DECEMBER 2010 QST Vol 94 No 12

D-STAR: CONNECT ACROSS MILES...

ANALOG & DIGITAL, ALL IN ONE

Every Icom portable and mobile transceiver that works D-STAR also offers world-class analog performance, all in the same rig. Keep in touch with friends via traditional FM while you advance in the hobby.

Shown with Optional GPS Speaker Mic (HM-189GPS)

D-STAR ready

IC–80AD NEXT GENERATION 2M/70CM DUAL BANDER

Join the future of amateur radio with the latest in D-STAR. This compact rig is perfect for those getting started on VHF/UHF bands, and who want to play with the technology. In addition to the 5 watt output for 2m and 70cm, there are three additional output levels to extend your operational time between charges. To increase your fun, the '80AD has a wide band receiver that goes far beyond just ham bands.

D-STAR ready

IC–92AD

MILITARY RUGGED AND SUBMERSIBLE

- 5/2.5/0.5/0.1 Watt Output
- RX: 0.495–999.990, 118–174, 350–470MHz*
- 1304 Alphanumeric Memory Channels
- Optional GPS Speaker Mic (HM-175GPS)
- IPX7 Submersible

D-STAR optional

IC–91A

ANALOG & DIGITAL DUAL BANDER

- 5/0.5 Watt Output
- RX: 0.495–999.990, 118–174, 350–470MHz*
- 1304 Alphanumeric Memory Channels
- Li-ion Battery
- Digital Voice and Data (Opt. UT-121 Required)

D-STAR optional

IC–V82 & IC–U82

D-STAR UPGRADEABLE FOR 2m OR 70cm

- 7/4/0.5W (V82), 5/2/0.5 (U82)
- RX: 136–174MHz* (V82), 400–479MHz* (U82)
- 207 Alphanumeric Memory Channels
- CTCSS & DTCS Encode/ Decode with Tone Scan
- Digital Voice & Data (Opt. UT-118 Required)

D-STAR Repeater System

ID–RP2C

REPEATER CONTROLLER

The cornerstone of the D-STAR system. Handles up to four RF modules. Basic in-band or crossband operation. Linking capabilities through the Internet.

ID–RP2D

1.2GHZ DATA MODULE

Access point with a data rate of up to 128kbps. Perfect for email, web applications and support via Internet.

*Frequency specs may vary. Refer to owner's manual for exact frequency specs. **IPX7: Tested to work after being under 1 meter of water for 30 minutes.

...INSTEAD OF METERS!

D-PRS™

www.icomamerica.com/amateur/DSTAR

It's where to go to get free control software for the IC-80AD portable and the ID-880H mobile next-generation D-STAR rigs. Go online today!

ID-880H VERSATILE 2M/70CM MOBILE

D-STAR ready

The mobile companion to the IC-80AD. Compact, dual band operation, remotable control head that fits just about anywhere, 50 full watts of output power on both VHF and UHF, easy-to-use menu system, wide band RX, and much more. It may be Icom's most affordable dual bander with D-STAR capability, but this workhorse is full of features you'd expect to find in expensive packages.

D-STAR ready

ID-1
GO DIGITAL ON 23cm

- 10 Watt on 23cm (FM, DV, DD)
- RX: 1240–1300MHz*
- 100 Alphanumeric Memory Channels
- USB Rig Control, Ethernet Plug for DD
- Black Box Operation
- Remote Control Head, Remote Speaker and Cables Included
- PC Software Included

D-STAR optional

IC-2820H
D-STAR UPGRADEABLE 2m/70cm

- 50/15/5 Watt Output
- RX: 118–549.995, 118–173.995, 375–549.999, 810–999.990MHz*
- 522 Alphanumeric Memory Channels
- One Touch Reply Function
- Digital Voice/GPS (Optional UT-123 Required)
- Low Speed Data (Optional OPC-1529R Required)

D-STAR optional

IC-2200H
D-STAR UPGRADEABLE FOR 2m

- 65 Watt Output
- RX: 118–174MHz*
- 207 Alphanumeric Memory Channels
- CTCSS & DTCS Encode/ Decode with Tone Scan
- Built-in 10dB Squelch Attenuator
- Digital Voice & Data (Optional UT-118 Required)

ID-RP2V
1.2GHZ DIGITAL VOICE MODULE

ID-RP2000V
2M DIGITAL VOICE MODULE

ID-RP4000V
70CM DIGITAL VOICE MODULE

ICOM®

30509

hy-gain ROTATORS

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

HAM-IV

HAM-IV
$649.95

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.**

HAM-V

HAM-V
$1099.95
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, $109.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $49.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

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.

TAILTWISTER SERIES II

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

T-2X
$799.95

T-2XD
$1229.95
with DCU-1

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

AR-40

AR-40
$349.95

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.**

AR-35 Rotator/Controller

AR-35
$89.95

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

NEW! Automatic Rotator Brake Delay

RBD-5
$29.95

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

CD-45II

CD-45II
$449.95

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.**

HDR-300A

HDR-300A
$1499.95

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.**

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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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Our Cover
This holiday season, as we marvel at the magic and wonderment of all that winter brings, we cannot help but reflect on the past year and look ahead to 2011. We here at ARRL Headquarters wish you peace, happiness and the fulfillment of all your dreams. In the photo, the winter Sun shines down on the season's first snowfall at the home of Thomas Hybiske, K3GM, of Sturbridge, Massachusetts. Glistening, the 3 element Yagi hints at good winter DX to come. Photo by Thomas Hybiske, K3GM.

Departments

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Ride Cycle24 to the Top with Yaesu

The radio... FT DX 9000

Photograph depicts after-market keyboard, keyer paddle, and monitor, not supplied with transceiver. Display image simulated and may differ in actual use.

HF/50 MHz Transceiver
FT DX 9000MP
Two Pairs of Meters, plus LCD Window; Data Management Unit and Flash Memory Slot Built In. Main/Sub Receiver VRF, plus Full Dual Receive Capability, External 50 V/24 A Switching Regulator Power Supply and Speaker with Audio Filters

Display color (Umber or Light Blue) may be selected at the time of purchase. Modification from 400 to 200 W not possible.

HF/50 MHz Transceiver
FT DX 9000D 200 W Version
Large TFT, Data Management Unit and Flash Memory Slot Built In, Main/Sub Receiver VRF, plus Full Dual Receive Capability, Three µ-Tuning Modules for 160 - 20 M, 50 V/12 A Internal Switching Regulator Power Supply

HF/50 MHz Transceiver
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"

Introducing the new FT DX 9000 Series and FT-2000 Series with PEP-9000 and PEP-2000 (Performance Enhancement Program)

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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Introducing the Yaesu FT-950 transceiver for DX enthusiasts
Superb receiver performance
Direct lineage from the legendary FT DX 9000 and FT-2000

HF/50 MHz 100 W Transceiver

FT-950

- Triple-conversion super-heterodyne receiver architecture, using 69.450 MHz 1st IF
- Eight narrow, band-pass filters in the RF stage eliminate out of band interference and protect the powerful 1st IF
- 1st IF 3 kHz Roofing filter included
- High-speed Direct Digital Synthesizer (DDS) and high-spec Digital PLL for outstanding Local Oscillator performance
- Original YAESU IF DSP advanced design, provides comfortable and effective reception. IF SHIFT / IF WIDTH / CONTOUR / NOTCH / DNR
- DSP enhancement of Transmit SSB/AM signal quality with Parametric Microphone Equalizer and Speech Processor
- Built-in high stability TCXO (±0.5 ppm after 1 minute@77 ° F)
- Built-in automatic antenna tuner ATU, with 100 memories
- Powerful CW operating capabilities for CW enthusiasts
- Five Voice Message memories, with the optional DVS-6 unit
- Large Multi-color VFD (Vacuum Fluorescent Display)
- Optional Data Management Unit (DMU-2000) permits display of various operating conditions, transceiver status and station logging.
- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

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Introducing the new FT-950 Series with PEP-950 (Performance Enhancement Program)

COMPACT HF/50 MHz 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

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)

Real Performance,
Really Portable

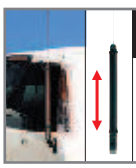
FT-817ND

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

60 m Band

Automatic Matching for FT-897/857 Series Transceivers

FC-40
Automatic-Matching 200-Memory Antenna Tuner (160 m ~ 6 m Band)
WATERPROOF



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ATAS-120A
Active Tuning Antenna System (no separate tuner required)

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

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Manually-Tuned Portable Antenna

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The Totally New - Advanced Dual Band Mobile Radio
5.2" x 1.6" Large dot matrix (264 x 64 dots) LCD display
GPS / APRS® / Bluetooth® Features

NEW

144/(220)* /430 MHz 50 W
FM Dual Band Transceiver

FTM-350R

*220 MHz 1W (USA Version only)

NEW Large (5.2" x 1.6"/130 x 40 mm) dot matrix (264 x 64 dots) LCD display for comfortable viewing for night and day. Choose your favorite LCD display from 8 vibrant color options

NEW The Display Control Head is designed for easy separation from the main RF power unit built by tough aluminum die-cast;10ft control cable included (Optional 20ft control cable available)

NEW Multi-purpose Global Positioning System display (with optional FGPS-1 GPS Receiver and Antenna. Optional FGPS-2 External GPS Receiver and Antenna is also available)

NEW Compatible with the worldwide standard data-communications system, APRS®, and SmartBeaconing™ capabilities

NEW Huge memory channel management capability! 500 Independent Memory channels + 9 Programmable Band Limit Memory Scan channels + 1 Rewritable Preferred channel for each L and R Band

NEW 3 Speaker System (including Built-in Dual Speakers on the rear of the Control Head for FM Broadcast in Stereo!)

Exclusive Dual Band AF Monitor for listening to FM/AM broadcast and monitoring ham bands as well

Exclusive Built-in Barometric Pressure Sensor

Screen Example

Dual Band (Spectrum Scope function)

Navigation (with GPS antenna unit attached)

Mono Band (Spectrum Scope function)

APRS®

Barometer

Timer

* APRS® is a registered trademark of Bob Bruninga WB4APR.
* SmartBeaconing™ from HamHUD Nichetronix

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"It Seems to Us"

Our Community Leaders

"Why do people become radio amateurs? If you ask new licensees, frequently you will hear that they are interested in radio technology or that they want to be prepared for emergencies and to provide public service communications. But there's more to it than that."

In general, people join groups with whom they have something in common and whose company they enjoy. Sometimes a desire to learn — to tap into a body of knowledge and expertise — is the motivator. At other times, sharing a common goal is enough to bring people together who might otherwise have no occasion to interact.

Amateur Radio is a global community. We can lay claim to being the first technology-based social network. The common goal that sparked the creation and early growth of the ARRL was the desire to develop a network of relay stations to overcome the limited range of the crude radio equipment of the day, so that amateurs could exchange messages with others well beyond the reach of their own stations.

The ARRL was not the only attempt, nor even the first, to organize radio amateurs at the national level. That the ARRL survived and flourished while other organizations did not is due in large part to the extraordinary leadership of our founding President, Hiram Percy Maxim, whose name continues to appear at the top of the list of ARRL officers on page 15 of every issue of *QST*. Mr. Maxim (affectionately known as HPM) had the vision not only to define a unifying mission, but also to refine that mission as the world of radio technology passed through its most dramatic period of change in the early 1920s.

HPM is often credited with the rebirth of Amateur Radio after the World War I shutdown, but an equally important achievement does not always get equal billing: the founding of the International Amateur Radio Union (IARU). He recognized the rapid development of intercontinental communication during the winter of 1923-24 both as Amateur Radio's crowning achievement up to that time and as a threat to its very existence. By demonstrating that global communication was possible with low power and a backyard antenna, amateurs also had increased the value of shortwave "virtual real estate" by many orders of magnitude. HPM saw the need for the coordination and representation of Amateur Radio internationally and immediately set out to meet that need. That Amateur Radio exists today is due not only to his founding vision for the ARRL; it is due equally to his willingness and ability to let go of that initial vision when it became obsolete and to move on to confront new challenges. HPM's example still serves us well, nationally and internationally, three quarters of a century after his death.

This is somewhat interesting (or not), you might think, but what does it have to do with why anyone would want to become a radio amateur?

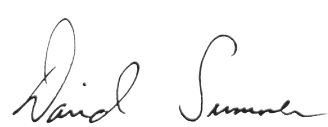
Amateur Radio is not just a single community. It comprises many communities, defined in all sorts of ways. Just as Amateur Radio required visionary leadership in its formative years — just as the ARRL and the IARU require visionary leadership today — so does each and every one of our other communities.

For people who are just becoming acquainted with Amateur Radio the most important community is likely to be a local radio club. When a newcomer encounters a group that enjoys doing things together and sharing their passion for radio with one another, when the first-time visitor is made to feel welcome, he or she is likely to return.

But a welcoming club doesn't just happen. It takes officers who are willing to devote the time to building a team, planning programs and activities, and seeing that the myriad tasks that are required to sustain a volunteer organization are all getting done. It takes leaders who are willing to move beyond their own comfort zone, to reach out to new people and entrust them with responsibility so they can develop into future leaders. It takes members who are willing to forego some of what they enjoy most — whether it's operating, building, experimenting, or just hanging out with old friends — to spend precious time sharing what they know with a new generation. There are many such clubs among the more than 2,000 ARRL affiliates, especially our Special Service clubs. We salute them. Through their efforts, Amateur Radio is healthy and growing — not just in numbers of licensees, but in our capacity to serve the public interest.

In addition to local clubs there are many other Amateur Radio communities, both formal and informal. We may have been the first virtual social network, but we also benefit greatly from our use of the Internet. This is especially true of specialized areas of interest that often lack a critical mass of enthusiasts in a given geographic area. Some groups that do important work in promoting and advancing various aspects of Amateur Radio only get together in person once a year, if that. To be successful they need the same sort of enlightened leadership that makes such a difference at the local level.

No other individual will ever leave such a huge, indelible mark on Amateur Radio as did our founding President. Yet each of us constantly leaves tiny marks on its future by what we do and what we don't do, particularly when we interact with newcomers. HPM had the vision for the ARRL but he didn't launch it all by himself. The co-founder and first ARRL Secretary — and no doubt the person who did most of the work to achieve HPM's initial vision — was Clarence Tuska, who later in life enjoyed telling the story of the first meeting between the distinguished inventor and himself, a schoolboy who knocked uninvited on Mr. Maxim's door. How fortunate we are that HPM wasn't the sort of "leader" who would say, "Go away, kid — I'm busy."



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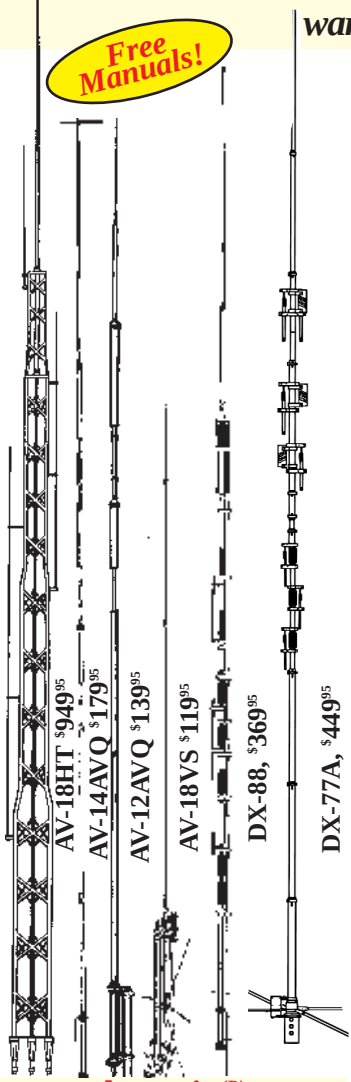

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Standing 53 feet tall, the famous *Hy-Gain HyTower* is the world's best performing vertical! The AV-18HT features automatic band selection achieved through a unique stub-decoupling system which effectively isolates various sections of the antenna so 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.

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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	**$179.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$139.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$119.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 80 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 40 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

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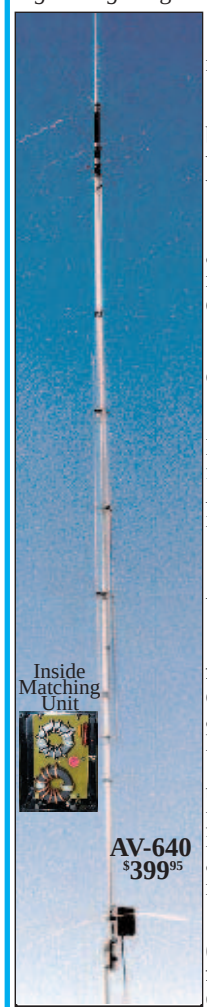

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- Four new DXCC entities came into existence with the dissolution of the Netherlands Antilles.
- The Administrative Council of the International Amateur Radio Union held its annual meeting October 1-2 in Salinitas, El Salvador. IARU Region 2 held its General Assembly in the same location the following week.
- The 2010 Global Amateur Radio Emergency Communications Conference was held in Curaçao.
- For the 27th year, ARRL HQ hosted the Amateur Radio Administration course sponsored by the US Telecommunications Training Institute.
- The fifth annual ARRL Online Auction once again brought out bargain hunters.
- The 53rd Scouting Jamboree on the Air gave Scouts worldwide the opportunity to enjoy Amateur Radio.
- The ARRL VEC office coordinated the first-ever VE session from Antarctica via video teleconference.
- The ARRL Logbook of The World has now processed more than 300 million contacts.
- The International Telecommunication Union has elected Dr Hamadoun Touré, HB9EHT, of Mali as its Secretary-General for a second four-year term, and François Rancy of France was elected Director of the Radiocommunication Bureau.
- The ARRL announced the Third Homebrew Challenge — a 10 and/or 6 meter transceiver.
- The ARRL/TAPR Digital Communications Conference was held in Vancouver, Washington and the ARRL Pacific Division Convention took place in San Ramon, California. In addition, digitally oriented amateurs gathered at Microsoft headquarters in Redmond, Washington for the MicroHAMS Digital Conference.
- The US Amateur Radio Direction Finding (ARDF) Team — sponsored by the ARRL — captured three medals at the 2010 ARDF World Championships in Croatia.

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

In September, many thousands saw the ARES® 75th Anniversary logo in Times Square, New York.

- "Radio Hams Celebrate 75 Years of Volunteer Emergency Service," and other news of the ARES® anniversary showed up in many places this fall, but ARES was not the only activity making news. Colonel Douglas Wheelock, KF5BOC, aboard the ISS was busy making headlines all over the country because of his Amateur Radio contacts.
- "Astronaut Wheelock speaks to students from space" in the *Elmira (NY) Star-Gazette*; "Man reaches astronauts with amateur radio" on ABC-TV7 in Pittsburg, Texas; "Ham Radio Operator Talks To Space Station" on KSBW; "East Texan makes new friends in outer space" on KYTX-TV19; "Astronaut Wheelock speaks to students from space" in the *Press & Sun-Bulletin*; "Out of this World Conversation for Local Ham Radio Operator" on WBRE News; Kopernik Speaks to Astronauts" on WBGH TV; "Speaking to the void: Young contacts space" in the *Pittsburg (TX) Gazette* — all these and many more were wonderful media hits showing the technological abilities of Amateur Radio in the space age.
- Hams' technical skills were also highlighted in "Wood Co. Communication Upgrade" on WUPW-Fox News, Toledo. Commercial providers wanted "millions of dollars," for new systems. But with a little ingenuity, and some help from local ham radio operators, the problem was solved and their system works well.
- The Yellowstone Amateur Radio Emergency Service (YARES) in Yellowstone County, MT was honored with the US Department of Commerce Public Service Award for their outstanding critical communication during numerous spring and summer severe weather events in 2010. Their radio communication provided critical updates for National Weather Service forecasters during a tornado that impacted Billings and their story was published by no less than NOAA.gov itself.
- Arizona hams got national notice with "Lost Boy Scout troop rescued from wilderness" in the *Sun Shopper*, "Phoenix-area Boy Scout troop rescued near Prescott" at AZ Central.com and "Boy Scouts get lost in northern Arizona" reported on KTAR.com when a Boy Scout troop was rescued near Prescott after they used a ham radio to signal for help.
- The Northern Michigan Amateur Radio Emergency Services Organization was featured on the cover of the *Mackinac Journal Magazine*. The four page feature story with color photographs is in the September 2010 issue.
- Then there were three stories that just seemed to go together:

"Parade takes coordination and volunteers" appeared in the *Grand Island Independent*. It told of 10 Grand Island ham radio club members who volunteered to be communication between different points in the parade. (So far, so good.) Then there was "Amateur Radio can Prevent Age Related Dementia" in the *American Chronicle*. "Wouldn't you agree that we Amateur Radio operators are mentally and socially stimulated? I know I am. Both on and off the air, we hams have plenty to do." Now just put those two stories together and you can see how "Hams avert a major snafu during the Evanston annual 100-mile bike ride" just *had* to be coming. It seems that having a parade going one way while another event with over 2000 bike riders try go another way on the same roads was neither a good idea nor coordination. But thankfully the (stimulated and obviously still competent) North Shore Amateur Radio Club volunteers on scene got it sorted out on the fly, averting total chaos.

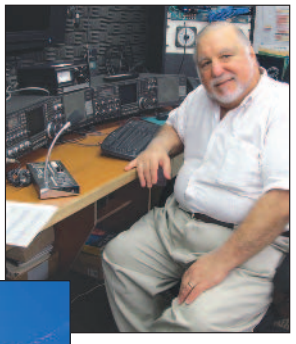
Obviously, more people should be ham-stimulated.

2010 Florida State Convention Draws Hundreds to Melbourne

The Florida State Convention (also the 45th annual Melbourne Hamfest) featured a wide array of enticements for area hams: Outside tailgate area, inside commercial booths, exams, forums and meetings, ARRL awards checking — and more. Held October 9-10, it was once again sponsored by the Platinum Coast ARS.

While in Melbourne for the Convention, ARRL COO Harold Kramer, WJ1B, visited the impressive array of emergency facilities under the aegis of Brevard Country ARES/RACES.

HAROLD KRAMER, WJ1B



Ray Kassis, N4LEM, at the 20 meter operating position of the well-equipped ARES Emergency Operations Center. Ray is District Emergency Coordinator for Brevard County ARES/RACES.

HAROLD KRAMER, WJ1B

Ray is fortunate to have at his disposal this 50 year old Collins 237B-3 log periodic antenna (6.5-40 MHz) at 60 feet. The boom is 63 feet long and the longest element is 80 feet long. Notice the vertical "skirt" wires on the tower. They are attached to a detuning box to erase the tower and antenna from the AM broadcast station directional towers at the remote site. "It's an incredible antenna," reports N4LEM.

HAROLD KRAMER, WJ1B

One of the highlights of the convention, the Brevard County Emergency Response van (one of two, actually) is equipped with an array of transceivers for communications with a number of served agencies.

Inside HQ

The Development Office

Voluntary contributions, raised by the ARRL Development Office, provide funding for essential programs and services not totally funded by member dues. Since 2001, the ARRL's fund raising efforts have raised nearly $9 million through the generosity of more than 41,000 ARRL members who have made voluntary contributions. The Development Office was initiated just nine short years ago by Mary Hobart, K1MMH (**k1mmh@arrl.org**). Mary, along with her two associates, Margie Bourgoin, KB1DCO, and Maryann Macdonald, still manages this office today.

What do these contributions pay for? The Spectrum Defense Fund, a key program that benefits from voluntary contributions, was created in 1996 to help fund ARRL's efforts to protect our Amateur Radio spectrum and operating privileges. This fund provides resources for the ARRL's efforts against BPL and other ongoing threats to our spectrum. We just launched an informative newsletter about Spectrum issues called *Spectrum Defense Matters.*

The Education & Technology Fund, created in 2001 introduces Amateur Radio to the next generation by placing Amateur Radio stations in more than 400 schools nationwide and conducting the Teachers Institutes in Wireless Technology. These week long professional development seminars are designed for classroom teachers and we have conducted seven Teachers Institutes this year. These programs are entirely donor-funded and they are successfully introducing electronics, Amateur Radio, space and robotics in classrooms across the country. For more, see **www.arrl.org/teachers-institute-on-wireless-technology.**

Launched in 2002, the ARRL Diamond Club is a recognition program designed to encourage and recognize increased annual support from individual donors. Membership benefits include pins and certificates and, at higher levels, there are publication discounts and no fees for DXCC applications and the Outgoing QSL Service. Brass level and above Diamond Club members enjoy access to the complete *QST* online archive, including the most recent four years of the archive. See **www.arrl.org/the-arrl-diamond-club**.

If you have visited us here at HQ, you certainly have noticed the awe inspiring Diamond Terrace in the front of our building. Installed in 2007, this red brick terrace provides Diamond Club members with an opportunity to honor family, friends, Silent Keys and others by placing an inscribed brick in the Terrace. Hundreds of bricks have been placed over the past four years.

You may wish to contribute to other funds that match your specific Amateur Radio interests. These include the Lab Fund, the Historic Preservation Fund, Ham-Aid and the W1AW Endowment Fund. The ARRL Legacy Circle honors members and friends who have included ARRL in their estate plans. This is an opportunity for members to designate the ARRL as the beneficiary of a will, insurance policy or trust.

In these difficult economic times, it is not easy to raise money. Contributions from members and friends support programs that are vital for the ARRL and for the future of Amateur Radio. Thanks to all of you who have donated and thanks to Mary and her staff for all of their efforts.

73,

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

Guide to ARRL Member Services

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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.

Membership inquiries and general correspondence should be addressed to the administrative headquarters: ARRL, 225 Main Street, Newington, Connecticut 06111-1494.

Officers, Division Directors and Staff

As an ARRL member, you elect the director and vice director who represent your division on ARRL policy matters. If you have a question or comment about ARRL policies, contact your representatives at the addresses shown.

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Hiram Percy Maxim, W1AW

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There are no tubes, no tube heat, no tuning, no worry rugged -- just turn on, select band and operate. 600 Watts PEP/500W CW -- lets you talk to anyone you can hear!

Covers 1.5-22 MHz, (10/12 Meters with $29.95 kit, requires FCC license), instant bandswitching, SWR/thermal protected, extremely quiet, lighted peak reading Cross-Needle SWR/Wattmeter, front panel ALC control, operate/standby switch. 12.5 lbs., 9½Wx7⅛Hx12D in.

Includes ALS-600PS transformer AC power supply for 120/220 VAC, inrush current protected. 32 lbs., 9½Wx6Hx12D inches.

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***New!* ALS-600S, $1599.** ALS-600 amplifier with 10 lb. ALS-600SPS switching power supply combo.

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Works with all ALS-600 amplifiers. Extremely lightweight, just 10 lbs. Superb regulation, very low radiated noise. 9Wx6Hx14½D in.

From QST Magazine, March, 2005

". . . the ampifier faulted only when it was supposed to. It protected itself from our boneheaded, sleep-deprived band changing manuevers . . . "

"I found myself not worrying about damaging this amplifier. It seems quite capable of looking out for itself. . . . Kudos to Ameritron."

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Instant bandswitching, no tuning, no warm-up, SWR protected, 1.5-22 MHz, quiet, compact

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Ameritron's ALS-500M solid state *mobile* amp gives you 500 Watts PEP SSB or 400 Watts CW output! Just turn on and operate -- no warm-up, no tuning, instant bandswitching. Fits in very small spaces. ***New*** ALS-500RC, $49 *Remote Head* lets you mount ALS-500M amplifier *anywhere* and gives you full control. Select desired band, turn On/Off and monitor current draw on its DC Current Meter. Has power, transmit and overload LEDs. RJ-45 cables plug into Amplifier/Remote Head.

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Virtually indestructible! *Load Fault Protection* eliminates amplifier damage due to operator error, antenna hitting tree branches, 18-wheeler passing by. *Thermal Overload Protection* disables/bypasses amp if temperature is excessively high. Auto resets.

Typically 60-70 watts in gives full output. ON/OFF switch bypasses amplifier for "barefoot" operation. Extremely quiet fan comes on as needed. Excellent harmonic suppression, push-pull output, DC current meter. 13.8 VDC/80 Amps. 3½x9x15 in. 7 lbs.

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Protects rig from damage by keying line transients and makes hook-up to your rig easy!

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Use 1 coax for **4** antennas. No control cable needed. SWR <1.25, 1.5 - 60 MHz. Useable to 100 MHz.

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Replace **8** coax with 1! SWR<1.3 to 60 MHz.**RCS-10L, $219.95** with lightning arrestors.

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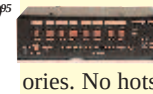

Band data from transceiver auto selects antennas. Antenna memories. No hotswitching. Rig-to-amp interface. For 3/4 BCD, 1 of 8 relay boxes. **RCS-12, $309.95**, auto controller with 8 coax relay box, to 60 MHz. **RCS-12L, $349.95**, with lightning arrestors.

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Active circuit gives *true* peak/average readings on lighted cross-needle meter.3000/ 300 Watt ranges, Remote sensor.

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Oil-cooled. 50 Ohms. 1500 Watts/5 minutes. SWR< 1.2 to 30 MHz. Low SWR to 400 MHz.

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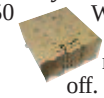

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$409.95 80-10M, fiberglass form, Pittman motor, CNC parts, magnetic sensors, #14 wire, 1.2 kW PEP. 6' whip, $24.95

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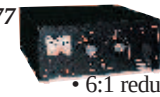
1500 Watt* True Legal Limit™ *Antenna Tuner



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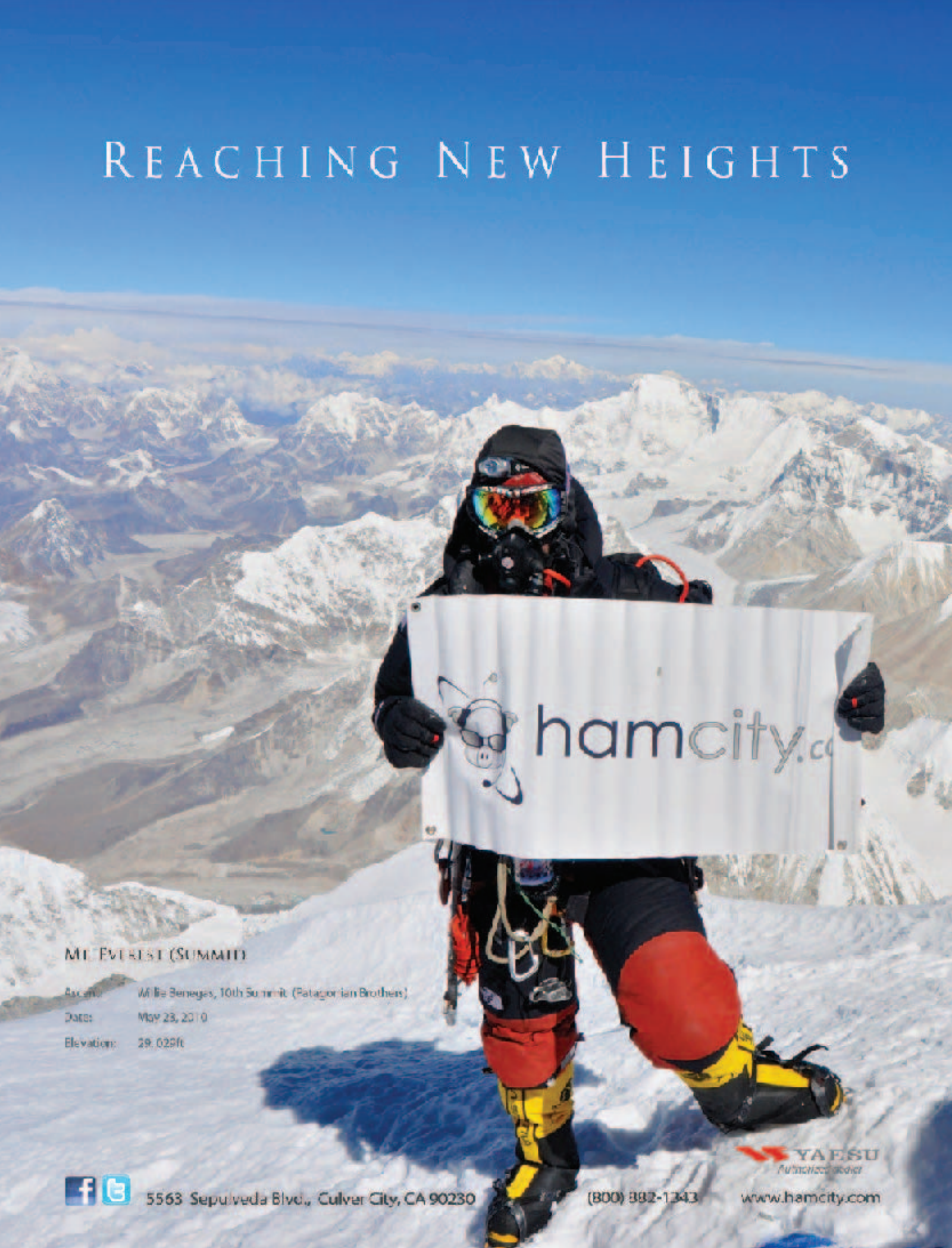

Mt. Everest (Summit)

Ascent: Willie Benegas, 10th Summit (Patagonian Brothers)

Date: May 23, 2010

Elevation: 29,029ft

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Up Front in QST

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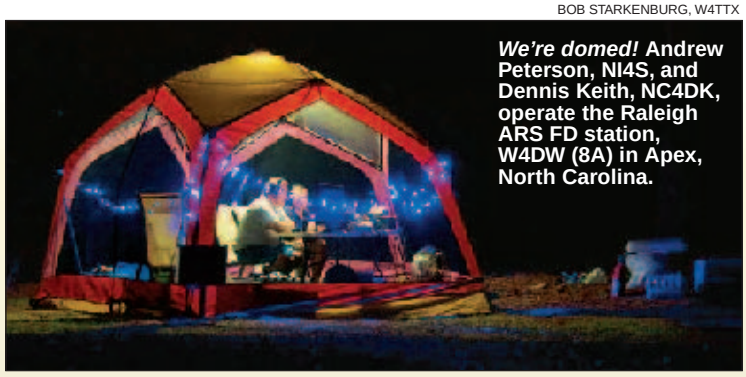
Field Day 2010: Fun for All!

Whether you operated from your sailboat, a national forest, a big box store parking lot or your own driveway, you more than likely had a great time during Field Day, held this year June 26-27. As thousands upon thousands of hams have found over the years, there's no better way to prepare for a real emergency while having a blast, meeting new people, getting youngsters and other newcomers on the air, and seeing how far you can work — propagation willing.

You'll find the full report on page 67 of this issue and online at **www.arrl.org/soapbox**.

Ready to gear up for next year? Field Day 2011 will be June 25-26, rain or shine!

BOB STARKENBURG, W4TTX



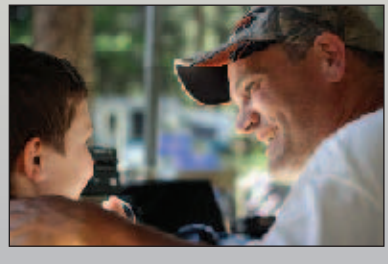
We're domed! **Andrew Peterson, NI4S, and Dennis Keith, NC4DK, operate the Raleigh ARS FD station, W4DW (8A) in Apex, North Carolina.**

JOE CLARK, KC6NLX

Getting high for Field Day: **Wanting to try something different, three members of the Shelby County (Ohio) local Amateur Radio club took to the air for some airborne mobile operation. Aircraft owner and pilot Eric Kindig, W8EJK, pilot Mike Bennett, N8BEN, and logger Joe Clark, KC6NLX, made HF and 2 meter contacts over Shelby County for about an hour on Saturday. Later in the day, Eric went back up with his 13 year old son John at the controls and made another 30 or so contacts.**

Impressive: **The Delaware Amateur Radio Association, DELARA, in Delaware, Ohio, used the Delaware County EMA/911 command post as one of our stations. The tower is a surplus 100 foot crank-up with an older tribander and a homebrew 40 meter dipole. Several wire antennas were strung from the tower as well. We operated using the club call sign, K8ES, as 4A Ohio. Another station was set up using the Radnor Volunteer Fire Department Operations Trailer, also on loan for the weekend. —** ***Stan Broadway, N8BHL***

STEVE MILLER, W6SDM



Father and son: **"This is a picture of me and my 10 year old son, Alex, KF7KKP, operating Field Day," writes Steve Thompson, N7TX, of Scottsdale, Arizona. They fired up W7AZO 2A on the Mogollon Rim in central Arizona.**

BOB GAULT, KD4NEC

After visiting the ARRL kit-building area at the Dayton Hamvention, Derek Wooley, KD5UBL, of Georgetown, Tennessee, came back home with an idea. In all, 27 people signed up to build a 2 meter tape measure Yagi from ***The ARRL Antenna Book*****. "By pooling together," he writes, "we got the cost down to $5 per antenna. Needless to say we had a full clubhouse and everyone had a great time."**

JOHN CHAPMAN, KD6QDA

On an 8000 mile solo car trip that included stops at towns with unusual names (been to Monkeys Eyebrow, Kentucky lately?), John Chapman, KD6QDA, of Folsom, California, came across Novice, Texas. Unfortunately, he didn't make it to Advance (in — take your pick — Missouri, Indiana and North Carolina).

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Sound Card - Rig Control - CW Keying - FSK Keying - Auto Switching

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CORRESPONDENCE

SUNSPOT PROJECTIONS

♦ Many of us look forward to improved HF propagation as Solar Cycle 24 continues, but with improved propagation will come new challenges. Back in 1957, a sunspot number of 5 had climbed to 175 in 3 years. George Jacobs, W3ASK, described that year as "Amateur Radio's Greatest Year" in *CQ Magazine* that January. I remember working all over the globe at any time, day or night. DX contacts were easy, but the DX population was sparse. It was simply unique and magical; with the ubiquitous communications of today, it would feel quite mundane

During major contests, one finds contention between contesters and rag chewers, even with today's sunspot number. With the rise of major world economies, significant growth in the amateur population is expected. How will we manage congestion with a sunspot number even close to 170? Communications via ham radio could become a virtual free-for-all option, similar to a pervasive Citizens Band. If that happens, we would lose the unique nature of our Service to the community: the magic, challenge and need for skill.

Setting aside anxiety, I am confident our hobby will flourish but only if we do two things: find ways to communicate that go beyond "shooting fish in a barrel," and develop and apply technologies for using spectrum that go beyond filtering and noise limiting.

We need more pioneers to expand the digital modes and support for the HSMM, TAPR and similar initiatives. Let's develop advanced techniques such as frequency agility and robust coding to increase our ability to share spectrum with each other. With great foresight, Jacobs concluded with these words: "We may be at the beginning of a new scientific age which presents a stimulating challenge, and the future of our hobby may depend upon how well this challenge is met."

RON SKELTON, W6WO
Capitola, California

EVERYTHING OLD IS NEW AGAIN

♦ Have you ever been in a waiting room, say at the doctor's office, only to find boring, out-of-date magazines? During recent visit to the doctor, I found golf magazines (I don't golf), women's magazines (I am a male), car magazines that were several years old, as well as other humdrum periodicals.

To counter this, I have recently started bringing my old *QST*s — with the address label cut out — and leaving them in the magazine racks or on the tables in the various waiting rooms I visit. The articles are far more interesting and timeless compared to what I usually find there. Who knows? Maybe someone will read *QST*, sparking an interest in Amateur Radio. I think this is an excellent way to promote the Amateur Service. I think this is a better way to share older issues of *QST*, instead of throwing them away or trying to sell them at hamfests.

MURRAY CUTLER, W9EHQ
Westmont, Illinois

LOW COST, HIGH QUALITY

♦ I just finished reading the article by David Cripe, NMØS ["Homebrew Challenge II Co-Winner," Oct 2010, pages 37-41]. I was very impressed by the author's clever ingenuity and creativity in the design. In addition to the interesting design concepts presented, the article was very well written. It is, in fact, a design tutorial in that the author presents the rationale for each and every design choice; he tells us where to find the parts, how to make your own Litz wire and even how to wind the coils. I do hope that we will see more articles of this caliber by Cripe in *QST* in the future.

BOB GARDENGHI, K3FQP
Catonsville, Maryland

A GOOD FIST IS BETTER THAN A FAST FIST

♦ I am 80 years old and was first licensed when I was 14, 66 years ago during World War II and Amateur Radio was forced off the air. I have been a CW fan since the beginning. I am happy to be able to say that I still receive many compliments on the quality of my fist with both a bug and straight key. The day I can no longer be proud of my CW skills is the day I will purchase a keyboard to send code.

Those of you who work CW on a regular basis are probably aware of the atrocious sending that can be heard every day on every band. The truly sad fact is that many, if not most of the awful fists are old-timers with more than 40 years of experience. Many use keyer/paddle outfits that they cannot control. The resulting mess is often totally unreadable! One op recently sent me his age three times, and each time it was different. As to his QTH, forget it!

If your CW skills aren't that great, please use a straight key and concentrate on the best code you can send, even if it's only at 12 or 15 words a minute. If that doesn't work for you, then please go out and buy a keyboard or use the one you already have in your shack. Good CW is music to the ears of many of us.

RAY GROB, NN8R
Fremont, Ohio

GUIDING LIGHT

♦ In reading his account of his trip to East Pen Island, I was immediately struck by the incompetence of Cezar Trifi's, VE3LYC, guide ["Stranded on East Pen: SOS de VYØV!" Oct 2010, pages 67-69]. The guide failed to prepare the sled for the trip prior to departure, took a vehicle that he knew was unreliable, and by the looks of it, supplied a tent that was too primitive for the weather conditions. This should serve as caution to would-be DXpeditioners to carefully check out the qualifications of any potential guide before you hire them.

ALAN ADELMAN, WB2ERJ
Redwood City, California

75 METERS: NOT FOR THE FAINT-HEARTED

♦ The debate rages about whether Amateur Radio is dying. At the very least, I am sure many licensees qualify for Social Security. But I think part of the problem with too few "newbies" is the kind of treatment we receive on certain bands. In June 2010, I earned my Technician license and proudly purchased a handheld transceiver, strapped it to a VHF/UHF tri-band external antenna and enjoyed the higher bands. It was fun mastering repeater codes and tones and interacting with lots of friendly folks. That said, I eagerly forged ahead and earned my General license two months later. Suddenly, HF — and the world — were at my doorstep! I purchased a 100 W transceiver and mated it with a vertical multiband antenna. That's when the trouble began: My baptism under fire on 75 meters.

Time and again I was pilloried by hams there for having purchased a vertical antenna and for not running more power. The fellow who sold the antenna to me was depicted as a charlatan (or worse) and I was "stupid" to have bought it. After meting out the obligatory lecture, they deigned further contact with me or others like me. As one of them put it, "Life's too short for QRP."

Suffice it to say that I was shocked and disappointed. If ham radio is serious about surviving in the long term, then newbies like me need to feel welcome on *all* the bands. It's just plain arrogant not to talk constructively to anyone you can hear who is trying to make contact. Instead of giving them a lecture, give them a QSL and a signal report — *make them feel welcome*! So lighten up. Get back in touch with the civilities, if not ham etiquette. Who knows, if you broaden *your* horizons, you may enjoy meeting some new people.

RANDY HAMUD, KJ6JAJ
San Diego, California

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— Joel Harrison, W5ZN

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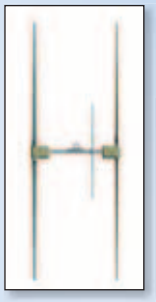
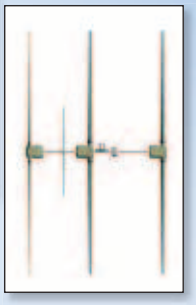
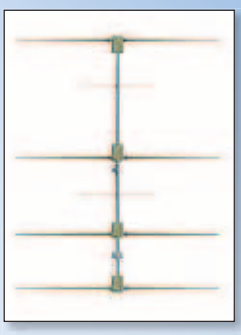


2 Element 20m-6m Yagi
2 element Yagi, 20m-6m continuous coverage; 57" boom, 36 ft longest element, 18.2 ft turning radius, 6 sq ft wind load, 30 lb; SDA 100 controller included.



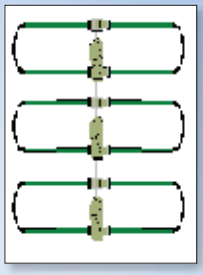
3 Element Yagi 20m-6m
3 element Yagi, 20m-6m continuous coverage; 16 foot boom, 36 ft longest element, 19.7 ft turning radius, 6.1 sq ft wind load, 51 lb; SDA 100 controller included.



4 Element Yagi 20m-6m
4 element Yagi, 20m-6m continuous coverage; 36 ft longest element, 24.1 ft turning radius, 9.7 sq ft wind load, 99 lb; SDA 100 controller included.

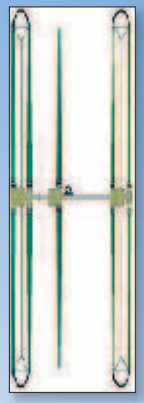
Dream Beam Series Yagi's

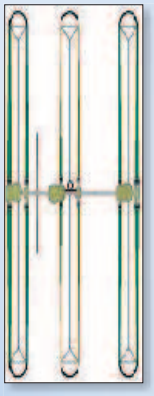
The Dream Beam series offers antennas for both space limited Hams as well as the "Big Guns" who have the space and want the very best.



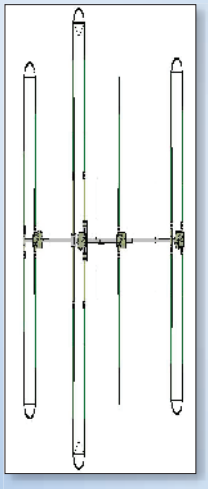
DB11 Yagi Antenna
DB11 Yagi, 18.5 ft element length, 11 ft boom, 10.8 ft turning radius, 61 lb, 5.9 sq ft wind load; 2 active elements on 20m; 3 active elements on 17, 15, 12, 10, 6m.

DB18 YAGI
Dreambeam DB18 yagi, 3 el on 20m-6m, 2 el on 40/30m, 18 ft boom; Does not include optional 6m passive element kit; Includes SDA100 controller.



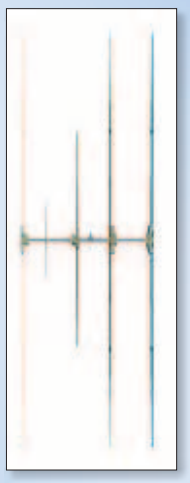


DB18E YAGI
Dreambeam DB18E, 3 el 30m-6m, 2 el 40m, three looped elements, does not include optional 6m passive element kit, 18 foot boom; Includes SDA 100 controller.



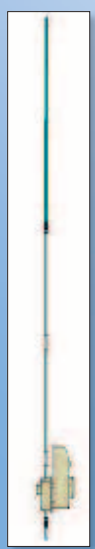
DB36 DreamBeam Yagi, 40m-6m
DreamBeam DB36 4 element Yagi, 40m-6m continuous coverage; 36ft boom, 48 ft longest element, 26 ft turning radius, 17.5 sq ft wind load, 160 lb; SDA 100 controller included.

MonstIR 4 Element Yagi 40m-6m
MonstIR 4 element Yagi, 40m-6m continuous coverage with full length elements; 34ft boom, 70 ft longest element, 39.7 ft turning radius, 23.9 sq ft wind load, 160 lb; SDA 100 controller included.



Vertical and Dipoles

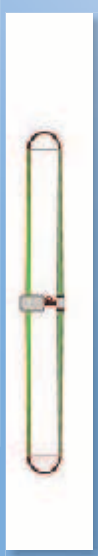
For the ham who may not have a tower, but a tree or two for a dipole. SteppIR verticals work great when there are no tall structures around to hang some wire. And, the low take-off angle can be your friend.



BigIR Vertical Antenna, 40m-6m
BigIR vertical antenna, 40m-6m continuous coverage, 32 ft length, 15 lb total weight, 2 sq ft wind load; EIA 222C wind rating when guyed; Comes with SDA 100 controller and 1.5"mounting pole ; Does not include optional 80m coil.

SmallIR Vertical Antenna 20m-6m
20m-6m continuous coverage, 18 ft total length, 12 lb weight, 1 sq ft wind load; EIA-222C wind rating without guys.

20m-6m Dipole
20m-6m continuous coverage dipole; 36 ft element length; Comes with SDA 100 controller.



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Constructing a Flagpole Antenna

Sometimes adversity can work to a ham's advantage.

Geoff Haines, N1GY

In the middle of the 2008 holiday season, a kind of catastrophe struck at our house. A significant amount of damage was caused by a water line that broke during the night. My wife, Audrey, and I eventually had to find a new home. This, in a strange way, turned out to be a blessing in disguise. Our new home is only about two blocks from our old one, but it is considerably newer and actually has a spare room that I immediately requisitioned for the "radio room."

Getting Back on the Air

As soon as the domestic necessities of moving and setting up housekeeping in our new home were taken care of, work began on the location of my station. Most of the furniture from the old radio room was used, if in a slightly different layout, the radios were hooked up and power was run. Some very good friends of mine from our local club, The Manatee Amateur Radio Club, volunteered to help me get the VHF and UHF antennas mounted on my roof. Coax was run to the radio room and I was soon back on the air. The only difficulty was found to be the HF side of things.

At our previous residence, I had used a commercial multi-band HF antenna for several years. It served me well and rarely needed any attention. My mounting system was an old telescopic TV type mast with a universal joint at the base to permit the antenna and mast to be tilted to the ground when a hurricane was imminent. The mast was secured to the roof at two places and never gave us a problem.

A Horse of a Different Hue

The new home is very different from the old place. It is oriented parallel to the road instead of at right angles to it. It is twice as wide and has virtually no backyard at all. To put the icing on the cake, the utility wires and poles run right behind the house and thus preclude any kind of a backyard setup for an antenna. The HF antenna would have to go right in the middle of the front lawn! Audrey took one look at my old vertical and said "No." Actually, she said considerably more than that, but let's leave that conversation out of this discussion. A new plan had to be found.

I did notice that many of my neighbors had flagpoles in their front yards and so the thought occurred to me that maybe that was a solution to my dilemma. You will note that I have not mentioned anything about restrictive covenants. That is because there aren't any where I live. When we first moved to the development a number of years ago, I specifically asked the park owner about Amateur Radio antennas. His answer was simple: "As long as it doesn't look like the Johnson Space Center, you'll be okay." To that end, I have steered clear of large dish antennas and HF Yagis and everyone seems happy.

Run it up the Flagpole

No, the problem here was one of simple esthetics, and the judge of what would be acceptable sleeps right beside me every night. An antenna combined with a flagpole seemed to be the right way to go. At the Orlando Hamcation in February, I purchased a remote HF automatic antenna tuner. After diligent research into what would best suit my situation I chose an ICOM AH-4 based on several factors — size, compatibility with my ICOM IC-706 MkIIG and ease of connection to the flagpole. For your station, another tuner may be more appropriate — as long as it will automatically match a wide range of loads and handle your transmitter's power.

Now I had a site (the middle of the front lawn), I had a tuner (the AH-4), and I had a plan for the radial runs under the sod. What was I forgetting? Oh yeah, the antenna/flagpole! There are several manufacturers of flagpole type antennas, and other antennas that can be disguised as a flagpole. I even visited with a fellow ham who built a flagpole around a commercial trap vertical that was featured in an issue of *QST* a few years ago.[1] I was all set to follow one of those paths when a member of our ham club mentioned that I could have an old sailboat mast from his back yard. What a find! For free, the price was right. The overall length was 22 feet. It even broke down into two sections, so it would be easy to get home. It was made of aluminum tubing, was light weight and even had some of the hardware attached so turning it into a flagpole would be simple.

Making it Happen

Initially, I thought that this would be dirt simple. Then I realized that I had to mount it so that it would stay vertical. I also had to design some way to take it down should one of our frequent hurricanes head my way. Here is where the sticky bit began. The mast has a diameter of 2½ inches at the bottom. This diameter transitions to 2 inches at the junction of the two mast sections. I checked with several vendors of tilt over mounts and all were very helpful, but none had a mount that could handle anything over 2 inches of mast diameter.

And I did want a tilt over mount. I don't know about anyone else, but I did not want to try balancing a 22 foot mast while trying to lower it gently to the ground. I wanted to be able to remove one or two bolts and smoothly walk the mast down to a horizontal position. At that point I can remove the other bolts and disassemble the mast in relative comfort.

[1] J. Ebner, N8JE, "Flagpole Vertical," *QST*, Apr 2007, p 21.

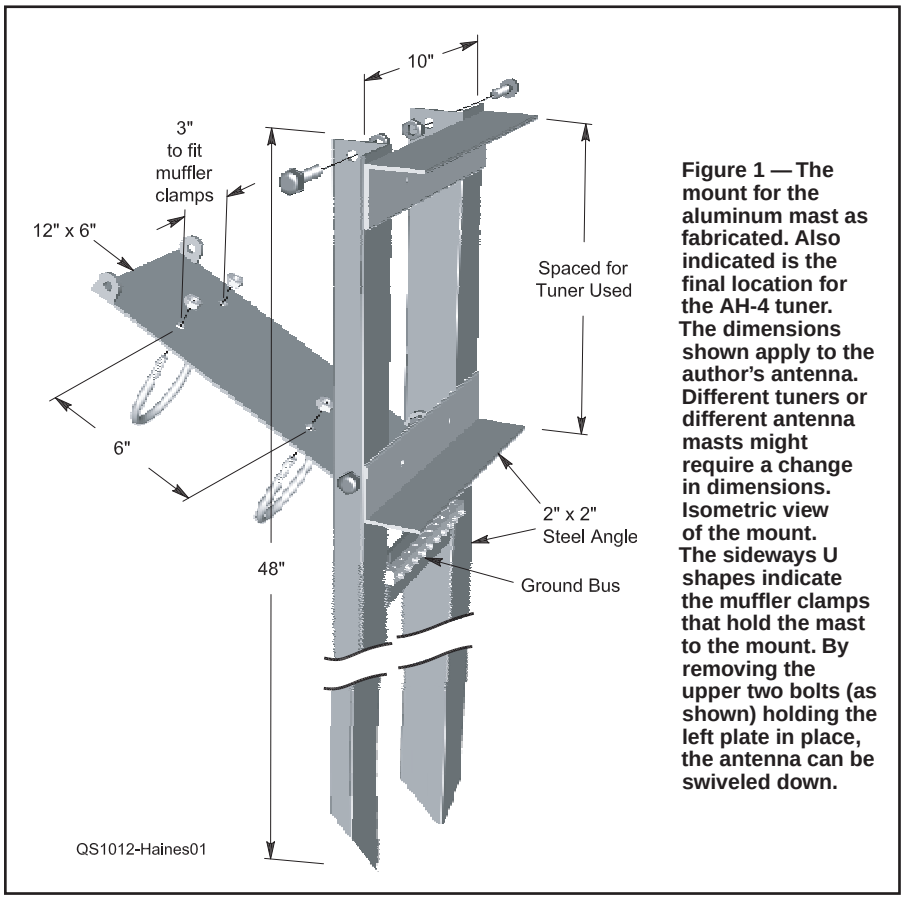

Figure 1 — The mount for the aluminum mast as fabricated. Also indicated is the final location for the AH-4 tuner. The dimensions shown apply to the author's antenna. Different tuners or different antenna masts might require a change in dimensions. Isometric view of the mount. The sideways U shapes indicate the muffler clamps that hold the mast to the mount. By removing the upper two bolts (as shown) holding the left plate in place, the antenna can be swiveled down.

Figure 2 — View of the finial on top of the mast shows how a toilet tank float and a little wire can be used to extend the antenna to a full 23 feet.

Figure 3— Base of the antenna with the enclosure in place and the surrounding flowers in full bloom.

Out came the graph paper and pencils (and the erasers too, if you must know). I tried to avoid reinventing the wheel and looked closely at the various tilt mounts available commercially. From one I took the idea of a solid base plate with the antenna/flagpole attached via U bolts. I insulated the mast from the mount with a section of PVC pipe — the darker type used for electrical conduit, since the white stuff is not tolerant of too much UV light. The white PVC works fine for situations in which not too much stress is placed on it, such as a radome for a VHF antenna or the like, but with even a light weight 22 foot mast, the extra support of the slightly thicker gray PVC is appreciated.

From another manufacturer I pinched the idea of a kind of *pickle fork* mount, driven deep into the ground. If necessary, this, like most others, can be surrounded with a concrete footing to add weight and permanence to the mount. In evaluating the other flagpoles in our neighborhood, I found that most of them were simply supported by driving a PVC sleeve into the ground and placing the pole into the sleeve. Some, however, had been mounted in a concrete filled hole dug into the soil.

I figured that I would wait until the time came to actually place the mount before making that decision. More on that later.

Figure 1 shows my basic design. I deliberately oversized the bolts and used steel rather than aluminum. Not being a structural engineer, I figured the safe approach was to look at what the commercially available units were made of and go up at least two notches in size. I took my design to a local welding shop and after a few modifications suggested by the owner, he proceeded to whip up the whole thing in just about one hour. The cost was no more than some of the commercial tilt mounts on the market.

After the mount was constructed, it was time for paint. I chose to paint the mast and the mount with white metal primer first, and then finish with a good grade of exterior white enamel. The finial on the very top of the mast, to be mentioned a little later, was painted with a spray can of metallic gold color paint so that the entire assembly would look as traditional as possible.

When I began to attempt driving my steel mount into our front lawn, I quickly realized that the ground under our lawn was much harder than that of my neighbors. I immediately borrowed a post hole digger from one of the neighbors and proceeded to dig a two and a half foot deep hole with it. The hole wound up sort of oval in shape because I had to allow for the fact that the mount had two legs. After the mount was placed in the hole, with a little gravel for drainage at the bottom, I poured in a bag of quick setting concrete obtained from the local home improvement store. One gallon of water was added as per the instructions on the bag. By this time the mount had been braced and held level and perpendicular with an assortment of scrap wood braces, to be removed once the concrete had set. With all of that done, I could now begin the process of erecting the flagpole.

I let the concrete cure for more than 24 hours before I removed the wood braces. Since I had already attached the tilting portion of the mount to the bottom section of the flagpole, it was relatively easy to attach the tilting plate to the steel uprights of the mount using the two large bolts that fit into the nuts welded on the back side of the plate. With Audrey's help, I then walked the flagpole up to the vertical plane. While she steadied it, I inserted the other two bolts at the top of the plate to hold it firmly

perpendicular to the lawn. Before raising the mast to its final position, I added a 12 inch extension to the top, bringing the overall length to 23 feet. ICOM specifies that length as the minimum for 10 to 80 meter coverage using the AH-4. Only about 8 inches of the whip is visible above the copper toilet tank ball that I attached to the top of the mast to make the transition to flagpole complete (see Figure 2). A short piece of wire with ring terminals soldered at both ends makes the electrical connection from mast to the finial extension. With the extension painted a nice gold color, the humble origin of the finial is completely disguised.

The End Result

The flagpole antenna looks very nice in the middle of the front lawn, surrounded as it is by flowering plants installed by Audrey and me. The planting bed is protected from the lawn service's weed whacker by a ring of concrete edging blocks (see Figure 3). The plantings also hide what few wires are above ground, completely disguising the fact that it really is an antenna with a flag on it. I purchased a very nice 3 × 5 foot flag from a local flag dealer and 40 feet of 3⁄16 inch rope, along with a cleat to secure the rope about 4½ feet above the ground completing the flagpole disguise. Now to get to the bits that turn this flagpole into an HF antenna.

The AH-4 tuner is mounted to the "back" of the mount, while the tilting part of the mount is on the front. At the point where the mount disappears underground there is a flat steel strap welded across the legs of the structure. This has an electrical ground buss attached to it to accept the wire radials. The ground connection on the AH-4 is also wired to this buss bar. An 8 foot ground rod driven near the legs of the mount is also tied to this point. This ground rod is connected by a large size wire to the ground rod just outside the radio room.

The coax, ground wire and control cable are buried from the mount to the house about 6 to 8 inches deep. A direct bury rated coax was purchased for this application. The control cable is four conductor cable obtained from a local electronics supply house. I have used this type of cable before to remotely control other auto tuners on ARRL Field Days. A lightning arrestor was inserted in the coax run and connected to the ground rod near the base of the mount rather than at a point just outside the house. The ground rod at the base of the antenna was connected via a #6 AWG copper wire to both the station ground rod and the house safety ground.

The Radials Finish the Story

The radial arrangement I use cannot be called optimum. The lawn area I can use is probably no more than 40 × 30 feet, with the mast just about in the center. The screened porch of our house encroaches on this area somewhat, so the radials were laid and buried where I could. A total of 4 were placed, roughly at 90° intervals around the base, varying from 10 to 25 feet in length. I used about 100 feet of #18 AWG vinyl insulated wire from a local auto parts store. I know that is not nearly broadcast station quality, but with such a constricted site, it was the best I could do. The sod was cut using an electric edger and the wire was placed in the resulting slit trench about 1 to 2 inches below the bottom of the grass. I had originally planned to install about 300 feet of radials, but the work involved turned out to be more than I could tolerate. More may be added later if I suddenly become 25 again. The radials are all connected to the base of the antenna flagpole (see Figure 6) along with the 8 foot ground rod driven at the base of the mount.

The entire base mount is hidden by the simple expedient of taking a surplus kitchen waste basket and inverting it over the base mount, tuner and the assorted cables. At the top of the waste basket (now the bottom of the enclosure) about 4 inches was cut off to allow the top of the enclosure to sit right on the top of the base mount. A 3 inch diameter hole was cut off center in the bottom of the waste basket (now the top of the enclosure) and several cuts made outward from the hole to allow it to be maneuvered around the base without having to remove the mast first. These cuts were then secured by screwing small aluminum plates over them. If I need to work on the tuner or the connections, the enclosure can be lifted up and rotated so that it sits on the top of the mount while I make any needed adjustments to the system.

Once all this is done, I simply rotate the enclosure back to its normal position and it slides down the mast until it meets the planting bed that surrounds the base. The white plastic of the enclosure matches the white paint of the mast well and, since the flowers around the base have grown a bit, all anyone can really see is the top couple of inches of the enclosure. The enclosure is not waterproof and it was not intended to be. Really, it is just there to cover the tuner and all the wires and cables that attach to it, purely for esthetic value. If your antenna is in the middle of your front lawn, it pays to think about the esthetics of the situation.

While I do not spend a lot of time on HF and certainly am not what one could call a contester, I wanted to have an antenna that would let me use the capabilities of my radio to the degree I needed. That statement brings us to the obvious question: "So, how does it work?" Once the labor of installing radials and coax and control lines was done, the testing began.

So, How's It Play?

I am quite sure that those hams who are lucky enough to have towers and multiband Yagis on big rotators running the legal limit will be quite underwhelmed by the results. But for those of us who, for one reason or another cannot put up big towers or who have to go to stealth mode due to covenant restrictions, even a half decent antenna is better than none at all.

Given the experience I had with my commercial vertical for the past eight or nine years, I would say the results are satisfactory. With my previous setup and 100 W, I was pretty much able to work most of the stations I could hear and I find much the same to be true with the flagpole antenna. The addition of coverage on 75 meters is welcome as the previous antenna was only designed to go down to 40 meters. Because I live only a couple of miles from the Gulf of Mexico, the water table is quite high so the performance is somewhat enhanced compared to another location on higher or rockier terrain.

The point of all this is simple. If your site is less than optimum, or if antenna restrictions limit what you can set up, you do not have to forgo your HF privileges. You just have to get a little creative and hide the antenna in plain sight. Just make sure that you pay attention to the details. As someone once said: "Take care of the little details and the big picture will take care of itself."

Photos by the author.

ARRL member Geoff Haines, N1GY, was first licensed in 1992 as N1LGI. Geoff upgraded to Amateur Extra in 2005 and received his current call sign. He retired following a career in respiratory care. Geoff currently holds several ARRL appointments in the West Central Florida Section, including Assistant Section Manager, Technical Coordinator and Net Manager among others. He is a past president of the Manatee Amateur Radio Club, and a member of several ham radio clubs both in Florida and Connecticut. In his spare time, Geoff is the editor of the quarterly e-magazine "The Experimenter" for the West Central Florida Section. Geoff is active in designing small projects such as antennas and accessories suitable for the new ham. He also finds time to update his Web site, **www.n1gy.com**, *on a regular basis. Recently, his wife Audrey became licensed as KJ4YMX. Geoff can be reached at 904 52nd Avenue Blvd W, Bradenton, FL 34207 or at* **n1gy@arrl.net**.

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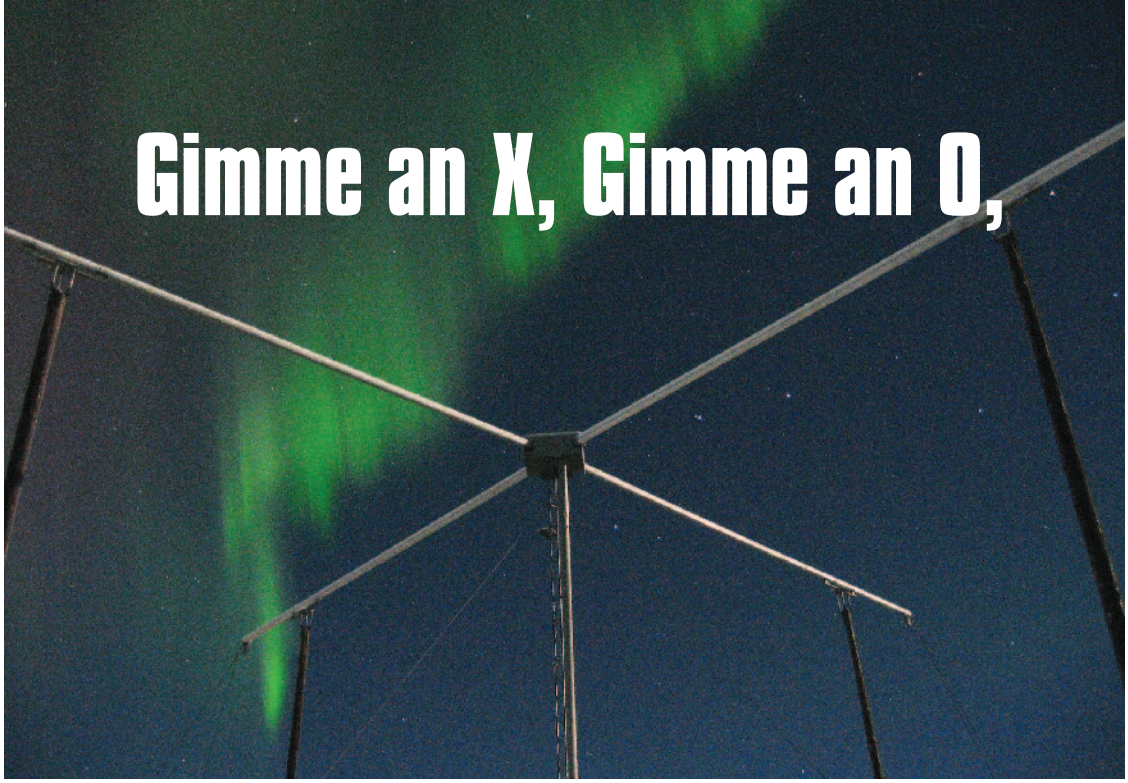

RICHARD DICKMAN

What's that Spell? — Radio

HF ionospheric propagation may not happen quite the way you think it does.

Eric Nichols, KL7AJ

Let's see if you can answer this simple question. You hear a European DX station coming over the North Pole by skywave on 20 meters. What polarization is that signal when it arrives at your location: horizontal, vertical, whatever polarization the DX station is using or it's impossible to tell because the polarization gets scrambled by the ionosphere?

It will come as a surprise to even experienced amateurs that all of those answers are absolutely false. All ionospherically refracted signals are, in fact, elliptically polarized, the general case of circular polarization (CP). That's right — all of them. They may be clockwise elliptically polarized. They may be counterclockwise elliptically polarized. But they will be elliptically polarized. We can even go further than that. (See Note 1, "How Round is Round?")

Heresy

When I present this truth for the first time at Amateur Radio club meetings and other talks, I get the sort of reception as one who has just blasphemed a religion. This is somewhat understandable because, as with so many other situations, if a lie is repeated often enough it begins to resemble the truth.

In this case, the most oft-repeated lie is that HF skywave signals are *randomly* polarized. As we will see, there is a remarkable consistency and predictability to skywave signals. If there's anything random, it's the average ham's methods of using them. By getting to the core of how HF propagation actually happens, we can actually learn and take advantage of this behavior, rather than merely chalking it up to general weirdness.

The fact of the matter is that this truth, the fact that all HF *skywaves* are elliptically polarized, has been known by ionospheric physicists, shortwave broadcasters and military communications experts for over 70 years. The only ones who seem to have missed the message entirely are radio amateurs.

Well, Perhaps Not Entirely

The March 1940 issue of *QST* has an outstanding, and completely accurate, description of this matter in an article entitled "The Ionosphere and Radio Transmission."[2] This article should be required reading for every ham who even thinks about operating HF. So this is not some newly discovered or oddball phenomenon. It is the normal way radio works. The real mystery is why this has had such scant mention in the annals of hamdom in the intervening seven decades.

Before continuing my heresy any further, I want to make it absolutely clear that all these surprising assertions are easily confirmed by any radio amateur, with readily available hardware. In fact, I strongly recommend that you test these truths for yourself. Later in this article, we will describe exactly how to do this — actually using a couple of methods.

Mirror Images — Sort of

The ionosphere is a magnetized plasma, an ionized gas. This plasma is magnetized by the Earth's natural magnetic field. A magnetized plasma has a curious property called *birefringence*. This is defined as having two different refractive indices. The mathematics that describe this is known as the Appleton-Hartree dispersion relation, and it's a pretty hairy formula, well beyond "the scope of this course."

The end result, however, is fairly straightforward. If a linearly polarized electromagnetic wave is launched into a magnetized plasma, it splits into two separate counter rotating, circularly polarized waves. One of these is called the *O-mode* for *ordinary* wave, and the other twin is called the *X-mode* for *eXtraordinary* wave. (Nobody ever said physicists could spell.)

[1]Notes appear on page 37.

A Switchable Sense HF Receiving Antenna

One possible objection to the use of circularly polarized (CP) antennas for HF is the fact that they use a bit more real estate than other antennas, at least for transmitting. However, one can take advantage of the CP properties of HF propagation by simply using CP antennas for *reception.* We'll describe a simple semi-compact CP turnstile (crossed inverted V) antenna for 15 MHz, so you can demonstrate X and O propagation using WWV as a test generator. Once you see how this works, you'll probably want to modify this antenna for your favorite ham band — or even several of them.

It's a simple matter to build an HF CP antenna with 30 to 35 dB of discrimination between clockwise and counterclockwise waves. There are two factors that determine how much discrimination you can get. First, you want to have an accurate 90° phase shift between your two crossed dipoles. Secondly, the arriving signal has to arrive on axis. For a CP turnstile antenna, the proper angle of arrival is perpendicular to the plane containing the two dipoles.

However, even if your turnstile is not oriented ideally, you can still get useful discrimination between modes, certainly enough to demonstrate that the X and O modes exist. In fact, a horizontal turnstile antenna at reasonable height is capable of separating X and O mode signals at most angles of arrival you're likely to encounter.

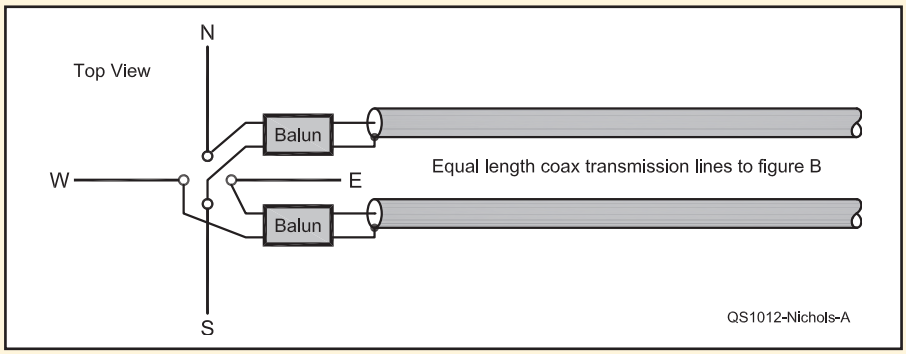

Figure A — Connection diagram of HF turnstile antenna.

A Little Geometry

It's a bit of a curiosity that a horizontal turnstile antenna (two horizontal crossed dipoles fed 90 electrical degrees apart) transmits and receives an *omnidirectional horizontally* polarized signal off the edges — that is, radially from the antenna. Looking straight down upon such an antenna, you will have an ideal circularly polarized antenna. This isn't too hard to visualize if you have some experience with NEC antenna modeling. For a simple dipole, of course, polarization is undefined off the ends. Also, any dipole has the greatest polarization sensitivity to signals arriving broadside, with progressively less polarization sensitivity for signals arriving off axis.

Such a turnstile antenna can be modified into the form of an inverted V with little sacrifice of performance; in fact it may have a little better overall sensitivity to low angle signals. At HIPAS observatory, we had a large array of such antennas, as well as a few portable ones for on the fly propagation studies. This configuration only needs one tall support, and it doesn't have to be a very tall one at that.

Free Ticks

Most hams know a little bit about WWV, but we seldom take advantage of all that the stations have to offer. See **tf.nist.gov/timefreq/stations/wwv.html** for more information on the opportunities. There's a bunch of great information there.

Since WWV's signal is so well defined, it's an ideal test generator for our X and O demonstrations. We all know about the frequency accuracy of WWV, but beyond that, the radiation characteristics are also rather precise. WWV transmits an ideal omnidirectional, vertically polarized signal with a very closely controlled effective radiated power (ERP).

At 15 MHz, the true ground wave of WWV attenuates rather rapidly. Unless you happen to live in their back yard, you won't need to unduly concern yourself with it. Also, as with any vertical antenna, there is a substantial *cone of silence* directly overhead, so you won't be led too far astray if you happen to be in the near vertical incidence skywave (NVIS) zone of the station.

