DECEMBER 2011 QST Vol 95 No 12

QST

DEVOTED ENTIRELY TO AMATEUR RADIO

December 2011 WWW.ARRL.ORG

QST reviews:

45 | **FlexRadio Systems FLEX-1500**
Software Defined HF+6 Meter QRP Transceiver

Inside:

$4.99 US $6.99 Can.

12

19260

0 843655 9

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Official Journal of the ARRL "the national association for AMATEUR RADIO"

The radio YAESU ...

The Dawn of a New Era
Dynamic Range 112 dB/IP3 +40 dBm

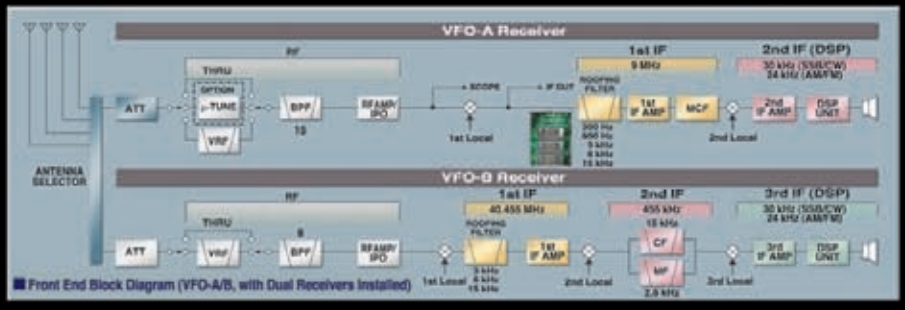
The New Premium HF/50 MHz Transceiver
FT DX 5000 Series

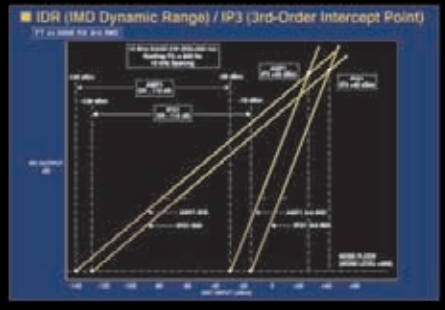
Two Totally Independent Receivers - The VFO-A/Main Receiver utilizes Super Sharp Roofing filters to give you the highest performance and best flexibility

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)





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℠

Vertex Standard US Headquarters
6125 Phyllis Drive, Cypress, CA 90630 Phone: (714) 827-7600

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

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

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

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

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

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

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

DMU-2000
Data Management Unit (option)

"The Best of the Best Just Got Better"

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

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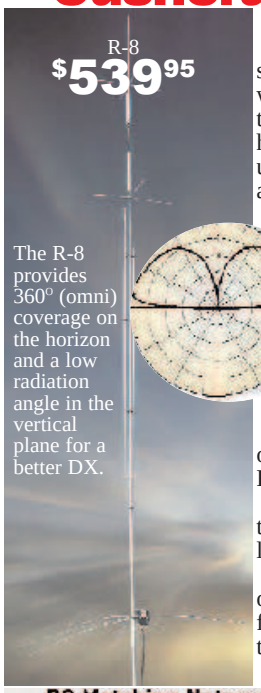
Cushcraft R8 *8-Band Vertical*

Covers 6, 10, 12, 15, 17, 20, 30, and 40 Meters!



The R-8 provides 360° (omni) coverage on the horizon and a low radiation angle in the vertical plane for a better DX.

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!

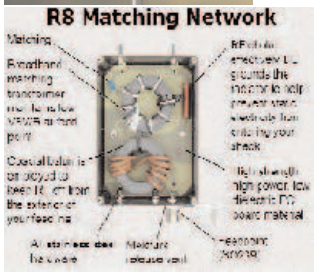
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

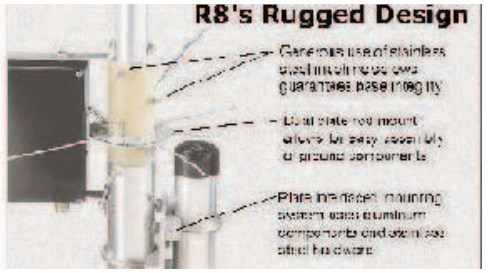
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

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!

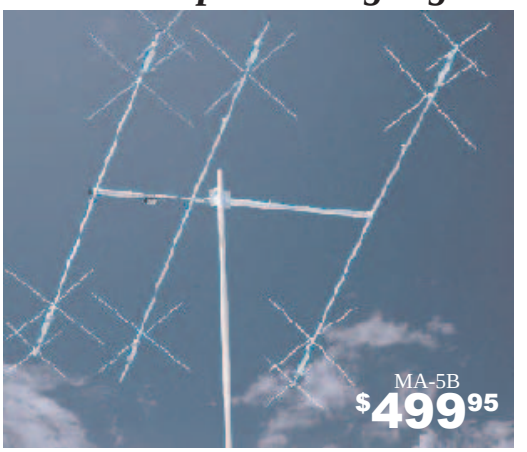
R-8GK, $56.95. R-8 three-point guy kit for high winds.





