Washington and his team scored 17,064 points.

Affiliated Club Competition

The largest radio club that focuses on the world above 50 MHz is the Mt Airy VHF Radio Club, a very old and extremely active organization based in southeastern Pennsylvania. This year, the Mt Airy organization fielded entries from 63 members with a combined total of 2,163,226 points, up slightly from last year's 1.97 million entry from 61 members. This is the only club reporting an Unlimited Club score.

Competition at the top two positions in the Medium Club group was close with the Northeast Weak Signal Group (NEWS Group) posting 1,059,914 points from 23 member entries. The Potomac Valley Radio Club (PVRC) came in a close second with 985,655 points from 29 members. Third place was taken by the North Texas Microwave Society with 11 members reporting a total score of 667,421 points.

Except for the top spot, competition in the Local Club category was tight this year. The top spot was taken by the Mount Frank Contesters group with 214,306 points reported from a total of four participating members. The Connecticut AM Society posted the second highest score at 97,036 points from three participating members. The number three spot was claimed by the Florida Weak Signal Society with 83,066 points from seven members.

The total number of clubs reporting combined member scores is 37. This total includes 20 entries in the Local (L) category, 16 entries in the Medium (M) category and one club in the Unlimited (U) category. Club totals reported for 2007 were 35, 40 in 2006 and 30 in 2005. We appear to be on an upward trend, and I am hopeful that the 2009 January VHF SS competition will bring the total number of Clubs reporting scores ever closer to the 50 figure!

Going Forward

I hope that active HF contesters reading this report will discover an interest in contesting on the VHF and higher bands. Begin with the 6 meter band. Many of the late model HF radios include 6 meter coverage, and adding an effective 6 meter Yagi to your HF stack is usually an easy task. The bottom of the current solar cycle is a great opportunity to enjoy the world above 50 MHz, while you are waiting for the European and JA runs to return on the HF bands. QST

Expanded Reports Available

For complete results, participant soapbox and the complete scores in a user-searchable database, please visit **www.arrl.org/contests/results**. ARRL members without Internet access may obtain a printout of the complete line scores by sending a self-addressed, stamped envelope to ARRL Contest Results, 225 Main St, Newington, CT 06111. Please be sure to include the contest name and year.


W3ZZ

THE WORLD ABOVE 50 MHz

48 State WAS by Terrestrial Modes

It has been over a decade since this column discussed one of the most interesting and challenging exploits in VHF radio, the attempt to work all 48 of the contiguous US states on 2 meters without the use of EME. This subject has recently been revisited by Kevin Kaufhold, W9GKA, who will present his results in a paper entitled "Coast-to-Coast on 2-Meters Terrestrial" at the 2008 Central States VHF Society (CSVHFS) conference this month in Wichita, Kansas (see Here and There, below). I feel the subject is one of considerable interest and the following column is based closely on and borrows liberally from that paper. Better yet, you still have time to go the CSVHFS meeting yourself and hear it in person.

One of the interesting characteristics of VHF radio and of the 2 meter band in particular is the vast distances that can be traversed. Distances greater than 2000 km are readily possible on aurora, more than 2300 km on meteor scatter and E-skip, sometimes quite a bit more in the case of E_s. Although a small section of the central US lies within the propagation range of both coasts on 2 meters, not many people realize just how far radio amateurs can work on 2 meters. For years, serious VHF operators have circulated among themselves the call signs of those who may have worked all 48 states on 2 meters using terrestrial means only. KØMQS was rumored to have achieved the feat as far back as the 1960s, although to this day that has not been confirmed (but see below). We do know that KØMQS was the first to achieve 2 meter WAS in 1976, but that was done with the aid of some EME contacts.

The W9GKA Literature Search

Bill Tynan, W3XO, in his November 1979 "World Above" column[1] appears to have been the first written source to comment on the possibility of working all lower states terrestrially (although there are also rumors that a 1960s era *QST* "World Above" column may have been written on the topic; neither Kevin nor I could find anything). In an article appropriately entitled "Challenges," Tynan asked: "How many states can be worked without using the moon? Can the 48 continental states be worked using terrestrial propagation modes alone? I don't know but it sure would be interesting to try."

Little did W3XO know, but WØSD had just worked his last state in August 1979. Tynan got wind of it the next year (news must have traveled slow back then!) when he commented in November 1980[2] that: "Few imagined how short a time it would be before someone would do it. That someone is WØSD. At the Central States Conference, Ed displayed the cards (all but one had yet to arrive from K1WHS; that one has now been received). I am sure that everyone congratulates WØSD on accomplishing a most notable feat."

Over the years, VHF ops continued to keep tabs on who else was close.[3] It became a type of guessing game and also a point of pride. "How many states do you have the hard way?" was a much bandied about question. Even the owners of the biggest stations on 2 meters commonly believed that the moon was actually easier than working the same 48 states terrestrially.

Emil Pocock, W3EP, had heard that several people had worked 48 states in the intervening years and published two separate articles[4,5] on the matter in his "World Above" column. In these columns, Emil confirmed that seven different people had worked the 48 contiguous states terrestrially on 2 meters and drew the accompanying map in one of his articles showing the locations of the first four ops that he knew of.

Spurred by the Above 50 MHz States Award sponsored by CSVHFS, Mike King, KMØT, worked 48 state WAS in 2001 and 2003. He published an article in *CQ VHF* on his two-time accomplishment.[6]

This Month

*July 6	Very good EME conditions
July 19-20	CQ World Wide VHF Contest
July 24-27	Central States VHF Society Conference

*Moon data from W5LUU

2008 Survey of Stations

The foregoing is the extent of the printed knowledge on the subject. From time to time, Kevin would hear about other people who may have worked all 48 states, or were close to it. During the June, 2007 VHF QSO Party, he worked Craig, K9CT, who commented that he had just worked his 43rd state on 2 meters non-EME. Kevin thought that not surprising given Craig's potent signal on all VHF bands.[7] That QSO made Kevin wonder how close other operators were to working the lower 48.

So, he began collecting information on VHF stations that might be close to all 48 states. The scope of those inquiries was broadened to a more comprehensive survey of any stations anywhere that may have worked 48 states. Requests sent to the VHF reflectors in February and March 2008 yielded over two dozen replies, some with confirmed status. Many responders produced names or call signs of people to contact for more information. In all, at least 36 people supplied information and leads! The list in Table 1 comprises the results of this research. For each call sign, the source of the information is cited, as the data is only as good as the source documentation.

Analysis of Survey Results

Simply reviewing the numbers of recipients for the various operating awards shows just how difficult working 48 state WAS on 2 meters really is. Almost 700 have obtained VUCC on the band, 155 have achieved WAS on 2 meters via EME in part and over 25 have obtained 2 meter DXCC also via the moon.[8] But only a handful of stations have ever worked and confirmed the lower 48 states via tropo, MS, E_s and AU.

As can be seen from a review of the above list, Kevin has confirmed, to a reasonable degree, that 11 stations have worked all 48 states terrestrially 12 times based on published articles or direct contact with the operators themselves. The evidence is

[1] *QST*, Nov 1979, p 81.
[2] *QST*, Nov 1980, p 77.
[3] *QST*, Nov 1981, p 85.
[4] *QST*, Jun 1997, p 91.
[5] *QST*, Oct 1997, p 101.
[6] *CQ VHF*, Summer 2003.
[7] E-mails with the above noted stations.
[8] Statistics on 2 meter operating awards from Bill Moore at ARRL and from VE2PIJ Web site.

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Table 1

48 States Terrestrial, 2 Meters (Compiled by W9GKA)

List of stations who have, or are close to working, the 48 contiguous states.

Call	*State*	*Grid*	*Date*	*References*
First Published Source				(1)
Confirmed				
WØSD	SD	Pre-grid; (EN13)	08-1979	(2) (3) (4)
K5CM	OK	Pre-grid; (EM25)	12-1980	(4)
WØEMS	NE	Pre-grid; (EN11)	08-1981	(3) (4)
KØALL	ND	EN16	05-07-1984	(5); E-mail KØALL, 02-08
K5UR	AR	EM35	1985	(5); E-mail K5UR, 02-08
WØRRY / K5BXG	OK	EM26	1986	E-mail WØRRY, 2-8-08
W5ZN (as WB5IGF)	AR	EM45	08-1992	(5); E-mail W5ZN, 2-08
WQØP	KS	EM29	08-1993	(5)
W7XU	SD	EN13	8-13-1997	E-mail W7XU, 2-7-08
NØQJM	SD	EN13	Late 1990s	E-mail W7XU, 2-7-08
KMØT	IA	EN13	2001/2002	(6)
Unconfirmed				
KØMQS	IA	EN31	Twice?	Via telephone, KØMQS unsure. Has the difficult ones. CA, OR and WA worked via MS.
Close				
NØLL	KS	EM09	Missing ME	E-mail NØLL, 2-8-08
K9HMB	IL	EN52	Missing a 7?	E-mail W9RM, 3-08
W9UD	IL	EN41	Missing CA	E-mail K9AKS, 2-8-08
KMØA	MO	EM48	CA, WA	E-mail WØFY, 2-08
NØUK	MN	EN34jv	CA, WA	E-mail NØUK, 2-08
NØJK	KS	EM17	ME, RI	E-mail, NØJK 2-08
K2DRH	IL	EN41	CA, OR, WA	K2DRH e-mail 2-08
WØFY	MO	EM48	CA, OR, WA	WØFY e-mail 2-08
KWØA	MO	EM48	CA, OR, DE	E-mail KWØA, 3-08
N9LR	IL	EN50du	CA, OR, WA	E-mail N9LR, 3-08
KA9CFD	IL	EN40om	CA, OR, WA	E-mail NN1N, 3-08

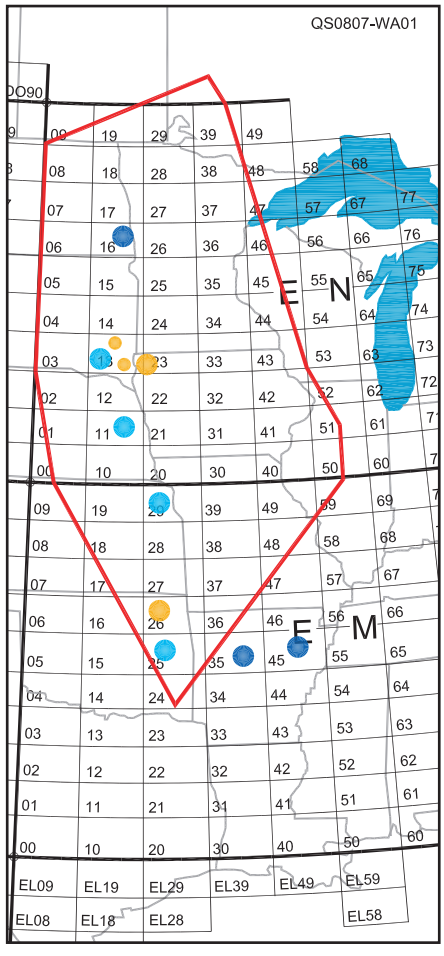


Figure 1 — How to work 48 state WAS. The area outlined in red lies within 2300 km (1400 mi) of all contiguous 48 states. The western edge is 2300 km from the westerly borders of ME and RI. The Eastern edge is limited by the distance to the eastern boundaries of CA, OR and WA. The northern edge is limited by the distance to Florida. Legend:
Lt Blue = identified by W3EP in Note 4
Dk Blue = identified by W3EP in Note 5
Orange = identified by W9GKA

somewhat less firm for those who are close to all 48 states, although most of these are also based on direct e-mails from the stations involved. Clearly this survey is not exhaustive but is likely to contain almost all who have achieved this feat or are close. It is in fact striking to see who is on the "confirmed" and "close" lists. The lists read like a "who's who" of the all-time greatest stations ever assembled in the central part of the country. In particular it is gratifying to note that ARRL President Joel Harrison, W5ZN (ex-WB5IGF), an avid VHFer, is on a list that requires such large amounts of both technical and operating skill.

It is also fascinating to see exactly where the stations are located. The map in Figure 1 is adapted from W3EPs June 1997 *QST* article. Emil had four dots on the map, for those that he knew about at that time. In his Central States paper Kevin has added the other dots to indicate the rough location of all 11 stations, 4 that he added and 3 added by Emil in October 1997.

The map shows a very distinct pattern of stations. With the exception of the two Arkansas operators (both of whom had great stations at the time), everyone else lies in a due north-south line aligned with the western borders of Missouri, Iowa and Minnesota. In fact, no one east of the Mississippi has worked the contiguous US, not even super stations like K2DRH (EN41) or K9HMB/K9NS (EN52). While it may theoretically be possible to work all 48 states from anywhere in the outlined area, it is somewhat surprising that only those stations in a very tight line have managed to do so. Perhaps the new WSJT digital modes will expand the practical range beyond the N-S line that is so apparent on the map.

KØMQS remains unconfirmed. Several people felt that he worked all lower 48 states at least once; some even thought he may have worked them twice. Your conductor contacted him. His records are all on paper and may not be readily accessible. He does know that he has worked the "difficult" ones — CA, OR, WA — with his 800 ft on a leg rhombic. But W3XO believes that he was missing one of the W7s (perhaps ID though Bill is not sure). KØMQS is inactive at the present time, having suffered wind and tower damage, but he hopes to have his antennas repaired.

Alternate Challenges

Is there a similar albeit less interesting challenge possible from the coastal areas of the country? From the northeast it is well known that the same 2300 km distance encompasses 37 states — everything east of the Mississippi River and the contiguous states in a north/south line of ND, SD, NE, KS, OK and TX. Going beyond that is truly difficult though it can be done in rare instances to CO and NM. Currently the 2 meter Standings lists W3ZZ (+CO) and K1RZ/3 (+NM) both FM19 with 38 states; and K1TEO (FN31), WB2CUT (FN20) and K4RTS (FM08) with 37 states. W1EP (FN31) and AK3E (FM19) are close with 36. There are likely a few others but they either do not have current listings in Standings or their terrestrial achievement is not apparent because they use EME and Standings does not differentiate between the two.

Conclusion and Acknowledgments

Working the lower 48 states "the hard way" has proven to be quite a challenge, most likely being more difficult than VUCC, WAS, WAC or even DXCC on 2 meters. While possible, only the most skilled operators who possess solid stations and have the good fortune to live in a very tight N-S line in the Central US have accomplished the feat over the years.

Both W9GKA (**w9gka@arrl.net**) and I would like to know of any other articles on this topic and/or if anyone has information on

other stations that may be at or close to all 48 states terrestrially on 2 meters. I wish thank W9GKA for his fine research on which this column is based and W3XO, W9FZ, KØMQS and KBØPE for their help.

ON THE BANDS

Thought last month was poor? If it weren't for the Spring Sprints and some good news on the EME front there would be very little to discuss this month. Things are bound to get better in May.

6 meters. Only two reports reached me this month. Dave, N9HF/4 (EL99), heard TI2NA/B on April 9 and worked YN2N. He heard only 2 others work Octavio. Jon, NØJK, notes the first E_s of the season in Europe on April 25 reported on DX Summit north/south from G to EA/CT and I.

Spring Sprints. While band conditions were relatively unenhanced, the 144, 222 and 432 MHz Sprints exhibited a decent amount of activity in the highly populated areas, for some of the Sprints. Based on the reports that I have, for the 2 meter Sprint, the top three included K1TEO (FN31) 124/33, K1RZ/3 (FM19) 108/25 and K3TUF (FN10) 101/37 withWB8BZK/R 76/29 the top rover in four grids. There was a lot less activity for the 222 Sprint, with the top three being K1RZ/3 44/27, K3TUF 44/24 and K1TEO 47/20. The 432 Sprint was somewhat better with K1TEO 67/29; K3TUF 52/28; WZ1V 55/20 and VE3CRU/R 18/15 top rover in 3 grids. N6ZE (DM04) reported dismal activity from southern CA with 10/5 on 2 meters and 11 Qs on 432, all on FM with no SSB or CW heard.

Tropospheric ducting. No transgulf propagation was reported this month. Rick, WØRT (EM27), worked into MS and central TX on April 6. Dan, K4ZXL (EM87), worked FM06 and EM85 on the 11th. Just preceding the 432 Sprint starting on April 21, Ron, WZ1V (FN31), reports excellent coastal tropo first down the coast into the Mid-Atlantic on 1296 and then for 2 days into the Canadian Maritimes as far as FN95 on 2 and 432.

EME. Dave Blaschke, W5UN, has reached a new benchmark by working ET3AA on April 16 for 2 meter EME country #200. He writes: "My 2 meter DXCC #1 was awarded on January 11, 1991. It has taken over 17 years since then to reach the 200 country plateau. In my 1990 *QST* article I stated that it would probably take a lifetime to work DXCC on 2 meters. How wrong I was. The gauntlet was thrown down and many who went on DXpeditions took up the challenge. I want to thank all those who have made 2 meter EME a part of their DXpeditions over the years. There were several, but two of the most notable are ZL1RS and W6JKV, who both gave me many new countries on 2 meters." Hearty congratulations, Dave, on an accomplishment for the ages!

Al Katz, K2UYH, aptly summed up the month in his *432 and Up Newsletter*: "What a month, what a time! Congratulations to Willi, LX1DB, on the first WAC on 13 cm and to DL1YMK (Michael and Monica) for making it possible! Congratulations to all the newly successful 24 GHz EME stations. And TNX to all the DXpedition operators/organizers that keep life interesting. The DUBUS/EWW EME Contest in April produced high activity on 13 cm and new activity levels on 9 cm. ES5PC appears to be leading the pack with 30 QSOs on 13 cm and is followed by F2TU with 28 QSOs." New 24 GHz stations include PAØEHG, DF1OI and OK1KIR. Al, W5LUA, notes that 24.048 GHz rather than 24.192 GHz is now the center of activity because 24.192 is not allocated everywhere. 20-25 W at the dish feed is sufficient for successful operation.

HERE AND THERE

2008 CQ World Wide VHF Contest. This duo-band 6 and 2 meters contest that begins at 1800Z July 19 and ends at 2100Z July 20. Details, rules and log sheets can be found in the June issue of *CQ* or at **www.cq-amateur-radio.com.** In 2007 there was a spirited battle for the top multi-multi. Tune in and see what develops this year.

Central States VHF Society 2008 Conference. The 42nd annual CSVHFS conference will be held in Wichita, Kansas July 24-27. This is usually the biggest VHF conference of the year. The program covers many of the most interesting facets of VHF+ radio along with antenna and preamp measuring. More details can be found at **www.csvhfs.org/conference/index.html**.

DXpedition to FJ St Barts. Ed, WØSD, and Arliss, W7XU, plan to go to St Barthelemy, FJ (FK87nv) for June 28-July 6 probably under a TO5 call sign. They will operate on 50.103 CW and SSB, listening up and will be running a beacon. There will be an online log at **www.w0sd.com/stbart/bart.htm**. QSL via W7XU.

Gridpedition to FM13. Bill, W4GRW writes that a group from NC will operate as N4BX from FM13, a rare grid on the NC coast on 2 and 6 meters during the CQWW VHF contest July 20-21. Check their Web site at **nfourbx.googlepages.com/fm13dxpedition**.

Second sunspot of Cycle 24. NOAA reports that the second sunspot for Solar Cycle 24 numbered 990 has appeared at high latitude with the magnetic signature of Cycle 24 the weekend of April 12-13. The first spot was in early January. Be of good cheer. Conditions will get better!

144-MHz Standings

Published 144 MHz standings include call area leaders as of April 1, 2008. For a complete listing, check the Standings Boxes on the "World Above 50 MHz" Web pages at **www.arrl.org/qst/worldabove/**. There are two requirements for inclusion in this list: US operators located east of the Mississippi River must have worked at least eight states. All operators must have submitted information within the previous 2 years. (You need not work additional stations to remain in the standings, but please confirm your continued interest.) Submit data by e-mail to **standings@arrl.org** or mail paper submissions to Steve Ford, WB8IMY, ARRL, 225 Main St, Newington, CT 06111.

Listing by States Worked

Call Sign	State	States	DXCC	Grids	DX (km)
1					
K1MS*	MA	50	32	—	2,166
W1AIM*	VT	50	18	223	2,340
K1SIX*	NH	43	14	201	2,501
AA1YN*	NH	39	43	191	2,201
K1TEO	CT	37	5	240	2,420
W3EP/1	CT	36	3	177	2,450
W1ZC	NH	35	2	87	2,490
2					
W2CNS*	NY	50	22	125	2,367
K1JT*	NJ	43	49	311	2,369
W2MPK*	NY	37	17	—	—
WB2CUT	NJ	37	2	155	—
K2OVS*	NY	36	6	165	2,812
3					
W3CMP*	PA	50	63	408	—
WA2FGK*	PA	45	36	255	—
W3ZZ	MD	38	6	241	2,526
K1RZ	MD	38	2	201	2,408
AK3E	MD	36	4	168	2,293
4					
W8WN*	KY	50	73	522	2,273
WA4CQG*	AL	50	16	—	—
W4WA	GA	42	5	167	—
K4RF	GA	40	4	212	2,147
W4DEX	NC	40	—	—	—
K2BLA*	FL	39	58	373	—
K4QI	NC	38	6	229	—
K4RWP	TN	38	3	172	2,323
AA4H	TN	38	3	168	2,007
K4RTS	VA	37	3	166	2,023
N4MM	VA	35	5	149	—
K4MM	FL	34	8	163	2,347
N4HN	NC	34	2	143	—
K3XA	VA	32	2	—	1,953

Call Sign	State	States	DXCC	Grids	DX (km)
5					
W5UWB*	TX	50	53	390	2,332
W5ZN*	AR	50	37	325	2,400
WD5AGO*	OK	50	32	220	2,050
W5RCI*	MS	50	16	284	2,992
K5CM*	OK	50	—	—	—
W5LUA*	TX	50	—	—	—
N5KDA*	MS	48	55	343	—
K5YPV	MS	41	3	199	2,902
K5LLL	TX	39	3	208	2,089
AA5JG	OK	39	3	150	2,171
W5HNK	TX	37	3	—	2,442
W3UUM*	TX	36	23	237	2,547
WA5UFH	TX	35	6	171	—
K5AM	NM	31	9	157	—
AA5AM	TX	31	3	125	2,271
6					
K6AAW*	CA	50	57	401	3,831
K6QXY*	CA	24	8	—	3,794
KR7O*	CA	23	24	199	2,134
N6ZE*	CA	22	16	115	2,600
KC6ZWT*	CA	20	5	150	3,934
7					
W7GJ*	MT	50	110	—	—
W7MEM*	ID	50	62	410	10,017
K7XC*	NV	31	21	189	4,056
WA7GSK	ID	29	2	211	3,635
WA7JTM	AZ	27	1	100	—
8					
K8BHZ*	MI	50	45	362	2,278
WA8RJF*	OH	44	27	227	2,131
K2YAZ	MI	38	2	163	2,167
N8PUM	MI	22	2	108	2,188
KB8O	OH	17	2	39	1,097

Call Sign	State	States	DXCC	Grids	DX (km)
9					
AA9MY*	IL	49	64	379	1,989
KA9UVY	IL	43	2	161	2,373
K9SM	IL	40	36	237	1,752
KJ9I*	WI	35	102	—	—
W9RPM	WI	32	4	133	2,507
WA9PWP	WI	32	2	144	1,940
W9RM*	IL	26	5	70	1,609
Ø					
KØFF*	MO	50	35	267	2,185
KØALL*	ND	50	15	—	—
WØSD*	SD	50	13	297	10,723
KØAWU*	MN	48	48	372	15,319
NØLL	KS	47	3	387	2,378
KWØA	MO	45	2	238	2,501
KØCJ	MN	45	2	—	2,330
KØGU*	CO	42	40	350	2,400
KBØPE	MO	29	1	106	1,702
KØRZ*	CO	26	2	107	2,173
KØCS	CO	26	2	82	2,177
Canada					
VE3KH*	ON	50	63	400	1,985
VE3TMG	ON	35	2	172	1,994
VE2PIJ*	PQ	14	2	52	1,781
International					
XE2AT*		40	45	236	2,191
PA3CEE*		22	87	644	—
NP3CW	PR	2	9	18	6,390
SV1DH		—	45	223	7,230
F5DE	INT	—	44	241	2,399
GW3HWR		—	34	177	2,760
PD3UX		—	33	180	2,593

*Includes EME contacts
— Not given

W3UR

HOW'S DX?