The 1 s time ticks broadcast by WWV are of particular interest, as they give us reliable differential propagation information. Even with a linear polarized receiving antenna, you can see the two separate reflections of the ticks with an oscilloscope bridged across your audio output. (With a little more sophisticated setup, using a dual trace scope and two CP antennas, one for each sense, you can accurately measure the difference in tick times for the X and O mode) In either case, the ticks give us a great time of flight marker for X and O demonstrations.

So Simple A Caveman Can Do It

The actual construction of a 15 MHz CP inverted V is so straightforward as to be trivial. You can adapt the basic design described to your available materials. The only thing you need to worry about is symmetry.

Using a 20 foot section of 4 inch diameter PVC plumbing as a center mast is quite convenient. The four half Vs act as guy wires. For 15 MHz, you want each half V to be about 5 meters long. The exact length is not too critical, but you want each of the two Vs to be identical (see Figure A). You want each the Vs to cross each other at 90°. You also want to drop them down from the mast at the same angle. 45° is a good choice, but not too critical. Just be sure they're all the same. Use enough rope or cord at the bottom end of the Vs to reach some ground stakes. Again, be sure the stakes are all the same distance from the base of the mast, so that the angles are all the same.

You want a good balun at the apex of each V. At HIPAS we used W2AU baluns, but anything is fine as long as they're the same model.

Saving Phase

Once you've built your symmetrical

crossed V antenna, only one thing is critical, the 90° phasing network. You can build a 90° coax stub at the feed point of the antenna, but you'll have a lot more versatile (and verifiable) antenna, if you run two identical runs of coax into your shack. If you do the phase shifting in the shack, it's a lot easier to change frequencies, which you will eventually want to do. It also makes it easier to gain access for various test instruments.

You will want to cut a quarter wave chunk of coax (at 15 MHz) for your phasing section. Be sure to compensate for the velocity factor of your coax. When in doubt, you can short one end, couple the opposite end to a grid dip oscillator with a small loop, and see that your grid dip oscillator (GDO) or antenna analyzer dips at exactly 15 MHz. Once you have the phasing section cut, simply add it in series to one of your transmission lines, and then feed both lines into a coaxial T. The output of your T goes to your receiver. To switch between X and O modes, insert the series section into the opposite transmission line. Eventually, you will want to build some sort of switch for this (see Figure B), or use a couple of coaxial relays. (PIN diode switches work great for this as well, and allow you to do very rapid X and O switching for some interesting experiments.)

Although it isn't critical for demonstration purposes, in ionospheric research it's standard practice to orient the antenna with magnetic North. You might want to clearly label your EW and NS transmission lines inside your shack, if you decide to align your antenna. More importantly than magnetic orientation, however, is your relative EW and NS phasing, if you want to positively identify your X and O modes. Your north and east legs should be attached to the center conductor of your transmission line, while the south and west legs should be connected to the shield. If you're using a voltage balun, the north and east terminals of your balun should correspond. If you delay the NS by 90° with respect to EW, using this polarity, the result will be clockwise CP (O mode in the northern hemisphere).

By the way, this is reversed if you transmit through the array. Just to keep things simple, we'll only deal with this as a receiving array.

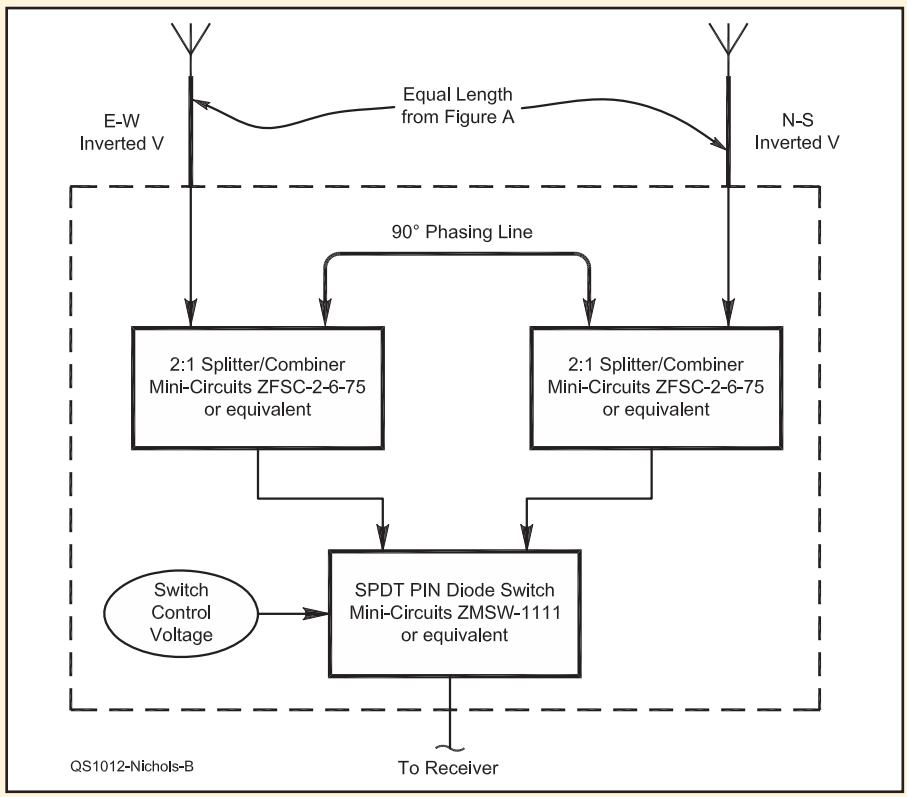

Figure B — Simple X-O switch for 15 MHz.

The Proof

In all likelihood, your O mode signal will be a little stronger, all things being equal. Since WWV transmits an omnidirectional signal, you probably won't be able to discriminate azimuth skewing too well. However at low takeoff angles, there will be a large difference in distance between the X and O modes. If you have access to a local digisonde (see **ulcar.uml.edu/slist.htm**) you can make an educated guess as to whether the X or O mode is landing at your location. The closer you live to WWV, the more likely you will be to receive the O mode, assuming you're near the maximum useable frequency (MUF). If WWV is a long distance from you, you're more likely to be receiving the X mode, at least on the first hop.

The best way to get the feel for how things are at your location is as follows: Tune in WWV with just the NS antenna connected. Note the signal strength. Switch to the EW antenna. If everything is working reasonably well, the signal strength should be nearly identical.

Now connect both antennas. Your signal will either increase by 3 dB or drop precipitously. If it increases by 3 dB, you know your polarization sense is matched to the mode of the incoming wave. If it goes way down, you're on the wrong polarization — at least for that mode.

Jim Parkinson, W9JEF, is one of my handful of "CP Envoys" in the lower 48, where conditions are likely to be a lot more typical than they are up here in the subarctic. Jim reports that upon first firing up his antenna, he was astonished at the difference in signal strength between the X and O modes — on just about any signal. This is a very typical response on one's first encounter with HF CP antennas. The shocker isn't so much that it's a great antenna by most standards, but that there is such a huge difference in sensitivity between modes — something alien and jolting, to even seasoned old timers — and impossible to experience on any linearly polarized antenna. As much as a 3 S-unit difference is easily achieved on even a haphazardly assembled CP antenna.

Don't take our word for it. Build it and see. For those who want to go into this one step deeper, an advanced I and Q polarimeter receiver is described in the QST-in-Depth Web site (**www.arrl.org/qst-in-depth**).

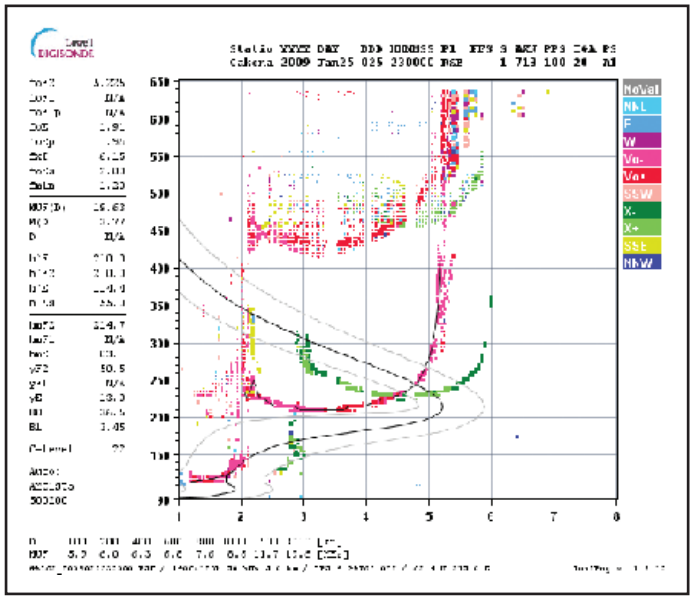

Figure 1 — Real time ionogram showing the reflection height of vertically transmitted signals as a function of frequency. See the text for an interpretation of the significance of the data.

The O-mode wave is aligned with the actual electron orientation in the plasma. It travels a little faster and with a little less loss than the X-mode wave. Conversely, the X-mode wave tends to operate a bit against the grain of the natural plasma. The different velocity factors of these two waves due to there being two different but simultaneous refractive indices, has a couple manifestations of interest to radio amateurs. The first is that the X-mode signal travels higher into the ionosphere before being refracted. This difference in *time of flight* is easily visible on any of the numerous real time ionograms available from the worldwide ionosonde network.

Taking a Look

Figure 1 is a typical ionogram taken from the HAARP Digisonde in Gakona, Alaska.[3] There are a lot of features here, but let's look at just a few of the crucial ones. The X axis is the sounding frequency. In this case the sounder is swept from 1 to 8 MHz. (This range can be tweaked by the operator to accommodate prevailing conditions). The Y axis is the reflection height in kilometers; this particular instrument is accurate between 90 and 650 km, about the upper extremity of the F2 layer. The traces in red are the O-mode (clockwise CP) returns and the green traces are the X-mode (CCW CP) returns. Notice there are two clear sets of returns for both modes — this is due to double hops, a good sign of low absorption. In fact, you can see just a trace of a third O-mode reflection right at the top of this sample.

The first hop is what we're interested in, of course, which is what all the numbers on the left table are derived from. Let's just look at what's happening below 300 km, the primary reflection. For now, we can also ignore what's below 2 MHz. In this case we see a significant F1 layer as well. Most frequently it's the F2 layer where the magic happens.

Another prominent feature is the black line with a bell shaped curve. This is the electron density profile. This shows us the relative number of free electrons versus height. Note that there is no units scale for this trace. In this case we see that we have the maximum electron density at around 215 km. But notice what else coincides with the maximum electron density, the critical height. This is the height at which the O-mode trace turns vertical. The frequency at which this occurs is the O-mode critical frequency, which in this case is 5.225 MHz, the first listing on the column at the left.

Since the curve doesn't make a sharp right angle bend at the critical frequency, there's a lot more number-crunching here than meets the eye. In fact, the electron density profile is derived from the shape of the O-mode trace near the critical height and frequency, not measured directly. The gray lines flanking the black line are error probability boundaries, so there's a lot of room for slop in achieving the electron density profile. The critical frequency and height are right there — what you see is what you get.

What's it all Mean?

Notice the X-mode critical frequency (at which the green trace turns vertical). It's about 1 MHz higher than the O-mode, critical frequency, around 6 MHz. This means that you can use X-mode propagation around 1 MHz higher than for O-mode, all things being equal. But also notice that the average reflection height of the X-mode is a bit higher as well (the horizontal part of the curve). This means for a given frequency, the X-mode will have a longer skip distance.

Most ionosondes are *vertical incidence* instruments, meaning they shoot a signal straight up, and look for a signal coming straight down. Of course, this is of limited application for most radio amateurs. As the launch angle becomes lower, however, it shouldn't take a great deal of imagination to see what happens. The X-mode and O-mode signals will return to Earth at different distances, the distance differential being progressively greater at lower launch angles. But this is only part of the story, and, actually of lesser importance for most amateur operation.

What you don't see in the ionosonde data is the profound difference in lateral (azimuth) angle of the two different waves. In fact, near the magnetic poles (such as in Fairbanks, Alaska) the azimuth difference between the X and O signals can diverge by as much as 90°. It also explains why great circle paths up here are essentially meaningless.

Now, though this extreme case of X/O azimuth skewing is confined to the magnetic polar regions, the effect is present to some degree everywhere. The one exception would be the case of communication between two stations both lying precisely on the magnetic equator, not too likely.

For a given mode, for example, O-mode going both directions, the direction of skew is the same relative to wave propagation. In other words a wave going North would be skewed to the right (West), while a southbound signal will also be skewed to the right, (East). Might this conceivably result in nonreciprocal propagation? You betcha. In fact, this is the primary cause of the *one way skip* we experience in Alaska.[4]

What It Isn't

Without exception, when I introduce this X and O business to people, someone will pipe up: "Oh, that's just Faraday rotation."

No it isn't. Faraday rotation will twist the *plane* of a radio signal, but at any point in space, the Faraday rotated signal is still linearly polarized. X and O modes are circularly polarized. This is easily tested by means of circularly polarized antennas. A simple crossed dipole with a 90° phasing line between the elements is all you need to do this experiment. You will see a 3 dB increase in signal strength of any given mode skywave signal over a simple dipole, or nearly complete cancellation of the signal if you are using circular polarization of the opposite sense. Most hams are positively astonished when they actually demonstrate this to themselves.

Out of the Lab and into the Shack

I've found that, once I'm able to convince hams that X and O modes actually exist, it's a relatively simple task to explain the "so what." The implications of these two very distinct and separate signals being generated by every long distance HF transmission become

fairly self evident. We can reuse frequencies by careful use of CP antennas. We get an automatic bonus of 3 dB just by using CP receiving antennas. We can even more accurately predict DX propagation by making an educated guess as to which mode we're working with — and concentrate our efforts on just that mode. Probably most importantly of all, many of the mysteries of propagation we normally just chalked up to weirdness are suddenly, and nearly as mysteriously, gone. Things begin to make sense. There is new order to our perceived universe.

We have a relatively common malady up here, especially on 20 meters.[5] We often experience conditions in which rotating a high gain Yagi clear around the compass has no effect on an incoming signal's strength. This is especially prominent on incoming Northern European stations. The signal seems to come from everywhere at once.

The answer is rather simple, once one recognizes that those signals are circularly polarized. Actually it's coming from straight overhead. This is what happens when you have a low angle signal bouncing off an ionosphere that's tilted at a 60° angle. This isn't rocket science, it's just geometry. Well, the ionospheric tilt only explains part of it. By rotating the Yagi, shouldn't there be some cross polarization effects on a downward arriving signal? Not if the signal is circularly polarized. A horizontal Yagi has no way of knowing what the polarization is of a circular signal coming in broadside.

Probably a little closer to home for most hams (the above is an Alaskan weirdness, after all) is the matter of circular polarization in the FM broadcast business (and to a limited degree in TV broadcasting). Has it ever occurred to you why nearly every FM broadcast station in the past 40 years has transmitted a circularly polarized signal? Is it because the vast majority of FM listeners have circularly polarized antennas? Not likely. Is it because about half the listeners use vertical polarization, and half use horizontal polarization? No, it's still about 80% in favor of horizontal polarization, even with car radios. Industry specialists who have major financial interests in getting the correct answer to this question have known the answer for years.

The real reason for using circular polarization in FM broadcasting, as delineated in the very FCC documents that authorized its use, is solely for the reduction of multipath distortion — primarily in the form of phase cancellation. How does this work? A linearly polarized signal, after being reflected from a surface, will generally be out of phase with the incident signal. If this reflected signal is recombined in the receiving antenna, along with a direct signal, the chances of phase cancellation, to some degree at least, are very good.

On the other hand, if a circularly polarized wave reflects off a surface, it remains circularly polarized, but its sense is reversed. Statistically, this has a much lower chance of causing phase cancellation, regardless of the polarity of the receiving antenna. Additionally, if the receiving antenna should use circular polarization (as exceedingly rare as this might be in consumer circles) the chance of phase cancellation would be nearly zero.

"This isn't rocket science, it's just geometry."

Now, could it be within the realm of possibility that some of these effects, though naturally of different scale from those on HF, could be used to some advantage? Why not? Furthermore, could this account for some otherwise inexplicable behavior of certain HF signals? Quite likely. At the very least, would this merit further investigation?

Building a CP antenna to at least investigate these possibilities is so simple, there's no excuse for the enterprising ham to not at least give it a shot. It's a great field for experimentation. Still not convinced about this whole X and O business? Good. I invite you to build a circularly polarized antenna and find out for yourself. The sidebar describes how to make a simple one for yourself. In so doing, you will prove the physicists (and yourself) right. I'm so confident of this that I will give you the weapons to do this in the associated polarimeter projects, one simple (on the QST-in-Depth Web site) and one quite fancy.[6] Both methods will use WWV as the reference transmitter, since it has such well controlled characteristics.

Notes

[1]The more pedantic radio amateur (and mathematician) is apt to remind us that the circle is merely a special case of the ellipse, that is an ellipse with an ellipticity of 1. At the other extreme, an ellipse with infinite ellipticity, is the line. This, of course, covers all possible cases of any radio wave, which may seem to largely dilute the impact of the first paragraphs of this article.

Once one actually does the experiments, however, one finds that the degree of roundness of ionospheric signals is amazingly good. One of the best indications of the degree of circularity is the degree of incorrect sense signal rejection. Up to 3 S-units (on the order of 15-18 dB) is typical for most haphazardly installed HF CP antennas. Such figures would not be possible if the waves had a high degree of ellipticity. With careful alignment of the antenna "on bore" much higher degrees of rejection are realizable.

Although there is no theoretical maximum value for the cross-polarization discrimination of a CP antenna, there's no point in trying to achieve particularly high degrees of discrimination. The limiting factor for this application, as mentioned above, is the *lumpiness* of ionospheric reflections, anyway.

[2]Extracted from US Bureau of Standards' Letter Circular LC-375, "The Ionosphere and Radio Transmission," *QST*, Mar 1940, pp 32-35, 88-92.

[3]The *High Frequency Active Auroral Research Program* (HAARP), an ionospheric research program funded by the US Air Force, the US Navy, the University of Alaska and the Defense Advanced Research Projects Agency.

[4]There is a further exacerbating cause up here, somewhat unrelated to this topic — that of a tilted ionosphere. Most models of ionospheric propagation make a couple of assumptions, and those are huge assumptions. The first is that the ionosphere is flat, and the second that the ionosphere is horizontal. Neither of these conditions prevails in Alaska, but again, this is a separate issue.

[5]I don't know precisely why 20 meters is so pronounced in this regard — we haven't solved *all* the mysteries. This is where every ham can contribute to the state of the radio art.

[6]**www.arrl.org/qst-in-depth**

Eric P. Nichols, KL7AJ, has written numerous QST *and* QEX *articles over the past 30 years, with a strong emphasis on RF design and techniques. He worked as a broadcast engineer for a quarter century, later applying his RF experience to experiments conducted at HIPAS (High Power Auroral Stimulation) Observatory and HAARP, as well as designing instrumentation for the UCLA Plasma Physics Department. His first novel,* Plasma Dreams, *was published in 2005. His upcoming book,* The Opus of Amateur Radio Knowledge and Lore, *is slated to be published sometime in the not too distant future. Eric can be reached at PO Box 56235, North Pole, AK 99705 or at* **eric.nichols@eielson.af.mil**.

New Products

NEW CONNECTORS FOR TIMES MICROWAVE LMR-300 CABLE

◊Times Microwave Systems has introduced two new EZ series solderless connectors for LMR-300 coaxial cable. The EZ-300-NMH-D (type N male) and the EZ-300-TM-D (type TNC male) connectors both feature a combination hex/knurl coupling nut that allows tightening by hand or with a wrench; tri-metal plating to eliminate tarnishing; a chamfered cable entry hole for ease of termination; a ridged landing area on the aft end for better grip and sealing of the heat shrink boot; and enhanced impedance matching to improve SWR performance. Price: EZ-300-NMH-D (3190-2420), $8.50; EZ-300-TM-D (3190-2421) $7. For more information, see your favorite dealer or **www.timesmicrowave.com**.

Antenna Measurement for the Ham on a Budget

An inexpensive frequency counter, combined with Morse skills, bring a low cost antenna meter up a notch.

Martin Huyett, KØBXB

Many hams, including me, have longed for one of those fancy antenna analyzers with meters, digital readouts and all the bells and whistles. Somehow, none of my antenna problems ever seem quite worthy of such an elegant solution. In the '70s I even built my own impedance bridge and, using an early PC and a program written in *BASIC*, I was able to observe the complex impedance results obtained from the bridge. But most of the time I would just calculate the length of my antenna, string it up and then run back and forth from the shack to the yard as I trimmed it an inch or two each time until I finally gave up.

Figure 1 — Modified MFJ-204B. Note the small red button labeled FREQ. Press it to hear the exact frequency in Morse code. Also notice the single Philips screw directly across from the PWR LED. That screw holds the standoff the Freq-Mite circuit board mounts to.

A New Dawn

Then one day I bought the used MFJ-204B Antenna Bridge, shown in Figure 1, on an Internet auction site. Wow, what fun. I could take this out into the yard, hook it to the feed line and quickly trim and read until everything was just the way I wanted it. One limitation of the little bridge is that the mechanical frequency dial does not allow as precise a readout as their more advanced meters with a built in electronic counter. Nonetheless that $99 gadget will tell you the resonant frequency of your antenna system and the feed point resistance at resonance. That is often all you need to know.

One Small Achilles' Heel

MFJ does offer more expensive units that include a digital frequency readout that solves this problem, so you do get what you pay for with the MFJ-204B, a good value at its price point. Yes, you can plug in your frequency counter and read the frequency. Alternately, you can listen to it on your receiver or transceiver.

The frequency counter option is kind of hard to do out among the trees and requires one more piece of equipment. If you don't have a portable transceiver, then even adjusting your antenna in the back yard may require multiple trips to the house. Yes, we all need the exercise, but it sure can get on your nerves after a while, especially when you get frustrated and lop off 10 inches to get it over with — only to find you cut it 9 inches too short.

…And an Inexpensive Solution

Enter a marvel of the modern digital era: the Small Wonder Labs (**www.smallwonderlabs.com**) *Freq-Mite*, a "PIC-Based Morse Frequency Counter" kit. Small Wonder Labs thinks of it as an accessory for their small transceiver kits. But it can be set to work as just a frequency counter. Its 1.25 × 1.75 inch circuit board will fit nicely into the MFJ-204B box, as well as for other projects you may think of. The low power consumption doesn't unreasonably tax the 9 V battery in the '204B.

This tiny counter has no room for the usual frequency display, so it outputs the frequency as Morse digits — either just the kHz part (three digits), or four or five for the full frequency in kHz. The default speed is 13 WPM, but 26 WPM is an option. Even those not proficient in Morse reception should be able to copy three digit characters, arguably the easiest to learn, in short order.

Making it Happen

Installation is straightforward. You will need to figure out how and where you want to put the circuit board (see Figure 2). Then you'll need to drill a small hole to add a small push-button switch and, depending on how you install the board, another hole for a standoff. You'll also need a small piezo annunciator or speaker (I got one out of an old cable modem). Before mounting the board, solder a wire from the power switch to the board, another from ground to the board, two wires to the switch and two wires to the annunciator. I accidentally put the circuit board exactly where the battery was previously located so had to remove the battery clip by drilling out the little rivets. I opted for Scotch double sided tape to mount the battery on the end of the unit, just above the meter.

Actually that is an improvement over the original design, as the bottom cover can now be removed without those pesky wires keeping it tethered to the main chassis. Double sided tape also holds the annunciator in place. The whole assembly took me just a couple of hours.

The Results are In

The result? The day after I finished it, I took it to my back yard and trimmed my 40 meter dipole to the precise frequency of 7.100 MHz. It was previously resonant at 6.9

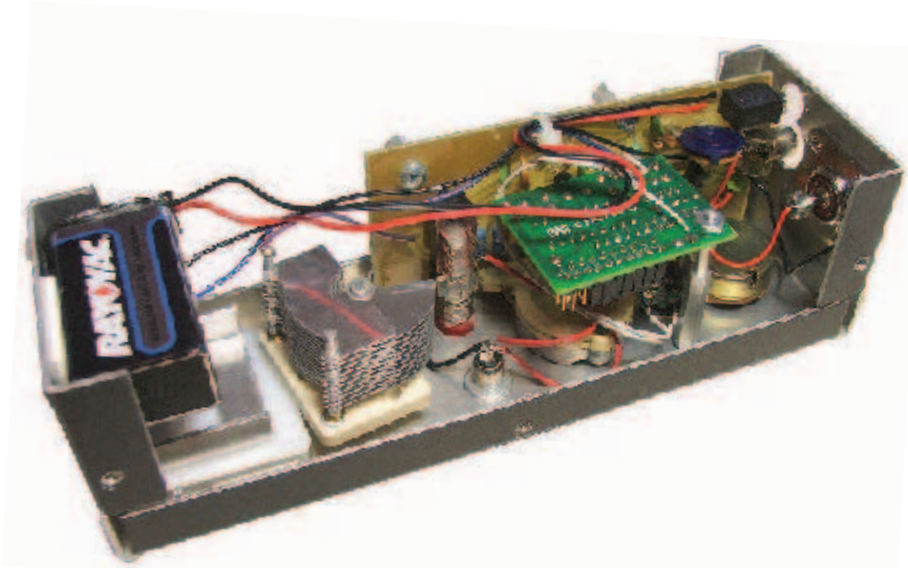

Figure 2 — Inside shot of the MFJ-204B. Notice the battery stuck to the left end above the meter with double sided tape. The green Freq-Mite circuit board is mounted on the metal stand-off near the right end. The push button switch is in the lower center.

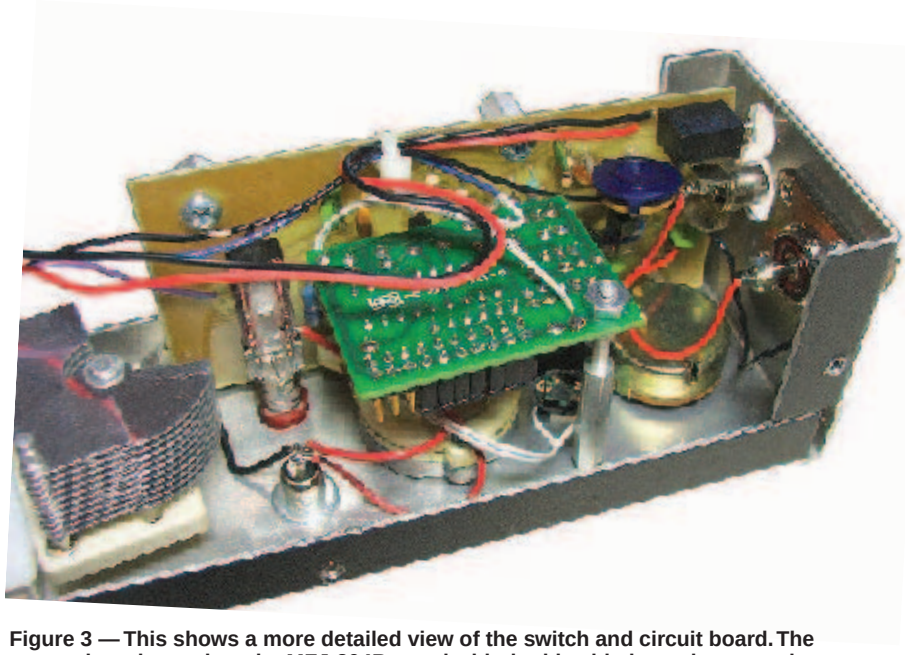

Figure 3 — This shows a more detailed view of the switch and circuit board. The annunciator is stuck to the MFJ-204B panel with double sided tape between the BAND SELECTOR and the RESISTANCE potentiometer. Also notice that the red power wire is connected to the center pin on the right side of the MFJ-204B power switch. Ground can be picked up at any convenient location. The RF input for the Freq-Mite is taken from the back of the FREQ OUT connector on the end of the MFJ-204B.

plus a bit, after repeated trips last fall into the shack to check it with my transceiver. After all I have a tuner so forget several more trips! I also used it to set up my antenna tuner for my G5RV antenna. It was so easy compared with the old method of keying the transceiver. And perhaps my neighbor just five houses away, also a ham, appreciated my not blasting him out of his shack on every band.

The only downside I've found so far is that the MFJ-204B oscillator output is too low for the Freq-Mite above about 20 MHz. I may experiment with a small broadband amplifier in the future.

For me this is a viable alternative to the much more precise and expensive impedance bridges out there. Still, it tells the budget conscious ham what he really needs to know about his HF antennas. It was also a fun little homebrew project. I like the MFJ-204B so much that I am going to buy another used one and mount it permanently into the antenna control panel in the shack so I can quickly and easily adjust my tuner or play with my antennas without having to fire up the transceiver just to tune up.

Photos by the author.

ARRL member and Amateur Extra class operator Martin Huyett, KØBXB, has been licensed since 1958. Martin enjoys SSB and digital modes, but currently can mostly be found on HF CW. He also works VHF and UHF both fixed and mobile, as well as HF from his vehicle. With an undergraduate degree in electrical engineering, Martin particularly enjoys the practical technical side of the hobby. You can reach Martin at 7735 Big Pine Ln, Burlington, WI 53105 or at **huyettmeh@tds.net**. QST

New Products

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Selecting Your First VHF Handheld Transceiver

A VHF handheld transceiver is likely on the top of a new ham's holiday list — but how does one pick?

Joel R. Hallas, W1ZR

Often, the first radio acquisition a new amateur makes is a VHF handheld transceiver. This makes a lot of sense. Such a transceiver allows immediate operation without the need for external antennas, wiring, permissions or any of the other steps that can make a larger fixed or mobile station into a major project. It also comes in a small box at a relatively low price, making it a great candidate for a holiday gift list.

But Which One to Hint For?

Because this is such a popular item, it seems like all the major manufacturers offer multiple models ranging in price from less than $100 to more than $500. It can be a major hurdle for the new amateur to decide which one is best suited for the kind of operation she hasn't even tried yet. Modern handheld transceivers pack an amazing number of operational features into a miniaturized radio. It can be a real challenge to understand what they do and whether or not you will ever have use for them. This article will discuss some of the major features and try to make some sense out them.

Single or Multiband Operation

The least expensive transceivers, with few exceptions, cover just the 2 meter band. Many also cover 70 cm, and a few add in other bands. It's safe to say that if there is at least one local repeater it is likely to be on 2 meters. If you live (or travel to) a larger metro area there will likely be some on 70 cm as well — and perhaps some on 6, 1.25 or 10 meters, and even 33 and 23 cm. The price can go up significantly as bands are added so this is a good place to start eliminating candidates.

Another variation is a transceiver that actually contains two complete transceivers. Usually one is set on 2 meters, while the other could be on 70 cm. This allows you to monitor multiple repeaters simultaneously. This arrangement can even be set up as a kind of portable repeater — useful in some situations, but not an everyday requirement for most. As you might expect, two radios in one box costs more. It also adds to the complexity of operation. (Which band am I talking on now…?)

In addition to "operating" frequency ranges, many handhelds offer receive-only coverage on other ranges, such as public service bands, aircraft VHF frequencies, NOAA weather channels, shortwave AM, AM and FM broadcast receive. These may or may not be of interest to you, and are really a different topic. Generally don't expect the performance on these frequencies that you would get from a dedicated receiver, especially with the small antenna provided.

The first step is to find out what repeater frequencies are in use in your area(s). One way is the buy or borrow a copy of *The ARRL Repeater Directory*.[1] This book, available in pocket or desk sized versions, lists repeaters by geographic region. It includes the important operating parameters you will need to set into your radio, such as frequency offset and access code. You'll also find operating practices, hints for those new to repeaters and much more.

Knowing what repeaters are out there is only part of the story. You will want to know which are typically in regular use, and which are used for emergency communication by organized EmComm groups in your area. All of this information is best found by checking in with local amateurs, usually made easy by attending a local radio club meeting. A list of ARRL Affiliated Clubs is provided by region on the ARRL Web site at **www.arrl.org/find-a-club**. Just enter your ZIP code to find clubs in your area. If one looks interesting click on GO NOW for contact and meeting information, or look at

Figure 1 — Representative VHF and VHF-UHF handheld transceivers from Alinco, ICOM, Kenwood and Yaesu give examples of different size and feature choices.

[1]Notes appear on page 41.

their Web page if it's listed. Club members should be able to give you the lowdown on local emergency and informal nets, as well as fill you in on, and perhaps demo, their handheld choices.

Access Codes

It's been some years since I've encountered a repeater that didn't use some access technology to make sure unintended transmissions don't get rebroadcast by the repeater.[2] The most common in current use in North America is via a continuous tone coded squelch system (CTCSS). This arrangement requires an encoder in your transceiver that sends a subaudible tone whenever your PTT button is pressed. At one point it was common for all repeaters in an area to share the same tone (on different radio frequencies) so you didn't have to change it. Now that most radios have selectable tones, that is no longer the case.

A newer technology is called digital coded squelch (DCS). This works in a similar way but uses a pulsed digital code. Although there may be slight technical advantages, not all radios support this. There's no harm in having the capability, but check with your club to find out if DCS is in use in your area, or if it is in plan, before you decide it's a "must have" feature.

Telephone Type Keypad

Most handhelds had a dual tone multiple frequency (DTMF) keypad, looking, and working like a telephone key pad. By the use of an *autopatch* at the repeater FM operators could transfer calls to the local telephone network — dialing the calls just as with a home telephone. This was very handy for contacting non ham family members while stuck in traffic or for calling emergency services. The advent of inexpensive and ubiquitous cell phone service has resulted in most of my local autopatch facilities being shut down. If your area has poor cell coverage, the autopatch may remain useful — and we've all heard how cell networks overload in emergencies. Once again, check you local repeaters and see if it's something you require.

DTMF pads may also be used to provide remote access to certain control codes on some repeaters. If yours has such functions, it may be another reason to look for a handheld with a pad.

Memories and Memory Management

You will need enough memories to be able to store the frequency, offset, access tone and perhaps the name of every repeater in your local area as well as those in other areas you frequently travel to. It used to be that 20 or 25 memories were plenty, and they may still be enough for some. Most new transceivers seem to have hundreds in separate banks — enough so that you are unlikely to ever fill them.

Keeping that many memories under control can be a hobby all its own. Many radios offer accessory software and a computer access cable that can be used to set up and manage memories with easy to use computer screens. Some allow *cloning* — copying the memories from one radio to another. This can be very handy if a group — or even a friend decides to select the same radio.

Connectivity Options

A handheld can also serve as a mobile transceiver, although a radio designed for the job offers significant benefits. Still, until you get a mobile rig, or while traveling in a rental car, it can work well if properly equipped. To do so, it needs a few features. The antenna connection needs to be one that can be hooked to a mobile antenna while you're in the car. A BNC type coax connector may be the easiest to deal with, but an SMA type may be usable as well.

I have one handheld transceiver that can only be powered by rechargeable battery, and it can only be charged by a drop-in charger — not a good choice for mobile operation. The best arrangement is probably a power cord with a plug that fits the car's auxiliary power connector.

While the radio's internal mic and speaker can be pressed into service for mobile operation, with the antenna and power cables attached it can get pretty tricky, especially if they take a turn around the shift or emergency brake lever. A better choice may be a plug-in accessory combination speaker/mic.

Speaking of emergencies, most EmComm groups like to power handheld radios from an AA battery pack to enable extended operation without ac power. If that's important, make sure the transceiver you select has an optional dry battery pack available.

Other Features

Different manufacturers offer multiple features that may be of use to some operators — but may just add confusion to others. (It's good to understand what they are and see if any are in use by your local groups.) One that is getting a lot of attention is D-STAR, a digital voice and data capability that is being used in some areas.[3] It adds considerably to the price of a handheld transceiver, and currently would restrict you to certain ICOM models. Still, if your group makes use of it, it might be worth considering.

Another popular feature is the automatic position reporting system (APRS) that provides for the automatic transmission of position and other data.[4] This can be set up with practically any radio, but if you are interested in this feature, some radios are easier to setup than others, while some have the function completely built in.

Documentation

The key to being able to make use of any features is the *documentation* provided. Each radio comes with an instruction manual, but not all are of the same quality. Fortunately, most manufacturers provide the opportunity to download their manuals from the Internet. I would suggest that before deciding on a radio, you download the manual and see if you can imagine following it to set up each feature. If you can't work your way through the menus, it doesn't matter what features it has.

Take a look at the *QST* Product Review of every radio you are considering. They are all available to members on the ARRL Web site (**www.arrl.org/product-review**). Not only will you be able to check the specs of each radio based on our independent testing in the ARRL Lab, but you'll also get the reviewers' take on the features, ease of use and the user friendliness of the documentation.

Make That Choice

Please don't allow all the possible options and choices to scare you off! While there are many options, any transceiver you select will provide you with all the basic communication you need, as well as the features you want — and even some you will likely never use — but who knows? The more information you have on what's happening in your area, the more likely you will be happy with what you select.

Notes

[1] *The ARRL Repeater Directory,* 2010-2011 Edition. Available from your ARRL dealer or the ARRL Bookstore in either desktop-sized edition, ARRL order no. 0861, or pocket-sized edition, ARRL order no. 0854. Also see *TravelPlus* CD-ROM, 2010-2011 Edition, version 14.0. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0878. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2] J. Hallas, W1ZR, "Getting to Know Your Radio — VHF Squelch Modes," *QST*, Aug 2005, pp 46-47.

[3] G. Pearce, KN4AQ, "Operating D-STAR," *QST*, Sep 2007, pp 30-33.

[4] S. Horzepa, WA1LOU, "What is APRS?" (sidebar to Teaching an Old APRS New Tricks), *QST*, Feb 2006, p 40.

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PRODUCT REVIEW

Yaesu FTDX5000D HF and 6 Meter Transceiver

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Managing Editor,
National Contest Journal

Yaesu's latest colossus *rules*, delivering top tier performance at a *substantially* less than a top tier price. The FTDX5000 series establishes a new benchmark, the highest close-in IMD dynamic range and third-order intercept we've ever measured. It *can* and *will* do the heavy lifting for the most demanding DXer or contester.

This radio shares DNA with earlier Yaesu offerings. Over the past several years, Yaesu has deployed an array of such signature signal enhancing features as *Contour*, *VRF*, *μ-Tune* and *Class A*. As with the FT-2000 and FTDX9000 models reviewed previously, the FTDX5000 builds upon this legacy, and it may be helpful to reread those reviews (you *did* read them already, right?).[1] Three FTDX5000 models are available according to option package: The FTDX5000, the FTDX5000D and the FTDX5000MP. The basic 5000 is very well equipped. The D model adds the SM-5000 monitor scope, and the MP adds the SM-5000, 300 Hz roofing filter (optional on the other models) and high stability oven controlled crystal oscillator.

The FTDX5000D with optional 300 Hz roofing filter reviewed here is a transceiver for the discriminating contester or DXer, who may even consider its roughly $6000 price a bargain. Although extremely rich in performance, it lacks some "convenience" features. For example, you cannot connect a keyboard for digital modes or data entry. Then again, you don't put a backup cam on an Indy car. Optional Yaesu accessories let you trick out your ride.

Some Broad Strokes

Main (A) and subreceiver (B) performance tops that of several vaunted radios already on the market, although the main receiver does outperform the subreceiver (see Table 1). The two discrete and comparable receivers make it possible to transmit and/or receive on separate bands — SO2R in a box (details to come)!

Both receivers cover from 0.03 to 60 MHz. Receiver A is double conversion, with the first IF at 9 MHz and the second DSP IF at 30 kHz for SSB and CW and 24 kHz for AM and FM modes. Receiver B is a triple-conversion design, with the first and second IFs at 40.455 MHz and 455 kHz, respectively, and the DSP third IF identical to the second IF in the main receiver. The 300 and 600 Hz roofing filters are not available to the subreceiver.

The radio delivers 200 W on HF and 6 meters on SSB and CW. Yaesu advises reducing the power to ½ to ⅓ of maximum when using high duty cycle modes such as RTTY or PSK31 for "longer than a few minutes," and rolling back to 50 W on AM.

As revisions become available, you can update the radio's firmware via an RS-232 port using files downloaded from the Internet. Since most new PCs don't come with RS-232 serial adapters/ports, USB would have been a nice option; there are arguments on both sides of this technological issue, however. A serial to USB adapter (Prolific chipset) worked fine for me. We did not perform a firmware update on our review radio, since this would have presented a moving target for evaluating performance. The procedure is relatively straightforward, and Yaesu has resolved early issues with the update writer.

The FTDX5000 takes DSP noise reduction to a new level — absolutely the best implementation I've ever experienced. It's just spectacular and could even make the horrid racket from my neighbor's solar array system melt into the background.

To enhance selectivity, the '5000 offers a selection of six pole crystal roofing filters (300 Hz, 600 Hz, 3 kHz, 6 kHz and 15 kHz are available for the main receiver), a feature several quality transceivers have begun offering. On CW the 300 Hz roofing filter is amazing. Coupled with a narrow DSP filter, you can sidle up to the strongest signals on the band to pull someone out.

In general, the radio's various DSP tools may impart some echo — the audio equivalent to "ringing" — especially at more extreme settings. This apparently is a result of latency.

A 46.3 Pound Gorilla in the Shack

This is a substantial radio, although it doesn't match the girth or weight of the FTDX9000MP reviewed in July 2010 *QST*, nor that radio's 400 W output. The ac power supply is built in. The FTDX5000 presents the user with a surfeit of knobs, buttons and displays that let you know you're at the helm. The ample main tuning knob augments this sense of control. It can be daunting at first. Some controls probably could have been relegated to menus; MIC gain, for example, is not something you typically adjust on the fly.

The front panel layout is sensible, although I did wish the legends were in a more contrasting shade. Style does *not* triumph over substance here. I'd expressed similar

[1]The following *QST* Product Reviews may be of interest: FT-2000 (Feb 2007), FT-2000D (Oct 2007), FTDX9000D (Aug 2005), FTDX9000 Contest (Mar 2006) and FTDX9000MP (Jul 2010). Past *QST* reviews are available to ARRL members at **www.arrl.org/product-review**.

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concerns in reviewing the FTDX9000 Contest (see "Product Review," Mar 2006 *QST*). On the other hand, all readouts are easy on the eyes. The three subdisplays are crisp, organic light emitting diode types. The multipurpose meter has a D'Arsonval movement. As in earlier Yaesu incarnations, a system summary panel, part of the main display, shows basic signal paths and settings for the main receiver (VFO A) and the subreceiver (VFO B) per the antenna, attenuator, IPO, roofing filter and AGC settings.

A couple of things struck me. First, there is no separate indication on the main display to let you know when VOX is enabled, beyond a tiny red LED on the VOX button. Second, there is no main display SPLIT indicator. You must instead pay attention to whether the TX indicator adjacent to the VFO B knob is illuminated. (You'll also see the TX indicator switch to VFO B when transmitting.).

The VFO A and VFO B subdisplays continue to show the set value, even after the function is off. For example, if you turn off the NR, the display dims, and turning the knob still changes the displayed setting while not affecting reception. Enabling another function shifts the subdisplay's focus to the new function.

Through menus, the operator can set individual brightness levels for the analog meter, main frequency display, subdisplays and SM-5000 when the DIM switch is pressed. Color and contrast are not adjustable. There are several color choices for the SM-5000 screen, but color and contrast are not adjustable on the main radio displays.

The FH-2 keypad accessory can be used for controlling the built-in CW memory keyer and voice keyer, as well as for frequency adjustments. At first I didn't figure the FH-2 would come in handy, but it turned out to be just the thing for those times when you're repeatedly calling a DX station that's generated a massive pileup (and you're running 200 W to wires).

A Problem Solved

Out of the box, our '5000 would not key properly, especially with an external keying source. We found dit shortening at 60 WPM, which was not affected by the waveform shaping menu or by adjusting the break-in (QSK) delay. In addition, while using the internal keyer in full break-in, unwanted spikes materialized between dits above 33 WPM, possibly a result of some sort of relay bounce. ARRL Lab Test Engineer Bob Allison, WB1GCM, described these as "phantom spikes" that looked "like triangles in the blank spaces between dits, causing a not so pretty keying waveform."

A Yaesu-provided circuit modification fixed the problem. The manufacturer says its production line incorporated the keying modification starting with Lot 2, although *not all Lot 2 radios were modified*. The problem has been corrected in all Lot 3 and later radios, however, and Yaesu says it will fix any radios already in the hands of customers.

A Problem Unsolved

So called "spurs" in the '5000's main receiver generated considerable chatter among owners and wannabes on the Yaesu FTDX5000 reflector. While Yaesu is looking into this issue, it remained unresolved as this review went to press. Here's the thing: You have to be looking for these artifacts (they are not "spurs" in the true sense of the word) in order to hear them. If the radio is set for 1 Hz resolution and a signal — preferably a strong one — is on or near certain frequencies in certain bands, you can hear a faint blip as you turn the VFO knob past certain *other* specific frequencies. They're easy to miss altogether and may give the impression of tuning past a real signal very quickly, but there is no spur that you can actually tune to. Some users consider this a serious issue that's deserving of Yaesu's attention.

High Fidelity

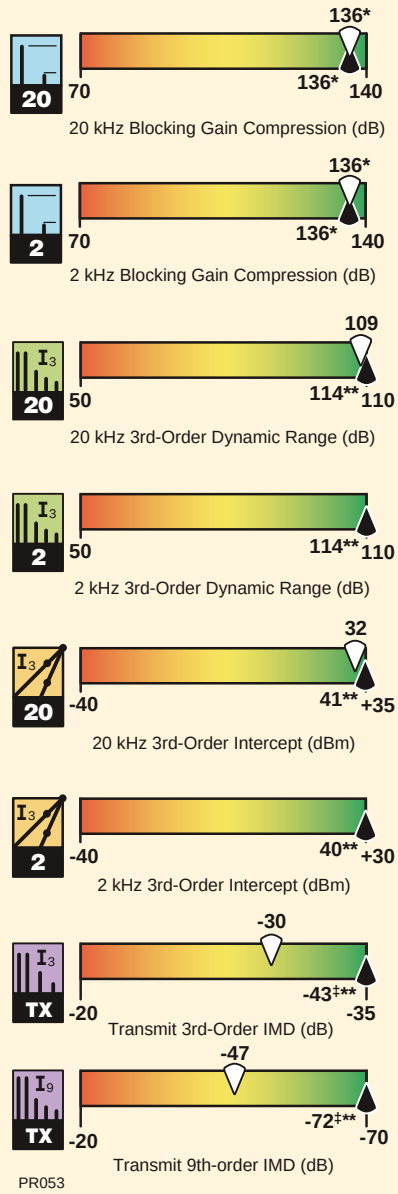
SSB enthusiasts will enjoy the FTDX5000's comprehensive transmit audio tailoring capabilities using the three octave equalizer. There are two tiers of settings — one for when the processor is off, the other for when it's on. The PROC button steps through MIC EQ and PROC steps, as indicated on the main display. These settings allow you to adjust gain, bandwidth and even Q for each bandwidth range in the equalizer, punching up one range of frequencies and tempering another to suit your voice. This is akin to the sort of audio processing broadcasters use on their studio microphones to make even the most modest voice sound appreciably more robust.

The equalizer can take some time to set up, and for situations in which multiple operators will be using the radio, you may just want to go with the *flat* response defaults and trim your audio using any adjustments available on your mic or headset. The radio is capable of enhanced SSB (ESSB) operation. The FTDX5000 offers similarly extensive audio tweaking capabilities for the receivers' audio.

Intercept Point Optimization and Preamps

Yaesu employs IPO buttons on its HF transceivers. The '5000's main receiver has two IPO settings, IPO1 and IPO2; the subreceiver has just IPO1. IPO stands for *intercept point optimization*, referring to third order intercept point (IP3), a popular metric that takes into account a receiver's sensitivity and dynamic range (see Table 1). What the IPO buttons *actually* do is turn *off* any preamps, which typically degrade dynamic range. Pushing the IPO button can improve the dynamic range on a band that has external

Key Measurements Summary



PR053

Key: ** Off Scale

80 M / 20 M

Values shown are for Receiver A with 600 Hz roofing filter.

Dynamic range and intercept values with preamp off.

Intercept values were determined using -97 dBm reference.

* Blocking exceeded the levels indicated. See Table 1.

‡ Class A operation.

Bottom Line

An extraordinary transceiver for the discerning contester or DXer. This one will become the gold standard for operators seeking the best receive performance and best value in its class.

noise well above the receiver noise. This doesn't show up in lab testing, but can make a difference with an antenna connected — especially on the bands lower in frequency than 14 MHz.

Just why the main receiver has *two* IPO levels is unclear. The IPO2 setting routes the signal directly to the first mixer. The manual says only that the IPO1 setting "improves the IPO." The radio also has twin preamps, and Yaesu recommends using PREAMP1 for the higher bands (there are three levels of attenuation as well). I found no occasions when I needed to use PREAMP2, although the attenuator came in handy.

SO2R in a Box!

A growing number of contesters are adopting the single operator/two radio (SO2R) operating model. The SO2R shack utilizes two transceivers. The main transceiver is the "run radio" for calling CQ; the secondary transceiver is the "multiplier radio" for tuning around. The typical SO2R setup also employs separate antennas for each transceiver.

The FTDX5000 opens the door to SO2R with a single box and, if desired, just *one* antenna. Both receivers can use the same antenna at the same time, although with four antenna ports on the rear apron, they don't have to. While running SO2R you can still log contacts as though you were using one radio. Swapping the transmit VFO from B to A lets your logger record the contact on the correct band.

The Stats

Subjective observations aside, the numbers tell the big story here. Don't be misled by nomenclature. Both FTDX*5000*D receivers outperform the FTDX*9000*MP's roughly equivalent receivers in terms of dynamic range and IP3.

For Receiver A, at the where-it-really-matters 2 kHz spacing, the two-tone third-order IMD dynamic range at 14 MHz is just as good as at 20 kHz spacing. In all cases, IMD dynamic range was well over 100 dB. This is the receiver with a 9 MHz first IF and narrow roofing filters, currently the hot setup for top-of-the-line close-in dynamic range. One interesting phenomenon was noted during the testing. The sensitivity (MDS) of receiver A lowered by a few dB after the radio had been in use for a few hours. This did not change the excellent measured dynamic performance. This represents *excellent* real-world performance, which holds up right through 6 meters!

For Receiver B, with a VHF IF and without the narrow roofing filters, the *worst*-case dynamic range was 88 dB on 14 MHz at 2 kHz spacing; all other numbers were in the 90s, the best being 98 dB on 14 MHz at 5 kHz spacing, yielding an IP3 of +25 dBm.

Table 1

Yaesu FTDX5000, serial number 00020034

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-60 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, 21-21.44, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive and transmit, as specified.
Power consumption at 117 V ac: receive, no signal, 70 VA; signal present, 80 VA, transmit, 200 W output, 720 VA.	Receive, no signal, 61 VA; receive signal present, max audio, 66 VA; transmit, 481 VA at 200 W RF output.
Modes of operation: SSB, CW, AM, FM, RTTY, PKT.	As specified.
Receiver	**Receiver Dynamic Testing, Receiver "A"**
SSB/CW sensitivity: 2.4 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz, 2.0 µV; 1.8-30 MHz, 0.2 µV (Amp 2); 50-54 MHz, 1.25 µV (Amp 2). Preamp not available below 1.8 MHz.	Noise floor (MDS), 500 Hz bandwidth, 600 Hz roofing filter: *Preamp / Off (dBm) / 1 (dBm) / 2 (dBm)* 0.137 MHz –116 — — 0.505 MHz –117 — — 1.0 MHz –118 — — 3.5 MHz –126 –136 –143 14 MHz –126 –136 –142 50 MHz –120 –131 –140
Noise figure: Not specified.	14 MHz, preamp off/1/2: 21/11/5 dB
AM sensitivity: 6 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz, 6 µV; 1.8-30 MHz, 2 µV (Amp 2); 6 meters, 1 µV (Amp 2).	10 dB (S+N)/N, 1-kHz, 30% modulation, 9 kHz filter, 15 kHz roofing filter: 1.0 MHz 8.60 µV 3.8 MHz 0.47 µV (Preamp 2 on) 50 MHz 0.59 µV (Preamp 2 on)
FM sensitivity: 15 kHz bandwidth, 12 dB SINAD: 0.1-30 MHz, 0.5 µV (Amp 2); 50-54 MHz, 0.35 µV (Amp 2)	For 12 dB SINAD, preamp 2 on: 29 MHz 0.22 µV 52 MHz 0.23 µV
Spectral display sensitivity: Not specified.	–115 dBm maximum with optional SM-5000 station monitor.
Blocking gain compression: Not specified.	Gain compression, 500 Hz bandwidth, 600 Hz roofing filter: *20 kHz offset Preamp off/1/2 / 5/2 kHz offset Preamp off* 3.5 MHz 136*/146/142 dB 136*/136* dB 14 MHz 136*/146/142 dB 136*/136* dB 50 MHz 130*/141/137 dB 130*/127 dB
Reciprocal Mixing (500 Hz BW): Not specified.	20/5/2 kHz offset: –109/–109/–104 dBc.

ARRL Lab Two-Tone IMD Testing (300 Hz bandwidth, 300 Hz roofing filter)**

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz Off	20 kHz	–17 dBm	–126 dBm	109 dB	+38 dBm
		–11 dBm	–97 dBm		+32 dBm
14 MHz/Off	20 kHz	–12 dBm	–126 dBm	114 dB	+45 dBm
		–5 dBm	–97 dBm		+41 dBm
		0 dBm	–84 dBm		+42 dBm
14 MHz/Pre 1	20 kHz	–24 dBm	–136 dBm	112 dB	+34 dBm
		–22 dBm	–97 dBm		+28 dBm
14 MHz/Pre 2	20 kHz	–36 dBm	–143 dBm	107 dB	+18 dBm
		–22 dBm	–97 dBm		+16 dBm
14 MHz/Off	5 kHz	–12 dBm	–126 dBm	114 dB	+45 dBm
		–6 dBm	–97 dBm		+40 dBm
		0 dBm	–82 dBm		+41 dBm
14 MHz/Off	2 kHz	–12 dBm	–126 dBm	114 dB	+45 dBm
		–6 dBm	–97 dBm		+40 dBm
		0 dBm	–82 dBm		+41 dBm
50 MHz/Off	20 kHz	–14 dBm	–120 dBm	106 dB	+39 dBm
		–8 dBm	–97 dBm		+37 dBm

Second-order intercept point: Not specified.	14 MHz, Preamp off/1/2: +65/+71/+71 dBm.
DSP noise reduction: Not specified.	Variable, 30 dB maximum.
Notch filter depth: Not specified.	Manual: >70 dB, auto: >70 dB. Attack time: 60 ms.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, Preamp 2: 29 MHz, 100 dB†; 52 MHz, 96 dB†. 10 MHz channel spacing: 52 MHz, 91 dB.

Receiver	Receiver Dynamic Testing, Receiver "B"
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz, preamp off/1/2, 135/36/10 µV.
Squelch sensitivity: Not specified.	At threshold: SSB, 14.6 µV; FM, 29 MHz (preamp 2), 0.32 µV; 52 MHz, 0.12 µV.
Receiver audio output: 2.5 W into 4 Ω at 10% THD.	2.8 W at 8.7% THD into 4 Ω. THD at 1 V RMS: 0.7%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): ‡ CW (500 Hz filter): 435-950 (515 Hz) ‡ Equivalent Rectangular BW: 506 Hz USB: (2.4 kHz filter): 268-2628 (2360 Hz) LSB: (2.4 kHz filter): 268-2622 (2354 Hz) AM: (9 kHz filter): 137-3410 (6546 Hz).
Spurious and image rejection: 160-10 meters, >70 dB; 50-54 MHz, >60 dB.	First IF, 14 MHz, 99 dB; 50 MHz, >111** dB; image, 14 MHz, 60 dB; 50 MHz, 73 dB.
SSB/CW sensitivity: 2.4 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz, 2.0 µV; 1.8-30 MHz, 0.2 µV (Amp 2); 50-54 MHz, 1 µV (Amp 2).	Noise floor (MDS), 500 Hz bandwidth, 3 kHz roofing filter: *Preamp / Off (dBm) / 1 (dBm) / 2 (dBm)* 0.137 MHz –111 — — 0.505 MHz –113 — — 1.0 MHz –113 — — 3.5 MHz –124 –133 –137 14 MHz –122 –132 –136 50 MHz –120 –131 –136
Noise Figure: Not specified.	14 MHz, preamp off/1/2, 25/15/11 dB
AM sensitivity: 6 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz, 6 µV; 1.8-30 MHz, 2 µV (Amp 2); 6 meters, 1 µV (Amp 2).	10 dB (S+N)/N, 1-kHz, 30% modulation, 9 kHz filter, 15 kHz roofing filter: 1.0 MHz 15.1 µV 3.8 MHz 0.86 µV (Preamp 2 on) 50 MHz 1.16 µV (Preamp 2 on)
FM sensitivity: 15 kHz bandwidth, 12 dB SINAD: 0.1-30 MHz, 0.5 µV (Amp 2); 50-54 MHz, 0.35 µV (Amp 2)	For 12 dB SINAD, preamp 2 on: 29 MHz 0.46 µV 52 MHz 0.46 µV
Blocking gain compression: Not specified.	Gain compression, 500 Hz bandwidth, 3 kHz roofing filter: *20 kHz offset Preamp off/1/2 / 5/2 kHz offset Preamp off* 3.5 MHz 130/134/129 dB 126/105 dB 14 MHz 130/133/128 dB 126/106 dB 50 MHz 129/133/127 dB 122/103 dB
Reciprocal Mixing (500 Hz BW): Not specified.	20/5/2 kHz offset: –109/–101/–94 dBc.

ARRL Lab Two-Tone IMD Testing (500 Hz bandwidth, 3 kHz roofing filter)**

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz Off	20 kHz	–26 dBm	–124 dBm	98 dB	+23 dBm
		–17 dBm	–97 dBm		+23 dBm
14 MHz/Off	20 kHz	–24 dBm	–122 dBm	98 dB	+25 dBm
		–16 dBm	–97 dBm		+25 dBm
		0 dBm	–53 dBm		+27 dBm
14 MHz/Pre 1	20 kHz	–34 dBm	–132 dBm	98 dB	+15 dBm
		–23 dBm	–97 dBm		+14 dBm
14 MHz/Pre 2	20 kHz	–42 dBm	–136 dBm	94 dB	+5 dBm
		–29 dBm	–97 dBm		+5 dBm
14 MHz/Off	5 kHz	–24 dBm	–122 dBm	98 dB	+25 dBm
		–14 dBm	–97 dBm		+28 dBm
		0 dBm	–52 dBm		+26 dBm
14 MHz/Off	2 kHz	–34 dBm	–122 dBm	88 dB	+10 dBm
		–17 dBm	–97 dBm		+28 dBm
		0 dBm	–52 dBm		+26 dBm
50 MHz/Off	20 kHz	–27 dBm	–120 dBm	93 dB	+20 dBm
		–20 dBm	–97 dBm		+19 dBm

Second-order intercept point: Not specified.	14 MHz, Pre off/1/2: +71/+37/+31 dBm.
DSP noise reduction: Not specified.	Variable, 30 dB maximum.
Notch filter depth: Not specified.	Manual notch: >70 dB, auto: >70 dB. Attack time: 64 ms.

[Table 1 continues on next page.]

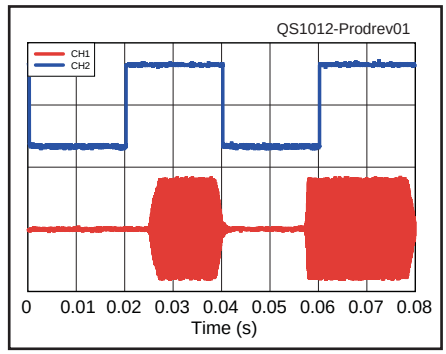


Figure 1 — CW keying waveform for the FTDX5000D showing the first two dits in full break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output on the 14 MHz band.

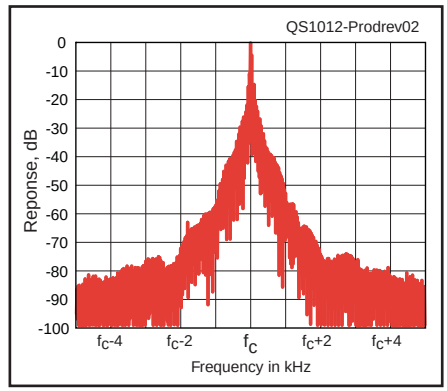


Figure 2 — Spectral display of the FTDX5000D transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 200 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

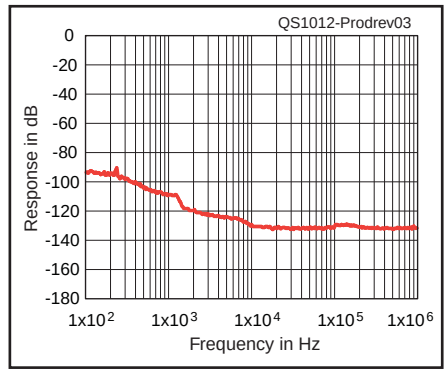


Figure 3 — Spectral display of the FTDX5000D transmitter output during composite-noise testing. Power output is 200 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

Going Digital

There are separate RTTY (FSK) and PKT (packet) modes and jacks; the PKT jack works for AFSK data modes such as PSK31, what the manual calls "SSB-based AFSK data modes." You can adjust various AFSK and RTTY parameters separately via the menu. It will do either HF PKT (LSB) or FM PKT. In our radio the IF notch did not function in the USB/PKT setting, only in LSB/PKT. Yaesu has addressed this via a firmware update. It's possible to set up AFSK modes to work in VOX mode, obviating the need for a PTT connection.

SM-5000 Spectrum Scope

The separate SM-5000 spectrum scope comes standard with the D and MP models. Yaesu provides hardware to secure it in place atop the radio. I have to agree with those who deem the speakers in the SM-5000 spectrum scope *terrific*. The spectrum scope display, however, is not terribly sensitive to weak signals, which seem to hover at or below the horizon. It's two tone and best viewed straight-on. Perhaps I've been spoiled by the color spectrum scopes on other radios.

The SM-5000's PEAK HOLD is great for seeing CW signals, which can be rather evanescent otherwise. Signal levels must be fairly high before they're very visible on the scope, although maybe that's just because I don't have three elements at 150 feet on 40 meters. The menu's LBWC 1 setting shows what's in your immediate and general vicinity, depending upon the selected frequency span (25 to 2500 kHz).

Automatic Antenna Tuner

The effective automatic antenna tuner puts out a low level signal when it's working. Heard on another receiver, this sounds a bit like PSK31. When it's in action you can hear the relays clicking as the tuner seeks the most appropriate component combination to bring the SWR into line. The ATU does *not* affect the received signal.

During initial setup, the tuner takes a little time to find a match and memorize settings for a given frequency (The tuner reserves one main setting for each band; the other 89 are up for grabs.) The next time it tunes to that frequency, it checks the memory and quickly makes adjustments. This means that if you use more than one antenna for a given band and, as I do, have only one feed line coming into the shack and a remote switch outside, you will have to retune as you swap antennas. Our FTDX5000 would not recall ATU memory settings after powering down. Yaesu has since corrected this via a firmware update.

Simply Awesome!

Yaesu has scored several home runs with the FTDX5000. Here are a few highlights we've not yet mentioned, in random order.

Receiver

FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, Preamp 2: 29 MHz, 84 dB†; 52 MHz, 85 dB†. 10 MHz spacing: 52 MHz, 87 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off/1/2: 240/69/26 µV.
Squelch sensitivity: Not specified.	At threshold: SSB, 24.8 µV; FM, 29 MHz (preamp 2), 1.10 µV; 52 MHz, 1.49 µV.
Receiver audio output: 2.5 W into 4 Ω at 10% THD.	2.3 W at 1.0% THD into 4 Ω. THD at 1 V RMS: 1%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): ‡ CW (500 Hz): 391-928 Hz (537 Hz) ‡ Equivalent Rectangular BW: 531 Hz USB: (2.4 kHz): 147-2417 Hz (2270 Hz) LSB: (2.4 kHz): 144-2395 Hz (2251 Hz) AM: (9 kHz): 116-2845 Hz (5458 Hz).
Spurious and image rejection: 160-10 meters, >70 dB; 50-54 MHz, >60 dB.	First IF reject, 14 MHz, 89 dB; 50 MHz, 44 dB; image reject, 14 MHz, 101 dB; 50 MHz, 48 dB.

Transmitter

Power output: 10-200 W, (5-50 W AM); 10-75 W (Class A mode, SSB).	CW, SSB, RTTY, FM, typ 10-202 W, AM, 4-67 W; Class A (SSB), typ 10-75 W PEP.
Spurious-signal and harmonic suppression: >60 dB, 1.8-54 MHz.	Worst: 54 dBc emission at 19.460 MHz, carrier freq of 21.020 MHz at 10 W RF output. Meets FCC requirements.
SSB carrier suppression: >60 dB.	As specified.
Undesired sideband suppression: >60 dB.	As specified.
Third-order intermodulation distortion (IMD) products: –31 dB @ 14 MHz, 100 W PEP below peak output, -40 dB, Class A, 75 W PEP below peak output.	3rd/5th/7th/9th order (worst case): HF, 200 W PEP, –30/–48/–46/–47 dB; HF, Cl A 75 W PEP, –43/–64/–68/–72 dB; 50 MHz, 200 W PEP, –30/ –48/–52/–58 dB.
CW keyer speed range: Not specified.	4 to 56 WPM.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, AGC fast, 66 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 37 ms; FM, 36 ms.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): FTDX5000D 5.3 × 18.2 × 15.3 inches; weight, 46.3 lbs; SM-5000 station monitor: 1.8 × 18.5 × 7.2 inches; weight, 5.5 pounds.

Price: FTDX5000D, $5500; XF-126CN 300 Hz roofing filter, $170.

*Exceeded figures indicated, +10 dBm maximum output from test fixture.
**ARRL Product Review testing now includes Two-Tone IMD results at several signal levels. Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The optional 300 Hz roofing filter (standard on MP) was used. The 600 Hz filter gave similar results. The "IP3" column is calculated Third-Order Intercept Point. Second-order intercept points were determined using –97 dBm reference.
†Measurement was noise-limited at the value indicated.
‡Default values; bandwidth and cutoff frequencies are adjustable via DSP. CW bandwidth varies with PBT and Pitch control settings.

Receiver Dynamic Testing, Receiver "B"

Transmitter Dynamic Testing

Figure 4 — Close-up of the main display and SM-5000 station monitor screen. To the left of the frequency display is information about the status of antenna, attenuator, filter, preamp, roofing filter and AGC settings for each receiver.

Another Perspective

Well-known Delaware contester and DXer Jon Zaimes, AA1K, ran the FTDX5000 through its paces. Here are his observations.

A lot of features will take a more thorough absorption of the manual to master; a few things didn't seem very intuitive, and I'm a longtime previous Yaesu user. But it certainly has the feel of a quality radio, and I really like the way it sounds! It has a quiet band floor and handles noise very well.

The receiver seems nice and tight. I never encountered any problems with overload while tuning across the band, even with the 20 meter Yagi stack aimed toward Europe and many strong signals. While transmitting on a separate radio on 1820.6 kHz with 1.5 kW and with no extra band-pass filters in line, I could hear *no* interference across 20 meters while beaming right at the transmitting antenna.

The 300 Hz roofing filter really makes for nice tight skirts on CW. The APF also was very effective for isolating really close-in signals, making the desired one pop right up.

The separate SM-5000 band display makes it easy to find signals on a quiet band. A way to "point and shoot" with a mouse would be nice. Also, I never found a setting that yielded optimal contrast yet was still bright enough.

Some ergonomic concerns: If sitting upright at normal distance to reach tuning knob and other controls, one cannot see the top of the S meter and the top row of labels of the main display. In addition, the light-gray lettering on the charcoal panel is *very* difficult to read, even under bright lighting, and this made for a more difficult learning curve.

I found the relative placement of the VFO A and VFO B AF GAIN controls confusing. The VFO B control is to the left of the VFO A AF GAIN control, but the VFO A and B subdisplay clusters are just the opposite. For me this was counterintuitive.

At first I thought the ATU was going bonkers as the dial lights flashed HI SWR and TUNE in rapid succession after I held in the TUNE button. But after a few seconds it had tuned the radio to a flat SWR on 7295 kHz with my 40 meter beam, which is cut for the low end of CW and has a high SWR at the high end. *Nice!*

Some front-panel buttons have an integrated LED to indicate when the function is on, but others do not. You have to look at the main display to see if the function has been toggled on or off.

■ The very effective DSP CONTOUR feature allows additional filter shaping within the receive passband.

■ The FTDX5000 has two notches. The IF notch can be set to narrow or wide via the menu. The DNF (digital notch filter) is automatic and fixed.

■ Everyone's radio should have the FTDX5000's CW tuning guide, especially those folks who persist in calling you 300 Hz off frequency when you're running a tight filter. You can repurpose the CW tuning guide to serve as a CLAR (clarifier or RIT) offset bar.

■ The APF is great, particularly on CW. It lets you tease otherwise barely audible stations out of the noise.

■ You can toggle between narrow and wide noise blanker settings.

■ It's possible to set certain parameters to be band-specific.

■ The menu permits a wide range of DSP filter customization, including steep, medium or gentle shape factors.

■ When setting certain parameters, such as RF output or keyer speed, its value appears briefly on the main display.

■ The MONI knob also sets the CW sidetone level, typically a separate adjustment on lesser transceivers (and sometimes hidden in a menu).

■ The VRF, inserted in the signal path between the antenna and the band-pass filter and RF amplifier, is handy to enhance noise reduction on a very noisy band, although it's not really intended for that.

■ The NAR (narrow) button is an excellent feature that expands the WIDTH range downward to 500 Hz or less for a given receiver. This two-tier system lets you use the NAR button to toggle between one very narrow setting and one not-so-narrow setting.

■ The CLASS A setting greatly reduces third and fifth-order transmit IMD (ie, "splatter") at a 75 W output level that's sufficient for most amplifiers.

■ The full break-in keying sounds great, but as is the case with many radios you can hear the TR relay clicking along as you send.

■ The FTDX5000 provides two options for filling CW keyer memories: Send the desired message and record it in one of the memory positions, or "dial in" the text, one character at a time, using the text message programming setting.

■ The cooling fan is whisper quiet.

Not So Much

Despite its overall outstanding performance, our FTDX5000 did not *quite* represent the apex of Amateur Radio transceiver enterprise. Yaesu has addressed several issues through firmware updates or hardware modifications, but others are simply design drawbacks. Here are some kinks we spotted, again in no particular order.

■ A front panel label on earlier-run FTDX5000s (including ours) misspelled the word "transceiver." This has been fixed in later production runs, and some already are calling units bearing the TRANCEIVER label "The Collectors' Edition."

■ The 176 item menu system is a huge improvement over what I've seen from Yaesu in the past, but it still mandates occasional visits to the manual to decipher. Other manufacturers have implemented plain language menus; Yaesu is behind the curve on this one.

■ The 144 page *Operating Manual* has a lot of information about setting up and using the many features this radio offers, but it could use some improvement. Among other things it lacks a CAT reference as well as a detailed index, although Yaesu does provide supplementary information on its Web site. The downloadable PDF version is easily searchable.

■ I detected a low level hum or tone when turning the VFO A AF GAIN control past about 12 o'clock. Yaesu said it would look into this.

■ With headphones connected, the speaker comes on for about a second when you turn off the radio.

Close the Door and Have a Seat

The FTDX5000 represents a giant leap forward for Yaesu in the high end transceiver market, and it already has begun to attract an enthusiastic following.

Given the FTDX5000's price class and intended market, we are compelled to comment on the apparent lack of attention to some details. [Of course as noted in other reviews, Yaesu is not alone in making updates as issues are discovered in early release radios. Another way to look at it is that in previous generations of radios, fixes to major problems were slow to come and minor issues were rarely resolved. — *Ed.*]

As noted throughout the review, Yaesu has addressed reported issues through firmware updates or hardware modifications (in some cases requiring the radio to be shipped back for service). Current production radios should not exhibit many of the issues encountered in our early production model.

Yaesu is to be commended for combining top tier receiver performance and a clean Class A transmitter with the features and functions users expect, all in a competitively priced package.

Manufacturer: Vertex Standard, 10900 Walker St, Cypress, CA 90630; tel 714-827-7600; **www.yaesu.com**.

W1ZR

THE DOCTOR IS IN

Q Bil, KD6JUI, notes that he noticed while tuning his homebrew antenna tuner that tuning for maximum background noise while in receive mode came close to, but didn't match the dial positions for minimal SWR while transmitting. He then asked which of the two antenna tuner dial settings would result in the most transmitted energy while in transmit mode. He also asked: Does minimal SWR always indicate the most transmitted energy going to the antenna system?

A In answer to the first question, by setting the antenna tuner to an SWR of 1:1, you have transformed the impedance at the bottom of your antenna feed line to 50 Ω, just what your transceiver is designed to deliver its rated power into. If your receiver input impedance were exactly 50 Ω, that setting would likely also be the position that would yield maximum receiver noise. As it happens, there is no such guarantee that the input impedance of the receiver will be exactly 50 Ω, although it should be pretty close. Thus a slight change may yield a stronger signal into the receiver.

Regarding the second question, the transceiver is rated to provide its design output power into 50 Ω, usually within a specified SWR range. As was pointed out in a *QST* article last year, an SWR of 1:1 does not generally result in the maximum power output.[1] By building a transmission line current meter, such as described by Eric, or later by Paul Danzer, you can actually tune the antenna tuner to get the highest output, corresponding to the maximum current into the antenna, which may occur at some setting different from either of the above.[2]

Be careful though. If you exceed the maximum rated SWR, the resulting voltages or currents in the final amplifier or output filter of the transceiver will exceed design specs and damage may result. The likely small increase in transmitted power is likely neither worth the trouble nor the risk, in my opinion.