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.

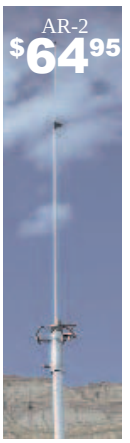
The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS**, **$499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

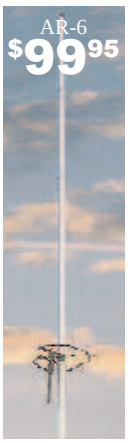
Cushcraft Dual Band Yagis

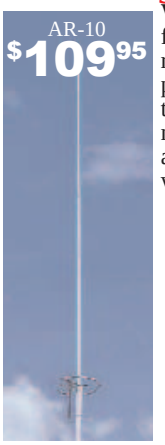
One Yagi for Dual-Band FM Radios

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!

***Free* Cushcraft Catalog**
and Nearest Dealer . . . 662-323-5803
Call your dealer for your best price!

Cushcraft
Amateur Radio Antennas
308 Industrial Park Road, Starkville, MS 39759 USA
Open: 8-4:30 CST, Mon.-Fri. ***Add Shipping.***
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http://www.cushcraftamateur.com

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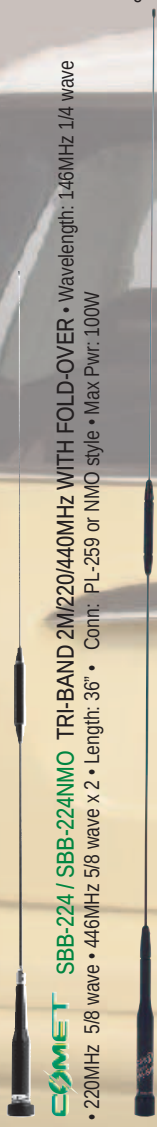
Life is a JOURNEY, Enjoy the ride!

Maldol MH-511 TRI-BAND 6M/2M/70CM HT ANTENNA • Length: 4" • Conn: Male SMA

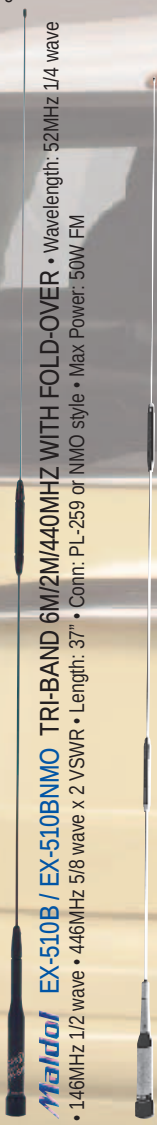
Maldol MH-510 TRI-BAND 6M/2M/70CM HT ANTENNA • Wavelength: 6M 1/4 wave top-load • 2M 1/4 wave • 440MHz 1/2 wave • Length: 20.75" • Conn: Male SMA

COMET HT-224 TRI-BAND 2M/220/70CM HT ANTENNA • Wavelength: 2M 1/4 wave • 220MHz 1/2 wave • 440MHz 1/2 wave • Length: 11.5" • Conn: Male SMA

Maldol MH-610 TRI-BAND 2M/220/70CM HT ANTENNA • Wavelength: 2M 1/4 wave • 220MHz 1/2 wave • 70cm 5/8 wave • Length: 14" • Conn: Male SMA



COMET SBB-224 / SBB-224NMO TRI-BAND 2M/220/440MHz WITH FOLD-OVER • Wavelength: 146MHz 1/4 wave • 220MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 36" • Conn: PL-259 or NMO style • Max Pwr: 100W



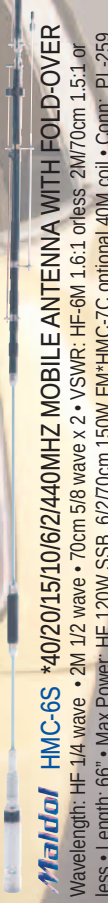
Maldol EX-510B / EX-510BNMO TRI-BAND 6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 52MHz 1/4 wave • 146MHz 1/2 wave • 446MHz 5/8 wave x 2 VSWR • Length: 37" • Conn: PL-259 or NMO style • Max Power: 50W FM

COMET SB-15 TRI-BAND 6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 52MHz 1/4 wave • 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

COMET UHV-4 QUAD-BAND 10M/6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 10M & 6M 1/4 wave • 2M 1/2 wave • 70cm 5/8 wave x 2 • Length: 55" • Max Power: 10M 120W SSB 6M2M/70cm 100W FM • Conn: PL-259 • 10M and 6M bands have individual tuning stubs