Six Meter DX

By the time you read this, hopefully we will be in the middle of the Magic Band (6 meters) DX E-skip season. Many HF DXers, including your editor, look forward to this DX season on 6 meters. This is just to remind everyone that the 6 meter DX window in the US is from 50.100 to 51.125 MHz. That means there should be no US to US QSOs taking place in the DX Window. Well, in reality 50.125 is also the US calling frequency. So you will want to avoid going below 50.125 MHz to work US stations, unless below 50.100 MHz on CW.

The DX calling frequency is 50.110 MHz. This is a good place to be monitoring for those band openings. DX stations, once you have established the band is open, should spread out and leave 50.110 for others to make their initial call and then doing likewise (moving off the calling frequency). Don't worry, the US guys will spot your every move on the packet clusters! Now on to the DX news, including some 6 meter operations.

DX NEWS FROM AROUND THE GLOBE

CYØ — SABLE ISLAND

Members of the late June to early July Sable Island (grid FN93) 6 meter DXpedition team now have their CYØX Web site up and running. You can see it at **www.cy0x.com**. Plans are to be QRV 24 hours a day on 6 meters. They will have an 8 element Yagi on a 40 foot boom and 800 W. Dick, K5AND; Pete, VE3IKV and Chris, W3CMP, will be QRV on 50 MHz from June 25 to July 7. Look for CYØX to be operating on 50.117 MHz. They do not want or care what your grid square is, so just give signal reports to help speed up the contacts on the Magic Band. If there is a really good opening they will have a second station QRV from grid GN03 with the call CYØRA using a 5 element Yagi. The team will have limited HF activity when 6 meters is not open. Look for them on 20 and 40 meters on CW and SSB. QSL via VE3IKV with two green stamps.

FJ — SAINT BARTHELEMY

Ed, WØSD, and Arliss, W7XU, are planning a 6 meter DXpedition to St Barthelemy, FJ, for June 28 to July 6. They have applied for a TO5 call sign and plan to operate on 50.103 CW and SSB, listening up. They will have high power and a long boom Yagi. They plan to operate the daylight hours and into the evening. When they are not working people, they will be in beacon mode to discover openings. They have chosen this time of year to coincide with the highest probability of sporadic E openings to North and South America, Europe and Africa.

The QTH will be on a rocky point 70 meters above the ocean, on the northeast corner of the island, with a clear shot to the west, northwest, north, northeast and east. They request that you do not give your grid square during your QSO with them, to keep the QSOs fast. They want to maximize the number of QSOs during the brief openings. They will be in grid square FK87nv for those looking for new grid squares. They say they may also operate some HF RTTY and CW during the nighttime, 40 and 30 meters, when 6 meter sporadic E is over for the day.

Ed says that experience since the early 1990s with a similar station shows that sporadic E openings on 6 during this time of year typically make it possible to log around 1000 QSOs from this part of the Caribbean. They ask that you check their online log, uploaded nightly, **www.w0sd.com/stbart/bart.htm**. If you're already in the 6 meter log, don't keep calling so others will have more of a chance for a QSO. They note that paths beyond 9000 km are quite rare. And past experience shows they will be working many stations that have 100 W or less, so even modestly equipped 6 meter stations should have a good chance. QSL via W7XU.

FP — ST PIERRE & MIQUELON

FP/KV1J and FP/W1MAT will be on the air from St Pierre and Miquelon July 9 to 14. Eric and Matthew, father and son, will be on 80-6 meter SSB, CW and RTTY with 100 W to verticals and a TW2010. They will be on for the IARU HF World Championships contest. They have a Web page at **www.kv1j.com/fp/**. QSL to their home call signs, direct, bureau or Logbook of The World.

HKØ/S AND V3 — SAN ANDRES AND BELIZE

Dennis Motschenbacher, K7BV, has announced his plans for a June/July 2008 6 meter DXpedition to two islands in the Caribbean. He may also be QRV on HF when the Magic Band is not open. His first stop will be back to Belize (V3) where he will be QRV from Caye Caulker Island (NA-073) from June 20 to 26. This is grid EK57xr. His next stop will be even better! Plans are to be on San Andres Island (NA-033) from June 28 to July 6. This is from grid EK92dm. Dennis says, "The budget for this two-island trip is a bit staggering and beyond my pocket book, but I am going to 'go for it' believing sufficient financial support will come." Mick McManus, W1JJ, will be the DXpedition treasurer and QSL manager. Complete details can be found on Dennis' Web site at **www.qth.com/k7bv/caribe2008**.

JX — JAN MAYEN

Start looking for Svein, LA9JKA, to be "very active" as JX9JKA from Jan Mayen now through early October 2008. He plans to be QRV on 6 through 160 meters on SSB and the digital modes. QSL via LA9JKA, Svein Rabbevag, Brendlia 12, N-6013

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

Alesund, Norway with at least one IRC or two green stamps.

Wojtek, SQ4MP, will now be joining Michael, G7VJR, on Jan Mayen from June 27 to July 4. The two plan to be QRV 24/7. Donations before or after the operation will get a direct QSL automatically, provided there was a QSO! They have a Web page at **www.jx08.eu**.

KH9 — WAKE ISLAND

Colin, WA2YUN/KH9, has been on Wake Island for some time now running a multiband wire antenna. He should have a three element tribander up and an amplifier by the time you read this. Look for activity on 1.8 to 28 MHz. Colin says, "I will probably be here through 2009." QSL via K2PF.

KL7 — ALASKA

Six meter aficionado Jimmy Treybig, W6JKV, has announced he's going to Alaska to operate on the Magic Band next year. He'll be QRV from a mountaintop some 30 miles northeast of Fairbanks between June 18 and June 30. His planned location is 2500 feet asl with a clear view in all directions. Jimmy will have a big Yagi and 800 W.

John, KE7V; Yuri, N3QQ, and Yuri, UA9OBA, plan an expedition to Chuginadak Island in Alaska, NA-234, in the Islands of the Four Mountains Group. This is set for July 21 to 27 with the call sign KL7DX. Their Web page can be found at: **www.NA-234.com**. QSL via AC7DX.

OJØ — MARKET REEF

Six operators will have OJØ, Market Reef, on for the IARU HF World Championship July 12 to 13 with three stations, 160-6 meters. The operators will be SMØCKV, OH1VR, OH3RM, W6RGG, AE9YL and K9LA. They will sign OJØ/home call before and after the IARU event, except for OH1VR who has his own OJØ call sign, OJØVR. Send for the OJØ/ cards to the individual ops' home calls and OJØVR via OH1VR. The special call for the contest has been applied for and is as yet not known. We'll update this story when the ops get that call. This operation will be July 11 to 14. In the contest they'll be multisingle.

PACIFIC NORTHWEST DX CONVENTION

The Willamette Valley DX Club will be hosting the 53rd annual Pacific Northwest DX Convention on August 1 to 3, 2008 in Portland, Oregon. This year's event will be at the Monarch Hotel (**www.monarchhotel.cc**). Make sure you ask for the Northwest DX Convention rate. There will be technical sessions, a banquet and breakfast, and other prizes. This is a great opportunity to meet old friends and make new ones. ARRL DXCC Card Checkers will be present to check DXCC QSL submissions. For complete details check out the PNWDX Convention's Web site at **wvdxc.org/dxconvention**, where you can find the registration form, latest information on programs, prizes and a list of those already registered. If you have questions concerning the convention, contact Al Rovner, K7AR, at **k7ar@arrl.net**.

Registration forms received before June 15 will receive a free raffle ticket for a $1000 gift certificate redeemable at HRO.

VK9X — CHRISTMAS ISLAND

A team of four Amateur Radio operators from the Iberian Peninsula have announced their plans to operate from Christmas Island (OC-002) for 10 days in July. Plans are to have three stations, one with high power and the other two running 100 W on 10 through 160 meters (possibly 6 meters) on CW, SSB, RTTY and possibly PSK31. The DXpedition will be led by Marq, CT1BWW (VK9XWW), and joining him will be John, EA3GHZ (VK9XHZ); Henry, EA5EOR (VK9XOR) and Claudina (YL), EC5BME (VK9XME). Suggested frequencies (kHz) will be:

CW — 1825; 3506/3523; 7006/7023; 10,102/10,108; 14,006/14,023; 18,073; 21,006/21,023; 24,895; 28,006/28,023; 50,115

SSB — 1835-1840; 3795-3802; 7075; 14,145/14,195; 18,140; 21,295; 24,945; 28,495; 50,115

RTTY — 7037/7080; 10,140; 14,080; 18,102; 21,080; 24,920; 28,080

SSTV — 14,230/14,233; 21,340

PSK31 — 18,070; 21,070; 28,120

FM — 29,260; 50,115

The pilot stations for this operation will be Dennis, ZS1AU (Africa); Toshi, JA8BMK (Asia); Oscar, EA4TD (Europe); Lee, ZL2AL; Dave, VK2CZ (Oceania) and Dave, K4SV (North America). Keep an eye on the team's Web site at **www.dxciting.com/vk9x**.

VR2 — HONG KONG

In celebration of the upcoming Beijing Olympics members of the Hong Kong Amateur Radio DX Association (HARDXA) have received official authorization from the Office of the Telecommunications Authority (OFTA) to operate with special call VR2ØØ8O. Activity will run from July 15 to August 31 on 7-50 MHz using SSB, RTTY and PSK31. QSL direct only via VR2XMT as there will be no LoTW or e-QSLs.

WØDXCC

This year's Dakota Division ARRL Convention will be the place for the WØDXCC Convention that will be held at the University Center Rochester in Rochester, Minnesota August 8, 9 and 10. The event is being endorsed by the Rochester Amateur Radio Club, Minnesota Wireless Association and the Twin Cities DX Association. On Saturday and Sunday multiple HF and VHF DXing and Contesting forums will be held. This looks like a great event for DXers and Contesters who are just beginning or seasoned veterans. Even those who are just curious will find items of interest. For complete details check out **www.tcdxa.org/RARExpo.pdf**.

ZD9 — TRISTAN DA CUNHA

Tom, ZD7X (KCØW), plans to leave St Helena Island in late June and plans on moving to 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).

ZS8 — MARION ISLAND

Petrus, ZS6GCM (3YØE), arrived on Marion Island in early April. He is on a work assignment on the island until March 2009.

In his spare time he will be QRV as ZS8T. A Web page has been set up at **http://zs8t.net/**. LZ3HI will be the QSL manager.

WRAP UP

That's all for this month. Do you have DX news? Don't forget to let your DX editor know! Until next month, see you in the pileups! — *Bernie, W3UR*

AT THE FOUNDATION

Young Texan Wins 2008 Goldfarb Scholarship!

In May 2008 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. Wilmot will graduate from Richardson High School this year with a cumulative GPA of 97.64%, which places him 19th in a class of 431.

First licensed in 2001, Wilmot holds a Technician class license and is active in the St Paul School Amateur Radio Club (W5SPS) as well as the Richardson Wireless Klub (K5RWK) and enjoys a variety of activities in both clubs. His commitment to volunteer service in his community includes support for the BP MS 150 Bike Tour and the City of Richardson Annual Christmas Parade. He is regularly on local repeaters and is currently studying for his General class license.

Wilmot credits Amateur Radio with helping to develop leadership, organization and communication skills. Wilmot's studies at Washington University in St Louis will concentrate on medicine and will include his interest in mathematics and finance. He envisions a future as a scientist and economist where he can apply his analytic skills with the compassion and curiosity that are his hallmark.

Austin Evans Wilmot, KD5QKS

Mary M. Hobart, K1MMH ♦ Secretary, ARRL Foundation Inc ♦ mhobart@arrl.org

SPECIAL EVENTS

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

Jun 20-Jul 1, 0500Z-0459Z, Mt Union, PA. Camden Bullock and Ben Myers, N3C. 30th Creation Festival. 50.125 14.250 7.225 3.825. QSL. Camden Bullock, 134 Spring Wood Dr, Fredericksburg, VA 22401. *Festival dates June 25-28, 2008.* **www.creationfest.com/ne**

Jun 21, 1000Z-1800Z, Newington, CT. Newington Amateur Radio League, W1N. Hamfest at Newington High School. 28.350 21.350 18.150 14.250. QSL. Richard Lawrence, KB1DMX, 335 Lloyd St, Newington, CT 06111. **kb1dmx@arrl.net** *or* **www.narl.net**

Jun 21, 1200Z-2100Z, Gaylord, MI. Top of Michigan Amateur Radio Club, W1R. Otsego County Air Show. 28.400 14.290 7.270 3.940. Certificate. Air Show, 1349 S Otsego Ave, Gaylord, MI 49735. **www.nm8rc.org**

Jun 28-Jul 27, 0100Z-2359Z, Charlottetown, PE, Canada. Charlottetown and Summerside Amateur Radio Clubs, VF2ANNE. 100th Anniversary of publishing *Anne of Green Gables.* 21.250 14.240 7.160 3.780. QSL. George Meggison, 22 Bendella Dr, Charlottetown, PE C1E 1P4, Canada. *Special prefix CI2 for all operators, June 1-July 30, 2008. Also, a mini DXpedition from PEI in early June.* **www.anne2008.com**, **www.summersidearc.com** *or* **carc.isn.net**

Jul 1-Jul 16, 0500Z-0500Z, Hancock, MI. United States Guts Players Association, K1G. 50th Anniversary of Guts Frisbee (the original Frisbee game). 18.130 14.290 7.178 3.902. QSL. Miles Marsh, K8NET, 2034 Dornoch Dr, Uniontown, OH 44685. *Other bands and frequencies, mobile and portable ops possible depending on conditions.* **www.usgpa.com**

Jul 1-Jul 31, 0000Z-2359Z, Quantico, VA. FBI Amateur Radio Association, K3FBI. 100th Anniversary of the Federal Bureau of Investigation. 14.280 7.280 All bands phone and PSK. Certificate. FBIARA, ERF Building 27958A, Quantico, VA 22135. *No SASE required for certificate, just send QSL.* **www.fbi.gov/fbihistory.htm**

Jul 3-Jul 5, 1800Z-0000Z, Jonesborough, TN. Johnson City Amateur Radio Club, W4ABR. 37th Annual Jonesborough Days — Tennessee's oldest town. 21.375 14.250 7.265 3.870. Certificate. Ed Ingraham, 377 AA Deakins Rd, Jonesborough, TN 37659. **www.jcara.org**

Jul 4, 1300Z-2300Z, Van Wert, OH. Van Wert Amateur Radio Club, W8FY. Holiday at Home Van Wert County Museum. 7.204 14.204 7.044 146.700 EchoLink 315705. Certificate. Van Wert Amateur Radio Club, PO Box 602, Van Wert, OH 45891. **www.w8fy.org**

Jul 4, 1500Z-2200Z, Missoula, MT. Hellgate Amateur Radio Club, W7PX. Independence Day at Fort Missoula. 21.360 14.260 7.260. QSL. HARC, POB 3811, Missoula, MT 59806-3811.

Jul 4, 1500Z-2300Z, Paonia, CO. Montrose (Colorado) Amateur Radio Club, KØP. Paonia Cherry Days Celebration of local fruit harvest. 14.260 7.220. QSL. Steve Schroder, KIØKY, 29848 Stingley Gulch Rd, Hotchkiss, CO 81419. **ki0ky@montrosearc.org** *or* **www.montrosearc.org**

Jul 4-Jul 5, 2300Z-0200Z, Plattsburg, MO. Northwest Missouri ARES Group, WDØSKY. Commemorating the 175th Anniversary of Plattsburg, MO. 28.430 14.330 3.970. QSL. Trevor Black, 568 NW 305th, Plattsburg, MO 64477. **nwmoares.org**

Jul 4-Jul 18, 0000Z-2359Z, Northern NJ. North Jersey DX Association, W2B. 50th Anniversary of the North Jersey DX Association. 14.250 14.050 7.250 7.050. QSL. W2 QSL Bureau or direct to W2IRT, PO Box 1623, West Caldwell, NJ 07007-1623. **www.njdxa.org**

Jul 5, 1230Z-1900Z, Ashland, KY. River Cities Amateur Radio Association, K4S. 20th year, Summer Motion a community get-together. 146.94 14.240 7.240. Certificate. RCARA, PO Box 612, Ashland, KY 41105. **www.summermotion.com/** *or* **www.rcara.org**

Jul 5, 1400Z-2200Z, Smithville, TN. DeKalb County Amateur Radio Club, K4F. 37th Annual Smithville Fiddlers' Jamboree & Crafts Festival. 28.425 21.335 14.280 7.275. QSL. Wm Freddy Curtis, DeKalb County Amateur Radio Club, 288 Dogwood Cir, Smithville, TN 37166-2712. **www.dcarc.drivehq.com**

Jul 5, 1400Z-2030Z, Williamsburg, VA. Williamsburg Area Amateur Radio Club, K4RC. Celebrating the Proclamation of the Declaration of Independence. 14.261 7.261 3.951. QSL. KU4FP, 132 Druid Dr, Williamsburg, VA

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

23185. *Certificate offered for stations working all three of our Historic Triangle Events.* **www.k4rc.net/special.event.htm**

Jul 5, 1600Z-2300Z, San Diego, CA. USS *Midway* CV-41 Museum Radio Room, NI6IW. Commemorating Independence Day. 14.325 7.250 14.060 7.040. QSL. USS *Midway* CV-41 Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **af6ha@yahoo.com.**

Jul 5-Jul 6, 1600Z-2300Z, Winona, MN. Winona Amateur Radio Club, Inc, N2B. Season Five of the Great River Shakespeare Festival. 14.250 7.250. Certificate. Leslie Hittner, KØBAD, 1340 Conrad Dr, Winona, MN 55987. **www.w0ne.org**

Jul 9-Jul 13, 1800Z-2200Z, Austin, TX. Naturist Amateur Radio Club, NU5DE. Nude Awareness Celebration — Nude Recreation Week. 21.365 14.265 7.265. QSL. Naturist Amateur Radio Club, PO Box 200812, Austin, TX 78720-0812. **www.nu5de.org**

Jul 12, 0800Z-2100Z, Vernon, CT. Jesus Festival, K1J. 145.110. Certificate. John Winkley, 105 Oxford Dr, East Hartford, CT 06118. **gospeljohn7767@yahoo.com**

Jul 12, 1200Z-1700Z, Hamilton, OH. Butler County VHF Association, W8CCI. Celebrating the 50th anniversary of our club. 14.260 7.260 EchoLink w8cci-r. Certificate. John DeLaCroix, 67 Woodcrest Dr, Middletown, OH 45044. **w8wcq@cinci.rr.com** *or* **www.mindspring.com/~bcvhfa**

Jul 12-Jul 13, 1200Z-2200Z, Geneseo, NY. Squaw Island Amateur Radio Club, W2G. Geneseo, NY Airshow & Flying Tigers Reunion. 14.265 7.265. QSL. Norm Schrader, WB2GGM, 6009 Pine Haven Ln, Honeoye, NY 14471. **wb2ggm@yahoo.com** *or* **www.siarc.us**

Jul 12-Jul 13, 1600Z-2300Z, Hollister, CA. San Benito County ARES, N6LY. 61st Anniversary, Hollister Motorcycle Rally. 28.400 21.340 14.250 7.250. QSL. Harry Hill, 1060 Nez Perce Dr, Hollister, CA 95023. **www.sbcares.org**

Jul 12-Jul 20, 0100Z-2359Z, Cedar Rapids, IA. Rockwell Collins Amateur Radio Clubs, WØCXX. 50th Anniversary of the Collins S-Line. 14.285 14.050 7.285 7.050. QSL. Collin Amateur Radio Club, South Campus, HQ Station, 10211 Hall Rd, Cedar Rapids, IA 52411. *Collect 4 or more QSLs from 4 different facilities and mail to WØCXX for special certificate (QSLs will be returned).* **w5rok.us** *or* **w0cxx.us**

Jul 12-Jul 20, 0100Z-2359Z, Cedar Rapids, IA. Rockwell Collins Amateur Radio Clubs, NØCXX. 50th Anniversary of the Collins S-Line. 14.285 14.050 72.85 7.050. QSL. Rockwell Collins Amateur Radio Club, North Campus, 10211 Hall Rd, Cedar Rapids, IA 52411. *Collect 4 or more QSLs from 4 different facilities and mail to WØCXX for special certificate (QSLs will be returned).* **w5rok.us** *or* **w0cxx.us**

Jul 12-Jul 20, 0100Z-2359Z, Richardson, TX. Rockwell Collins Amateur Radio Clubs, W5ROK. 50th Anniversary of the Collins S-Line. 14.285 14.050 7.285 7.050. QSL. Rockwell Collins Amateur Radio Club, PO Box 833807 Mail Stn 461-290, Richardson, TX 75083-3807. *Collect 4 or more QSLs from 4 different facilities and mail to WØCXX for special certificate (QSLs will be returned).* **w0cxx.us** *or* **w5rok.us**

Jul 12-Jul 20, 0100Z-2359Z, Toulouse, France. Rockwell Collins Amateur Radio Clubs, F6KNZ. 50th Anniversary of the Collins S-Line. 14.285 14.050 7.285 7.050. QSL. Rockwell Collins Amateur Radio Club, 6 avenue Didier Daurat, Blagnac, France. *Collect 4 or more QSLs from 4 different facilities and mail to WØCXX for special certificate (QSLs will be returned).* **w5rok.us** *or* **w0cxx.us**

Jul 12-Jul 20, 0100Z-2359Z, Tustin, CA. Rockwell Collins Amateur Radio Clubs, W6CXX. 50th Anniversary of the Collins S-Line. 14.285 14.050 14.285 7.285. QSL. Rockwell Collins Amateur Radio Club, Southern California Chapter, 14192 Franklin Ave, M/S 550-100, Tustin, CA 92780. *Collect 4 or more QSLs from 4 different facilities and mail to WØCXX for special certificate (QSLs will be returned).* **w5rok.us** *or* **w0cxx.us**

Jul 12-Jul 20, 0200Z-2359Z, Melbourne, FL. Rockwell Collins Amateur Radio Clubs, W4CRC. 50th Anniversary of the Collins S-Line. 14.285 14.050 7.285 7.050. QSL. Rockwell Collins Amateur Radio Club, 1874 Palmer Dr, Melbourne, FL 32935. *Collect 4 or more QSLs from 4 different facilities and mail to WØCXX for special certificate (QSLs will be returned).* **w5rok.us** *or* **w0cxx.us**

Jul 13, 1800Z-2359Z, Cookeville, TN. Sons of Confederate Veterans, N4F. Confederate General Nathan Bedford Forrest Day. 14.270 7.270 3.870 145.270 FM EchoLink N4ECW-R. Certificate. Dennis M. Barrett, N4ECW, 1035 E 6th St, Cookeville, TN 38501. **n4ecw@arrl.net**

Jul 15-Jul 17, 1500Z-2100Z, Greenleaf, WI. Green Bay Mike & Key Club, K9EAM. Wisconsin Farm Technology Days. 14.230 7.250 3.875. Certificate. David Catalano, N8KQS, 2937 Beth Dr, Green Bay, WI 54311-7516. **n8kqs@sbcglobal.net** *or* **www.k9eam.com**