Q Jason, KB3LMS, asks: I have a copper pipe J-pole antenna (see Figure 1) for two meters that I built a few years ago and it works great.[3] The antenna was mounted on a 20 foot mast made of EMT conduit but the mast has now failed and I need to build a new one or find another place to mount the antenna. There is a really nice oak tree with a sturdy branch at about 40 feet high that would work well just outside the shack. In trying to think of a way to hang the antenna, however, it seems the simplest mechanical arrangement might be to hang it upside down by the small shaft extending from the bottom. This previously attached to the mast. Would the antenna work the same if it were hung upside down? What effect would it have on the radiation pattern? Does vertical orientation have much effect on antenna performance?

A First, I'm guessing you are working FM stations with your J-pole. If so, you need to match their polarization, which is universally vertical (SSB and CW operators use horizontal antennas in most parts of the country). The difference between being the same and being 90° off can be as much as 30 dB (factor of 1000 in power). If the polarization disparity is less extreme it's not as bad. For example, an offset of 45° is only down 3 dB — but that's still half power — on both send and receive. So for FM only operation you do want to be as close to vertical as practical.

An upside down J-pole, by itself, should work as well as one right side up. The problem will be the transmission line. If it hangs down next to the antenna it will severely distort the pattern, since it will be in the full field of the antenna. Note that the usual orientation, with the feed on the bottom, generally can have the line going straight down and out of the field. If you can run the coax up the tree 3 or 4 feet and then run perpendicular toward the shack for at least 10 feet or so, it shouldn't be a problem. Otherwise, try to stick it up in the normal orientation. One way would be to hoist it with a halyard attached to the top of the antenna.

MARK SPENCER, WA8SME

Figure 1 — A copper pipe J-pole antenna made by and mounted on the tower of Mark Spencer, WA8SME. Construction details are provided in the reference cited as Note 3.

Q Sam, WA6QGH, asks: I have a problem with radio frequency interference (RFI) coming from my Linksys wireless broadband router model WRT54GL. It seems to be creating signals on 10 meters into my new transceiver. When I turn on my computer and the wireless router, I notice S-5 to S-6 level signals every 30 kHz across 10 meters. I ran the router power cord through a ferrite toroid five times and used a ferrite split bead. This reduced the RFI down to S-2 to S-3.

Is there any way to reduce RFI from the router to zero from the router, perhaps by using a specialized power line filter on the router power cable?

A Thanks for the tip! I have the same type router, just one thickness of paneling away from my station — and yes, I found the same signals. Mine are just above antenna noise, about S-1, so they wouldn't be a great problem for a reasonable signal, but 10 meter signals are rather weak these days.

I had blamed them on receiver birdies, but sure enough, when I powered down the router, they went away. They are definitely coming in via the antenna port, since they almost go away if I switch to the dummy load. If your setup is like mine, the wireless part of the system is not frequently used, and I have my house wired with 100Base-T twisted pair Ethernet connections to 8 jacks throughout

[1] E. Nichols, KL7AJ, "Keeping Current with Antenna Performance," *QST*, Feb 2009, pp 34-36.

[2] P. Danzer, N1II, "A Simple Transformer to Measure Your Antenna Current," *QST*, Sep 2009, p 35.

[3] Construction details for a 2 meter copper pipe J-pole antenna are found in R. D. Straw, Editor, *The ARRL Antenna Book,* 21st Edition, pp 18-25, 18-26. 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**.

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

the house, using a hub behind the router.

While it is possible that the signals are being radiated by the power wiring, I would suspect that the Ethernet wiring might be even more likely. It seemed to go down when I pulled some of the cables from the back of the router. If you don't have twisted pair wiring anywhere else, you do have it on the way to the cable or DSL modem. I would start (while no one is using the Internet) by pulling all the Ethernet connections from the back of the router and see what happens. If the interference goes away, chances are it's coming via the Ethernet wire and I'd focus on filtering that with your toroids.

If you still have interference, I'd put ferrite on the power cable connector going to the wall supply first. I'd put it as close to the router as possible with multiple turns (the snap on beads can help at VHF, but it takes quite a few at HF). It could be radiating right from that wire.

QRon, N3AEA, asks: I own two identical model VHF/UHF SWR/wattmeters that both perform the same way, as described below. I repeated the test with two different radios and received identical results.

In each case, the transceiver is connected to the SWR/wattmeter with a coax UHF to UHF or UHF to type N male-to-male adapter depending on the radio. No cables are used, just the adapter. A 47 Ω composition resistor is attached directly to the meter's ANTENNA connector with leads that are about ½ inch long. At 430 MHz, the indicated SWR is about 3:1. At 450 MHz, it rises to about 5:1.

I ran these tests because I noticed moderately high SWR readings on a UHF antenna and wanted to use the meters to troubleshoot — but now I can't tell if I have an SWR problem or a meter problem

Both meters seem to work fine on 2 meters. Do I need to calibrate the SWR/wattmeters on 440? Or do you think this is this expected performance for this configuration?

AI'm with you — I would make sure that I had a solid dummy load before I blamed the SWR meters. Good loads can be tricky at these frequencies, but not impossible.

Instead of putting your composition resistor across the SO-239 with short leads, I suggest inserting a ½ or 1 W, 51 Ω noninductive resistor into a PL-259 plug until the resistor body stops at the pin. Then solder it in and solder the other end right to the inside of the connector with almost no lead length. That should be a reasonable, but low power, load well into VHF.

The absolute best do it yourself load at 440 MHz, however, may be some regular (non-foam) RG-58 opened at the far end (see Figure 2). While the open is an infinite SWR, because of the coax loss at 440 MHz, it shows up at the radio end with the SWR shown in Table 1.

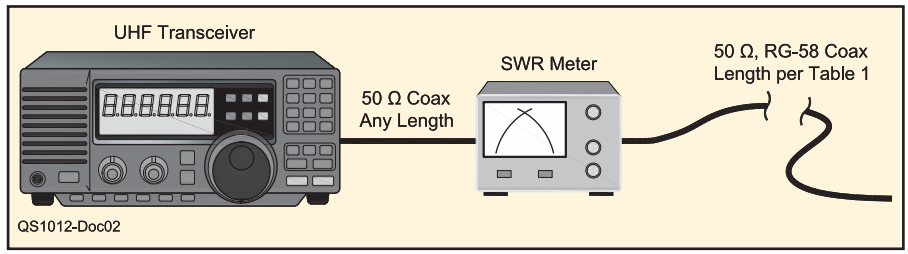


Figure 2 — Easy, do it yourself dummy load for UHF. Because of the loss enough of RG-58 (see Table 1) acts like a pretty good 50 Ω termination.

Table 1

SWR of Unterminated RG-58 Used as a Dummy Load at 440 MHz

Length (feet)	*Indicated SWR*
50	1.5:1
100	1.1:1
200	1.0:1

This is because RG-58 is so lossy at 440 MHz that almost no power makes it down and back! It may be even somewhat better if you put your 51 Ω resistor across the open end, but the leads will result in less difference than you might think.

QJeffrey, KB8PIH, asks: What is the proper operating etiquette to answer a call of "CQ contest" if you are not participating in the contest? Can you answer the contesting station to give them credit for a contact if you are not participating in the contest yourself?

AContests are a good way to make sure your station is getting out towards different directions. This is because in many contests you can usually work many stations in a short period of time.

Each contest has its own rules, but I'm not aware of any that require formal participation. In fact, unless there are requirements for organization membership, for example, if you make a contact — you have participated! I often listen in on DX contests in the hope of snagging a new country, even if I'm not able to compete seriously.

In terms of etiquette, the first rule, in my opinion, is to figure out what contest it is and then read the contest rules. These are normally available on the ARRL Web site or, if sponsored by another organization, on that organization's Web site.

The rules will tell you what constitutes a contest "exchange." For some contests, it's your ARRL section (or IARU section, or CQ zone...), and sometimes it includes a sequence number, sometimes a check number — which can be the year you were first licensed, your transmit power or sometimes it requires your grid zone. It is not good etiquette to ask the other station "what they need" for the contact, since they could probably make five contacts with informed operators while they go through it with you — that's why you need to check the rules.

Sometimes, if it's a simple exchange, you can decode it just by listening — but be sure you listen to stations from your own country since the exchange can be different for different categories of entrants. Of course, if you listen and decide it's just a signal report (always 59 or 599, by the way) and your state, you are pretty safe.

Some contests have provision for "check logs." These are for people who are not participating to allow their contacts to be checked against claimed contacts of usually the top scorers. If there are more than a given number of contacts submitted that don't check, there is usually a penalty, so it is good etiquette to submit your check log if the contest has provision for it.

◊Stan, W8NNX, read my comment on the splatter report that was received by KØHL as reported in the September 2010 column. He noted that I neglected to mention another item that might have contributed to the report. He notes that many of the current crop of receiver noise blankers are capable of chopping the incoming signals so fast that any strong signal that gets chopped off as a byproduct of the blanking operation can create the sounds of SSB overmodulation, as well as CW key clicks. The extreme rise or fall time of the blanking operation causes exactly the same splatter effect. Stan believes that this is a more likely cause than misadjustment of Ken's transmitter, and someone receiving such a report should ask the other operator to turn off their noise blanker, as well as turning on their attenuator. If either makes the problem go away, it's in the receiver — not the transmitter.

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. QST

National RF Type 2-MQ PortaQuad

"Short Takes" usually focuses on relatively new products, but this month I've shifted the spotlight to a product with a pedigree stretching back three decades.

The September 1980 issue of *QST* featured an article by Robert Decesari, WA9GDZ/6 titled, "A Portable Quad for 2 Meters." The article, and the *QST* cover photo for that issue, described a directional two-element quad antenna that was lightweight and easily transportable. The author patented the design and made it part of the product line for his company, which ultimately came to be known as National RF.

The portable quad antenna, now called the Type 2-MQ PortaQuad, has been part of the National RF inventory for a number of years, but it is not widely familiar to hams today. That's a pity because this unique antenna has much to offer, especially to the EmComm community.

The author's PortaQuad station during the 2010 ARRL September VHF QSO Party.

It's All in the Tube

The PortaQuad arrives in an unusual looking tube about 18 inches tall by 3.5 inches wide. Protruding from the plastic white cap at the top of the tube is a 1-inch bolt with a knurled brass nut, or "thumb nut." If you didn't read the original *QST* article, the appearance of the cap may have you scratching your head, but its purpose soon becomes obvious.

When you remove the cap you find that the tube contains what appears to be a loose collection of insulated wire, white fiberglass tubes and coaxial cable. What you're looking at is the quad antenna itself. Following the instructions, you simply "unfold" the fiberglass supports and their connecting wires. The antenna opens like an umbrella at both ends, the supports and wires swinging outward and creating the classic dual-diamond quad configuration. Each support is held in place with a knurled nut that you tighten by hand — no tools required. A three-foot length of RG-58 coax (with a PL-259 connector) snakes away from the feed point, secured along one of the supports with cable ties.

Also inside the package are four solid metal rods. These are pushed into holes at the bottom of the tube and form a stand to hold it upright. Replacing the cap on the tube, you slide the antenna boom onto the cap bolt and secure it with the knurled nut that seemed so puzzling mere minutes ago. It turns out that the packaging tube is more than a container; it is a support stand for the antenna itself!

The PortaQuad booms are held in place by knurled brass nuts, as shown in the center of this image. Thanks to its no-tools-required-design, the antenna assembles in minutes.

ARRL September VHF QSO Party

My first opportunity to test the PortaQuad came during the 2010 ARRL September VHF QSO Party. I tossed my multiband rig into the car along with the PortaQuad and headed for a nearby parking lot atop a tall ridgeline.

Within minutes — 7 minutes to be precise — I had the PortaQuad assembled and ready to go. The SWR measured no more than 1.1:1 throughout the 2 meter band. In fact, its 2:1 SWR bandwidth extended from 139 to 161 MHz.

As I began working stations it was obvious that the PortaQuad was fairly directional with substantial gain. Running only 50 W PEP, I was easily making contacts over more than 100 miles. At one point I flipped the PortaQuad from horizontal to vertical polarization and picked up a number of stations on FM simplex over a considerable distance as well. Changing polarization is simplicity itself. The PortaQuad boom is drilled and marked with an H for horizontal and a V for vertical. All you have to do is remove the boom from the support bolt, reposition the bolt in the desired hole, slide the boom back down and continue.

The PortaQuad would be ideal for hikers and backpackers since it is so easy to carry and assemble. This is its strength for emergency communications as well. I could see hams quickly setting up PortaQuads in situations where directional antennas are needed to span substantial distances between stations, or between individual stations and distant repeaters.

The PortaQuad isn't intended for permanent installations. Its design isn't robust enough to withstand high winds, ice and other challenges of nature. Even so, if you need a 2 meter gain antenna to drop into your backpack or add to your EmComm go-kit, the PortaQuad is a strong candidate.

Manufacturer: National RF, 7969 Engineer Rd, Suite 102, San Diego, CA 92111; **www.NationalRF.com***; tel 858-565-1319. $119.95 plus $5 shipping and handling.* QST

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

NØAX

HANDS-ON RADIO

Experiment 95 — Watt's In a Waveform?

As a beginner in ham radio and then again in my introductory electrical engineering courses (between operating stints at the college radio club, WØEEE) I remember struggling to understand the differences between all of the different ac waveform metrics and terminology. More than once I crisscrossed peak, RMS and average — and all the other possible combinations. In this experiment — it's always good to check up on the foundation!

Before we begin, note that this article will use degrees for angular values instead of the *radians* used in most engineering calculations. There are 2π radians in a circle so each degree equals $2\pi/360 = 0.0174$ radians and each radian equals $360/2\pi = 57.3°$. If you are using a calculator for the exercises here, be sure it is set to use the right units.

What's Your Sine?

It seems that ac waveforms are nearly always shown as sine waves. Why is the sine wave so ubiquitous? Why not a square wave or an irregular waveform? The key is rotation. If you imagine a point on a circular wheel rotating counterclockwise as in Figure 1, beginning at point 1 a point on the rim will rise and fall with a vertical height above or below the X axis equal to the sine of the angle through which it has rotated — a total of 360° in one rotation. At location 3, for example, it has rotated through 90° and reached maximum height. If we specify a radius of 1 for the wheel (the units of measurement don't matter), the height of the point is $\sin(90°) = 1$. At any other angle, θ, the height of the point = $\sin(\theta)$. As the point continues past 180° to 360°, which is the same as 0°, the point is below the X axis and $\sin(\theta)$ is negative.

Starting from $\sin(0°) = 0$ at location 1, plotting the height of the point against the angle of rotation (θ) on the X axis forms the familiar sine wave. When the point is rotating at a constant rate each degree of rotation always takes the same amount of time, so the sine wave is the same whether plotted with angle or time on the X axis. If each rotation takes T seconds, then the angle through which the point has rotated in t seconds, $\theta = 360 \times t/T$. Since 1/T is the frequency, f, of the wheel's rotation, $\theta = 360 \times f \times t$ and the value of the sine wave is $\sin(360 \times f \times t)$.

The cosine also makes an appearance as the point's horizontal distance from the Y axis. Positive is assigned to the right so that the cosine wave begins with a maximum value at $\theta = 0°$ of $\cos(0°) = 1$. The cosine wave looks just like the sine wave, but offset by 90°, starting at 1 and decrerasing.

But why is the sine wave the "standard" ac waveform? Aside from the important fact of mathematical convenience, which is of primary concern to engineers and scientists, the sine wave also describes the output voltage from a rotating generator. As the generator's armature coil rotates between the poles of its field magnet, the voltage induced in the coil is a sine wave. That sine wave then appears at your ac wall outlet and everywhere else on the utility grid. Most of the metrics we use today for all ac waveforms were originally developed to describe generator output, the first application of ac power.

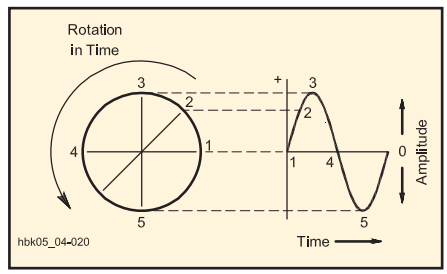


Figure 1 — The relationship between rotation and sine waves. The height of the rotating point is given by the sine of the angle of rotation.

A Peek at the Peaks

The first stop on the journey is Figure 2 which illustrates the primary points of interest using the voltage of an ac sine wave. At any single point in time, the value of the sine wave is called its *instantaneous value*, E_{INST}. The maximum value of the sine wave is its *peak value*, E_{PK}. It is also useful to know the difference between the maximum positive and negative values — this is called the *peak-to-peak value*, $E_{PK\text{-}PK}$ or just $E_{P\text{-}P}$. The same subscripts apply to values of current or any other quantity varying this way.

Why E and not V? E is used because it represents *electromotive force* or *EMF*, the original term that was renamed *voltage* in honor of Alessandro Volta. EMF and voltage are the same. V is often used to represent a specific value of voltage in volts. For current, I is used as an abbreviation for intensity (or impetus, depending on your sources of information) because the letter C was already used to represent charge in the early days of electrical experimentation. The letter A is used to represent a specific value of current in amperes.

Here are the key equations relating these values for a sine wave, using voltage and

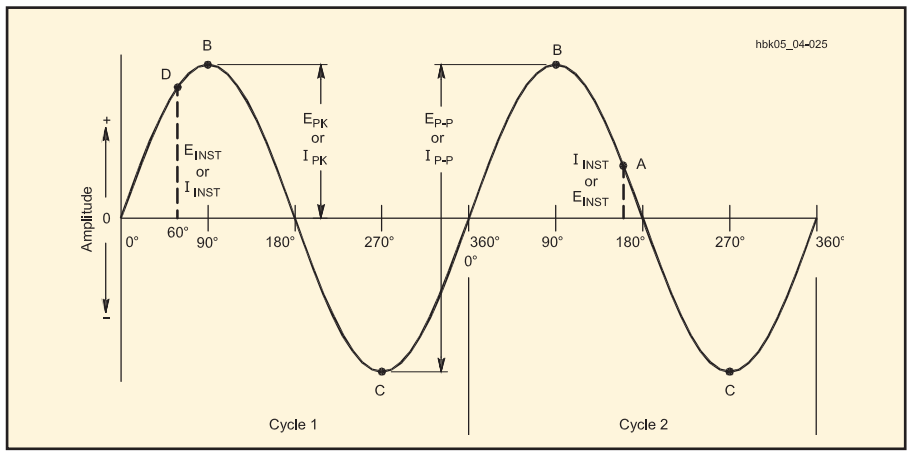


Figure 2 — Using a sine wave illustrates the difference between instantaneous, peak, and peak-to-peak values.

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remembering that the same applies for current:

$E_{INST} = E_{PK} \times \sin(\theta)$
$= E_{PK} \times \sin(360 \times f \times t)$
$E_{P-P} = 2 \times E_{PK}$ and $E_{PK} = \frac{1}{2} \times E_{P-P}$
$\theta = 360 \times f \times t$ and $t = \theta/(360 \times f)$

Got your calculator ready? Here are a few problems to work out:

If E_{PK} = 150 V, what is E_{P-P}? (300 V)

If E_{P-P} = 28 V, what is E_{INST} when θ = 45°? (28/[2 × sin (45°)] = 14/1.411 = 9.898 V)

What is the period of a 60 Hz waveform? (T = 1/f = 16.67 ms)

What is E_{INST} of a 60 Hz sine wave with E_{P-P} = 100 V if t = 1 ms? (100/2 × sin (360 × 60 × 0.001) = 50 × sin (21.6°) = 18.4 V)

Table 1

Conversion Factors for AC Voltage or Current

From	*To*	*Multiply By*
Peak	Peak-to-Peak	2
Peak-to-Peak	Peak	0.5
Peak	RMS	$1/\sqrt{2}$ or 0.707
RMS	Peak	$\sqrt{2}$ or 1.414
Peak-to-Peak	RMS	$1/(2 \times \sqrt{2})$ or 0.35355
RMS	Peak-to-Peak	$2 \times \sqrt{2}$ or 2.828
Peak	Average	$2/\pi$ or 0.6366
Average	Peak	$\pi/2$ or 1.5708
RMS	Average	$(2 \times \sqrt{2})/\pi$ or 0.90
Average	RMS	$\pi/(2 \times \sqrt{2})$ or 1.11

Note: These conversion factors apply only to continuous pure sine waves.

Power of a Waveform

Once the voltage and current of a waveform are known, the next step is to figure out how much power the waveform can deliver. After all, that's why the waveform was created in the first place — to do some useful thing and that requires power.

Just as with the values of voltage and current, power has an instantaneous value, $P_{INST} = E_{INST} \times I_{INST}$, and a peak value, $P_{PK} = E_{PK} \times I_{PK}$ (assuming voltage and current peak values occur at the same time as they do for a completely resistive circuit without reactance).

While it would seem natural to calculate a "peak to peak power", a more useful measurement is to compare the power supplied by the ac waveform to the power that would be supplied by a dc waveform with the same *effective value* of voltage or current. Back in the early days of electrical utilities some supplied dc and some supplied ac voltage. Engineers needed to be able to design equipment that would work with either type. For example, if a heater was needed for a manufacturing process, they needed to know what values of ac and dc voltage produced the same amount of heat. For dc power, that was straightforward: P = V × I. For ac power, where the voltage and current were continuously varying, the answer wasn't so straightforward.

By applying some mathematics to add up the total power available at each instant of the waveform, it was determined that for any continuous, regularly varying waveform the effective value could be calculated by squaring the instantaneous values of voltage or current, finding their average or *mean* over one complete cycle, and taking the square root of the result. This was called the *root mean square* or *RMS* value because it represented the square root of the mean of the squared values.

While this could get complicated, the regular variations of a sine wave make the calculations easy if the peak value is known: $V_{RMS} = 0.707 \times V_{PK}$ and $I_{RMS} = 0.707 \times I_{PK}$. You may recognize 0.707 as $\frac{1}{2} \times \sqrt{2}$ or $1/\sqrt{2}$. A less commonly used waveform value is the *average value*, which is taken over one half cycle of the waveform. (The average value over a full cycle for any symmetrical waveform is zero.) For a sine wave:

$V_{AVG} = 0.637 \times V_{PK}$ and $I_{AVG} = 0.637 \times I_{PK}$

The value 0.637 is equal to $2/\pi$.

It is important to remember that these simplified calculations apply *only* to sine waves. The RMS and average values of a non-sinusoidal waveform, such as a square or triangle wave or speech, is quite different. To measure RMS values of these waveforms, a specially calibrated meter must be used or a *true RMS* measurement must be made that performs the complete root mean square calculation. If you have a function generator, set it to 1 kHz, connect the output to your DVM set to measure ac voltage. Switch the waveform between sine, square, triangle and pulse to see how the displayed value changes.

The power of any ac waveform can be calculated as the product of RMS voltage and current:

$P = V_{RMS} \times I_{RMS}$

The equivalence in available power between a waveform with a specific RMS voltage and the same numeric dc voltage is why RMS voltage is used to specify the ac voltage of today's utility grid, even though dc power is very rarely encountered outside of special applications. RMS is so widely used that it is the voltage displayed by voltmeters unless specially configured or a *peak* setting is used.

Hams need to be able to convert between peak and RMS voltages, especially when trying to determine the ratings of components such as capacitors connected to an ac voltage or a rectified ac voltage.

$V_{PK} = 1.414 \times V_{RMS}$

For example, what is the peak voltage at your wall outlet if the utility is delivering 117 V_{RMS}? $V_{PK} = 1.414 \times 117 = 165$ V

If you are trying to filter RF from the ac line with a capacitor rated at 150 V, be prepared to watch some fireworks when the capacitor fails from the overload! (Note: Always give yourself plenty of safety margin when working with ac line voltage because of transients and over voltage conditions.)

Here are a few more problems to exercise the information:

What is the RMS value of a 220 V_{PK-PK} sine wave? (220/2 × 0.707 = 77.8 V)

What is the power of a sine wave with E_{PK} = 24 V and I_{PK} = 2 A? (0.707 × 24 × 0.707 × 2 = 24 W)

What is the peak voltage of 240 V ac power? (240 × 1.414 = 339 V)

Table 1 gives a number of useful conversions between peak, average, and RMS. You might want to keep those handy around your workbench or toolbox! QST

New Products

NATIONAL RADIO CLUB *AM RADIO LOG*

♢The 31st edition of the NRC's *AM Radio Log* is a comprehensive source of information about AM radio stations in the US and Canada. This new edition contains 278 pages of data and cross references and 18 pages of instructions. The book is published in 8½ × 11 inch, three-hole punched, loose-leaf format — you provide a three-ring binder. The new edition is said to contain 10,000 updates from the previous version. Also included are call letters of FM simulcasts, listings of regional radio station groups and stations licensed for IBOC digital audio. Price (postpaid) for NRC members: $19.95 USA, $24 Canada; nonmembers: $25.95 USA; $29 Canada. International orders $34. USA add $3.50 for Priority Mail. For more information, or to order, visit **www.nrcdxas.org**.

AG1YK

HINTS & KINKS

FLOATING LEAD RFI

◊One of my neighbors had been experiencing some strange problems. His garage door opener ceased to operate after I transmitted with the beam pointing in his direction running 800 W on any band. The unit was on but would not respond to either the remote opener or the push button inside the garage. Only a power off/power on reset would restore operation. Ferrite chokes on the ac mains or the control line failed to make any difference.

I discovered that the cable from the opener to the push button control had three wires. Two were connected and one wire was floating. I thought that the floating wire might be acting as a decent antenna and might be inducing RF into the opener's main unit. I simply connected the third floating wire at both ends to one of the other wires and the problem was solved.

He also had a severe TVI issue on one of his two TV sets. Both sets are using the local cable TV service. Indications were that the TVI was unrelated to any particular channel and the symptom was fundamental overload. All the usual fixes were tried including an ac line RFI filter, ferrite chokes on the cable and ac mains, etc. I even tried a conventional high pass filter (which is not suited for cable TV as some of the channels are shifted down in frequency from their "normal" broadcast frequencies) but nothing worked.

I noticed that there were four cables going to the room with the TV being affected. One was carrying the TV signals and three were unconnected and just floating. After the garage door opener experience, I again thought that these floating cables might be acting like antennas. We removed the three floating cables and the TVI problem was solved.

In 48 years of ham radio operation, this is the first time I have encountered this and thought it would be good to share the experience. — *73, Al Koblinski, W7XA, 2733 S Davis, Mesa, AZ 85210,* **w7xa@qwest.net**

TACK IN THE SHACK

◊I've found a new use for a product designed to hang items on the wall. Things like maps, charts and other items can be stuck to your wall using a low-tack putty sold under many names. This putty makes it easy to remove and reposition your item without damaging the wall. This alone makes it very useful in a ham shack.

Figure 1 — Tacking putty is inexpensive and readily available at a variety of stores selling household accessories.

A small pea of this stuff under the feet of your key eliminates chasing it across the desk. When stacking equipment, a piece on the top unit's feet will keep it from sliding and prevents scratches. A small piece placed on screw heads between rigs on the desk prevents (new) scratches. I even use a gob of it to hold wires in corners to keep them neat and out of the way. Put a piece in the corner, press the wire into the putty and another small piece over it to keep it all secure.

Usually found in the stationery aisle of office stores (see Figure 1), this low-tack putty has literally hundreds of uses around the shack. I wonder if it'll waterproof a PL-259? Gotta go... — *73, Jim Philopena, KB1NXE, 265 Frost Hill Rd, Marlborough, NH 03455,* **kb1nxe@arrl.net**

DRILL CHARGER RFI

◊Last weekend while operating on HF I noticed some RFI that I had not previously heard. The interference signals sounded like noise, were about 20 kHz wide and spaced approximately 11 MHz apart from 9 MHz to 30 MHz. The noise occurred at exactly 1 second intervals with ½ second duration and registered about S9 on my transceiver.

I checked for the interference from my mobile and determined that it was only present near my home. I then took my portable HF receiver and walked around the house holding it near my clocks that monitored WWVB, my computers, Wi-Fi routers, TVs and anything else that I could find that was electronic. I noticed that the RFI was loudest in my shack, which also contains a small workbench. After further investigation, I noticed that my new Hitachi cordless drill battery charger has an LED that blinks at a 1 second rate when the battery is fully charged or not in the charger. I unplugged the charger and the RFI disappeared.

The drill is a Hitachi DS18DSAL and the charger is a UC 18YGSL. Now, I will only plug in the charger when charging a battery. — *73, Jere Sandidge, K4FUM, 1770 Oak Ridge Cir SW, Stone Mountain, GA 30087-3286,* **k4fum@arrl.net**

PRO FRONT PANELS

◊I read the article in *QST* on creating custom front panels with great interest.[1] I would like to suggest a very useful resource for this that many may not be aware of, but I have been using since discovering it. A company called Front Panel Express, based in Seattle, offers a free software program for designing front panels. Once designed the panel can be submitted to them to be manufactured or you can print it out for application to a panel that you make yourself. Their prices are quite reasonable for a professionally drilled, engraved or screened panel.

The free software is quick and easy to learn and use. You can go to their Web site at **www.frontpanelexpress.com** and click on DOWNLOAD to get a copy of their *Front*

[1]F. Boyer, N3QK, "Making Front Panels — the Easy Way," *QST*, Mar 2009, pp 75-76.

Steve Sant Andrea, AG1YK ♦ Assistant Editor ♦ h&k@arrl.org

Panel Designer software. After creating a design you can request a quote if you want them to produce the panel for you, otherwise you can print out a paper copy for your own use. With this software I have been able to duplicate many equipment panels for modification or restoration. — *73, Scott Lichtsinn, KBØNLY, 406 E Bradley St, Tyler, MN 56178,* **kb0nly@mchsi.com**

SPLIT BOLT

◊I'm embarrassed to say that it took me nearly 50 years to discover and fully appreciate the usefulness and versatility of the "split bolt" (see Figure 2) used so often by electricians. While they come in various sizes, I use primarily S8 and S6. Split bolts have many uses around the shack. They are useful for splicing additional wire onto the ends of a dipole to lower the frequency. Instead of soldering or tying knots, a split bolt will do a better job of attaching a wire through an insulator, it even allows for easier frequency adjustments since the wire can be quickly shortened and clamped again.

STEVE SANT ANDREA, AG1YK

Figure 2 — Split bolts, commonly used in electrical work, can be used around the shack both inside and out.

Instead of using standard ropes and lines to hold wire antennas up in trees, I now use 0.095 monofilament trimmer line since it doesn't fray in the branches when the wind blows. This heavier size is impossible to tie off but a split bolt holds it nicely. Of course, the best and most common use is to connect a pigtail from each piece of station equipment to the ground bus wire. Split bolts can be found in the electrical section of your favorite hardware store. — *73, Dick Hayman, WN3R, 15 Arlive Ct, Rockville, MD 20854,* **wn3r@arrl.net**

SCREW STARTING TIPS

◊If you need help starting a screw in a difficult spot, rub the tip of any kind of screwdriver on a wax ring gasket used to seal the bottom of a toilet bowl to the floor. I bought mine about 10 years ago for $1.26 at the local hardware store. I use it any time I have to position hardware in a hard to reach location and I still have enough to last the rest of my life. It's sticky, like soft beeswax and wipes right off anything you use for an insertion probe. You'll find numerous uses for the stuff anytime you want to hold something light in position.

A second tip involves when you have to remove a screw from a location where the screw head isn't visible. What kind of tool do you use? Press a fingertip on it for a few seconds. You'll find a perfect image of your target embossed in the tip of your finger. — *73, Robert Barnes, W8SEB, 168 Belmont Ln, Whitmore Lake, MI 48189,* **w8seb@arrl.net**

ONLINE RINGTONE GENERATOR

◊On my commute in to work this morning I was reading through my May *QST* and read the submission from Greg about the CQ ringtone.[2] An alternative that might be easier for folks is to go to **www.planetofnoise.com/midi/morse2mid.php** and enter in whatever text you want converted to Morse code. You can adjust the speed, pitch and sound of the code and you can save and play it on your computer. It also provides a direct URL to a file, so if you have a browser enabled phone (such as the Blackberry referenced in the magazine) you can go to that URL, save the file and then make it your own ringtone. Depending on the features of your phone, you can have different ringtones assigned to different contacts in your address book. The Web site above is free and there's no cost to generating as many ringtones as you like. — *73, David Levine, K2DSL, 11 Mackay Ave, Waldwick, NJ 07463-1909,* **k2dsl@arrl.net**

KITCHEN HELPER

◊I needed a center support for a log periodic antenna I was building. Because the support bars are also a transmission line for the elements, I needed to find a strong insulating material that could be attached directly to the bars and could have "U" clamps attached to it for mast mounting. After some research I found that the material in plastic kitchen cutting boards is ideal. It is a quarter inch thick, is automatic dishwasher safe (will not deform with heat), is white and nonconductive, and cuts nicely with a hand or hack saw. As with most plastic, drilling is a breeze and produces nice clean holes. Depending on the project, one board would supply several insulating blocks and this material could serve for other purposes. — *73, Britt Belyea, W4GSF, 92 Waterview Dr, Newport News, VA 23608,* **w4gsf@cox.net**

[2]G. Tyre, "CQ Ringtone," *QST*, May 2009, pp 65-66.

ED SWIDERSKI, KU4BP

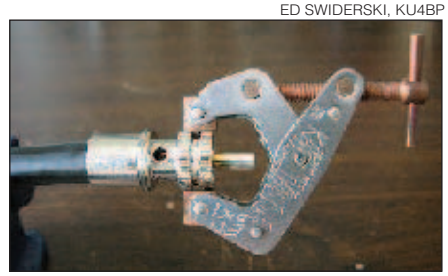


Figure 3 — The "Kant Twist" clamp attached to the PL-259 connector simplifies the task of threading the connector onto the coax.

THREADING PL-259S ONTO CABLE

◊When soldering PL-259s we all know that it's a real pain to thread it onto the outer jacket of the cable. I have a method to simplify this process. My method is to start the connector on the cable and, once the thread is started, I grasp the connector with a 1 inch "Kant Twist" clamp (see Figure 3). These clamps are inexpensive and are available for a couple of bucks at any industrial supply dealer. (MSC, Travers Tool or Penn Tool) I merely clamp it onto the connector and twist it on with no damage to the connector. — *73, Ed Swiderski, KU4BP, 108 Tori Ln, Lexington, NC 27295,* **ku4bp@arrl.net**

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

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

Feedback

◊ In "Antenna Gain Specs — What Do They Really Mean," [Nov 2010, p 40], the description of dipole and isotropic antennas was correct, but the relationship provided in the first colum had the wrong sense. The correct description of the conversion is: "Thus, if free space gain figures are given in decibels with reference to a dipole (dBd), **adding** 2.1 dB will provide the corresponding free space gain with respect to an isotropic radiator (dBi), and vice versa."

US Islands: Celebrating 16 Years on HF

The US Islands Award program puts an adventure in every contact.

Claire Hadfield, WL7MY

It seems most hams are collecting something on Amateur Radio these days. Just tune in on any ham band and you'll find someone chasing counties, 10-10 numbers, states, countries, zones, grids, lighthouses or islands. The US Islands (USI) Awards program has been very active on HF for 16 years not only providing island contacts by county, but also state contacts. Club station KL7USI has made thousands of contacts from all over Alaska, Hawaii, the lower 48 and on to the Virgin Islands to promote island collecting. USI operations span a broad range from Alaska's Arctic Ocean to the Florida Keys and all points in between including all US Territories and Protectorates.

Bob Richie, KL7BOB, DXing from high above Cook Inlet in Anchorage, Alaska. He had a ball working JAs on 17 meters.

Some of the crew taking turns in the operator position during the Squaw Island activation. From the left: Jay Hamill, KC2TCM; Scott Teresi, N2UMH; Norm Schrader, WB2GGM; Jim Wagner, KB2RPV; Lee Schutt, WA2LEE, and Sabrina Hamill, WD2STK.

Kick Starting USI

Rick Kaplan, KL7AK (past USI Program Coordinator), and John Reisenauer, KL7JR (USI founder and past Program Coordinator), were thrown together back in 1993 when, unknown to each other, both were planning to activate Herschel Island in the Arctic Ocean. They joined together, but their plans fell apart when they were beaten to the punch. This saw the beginnings of a friendship that involved traveling to remote areas of Alaska for Amateur Radio.

Some of John's affection for the Yukon must have rubbed off on Rick. While they were en route to islands off Homer, Alaska, Mother Nature thwarted their plans in 1995 and again in 1996 as the duo tried desperately to reach Jacquot Island, the largest island in Yukon's Kluane Lake.

Rick and John are alike when it comes to Amateur Radio DXpeditioning. They are responsible for many of the Alaskan island adventures that kick-started USI early on. Rick is the technical engineer-type who loves to tinker with radios. John is the experimenter, the "fly by the seat of his pants — hanging out in trees installing antennas" type. I saw a video of him falling out of a short scrub pine tree on Fox Island and he amused the captain and his family by scurrying right back up the tree to cinch down the tribander.

Rick and John reach their islands by car, ferry, bush plane, canoe or simply by wading to the island and towing their gear. Licensed amateurs for over 30 years, they thrive on operating Amateur Radio from remote areas of Alaska and the Yukon.

Some of the incredible DXpeditions the two put on over the past decade were not only "rare" Alaskan islands for USI, but IOTA as well. These include Barren Islands (AK-95S), Fox Island (AK-94S), Deer Island (AK-98S), Zarembo Island (AK-101S), Sitkanof Island (AK-111S), Shelter Island (AK-119S), Cove Island (AK-184S), Nunivak Island (AK-27S), Barter Island (AK-44S) and Shemya Island (AK-19S).

The US Needs an Island Program

It was the summer of 1994 when John Reisenauer, NL7TB (now KL7JR), and I really got hooked on island chasing. Why didn't the US have an island program, we asked? Other countries did. With John's ideas and advice from other interested hams, the United States Islands (USI) Awards program came to be. USI philosophy is simple: our state island collecting program would be most professional with minimal rules, operate totally on the honor system and be the best island program around. In September 1994, John and his son John, KC7FVA, set up on Whidbey Island (WA-001S) and Fidalgo Island (WA-002S) in Washington's Puget Sound with a tribander on the roof of a motor home to officially launch USI. Acting as the secretary for USI, I soon inherited QSL manager duties as well.

The Annual W/VE Island Contest emerged in September 1995 to celebrate the inception of USI. Many other hams were getting involved. Joe Gumino, K2OLG (now SK), activated several hundred Florida islands operating from his mobile.

US island chasing clubs were being organized to advertise "who we are and what we do," including; KL7USI (Official Club Station for USI), K3USI (Mid-Atlantic Crew), K4USI (Island Rovers of Georgia), W4USI (Southeast Georgia Island Hoppers), KA3USI, VE7USI/VY1USI (USI Canadian operator) and many special event 1×1 calls used to activate US islands.

USI is very "island activator" friendly because island hopping is the basis of our existence. By late 2009 we had 15 successful contests under our belt and over 1900 state islands activated. Within USI's first year, e-mail QSLing (eQSL) was established and has been widely used. USI pioneered eQSLing, which has saved hundreds of island enthusiasts many dollars in time and postage.

The USI Web site (**www.usislands.org**) is currently being administered by Jay Chamberlain, NS4J, in Virginia. Dean Jeutter, K3GGN, previously hosted the Web site at Marquette University for a decade. Jay and Dean both remain active supporters of USI.

Awards and Adventures

Awards offered by USI include USI Stations Worked, WASI (Worked All State

Putting a New Island on the USI Map

As the ARRL Contest Manager, I'm always looking for new ways to incorporate fun and Amateur Radio. Through the US Islands program, I discovered a fresh-water island near my girlfriend's home in New Hampshire that counted as "DX." With my Yaesu FT-817ND low power transceiver and a simple wire antenna, I made 34 contacts in 2 hours of casual operating on September 26, 2010, and my backyard island (now known in the US Islands program as "NH-018") was a brand new counter for their award. There are thousands of islands in the US in lakes, rivers and along the seashore that *you* could be activating. If you're looking for some DXpedition adventure without spending tons of money, the US Islands program is a great way to combine outdoor adventure with Amateur Radio fun! Read the complete story on my US Islands expedition to Eastman Pond Island here: **www.arrl.org/more-pileup-for-the-buck**. — *Sean Kutzko, KX9X*, **kx9x@arrl.org**

US Islands Last Frontier ARC, KL7USI, special event operation from Hyder, Alaska. Hyder is the only Alaskan town you can drive to without going through the Yukon. Hyder and Stewart, British Columbia (Canada) share many of the same amenities.

Islands) and USI QSO Party (formerly W/VE Islands Contest). The USI program also has certificate levels for islands worked: 100+, 300+, 500+, 750+ and 1000+. Currently, there are seven 1000+ US certificate holders with David Rees Jenkins, VE7IU, holding the top honor at 1500+ islands confirmed!

USI has its own logging program, developed by Mark Kachel, NØOKS, which makes logging islands a snap. The USI Web site features columns on many other aspects of our great hobby, including "Island Stories," "Island Calendar," "Photo Album," "Newsletter" and "Homebrew." Some of our island stories have appeared in club newsletters throughout the world and in *QST* and *TCA* magazines.

It must be said that not all island adventures go off without some sort of danger (see the "Island Stories" section of the USI Web site) and sometimes the very tool we use (our Amateur Radio transceiver) for fun can also help in emergencies. In one instance, a phone call placed by Don Burns, AA5AT, via a 20 meter contact brought a police boat to the rescue of KL7JR and others on board a stranded tour boat. They were some 12 miles from shore as a storm was threatening to smash them on the rocky shoreline. One hour later the crew was being towed back to shore as the captain was scratching her head trying to understand how some guy in Louisiana via a relay from another guy in California was able to get them help.

On another occasion, I vividly remember listening to Rick and John giving weather reports on 20 meters to Russ Wilson, VE6VK (the only one hearing them during the last storm), who relayed their messages from the Barren Islands to their charter boat in Homer, Alaska via the telephone. It took over 6 hours for the weather to clear enough for the F/V *Open Seas* to retrieve them and they only had a 20 minute window to load their gear on the boat before the next storm hit!

Cruise to the Islands

Thanks to our followers, both island collectors and island activators, USI's presence on the ham bands is strong. The USI governing body is the USI Committee (COM) and is presently composed of the following dedicated individuals: Ted Sarah, W8TTS (Qualifications/Awards Manager); John Almon, WA4JA (Contest Manager); Jay Chamberlain, NS4J (Web site Manager); Paige Pyne, WA3EOP (Program Director); Dennis Tuchalski, N9WDQ; Ralph Clark, NM5RC, and John, KL7JR (Advisors).

Check out the USI Web site for news updates and spin your dials to 14.260 MHz to catch all the special event USI stations. Please join us in USI in the fast-paced action of our hobby — island collecting. I'd like to personally thank all the hams who have made USI what it is today, whether you serve on USI COM, activate islands or are in the pileups collecting islands.

In conclusion, let me say that Rick and John are "the good guys in white hats" who exemplify what Amateur Radio is all about. They've inspired us with their ham radio excursions and expertise by teaching us to take nothing for granted, always be prepared and most importantly, have fun with Amateur Radio. They thrive on operating from extreme northern locations in all kinds of weather and truly believe "arctic flutter" is soothing to the soul.

Photos by John Reisenauer, KL7JR.

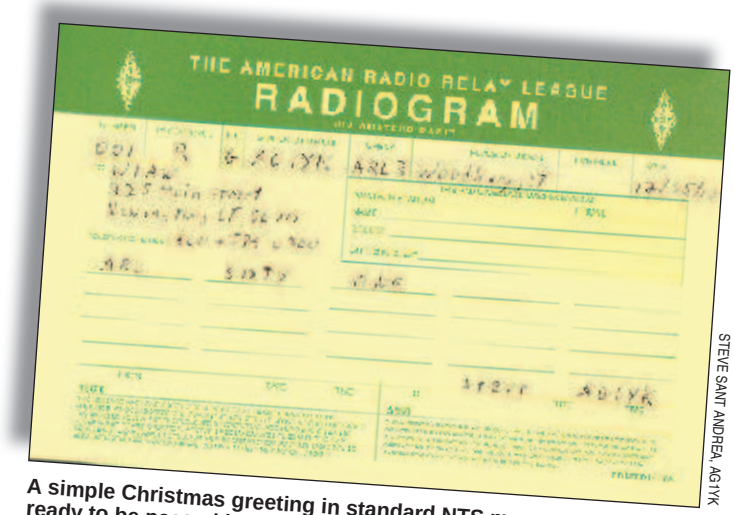
Claire Hadfield, WL7MY, was introduced to Amateur Radio by John, NL7TB (now KL7JR), in 1991 contesting from the Yukon. She received her Alaskan call sign WL7MY in 1993. Claire is a computer programmer and was fascinated with ham radio almost from the start. She enjoys operating RTTY and PSK-31.

John and Claire currently live in Anchorage and are in the process of relocating to Hawaii. Besides their involvement in USI, they are very active in the North Country DX Association's (K7ICE) chapter clubs VY1RST, VE8RST and KL7RST. Claire can be reached at 3705 Arctic Blvd, #1830, Anchorage, AK 99503, **wl7my@yahoo.com**.

Twenty Five Words or Less

Learn about traffic handling because "all else" eventually fails.

Steve Sant Andrea, AG1YK



A simple Christmas greeting in standard NTS message format ready to be passed into the traffic system.

"This is AG1YK net control for the Hurricane Zachary emergency net. The net is currently holding traffic for Connecticut. Is there any station on frequency that can take Connecticut traffic?"

Well, there it is. You have been monitoring the net with the vague idea of helping out. You have great copy on all the stations and you're in Connecticut. The opportunity to help out in a real emergency is knocking on your beam — but you hesitate.

"Traffic?" you think, "I've never tried any of that before…"

Getting the Message Through

A hundred years ago in the early days of ham radio, relaying messages, passing them from station to station to get them to their destination, was the most essential service we provided. Although it is one of the most fundamental of all ham radio operations, many active hams have never handled traffic. The American Radio *Relay* League was started to knit together the jumble of traffic nets that existed in 1914 into a coherent message handling system.

Today's ham has a multitude of ways to enjoy the airwaves. From AM to WSPR, contesting to ragchewing, Amateur Radio provides us with a broad range of activities. Some would argue that passing message traffic is the most essential of all.

Whether or not you are interested in emergency communications, you never know when you might be thrust into a situation where your radio is the only means of communication.

"Hey now, hold on. I live in a city, not the backwoods of Alaska. It's not like I'm going to be caught in any kind of emergency where I am."

Think again. On April 1, 2010 the southeastern section of Nebraska, including 12 counties and 40,000 people, lost all landline and cellular telephone service — including 911. What caused it? Earthquake, wildfire, flood, terrorists? No — an equipment malfunction at a commercial switching station. All else failed, and when it did it took 62 hams working all day to maintain essential communication in the city of Lincoln. As a ham you should always be prepared to help get the message through.

Formal Messages

"Formal message? What is that supposed to mean? I'm just a regular guy. I don't even own a tux."

And you don't need one. Message traffic is handled by the National Traffic System. Messages passed through the NTS use a standardized *form*. Hence, messages that are prepared in the NTS style are referred to as *formal* messages. Getting to know the NTS message form is the first step in preparing yourself to serve a useful role should some unpleasant occurrence befall your community.

The NTS message form is broken up into four areas: preamble, address, text and signature. The ARRL Web site has an excellent *PowerPoint* presentation of the NTS system that includes an explanation of the NTS message form. (go to **www.arrl.org/nts** and select the **National Traffic System—An Introduction** link)

The form is designed for a message that is 25 words long. This may not sound like much but, considering a "standard" word is 5 characters long, that's 150 characters — 10 more than you can use for a Twitter message and we all know how much information people manage to pack into a Tweet.

Learning What's Important

I hope at this point you can see that handling messages is an important ham radio skill. That brings us back to the Hurricane Zachary emergency net: Should you jump in to take that piece of traffic?

No.

An emergency net is not the place to learn how traffic nets work, how to pass a message, or how to relay or deliver it. These are skills that you need to cultivate during normal times. Like right now.

"Okay, I can see that makes sense. So how do I learn how to handle a message, just in case?"

First start by reviewing the NTS *Power Point* presentation. Next go to **www.arrl.org/nts**, open the RADIOGRAM IN PDF FORMAT link and download the radiogram form. Once you have some idea of how NTS works and a message blank, make up your own message. With the holiday season approaching, think of a ham friend in some other part of the country you would like to greet. Make up a holiday greeting in 25 words or less and prepare it in the proper form. Have a look at the photo for an example using the ARRL Numbered Radiogram codes or make up something more personal.

Now go to **www.arrl.org/arrl-net-directory-search** and search for a *local* net, in your state, that is NATIONAL TRAFFIC SYSTEM AFFILIATED. Listen in for a couple of sessions to get a feel for the procedures, then call net control, check in and tell the NCS that you are new to traffic handling but you have a message you would like to pass. Soon your holiday greeting will be wending its way to your buddy's holiday homestead.

ARL Sixty One to All and to all good DX.[1]

[1]What does ARL Sixty One mean? Download the FSD-3: ARRL Numbered Radiograms form from **www.arrl.org/nts** and find out.

Steve Sant Andrea is an Assistant Editor at QST *who came to message handling through his involvement in ARES®. He can be reached at* **ag1yk@arrl.org**.

HAPPENINGS

Four New Entities Placed on DXCC List

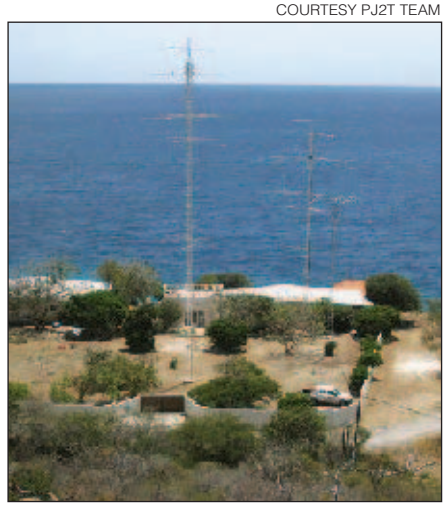
With the dissolution of the Netherlands Antilles on October 10, two now-deleted DXCC entities are now four *new* DXCC entities, effective October 10, 2010. The island pair of Bonaire and Curaçao (PJ2 and PJ4, the Leeward Islands) and the three-island group of St Maarten, Saba and St Eustatius (PJ5, PJ6 and PJ7, the Windward Islands) have been deleted from the DXCC list of active entities and replaced with four new entities: Curaçao, Sint Maarten, Bonaire (three separate entities), Saba and St Eustatius (one entity). Not since the break-up of the French colonies in Africa in 1960 have so many new DXCC entities come into existence all at once.

The US Department of State has recognized the dissolution of the Netherlands Antilles, placing the new entities on its Dependencies and Areas of Special Sovereignty List: "Curaçao and Sint Maarten (the Dutch two-fifths of the island of Saint Martin) became autonomous territories of the Kingdom of the Netherlands. Bonaire, Saba, and Sint Eustatius now fall under the direct administration of the Netherlands."

According to the DXCC rules (Section II: Criteria), "...entities may be added or removed from the DXCC List as the result of political or geographic change..." Four new DXCC entities qualify under two separate DXCC rules. Under Section II rule 1(c), Curaçao and Sint Maarten qualify due to their addition to the US State Department's List of Dependencies and Area of Sovereignty as having an Administrative Center. On the State Department list under Note 11, Bonaire, Saba and St Eustatius are noted to "fall under the direct administration of the Netherlands." Bonaire is added due to its separation from its parent (the Netherlands) by exceeding the 350 km rule as noted in Section II rule 2 Island Areas (b) (ii). Further, St Eustatius meets the 800 km rule from Bonaire (determined to be 806 km); however, Saba, due to its distance from St Eustatius, does not meet the criteria of 2(b)(ii) as it must also be 800 km from St Eustatius. Due to this, Saba and St Eustatius are considered as one entity.

Four new DXCC entities were added on October 10, 2010, thanks to the dissolution of the Netherlands Antilles on that date.

COURTESY PJ2T TEAM



The PJ2T station, located at Signal Point, Curaçao.

With the addition of four new entities coming into being at the same time, many amateurs made their way to Curaçao (PJ2T, PJ2/OH1VR, PJ2/PB2T, PJ2A and PJ2MI), Sint Maarten (PJ7E, PJ7MF), Bonaire (PJ4B, PJ4D, PJ4I, PJ4LS and PJ4W), Saba (PJ6A) and St Eustatius (PJ5/AA4NC, PJ5/AH6HY and PJ5/K1XM) to put these new ones on the air, and beginning at 0400 UTC on October 10, the airwaves were filled with those looking to snag these new entities. Just days after the entities became "live," stations on the islands had made more than 15,000 QSOs on SSB and CW.

The international PJ7E team — led by Joe Pater, W8GEX, and Craig Thompson, K9CT — reported that due to Tropical Storm Otto, they did not receive their equipment until October 13. So in order to put PJ7E on the air on October 10, the team relied on two "barefoot" stations — one for phone, the other for CW — and wire dipoles. Nonetheless, the team of 14 operators managed to make more than 8000 QSOs with just minimal equipment before their antennas, rigs and amplifiers arrived days later.

Over on Bonaire, the PJ4D team helped to facilitate a series of QSOs between schoolchildren on that island and schoolchildren in the Netherlands, hosted by Dutch ham Erik Vervast, PD1DX. According to the PJ4D team, the purpose of the contacts were "to provide opportunities for the group of new Dutch country citizens on Bonaire to ask the students in the Netherlands some questions in order to get to know one another a little bit better."

Per the ARRL DXCC Desk, no confirmations for these new entities will be accepted until after January 1, 2011

UNITED STATES SUPPORTS SECONDARY AMATEUR RADIO ALLOCATION AT 461-469 AND 471-478 kHz

The Federal Communications Commission and the National Telecommunications and Information Administration (NTIA) — the spectrum regulators for United States private sector and government users, respectively — have agreed to support a secondary MF allocation to the Amateur Radio Service at 461-469 kHz and 471-478 kHz at the 2012 World Radiocommunication Conference (WRC-12). The conference will be held in Geneva, Switzerland from January 23-February 17, 2012. FCC and NTIA officials formally presented the proposal at a meeting of the Second Permanent Consultative Committee (PCC.II) of the Inter-American Telecommunication Commission (CITEL), held August 30-September 3 in Fortaleza, Brazil.

According to ARRL Chief Technology Officer Brennan Price, N4QX, the proposal reconciles two widely divergent proposals for WRC-12 Agenda Item 1.23, adopted by consensus of the private sector and

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government users. Agenda Item 1.23 calls on WRC-12 "to consider an allocation of about 15 kHz in parts of the band 415-526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services." The FCC's WRC-12 Advisory Committee (WAC) had adopted a proposal for a secondary amateur allocation at 495-510 kHz, but the NTIA, acting on the advice of government maritime interests, initially supported no change from the status quo.

"I am pleased that the United States is taking an affirmative position on Agenda Item 1.23," Price said, "While the proposed frequency bands differ from both what the ARRL proposed and the private sector supported by consensus during WAC deliberations, it is gratifying that government interests have backed off a no change position."

Some maritime interests, both domestically and internationally, have expressed opposition to any amateur allocation in the range 415-526.5 kHz, citing existing narrowband direct printing applications at 490 and 518 kHz, as well as future plans for the band that have yet to be fully characterized, Price explained. To the extent future maritime uses of the band have been discussed, the focus has been on the 495-505 kHz segment. Despite the lack of plans for the remainder of the range under consideration, the International Maritime Organization (IMO) has adopted a draft position of "no change" and has communicated this position to the ITU. IARU President Tim Ellam, VE6SH, has met with IMO officials in efforts to soften this position.

"The road to a favorable outcome for Agenda Item 1.23 at WRC-12 remains treacherous," Price said. "The IMO is a respected organization, and their opinion carries weight. It's up to us to continue to make the case that a secondary allocation can be made while protecting existing services, both to the IMO and to the ITU Member States who will make the decisions at WRC-12."

Technical Relations Specialist Jon Siverling, WB3ERA, represented the ARRL on the United States delegation to the CITEL PCC.II meeting. From that meeting, he notes other matters of concern to the Amateur Radio Service:

■ Regarding Agenda Item 1.14, considering an allocation to the radiolocation service between 30-300 MHz, the United States proposed that no change be made in ITU Region 2 and suggested that changes in other regions should be addressed by country-by-country footnotes to the ITU *Radio Regulations*. Proponents appear to be focusing on 154-156 MHz.

■ Regarding Agenda Item 1.19, considering regulatory provisions for software defined radio (SDR) and cognitive radio systems (CRS), sufficient support for a United States proposal of "no change" was garnered to have the proposal deemed a region-wide Inter-American proposal. The status quo reduces the risk of provisions in the *Radio Regulations* that could curtail experimentation in SDR and CRS by the Amateur Service and reduce the portability of equipment across international boundaries.

ARRL TEACHERS INSTITUTE EXPANDS TO INCLUDE SPACE, ELECTRONICS IN THE CLASSROOM

This summer, the ARRL offered two advanced ARRL Teachers Institutes on Wireless Technology (TI-2) sessions. One session focused on how to integrate space into the classroom, while the other concentrated on basic and more advanced electronics concepts and ham radio operations. "As we gain experience as to what content is need to help teachers to better integrate basic electronics, the science of radio, microcontrollers and robotics into their curriculum, the TI program continues to be refined and expanded," said ARRL Education and Technology Program Coordinator Mark Spencer, WA8SME. "The TI-2 program is an offshoot of that effort and provides a 'graduate level' opportunity for graduates of the regular Teachers Institute sessions."

Space in the Classroom

The Dayton Amateur Radio Association sponsored the Space in the Classroom TI-2; this session was also made possible thanks of the generous support of Yaesu and Ham Radio Outlet. The eight TI-2 Space participants received a basic satellite ground station that consisted of a Yaesu FT-817 transceiver and G5500 rotor, an ARROW antenna, rotor controller interface and software, as well as associated cabling. During the TI-2, the teachers learned how to setup and operate their ground stations and how to locate and access ham radio satellites. They then practiced by making on-the-air contacts through the satellites. Spencer explained that the satellite operations were not restricted to voice QSOs, but also included receiving satellite telemetry transmitted by Morse code and receiving SSTV pictures sent by other amateur satellite enthusiasts during a dedicated AO51 pass. Spencer thanked AMSAT and the satellite community for supporting this popular and motivating experience.

Besides working what he called "a bazillion satellite passes," Spencer said that there were some standout activities in the session: "The International Space Station (ISS) was up with APRS packet, allowing the teachers to experience, as close as possible, what is involved in making an ISS voice contact under the Amateur Radio on the Space Station (ARISS) program. Additionally, the teachers were in a good position to listen in on a test between the ISS and the White Sands Missile Range (on a non-ham frequency, but at least it was a signal from the ISS). The participants quickly scrambled to upload projected Keplarian data into the tracking software to access one of the first passes of a new satellite — TISat — that was launched on the first day of the TI-2 (it's a nice name choice for this new bird, but we had nothing to do with it). It was a hoot to hear the first signals from this bird — HI HI HI TISat — sent in Morse code!"

Electronics in the Classroom

The Basic Electronics TI-2 was conducted at ARRL Headquarters. Each of the 12 participants were licensed amateurs and was expected to attempt to upgrade their license privileges as an extracurricular activity. Of the 12, six upgraded to General and one to Amateur Extra (a number of the teachers already held an Amateur Extra class ticket). Additionally, a significant number of the participants obtained their ARRL Volunteer Examiner credentials through after-hours study.

During the four days of the TI-2, the participants built on the basic electronics knowledge and skills that they had learned during their original TI experience. Spencer explained that after a quick refresher of previous material, more advanced topics that focused on digital electronics and digital communications techniques took the teachers to a new level of understanding: "Through the use of the OptaScope and prototyping boards, the teachers built circuits that demonstrated various digital electronics concepts, and then watched as the signals produced were displayed on the computer screen, proving that a picture is worth a thousand words. Actual Amateur Radio digital transmission modes rounded out the digital unit by allowing the students to see digital communications in action."

As a prerequisite to attend the TI-2 program, teachers must be a graduate of the regular TI program *and* be actively engaged in integrating the content of the TI program

into their school curriculum. Seating in the TI-2 classes is limited, making it important for those that want to participate in the program to get their applications in early. Keep watching *QST* and the ARRL Education and Technology Program (ETP) Web page at **www.arrl.org/education-technology-program** for the latest information on the ARRL Teachers Institute program.

How Can You Help?

You can make an impact! The success of the Education & Technology Program is a tribute to the generosity of ARRL donors. Each year, donors contribute more than $200,000 to support the ARRL's programs described in this story. Gifts of every amount help the ARRL reach thousands of students and teachers across the country with the story of Amateur Radio and related subjects. Why not join the ranks for ARRL members with your contribution this year?

Because the ARRL's Education & Technology Program is entirely donor-supported, your contribution of $1000, $250 or $100 will have a direct impact on the next generation of radio amateurs. You can make your contribution by mail to ARRL, 225 Main St, Newington, CT 06111, by phone to the Development Office at 860-594-0397 or via the secure ARRL Web site at **www.arrl.org/arrl-donation-form**. Feel free to call the Development Office for more information about other giving options, including installment giving or gifts of securities.

ARRL'S LOGBOOK OF THE WORLD: 300 MILLION QSOS …AND COUNTING

Congratulations to Victor Morozov, RD3PQ, for submitting QSO number 300 million to the ARRL Logbook of The World (LoTW). His QSO with Ivan Gombos, SV2/OM3CGN, on October 5, 2010 did the trick. To date, Morozov has submitted nearly 6300 contacts to LoTW and will receive free DXCC and Worked All States awards for his well-placed log.

"We're very pleased with the high level of use and acceptance of LoTW from operators around the world," said ARRL Membership and Volunteer Programs Manager Dave Patton, NN1N. "January 2011 marks the 10 year anniversary of the ARRL's announcement of the LoTW system. While it has taken longer than anyone expected to return to building-out the system, progress is being made. ARRL's programmers are working hard to improve usability and to add support for the VUCC award, and we have received valuable assistance from volunteers in the development of the system and software."

Thanks to many volunteers, LoTW instructions have been translated to other languages, helping drive activity. Patton explained that other volunteers work with people who aren't yet using the system in order to put more logs from more places into LoTW. The level of acceptance has not slowed down — in fact, it may be increasing. At this time, more than 3600 applicants have requested a digital certificate and not yet finished the process, to go along with the 36,300 individual users who have already signed up.

"We continue to hear from users who have happily folded the use of LoTW into their operating and awards-chasing worlds," Patton said. "They have found the best ways to use the system and continue to collect the QSL cards that many of us enjoy so much. The use of the worldwide QSL Bureau system is still quite valuable for obtaining traditional QSL cards at the lowest possible cost. Both LoTW and the QSL Bureaus combine to make a strong combination of cost savings and lessened risk from sending cards to ARRL Headquarters for processing."

Patton pointed out that the use of direct QSLing is also still important in order to help support DXpeditions and to obtain quick confirmations from stations that are not yet using LoTW or the Bureau. "The beauty of using LoTW comes through again as a supplement to awards and QSL chasing in that we still want a nice QSL for our collection, but now we don't need to obtain 10 or 12 cards," he said.

ARRL VEC LINKS UP WITH SOUTH POLE TO ADMINISTER TECHNICIAN EXAMS

While much of the United States was enjoying a beautiful autumn day on October 8, those who winter over at the Amundsen-Scott South Pole Station were experiencing a typical day for their clime, a day in the –70s. But though the day was indeed frigid, six men and two women at Amundsen-Scott didn't feel the cold as they were too excited (and maybe just a touch nervous), knowing they were going to be part of the first Amateur Radio license exam session ever held at the South Pole.

Ernie Gray, W1MRQ — who is at Amundsen-Scott as a contract worker for Raytheon Polar Services in Colorado — is an ARRL-accredited Volunteer Examiner (VE). He told the ARRL that the process to do an exam session at the South Pole base began last year, but nothing really happened with it until this past winter (summer in the Northern Hemisphere). Saying that the crew had been exposed to ham radio through the permanent ham stations at Amundsen-Scott — not to mention that some professed that they had wanted for years to be a ham — Gray said that they really didn't know how to go about getting those interested licensed.

"The South Pole winter crew has been isolated here since February and I have been giving talks and demonstrations about Amateur Radio, even making some contacts from my shack," Gray explained. "We do try to fight isolation from all the things at home, as well as the boredom from being sequestered inside this steel cocoon. I knew at that moment that I had to make this happen, that I was going to make this happen. And they were in my face asking how we can make this happen. So we had a meeting in May with about a third of the 47 'winter-overs' attending and the idea of an exam session came up almost right away."

With only one VE on site — three VEs are needed to conduct an exam session — ARRL VEC Manager Maria Somma, AB1FM, hit upon the idea of a video feed between Amundsen-Scott and ARRL Headquarters. With Gray at the South Pole, Somma recruited two ARRL HQ staffers who are also ARRL-accredited VEs to complete the team. ARRL Receptionist Penny Harts, N1NAG, and ARRL Field Organization Supervisor Steve Ewald, WV1X, assisted Gray in conducing the session via streaming live video. According to Somma, this is

ERNIE GRAY, W1MRQ

Six men and two women took and passed their Technician exam at the Amundsen-Scott South Pole Station via video link with ARRL HQ in October.

the first time that VEs at different locations have conducted an exam session via video.

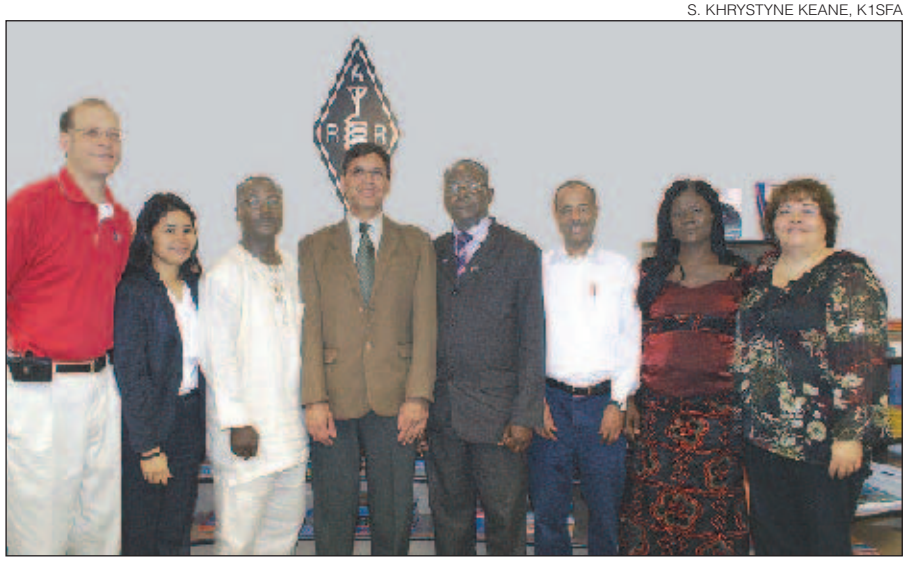
A total of eight candidates took the Technician exam and all eight passed. Gray told the ARRL that a couple of the new hams were active on the air over the following weekend, creating pileups while making their first contacts. "I had a couple in the KC4AAA ham shack and they had a short QSO on 40 SSB," Gray said. "I hope to have them all through before we depart for home [starting in November]."

"On October 8 around 5 PM, we gathered in the ARRL VEC office to start the video conference exam session," Somma explained. "At the South Pole it was already 10 AM on Saturday. Everyone there was in their conference room with each candidate's laptop logged onto the ARRL VEC Examination Web site. All three participating ARRL VEs were able to observe and communicate before, during and after the session. Participating VEs filled in all forms related to the session via the Web. Three different interactive online Technician exams were available so Ernie could randomly assign different versions to the candidates and they could all take the exam at the same time.

"The results were reported to the candidates within a few minutes of electronic submission to the VEC and VE team. All eight had passed! During my 25 year tenure at the ARRL, this has been one of the most rewarding experiences I have ever been involved in. It was very gratifying to help them achieve their goal!"

Gray agreed, commenting: "*Nothing* I have ever done previously and probably *nothing* I will ever do again will give me as much satisfaction as what has been accomplished by these eight individuals down here this winter. This is the highpoint of my ham radio experience and I hope I still have a few more good years to go!"

S. KHRYSTYNE KEANE, K1SFA



The USTTI Amateur Radio Administration Course course, led by ARRL Chief Technology Officer Brennan Price, N4QX (left), brought Mary Coleen F. Cas, KJ4YPR (second from left), Jonathan Aina, Edgard Pakes, PY2GOD, Anthony Gakpey, Chalew D. Anteneh, KJ4YPQ, and Florence Adigun to ARRL HQ for the four-day course. Assistant to the CEO and Meeting Planner Lisa Kustosik, KA1UFZ (far right), coordinated the ARRL's participation with USTTI.

ARRL HQ HOSTS USTTI CLASS

Students from the Philippines, Ethiopia, Ghana, Brazil and Nigeria attended the United States Telecommunications Training Institute (USTTI) Amateur Radio Administration Course (ARAC) at ARRL Headquarters September 27-October 1. ARRL Chief Technology Officer Brennan Price, N4QX, coordinated the session and led the course. ARRL Assistant to the Chief Executive Officer and Meeting Planner Lisa Kustosik, KA1UFZ, coordinated ARRL's participation with USTTI.

According to Price, the students work in their respective government telecommunications offices dealing with telecommunications and Amateur Radio testing, licensing and monitoring. "Our six students — Mary Coleen F. Cas (the Philippines), Chalew D. Anteneh (Ethiopia), Anthony Gakpey (Ghana), Edgard Pakes, PY2GOD (Brazil), Jonathan Aina (Nigeria) and Florence Adigun (Nigeria) — made the trek to Newington," said Price. For the second year in a row, some students elected to take examinations for United States amateur licenses on the course's final day. Anteneh and Cas passed these examinations, becoming KJ4YPQ and KJ4YPR, respectively. Last year, Yaw Kwarteng from Ghana took the Technician class license exam and passed. Kwarteng, who was not licensed in his home country, now holds US call sign KJ4PVL.

The ARAC curriculum covers a wide variety of Amateur Radio topics and concerns, including licensing, spectrum requirements, disaster communications and antenna requirements. The curriculum also covers the ITU and its regulations, as well as the process leading to the World Radiocommunication Conference 2012 (WRC-12). "All six students took a keen interest in how the Amateur Radio Service has developed through its history and continues to develop today," Price said. "There was a particular interest in licensing and human resource issues, and students were receptive to our ideas and suggestions concerning these issues."

ARRL staff members served as faculty, teaching units within their areas of expertise. Emergency Preparedness and Response Manager Mike Corey, W5MPC, taught a unit on Amateur Radio's emergency communications capabilities. Membership and Volunteer Programs Assistant Manager Norm Fusaro, W3IZ, explained how organizations of Amateur Radio operators could serve as a resource for regulators and the public. *QST* Editor Steve Ford, WB8IMY, taught units on digital communications and the fleet of Amateur Radio satellites. VEC Manager Maria Somma, AB1FM, and Assistant VEC Manager Perry Green, WY1O, discussed licensing and examination issues. Laboratory Manager Ed Hare, W1RFI, discussed electromagnetic compatibility and RFI issues, and Laboratory Engineer Bob Allison, WB1GCM, supervised each student's successful assembly of a 40 meter receiver kit, which they got to take home.

USTTI is a non-profit joint venture between leading US-based communications, IT corporations and leaders of the federal government who together provide tuition-free management, policy and technical training for talented professionals from the developing world. The ARRL hosts a course on Amateur Radio each year to introduce or further educate regulators and other spectrum users to its needs and unique issues; this is the ARRL's 26th year to host the ARAC. The next ARAC course is scheduled for fall 2011. QST

SKYWARN Recognition Day

The 12th annual SKYWARN Recognition Day (SRD) is scheduled for 0000-2400 UTC Saturday, December 4, 2010. This is the day that Amateur Radio operators visit National Weather Service (NWS) offices and contact other operators around the country and the world. The purpose of the event is to recognize Amateur Radio operators for the vital public service they perform during times of severe weather and to strengthen the bond between radio amateurs and their local National Weather Service office. The event is cosponsored by the American Radio Relay League and the National Weather Service.

Traditionally, hams have assisted the National Weather Service during times of severe weather by providing real time reports of severe events and storm evolution. The assistance that radio amateurs provide to the NWS throughout the year is invaluable. To learn more, check the NOAA Web site at **www.wrh.noaa.gov/mtr/hamradio**.

HAM RADIO KEEPS THE PONY EXPRESS ON THE TRAIL

Ron Norton, KJ6XI
svensk41@yahoo.com

2010 is the 150th anniversary of the Pony Express, which from 1860-1861 carried mail between St Joseph, Missouri and Sacramento, California on horseback and on to San Francisco by steamer. The National Pony Express Association (NPEA) stages a re-ride each year commemorating the original rides of 1860-1861. Unlike in 1860, the re-ride only goes in one direction and it alternates each year.

The re-ride of 2010 started on June 6 in San Francisco. The first rider left the Transamerica Building, site of the old Wells Fargo office, and rode down to the wharf. There, the mochila (a leather knapsack containing four letter pouches that fits easily over a saddle) was thrown on a speed boat that winged its way over to the Vallejo Yacht Club where Joe Balocca, the skipper of the yacht *Whitestar* sailed up the river. *Whitestar* was escorted by Steve Allen, KC6VCC, and his crew from the Coast Guard Auxiliary from Rio Vista to Old Sacramento.

The next day, the pony and rider sped on their way to start the journey to St Joseph. Normally, the re-ride takes 10 days to go from Old Sacramento to St Joseph, Missouri or vice versa — just as in 1860-1861. Because this was the 150th anniversary, there were events at various locations throughout the 1966 mile trek across the eight states. This caused the trip to take twice as long as usual.