COMET UHV-6 HF/6M/2M/440MHZ MOBILE ANTENNA *80/*20/*17/40/15/10/6/2M/70cm Mobile antenna with fold-over hinge• Wavelength: 2M 1/2 wave • 70cm 5/8 wave x 2 • VSWR: HF 1.6:1 or less, 6M-70cm 1.5:1 or less • Length: 44" (min), 78"(max) • Max Pwr: HF 120W SSB, 6M 200W SSB/100W FM, 2M/70cm 100W FM • **L-14 optional 20M coil *L-18 optional 17M coil *L-3.5 optional 80/75M coil • Features: • 6M/2M/ 70cm operation is constant. You CHOOSE the HF coils you want to add, up to four stock or optional. One vertical, the rest horizontal. • Easily mounts to standard trunk/door mount in minutes • Economical • Fold-over hinge built in• Select the duplexer or triplexer for your specific radio(s). CF-706A, CF-530, CFX-514N • Conn: PL-259

UHV-6 in fold-over position.
Fold-over hinge included for easy entry to garage, parking structure, drive-thru etc... SB-15 / UHV-4 / UHV-6 / HMC-6S fold-over hinge has a threaded collar to lock the hinge vertically in place. It can't fold-over by itself at highway speed!



Maldol HMC-6S *40/20/15/10/6/2/440MHZ MOBILE ANTENNA WITH FOLD-OVER Wavelength: HF 1/4 wave • 2M 1/2 wave • 70cm 5/8 wave x 2 • VSWR: HF-6M 1.6:1 orless 2M/70cm 1.5:1 or less • Length: 66" • Max Power: HF 120W SSB 6/2/70cm 150W FM*HMC-7C optional 40M coil • Conn: PL-259

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 and Maldol Mobile

For a complete catalog, call or visit your local dealer.
Or contact NCG Company. 15036 Sierra Bonita Lane, Chino, CA 91710
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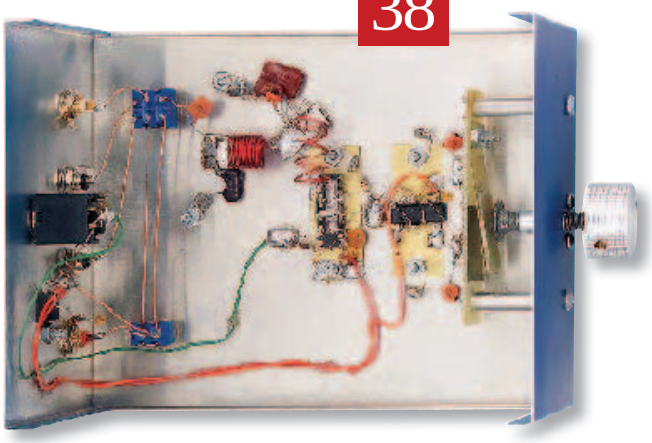
This Month in QST

December 2011 ■ Volume 95 Number 12

Technical



News and Features

Interested in Writing for *QST*? www.arrl.org/qst-author-guide e-mail: qst@arrl.org

Radiosport

Announcements

Season's Greetings

Our Cover
Between tiny tots with their eyes all aglow and Jack Frost nipping on your nose, it's good to escape from all the holiday hullabaloo and get on the radio. Whether you're chasing DX, looking for another multiplier, participating in a public service event or just chewing the rag with the ham across town, Amateur Radio is the one thing that draws us all together. So relax, put your feet up and enjoy all that the holiday season — and Amateur Radio — have to offer. Happy Holidays from ARRL HQ.
(Photo: Bob Snyder, W1RS, Westford, Massachusetts)

Departments

December 2011 ■ Volume 95 Number 12

QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, Inc, 225 Main Street, Newington, CT 06111-1494, USA. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices.

POSTMASTER: Send address changes to: QST, 225 Main St, Newington, CT 06111-1494, USA. Canada Post: Publications Mail Agreement #40612608. Canada Returns to be sent to Bleuchip International, PO Box 25542, London, ON N6C 6B2.

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Advanced Dual Band Mobile Radio
5.2" x 1.6" Large dot matrix (264 x 64 dots) LCD display
GPS / APRS® / Bluetooth® Features
FTM-350AR

New Vacuum Cup-Mounting Bracket permits Angle Adjustment
New APRS® Operation Capability, and newly Expanded User Friendly Functions

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

FTM-350AR NEW

220 MHz 1 W (USA version only)

New Features of The FTM-350AR

1. New Vacuum Cup-Mounting Bracket with Angle Adjustment

The new MMB-98 Mounting bracket allows easy installation of the radio control display to your Dashboard by placing the vacuum mount in the desired location and pressing a lever. You may then adjust the display to the optimum viewing angle.