Jul 17-Jul 23, 1200Z-2100Z, Warren, OH. Warren Amateur Radio Association, W8P. 19th Annual Packard Car Show. 20 m 40 m. Certificate. Gail Wells, KC8LRH, 708 Delaware Ave SW, Warren, OH 44485. **kc8lrh@hotmail.com** *or* **www.w8vtd.org**

Jul 19, 1300Z-2000Z, Paris, TX. Red River Valley Amateur Radio Club, WB5RDD. 24th Annual Tour de Paris Bike Rally. 28.350 14.295 146.76 444.500. QSL. Leo Salas, N5JEP, PO Box 6103, Paris, TX 75461-6103. **www.wb5rdd.org**

Jul 19, 1300Z-1600Z, Wapakoneta, OH. Reservoir Amateur Radio Association, K8QYL. Celebrating the 39th anniversary of Moon Landing. 14.235 7.185. QSL. Rick Wagaman, WB8ZRQ, 240 Lincoln Dr, Celina, OH 45822. **rwag1@verizon.net**

Jul 19, 1800Z-2200Z, Los Alamos, NM. Los Alamos Amateur Radio Club, W5PDO. The Earthwatch Institute's Student Challenge Awards Program. 28.450 21.350 14.250. Certificate. Don Casperson, AA5PA, 1423 43rd St, Los Alamos, NM 87544. *From Fenton Hill Observatory.* **laastro.lanl.gov/earthwatch**

Jul 19, 1200Z-2400Z and **Jul 20, 1200Z-1800Z**, Holyoke, MA. Hampden County Radio Association, W1NY. American Legion 351 27th Annual Catfish Derby. 14.260 7.260. QSL. HCRA Catfish, PO Box, Agawam, MA 01001. **www.hcra.org**

Jul 19-Jul 20, 1300Z-2200Z, Cambridge, OH. Cambridge Amateur Radio Association, W8C. Zane's Trace, 200 year anniversary of the first road in the NW Territory. 14.260 7.235. QSL. George A. Alfman, 1975 N Moose Eye Rd, Norwich, OH 43767. *Look for other special events in main cities along the original Zane's Trace road across Ohio — from Wheeling, WV through OH to Maysville, KY.* **geoalfman@aol.com** *or* **www.w8vp.org**

Jul 19-Jul 20, 1300Z-2300Z, Forest City, IA. Winnebago-Itasca Travelers Ham Club, WØWIT. 50th Anniversary of Winnebago Industries. 14.263 7.253 3.970 147.27+. QSL. Frank Krizan, 1005 Talley Rd, Garland, TX 75044. **www.orgsites.com/ia/witcars**

Jul 19-Jul 20, 1300Z-0100Z, Springfield, MO. Southwest Missouri Amateur Radio Club, WØEBE. Celebrating 60 years of affiliation with ARRL. 14.275 7.275. QSL. Southwest Missouri ARC, PO Box 11363, Springfield, MO 65808. **www.smarc.org/specialevent**

Jul 19-Jul 20, 1300Z-2200Z, Zanesville, OH. Muskingum Valley Amateur Radio Group, W8Z. Zane's Trace, 200 year anniversary of the first road in the NW Territory. 14.260 7.235. QSL. George Alfman, 1975 N Moose Eye Rd, Norwich, OH 43767. *Look for other special events in several main cities along the original Zane's Trace road across Ohio — from Wheeling, WV through OH to Maysville, KY.* **geoalfman@aol.com**

Jul 25-Jul 26, 1200Z-2000Z, Berne, IN. Adams County Amateur Radio Club, W9A. Annual "Swiss Days" in the Swiss community of Berne, Indiana. 14.280 7.280 7.120 18.140. QSL. Adams Co Amateur Radio Club, c/o 604 Sprunger St, Berne, IN 46711. **wb9kqo.com**

Jul 25-Jul 27, 1500Z-0300Z, Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club, W9IMS. 15th running of the Brickyard 400. 21.340 14.240 7.240 3.840. QSL and certificate. Indianapolis Motor Speedway ARC, PO Box 18495, Indianapolis, IN 46218-0495. **www.w9ims.com**

Jul 26-Jul 27, 1400Z-0600Z, Leonore, IL. Starved Rock Radio Club, W9MKS. 75th anniversary of club founding. 14.290 7.240 3.900 146.55 FM. Certificate. Starved Rock Radio Club, PO Box 198, Leonore, IL 61332. **www.qsl.net/w9mks**

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/spev-form.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 **Mar** *QST* would have to be received by **Jan 1**. In addition to being listed in *QST*, your event will be listed on the ARRLWeb Special Event page. QST

K2TQN

OLD RADIO

3ZO and Mr Horace A. Beale, Jr — *Part 3*

station of prominence and an operator of significance. This was A. Bertha Hilton, first licensed as 3KO around 1923. She was recruited by Mr Horace A. Beale Jr to be his telegraph operator. After he built his ham station, 3ZO, she passed her Amateur Radio test and was issued the call 3KO. She was the primary radio operator for Mr Beale.

Tom Appleby commented about her in his autobiography, "Among the various operators of the amateur circuit was probably the first YL (young lady operator) Bertha Hilton, whom Mr Beale previously had employed as the company telegraph operator, and she became a full time amateur radio operator on the 3ZO circuit." [She may have been the first YL Tom knew, but she was not the first YL. — *Ed.*]

A Philadelphia newspaper originally published an article about Miss Frances Rice, W3AKB, of Philadelphia in late1930 or early 1931 saying that she was "believed to be the only girl in the state holding such a license." On April 30, 1931 they printed this story along with a small photo of A. Bertha Hilton:

"Two Penna. Girls Licensed Amateur Radio Operators

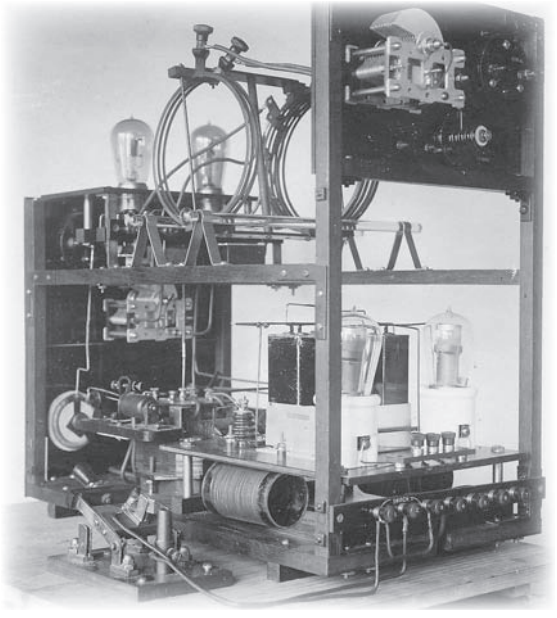
"Miss A. Bertha Hilton, Parkesburg and Miss Frances Rice, This City

"Parkesburg, Pa., April 30. - There are two girls in Pennsylvania, licensed as amateur wireless operators, it was revealed here after publication of an article concerning Miss Frances V. Rice, Philadelphia, who was believed to be the only girl in the state holding such a license.

"The other girl is Miss A. Bertha Hilton of Parkesburg who has had a similar license for the past eight years. At present her station W3KO, which she has built herself, is not in operation, but Miss Hilton stated it will be "on the air" again after minor repairs.

"Shortly after Miss Hilton received her license she became operator of station 3ZO, owned by the late H. A. Beale, Jr of Parkesburg. Miss Hilton said she has "worked" nearly all parts of the world. While she was operator of this station she was elected Superintendent of the third division of the American Radio Relay League. Miss Hilton is manager of the Western

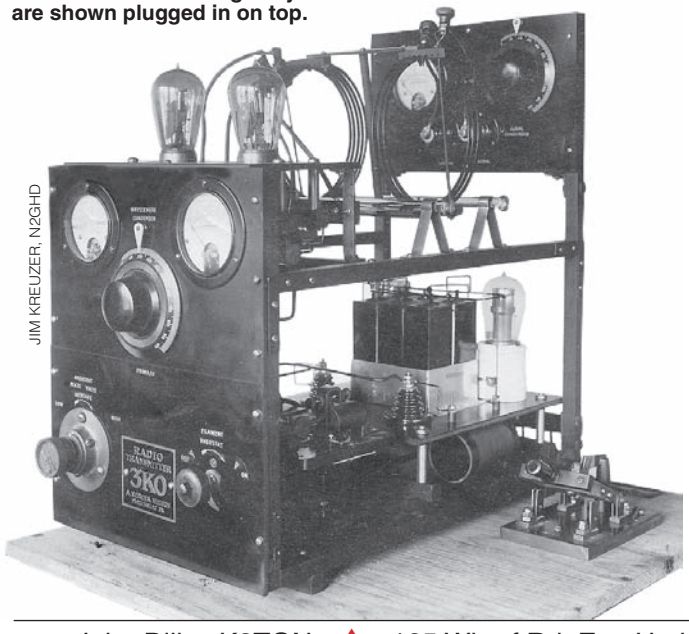
JIM KREUZER, N2GHD



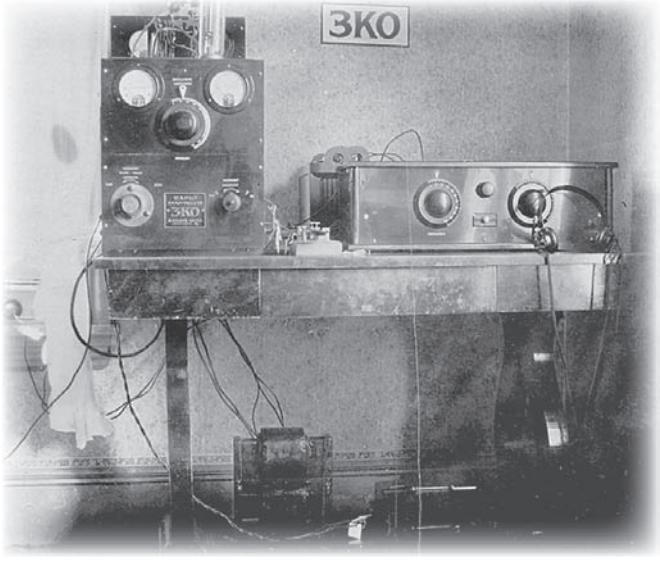
Rear view of the 3KO transmitter showing details of the wiring and parts placement.

The transmitter as originally built. Two 5 W tubes are shown plugged in on top.

JIM KREUZER, N2GHD



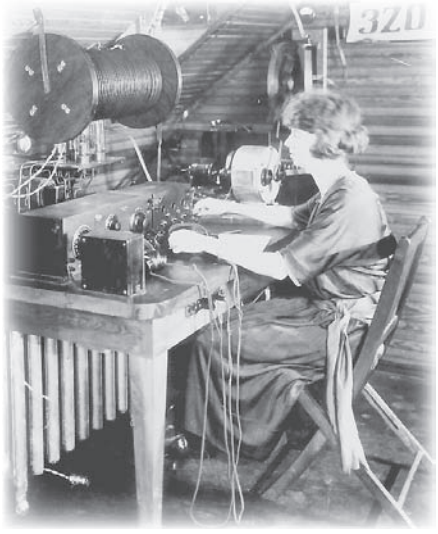
JIM KREUZER, N2GHD



The 3KO station that was set up in Bertha Hilton's home. The power supply is sitting in the open, under the table.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

JIM KREUZER, N2GHD, LLOYD JURY



Bertha operating the 3ZO station at Parkesburg.

JIM KREUZER, N2GHD

TWO PENNA. GIRLS LICENSED AMATEUR RADIO OPERATORS

Miss A. Bertha Hilton, Parkesburg and Miss Frances Rice, This City

Parkesburg, Pa., April 30.—There are two girls in Pennsylvania, licensed as amateur wireless operators, it was revealed here after publication of an article concerning Miss Frances V. Rice, Philadelphia, who was believed to be the only girl in the State holding such a license.

A. Bertha Hilton

The other girl is Miss A. Bertha Hilton, of Parkesburg who has had a similar license for the past eight years. At present her station W3KO, which she has built herself, is not in operation, but Miss Hilton stated it will be "on the air" again after minor repairs.

Shortly after Miss Hilton received her license she became operator of station 3ZO, owned by the late H. A. Beale, Jr., of Parkesburg. Miss Hilton said she has "worked" nearly all parts of the world. While she was op-

Union Telegraph Office at Downingtown [Pennsylvania]."

3KO on the Block

On November 20, 2005 eBay listed a beautiful early ham radio station. The seller was one of those stores who sell things belonging to others. The description and photos were excellent, they certainly attracted my attention, and I started bidding. Soon I realized that this was going to be expensive, so I bid some more; in fact I bid a lot and for a while I was top bidder. It was not to be, as a last minute bidder came along and bid enough to win. Luckily I knew him; he was my collector friend Jim Kreuzer, N2GHD. In a short while I asked him for photos of the equipment and copies of the original photos that were included with the station. He agreed.

After receiving the photos and information from him, I was able to match them up with the other information I had from Tom Appleby's autobiography and his time in Parkesburg. It all became the story I started in the May 2008 column. Of course in owning such a historic station I feel one should display it so others may learn from it. My friend ended up selling it to a collector in Texas who has not set it up in a display as yet. If I receive photos of his display, I will post them on my Web page **www.k2tqn.com/** so everyone can see the excellent job that Tom Pamula, KA3MJN, did in the restoration. I have not heard if it has been on the air yet, but I suspect it probably has not.

Even though the newspaper article mentioned that Bertha built the station, both Lloyd Jury and I see the strong influence of Tom Appleby in both the transmitter and receiver. They resemble the other equipment he built early on for Mr Beale and, since she was the operator there, he probably helped her with the parts and perhaps some of the assembly.

Tom Appleby said, "The first power vacuum tube was only rated at 5 watts output and so many had to be used in order to generate any considerable amount of power, added to their disadvantage of not operating very well in parallel, so we temporarily decided to concentrate on a few low power transmitters."

An Early Appleby Transmitter

I think this was one of those transmitters. If you look at the original photos, you will see two 5 W tubes in it. Later, when it was sold on eBay, it had one 5 W tube and one 50 W tube in it, obviously modified for higher power.

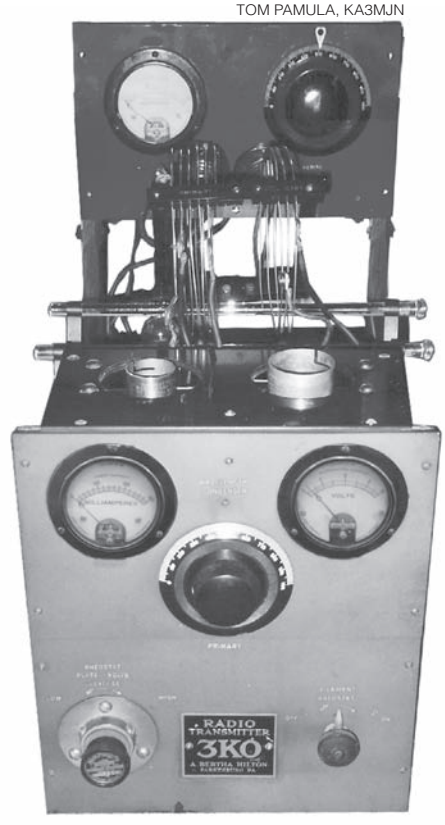
Looking carefully at the name plate attached to the front panel, it is obvious that it was professionally cast in a foundry, probably where she worked.

Lucky for all of us, the station survived for many years in someone's attic or basement and the relatives thought enough to pass it on to others who would appreciate it and preserve it.

A note about the 3ZO QSL card in the June column. If you look carefully at the signature "B" near the bottom, and compare it to the "B" in her signature shown here, you will note they are almost exactly the same. It is obvious that she was the operator for that QSO.

The last information I have about the station came from the eBay seller. It was in a response to a question posed by Carl Nord, WA1KPD: "Yes, it came from our Clients Grandfather's estate located in Seville, Ohio. Farnum Forbes was the name of the Grandfather who has since passed away. The family is not sure how long she was active in HAM. The last they think they know is the late 1940s to possibly early 1950s."

TOM PAMULA, KA3MJN



3KO transmitter as restored by Tom Pamula, KA3MJN. Note the larger tube socket for the 50 W tube on the right. This was a modification by Bertha Hilton for higher power.

If anyone has any information about Bertha Hilton, Farnum Forbes or possibly Bertha Forbes in Seville, Ohio, please contact me by e-mail. It would be nice to learn about what she did after Parkesburg. I'll add the information to the Web page I'm creating about her on **www.k2tqn.com/**. You can check there from time to time for updated information. I'll also have all the photos, and there were a lot of them, from the eBay seller of the 3KO station in 2005.

One correction: All of the 3ZO photos I used in the columns were provided by Lloyd Jury, twin brother of Floyd Jury, W3OLV. Lloyd personally knew Bertha Hilton. My apologies to Lloyd for mixing up the names.

Next month I plan to have a short story called, "Where in the world is the *Bowdoin*?" I was up in Maine recently visiting her.

— *K2TQN* QST

COMING CONVENTIONS

ROCKY MOUNTAIN DIVISION CONVENTION

July 11-13, Bryce Canyon, Utah

F D V S

The Rocky Mountain Division Convention, sponsored by the Utah Hamfest Committee, will be held at Ruby's Inn, 1000 S Hwy 63. Doors are open Friday 2 PM to Sunday 11 AM. Features include BBQ/Eyeball QSO Party (Friday eve, $11); swapmeet (outside, free; bring your own tables); dealers; seminars and forums; VE sessions (Saturday, promptly at 2:30 PM); Dutch Oven Dinner (Saturday eve, $16); women's and children's activities; QSL card checking; contests (CW, QLF, Mobile Installation, Transformer Toss, Transmitter Hunts); Wouff Hong ceremony; Sunday Breakfast with Keynote Speaker Katie Breen, W1KRB, ARRL Membership Manager; camping. Talk-in on 146.98, 447.575. Admission is $12 in advance (under 18, $5), $15 at the door (under 18, $7). Contact Bob Anderson, AA7TR, 995 N Tremont St, Tremonton, UT 84337; 435-863-5272 (days), 435-257-2154 (eves); **aa7tr@arrl.net**; or Eugene McWherter, N7OVT, **n7ovt@arrl.net**; **www.utahhamfest.org**.

OMIK CONVENTION

July 15-20, Baton Rouge, Louisiana

H V S

The OMIK Convention (56th Annual Convention), sponsored by the OMIK ARA, will be held at the Holiday Inn South, 9940 Airline Hwy. Doors are open 9 AM-11 PM. Features include technical sessions, meetings, tours of New Orleans and the Baton Rouge areas, mobile shootouts, hospitality suite and radio room, Saturday eve scholarship award banquet (7 PM), VE sessions, handicapped accessible. Talk-in on 145.45 (107.2 Hz). Admission is $30. Tables are $10. Contact Amos Favorite, W5SJL, 17542 Five Oaks Dr, Baton Rouge, LA 70810; 225-719-3077; fax 225-753-5212; **w5sjl@msn.com**; **www.omik2008.com**.

OKLAHOMA STATE CONVENTION

July 18-19, Oklahoma City

F D V S

The Oklahoma State Convention ("Ham Holiday 2008"), sponsored by the Central Oklahoma Radio Amateurs, will be held at the Oklahoma State Fair Park (Oklahoma Expo Hall), NW 10th St and May Ave. Doors are open Friday 4-8 PM, Saturday 8 AM-3 PM. Features include 33rd Annual Ham Holiday, flea market, vendors (contact **kc5qcv@cox.net** for details), technical and non-technical programs, WAS card-checking, VE sessions. Talk-in on 146.82 (151.4 Hz). Admission is $7 in advance, $10 at the door; under 16 free with paying adult. Tables are $15 in advance, $20 at the door (if available); electrical hookup $10. Send pre-registrations to William Roberson, N5AQ, c/o "CORA Ham Holiday 2008," 1629 Rolling Stone Dr, Norman, OK 73071-1430; or contact Bill Wilburn, N5NUK, 405-843-4705; fax 405-841-2624; **n5nuk@sbcglobal.net** or **hamholiday@hotmail.com**; **www.HamHoliday.org**.

MONTANA STATE CONVENTION

July 18-20, Essex

F D V S

The Montana State Convention (74th Annual Glacier-Waterton International Peace Park Hamfest), sponsored by the Great Falls Area ARC, will be held at the Glacier Meadow RV Park, US Hwy 2 (Mile Marker 191). Features include vendors; dealer displays; tailgating; bunny hunts; lots of seminars (QRP, APRS, ATV, Repeater Linking, DXCC); meetings (QCWA, annual hamfest, ARES, ARRL, RAC); contests (high speed CW); old equipment auction; DXCC, VUCC, and WAS field card checking; VE sessions; camping; potluck and barbeque. Talk-in on 146.52, 146.7. Admission is $18 in advance, $25 at the door. Tables are $5. Contact George Forsyth, AA7GS, 212 Skyline Dr, Great Falls, MT 59404; 406-868-2212; fax 406-453-8661; **aa7gs@arrl.net**; **www.gwhamfest.org**.

July 4
Eastern Pennsylvania Section, Bressler*

August 16-17
Southeastern Division, Huntsville, AL

August 17
Kansas State, Salina

August 22-24
New England Division, Boxboro, MA

August 23-24
Roanoke Division, Weston, WV

August 24
Western Pennsylvania Section, New Kensington

September 5-6
Arkansas State, Mena

*See June *QST* for details.

CENTRAL STATES VHF CONFERENCE

July 24-26, Wichita, Kansas

F D H S

The Central States VHF Society Conference (42nd Annual Conference), sponsored by the Central States VHF Society, will be held at the Hilton Wichita Airport Executive Conference Center, 2098 Airport Rd. Doors are open Thursday evening, all day Friday and Saturday. Features include technical presentations, antenna range, noise figure testing/pre-amp workshop, rover row/dish bowl, poster sessions/table-top displays, dealer/vendor area, flea market, Saturday eve banquet, hospitality suite, handicapped accessible. Registration is $40 in advance, $45 at the door. Contact Mel Graves, WRØI, 320 Lulu, Wichita, KS 67211; 316-945-5535; fax 316-945-0402; **wr0i@sgdrugfree.com**; **www.csvhfs.org**.

TEXAS STATE CONVENTION

August 1-2, Austin

F D H V S

The Texas State Convention (Austin Summerfest 2008), co-sponsored by the Austin ARC and the Texas VHF-FM Society, will be held at the Wyndham Garden Hotel and Conference Center, 3401 S IH-35. Doors are open Friday 5-9 PM, Saturday 8 AM-5 PM. Features include indoor swapfest, outdoor tailgate swap area, ARRL sessions, seminars (WX, DX, Microwave, QRP), annual Texas VHF-FM Society meeting, VE sessions (Saturday, 12:30 PM, all elements; Larry Gunter, WB5BEK, **wb5bek@arrl.net**). Talk-in on 146.34/.94, handicapped accessible. Admission is $8 in advance, $10 at the door. Tables are $10 each (limit of 3 to a customer; first come-first served basis); power is available at an additional $5 charge (through advance registration only). Contact Joe Makeever, W5HS, 8609 Tallwood Dr, Austin, TX 78759; 512-345-0800; **w5hs@arrl.net**; **www.austinsummerfest.org**.

PACIFIC NORTHWEST DX CONVENTION

August 1-3, Portland, Oregon

H S

The Pacific Northwest DX Convention (53rd Annual Event), sponsored by the Willamette Valley DX Club, will be held at the Monarch Hotel and Conference Center, 12566 SE 93rd Ave (Clackamas). Doors are open Friday 6 PM to Sunday 11 AM. Features include hospitality suite, QSL Bureau card sort, DXCC field card checking, technical sessions, special guest speakers (Ward Silver, NØAX; Rudy Severns, N6LF; Bill Vanderheide, N7OU; Bob Norin, W7YAQ), Saturday eve banquet ($26), Sunday breakfast buffet ($16), handicapped accessible. Talk-in on 147.14 (107.2 Hz). Admission is $25. Contact Al Rovner, K7AR, 18809 NE 21st St, Vancouver, WA 98684; 360-256-7437; **k7ar@arrl.net**; **wvdxc.org/dxconvention**.