Over 500 riders participated in the event. Amateur Radio clubs and individual radio amateurs provided coverage for about 70% of the nearly 2000 miles of trail. The Radio Amateur Mobile Society and the El Dorado County Amateur Radio Club covered California; Sierra Intermountain Emergency Radio Association handled Nevada; Davis County Amateur Radio Club provided support in Utah; Casper Amateur Radio Club and Donnie Norvell, KD5HQM, covered parts of Wyoming; Midway Amateur Radio Club handled Ft Kearny, Nebraska, and Dennis Mason, KØBYK, and his group covered the trail through Kansas and on to St Joseph.

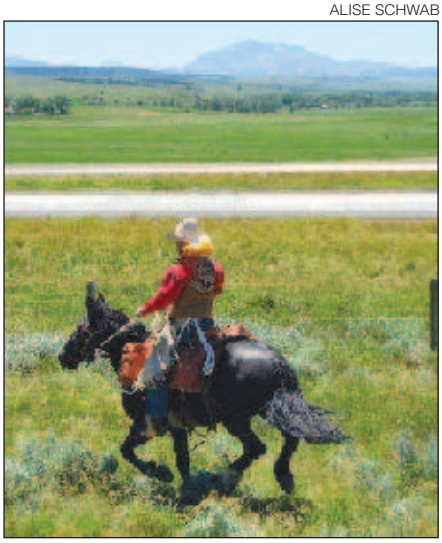
These radio amateurs provided communications day and night through the cities, the foothills and the gold country of California, the Sierras, and more than 400 miles of Nevada desert and mountain ranges that

STEVEN BICKFORD, KJ6CCJ

Riders in the Pony Express re-ride transfer the mochila from the arriving horse to the departing horse.

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

ALISE SCHWAB



Donnie Norvell, KD5HQM, was one of the Pony Express riders for the 150th anniversary re-ride.

Get Ready for Winter

Mike Corey, W5MPC, ARRL Emergency Preparedness and Response Manager, **w5mpc@arrl.org**

At the time I'm writing this (September), the first signs of fall have arrived here in the Northeast. Leaves are beginning to turn, temperatures are cooling off and before long the first frost will arrive. All are reminders that the winter months are not that far off. For ARES® members in many parts of the country that means it's time to get ready for the threats that winter can pose to communications.

Now is a good time to start winterizing your go-kit. Make sure you include items such as an emergency blanket, spare gloves, a winter hat and warmer packs. If your emergency communications duties involve operating from home, make sure you have a backup plan if the power goes out or weather takes out your antennas.

It doesn't hurt to go over information available through the National Weather Service. You can find winter weather information at **www.weather.gov/om/winter**.

As the weather cools off, stay warm, stay safe and be ready.

extend into Utah. The trail went through Salt Lake City, up Echo Canyon into Wyoming, over South Pass and on to Casper. The trek then followed the North Platte River toward Julesburg, Colorado and into Nebraska. The trail continued to Marysville, Kansas and straight ahead to the Missouri River. The re-ride ended at The Patee House Museum, a luxury hotel that housed Pony Express headquarters and accommodated riders prior to their departure in 1860, in St Joseph.

Just as in the 1860s, riders must deal with all kinds of weather, such as blue skies, rain, lightning, snow and wind. I'm sure that the hams in their quiet moments while waiting for the rider and horse to show up for the next exchange of the mochila are imagining the spirits of the riders of 1860-1861 coming down the trail.

VHF and HF are the primary means of communication for this annual event. The main concern of the radio amateur communicators is not just to keep track of the horse and rider, but to be there for emergency purposes. So, if you happen to be around on the XP (Pony Express) Trail in June when the NPEA does their annual re-ride, you just may see four wheelers with antennas in addition to the ponies and riders.

For more information on the Pony Express, log onto **www.xphomestation.com**.

NATIONAL WEATHER SERVICE HONORS DAVID ZAVADIL, KEØZF

Recognizing 22 years of dedication, NOAA's National Weather Service has named Crofton, Nebraska, resident David Zavadil, KEØZF, a 2010 recipient of the agency's John Campanius Holm Award for outstanding service in the Cooperative Weather Observer program. The award is the agency's second-most prestigious, and only 26 are presented this year to deserving cooperative weather observers from around the country.

Nebraska Governor Dave Heineman and Meteorologist in Charge of the Omaha office, Jim Meyer, presented the award during the Winter Weather Awareness proclamation signing ceremony at Lincoln, the state capitol, on October 6. Observations program manager Terry Landsvork of the Omaha office of the National Weather Service nominated Zavadil for the award.

Zavadil began service at the Crofton observing site August 11, 1988, reporting daily temperature and precipitation data, including snowfall, snow depth and water equivalent to the forecast office. He also provides wind reports and daily soil temperature data and is an amateur radio operator. Zavadil's reports have provided important data to NOAA forecasters and hydrologists and climate scientists. Over the years, he has provided more than 8,000 daily reports to the National Weather Service.

The first extensive network of cooperative stations was set up in the 1890s as a result of an 1890 act of Congress that established the U.S. Weather Bureau. Many of the stations have even longer histories. John Campanius Holm's weather records, taken without benefit of instruments in 1644 and 1645, are the earliest known recorded observations in the United States.

NOMINATIONS STILL OPEN FOR INTERNATIONAL HUMANITARIAN AWARD

Nominations for the 2010 International Humanitarian Award are open until December 31, 2010. This award is conferred upon an amateur or amateurs who demonstrate devotion to human welfare, peace and international understanding through Amateur Radio. Nominations and supporting materials must be submitted in writing in English to ARRL International Humanitarian Award, 225 Main St, Newington, CT 06111. For background and further details, see Happenings in the November 2010 issue of *QST* or visit **www.arrl.org/international-humanitarian-award**.

In The November/December 2010 Issue:

■ Michel Barbeau, VE3EMB, describes how to use *Linux* to get the most from a powerful, flexible analog/digital converter for software defined radio in "Programming the AD7476 Analog to Digital Converter on the Linux/BF537 Platform."

■ In "An RF Phase Meter" Dave Bowker, K1FK, shows you how to build a direct-reading RF phase meter capable of making accurate phase angle measurements from 0º – 180º over a frequency range of 50 Hz to 50 MHz.

■ Bob Nash, KF6CDO, in makes an excellent device even better in "An Event per Unit Time Measurement System for Rubidium Frequency Standards."

■ In "Fifth-Order Unequal-Ripple Low-pass Filter Design" by Dave Gordon-Smith, G3UUR, you'll discover the advantages of using unequal-ripple acromorphic designs for filtering the harmonics from broadband power amplifiers.

■ In "Measuring HF Balun Performance" Ron Skelton, W6WO, describes an important figure of merit that many neglect.

■ Do you need a high frequency crystal filter? In "High-Frequency Ladder Filters with Third-Overtone Crystals, A Purely Empirical Approach," Horst Steder, DJ6EV, offers an interesting alternative.

QEX is edited by Larry Wolfgang, WR1B (**lwolfgang@arrl.org**) and is published bimonthly. The subscription rate (6 issues) for ARRL members in the US is $24. For First Class US delivery, it's $37; in Canada and internationally by airmail it's $31. Nonmembers add $12 to these rates. Subscribe to *QEX* today at **www.arrl.org/qex**.

Would you like to write for *QEX*? It pays $50/printed page. Get more information and an *Author's Guide* at **www.arrl.org/qex-author-guide**. If you prefer postal mail, send a business-size self-addressed, stamped envelope to *QEX* Author's Guide, c/o Maty Weinberg, ARRL, 225 Main St, Newington, CT 06111-1494.

Strays

QST congratulates…

◊ARRL member Dave Zavadil, KEØZF, of Crofton, Nebraska, who has been named a 2010 recipient of NOAA's National Weather Service's John Campanius Holm Award for outstanding service in the cooperative weather observer program.

◊ ARRL member Richard L. Bonkowski, W3HWJ, of Santa Rosa, California, who has been granted his eighth patent, this one for "Methods for forming security articles having diffractive surfaces and color shifting backgrounds," a new development in optical devices to promote document authenticity and security.

◊ARRL Life Member Rob Brownstein, K6RB, of Santa Cruz, California, who has been promoted to vice president of intellectual property and innovation at LitePoint Corporation, a maker of wireless test and measurement systems.

I would like to get in touch with…

◊ Mexican Amateur Radio operators who worked for the company Telegrafos Nacionales.

— Joe Prewitt, WØTUT, 119 Oakridge Pl, Panama City Beach, FL 32408

Season's Greetings and Peace on Earth

Leona Adams, W1LGA
Bob Allison, WB1GCM
Katherine Allison, KA1RWY
Zoe Belliveau, W1ZOE
Jon Bloom, KE3Z
Shelly Bloom, WB1ENT
Margie Bourgoin, KB1DCO
Antoinette Brinius
Al Brogdon, W1AB
Hugh Brower, KB1NFI
Dennis Budd
Steve Capodicasa
Joe Carcia, NJ1Q
China Chaney
Mike Corey, W5MPC
Paul Cuppini
Al Dewey, KØAD
John Dilks, K2TQN
Mark Dzamba, KB1FMY
Steve Ewald, WV1X
Sue Fagan, KB1OKW
Maureen Farmer
Trish Feeney
Jackie Ferreira, KB1PWB
Ann Figat
Steve Ford, WB8IMY
Norm Fusaro, W3IZ
Scott Gee, WB9RRU
Katie Glass, KB1ULQ
Alan Gosselin
Perry Green, WY1O
Amanda Grimaldi
Mike Gruber, W1MG
Joel Hallas, W1ZR
Nancy Hallas, W1NCY
Ed Hare, W1RFI
Penny Harts, N1NAG
Dan Henderson, N1ND
Mary Hobart, K1MMH
Gary Hoffman, KBØH
Stan Horzepa, WA1LOU
Sabrina Hughes
Amy Hurtado, KB1NXO
Gail Iannone
Chris Imlay, W3KD
Bob Inderbitzen, NQ1R
Karen Isakson, W1KLI
Sabrina Jackson
Deb Jahnke, K1DAJ
Debra Johnson, K1DMJ
Michael Keane, K1MK
S. Khrystyne Keane, K1SFA
Joel Kleinman, N1BKE
Linda Kleinschmidt
Jennifer Knapp
Harold Kramer, WJ1B
Lisa Kustosik, KA1UFZ
Sean Kutzko, KX9X
Greg Kwasowski, W1GJK
Zachary Lau, W1VT
Rose-Anne Lawrence, KB1DMW
Amy Leary, KB1TLM
Elaine Lengyel
Monique Levesque
Rick Lindquist, WW3DE
Maryann Macdonald
Duncan MacLachlan, KUØDM
Bernie McClenny, W3UR
Kim McNeill
Carol Michaud, KB1QAW
Diane Middleton
Bill Moore, NC1L
Jodi Morin, KA1JPA
Trevor Morris
Anthony Nesta, AA1RZ
Rick Palm, K1CE
Dave Patton, NN1N
Diane Petrilli, KB1RNF
David Pingree, N1NAS
Ann-Marie Pinto
Allen Pitts, W1AGP
Brennan Price, N4QX
John Proctor, K1JMP
Ashley Rakus
Ally Riedel
Lisa Riendeau
Janet Rocco, W1JLR
Kim Rochette
Dewey Rykard, KI4RGD
Steve Sant Andrea, AG1YK
Cathy Scharr
Andrew Shefrin
Barry Shelley, N1VXY
H. Ward Silver, NØAX
Jon Siverling, WB3ERA
Chuck Skolaut, KØBOG
Maria Somma, AB1FM
Mark Spencer, WA8SME
Cathy Stepina
David Sumner, K1ZZ
Diane Szlachetka, KB1OKV
Alexandra Tara
Sharon Taratula
Lisa Tardette, KB1MOI
John Troster, W6ISQ
Paul Wade, W1GHZ
Maty Weinberg, KB1EIB
Rosalie White, K1STO
Perry Williams, W1UED
Mark Wilson, K1RO
Philip Witham
Larry Wolfgang, WR1B
Janice Wytas, KB1ODH
Gene Zimmerman, W3ZZ

From the ARRL Staff and Contributing Editors

This Month in Contesting

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

HOLIDAY CHEER

While it's the end of the year, we're just in the thick of the 2010-2011 contest season. Fewer things in life are as pleasing as a warm radio shack, a hot cup of coffee and great propagation on the bands on a cold winter night.

We've already had several major contests take place this season. CQ WW RTTY was the kick-off, with great activity and a smattering of propagation on the high bands reported. CQ WW SSB brought October to an end with a flourish, and the November Sweepstakes gave us some excellent activity as well. By the time you are reading this, it will be right around the time of CQ WW CW. That still gives us two major competitions in December to look forward to, plus a few smaller events that are tremendous amounts of fun.

December 3-5 is the ARRL 160 Meter contest. Long thought of as a band for the Big Guns because of the size of antennas required (a half-wave dipole for 160 meters is roughly 260 feet long), this contest is seeing more casual participation thanks to the antenna tuner. While a half-wave dipole or ¼ wave vertical with radials is preferred, many stations can be worked with shorter wires. One of my favorite stories is from Jon Jones, NØJK. Many know Jon as a great VHF+ operator, frequently winning in the QRP Portable category from the fields of Kansas. A couple of years ago, though, Jon wanted to play in the ARRL 160 Contest, having only 50 W and an antenna tuner:

I live in a "no outside" antenna sub-division, with no trees either to put up wires. So to hand out a few points, I bought a 100 ft length of #24 AWG wire from the hardware store for $4 Friday afternoon and taped it alongside our house. Tossed the end up over the garage... It actually loaded up OK. I figured I might work a couple of the "big guns" with this setup… As dusk approached I turned on the radio and could hear many stations CQing away…KØPY KS went into the log at 2239 followed by K9CT IL at 2241 UTC. This thing actually works! By 0410 UTC I had over 100 stations in the log "Search & Pouncing."

Jon managed 156 QSOs and 43 Sections, including the Virgin Islands. Not too bad for a $4 antenna! If Jon can do it, so can you. If you've never been on 160 meters, try the ARRL 160 Contest with whatever antenna you can muster. You may be surprised at how well you actually get out on the band.

The weekend of December 11-12 is the ARRL 10 Meter Contest. While we haven't had much to cheer about on 10 meters in some time, things are finally looking up, thanks to the beginning of Cycle 24. In last year's running, many stations made several hundred QSOs. There was even some activity on 10 meters in September's CQ WW RTTY contest, much to everyone's delight.

Perhaps the biggest news about this year's 10 Meter Contest is the inclusion of the Mexican states as multipliers. Our friends to the south have been making plans to get every XE state active in this year's contest since the announcement was made in April. I think you'll be happy with their efforts.

You will hear lots of new abbreviations for those new multipliers when your antennas are pointed south. Not sure where Jalisco or Quintana Roo are located? Have no fear. Grupo DXXE has created a map with all 32 Mexican multipliers listed, along with their abbreviations and their relative rarity. You can find a link to this map at **arrl.org/10-meter**; print it and keep it by the rig for handy reference.

For the Technician class licensee readers out there, don't forget that you can operate from 28.3 to 28.5 MHz USB and CW from 28.0-28.3 MHz, so be sure to get on the air and see what you can work. No station for 10 meters? A dipole for 28.4 MHz is only 16.5 feet long; make one and throw it up in a tree as high as you can and start crankin' out some QSOs. Maybe your club can coordinate a contest effort for Tech members and get them on the air to have some fun, or make up a multioperator team of Techs yourself and share the experience with some of your friends. Many new operators have never experienced the sheer joy of 10 meters during a good opening. If you are one of those, I feel very excited for you, for you truly don't know the excitement that will accompany increased sunspots.

Lastly, on Sunday, December 19, the Rookie Roundup returns for the final time in 2010. December's RR will be on CW, so prepare those keyers, paddles and straight keys for some action! If you've never tried CW, this event is an excellent introduction. Speeds will be slow and there will be a lot of activity, so try your hand (or fist, as the case may be) with CW in this 6 hour contest aimed at the newcomer. Numerous clubs promote CW activity in various forms. If you are an experienced CW operator and a member of a CW club, I encourage you and your club to get on the air during the Rookie Roundup and work the Rookies. If you ever wanted a practical way to encourage and promote CW activity among the newly licensed, this is it. More information is available at **www.arrl.org/rookie-roundup**.

As the door closes on 2010 and 2011 comes into being, let us not forget that this is the time of year to remember that giving is better than receiving. I talk about this a lot, but especially so during the holidays: Think about how you can give back to the contesting community and to Amateur Radio in general. We all had our Elmers when we first got started; it is a privilege to be in that position for a new ham today. What have you or your club done to promote on-air activity in its myriad forms? Take the time to help newcomers, for if we look at them closely, we can all see ourselves.

Happy holidays to all.

In the November/December "Contesting 101"

"Giving back to contesting." Kirk Pickering, K4RO, covers some of the ways people contribute to the sport of contesting, and reasons you might want to join them. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

Sean's Picks

- **State QSO Parties this month:** South Dakota
- **ARRL December events:** 160 Meter Contest (December 3-5), 10 Meter Contest (December 11-12), Rookie Roundup — CW (December 19), Straight Key Night (January 1).
- **QRP-ARCI Top Band Sprint (December 2):** 6 hours of QRP CW on 160 meters. A nice warm-up before the ARRL 160 Meter Contest that begins December 3.
- **TARA RTTY Melee (December 4):** 24 hours of RTTY fun, sponsored by the Troy Amateur Radio Association. Everybody works everybody. W/VE stations send RST and state or province; DX stations send RST and a sequential serial number.
- **Lighthouse Christmas Lights QSO Party (December 18-January 2):** A great two week event to activate as many lighthouses as possible. Visit **www.arlhs.com** for complete rules and tips on how to activate a lighthouse yourself!

CONTEST CORRAL

in association with the *National Contest Journal*

DECEMBER 2010

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site or Contact
Dec 2, 0000Z - Dec 2, 0600Z	1.8		Top Band Sprint		✘		RST, S/P/C, ARCI number or Power	qrparci.org/contests
Dec 3, 0230Z - Dec 3, 0300Z	1.8-14		NS Weekly Sprint		✘		Serial, name, and S/P/C	www.ncccsprint.com/rules.html
Dec 3, 2200Z - Dec 5, 1600Z	**1.8**		**ARRL 160 Meter Contest**		✘		**RST and ARRL/RAC section if US/VE**	www.arrl.org/contests
Dec 4, 0000Z - Dec 4, 2400Z	1.8-28		TARA RTTY Mêlée			✘	RST and State/Province or serial	www.n2ty.org/seasons/tara_melee_rules.html
Dec 4, 1600Z - Dec 5, 1559Z	3.5-28		Top Operators Activity Contest		✘		RST, serial, and TOPS/PRO number	www.procwclub.yo6ex.ro
Dec 4, 2300Z - See Web site	3.5,7		AWA Bruce Kelly QSO Party		✘		RST, Xmtr type, power, name	www.antiquewireless.org
Dec 7, 0200Z - Dec 7, 0400Z	3.5-28		ARS Spartan Sprint		✘		RST, S/P/C, and power	www.arsqrp.blogspot.com
Dec 8, 1100Z - See Web site	3.5-14		CWops Mini-CWT Test		✘		Name and member number or S/P/C	www.cwops.org/onair.html
Dec 11, 0000Z - Dec 11, 2400Z	3.5-28		Feld-Hell Happy Birthday Sprint			✘	RST, Feld-Hell nr, S/P/C	www.feldhellclub.org
Dec 11, 0000Z - Dec 16, 0200Z		50-432	NA High-Speed Meteor Scatter Contest			✘	Both calls, grid square, acknowledgement	www.ykc.com/wa5ufh/Contests/2010Contest.htm
Dec 11, 0000Z - Dec 12, 2400Z	**28**		**ARRL 10 Meter Contest**	✘	✘		**RS(T) and State/Prov or serial**	www.arrl.org/contests
Dec 11, 0000Z - Dec 12, 2400Z	28		28 MHz SWL Contest	✘	✘		Log ARRL 10 Meter Contest QSOs	swl.veron.nl/swlcontest.htm
Dec 11, 0000Z - Dec 12, 2400Z	1.8-28	50	PSK Death Match			✘	Name and S/P/C	www.mdxa1.org/deathmatch.html
Dec 11, 1700Z - See Web site	1.8-7		UBA Winter Contest	✘	✘	✘	RS(T) and UBA section or serial	www.uba.be/en/hf/contest-rules
Dec 12, 0000Z - Dec 12, 2359Z	3.5-28		Straight Key Weekend Sprint		✘		RST, S/P/C, SKCC nr or power	www.skccgroup.com/sprint/wes
Dec 12, 2100Z - Dec 12, 2259Z	14		Great Colorado Snowshoe Run		✘		RST, S/P/C, class, CQC number or power	www.cqc.org/contests
Dec 16, 2100Z - Dec 16, 2300Z	1.8		Russian 160 Meter Contest	✘	✘		RS(T), serial, square ID (see Web site)	www.radio.ru/cq/contest/rule-results/
Dec 18, 0000Z - Dec 19, 2400Z	3.5-28		OK DX RTTY Contest			✘	RST and CQ Zone	www.crk.cz/ENG/DXCONTE.HTM
Dec 18, 0000Z - Dec 18, 2359Z	1.8-28	50,144	RAC Winter Contest	✘	✘		RS(T) and province or serial	www.rac.ca/en/rac/programmes/contests
Dec 18, 0001Z - Jan 2, 2359Z	1.8-28	50,144	Lighthouse Christmas Lights QSO Party	✘	✘	✘	Serial or ARLHS number	arlhs.com
Dec 18, 1400Z - Dec 19, 1400Z	1.8-28		Croatian CW Contest		✘		RST and serial	www.9acw.org
Dec 18, 1500Z - Dec 19, 1500Z	1.8		Stew Perry Top Band Distance Challenge		✘		Grid square	jzap.com/k7rat/stew.rules.txt
Dec 19, 1800Z - Dec 19, 2359Z	**3.5-28**	**50**	**ARRL Rookie Roundup**		✘		**Both calls, name, check, S/P/XE or "DX"**	www.arrl.org/contests
Dec 19, 2000Z - Dec 19, 2400Z	1.8-28		Holiday Spirits Homebrew Sprint		✘		RST, S/P/C, ARCI number or Power	qrparci.org/contests
Dec 20, 0200Z - Dec 20, 0400Z	1.8-28		Run For the Bacon		✘		RST, S/P/C, Flying Pig nr or power	www.fpqrp.com/fpqrprun.php
Dec 22, 0000Z - Dec 22, 0200Z	1.8-28	50	SKCC Straight Key Sprint		✘		RST, QTH, name and SKCC nr or power	www.skccgroup.com/sprint/sks
Dec 26, 0000Z - Dec 26, 1200Z	3.5-28		RAEM Contest		✘		Serial and lat/long in degrees	www.raem.qrz.ru
Dec 26, 0000Z - Dec 26, 2400Z	14		070 Club QRP DX Scramble			✘	Call sign, first name, WR 100 entity	www.podxs070.com
Dec 26, 0830Z - Dec 26, 1059Z	3.5-7		DARC Christmas Contest	✘	✘		RS(T) and DOK or special station code	www.darc.de/referate/dx/contest/xmas/en
Dec 31, 1700Z - Dec 31, 12 Mid	1.8-28		South Dakota QSO Party	✘	✘		RS(T) and SD county or S/P/C	www.w0blk.org
Jan 1, 0000Z - Jan 1, 2400Z	**3.5-28**	**50+**	**ARRL Straight Key Night**		✘		**General QSO information**	www.arrl.org/straight-key-night

All dates refer to UTC and may be different from calendar date in North America. Times given as AM or PM are local times and dates.
Refer to the contest Web sites for full rules, scoring information, operating periods or time limits, and log submission information.
No contest activity occurs on 60, 30, 17, 12 meters. Serial = Sequential number of the contact. S/P/C = State, Province, DXCC Entity. XE = Mexican state.
Publication deadline for Contest Corral listings is the first day of the second month prior to publication.

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

December 2010 W1AW QUALIFYING RUNS

W1AW Qualifying Runs are 10 PM EST Friday, December 3 (0300Z December 4) and 9 AM EST (1400Z) Tuesday, December 14 (10-40 WPM). The West Coast Qualifying Run will be transmitted by station K6KPH on 3581.5, 7047.5, 14047.5, 18097.5 and 21067.5 kHz at 2 PM PST (2200Z) Saturday, December 11 (10-40 WPM). Unless indicated otherwise, speeds are from 10-35 WPM.

Field Day 2010
A Parrothead Ham Looks At 40

With a tip of the cap to Jimmy Buffett…

Dan Henderson, N1ND, Growing Older But Not Up

It is hard to believe that 40 years ago I took my Novice test and was first licensed. That factoid hit me recently as this proud Parrothead was listening to the streaming audio of the latest Jimmy Buffett concert. Jimmy had just started singing ***A Pirate Looks At Forty*** and it dawned on me that I had been licensed (and thus not a "pirate") that many years. When I started researching this year's ARRL Field Day results article and discovered that James William Buffett released his first album in 1970 (40 years ago), the die was cast: tell this year's story with ***Songs You Know By Heart***.

When the fourth full weekend in June comes around amateurs across the US, Canada and much of the world get the restless demeanor of ***Gypsies in the Palace*** as they participate in the largest 24-hour on-the-air operating event sponsored by the ARRL. Among the record 37,765 participants reported this year, you will find all kinds of operators, groups and characters. You might find a few ***Fruitcakes*** set up in the local park while others would be ***In the Shelter*** (maybe a picnic shelter or the county EOC).

Whether at home ***A Mile High in Denver*** or in downtown ***Margaritaville***, it was easy to see ***Everybody's Talkin'*** or perhaps using the ***Coconut Telegraph***. The total number of contacts was down a bit (1,329,810 in 2010 down from 1,360,401 in 2009). This can best be attributed to our sunspot lament — ***Miss You So Badly***. Of course, some would wish to ***Take the Weather with You***, hoping for cooler or warmer conditions at their location. What may be a ***Sunny Afternoon*** for some may be a ***License to Chill*** for others. No weekend is going to be perfect weather for everyone. That is one of the strengths of Field Day. If the weather does not suit what your group or club can handle, you always have the alternative of operating from different venues, locales or even from home stations.

All types of operations have a place in Field Day. Whether you are the ***Twelve Volt Man*** who is a Class B1B low power station on a mountain top, a Class F station at the town Emergency Management office, setting up in the ***One Particular Harbor*** where your club always goes or simply deciding that it is ***Time To Go Home*** and operate, there is a place and a way for you to enjoy the weekend.

A little over half of this year's Field Day entries (52.2%) were Class A stations where ***Everybody's On the Run***. These in-the-field operations often resemble a ***Carnival World***. Operating tents or RVs need to be placed, antennas erected safely, plans made for what to do ***If It All Falls Down*** and coordinating who is responsible for making sure that we have a ***Cheeseburger in Paradise***. If you haven't shown ***An Attitude of Gratitude*** to your Field Day chairman, do so. The hard work and the efforts of the volunteers he/she organize allow hams to ***Bring Back the Magic*** at least once a year.

When there are ***Changes in Latitudes***, ***Changes in Attitudes*** are bound to happen. Being out in the field adds responsibilities to everyone attending. If you ask, "***Who's the Blonde Stranger?***" the answer may be one of the invited government officials or a representative of a served agency. They might be a visitor learning about Amateur Radio and looking for someone to make ***The Perfect Partner*** to Elmer them along their journey. It could be a reporter for the local paper who says they are there because ***It's My Job***. Perhaps it is someone who wandered up to see what the hubbub was all about. Makes no difference: everyone at the site — from seasoned ham to ***The Son of a Son of an "Elmer"*** — helps give these VIPs a positive ***Public Relations*** fix.

Over one quarter (27.1%) of all entries come from those who chose to operate from home. Whether Class D using commercial power or Class E with emergency power, these stalwarts are not operating ***Incom-***

Top 10 Claimed Scores

Call Sign	Score	Class
W3AO	33,452	24A
W9CA	19,748	3A
K1R	19,638	5A
K4BFT	17,140	4A
W2RDX	16,510	3A
K4FC	15,902	7A
K6EI	15,450	7AB
K7UM	15,154	4A
W6YX	14,260	2F
W1NVT	14,230	2A

***Parrothead (n)* — A commonly used nickname for fans of Jimmy Buffett.**

Entries by Class

1A	166	1B2	57	7E	2
2A	474	2B2	30	8E	1
3A	384	1C	56	12E	1
4A	173	2C	3	1EB	55
5A	83	3C	1	2EB	5
6A	40	1D	396	3EB	1
7A	16	2D	14	1F	39
8A	13	3D	4	2F	66
9A	6	4D	2	3F	41
10A	5	5D	1	4F	18
11A	2	1E	191	5F	10
15A	1	2E	19	6F	2
19A	1	3E	20	8F	1
24A	1	4E	4	9F	1
1B1	208	6E	2	13F	1

HAROLD WITTEN, K6TQM

Coachella Valley Amateur Radio Club, the Coachella Valley RACES group and QCWA Chapter 154 combined for Field Day operating as NR6P. Fourteen year old Lanae Smit, KJ6ISE, handled the TV news interview like a pro.

Participation By ARRL Section

Section	Entries
AB	9
AK	9
AL	40
AR	33
AZ	56
BC	27
CO	57
CT	36
DE	9
DX	1
EB	23
EMA	32
ENY	27
EPA	72
EWA	26
GA	57
IA	26
ID	19
IL	89
IN	64
KS	32
KY	34
LA	24
LAX	38
MAR	11
MB	3
MDC	42
ME	18
MI	88
MN	39
MO	58
MS	20
MT	23
NC	69
ND	6
NE	12
NFL	53
NH	28
NL	2
NLI	29
NM	24
NNJ	45
NNY	7
NT	1
NTX	59
NV	15
NWT	5
OH	136
OK	28
ON	68
OR	47
ORG	50
PAC	8
PR	3
QC	33
RI	12
SB	14
SC	27
SCV	38
SD	7
SDG	24
SF	12
SFL	26
SJV	27
SNJ	19
STX	58
SV	31
TN	56
UT	25
VA	77
VI	1
VT	15
WCF	20
WI	48
WMA	13
WNY	46
WPA	45
WTX	12
WV	20
WWA	64
WY	10

General Field Day Statistics

Year	2010	2009	2008	2007	2006	2005
CW Contacts	540,419	556,525	506,139	511,580	518,799	503,205
Digital Contacts	41,872	38,340	27,869	22,112	21,459	21,766
Phone Contacts	747,519	765,536	702,847	679,240	696,567	692,722
Total Contacts	1,329,810	1,360,401	1,236,855	1,212,932	1,236,825	1,217,693
Total Entries	2,649	2,642	2,409	2,331	2,199	2,212
Novice/GOTA	467	470	447	467	432	396
Participants	37,765	37,592	35,798	34,833	32,506	33,078

municado. They are a strong element of the total Field Day experience. That is another special feature of Field Day — there is little differentiation between those operating from home or remote locations. Circumstances may dictate the time has come to ***Send the Old Man Home*** or for the group to be ***Trying to Reason with Hurricane Season*** (or thunderstorms or tornados). From an emergency communications test vantage point, there is room for everyone.

All 80 ARRL sections were on the air for Field Day leading many to opine ***I Heard I Was in Town***. Dupe sheets and logs show DX participation from Europe, Asia, ***Back To The Islands (***of the Pacific and Caribbean), places where you can see the ***Southern Cross*** and even a few contacts that might qualify as a ***Cuban Crime of Passion*** (for the hobby). Add this all together and one quickly sees that Field Day is a ***Window on the World***.

One area of interest observed this year is what seems to be an increase in the weak signal stations on both HF and VHF. You know these operators — the ones ***Quietly Making Noise***. They may be ***Up on the Hill***, on a mountain with a portable beam and a solar panel or trying their hand making contacts from a cottage where you can see ***Stars on the Water***. Maybe they are between ***Honey Do*** projects and can only get on for short periods. They frequently tackle operating ***Anything Anytime Anywhere***. When you ask why, their answer is simple: ***That's What Living Is to Me***. They are an important part of the Field Day ***Feeding Frenzy***.

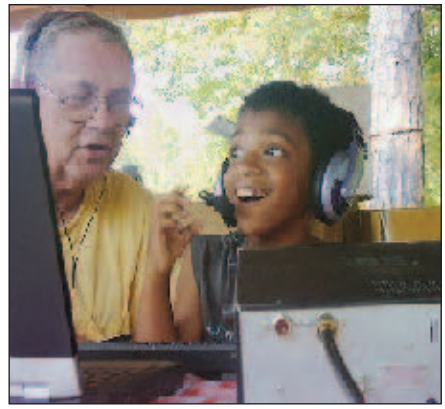
The special memory of making your first contact is one of the reasons the GOTA — Get On The Air — station is a popular feature of Field Day. There were 467 GOTA stations reported for 2010. That translates to 34.9% of groups eligible to employ one did so. We suspect that many of those GOTA operators will look back at Field Day 2010 as ***The Night I Painted the Sky***.

Unfortunately, all good things must come to an end. So on Sunday afternoon June 27 it became ***Time to Go Home***. But ***Come Monday*** the next phase of Field Day started. Summary sheets from 2146 entries were submitted using the **www.b4h.net/cabforms** Web applet (thanks WA7BNM, for making this tool available to the amateur community). Another 502 submissions were received by other methods, which meant a record 2648 entries were received for this year. When it came time to ***Let Me Tell You Babe***, about 190 groups and individuals posted their individual stories on the ARRL online Soapbox at **www.arrl.org/soapbox**. Visit the site and see what ***Stories We Could Tell***.

There are those whose Field Day focus is to post more points than anyone else. They sit around Sunday afternoon and ***Can't Remember When I Slept Last***. These operators live Field Day to the fullest, not only maximizing on-the-air points but working hard to do the same with the non-operating bonus points. To those who put up ***The Good Fight*** we say congratulations. It is all part of the Field Day game.

Field Day is many things to many people. ***Some Wonder Why You Ever Go Home***. Others will anxiously seek to return home to their ***Quiet Village***. A few of ***The Natives Are Restless***, already planning strategies for Field Day 2011 — scheduled for June 25-26 when we will be singing ***A Summer Song***. After all, this Field Day thing is ***Bigger Than the Both of Us***… 73.

MILTON COLEMAN, K4OSO



At W4ML the Central Virginia Contest Club, Trey (right), son of Milt, K4OSO, just made a 15 meter SSB contact at their GOTA station manned by Howard Motley, W4PM, who was the control operator.

Scores

Class A stations are clubs or groups operating with more than two operators. Score listings are grouped according to the number of transmitters in simultaneous operation. The listings show club or group name (Class A and F only), call sign(s) used, total number of QSOs, a number indicating power output used (5 is less than 5 W, 2 is less than 150 W; 1 is more than 150 W), number of participants, total score including bonus points and ARRL section. Scores are listed from highest to lowest in each class. Class B stations are portables manned by one or two operators. When there are two operators, the other operator's call is listed in parentheses, if it is known. Class C stations are mobiles. Class D stations are home stations using commercial power. Class E stations are home stations using emergency power. Class F stations are EOC stations.

1A

SPAWAR Team
K6AM 3277 2 6 10,096 SDG
NAQRO Club
K9ZC 2531 2 8 7,580 IL
Hoosier DX and Contest Club
KJ9D 1327 2 14 6,294 IN
Robert F Heytow Memorial RC
K9YA 1263 2 4 5,802 IL
EMARC / TAC
K8EPV 1231 2 10 5,758 MI
Tucson TRACON ARC
WA7NB 2573 2 3 5,744 AZ
Lafayette DX Assn
W9LDX 1650 2 10 5,726 IN
Buckeye DX Club
W8OS 1218 2 5 5,522 OH
K9TP 1534 2 3 5,256 IL
Saratoga ARA
K6SA 1215 2 8 4,580 SCV
Oconee District 17 ARC
W9DC 1068 2 6 4,360 SC
Case ARC
W8EDU 1152 2 4 4,288 OH
K9ZA 1143 2 3 4,282 IL
Greer ARC
W4IT 1162 2 12 4,254 SC
Murphy's Law Radio Group
W5MT 1185 2 5 4,240 NTX
Bear Mountain Group
WA5Y 1180 2 3 4,186 NM
FAULT
K1LT 1007 2 10 4,178 OH
Dr Loomis Memorial Junior Mechanics League
W3KDR 1174 2 10 4,146 MDC
VE2FET 950 2 6 4,086 QC
Neurosa Gopher Munchers
AE6C 928 2 4 4,066 SV
Assn Radio Amateurs of Southern New England
W1AQ 1101 2 23 3,842 RI
Big Hill ARC
KØHP 771 2 4 3,732 SD
Sam Houston AR Klub
AI5M 781 2 60 3,602 STX
South Georgian Bay ARC
VE3SGB 1312 2 7 3,594 ON
Bozo and the Lids
W9TG 702 2 6 3,546 IN
Central WI Radio Amateurs
K9UW 923 2 6 3,170 WI
Union Metropolitaine des Sans-filistes de Montreal
VE2UMS 917 2 40 3,168 QC
Page Valley ARC
K4PMH 811 2 13 3,078 VA
W8A 974 2 8 3,074 MI
W2GSA 630 2 18 3,008 NNJ
Alberta Clippers
VE6EX 703 2 5 3,006 AB
Portland Radio CC
KK7PR 1027 2 9 2,964 OR
Kentucky Contesters
KY4CW 607 2 3 2,928 KY
Boulder ARC
WØDK 1500 1 11 2,886 CO
IOOK Vice Presidents
W8ED 759 2 8 2,816 WV
Dick Turrin Memorial ARC
W2IMU 642 2 5 2,752 SNJ
The Crashing Tower Group
KD2A 1070 2 9 2,742 WNY
Sandia National Laboratories ARC
W5MPZ 787 2 10 2,624 NM
Newton ARA
WØWML 433 2 8 2,536 IA
Athens County ARA
W8MHV 456 2 12 2,504 OH
Pepin Hill AR & TV Society
KIØF 623 2 5 2,416 MN
Owensboro ARC
K4HY 510 2 20 2,370 KY
4-landers in CA
KØDI 527 2 3 2,348 WV
Bass Hill Repeater Group
W1KX/1 503 2 6 2,246 ME
Benton ARS
K5NE 531 2 16 2,238 AR
W5WQ 919 2 8 2,188 MS
First State ARC
K3QBD 434 2 12 2,138 DE
Acadiana ARA
W5DDL 374 2 33 2,128 LA
N6WIN 1237 1 3 2,006 SJV
W4SEC 407 2 3 1,978 NFL
West Island ARC
VE2CWI 340 2 65 1,916 QC
KS7T 760 1 4 1,870 MT
Lanark & North Leeds ARES®
VE3LCA 470 2 6 1,850 ON
Morris RC
W2YD 387 2 9 1,844 NNJ
JJ&V Contesters
WAØVPJ 829 2 4 1,808 MN
W4FLO 449 2 9 1,762 TN
SCVRA
KØCD 303 2 23 1,730 WI
Keystone Radio Amateurs of PA
W3BD 532 2 3 1,714 EPA
Hellgate ARC
W7PX 393 2 18 1,692 MT
Anaconda ARC
W7VNE 560 2 4 1,670 MT
Transplanted Vertical
K4QXX 559 2 4 1,636 KY
U of Arkansas ARC
K5GOE 348 2 20 1,586 AR
Marshall City ARC
WØGCJ 310 2 12 1,554 KS
Club Radio Amateur de Beauce
VE2CRB 295 2 9 1,538 QC
York Cty Contesters
W4YCC 512 2 4 1,528 OH
Maui ARC
KH6RS 1400 1 10 1,500 PAC
Covey Hill ARC
VE2CYH 320 2 13 1,442 QC
Team Zone 2
VA2ZM 504 2 3 1,426 QC
Bitterroot AR Contest Group
K7GO 335 2 3 1,420 MT
Hanburger's Helpers ARC
K3HH 294 2 3 1,402 MDC
Great River ARC
WØDBQ 333 2 20 1,400 IA
The Alaskhams
KL7Y 987 1 3 1,377 AK
Low Country Contest Club
NU4SC 404 2 5 1,324 SC
London Bridge ARA
K7LHC 238 2 13 1,226 AZ
Parma RC
W8PRC 295 2 26 1,222 OH
Juneau ARC
KL7IG 274 2 13 1,222 AK
Vaca Valley RC
W6VVR 202 2 15 1,212 EB
Vashon/Maury Island RC
W7VMI 201 2 24 1,206 WWA
KB9OFM 467 2 3 1,184 WI
Bitterroot AR School Club
NW7US 208 2 7 1,162 MT
Halton ARC
VE3OD 193 2 15 1,144 ON
Gallatin Ham RC
W7ED 333 2 12 1,136 MT
K4HSM 324 2 8 1,118 TN
Orchard City ARC
VE7CQM 91 2 20 1,102 BC
Goodyear ARC
WA8UXP 296 2 5 1,088 OH
LOWARS
VE3JJF 183 2 12 1,048 ON
Bitterroot ARC
W7FTX 230 2 9 1,044 MT
Bruin ARC
W6YRA 258 2 5 1,030 LAX
Bawating Amateur Group
VE3LSC 207 2 10 1,020 ON
Baccalieu AR Klub/Upper Trinity ARC
VO1BRK 101 2 10 1,012 NL
St John ARC
KP2SJ 190 2 6 978 VI
Amargosa ARC
KE7SFA 259 2 6 968 NV
Crossover Ham Group
KA3UOL 434 2 4 968 WPA
Moncton Area ARC
VE9MSR 201 2 5 956 MAR
International Travel News ARC
W6ITN 413 2 3 926 SV
SOLAR
NØSFF 170 2 6 910 IA
3 Amigos
N4EM 326 2 4 902 KY
VE3MND 276 2 9 902 ON
Sioux Empire ARC
WØZWY 275 2 18 900 SD
Fort Saskatchewan ARC
VE6CJ 648 1 6 898 AB
Hendricks Cty ARS
N9HC 186 2 22 872 IN
Peruvian-American RC
KEØRR 178 2 4 862 MN
Thick Mountain Group
KB3GDG 351 2 10 852 WPA
Texins ARC/Richardson Wireless Klub
K5DM 247 2 21 810 NTX
Presque Isle Cty ARC
WB8TQZ 165 2 4 798 MI
DeFOREST ARC
K8GE 100 2 5 776 OH
Kewaunee Cty ARES®/RACES (Bay Lake AR Group)
N9NX 184 2 10 680 WI
Atchison Cty AR Service
KØHK 129 2 14 680 KS
WEDIXIE ARC
WB4MZO 47 2 6 678 GA
Old Field Day Hounds
WA1HRE 249 2 6 652 CT
WBØSMX 85 2 3 620 AZ
The Motley Crew ARC
WB9RDE 1 2 6 602 IL
Apple City AR
W7TD 46 2 21 592 EWA
Novi ARC
N8OVI 160 2 4 570 MI
NGØR 72 2 6 546 MN
WØVFW ARC Post 3115
WØVFW 190 2 4 480 KS
Cedar Creek ARS
KC9OYM 101 2 8 478 IL
Arkansas Diamond Radio
KE5FSY 32 2 3 464 AR
Hickory Grove Camping Group
K8SE 104 2 4 458 OH
Bluewater AR Operators
VE3FRX 103 2 4 448 ON
WD8MQN 73 2 15 412 VA
Park Cty RC
ABØPC 21 2 5 402 CO
Rochester Institute of Technology ARC
K2GXT 21 2 6 392 WNY
The One-Alfalfas
NB3O 110 2 3 390 VA
MARA Net
AC7R 53 2 14 376 AZ
NKDXE
WA4ZKO 42 2 4 290 KY
Northern MI ARES®
NM8ES 5 2 4 260 MI
Turkey Ridge RC
WA3WSB 64 2 3 228 VA
Sullivan Cty ARG
KU1R 39 2 10 178 NH
WD9EEK 32 2 6 114 IL

1A Battery

W5YA 1074 5 5 11,430 NM
Chew's Ridge Gang
K6MI 976 5 6 10,665 SCV
Fresno QCWA Chapter 213
W6GV 500 5 5 5,350 SJV
Hunters Ridge Hams
NK9R 372 5 5 4,170 GA
Hapless Dinks
K1SWL 287 5 3 3,270 NH
Minnesota QRP Soc
WQØRP 213 5 5 2,635 MN
Hiawatha / Falls City ARC
KØJKS 213 5 23 2,390 KS
K1DFT 229 5 3 2,390 ME
Bolingbrook Area Radio Contesters
NA9US 217 5 3 2,360 IL
Los Chupacabraderos
WB5TXW 133 5 5 1,895 STX
The Hill People
AB6S 326 5 3 1,880 EB
Oakville & Burlington ARCs
VE3RAB 85 5 5 1,475 ON
W8KJ 84 5 8 1,435 OH
CRA Sorel/Tracy
VE2CBS 90 5 10 1,150 QC
Tidelands ARS
K5BS 82 5 25 1,090 STX
Green Mountain Boys
WA1QCG 99 5 3 1,090 VT
Laurens ARES®
KI4ONJ 67 5 4 1,015 SC
Club amateur de St-Hyacinthe
VE2CAM 49 5 21 745 QC
Hawaii QRP Club
KH6AA 2 5 8 520 PAC
WØFS 48 5 4 440 IA
Musselshell ARC
KF7ELT 26 5 4 280 MT
K8IYO 29 5 3 245 OH

1A Commercial

LOFoTN
W6UB 662 2 3 2,892 TN
Beldar & His Minions
NØAX 630 2 5 2,380 IN
Callaway ARL
KSØB 558 2 14 2,050 MO
KC9HGW 278 2 10 1,112 IL
IL Valley RA
K9AVE 231 2 3 974 IL
Tyndall Family Radio
KJ4BIZ 508 1 4 698 GA
VA4PAR 208 2 15 686 MB
Richmond ATS
W4RAT 101 2 21 452 VA
KY8B 47 2 4 344 WV
Elmendorf ARS
KL7AIR 101 2 3 252 AK
North Shore ARC
VE7EMR 76 2 7 218 BC
Ozark ARS
WØOAR 7 2 8 164 MO
NØOMC 25 2 3 150 KS
Operators of Portable Radio Equipment
K7RLL 64 2 3 128 VA

2A

Radio Amateurs of Northern VT
W1NVT (+W1PU)
4565 2 29 14,230 VT
Buckhead CC
W4KJ (+W4TE)
4215 2 9 13,370 GA
Batesville ARC/NCAARS
K5UZ (+KD5J)
3981 2 24 12,648 AR
Tampa ARC
N4TP (+AK4K)
3550 2 55 11,886 WCF
Raytown ARC
KØGQ (+KCØMO)
3113 2 91 11,822 MO
The Udder RC
W1MOO (+W1CX)
3060 2 7 10,736 VT
The Sakonnet 49'ers
W1LY (+WA1VQY)
2985 2 24 10,656 RI
McMinn Cty ARC
NA4K (+K4BP)
3123 2 27 10,414 TN
Randallstown ARC
N3IC (+K3MZ)
2933 2 16 10,174 MDC
Mississippi State University ARC
W5YD (+N5F)
2471 2 9 10,108 MS
LA Cane Field CC
W5ZR (+KF5EID)
2107 2 9 9,278 LA
MARC
KK5I (+KE5UIU)
2413 2 17 9,066 OK
Central VA Contest Club
W4ML (+W4PM)
2666 2 28 8,978 VA
Redneck Riviera Radio Sport Models
N4OX 3109 2 6 8,938 NFL
CARS
K4M (+W4PQ)
2359 2 15 8,852 NC
Canton ARC
W8AL (+N8YB)
2097 2 30 8,010 OH
Northern OH DX Assn
W8DXA (+NO8DX)
2320 2 25 7,996 OH
Mesa Marauders
W7UT 2129 2 5 7,818 UT
Pacific Cty ARC
W7R (+W7Y)
1917 2 28 7,790 WWA
Big Bend ARC
K5FD (+W5ATO)
2237 2 15 7,716 WTX
Massanutten and Valley ARA
W4XD (+K4MRA)
2168 2 62 7,592 VA
Santa Barbara ARC
K6TZ 1903 2 20 7,492 SB
Escondido ARS
N6SD (+N6WB)
2057 2 24 7,398 SDG
Boomer CC
NN5Z 1803 2 6 7,238 OK
Northwest ARS
W5NC (+N5NXS)
1824 2 61 7,066 STX
Lake Cty ARC
W9LJ (+W9EMA)
1741 2 27 7,010 IN
Pikes Peak DX Group
WØGG 1974 2 4 6,942 CO
Victor Zulu FD Group
N3VZ (+KB3CO)
2101 2 8 6,792 EPA
Wayne ARC
W8AV (+N8RNK)
1635 2 10 6,730 OH
Mills Cty ARC
K5TRO (+N5QBU)
1702 2 25 6,696 NTX

Harris Intersil ARC
K4HRS (+WA4AQV)
1758 2 24 6,658 SFL
Motor City RC
W8MRM (+W8GTZ)
1790 2 44 6,414 MI
Explorer Post 599
WA2DFI (+W7BSA)
1819 2 20 6,406 AZ
Falmouth ARA
K1RK 1668 2 42 6,196 EMA
Cape Fear ARS
K4MN (+KA4ULH)
1567 2 30 6,190 NC
Alamance ARC
K4EG (+W4VGZ)
1533 2 30 6,138 NC
Schaumburg ARC
N9RJV (+KA9QGG)
1378 2 43 6,080 IL
Montgomery ARC
W4AP 1534 2 40 5,974 AL
Williamson Cty ARC
WC5T (+W5C)
1630 2 25 5,906 STX
Ski Country ARC
KØRV (+WWØAL)
1579 2 36 5,860 CO
Monroe Co Radio Comm Assn
W8PI (+W8DWL)
1681 2 15 5,800 MI
W/K ARC of Greater Milwaukee
N9AW 1506 2 11 5,790 WI
MARCA
W7MOT (+WN7TSY)
1633 2 22 5,702 AZ
KØLIR 1595 2 31 5,680 MO
Smith Chart ARS
K4OO 1438 2 10 5,620 VA
Philips ARC
W1HP (+KD1NA)
1379 2 20 5,618 EMA
Central OR DX Club
N7LE 1472 2 13 5,594 OR
Motorola ARC - Schaumburg
K9MOT 1755 2 18 5,558 IL
Sarasota Cty ACS/Suncoast ARS
WC4EM 1626 2 15 5,476 WCF
Palos Verdes ARC
K6PV 1565 2 26 5,468 LAX
Heart O' Texas ARC
W5ZDN (+W5TSA)
1588 2 38 5,452 NTX
Kishwaukee ARC
WA9CJN (+N9RFR)
1229 2 15 5,386 IL
Texas DX Society
K5DX (+K5UO)
1411 2 20 5,358 STX
MIT Radio Society & Friends
W1MX (+W1AF)
1332 2 16 5,156 EMA
OH-KY-IN ARS
K8SCH (+KG8AP)
1294 2 25 5,148 OH
WJ4N 1331 2 10 5,142 SFL
Marietta ARC
W8HH 1454 2 8 5,110 OH
Lighthouse AR Alliance
K4LRA 1285 2 18 5,092 SFL
Meriden ARC
W1NRG (+KB1CIW)
1137 2 34 5,088 CT
Purveyors of Doom DX'n Club
W9UFO 1851 2 6 5,084 NM
Ascension ARC
K5ARC 1201 2 35 5,064 LA
Candlewood ARA
W1QI 1518 2 19 5,034 CT
Northern AZ DX Assn and Coconino ARC
W7FYW (+NF7E)
1227 2 15 5,028 AZ
Oregon High Desert CC
K7AW 1310 2 3 5,020 OR
Clay Center ARC & Waltham ARA
W1CLA (+W1MHL)
1400 2 28 5,000 EMA
Mountaineer ARA
W8SP 1310 2 23 4,988 WV
Koolau Amateur RC
KH6J 1388 2 25 4,978 PAC
TN Valley DX Assn
W4PL (+WA4AA)
1087 2 42 4,958 TN
W3MIE (+N3QQH)
1277 2 46 4,950 WPA
Rochester Oakland CERT
K8ED 1192 2 14 4,936 MI
Lakes Region Repeater Assn
W1UR (+W1BST)
1679 2 38 4,860 NH
Vintage Iron RC
N3KR (+N3OD)
1686 2 6 4,842 NNJ
Williamsburg Area ARC
K4RC (+K6OWD)
1232 2 31 4,834 VA
Dickson Cty ARC
WC4DC (+AF4YL)
1094 2 13 4,828 TN
Lynchburg ARC
K4CQ 1072 2 30 4,692 VA
Halifax ARC
VE1FO (+VE1QD)
1413 2 42 4,674 MAR
Mid-MO ARC
NØSS (+KØETY)
1087 2 35 4,662 MO
San Mateo RC
W6UQ (+KJ6FIC)
1289 2 20 4,530 SCV
Massillon ARC
W8NP (+N8DJD)
1183 2 35 4,490 OH
North East Tarrant Cty ARC
N5EOC (+N1OZ)
938 2 30 4,488 NTX
Pen Bay ARC
W1PBR (+NY1B)
856 2 16 4,450 ME
Schuylkill Amateur Repeater Assn
W3SC (+W3EEK)
1080 2 25 4,434 EPA
W9MQB (+W9FIB)
899 2 12 4,378 WI
Trojan ARC
NWØK 1065 2 7 4,362 KS
W1TU (+KB1CEJ)
1012 2 20 4,360 ME
Des Moines Radio Amateurs Assn/
AR Technical Soc
WØAK (+WØSCI)
1036 2 44 4,284 IA
Prime ARA/St. Clair ARC
K9JHQ 1274 2 7 4,268 IL
WB2QBP (+K2ARC)
1513 2 17 4,204 NLI
Ashe County ARC
W4FD (+W4APP)
922 2 37 4,116 NC
Anderson RC
N4AW (+N4SBA)
1111 2 26 4,086 SC
KP4ES 967 2 15 4,072 PR
Souris Valley ARC
KØAJW (+KDØJCD)
948 2 20 4,030 ND
Radio Farm
NØMA (+NØMMA)
1405 2 27 3,978 IA
Hancock ARC
W9ATG (+N9TT)
939 2 34 3,908 IN
Utah ARC
W7SP (+N7HVF)
862 2 105 3,894 UT
W9ZL 979 2 34 3,834 WI
Scorpion Ranch Hands
WS4Y 1241 2 9 3,806 KS
Montrose ARC
KØIIT (+KCØQXX)
924 2 37 3,716 CO
Twin Cities Repeater Club
WØBU 799 2 18 3,714 MN
Fort Madison ARC
WFØRT (+NWØX)
711 2 24 3,688 IA
Crown Radio Group
W3RP 931 2 4 3,660 WPA
Azalea Coast ARC
AC4RC (+W3NZ)
796 2 20 3,610 NC
Heart of Dixie ARS
W4HOD 739 2 6 3,594 AL
N6MI 947 2 11 3,570 SCV
Hilltop Hillbillys AR Group
K1XI 1321 2 10 3,564 ME
Ottawa ARC
VE3RC 780 2 50 3,522 ON
Minden ARA
N5RD (+KA5KBP)
1081 2 15 3,480 LA
Green River Valley ARS
K9WM 911 2 12 3,434 IL
The Villages ARC
K4VRC (+KI4DYE)
679 2 60 3,428 NFL
Charlestown ARES
KA1RI (+KW2G)
719 2 20 3,414 RI
Pearl River Cty ARC
W5PMS (+KR5T)
953 2 22 3,404 MS
Kent Cty ARC
W3HZW (+KE3UY)
638 2 35 3,320 DE
Sudbury ARC
VE3ZI 903 2 14 3,274 ON
VE7RAR (+VE7ODY)
599 2 29 3,196 BC
Bladen ARS
W4BLA 865 2 25 3,186 NC
Valencia Cty ARA
K5OUR (+KC5OUR)
651 2 97 3,168 NM
South Kitsap ARC
N7IG (+N7CQ)
745 2 22 3,146 WWA
Eastern Panhandle ARC
K8EP (+N3JDR)
867 2 17 3,122 WV
Hambuds
KA5E 879 2 21 3,106 STX
Dial Radio Club
K8PI (+W8BLV)
813 2 38 3,104 OH
Colorado Mountain Moguls
WØDZ (+WØGMJ)
681 2 25 3,068 CO
Hospital Disaster Support Comm System
N6ER (+WB2LRH)
591 2 72 3,050 ORG
Southwest LA Amateur Repeater Club
W5BII (+K5LCW)
990 2 40 3,004 LA
Cedar Valley ARC
WØGQ (+WØMRZ)
730 2 60 2,948 IA
Pamlico ARS
N4PRS (+AI4WL)
739 2 50 2,892 NC
Tallahassee ARS
K4TLH 569 2 70 2,884 NFL
ARES LAX
WA6P (+NY6Y)
735 2 79 2,872 LAX
EPCOM
VE7PCE 893 2 25 2,866 BC
Oxford Cty ARES
W1OCA (+N1YIS)
605 2 31 2,850 ME
Table Mtn Boys
N7QT 638 2 3 2,814 EWA
East Greenbush ARA
W2EGB (+K2CK)
923 2 35 2,774 ENY
Algoma ARC
VE3SOO 662 2 9 2,730 ON
Garland ARC
K5QHD 488 2 22 2,716 NTX
Metuchen RC
K2YNT 672 2 11 2,674 NNJ
North Idaho Mountain Toppers
K7TM 558 2 3 2,622 ID
Sturdy Memorial Hospital ARC
W1SMH 660 2 20 2,614 EMA
Rockingham Cty ARC
N4IV 565 2 30 2,610 NC
Straits Area ARC
W8GQN 756 2 5 2,604 MI
Ole Virginia Hams
W4OVH (+W4PVA)
582 2 26 2,604 VA
Laredo Hams ARC
W5LRD 737 2 12 2,586 STX
Playground ARC
W4ZBB (+K4FWB)
579 2 15 2,528 NFL
Seattle ACS/PSRG/West Seattle ARC
W7ACS (+WW7PSR)
518 2 91 2,526 WWA
WB2ELW (+K2VTK)
655 2 24 2,514 WNY
Salem Cty ARES/RACES
N2FI (+WB2B)
751 2 16 2,504 SNJ
Middle TN ARS, Inc.
W4UOT (+AJ4QR)
463 2 37 2,500 TN
Sierra Blanca ARC
KR5NM (+K5RIC)
488 2 20 2,498 NM
Pine State ARC
N1ME (+W1JFF)
663 2 45 2,482 ME
AC4XQ 876 2 14 2,458 SFL
AK9G (+WX9PAL)
598 2 17 2,452 IL
Muscatine ARC
N2AM (+KØBDU)
637 2 17 2,442 IA
Port St Lucie ARA
W8HW 732 2 25 2,434 SFL
Mich-A-Con ARC
KC8VC (+K9TRY)
479 2 10 2,424 MI
Goddard ARC
WA3NAN (+N3RLL)
570 2 13 2,422 MDC
Oroville ARS
W6AF 617 2 23 2,408 SV
South Wahkiakum ARS
WW7LW 652 2 5 2,402 WWA
Englewood ARS
N4EAR 579 2 16 2,386 WCF
North Coast Contest Club
AA8BV 603 2 4 2,344 OH
South Baldwin ARC
AF4I 469 2 21 2,340 AL
Franklin Cty ARC
WE4A 525 2 15 2,298 NC
Tyler ARC
K5TYR (+W5ETX)
552 2 64 2,294 NTX
Sportsman's Paradise ARC
K4WAK 460 2 12 2,278 NFL
Bedford ARC
K5BED 416 2 48 2,276 NTX
Decatur ARC
W4ATD 753 2 10 2,276 AL
San Jose ARES/RACES/ACS
W6SJC (+KF6IIY)
532 2 42 2,266 SCV
New Providence ARC
N2XJ (+KC2WUF)
528 2 25 2,264 NNJ
Blackstone Valley ARC
W1DDD (+W1BRU)
491 2 26 2,262 RI
Fresno ARC
W6TO 570 2 10 2,244 SJV
Irvine Disaster Em Comm
N6IPD (+K6PB)
476 2 35 2,242 ORG
Verde Valley ARA
W7EI 640 2 65 2,230 AZ
Keowee-Toxaway ARC
K4WD 602 2 18 2,230 SC
Green Valley ARC
WE7GV 461 2 21 2,222 AZ
OARS
KD8SQ (+KD8GWZ)
670 2 8 2,210 OH
Heartland DX Assn
NIØDX 536 2 8 2,206 NE
AE6ZV 720 2 9 2,204 SB
West Allis RAC
W9FK 668 2 15 2,154 WI
East Bay ARC
W6CUS 479 2 35 2,140 EB
Elko ARC
W7V (+W7LKO)
559 2 14 2,136 NV
Hoosier Hills Ham RC
W9QYQ 393 2 11 2,134 IN
Montgomery ARC
KV3B (+W3EXP)
429 2 40 2,134 MDC
Lowell AR Youth Club
K8LHS 741 2 9 2,132 MI
Lincoln Cty Volunteer Communicators
N4ARR (+NC4LC)
511 2 59 2,130 NC
Zerobeaters ARC
WAØFYA 796 2 12 2,094 MO
Quarry Top Hams
N8ZV 648 2 32 2,082 OH
Reno Cty ARA
WØWR 404 2 10 2,078 KS
AC1L (+KB1MSU)
438 2 25 2,078 WMA
Jefferson Cty ARC
W7PT 449 2 11 2,062 WWA
W2LRC (+KC2TFS)
446 2 24 2,058 NLI
Los Alamos ARC
W5PDO 442 2 15 2,034 NM
Eastern AZ ARS
K7EAR (+AF7AT)
400 2 4 2,030 AZ
South Alabama RC
WC4M 327 2 14 2,026 AL
Gateway Technical College ARC
N9GTC 395 2 16 2,024 WI
Androscoggin Valley RC
K1AVR 500 2 12 2,024 NH
Martin Cty ARES/MCARA
K4ZK 584 2 42 2,018 SFL
North Country ARC
W2LCA (+K2CC)
414 2 15 2,008 NNY
Coastside ARC
WA6TOW 467 2 17 2,004 SCV
Olive Branch ARC
W5OBM (+W5KDM)
326 2 15 2,004 MS
Sullivan ARC
WØW (+KD5ZIQ)
323 2 32 2,002 MO
Okaw Valley ARC
KK9N (+W9KXQ)
433 2 15 1,988 IL
NHRC ARS
W1CUM 594 2 11 1,980 NH
W8DO 525 2 10 1,952 MI
Neptune ARC
W2NRC (+N2GT)
297 2 48 1,944 NNJ
Riverside Cty ARA
W6TJ 413 2 37 1,934 ORG
M&M Amateur Radio Club
W8PIF 831 1 44 1,931 MI
Arlington ARC
K5SLD (+AE5PC)
382 2 72 1,918 NTX
Iroquois Cty ARC
W9RWX (+W9GRS)
317 2 31 1,910 IL
Delaware Valley RA
W2ZQ (+KB2SYB)
320 2 56 1,910 SNJ
Johnson City ARA
W4ABR 304 2 35 1,904 TN
W4BFB (+NC4DP)
433 2 45 1,904 NC
Renton Em Comm Service
K7FDF (+K7OTV)
322 2 21 1,900 WWA
Moreno Valley ARA
AB6MV (+KI6SOT)
385 2 30 1,900 ORG
NØZS 524 2 26 1,898 MO
NXØG 518 2 4 1,894 CO

Sonoma Cty Radio Amateurs Inc
W6SON (+W6LFJ)
407 2 37 1,886 SF
Prescott-Russell ARES
VE3PRV 500 2 14 1,884 ON
Ocean State ARG, Inc.
K1OS 651 2 6 1,866 RI
Middle Peninsula ARC
W4HZL 400 2 20 1,840 VA
Kootenai ARS
K7ID 336 2 48 1,840 ID
Nanaimo ARA
VE7NA 363 2 18 1,828 BC
Bloomington ARC
K9DIY (+K9SOU)
350 2 68 1,824 IN
Peoria ECRT
WX9JC 664 2 10 1,818 IL
Green Bay Mike and Key Club
K9EAM 378 2 27 1,802 WI
Los Angeles ARC
W6QET 313 2 21 1,802 LAX
W6SF 578 2 15 1,792 SJV
Eastern Shore ARC
K4BW 336 2 23 1,786 VA
Rockwall / Trinity Valley ARC
K5RKW 285 2 35 1,776 NTX
Mt Magazine ARC
W5MAG 660 2 10 1,770 AR
Jasper RC
K4ACW (+WN4S)
411 2 11 1,764 GA
Theodore Roosevelt ARC
KØND 506 2 22 1,762 ND
21 Repeater Group / Kendallville Contesters
N9VI (+K8IAT)
553 2 23 1,756 IN
Midwest ARS
W9MAR (+KA9NOO)
278 2 10 1,752 IN
North Augusta - Belvedere RC
K4NAB 338 2 11 1,750 SC
Hannibal ARC
WØKEM 444 2 15 1,702 MO
W9JOZ 212 2 35 1,664 IN
Yavapai ARC / Yavapai Cty ARES/RACES
W7YRC 304 2 25 1,662 AZ
435 hammers
K2AOQ 416 2 6 1,644 WNY
Parkersburg AR Klub
N8NBL 348 2 28 1,626 WV
West River RC
WR1VT (+W1CWB)
345 2 28 1,622 VT
Hiawatha ARA of Marquette Cty
K8LOD (+KD8MAE)
361 2 21 1,618 MI
Littleton Area Radio Klub
K1EME 326 2 10 1,602 NH
Gainesville ARS
K4GNV (+KC4MHH)
290 2 20 1,596 NFL
Half Moon Bay ARES
WR6HMB 392 2 15 1,592 SCV
Kamloops ARC
VE7UT 324 2 10 1,590 BC
Trident ARC
N4EE (+W4ANK)
270 2 25 1,586 SC
Winona ARC
WØNE 217 2 25 1,584 MN
Greater Nebraska ARL
KØGNE 221 2 7 1,574 NE
VE7AFA (+VE7GMG)
503 2 25 1,560 BC
SC4 ARC
W6SCF 332 2 44 1,556 SCV
Gold Coast ARA
N4FL 320 2 55 1,554 SFL
W5AUU 450 2 25 1,550 AR
Maumee Valley CC
W8OH 598 2 3 1,546 OH
Bears Seattle
K7NWS (+N7XTL)
285 2 14 1,536 WWA
Dayton ARA
W8BI (+W8HEQ)
424 2 55 1,528 OH
Northeast WY ARA
NE7WY 298 2 19 1,526 WY
Egyptian RC
W9AIU 285 2 23 1,524 IL
Sand Hill ARC
WØMI 288 2 25 1,520 KS
Northwest OH ARC, Inc.
W8EQ 304 2 12 1,520 OH
OCRACES
W6ACS (+W6HK)
294 2 14 1,502 ORG
Ogensburg ARC
K2RUK 279 2 14 1,498 NNY
Chattanooga ARC
W4AM 419 2 15 1,488 TN
Indian Hills RC
W8DDD 277 2 8 1,482 OH
Rains ARA/ Hopkins Cty ARC
W5ENT 180 2 20 1,472 NTX
Northwest AR & Electronics Assn
WØKE 388 2 26 1,466 MO
Pitt Community College ARC
K4PCC 271 2 9 1,464 NC
Hot Spring Cty AR Emergency Net
W5AR 242 2 21 1,460 AR
Tri-States ARC
W4GTA 348 2 7 1,446 GA
FILAMARS of San Diego
ND6U 423 2 15 1,436 SDG
Milwaukee RAC
W9RH 306 2 3 1,434 WI
UCSC ARC
AC6P 199 2 26 1,432 SCV
ARC of Alameda
K6QLF (+KF6UVB)
171 2 50 1,430 EB
Knob Hill Krew
K5K 297 2 4 1,424 NTX
WD5DDH (+KB5YYK)
332 2 25 1,422 NTX
Chesapeake Bay RA
WD3E 386 2 13 1,416 MDC
Bloomington Comm Group
WCØAAA (+KDØCL)
288 2 30 1,406 MN
Fredleebud FD Group
N7CW 386 2 3 1,392 AZ
Frederick ARC
K3ERM 270 2 15 1,382 MDC
WØGOR 215 2 6 1,382 ORG
Quinte ARC/Prince Edward RC
VE3RL 393 2 20 1,380 ON
SARES
K6SNY 211 2 50 1,372 SCV
Addison Cty ARA
N1FS 897 1 20 1,362 VT
STARS
W9SRC (+AB9JW)
184 2 30 1,360 IL
Mayes Cty ARC
WX5MC 165 2 7 1,350 OK
Central MS ARA
W5W 150 2 10 1,350 MS
KF5ADC 241 2 37 1,346 STX
Tippecanoe ARA
W9REG (+WB9SWD)
297 2 23 1,330 IN
Huron ARA INC
WØNOZ 271 2 16 1,326 SD
Bankhead ARC
N4IDX 387 2 12 1,326 AL
FL Atlantic Univ ARC/BRARA
K4FAU (+WB4QN)
314 2 30 1,320 SFL
Bryan ARC
W5BCS 365 2 35 1,316 STX
Shuswap ARC & North Okanagan
Radio Amateur Club
VE7RAW (+VE7DNG)
172 2 18 1,316 BC
Santa Clarita ARC
W6JW 194 2 25 1,308 LAX
WARA
VE7VCC 331 2 11 1,308 BC
ARC of Augusta
W4DV 188 2 12 1,304 GA
Michigan City Porter & LaPorte Cty
W9SAL (+W9LY)
272 2 25 1,298 IN
Edison AR Network
W6SCE 424 2 12 1,286 LAX
Ogle Cty ARES
W9GD 308 2 5 1,278 IL
RADOPS of El Jebel Shrine
KØFEZ 320 2 17 1,274 CO
Laurel ARC
W3LRC 277 2 10 1,262 MDC
Central Missouri RA
KØSI 245 2 30 1,260 MO
Paulding ARC
W4TIY 201 2 15 1,252 GA
Convair/220 ARC
W6UUS 297 2 30 1,248 SDG
BARC
K2EC 347 2 20 1,244 NLI
Mayerthorpe Flying Tigers
VE6FT 492 1 13 1,243 AB
Moosehorn ARC
AL7LE 196 2 30 1,242 AK
W3S 245 2 11 1,240 WPA
Rio Hondo ARC
W6GNS 294 2 16 1,234 LAX
Anoka Cty RC
WØYFZ 234 2 33 1,228 MN
Milford ARC
W8YDK (+KC8GFN)
204 2 10 1,226 MI
Ogden ARC
W7SU 367 2 44 1,220 UT
Crescenta Valley ARC & Glendale Em
Auxiliary Radio Service
AD6IZ (+AE6VX)
238 2 15 1,220 LAX
Clinton Cty ARC
W9AH 248 2 25 1,216 IN
Heart of TX Ham Operators Group
WA5HOT 160 2 6 1,216 STX
Flathead Valley ARC
K7LYY 369 2 7 1,210 MT
Sweetwater ARC
WY7U 299 2 10 1,208 WY
K6SRA 124 2 6 1,204 SCV
WM5T (+WB5NET)
205 2 17 1,200 LA
Ouachita ARA
W5HUM 388 2 7 1,186 AR
Laguna Beach Em Comm Team
N6L (+KE6GFF)
97 2 50 1,184 ORG
Central AR UHF/ AR Em Radio Service
N5AT 163 2 63 1,184 AR
3 Rivers ARC
KK3ARC 145 2 50 1,180 ID
Pearland ARC
K5PLD 202 2 22 1,166 STX
Beaufort RA Group
W4BFT (+K3LLH)
195 2 20 1,142 SC
Three Rivers ARC
WØEND 209 2 6 1,132 ND
West Palm Beach ARC
W2CB 291 2 32 1,132 SFL
Koomer Ridge Contesters
K3QY 416 2 4 1,132 KY
Henry Cty ARC
K8TII (+W8FK)
234 2 15 1,124 OH
Puerto Rico FD Group
KP4FD 270 2 12 1,118 PR
Helena ARC
W5HAR (+N5MIG)
59 2 10 1,112 AR
Charles Cty ARC
K3SMD 140 2 9 1,110 MDC
West Virginia Amateur Radio
WV8AR 253 2 25 1,106 WV
Penn-Mar RC
W3MUM 320 2 15 1,090 EPA
Friends of AR Operating Unusually
K2BC 267 2 5 1,082 NNJ
Kauai ARC
KH6E 314 1 20 1,079 PAC
Wexaukee ARC
K8CAD (+N8NJA)
272 2 19 1,074 MI
Lake Chelan RC
K7YR 374 2 4 1,062 EWA
Summerside ARC
VY2PEI 374 1 24 1,058 MAR
Foothills ARC
W4HF 254 2 6 1,058 NC
Harrisburg Radio Amateurs Club
W3W 140 2 31 1,038 EPA
Clinton AR Service
KJ4TRK 167 2 31 1,034 TN
Pahrump AR Repeater Assn
K1NV 296 2 11 1,034 NV
3 HAMS
WA8FZZ 220 2 3 1,034 NC
Alamogordo ARC
K5LRW 212 2 30 1,020 NM
River City ARA
K4K 135 2 12 1,020 KY
Club de Radio Amateur Outaouais Inc
VE2CRO (+VE2SY)
314 2 20 1,018 QC
N9TO 215 2 4 1,012 IL
Penasco Valley ARC
K5PVR 227 2 11 1,010 NM
Kingsport ARC
W4TRC 305 2 15 1,010 TN
TARA
K3TAR 379 2 6 1,008 EPA
Stanly Cty ARC
K4OGB 310 2 14 1,008 NC
W6BW 224 2 16 1,000 SJV
Panoramaland ARC
K7JAR 337 2 13 984 EWA
Woodford Cty ARC
KY4WC 105 2 23 980 KY
Renfrew Cty ARC
VA3NRR 159 2 28 976 ON
Martinez ARC
KF6HTE 159 2 25 968 EB
Flood Street Irregulars
N7N 205 2 3 962 UT
Manhattan Area ARS
KSØMAN 240 2 10 956 KS
Gulf Coast ARC
WA4GDN 182 2 41 952 WCF
Owen Cty ARA
K9EOH 99 2 6 944 IN
Suffolk Cty RC
W2DQ 135 2 27 920 NLI
Flint Hills ARC
KBØVAC 172 2 5 918 KS
Winnipeg ARC
VE4BB 162 2 62 914 MB
Washington Area ARC
WØARC (+ABØDX)
174 2 24 908 IA
Carteret Cty ARS
W4YMI 132 2 15 904 NC
Watertown ARC
N9HR 193 2 14 900 WI
Pioneer AR Fellowship
W8CTT 117 2 5 894 OH
KD1HF 260 2 3 890 EMA
Jim Bell Wireless Assn
K4TNS (+W4TDE)
82 2 6 874 AL
Alger ARC
KC8BAN 186 2 15 862 MI
North Jeffco ARL
KDØKOB 154 2 6 858 CO
Carolina ARES
WX4SC 153 2 18 856 SC
Plumas ARC
K6PLU 196 2 10 852 SV
Yellowknife ARS
VE8YK 101 2 13 842 NWT
Navarro Amateur RC
N5VO 96 2 21 842 NTX
Ontario Science Centre ARC
VE3OSC 168 2 7 832 ON
Davis Family
W9ZB 220 2 4 824 WI
K5PAL (+KE5AAY)
79 2 20 808 NTX
Clarksville Amateur Transmitting Soc
KF4L 168 2 12 800 TN
Long Island AR Simplex Club
W2LIS 219 2 10 788 NLI
Marshall Radio
AA7SM 217 2 3 784 UT
Columbia ARS
NF4CQ 40 2 20 780 NFL
Waldo Cty ARA
N1TN 163 2 25 776 ME
Black Diamond RG
KX9M 256 2 8 766 WI
Small Town AR Service
W5STR 236 2 22 762 AR
Every ARS
KØEAR 125 2 3 744 MO
ID Society of Radio Amateurs - Boise
Chapter
K7BSE 116 2 12 742 ID
W8SAI 147 2 3 712 OH
Toronto ARC
VE3TNC 224 2 12 698 ON
Team PIR
K7PIR 232 2 3 684 AZ
W4KP 145 2 8 680 KY
Pike Cty ARC
W9UL 123 2 10 678 IN
Haywood Cty ARC
KI4SLZ 160 2 8 670 NC
Broward ARC
W4AB 99 2 30 668 SFL
USC ARC
W6YV 109 2 3 668 LAX
Georgian Bay ARC
VE3OSR 305 2 15 668 ON
4X4Ham
W7AZO 170 2 40 664 AZ
Daviess Cty ARC
KC9SFL 47 2 6 664 IN
Triple A ARA
N3TN 103 2 12 656 WPA
Montgomery ARS
NC4MC (+KJ4VLH)
113 2 8 652 NC
YKARS
VE8RAC 29 2 5 650 NWT
Mizpah Shrine Radio Unit
W9FEZ 260 2 8 632 IN
KB6DMZ 88 2 14 626 ORG
Southeast Missouri ARC
WØQMF (+WØRMS)
156 2 12 612 MO
Phillips Cty ARC
WØZXN 80 2 14 610 KS
C17 SIM TECHS
NE5JK 129 2 3 604 OK
Red River Radio Amateurs
WØILO 155 2 10 602 ND
Cascade Radio Group
N7CFO 100 2 10 600 EWA
Pittsburg Repeater Org
KØPRO 73 2 7 596 KS
NW Hall Contesters
N4YT 170 2 5 590 GA
Big Rapids Area ARC
N8OE 90 2 12 570 MI
WAØHOU 217 1 12 567 NE
Nassau Cty ARES
W4NAS 45 2 15 540 NFL
Nantucket ARA
N1NBQ 74 2 5 516 EMA
Wellesley ARS
W1TKZ 62 2 21 506 EMA
Bayouland Emergency ARS
W5BMC 28 2 9 506 LA
Seattle American Red Cross Comm Team
W7DAO 177 2 3 504 EWA
Panama City ARC
W4RYZ 47 2 5 502 NFL
Brookby ARG
W1BBV 41 2 5 482 EMA
University ARC
N7UW 91 2 24 482 WY
Virginia Tech ARA
K4KDJ 115 2 4 480 VA
Conneaut ARC
W8BHZ 59 2 7 468 OH
Richmond ARC
W4ZA 19 2 25 458 VA
Pontotoc Cty ARA
KE5BWG 60 2 13 420 OK
Lorain Cty ARA
KC8BED 68 2 14 386 OH
Heritage Harbour ARS
K3TEZ 54 2 9 378 MDC
Mid-State ARC
N9LC 65 2 6 180 IN