2. Expanded APRS® functions

- Uses the worldwide-accepted GPS NMEA data format
- Navigation to another APRS® BEACON station is possible, even if the beacon station is moving.
- Waypoint data (Data in/out) is available from the ACC connector on the rear of the main unit.
- Sub-Band APRS® operation may be active in the background, even when operating in Mono-Band Display mode.
- Newly added Voice Alert function
- Re-allocated often used keys to more convenient positions for easier operation
- Programmable keys on the DTMF Microphone provide direct access to APRS® functions

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

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YAESU
Choice of the World's top DX'ers™

Vertex Standard
US Headquarters
6125 Phyllis Drive, Cypress, CA 90630
Phone: (714) 827-7600

A TECHNOLOGY BREAKTHROUGH

New Advanced VX-8 Series GPS/APRS® Handheld Transceivers
Choose the Yaesu that meets your APRS® operating preferences in the field

50/144/(222)*/430 MHz
FM 5 W/AM 1W (50 MHz) Triple Band Handheld
VX-8DR * 222 MHz/1.5 W (USA version)
(7.4V 1,100 mAh Lithium Ion battery/FNB-101LI and battery charger/NC-86A included)

Actual Size

144/430 MHz
FM 5 W Dual Band Handheld
VX-8GR
(7.4V 1,100 mAh Lithium Ion battery/FNB-101LI and battery charger/NC-86A included)

Actual Size

VX-8DR NEW

All-in-one Prestigious Tri-band Transceiver
Bluetooth® for hands-free Operation with optional accessories
Waterproof/Submersible IPX 7 rated - 3 ft for 30 minutes

Optional GPS and antenna unit for GPS/APRS® operation

Attached to the radio (microphone input) using the optional GPS Antenna Adapter CT-136

The optional GPS Antenna Unit FGPS-2 attached to the optional speaker Microphone MH-74A7A

Bluetooth®

VX-8GR NEW

144/430 MHz Dual Band Transceiver with GPS unit included
Built-in GPS Antenna - Waterproof
Wide Band Receive for 108-999 MHz (Cellular blocked – US Version)

Supports APRS® communication by the Built-in Worldwide Standard AX.25 Data TNC

The VX-8 series radios are compatible with the world wide standard APRS® (Automatic Packet reporting System) using the GPS system to locate and exchange position information.

- SmartBeaconing™ Function
- Memories to list 50 stations
- Memories to store 30 APRS® messages
- DIGI-PATH routing indication function
- 8 DIGI-PATH routing settings
- GPS Compass Display - "Heading Up" or "North Up"
- APRS® Symbol Icon pre-set function
- Clearly displayed APRS® Beacon Messages
- Selective Message Received indicated by Flashing LED

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http://www.yaesu.com

YAESU
Choice of the World's top DX'ers℠

Vertex Standard US Headquarters
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Field Gear That Goes The Distance!

FT-897D

HF/VHF/UHF Portable Operation Powerful Transceiver

- The Ultimate Emergency Communications Radio
- Rugged, Innovative Multi-Band
- Operates on the SSB, CW, AM, FM, and Digital Modes
- Wide Frequency Coverage
- 20-Watt Portable Operation Using Internal Batteries
- 100 Watts When Using an External 13.8-Volt DC Power Source

FT-817ND

The Ultimate Backpack, Multi-Mode Portable Transceiver

- Self-Contained
- Battery-Powered
- Covering the HF, VHF, and UHF Bands
- Provides up to Five Watts of Power Output
- SSB, CW, AM, FM, Packet, or SSB-based Digital Modes like PSK31

FT-857D

The World's Smallest HF/VHF/UHF Mobile Transceiver

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We've Got Spots!

"As the saying goes, 'Better late than never.' At long last, Solar Cycle 24 is off and running!"

It's difficult to believe now, but four years ago one group of "solar weather forecasters" was predicting a sunspot peak in October 2011. If you are among the countless amateurs who keep track of ionospheric propagation conditions you now know that they were wildly optimistic. When that prediction was made we were in a trough of solar activity whose end already was overdue but would continue for another two years. Many of us with experience from previous sunspot peaks began to wonder if we would ever see their like again.

October 2011 did not turn out to be a peak — at least we hope not! — but it was a very, very good month for HF radio propagation. There were glimmers of improvement in 2010 and brief periods of excellent conditions this past spring, but it was the fall 2011 operating season that finally brought consistent global DX to the 10 and 12 meter bands. The excitement may have died down a bit by the time this issue of *QST* makes it into print and into your mailbox — band openings grow shorter along with the hours of daylight — but as of mid-October we're feeling a bit giddy.

Greater solar activity expands the useful HF radio spectrum but it is 10 meters that benefits the most. The band is special for a number of reasons. It is the widest HF amateur allocation, so crowding is less of a problem than elsewhere. Every FCC-licensed amateur has privileges on 10, including Technicians and Novices who can operate SSB between 28.3 and 28.5 MHz, RTTY and data in the lower part of the band, and CW all the way from 28.0 to 28.5 MHz. A quarter-wave vertical antenna element is just eight feet long and a half-wave dipole is just 16 feet from end to end. Small Yagis are relatively easy to manage and work pretty well at modest heights. Even with low power and a compromise antenna you can make a lot of memorable intercontinental contacts, although you may have to wait in line for the juicier stuff.