3.905 CENTURY CLUB EYEBALL CONVENTION

August 1-3, Hanover, Pennsylvania

S

The 3.905 Century Club Eyeball Convention, sponsored by the 3.905 Century Club, will be held at the Pleasant Hill Volunteer Fire Company, 2941 Baltimore Pike (W Manheim Township). Doors are open Friday 9 AM-10 PM, Saturday 9 AM-10 PM, Sunday 8 AM-noon. Features include Antenna Shootout contest (Saturday morning), forums, guest speakers, awards ceremony, annual board meeting, Saturday eve banquet, Sunday morning breakfast, RV camping (first night $25; $20 per each additional night). Talk-in on 147.135. Registration is $30; 12 and under $15. Contact Bill Dobson, N3WD, Box 922, Reisterstown, MD 21136; 443-465-6583; **n3wd@arrl.net**; **www.n3wd.org/n3wd/2008%20Eyeball.htm**.

ALASKA STATE CONVENTION

August 1-4, Anchorage

D H V S

The Alaska State Convention (37th Annual Hamfest), co-sponsored by the Anchorage ARC, Matanuska ARA, Moose Horn ARC, and Arctic ARC, will be held at the Anchorage Sheraton Hotel, 401 E 6th Ave. Doors are open Friday 1-8 PM, Saturday 7 AM-midnight, Sunday 9 AM-5 PM, Monday 6 AM-8 PM (HAARP Tour). Features include AR presentations, technical and educational seminars, prominent speakers (including special guest ARRL President Joel Harrison, W5ZN), national vendors and exhibitors, ham radio equipment and accessories sales, Special Event Stations, hospitality suite, tours and events, transmitter hunt, VE sessions, banquets and luncheons, Wouff Hong ceremony, handicapped accessible. Talk-in on 147.27 (103.5 Hz). See event web site for various registration fees. Tables are $20. Contact Richard Tweet, KL2AZ, Box 101987, Anchorage, AK 99519; 907-278-9338; **secretary@kl7aa.net**; **www.akhamfest.com**.

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

ILLINOIS STATE CONVENTION

August 3, Bolingbrook

F D V S

The Illinois State Convention (23rd Annual Event), sponsored by the Bolingbrook ARS, will be held at Bolingbrook High School, 365 Raider Way (enter door #17). Doors are open for setup at 6 AM; public 8 AM-1 PM. Features include huge outdoor flea market, vendors, AR gear, computer items, electronics, forums (ARRL, EMCOMM, ARES, D-Star), VE sessions (9 AM-noon; walk-ins welcomed), DXCC QSL card checking, outdoor emergency equipment displays, free parking on paved lot. Talk in on 147.3 (107.2 Hz), 224.54. Admission is $6 in advance, $8 at the door. Tables are $12 (without power), $15 (with power) in advance; $20 (without power), $25 (with power) at the door. Contact Tom Ballard, N9LJY, 19 W 609 Dystrup Ave, Lemont, IL 60439; 630-739-3740 (before 9 PM); fax 312-499-7602; **tb1301@comcast.net**; **www.k9bar.org**.

DAKOTA DIVISION CONVENTION

August 8-10, Rochester, Minnesota

F D H V S

The Dakota Division Convention (Rochester AR Expo), sponsored by the Rochester ARC, will be held at the Rochester University Center Regional Recreational Sports Center, 851 30th Ave SE. Doors are open Friday 4-9 PM, Saturday 8 AM-5 PM, Sunday 8 AM-noon. Features include flea market; buy and sell ham-related equipment; commercial vendors; Friday eve banquet ($25); WØ DXCC, VHF WØ DXCC, and Contest Central programs with special prominent speakers; DXCC card checking; special guests from ARRL Hq (Contest Branch Manager Sean Kutzko, KX9X, and Emergency Preparedness and Response Manager Dennis Dura, K2DCD); Youth in Radio forums; Special Event Station; VE sessions (Saturday and Sunday morning; all levels of licenses, $14; walk-ins welcomed); free parking; handicapped accessible; refreshments. Talk-in on 146.82 (100 Hz). Admission is $9 in advance, $10 at the door (RARExpo); $25 (WØ DXCC and Contest Central). Tables are $15 (flea market), $25 (commercial vendors); electricity $25 extra (must reserve). Contact KariAnn Wiles, KCØWIP, Box 1, Rochester, MN 55903; 507-280-4003; fax 507-287-1862; **kc0wip0802@yahoo.com**.

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

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 **July 1** to be listed in the **September** 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, *TI* = Talk-in frequency, *Adm* = Admission.

Alabama (Cullman) — Jul 26 F D H V S
7 AM-3 PM *Spr:* Cullman ARC. Cullman County Fairgrounds, Sportsman's Lake Rd. 2nd Annual Mid-Summer Swapfest, Friday eve barbeque party ($5, reservations requested but not required), flea market, tailgating ($5 per space plus admission), vendors, forums, VE sessions (11:15 AM), handicapped parking area, RV parking with hookups available by reservation ($25 per space, includes admission), refreshments. *TI:* 145.31. *Adm:* $5 per car (passengers included); $2 per walk-in person; under 13 free. Tables: $10 (power $5 extra); commercial vendors $20 for display space plus table fee. Charles McBrayer, WB4PED, 614 6th Ave SE, Cullman, AL 35055; 256-708-1000; fax 205-237-3546; **cmcbrayer@corrwireless.com**; **www.qsl.net/cullmanarc**.

Alaska (Anchorage) — Aug 1-4, Alaska State Convention. See "Coming Conventions."

California (Goleta) — Aug 10 F D V
8:30 AM-2:30 PM *Spr:* Santa Barbara ARC. Santa Barbara Elk's Lodge #613 Picnic Grounds, 150 N Kellogg Ave. Hamfest and Family Reunion, flea market, vendors, demos, ARRL Bookstore, VE sessions, Santa Barbara-style BBQ. *TI:* 146.79 (131.8 Hz). *Adm:* Free. Alan Soenke, WA6VNN, 497 Camino Talavera, Goleta, CA 93117; 805-967-1772; fax 805-967-3735; **wa6vnn@sbarc.org**; **www.sbarc.org**.

Connecticut (Ledyard) — Aug 9 D H V
Set up 7 AM; public 9 AM-1 PM *Spr:* Radio Amateur Society of Norwich. Gales Ferry Firehouse, 1772 Rte 12. Vendors, information table, VE sessions (registration 9:30 AM, testing 10 AM), handicapped accessible, refreshments. *TI:* 146.73 (156.7 Hz). *Adm:* $4. Tables: $15 (6-ft); $13 (5-ft); all tables are indoor. Wayne Rosenfield, KB1NKK, 206-350-3064 (phone and fax); **rason@snet.net**; **www.rason.org**.

Florida (Fort Pierce) — Aug 9 V S
8 AM-2 PM *Spr:* Fort Pierce ARC. Indian River Community College, 3209 Virginia Ave. Forums, VE sessions. *TI:* 147.345, 444.8 (both 107.2 Hz). *Adm:* $5. Tables: $15 (with electricity), $10 (without electricity). Pete Amar, KD4SPW, 1046 Trinidad Ave, Ft Pierce, FL 34982; 772-465-5204 or 772-519-1530; **kd4spw@aol.com**; **www.qsl.net/w4akh**.

Florida (Milton) — Jul 11-12 F V
Friday 5-9 PM; Saturday 8 AM-2 PM *Spr:* Milton ARC. Santa Rosa County Auditorium, 4530 Spikes Way. 13th Annual Hamfest, VE sessions (Saturday, 8 AM-noon). *TI:* 145.49. *Adm:* $3. Tables: $8. Ken Dunn, K4SVX, 4814 Williams Rd, Milton, FL 32571; 850-994-5726; **k4svx@inbox.com**; **www.miltonarc.org**.

Georgia (Ellijay) — Aug 9 F V
Set up Friday 5-9 PM, Saturday 6 AM; public 7 AM-2 PM *Spr:* Ellijay ARS. Ellijay Lions Club, 1729 S Main St (old Hwy 5 S). Inside tables, tailgate area, VE sessions (11 AM), barbeque lunch, refreshments. *TI:* 145.17, 443.975 (both 100 Hz). *Adm:* $5. Tables: Free. Sam Underhill, K4SWU, Box 1371, East Ellijay, GA 30539; 706-276-4877; **k4swu@ellijay.com**; **www.ngamtn.com/w4hhh/**.

Illinois (Aurora) — Jul 13 F D H V S
Set up Saturday 5-7:30 PM, Sunday 6-8 AM; public 8 AM-2 PM *Spr:* Fox River Radio League. Aurora Central Catholic High School, 1225 N Edgelawn Dr. Huge paved outdoor flea market, commercial vendors, new and used Amateur Radio equipment, educational forums, VE sessions (10 AM), hidden transmitter hunt, handicapped accessible, free parking, refreshments. *TI:* 147.21 (103.5 Hz). *Adm:* advance $6, door $8. Tables: $10. Dean Holste, KC9EOQ, c/o FRRL, Box 673, Batavia, IL 60510; 630-966-8521; **hamfest@frrl.org**; **www.frrl.org**.

Illinois (Bolingbrook) — Aug 3, Illinois State Convention. See "Coming Conventions."

Illinois (Carlinville) — Aug 2 V
7 AM-2 PM. *Sprs:* Macoupin and Montgomery County ARCs. Macoupin County Fairgrounds, IL State Route 4 N. Hot Air Balloon Launch, VE sessions. *TI:* 146.82, 444.25 (both 103.5 Hz). *Adm:* advance $4, door $5. Tables: $5. Jim Pitchford, N9LQF, c/o Macoupin County RC, Box 253, Carlinville, IL 62626-0253; 217-854-3352; fax 217-854-8477; **k9mce@hotmail.com**.

Illinois (Peotone) — Jul 20 F H V
6 AM (flea market), 8 AM (indoor sales) *Spr:* Kankakee Area Radio Society. Will County Fairgrounds, Wilmington/Peotone Rd. 25th Annual Hamfest, VE sessions, handicapped accessible. *TI:* 146.94 (107.2 Hz). *Adm:* advance $6, door $8. Tables: $10 (first table), $8 (for each additional table). Carl Schroeder, K9CS, 1505 N 2000 East Rd, Watseka, IL 60970; 815-473-4263; **kn2qzr@hotmail.com**; **www.w9az.com**.

Illinois (Peotone) — Aug 10 F D H V
6 AM-3 PM *Spr:* Hamfesters RC. Will County Fairgrounds, Wilmington/Peotone Rd. 74th Annual Hamfest, flea market, dealers, vendors, VE sessions, handicapped accessible. *TI:* 146.52. *Adm:* advance $6, door $8. Tables: $15.

Mr. Kerry Nelson, AA9SB, 3404 Hazel Ln, Hazel Crest, IL 60429; 708-335-4574 (phone and fax); **kw_nelson@earthlink.net**; **www.hamfesters.org**.

Illinois (Quincy) — Aug 9 F V
8 AM-1 PM *Spr:* Western Illinois ARC. Eagles Alps, 3737 N 5th St. Swapfest, free tailgating, VE sessions. *Tl:* 147.03 (103.5 Hz). *Adm:* advance $4, door $5. Tables: $10. Danny Pease, NG9R, Box 231, Camp Point, IL 62320; 217-430-2046; **ng9r@arrl.net**; **www.w9awe.org**.

Indiana (Indianapolis) — Jul 12 F V S
6 AM-3 PM *Spr:* Indianapolis Hamfest Assn. Camp Sertoma, 2316 S German Church Rd. Indoor and outdoor flea markets, forums, VE sessions. *Tl:* 146.76. *Adm:* advance $6, door $8. Tables: $15. Bob Blake, N9FIM, 11064 Indian Lake Blvd, Indianapolis, IN 46236; 317-261-6658; **bob9fim@att.net**; **www.indyhamfest.com**.

Iowa (Cedar Rapids) — Aug 3 H V
8 AM-1:30 PM *Spr:* Cedar Valley ARC. Teamsters Hall, 5000 J St SW. VE sessions, handicapped parking. *Tl:* 146.745, 146.52. *Adm:* $5. Tables: $10. Rick Olney, NØXZL, 1574 W Mt Vernon Rd, Mt Vernon, IA 52314; 319-396-8979; **rolney@qwest.net**; **cvarc.rf.org**.

Kansas (Wichita) — Jul 24-26, Central States VHF Conference. See "Coming Conventions."

Kentucky (Lawrenceburg) — Aug 10 V S
8 AM-2 PM *Spr:* Bluegrass ARS. American Legion Post #34, 725 W Broadway (US Rte 62). ARRL forum, Kentucky ARES forum, Silent Auction, VE sessions (Fernie Williams, KE4MAI, 859-245-2140; **ke4mai@arrl.net**). *Tl:* 146.76, 145.39. *Adm:* advance $5, door $6. Tables: advance $15, door $25. Jeanie Dalton-Pugh, KB8QLC, Box 4411, Lexington, KY 40544-4411; 859-619-8164; **kb8qlc@arrl.net**; **www.BluegrassARS.org.**

Louisiana (Baton Rouge) — Jul 15-20, OMIK Convention. See "Coming Conventions."

Louisiana (Leesville) — Aug 9 F V S
7:30 AM-1 PM *Spr:* West Central Louisiana ARC. First United Methodist Church of Leesville, 202 W North St. 33rd Annual Hamfest, ARRL forums, VE sessions. *Tl:* 145.31 (203.5 Hz). *Adm:* $5. Tables: First one free with entrance ticket; additional tables $5 each. Lonnie Jacobs, W5LPJ, 12326 Lake Charles Hwy, Leesville, LA 71446; 337-239-4888; fax 337-462-0305; **lojos@cebridge.net**; **www.wclarc.com**.

Louisiana (Slidell) — Jul 19 F D V S
8 AM-2 PM *Spr:* Ozone ARC. Slidell City Auditorium, 2056 Second St. Flea market, commercial dealers, QLF contest, forums, VE sessions. *Tl:* 147.27 (114.8 Hz). *Adm:* $5. Tables: $7. Mike King, W5PY, 592 Marina Dr, Slidell, LA 70458; 985-641-0831 or 985-640-7708 (cell); **w5py@arrl.net**; **www.w5sla.net**.

Maine (St Albans) — Aug 9 F V
8 AM-noon *Spr:* Piscataquis ARC. Sno-Devils Snowmobile Club, 9 Bryant Rd (Rte 152). 24th Annual Hamfest, free tailgating, VE sessions (9 AM, all classes; walk-ins welcomed), dry camping, breakfast and lunch on site. *Tl:* 146.52, 146.85. *Adm:* $5, under 12 free. George Dean, WA1JMM, 39 Railroad Ave, Brownville, ME 04414; 207-441-6112; **wa1jmm@roadrunner.com**; **www.qsl.net/parc/**.

Maine (Union) — Jul 12 F V
Set up 7 AM; public 8 AM-1 PM *Spr:* Pen-Bay ARC. Thompson Community Center, 51 S Union Rd. Indoor flea market only (no tailgating), VE sessions, refreshments. *Tl:* 145.49 (91.5 Hz). *Adm:* $5, under 12 free with paying adult. Tables: $4. Scott Ewen, KB1DSW, 408 River Rd, Cushing, ME 04563; 207-354-6809.

Maryland (West Friendship) — Jul 20 F H V
8 AM-3 PM *Spr:* Baltimore RA Television Society. Howard County Fairgrounds, Rte 144 at Rte 32. Hamfest/Computerfest, giant flea market, outdoor exhibit areas, computers, 300 tailgating spaces (grounds open 6 AM), DXCC/WAS card checking, free VE sessions (check-in 8:30 AM, exams 9 AM only; pre-registration required, 301-572-5124 6-9 PM; **creewb3gxw@aol.com**), handicapped accessible, refreshments. *Tl:* 147.03, 224.96, 448.325. *Adm:* $6, under 12 free. Tables: $30 (in advance only, prior to Jul 12). Les McClure, W3GXT, c/o BRATS, Box 5915, Baltimore, MD 21282; 410-461-1212 (voice or fax); **lesmcclure@comcast.net** or **brats@bratsatv.org; www.bratsatv.org**.

Massachusetts (Cambridge) — Jul 20. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Escanaba) — Aug 2 F S
9 AM-2 PM *Spr:* Delta County ARS. Bay de Noc Community College, 2001 N Lincoln Rd. Swap area, group meeting, forums. *Tl:* 147.15 (107.2 Hz). *Adm:* $5. Tables: $5. John Anderson, WD8RTH, Box 295, Wells, MI 49894-0295; 906-789-9148; fax 906-789-6914; **wd8rth@dcars.org**; **www.dcars.org**.

Michigan (Hale) — Aug 9 F V
8 AM *Spr:* Iosco County AR Enthusiasts. Plainfield Township Hall, 220 N Washington (M-65). Ham Swap, electronic equipment, VE sessions. *Tl:* 146.64. *Adm:* advance $4, door $5. Tables: $7. Clifford Dolliver, N8HA, 3636 Glennie Rd, Glennie, MI 48737; 989-735-3186; **n8ha@centurytel.net**; **w8icc.com**.

Minnesota (Brainerd) — Jul 12 F D V S
Set up Friday noon-4:30 PM, Saturday 7 AM; public 9 AM-1 PM *Spr:* Brainerd Area ARC. National Guard Armory, 1115 Wright St. 8th Annual Hamfest, all events and sales indoors, commercial vendors, AR and computer equipment, VE sessions (10 AM), VSWR Seminar, free parking, refreshments. *Tl:* 147.225. *Adm:* $5, under 12 free. Tables: $10 (plus admission; best to reserve in advance). Al Doree, WØRC, 33247 E Shamineau Dr, Motley, MN 56466; 218-575-2404; **doreeaj@brainerd.net**; **www.brainerdham.org**.

Minnesota (Rochester) — Aug 8-10, Dakota Division Convention. See "Coming Conventions."

Minnesota (St Paul) — Jul 26 F
8 AM-noon *Spr:* Magic Repeater Group. Art's (KAØJLB) QTH, 37 Hatch St. Free Swapmeet/Yard Sale. *Tl:* 145.17. *Adm:* Free. Tables: Free. George Lavallee, NØSBU, 5578 141st St N, Hugo, MN 55038; 651-429-5948; **n0sbu@arrl.net**; **www.magicrepeater.net**.

Missouri (St Charles) — Aug 3 F D V
6 AM-noon (flea market); 8 AM-noon (building/vendors). *Spr:* St Charles ARC. American Legion Hall, 2500 Raymond Dr. 36th Annual Hamfest, flea market, vendors, VE sessions. *Tl:* 146.67. *Adm:* $3. Tables: $15. David Livingston, WBØRAB, 280 Diekamp Ln, St Charles, MO 63303; 314-973-0783; **dlivinston@charter.net**; **www.wb0hsi.org**.

Missouri (Warrensburg) — Jul 19 V S
8 AM-1 PM *Spr:* Warrensburg Area ARC. Johnson County Fairgrounds, Hwy 50. Forum (building duplexers for repeaters), VE sessions. *Tl:* 146.88 (107.2 Hz). *Adm:* $4. Tables: $10. Keith Raihala, NØVJ, 457 NW 501st Rd, Warrensburg, MO 64093; 660-422-7273; **n0vj@arrl.net**; **www.waarci.org**.

Missouri (Washington) — Jul 20 F D V S
6 AM-1 PM *Spr:* Zero Beaters ARC. Bernie E. Hillerman Park, Grand Ave. 46th Annual Hamfest, ham radio and computer flea market, commercial vendors, display of county emergency vehicles, technical sessions, ham radio demonstrations, VE sessions, free parking, refreshments. *Tl:* 147.24. *Adm:* Free. Tables: $10. Jim Glasscock, WØFF, 8300 Whiskey Creek Rd, Union, MO 63084; 636-584-8888; **foxfoxdxer@gmail.com**; **www.wa0fya.org**.

Montana (Essex) — Jul 18-20, Montana State Convention. See "Coming Conventions."

Nebraska (North Bend) — Jul 12 F H
Set up 7:30 AM; public 9 AM-12:30 PM *Spr:* Pioneer ARC. St Charles Parish Center, 8th and Locust Sts. 11th Annual Flea Market, air-conditioned building, easy parking, handicapped accessible, breakfast and lunch available. *Tl:* 146.67. *Adm:* $2. Tables: $5. Rich Mehaffey, KBØARZ, 1525 County Rd 5, North Bend, NE 68649; 402-652-3410; fax 402-352-8713; **4randjme@futuretk.com**; **www.k0jfn.com**.

New Jersey (Augusta) — Jul 13 F
8 AM *Spr:* Sussex County ARC. Sussex County Fairgrounds, Plains Rd. Flea market, food service. *Tl:* 147.3 (151.4 Hz). *Adm:* $6. Tables: $15. Dan Carter, N2ERH, 8 Carter Ln, Branchville, NJ 07826; 973-948-6999; **hamfest@scarcnj.org**; **www.scarcnj.org**.

New York (Alexander/Batavia) — Jul 19 F V
7 AM-3 PM *Spr:* Genesee Radio Amateurs. Alexander Firemens Grounds, 10708 Rte 98. 28th Annual Summer Hamfest, VE sessions, Echo Link. *Tl:* 147.285. *Adm:* advance $6, door $7. Tables: $10. Rob McLean, KC2MHH, 220 W Main St, Batavia, NY 14020; 585-343-1347 (phone and fax); **kc2mhh@verizon.net**; **www.geocities.com/gram_radio_club?index.html**.

New York (Frankfort/Utica) — Jul 19 F V
Set up 6 AM; public 8 AM-1 PM *Spr:* Utica ARC. Herkimer County Fairgrounds, Cemetery St. RadioCom 2008, Arts and Crafts Fair in addition to hamfest, VE sessions. *Tl:* 146.76. *Adm:* $5. Tables: $6 plus $3 per indoor space (plus admission). Bob Decker, AA2CU, 4 Forest Rd, Utica, NY 13501; 315-797-6614; **tbd2626@yahoo.com**; **www.uticaarc.com**.

New York (Howard) — Aug 9 D V
Set up 6 AM; public 7 AM-1 PM *Spr:* Keuka Lake ARA. The Friends of Howard, Inc Community Building, 7481 Hopkins Rd. Vendors, VE sessions, ladies events. *Tl:* 145.19. *Adm:* $5. Richard Torrey, W2RMT, 2 Whitney Valley Ext, Almond, NY 14804; 607-276-6011; **hamfest@xdrcertified.com**; **www.klara.us**.

New York (Ithaca) — Aug 2 V
7 AM-2 PM *Spr:* Tompkins County ARC. Trumansburg Fairgrounds, 2150 Trumansburg-Ithaca Rd (NYS Rte 96). Free crystal radio build for children, free tube testing, VE sessions. *Tl:* 146.97 (103.5 Hz). *Adm:* advance $4, door $5. Tables: $10. Doug Reid, NE2T, 105 Sheldon Rd, Ithaca, NY 14850; 607-257-6066; **ne2t@arrl.net**; **tcarc.compcenter.com**.

North Carolina (Cary) — Jul 19 F V
8 AM-2 PM *Spr:* Cary ARC. Ritter Park Pavilion, 301 W Lochmere Dr. 36th Annual Swapfest, tailgating ($5 per space), VE sessions. *Tl:* 146.88. *Adm:* $3. Tables: $10. Herb Lacey, W3HL, 1022 Medlin Dr, Cary, NC 27511; 919-467-9608; **infoman@bellsouth.net**; **www.qsl.net/n4nc**.