2A Battery

Buffalo Lighthouse Crew
K2ZR 1301 5 34 13,525 WNY
Colorado QRP Club & 285 Tech Connect Club
WØCQC (+NAØTC)
1180 5 14 12,295 CO
NA3DX (+NA1DX)
635 5 5 5,720 MDC
Cochise Digital Guys
K1KBO 319 5 5 4,040 AZ
Walton RA
W2LZ (+W2CD)
380 5 9 3,945 WNY
W6HUG (+AD6WL)
335 5 31 3,280 ORG
Pueblo West ARC
NAØPW 237 5 15 3,190 CO
WHAM QRP Group
N8IW 300 5 6 2,855 OH
Air Mobile Radio Operator Soc
AE3J 385 5 6 2,845 DE
Androscoggin ARC
W1NPP 276 5 10 2,795 ME
RARC-QRP
WØMXW 170 5 12 2,530 MN
Portland Amateur Wireless Society
W1KVI 139 5 26 1,915 ME
Ottawa Valley QRP Soc
VA3OVQ 74 5 5 1,580 ON
Tango ARS
K9TAS (+W9INL)
77 5 5 1,340 IN
Benton Cty ARES
K7CVO (+W7QH)
27 5 44 1,270 OR
Wallowa Ham Operators
K7BUY 124 5 7 1,140 OR

2A Commercial

Radio Central ARC / Order of Boiled Owls
W2RC (+KW2O)
2038 2 28 6,464 NLI
East Pasco ARS
K4EX (+N3OS)
1049 2 16 4,368 WCF
Bahama Beach CC
N1GN 1099 2 6 3,380 NH
NETQCF
WW5R 918 2 5 2,740 NTX
WØJH 508 2 30 2,398 MN
Central OH Operators Klub Extra-Novice
W8FD 518 2 14 2,132 OH
Fullerton RC
W6ULI 652 2 21 1,854 ORG
Chicago FM Club
WA9ORC 439 2 15 1,728 IL
Rogue Valley ARC
W7DTA 457 2 16 1,542 OR
Columbia Cty ARC
K4KNS (+WE4GW)
308 2 52 1,514 GA
Fort Pierce ARC
W4AKH 441 2 35 1,494 SFL
Nassau Cty Police ARC
NC2PD 410 2 27 1,290 NLI
N4DLR 420 2 4 1,178 OH
Seneca RC
W8ID 269 2 10 1,120 OH
W3LRS 211 2 7 1,110 DE
W2VA 189 2 14 1,080 NLI
Palouse Hills ARC
W7NGI (+WB7TBM)
371 2 20 1,038 ID
Speculator ARC
KC2WI 183 2 15 986 NNY
Scott Cty ARES
NØBHC (+NØBHC)
196 2 5 982 MN
Champaign Cty ARES
WB8UCD 171 2 8 938 OH
GREAT Club
N4VU 332 2 4 784 GA
Mountain Air RC
W4AE (+W4LA)
231 2 3 776 NC
Gulf ARS
AF4WU 189 2 16 770 NFL
Franklin ARC
WF4RC 192 2 15 766 VA
Russell Cty ARC
WR4RC 241 2 7 750 VA
Community Service RC
WØP 85 2 4 720 MO
Lancaster Radio Transmitting Society
W3AD 300 2 10 650 EPA
Mora Open Repeater Assn
KDØCI 87 2 12 542 MN
Scott Cty ARS
KDØHHZ 96 2 4 542 MO
Salem Area ARA
K8BTP 20 2 10 540 OH
W9IDX 103 2 5 540 WI
Greater Westfield Medical Reserve Corps
KB1UMZ (+KB1UMZ)
41 2 3 452 WMA
Piedmont ARES
K4PAR 58 2 8 316 GA
Lower Yellowstone ARC
W7DXQ 24 2 3 48 MT

3A

CorTek Radio Association
W9CA (+N9BX)
5182 2 30 19,748 IL
Rochester DX Assn
W2RDX (+W2AN)
4042 2 42 16,510 WNY
W5UR (+K5HAB)
3575 2 18 13,414 NM
North East WY Contest Assn
WY7FD (+WY7SS)
3801 2 11 12,430 WY
North Shore RC
K9OR (+K9RST)
2767 2 50 10,666 IL
REDXA & MARS
W6SG (+W6KB)
3195 2 50 10,176 SF
Providence Radio Assn
W1OP (+W1PRA)
3089 2 23 9,748 RI
NC Contesters
NR3X 2774 2 10 9,638 NC
North Fulton AR League
K4JJ (+NF4GA)
2924 2 246 9,540 GA
Greater Norwalk ARC
N1EV (+W1NLK)
2696 2 50 9,492 CT
N4N FD Group
N4N (+KE4UW)
2602 2 21 9,298 GA
Midland ARC
KD5C (+W5QGG)
2300 2 57 9,132 WTX
Peoria Area ARC
W9PIA (+K9PEO)
2469 2 70 9,048 IL
OCARS
W8TNO (+K8O)
2941 2 20 8,608 MI
Sterling Park ARC
K4NVA (+NQ4K)
2120 2 25 8,372 VA
South Orange ARA
K6SOA (+K6WO)
2467 2 80 8,196 ORG
Twin City FM Club
WØEF 2212 2 50 8,132 MN
Stamford ARA
W1EE (+K1FC)
2526 2 38 8,018 CT
Southern Inyo ARC
W6TD 2240 2 7 7,840 ORG
South Lyon Area ARC
N8SL (+N8AR)
2259 2 27 7,702 MI
Oakville/Burlington ARCs
VE3CJ (+VE3HB)
2147 2 30 7,626 ON
Dixie AR Klub
W4DAK 1950 2 19 7,614 NFL
Albany ARA
K2CT (+KM2O)
2109 2 40 7,578 ENY
Shreveport ARA
K5SL (+K5JMR)
2158 2 101 7,386 LA
Twin City Ham Club
W5EA (+KB5YEG)
1894 2 32 7,262 LA
Cuyahoga Falls ARC
W8VPV 2023 2 22 6,844 OH
Edmond ARS
K5EOK 1846 2 76 6,554 OK
Fauquier ARA
W4VA (+KX4O)
1530 2 24 6,394 VA
San Lorenzo Valley ARC and Santa Cruz Cty ARC
K6WC (+KE1B)
1752 2 73 6,386 SCV
Sussex Cty ARC
W2LV (+N2ERH)
1783 2 24 6,344 NNJ
Reelfoot ARC
K4RFT (+N4MJ)
1355 2 18 6,182 TN
Arrowhead RAC
WØGKP 1736 2 26 6,074 MN
Stones River ARC
K4FUN 1433 2 52 5,926 TN
Stonewall Jackson ARA
K8DF (+K8TPH)
1846 2 20 5,922 WV
Indianapolis RC
W9JP (+W9RCA)
1798 2 35 5,876 IN
Jefferson Cty ARC
W7JCR 1375 2 44 5,822 WWA
Rochester ARC
WØBM (+KØRGR)
1547 2 41 5,806 MN
Nashoba Valley ARC
N1NC 1311 2 57 5,802 EMA
NØGF 1600 2 21 5,674 ND
ARC of the National Electronics Museum
K3NEM (+W3GR)
1308 2 25 5,654 MDC
TriState ARC
W9OG (+WA9C)
1447 2 28 5,610 IN
Nixa ARC
NØA 1779 2 45 5,500 MO
McKinney ARC
W5MRC (+AE5IT)
1493 2 52 5,486 NTX
Lincoln ARC
KØKKV (+KØKSP)
1785 2 70 5,476 NE
Colorado ARES District 24
WØDTF (+WØRDR)
1250 2 24 5,474 CO
Southern VT ARC
K1SV (+WT1B)
1810 2 22 5,380 VT
Coquitlam/Burnaby/New-Westminster ARCs
VE7SCC 1508 2 35 5,340 BC
MS Valley ARA
W9FCC 1536 2 18 5,122 WI
W4FCR (+WG2J)
982 2 13 5,098 VA
Barnstable ARC
N1UI (+W1EXP)
1407 2 23 5,094 EMA
K7DAV (+AA7AK)
1262 2 81 5,002 UT
FARL-LARC
K8UTT 1385 2 40 4,992 MI
Carbon ARC
W3HA 1409 2 9 4,986 EPA
Rowan ARS
N4UH (+W4EXU)
1123 2 27 4,986 NC
Morrow Cty ARES
W8NL 1245 2 8 4,948 OH
Johnson Cty ARC
WØERH (+WØAR)
1256 2 34 4,912 KS
Kankakee Area Radio Soc
W9AZ (+N9FD)
1032 2 28 4,890 IL
Naval Postgraduate School ARC
K6LY (+K6NPS)
1195 2 28 4,812 SCV
Lone Star ARA
N5HW (+W5TA)
1116 2 29 4,810 STX
Yonkers ARC
W2YRC (+KF2FK)
1152 2 67 4,750 ENY
San Andreas Faultline Survivors
W6SW (+W6KC)
1515 2 11 4,750 SJV
Blue Ridge ARC
W4YK 1130 2 59 4,728 NC
St Paul RC / Mining RC
WØMR (+KØAGF)
1422 2 128 4,548 MN
Albemarle ARC
WA4TFZ 1096 2 39 4,528 VA
Northeast Wireless RC
NW2C 1065 2 54 4,504 NLI
CRES ARC
W8ZPF 1126 2 36 4,430 OH
Paducah ARA
W4NJA 1281 2 18 4,402 KY
Bristol County RA
W1ACT (+N1JOY)
1211 2 12 4,310 EMA
QSY Society
K2QS (+WB2LQF)
1074 2 83 4,222 ENY
Bristol ARC
W4UD 1062 2 70 4,208 TN
Granite State ARA
N1QC (+KB1NH)
949 2 35 4,202 NH
Foothills ARS
K6YA (+NE6RD)
1092 2 25 4,174 SCV
Orange Park ARC
K4BT 1179 2 32 4,172 NFL
Hamfesters RC
W9AA (+WB9STB)
1063 2 31 4,148 IL
Central MI ARC
W8MAA (+K8YHH)
913 2 29 4,104 MI
W4ULH (+K4UA)
776 2 47 4,080 SC
Jackson ARC
W5PFC (+N5DU)
772 2 85 4,058 MS
NA4GC (+AJ4DV)
1167 2 25 4,052 NC
Howell Cty ARC
WØHCA 886 2 10 4,000 MO
Lockheed Martin ARC & Kelo Cycle Club
W5IU 975 2 27 3,934 NTX
South Canadian ARS
W5NOR 894 2 25 3,866 OK
K4HH (+KJ4IKN)
1154 2 32 3,838 KY
Fond Du Lac ARC
W9EBV 937 2 40 3,834 WI
Ashtabula Cty ARC
K8CY (+KD8FDP)
1062 2 19 3,834 OH
Tuscaloosa ARC
W4XI 1339 2 40 3,686 AL
Glynn ARA
N4FD 826 2 14 3,664 GA
K6LQ 979 2 6 3,646 SV
Riverland ARC
W9UP 819 2 20 3,636 WI
Monessen ARC
W3CSL 1158 2 30 3,626 WPA
Langley Surrey FD
VE7LSY (+VE7RLY)
748 2 35 3,620 BC
Overlook Mountain ARC
N2LL (+N2VOT)
680 2 33 3,616 ENY
Aero ARC/BRATS
W3PGA 775 2 36 3,602 MDC
Hernando Cty ARA
K4BKV (+W1LBV)
626 2 34 3,598 NFL
Xerox ARC
W2XRX 1047 2 17 3,598 WNY
Keystone VHF Club & Hilltop Transmitting Assn
W3ZGD (+AD3PA)
736 2 37 3,528 EPA
JTRG
WY5I (+W4K)
902 2 47 3,516 SFL
Columbia-Montour ARC
WC3A (+K3BD)
641 2 30 3,480 EPA
Stanwood Camano ARC
W7PIG (+N7KRE)
978 2 46 3,478 WWA
Wireless Assn of South Hills
N3SH 859 2 10 3,424 WPA
Fluvanna Cty ARES Group
W4XR 977 2 12 3,368 VA
Alliance ARC
W8LKY 779 2 14 3,334 OH
Oklahoma City Autopatch Assn
W5MEL 813 2 20 3,330 OK

JAMES W. BROWN, K9YC

Rusty, W6OAT, mentors Rodna Presley, KJ6GVQ, at the Palo Alto Amateur Radio Association, W6ARA, operation.

San Fernando Valley ARC
W6SD (+KJ6CNK)
691 2 48 3,312 LAX
Dog Hollow Contest Group
AK9D (+WGØTA)
814 2 5 3,302 MO
Austin TX ARC
W5KA (+K5LBJ)
726 2 92 3,284 STX
Lakeland ARC
K4LKL (+K1DU)
649 2 40 3,268 WCF
Long Island Mobile ARC
W2VL (+WV2LI)
714 2 93 3,254 NLI
Lake Area Radio Klub
WØWTN 560 2 28 3,206 SD
Franktown FD Group
WØCBH 1055 2 10 3,172 CO
Milford ARC
W8MRC 781 2 44 3,158 OH
Spring Hill ARC
N4WO 653 2 24 3,118 NFL
Shelby ARC & ARES of Cleveland Co
KM4C 805 2 24 3,102 NC
Blue Ridge ARS
W4KA 797 2 46 3,092 SC
St Louis and Suburban RC
WØSRC 677 2 105 3,088 MO
Gaston Cty ARS
N4GAS (+K4GNC)
606 2 34 3,082 NC
Shenandoah Valley ARC
W4RKC 781 2 26 3,080 VA
Goochland Cty ARES / VA District 6 ARES
N4MI 763 2 30 3,052 VA
Southern Berkshire ARC
W1BAA/2 (+K1LEE/2)
554 2 33 3,042 ENY
San Joaquin Valley ARS
WA6SJV (+WA6FFJ)
699 2 30 3,036 SJV
Peterborough ARC
VE3RB (+VE3KRG)
672 2 22 2,978 ON
Grand Rapids ARA
W8DC 680 2 25 2,978 MI
Albemarle ARS
K4WO 799 2 30 2,976 NC
North Okaloosa ARC
W4AAZ (+KI5FR)
725 2 20 2,960 NFL
Anchorage ARC
KL7AA (+KL7G)
1117 1 33 2,944 AK
Cape Ann ARA
W1GLO (+KB1PGH)
466 2 41 2,934 EMA
Snohomish Cty Hams Club
WA7LAW (+NR3O)
566 2 24 2,930 WWA
KC7Z (+NM7E)
655 2 23 2,928 WWA
Ellijay ARS
K4LDI 805 2 19 2,896 GA
Randolph Cty Emergency RC
K4RAN 1070 2 10 2,890 AL
KCØWBA 903 2 89 2,834 CO
Clark Cty ARC
W7AIA (+K7JAO)
628 2 161 2,830 WWA
The FPL Group
K8ESQ 727 2 5 2,822 MI
Six Meter Club of Chicago, Inc.
K9ONA 645 2 15 2,810 IL
South Bay ARS
K6QM 651 2 12 2,780 SDG
Tri-County ARC
WX4TC (+AJ4YR)
802 2 42 2,746 GA
Joplin ARC
WØIN 555 2 20 2,742 MO
Eastern NM ARC
KA5B 628 2 20 2,734 NM
Northwest IL ARC
W9F (+N9WN)
641 2 20 2,734 IL
Kaw Valley ARC
WØCET 553 2 25 2,728 KS
Brandon ARS
K4TN (+KJ4GEK)
530 2 32 2,716 WCF
Mount Diablo ARC
W6CX 848 2 75 2,710 EB
Rolla Regional ARS
WØGS 531 2 22 2,708 MO
Penn Wireless Assn
W3SK 622 2 40 2,678 EPA
Plano AR Klub
K5PRK (+WA5UP)
580 2 70 2,658 NTX
Warrensburg Area ARC
WØAU 759 2 42 2,646 MO
Hidden Valleys ARC
KC9KQ 492 2 39 2,616 WI
Royal Gorge ARC
NCØA 477 2 25 2,588 CO
Coshocton Cty ARA
W8CCA 414 2 28 2,586 OH
AR Transmitting Soc
W4CN 633 2 16 2,580 KY
AF6AV 1098 2 6 2,562 SDG
New Bern ARC
W4EWN 457 2 23 2,556 NC
Milton ARC
W4VIY 688 2 10 2,526 NFL
Delta ARC
W4BS (+W4GMM)
648 2 85 2,524 TN
Oakland Radio Comm Assn
WW6OR 553 2 45 2,512 EB
CVARA
W2RME (+W2MK)
353 2 27 2,496 WNY
New River Valley ARC
N4NRV 538 2 8 2,494 VA
Spartanburg ARC
K4II 559 2 32 2,448 SC
Dubois Cty ARC
N9NAU 551 2 25 2,380 IN
Troy ARA
N2TY 482 2 52 2,376 ENY
North Port ARC
W4NPT 444 2 19 2,370 WCF
Chatham-Kent ARC
VE3CRC 466 2 19 2,366 ON
Scranton Pocono Amateur Radio Klub
K3CSG (+NA2T)
625 2 31 2,346 EPA
Jayhawk ARS
WØLB 470 2 30 2,330 KS
Black Rock Mountain FD Group
K4T 655 2 5 2,320 GA
N3IS 599 2 25 2,314 EPA
Clark Cty ARC
W9WWI (+N9UGP)
365 2 61 2,312 IN
South Bay ARC
W6SBA 651 2 28 2,290 LAX
Hamvaders
W9DKB 570 2 3 2,284 WI
KM5PS 458 2 40 2,272 AR
Wyandot Area Ham Operators Org
KD8BNV (+KD8FLT)
359 2 10 2,254 OH
W7W 490 2 10 2,252 WWA
Nutley ARS
W2GLQ 625 2 8 2,240 NNJ
Lillian ARG
K4DEY 392 2 11 2,212 AL
Navarre CERT ARC
KC4ERT 444 2 20 2,202 NFL
Lambton Cty RC
VE3SAR 567 2 22 2,180 ON
Eaton Cty ARC
K8CHR 528 2 16 2,174 MI
Dallas ARC
W5FC 413 2 49 2,160 NTX
Dixie AR Team
KE5WEE 604 2 54 2,138 MS
Wlson ARC
WC4AR 434 2 15 2,122 TN
Club Radio Amateur de Quebec
VE2CQ 500 2 35 2,108 QC
Aeronautical Center ARC
W5PAA 359 2 32 2,100 OK
Grumman ARC
WA2LQO 527 2 12 2,088 NLI
Lake Erie ARA
WB8CQR 488 2 7 2,082 OH
Wide Area AR Network
W1R 519 2 11 2,054 ME
Cumberland Valley ARC
W3ACH 342 2 54 2,046 WPA
W7DRC 569 2 7 2,026 UT
Borderline ARC
W7BAR (+AD7OW)
510 2 30 2,020 UT
K6AGF (+NU6Z)
449 2 24 2,018 ORG
St Genevieve Cty ARC
KØQOD (+NØANA)
324 2 14 2,010 MO
Cherryville Repeater Assn II
W2CRA 342 2 30 1,996 NNJ
Schenectady Museum ARA
W2IR (+KC2VWW)
422 2 15 1,994 ENY
Iowa City ARC
WØJV 499 2 17 1,986 IA
Ft Herkimer ARA
W2FHA (+N2ZWO)
325 2 17 1,974 WNY
San Gorgonio Pass ARC
W6PRC (+WA6MOD)
255 2 35 1,974 ORG
Burlington Cty RC
K2TD (+AK2S)
364 2 35 1,956 SNJ
Fort Armstrong Wireless Assn
K3TTK 595 2 20 1,954 WPA
Leeds Area Hams
AG4ZV 576 2 7 1,952 AL
Springhill ARC, Inc.
N5II 456 2 4 1,944 LA
VE9ND 337 2 15 1,940 MAR
West Santa Barbara ARES
W9EC 539 2 28 1,936 SB
Huntington Cty ARS
K9HC 444 2 18 1,928 IN
LVSRA / AARG
K3LV 422 2 32 1,924 EPA
Reading RC, Inc.
W3BN 368 2 44 1,906 EPA
Bill Gremillion Memorial RC
K4NRC (+K4PMR)
476 2 32 1,890 GA
Brownwood ARC
K5BWD (+AE5HP)
422 2 40 1,876 NTX
Peconic ARC
W2AMC 438 2 35 1,876 NLI
Western Lake Country ARS
W9WLC 518 2 14 1,866 IL
Chicago Suburban RA
N9BAT 404 2 28 1,864 IL
Irving ARC
N5BB 336 2 35 1,864 NTX
COARES
K8DDG (+WA8RES)
446 2 38 1,810 OH
Hampton Public-Service Team
W4HPT (+W4QR)
306 2 48 1,804 VA
Binghamton ARA
W2OW 437 2 25 1,796 WNY
Newington ARL
NA1RL (+W1OKY)
339 2 15 1,784 CT
Peace River Radio Assn
W4DUX 450 2 35 1,780 WCF
Shoreline ACS
W7AUX 369 2 17 1,762 WWA
RAS of Norfolk
W4NPS (+KJ4OLW)
352 2 10 1,760 VA
Sierra Foothills ARC
W6EK (+AE6LR)
331 2 18 1,760 SV
Kings Cty RC
W2RAK 331 2 8 1,744 NLI
WAFAR
W9FT 495 2 22 1,740 IL
Southern Oregon ARC
K7LIX (+WM7K)
413 2 10 1,738 OR
Valley of the Moon ARC
W6AJF 381 2 10 1,730 SF
N8ARA 419 2 28 1,708 OH
Cass Cty Area Hams
NØUMP 324 2 3 1,700 MO
Rappahannock ARA
K4YM 336 2 14 1,692 VA
Onslow ARC
NC4OC 346 2 4 1,690 NC
CTARC
WD5IYF 270 2 12 1,690 OK
Corona PD CSV Team
W6CPD 607 1 15 1,688 ORG
Metropolitan ARC
K8NOW 421 2 11 1,680 MI
Southwest MO ARC
WØEBE 333 2 50 1,678 MO
Nashville ARC Inc
K4CPO 212 2 32 1,668 TN
Randolph ARC
NC4ZO 286 2 61 1,664 NC
Bloomfield ARC
W1CWA 296 2 8 1,662 CT
Barrie ARC
VE3GCB 370 2 15 1,658 ON
Holmesburg ARC
K3FI 372 2 15 1,658 EPA
Lake Washington Ham Club
K7LWH 262 2 56 1,640 WWA
Desert Radio Amateur Transmitting Society
WD6RAT 379 2 17 1,638 ORG
Pioneer ARC
KØJFN 255 2 10 1,622 NE
WFARC/NTWG
N5WEB 423 2 9 1,606 NTX
San Angelo ARC
W5QX (+N5CBQ)
289 2 46 1,594 WTX
Laurel ARS
KJ4ND 351 2 15 1,540 KY
Matanuska ARA
KL7JFU 379 1 26 1,536 AK
Fallbrook ARC
N6FQ 416 2 40 1,536 SDG
Lafayette Cty ARES
KBØNHW (+NVØU)
236 2 17 1,522 MO
Hiawatha Valley RC
NØDH 255 2 20 1,518 MN
Naval Research Lab ARC
W3NKF 344 2 8 1,514 MDC
Shiawassee ARA
W8QQQ 300 2 7 1,510 MI
Humboldt ARC
KD6LM 291 2 40 1,510 SF
W4POX 48 2 24 1,504 VA
W5CCW 223 2 6 1,500 MS
Genesis ARS
N1ZIZ (+KB1FVR)
152 2 26 1,494 EMA
Hammin' Sams
KØHSC (+WØMHP)
320 2 12 1,494 CO
Clay Cty ARC
WØTE 543 2 12 1,488 MO
Lewis-Clark ARC
W7VJD 208 2 42 1,486 EWA
Whitley Cty ARC
WC9AR 390 2 40 1,480 IN
Soc of Newfoundland Radio Amateurs/
Avalon RAC
VO1AA 155 2 16 1,472 NL
South Park Marauders
WVØH 397 2 16 1,468 CO
Coos Cty RC
K7CCH 295 2 35 1,464 OR
Madison-Oneida ARC
W2MO 220 2 16 1,444 WNY
Luce Moose-cateers
W8NBY 391 2 15 1,442 MI
Dugger ARC
KC9AK (+K9PIE)
335 2 15 1,440 IN
LCSARO
W7EUG 385 2 23 1,430 OR
Lakeway ARC
W2IQ (+WØFES)
286 2 37 1,428 TN
Montacussett ARA
W1GZ 190 2 9 1,394 WMA
Aroostook ARA
K1FS 285 2 28 1,388 ME
Webster County ARES
KØS (+KCØOKO)
216 2 24 1,382 MO
Tri-State AR Group
W5OKT 259 2 15 1,380 OK
AARC/ARCC
N5VA (+KD5RHR)
344 2 32 1,378 NM
Moore County ARS
NC4ML 154 2 15 1,376 NC
Voice of Rockvale
W8DQ 361 2 7 1,368 TN
LAARK
K5LRK 362 2 11 1,358 NTX
Somerset Cty ARC
K3SMT (+NS3HS)
379 2 25 1,352 WPA
Idaho FD Group
W7RNF 988 1 3 1,338 ID
Insurance City Repeater Club
K1DFS 321 2 14 1,324 CT
Polk Cty ARA
N9XH 156 2 11 1,324 WI
Easton ARS
K3EMD 214 2 19 1,322 MDC
Kachina ARC
W7EH 328 2 10 1,316 AZ
NM High Desert ARC
NM5HD 381 2 35 1,312 NM
Wichita ARS
N5WF 250 2 20 1,300 NTX
Yellow Thunder ARC
WB9FDZ 348 2 10 1,296 WI
Tri-County CW ARC
W3TCW 282 2 18 1,274 WPA
W4ATC 372 2 8 1,230 NC
Copper Country Radio Amateur Assn
W8CDZ 180 2 27 1,226 MI
Sun Parlour ARC
VE3SPR 147 2 25 1,196 ON
W8DF 395 2 20 1,190 MI
Dawg Days Group
W6BIV 204 2 4 1,182 SB
Lake Wales Repeater Assn
K4LKW 100 2 26 1,176 WCF
Bear Bait RC
WA2DAD 198 2 6 1,174 NNY
Murray Cty ARC
KDØIXB 134 2 14 1,162 MN
Piqua ARC
W8SWS 161 2 15 1,160 OH
ARC of Savannah
W4HBB 120 2 27 1,140 GA
Cumberland EmComm Operators' Club
KC2TXB 161 2 7 1,134 SNJ
Radio Amateurs of Corry
W3YXE 141 2 11 1,132 WPA
Hall of Science Amateur Radio Club
WB2JSM 284 2 20 1,130 NLI
W6BA (+AE6SG)
173 2 5 1,116 ORG
Benton Cty Radio Operators
KD5DMT 112 2 12 1,074 AR
Independent RC
WA6IRC 210 2 30 1,070 LAX
San Juan Cty ARS
N7JN 168 2 38 1,066 WWA
Cascades ARS
W8JXN 218 2 15 1,036 MI
Bluegrass ARS
K4KJQ 237 2 19 1,020 KY
Radio Amateurs of Skagit County
N7GDE (+W7ABF)
124 2 20 1,008 WWA
Buffalo AR Repeater Assn
W2EUP 212 2 17 1,002 WNY
K4PAY 206 2 7 996 VA
Northern Lakes ARC
KØGPZ 234 2 35 996 ND
The Atlanta IBM ARC
W4IBM 185 2 10 994 GA
Southside ARC
NØHV 128 2 22 992 MO
Mile High RC
KN6JV 76 2 13 984 ORG

Northeast MO ARC
WØCBL 110 2 3 970 MO
Capital City ARS
AA3DC 261 2 15 968 MDC
NJ2GC 54 2 13 968 SNJ
NorWesCo
N9PHS 78 2 3 926 WI
BAT Ham
WT7E 288 2 14 926 ID
Old Post ARS
W9EOC 118 2 15 886 IN
Mercury Northwest
W7MNW (+KO9G)
120 2 17 880 WWA
Hornet ARC
NB6GC 64 2 4 878 EB
Ohio Valley Experimenters Club
KD8LBS 203 2 15 870 OH
220 MHz Guys
W9BBQ 93 2 7 856 IL
Delaware Cty ARES-RACES
W3AEC 100 2 7 856 EPA
Fulton Cty ARC
K9ILS 127 2 18 846 IL
Madison Cty DX Club
KKØG 93 2 24 836 IA
Oak Forest ARC
KE5TRB 88 2 11 832 STX
Delmarva ARC
K3DRC 151 2 11 828 MDC
Disney Emergency AR Service
WD4WDW 174 2 36 818 NFL
Coronado Em Radio Operators
W6MLI 32 2 12 814 SDG
Northern Alberta RC
VE6NC 65 2 44 810 AB
Ex High School Novice Class CW Ops
K6VRS 176 2 4 796 SDG
Desert Circle ARC
NU7DE 94 2 3 774 AZ
Four Rivers ARC
K4HAO 351 2 7 772 GA
W7MIR 56 2 13 766 WWA
MS Coast ARA
W5SGL 346 2 23 754 MS
Sacramento ARC
W6AK 178 2 10 706 SV
W1PHB 137 2 8 674 CT
WW Medical Services Em Comm Dist 5
AD7AW 104 2 3 658 WWA
Emporia ARS
KBØSSR 122 2 20 644 KS
Mystic Valley ARG
N1MV 18 2 25 636 EMA
Lunenburg Cty ARC
VE1LUN 287 2 7 626 MAR
Thunderbolt ARA
KJØT 38 2 8 626 CO
OFOG Group
WAØCTZ 61 2 6 616 CO
Southern California Japanese Ham Club
K6JP 110 2 6 570 LAX
Decatur Cty ARC
WS8R 67 2 20 534 TN
Inland Empire ARC
W6IER 197 2 8 530 ORG
Keweenaw Cty Repeater Association
K8MDH 84 2 3 518 MI
MWA
N8OXC 59 2 8 486 OH
Portage ARC
VE4PTG 62 2 6 474 MB

3A Battery

K5DF 928 5 30 10,060 LA
Scenic City ARS
W4SCA 474 5 12 4,885 GA
Reno QRP Group
W7FST 454 5 19 4,860 NV
Illiana RC
W9IRC 344 5 10 3,245 IL
DeKalb Cty ARC
W4GBR 286 5 16 3,050 AL
Colorado QRP Club
NØCQC 231 5 37 2,830 CO
Amherst U-U Hams
WB2VUO 220 5 4 2,355 WNY
Elgin ARS
VE3RSE 248 5 11 1,895 ON
French Creek QRP Renegades
W3PBC 112 5 4 1,445 EPA
QCWA Chapter 162
K9AKG 52 5 12 1,370 WI
C^5
KI7EL 91 5 3 1,245 WWA
Bathurst Area Amateurs
VE9BNB 46 5 5 780 MAR
N4ZAK 56 5 5 730 NC

3A Commercial

Zamora Shrine RC
W4ZHR (+KD4N)
1467 2 27 5,298 AL
North Franklin ARS
N2NNY (+KC2VMF)
1005 2 10 4,258 NNY
Splitrock ARA
K2RF 1000 2 20 3,784 NNJ
Pottstown Area ARC
K3ZMC (+N3WXW)
1109 2 65 3,642 EPA
Macon Cty ARC
NØPR (+ABØC)
884 2 12 3,426 MO
K5M Consortium
K5M 680 2 7 2,776 WTX
CBF ARC
W8CBF 870 2 33 2,254 OH
Douglas Cty ARC
WØUK 445 2 50 1,992 KS
RA of WNY
W2PE 406 2 15 1,764 WNY
Fayette Cty ARC
KK4GQ 675 2 13 1,642 GA
Cascade RC
W7EK 436 2 19 1,588 WWA
Cumberland ARC
K3IEC 426 2 16 1,576 EPA
Club Radio Amateur de l'Estrie
VE2RAE (+VA2MZ)
409 2 52 1,382 QC
Beach & Inland Group of Emergency Amateur Repeater System
NE4SC 283 2 16 1,250 SC
Stubblefield Repeater Club
K4HJ 222 2 16 1,112 KY
ARA of the Southern Tier
W2ZJ 168 2 25 1,062 WNY
Sylvan Springs ARC
KJ4SWD (+KA4BRG)
106 2 32 1,062 AL
Southern Sierra ARS
K6EO 500 2 22 1,050 SJV
Hillsdale Cty ARC
K8HRC 187 2 9 1,028 MI
Skyline ARC
W7DTV 459 2 8 980 OR
Emerald ARS
WA7FQD 168 2 18 934 OR
WU5PIG 233 2 10 816 AR
Jersey Shore ARS
NJ2AR 178 2 65 646 SNJ
Northwest IA ARC
WØVHQ 107 2 29 564 IA
Lakes Area ARC
W5JAS (+KE5RIJ)
117 2 10 544 STX
Portage ARC
KJ3O (+N8IIQ)
97 2 10 444 OH
Islanders ARA
W4IAR 108 2 12 322 SC
Chipola ARC
W4BKD 34 2 14 250 NFL

4A

Huntsville ARC
K4BFT (+KI4PMW)
5506 2 39 17,140 AL
Utah DX Assn
K7UM (+KE7VHF)
4739 2 37 15,154 UT
Palo Alto ARA
W6ARA (+W6OTX)
4114 2 108 13,570 SCV
Boars RC
NG5A (+AD5NR)
2980 2 47 11,874 NTX
Delaware ARA
K8ES (+W8JK)
3439 2 48 11,610 OH
Old Barney ARC
N2OB (+N2CW)
3288 2 25 11,122 SNJ
Vienna Wireless Society
K4XY (+K4HTA)
3075 2 127 10,358 VA
United Radio Amateur Club
K6AA (+W6ADC)
2782 2 32 8,872 LAX
Jackson Cty ARA & Magnolia DX Assn
K5MDX (+N5OS)
2423 2 119 8,636 MS
Westchester Em Comm Assn
N2SF (+KD2SQ)
2454 2 35 8,626 ENY
Roanoke Valley ARC
W4CA (+AB4A)
2453 2 30 8,316 VA
Portage Cty AR Service
K8BF (+N8QE)
2669 2 140 7,880 OH
Contoocook Valley RC
K1BKE (+K1DFQ)
2348 2 58 7,460 NH
Nassau ARC
K2VN 1782 2 41 6,638 NLI
White Mountain ARC
W1MWV 1497 2 25 6,256 NH
North Richland Hills ARC
K5NRH (+W5GT)
1474 2 57 6,216 NTX
Orange Cty ARC
W6ZE (+W6BAC)
1878 2 66 5,936 ORG
Radio Club of Tacoma
W7DK (+W7OS)
1586 2 82 5,906 WWA
Murgas ARC
K3YTL (+W3MTP)
1736 2 31 5,872 EPA
Cumberland Plateau ARC
W4CV (+KJ4RRZ)
1373 2 50 5,808 TN
Estes Valley ARC
NØFH (+NØFHS)
1282 2 7 5,564 CO
Mt Vernon ARC
K8EEN 1514 2 25 5,550 OH
Warminster ARC
K3DN 1757 2 35 5,434 EPA
Green Mtn Wireless Soc
N1VT (+AB1CH)
1476 2 26 5,390 VT
Medina 2 Meter Group
W8HN (+W8EOC)
1412 2 19 5,338 OH
Northern Berkshire ARC
N1WM (+K1FFK)
1224 2 30 5,298 WMA
Kennehoochee ARC
W4BTI 1302 2 106 5,238 GA
Eastern Connecticut ARA
K1MUJ 1579 2 30 5,144 CT
Manotick ARG
VE3AIR 1277 2 57 4,764 ON
Washington Amateur Communications
WA3COM (+KC3HW)
1253 2 73 4,736 WPA
Oregon Tualatin Valley ARC
W7OTV 1338 2 95 4,694 OR
Hamilton ARC
VE3DC 1756 2 51 4,662 ON
W8VP 914 2 40 4,656 OH
WB7QIW (+N7QR)
1180 2 30 4,440 OR
RS of Tucson
K7RST (+WØHF)
1122 2 37 4,224 AZ
ALL ARC
W7PU (+KR7DX)
898 2 6 4,038 WWA
Rip Van Winkle ARS
WD2K 904 2 18 4,022 ENY
Delaware Lehigh ARC
W3OK (+WX3MAS)
1083 2 56 3,972 EPA
W9AML 1008 2 30 3,956 IL
Wilderness Road ARC
W4CDA 798 2 28 3,862 KY
Brazos Valley ARC
KK5W (+W5DPA)
1021 2 48 3,834 STX
Peel ARC
VE3XR (+VA3ITA)
909 2 32 3,766 ON
T-CEP Disaster Radio Team
K6TI (+W6TOP)
914 2 36 3,760 LAX
Beloit ARC
W9BJ 1061 2 20 3,384 WI
Hot Springs ARC
KØHS 672 2 21 3,352 SD
Marion ARC
W8GVB (+WW8MRN)
564 2 25 3,340 OH
Garrett Cty ARES
KB3SKW 607 2 15 3,310 MDC
Chesapeake ARS
W4CAR (+W4FOS)
827 2 40 3,290 VA
Saratoga Cty ARA
K2DLL (+N2MBX)
883 2 40 3,158 ENY
Central NH ARC
W1JY (+W1CNH)
525 2 27 3,126 NH
Pasadena RC
W6KA 711 2 45 3,062 LAX
Thin Air Radio Society
KØUE 985 2 6 3,060 CO
Orange Cty ARC
W2HO 803 2 34 3,054 ENY
Southern PA Communications Group
K3AE 780 2 54 3,044 EPA
Siskiyou Cty ARA
K6SIS (+NR6J)
953 2 4 3,014 SV
Intercity ARC
W8WE (+W8WER)
669 2 12 2,982 OH
High Sierra FD Group
W6PS 926 2 8 2,966 SV
West Chester ARA
WC8VOA 1226 1 20 2,946 OH
Hewlett Packard Boise ARC
AB7HP (+W6ZOH)
544 2 16 2,938 ID
Brightleaf ARC
W4AMC 512 2 36 2,924 NC
Panhandle ARC
W5WX (+N5HPJ)
713 2 25 2,922 WTX
Plattsmouth ARC
KBØSMX 482 2 34 2,912 NE
Delta Cty ARS
K8PL 814 2 15 2,896 MI
W8ZHO 494 2 47 2,886 MI
Middlesex ARS
W1EDH 612 2 15 2,872 CT
Benzie AR Friends
W8BNZ 817 2 41 2,848 MI
Sky Valley ARC
W7SKY 615 2 22 2,812 WWA
Triangle ARC
K8BLP (+K8HGY)
521 2 14 2,730 OH
Central Kansas ARC & KWU RC
WØCY (+KAØKWU)
873 2 20 2,684 KS
Southern PA ARC
K3IR 616 2 11 2,610 EPA
Silvercreek ARA
W8WKY 823 2 13 2,598 OH
North Hills ARC
K3GT (+W3EXW)
479 2 68 2,486 WPA
Thunderbird Amateur RC
WG7J 658 2 15 2,482 AZ
Littleton Radio Amateurs
KØXTR (+NØXDB)
620 2 8 2,480 CO
North Ottawa ARC
W8CSO 497 2 37 2,376 MI
Skyline ARC/Liverpool Am Repeater Club
K2IWR 694 2 35 2,358 WNY
Southern IN Mobile Em Comm Team
KB9NEJ 744 2 7 2,338 IN
Eva ARC
KI4FDU (+N5TRL)
510 2 15 2,302 AL
Monongalia Wireless Assn
W8MWA 455 2 15 2,274 WV
Ramapo Mtn Amateur RC
WA2SNA 555 2 8 2,268 NNJ
Golden Spike ARC
K7UB 487 2 51 2,262 UT
York Region ARC
VE3YRA 578 2 25 2,240 ON
Boston ARC
W1BOS 635 2 15 2,214 EMA
Cheshire Cty DX Club
AD1T 804 2 9 2,164 NH
Yakima Amateur RC
W7AQ 651 2 10 2,152 EWA
Radio Assn of Erie
W3GV 702 2 10 2,150 WPA
XWARN
W8XRN 331 2 13 2,124 OH
South East Texas Amateur Club
KD5MAM 393 2 25 2,110 STX
K3FLT 420 2 20 2,110 EPA
North Shore ARC
VE3NSR 492 2 20 2,098 ON
Skyview ARS
WX3SKY (+NU3Q)
360 2 15 2,082 WPA
Santa Fe Trail ARC
KSØKS (+KDØKLD)
323 2 27 2,036 KS
Northern KY ARC
K4CO 470 2 24 2,008 KY
10-70 Repeater Assn
N2SE (+W2INS)
284 2 34 1,990 NNJ
W4W 435 2 21 1,960 TN
Las Vegas RAC
N7A 447 2 81 1,942 NV
Lake Oswego ARES
WA7LO 321 2 42 1,920 OR
Palisades ARC
W9IW 469 2 15 1,920 IL
Cleveland ARC
W4GZX (+KD5UBL)
213 2 65 1,908 TN
Breck AR VE Net
K5SMH 408 2 6 1,880 NTX
N9JM 555 2 9 1,880 IN
Lassen ARC
K6LRC 350 2 22 1,866 SV
Columbia ARA
N7EI 336 2 20 1,860 OR
Mountain ARC
W3YMW 230 2 10 1,830 MDC
Yellowstone RC
K7EFA (+WN7Y)
345 2 38 1,782 MT
VE3RAM 397 2 30 1,758 ON
Terrie Hill and Friends
W7SST 301 2 20 1,724 OR
Grande Ronde RA Assn
W7GRA (+KE7ZSC)
256 2 12 1,670 OR
Elk Cty ARA
N3NIA (+K3TMD)
452 2 31 1,664 WPA
Tulore Cty ARC
WA6BAI (+KI6QCY)
304 2 25 1,662 SJV
Sun Country ARS
W4CW 325 2 10 1,608 NFL
Rural Iowa ARES
WØI 237 2 10 1,594 IA
Fulton ARC / Oswego RACES-OCEC
W2OSC 404 2 15 1,586 WNY
Elliot Lake ARC
VA3TOP 230 2 8 1,532 ON
Butler Cty AR Public Service Group
K3PSG 383 2 22 1,524 WPA
Land of Lakes ARC
K9HD 451 2 11 1,492 IN
Bootheel ARC
KBØUFL 109 2 33 1,488 MO

Capital City ARC
W7TCK (+W7MRI)
143 2 24 1,484 MT
Thumb ARC
W8AX 240 2 42 1,480 MI
Columbus ARC
W9ALQ (+W9SCI)
224 2 24 1,450 IN
Durant Amateur Repeater Assn
K5KIE 292 2 13 1,434 OK
ARC of Anderson
NC6I 214 2 57 1,394 SV
Maxim Ham Club
K7AKP 710 1 7 1,384 OR
San Antonio RC
W5SC 199 2 24 1,286 STX
AD4X 169 2 10 1,262 KY
Haywood Cty ARG
KI4BXI 66 2 35 1,252 TN
Radio Amateurs of The Gorge
W7RAG 129 2 34 1,248 OR
North GA Tri-State ARC
W4NGT (+AJ4YH)
205 2 8 1,248 GA
Bellevue ARC
WØWYV 230 2 19 1,242 NE
Northwest GA ARC
W4VO 110 2 6 1,210 GA
TriCities ARC
W7AZ 166 2 7 1,184 EWA
Maple Ridge ARC
VE7CMR 292 2 15 1,174 BC
Grays Harbor ARC
W7ZA 246 2 28 1,128 WWA
Great Falls ARC
W7ECR 172 2 9 1,120 MT
Allegan Cty ARC
AC8RC (+KD8LZT)
152 2 21 1,106 MI
Northern Colorado ARC
WØUPS 183 2 21 1,102 CO
Northeastern Indiana ARC
W9OU 238 2 12 1,078 IN
Jonestown Mtn Repeater Assn
N3CSE 231 2 12 1,036 EPA
DARA Site 2
AC8DE 222 2 10 1,002 OH
Headwaters ARC
N3PC 206 2 15 1,002 WPA
Mountain Rangers
N7TCO 290 2 4 980 EWA
Ogemaw Arenac ARS
K8OAR 178 2 13 956 MI
Superstition ARC
WB7TJD 71 2 10 934 AZ
Honeywell-Glendale ARC
K7HON 265 2 11 930 AZ
Sequoia ARG
N6KRV 134 2 6 878 SJV
Altus Area ARA
AJ5Q 56 2 12 862 OK
Clare Cty Emergency Management
KA8DCJ 80 2 20 860 MI
Katy ARS
KT5TX 69 2 25 834 STX
Jungle Jims
K9VSO 109 2 8 822 WI
KC2QVQ 207 2 6 814 WNY
Delaware Valley Ragchew Club
N2HQX 34 2 12 768 SNJ
KC7YSW 36 2 8 722 ORG
Ozark Repeater Assn
K4OZK 93 2 6 684 AL
Northwoods AR Group
KDØJFI 101 2 10 678 MN
WA6YBN 77 2 14 236 ORG

4A Battery

St Louis QRP Society
NFØR 326 5 10 4,410 MO
Portland ARC
W7LT 452 5 16 4,135 OR
Friends Of The 045 Repeater
W6V 300 5 13 2,690 EB
Seaside Tsunami ARS
WA7VE (+WA7FIV)
190 5 61 2,170 OR
K7SI 131 5 4 1,755 ID

4A Commercial

Western Tidewater RA
WT4RA 1510 2 30 4,000 VA
RL Drake ARC
K8UU 1055 2 17 3,272 OH
Scioto Cty ARES / PRC
N8QA 1379 2 7 2,926 OH
Milledgeville ARC
W4M 839 2 15 2,682 GA
Drake State Technical College ARC
N4DTC 936 2 7 2,520 AL
Hazleton Anthracite Repeater Assn
W3SJI 597 2 20 1,876 EPA
DCAR
KDØLDI (+KØRGT)
331 2 25 1,694 MO
W5KS (+K5USA)
516 2 25 1,648 OK
Four Cty ARES
NC4CA (+NC4CA)
460 2 7 1,470 NC
Ashland Area Amateur Call
N8IHI 400 2 12 1,266 OH
Black River ARC
K8BRC 377 2 10 1,204 MI
WCLARC
WM5X 272 2 33 932 LA
Foothills ARS
VE6FAR 130 2 22 610 AB

5A

Port City ARC
K1R (+W1WQM)
6206 2 40 19,638 NH
Loudoun ARG
K4LRG (+AJ4EY)
3757 2 57 13,674 VA
North Shore RA
NS1RA (+KB1PAL)
3707 2 70 13,666 EMA
VA Beach ARC and VADXCC
W4UG (+K4IX)
3355 2 60 10,922 VA
Ozaukee Radio Club SSC
W9LO (+AA9W)
3112 2 43 10,624 WI
Cherryland ARC
W8TCM 3242 2 35 8,534 MI
Ft Smith Area ARC
W5ANR 2443 2 38 8,326 AR
Columbus ARC & Russell Cty RC
W4AN (+W4CVY)
1684 2 49 7,862 AL
Arrow Comm Assn
W8UM (+W8PGW)
1865 2 50 7,584 MI
St Petersburg ARC
W4TA 1662 2 35 7,018 WCF
Catalina RC
W7SA (+AK7AZ)
1909 2 105 6,712 AZ
Phil-Mont Mobile RC
W3EM (+W3PSH)
1747 2 40 6,344 EPA
Hazel Park ARC
W8HP (+W8JXU)
1674 2 35 6,302 MI
Schenectady ARA
K2AE (+W2UI)
1537 2 36 6,268 ENY
L'Anse Creuse ARC
N8LC 1777 2 22 5,474 MI
Smoky Mt ARC
W4OLB 1179 2 21 5,446 TN
Highlands Cty ARC
K4W (+KD4GMK)
1263 2 25 4,900 WCF
Two Rivers ARC
W3OC 1178 2 21 4,806 WPA
Sun Parlour Retirees ARC
VE3OW 1623 2 25 4,486 ON
Owatonna Steele Cty ARC
NØUW (+NØRPI)
1057 2 25 4,250 MN
Niagara Peninsula ARC, Inc.
VE3VM (+VE3ROW)
1521 2 30 4,194 ON
Cambridge ARC
VE3SWA 999 2 5 4,144 ON
Iredell Cty ARS
W4SNC 1091 2 25 3,910 NC
Twin City ARC
K9CU 976 2 40 3,880 IL
Tipp City AR Group
K8ZC 741 2 10 3,640 OH
Bellbrook ARC
W8DGN 808 2 68 3,506 OH
Kern Cty Central Valley ARC
W6LIE 941 2 56 3,460 SJV
Starved Rock RC
W9MKS (+K9ZQ)
616 2 67 3,456 IL
Wheaton Community Radio Amateurs
W9CCU 896 2 15 3,454 IL
South Pickering ARC
VE3SPC 1057 2 20 3,364 ON
Sheboygan Cty ARC
W9VCL (+AB9FT)
729 2 15 3,260 WI
Alford Memorial RC
W4BOC (+KJ4QIB)
644 2 100 3,242 GA
RA of Greater Syracuse
W2AE 591 2 45 3,180 WNY
Citrus Belt ARC
W6JBT 644 2 21 2,962 ORG
Wood Cty EmComm
WC8EC 543 2 25 2,826 WV
Maury ARC
W4GGM 514 2 20 2,728 TN
Athens ARC - NE Georgia ARC
W4G (+NE4GA)
557 2 28 2,702 GA
Alexandria RC
W4HFH 636 2 25 2,568 VA
Wayne Cty ARA
K4CYP 546 2 26 2,530 NC
Bridgerland ARC
W7IVM 539 2 30 2,488 UT
Kendall ARS
KB5TX 499 2 13 2,482 STX
Sangamon Valley RC
W9DUA 649 2 40 2,456 IL
Whitman ARC, Inc.
W1N 614 2 34 2,362 EMA
Clinton / Highland ARAs
W8O (+W8GO)
446 2 45 2,348 OH
Alphalpha Repeater Group &
Lealman Fire CERT
W4A 408 2 18 2,316 WCF
Tri-Cty Amateurs
KC9OLF 566 2 21 2,232 IN
Crawford Cty ARC
W8BAE 632 2 27 2,134 OH
RF Hill ARC
W3AI 431 2 16 2,052 EPA
Kent ARS
K3ARS (+N3WGC)
296 2 23 2,044 MDC
W6RHC (+KJ6HCG)
282 2 9 2,038 SV
Sun City ARC
K5WPH 482 2 25 1,944 NM
International Brotherhood Radio Operators
KD8KNX 343 2 22 1,902 OH
Riverside Radio Amateurs
WA8RRA 322 2 14 1,824 MI
Regional EmComm & Weather Assn
WW2FD 539 2 6 1,778 ENY
Int'l Radio Consortium of the Mystical Town
of Waugh
W9B 484 2 18 1,776 IN
London ARC
VE3LON 345 2 49 1,750 ON
Issaquah ARC
W7BI (+AJ4AD)
192 2 15 1,728 WWA
Chelsea ARC
WD8IEL 328 2 11 1,720 MI
ARCs of Spokane
N7LC (+K7YY)
194 2 50 1,716 EWA
Kent Muskegon Ottawa Cty RACES
K8WNJ 303 2 12 1,698 MI
Bolingbrook ARS
K9BAR 244 2 36 1,688 IL
Mount Vernon ARC
K4US 244 2 7 1,488 VA
Sunset Empire ARC
W7BU (+WA7PIX)
215 2 10 1,480 OR
Ak-Sar-Ben ARC
KØUSA 248 2 21 1,464 NE
Outdoor Adventure USA
KI6ZQL 332 2 25 1,414 ORG
Johnston Cty ARS
K4SWR 250 2 30 1,360 NC
VE3WOM 394 2 10 1,338 ON
Western Placer ARC
K6PAC 209 2 37 1,320 SV
Kings Cty Repeater Assn
KC2RA 155 2 22 1,282 NLI
Lancaster & Fairfield Cty ARC
K8QIK 116 2 23 1,262 OH
Duval Cty ARES/BARS
K4D 169 1 10 1,129 NFL
Western Reserve ARC
W8WRC 50 2 20 1,108 OH
TCARES
K6TUO 298 2 40 1,058 SJV

5A Battery

Zuni Loop Mtn Expeditionary Force
N6GA 958 5 9 9,145 LAX
Forsyth ARC
W4NC (+W4WS)
1023 5 22 8,430 NC
McMinnville ARC /YCARES
W7YAM 237 5 12 2,725 OR
North Coast ARC
N8NC 219 5 35 2,325 OH
Alamo Area Radio Organization
AA5RO (+W5QS)
91 5 67 1,780 STX
Houston QRP Club
W5MSQ 91 5 16 1,420 STX

5A Commercial

Sawnee ARA
N4NE 2497 2 114 7,904 GA
Wisconsin ARC
W9CQ (+KC9SLL)
625 2 11 2,450 WI
W5TCR 343 2 10 1,360 MS
Iowa Great Lakes ARC
WØDOG 195 2 6 640 IA

6A

Woodbridge Wireless
W4IY 4072 2 30 13,308 VA
South Jersey Radio Assn
K2AA (+W2EA)
3635 2 27 12,856 SNJ
Mike & Key ARC
K7LED (+AB7HA)
3230 2 76 9,632 WWA
Fox River Radio League
W9NE (+W9CEQ)
1979 2 45 8,240 IL
Findlay RC
W8FT (+NA8W)
1848 2 33 7,726 OH
Orlando ARC
W1SE (+W4PLB)
1890 2 28 7,240 NFL
Lake Monroe ARS
N4EH (+KJ4QOX)
2126 2 80 6,696 NFL
Fort Wayne RC
W9TE (+K9RFZ)
1675 2 50 6,588 IN
Central Mass ARA
W1BIM 1659 2 21 6,230 WMA
Delta ARS
VE7SUN (+VE7TJL)
1290 2 15 5,318 BC
Fountain Valley Amateur Comm Team &
West Coast ARC
WA6FV 1320 2 26 5,292 ORG
Andrew Johnson ARC
W4WC (+AG4OB)
1215 2 22 5,056 TN
ARA of Southwest FL
W4F 1664 2 29 4,426 SFL
Silver Springs RC
K4GSO 1414 2 20 4,234 NFL
Columbia ARC
W4CAE (+AL7MO)
791 2 55 3,730 SC
W4LX (+KJ4MUY)
986 2 25 3,634 SFL
Brantford ARC
VE3BA 1249 2 9 3,512 ON
Fulton County ARC
K8BXQ 885 2 10 3,434 OH

PETE THEILER, KI4KN

Ninety year old Fritz Nitsch, W4NTO, the oldest member and one of the founders of the Spartanburg Amateur Radio Club, K4II, handles some of their PR responsibilities.

W7JVO 553 2 16 3,054 OR
Kitchener-Waterloo ARC
VE3IC 761 2 10 3,038 ON
Upper Valley ARC
K8FBN 633 2 32 2,966 OH
Denver RC
WØTX 598 2 41 2,858 CO
Waterville Area Wireless Assn
WA1WA 537 2 7 2,670 ME
East River ARC
W8MOP 504 2 14 2,526 VA
Coachella Valley ARC
NR6P 431 2 15 2,446 ORG
Saginaw Valley ARC
K8DAC 381 2 38 2,372 MI
W8KEA 432 2 20 2,346 MI
Holland ARC
K8DAA 403 2 25 2,278 MI
Toledo Mobile RA
W8HHF (+NN1I)
574 2 63 2,200 OH
Northern OH ARS
K8KRG 421 2 44 2,096 OH
South East Metro ARC
WØCGM 330 2 21 2,088 MN
Greene Cty ARC Of NY
N2LEN (+KC2HTV)
235 2 11 2,048 ENY
N7OY (+KU7G)
143 2 30 1,816 OR
Clarksville Operating Radio Enthusiasts
K4ORE 309 2 15 1,778 TN
Atascosa Cty ARC
WA5AR 107 2 6 1,624 STX
Sterling Rock Falls ARS
W9MEP 284 2 33 1,534 IL
Pickaway ARES
KG8EK 126 2 16 1,348 OH
Calaveras ARS
N6FRG 186 2 14 992 SJV

6A Commercial

LaGrange ARC
AB4KE 563 2 47 1,968 GA
AA2GV 199 2 16 1,014 WNY

7A

Lake ARA
K4FC (+WN4AMO)
4977 2 46 15,902 NFL
Carroll Cty ARC & Carroll Cty Contesters
WY3P (+WO3L)
3860 2 28 12,180 MDC
Hampden Cty RA
W1NY (+WB1Z)
2874 2 30 9,938 WMA
Central KY ARS
AA4NJ (+KE4YVD)
2501 2 21 8,438 KY
Lake Cty ARA
N8BC 1932 2 23 7,532 OH
K6BB 1679 2 20 6,730 ORG
Marple-Newtown/Mobile 6ers/MARC/
Vertol Bears
N3NZ (+KB3TVK)
1248 2 67 6,046 EPA
Broken Arrow ARC
W5BBS (+KF5COA)
1082 2 100 4,412 OK
MGRA & CGARC
K4R (+KJ4O)
1062 2 75 4,054 GA
Four Lakes Amateur Radio Club
W9JZ 691 2 23 3,824 WI
Silverado ARS
W6CO (+KO6FR)
688 2 14 3,172 EB
Scharborough ARC
VE3WE 429 2 22 2,324 ON
W6BXN (+AA6D)
637 2 19 2,290 SJV
Bucyrus ARC
W8BRG 340 2 11 2,192 OH
Cherokee Capital ARS
K4WOC 290 2 30 2,082 GA

7A Battery

West Valley ARA
K6EI (+W6ZZZ)
1611 5 20 15,450 SCV

8A

Raleigh ARS
W4DW (+W4RNC)
3920 2 61 12,802 NC
Gloucester Cty ARC
W2MMD 2848 2 24 11,306 SNJ
Rappahannock Valley ARC
K4TS (+NX4Q)
2938 2 49 10,450 VA
Cuyahoga ARS
W8BM 2336 2 30 8,454 OH
Gwinnett ARS
W4GR 2232 2 150 7,516 GA
DuPage ARC
W9DUP (+K9RMZ)
1718 2 66 7,132 IL
Mahoning Valley ARA
W8QLY (+W8IZC)
1362 2 63 4,876 OH
South West IA ARC
KØSWI 945 2 20 4,004 IA
Kalamazoo ARC
W8VY 1252 2 25 3,998 MI
Associated RA of Long Beach
W6RO 776 2 60 3,402 LAX
Lancaster ARC
W2SO 721 2 10 2,810 WNY
Barry ARA
K8BMI 501 2 48 2,620 MI

8A Battery

Durham Region QRP Club
VE3QDR 896 5 8 9,540 ON

9A

Wabash Valley ARA
W9UUU 1454 2 58 5,586 IN
Boeing Employees ARS / Kansas
NØW (+KØW)
1157 2 51 5,512 KS
Keuka Lake ARA
AI2U 587 2 38 3,142 WNY
Laughery Valley ARC
K9DRT 529 2 12 2,666 IN
Stanislaus ARA
W6ERE 397 2 27 2,024 SJV

9A Battery

David Sarnoff ARC
N2RE (+N4MVU)
193 5 40 3,040 SNJ

10A

Mississauga ARC
VE3MIS (+VE3RCX)
2273 2 25 8,088 ON
Anne Arundel RC
W3VPR 1735 2 103 7,228 MDC
W7SAA 1777 2 30 7,056 OR
Sabine Valley ARA
K5GVL 364 2 30 2,496 NTX

10A Battery

Orange Co Radio Amateurs/
Durham FM Assn
W4EZ 1434 5 27 13,445 NC

11A

Nashua Area RC
N1FD (+KA1RON)
2894 2 50 11,212 NH
El Dorado ARC
AG6AU 491 2 41 2,412 SV

15A Battery

USECA ARC
K8UO 1446 5 100 13,890 MI

19A

Ventura Cty ARS/AARC/CVARC/HHQCC/
SSARC/VCARC
N6R (+K6VCS)
2204 2 75 9,592 SB

24A

Potomac Valley RC and Columbia ARA
W3AO (+KE3Q)
10,585 2 60 33,452 MDC

1B-1 Op Battery

N4TY 921 5 1 9,360 KY
W7QC 683 5 1 7,280 ID
N8BB 642 5 1 6,570 MI
K5WNH 573 5 1 5,980 NTX
W3TS 503 5 1 5,480 EPA
W1ECH 610 5 1 5,385 VT
W5JBV 505 5 1 4,940 NFL
KXØR 420 5 1 4,475 WY
KEØG 417 5 1 4,270 MN
VE3RER 378 5 1 3,980 ON
K7IA 359 5 1 3,940 NM
K8AB 300 5 1 3,150 OH
W7GKF 283 5 1 2,980 MI
W9NJY 254 5 1 2,890 WI
AA5CK 261 5 1 2,730 OK
NZ5A 246 5 1 2,710 STX
K4RDU 250 5 1 2,700 VA
K5WX 254 5 1 2,690 STX
VE2GB 246 5 1 2,660 QC
AD5WI 241 5 1 2,600 AR
K9JWV 229 5 1 2,540 UT
N3AB 232 5 1 2,470 EPA
KD2JC 216 5 1 2,360 NNJ
KX9X/1 222 5 1 2,055 VT
N3XRV 140 5 1 1,950 DE
K1PDY 158 5 1 1,930 NH
AE8M 166 5 1 1,910 NC
NQ7R 147 5 1 1,705 AZ
N3RN 153 5 1 1,605 EPA
K9FOH 129 5 1 1,505 IN
W7CD 105 5 1 1,490 WWA
NØFKC 82 5 1 1,470 MN
KD9KC 125 5 1 1,450 WTX
KB7LJP 107 5 1 1,420 WWA
K8ZT 99 5 1 1,325 ME
N7ARE 172 5 1 1,310 UT
AF4O 104 5 1 1,290 TN
N4AX 126 5 1 1,255 AL
KIØII 99 5 1 1,240 NE
K9SIU 108 5 1 1,225 IL
NM5S 157 5 1 1,220 NM
VA7XN 119 5 1 1,155 BC
VE3ENG 91 5 1 1,110 ON
WD5HNI 190 5 1 1,100 STX
NI8N 104 5 1 1,090 OH
AB8DF 91 5 1 1,060 MI
WB5UAA 77 5 1 1,020 NTX
WB3CEG 75 5 1 1,000 STX
KA5GIS 90 5 1 1,000 AR
WBØKHQ 88 5 1 990 IA
K6CU 82 5 1 970 ORG
N8XMS 71 5 1 960 MI
KB5FIO 48 5 1 930 STX
WB5NMZ 71 5 1 910 AL
N2JR 80 5 1 895 VA
KFØQS 73 5 1 880 CO
WUØL 53 5 1 880 SD
N8MFN 78 5 1 875 OH
K5SI 75 5 1 850 STX
N6DIT 69 5 1 840 SJV
W9HBH 91 5 1 805 IN
W9SRB 110 5 1 800 IL
KB2BIT 51 5 1 770 NFL
WA4MXF 56 5 1 760 TN
AM1MI 74 5 1 720 NH
WD9EWK 49 5 1 695 AZ
KE3HG 39 5 1 690 EPA
K6GCN 107 5 1 685 SCV
AB4EL 53 5 1 680 NC
AB1MI 74 5 1 670 NH
KB1PBA 48 5 1 630 EMA
KD2MU 48 5 1 625 NLI
K3TW 45 5 1 600 NFL
KØWRZ 87 5 1 585 KS
VA2SG 51 5 1 560 QC
AF6NI 32 5 1 545 SDG
AD7L 39 5 1 540 OR
AC4QX 44 5 1 540 NC
W2EB 18 5 1 530 WNY
W9AQ 93 5 1 515 IL
KQ6ES 30 5 1 450 ORG
W8CDL 50 5 1 450 OH
KD5FJJ 12 5 1 410 NTX
K7CN/7 26 5 1 410 OR
AK4BH 42 5 1 395 VA
AD7QF 6 5 1 385 UT
N7WY 27 5 1 370 SCV
WA3LGG 7 5 1 370 EPA
WB2GBF 41 5 1 355 NNJ
W4HH 24 5 1 340 VA
KF7DVJ 5 5 1 300 UT
KE7UQL 10 5 1 300 NV
AE4M 6 5 1 280 AL
VE7BQO/VY 113 5 1 280 NWT
KD7OED/6 3 5 1 265 SCV
VE2AHH 16 5 1 260 QC
KD8EFR 1 5 1 255 OH
N2ESE 10 5 1 250 NNJ
K9CHP 17 5 1 235 WNY
KB1QKB 4 5 1 220 NH
VE7XPK 13 5 1 215 BC
K2RNY 16 5 1 210 WNY
W1INC 10 5 1 200 NH
W5OK 9 5 1 195 OK
KB1HCD 28 5 1 190 CT
N1MMY 25 5 1 175 EB
KD5MFY 4 5 1 170 OK
KL7/WA4DOX 1 5 1 160 AK
KI4FW 8 5 1 125 VA
KE6SMG 10 5 1 100 SJV
W9VQ 8 5 1 100 IL
WA7TPB 9 5 1 95 EWA
KE7WHC 1 5 1 60 AZ

1B-1 Op

NØAT 1100 2 1 5,040 MN
K5LG 1139 2 1 4,606 AR
WB9COY 1160 2 1 4,564 SDG
WØQE 949 2 1 3,970 CO
K3TM 745 2 1 3,130 MDC
K9CJ 715 2 1 2,960 IN
KB4PPE 599 2 1 2,746 SC
N4UF 531 2 1 2,232 NFL
ABØRX 711 2 1 2,210 MO
K7RF 487 2 1 1,994 OR
N7DLV 428 2 1 1,506 WWA
KA2OUO/3 377 2 1 1,482 MDC
VE2EZD 227 2 1 1,336 QC
N4QQ 310 2 1 1,334 MDC
NØUY 282 2 1 1,284 MN
N8TD 219 2 1 1,206 OH
KU4MH 228 2 1 1,162 VA
W4UX 292 2 1 1,084 TN
KU7K 231 2 1 982 OR
W1VR 362 2 1 974 NFL
NØRU 275 2 1 964 CO
WE6Z 516 1 1 953 SV
WB3AKD 126 2 1 896 VA
W9KHH 164 2 1 856 WI
KE7ZCU 224 2 1 850 WWA
KB8UHN 328 2 1 826 OH
W7ATC 235 2 1 820 ID
NB7O 119 2 1 796 OR
KB8HOC 130 2 1 770 OH
W5TAF 153 2 1 762 OK
KJ4RSK 291 2 1 732 NFL
WA3HJR/4 185 2 1 720 NC
W5ENG 183 2 1 716 STX
NØUB 156 2 1 692 MO
KC7O 204 2 1 692 SB
W1UJ 110 2 1 690 NH
K7EVI 53 2 1 656 EWA
W6SGJ/7 111 2 1 594 WWA
K6KS 138 2 1 526 SV
K7DNH 184 2 1 518 NV
N4QX 79 2 1 494 VA
N2CJ 56 2 1 474 ENY
WA6WPG 64 2 1 440 SB
NT4OM 140 2 1 430 GA
WA2CRQ 68 2 1 422 SV
AD7DD 34 2 1 418 EWA
KW7I 27 2 1 404 OR
W9OOT 140 2 1 380 IN
KJ4BLN 105 2 1 360 GA
VE2PUI 79 2 1 358 QC
W4BFL 53 2 1 356 SFL
VA2BS 125 2 1 350 QC
WB5LRP 99 2 1 348 STX
KF4MKP 99 2 1 338 TN
AC7CJ 34 2 1 318 EWA
KBØYTO 32 2 1 314 NE
N4YLC 22 2 1 294 SF
AI5C 19 2 1 288 SF
W7JAZ 37 2 1 280 OR
VE7DAQ 10 2 1 270 BC
K6ZY 2 2 1 256 WWA
WD8OTT 103 2 1 256 MI
NØBHT 102 2 1 254 CO
KK7OQ 28 2 1 206 OR
KB9BJH 47 2 1 194 WI
WB6MMQ 18 2 1 186 LAX
N5JZD 34 2 1 186 NTX
K7UWR 66 2 1 182 WY
VE2BHH 38 2 1 176 QC
KC2TND 7 2 1 164 WNY
KC7ZO 1 2 1 152 MT
K9XB 30 2 1 110 WI
KB2GGK 5 2 1 110 NNJ
K2EVD 5 2 1 60 NLI
N1GNV 1 2 1 52 CT

1B-1 Op Commercial

K9OM 903 2 1 3,762 WI
K7DR 828 2 1 3,026 MI
WØXR 420 2 1 1,730 CO
W9TCH 470 2 1 1,688 WI
N4UOH 307 2 1 1,216 NC
N9EAX 298 2 1 900 WI
W5RMB 439 2 1 878 AL
KJ4LQX 158 2 1 722 SFL
K4XD 236 2 1 698 NC
WA4IZK/1 128 2 1 306 NH
NØDLS 72 2 1 294 MN
VA2NU 67 2 1 284 QC
ND1T 101 2 1 254 ME
K7YJ 21 2 1 192 EWA
KC2RXS 9 2 1 186 ENY
KF6IIU 37 2 1 124 SV
AF6VN 15 2 1 110 SCV
ABØDK/2 31 2 1 98 WNY
N4NIA 42 2 1 84 GA
N7ZF 8 2 1 66 ID