For Generals and above there is plenty of room above 28.5 MHz. There is even some FM activity at the high end of the band. Generals also have full use of 12 meters, which opens earlier and stays open longer than 10. On some days the maximum usable frequency (MUF) may make it to 25 MHz but not quite to 28 MHz; those are the days when you'll be glad you thought to check 12 meters!

If you're new to DXing and have been working toward DXCC or the DXCC Challenge you can fill in a lot of the blank spaces on your list in a hurry on these two bands — but it would be a shame if that's all you do. Ten meters in particular lends itself to more leisurely chats with new friends and old, half a world away. Especially after such a long famine it's tempting to gorge ourselves on DX, working every station we hear and moving on to the next as quickly as possible. That's not likely to give us the most satisfying meal. You can't force someone into an extended conservation — a "ragchew" in traditional parlance — but if you find yourself in contact with someone who wants to chat, take advantage of the opportunity to learn a bit about someone you may not ever meet in person who lives in a place you may never get to visit. Who knows? Your initial on-the-air acquaintance may grow into an opportunity to do both!

It also behooves those of us who have "been there, done that" to give our newer brothers and sisters a chance. No one who was first licensed for HF operation in the past six or seven years has had the chance to experience conditions as good as they are right now. They have a lot of catching up to do! Remember that Technicians and Novices have limited frequency privileges and a 200 watt power limit; on phone, move up the band if you can.

If you have no new worlds to conquer on HF, six meters beckons. Thanks to the fact that it is now included on most HF rigs there has been a tremendous surge of interest in the "Magic Band." Even if the peak of Cycle 24 turns out to be less lofty than its recent predecessors there will be some outstanding days when the MUF gets up to 50 MHz, or close enough to allow for skew-path propagation.

How long will these conditions last? As we have discovered, predictions are unreliable — but for what it's worth the consensus appears to be that the peak will occur sometime in 2013 and will be lower than most recent cycles. Enjoy them while you can!

David Sumner, K1ZZ
ARRL Chief Executive Officer

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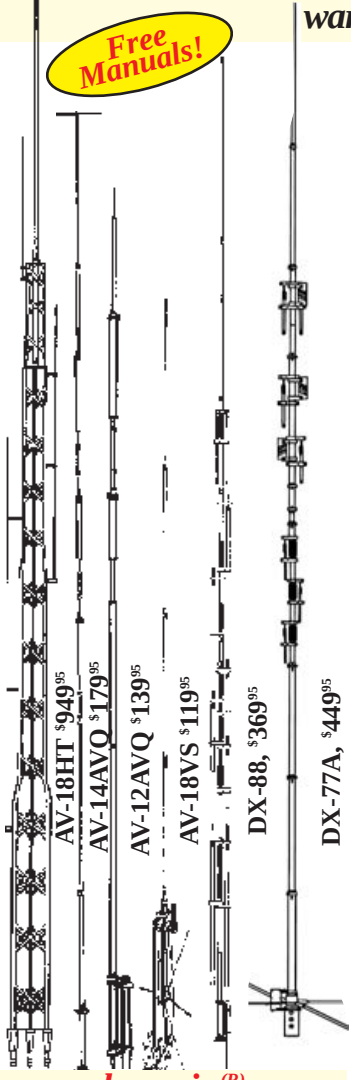

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AV-18HT, $949.95. (10,12,15,20,40,80 M, 160, 17 Meters optional). 53 ft., 114 lbs.

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

AV-14AVQ, $179.95. (10,15,20,40 Meters). 18 ft., 9 lbs. **The** Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

AV-12AVQ, $139.95. (10, 15, 20 Meters). 13 ft., 9 lbs. **AV-12AVQ** also uses Thunderbird beam design air dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Roof mount with AV-14RMQ kit, $89.95.

AV-18VS, $119.95 (10,12,15,17,20,30,40,80 Meters). 18 ft., 4 lbs. **High** quality construction and low cost make the AV-18VS an exceptional value. Easily tuned to any band by adjusting feed point at the base loading coil. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs.

All bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: 160 Meter add-on kit, KIT-160-88, $199.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

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

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

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$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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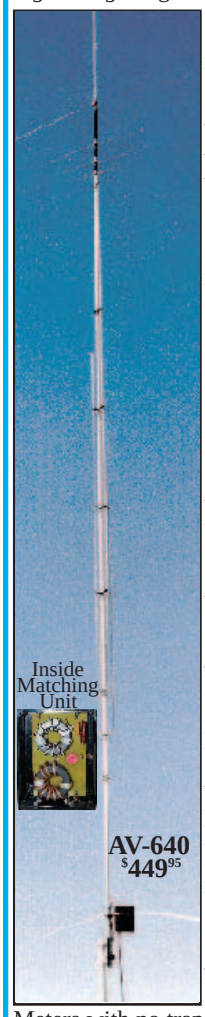
Hy-Gain's new PATRIOT HF verticals are the best built, best performing and best priced multiband verticals available today. For exciting DX make full use of your sunspot cycle with the PATRIOT's *low 17 degree angle* signal.