North Carolina (Fayetteville) — Aug 9 F H V
8 AM-noon *Spr:* Cape Fear ARS. Methodist University (Reeves Auditorium), 5400 Ramsey St. 10th Annual Swapfest, VE sessions, handicapped accessible. *Tl:* 146.91 (100 Hz). *Adm:* Free. Tables: Free. David Cowart, KR4OE, 637 E Raynor Dr, Fayetteville, NC 28311; 910-237-9097; **kr4oe@arrl.net**; **www.k4mn-cfars.org/**.

North Carolina (Salisbury) — Jul 12 F V
8 AM-3 PM *Spr:* Rowan ARS. Salisbury Civic Center, 315 Martin Luther King Jr Ave S. Paved tailgating, spacious air-conditioned indoor area, VE sessions (10 AM), refreshments. *Tl:* 146.73 (94.8 Hz). *Adm:* advance $4, door $5. Tables: $5. Ralph Brown, WB4AQK, 1621 Emerald St, Salisbury, NC 28144; 704-636-5902; **rkbrown5902@bellsouth.net**; **www.rowanars.org**.

Ohio (Lima) — Aug 9 D V
Set up 6 AM; public 8 AM *Spr:* Northwest Ohio ARC. Fair Radio Sales Grounds, 2395 Saint Johns Rd. Vendors, Phil's Ham Radio Store, VE sessions (10:30 AM). *Tl:* 146.67. *Adm:* $5. Tables: $10. Gary Clements, K8FRS, c/o Fair Radio Sales, 2395 Saint Johns Rd, Lima, OH 45802; 419-227-6573; fax 419-227-1313; **kc0jdt@yahoo.com**; **www.nwoarc.info/hamfest.shtml**.

Ohio (Randolph) — Jul 27 F D V S
Set up 6 AM; public 8 AM-3 PM *Spr:* Portage ARC. Portage County Fairgrounds, 4215 Fairgrounds Rd (SR 44). Portage Hamfair, huge flea market ($5 per space), indoor vendors, computers, electronics, ARRL officials and forums, VE sessions, QSL card checking, unlimited free parking, breakfast and lunch on grounds. *Tl:* 145.39. *Adm:* advance $5, door $6. Tables: $15 (includes electricity). Joanne Solak, KJ3O, 9971 Diagonal Rd, Mantua, OH 44255; 330-274-8240; fax 330-274-8527; **kj3o@arrl.net**; **www.portagearc.org**.

Ohio (Van Wert) — Jul 20
Set up 6 AM; public 8 AM *Spr:* Van Wert ARC. Van Wert County Fairgrounds, 1055 S Washington St (US Rte 127 S). *Tl:* 146.85. *Adm:* $5. Tables: $10. Louie Thomas, WD8LLO, 208 N Chestnut St, Van Wert, OH 45891; 419-238-2812; or Stephen Kouts, WA8WKF, **skouts@bright.net**; **www.w8fy.org**.

Ohio (Wellington) — Jul 12 F D
Set up Friday 6-9 PM, Saturday 6-8 AM; public 8 AM-noon *Spr:* Northern Ohio ARS. Lorain County Fairgrounds, Rte 18. 44th Anniversary Hamfest and Computer Show, large flea market ($5 per space), indoor vendors, computer and Amateur Radio sales, Special Event Station, ladies events. *Tl:* 146.7. *Adm:* $6. Tables: $15 (8-ft; for reservations contact Darlene Ohman, KA8VTS, 216-398-8858; **dfohman@netzero.net**). John Schaaf, K8JWS, Box 35, Avon Lake, OH 44012; 216-696-5709; **noarsfest2008@noars.net**; **www.noars.net**.

Oklahoma (Oklahoma City) — Jul 18-19, Oklahoma State Convention. See "Coming Conventions."

Oregon (North Bend) — Jul 19 F V
9 AM-3 PM *Spr:* Coos County RC. North Bend Middle School, 1500 16th St. Swapmeet, demonstrations, VE sessions. *Tl:* 146.61, 147.28 (146.2 Hz). *Adm:* $3. Tables: $15. Marilyn Mansker, KE7OAM, 96900 Sitkum Ln, Myrtle Point, OR 97458; 541-572-3406; **ke7oam@yahoo.com**; **www.coosradioclub.net**.

Oregon (Portland) — Aug 1-3, Pacific Northwest DX Convention. See "Coming Conventions."

Pennsylvania (Erie) — Jul 12 F D V
7 AM-noon. *Sprs:* Wattsburg Wireless and Union City Wiresless Assns. Greene Township Municipal Bldg, 9333 Tate Rd. 7th Annual Hamfest, tailgating, vendors, indoor and outdoor tables, VE sessions, foxhunting, fun and fellowship, free parking, excellent food. *Tl:* 146.7 (186.2 Hz). *Adm:* advance $4, door $5 (under 16 free). Tables: $5. Ron Rycek, KB3QBB, 1412 Grant Ave, Erie, PA 16505; 814-833-6829 (phone and fax); **kb3qbb@arrl.net**; **www.nw-pa-hamfest.com**.

Pennsylvania (Hanover) — Aug 1-3, 3.905 Century Club Eyeball Convention. See "Coming Conventions."

Pennsylvania (Kimberton) — Jul 13 F
7 AM-noon *Spr:* Mid-Atlantic ARC. Kimberton Fire Company Fairgrounds, Rte 113 and Firehouse Ln. Valley Forge Hamfest and Computer Fair. *Tl:* 145.13, 147.06 (131.8 Hz). *Adm:* $6. Tables: $10. Mike Pilotti, KF3CD, 212 Amanda Ln, Phoenixville, PA 19460; 610-935-4429; fax 610-254-8539; **kf3cd@arrl.net**; **www.marc-radio.org/hamfest.html**.

Pennsylvania (Lehman) — Jul 6 F D V
Set up 6 AM; public 8 AM-3 PM *Spr:* Murgas ARC. Luzerne County Fairgrounds, Rte 118. 29th Annual Hamfest and Computerfest, flea market, dealers, equipment, computer hardware and software, tailgating (first space free, extra spaces $5 each), VE sessions (10 AM; walk-ins only). *Tl:* 146.61 (82.5 Hz), 146.52. *Adm:* $6. Tables: $15 (8-ft, with electricity). Carol Nygren, KA3EEO, 2081 State Rd, Sweet Valley, PA 18656; 570-477-2294; **cnygren@epix.net**; or Bob, N3FA, 570-288-3532; **www.qsl.net/k3ytl**.

Pennsylvania (Pittsburgh) — Jul 13 F
8 AM-2 PM *Spr:* North Hills ARC. Northland Public Library, 300 Cumberland Rd. 23rd Annual Hamfest, paved tailgating (first space free, additional spaces $5 per space). *Tl:* 147.09 (88.5 Hz). *Adm:* Free. John Gorman, N3RQD, 162 Home Dr, Pittsburgh, PA 15223; 412-487-9254; **n3rqd@earthlink.net**; **www.nharc.org**.

Pennsylvania (Sinking Spring) — Aug 9 F V
7 AM-1 PM *Spr:* Reading RC. Heritage Park, Clematis St. Mini-Hamfest, outdoor tailgating only, VE sessions. *Tl:* 146.91 (131.8 Hz). *Adm:* $1. Tables: $1. Harry Hoffman, W3VBY, 104 Evans Ave, Sinking Spring, PA 19608; 610-678-8976; **harryhoffmanjr@juno.com**; **www.readingradioclub.org**.

Pennsylvania (Somerset) — Jul 20 D V
8 AM-noon *Spr:* Somerset County ARC. Somerset County Technology Center, 281 Technology Dr. New equipment dealers, VE sessions (10 AM), breakfast and lunch. *Tl:* 147.195 (123 Hz). *Adm:* advance $4, door $5. Tables: $10. Stew Saylor, AK3J, 156 Sequoia Ln, Friedens, PA 15541; 814-444-0637; **ak3j@arrl.net**; **www.k3smt.org/hamfest**.

South Dakota (Clear Lake) — Jul 26 F V
8 AM-6 PM *Spr:* Deuel County ARC. Clear Lake City Park, N Hwy 15. Complete outdoor event, VE sessions, camping. *Tl:* 147.315, 444.3 (both 136.5 Hz), 145.39. *Adm:* $5. Tables: Free. Robert Schmidt, NØTAW, Box 427, Clear Lake, SD 57226; 605-695-0219; fax 605-874-2449; **rjtaw1@itctel.com**; **www.w0gc.org**.

Tennessee (Athens) — Jul 19 F
7 AM-noon *Spr:* McMinn County ARC. Athens Regional Park, Hwy 30 E. 4th Annual Hamfest, tailgating, MCARC communications trailer. *Tl:* 145.31 (141.3 Hz). *Adm:* Free. Tables: $5. Scott Duckworth, NA4IT, 522 Co Rd 783, Etowah, TN 37331; 423-263-1989; **na4it@yahoo.com**; **www.mcminnarc.com/fest/fest.html**.

Texas (Austin) — Aug 1-2, Texas State Convention. See "Coming Conventions."

Texas (Texas City) — Jul 12 F D V
8 AM-2 PM *Spr:* Tidelands ARS. Doyle Convention Center, 2010 5th Ave N at 21st St N. Swap tables, major vendors, left foot CW contest, hidden transmitter hunt, VE sessions, free parking, refreshments. *Tl:* 147.14 (167.9 Hz), 442.025 (103.5 Hz). *Adm:* advance $4, door $5. Tables: $7. Joe Wileman, AA5OP, Box 73, Texas City, TX 77592; 409-945-6794; **aa5op@yahoo.com**; **www.tidelands.org**.

Utah (Bryce Canyon) — Jul 11-13, Rocky Mountain Division Convention. See "Coming Conventions."

Virginia (Berryville) — Aug 3 F V
6 AM-5 PM *Spr:* Shenandoah Valley ARC. Clarke County Ruritan Fairgrounds, Business Rte 7. 58th Annual Hamfest and Computer Show, tailgating ($10 per space plus admission), VE sessions (registration at noon, exams promptly at 1 PM; Cooley School, across the road from hamfest; all classes, walk-ins welcomed), Ruritan's Famous Chicken and Beef BBQ. *Tl:* 146.82. *Adm:* $6 (under 16 free). Tables: $20 (air-conditioned bldg); $15 (other bldgs). Laura Stewart, N4LLS, c/o SVARC, Box 139, Winchester, VA 22604; 540-533-2626; fax 540-869-7067; **hamfest@svarc.us**; **www.svarc.us/hamfest**.

Virginia (Vinton) — Aug 2 F V S
8 AM-3 PM *Spr:* Roanoke Valley ARC. William Byrd High School, 2902 Washington Ave. Flea market, forums, VE sessions. *Tl:* 146.985 (107.2 Hz). *Adm:* $5. Tables: $10. Phil Roark, K4WFO, 405 Yorkshire St, Salem, VA 24153; 540-387-4487 (phone and fax); **k4wfo@arrl.net**; **www.w4ca.com**.

Washington (Chehalis) — Jul 12 F V
9 AM-noon *Spr:* Chehalis Valley ARS. Southwest Washington Fairgrounds, 2555 N National Ave. Indoor/outdoor swapmeet, VE sessions. *Tl:* 147.06 (110.9 Hz), 146.58. *Adm:* $3. Tables: $5. John Ellingson, K7OSK, 18140 Mi-Lane, Rochester, WA 98579; 360-791-7934; fax 360-273-5929; **k7osk@boatanchor.com**; **www.cvars.org**.

Washington (Spanaway) — Aug 9 D V
9 AM-2 PM *Spr:* Radio Club of Tacoma. Bethel Junior High School, 22001 38th Ave E. Vendors, demos, VE sessions, consignment. *Tl:* 147.28 (103.5 Hz). *Adm:* $5. Tables: $20. Bob Purdom, AD7LJ, Box 65171, University Place, WA 98464-1171; 253-691-2388; **hamfest@w7dk.org**; **www.w7dk.org**.

Wyoming (Jackson) — Aug 2. Mick Dettmer, W7CAT, 307-690-9848; **president@jhaarc.org**; **www.jhaarc.org**.

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

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SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

♦ AK1B **Boomer**, Sam D., Norwich, CT
W1DLW **Clark**, Patrick E., Avon, CT
KA1FUA **Watson**, William F., Hill, NH
W1HSM **Whitham**, Glenn E., Wayland, MA
N1LRR **Burton**, Arthur E. Sr, North Smithfield, RI
K1MDX **Conley**, Dorothy G., Atkinson, NH
N1MVH **Thompson**, Douglas V. Sr, Londonderry, NH
W1QGL **Weiss**, William R. Jr, Lexington, MA
ex-K1RHE **Lopolito**, Patricia C., Dover, NH
K1SC **Cole**, Sanford H. Jr, Wolfeboro, NH
K1SFC **Ellsworth**, George C., Ledyard, CT
W1WKO **De Fusco**, Armand, Providence, RI
KC2AQX **Brewley**, Reece, Rochester, NY
WB2BLL **Piperno**, Charles A., Solvay, NY
N2BUC **Start**, Richard W., Rochester, NY
♦ W2CVF **Hasslinger**, Ralph, Glen Rock, NJ
W2DBS **Nicols**, Donald P., Palmyra, NY
KB2FXY **Hamann**, Arthur K., Rochester, NY
W2GKG **Ilowite**, Ralph, Ramsey, NJ
♦ W2HOS **Crocker**, Albert R., Memphis, NY
WI2J **Daley**, Leo E., Brigantine, NJ
WB2OHR **Pinheiro**, George G., Ballston Lake, NY
WA2PXM **Galerstein**, David H., New Hyde Park, NY
WB2QLP **Mash**, Jordan E., Naples, FL
W2WAX **Morse**, Philip H., Hackettstown, NJ
KE3EZ **Bakalorz**, Georg W., Palmyra, PA
WA3GRR **Grasha**, Matthew G., Pittsburgh, PA
KB3MJA **Walterick**, Paul D. Sr, Camp Hill, PA
NE3M **Maas**, Louis O., Severna Park, MD
♦ W3NRU **Garrigus**, Charles S., Meadville, PA
♦ W3NTD **Jones**, John T., Bryn Athyn, PA
W3PWH **Colvin**, Roger O., Elizabethtown, PA
W3XF **Luschini**, Ray P., Erie, PA
W4AYA **Hunter**, Horace R., Charlotte, NC
KF4BZV **Simms**, Dolores L., Panama City Beach, FL
KE4CAF **Johnson**, Everett E., Nashville, TN
KF4CBK **Davidson**, James, Gray Hawk, KY
WD4CWT **Sears**, R. E., Everett, WA
KA4GGN **Clark**, Floyd M., Collegedale, TN
K4HYQ **Dickens**, Richard, Kingsport, TN
K4IGI **McMullen**, Alton R., Inverness, FL
N4JRS **Cotton**, Rickey B., Dallas, GA
KG4KIV **Goff**, Elbert S., Warner Robins, GA
K4LGF **Camadello**, Alfred Jr, Sheffield, AL
WA4LRT **Howard**, Arch L., Lexington, KY
AE4LV **Sigler**, Boyd C., Louisville, KY
KA4MNH **Poynor**, Robert T., Bradford, TN
KE4OJV **Douglas**, Ben E. Jr, Charlotte, NC
WD4OLQ **Ericson**, Don V., Birmingham, AL
WA4PQK **Carter**, Davis I., Fayetteville, GA
KI4PST **Jenkins**, Bobby D., Calhoun, KY
♦ W4RNL **Cebik**, L. B., Knoxville, TN
WA4SIR **Parise**, Ronald A., Silver Spring, MD
KS4VP **Reeves**, Wilson L., Ashland, KY
WB4VYA **Wallace**, Bobby L., Darlington, SC
KF4YIO **Absalom**, John, Ringgold, GA
N4YMI **Garratt**, Richard, Clarksville, VA
♦ W5DHK **Stroman**, William J., San Angelo, TX
♦ W5GOW **Oyler**, Leo E. Jr, Albuquerque, NM
WD5HDY **Elder**, Floyd C., Albuquerque, NM
KD5HEC **Collins**, Elizabeth A., Albuquerque, NM
W5HVI **Price**, Marguerite E., Crowley, TX
WA5HZF **Beissner**, Joseph C., San Antonio, TX
WB5KCP **Goodpaster**, Howard W., Corpus Christi, TX
K5LUB **Wesson**, Gary D., Minden, LA
KC5LVE **Armstrong**, Donald F., Little Rock, AR
KD5MQF **Sinden**, J. Dale, Las Cruces, NM
♦ K5SJA **Ligon**, Harmon P., Dallardsville, TX
N5TZM **McIntosh**, Bobby G., Breckenridge, TX
KI5WF **Myster**, Stuart H., Sterling, IL
K6BGK **Lusk**, William H., Fresno, CA
WN6B **Sams**, Richard L., Yucca Valley, CA
KH6CC **Wheeler**, Jack N., Paauilo, HI
WA6CKI **Small**, Alvin L., Red Bluff, CA
W6DL **Watson**, Norman B., Torrance, CA
♦ N6DXA **McMillin**, Donald L., Anaheim, CA
KD6DZR **Greer**, Kent B., Covina, CA
W6EFM **Pesely**, John W., Carmichael, CA
KI6FBP **Dean**, Raymond, Riverside, CA
W6IQK **Wilcox**, Richard P., Long Beach, CA
K6KLV **Pietz**, Farreol B., Mendota, CA
WA6KZA **Launer**, Ray E., Felton, CA
KD6MHB **Kneass**, Kathleen K., Modesto, CA
AA6MW **Johnson**, Yvon O., Medford, OR
WB6OHK **Whiteside**, Richard H., Visalia, CA
W6WVD **Atherton**, George A., Paradise, CA
W6YCB **Schmidt**, Raymond C., Modesto, CA
AC6YD **Lynd**, Patrick B., Rohnert Park, CA
NV7B **Wyatt**, Clair L., Providence, UT
♦ KA7BRR **Ewing**, Ronald L., Kennewick, WA
♦ K7ESS **Gourley**, Harry J., Yuma, AZ
WA7KMP **Krueger**, Otto L., Forsyth, MT
W7LHF **Galhouse**, Leroy L., Tucson, AZ
W7MCT **Bauman**, Larry L. Sr, South Colby, WA
KG7MP **Thomas**, Boyd, Malad City, ID
WA7NDC **Wilson**, William E., McMinnville, OR
W7OOS **Stires**, Orly O. Jr, Sun City, AZ
KB7PBG **Thompson**, Clifford W., Sandy, UT
W7WR **Feather**, Gordon, Chehalis, WA
KA7WUO **Chilcott**, V. C., Sequim, WA
W7ZZG **Kolar**, Clarence F., Great Falls, MT
N8DKZ **Nicholson**, Jan A., Negley, OH
W8ISE **Sweetnich**, Joseph, Fairmont, WV
WB8IYW **Poletti**, Rudolph O., Montrose, MI
K8JVK **Chamberlain**, Welton C., Pinckney, MI
KA8LCC **Conrad**, Joan C., Strongsville, OH
W8ML **Bynum**, John G. Jr, New Carlisle, OH
NC8M **Oliver**, Maurice E., Delta, OH
KC8OEN **Birkholtz**, Robin W., Youngstown, OH
W8OHC **Yager**, Robert A., Gahanna, OH
K8ONJ **Lease**, Kenneth G., Ridgeley, WV
W8PAH **Zaverzence**, Walter, Boynton Beach, FL
KC8PMF **Macauley**, William, Zeeland, MI
N8UJG **Van Slot**, Andrew, Holland, MI
KA8ZAG **Fawley**, Mark J., Whitmore Lake, MI
K8ZHT **Heck**, Doug, Perry, OH
K9BJL **Mason**, Robert D., Crawfordsville, IN
WB9DXL **Struxness**, Lemont B., Viroqua, WI
WA9DZY **Prall**, Bert A., San Antonio, TX
W9EQP **Brossmann**, William F., Brookfield, WI
N9FCT **Riggins**, Maurice R., Macomb, IL
K9FM **Lehman**, Melvin, Fruitland Park, FL
WA9GOP **Dzialak**, Melvin H., South Bend, IN
KB9JFL **Howe**, Michael J., Burlington, WI
♦ W9JNH **Woodling**, Victor A., Van Alstyne, TX
KB9MPE **Wisner**, Wilfred J., Spooner, WI
N9NCY **Perkins**, Nancy L., Westville, IN
K9OPO **Grady**, Roger A., Kokomo, IN
W9PHJ **Ladwig**, Herbert R., Kenosha, WI
W9PUG **Tremaine**, Krone W., Belleville, IL
KA9TTB **Chapman**, Joy L., Bealeton, VA
W9UJE **Hall**, Larry A., Valparaiso, IN
N9XTR **Groves**, David D., Mascoutah, IL
WA9ZTY **Hummel**, Robert E., Marshall, WI
KØBTF **Lappann**, Bert H., Anoka, MN
KAØCMG **Forman**, Chris, Sioux Falls, SD
WØHAW **Blase**, George A., Saint Louis, MO
KCØHOX **Schram**, Jerald C., Kearney, NE
KCØHOY **Juehring**, Raymond E., Hiawatha, IA
WØKEY **Richardson**, Richard R., Saint Paul, MN
WØNAH **Wessels**, Harold, Marshfield, MO
WØSDN **Bailly**, Everette L., Walhalla, ND
KBØVPI **Fuller**, John W., Marion, IA
WAØVQM **Fasold**, Howard R., Manitou Springs, CO
WBØWVE **Murray**, Clifford W., McCook, NE
KFØZW **Lawrence**, Jerome T., North English, IA
♦ JA1BAR **Nishino**, Fumio, Tokyo, Japan
VP9IW **Petty**, Margaret A., Bermuda
VU2BK **Kabraji**, R. Z., Aundh Pune, India

♦ Life Member, ARRL

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 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

QST congratulates...

◊ ARRL life member, Diamond Club member and *QST* author Dennis Silage, K3DS, of Newtown Square, Pennsylvania, who received the National Outstanding Teaching Award at a special awards ceremony held at the 2007 American Society of Engineering Education Annual Conference. The National Outstanding Teaching Award recognizes an engineering or engineering technology educator for excellence in outstanding classroom performance, contributions to the scholarship of teaching, and participation in ASEE Section meetings and local activities. Dennis is Professor of Electrical and Computer Engineering at Temple University.

◊ Major James R. Stephens, US Army Signal Corps (Ret), W6JMA, upon the publication of his first novel, *Camera Soldiers: The Philippine Odyssey*, the story of the first two invasions of the Philippines in late 1944 (**www.camerasoldiers.com**). It is told from the perspective of a combat cameraman-photographer who was there when General Douglas MacArthur "returned" with over 200,000 men. — *Jim Stephens, W6JMA*

◊ ARRL member Gregory Andracke, W2BEE, of New York City and Pine Plains, New York, who was one of two principal cinematographers on Alex Gibney's documentary "Taxi to the Dark Side." The film won a 2008 Oscar for Best Documentary Feature.

◊ Richard Ballou, AC2I, of Camden, New York, who has received a citation for excellent net operations from the FCC Official Observer program. Ballou, a WWII combat veteran, serves as net control for the Armored Force Amateur Radio Net, founded in 1981 by WWII veterans who were members of armored and armored infantry units. — *John Paskevicz, KA9NLX, US Army (Ret)*

◊ Joe Schroeder, W9JUV, of Glenview, Illinois, who has received the FAA's Wright Brothers Master Pilot Award. The award is given to pilots who have maintained safe flight operations for 50 or more consecutive years of piloting aircraft.