1B-2 Op Battery

NØEVH 460 5 2 5,250 MO
VA3DF 451 5 2 4,555 ON
N4RE 351 5 2 3,760 NC
VA3YV 364 5 2 3,675 ON
K2WNY (K2SH & K2UD)
304 5 2 3,450 WNY
W7RIN 235 5 2 2,445 AZ
WG5F 150 5 2 1,850 OK
KØG 133 5 2 1,645 CO
N3CU 132 5 2 1,640 EPA
K4NGA 121 5 2 1,065 GA
KA2KGP 86 5 2 1,010 WNY
K2QR 49 5 2 940 WNY
W9RFS 51 5 2 905 WI
K4RET (+N4MJM)
156 5 2 880 VA
N7JI 56 5 2 845 OR
N1BFK 16 5 2 430 NH
N6OSB 27 5 2 410 SCV
AAØT 25 5 2 360 SC
KI6TPX 12 5 2 310 LAX
N6MDV 21 5 2 255 LAX

1B-2 Op

W8TK 1526 2 2 6,854 OH
KEØUI 1232 2 2 4,556 CO
VE6KC 747 2 2 3,238 AB
K7GGG 868 2 2 2,814 AZ
N9EZ 656 2 2 2,774 MI
N5JB 587 2 2 2,568 NTX
VE6AID 565 2 2 2,474 AB
W7POE 428 2 2 2,162 MT
K3WGR 422 2 2 1,794 EPA
WT7B 665 2 2 1,580 ID
K6SB/7 (KI6VFO & W6GL)
325 2 2 1,532 NV
W3SW 626 2 2 1,502 WNY
N5LBJ 571 2 2 1,472 MDC
W6ZH 309 2 2 1,318 LAX
N6JF 279 2 2 1,262 LAX
WB5LYJ 184 2 2 1,212 NM
K7PX 200 2 2 988 MT
KEØPX (+NØSRF)
415 2 2 930 CO
NZ5G 201 2 2 856 STX
K7AUO 209 2 2 602 WWA
WA6RC 59 2 2 568 LAX
K5TEE 29 2 2 528 NM
WB2AZE 66 2 2 482 NNJ
K7NS 57 2 2 456 UT
NA9Q/VY1 50 2 2 350 NWT

KB8TWM	146	2	2	342	OH
N2MEE (+KC2YRU)					
	113	2	2	326	ENY
K7FD	107	2	2	282	OR
NX1T	61	2	2	272	CT
ACØFQ	50	2	2	250	CO
N5QZ	79	2	2	208	AR
WO9Z	28	2	2	206	IN
WA2YCJ (+WAØLHC)					
	48	2	2	196	NNJ
KDØGUY	17	2	2	184	CO
KC8NDA	65	2	2	180	MI

1B-2 Op, Commercial

NT2A	806	2	2	2,658	NLI
K5PA	141	2	2	374	STX

2B-2 Op Battery

K3ZZ	1188	5	2	8,725	MDC
W1RT	623	5	2	6,125	EPA
KY4HF	458	5	2	5,030	KY
N8EFO	436	5	2	4,270	OH
KGØRD	271	5	2	3,160	IA
WA2SOC	281	5	2	2,585	NNJ
VE3LM	195	5	2	1,840	ON
N6MBY (+K6RHB)					
	109	5	2	1,045	SB
KI4WXI	87	5	2	1,005	TN
K6ORI	14	5	2	420	EB

2B-2 Op

AA6PW	2229	2	2	7,956	LAX
AA1PL	1041	2	2	3,908	RI
KE7NO	1070	2	2	3,626	MT
K5UA	867	2	2	3,580	LA
N1UR	640	2	2	2,448	VT
N7CQQ	464	2	2	1,884	AZ
W1LN/VY2	686	2	2	1,842	MAR
K7ZZ (+W7UG)					
	299	2	2	1,396	OR
W7EAT	250	2	2	1,286	WWA
W6S	342	2	2	1,134	SB
AG4F (+KE4R)					
	294	2	2	1,126	GA
K7AWA	175	2	2	900	AZ
KC2TOO	62	2	2	574	WPA
W8OHR	71	2	2	504	MI
W4WCQ	21	2	2	392	NFL

2B-2 Op, Commercial

NE7D	581	2	2	2,374	OR
KC3M (+KC3Q)					
	443	2	2	1,796	EPA
N8NOE	128	2	2	526	MI
WBØPOQ (+AK6L)					
	98	2	2	370	MN
WD8BAH (+KC8ZJE)					
	91	2	2	280	WV

Mobile Stations

1C

N6VW	420	5	4	4,550	LAX
AA6DP	808	2	4	3,224	LAX
WØIVJ	1039	2	1	2,308	CO
K7VO	713	2	1	1,676	WWA
K3ONW	302	2	1	1,358	EPA
K5YAA	590	1	1	1,330	NTX
W9XS	216	2	1	1,100	IL
NA1GB	179	2	2	1,014	CT
WO8L	178	2	1	934	NC
K2NV/VE3	210	2	1	890	ON
WA7ZZB	217	2	1	884	WWA
K8SSJ	66	2	15	764	OH
KK2O	216	2	1	682	CO
KN3A	233	2	2	616	MDC
AF5Q/M	31	2	1	612	OK
W7CGA	90	2	1	610	WY
KFØUU	32	5	1	570	MN
KCØVFO/M	206	2	1	562	CO
KK4PQ	101	2	5	540	GA
K8LL	167	2	1	484	OH
N3MX	107	2	1	478	EPA
AA1K	67	2	1	418	DE
K7BFL	67	2	1	418	ID
K1KNQ	83	2	1	416	WCF
ABØYM	53	2	1	402	CO
NS7F	79	2	3	394	AZ
KH6/K4IQJ	49	2	1	346	PAC
NF8M	38	2	1	302	MI
N2SQW	21	2	1	292	ENY
N7JEH	60	2	2	290	NV
K5VHH	90	2	1	280	STX
W4ZPR	44	2	1	276	VA
N1LU	55	2	1	270	SC
NE3I	3	2	1	258	EPA
NE9T	41	2	1	252	IN
NE9G	44	2	1	238	IL
N5BF	19	2	2	214	LAX
KA3KSP	56	2	1	212	WPA
KA1KNW	41	2	1	190	CT
W9BNO	20	2	1	190	CO
KE4PCX	43	2	1	186	VA
VE3RKS	14	2	1	178	ON
W9ILY/M	14	2	1	178	IL
AJ6T	13	2	2	176	SCV
VA7ANI/MM	56	2	1	162	BC
KCØJQO	30	2	1	160	MN
KI6DSW	3	2	2	156	SCV
N3TG	44	2	1	138	VA
W9CNF/M4	16	2	1	132	NFL
WA4CHJ	12	2	1	124	VA
K2EFK	7	2	1	114	NNJ
AI4GY	25	2	2	100	SC
N6IGI	20	2	1	90	ORG
KB9UTO	10	2	1	70	IN
K9SWX	4	2	1	58	IL
N6AJR	1	5	1	55	EB

2C

N4KK/MM	260	2	4	1,204	SFL
NB1RI/MM	208	2	2	1,166	RI
KD7WCD	63	2	2	476	AZ

3C

KZ3AB	13	2	2	76	MDC

Home Stations
Commercial Power

1D

K3WW	1029	2	1	3,678	EPA
KT8K	718	2	1	2,884	MI
VE1RGB	527	2	1	2,158	MAR
N5WR	516	2	1	2,114	TN
W8VM	427	2	8	1,958	OH
NH6P	1313	1	9	1,934	PAC
VE2JCW	473	2	1	1,892	QC
W6AEA	837	1	1	1,712	EWA
WI2E	447	2	2	1,710	EPA
N2RI	388	2	1	1,702	NLI
KØPK	411	2	1	1,694	MN
W3CQB	388	2	1	1,686	EPA
W1RM	419	2	1	1,668	CT
K8EE	400	2	1	1,650	OH
AAØA	722	2	1	1,444	MO
WØRAA	381	2	1	1,430	CO
KB3LIX	370	2	1	1,368	WPA
VE6AO	1317	1	1	1,367	AB
AA8IA	355	2	1	1,324	OH
VA3SB	307	2	1	1,228	ON
K9CR	416	2	2	1,170	WI
CF3NAVY	397	2	1	1,154	ON
W6AFA	538	2	1	1,126	LAX
W4UEF	313	2	1	1,012	NC
N6NF	744	1	1	1,002	SCV
W8TM	232	2	1	962	OH
KD5AR	227	2	1	948	AR
WU9B	228	2	1	930	AZ
N3CZ	231	2	1	922	NC
W6KY	210	2	1	890	SDG
K9UQN	184	2	1	886	IL
K2MK	418	1	1	886	SNJ
W5GAI	272	2	1	878	STX
VE3IAE	233	2	1	874	ON
AG5Z	867	1	1	867	MS
NN4DF	209	2	1	858	NFL
VE3XD	200	2	1	850	ON
K5BZH	230	2	1	832	WTX
KK3Q	194	2	1	826	NFL
VA2WDQ	205	2	1	820	QC
KØVM	276	2	1	792	IA
N5VI	181	2	1	774	MS
AA2JZ	200	2	1	766	NFL
W1SRG	282	2	2	746	EMA
KA3TKV	160	2	1	740	EPA
W7QN	182	2	1	738	WWA
KCØUXC	137	2	2	708	SD
KA2FHN	191	2	1	696	WNY
W2DXE	162	2	1	690	WNY
AA9WJ	206	2	1	674	IN
K4UB	336	2	1	672	GA
N8KC	170	2	1	668	MI
W5QLF	153	2	1	662	STX
NG1O	185	2	1	644	MO
KC4YOT	129	2	1	636	NC
K6HRT	297	1	1	634	ORG
KØLWV	145	2	1	630	MO
WØBH	161	2	1	630	KS
K2XE	140	2	1	610	SNJ
KØUK	280	1	1	610	CO
N6DW	296	1	1	593	SV
N8KV	159	2	3	590	MI
WX9DX	522	1	5	572	IL
KI6WD	260	2	3	570	ORG
KB9YGD	171	2	1	568	IN
WR9Y	145	2	2	556	WI
K8CI	252	1	1	554	OH
W1/YO7ARY	141	2	1	552	CT
KI1M	270	1	1	540	NH
VE2FXL	163	2	1	540	QC
N4DXI	116	2	1	538	NFL
N3GGT	122	2	1	536	EPA
K9AHH	120	2	1	530	IL
K8CPA	126	2	1	526	MI
VA3FN	118	2	1	522	ON
WA3IVV	130	2	1	520	WPA
KC4TVZ	465	1	1	515	GA
W6ZN	204	2	1	510	AZ
K5ECX	114	2	1	506	NTX
W8DCQ	226	2	1	502	MI
N2QGV	88	2	1	502	NFL
NE8J	328	1	1	500	NFL
N3GD	124	2	1	496	WCF
WB4MNK	159	2	1	496	NFL
KB3P	240	1	1	490	EPA
ADØA	160	1	2	487	CO
W4HAY	121	2	1	484	TN
K6CSL	125	2	1	484	SJV
W2BEE	120	2	1	480	ENY
AB8XG	107	2	1	478	OH
K6DGW	210	1	1	470	SV
W8IQ	232	1	1	464	OH
W5OV	206	1	1	462	NTX
NØEID	108	2	1	462	MO
N8XI	102	2	1	458	MI
WO2N	101	2	1	454	NLI
W3IBT	227	1	1	454	WPA
VE3TW	243	1	1	450	ON
WA8BIJ	107	2	1	438	MI
K9KLO	97	2	2	438	GA
VA3ATT	107	2	1	428	ON
W3FV	216	1	1	422	EPA
W2LRO	110	2	1	422	NNJ
W1WAB	67	2	1	416	WCF
W3SFG	91	2	1	414	MDC
WA8YVF	103	2	1	412	OH
KD7MEK	90	2	2	410	AZ
WB2ETR	120	2	1	406	NLI
WB4LEQ	177	2	1	404	NFL
W5JBO	87	2	1	398	STX
K7TFY	87	2	1	398	ORG
K6NDV	186	1	3	395	WMA
KCØRRS	84	2	2	386	KS
N1NN	84	2	1	386	EMA
KG2NI	168	2	1	386	WNY
K7EIQ	96	2	1	384	EWA
AA6EE	95	2	1	380	SDG
K9UT	95	2	1	380	IN
WA4YHA	124	2	1	380	VA
K9MQ	81	2	1	378	IN
KZ2G	94	2	1	376	NLI
AB1HL	81	2	1	374	EMA
VA3OPN	116	2	1	374	ON
W7MTL	109	2	1	372	OR
KJ4FDV	49	2	1	364	AL
K3GWK	155	2	1	360	GA
NN1N	208	1	1	358	CT
KB3PU	151	2	1	352	SC
NFØT	109	2	2	352	IA
VE7CA	176	1	1	352	BC
KS3Z	50	2	1	350	EPA
W9WXN	50	2	1	350	IN
W1RS	147	2	3	344	EMA
NK3Y	142	2	1	342	EPA
KD4QMY	282	1	1	332	GA
KN6N	54	2	3	330	ORG
W6CT	44	2	1	326	SCV
K7ING	68	2	1	322	AZ
K7DD	68	2	1	322	AZ
K2FEO	135	2	1	320	WNY
VE1SKY	104	2	1	318	MAR
WB9FJO	82	2	1	314	MI
WØDMT	131	2	1	312	MO
N7RVD	156	1	1	312	MT
KI7N	100	2	1	300	OR
KO8S	75	2	1	296	MI
KA5VZG	66	2	1	292	TN
W2LHL	67	2	1	290	NNJ
N2WN	60	2	1	290	TN
WB1FJH	72	2	1	288	EMA
K9JH	68	2	2	286	SC
KC2MBV	77	2	1	284	NLI
KC9DKQ	141	2	1	282	WI
VE2CLM	42	2	6	280	QC
AB1BW	68	2	1	274	CT
W9UW	68	2	1	272	CO
WB9GHD	55	2	1	270	SDG
VE2TSM	108	2	1	266	QC
W5GZ	63	2	1	266	NM
KB6A	53	2	1	262	ORG
WO9S	55	2	1	260	IL
KK4LH	67	2	1	258	NC
KØGOB	129	2	1	258	MO
K5KVN	207	1	2	257	AR
N8YYS	76	2	1	256	WV
KD6FVA	103	2	1	256	SV
WB4UIC	127	2	1	254	WY
K4XDX	101	2	1	252	VA
VA3GUY	100	2	1	250	ON
VE3CX	64	2	3	248	ON
N4NC	62	2	1	248	NC
WD6LL	84	2	1	246	SV
KL5E	47	1	1	244	AK
WB9RFV	121	2	1	242	IN
K6III	127	1	1	240	SV
AD4CS	92	2	2	234	SFL
K7ULS	182	1	1	233	UT
K8WHA	58	2	1	232	EPA
NKØE	46	2	1	230	CO
K1XO	229	1	1	229	CT
W1WIU	162	1	1	226	RI
WA7YNU	87	2	1	224	MT
WBØRUR	67	2	1	220	AR
K9ADL	83	2	1	216	IL
AC6TU	41	2	1	214	LAX
WS7R	107	2	2	214	AZ
KU4UV	53	2	1	212	KY
AB8S	61	2	1	212	WV
AI3G	40	2	1	210	DE
K6LMN	29	2	1	208	LAX
W5PQ	52	2	1	208	LA
K5SS	52	2	1	208	NTX
KW8V	79	2	1	208	WV
AA8DN	77	2	1	204	OH
AE9K	38	2	1	202	IN
K7TQS	76	2	5	202	OR
KC2NOR	25	2	1	200	NLI
NE9DX	100	2	2	200	AR
N6RY	147	1	1	197	SDG
KI6ORO	98	2	1	196	SF
W6SNE	59	2	4	196	SB
K6UMO	72	2	1	194	SJV
K2GTM	69	2	1	188	VA
N1YDU	68	2	1	186	WPA
N7FF	40	2	1	186	AR
N3UA	92	1	1	182	VA
VA7GLL	66	2	1	182	BC
W2PQG	16	2	4	182	NNJ
KC2NOS	16	2	1	182	NLI
N3KN	68	1	1	181	VA
WA3AAN	32	2	1	178	EPA
K5YQF	32	2	1	178	STX
W2MRD	12	2	1	174	ENY
WA5OK	87	2	1	174	OK
KB2UUL	57	2	1	174	NC
W7LN	43	2	1	172	MO
KU1Q	86	2	2	172	CT
KG4WNA	61	1	1	172	KY
KB7HDX	60	2	1	170	EWA
W4EGR	60	2	1	170	AL
KC8ZUM	60	2	1	170	IL
W2QJH	60	2	1	170	NNY
K6JRA	59	2	1	168	EB
KJ2P	33	2	1	168	ENY
KF6JQC	58	2	1	166	SJV
KØCO	29	2	1	166	CO
KF5ATN	29	2	1	166	NM
W5BIT	58	2	1	166	NTX
KB1OCL	50	2	1	164	NH
ND6S	41	2	1	164	SV
KE5ZSW	57	2	1	164	AR
KDØCPA	81	2	3	162	CO
KF6FIX	18	2	1	162	ORG
KD5BBR	80	2	1	160	OK
W9SID	55	2	1	160	IL
W9BAG	54	2	2	158	IN
VA2UTC	54	2	1	158	QC
K1RM	39	2	1	156	CT
N6RZR	77	2	1	154	SV
WA6GFR	26	2	1	154	ORG
WB1BRE	52	2	1	154	VT
KI7DG	102	1	1	152	EWA
W2RR	51	1	1	151	WNY
WD4AJI	49	2	1	150	SFL
KE3X	25	2	1	150	MDC
KI6ZHD	25	2	1	150	SCV
K3MAF	49	2	1	148	VA
N7IZM/W3	74	2	1	148	WPA
WA7SLH	48	2	1	146	AZ
VA7FC	48	2	1	146	BC
W4JHU	24	2	1	146	VA
K6TXT	45	2	1	142	SDG
W7WOW	43	2	2	140	NV
WG7X	129	1	1	139	WWA
WA7BME	22	2	1	138	UT
KBØERS	22	2	1	138	STX
KD3JA	42	2	1	134	MDC
AA6LAC	33	2	1	132	SB
K3VED	65	2	1	130	WPA
ND8L	63	2	1	126	OH
KD5BYB	19	2	1	126	AL
NK1X	36	2	1	122	WMA
KB1MNN	26	2	1	122	WMA
WB4DVN	61	2	1	122	NC
AI4G	36	2	1	122	KY
W3CDI	36	2	1	122	MDC
KA1GYB	18	2	1	122	CT
W6UX	34	2	1	118	ORG
KC5WA	34	2	1	118	LA
W7MWL	23	2	1	118	WWA
W2KRD	33	2	1	116	SNJ
N8KOJ	65	1	1	115	OH
KB1NZA	22	2	1	114	EMA
K4IU	16	2	1	114	MN
KD5WJS	31	2	1	112	NTX
W4JJG	30	2	1	110	SFL
N5UBL	29	2	1	108	STX
KJØP	16	2	1	108	MN
KE5UTN	29	2	1	108	LA
NS4DX	31	2	11	106	VA
WA2OOB	49	2	1	104	SB
W7YMS	26	2	1	104	OR
WT5ARC	103	1	1	103	WTX
KB8RWQ	20	2	2	100	ENY
AE5LQ	50	2	1	100	STX
K1BTD	50	2	1	100	CT
K4OL	50	2	1	100	GA
AD4RG	50	2	1	100	VA
K1VI	49	1	1	99	CT
WA4MAE	99	1	1	99	VA
WØNFS	24	2	1	98	MO
W8IDW	24	2	1	98	WV
K1JW	48	1	1	98	ME
KCØHUJ	24	2	1	98	KS
KD7SWL	23	2	1	96	UT
VE2AXO	23	2	1	96	QC
ND3R	31	2	1	94	WPA
WD4NIT	22	2	1	94	GA
KVØO	22	2	1	94	GA
W3NWS	12	2	1	94	MDC
W4BWQ	22	2	1	94	NFL
N8MS	45	2	1	92	MI
KE4GRY	21	2	1	92	NC
K9VS	91	1	1	91	WI
KCØRNS	20	2	1	90	WI
N9VPV	20	2	1	90	IL
WA4DYN	19	2	1	88	NTX
K9IXS	22	2	1	88	LAX
W5BSX	18	2	1	86	STX
K4IJK	18	2	1	86	RI
N3JNX	18	2	1	86	EPA
KC9HEQ	18	2	1	86	IL
KC9REL	17	2	1	84	WI
KC2AEI	17	2	1	84	MDC
W4GFY	17	2	1	84	TN

K4GOP	41	2	1	82	NFL
KD7YZW	16	2	1	82	AZ
W9NFL	41	2	1	82	WI
N9NUZ	16	2	1	82	WI
W1NHS	16	2	1	82	CT
N1AOK	15	2	1	80	CO
VA2ZIG	15	2	1	80	QC
KK7CG	15	2	1	80	OR
AC7TB	15	2	1	80	WWA
K4RT	20	2	1	80	VA
KF4IRC	34	2	1	80	AL
W8CAH	7	2	1	78	IL
KF6RXB	78	1	1	78	SF
NØUL	14	2	1	78	MN
WA8YXM	13	2	1	76	MI
VE1RSM/VY119		2	1	76	NT
W7TED	13	2	1	76	WWA
N9YSQ	13	2	1	76	KY
WO3T	75	1	2	75	WPA
KB3IPZ	12	2	1	74	EPA
KB7QOA	12	2	1	74	ID
VE2XL	37	2	1	74	QC
KCØWIR	1	2	1	72	MO
N3PDT	11	2	1	72	MO
WS6T	35	2	1	70	EB
W3GQ	7	2	1	70	NC
JA3JM	5	2	1	70	DX
K9FH	10	2	1	70	IL
N1XUQ	9	2	1	68	NH
K7ACT	9	2	1	68	WWA
KA6MLE	4	2	1	66	SB
ACØPB	16	1	1	66	IA
K6MYH	4	2	11	66	SF
KØSGF	33	2	1	66	MO
K7AWB	15	1	1	65	EWA
KC7NJB	7	2	1	64	SCV
WAØBSW	3	2	1	62	MO
AA2JT	6	2	1	62	NNJ
KB4EHS	6	2	2	62	SFL
WBØQIR	6	2	1	62	MO
KC9LDR	5	2	1	60	IL
WA2VQV	5	2	1	60	DE
AB2WS	5	2	1	60	ENY
K7HRW	5	2	1	60	WWA
KA6FBB	5	2	1	60	ORG
VE2KOT	2	2	1	58	QC
KD8LEB	4	2	1	58	OH
WD4MKU	29	2	1	58	NC
KCØFUE	4	2	1	58	KS
ABØLJ	4	2	1	58	MO
KF6TJR	4	2	1	58	EB
KC8KSK	3	2	1	56	SC
KU4RC	3	2	1	56	NTX
KD8MBI	25	2	1	54	OH
KD8DKG	22	2	1	52	MI
KI4BKE	1	2	2	52	NC
VE2GLA	13	2	1	52	QC
KB5DRJ	23	2	1	46	NTX
AB9RI	11	2	1	44	WI
K9SQG	41	1	1	41	OH
KF7VG	20	2	1	40	WWA
N8DSG	38	1	1	38	MI
AJ4HK	17	2	1	34	NC
K2WT	33	1	1	33	WCF
KC7YE	8	2	1	32	WWA
WB2JMX	16	2	1	32	WNY
KD8HYU	15	2	1	30	OH
WB6BET	14	2	1	28	EB
K4ZKS	11	2	1	28	WCF
AI4UN	12	2	1	26	GA
WA5YNE	26	1	1	26	OK
KC9EHQ	13	2	1	26	IL
KB7UJI	22	1	1	22	EWA
N5UWY	9	2	1	18	OK
NB7A	18	1	1	18	NV
KD8KTN	16	1	1	16	MI
VE3IKT	8	2	1	16	ON
KE7UXN	16	1	1	16	WWA
N2RJ	13	1	1	13	NNJ
WA6AQK	6	2	1	12	AZ
N7NTM	5	2	1	10	AZ

2D

NR5M	3759	2	2	9,976	STX
K7SDX	568	2	7	1,878	EWA
W4NUN	420	2	4	1,830	GA
N8BJQ	500	1	1	798	OH
KK6I	337	2	7	724	SDG
K2BNL	122	2	6	470	NLI
K2VK	124	2	4	460	NNJ
K8RJW	131	2	2	332	OH
NS4T	129	2	2	308	AL
WE5DX	129	2	3	258	MS
WA1KBE	60	2	2	204	EMA
W6SJN	14	2	1	178	SJV
KØUSN	33	2	2	160	CO
K4TAK	14	2	1	78	TN

3D

W2LI	344	2	12	1,490	NNJ
KJ5ZT	671	2	9	1,392	AR
VE2CSP	101	2	15	492	QC
W1VCM	153	2	9	472	CT

4D

W4V	1811	2	14	3,672	AL
VE3URF	952	2	4	2,352	ON

5D

KSØLV	173	2	20	694	KS

Home Stations Emergency Power

1E

AA3B	2077	2	1	8,558	EPA
W2BC	1733	2	4	7,382	WNY
WA9S	1223	2	2	5,042	IN
W5CT	1320	2	3	4,794	STX
AD4ES	1417	2	3	4,624	SFL
N5CW	924	2	1	3,996	MS
K7NX	915	2	2	3,810	AZ
AG3H	770	2	1	3,190	WPA
WA2EQF	686	2	5	3,114	NNJ
N3HBX	1456	2	1	3,062	MDC
W2IRT	1123	2	2	2,904	NNJ
W3HGT	1165	2	6	2,886	WPA
NØTT	661	2	1	2,794	MO
VE3GSI	612	2	1	2,698	ON
N6RZ	812	2	5	2,608	SCV
N6RK	615	2	1	2,248	SV
K4WOP	471	2	2	2,134	VA
N1CC	508	2	1	1,970	NTX
W7GB	376	2	1	1,830	EWA
NY6J	457	2	1	1,810	IN
AH6V	402	2	1	1,780	PAC
K4WW	450	2	1	1,650	KY
K7TR	417	2	1	1,584	AZ
WWØJD	346	2	2	1,526	AR
K8MN	428	2	1	1,506	WV
N7WS	312	2	1	1,438	AZ
K6EMI	302	2	4	1,436	ORG
NS9I	331	2	1	1,424	WI
WR2G	248	2	1	1,382	NNJ
WA1VKO	364	2	1	1,378	NH
W8AWE	286	2	1	1,326	MI
NU7B	268	2	2	1,298	AZ
W4UAL	297	2	1	1,288	AL
WØFMS	549	2	1	1,258	IA
N7VR	342	2	1	1,250	MT
K2OGT	240	2	1	1,210	EPA
K7NAL	511	2	1	1,172	UT
NN6CH	290	2	1	1,140	ORG
WB8EJN	222	2	1	1,138	MO
KØRFD	250	2	1	1,098	CO
KØLMD	328	2	1	1,076	CO
N2MTG	457	2	1	1,064	ENY
N2EIK	228	2	1	1,062	ENY
W3WC	240	2	1	1,050	WPA
VE2AWR	262	2	1	1,038	QC
NU6N	214	2	1	1,036	SJV
K6TY	135	2	4	990	LAX
W4ZKE	209	2	1	986	KY
W3KS	315	2	1	980	DE
KBØYH	351	2	1	952	CO
WZ8N	213	2	1	952	MI
K7RFW	115	2	2	930	UT
W5UGD	264	2	4	924	SC
N6LAL	193	2	1	922	LAX
KU4WD	405	2	1	910	TN
N5MIJ	365	2	4	900	NTX
AG4V	800	1	1	900	TN
W5JMW	193	2	1	862	WTX
KG6TT	187	2	1	848	EB
KJ6RA	318	2	1	810	SV
K6KQV	152	2	1	800	SCV
K7IN	184	2	1	786	NV
K4RFE	150	2	1	750	TN
K7SEL	179	2	4	748	ID
KI4GOT	123	2	1	742	VA
KD3FG	251	2	3	736	MDC
KX8X	203	2	1	734	SJV
AA9UF	160	2	1	728	IL
W5WZ	167	2	1	718	LA
K7VGF	128	2	1	714	WWA
KR7LD	207	2	2	712	ID
KG6S	152	2	2	708	SV
WA9STI	225	2	1	700	LAX
WM4X	241	2	2	652	VA
KD5QHV	250	2	1	640	WTX
VA7ST	121	2	1	634	BC
K7EA	119	2	1	626	UT
WA7LK	133	2	1	616	WWA
AD7MQ	104	2	1	596	MT
NM7L	200	2	1	596	EWA
W7DML	86	2	1	594	UT
AG4FK	245	2	1	590	TN
KC8IMB	244	2	1	588	OH
KT7AZ	161	2	1	572	AZ
N7MAL	130	2	1	570	AZ
KE4UKX	105	2	7	570	VA
KK5OQ	211	1	1	560	MS
WA3SWJ	52	2	1	556	MDC
NO2J	227	2	2	554	WNY
KB3ORR	150	2	1	550	WPA
KCØDWX	147	2	2	544	KS
K9KK	178	2	1	506	OK
N2DD	125	2	1	500	WNY
N4MUH	174	2	1	488	NFL
W7ASU	111	2	10	482	AZ
VE1ZA	210	2	1	470	MAR
AB5JR	105	2	1	460	NM
ND2E	77	2	1	458	TN
KF6ROE	50	2	1	450	SDG
KC4YAU	75	2	1	450	AL
W3TZ	172	2	1	444	AR
N8HC	171	2	1	442	OH
KC5LN	139	2	1	428	OR
K3ORS	114	2	1	428	TN
W4SNP	73	2	1	418	VA
KC9QQ	66	2	1	414	IN
K2XC	82	2	1	414	NNY
K5J	110	2	3	410	NTX
N6ZFO	67	2	1	404	SF
N5PU	88	2	1	402	MS
N4YHC	99	2	1	400	IN
WD8MGZ	93	2	1	386	WV
NAØBR	70	2	1	380	CO
W4OTN	5	2	1	380	VA
K6RJP	210	1	1	370	EB
WU9Z	49	2	2	368	IN
KNØBS	58	2	6	366	IA
W9BMW	76	2	1	354	WWA
N8EN	144	2	1	354	MI
KC4ONA	53	2	1	350	NFL
WA5JEC	147	2	2	344	STX
WO3X	90	2	1	330	OH
KA9CAR	52	2	1	316	IL
WW8ZZ	82	2	1	314	OH
K6PUD	106	2	3	312	SF
K8MCA	104	2	1	308	OH
N3ZEL	101	2	2	302	WPA
KCØMPD	76	2	1	302	NFL
KBØMPY	100	2	1	300	CO
WA4RNN	100	2	1	300	TN
KC7PVD	24	2	1	298	UT
KE5QBZ	21	2	1	292	NTX
KG6LJO	95	2	1	290	NV
KAØEIC	62	2	1	284	KS
NW1V	91	2	1	282	VT
WB5SGN	65	2	1	280	NTX
WA4RDZ	113	2	1	276	NC
K6EBN	31	2	1	274	SCV
KS6M	62	2	1	274	EB
N3OSN	10	2	1	270	EPA
K7EMS	60	2	1	270	WY
K7FED	109	2	1	268	NV
W6DMS	58	2	1	266	ORG
K7RQN	79	2	1	258	AZ
KCØPPA	51	2	2	252	MN
N4EMP	52	1	4	252	AL
KD5COL	48	2	1	246	TN
WB9WHG	24	2	1	246	MN
KI4CPL	35	2	1	240	TN
KI4VLW	67	2	1	234	NC
WE5T	42	2	1	234	NTX
NJ7W	33	2	1	232	WWA
KD6PQF	41	2	1	232	SB
KC8WH	53	2	1	228	OH
W6KYF	18	2	1	222	SCV
VE8GER	36	2	1	222	NWT
KG4GWB	35	2	1	220	AZ
AK6QJ	32	2	1	214	SDG
N6MWX	56	2	1	212	NNJ
AD6JV	21	2	1	212	VA
K4GDW	31	2	1	212	AL
K1NPT	5	2	1	210	RI
N1ILZ	25	2	1	200	SJV
NT7MI	73	2	1	196	AZ
N2ZPY	73	2	1	196	WNY
N5IAC	48	2	1	196	NM
K4GRE	20	2	1	190	SC
KG4TQQ	45	2	1	190	WCF
KK5CT	30	2	1	184	NTX
KA2BXH	30	1	1	180	SNJ
K7LA	40	2	1	180	ORG
W7EEI	14	2	1	178	OR
KI4EBD	14	2	1	178	NFL
K6GEP	32	2	1	176	ORG
W3LL	11	2	1	172	MDC
K4CSS	36	2	1	172	AL
W1JPZ	10	2	1	170	RI
WØEB	16	2	1	164	KS
KY6LA	41	2	3	162	SDG
N6NFB	29	2	1	158	WWA
WB4QNG	24	2	1	148	KY
VA7HZ	30	2	1	142	BC
WBØIWG	43	2	1	136	WPA
N6VNO	8	2	1	132	SCV
KH6BZF	8	2	1	116	PAC
AD7T	6	2	1	112	WWA
AE7FJ	4	2	1	108	WWA
KE7WXF	28	2	1	106	OR
WI6ZRD	2	2	1	104	ORG
KC9SGV	23	2	1	100	IL
W1XM	17	2	1	84	EMA

2E

W3VPJ	1417	2	15	5,044	EPA
K5ER	1863	2	3	4,442	LA
WP4Y	1000	2	7	2,864	PR
VE6FI	1923	1	4	2,173	AB
K2HIG	525	2	4	1,984	STX
W2JJ	722	2	4	1,644	NNJ
VA7MM	312	2	2	1,598	BC
VE3IDI	465	2	7	1,388	ON
WB5LVI	376	2	13	1,382	STX
AB2DE	477	2	4	1,288	NNJ
N9AKR	545	2	3	1,140	IL
KB3IRR	334	2	2	1,018	NC
W5ES	131	2	26	912	WTX
KØJJM	290	2	2	780	KS
K7FA	455	1	3	765	AZ
N4QLX	207	2	6	664	NC
K7WXO	198	2	2	646	EWA
K4UOL	182	2	2	556	KY
KC2VUP	50	2	4	350	WNY

3E

W4DXA	2819	2	24	10,020	SC
K6LRG	2451	2	7	7,570	EB
W4GJ	1568	2	5	6,172	NFL
K3MJW	1768	2	12	5,700	WPA
W5ROK	1352	2	15	4,864	NTX
W6VIO	1311	2	24	4,858	LAX
N3DUE	1300	2	4	4,366	MDC
N3KAE	1318	2	5	4,002	EPA
W7FLY	687	2	5	3,356	WWA
W3KWH	697	2	20	2,316	WPA
W8DYY	1184	1	20	1,951	OH
N5BL	425	2	14	1,678	NM
NN6MI	330	2	50	1,578	EB
W5SSV	278	2	58	1,576	STX
AD7KI	325	2	12	1,246	WY
K3TI	139	2	5	1,188	EPA
W8BAP	256	2	20	1,154	OH
W6DOJ	1084	1	3	1,148	SV
WØCS	268	2	15	1,110	IA
N9QID	189	2	3	828	IN

4E

N2BJ	2659	2	9	8,836	IL
N2MO	716	2	27	3,400	NNJ
W8WZZ	1022	2	10	3,170	OH
W7S	420	2	12	1,794	WWA

6E

W6NWG	2871	2	28	10,418	SDG
WØIW	1065	2	13	2,840	IA

7E

KL2R	259	2	20	2,528	AK
WGØD	272	2	14	1,692	MN

8E

K1TTT	3791	1	5	3,913	WMA

12E

WØNT	3384	2	32	11,524	CO

Home Stations Battery Power

1E Battery

N4BP	1360	5	1	14,050	SFL
W6JTI	671	5	1	6,960	SF
AF4OX	647	5	1	6,720	SC
WB8RTJ	464	5	1	4,790	OH
AE5GT	372	5	1	4,070	STX
W9TS	381	5	1	4,060	IL
W3GS	357	5	3	3,585	EPA
WA8KAN	329	5	1	3,440	WV
K5WO	257	5	1	2,820	NM
VE7NI	185	5	1	2,425	BC
K4KSR	201	5	1	2,360	VA
W8JJ	217	5	1	2,220	MI
NQ2W	170	5	1	1,850	ENY
VE3UZ	145	5	1	1,700	ON
KB3FJJ	130	5	1	1,650	EPA
W4ABZ	180	5	2	1,590	GA
VA2NB	141	5	1	1,510	QC
VE3LC	135	5	1	1,500	ON
N4LZY	136	5	1	1,460	TN
WB5BKL	119	5	1	1,440	STX
K3HX	132	5	1	1,405	WPA
KU4A	154	5	1	1,390	KY
WA4FOM	96	5	1	1,305	NNJ
KCØVEP	100	5	1	1,265	NE
WT6P	108	5	1	1,230	AZ
KK6TV	77	5	9	1,205	SDG
W1JN	107	5	1	1,170	CT
VE3KI	80	5	1	1,050	ON
WA9PYH	81	5	1	910	IN
N7NB	66	5	1	910	WWA
K3RLL	60	5	1	850	WPA
KIØOV	143	5	2	815	NE
W1HKJ	66	5	1	810	AL
AA9NF	69	5	1	740	IL
ACØLP	48	5	1	730	MO
KV9R	68	5	1	710	VT
NB4M	60	5	1	650	TN
W6EM	58	5	1	540	AL
N5SY	57	5	1	535	STX
N6IV	38	5	1	530	SJV
WA5RML	28	5	1	380	NTX
KJ4LBZ	26	5	1	380	EMA
WØIS	26	5	1	375	MN
VE3XAM	47	5	1	335	ON
K4JWM	30	5	1	300	AL
NA6ST	28	5	1	290	SCV
K5DCM	37	5	1	285	AR
K1YYY	19	5	1	265	WCF
K3PH	1	5	1	260	EPA
W5VDM	14	5	1	240	STX
KFØF	28	5	1	240	MO
N9BT	3	5	1	180	IL
W3ELW	25	5	1	175	WPA
K7II	13	5	1	165	WWA
KO6YG	3	5	1	115	SCV

2E Battery

N1URA	570	5	4	6,420	ME
K1EEE	625	5	4	5,505	NH
AC3V	370	5	4	3,455	EPA
KC9CCQ	241	5	3	2,375	MN
W5TB	157	5	3	1,710	NTX

3E Battery

W5ROS	238	5	11	2,685	STX

EOC Stations

1F

Wildcat Valley Contesters

W9PC	1152	2	6	4,262	IN

West Essex ARC

W2EF	555	2	10	2,846	NNJ

CO ARES D10 - Loveland EOC
WØFT 669 2 10 2,428 CO
Fayette ARA
K8FAY 479 2 15 1,948 OH
New Providence ARC
WK2I 389 2 20 1,934 NNJ
Cal Fire SCU Volunteers in Prevention
W6HUL 325 2 19 1,802 SCV
Shelby Cty ARES
K8EMA 415 2 10 1,636 OH
Will Cty EM Amateurs
W9WIL 190 2 4 1,558 IL
Rim Country ARC
W7RIM 282 2 53 1,510 AZ
Baltimore City RACES
KB3SZT 402 2 8 1,448 MDC
W5YL 301 2 10 1,152 LA
Mansfield EMA Comm Group
KB1JJE 201 2 8 1,062 EMA
WX5FWD NWS SKYWARN
WX5FWD 272 1 5 1,052 NTX
Metro ARC
W9LYA 385 2 8 1,052 IL
Mt Shasta ARC
W6BML 192 2 8 1,042 SV
Washington State Net
N7EIE 90 2 5 1,006 WWA
Addison Cty ARES
N1NRA 165 2 2 980 VT
Quad-County ARC
N3QC 146 2 6 942 WPA
Athens ARC
K5EPH 230 2 10 942 NTX
Butte ARC
W7FO 809 1 5 859 MT
Utah Cty ARES
K7UCA 223 2 30 796 UT
Tar River ARC
W4DCG 217 2 10 784 NC
W4CQ 314 2 14 678 NC
Southern Plains AR Klub
ABØRA 101 2 20 672 KS
BRHC
KAØTTY 101 2 1 664 MO
OK City Em Management
WX5EOC 53 2 6 656 OK
Westfield Em Management
N1VMJ 268 2 3 586 WMA
Evanston AR Community
KC9OAS 14 2 5 578 IL
Fayette Cty EOC
KU4K 169 2 14 494 TN
Meridian ARC
W5FQ 61 2 19 472 MS
CESRA
W5OES 33 2 2 438 SJV
Westside ARC
W5ABD 99 2 10 398 LA
Brookfield Emergency Management
KA1PTW 12 2 17 344 NH
Westcumb ARC
VE1WRC 141 2 12 342 MAR
Santa Cruz ACS Club
W6TUW 41 2 3 232 SCV
Roseland ARC
K2GQ 131 1 6 208 SNJ
Berkeley Cty OES ARC
KD8ALZ 50 2 3 100 WV
Southampton ARES Group
KC2OJ 13 2 2 76 NLI
Somerset Cty ARC
AK3J 14 2 2 48 WPA

2F

Stanford ARC
W6YX (+K6SU)
3887 2 40 14,260 SCV
Platinum Coast ARS
W4MLB (+K4QD)
2082 2 33 8,424 SFL
Bullitt ARS
KY4KY (+W4KBR)
1376 2 77 5,688 KY
Lake Cty RACES/ARES
K9IQP (+W9QL)
1382 2 35 5,362 IL
Montgomery Cty ARES/RACES
AA3E (+WM3L)
1914 2 6 5,254 EPA
Story Cty ARC & Cyclone Amateur Club
WØYL (+WØISU)
1279 2 26 5,162 IA
Oak Ridge ARC
K4PJ 1093 2 35 4,754 TN
Murray State Univ ARC
K4MSU (+W4GZ)
931 2 46 3,968 KY
Oakland Cty ARPSC
W8OAK (+K8G)
852 2 12 3,884 MI
Imperial Cty ARES/RACES
W6ICR 1073 2 29 3,780 SDG
York RC
W9YRC (+NN9L)
1291 2 23 3,726 IL
Johnson AR Service
WA5JRS (+AE5FN)
1280 2 12 3,352 NTX
Heart of America RC
WØRR 719 2 13 3,220 MO
Benicia ARC
KB6EOC 964 2 67 2,906 EB
Merrymeeting ARA
KS1R (+N1TRC)
544 2 15 2,896 ME
Cowichan Valley ARS
VE7CVA (+VE7RVC)
893 2 20 2,854 BC
Madison Cty ARC
KE8RV 458 2 11 2,828 OH
Virginia Mountain ARC
W4COV 794 2 6 2,684 VA
Orleans Cty ARC
WA2DQL (+KZ2R)
609 2 39 2,656 WNY
Great Falls Area ARC
W7ECA (+KF7GFA)
664 2 28 2,334 MT
Waterbury ARC
W1LAS 888 2 7 2,326 CT
Cass Cty ARC
W9VMW (+KV9N)
630 2 42 2,176 IN
Hays Caldwell ARC
KE5LOT (+K5GWC)
328 2 34 2,134 STX
Turkey Heaven Mtn Repeater Assn
N4THM (+N4IF)
383 2 20 2,086 AL
Southwick RACES / ARES
WC1SW 398 2 15 2,036 WMA
Anderson RC
K4TG (+KY4LAW)
449 2 9 1,920 KY
Harney Cty RA
W7HRN (+KE7YLA)
249 2 16 1,914 OR
Central Carolina AR Comm Team
NC4CC (+AE4AA)
326 2 29 1,864 NC
Corona Norco ARC
W6PWT (+AF6UI)
475 2 10 1,856 ORG
Robeson Cty ARS
W4LBT 224 2 19 1,726 NC
Carteret Emergency Mgt Vol ARC
K2ZV (+KB2LAV)
332 2 10 1,622 NNJ
Tupelo ARC
KK5K 443 2 11 1,582 MS
Westminster RACES
W6JNU 165 2 9 1,582 ORG
Marshall Cty ARA
KI4HUS 278 2 18 1,570 KY
Lisbon Area ARA
WX8EMA (+WB8WTI)
240 2 4 1,536 OH
Pilgrim Amateur Wireless / SE MA AR Group
KA1GG 631 2 8 1,532 EMA
Lehigh Valley ARC
W3OI (+W3GRD)
210 2 27 1,512 EPA
Tri City ARC
W1QV 329 2 12 1,502 CT
SATERN – Cen-Cal Mutual EmComm ARES/RACES
K6CME (+KI6QYD)
290 2 10 1,430 SJV
Burlington ARC
W1KOO 331 2 18 1,412 VT
Cupertino ARES
K6KP 134 2 21 1,408 SCV
Key City ARC
K5ABI (+KF5HLA)
343 2 45 1,396 WTX
Treasure Valley RA-Malheur Cty ARES
K7OJI (+KF7CWC)
266 2 21 1,372 ID
Amateur Radio Klub of Arkansas Northwest
AA5AR (+N5NTI)
335 2 24 1,370 AR
Vernon RACES
W2VER 286 2 10 1,312 NNJ
Manalapan RACES/
Raritan Bay Radio Amateurs
K2PW 143 2 10 1,248 NNJ
Preble ARA
K8YR 333 2 5 1,162 OH
North Shore ARC
VE7NSR 255 2 21 1,162 BC
Picorams
K9IYP 118 2 5 1,086 IL
Geauga ARA
W8DES 227 2 7 1,028 OH
Independent Radio Assn
K8IRA 278 2 9 1,006 OH
Lincoln Cty ARES/RACES
AD7OY 122 2 2 986 NV
N8LS 292 2 10 882 MI
Raymond J. Levesque Memorial ARC
K1ZZN 188 2 3 876 EMA
San Diego/Imperial Counties Chapter — American Red Cross
W6RDX 258 2 19 766 SDG
MEMS
AE5EE 15 5 2 765 AR
Tri-County
NC4AR 102 2 10 704 NC
Campbell River ARS
VE7CRC 272 2 9 694 BC
OKRA
W5LOC 217 2 4 684 STX
Big Bend ARC
KA9FAJ 100 2 12 670 IL
Cochise ARA
K7RDG 96 2 7 642 AZ
Ellicott Fire ARC
KØEFD 67 2 2 584 CO
BCARES
W3FTP 213 2 5 570 EPA
Downey ARC
W6TOI 158 2 13 466 LAX
ARC of Sabine
K5MNY 85 2 10 458 LA
Friends & AR Communications Enthusiasts
KF6NNM 82 2 5 422 SV

3F

West Jersey DX Group
K2NJ (+W2EN)
3724 2 39 13,678 NNJ
Williamson Cty ARES
N4FR (+W4SQD)
2892 2 175 9,454 TN
Southwest Dallas Cty ARC
W5WB (+N5UV)
1555 2 44 6,950 NTX
Arkansas River Valley AR Foundation
K5PXP (+KE5EBC)
1179 2 31 4,714 AR
Worcester EmComm Team
W1C (+WE1CT)
1165 2 36 4,068 WMA
Boeing ARS - STL
WØMA 1135 2 15 3,848 MO
Algonquin ARC
N1M 758 2 25 3,438 EMA
N Wildwood OEM RC
NW2NJ (+N3BHM)
785 2 6 3,098 SNJ
Queen City Emergency Net
W8VVL 841 2 31 2,978 OH
Jones Cty ARC
WV5D 1136 2 14 2,742 MS
Raritan Bay Radio Amateurs/South River OEM
K2GE 559 2 15 2,660 NNJ
McHenry Cty RACES/ARES
K9ESV (+KB9BNY)
595 2 20 2,640 IL
W9AWE 625 2 28 2,634 IL
Indian River ARC
W4NLX (+KC2UFO)
474 2 30 2,354 SFL
ARC of Central Louisiana
AB5IS 623 2 14 2,078 LA
Middle East TN Em Radio Service
KC4EM (+N1DRI)
422 2 38 2,072 TN
Blount Cty ARC
W4BLT 482 2 25 2,052 AL
Southington ARA
W1ECV 657 2 25 2,024 CT
Centralia ARES
K7CEM (+KD7OWN)
353 2 14 1,964 WWA
Culver City ARES
K6CCR (+K6RMP)
348 2 75 1,942 LAX
Adams Cty ARS
W3KGN (+K3DCS)
471 2 18 1,934 EPA
AC5PW 623 2 15 1,908 LA
Arlington ARC
W4WVP 314 2 24 1,866 VA
South Mtn Radop Amateurs
N3TWT 354 2 13 1,822 EPA
DB CERT ARC/DBARA
N4DAB (+KI4VWP)
170 2 26 1,740 NFL
W8TPY 415 2 20 1,516 OH
Seal Beach/Los Alamitos RACES
K6ZT (+KC6YNQ)
160 2 20 1,482 ORG
Westmoreland Cty ARES Group
KJ4LOP 187 2 7 1,410 VA
TriCity ARA
W7GDY 429 2 4 1,334 AZ
NF1Y (+WA1LEI)
301 2 10 1,272 CT
Carousel RC
K2OQ 315 2 5 1,174 WNY
Camden Cty ARS
KB4CC 270 2 10 1,162 GA
Teton Emcomm
W7RAC 296 2 5 1,040 ID
Metrocrest ARS
KB5A 55 2 29 980 NTX
DMAT OK-1 ARC
ND5MS 173 2 18 974 OK
KC8WIT 520 1 18 937 OH
WHERE RC
WT9H 201 2 15 852 IL
Gateway ARC
NG4AR 133 2 16 796 GA
Laurens Cty ARES Group
KF5TA 110 2 15 790 GA
Carter Cty ARA
KD4NH 183 2 47 716 TN
Ozone ARC
W5SLA 78 2 10 448 LA

FREDERIC HONNOLD, KH7Y

Matt, WH7XM, running the pileup on 20 meters for NH6P, the Big Island Amateur Radio Club.

4F

Bergen ARA
K2BAR (+KC2VRY)
2128 2 56 6,226 NNJ
Thomasville ARC
W4UCJ (+KI4RGD)
1735 2 89 6,084 GA
Denton Cty ARA
W5NGU (+KD5EOC)
1333 2 62 6,038 NTX
Van Wert OH RaRC
W8FY 1878 2 20 5,486 OH
Maxim Memorial Station
W1AW (+KA1UFZ)
2979 1 11 4,778 CT
Tri Town RAC
W9VT (+N9WDG)
1477 2 16 4,168 IL
ARA Tonawands
W2SEX 515 2 26 2,542 WNY
Kokomo ARC
W9GO 508 2 34 1,916 IN
National Trail ARC
K9UXZ 674 2 10 1,868 IL
Baytown ARC
K5BAY (+K5MRM)
445 2 26 1,580 STX
CQ RC
K1BCI 215 2 21 1,470 CT
TX Emergency Amateur Comm ARC
W5SI 241 2 33 1,090 STX
Laguna Woods ARC
W6LY 199 2 10 1,074 ORG
Citrus Cty ARES
KD4FG 121 2 5 1,040 NFL
Mercer Cty ARC
W3LIF 15 2 5 980 WPA
Osceola Cty ARES/Emcat
KG4EOC 134 1 27 899 SFL
Valley Camp
K7S 296 1 7 772 WWA
Endless Mts ARC
N3EP 182 2 16 632 EPA

5F

Southern Cty ARA / Cape May Cty ARC
K2BR (+N2CMC)
1259 2 40 5,288 SNJ
Shelby Cty ARC
W4SHL (+KJ4USA)
1076 2 20 4,634 AL
Flagler Em Comm Assn
AF2C 816 2 18 3,708 NFL
Garden City ARC
K8GC (+KD8LIY)
681 2 68 3,380 MI
Tri-State ARA
W8VA 493 2 55 2,632 WV
Coastal ARS
W4LHS 431 2 45 2,312 GA
Flagler Palm Coast ARC
W4FPC 392 2 21 2,236 NFL
Metroplex ARC
W2MPX 307 2 29 2,062 NNJ
Cross Cty ARC
WA5CC 297 2 25 1,828 AR
Lower Columbia ARA
W7DG 257 1 10 387 WWA

6F

Metro Detroit SATERN
N8SE 460 2 17 2,578 MI
Wabash Emergency Management
KC9MAK 143 2 6 1,386 IL

8F

W2GSB 1395 2 55 6,176 NLI

9F

Bears of Manchester
W1BRS (+N1FUL)
1384 2 64 5,158 CT

13F

SATERN: San Bernardino & Riverside Ctys
W1SAT 196 5 40 3,680 ORG

2010 ARRL June VHF QSO Party Results

A 6 meter bonanza and working the system.

Rick Rosen, K1DS
rick1ds@hotmail.com

There hasn't been a contest in recent memory that kept so many band indicators stuck on 6 meters. Regardless of rig, antenna or power output, if you were on the air during this contest weekend and were tuned to 50 MHz, you were busy making plenty of contacts in numerous grids. Stations in the middle of the country had an advantage with propagation in all directions. Twenty-two percent of the 1202 log entries had totals of over 100 grids on 6 meters. Forty logs showed 200 or more 6 meter grids and two Single Operator, High Power (SOHP) stations and one Multioperator (MO) had over 300 6 meter grid multipliers. With 1202 log entries representing 237,386 contacts, the activity set some all-time records and this is not even a high sunspot number year. Only 23 of all submitted logs lacked a 6 meter entry.

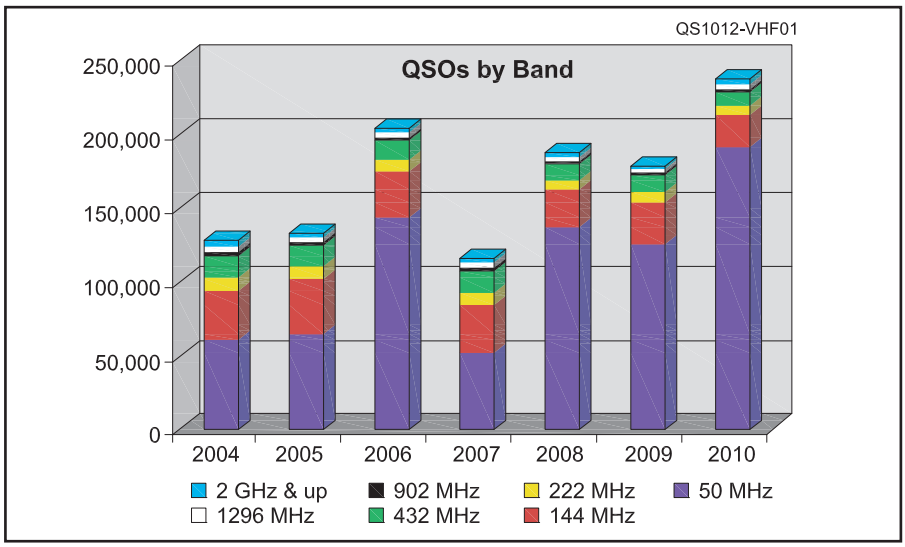


Figure 1 — QSOs by band for the years 2004 to 2010.

Record Setting Activity

Looking back over the records since VHF contest scoring has moved from EARL section to grid square multipliers, the records set this year are likely to last for many years to come. This was clearly a big scoring year as there were 39 section category records broken! [A table of the new records is available in the online version of this article. — *Ed.*] These records have been faithfully managed by Curt, K9AKS for the past 10 years. The plan is to have these records posted on the ARRL Web site in the near future.

In the Single-Operator, Low Power (SOLP) category, Dave, K5RQ, in WCF made 1172 QSOs, besting the previous record set in 2006 by K9MU. Webster, WY3X, had fewer QSOs on 6 meters, but beat the previous SOLP record also held by K9MU by scoring 268 grids on this band. For the SOHP entrants, George, K5TR, topped the old record by 253 contacts, making 1883 6 meter QSOs in 310 grids. That's just about 1 contact per minute for the entire 33 hours of the contest. Former ARRL President W5ZN's MO team with a total of 295 grids beat the previous record for this category of 269 grids. The KN5O team ran a close second with 292 grids on 6 meters. I hear a drum roll for the efforts of the K5QE MO team that managed to put 1834 contacts on 6 meters in their logs with 337 grid multipliers that tops their two previous year efforts when their team also set records in this category.

This year's 1202 entries surpass last year's total of 1135 by a nice margin. Of course, when the bands are productive, more operators are encouraged to submit their logs. As I have discovered and mentioned many times before, there are usually twice the number of active stations on for the contest activity than there are logs submitted. Taking a look at the 6 meter QSO totals, you can see that there were over 1800 contacts on just one band in the K5QE log.

DX Activity

We were all pleased to see the increased number of XE stations active and submitting their logs this year. All 8 were active on 6 meters and added a total of 1649 contacts on that band. Hector, XE2K, was also active

Table 1
Band Designators

Designator	Band	Designator	Band
A	50 MHz	I	10 GHz
B	144 MHz	J	24 GHz
C	222 MHz	K	47 GHz
D	432 MHz	L	75 GHz
9	902 MHz	M	119 GHz
E	1296 MHz	N	142 GHz
F	2304 MHz	O	241 GHz
G	3456 MHz	P	Light
H	5760 MHz		

Table 2
Category Designators

Designator	Category
SOLP	Single-Operator, Low Power
SOHP	Single-Operator, High Power
QRP	Single-Operator, Portable
R	Rover
RL	Limited Rover
RU	Unlimited Rover
MO	Multioperator (Unlimited)
LM	Limited Multioperator

Single Operator, Low Power

K2DRH	374,070
WY3X	315,744
WB4SLM	310,786
W5SXD	299,294
K5RQ	255,496
NØLL	252,280
K4LY	248,442
N3LL	244,062
AE5T	244,024
K4WI	243,312

Single Operator, High Power

K5TR	702,702
K1TEO	579,600
K1RZ	481,730
KC4PX	475,020
WA2FGK (K2LNS, op)	473,475
K2EK	326,534
W6OAL	265,545
W3UUM	259,424
WD5K	250,992
K1TOL	242,136

Single Operator Portable

KA1LMR	115,260
K9AKS	38,592
KJ5RM	19,470
W4RXR	11,890
WB2AMU	10,395
NØJK	8,970
W9SZ	6,903
N1SPX	4,408
AA1I	1,242
WA2ASQ/4	399

Limited Multioperator

K8GP	675,920
W5ZN	606,832
NR5M	420,912
W3SO	407,968
KN5O	391,864
KA2LIM	325,238
W4IY	312,872
W4NH	304,145
AA4ZZ	273,988
W2LV	259,915

Multioperator

W2SZ	1,837,944
K5QE	1,280,241
W3CCX	813,216
K3YTL	520,344
WØEEA	494,256
KBØHH	385,125
WØUC	348,168
N6TEB	301,466
WA7JTM	254,286
W4MYA	202,000

Rover

W6TAI/R	299,088
N6NB/R	295,560
N6MU/R	269,905
KK6KK/R	260,628
W6XD/R	236,742
K6MI/R	230,400
N6VI/R	225,522
W6TE/R	224,220
VE3NPB/R	126,463
VE3SMA/R	98,250

Limited Rover

W5HN/R	88,500
NO5LA/R	80,196
W6YLZ/R	61,120
AL1VE/R	60,216
KK6MC/R	59,500
N4JDB/R	50,112
WAØVPJ/R	49,248
K2QQ/R	47,722
W3DHJ/R	29,512
KD5IKG/R	22,896

Unlimited Rover

N3IQ/R	180,164
WA3PTV/R	65,508
NN3Q/R	60,320
KRØVER/R	58,743
NØLP/R	45,784
W3BC/R	7,950
NØQE/R	7,725
KC2IRO/R	2,970
KR5J/R	2,825
NV6C/R	1,127

on bands BD9. (See Table 1 for band designators.) Three single-band entries on 6 meters were received from Brazil with a total of 85 contacts. Ed, KL7UW, had 5 bands ready and KL7/KB7Q operated on 6 — between them they had 24 QSOs on 6 and 1 QSO on 2 meters. Massimo, KH6ZM, added another 45 6 meter contacts from HI. NP2B (NP2X, op) gave us 195 two-ways from KP2 land, while Julio, NP3CW, managed to add 7 more 6 meter contacts from PR. We also received 6 meter logs from VP2MRT, VP9GE and VQ5M, who added to the excitement with a total of almost 1800 contacts from the Caribbean. As always, the VE stations were very active; 61 logs were entered from Canada.

Running the Bands

The excitement on 50 MHz is often to the dismay of the Multioperator stations that sit on the other bands seeking contacts and to the rovers who are trying to do several things at once; drive, operate multiple bands and encourage their contacts to "run the bands." This year's contact totals on 144, 222 and 432 MHz reflect that angst as those bands were down 20% in total QSO numbers from last year. The surprise though is that totals on the microwave bands were up as much as 100%. This was largely due to the efforts of a team of 9 Rovers each equipped with at least 10 bands, traveling together across 9 grids on the West Coast, working each other and some fixed stations. Operating within the confines of the new Rover category rules, they kept contacts between each other below the maximum of 100.

Although there were reports of modest 2 meter tropo and E_s openings, those reports are far out-shadowed by the sporadic E (E_s) conditions on 6 meters. Mike, K7ULS, on Powder Mountain in Utah caught some 2 meter openings with QSOs to OK, KS, WI, MI and IN. He managed this in spite of 60 MPH winds and snow in June. The Multioperator team at KA2LIM in FN12 in upstate NY reported a 2 meter QSO as far south as Alabama in EL49. Tom, N4HN, reported a 2 meter contact from EM95 North Carolina to EM25 in Oklahoma. Marshall's team at K5QE also reported working many FN grids from their STX QTH with an extended 2 meter E_s opening to the NE. Their 2 meter grid count also benefited greatly from the EME activity contribution of an additional 28 grids.

Comedy, Tragedy or Drama — The Show Must Go On

With all the planning and rehearsal, stations were primed for action. There was the "almost tragedy" as Sebastian, W4AS, experienced a power failure four minutes before the start of the contest. Luckily it lasted only a minute and he had three more minutes to regain his composure and get everything restarted.

The KA2LIM team reported visits by Murphy with problems on their 432 MHz and 222 MHz stations that required swapping out rigs as soon as they started operating on those bands. They attempted to raise their microwave tower, succeeded in having the mast bend a bit, and in the attempt to get it straighter wound up having it bent over. Lest this comedic scene be lost, they snapped a picture of it to use as their contest QSL card.

Zack, W9SZ, a long-time rover, found himself in a tragi-comedy when he rushed to get his rover ready. He was beset with a downpour just as he was about to hit the road. Compounding his troubles were missing parts as he rushed to get moving. To add to his luck, he was hit with another storm on Sunday. He managed to get everything packed and stowed just as the 50 mph winds hit and rain started. Needless to say there was a lot of mud to clean out of his vehicle and gear. The WA7JTM MO team in Arizona loved the 6 meter opening, but also had to manage against big winds and snow flurries in AZ!

The team of Kim, KB1DFB, and Jay, W1UJ, had a great time with their LMR (Last Minute Rover) setup. They lashed a series of halos and squalos to a bar over the cab of their pickup and operated from popular New England grids. The key to their enjoyment was the density of activity in their geography and the elevations they chose.

Brian, ND3F, and David, N3XUD, teamed up as Rovers and encountered some stormy weather that made them pack up and move almost as soon as the activity started. When they got to their last grid they found their stack of radios had fallen over and the amplifiers were not able to be keyed. Brian quickly assessed the situation and resolved it by pulling out the RCA connectors used to key the amps. He used the old "touch-to-talk" method of grounding the center pins in color sequence when running the bands.

The Fourlanders Contest Team in the North Carolina mountains experienced a seized pulley in the cooling portion of their large field generator that then started to steam up and was shut down. Their high power operation went to low power using back-up generators. Lessons learned — always have a plan B and spares.

Single-Operator Category

Although we generally focus on the highest scoring stations in these reports, thanks go out to all of the stations that got on the air to

Table 3
Affiliated Club Competition

Club Name	*# of Logs*	*Score*
Unlimited Club		
Society of Midwest Contesters	58	1,402,166
Medium Club		
Southern California Contest Club	21	2,813,852
Potomac Valley Radio Club	34	2,722,193
Florida Contest Group	18	1,395,420
Nacogdoches ARC	4	1,336,915
North East Weak Signal Group	21	1,311,769
Mt Airy VHF Radio Club	14	1,176,152
Yankee Clipper Contest Club	19	1,043,026
Northern Lights Radio Society	14	998,633
Central Texas DX and Contest Club	8	868,066
Florida Weak Signal Society	10	747,062
Carolina DX Association	8	625,210
Badger Contesters	21	602,461
Contest Club Ontario	27	511,813
South East Contest Club	10	477,828
Mad River Radio Club	13	467,782
Alabama Contest Group	12	461,347
Louisiana Contest Club	5	434,935
Northern California Contest Club	27	428,279
Grand Mesa Contesters of Colorado	11	401,301
North Texas Microwave Society	7	335,868
Rochester VHF Group	4	326,737
North Texas Contest Club	4	302,213
Arizona Outlaws Contest Club	16	292,738
Tennessee Contest Group	22	273,221
Pacific Northwest VHF Society	21	239,351
Roadrunners Microwave Group	3	195,784
Frankford Radio Club	7	160,643
Utah DX Assn	3	111,688
Western New York DX Assn	5	50,887
Minnesota Wireless Assn	5	46,272
Mississippi Valley DX/Contest Club	3	38,728
Contest Group Du Quebec	6	14,436
Local Club		
Murgas ARC	3	996,919
Chippewa Valley VHF Contesters	4	319,088
Eastern Connecticut ARA	6	135,750
Midland ARC	3	59,837
Bergen ARA	5	52,678
Bristol (TN) ARC	3	50,243
Medina 2 Meter Group	3	35,469
Portage County Amateur Radio Service	4	30,456
Burlington County Radio Club	4	30,240
Schenectady Museum ARA	3	25,347
Raritan Valley Radio Club	6	24,631
Spokane DX Association	3	1,242

K7ULS

K7ULS operated from Powder Mountain, Utah reporting, "What a contest! It was well worth the 60 mph winds and snow."

make this a fun weekend. Always remember that it takes two to make a QSO! Even with the finest equipment, best operators and superb conditions, there has to be activity to make this weekend of on-the-air action engaging. 132 SOLP and 12 SOHP logs submitted had 25 contacts or less so if you think you had a thin log, you were in good company. Seven SOLP and 7 SOHP logs had over 1000 QSOs. Some concentrated on a single band to get those numbers, while others used 10 bands to make those totals.

In the SOLP category, Bob, K2DRH, in IL again topped the list with 374k points with his 8-band effort. In second place from SC, Webster, WY3X, garnered 315k points using only bands ABD racking up 1,009 6 meter contacts in 268 grids. Vic, WB4SLM, in GA placed third with 310k with another big 6 meter effort, yet finding enough time to add contacts and grid multipliers on bands through 2.3 GHz. In 4th place, Rich, W5SXD, from NTX had 299k with a 6 band station but the basis of the big score was again an over-1,000 QSO result from 6 meters. Rounding out the top five is Dave, K5RQ, from WCF with a single-band 6 meter total of 255k from 1172 QSOs in 218 grids. Rounding out the Top Ten for SOLP we have NØLL, K4LY, N3LL, AE5T and K4WI, with scores between 243k and 252k. The small margin of difference was the mix of QSO points on the higher bands and their additional multipliers, since all of them had quite substantial 6 meter contact and grid totals.

George, K5TR, rocked the SOHP world with 702k points based upon 1883 QSOs and 310 grids on 6 meters plus an additional 87 QSOs on bands BCD along with 41 grid multipliers. In second place, Jeff, K1TEO, managed 579k with contacts on bands through 10 GHz. Third place went to Dave, K1RZ, with 481k, also a 10 band effort. Both Jeff and Dave had similar 6 meter totals in the 500 contact range, giving the indication that 6 meter E_s did not bless the Mid-Atlantic and Northeast as much as it did the rest of the country. The one exception to that is Lefty, K1TOL, in ME, who turned in a single-band log with 1121 6-meter QSOs in 216 grids, capturing 10th place in SOHP. Ivars, KC4PX, from SFL ran up a score of 475k for 4th place, with a huge 6 meter run of 1507 contacts in 314 grids, and 1 additional 2 meter contact. Fifth place was captured by Herb, K2LNS, operating the WA2FGK station in EPA and garnering 473k points, also with a 10 band station. K2EK in NFL placed 6th with 326k on a strong 6 meter total of 1316/241. W6OAL from CO was in 7th place with 265k and an 8 band effort. In 8th place from STX we had W3UUM with 259k and 9th place from NTX was WD5K with 251k, again with lots of 6 meter contacts from the E_s epicenter.

Multioperator Action

The Limited Multioperator (LM) category had 52 entries and the K8GP Grid Pirates topped the list with a score of 675k. Their 6 meter totals were 779/201 from VA, but they bolstered that with a giant total of 463/71 on 2 meters, 115/39 on 222 and 216/44 on 432. Their outstanding 144, 222 and 432 totals were a result of a colossal array of antennas in addition to their station location at 1800 feet ASL (above sea level) and a team of experienced, savvy ops. For 2 meters they employed three Large Vertical Arrays (LVAs) each consisting of eight 6-element Yagi antennas, each stack being set at the major direction of population, with another pair of FO-12 Yagis rotatable atop the 140 foot tower. You can find their whole June VHF story and pictures at the K8GP Web site, **www.k8gp.net**. In 2nd place, the W5ZN team scored 606k, taking advantage of their AR location in the 6 meter E_s with a 1317/295 total on the magic band. NR5M was 3rd with 421k from STX, also in the eye of the E_s and 1299/239 on 6 meters. The Wopsonock Mountain team of W3SO caught the 4th spot with 408k and their strength was also the contribution of bands BCD as their 6 meter totals were limited to 705/179. Ted, KN5O, in LA turned in a single-band 6 meter entry of 1342/292 to place 5th in the category, although in a sense, he really wasn't a Multioperator. He dutifully followed the rules and reported his score as a Multioperator as he had the cluster running on his desktop even though he really didn't need it or use it as he had his hands full working the crowd on 6 meters. [Strong work, Ted! — *Ed.*]

The top three finishers in the Multiop category are no surprise, as these groups have substantial experience and resources.

WB3IGR

George, WB3IGR reports, "Great 6 meter opening this contest! Lots of new grids!"

W2SZ again dominated with 1.83M and a hefty number of microwave QSOs and grids from their super location in Western MA. K5QE maintained the 2nd spot with growth in their microwave scores and 2 m EME grids. W3CCX placed 3rd again with a solid effort on 12 bands. The K3YTL group had bands through 2.3 GHz and came in 4th. WØEEA was in 5th place using 12 bands and the only 47 GHz QSO. Each of these groups has a Web site that gives more details and pictures about their efforts and clubs. The 63 Multiop logs account for 10% of all the submitted QSOs.

Rover Category Mélange

Rovers are still increasing in numbers and finding great joy in the ability to be operating from coastal and hilltop locations and from otherwise inactive grids. There were a total of 94 Rover entries this year, similar to past June contests. Traditional Rover entries numbered 42, Limited Rovers (RL) 42 and Unlimited Rovers (RU) 10. The LR category allows up to two operators and use of bands ABCD.

Kudos to Al, W5LUA, and Tony, WA8RJF, who manned the W5HN Rover. Their 88k points from NTX topped the RL list. The combination of a 4th band and a few more contacts on bands BCD gave them an 8k point advantage over 2nd place NO5LA, operated by Dallas, K1DW, and Ed, N5KGV, who logged an amazing 482 6 meter contacts in 161 grids. I wonder if the rovers really had to move to follow the E_s. Third place goes to Mike, W6YLZ, who appears to have tracked along with the SCCC pack rovers and ran up a 61k score with lots of QSO points and multipliers well distributed across four bands. He had a limited 6 meter grid count of 43 that paled in comparison to the others in the top five who all tripled that amount. Tim, AL1VE, drove throughout SD and had 60k for a 4th place finish and Jim, KK6MC, in NM had 59k for 5th place.

Table 4
Sponsored Plaque Winners

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

Plaque Category	*Plaque Sponsor*	*Winner*
Overall Single Operator High Power	Southeastern VHF Society	K5TR
Overall Single Operator Low Power	Mike Coogan, KB7ME	K2DRH
Overall Single Operator QRP Portable	Dave Carlson, AA9D	KA1LMR
Overall Multioperator	Randy Stegemeyer, W7HR	W2SZ
Overall Limited Multioperator	K1TEO, W2GKR, W2GKO, KA1FVG	K8GP
Overall Rover	Southeastern VHF Society	W6TAI/R
Overall Unlimited Rover	Connecticut AM Society, KW1AM	N3IQ/R
Atlantic Division Multioperator	Mt. Airy VHF Radio Club	W3CCX
Atlantic Division Rover	Potomac Valley Radio Club	W3HMS/R
Delta Division Single Operator High Power	Barney Fogle, K3FM	KB5AAB
Midwest Division Limited Multioperator	Gene Gabry, N9TF	WØEWM
Northwestern Division Single Operator Low Power	Paul Beringer, NG7Z - Western Washington DX Club	K7BG
Northwestern Division Single Operator QRP Portable	Mike Coogan, KB7ME	N6LB
Northwestern Division Multioperator	Randy Stegemeyer, W7HR	K7VHF
Pacific Division Multioperator	Jim Davis, NN6EE	N6TEB
Roanoke Division Rover	Potomac Valley Radio Club	WA2IID/R
Southeastern Division Single Operator High Power	Southeastern VHF Society	WB4SLM
Southeastern Division Rover	Southeastern VHF Society	AF4OD/R
Southwestern Division Single Operator High Power	W5UWB - In Memory of John Chambers, W6NLZ	N6EQ
West Gulf Division Single Operator High Power	North Texas Microwave Society	K5TR
West Gulf Division Rover	North Texas Microwave Society	AE5BN/R

Unsponsored plaques may be purchased by the plaque winner. If you wish to purchase an unsponsored plaque or order a duplicate plaque, contact ARRL Contest Branch Manager Sean Kutzko, KX9X, at 860-594-0232 or by e-mail at **kx9x@arrl.org**. The cost for plaques is $75 (includes shipping).