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AV-620, $349.95. (6,10,12,15,17,20 Meters). 22.5 ft., 10.5 lbs. The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

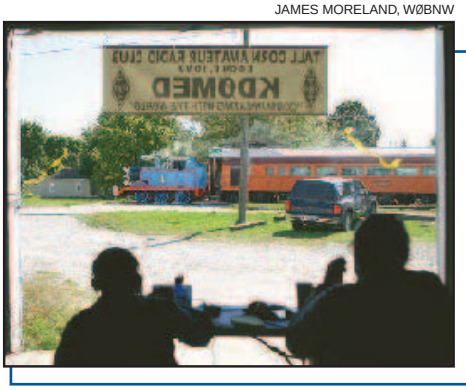
- The number of licensed Amateur Radio operators now exceeds 700,000 for the first time.
- Astronaut Mike Fossum, KF5AQG, made contacts from the International Space Station during the Scouts Jamboree on the Air weekend in mid-October.
- In preparation for the 2012 World Radiocommunication Conference (WRC-12), a committee has approved a draft European Common Proposal for an 8-kHz-wide amateur band between 472 and 480 kHz.
- The winner of the *QST* Cover Plaque Award for September is Robert Miller, KE6F, for his article "Yet Another Crystal Calibrator — The YACC 1-2-3."
- At long last, the higher-frequency HF bands were hopping in September, leading to impressive propagation on 10 meters and other higher-frequency HF bands.
- In September, Emergency Preparedness Manager Mike Corey, along with President Kay Craigie and CEO David Sumner, briefed several members of the National Security Staff on the capabilities of the Amateur Radio Service to communicate in emergencies.
- The ARRL Executive Committee met October 1 in Dulles, Virginia.
- Amateur Radio operators observed 2011 National Wildlife Refuge Week in October.
- IARU Region 1 President Hans Blondeel Timmerman, PB2T, presented a webinar on the IARU Region 1 General Conference.

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

- Earthquake, hurricane, fire and drought gave PIOs and others promoting Amateur Radio plenty to talk about in September. Our reliability was shown in the *Sentinel-Tribune* (OH), "Amateur Radio a steady system when other communication fails," which grew from the work of the Wood County Amateur Radio Emergency Services — WCARES for short. Our volunteerism was shown in "It's basically...helping people in emergencies," which appeared in the *Jacksonville Daily Progress* (FL), quoting Richard Nielsen.
- Then there was the earthquake. "Why Mobile Phones Didn't Work After Virginia Earthquake" was an article by Wayne Rash in *eWeek.* Appropriately noting the FCC rules, Wayne encouraged employers to allow hams to keep radios with them at work. "...if an employee gets injured during a disaster and the landlines and mobile networks are out, your resident ham radio operator can use the radio to call for help."
- Next in the batting order came Irene. "Hurricane Irene Leaves Disrupted Mobile Phone Service in Its Wake," Wayne wrote in another *eWeek* article. "You can probably find a ham radio operator in your neighborhood, but most shelters, emergency operating centers and many hospitals or fire stations will be staffed by amateur radio operators." Days later, ARRL's "Ham Radio Operators Still Active From Irene" was picked up from PRWeb and also got hits.
- And then there was a fire in the Boundary Waters Canoe Area. "Local Ham Radio Operators Assist in BWCAW Fire" headlined WDIO-TV (MN). "...many local Ham radio operators have had training for situations just like this."
- What could possibly be next? A blackout! "Giant Blackout Hits County, Extends to Arizona, Orange County and Tijuana." Patch.com was among the media covering it as the hams went into action. "Ham radio operator tells KOGO that Coachella and Salton Sea power plants have gone down. A massive power outage felt from south Orange County to Arizona and even Tijuana hit, affecting landline phone service as well as [broadcast] radio." San Diego Gas & Electric said it was "the most widespread power outage in the company's history."
- After all this, it was no wonder that there were more articles about our emergency work. The *Navarre Press* (FL) proclaimed "Citizens provide vital link in emergency response" and wrote of us, "There is another, less well known but equally important mode of communication that exists to assist citizens and first responders in the case of an emergency: Amateur Radio operators." Meanwhile SCNow.com showed modern capabilities with "Ham radio operators use new tools to keep communication open." "Because amateur radio equipment uses over-the-air radio waves and can operate on battery power for days at a time, it remains the way safety officials keep the lines of communication going."
- But one of the best placements of all was in the *ITU News* — yes, *that* ITU. Their article, "Climbing Mont Blanc," told major international leaders about us by reporting "This amateur radio operation improved the safety of the ITU Mont Blanc 2011 expedition (through online tracking and voice contact) and showcased new online communication methods using modern portable amateur radiocommunication equipment." It doesn't get any better than that!