75, 50, AND 25 YEARS AGO

July 1933

- The cover photo shows two hams "mountain-topping."
- The editorial discusses the "Cairo conference" that lies in the near future, expressing hope that the ham bands can be made wider to accommodate the rapidly growing ham population. The editor observes, "Heaven knows we need more room. There are 36,000 of us in this country alone, perhaps 60,000 of us in the world."
- S. L. Seaton writes about "OA4U—On the Roof of the World," 11,000 feet above sea level, at the magnetic observatory at Huancayo, Peru.
- "The Micrometer Frequency Meter," by G. F. Lampkin, W8ALK, gives great accuracy in shortwave frequency measurement.
- J. C. Hadlock, W3ACD, describes "An Unusual 56-Mc. Super-Regenerative Receiver."
- Assistant Technical Editor George Grammer discusses "Twisted-Pair Feeders for the Transmitting Antenna."
- "A Simple Tape Recorder for C.W." describes the inexpensive Teleplex, a system for inking lines of dits and dahs on paper tape.
- Phil Rand, W1DBM-W1FWL, describes "A Shack on Wheels," built into a large trailer.
- "Economical Use of a Milliammeter," by William Pierpont, W9BLK, tells us how to use resistive shunts and multipliers to vary a meter's range.
- G. W. Fox, R. J. Pieracci, and W. L. Heubner tell about "A Flea-Powered Portable 'Phone with Crystal Control." They used the unique idea of a small, collapsible, multi-turn loop that serves as the final amplifier's tank coil *and* the transmitting antenna!

July 1958

- The cover cartoon by Gil, W1CJD, shows hams converging on Washington, DC, for the 10th ARRL Convention, coming up in August.
- The editorial reminds us the famed and mystical Wouff Hong, its history, and the threat it holds toward hams of ill repute. *Be careful, errant hams!*
- William Barnard, W6STA, describes "An 80-Meter Tuner" that has good front-end performance and which provides an IF output of 2.215 Mc.
- "A Receiver for the 50-Mc, Man," by R. W. Brandt, W9LU, provides high performance with a simple circuit that uses a high-frequency crystal lattice filter.
- Robert George, W9KRU, reports on his "50- Kc. Transistor-Multivibrator Frequency Standard" that provides markers up to 30 Mc, using only two TI-301 transistors.
- Lew McCoy, W1ICP, describes "A Novice Band Checker," telling our new hams about the old but good idea of the absorption wavemeter.
- George Jones, W1PLJ, discusses "Flexible Transmitter-Receiver Frequency Control," that can be used for either tracked frequency control of transmitter and receiver or separate frequency control.
- "Recent Equipment" reports on the "Johnson Thunderbolt," a remarkably compact desktop kilowatt amplifier that contains both the RF deck and the power supply.
- Ernest Coons, W1JLN, describes using his small, simple, portable transmitter, in "Power 25 Watts—Fun Unlimited."

July 1983

- The dramatic cover photo shows the lift-off of the type of rocket that is to carry the state-of-the-art Phase IIIB satellite into orbit just after *QST*'s press time.
- The editorial looks back at "20 Years at 225 Main," and invites touring hams to stop by HQ for a visit.
- Paul Newland, AD7I, provides "An Introduction to AMTOR," the hot new RTTY mode.
- Gerald Hull, AK4L, describes "Filter Systems for Multi-Transmitter Amateur Stations."
- Chuck Hutchinson, K8CH, tells us about "Getting the Most out of Your Antenna," reviewing both basic theory and practical ideas.
- Arthur Kay, W5APX, relates a sad tale, in "Disaster Strikes Amateur Operation in Texas." The Port Arthur (Texas) ARC was providing communication support for a celebrity golf tournament when the weather took an unexpected and extremely bad turn. One portable station was set up in the Jackson County Airport's terminal building, which was destroyed by a supercell's 125 mph winds. Although other hams made it out of the collapsing building, Arthur "Pete" Vela, K5YLU, was killed. 73 and SK, Pete.

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**.

The Beauty of Spectrum Analysis — *Part 2*

Cathode ray tube (CRT) — A vacuum tube based display device used in oscilloscopes as well as early television and radar systems in which the image is formed by electrons driven from a cathode to a phosphorescent display screen. See **en.wikipedia.org/wiki/Cathode_ray_tube** for more information.

Digital radio mondiale (DRM) — High definition digitized transmission format used by short wave broadcast stations to improve reception in the presence of noise. Special hardware and proprietary software are required. See **www.drm.org** for more information.

FFT — Fast Fourier transform. Digital technique to interchange frequency and time domain data. FFT is particularly suited to real-time applications such as display systems.

Moonbounce — Communications mode in which the moon is used as a passive reflector. This is usually accomplished in the VHF and UHF regions of the spectrum. Due to the large distances involved and the small angular sky segment, very directive accurately pointed antennas and high power are used. Signal enhancement through special software and low data rate transmission is frequently used. See **www.arrl.org/tis/info/moon.html** for more information.

PSK31 — Popular keyboard-to-keyboard amateur digital transmission system developed in 1999 by Peter Martinez, G3PLX.[2] This system is based on phase shift keying at a required bandwidth of 31 Hz, hence its name. This was the first popular "sound card mode," in which a PC with a sound card was used to encode and decode the data.

RTTY — Abbreviation for radioteletype. RTTY is an adaptation of the wireline teletype system of record communication as provided by carriers beginning early in the last century. The Teletype machine used two directions of current flow to distinguish between a mark and space condition — the two transmission states. In radioteletype, the states are represented by two distinct tones sent via an SSB transmitter, or equivalently by two different frequencies sent by a CW transmitter, in what is called *frequency shift keying* or FSK. See **www.arrl.org/tis/info/digital.html** for more information.

[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**.

[2] P. Martinez, G3PLX, "PSK31: A New Radio-Teletype Mode (reprint from *RadCom*)," *QEX*, Jul 1999, pp 3-9. Available at **www.arrl.org/tis/info/pdf/x9907003.pdf**.

Software defined radio (SDR) — Radio system in which the majority of processing is performed in a PC using special software that defines the radio functionality. See **www.sdrforum.org** for more information.

Slow scan television — Freeze frame video transmission system encoded to allow image transmission over an analog voice channel. See **www.arrl.org/tis/info/sstv.html** for more information.

Splatter — Undesired artifacts resulting from overdriving an amplifier or modulator. The consequence is distortion that results in new frequency components being generated. This generally causes interference to adjacent channels and a wider than necessary frequency spectrum.

Swishing — Term for changing a transmitter frequency while the transmitter is keyed. This results in interfering signals that move in frequency from the original to final frequency.

Unmodulated carrier — Steady transmitted RF signal carrying no information.

White noise — Noise with a flat spectrum that covers all frequencies — just as the color white consists of all colors in the visible spectrum. See **en.wikipedia.org/wiki/White_noise** for more information.

The Doctor is IN

Balun — Balanced to unbalanced transformer. Typically used to couple from a balanced load, such as an antenna system fed with balanced transmission line, to an unbalanced system such as coaxial cable. See **www.arrl.org/tis/info/pdf/8004019.pdf** for more information.

Full carrier AM — Voice transmission modulation scheme in which a steady carrier is amplitude modulated by information resulting in upper and lower sidebands surrounding a carrier. This is the type of modulation used by standard MF broadcast stations. It was the primary modulation mode used by amateurs until the advent of single sideband suppressed carrier transmission that became popular from the late 1950s on.

SSB — Single sideband suppressed carrier transmission. A variant of AM in which the carrier and one sideband of the AM signal is not transmitted. The carrier is replaced by a locally generated carrier in the receiver. Although this system is more power and spectrum efficient than full carrier AM, it requires more receiver capability than does an AM receiver.

Get on the Air — Your *Second* HF Antenna

Ladder line — Kind of balanced two wire transmission line in which the wires are separated and have a spacing maintained by distinct insulators. This kind of line is also called open wire line.

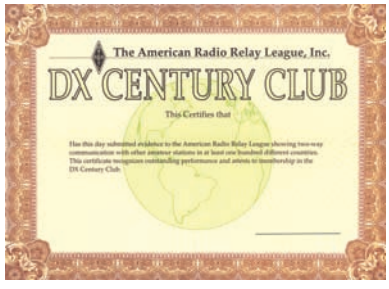
SWR — Standing wave ratio. A measure of the maximum to minimum voltage (or current) along the length of a transmission line. If the line has a load equal to the line's characteristic impedance, the ratio will be 1:1. A mismatch will result in a ratio higher than 1:1.

Window line — Similar to, and often called ladder line, window line is a kind of balanced two wire transmission line in which the wires are separated and have a spacing maintained by a web of flexible plastic insulation. The insulation has windows cut from the region between the wires to reduce loss.

The Pileup Buster

DX — Long distance communication. Often used to refer to desired countries and prefixes needed for various operating awards.

DXCC award — Award offered by the ARRL for demonstrated proof of legitimate two-way amateur contact with stations in 100 countries (entities), as identified on The ARRL DXCC List.[3] See **www.arrl.org/awards/dxcc** for more information.



HF — High frequency. That portion of the radio spectrum between 3 and 30 MHz. Often called *short waves*, these frequencies are characterized by long range propagation via ionospheric refraction.

Pileups — Term describing the situation in which a large number of stations are simultaneously calling the same DX station on about the same frequency.

Voice keyer — Device, sometimes included in an HF transceiver, that can transmit prerecorded messages. This is useful for calling DX stations as well as for contest exchanges.

Portable Two Element 15 Meter Yagi

Boom — Structural element that forms the support for multiple individual elements in a multielement, usually rotatable antenna array.

Front to back ratio (F/B) — Ratio of the relative power transmitted from the front or desired direction of a directional antenna to that radiated from the rear.

Yagi — Multielement directional array in which one element is directly connected to the transmission line and others are coupled through radiation between them and the driven element. See **www.arrl.org/tis/info/yagi-hf.html** for more information.

[3] *The ARRL DXCC List*. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9833. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

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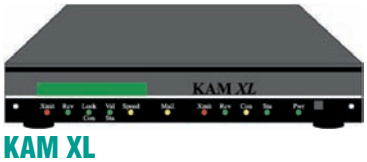

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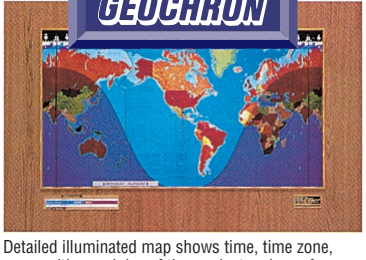

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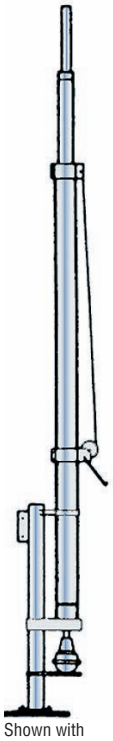

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DXE-AT1247	1.250", one end slit	$5.55	$1.85
DXE-AT1248	1.375", one end slit	$6.15	$2.05
DXE-AT1249	1.500", one end slit	$6.75	$2.25
DXE-AT1250	1.625", one end slit	$7.65	$2.55
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DXE-AT1252	1.875", one end slit	$9.15	$3.05
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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
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DXE-AT1212	1.375", one end slit	$12.30	$2.05
DXE-AT1213	1.500", one end slit	$13.50	$2.25
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DXE-AT1217	2.000", one end slit	$19.80	$3.30
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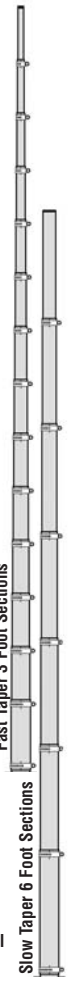
Aluminum Tubing, 2.000" Diameter, 0.125" Heavy Wall

Part Number	Length/End Type	Price	Cost/Foot
DXE-AT1255	3 ft., no slit	$14.85	$4.95
DXE-AT1204	6 ft., no slit	$29.70	$4.95



All Stainless Steel Element Clamps

DXE-ECL-060	0.375" to 0.875"	$1.80
DXE-ECL-10SS	0.500" to 1.000"	$1.90
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

DXE-VE-BASE $99.50

DXE-CAVS-1P	V-Saddle Clamp	$8.95
DXE-TB-3P	Tilt Base Assembly	$62.50

Heavy Duty Base

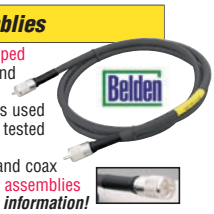
- Tilt Base included
- Two DXE-CAVS-2P mounting clamps required to attach base to mounting post

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!

TWO-IN-ONE RECEIVE ANTENNA CONTROLLER

1 Noise Nulling Controller

- Reduce overload or interference by nulling a strong local signal or noise before it gets to your receiver
- Better and more stable nulling than any other noise canceller on the market
- Peak weak signals hidden under a strong signal on the same frequency
- Null out local AM broadcast stations
- Null out noise from power line arcing, lamp dimmers, motors and consumer electronics from a single direction

2 Antenna Phasing Controller

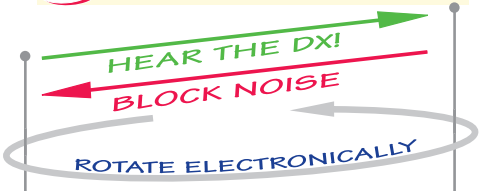
- 2 antenna alternative to DX Engineering's Receive Four-Square antenna
- Combine two antennas to create a directional pattern
- The DXE-NCC-1 enables you to adjust the antenna array pattern as if you were moving the antennas
- Use for direction finding

Special Features

- Exceptional dynamic range, nearly 1000 times better than nearest competitor
- Phasing is voltage controlled allowing precise resetting of phase
- Phasing rotates more than 360 degrees with smooth control
- Built-in two channel, voltage controlled attenuator system
- Low noise, high dynamic range amplifiers
- Vastly superior dual channel complementary phasing system
- Very low noise floor
- Separate controls for reversing channel and phase
- Works on all modes, 300 kHz to 30 MHz
- Provides power for external active antennas
- Input for mute on transmit

DXE-NCC-1 Receive Antenna Variable Phasing Controller.....**$495.00**

DXE-AAPS-1P *New!* Complete Active Antenna Phasing System with controller.....**$995.00**



Phase two antennas at any spacing. For optimal results, use identical antennas.

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**

DXE-ARAV-1P Vertical Configuration.....**$229.00**

DXE-ARAH2-1P Horizontal Configuration with relay.....**$289.00**

DXE-ARAV2-1P Vertical Configuration with relay.....**$259.00**

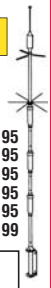
TVSU-1 Time Variable Sequencer Unit

- 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
- Ideal for protecting DXE ARAV-2 or ARAH-2 Active Antennas from RF damage

DXE-TVSU-1 Time Variable Sequencer Unit **$159.95**

VERTICALS ON SALE

Best Antenna Value Anywhere!



DX Engineering now stocks replacement parts for all BTV antennas

Easiest assembly and tuning of any multi-band vertical!

4BTV (10, 15, 20, 40m).....**$114.95**

5BTV (10, 15, 20, 40, & 75-80m).....**$149.95**

6BTV (10, 15, 20, 30, 40, & 75-80m).....**$174.95**

DXE-8X19-RT Coax Jumper Cable to BTV Base.....**$16.95**

DXE-A0K-DCF SO-239 Add-On Kit for BTV Base.....**$19.95**

DXE-CBC-8XU2 Jumper, Radial Plate to DCF.....**$18.99**

Hustler BTV Direct Coax Attachment All Stainless **$19.95**

MAXI-CORE™

Current Baluns and Feedline Current Chokes

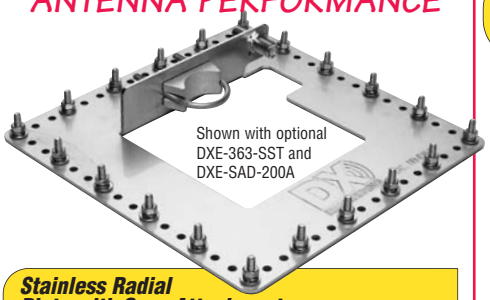
- 5, 10 and 10 kW+ Baluns and Current Chokes
- High efficiency, low loss—W8JI design
- All standard ratios available

Feedline Current Chokes

- Reduce RFI and pattern distortion

Starting at just $69.95 for FCC050-H05-A

MAXIMIZE VERTICAL ANTENNA PERFORMANCE



Shown with optional DXE-363-SST and DXE-SAD-200A

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**

DXE-RADW-1000KBD Radial Wire Kit, 1000 feet of wire, 40 lugs, 200 anchor pins.....**$123.95**

DXE-STPL-100BD Radial Wire Anchor Pins, 100-pack.....**$16.00**

ONE MAN TILT OVER

Patent Pending

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**

DXE-TB-4P For DX Engineering 40VA-1, Butternut, most Hy-Gain 1/4-wave verticals.....**$87.50**

HUSTLER BTV ADD-ONS

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-AOK-17M 17m add-on kit for BTV.....**$49.95**

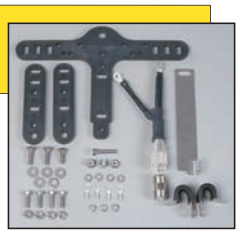
60m Add-on Kit

- 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-AOK-60M 60m Add-on Kit for Hustler BTV.....**$69.95**

EZ-BUILD™ HIGH PERFORMANCE ANTENNA COMPONENTS

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**

DXE-UWA213-KIT Universal Wire Antenna Hardware Kit with coax attachment and strain relief for use with RG-213 .....**$32.95**

DXERS 1ST CHOICE!

Remote Antenna Switches

- Best SWR and port isolation on the market!
- Weatherproof, welded stainless steel housing for best RF shielding
- 8-position switch, controller included
- Better than 1.1:1 SWR below 30 MHz

5 kW Key-Down RF Switch

- Better than 70 dB of port-to-port isolation

RR8-HP-P.....**$375.00**

10 kW Key-Down RF Switch

- Better than 60 dB of port-to-port isolation

RR8-SD-P.....**$495.00**

DXEngineering.com
1.800.777.0703

Order by 2:00 pm ET for Same-Day Shipping

8:30 am to 4:30 pm ET

Tech/International: **330.572.3200**

SOURCE CODE: 0807QS

Prices effective through August 15, 2008

The #1 Line of Autotuners

LDG ELECTRONICS

NEW! AT-1000Pro

Building on the success of the AT-1000, LDG Electronics has refined and expanded its 1KW tuner. The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Other features include:

- Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts.
- 2 Antenna connections
- Tunes from 1.8 to 54.0 MHz (inc. 6 meters)
- Tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds.
- 2000 memories.
- All cables included.

Suggested Price $599

radio not included

AT-897 for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897 Autotuner mounts on the side of your FT-897 just like the original equipment. We even added the ability to mount the "feet" on the side of the tuner so when you're transporting your rig by the handle, you can safely set it down and not worry about scratching the case. The AT-897 takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199***

AT-100Pro

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch, allowing you to switch instantly between two antennas. The AT-100Pro requires just 1 watt for operation, but will handle up to 125 watts. All cables included. ***Suggested Price $219***

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***

Z-100

Designed from the ground up to provide 100 watt power handling in a small, lightweight package. Perfect for portable as well as sitting on your desk in your shack! The Z-100 will tune with 0.1 to 125 watts (50 watts on 6 meters), making it an excellent choice for almost any radio or operating style. Backpackers and QRP operators will appreciate the latching relays. Power can be removed from the tuner once you have tuned. Additionally, when it's not tuning, it draws nearly zero amps. ***Suggested Price $149***

The #1 Line of Autotuners A warranty is a promise, a promise of quality and service life. The #1 line of autotuners in the industry now comes standard with a no-questions-asked 2-Year Transferable Warranty.

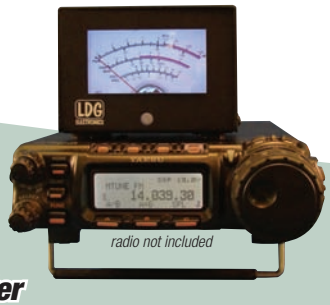
When something is wrong with an autotuner, switch, or meter, LDG will fix it - period. LDG is the leader in tuner technology and now leads the industry in customer support as well.

Our customers tell us we do the right things to meet their support expectations. Customers feel good about owning LDG products because service life and support is something they can count on - even when they are ready to sell a unit to another ham.

"I'd like to thank your staff for the VERY quick repair service they performed on my ailing unit. The service was top notch."

- A quote from one of our customers

Now With 2 Year Transferable Warranty!



New FT Meter

LDG's new version of its popular FT-Meter presents a lush, highly readable 2.5" meter face with calibrated scales for signal strength and discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit. Each function is selectable from the radio's menu. On/Off switch for the light.

- LED back-illuminated in cool, high-visibility blue.
- Calibration adjustment is on the back of the unit; makes it easy to calibrate.
- Backlight brightness adjustment is also on the back of the unit; so you can set the backlight to your desired level brightness.

The FT-Meter comes fully assembled and ready to go; just plug it into the radio and you're in the picture like never before. ***Still Only $49***

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.

"With 8,000 memories in LDG's exclusive "3-D Memory" array, the Z-11Pro uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. All cables included. ***Suggested Price $179***

IC-7800 Owners... Your Eye-Strain Problems Solved!

Your beautiful IC-7800 deserves the best; add LDG's new DM-7800 dual meter system, and you're in the picture like never before. The DM-7800 is made exclusively for the IC-7800; order yours today. ***List Price $179***

The DTS Series Antenna Switches

Instantly switch your rig between 4 or 6 antennas with the press of a button. Auto-grounding when you shut your rig down. Purchase the additional remote control and put the DTS Series switch anywhere indoors and operate it from your desk. They handle up to 1500 watts of RF power on HF (250W on 6M), and can be used with any coax-fed antenna. ***Suggested Price: DTS-4 $79, remote $39, DTS-6 $99, remote $49***

RCA-14 Your Cable Problems Solved!

RCA-14 is a breakout box for the accessory jacks on most popular transceivers. It comes with cables with the right DIN plugs, and all the outputs are RCA jacks. You simply plug the RCA-14 into your radio's accessory jacks, and all your ports are right there at your fingertips; just plug and play, one function or all of them. The RCA-14 is compatible with: Icom 703, 706, 718, 746, 756, 7000 and 7800, Yaesu 817, 857, 897 and 840, Kenwood 480, 570, 2000, Ten Tec Orion and many more. ***Suggested Price $59***

AT-200Pro

The AT-200 features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. All cables included.
Suggested Price $249

Call or visit your favorite dealer today!

Visit www.ldgelectronics.com for a complete dealer list.