The story of the Rover category leader board is best told from Wayne, N6NB's Web page at **commfaculty.fullerton.edu/woverbeck/n6nb.htm**. The Southern California Contest Club had a group of 15 operators in 10 vehicles and also worked with two fixed multiband stations, one MO and the other SOLP. Nine of the vehicles entered the Rover category and they captured the top eight spots. Each vehicle had 10 bands, with three of them also equipped for 24 GHz. Ninth-place scorer Murray, VE3NPB, with Russ, VE3OIL, used 11 bands + LASER and scored 126k. They appeared to track together with Steve, VE3SMA, who had a similar setup and came in 10th with 98k.

The Unlimited Rovers have many options, and 10 entrants chose this category. Topping the list was the team of Brian, ND3F, and David, N3XUD, operating the N3IQ rover. They had a busy rove with a 180k score based upon a 10 band station with 551 contacts and 146 grid multipliers. WA3PTV had a 65k score also using 10 bands. The NN3Q team Russ with Al, K3WGR, had nine active bands and turned in a healthy 60k for 3rd place. All of these stations operated across grids in the Mid-Atlantic States area.

When the Unlimited Rover category was added to the possible rover categories, it appeared that it was in response to the grid-circling pack rovers, giving them their own category. That also allowed the more traditional rovers to compete against each other by making the rounds of several grids and making contact with the fixed stations. No matter what your opinion may be about the West Coast rover group activities, it is clear that they have established themselves as a controversial force in the VHF contests. They have attracted a few more like participants to the shorter wavelengths with the "bands in a box" stations. When it comes to adding up the numbers of contacts on bands FGHIJ, they accounted for 57% of all the QSOs made on these bands. In addition to 6 meter activities monopolizing the weekend, the reduced number of microwave capable rovers on the East Coast also contributed to the limited number of microwave contacts made by all other stations.

Portable Operations

Single-Operator Portable entries get a lot of respect from me as they venture out to locations where they can hear well, but can transmit low power only, restricted to 10 W and required to use a portable power source, portable equipment and antennas. For several years, Chris, KA1LMR, in NH has been on the top of the QRP list, and his score of 115k with a 6 band effort put him there again. He had 389 contacts in 120 grids on 6 meters. That is a testament to what can be done when the band is making its magic. A long way back in 2nd place, Curt, K9AKS, had 38k using 4 bands in CO, capturing 238 QSOs on 6 meter with 129 grids. Jory, KJ5RM, was 3rd in QRP with his NTX score of 19k on bands ABD. W4RXR was 4th from VA with 11k on 5 bands. Rounding out the top five of the 20 entries in this category was Ken, WB2AMU, in NLI with a 4 band entry of 10k.

Aggregate Club Scores

Adding all the club entry logs together totaled 508. Considering that there are many MO entries in the club category, I estimate that 50% of all the contestants submitting logs are also members of ARRL Affiliated Clubs. Uncontested in the Unlimited category with 58 contributors, the Society of Midwest Contesters amassed 1.4 million points. In the Medium category, the Southern California Contest Club scored 2.8 million points, with 2.2 million of those points scored by their pack rovers. All told they had 21 contributors. The Potomac Valley Radio Club was second in the category by a mere 90k points and had a 2.7 million total representing 34 participants. The Florida Contest Group with their 18 stations produced a 3rd place score of 1.4 million. The Murgas ARC topped the Limited Club entry list again, with the score of WA2FGK as their main contributor. Their three stations had almost 1 million points total. The 2nd place club in the Limited Club category was the Chippewa Valley VHF Contesters and their 4 entries totaled 320k. In 3rd place we had the Eastern Connecticut ARA with 6 logs and 135k total score. What is remarkable about all the club entries is that they have stimulated growth of VHF and microwave activity and generated greater group participation in these and other on-the-air events. Any of the clubs listed represent a brotherhood of helping hands and technical support. If you are a VHF beginner, or merely seeking to improve your station or operating skills, these clubs are excellent resources. Information about these clubs and contacts can be gleaned by looking at the ARRL Affiliated Club listings or using an online search engine.

In Closing

I am grateful to all the stations for sending me reports of their successes and their frustrations. Without all of the reports and posts on the ARRL Soapbox, it would be difficult to make a contest summary. Even if you didn't see mention of your call and activity here, as space no longer permits all entries to be listed in *QST*, take solace in the fact that you were a participant in one of the most exciting June VHF QSO parties of the decade. I would also like to thank Jani, my XYL, for her editing skills and support.

Complete contest results including all submitted line scores are available on the ARRL Web site under "On the Air": click the Contests link. If you missed the magnificent conditions this time around, you'll get your next opportunity on June 11-13, 2011. This year's contesters will be looking for increased participation and as exciting, if not better propagation.

More Results Online

You can find additional commentary, regional and QSO leaders, and a complete table of all the new Section-level records in the online version of this article at **www.arrl.org/contests**.

The 2011 ARRL DX Contest

CW: 0000 UTC Saturday February 19 – 2359 UTC Sunday, February 20

Phone: 0000 UTC Saturday, March 5 – 2359 UTC Sunday, March 6

- E-mail Cabrillo-formatted electronic logs to **dxphone@arrl.org** or **dxcw@arrl.org**; paper logs to ARRL, 225 Main St, Newington, CT 06111 USA
- This is Amateur Radio's oldest contest, and the goal is still the same: Work as many stations as you can in as many different countries as possible. How many can you work? 25? 50? Can you earn DXCC in a weekend? Many amateurs have!
- W/VE stations send a signal report and state or province; DX stations send a signal report and transmit power.
- Complete rules are at **www.arrl.org/contests**
- Be sure to tell your ARRL DX story at **www.arrl.org/soapbox**

CW log submission deadline: 2359 UTC Tuesday, March 22, 2011

Phone log submission deadline: 2359 UTC Tuesday, April 5, 2011

BOB WILSON, W4BW

The TI8M crew enjoyed themselves in the 2010 ARRL DX Contest!

www.arrl.org/contests

The 2011 ARRL January VHF Sweepstakes

1900 UTC Saturday, January 22 – 0359 UTC Monday, January 24

- 6 meters and up will be full of activity on the 4th weekend of January as VHF+ operators fire up their rigs in pursuit of radiosport fun! Enhanced propagation via tropospheric ducting, aurora and maybe even a little sporadic-E will make QSOs over hundreds of miles possible! The exchange is simply your Maidenhead grid square.
- Participate from home, from your car or from a nearby hilltop. SSB/CW will be the main modes, but some FM work will be possible, especially if you live near a high-population center.
- All logs must be postmarked no later than 0400 UTC Wednesday, February 23, 2011. E-mail Cabrillo-formatted electronic logs to **januaryvhf@arrl.org**. Paper logs go to ARRL January VHF Sweepstakes, 225 Main St, Newington, CT 06111.

JOYCE WITTE, KØJJW

Bob Witte, KØNR, atop Mt Herman in DM79, near Monument, Colorado during the 2010 ARRL January VHF Sweepstakes.

"See you on the 'ultra-highs' in January!"

2010 Rookie Roundup Announcement – CW

SEAN KUTZKO, KX9X

Many Rookies will be trying their "fist" at CW in December's Rookie Roundup, like Katie Glass, KB1ULQ.

Sunday, December 19, 2010
1800 UTC – 2359 UTC

- The "RR" returns for the third time in 2010, with CW as the mode! Any amateur licensed in 2008-2010 can enter as a Rookie. "Old Timers" work the Rookies as Contest Elmers. All Rookies earn a certificate of participation!
- Complete rules, helpful tips and the online score submission form are available at **www.arrl.org/rookie-roundup**.
- The Rookie Roundup Web page lists logging software you can use, or try the free online logging service at **www.inthelog.com**.
- Report your score using the online submission form at **www.arrl.org/rookie-roundup-score-submission**. All entries must be received no later than 2359 UTC Wednesday, December 22, 2010.

"We'll see you on the air in the CW RR!"

THE 2011 ARRL RTTY ROUNDUP

1800 UTC Saturday, January 8 –
2359 UTC Sunday, January 9, 2011

Susan, K5DU, was not going to spend the weekend at the radio but ended up working the full 24 hours *and* working all states.

- **Digital contesting activity is at an all-time high, thanks to the availability of PCs, easy-to-use software and plug-and-play soundcard interfaces. Have you jumped on the digital contesting revolution yet? If not, the RTTY Roundup is a great way to start!**
- **Submit Cabrillo-formatted electronic logs to rttyru@arrl.org. Paper logs go to ARRL RTTY Roundup, 225 Main St, Newington, CT 06111.**
- **All logs must be e-mailed or postmarked no later than 2359 UTC Tuesday, February 8, 2011.**

Complete rules can be found at **www.arrl.org/rtty-roundup**

2011 ARRL Straight Key Night


VE3LC

Norm, VE3LC, enjoyed participating in SKN with his Johnson Viking Ranger transmitter and Drake 2B receiver.

- Amateur Radio's New Year's tradition! Dust off the old straight key or bug and enjoy CW the good-ol'-fashioned way: by hand!
- SKN is not a contest, but an activity night to get on the air and enjoy leisurely CW QSOs with a straight key or bug. Many amateurs use the occasion to operate vintage gear, but this is not required. Be sure to submit your votes of "Best Fist" and "Most Interesting QSO" along with your log.
- All reports must be received by January 31, 2011. E-mail reports to **straightkey@arrl.org**, or send paper reports to ARRL Straight Key Night, 225 Main St, Newington, CT 06111.

0000 – 2359 UTC January 1, 2011

ARRL VEC Volunteer Examiner Honor Roll

The ARRL VEC Honor Roll recognizes the top 25 Volunteer Examiners according to the total number of exam sessions they have participated in since their accreditations. Since each session requires an average time commitment of 2-4 hours or more, the thousands of hours these VEs have invested is extraordinary! Whether you are one of our VE Teams that test once a week, once a month or once a year, we want to express our warmest appreciation to all volunteers for their generous contribution to the ARRL VEC program.

If you are an ARRL VE, you can see your session stats online at **www.arrl.org/ve-session-counts**.

If you're not a VE, become one! See **www.arrl.org/become-an-arrl-ve**.

Examiner Call	*Sessions*	*Accreditation Date*
Sammy Neal, N5AF	504	20-Nov-84
Harry Nordman, ABØSX	425	09-Jan-02
Royal Metzger, K6VIP	368	29-Apr-85
Karen Schultz, KAØCDN	355	06-Sep-84
Kevin Naumann, NØWDG	346	17-Nov-02
Glenn Schultz, WØIJR	345	28-Sep-84
Franz Laugermann, K3FL	342	01-Dec-91
David Bartholomew, ABØTO	333	22-Mar-02
John Moore III, KK5NU	323	21-May-95
John Mackey Jr, KSØF	320	01-Oct-90
Paul Maytan, AC2T	316	06-Sep-84
Victor Madera, KP4PQ	302	01-Mar-92
Gerald Grant, WB5R	292	04-Jan-85

Examiner Call	*Sessions*	*Accreditation Date*
John Hauner, KØIH	289	11-Jan-85
David Fanelli, KB5PGY	285	01-Oct-91
Gary Mangels, AD6CD	282	30-Jul-97
Daniel Calabrese, AA2HX	281	01-Nov-91
Frankie Mangels, AD6DC	278	14-Oct-97
William Martin, AIØD	276	01-Nov-84
Michael Faucheaux, N5KBW	273	15-Jul-96
Leslie Dale, NI5S	267	06-Sep-84
Robert Hamilton, NØRN	267	19-May-87
Scott Swanson, K6PYP	266	01-Dec-92
Roy Johnson, N1IKM	264	24-Jul-95
Loren Hole, KK7M	263	06-Sep-84

2011 Kids Day Announcement

The first Sunday of 2011 is the time to get youngsters on the air and share the joys and fun that Amateur Radio can provide.

Kids Day returns January 2, from 1800 to 2400 UTC.

Sponsored by the Boring (Oregon) Amateur Radio Club, this event helps bring the excitement of Amateur Radio to a younger audience. The exchange is simple: First name, age, location and favorite color. After that, the contact can be as long or as short as each participant likes.

Suggested frequencies for Kids Day are 28.350 to 28.400 MHz, 24.960 to 24.980 MHz, 21.360 to 21.400 MHz, 18.140 to 18.145 MHz, 14.270 to 14.300 MHz, 7.270 to 7.290 MHz, 3.740 to 3.940 MHz, as well as your favorite 2 meter repeater (with permission of the repeater's sponsor, of course). You can work DX, but be sure to remember any third-party traffic restrictions that may exist when a non-licensed operator is working a DX station.

After Kids Day be sure to visit the ARRL Online Soapbox at **www.arrl.org/soapbox** and share the operating story from your location. It is a great way to show the up-and-coming generation of operators the fun they can find in the magic of Amateur Radio.

Then be sure to log on to **www.arrl.org/kidsday**, fill out the online survey and print a certificate for each of the kids who participated at your location. Suitable for framing, these certificates will help stoke their interest in Amateur Radio for some time to come.

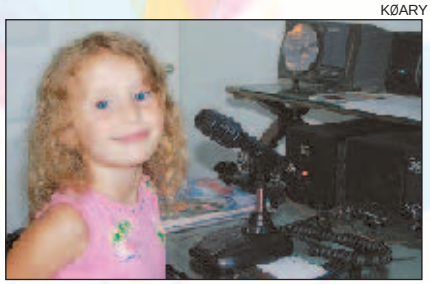
Kids Day opens doors and opens minds. Open your shack doors and invite the youngsters over to learn and enjoy themselves. Let's all work to get some fresh, young voices on the air January 2!

kidsday@arrl.org

AD6D

Luis Alberto and David operating Kids Day 2010 from the shack of Luis's dad, Hector Garcia, AD6D.

KØARY



Bruce, KØARY, opened up his shack to his granddaughter Adrianna. Adrianna and her sister Trinity almost completed Worked All States during last January's Kids Day.

Life Members Elected October 23, 2010

Gayle D. Adams, **KD8KWG**
Paul M. Alberghini, **W1IMD**
James S. Allen, **KB1UFY**
Richard E. Andersen, **N7OKQ**
Cody E. Anderson, **KI4FUV**
Peter Anvin, **AD6QZ**
Dennis S. Arcaro, **KB1BCT**
Dave Archer, **KA7RRA**
Paul W. Armes, **K5PWA**
James Avery, **KCØKTG**
Thomas H. Baldwin, **W6MDX**
Gary E. Barnes, **KI6HIG**
John W. Barr, **KA9LYK**
Mark L. Bary, **N4EOC**
Geoffrey M. Baugh, **KD6SJP**
Christopher R. Begg, **NN2G**
George E. Boswell, **K7YHB**
Mark A. Braden, **KA6HQT**
Kyle A. Brewer, **AE5IJ**
Jerry R. Bridges, **W6FPT**
Billy J. Brookins, **KC8MVW**
Adam R. Brown, **K2ARB**
Russell E. Bruhnke, **WAØRB**
Bruce D. Brumm, **KCØZMT**
Michael A. Burton, **N6KZB**
Steve Busono, **W2FB**
Fred I. Caswell, **WB1I**
James E. Chaggaris, **N9WW**
Patrick J. Champa, **KC8LQA**
Brian R. Chapman, **NB9E**
Anthony J. Chavez, **KCØFCK**
John J. Clarke, **KE4CRR**
Michael R. Clayton, **KØXH**
Glen R. Closson, **N6PQP**
Chris Conklin, **NØCF**
Tim Connolly, **AE5TC**
Michael Corey, **W5MPC**
Egbert C. Craig, **WA2SI**
Reid W. Crowe, **NØRC**
Paul C. Dallard, **KM3W**
Zane E. Darner, **KA7UOR**
Malcolm E. Davenport, **KI1G**
Daniel S. De Court, **W3WDD**
Donn S. Dengel, **W9TOC**
Michael E. Derbort, **KCØELG**
Laura K. Dill, **KDØFXV**
George R. Dobson, **W5GRD**
Jan G. Eberle, **W9EB**
Michael A. Edwards, **KG6TLD**
Clifford L. Ensley, **KI6LBD**
Gayle G. Essary, **WD5FWM**
Richard E. Essen, **N6CX**
Matthew D. Finlayson, **WS9F**
Raymond C. Fleisleber
Ben Franske, **KØBEN**
Shunichi Fujii, **NY9V**
Richard J. Gallant, **KF4HVT**
Virginia H. Gallenberger, **K4VHG**
Thomas R. Galloway, **W5XN**
John G. Gammon, **AD5MJ**
John C. Gaynard, **K8WDN**
Mark S. Gerber, **WH7W**
Marc Gergen, **WØWCH**
Richard C. Gillespie, **KC8BQ**
David Giuliani, **WA6PXX**
Robert L. Glasscock, **WA4WLI**
Luis A. Gonzalez, **KP4UD**
Melvin B. Graves, **WRØI**
Kenneth Gray, **MØKNT**
Max S. Green, **KG6LPH**
Erik K. Gregg, **KB3RXM**
Michael F. Gregory, **W5INC**
Harry Gross, **KC2FYJ**
Gary S. Gumowitz, **KB2KSW**
Greg T. Hader, **N7NHW**
Joseph L. Halbleib, **KI6SEB**
William J. Hance, **NV7X**
Cameron N. Hasson, **KJ4EDF**
Scott B. Hedberg, **AD7MI**
Richard J. Herzer, **AF2CW**
Edwin Hill, **K9KUV**
G. Hill, **K4QJZ**
David W. Hines, **W2NYS**
Darren S. Holbrook, **KH6OWL**
Charles F. Horejs, **KG6VCC**
John K. Humkey, **WD4LCX**
Robby Hutchinson, **KI4ODT**
Thomas Hutchinson, **N7PKK**
Kairy R. Ibrahim, **KSØHAM**
Brenda A. Jacob, **KF5GWF**
William F. Jessee, **K7KSO**
Gregory Z. Jigamian, **N6GZJ**
Jay H. Joerger, **NM2M**
Brian S. Jones, **KD4UYP**
Roger F. Jordan, **W4RFJ**
Marcus S. Justice, **KE7TR**
David L. Kamps, **AC5N**
Gary L. Keck, **KE7DX**
Lydia D. Kile, **NØLUG**
James E. Kinney, **AF6PK**
David M. Knapp, **KU9L**
Philip Koban, **KØBAN**
Steven M. Lafferty, **NØLTM**
Luc Lefever, **ON4NL**
John R. Lilly, **AB5NS**
Marc A. Lonstein, **KI4LJM**
Jay F. Lopes, **N7ZUF**
Jean Lynn, **KD6MNN**
Pierre Mainguet, **F8FHC**
Jimmie L. Mangus, **WB8YST**
John L. Marshall, **WA7BSR**
Thomas E. Martin, **N5OEY**
Anthony K. Mayernik, **K7AKM**
Ted A. Mc Arthur, **AC7II**
Bill W. McCollum, **KEØXQ**
Patricia A. McCollum, **KBØFSI**
Stephen M. Meer, **KØSCC**
Michael J. Mello, **N5MJ**
Robert Mershon, **N8RDL**
Matthew M. Millard, **KDØEEX**
Wakako Minami, **KF5HBW**
Nancy R. Mitchell, **KB5LCR**
Stephen C. Molnar, **KB3DJS**
John H. Moore, **KB1CSI**
Richard W. Moore, **KDØJDF**
David A. Norris, **K5UZ**
Avi Nutkis, **W2GKG**
Anthony M. Ochoa, **W6ZRD**
JP O'Connor, **WF4Z**
Charles T. Olinda, **N2SRQ**
John C. Oppenheimer, **KN5L**
Lynn Orendorff, **ACØPK**
Richard E. Pack, **KE6SHL**
Joseph G. Palsa, **K3WRY**
David A. Perkins, **N6DAP**
Krassimir D. Petkov, **K1LZ**
Gregory A. Phillips, **WI4T**
Hector C. Pineda, **KI6PTR**
Robert E. Pirkel, **WA9RUX**
Rhonda Pitone, **KJ4FSH**
Charles R. Poindexter, **KE5HGQ**
Tom Poindexter, **KE5GKK**
Juanita F. Portz, **KK7WA**
Dennis R. Presky, **K3PSP**
Glenn O. Raines, **KA4SZQ**
Stephen Ralph, **W6SKR**
Linda Reeder, **N7HVF**
Vernon M. Reher, **KB9ASN**
Manuel A. Rodriguez, **AB5YJ**
Jeremiah Z. Rogers, **KE4LSU**
Alex H. Rubenstein, **K2AHR**
Heather Sabin, **KI6TLG**
Woodrow W. Salyer, **K6WWS**
Blanche B. Sarratt, **N4LUV**
Takahisa Sato, **NY6A**
Edward A. Schalow, **AA2L**
Brian L. Short, **KCØBS**
James G. Shryne, **N6DHZ**
Alan R. Sifford, **KG5CC**
Vishnu K. Singh, **AJ4VS**
Robert R. Skutt, **W8PC**
Houstin G. Smith, **KAØHMQ**
Scott P. Soukup, **W7SPR**
William O. Speck, **W7WOS**
Larry L. Springsteen, **WB8LBZ**
Oscar Staudt, **WB5GCX**
Stephen A. Stimpson, **W1ST**
John Robert Stratton, **N5AUS**
Charles E. Thropp, **WC2X**
Jim Tiemstra, **K6JAT**
Brad L. Tracey, **N3NRN**
Robert L. Turpin, **N5AKA**
Rich Vanderwerker, **N9EMS**
Robert J. Verdon, **KA2FWN**
Weymouth D. Walker, **K8EAB**
Ronald J. Walkinshaw, **KØRJW**
Robert J. Walkney, **N5UJF**
Rex B. Walthers, **KE5ZYK**
Steven R. Weinert, **K9ZW**
Joseph P. Whelton, **KZ5P**
Newton B. White, **AA2LI**
Jeffrey A. Whitlatch, **KO7M**
Arthur L. Wicks, **KG4ZSM**
Douglas H. Wilson, **N1KB**
James Wilson, **K6WRJ**
Michael P. Wisniewski, **KCØTAF**
Charles C. Woodin, **KB1FTD**
Carl E. Young, **K5HK**
Lori A. Youngs, **KE7KXN**
Renee M. Zelickson, **KF4CHY**
David E. Zelinski, **W4CPO**
Edward Zeranski, **KG6UTS**

W3UR

HOW'S DX?

3B8 Mauritius and 3B9 Rodrigues Islands 2010

Giorgio Minguzzi, IZ4AKS

This year I promised my wife to spend our holidays without the radio. But eventually, an advertising flyer popped up in the middle of nowhere, promoting the island of Rodrigues. On the corner of the page I noticed a picture of the well-known Cotton Bay Hotel (the resort hosting 3B9C and later on many other DXers).

My enthusiasm was so evident that my wife sensed it instantly. "It is a most wanted, isn't it?" At this point I realized that I would be able to bring the equipment with me, as long as I would not spend all the time transmitting. My wife is an angel!

Actually, Rodrigues is not a most wanted, but the island stands out in a perfect equilibrium among the semi-rare prefixes on the DXCC list and it is a wonderful place for a family holiday. Just how I dreamt our holiday would be.

The procedure to get the license is very smooth, even if requiring 3-6 months to be fulfilled. MARS (Mauritius Amateur Radio Society) has done a perfect job in coordination with ICTA (the body charged to release the official license) and with the help of the organization secretary — Jacky Mandary, 3B8CF — it was very easy to obtain the necessary authorization.

Once reassured by ICTA, I started mailing La Pirogue, the resort where we would lodge during our short stay in Mauritius, and the Cotton Bay Hotel in Rodrigues to investigate the possibility of installing my equipment.

At this point, the very last difficulty was my luggage weight. Rodrigues is served by one daily flight, proceeding from Mauritius. The plane was an ATR 72-500 with a maximum luggage allowance of 15 kg per person. This is quite a considerable restriction, particularly for a lone traveler carrying all of his radio equipment. Even if a passenger has paid for extra baggage, the company has the right to load it subject to available space on board.

I had to pack my stuff several times in order to reach a good mix of equipment, thus passing from 45 kg on my first attempt down to 15 kg.

Obviously I had to give up the low bands and be content with only 100 W. My wife still torments me for removing a few clothes and her hair straightener from the suitcase to accommodate the power supply and the microkeyer.

Giorgio, IZ4AKS, and Jacky, 3B8CF, on Mauritius Island.

Giorgio, 3B9/IZ4AKS, operating from the first room of the Cotton Bay Hotel.

The multiband I1UJX homebrew vertical antenna weighs just 3.5 kg and was used on 7-28 MHz.

3B8/IZ4AKS Is On the Air

On our arrival in Mauritius, the first impression we got — aside from its paradisiacal nature — is the traffic. I was able to make it on time to ICTA to receive the documents thanks only to the flight landing ahead of schedule.

Anyway, I had already decided to transmit from Mauritius in order to add one more point to my DXFC score (**www.dxfc.org**) and use the short stay to visit the island and Jacky. I owed him a lot. He had helped me to fill out the papers and in the past he had given me many brand new band points. I could not miss the opportunity to meet him in person.

The resort accommodated us in the bungalow chosen via Google Earth. Room 001 — only 200 meters away from the sea — was waiting for us. It looked out on a road at the back and a large garden at the front, completely void of tourists. The multiband antenna that I brought with me was the one designed by the unforgettable I1UJX (only 3.5 kg for 10-40 meters). Not being close to the water, I did not expect anything special. As soon as I started logging European and Japanese stations simultaneously, I changed my mind. In the 3-4 hours maximum operating during the 2½ days at La Pirogue, I was able to put some 300 contacts in the log.

I cannot say that there was no propagation at all. There was propagation to locations not very populated by Amateur Radio in South East Asia or Africa. In fact, it was quite common to call for 15 minutes without a reply and then be answered by an XX or an XU with signals far over 9. The distance from Mauritius to the center of Europe is about 9500 km (more or less the same distance between Italy and California), and Japan is 10,000 km away, not to mention the West Coast located at a distance of over 17,000 km.

After the first days of transmitting from Mauritius I recognized that the only way to make some contacts from there was to not miss any openings. I should have tested immediately the hints received from Max, IK8LOV. Indeed the **DxCoffee.com** propagation analyst had drawn a detailed chart for me, providing any kind of suggestion on the subject and for each band. Max prepared all the propagation charts with the most updated information, just a few hours before my flight to Mauritius. So the forecast was very accurate.

Right when I was promising myself to use my first day in Rodrigues to check out this information, the in-room phone started ringing.

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The verticals on the shoreline as seen from the Cotton Bay Hotel on Rodrigues Island (3B9).

An Unexpected Event Saves Us

I felt my blood freezing as I heard the tour operator assistant talking about some problems with our trip to Rodrigues. The Honorable Pravind Kumar Jugnauth who is the vice prime minister and also minister of finance and economic development, had scheduled an official visit in Rodrigues and would be lodging at the Cotton Bay Hotel. His accommodations were in the exact same bungalow that I had booked. So the tour operator assistant proposed that we remain in Mauritius, at their expense. Well, we could not accept it!

I started protesting showing all my disappointment and eventually they proposed a compromise. I would stay in Rodrigues for 3 days in a smaller room and then — as soon as the Minister returned to Port Louis — I would move to my bungalow. Obviously, I checked if it was possible to install my shack in the new room and the answer was no problem. Even the service was upgraded as a sort of compensation for the disturbance to us.

That was real luck. The hotel paid for all of my meals because of the inconvenience so this saved me travel time as the Cotton Bay is quite secluded and it is not easy to go into town for meals. If I had had to use the car every time, I would have had little time to transmit. Therefore, aside from the initial shock, this unexpected event literally improved my micro-DXpedition.

3B9/IZ4AKS On the Air

Once I began my operation on Rodrigues, the first pileup was very strong but not as traumatic as I had experienced in other places. The operations were facilitated by the nearly complete absence of noise and electrostatic discharge. I thought I would have some trouble because of the monsoons but that was not the case. Not at all. At times the band was so silent that I started wondering if the receiver was working.

The propagation was variable and generated many different openings. Japanese stations were worked in the mornings and Europeans before lunch and then through dinner time. At times, on 15 meters the signals arriving from Europe and Japan had similar intensity and indeed it was often challenging to work with it.

I marked in my diary a few openings giving me huge satisfaction. On my first days I could log many Europeans on 10 and 12 meters with short but intense openings. And the last night I had an exceptional opening to the West Coast, allowing me to contact many Americans and Canadians. For this last opening I need to thank the European ham radio operators for behaving very correctly during this fantastic opening and keeping silence while waiting for me to start working them again. The conditions with the US were similar even on 40 meters and in accordance with my family duties I tried to be present at sunset on CW (the mode I prefer, even if I'm not really good at it). In any case even on 40 meters I had a good deal of satisfaction and my sole regret was to not have completed a contact with a KL7 being at the limit of background noise.

In my notes there are not only the good things, but also some "problems" and some mistakes of mine. For example, I was hoping that 30 meters would have granted me some extra contacts, but there was very little on this band. Also RTTY, for a one-man-show DX-activity, was not particularly fruitful. Very often I had to call for 15 minutes or so to get a response, but as soon as I was spotted on the cluster, the pileup was very hard to manage. This brought down the rate, which was very low. This experience taught me that to do RTTY right, it is necessary to have some extra operators, aside from being very well equipped.

The radio, without all its filters, had some limitations and even if positively impressed by the FT-897D transceiver, I don't think I had the proper configuration for RTTY.

Anyway, even for a few operations on SSB, mainly due to the band plan (on 40 meters from 7000 to 7100), the radio proved excellent for reception but not very handy to access the menu. This made it very hard to use its options fully. I do realize I'm very demanding. One cannot have everything in less than 4 kg.

On Rodrigues, as it was on Mauritius, at certain times the propagation offered very good paths without any ham radio activity. One day for example I heard very few calling R1ANP from Antarctica. So we exchanged the new one, even though I had some natural obstacles that were difficult to overcome in that direction.

Giorgio, IZ4AKS, enjoyed Rodrigues Island too much!

Giorgio, IZ4AKS, explaining ham radio to the Honorable Pravind Kumar Jugnauth, vice prime minister and also minister of finance and economic development of the Republic of Mauritius.

Conclusions

It is always difficult to draw conclusions, both for the person outside the activity and for the person living it in the first place. Having not asked for any sponsorship, I did not feel any pressure as to the methods and times of operation. I did not feel any pressure about the results I had to achieve. My first objective was to spend a nice holiday with my family and that allowed me to experience a most enjoyable and instructive micro-DXpedition.

Photos by Giorgio Minguzzi, IZ4AKS QST


W3ZZ

THE WORLD ABOVE 50 MHz

Pat Rose, W5OZI, and the Quest for FFMA #2

As I described in the November 2006 column, VHF+ operators define their locations by a worldwide system of grid squares, 2° wide by 1° high. This system is based on a system proposed in a 1980 meeting at Maidenhead, England convened by G4ANB based on a system in turn created by SM5AGM. The ARRL formally adopted the Maidenhead grid system in 1983 with the VUCC (VHF/UHF Century Club), a system of awards for working a given number of grid squares on the various VHF+ bands.

From its inception, one of the distant and difficult goals was to work all 488 contiguous grids in the continental United States on 6 meters. Viewed as an extremely difficult lifetime achievement, only one 6 meter operator until 2010 had ever completed this task, Fred Fish, W5FF (SK), one of the best recognized 6 meter operators ever.

All 6 meter old timers knew Fred Fish — his big station, his large antennas and his excellent operating. Even for Fred this was an arduous task. First Fred was in New Mexico, a fortuitous location for challenge. He was west of the Mississippi where most of the lightly populated grids existed, many of which were a single hop from his location in DM64, and also sufficiently far south that he encountered a larger amount of E-skip than he would otherwise have had were he farther north.

Secondly, he was not only a great operator but knew 6 meter propagation backward and forward. This was critical because in those days there was no FSK441 to make single hop (2000 km) QSOs almost guaranteed between reasonably equipped stations. SSB meteor scatter required relatively experienced operators at both ends who got no help from powerful software. Third he was willing to put in the time to achieve this goal. Like many other DXing and contesting objectives, it pays to have your butt in the chair and never to miss any openings.

I remember Fred approaching the 488 grids until only one remained — FN64, the easternmost Atlantic coastal grid in the United States and incidentally some 3500 km from NM to ME, a distance of two full E_s hops. Like most rare grids, FN64 was sparsely populated, had few hams and even fewer VHF operators. A beautiful place but one with limited work opportunities unless you were in the business of catching and selling seafood. As a native of southern New England and a frequent visitor to Maine, I can tell you that it is a large state, going northeast along the coast some 222 mi/358km from FN43pb to FN64mu. At that time there was as far as I know only one active 6 meter station in the grid, N1MLE, who appeared first circa 1993 and finally Fred snagged him in 1995 to become the first 6 meter operator to work all continental US grids.


Pat Rose, W5OZI, at his station console.

As I described in the April 2009 "World Above" column, more than 3 years ago Bill, W5WVO suggested that a Fred Fish Memorial Award (FFMA) be established and awarded to operators who subsequently worked all 488 contiguous US grids. Fred, W5FF was posthumously presented FFMA #1. This summer on July 8, 2010 Pat Rose, W5OZI was the second to achieve that feat — FFMA #2 (see photo). This column deals with Pat's accomplishments and is based on information that Pat has given me. The battle for #2 was quite spirited because on July 30, 2010 Rick Roderick, K5UR obtained FFMA #3.

This Month

December 11-16	2010 High Speed MS Geminids Test
December 14	Geminids Meteor Shower peaks 1100Z
*December 26	Very good EME conditions

*Moon data from W5LUU

W5OZI

Llewellyn P. "Pat" Rose was first licensed in 1948 in his hometown, Austin, TX as W5OZI. His original Elmer was George Harvey, W5NFC who first interested him in ham radio in the mid-1940s, but he was soon attracted to 6 meters by his father's friend, Wilmer Allison, W5VV (SK) who gave him a 3 element 6 meter beam in early 1950s. Pat worked some stateside stations and a little bit of DX with that beam, a Harvey Wells TBS-50 transmitter and an RME 10-6-2 m tuner probably into a BC348 receiver.

Following college and the Texas National Guard he went on active duty with the US Army Signal Corps in 1953. He operated from some stateside and overseas areas (as K4ADL, DL4FL, HS1R, KL7FCC, K4BLE, WØORQ and G5BGA) but only on HF. As KL7FCC and MARS Director for US Army Alaska he was involved in emergency communication between Alaska and the "lower 48" during the 1964 Good Friday earthquake. All through his service career, ham radio played a big part in his interests and military activities. In 1976 he retired from the Army and moved from London to the family ranch in Kimble County, TX where he continues to operate the ranch and play ham radio at his home in Junction, TX. Having now retired from his second career as an electrical contractor he remains an active rancher.

Pat has been very active on 6 meters since 1985 and has worked 164 DXCC entities and 1159 grids on that band. For almost 10 years

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he was Secretary of The Six Meter International Radio Klub (SMIRK) and remains President of that organization. He has operated as KG4ZI and VP2MFZ, providing many contacts to the VHF multitude. For many years he has enjoyed "grid hopping" to rare grids in Mexico and West Texas, to give lots of the guys a "new one" on 6 meters. One of the rarest was DL88, in southern Texas, the unsuccessful target of Marshall, K5QE and friends this past summer. DL88 is one of the most desolate spots in the US featuring dangerous terrain and numerous drug traffickers that have defied even well-organized Gridpeditions like Marshall's. Says Pat, "I wouldn't return there for love or money." On the HF bands he has 10 band DXCC and #1 DXCC Honor Roll with 343 entities worked. He presently runs a Yaesu FT-920 on 6 meters driving a homebrew linear amplifier with a pair of Eimac 3-500Zs into stacked 8 element W1JR-designed Yagis at 31 and 23 meters AGL. On HF he uses a Yaesu FT-1000MP and an Alpha 89. HF antennas are shunt fed verticals for 160/80 m, sloping half-wave dipoles for 40/30 m, and a 12 element Tennadyne log periodic antenna at 25 meters for 20 through 10 m.

CM79

As of the end of September there have been two feature length articles about Russ Dwarshuis' (KB8U) backpacking expedition to the intersection of the grid corner at CM79/CM89/CN70/CN80 (R. Dwarshuis, *QST*, Oct 2010, pp 70-71 and Lynch [VHF Plus] *CQ*, Sep 2010, pp 84-86). Having previously activated the rare DN67 grid in MT two years ago, Russ took on the challenge of CM79, which contains only 0.5 mi^2 of roadless wilderness in the King Range National Conservation Area of northern California (see photo). The four-grid corner was accessible at a point 70 ft down from a hiking trail along a ridge leading to a campground. Following FFMA rules, Russ located the body of his ICOM IC-706 transceiver and its attendant batteries at the grid corner and the front panel and a Moxon antenna on the ridge with LMR400 coax and the front panel extender cable running between them. Each day Russ set up the equipment after hiking 3 km and going 270 meters up the ridge. Pat was quite weak but as noted below was the initial out of the area contact. As I indicated in April 2009, rare FFMA grids are rare for a reason and only with perseverance, daring and hard work does anyone succeed in activating them. So Russ deserves a huge amount of credit for his operation.

Musings on being FFMA#2

Regarding winning FFMA#2 Pat says he is proud that he knew Fred Fish, W5FF through meeting him at some of Jimmy Treybig's BBQs in California, but mostly because Pat was able to give him some of his much-needed grids in South and West Texas plus some in Mexico operating with Pat's dear friend Rafael, XE2OR. Pat also considers it highly unfortunate that John, W9RPM did not win this award first, as he had already completed all 488 but lacked a card from just one. John and Pat have maintained a friendly competition during the past several years that they have documented on the FFMA Yahoo! Reflector and Pat considers him a fine gentleman.

Most of all, Pat wishes to thank Russ, KB8U for his energetic and practical approach to solving the problem of activating CM79. There were other options, such as an operation from a boat south of Shelter Cove, CA but that would have been expensive and difficult to perform and at best would have been at sea level, nowhere near as good a location as the hilltop at the grid intersection that was Russ' ultimate location. Still, more than a few of Pat's friends were looking into the sea level operation but Russ took the bull by the horns, flew from his home and trekked up that hill day after day with great success. Russ indicated to Pat that after he first reached the four corner grid he did have a few tropo or line-of-sight contacts with nearby locals, but Pat was his first E_s contact and he was amazed that it happened so quickly. "Frankly," says Pat, "so was I. Several stations, including Chip, K7JA, heard both sides of the contact, which helped my nerves after the contact. I am just eternally grateful to Russ."

Surely Pat is currently one of the best known 6 meter DXers. When Pat finally worked Russ for the final FFMA grid, the 6 meter chat nets and propagation nets erupted with dozens of congratulatory messages, including mine. I had heard directly from Chip, K7JA and headed forthwith to the ON4KST North American chat (**www.on4kst.com/chat**). This is truly a feat that takes a lifetime to achieve. Pat and Rick, K5UR, deserve our heartiest congratulations.

Aerial photo of the grid corner CM79/89/CN70/80 at 40° N 124° W. Note the dense wilderness surrounding this area of nothern California.

ON THE BANDS

September is one of our best tropospheric ducting months and this September produced some decent tropo. Many excellent microwave contacts were made. Let's take a look.

Tropospheric ducting. The big news is two significant tropo openings. On Sep 18 a high pressure area across the Southern tier of states set up a strong NE/SW tropo duct. Ken, KE2N (FM18) worked into EM54,58 and notes the sweet spot a little north of him in FN10 down into EM54,44. Herb, K2LNS operating WA2FGK (FN21bf) worked EM77,73,64,65,66,54,55,44 and 31 (ODX [greatest distance]=1802 km) on 2 meters; EM64,54 (ODX=1361 km) on 222; and K5YPV EM54 (ODX=1361 km) who was using 2.5 W to a single loop Yagi on 1296. Wayne, K5YPV (EM54mr) worked EM29,38,39 early on 2 meters and after 1100Z several new ones: K8TQK (EM89) on 4 bands new on 222; WA2FGK (FN21) on 222 and 1296; K1WHS (FN43) and WZ1V (FN31) on 432; and KE2N (FM18) on 144. On Sep 25 high pressure set up again. Todd, N4QWZ (EM66) worked westward into EM15,19,25, 27,29,47 with ODX NØYK/B (DM98) at 1270 km on 2 meters and EM26,27 on 432.

Two other tropo events generated interesting results. Rich, K1HTV (FM18ap) followed Hurricane Earl northward as close as 140 km east of Cape Hatteras, NC. The evening of Sep 2 he saw NC UHF TV stations at their normal headings. As Earl moved farther north, however, the NC stations were visible only with his beam almost 45° east of the normal heading. Slightly later at

432 MHz Standings

Published 432 MHz standings include call area leaders as of October 1. For a complete listing, check the "Records and Standings" pages on "The World Above 50 MHz" Web pages at **www.arrl.org/qst/worldabove**. To ensure that the "Records and Standings" pages reflect current activity, submit reports at least every 2 years by e-mail to **standings@arrl.org**. Printed forms are available by sending a request with an SASE to Standings, ARRL, 225 Main St, Newington, CT 06111.

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
1					
W1ZC*	NH	20	3	74	1,948
W3EP/1	CT	20	2	61	1,760
W1AIM	VT	18	2	56	1,725
K1VU	MA	11	1	16	814
K1WVX	CT	10	1	13	691
WA1FVJ	CT	10	1	14	400
2					
K1JT	NJ	17	2	52	757
NY2NY*	NY	16	4	48	1,879
3					
W3ZZ	MD	26	2	93	1,526
AE3T	PA	23	2	—	1,363
WA2FGK	PA	22	2	82	1,596
N3JNX	PA	11	1	28	786
4					
W4TJ*	VA	43	40	190	—
AA4ZZ	NC	32	2	102	1,255
K4RF	GA	28	2	96	1,742
N4QWZ	TN	27	2	135	1,601
K4CSO	GA	25	1	114	1,582
W4WA	GA	25	2	88	1,506
K4RWP	TN	22	2	52	1,046
K4RTS	VA	21	2	69	1,078
AA4H	TN	21	1	58	1,737
N4MM	VA	19	3	58	—
N4HN	NC	14	1	41	—
KØVXM	FL	11	3	70	2,164
W4SW	VA	9	2	22	521
K4MM	FL	8	2	34	1,691
K4MSG	VA	8	1	19	492
N9HF	FL	7	1	7	608
KE4WBO	FL	4	1	16	1,065
5					
W5LUA*	TX	50	—	—	—
*WD5AGO	OK	40	23	150	1,740
K5UR	AR	31	2	220	—
K5SW	OK	31	2	144	1,273
K5YY	AR	30	2	161	1,780
K5QE*	TX	29	4	62	—
K5YPV	MS	24	3	113	1,327
WA5VJB	TX	23	—	—	2,108
W5HNK*	TX	20	1	—	1,651
K5LLL	TX	16	2	98	1,673
*W5UWB	TX	14	7	49	2,167
AA5AM	TX	9	1	52	1,728
AA5JG	OK	6	1	32	1,855
6					
KC6ZWT*	CA	4	3	51	3,934
K6QXY	CA	4	3	36	3,794
KR7O	CA	2	3	41	582
N6ZE	CA	1	2	18	1,265
7					
W7MEM*	ID	18	18	71	—
W7EME	MT	18	18	69	—
WA7GSK	ID	3	1	12	—
8					
K2YAZ	MI	28	2	108	2,167
WA8RJF*	OH	22	3	80	1,287
K8ROX	OH	17	2	51	1,104
N8PUM	MI	11	2	44	1,368
9					
N9LR	IL	34	3	136	1,562
K3SIW/9	IL	34	2	136	1,469
KA9UVY	IL	27	2	84	1,409
AA9MY*	IL	25	3	68	1,567
W9RPM	WI	14	2	101	983
Ø					
KØRZ*	CO	47	50	292	1,083
WØRT	KS	30	1	105	1,940
NØPB	MO	27	1	115	1,936
NØLL	KS	21	2	113	1,690
KØFF	MO	20	1	74	1,189
KBØPE	MO	17	1	61	1,148
KØAWU	MN	15	2	70	1,478
NWØW	MO	9	2	—	890
WØLD	CO	8	1	15	1,032
Canada					
VE3KH	ON	18	—	54	1,174
VE2PIJ	PQ	9	2	37	694
DX					
NP3CW	KP4	0	1	2	114

*Includes EME contacts
—Not given

0600Z Washington, DC TV stations were strong but visible only at a beam heading of 110° rather than the normal 60°. The next morning around 1100Z, the NC TV stations were gone and the DC stations were weaker but at normal headings. What causes these anomalies is unknown but they do not appear to be nulling artifacts.

Dave, N7BHC reports that the South African ducts are alive and well. On Aug 31 Phil, FR5DN (LG78qs) reports 2 meter Qs with ZS2GK (KF47kt)-2891 km, ZS2ACP (KF26sa)-3249 km and ZS5DJ (KG59aa)-2629 km; and with ZS2GK on 70 cm. Conditions repeated on Sep 13-15 with ZS2/5. The Hepburn maps showed strongly enhanced conditions both times.

6 meters. Six meters fell into its usual September doldrums. Al, K7ICW (DM62) notes that his Sep 28 contact with DL92 was his first E_s since Aug 15 and for the first time in the September VHF contest he worked more stations on 1296 than he did on 6. Jon, NØJK (EM17) worked DM43 and noted E_s from the Midwest to the Mountain States on Sep 4-5. Jon heard beacons in CO/UT/MT. PY2ZX reports the first good fall transequatorial (TEP) opening with PY, ZP working into FM, J8, KP4 and 9Y.

Contests. Comments here focus on propagation conditions. Full reports will appear in *QST*.

September VHF contest. Activity in the Midatlantic was limited by some equipment and rover vehicle malfunctions by W1RT/R and ND3F/R and by average or worse conditions. Owen, K3CB (FM18) (291Q/145G) enjoyed himself although he was disappointed to make only seven 10 GHz contacts. Pete, N6ZE found only 3Q/3Q from DM04 in over an hour of operation. Substantial tropo covered the Heartland, however. Jon, NØJK (EM18) reports strong "top down" tropo functioning a lot better at the higher frequencies Sunday morning. Jon worked EN41,48 on 432 with a new quagi and EN50 on 2 meters. Rick, WØRT (EM27) worked 8 grids out to 500 km on 1296.

10 GHz and Up Contest. Falling during the Sep 18 tropo event, conditions were superior. Mike, N1JEZ (FN44ig) Mt Washington worked EM66,54 on 2 meters and then beat his old 595 km 10G ODX several times with KB8VAO (FN00sn) 719 km; WA3TTS (200 mW) (FN00rg) 745 km; NA4N (FM08us) 845 km; and K3CB (FM18vr) 740 km. Herb, K2LNS at WA2FGK (FN21bf) worked K8TQKI (EM89) 673 km; K1LPS (FN44ig) 505 km; and N1JFU, W1FKF and W1EX Mt Equinox, VT and VE3ZV (FN14).

Fall Sprints. The 144 MHz Sprints featured relatively flat conditions. The biggest scores I encountered were W8ZN (FM19bb) 104Q/38G, K1TEO (FN31jh) 96Q/26G and K1RZ (FM19jg) 88Q/32G. Many in New England had Qs in the mid-50s.

HERE AND THERE

Geminids Meteor Shower. The Geminids are a high activity (Zenith Hourly Rate=120) group of fairly slow (35 km/h) meteors. Peaking at 1100Z Dec 14, this shower is excellent for digital MS. Stoke up your FSK441 station and join the fun!

North American High Speed Meteor Scatter VHF 2010 Geminids Test. To take advantage of the Geminids meteor shower the WSJT Group (**groups.yahoo.com/group/wsjtgroup)** sponsors a digital (WSJT FSK441, JT6M and ISCAT modes) contest between 0000Z Dec 11 and 0200Z Dec 16. Entry categories are Single Band (6 meters, 2 meters) and Multiband (6M +2M). Contacts on 222 and 432 count in the multiband category. Self-spotting and setting up schedules before and during the contest are allowed, but exchanging information without the use of meteor scatter *during* the contact attempt invalidates the contact. Full details are available at **www.ykc.com/wa5ufh/Contests/2010%20Rules.htm**.

VYØSNO/B Active. Earle, VE6NM indicates that his beacon VE8BY/B is QRT and is being replaced by VYØSNO/B on the same frequency, 50.048 MHz. He and Larry, VYØHL would like to find an alternative location in NU for VE8BY. QST

VHF/UHF Century Club Awards

Compiled by Sharon Taratula
Administrative Manager

The ARRL VUCC numbered certificate is earned by amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid locators (indicated in italics) for each band listing. The numbers preceding call signs indicate total grid locators claimed. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from August 1, 2010 to September 30, 2010.

The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the VUCC Web site at **www.arrl.org/vucc**. An SASE to ARRL is required if you cannot download these forms. Send questions relating to VUCC to **vucc@arrl.org**.

50 MHz
100

1727	EB3JT
1728	WA8OJR
1729	W6TJU
1730	W7MHW
1731	K2NUD
1732	N1BCL
1733	NE5S
1734	K1HTV
1735	WØHBH
1736	KI6QDH
1737	W4OV
1738	K3WA
1739	AB4SF
1740	KD7DCR
1741	W4DFU
1742	K4DXA
1743	WC6DX

AB4SF	125
W7MHW	125
K3WA	150
N1BCL	150
NE1B	150
N5XES	175
WA7AJ	175
W4EJ	200
K5GZR	225
K5WMH	225
WØHBH	225
K1BD	275
ON5UE	275
XE1J	275
W4OV	300
HB9DDZ	325
N6ORB	325
W9OBG	375
K4MQG	400
K7AWB	400
W5TFW	450
N3JPU	500
KE7SW	525
W5WVO	525
AF2K	600
K7CW	675
K1HTV	750
W7KNT	750
N4MM	950
K1TOL	1,400

144 MHz
100

701	VE1AHM
702	WØHBH
703	K5RUS
704	WBØULX
705	KF7CQ
706	N4UFP

222 MHz
50

W9OBG	70

902 MHz
25

45	WBØJQQ
46	W9OBG

1296 MHz
25

164	N8IEZ

2.3 GHz
10

82	KBØHH

5.7 GHz
5

61	W9OBG

Satellite
100

200	W4AS
201	W6ZKH
202	W4DFU
W4AS	125
W6ZKH	125
KBØRZD	300
KB1RVT	300
K8YSE	600

QST

SPECIAL EVENTS

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

Nov 13, 1400Z-2200Z, K5EOK, Guthrie, OK. Edmond Amateur Radio Society. Oklahoma Statehood Day. 21.268 14.268 7.268. Certificate. Edmond Amateur Radio Society, PO Box 48, Edmond, OK 73083. **www.k5eok.org**

Nov 13, 1600-2200Z, K5C, Salineno, TX. USCG Auxiliary FL 72 and Charro Radio Club. Commemorating 204 Years of Service by the US Coast Guard. 14.320 21.320 28.320 146.700. Certificate. Larry Steller, 65 Sagua La Grande Ave, Brownsville, TX 78526.

CANCELLED Nov 13, 0800Z-2000Z, KMØSI, Tampa, FL. Museum of Science and Industry Amateur Radio Club. MOSI — Boy Scout Camporee. **www.mosihamradio.org**

Nov 26, 1200Z-2100Z, W1P, East Falmouth, MA. Marconi Radio Club. Steamship *Portland* Commemorative Event. 14.260 7.260 3.997. QSL. Henry Brown, 19 Sao Paulo Dr, East Falmouth, MA 02536.

Nov 26-Nov 27, 0800Z-1500Z daily, K4VRC, The Villages, FL. The Villages Amateur Radio Club. 15th Annual Radio on the Square. 18.140 14.310 7.261 3.940. Certificate. Dennis Hardoin, 601 Lacy Pl, The Villages, FL 32162. **w4dih@arrl.net**

Dec 4, 1300Z-1900Z, W1BEW, Maryville, TN. SEC Amateur Radio Clubs. SEC Special Event. 14.250 7.250. Certificate & QSL. SEC Amateur Radio Clubs, 2703 Chantay Dr, Maryville, TN 37803. *Contact all participating clubs for certificate; individual clubs will send QSLs*.

Dec 4, 1600Z-2300Z, W5BMC, Morgan City, LA. Bayouland Emergency Amateur Radio Service. Honoring the Traveling Vietnam Veterans Memorial Wall, the St Mary Parish Marine Corps League and honoring all veterans. 14.250 7.240. QSL. BEARS-W5BMC, 708 Front St, Morgan City, LA 70380. **ka5lmz@arrl.net**

Dec 4-Dec 5, 1500Z-2130Z, N4WIS, Virginia Beach, VA. USS *Wisconsin* Radio Club. Pearl Harbor Commemoration. 14.264. QSL. USS *Wisconsin* Radio Club, PO Box 6682, Virginia Beach, VA 23456. **n4wis.org**

Dec 4-Dec 5, 1700Z-1700Z, WR4BC, Bethlehem, GA. Barrow Amateur Radio Club. Christmas in Bethlehem. 21.365 14.265 7.265 3.875. QSL. Barrow Amateur Radio Club, 287 Crescent Ct, Winder, GA 30680. **barrowhamradio.org**

Dec 7, 1500Z-2245Z, W5KID, Baton Rouge, LA. Baton Rouge and USS *Kidd* Amateur Radio Clubs, Pearl Harbor Day. Gen bands CW in QRP bands. QSL. W5KID, 305 S River Dr, Baton Rouge, LA 70802. *Primary frequency is 20 meters*. **www.lsu.edu/brarc/uss_kidd.htm**

Dec 11, 1600Z-2300Z, KF5HDN, Deming, NM. Mimbres Valley Radio Club. International Space Museum. 21.300 14.270. QSL. David Jorgensen, WD5COV, 18645 Cortex Rd SE, Deming, NM 88030.

Dec 11, 1700Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV41) Museum Radio Operations Room. Pearl Harbor Remembrance Day; Fleet Marine Force established 1933. SSB 14.320 7.250 D-STAR 012C 2 m/7 cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

Dec 11, 2030Z-2359Z, W2HO, Newburgh, NY. Orange County Amateur Radio Club. Santa Net. 7.200 3.920. QSL. Orange County Amateur Radio Club–Santa, PO Box 624, Cornwall, NY 12518. *Santa Claus will be making a special appearance to talk to all good girls and boys on Santa Net. A special QSL card will be sent out immediately after the event, from Santa himself, to the call sign used. Santa trusts the license holder will pass the QSL card along to the child.* **www.ocarc-ny.org**

Dec 11-Dec 12, 1400Z-2000Z daily, WX3MAS, Nazareth, PA. Christmas City and Deleware-Leigh Amateur Radio Clubs. Annual Christmas Greetings from the Twin Christmas Cities. 28.465 21.365 14.265 7.270 3.970. QSL. CCARC/DLARC WX3MAS, Graystone Building, Gracedale Complex, RR 8, Nazareth, PA 18064. *Certificate on request.* **www.dlarc.org**

Dec 17-Dec 19, 1400Z-2200Z, W8ZQ, Wheeling, WV. Northern Panhandle Amateur Radio Club. The Winter Festival of Lights 26th Anniversary at Oglebay Park. 145.52 18.120 14.250 7.250 3.850 1.850 SSB & Digital modes; other bands when available. Certificate. Joe McCready, WB8CTC, PO Box 192, Blaine, OH 43909. *Look at DX clusters for sightings or if you hear us.*

Dec 18, 1500Z-2300Z, KC5OUR, Belen, NM. Valencia County Amateur Radio Association. 21.372 14.272 7.272. QSL. VCARA, PO Box 268, Peralta, NM 87042. **qsl.net/KC5OU**

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, use the ARRL Special Events Listing Form at **www.arrl.org/special-events**. A plain text version of the form is also available at that site. You can also request a copy by e-mail or send a self-addressed, stamped envelope (SASE) (Special Requests, ARRL, 225 Main St, Newington, CT 06111; write "Special Events Form" in the lower left-hand corner.) Off-line completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **Feb** *QST* would have to be received by **Dec 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Events page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through Oct 11. You can view all received Special Events at **www.arrl.org/special-events**. QST

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

New Products

XTAL SET SOCIETY ULTRASONIC RECEIVER AND PARABOLIC DISH KITS

◊ The Ultra-RX2 receiver kit from the Xtal Set Society is a follow-up to the RX1. The Ultra-RX2 PC board fits in a plastic case, along with a 9 V battery and piezo transducer (PZT). The circuitry expands on that of the RX1, including automatic gain control (AGC) for the 40 kHz preamplifier, a selectable attenuator for strong signals, audio LINE OUT for a recording device, and an 8 W output for headphones. The receiver can be used to listen to natural and man-made ultrasound emissions such as echolocating transmissions by bats or arcing on ac power distribution systems. Kit time for the experienced builder is said to be less than two hours. Through-hole parts are used.

Also shown in the accompanying photo is the Parabolic Dish Kit for 40 kHz ultrasound applications (sold separately). When trying to locate radio interference caused by ac power line arcing or to separate multiple natural sources at a distance, very narrow sensor beamwidths are desirable. This clear plastic 8 inch diameter, 6 inch focal length parabolic dish is designed to work with a 400SR16 or similar PZT. It is rated to achieve a pressure gain over the sensor alone at 40 kHz of 18 to 22 dB, and to narrow the field of view from 50° to less than 3°. The dish assembly can be used with either the Ultra-RX1 or Ultra-RX2 ultrasound receiver. The Parabolic Dish Kit includes the 8 inch clear plastic dish, a 400SR16 PZT, sensor PCB, three struts, instrumentation bracket, pistol grip and hardware. The kit manual includes assembly instructions, mounting techniques for the Ultra-RX1 or Ultra-RX2, a discussion on parabolic dish gain, and references. Assembly time is said to be about one hour for an experienced kit builder, requiring pliers, screwdrivers and soldering iron.

Price: Ultra-RX2 Receiver Kit, $119.95; Parabolic Dish Kit, $119.95. For more information or to order, visit **www.midnightscience.com**.

AMATEUR RADIO WORLD

A Look Back at 2010

Tim Ellam, VE6SH/G4HUA

As President of the International Amateur Radio Union (IARU), I often get asked by amateurs exactly what we do throughout the year. It is a valid question. The stated goal of the IARU is to be the watchdog and spokesman for the world Amateur Radio community. We do that by attending meetings of the International Telecommunication Union (ITU) and related bodies to advocate for the Amateur Services.

IARU President Tim Ellam, VE6SH/G4HUA

The IARU International Secretariat — the ARRL — is primarily responsible for coordinating which of our technical representatives will attend various ITU meetings throughout the year. In addition, each of the three IARU officers — myself, Vice President Ole Garpestad, LA2RR, and Secretary Rod Stafford, W6ROD — has various tasks assigned to them each year. IARU regional organizations also complement this role by attending meetings of the various Regional Telecommunications Organizations.

A look back at the year to date is illustrative of the work of the IARU.

Amateur Radio and the ITU

In February, one of our technical representatives, Peter Chadwick, G3RZP, attended meetings of the ITU Radiocommunication Bureau (ITU-R) Working Party 1A and B. These meetings are attended by administrations and other organizations to address spectrum engineering techniques and methodologies. Our role here is to protect the Amateur Services from electromagnetic interference, including Broadband over Power Lines (BPL). Later that month, I attended the ITU Radiocommunication Advisory Group (RAG) meeting, which reviews the priorities and strategies of the ITU-R and provides guidance for the various study groups and working parties. Our primary goal here is to ensure that the agenda items of interest to the Amateur Service at the forthcoming World Radiocommunication Conference in February 2012 (WRC-12) remain on schedule.

In addition to the ITU-R, we also attend meetings of the ITU Development Bureau (ITU-D). IARU Secretary Rod Stafford, W6ROD, is primarily responsible for our activities in this sector. ITU-D is aimed at ensuring the right to communicate of all peoples through access to infrastructure, information and communication services. Of importance at the ITU-D is our role in promoting our objectives for the Amateur Service, especially regarding emergency communications. The IARU and ITU-D have a very close working relationship with respect to the very beneficial role the Amateur Service can play in disaster relief.

In April, IARU Vice President Ole Garpestad, LA2RR, and IARU Region 1 President Hans Blondeel Timmerman, PB2T, together with others from IARU Region 1, arranged a Regional Conference on Amateur Radio (RCAR) for the Arab states in Doha, Qatar. The goal here was to strengthen contacts within the telecomm administrations in this region and to promote IARU objectives. This conference was a great success and well received by both the administrations and the IARU Member-Societies in that region.

One of our primary goals in protecting and enhancing the role of the Amateur Service is to attend meetings of Working Party 5A of ITU-R. These meetings typically take place in Geneva twice a year and are the "home" of the discussions relating to the Amateur Services. Working Party 5A deals with land mobile services above 30 MHz (excluding international mobile telecommunications), wireless access and the fixed services at Amateur and Amateur Satellite Services. Dr Ken Pulfer, VE3PU, primarily leads IARU at these meetings. Dr Pulfer is also the Chair of Working Group 1 of WP5A, which deals with issues affecting the Amateur Service. Given the importance of these meetings, either the IARU President or IARU Vice President attends WP5A in addition to Dr Pulfer.

In May, Ole Garpestad and IARU International Coordinator for Emergency Communications Hans Zimmermann, HB9AQS, attended a meeting of the World Summit on the Information Society (WSIS) in order to promote IARU objectives, especially regarding emergency communications. In late May and early June, Rod Stafford represented IARU at the World Telecommunication Development Conference (WTDC), the top level meeting of ITU-D in Hyderabad, India. In June, there was a second round of meetings of ITU-R WP1A and B where IARU was represented by Peter Chadwick. September was again a busy month with meetings of Study Group 2 of ITU-D, represented by Rod Stafford, and a further meeting of Working Party 1 of ITU-R where our interests were again represented by Peter Chadwick. I also met with representatives of the International Maritime Organization (IMO) to discuss spectrum issues of mutual interest.

In October, the top policymaking body of the ITU — the Plenipotentiary Conference — was held in Guadalajara, Mexico. The Plenipotentiary Conference is held every four years and sets the ITU's general policies and elects a new management team for the union. The IARU has only been recently entitled to attend this top-level meeting as an observer. This year, I attended to represent IARU and I was able to hold a number of meetings with ITU staff and top-level administrators from a number of countries.

Looking Ahead to 2011

As I write this, there are still a number of meetings left this year that the IARU will attend on behalf of the Amateur Service. This includes the Special International Committee on Radio Interference (known by its French acronym CISPR) by the IARU EMC advisor Christian Verholt, OZ8CY, and the second round of ITU-R WP5A meetings to be attended by myself and Dr Pulfer.

The IARU International Secretariat is also preparing for an important meeting in February 2011. The ITU-R Conference Preparatory Meeting (CPM) settles the draft text for possible amendments to the Radio Regulations for the various agenda items that will be discussed at WRC-12. In addition to ensuring that we maintain our present allocation of spectrum, we will be focused on an agenda item that seeks a secondary allocation for the Amateur Service at 500 kHz.

Of course, preparation for these meetings takes time and considerable effort by the IARU International Secretariat and our various technical advisors. Preparation of input papers are drafted well in advance of each meeting and circulated amongst officers and technical advisors for comment and revision. Most of the meetings take place in Geneva, the seat of the ITU. While this might sound like an exotic locale for a meeting, all of these ITU events take considerable time. Meetings often run late into the evening and on weekends and the IARU officers and advisors are constantly busy throughout the entire process.

While much of the work of the IARU may not be readily transparent to amateurs, I am hopeful that the foregoing will give you a brief overview of the nature of the work we have conducted in 2010. Of course, we could not conduct this important work for the Amateur Service without the support of the IARU Member-Societies and their respective members. QST

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

WB8IMY

ECLECTIC TECHNOLOGY

Can You Hear Me Now?

Let's say you've just put up a new antenna, or you've revamped your existing skywire. After you've spent some time admiring your new creation, you'll no doubt rush into your station, switch on your transceiver and quickly determine how well the antenna plays.

You can call CQ using the mode of your choice and wait breathlessly for the replies to come pounding in…or not. But if you don't have hours to spend at the radio and you want a quick glimpse of how well you are doing, you might want to give WebSDR a try at **www.websdr.org**. This site aggregates links from a number of remote software defined receivers in the United States, Canada and Europe. The receivers belong to groups and individuals who have made them available to curious people…like you.

Amateurs have been streaming audio over the Internet for a number of years, but what makes WebSDR unique is the fact that all of the receivers are software defined. This technology makes it possible for most listeners to tune them independently, which means that you might be listening to, say, 20 meters while I am monitoring 40 meters — from the same receiver at the same time. In Figure 1 you'll see a screen capture from the WebSDR server operated by PI4THT, the Experimentele Telecommunicatie Groep Drienerlo (ETGD) Amateur Radio club at the University of Twente in The Netherlands. Their receiver is connected to an 80 meter end-fed wire and monitors several bands from 63 kHz to 21.307 MHz.

Stan Schretter, W4MQ, has his receiver linked to the site and I used it this fall to test a 160 meter antenna. I sent a series of Vs on CW, followed by my call sign, and listened to the result. It is kind of spooky to hear your signal coming back to you via the Internet (with a slight delay).

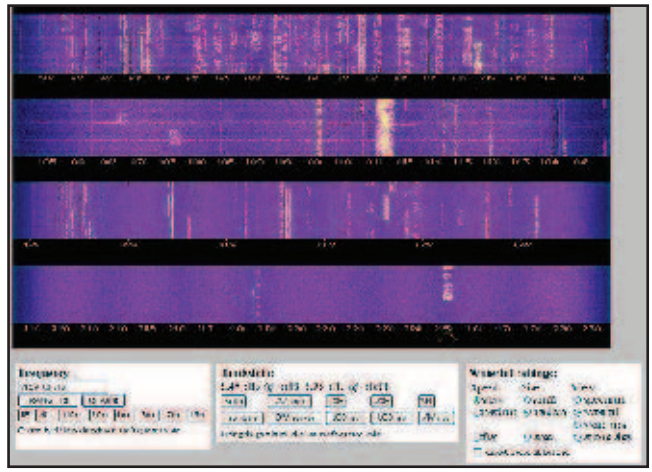

Figure 1 – A screen shot of PI4THT's 8-band WebSDR receiver at websdr.ewi.utwente.nl:8901/.

CMSK

Murray Greenman, ZL1BPU, and Con Wassilieff, ZL2AFP, have introduced a new digital mode specifically designed for use on Low and Medium frequencies. It's called Correlated, Convolved, Minimum-Shift Keying, but thankfully that mouthful is shortened to *CMSK*.

The "basement" of our radio spectrum below 80 meters is hostile territory for digital communication. Noise, in particular, is a serious issue on these frequencies; a static crash can easily wipe out large chunks of transmitted data. CMSK deals with this by coding the data so that information is cleverly interleaved throughout the message. This means that the data transmission can survive these noise bursts and still remain decodable.

There is a penalty involved in using such a robust approach. The interleaver in CMSK is a matrix type with a block size of 192 bits. When operating at 62.5 baud, it takes about three seconds to decode text on your screen. In CMSK's most robust mode (8 baud), it can extend to nearly 24 seconds.

Add CMSK's sensitive synchronizing techniques and its version of Varicode, and you have one of the best digital modes available for low band use. Murray has been running tests at 500 kHz with less than 200 W output — sometimes as low as 50 W — and has enjoyed conversations over about 1300 miles. US amateurs have been trying CMSK on 160 meters with impressive results.

The CMSK software for *Windows* is available free at Murray's Web site at **www.qsl.net/zl1bpu/CMSK/cmsk.htm**. If you are already set up to operate sound-card modes such as PSK31, you can try CMSK right away.

Solar Core Rotation and Radioactive Decay

Regular Eclectic readers know that I have a penchant for exploring the distant outskirts of scientific research. That's where you stumble into stories so bizarre that they almost make your hair stand on end. Adventures in quantum mechanics are perennial favorites, but here is another.

A team of scientists from Purdue and Stanford Universities has discovered that the decay of radioactive isotopes here on Earth fluctuates *in synch with the rotation of the Sun's core*.

Say what?

No kidding. The fluctuations are tiny, but measurable. This latest discovery adds to evidence of swings in decay rates in response to solar activity and the distance between the Earth and the Sun that Purdue researchers Ephraim Fischbach, a professor of physics, and Jere Jenkins, a nuclear engineer, have been gathering for the last four years. Jenkins and Fischbach reached their astonishing conclusions by carefully measuring the rate of decay of radioactive isotopes silicon-32 and chlorine-36. Their results were published in the October 2010 issue of *Astroparticle Physics*.

What does it have to do with Amateur Radio? Well, the Purdue team has observed drops in decay rates several days before solar outbursts. As Jere Jenkins said, "If the relationship between solar activity and decay rates proves to be consistent, it could lead to a method of predicting solar flares." So it may be possible to predict a solar flare — and, by extension, changing propagation conditions — well before a flare actually occurs.

What could possibly link solar activity with the decay of radioactive isotopes on Earth? No one knows. Some believe it could be caused by interactions with neutrinos, virtually massless particles that the Sun generates in enormous amounts. Or it could be caused by an effect yet to be discovered.

Either way, this is very "eclectic" and odd indeed. QST

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

K2TQN

VINTAGE RADIO

Radio Club Museums

A number of radio clubs have museums and some museums have radio clubs. This is a story about one that I belong to and how it all came about.

NJARC

Figure 1 — Tony Flanagan, founder of NJARC.

The New Jersey Antique Radio Club (NJARC) has a great museum, but getting to this point required some good luck and a series of people being in the right place at the right time and working very hard toward the goal.

After placing advertisements in *Antique Radio Classified* magazine and in local newspapers in the fall of 1992, Tony Flanagan (see Figure 1) convened a meeting of 15 charter members. They formed the organization and elected Tony as NJARC's first president. Tony ran the club for 4 years. During this time Tony's vision was perfect. He pushed the club to find a suitable location and establish a museum. The club grew and moved forward.

The Marconi Hotel

The Marconi Hotel (see Figure 2) was built in 1913 in Wall Township, New Jersey. The original facility was constructed by the Marconi Wireless Telegraph Company of America as the New York to London link in their "World Encircling Wireless Girdle." Built on a high bluff on the south bank of the Shark River basin, the complex was a self-sufficient early 20th century industrial village. The hotel is a U-shaped, 2½ story brick building constructed as a 45 bedroom hotel for unmarried Marconi employees at the time.

During World War I the Navy took over the station under the authority of the Radio Act of 1912. The land had several owners after the war, including, at one time, RCA. The US Army purchased the land in November 1941 to create a top secret research facility. It was named Camp Evans and was under control of the US Army Signal Corps and Fort Monmouth. After World War II, the Army utilized Camp Evans as a research facility. (For more on Camp Evans space and Sputnik activities see my "Old Radio" column in the February 2004 *QST*.)[1]

Then in 1993 the Department of Defense decided to close many military bases. Camp Evans in New Jersey was one of them. The Wall Township Committee formed the Marconi Park Complex Advisory Committee that recommended preserving the heritage of the site including the historic Marconi station and major WWII radar laboratory buildings; developing an "Information Age Learning Center" in the historic buildings to preserve that heritage; enable Brookdale Community College to develop an extension campus, and to use the remaining open areas of the Camp for passive and active township recreation.

[1]J. Dilks, K2TQN, "Old Radio," *QST*, Feb 2004, pp 96-97.

OLD POSTCARD, INFOAGE

Figure 2 — The 1913 Marconi Hotel at Camp Evans.

K2TQN

Figure 3 — The Radio Technology Museum at Camp Evans.

MATT REYNOLDS

Figure 4 — From left: Aaron Heskes, KC2WGQ; Walt Heskes, W2MQ; Marty Friedman, WB2BEW, and Chuck Paci, AC2DP, repair an All American Five radio at one of the club's repair clinics. The club is very proud of this clinic, which usually happens every other month with a dozen radios worked on. The public is often invited to bring in radios and they are repaired for only the cost of parts.

The Information Age Learning Center (InfoAge), a not-for-profit corporation, was incorporated in 1998 with the express purpose of preserving Areas B and C of Camp Evans and creatively reusing the 37 acre site as a science history center.

The NJARC was invited to join InfoAge, set up a Radio Technology museum (see Figure 3) and administer the National Broadcasters Hall of Fame. The club stepped up and with a lot of volunteer time the club has built a first-class museum.

Tony Flanagan would not live to see his dream come true, but his strong influence lives on through the members. Tony passed away in 1998.

The Radio Technology Museum

Imagine having a small Army base to play radio in. This is what the NJARC has. The Marconi Hotel and many of the large build-

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K2TQN

Figure 5 — Working vintage ham radios on display at the museum.

K2TQN

Figure 6 — One of the working early TV displays.

K2TQN

Figure 8 — An early wireless display with a working spark transmitter and crystal set receiver.

ings are available for our use.

To maintain this, it takes volunteers. Many of our volunteers are hams and their experience, expertise and influence are needed here. Wednesday is volunteer day and usually a dozen or so show up to work. Work involves building exhibits, restoring and repairing the radios and radio accessories (see Figure 4), repairing and painting buildings, electrical work and the big event of the day, lunch and the "at lunch meeting planning session." I'm happy to say that now that I am no longer working, I am able to attend. There is always more to do than the helping hands can manage; it looks like I have a lifetime job volunteering here.

We also look for ways to get donations. InfoAge needs equipment (see Figure 5 and 6), supplies, materials and money. If you are looking to donate, please consider InfoAge.

Radio museums around the country are always looking for volunteers. So if there is one near you, you might want to look into it. And if you are near InfoAge, you're invited to join us. Camp Evans is huge — we won't ever run out of things to do.

INFOAGE

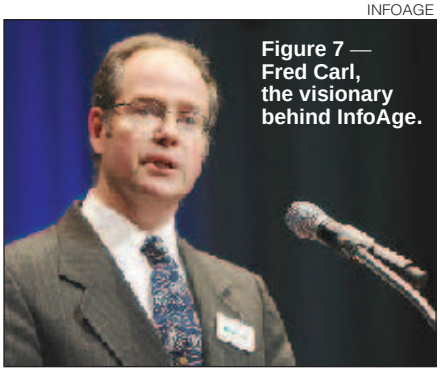

Figure 7 — Fred Carl, the visionary behind InfoAge.

Who Saved Camp Evans?