JAMES MORELAND, WØBNW



Iowa Special Event Station was "Train Mobile"

In September, the Tall Corn Amateur Radio Club hosted special event station KØT with the theme "A Day Out With Thomas The Tank Engine." This year we tried something new and ran a "train mobile" station on board the Boone and Scenic Valley Railroad's 2 hour excursion run. Many stations remarked that they had worked many mobile stations but none could remember working a train mobile that was on the move.

With improved solar conditions we had 16 DX stations check in when we called CQ. — *Jim Moreland, WØBNW*

Operating KØT: **On the left is Skip, ADØH, along with Steve, NØNEU.**

A Half Century of OSCAR

Amateur Radio entered the Space Age on December 12, 1961, when OSCAR I was launched from Vandenberg AFB in California. One of the developers of OSCAR I, Lance Ginner, K6GSJ, will be speaking at the AMSAT Space Symposium in early November. ARRL Lab Test Engineer Bob Allison, WB1CGM, will be there as well, to demo the OSCAR I prototype that has been on display at ARRL HQ. Thanks to W1AW Station Manager Joe Carcia, NJ1Q, and Bob Allison, WB1GCM, it now once again transmits HI in Morse code, just as it did a half century ago as thousands of hams and others around the world heard the beeping dits as it raced overhead. OSCAR I re-entered the Earth's atmosphere on January 31, 1962.

S. KHRYSTYNE KEANE, K1SFA

ARRL Lab Test Engineer Bob Allison, WB1GCM, with the refurbished OSCAR I prototype that he will bring to the 2011 AMSAT Space Symposium. Amateur Radio entered the Space Age 50 years ago this month.

Kansas 6 Year Old is Now KDØPLJ

Priscilla Harder, age 6, from Newton, Kansas, earned her Technician class license at the Kansas State Convention in Salina in August. She's no stranger to Amateur Radio, as dad Kent is NØXOS and mom Dana is KBØRAT.

New ham at the Kansas State Convention: **The Harders, from the left: Phebe, Dana, KBØRAT, Priscilla, KDØPLJ, and Kent, NØXOS.**

Inside HQ

Survey Reveals ARRL Members' Preferences

This month we have published the 2011 Field Day results. They are 13 pages long, reflecting a new record number of log submissions. Why were there so many FD log submissions this year? People are getting re-energized about Amateur Radio! There are more sunspots and Technician class licensees are upgrading their licenses and trying HF radio beyond 10 meters. We also believe that many recent retirees are renewing a previous interest in Amateur Radio. We've seen an eight-fold increase in the number of digital QSOs since the FD rules separated CW and digital contacts in 1998. There were more than 45,000 digital QSOs in this year's logs. Digital modes are becoming increasingly popular and easy to use due to advances in transceivers, software and interfaces.

Our members' interest in digital modes and technical topics was confirmed by a recent *QST* research study that we conducted. The most read sections of *QST* are those with technical content. These include *Product Review*, *Hints and Kinks*, *The Doctor is IN* and *New Product Announcements*. Also in the high readership categories are *Technical Correspondence, Hands-On Radio, Conventions and Hamfests* and *Short Takes*. Our members like informative, useful technical information presented clearly, accurately and concisely. This is not surprising, since nearly half of our members hold Amateur Extra class licenses.

Along with our members' desire to learn about contemporary technical topics, there is still plenty of interest in our Amateur Radio heritage and traditions. Both *Vintage Radio* and the *75, 50 and 25 Years Ago* columns are well-liked by our readers. Even though we have a dedicated search engine for *Conventions and Hamfests* on our website, these listings are still regularly read in *QST,* most likely because it is easier to see an overview of all these events in print format.

ARRL members are highly engaged in Amateur Radio activities. Over 80% of those responding to the survey enjoy at least one Amateur Radio activity and many of our members participate in multiple activities. What are these activities? The most popular, surprisingly, is just listening, followed by building antennas; attending hamfests and conventions; mobile/portable operating and emergency communications. Talking with and making new friends and working on public service and community events are other popular activities for members in 2011.

We learned some additional information about our members and readers from this study. Not to state the obvious, but 85% of *QST* readers are male and their median age is 59. Despite an occasional grumble, we learned that members like the advertising in *QST*. The ads are a great way to learn about new and existing products. And, you can often find a great deal. More than 80% of *QST* readers visited an advertiser's website during the preceding 12 months.

We'll be taking these research findings into account as we move ahead with our future editorial planning for *QST.* In the meantime, enjoy this Holiday issue.

73,

Harold Kramer, WJ1B
ARRL COO/Publisher *QST*
wj1b@arrl.org

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Get answers on a variety of technical and operating topics through ARRL's Technical Information Service. ARRL Lab experts and technical volunteers can help you overcome hurdles and answer all your questions.

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ARRL supports legislation and regulatory measures that preserve and protect access to Amateur Radio Service frequencies. Members may contact the **ARRL Regulatory Information Branch** for information on FCC rules; problems with antenna, tower and zoning restrictions; and reciprocal licensing procedures for international travelers.