LDG Electronics, Inc.
1445 Parran Road
St. Leonard, MD 20685
Phone 410-586-2177
Fax 410-586-8475

D-STAR EQUIPMENT

IC-92AD *D-Star Ready 2M/440 FM Submersible HT*

• TX: 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd)
• Power: 5/2.5/0.5/0.1W • Memories: 1304
• Submersible to 1 meter depth for 30 minutes • Optional HM-175GPS Speaker microphone adds GPS capabilities

$579.99

IC-2820H *D-Star Optional 2M/440 FM Mobile*

• TX: 144-148, 430-450 MHz • RX: 118-549.95, 810-990.990 MHz (cell blkd)
• Power: 50/15/5W • Memories: 522 • Supports diversity reception in the 127, 136, 146, 375, 440 and 500 MHz bands (two antennas required)
• Packet ready (9600 BPS – 6-pin DIN) • Upgradable D-Star DV (digital voice) & GPS capabilities with the optional UT-123

$649.99

ID-1 *1.2 GHz D-Star Data/Voice & FM Mobile*

• TX: 1240-1300 MHz • RX: 1240-1300 MHz • Power: 10/1W
• Memories: 105 • D-Star 128 kbps Data & 4.8 kbps Voice

$979.99 after mail in ®ebate

D-Star Repeater Modules:

ID-RP2C - Repeater Controller (control up to 4 modules) **$1459.99**

ID-RP2D - 1.2 GHz Data • RX & TX 1240-1300 MHz • Output 9-12W (high)/0.5-1.2W (low) • Communication speed: 128 kbps **$1112.99**

ID-RP2V - 1.2 GHz Voice • RX & TX 1240-1300 MHz • Output 6-12W (high)/0.5-1.2W (low) • Communication speed: 4.8 kbps **$1559.99**

ID-RP2000V - 2M Voice • RX & TX 144-148 MHz • Output 23-30W (high)/2-3W (low) • TX speed: 4.8 kbps (voice 2400 bps, FEC 1200 bps, data 952 bps) **$1399.99**

ID-RP4000V - 440 MHz Voice • 440-450 MHz • Output 23-30W (high)/2-3W (low) • TX speed: 4.8 kbps (voice 2400 bps, FEC 1200 bps, data 952 bps) **$1399.99**

HF RADIOS

IC-706 MK II-G *Multi Band Multimode Mobile*

• TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
• Power: 100W (HF/6M), 50W (2M), 20W (440 MHz) • Memories: 107
• 2 filter slots • AF-DSP • IF Shift • Preamp/attenuator

$899.99 after mail in ®ebate, free RMK-706

IC-718 *All Band HF Transceiver*

• TX: HF • RX: 0.03-30 MHz • Power: 5-100W • Memories: 101
• DSP built-in • SSB, CW, RTTY and AM (40W)

$549.99 after mail in ®ebate

IC-746PRO *Multimode HF/VHF Transceiver*

• TX: HF/6M/2M • RX: 0.03-60, 108-174 MHz • Power: 5-100W
• Memories: 102 • 32-bit floating DSP & 24-bit AD/DA converter
• Automatic HF/6M antenna tuner

$1499.99 after instant ©oupon & mail in ®ebate, free PS-125

IC-756PRO III *Multimode HF/6M Transceiver*

• TX: HF/6M • RX: 0.03-60 MHz • Power: 5-100W • Memories: 101
• 5 inch color screen • 32-bit floating DSP • Real time spectrum scope
• Improved 3rd order intercept point • Automatic antenna tuner

$2699.99 after instant ©oupon

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AES® LLC
Amateur Electronic Supply

See you in Huntsville for the World's Friendliest Hamfest

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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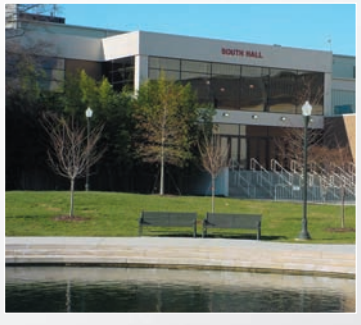
Group/Convention code: HAMFEST.
Reservations: **1-877-465-4329** or **1-256-553-1400 ext. 670**.
www.holidayinn.com/huntsvilleal

Embassy Suites Hotels
Group/Convention code: HAM.
Reservations: **1-800-362-2779** or **1-256-539-7573** or
visit **www.embassysuiteshuntsville.com**



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

ARRL The national association for AMATEUR RADIO

Huntsville Hamfest Association
The World's Friendliest Hamfest
www.hamfest.org

Free Extra Battery!

VX-150

VX-150 2M FM HT

- TX: 144-148 • RX: 140-174 • Power: 5W
- Memories: 209

$117.99 after instant ©oupon, free FNB-64 extra battery!

VX-6R

VX-6R Submersible 2M/440 FM Dual Band HT

- TX: 144-148, 222-225, 430-450
- RX: 0.5-999 (cell blkd)
- Power: 5/2.5/1/0.3W (1.5W on 220)
- Memories: 900
- Submersible 3 feet for 30 minutes

$249.99

FT-1802M 2M FM Mobile

- TX: 144-148 • RX: 136-174
- Power: 50/25/10/5W
- Memories: 221

$129.99 after instant ©oupon

Perfect for Field Day!

FT-817ND HF/VHF/UHF Backpack Transceiver

- TX: HF/VHF/UHF • RX: 0.1-56, 76-154, 420-470 MHz • Power: 0.7-5W
- Memories: 200 • Operate in the field using AA batteries or Ni-MH pack

$599.99

FNB-85 Extra 9.6V 1400mAh Ni-Mh Battery Pack
$69.99

ATAS-25 7 Band Antenna 40/20/15/10/6/2M & 440
$249.99

Perfect for Field Day!

FT-897D 100W HF/VHF/UHF Portable/Base

- TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz
- Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200
- Operate in the field without a 12VDC power supply using up to two optional FNB-78 battery packs which makes power output 20W (10W on 440 MHz)

$799.99 after instant ©oupon

FNB-78 13.2V 4500mAh Ni-Mh Battery Pack
$129.99

CD-24 4 Hour FNB-78 Charger
$129.99

Free Separation Kit!

FT-857D

FT-450

FT-857D 100W HF/VHF/UHF Mobile

- TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz
- Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200

$699.99 after instant ©oupon, free YSK-857

FT-450 100W HF/6M Portable/Base

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W • Memories: 500
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Thanks to Alinco, you can have a dual band dynamo in your pocket AND in your car!

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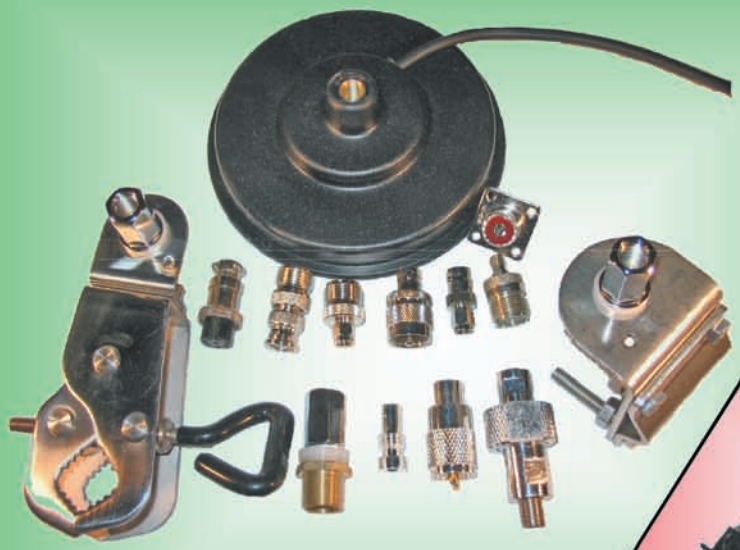

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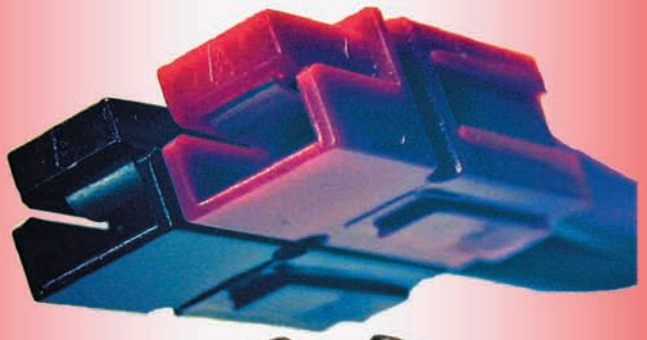

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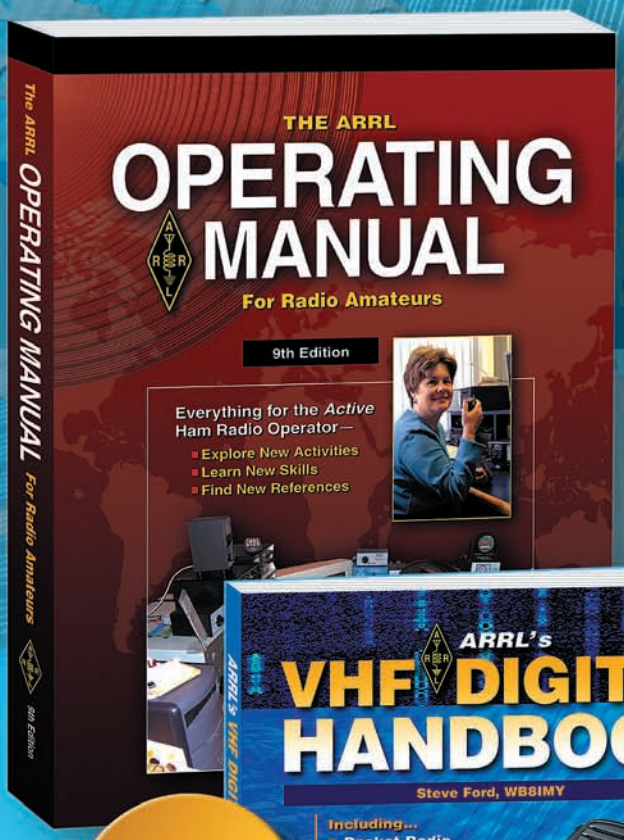

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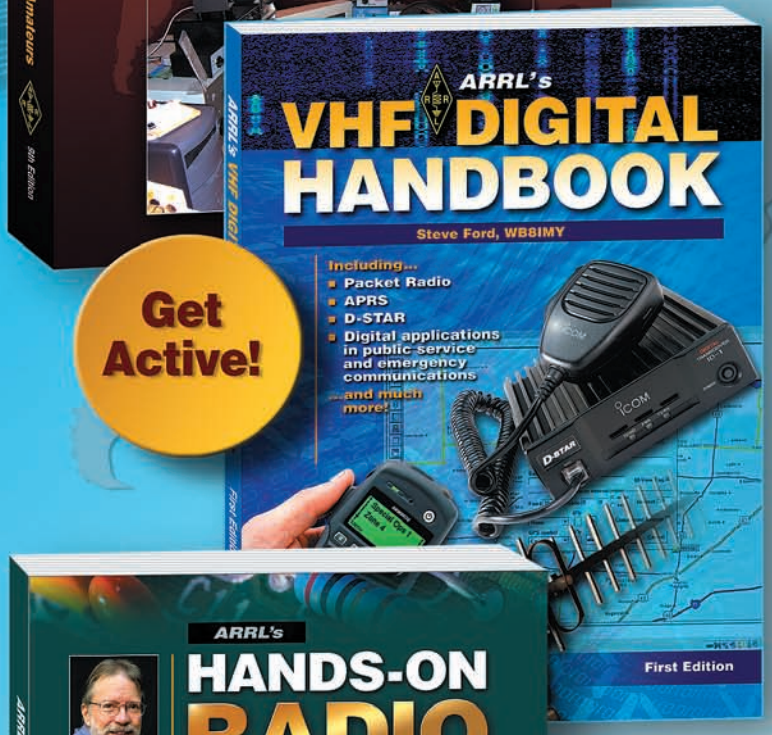

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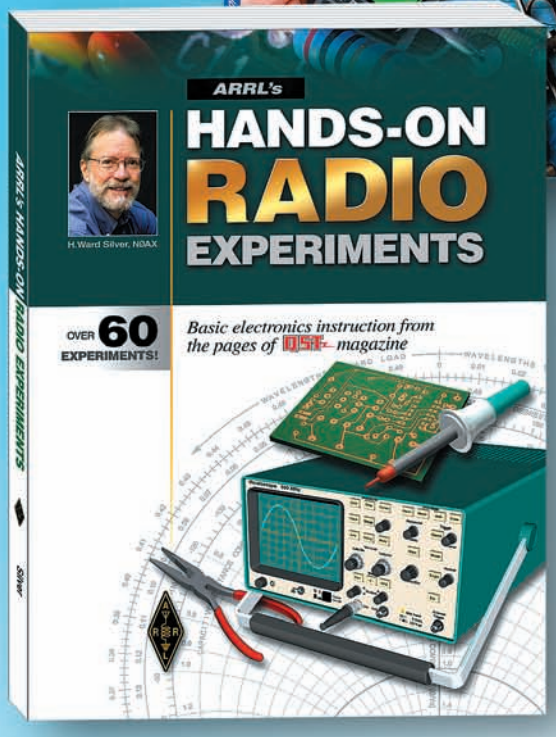

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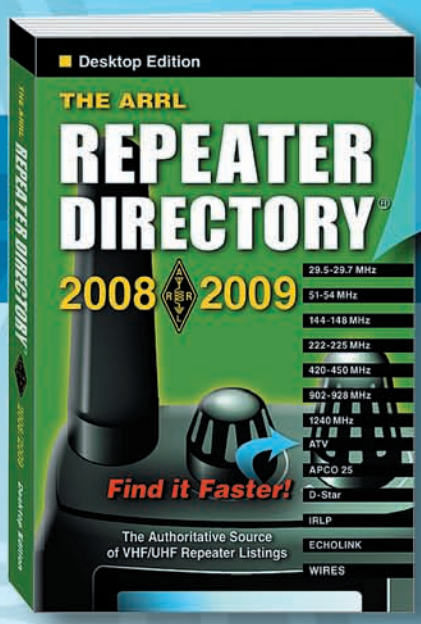

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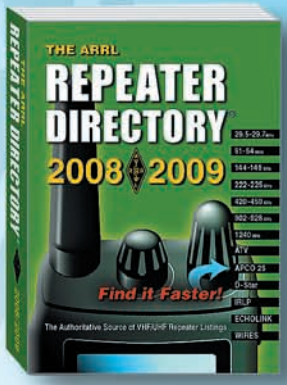

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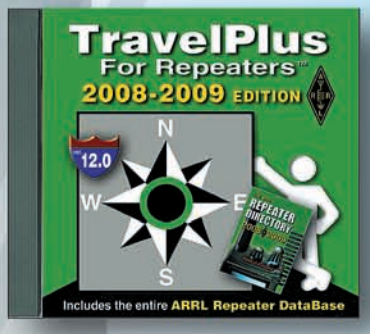

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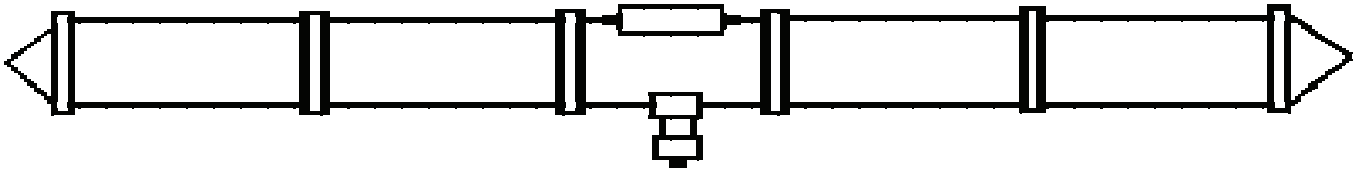

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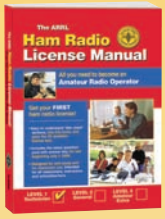

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Continued on page 134

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B-2518-G	5	7	40	60	80	100	125	160	160	160
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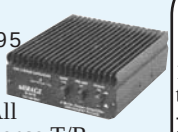
Watts In	.25	.5	3	5	8	10	15	25	35	50

35 Watts for 2 Meter HT



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Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

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Find your antenna's true resonant frequency. Trim dipoles and verticals.

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Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

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MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1312D, $15.95. Its rugged all metal cabinet is a compact 4x2x6¾ in.

How good is the MFJ-259B?

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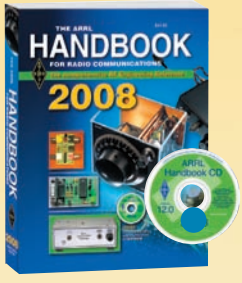

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New high voltage *current balun* lets you tune balanced lines at high power with no worries.

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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.

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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.

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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.

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MFJ-971 $119.95

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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.

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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.

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MFJ-16010 $69.95

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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.

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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.

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We won in court —but there's more work to do!

Even as we celebrate, we cannot afford to become complacent. Our access to the radio spectrum is too valuable, and much too important.

Last year, in the wake of Federal Communications Commission decisions that did not adequately protect licensed radiocommunication services from interference from Broadband Over Power Line (BPL) systems, **the ARRL went to court** to challenge the FCC.

On Friday, April 25, 2008 **the United States Court of Appeals** for the District of Columbia Circuit **confirmed what the ARRL has been saying for years** about how the FCC was handling the BPL interference issue: **FCC prejudice tainted the rulemaking process**.

We won a tremendous victory for all radio amateurs!

Yet, the Court's decision does not guarantee that the FCC will correct its errors. We face another round of technical arguments. When the FCC reopens the BPL proceeding as the Court has ordered, we must leave no room for technical issues to be settled on anything other than technical grounds.

There's more work to do!

The ARRL will not rest until the FCC has given licensed radiocommunication services the protection they are entitled to under international agreements and federal law. We must be prepared to take the next step, and the next, and the next...

So with our sincere thanks for your support, we ask you to consider a gift to the Spectrum Defense Fund now. Make your contribution by mail, phone or on the web at **www.arrl.org/defense**.

For more information, contact:

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MFJ *Balanced Line* Antenna Tuner

Superb balance . . . Very wide matching range . . . Covers 1.8-54 MHz . . . Cross-Needle SWR Wattmeter . . . Handles 300 Watts . . . Compact size . . .

The MFJ-974HB is a* fully balanced true *balanced line antenna tuner. It gives you superb current balance.

Johnson Matchbox

For decades, the Johnson Matchbox has been the standard of comparison for balanced line antenna tuners. But, it had a severely limited matching range and covered only 80, 40, 20, 15 and 10 Meters.

***The** MFJ-974HB is its successor*. It meets today's needs and even surpasses the Johnson Matchbox outstanding performance.

Everything You Need

The MFJ-974HB gives you excellent current balance, very wide matching range(12-2000 Ohms) and covers 1.8 through 54 MHz *continuously* including all WARC bands, 160 Meters, 6 Meters and the new 60 Meter band. Handles 300 Watts SSB PEP and 150 Watts CW.

Tuning is fast and easy - - just three tuning controls. You can adjust for highly efficient broadband low-Q operation or use higher Q when you encounter extreme loads.

A large three-inch lighted Cross-Needle SWR/Wattmeter lets you read SWR, peak or average forward and reflected power *all at a glance* on 300/60 or 30/6 Watt ranges.

A ground post is provided to ground one output terminal so you can also tune random wires and coax fed antennas.

Compact 7½Wx6Hx8D in. fits anywhere.

Tunes any Balanced Line

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

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

Excellent Balance, Excellent Design

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

MFJ-974HB
$209.95

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

Balanced Line = Extremely Low Loss

Balanced lines give extremely low loss.

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

6-80 Meter Balanced Line Tuner

MFJ-974B
$189.95

MFJ-974B, $189.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $59.95. 102 feet doublet antenna covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for 450 Ohm ladder line (100 feet included). Authentic *glazed ceramic* end insulators. Handles 1500 Watts.

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Choose super versatile 5-way binding posts AND/OR Anderson PowerPole(R) connectors

Anderson PowerPole® is a registered trademark of Anderson Power Products.

Provide multiple high current DC outlets for transceivers and accessories from your main 12 VDC power supply – keeps you neat, organized and safe. Prevents fire hazard. Keeps wires from tangling up and shorting. Outlets are fused and RF bypassed.

All MFJ DC power strips have *built-in* six foot, eight gauge, flexible color-coded cable with ring tongue terminals -- *no extra cost*. *RF-tight* aluminum cabinet has mounting ears and ground post with wing nut.

Choose MFJ's *super versatile* super heavy duty 5-way binding posts (spaced for standard dual banana plugs) and/or *Anderson PowerPole®* outlets.

Each *Anderson PowerPole®* is individually fused as needed. Standard color coded automobile fuses plug in externally. Extra *PowerPole®* connectors, contacts, fuses are included at *no extra cost*.

Versatile 5-Way Binding Posts

MFJ-1118
$84.95

Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts with master fuse, ON/OFF switch, and "ON" LED provide 15 Amps for accessories. 12½x2¾x2½ in.

All PowerPoles®

MFJ-1128
$104.95

12 outlets, each fused, 40 Amps total. Three high-current outlets for transceivers. Nine *switched* outlets for accessories. Mix and match in-cluded fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 12 pairs of *PowerPole®* contacts and *extra* 10 fuses (2 each: 1, 5, 10, 25, 40A) -- *no extra cost*. 12Wx1¼Hx2¾D in.

MFJ-1126
$84.95

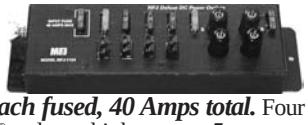
8 outlets. each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *Built-in 0-25 VDC Voltmeter*. Includes *extra* 6 pairs of *Anderson PowerPole®* contacts and *extra* 5 fuses (1, 5, 10, 25, 40A) -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles® AND 5-Way Binding Posts

MFJ-1129
$114.95

The best of both worlds! ***10 outlets, each fused, 40 Amps total.*** Three high-current outlets for rigs -- 2 *PowerPoles®* and 1 versatile high-current 5-way binding post. Seven *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 versatile binding posts. Mix and match included fuses as needed (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 7 pairs of *PowerPole®* contacts, and 10 fuses (2 each,1,5,10, 25, 40A) -- *no extra cost*.12½Wx1¼Hx2¾D in.

MFJ-1124
$64.95



6 outlets, each fused, 40 Amps total. Four *PowerPoles®* and two high-current 5-way binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes 4 pair *PowerPole®* contacts, and 5 fuses -- *no extra cost*.

•1 Year *No Matter What*™ warranty •30 day money back guarantee (less s/h) on orders direct from MFJ.

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MFJ tiny Travel Tuner

Tiny 4½x2¼x3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything!

MFJ brings you the *world's smallest* full power 150 Watt 80-10 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna.

It's no toy, its got guts! Built with real *air* variable capacitors (600 Volt, 322 pF) and *three* stacked powder iron toroids to handle real power -- not just QRP. Bypass switch lets you bypass tuner when you don't need it.

You can use nearly any transceiver at full power with nearly any coax fed or random wire antenna for portable, home or mobile operation.

It's perfect for compact rigs like Icom IC-706MKIIG, Yaesu FT-100D, Kenwood TS-50, QRP rigs and others with a built-in SWR meter.

Operate anywhere, anytime with a quick easy set-up! Tune out SWR on your mobile whip from inside your car. Operate in your apartment with a wall-to-wall antenna or from a motel room with a wire dropped from a window or from a mountain top with a wire over a tree limb. Great for DXpeditions or field day. Be prepared for emergencies.

MFJ-902 is so small and handy, you'll rely on it wherever you go! It's easy to pack away in your briefcase, suitcase, backpack, glove compartment or desk drawer. It's tiny enough to slide in your back hip pocket! 4½Wx2¼Hx3D inches.

MFJ-902
$99.95

Tiny Travel Tuner with 4:1 Balun

MFJ-902H
$119.95

MFJ-902H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun* for balanced lines and 5-way binding posts for balanced lines and random wire. 5¾Wx2¼Hx 2¾D in.

Tiny Travel Tuner with Cross-Needle SWR/Wattmeter

MFJ-904
$129.95

MFJ-904, same as MFJ-902 *Tiny Travel Tuner* but has *Cross-Needle SWR/Wattmeter.* Read SWR, forward and re-flected power all at a glance in 300/60 and 30/6 Watt ranges. 7¼Hx2¼Hx2¾D inches.

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

MFJ-904H
$149.95

ALL-in-one! MFJ-904H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun for balanced lines* and Cross-Needle SWR Wattmeter. Read SWR, forward and reflected power all at a glance in 300/60 and 30/6 Watt ranges. Has 5-way binding posts for balanced lines and random wire. 7¼Hx2¼Hx2¾D inches.

Long 10/12 foot Telescoping Whips

MFJ-1954
$29.95
10 Feet

MFJ-1956
$34.95
12 Feet

10 foot extended, 19 inches collapsed, MFJ-1954, $22.95. 12 foot extended, 22.5 inches collapsed. MFJ-1956, $29.95. Standard 3/8 inch by 24 threaded stud for use with all standard mounts. Durable 1/2 inch diameter plated brass. Telescopes for full 1/4 wave operation 2 to 12/15 Meters. Cover 17, 20, 30, 40, 60, 80, 160 Meters with loading coil. Use two for multi-band dipoles. Replace screwdriver antenna whip for highly efficient *fixed* mobile operation.