For 17 years, Mr Fred Carl (see Figure 7) of Wall Township has worked tirelessly to save Camp Evans as a history and science center, rather than see it demolished. The US Army camp, which served as a site for telecommunications research and development beginning in 1913, is associated with many science luminaries including Guglielmo Marconi, Edwin Armstrong and David Sarnoff. Through InfoAge, a nonprofit agency, Mr Carl convinced other organizations to support his vision including the National Trust for Historic Preservation and Congressman Chris Smith. After hard-fought legal, jurisdictional battles and a personal investment of $50,000, the site was transferred in 2006 and 2009. Now 10 buildings are in use, including the 1913 Marconi Hotel with 15 rooms of exhibits.

Many Organizations

InfoAge is unique; it has many clubs, organizations, displays and museums within. Besides NJARC here's a short list: the New Jersey Science Teachers Association, QCWA — Chapter 138, New Jersey Resources, Ocean Monmouth Amateur Radio Club, New Jersey Historical Divers Association, Mid-Atlantic Retro Computer Hobbyists, Blossom International, Military Technology Museum of New Jersey, Association of Old Crows, Armed Forces Communications and Electronics Association, and IEEE.

Radio and Radar History

There is so much important history that happened here. Please visit my Web page (**www.k2tqn.com)** for links to several excellent YouTube videos on the history of Camp Evans.

What a great location for a radio museum this is, at the 1913 Marconi Wireless Station (see Figure 8)! We are located in the first building, just behind the Marconi Hotel. The Radio Technology Museum and the National Broadcasters Hall of Fame are open for visitors each Sunday afternoon and by appointment. Ham clubs and large groups wishing to stop by should contact the museum for best times and days to visit. The museum's address is The Radio Technology Museum at InfoAge, 2201 Marconi Rd, Wall Township, NJ 07719. You can check their Web pages for more information: **www.InfoAge.org** or **www.njarc.org**.

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

Arizona (Mesa) — Dec 4 D F H R T V
Saturday 6 AM-3 PM. *Spr:* Superstition ARC Hamfest. Mesa Community College West Parking Lot, NE corner Dobson Rd & Rt 60. *TI:* 147.120 (162.2 Hz). *Adm:* $2. Tables: $10. Steve Gurley, KY7W, 1104 East Campus Dr, Tempe, AZ 85282, 480-704-3666; **kj7wk@arrl.net**; **wb7tjd.org/wiki/Superstition_Hamfest**.

WEST CENTRAL FLORIDA SECTION CONVENTION

December 4-5, Palmetto
D F H Q R S T V

The West Central Florida Section Convention (35th Annual Tampa Bay Hamfest), sponsored by the Florida Gulf Coast AR Council, will be held at the Manatee Civic Center, US-301 and Haben Blvd. Doors are open Saturday 8 AM-5 PM, Sunday 9 AM-2 PM. Features include large electronics flea market, paved tailgating ($20 per space plus admission for the entire weekend; opens Saturday for setup at 6 AM, public 7 AM, Sunday at 8 AM; **tailgate@fgcarc.org**), commercial exhibit booths ($175 each; **commercial_booths@fgcarc.org**), vendors, forums and programs, VE sessions (Saturday, 10 AM-2 PM; **testing@fgcarc.org**), ARECC Testing (Saturday 2-3 PM; $14 fee), card checking (DXCC, WAS, VUCC, IARU; both days), handicapped accessible. Talk-in on 145.43 (100 Hz). Admission is $7 in advance, $8 at the door (good all weekend; **tickets@fgcarc.org**). Tables are $25 each for the weekend, plus admission (electricity available for $32 per outlet for the weekend; **tables@fgcarc.org**). Contact Keating Floyd, KC4HSI, c/o FGCARC, Box 22042, Tampa, FL 33622-2042; 813-765-8916; **kc4hsi@arrl.net**; **www.tampabayhamfest.org**.

D = DEALERS / VENDORS
F = FLEA MARKET
H = HANDICAP ACCESS
Q = FIELD CHECKING OF QSL CARDS
R = REFRESHMENTS
S = SEMINARS / PRESENTATIONS
T = TAILGATING
V = VE SESSIONS

Coming ARRL Conventions

November 13
Alabama Section, Montgomery*

November 13-14
Indiana State, Fort Wayne*

December 4-5
West Central Florida, Palmetto

January 8
Delta Division, Hammond, LA

January 9
New York-Long Island Section, Bethpage

January 15
Southern Florida Section, Fort Myers

January 28
Mississippi State, Jackson

*See November *QST* for details.

Louisiana (Minden) — Dec 18 D F H R S V
Saturday 8 AM – 2PM. *Spr:* Minden Amateur Radio Association. Minden Civic Center, 520 Broadway Ave. Displays. *TI:* 147.300. *Adm:* $5. Tables: advance $5, door $10. Mary "Fran" Sullivan, KD5LKB, 6018 Fox Chase Trl, Shreveport, LA 71129, 318-658-5087, **kd5lkb@aol.com**; **www.n5rd.org**

Michigan (Harrison Township) — Dec 5
D F H R V
Sunday 8 AM – Noon. *Spr:* L'Anse Creuse Amateur Radio Club. L'Anse Creuse High School 384955 L'Anse Creuse St. *TI:* 147.08 (100 Hz). *Adm:* $5. Tables: $14. Gregg Crump, N8GEO, 29729 S River Rd, Harrison Township, MI 48045, 586-344-7013, **n8geo@arrl.net**; **www.N8LC.org**

Mississippi (Gulfport) — Dec 11 H R S
Saturday 6:30 PM – 9:30 PM. *Spr:* Magnolia DX Association Annual DX Dinner. Steve's Marina Restaurant, 15151 Airport Rd. *TI:* 147.375. *Adm:* $30 in advance. Dan Miller Sr, AE5JG, 18724 Reese Dr, Saucier, MS 39574, 228-539-4930, **dwarden233@aol.com**

Mississippi (Pearl) — Dec 11
D F H R S T V
Saturday 8 AM – 2 PM. *Spr:* Pearl River County Amateur Radio Club. Old National Guard Armory, Intersection of Hwy 11 and Hwy 26. *TI:* 145.210 (136.5 Hz). *Adm:* $5. Tables: $10. Larry Wagoner, N5WLW, 40 Pinetucky Rd, Carriere, MS 39426, 601-590-0553, **N5WLW@arrl.net, www.prcarc.com**.

Tennessee (White Pine) — Jan 1 D H R V
Saturday 8 AM – 2 PM. *Spr:* Lakeway Amateur Radio Club. WSCC Great Smoky Mountain Expo Center, 1615 Pavilion Dr. *TI:* 147.03 (100 Hz). *Adm:* $6. Tables: $15. Ed Bradley, W4VGI, 126 Ellis St, Bean Station, TN 37708, 865-993-3001, **w4vgi@juno.com**; **www.lakewayarc.org**.

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online, donated ARRL prize certificates and handouts.

For hamfests: Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions:* Approval must come from your director and the ARRL executive committee.

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 **December 1** to be listed in the **February** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's Web site for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRLWeb* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**. QST

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

New Products

TELESCOPING 43 FOOT VERTICAL FROM S9 ANTENNAS

♢S9 Antennas has added a 43 foot vertical to its line of telescoping fiberglass HF verticals. The S9v 43' weighs 7 pounds and operates on 80 through 6 meters. The antenna may be erected by one person and requires an antenna tuner and radials. Price: $139.95. For more information or to order, visit **www.s9antennas.com**.

LMR PRODUCTS CATALOG FROM TIMES MICROWAVE

♢Times Microwave Systems has released the 15th edition of its LMR Wireless Products Catalog. The new catalog includes the entire range of LMR cables including LMR-DB, LMR-FR, LMR-Ultraflex, LMR-LLPL and LMR-75, as well as TCOM, FBT, T-RAD and SilverLine series cables. Also included in this latest edition is the new Times-Protect line of lightning surge protector products for RF equipment. For more information, see your dealer or **www.timesmicrowave.com**.

75, 50 AND 25 YEARS AGO

December 1935

- The cover photo shows a ham with globe and string, calculating Great Circle bearings.
- The editorial discusses the new F.C.C. Rule 381, concerning the purity of emissions, and warns us that we better clean up our act and our signals!
- A "FLASH!!" notice in last month's *QST* reported that ZS1H had completed WAC on 28 Mc. "28-Mc. WAC accomplished" gives a full report on ZS1H, W7AMX, and W3FAR having *all* completed WAC! Other WACs are rumored…it's difficult to keep up with the rapid progress being made!
- M. P. Mims, W5BDB, tells about "The All-Around 14-Mc. Signal Squirter," a compact remote-controlled directional system that occupies only a small space.
- J. M. Wolfskill discusses "Oscillators Using 14-Mc. Quartz Crystals" made of the new thick-cut plates.
- Henry Keen, W2CTK, describes "Class-B Carrier Control in the Low-Power 'Phone."
- "Strays" notes some interesting copy in recent radio ads, such as "…the power transformer delivering 600 bolts," "…the receiver in the black-crackled mental case," and "…an electro dynamite speaker."
- Ross Hull gives us Part 2 of his groundbreaking article, "A New Receiving System for the Ultra-High Frequencies" of 56 Mc.
- H. J. Powditch, G5VL, announces the "3500- to 4000-Kc Transoceanic Test," to be held December 14-22.

December 1960

- The cover art of things A.R.R.L. reminds us of the 45th anniversary of the League.
- The editorial looks back 45 years, to those early days of the fledgling A.R.R.L. and of the beginnings of *QST*.
- James McCoy, WØLQV, discusses "Radioteletype Reception by Tone Conversion," and describes a complete converter, monitor, and A.F.S.K. oscillator.
- William Lattin, W4JRW, tells about building "Multiband Antennas Using Decoupling Stubs," with the stubs made from sections of transmission lines.
- Roy Campbell, W4DFR, presents "A Synched-Multivibrator pElectronic Keyer."
- "Recent Equipment" reviews the Heathkit Mohican communications receiver, opening with the statement, "The new Heathkit Mohican receiver Model GC-1A should squelch the cries of the skeptics who still insist that transistors are still experimental…."
- In "Using the 7360 in the HRB-16," John Filipczak, K2BTM, tells how he used the new 7360 beam-deflection tube in that popular homebrew receiver as a product detector.
- Daniel Meyer describes his "Transistor Converter for Six Meters," the performance of which, he says, "rivals vacuum-tube models."
- Lew McCoy, W1ICP, presents "A Simple Antenna System for the Novice," which uses a simplistic but effective antenna tuner that works well with end-fed wires.
- Lew also gives us some new circuitry "For the Command Receiver," adding a noise limiter, A.V.C., and S meter.

December 1985

- The cover photo shows W6RYX's directional antenna for 220 MHz, described in this issue.
- The editorial discusses the good job done by amateur after September's Mexico City earthquake, but also looks at lessons learned and how our emergency support might be better in the future.
- "In Search of the Perfect Picture," by Clayton Abrams, K6AEP, reports on the state of the art of slow-scan color TV.
- Dick Plasencia, WØRPV, discusses "Computer-Aided Two-Band Vertical Antenna Design" for 75 and 40 meters, with the option of adding 160 meters to the package.
- George Murphy, VE3ERP, presents his very versatile power supply, "The Super ACadapt," which replaces a double handful of "wall wart" adapters.
- Doug DeMaw, W1FB, gives us ideas about how to set up "The Ham-Radio Test Bench."
- Pat Patterson, W6RYX, tells about "The W6RYX Antenna," a ground-plane, phased 90º corner reflector for 220 MHz.
- Al Ward, WB5LUA, wants us to work DX with his "1296-MHz Solid-State Power Amplifiers."
- Mike Riley, KX1B, and Steve Ewald, WA4GMS, tell the tale of hams supporting disaster-relief efforts in Mexico City, in "The 'Mexican Connection'."

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

SEPTEMBER 2010

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program are at this Web page: **www.arrl.org/public-service-honor-roll**.

575
W7TVA

441
AC6C

345
KA2ZNZ

325
N2LTC

293
KB7BRW

290
WB9YBI
KB2RTZ

265
KT2D

246
W2MTA

245
KB2ETO

244
K2HAT

236
KC2SFU

221
WM2C

220
N1UMJ

210
AK2Z
K8OLY

200
KT5R
WA2BSS
WB9JSR

190
W5KAV

180
W5DY

175
N9VC
K2HJ

165
NX8A

163
K6NCX

160
WD9FLJ

KK3F

157
WD8USA

156
W4LHQ

155
NX9K
KD5HYW
WB9FHP
K4BEH

151
KA8ZGY

150
K2ABX
K9EOH
WØLAW
KD1LE
K8RDN

148
N4EJF

146
KB8RCR

145
K9LGU
KF4GC
K7OAH

142
KØLQB

140
KF5CRX
N9DVL
K4GK
K7BFL
KB2BAA

135
KCØM
N1QLN
W3YVQ

132
WB8RCR

131
N2VC

130
K6JT
N8IO
WB2FTX
N2GJ
KK5NU
N2JBA

125
NN7H
K1HEJ

W7JSW

121
N4HUB

120
KA4FZI
AG9G
W8UL
N2GS
N3RB
W1GMF
KW1U
N1LKJ
K8DD
WB8WKQ

117
W3CB

115
WA4UJC
W5XX
N1IQI
KB8GT

110
KE4CB
K3RC
WB8HHZ
KB1NMO
WI2G
K4BG
N9MN
KJ4MNW
K1YCQ

108
W1PLW

107
KB5PGY

105
KE5YTA
WB6OTS
WE2G

104
WS6P
WD8BCS

103
KD7OED

101
K6HTN

100
W6WW
WØCLS
NØMEA
K4SCL
KC5MMH
N5OUJ
N8OD
WB8SIQ

N8CJS
WG8Z
WD8Q
N3SW
W3TWV
W9LW
N1JX
K2WRC
N5EEO
AA3SB
NR2F
W1SGC
WA2NDA
KC2UVQ
K2TV
KBØDTI
KK1X
WB6UZX
K8VFZ

98
N9WLW

97
KC5OZT
W8CPG

94
NA9L

93
W2CC
N8NMA

91
AD4BL
N5ASU
KN8B

90
NIØI
N8DD
KC8WH
W8DJG
W9MBT
WB2KNS
W4WNE
WB4BIK
N3ZOC
K3IN
W3GQJ
KA1EHR
KJ4HGH
W8IM
K1JPG
NU8K
KZ8Q
N3KB
WA2CUW
KC2UMX
KD8CYK

89
WD8DHC

88
KB3LNM

87
K2GW
W2DSX

86
WØSJS
KJ7NO

85
W5GKH

84
KS3Z
KØBXF
N7IE

81
N2DW
KB9KEG

80
KCØZDA
WA3EZN
N4ELI
WB4GHU
N2YJZ
KD8LZB
K8KV

78
N2VQA

77
WDØGUF
NA7G

74
AD8BC
W8QZ

72
K6RAU

70
KØDEU
NØDLK
NØDUW
NØDUX
NUØF
KAØFUI
KGØGG
KBØJKO
NØMHJ
N3NTV
KØPTK
KØOR
KØRXC
NØUKO
WAØVKC
KD7ZUP
KA8NSG
KA8IAF
W9WXN
KB3LFG
W4AVD
KC4PZA

The following stations qualified for PSHR in previous months, but were not properly recognized in this column: (Aug) N8IO 130, W8UL 120, K3CSX 120, K3RC 110, WB8HHZ 110, N8OD 100, WB8SIQ 100, WG8Z 100, WD8Q 100,N8DD 90, KC8WH 90, W8DJG 90, WA8EZN 80, KA8NSG 78, KA8IAF 75, KC4PZA 72. (Jul) KC3CSX 154, K4BG 100. (Jun) K3CSX 120. (Jan) K4BG 100. (May 2009) K4BG 100.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AL, AZ, CO, CT, EB, EMA, ENY, EPA, EWA, GA, IN, KS, LAX, MDC, ME, MI, MN, MO, MS, NC, NFL, NLI, NNJ, NNY, NTX, OH, OK, SFL, SJV, SNJ, TN, UT, WCF, WMA, WNY, WPA, WI, WV, WY.

(The Ohio STM reported August activity, but was not acknowledged in the November *QST* column.)

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AK, AZ, CT, EWA, IA, KS, ME, MI, MN, MO, MT, NLI, OH, SD, SFL, SV, STX, TN, WV.

Brass Pounders League

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

N1IQI 2179, WB5NKD 1706, W1GMF 1626, KA9EKG 1438, KK3F 1613, W8UL 1235, KZ8Q 1112, WB8WKQ 762, N1UMJ 693, WB5NKC 631, N1LKJ 565, K6JT 553, K1JPG 524, WB-9JSR 521, N8IXF 515, K1YCQ 501. Stations earning BPL by Originations plus Deliveries: NM1K 103.

The following stations qualified for BPL in August, but were not properly recognized in this column: W8UL 1433, N8IXF 696.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

W1ACM **Moutran**, Albert C., Niantic, CT
K1AHL **Dahl**, Nelson E., Palisade, NE
KB1DZP **Berry**, Anita, Berlin, NH
K1JAW **Whitehouse**, James A., Longmeadow, MA
NN1L **Moore**, Terrell E., Kennesaw, GA
W1LR **Rich**, Larry A., Orange Park, FL
W1ZQI **Ouellette**, Joseph N. "Bob," Salem, NH
KC2ALF **Campbell**, Anne H., Syracuse, NY
K2CWD **Gyidik**, Frank Jr, Vestal, NY
K2GDD **Palazzo**, Vincent E., Hampstead, NC
WB2GWL **Snyder**, Frederick A., Pulaski, NY
WA2VGW **Stomachin**, Leonard, Margate City, NJ
N3AGI **Nale**, Jeffrey L., Mifflintown, PA
KP3AN **Owen**, William A., Mayaguez, PR
W3IPA **Coltman**, John W., Pittsburgh, PA
W3ITF **Larrabee**, Robert D., Derwood, MD
W3OV **Rotondo**, Samuel M., Gilbertsville, PA
W3PIX **Shreve**, Richard, Erie, PA
KJ4AT **Toth**, Steve Jr, Amherst, OH
WA4BSL **Knight**, George S., Nashville, TN
KC4CNE **Blanton**, Hugh, Corbin, KY
W4DCW **Kanoy**, Lewis S. "Tink," Winston-Salem, NC
W4DZR **Scott**, Robert C. "Bob," St Petersburg, FL
♦K4FNI **Madaris**, William A., Chickamauga, GA
KE4FSE **MacPherson**, John, Gulf Breeze, FL
♦W4GKO **Fortenberry**, Ullman J., Haleyville, AL
KI4HRP **White**, Charlie W. Jr, Elizabeth City, NC
N4IYC **Penland**, Jim A., Newport News, VA
♦W4JLV **Pond**, Arthur L. Jr, Richmond, VA
N4JZJ **Duncan**, Sidney R., Akron, AL
KB4KZ **Flowers**, Priar "Pete," Mobile, AL
♦N4OT **Harris**, Andrew D., Woodbridge, VA
KI4RHN **Schambach**, Dan, Independence, KY
W4RJK **Koziomkowski**, Robert J., Fayetteville, NC
KS4SB **Brooks**, Vincent L., Cookeville, TN
KK4TB **Boss**, Aldrich J., Fairhope, AL
K4TXD **Schneider**, Ralph J., Alexandria, VA
KC4UWG **Desler**, David L. Sr, Chesapeake, VA
W4VEM **Chreste**, Herbert L., Crestwood, KY
K4YAF **Jones**, Bobby L., Mobile, AL
KA4ZBJ **Rogers**, Sharon K., Chapel Hill, NC
KF5CXB **Savage**, John W., Bull Shoals, AR
W5DIF **Caldwell**, William C. "Bill," Rockdale, TX
KA5EWK **Schoen**, Robert D., El Paso, TX
W5GEQ **Fleissner**, Conny L., Las Cruces, NM
♦K5HFY **Sessions**, Claude E. Jr, Sugar Land, TX
KC5HJD **Robb**, Roger D., Grants, NM
KF5JS **Eason**, Kenneth E., Bethany, OK
N5LTP **Burkhardt**, Louis C., Los Alamos, NM
NF5M **Newman**, Larry J., Charlotte, NC
W5NOB **Springfield**, Norma, Carrollton, TX
KB5OAA **Holmes**, Howard W., Broken Arrow, OK
K5UPP **Krampitz**, Frank J. "Bo" Jr, Pflugerville, TX
♦W5VPN **Galli**, Clarence F., Bernalillo, NM
KC5WXA **Driver**, Jake M., Houston, TX
KJ6CFL **Hedlund**, William D., Richmond, CA
KA6CWI **Lehan**, Donald E., Morgan Hill, CA
K6DRW **Wilson**, Donna R., Anaheim, CA
W6EGC **Genazzi**, Harold F., Point Reyes Station, CA
KG6IA **McGough**, Edward V., Grants Pass, OR
KB6KIA **Hultman**, Nancy G., Grants Pass, OR
♦W6KNO **Jackson**, Charles K., Venice, CA
WA6ULL **Boeckman**, Robert B., Folsom, CA
KF6URS **Doty**, Kenneth E., Orinda, CA
KI6YPO **Spanos**, John S., Rocklin, CA
K6ZAN **Butler**, Ralph E., Granite Bay, CA
KE6ZUI **Acosta**, Francisco O., Lancaster, CA
KE7CXD **Groseclose**, James Jay, Palm Beach Gardens, FL
K7MCA **Fletcher**, Fern M., Hoquiam, WA
K7PHZ **Carpenter**, James D., Auburn, WA
N7PTG **Lampert**, Vernon H., Sun City West, AZ
W7YCK **Brown**, Harold E. "Gene," Astoria, OR
KC8EGR **Haack**, Edward E., Columbiaville, MI
K8EIG **Zipfel**, Robert B., Woodville, OH
NF8P **Visser**, John C., Comstock Park, MI
KB8SGD **Myers**, William C., Deckerville, MI
N8SND **Mangus**, William A., West Union, OH
WA8UQG **Lappin**, Robert F., Willoughby, OH
N9BA **Phoenix**, Ronald L., Macomb, IL
K9CLO **Branche**, William H., Indianapolis, IN
K9CNP **Dunn**, Harold James, Auburn, IL
K9DGX **Roberts**, Leo O., Farmington, IL
W9KFX **Sims**, Virgil, Urbana, IL
W9LLF **Maerker**, Harold O., Murphysboro, IL
N9OHQ **Drause**, Mark E., Madison, WI
N9TCA **Rieck**, Robert L. "Bob," Eau Claire, WI
W9WED **Alongi**, Buster F., DuQuoin, IL
W9YCI **Thompson**, Donald G., Springfield, IL
♦KØCJL **Hachenberg**, Dean M., Hot Springs, AR
KCØDZF **Baker**, David J., Shawnee, KS
KDØENY **Honeywell**, Eugene C., Licking, MO
KBØGET **Fugitt**, Bette J., Springfield, MO
♦KØHNY **Srsen**, Charles E., Owatonna, MN
KØIFB **Kirsch**, Edward P., Broomfield, CO
NØJFZ **Schmidt**, Fred, St Louis, MO
WØORT **Hobson**, Rodney D., Stillwater, MN
♦KØQYD **Broten**, Donald W., Hinton, IA
WØRPW **Chandler**, Raymond C. A., Clinton, MO
WBØYXS **Scott**, Frances D., Kearney, NE
VE3CWD **Holland**, Kenneth G., Leamington, ON Canada
VA3DIL **Hubel**, Leo T., Windsor, ON, Canada
VE3EZY **Purdy**, Albert, Windsor, ON, Canada
G3KWG **Spratt**, John, Southend on Sea, UK

♦ 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

Gail Iannone ♦ Silent Keys Administrator ♦ sk@arrl.org

Strays

NOSTALGIC RADIO CONTACT COMMEMORATES END OF WW2

♢In early September, the operators of the Azalea Coast Amateur Radio Club made Morse code contact with the station aboard the USS *Missouri* (KH6BB), which is docked in Pearl Harbor, Hawaii. The contact was made via the original equipment on board the USS *North Carolina* (NI4BK) in honor of the 65th anniversary of the end of World War II in the Pacific. The operators of the Azalea Coast ARC maintain the old radio equipment on the *North Carolina*.

To underscore the dedication of the group that maintains the radio gear, Allen, KX2H, made a trip to New York to secure a new 861 final tube from Karl Corder, WA2OVJ, just in time to get it installed and get the transmitter humming on 14 MHz.

On board the USS *Missouri* that evening was Bill Kendall, KH6OO, assisted by Ray, WH6ASW. KH6OO and Ned Conklin, KH6JJ, were great to work with and were instrumental in making the contact happen.

You can learn more by visiting the North Carolina Battleship Memorial and Museum in Wilmington (**www.battleshipnc.com**/). If you are interested in helping to maintain the radio equipment, please contact Glenn Cox at **ke4bmy@hotmail.com**. — *Charlie Vaughan, K4UWH*

COURTESY BILL KENDALL, KH6OO

Aboard the USS *Missouri*, where the treaty was signed ending the war in the Pacific, are Bill Kendall KH6OO, and (standing) Ray Fabre, WH6ASW.

BILL USHER, AG4PA

The Morse code operator aboard the *North Carolina* was Charlie Vaughan, K4UWH, president of the Azalea Coast ARC (seated). His father had served aboard the battleship during the entire WW2 Pacific Campaign. Standing is Norm Clemmons, KI4YSY.

HAMSPEAK

The following are brief descriptions of Amateur Radio related terms found in this month's issue of *QST*. More information can be found in *The ARRL Handbook*, or other specialized ARRL publications.[1] See also **www.arrl.org/ham-radio-glossary**.

Antenna Measurement for the Ham on a Budget

Antenna analyzer — Test instrument designed to measure the impedance and standing wave ratio (SWR) of an antenna or an antenna and feed line combination as a function of frequency. See **www.arrl.org/reviews-listed-by-issue** and look for May 2005.

BASIC — Computer programming language (*Beginner's All-purpose Symbolic Instruction Code*) designed (c 1964) to be used by persons unfamiliar with computer programming. It was popular with early personal computer users. See **www.fys.ruu.nl/~bergmann/history.html**.

Complex impedance — The combination of resistance and reactance, measured in ohms (Ω) expressed as a complex number.

Frequency counter — Measurement instrument that determines frequency or repetition rate by measuring the number of occurrences or cycles during a precise interval.

G5RV — Form of dipole antenna in which a 100 foot center fed antenna is fed with about 30 feet of balanced high impedance transmission line. The line section acts as a transformer, intended to match the system to 70 Ω at the bottom on multiple bands. The antenna was developed by Louis Varney, G5RV (SK), near the end of WW2 as a multiband antenna with a particular pattern he wanted on 20 meters.

Impedance bridge — a test instrument designed to measure both the resistance and reactance of a circuit element or network. See **www.teradyne.com/corp/grhs/products_impedance-bridges.html**.

Piezo annunciator — Electrical sounding device with a function similar to an electromechanical buzzer.

The Doctor is IN

Antenna tuner — Device that sits between an antenna and a transmission line, or a transmission line and a radio, and transforms the impedance to match the radio or line.

[1]*The ARRL Handbook for Radio Communications,* 2011 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0953 (Hardcover 0960). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

Composition resistor — Passive component constructed of a thin cylinder of a formed carbon material mixed to provide a specified omhic value. A composition resistor has less reactance than other types of resistors.

Ethernet — Most commonly encountered wired local area network (LAN) arrangement. The original version of Ethernet provided a shared media communications structure in which a twisted pair bus was accessed by multiple users using a "listen before talk" contention protocol (carrier-sense multiple access with collision detection, CSMA-CD) at a 10 Mbps signaling rate (10Base-T Ethernet). Currently Ethernet can be found operating with 10, 100 and 1000 Mbps signaling rates using switched rather than shared access.

J-pole antenna — Single element, vertical half wave antenna, end fed with a quarter wave matching section of open wire or window line. It is generally used on VHF and UHF bands. If the matching section continues downward, it has the appearance of the letter "J."

Receiver noise blanker — Circuitry in a receiver that detects the presence of electrical noise pulses and then turns off the receiver for the duration of the noise on a pulse by pulse basis.

Type N connector — Constant impedance coaxial connector similar in size to the so-called UHF series. The type N provides a waterproof connection, is usable into the microwave region and provides a shield connection not dependent on coupling ring tightness.

Twisted pair wiring — Wiring technique used for telephone and later for local area network wiring, in which the two wires of a single path are twisted in an attempt to minimize coupling between multiple runs of such wire.

UHF (ultra-high frequencies) — The radio frequencies from 300 to 3000 MHz.

Wireless broadband router — Device that routes local area network signals between ports based on IP address. In the case of a wireless router, the connection mechanism is via microwave radio.

Gimme an X, Gimme an O, What's that Spell? — Radio

Antenna polarization — Direction of orientation of the electric field of the wavefront emanating from a transmitting antenna, or the orientation a receiving antenna will best respond to.

Circular polarization — Electromagnetic propagation mode in which the polarization, rather than being vertical or horizontal as in *linear* polarization, rotates as the wave moves from the source.

Critical frequency — Radio frequency above which signals will propagate through the ionosphere and not be returned to Earth. Frequencies above the critical frequency are useful for space communication, while those below may be usable for long range terrestrial communication.

Cross polarization — Attempt at communication between stations using antennas of different polarization. In the case of line of sight communication between linear antennas, a perfectly oriented horizontally polarized antenna, for example, will not be able to receive signals from a perfectly oriented vertically polarized antenna.

F layer — The highest of the identified layers of the ionosphere, and the most important for long range HF propagation. During the day it often acts as two distinct sub layers, F1 and F2. These appear to merge at night into a single layer.

Ionosonde — Radar- or sonar-like *ionospheric sounding* system in which radio signals are sent vertically over a wide range of frequencies. The frequencies that are reflected back are noted, along with the delay, allowing a determination of the effective height of the reflective layer of the ionosphere.

Plasma — Distinct state of matter in which some gaseous molecules are ionized. The ionized region is conductive and reflective to radio waves of some frequencies.

Skywave — Radio signal that propagates via the ionosphere, in contrast to a ground wave that travels along the ground or line of sight signals that go directly between end points.

WWV — Time and frequency standard radio station operated by the US National Institute of Standards and Technology (NIST). WWV broadcasts in the shortwave spectrum at 5, 10, 15, 20 and 25 MHz. See **tf.nist.gov/stations/wwv.html** for more information.

Selecting Your First VHF Handheld Transceiver

2 meter band — VHF radio frequency range of 144 to 148 MHz, allocated by the FCC to the Amateur Radio Service in the US. This band is popular for FM use, direct or through repeater stations, as well as for single sideband, CW and data modes via space or other propagation modes.

70 cm band — Radio frequency range of 420 to 450 MHz, allocated by the FCC to the Amateur Radio Service, on a shared basis with the US government in the US.

ARRL Affiliated Club — Independent local or regional Amateur Radio clubs that have agreed to be connected to the ARRL. Such clubs receive various benefits from this affiliation.

CTCSS — Abbreviation for continuous tone-controlled squelch system, a series of subaudible tones that some repeaters use to restrict access.

EmComm — Emergency communication. Amateur Radio communication that takes place during a situation where there is danger to lives or property.

Repeater — An amateur station, usually located on a mountaintop, hilltop or tall building, that receives and simultaneously retransmits the signals of other stations on a different channel or channels for greater range.

Repeater Directory — Annual ARRL publication that lists repeaters in the US, Canada and other areas.

Subaudible tone — Basis for a tone squelch system in which one of 50 audio tones in the 67 to 254 Hz frequency range is used to allow communication.

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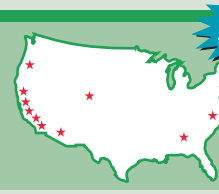

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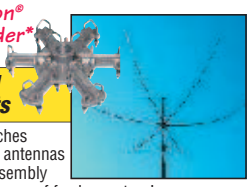

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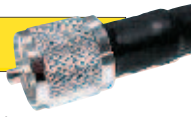

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Purchase any new LDG tuner between Oct 15 2010 and March 15, 2011 and receive a Free SP-200 200W Surge Protector from LDG*.

NEW! AT-600Pro

The LDG AT-600Pro will handle up to 600 watts SSB and CW, 300 on RTTY (1.8 – 30 MHz), and 250 watts on 54 MHz. It will match virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use the AT-600Pro with longwires, random wires and antennas fed with ladder line just by adding a balun. It has two antenna ports with a front-panel indicator, and separate memory banks for each antenna. Easy to read LED bar-graph meters showing RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11 – 16 volts DC at 750 mA. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $359.99***

radio not included

AT-897Plus

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-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment and 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$199.99***

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-100ProII

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 with LEDs, allowing you to switch instantly between two antennas. The AT-100ProII requires just 1 watt for operation, but will handle up to 125 watts. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $229.99***

Z-11ProII

Meet the Z-11ProII, 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. The Z-11ProII 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. Includes Icom interface cable, DC power cable and coax jumper.
Suggested Price $179.99

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required. A coax jumper cable is also induced for fast hook up.
Suggested Price $129.99.

Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes Icom interface cable, DC power cable and coax jumper.
Suggested Price $159.99

*To receive your free SP-200, simply fill out the rebate form available at www.ldgelectronics.com and mail to LDG along with a copy of your dated sales receipt. All rebate forms must be received by LDG before March 31, 2011. Limit one per household, valid worldwide.

LDG Electronics, Inc. 1445 Parran Road, St. Leonard, MD 20685 ***Phone 410-586-2177 • Fax 410-586-8475***

The #1 Line of Autotuners!

AT-1000Pro

The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $599***

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-200Pro

The AT-200Pro 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. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $249***

NEW! YT-450

LDG's newest tuner is specially designed for Yaesu's newest 100 watt radios. The YT-450 interfaces directly with the Yaesu FT-450 and FT-950 radios, making integration easier than ever. Simply connect the tuner to the radio with the supplied cables and you are ready to operate. DC power and all control is done through the interface cable. Just press the tune button on the tuner and the rest happens automatically: mode and power are set, a tune cycle runs and the radio is returned to its original settings. It will quickly match nearly any kind of coax fed antenna with an SWR of up to 10:1. 2000 memories recall settings in an instant! An extra CAT port on the back allows seamless connection to a PC. You have the newest radio, now get the newest tuner to go with it! ***Suggested Price $249.99***

IT-100

Matched in size to the IC-7000 and IC-706, the new IT-100 sports a front panel push-button for either manual or automatic tunes, and status LEDs so you'll know what's going on inside. You can control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. It's the perfect complement to your Icom radio that is AH3 or AH-4 compatible. ***Suggested Price $179.99***

KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199.99***

YT-100

An autotuner for several popular Yaesu Radios. An included cable interfaces with your FT-857, FT-897 and FT-100 (and all D models) making it an integrated tuner, powered by the interface. Just press the tune button on the tuner, and everything else happens automatically: mode and power are set, a tune cycle runs, and the radio is returned to its original settings. It's the perfect complement to your Yaesu radio. ***Suggested Price $199.99***

Meters!

FT Meter 2.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu. ***Still Only $49***

FTL Meter For Yaesu FT-857(D) and FT-897(D). 4.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu. ***Suggested Price $79.99***

NEW! M-7600 For IC-7600. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7700 and the virtual meter on your radio can work together. ***Suggested Price $79.99***

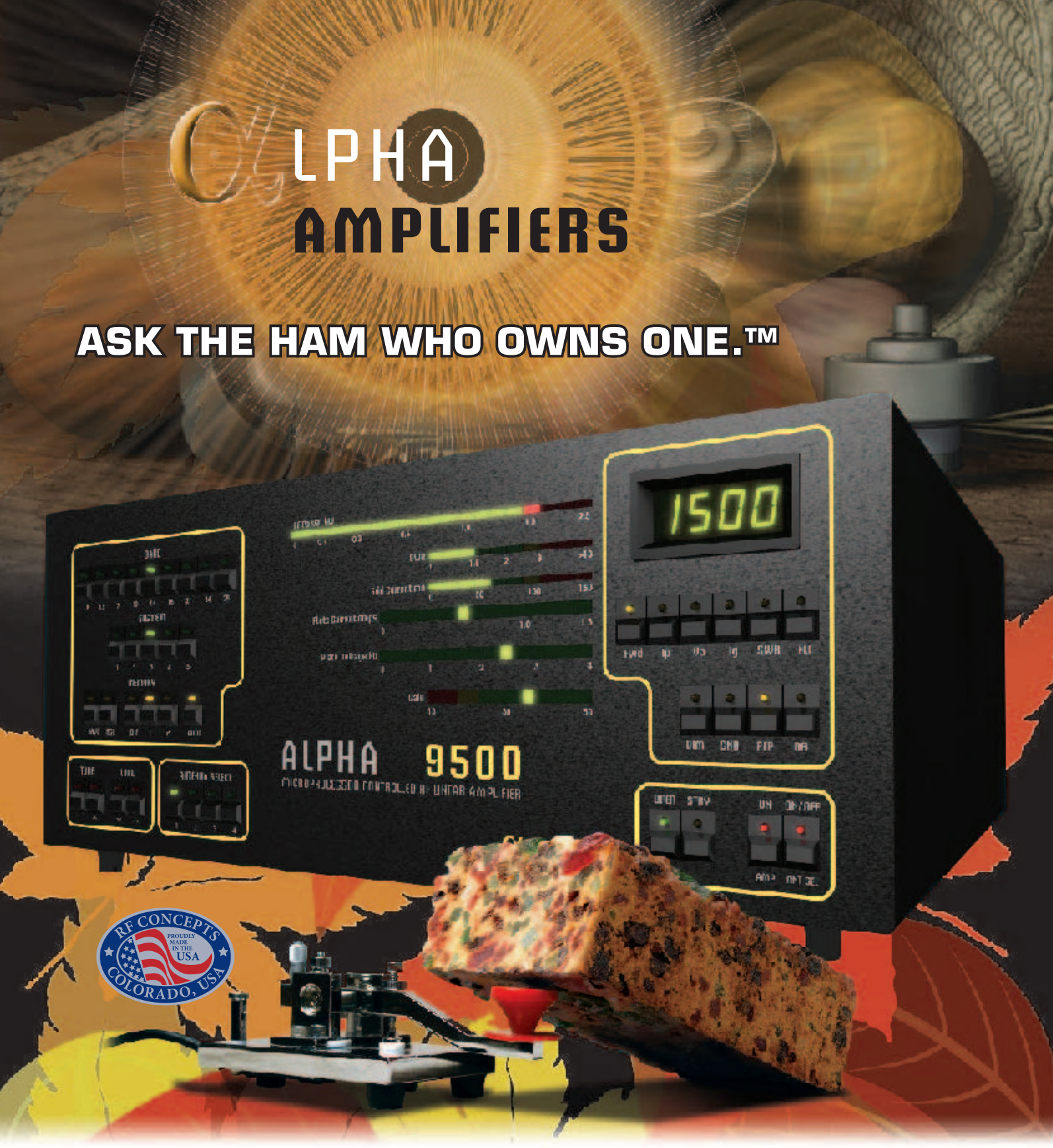
NEW! YT-847

YT-847 Autotuner is an integrated tuner for the Yaesu FT-847. An included CAT/Power cable interfaces with your FT-847. Just press the tune button on the tuner and everything else happens automatically! The mode is set to carrier and the RF power is reduced, a tune cycle runs and the radio is returned to the original settings. Also includes coax jumper cable. ***Suggested Price $249.99***

Visit our website for a complete dealer list.

Call or visit your favorite dealer today! ***www.ldgelectronics.com***

LDG



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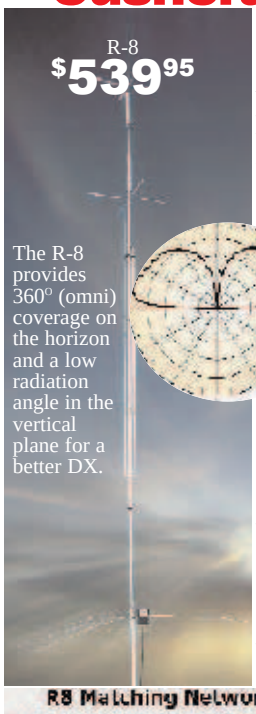
Cushcraft R8 *8-Band Vertical*



The R-8 provides 360° (omni) coverage on the horizon and a low radiation angle in the vertical plane for a better DX.

Covers 6, 10, 12, 15, 17, 20, 30, and 40 Meters!

The Cushcraft R8 is recognized as the industry gold standard for multi-band verticals, with thousands in use worldwide. Efficient, rugged, and built to withstand the test of time, the R8's unique ground-independent design has a well-earned reputation for delivering top DX results under tough conditions. Best of all, the R8 is easy to assemble, installs just about anywhere, and blends inconspicuously with urban and country settings alike.

Automatic Band Switching: The R8's famous "black box" matching network combines with traps and parallel resonators to cover 8 bands. You QSY instantly, without a tuner!

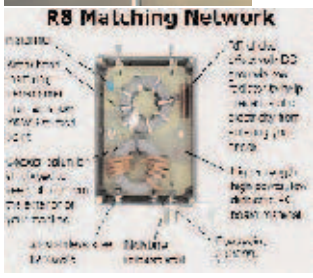
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

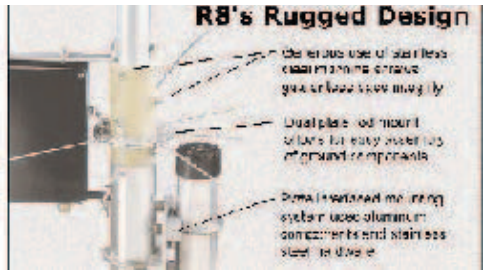
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

Legal-Limit Power: Heavy-duty components are contest-proven to handle all the power your amplifier can legally deliver and radiating it as RF rather than heat.

The sunspot count is climbing and long-awaited band openings are finally becoming a reality. Now is the perfect time to discover why Cushcraft's R8 multi-band vertical is the premier choice of DX-wise hams everywhere!

R-8GK, $56.95. R-8 three-point guy kit for high winds.





MA-5B *5-Band* Beam

Small Footprint -- Big Signal

The MA-5B is one of Cushcraft's most popular HF antennas, delivering solid *signal-boosting directivity* in a bantam-weight package. Mounts on roof using standard TV hardware. Perfect for exploring exciting DX without the high cost and heavy lifting of installing a large tower and full-sized array. Its 7 foot 3-inch boom has less than 9 feet of turning radius. Contest tough -- handles 1500 Watts.

The unique MA-5B gives you 5-bands, automatic band switching and easy installation in a compact 26-pound package. On 10, 15 and 20 Meters the end elements become a two-element Yagi that delivers solid power-multiplying gain over a dipole on all three bands. On 12 and 17 Meters, the middle element is a highly efficient trap dipole. When working DX, what really matters are the interfering signals and noise you *don't hear*. That's where the MA-5B's impressive side rejection and front-to-back ratio really shines. *See* ***cushcraftamateur.com*** *for gain figures.*

Cushcraft 10, 15 & 20 Meter Tribander Beams

Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to success comes from attention to basics. For example, element length and spacing has been carefully refined over time, and high-power traps are still hand-made and individually tuned using laboratory-grade instruments. All this attention to detail means low SWR, wide bandwidth, optimum directivity, and high efficiency -- important performance characteristics you rely on to maintain regular schedules, rack up impressive contest scores, and grow your collection of rare QSLs!

It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the difference.

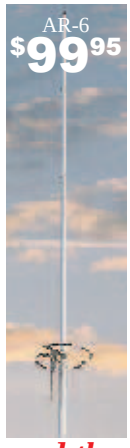
The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS**, **$499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios

Dual-bander VHF rigs are the norm these days, so why not compliment your FM base station with a dual-band Yagi? Not only will you eliminate a costly feed line, you'll realize extra gain for digital modes like high-speed packet and D-Star! Cushcraft's A270-6S provides three elements per band and the A270-10S provides five for solid point-to-point performance. They're both pre-tuned and assembly is a snap using the fully illustrated manual.

Cushcraft Famous *Ringo* Compact FM Verticals



W1BX's famous *Ringo* antenna has been around for a long time and remains unbeaten for solid reliability. The Ringo is broad-banded, lighting protected, extremely rugged, economical, electrically bullet-proof, low-angle, and more -- but mainly, it just plain works! To discover why hams and commercial two-way installers around the world still love this antenna, order yours now!

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FT-250R

FT-270R

FT-250R 2M FM HT

- TX: 144-148 • RX: 140-174
- Power: 5/2/0.5W • Memories: 209

FT-270R 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/2/0.5W • Memories: 200
- Extra large LCD display & speaker

VX-8DR

VX-8GR

VX-8DR Quad-band FM HT

- TX: 50-54, 144-148, 222-225, 430-450 MHz
- RX: 0.5-999 MHz (cell blocked) • Memories: 1200+
- Power: 5/2.5/1/0.05W (1.5W on 220)
- Optional GPS Unit FGPS-2 with either CT-136 adapter or MH-74A7A hand mic provides you with APRS® data

VX-8GR 2M/440 FM HT w/Built-in GPS

- TX: 144-148, 430-450 MHz
- RX: 108-999 MHz (cell blocked) • Memories: 1200+
- Power: 5/2.5/1/0.05W • Waterproof 3' for 30 min
- GPS unit and antenna is built-in for APRS® data

FT-2900R 2M FM Mobile

- TX: 144-148 • RX: 137-174
- Power: 75/25/10/5W • Memories: 221

Remote Kit included!

FT-7900R 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 108-520, 700-999 MHz (cell blocked)
- Power: 50/20/10/5W (2M), 45/20/10/5W (440 MHz)
- Memories: 1055 • YSK-7800 included!

FT-857D

FT-897D

Remote Kit included!

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 • YSK-857 included!

FT-897D 100W HF/VHF/UHF Portable

- Similar to the FT-857D but can also operate using optional FNB-78 13.2V @ 4.5 Ah NiMH battery packs

FT-950 100W HF/6M Transceiver

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 100 • Auto Antenna Tuner
- 32-bit Floating Point DSP • Built-in high stability TCXO
- Optional DMU-2000 Data Management Unit displays various operational conditions
- Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-2000 100W HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 10-100W
- Memories: 99 • Auto Antenna Tuner • 32-bit Floating Point DSP • Dual In-Band Receive • Internal Power Supply
- Optional DMU-2000 Data Management Unit displays various operational conditions
- Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-2000D 200W HF/6M Transceiver

- FT-2000 except RF output is 200W and supplied power supply is external

FTDX-5000MP

FTDX-5000 Series – Covers HF and 6M;

Three different configurations all running 10-200W on CW, SSB, FM, RTTY & PKT and 5-50W on AM • RX: 0.03-60 MHz • Memories: 99 • The "D" and "MP" model comes with SM-5000 Station Monitor that features an excellent bandscope • The "MP" comes with high stability ±0.05ppm OCXO & 300 Hz roofing filter

FTDX-5000 Basic Model & ±0.5ppm TCXO
FTDX-5000D With Station Monitor & ±0.5ppm TCXO
FTDX-5000MP With Station Monitor, ±0.05ppm OCXO & 300 Hz Roofing Filter

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ARRL Spectrum Defense Matters

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In July we launched an electronic newsletter, **Spectrum Defense Matters** to keep you informed on issues related to Amateur Radio, both domestic and international. And we will continue that newsletter and archive each issue on the web.

Because spectrum defense is vital to every ham, **please make the most generous contribution you can manage today**—by mail, by phone or on the web at **www.arrl.org/arrl-donation-form**.

For more information, contact

Mary Hobart, **K1MMH**
Chief Development Officer
ARRL
225 Main Street
Newington CT 06111-1494
Telephone: 860-594-0397
Email:mhobart@arrl.org

IC-V80 2M FM Handheld

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 5.5/2.5/0.5W • Memories: 207
- Comes with NiMH Battery and Wall Charger

IC-V80 SPORT 2M FM Handheld

- No NiMH Battery and Charger • Has AA Battery Case

IC-91A 2M/440 FM Dual Band HT

- TX: 144-148, 420-450 MHz
- RX: 0.495-999 MHz (cell blkd) • Power: 5/0.5W
- Memories: 1304 • D-Star w/optional UT-121 board

IC-2200H 2M FM Mobile

- TX: 144-148 MHz • RX: 118-174 MHz
- Power: 65/25/10/5W • Memories: 207
- D-Star upgradable with optional UT-118

ID-880H 2M/440 FM Analog & D-Star Digital Dual Bander Mobile

- TX: 144-148, 430-450 • RX: 118-173.995, 230-549.995, 810-999.99 MHz (cell blkd) • Power: 50/15/5W
- Memories: 1052 • D-Star Digital Ready
- Improved User Interface

ID-1 1.2 GHz D-Star & FM Mobile

- TX: 1240-1300 MHz • RX: 1240-1300 MHz
- Power: 10/1W • Memories: 105
- D-Star 128 kbps Data & 4.8 kbps Voice

IC-703 PLUS HF/6M QRP Portable Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 10W @ 13.8VDC, 5W @ 9.6VDC • Memories: 105 • Built in HF automatic antenna tuner • Take it with you to the great outdoors with the optional LC-156 Back Pack!

IC-706 MK II-G 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 • AF-DSP • IF Shift • Preamp/attenuator
- RMK-706 included • Quantities are limited!

IC-7200 HF/6M Portable Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 201 • Rugged design for outdoor use
- 32-bit IF-DSPs + 24-bit AD/DA Converters
- USB Port for CI-V Format PC Control and Audio In/Out

IC-7600 Multimode HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 101 • 5.8 inch color screen
- High-resolution real time spectrum scope using a dedicated DSP unit • Automatic antenna tuner
- Dual DSP units • 3, 6 & 15 kHz 1st (roofing) filters

IC-7700 Multimode HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7 inch color screen
- Two 32-bit floating DSPs • Power supply built-in
- Three roofing filters • External VGA connector
- Automatic antenna tuner • USB memory drive socket

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TM-271A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 60/25W • Memories: 200

TM-V71A Dualband FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Cross-band repeat • EchoLink® ready

TM-D710A

Dualband FM Mobile w/TNC

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Built-in TNC for APRS (needs GPS)
- Cross-band repeat • AvMap G5 & EchoLink® ready

TS-480HX

200W HF/6M Mobile Transceiver

- TX: HF/6M • RX: 0.5-60 MHz
- Power: 10-200W (with two optional 22A PS's)
- Memories: 99
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-480SAT

100W version with built-in auto antenna tuner.

TH-K2AT

TH-F6A

TH-K2AT 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/1.5/0.5W • Memories: 100

TH-F6A Triband FM HT

- TX: 144-148, 222-225, 438-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Dual band RX
- FM Wide/Narrow, AM, SSB and CW receive modes
- Power: 5/0.5/0.05W • Memories: 435

TS-2000 100W HF/VHF/UHF Transceiver

- TX: HF/6M/2M/440 MHz • RX: 0.03-60, 142-152, 420-450 MHz • Power: 10-100W (10-50W on 440 MHz)
- Memories: 99 • HF/6M Auto Antenna Tuner
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-B2000

Same as the TS-2000 with & no front panel controls. Includes PC control software.

TS-2000X

The TS-2000 with 1.2 GHz @ 10W.

TS-590S 100W HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz
- Power: 5-100W (5-25W on AM)
- Memories: 110 + 10 Quick Channels
- HF/6M Auto Antenna Tuner
- Down conversion receiver, narrow first roofing filter and dedicated first mixer, which gives it the best dynamic range in its class when handling unwanted adjacent off-frequency signals
- The transmit section uses a die-cast aluminum chassis and a large heat-sink with two quiet fans which makes it capable of withstanding long hours of operation
- Full/semi break-in CW • 10 Hz Dual VFO Display
- USB connectivity for PC and remote control

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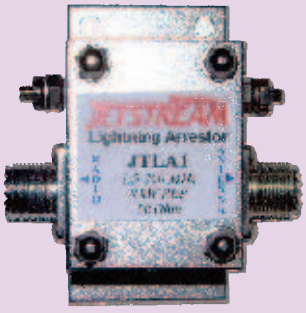

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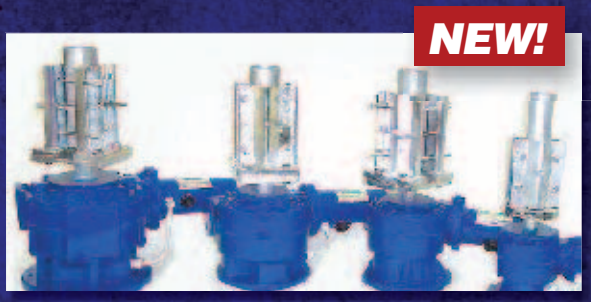

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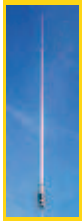

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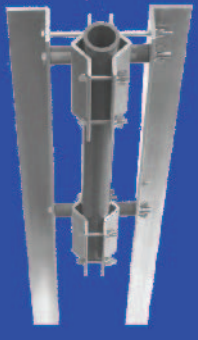

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QST QuickStats

sta·tis·tics (st-tstks) n.
1. (used with a sing. verb) The mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.
2. (used with a pl. verb) Numerical data.

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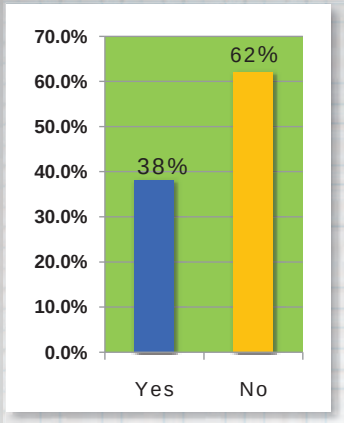
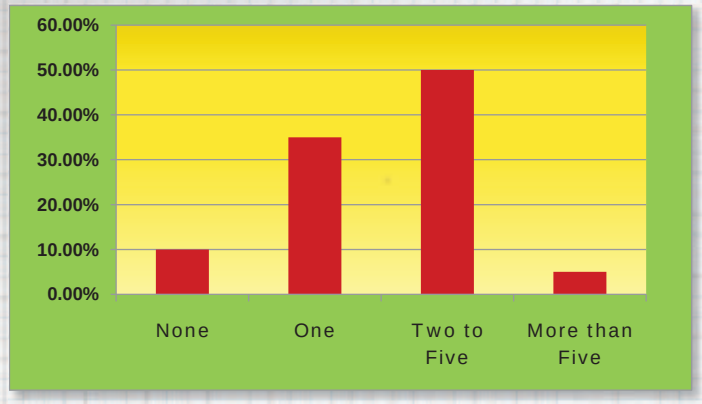
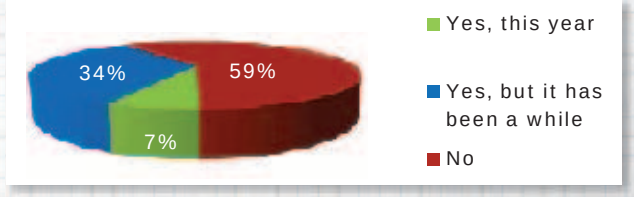


How many handheld FM transceivers do you own?



Have you ever participated in a radio "foxhunt"?

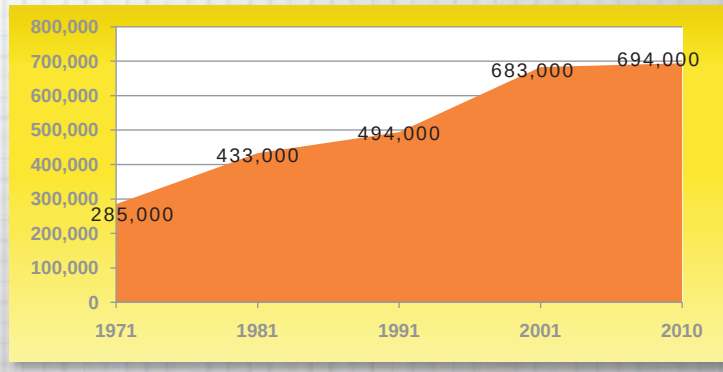


Top Five Most-Read *QST* Departments

(Percentage of members who indicated that they read the departments every month, according to semi-annual online surveys.)

Hints and Kinks	86%
Product Review	79%
The Doctor is IN	78%
Short Takes	67%
Hands on Radio	64%

39 Years of US Amateur Population Growth



Data Sources:

1971-1991:
The Radio Amateur Callbook

2001-2010:
FCC Database

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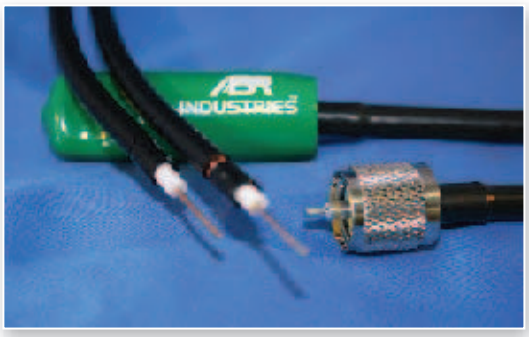

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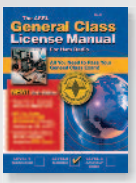

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New!

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The entire length radiates to provide exceptional low angle DX performance on 160 through 20 meters and very good performance on 17 through 6 Meters. You can shorten it by telescoping it down for more effective low angle radiation on higher bands if desired.

With an automatic antenna tuner there's no fuss -- just talk!

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An optimized balun design allows *direct coax feed* with negligible coax loss (typically less than 1/2 dB 60-6 Meters and less than 1 dB 160-80 M with good quality, low-loss coax).

Fully self-supporting, Extremely low wind loading, Very low visibility . . .

With just 2 square feet wind load, the fully self-supporting MFJ-2990 -- *no guy wires needed* -- has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D. and .120 inch

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Assembles in an hour

You can easily assemble it in an hour! Ground mounting lets you completely hide its antenna base in shrubbery. Includes ATB-65 high-strength antenna mount. Requires ground system -- at least one radial. More extensive ground system will give much better performance.

Great for Stealth Operation in antenna restricted areas

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Weather-proof window feedthrough panels bring coax, balanced lines, HF/VHF/UHF antennas, random wire antennas, ground, rotator/antenna switch cables and DC/AC power into your hamshack without drilling through walls!

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6 high quality *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Stainless steel ground post. Full 1500 Watt legal limit.

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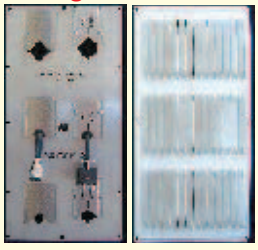
Bring cables thru eave of your house



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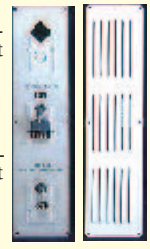

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Bring in coax, rotator, antenna switch, power cables, etc. *with connectors* up to 1¼x1⅝ inches!

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MFJ *IntelliTuner*™ Automatic Tuners

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

MFJ-998 1500 Watt *Legal Limit IntelliTuner*™

Only the MFJ-998 gives you fully automatic antenna tuning for your legal limit full 1500 Watts SSB/CW linear amplifier!

MFJ-998 $699.95

Ultra-fast Automatic Tuning

Instantly match impedances from 12-1600 ohms using MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms with over 20,000 *VirtualAntenna*™ Memories.

Safe auto tuning protects amp

MFJ's exclusive *Amplifier Bypass Control*™ makes tuning safe and "stupid-proof"!

Digital/Analog Meters

A *backlit* LCD meter displays SWR, forward/reflected power, frequency, antenna selected, an auto-ranging bargraph power indication, and much more.

Has quick-glance auto-ranging Cross-Needle SWR/Wattmeter.

MFJ VirtualAntenna™ Memory

MFJ new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 switchable antenna coax connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total. Has binding post for end-fed long wire antennas.

Download & Upgrade Remotely

Download from internet and upgrade your MFJ-998 firmware as new features are introduced.

Plus Much More!

Built-in radio interface controls most transceivers.

Automatically bypasses with excessive tuning power.

Use balanced line antennas with external **MFJ-912, $59.95**, 1.5 kW 4:1 balun.

Small 13Wx4Hx15D inches easily fits into your ham station. 8 pounds. Requires 12-15VDC at 1.4 amps maximum or 110 VAC with **MFJ-1316, $21.95**.

for 600 Watt amps

AL-811/ALS-600/ALS-500

For 600 Watt amps like Ameritron AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. 10,000 *Virtual Antenna*™ memories. Cross-Needle SWR/Wattmeter. 10Wx2¾Hx9D inches.

MFJ-994B $359.95

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

300 Watt...Best Seller

Digital Meter, Ant Switch, Balun

The *world's best selling* automatic antenna tuner is *highly acclaimed the world over* for its ultra high-speed, wide matching range, reliability, ease-of-use! Matches virtually *any* antenna.

MFJ-993B $259.95

300 Watt...*Extra* Wide Range

SWR/Wattmeter, 10000 VA Memories

***Extra** wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B $219.95

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 $219.95

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 $199.95

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

***No** extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 $179.95

G5RV Antenna

MFJ-1778 $44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

200W...Weather-sealed

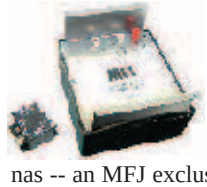
for Remote/Outdoor/Marine

MFJ-926B $399.95

***Fully** weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed



MFJ-927 $259.95

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

Free MFJ Catalog

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

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The Best Powerpole Crimper

The only professional ratcheting crimp tool for 15, 30, 45, 50 and 75 Amp Anderson Powerpoles. It will also crimp Molex type connectors. Over a year in development, our new Andy Crimp Pro is the most versatile crimping tool ever with its 4 die cavities.
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Dipole Center Insulator with End Insulators
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22 x 12 x 12 Inches
Two End Pockets
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MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New *TrueActive*™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.

MFJ-989D $389.95

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob ***Differential-T***™

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D ***compact*** kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$x$10^{7}/_{8}$ in.

MFJ-969 300W ***Roller Inductor*** Tuner

MFJ-969 $219.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E ***deluxe*** 300 Watt Tuner

More *hams use MFJ-949s than any other antenna tuner in the world!*

MFJ-949E $179.95

Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3^{1}/_{2}$Hx$10^{5}/_{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E ***super value*** Tuner

The *most for your money!*

MFJ-941E $139.95

Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M ***mobile*** Tuner

MFJ-945E $129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 ***portable/QRP*** Tuner

MFJ-971 $119.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B ***smallest*** Versa Tuner

MFJ-901B $99.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 ***Tiny Travel*** Tuner

MFJ-902 $99.95

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 ***random wire*** Tuner

MFJ-16010 $69.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 ***6 Meter*** Tuners

MFJ-906 $99.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 ***VHF/UHF*** Tuners

MFJ-921/924 $89.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 ***artificial*** RF Ground

MFJ-931 $109.95

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

Dealer/Catalog/Manuals

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MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"What did you say?" Can you hear but . . . just can't always understand everything people are saying?

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$199.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null *wipes out* noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ *tunable* Super DSP filter

MFJ-784B
$279.95

Only MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

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http://www.mfjenterprises.com *for instruction manuals, catalog, info*

MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English! Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . . More!

Is your CW rusty?

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

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

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

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

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

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

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

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW. Digs out weak signals. Phase-Lock-Loop even tracks slightly drifting signals.

MFJ-461 $89.95

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

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

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable. A battery saving feature puts the MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery. Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 inches. 5½ ounces.

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

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

MFJ-5161, $16.95. MFJ-461 to computer serial port cable (DB-9).

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

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

MFJ Morse Code *Reader and Keyer* Combination

Plug MFJ's CW Reader with 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're still learning the code!* 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-464 $199.95 *(Keyboard, paddle not included.)*

MFJ-551, $39.95. RFI suppressed keyboard, a must to avoid RFI problems.

MFJ Iambic Paddles

MFJ-564 Chrome
MFJ-564B Black
$69.95

MFJ *Deluxe Iambic Paddles*™ feature a full range of adjustments in tension and contact spacing. Self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. Works with all MFJ and other electronic keyers.

***Miniature* Travel Iambic Paddle**

MFJ-561, $24.95. 1¾Wx1¾D x¾H inches. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

MFJ Code Oscillator

MFJ-557 $39.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312D, $15.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ inches.

MFJ-550, $14.95. Telegraph Key Only with adjustable contacts. Handsome black.

MFJ Deluxe CW Keyer

Deluxe MFJ Keyer has all controls on front panel for easy access -- speed, weight, MFJ-407D tone, volume knobs, and tune, semi/ $79.95 auto, on/off push-buttons. You get all keyer modes, dot-dash memories, self completing dots/dashes, jam- proof spacing, sidetone, built-in speaker, type A /B keying. RF proof. Solid state keying. 7x2x6 inches.

MFJ-401D, $69.95. Econo Keyer II has front-panel volume/ speed controls (8-50 wpm), tune switch. Internal adjust weight, tone. Solid state keying. Tiny 4x2x3½ inches.

Keyer/Paddle Combo

MFJ-422D $189.95

Best of all CW worlds -- a *deluxe MFJ Curtis*™ *keyer* that fits right on *Bencher paddle*! Adjustable weight and tone, front panel volume and speed controls (8-50 WPM), built-in dot-dash memories, speaker, sidetone, semi-automatic/tune or automatic modes. Use 9V battery or 110 VAC with MFJ-1312D, $15.95. 4½/8x2⅝/8x5¼ in.

MFJ-422DX, $99.95.

MFJ *Curtis*™ Keyer only, fits on your Bencher paddle or MFJ-564 (chrome) or MFJ-564B (black) paddles above.

MFJ*Pocket* Morse Tutor

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

MFJ-418 $89.95

MFJ *ClearTone*™ Speaker

MFJ-281, $12.95. Makes copying easier, enhances speech, improves intelligibility, reduces noise, static, hum. 3" speaker, 8 Watts, 8 Ohms.

MFJ 24/12 Hour Station Clock

MFJ-108B, $21.95. Dual 24/12 hour clock. Read UTC *and* local time *at-a-glance.* High-contrast 5/8" LCD, brushed aluminum frame. Batteries included. 4½Wx1Dx2H in.

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MFJ . . . the world leader in ham radio accessories!

Do-It-Yourself: Wireless Technology

Available Now
Limited-Time BONUS Offer!

The ARRL Handbook is the most comprehensive guide to radio electronics and experimentation. The book is part reference and part applied theory, filled with practical treatments of basic electronic fundamentals, RF design, digital and software radio technology, and antenna construction.

For more than eight decades, ***The Handbook*** has empowered radio amateurs and professionals alike with its do-it-yourself approach, finding its way onto workbenches and operating desks, and into technical libraries and institutions.

Always Revised!

This eighty-eighth edition has been significantly expanded, featuring brand-new projects and the most up-to-date information…

New Topics:

- Schematic capture and Printed Circuit Board layout
- Amplifier tuning and maintenance, using surplus amp parts
- Restoring vintage equipment
- Remote station design

New Project Material:

- Microprocessor-based SWR Monitor-Meter by Larry Coyle, K1QW
- LTspice simulation files for basic electronic circuits
- Selecting the right battery for mobile operation

Expanded Content:

- New from Dr. Ulrich Rhode, N1UL: Oscillator and mixer circuit designs, HF mixer testing, VHF down-converter front end design, and RF circuit simulation
- 50% more on RF Interference, including digital TV, power-line noise, and automotive RFI
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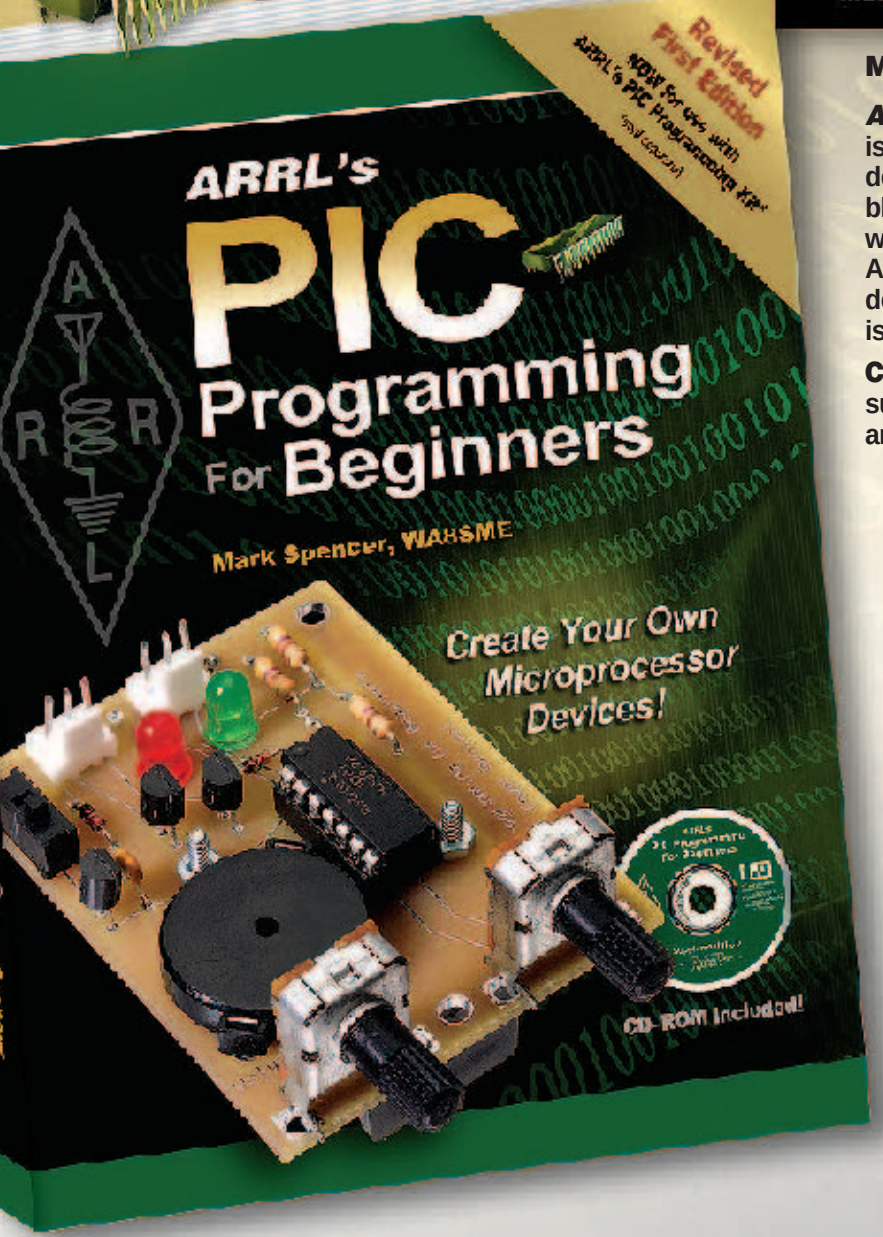

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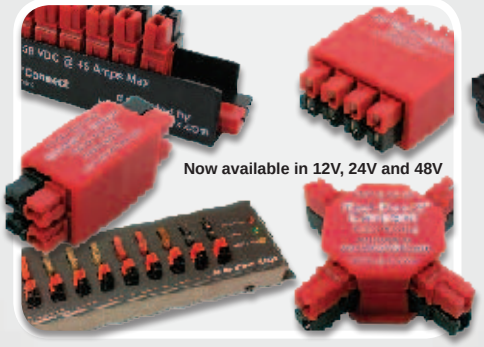

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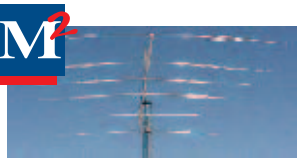

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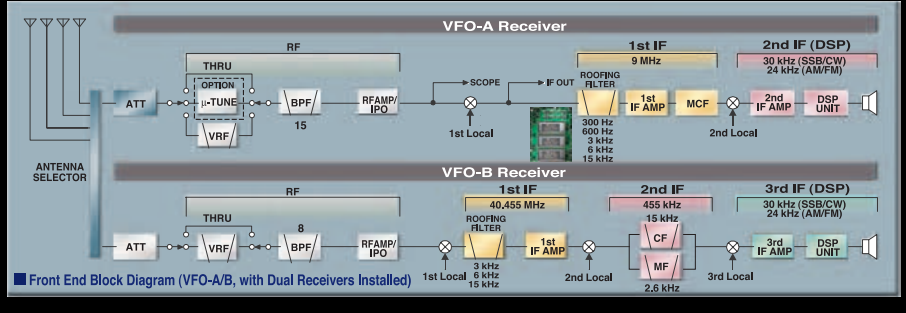
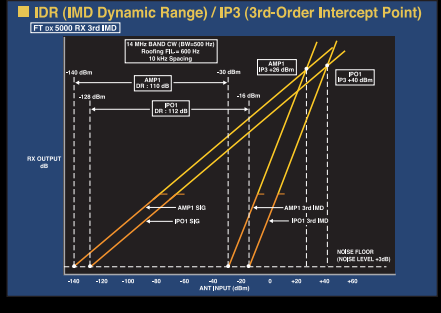
The tight shape factor 6 pole crystal filters and D Quad Double Balanced Mixer design afford incredible improvement in 3rd – Order dynamic range and IP3 performance

Superb 3rd-Order Dynamic Range and 3rd-Order Intercept Point (IP3)

You will be pleased with the astounding 112 dB dynamic range and superb IP3 + 40 dBm at 10 kHz separation (CW/500 Hz BW). Experience the unmatched close-in dynamic range of 105 dB, IP3 +36 dBm at 2 kHz separation (CW/500 Hz BW)! (VFO-A/Main Receiver, 14 MHz, IPO-1)



Front End Block Diagram (VFO-A/B, with Dual Receivers Installed)



HF/50 MHz 200 W Transceiver NEW
FT DX 5000MP

Station Monitor SM-5000 included
± 0.05ppm OCXO included
300 Hz Roofing Filter included

HF/50 MHz 200 W Transceiver NEW
FT DX 5000D

Station Monitor SM-5000 included
± 0.5ppm TCXO included
300 Hz Roofing Filter optional

HF/50 MHz 200 W Transceiver NEW
FT DX 5000

Station Monitor SM-5000 optional
± 0.5ppm TCXO included
300 Hz Roofing Filter optional

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

YAESU
*Choice of the World's top DX'ers*SM

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