MFJ RF Isolator

MFJ-915 *RF Isolator*

MFJ-915
$29.95

prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. *Don't operate without one!* 5x1½ inches. For 1.8 to 30 MHz.

Portable Collapsible Antenna Tri-Pod

MFJ-1918
$49.95

Holds 66 pounds of antenna steady. Black *steel* base forms strong braced equilateral triangle 40 inches on a side. Non-skid feet. One inch diameter steel mast extends height to six feet. Strong base and mast locks. Easily add antenna mount or mast extension for greater heights. Collapses to 38 inches by 4 inch diameter. 6¾ pounds.

40-10M G5RV Junior
MFJ-1778M, $39.95.
Half-size 52 foot *G5RV Jr* 40-10 Meters, 1500 Watts.

1500 Watt Lightning Surge Protector

MFJ-272
$39.95

Protect your expensive transceiver from static electricity and lightning induced surges with an ultra-fast gas discharge tube. Plug between rig and antenna, attach ground. DC to 1000 MHz. SO-239s.

All-Band G5RV Antenna

MFJ-1778
$44.95

Cover all bands, 160-10M with tuner. 102 ft. long, 1.5kW. Custom fiberglass insulator stress relieves 450 Ohm ladder line. Use horizontally, as inverted vee or sloper. Marconi on 160M.

Glazed Ceramic Antenna Insulator

MFJ-16C06
6-Pack
$4.56
(79 cents each)

Authentic *glazed ceramic* antenna insulator. Extra-strong -- will not break with long antennas and will not arc over or melt even under full legal power. Molded ridges give extra-long high voltage path to prevent high-voltage breakdown. Smooth wire holes prevent wire damage. Use as center or end insulator for dipoles, doublets, G5RVs, guy wires and others.

Current Balun/Center Insulator

MFJ-918
$24.95

True *1:1 Current Balun/Center Insulator* forces equal currents into dipole halves to reduce coax feedline radiation and field pattern distortion. Reduces TVI, RFI and RF hot spots in your shack. 50 ferrite beads on *Teflon*(R)coax. 1.5kW, 1.8-30 MHz. Stainless steel hardware. *Direct* antenna connection. 5x1½ in.

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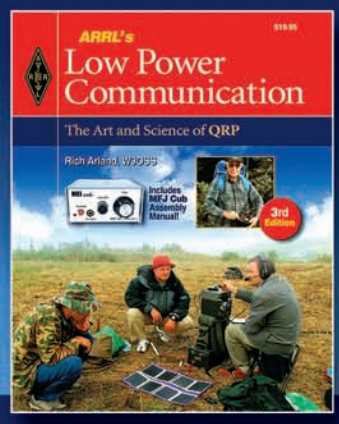

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MFJ Compact 200 Watt *IntelliTuners*™

Automatically tunes any unbalanced antenna . . . Ultra fast . . . 20,000 VirtualAntenna™ Memories . . . Antenna Switch . . . Efficient L-network . . . Matches 6-1600 Ohms at 200 Watts . . . 1.8-30 MHz . . . Digital SWR/Wattmeter . . . Audio SWR meter . . . Radio interface . . .

The MFJ-929 *IntelliTuner-Compact*™ lets you *automatically* tune any coax fed or random wire antenna 1.8-30 MHz at full 200 Watts SSB/CW. It can match 6-1600 Ohms (SWR up to 32:1) - - that's a 50% wider matching range at a higher power level than lesser competing products.

You get a *digital* SWR/Wattmeter with backlit LCD, antenna switch for 2 antennas, built-in radio interface and built-in internal BiasTee for remote tuner operation.

MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms give you ultra-fast automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

MFJ VirtualAntenna™ Memory

MFJ new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 antenna connectors. You can select up to 4 antennas on each antenna connector. Each antenna has 2500 memories.

New!

MFJ-929
$219.95

4 Times the Solutions!

MFJ-929 gives you 256 values each of capacitance and inductances for 131,072 matching solutions. That's *4 times* the 32,768 matching solutions of competing products with only 128 L/C values each!

Highly intelligent, ultra-fast tuning!

Don't be fooled by competing products claiming fast search times -- if you have a *quarter* of the matching solutions, of course, it takes less time to search but it's *not* faster.

MFJ's much faster speed comes from advanced technology and software algorithms *not* from fewer matching solutions.

MFJ's *IntelliTuner-Compact*™ actually *measures* complex impedance -- *R* and *X* -- of your antenna, computes the L-network values needed and snaps in those components to give you an *instant* match.

If the load is out of measurement range, *AdaptiveSearch*™ determines the *smaller* subset from all solutions that can match a safe load -- and then searches *only* that subset -- others search through far more solutions.

Digital LCD SWR/Wattmeter

An easy-to-read, two-line, 16-character backlit LCD displays SWR, peak or average forward/reflected power, frequency, antenna 1 or 2, L/C tuner values, on/off indicators and other info. They are selected from easy-to-understand menus -- *not* complex combinations of buttons you can't remember.

A fast-response, high-resolution bargraph gives you an auto-ranging 20/200 Watt power meter. You get 60 segments each for forward and reflected power and 36 segments for SWR -- *try that with an 8 segment bargraph that makes you change power ranges and doesn't even give you reflected power!*

You can read inductance and capacitance *directly* in uH and pF. This turns you into an expert *L-network designer!* Match your load, read the resulting L/C values, then use them to build your fixed L-network.

Or, knowing the L/C values you can determine R and X of the load impedance.

Plus Much More!

***StickyTune*™** mode gives you one-hand tuning by locking the TUNE button -- just transmit to tune regardless of SWR.

Has audio SWR meter and audio feed back. Competing products don't.

Built-in 50 MHz frequency counter.

Its built-in radio interface lets you use a simple wire cable to compatible rigs. Others require a cable with expensive electronics.

Binding post for random wire. Self-test.

Highly efficient L-network. 10 Amp/1000V relays, RF duty silver mica capacitors. 6½ Wx2¾Hx7½D in. 2.4 lbs. 12-15 VDC/ 1Amp or 110 VAC with MFJ-1316, $21.95.

MFJ-928, $199.95. **Like** MFJ-929, less LCD, manual tune buttons.

MFJ-927, $259.95. **Weather** protected *remote* auto tuner for coax/ wire ant., includes MFJ-4116 Power Injector. Most MFJ-929 features, no LCD/buttons.

MFJ-5114 K/Y/I/A, $19.95. Prewired Radio Interface cable for MFJ-929/928.

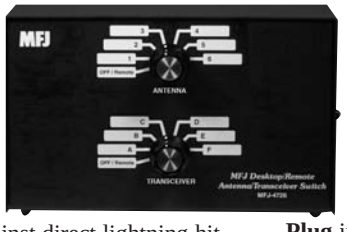
MFJ-4116, $24.95. Power Injector for remote MFJ-929/928 use. Sends DC/RF down coax.

Desktop/Remote Antenna and Antenna/Transceiver Switches

MFJ-4716
$89.95
6-position *Antenna* Switch

New!

MFJ-4726
$159.95
6-position *Antenna/Transceiver* Switch



Place these MFJ antenna or antenna/ transceiver switches on your *desk* or use them *remotely*. You can place them out-of-the-way under your desk, in your garage or closet -- saves cable, eliminates cable mess.

Super easy-to-use rotary switches -- no complicated computer buttons to learn or microprocessors to fail or generate RFI that covers up rare DX.

Select 1 of 6 antennas and/or 1 of 6 transceivers in any combination. All unused inputs are grounded. Automatically grounds all inputs when you turn off your transceiver -- simply connect a sense line to your transceiver. When rotary switches are in OFF position, all inputs are grounded or control is transferred to the optional remote control.

Ultra-fast gas discharge tube *lightning surge protector* protects transceiver and safely shunts static electricity and lightning induced surges safely to ground. Does not protect against direct lightning hit.

SO-239 connectors. 1500 Watts/50-75 Ohm load, 1-60 MHz. Useable to 150 MHz. Connects to remote control with common CAT 5 cable, not included (available from WalMart, etc.). Use 12 VDC or 110 VAC with MFJ-1312D, $14.95. For indoor use, not weather protected.

Antenna Switches - - 6 and 4 positions

• MFJ-4716, $89.95, *6-positions*; **• MFJ-4714, $79.95,** *4-positions*. 8Wx2¾Hx4¼D in.

Remote Controls:

• MFJ-4716RC, $39.95, *6-positions*; **• MFJ-4714RC, $39.95,** *4-positions*. 2¾Wx3¾Hx1D inches.

Antenna/Transceiver Switches - - 6 and 4 positions

Select one of 6 antennas *and* one of 6 transceivers in any combination with just two easy-to-use rotary switches.

Plug in antenna tuner, SWR/Wattmeter or other into its common ports, so it's always connected to the antenna and radio selected.

• MFJ-4726, $159.95, *6-positions*; **• MFJ-4724, $139.95,** *4-positions*. 8Wx5Hx4¼D"

Remote Controls: • MFJ-4726RC, $59.95, *6-positions*; **• MFJ-4724RC, $59.95,** *4-positions*. 2¾Wx3¾Hx1D"

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MFJ Dummy Load/Wattmeter

1.5 kW Dry Dummy Load has built-in precision, true peak-reading SWR/Wattmeter switchable to external antenna!

MFJ-267
$159.95

World's most versatile 1.5 kW dummy load has a *built-in* true peak reading SWR/Wattmeter that you can switch and use independently!

You'll find tons of uses!

Tune up your transceiver, linear amplifier or antenna tuner into a safe 50 Ohm dummy load at *full power*. Then instantly switch to your antenna and monitor SWR, forward and reflected power.

Use for testing/tuning transmitters, transceivers, amplifiers, antenna tuners, baluns, transformers, filters, matching networks, coax, stubs, transmission lines and antennas.

The 50-Ohm dry dummy load works DC to 60 MHz. SWR is below 1.3:1 at 30 MHz. Can handle 100 Watts for ten minutes or 1500 Watts for ten seconds. Comes with power derating curve.

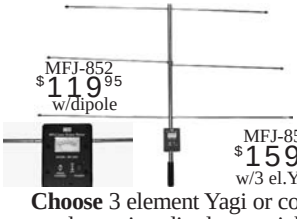
Extra-large three-inch lighted Cross-Needle meter reads SWR (1:1 to 8:1), forward and reflected power *simultaneously*.

Reads *true peak* PEP or average power on 300/3000 Watts forward and 60/600 Watts reflected power ranges 1.8-54 MHz.

High accuracy comes from a carefully designed directional coupler, an accurate active-peak reading circuit and a precision d'Arsonval meter movement.

RF tight perforated aluminum cabinet. 4½Wx3½Hx10½D inches. Uses 12 VDC or 120 VAC with MFJ-1312D, $15.95.

Find Power Line Noise fast!

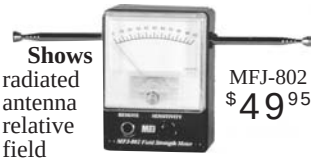


MFJ-852
$119.95
w/dipole

MFJ-856
$159.95
w/3 el.Yagi

Choose 3 element Yagi or compact telescoping dipole to quickly pinpoint noise. Walk or drive with these handheld, directional noise finders to search out leaky insulators, loose hardware and corroded ground lines quickly. Track noise directly to pole, transformer, insulator or others. Has field-strength meter, headphone jack to listen or record. Operates in optimum 135 MHz region. Sensitive .3uV receiver, 70 dB AGC.

Field Strength Meters



MFJ-802
$49.95

Shows radiated antenna relative field strength. Determine radiation pattern. **MFJ-802** has huge 3 inch meter. Telescoping dipole reduces influence of surrounding objects and is more reliable, repeatable than monopole. Sensitivity control. Jack for remote sensor, MFJ-802R, $34.95.

MFJ-801
$29.95

MFJ-801 has 1¾ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

81 dB Step Attenuator

MFJ-762
$89.95

81 dB Attenuator in 1 dB steps. 50 Ohms. Usable to 500 MHz. 250 milliwatt maximum input. BNC connectors. Shielded stages. Connect between receiver and antenna and use S-meter as a precision calibrated field strength meter. Prevent receiver blocking, cross-modulation. Determine gain/loss, ideal for fox hunting. Evaluate linearity. Isolate circuits. Extend range of sensitive equipment. Measure input/output level differences.

MFJ Frequency Counters

MFJ-886
$119.95

MFJ-886 covers 1 MHz to 3 GHz with 300 MHz direct count, 0.1 Hz resolution. 4 gate times. 10-digit high-contrast 3/4 inch LCD display. Lock display button. Bargraph shows RF field strength. Includes rechargeable Ni-Cad batteries, charger, telescopic antenna. Black anodized aluminum. 2¾x2¼x1¼ in.

MFJ-888
$189.95

MFJ-888, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/period, has 50/1M Ohm input, auto hold, LED backlight, beeper. 2¾x4¼x1¼ in.

MFJ *HF/VHF/UHF* Dummy Loads

Oil-Cooled 1 KW CW 2 KW SSB *VersaLoad*™

MFJ-250X
$49.95

Run 1KW CW or 2 KW PEP for 10 minutes. Run *continuous duty* with 200 Watts CW or 400 watts PEP. Transformer oil not included. Low VSWR to 400 MHz. Under 1.2:1 to 30 MHz. SO-239 connector. Safety vent with cap, carrying handle. 7½Hx6⅝D in. **MFJ-250, $69.95.** Includes transformer oil (no PCB).

Dry 1.5 kW *HF/VHF/UHF* Load

MFJ-264
$74.95

Ham radio's most versatile 50 ohm *dry* dummy load. Works with all radios from 160 Meters through 650 MHz. SWR below 1.3 to 650 MHz and below 1.1 at 30 MHz. Handles 100 watts for 10 minutes, 1500 Watts for 10 seconds. 3Wx3H x9D in. SO-239 connector. **MFJ-264N, $84.95.** With type "N" connector.

Dry 300 Watt *HF/VHF* Dummy Load

MFJ-260C
$39.95

Air-cooled, non-inductive resistor in a perforated metal housing; SO-239 connector. Full load for 30 seconds. Silk-screened derating curve to 5 minutes. Handles 300 Watts. SWR below 1.1:1 to 30 MHz, 1.5:1 from 30 to 650 MHz. 2¼x2¼x7 inches. **MFJ-260CN, $49.95.** With type "N" connector.

MFJ CW Reader/Keyer

MFJ-464
$199.95
(Keyboard, paddle not included.)

Plug MFJ's CW Reader with *built-in* Keyer into your transceiver's phone jack and key jack. Now you're ready to compete with the world's best hi-speed CW operators -- and *they won't even know you just passed the code test!* Sends and reads 5-99 WPM. Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use paddle or computer keyboard. Easy menu operation. Front panel speed, volume controls. 4 message memories, type ahead buffer, read again buffer, adjustable weight/sidetone, speaker. RFI proof.

MFJ Atomic Wrist Watch

MFJ-186RC
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Receives atomic time signal WWVB and sets your watch automatically -- always accurate to milliseconds. Select 12/24 hour format and pacific, mountain, central, eastern time zones. Displays hour, minutes, seconds, day and date. Displays year, month and day in calendar mode. Alarm, stopwatch functions. Brilliant blue backlight. Water-resistant.

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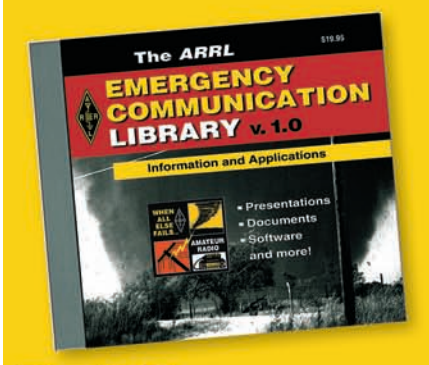

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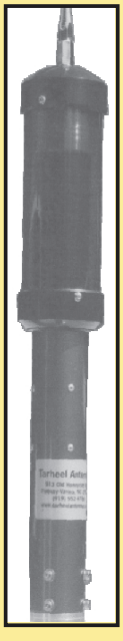

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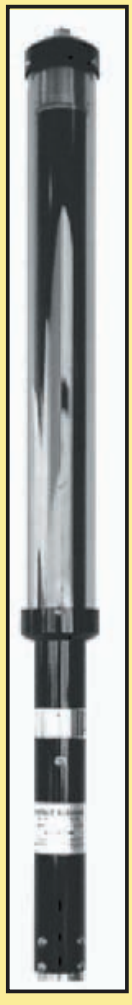

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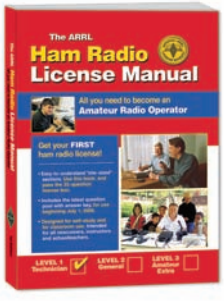

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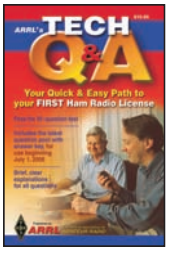

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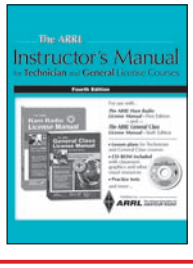

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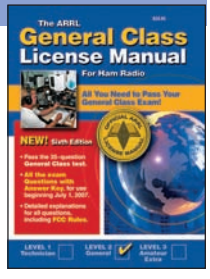

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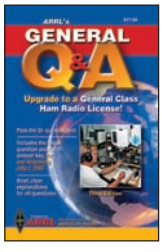

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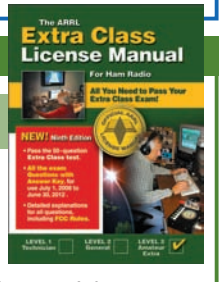

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4. Closing date for Ham-Ads is the 15th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received May 16th through June 15th will appear in August *QST*. If the 15th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day. Please contact the Advertising Department at 860-594-0255 or hamads@arrl.org for further information or to submit your ad.

5. No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance etc is not permitted in *QST* advertising.

6. New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The American Radio Relay League does not discriminate in its advertising on the basis of race, color, religion, age, sex, sexual orientation, marital status or national origin. The League reserves the right to decline or discontinue advertising for any other reason.

7. AN IMPORTANT NOTICE TO ALL HAM AD POSTERS AND RESPONDERS, FROM THE ARRL ADVERTISING DEPARTMENT Greetings from ARRL HQ! Please note that we have received reports from many ARRL members who have placed classified ads in these listings, and have received responses from individuals proposing "creative" payment schemes. These particular instances involved offers of overpayments for goods by bank check, followed by instructions to deduct the cost of your item from the overpayment, and to transfer the overage back or to another individual. This is a well-known scam. Unfortunately, we have no control over this and other scams of this type. Once your email address is posted, you are vulnerable to those individuals seeking to provide you with questionable information. See **http://www.arrl.org/news/features/2005/07/15/1/?nc=1** for further details. REMEMBER: TRANSACT CAREFULLY AND PROTECT YOURSELF.

QST Ham Ads on the Web – Updated Monthly!

www.arrl.org/ads/ham-ads.html

Club/Hamfests/Nets

After 25 years as a Hamfest Vendor, health is forcing me to slow down. The entire operation is for sale, including inventory, traveling show trailer with RV area, and all contacts. Buying, wholesale, all future locations which are always the best. Will assist as needed. All shows pre-paid now are included. Satellite Sam, KG4JMN. 434-942-8057.

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MARCO The Medical Amateur Radio Council Ltd. is a charitable non-profit group of health care professionals who meet weekly at 10:00 am Eastern on Sunday for "Grand Rounds" 14.308 MHz. All welcome. Membership inquires to WE1MD@arrl.net or CBA. SASE for newsletter to: MARCO, 144 Head of the Tide Road, Belfast, ME 04915. http://www.marco-ltd.org

RAINBOW AMATEUR RADIO ASSOCIATION Serving the gay/lesbian community since 1995. ARRL affiliated. Privacy respected. Four active weekly HF nets, newsletter, message board, chat room, VE teams, DXpeditions. Web site: www.rara.org. Information: PO Box 18541, Rochester, NY 14618-0541.

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General

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FT DX 9000 Contest
Custom-Configurable Version
Two Pairs of Meters, plus LCD Window, VRF Input Preselector Filter, Three Key Jacks, and Dual Headphone Jacks, 50 V/12 A Internal Switching Regulator Power Supply

Display color (Umber or Light Blue) may be selected at the time of purchase. Modification from 200- to 400-Watt version not available.

Loaded with Leading-edge Performance Capabilities. . . The First Triumph in the 2nd Generation of the FT DX 9000 Lineage: The Powerful FT-2000!

Shown with after-market keyboard, and monitor (not supplied).
Optional Data Management Unit (DMU-2000)

HF/50 MHz Transceiver
FT-2000D
200 W Version (External Power Supply)

HF/50 MHz Transceiver
FT-2000
100 W Version (Internal Power Supply)

"The Best of the Best Just Got Better"

Contact Dennis Motschenbacher K7BV at k7bv@vxstdusa.com for details

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

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

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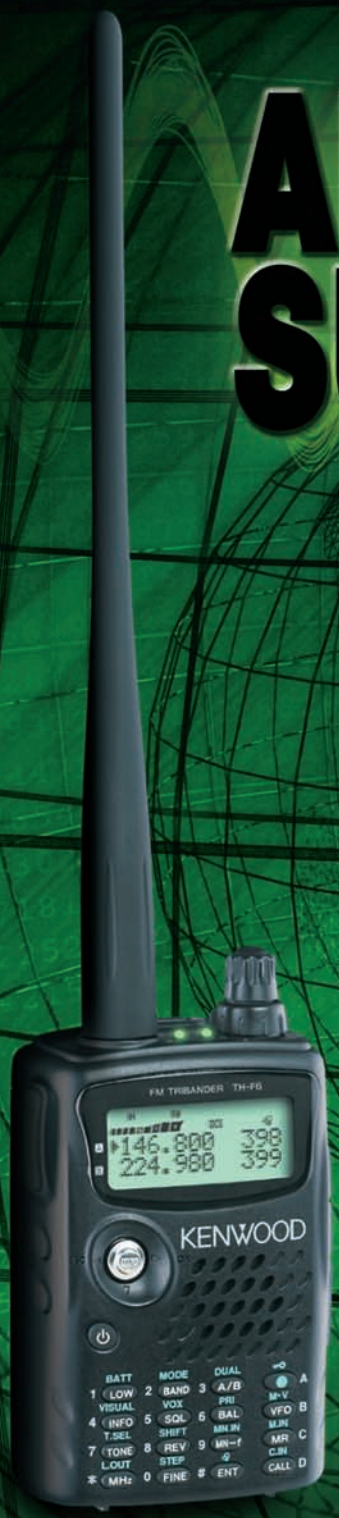
- Triband (144/220/440 MHz)
- Receives 2 frequencies simultaneously even on the same band
- 0.1~1300MHz high-frequency range RX (B band)[1]
- FM/FM-W/FM-N/AM plus SSB/CW receive
- Bar antenna for receiving AM broadcasts
- Special weather channel RX mode
- 435 memory channels, multiple scan functions
- 7.4V 1550mAh lithium-ion battery (std.) for high output[2] and extended operation
- 16-key pad plus multi-scroll key for easy operation
- Built-in charging circuitry for battery recharge while the unit operates from a DC supply
- Tough construction: meets MIL-STD 810 C/D/E standards for resistance to vibration, shock, humidity and light rain
- Large frequency display for single-band use
- Automatic simplex checker
- Wireless remote control function
- Battery indicator • Internal VOX • MCP software

[1]Note that certain frequencies are unavailable. [2]5W output



TH-F6A

TRIBANDER

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