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Quick Links and Resources

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QEX – *A Forum for Communications Experimenters* – **www.arrl.org/qex**
NCJ – *National Contest Journal* – **www.arrl.org/ncj**
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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 with a pervasive and continuing conflict of interest 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.

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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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President
KAY C. CRAIGIE,* N3KN
570 Brush Mountain Rd
Blacksburg, VA 24060
540-552-3903; n3kn@arrl.org

First Vice President
RICK RODERICK, K5UR*
PO Box 1463, Little Rock, AR 72203
501-988-2527; k5ur@arrl.org

Second Vice President
BRUCE FRAHM, KØBJ
1553 County Rd T, Colby, KS 67701
785-462-7388; k0bj@arrl.org

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Bill Edgar, N3LLR
22 Jackson Ave, Bradford, PA 16701
(814-362-1250); **n3llr@arrl.org**

Vice Director: **Tom Abernethy, W3TOM**
PO Box 73, Accokeek, MD 20607
(301-292-6263); **w3tom@arrl.org**

Central Division

George R. Isely, W9GIG*
736 Fellows St, St Charles, IL 60174
(630-584-3510); **w9gig@arrl.org**

Vice Director: **Kermit Carlson, W9XA**
1150 McKee St, Batavia, IL 60510
(630-879-0983); **w9xa@arrl.org**

Dakota Division

Gregory P. Widin, KØGW
13457 Sixth St N, Stillwater, MN 55082
(651-436-8811); **k0gw@arrl.org**

Vice Director: **Kent R. Olson, KAØLDG**
148 Ironwood Dr, Horace, ND 58047;
(701-298-0956); **ka0ldg@arrl.org**

Delta Division

Mickey D. Cox, K5MC
754 Cheniere Drew Rd, West Monroe, LA 71291
(318-397-1980); **k5mc@arrl.org**

Vice Director: **David A. Norris, K5UZ**
640 Josephine Dr, Batesville, AR 72501
(870-793-6431); **k5uz@arrl.org**

Great Lakes Division

Jim Weaver, K8JE
5065 Bethany Rd, Mason, OH 45040-8130
(513-459-1661); **k8je@arrl.org**

Vice Director: **Gary L. Johnston, KI4LA**
3056 Hergott Dr, Edgewood, KY 41017
(859-391-6399); **ki4la@arrl.org**

Hudson Division

Joyce Birmingham, KA2ANF
235 Van Emburgh Ave, Ridgewood, NJ
07450-2918 (201-445-5924); **ka2anf@arrl.org**

Vice Director: **William Hudzik, W2UDT**
111 Preston Dr, Gillette, NJ 07933
(908-580-0493); **w2udt@arrl.org**

Midwest Division

Cliff Ahrens, KØCA
65 Pioneer Trail, Hannibal, MO 63401
(573-221-8618); **k0ca@arrl.org**

Vice Director: **Rod Blocksome, KØDAS**
690 Eastview Dr, Robins, IA 52328-9768
(319-393-8022); **k0das@arrl.org**

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Vice Director: **Mike Raisbeck, K1TWF**
85 High St, Chelmsford, MA 01824
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Northwestern Division

Jim Fenstermaker, K9JF
10312 NE 161st Ave, Vancouver, WA 98682
(360-256-1716); **k9jf@arrl.org**

Vice Director: **Grant Hopper, KB7WSD**
PO Box 3318, Everett, WA 98213
(425-238-1433); **kb7wsd@arrl.org**

Pacific Division

Bob Vallio, W6RGG*
18655 Sheffield Rd, Castro Valley, CA 94546
(510-537-6704); **w6rgg@arrl.org**

Vice Director: **Jim Tiemstra, K6JAT**
13450 Skyline Blvd, Oakland, CA 94619;
(510-569-6963); **k6jat@arrl.org**

Roanoke Division

Dennis Bodson, W4PWF
233 N Columbus St, Arlington, VA 22203
(703-243-3743); **w4pwf@arrl.org**

Vice Director: **Dr James Boehner, N2ZZ**
525 Barnwell Ave NW, Aiken, SC 29801-3939
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Rocky Mountain Division

Brian Mileshosky, N5ZGT*
PO Box 20186, Albuquerque, NM 87154-0186
(505-463-9468); **n5zgt@arrl.org**

Vice Director: **Dwayne Allen, WY7FD**
PO Box 1482, Sundance, WY 82729-1482
(307-756-9439); **wy7fd@arrl.org**

Southeastern Division

Greg Sarratt, W4OZK
230 Latigo Loop, Huntsville, AL 35806;
(256-337-3636); **gsarratt@arrl.org**

Vice Director: **Andrea Hartlage, KG4IUM**
PO Box 608, Grayson, GA 30017
(404-509-4054); **kg4ium@arrl.org**

Southwestern Division

Richard J. Norton, N6AA
21290 West Hillside Dr, Topanga, CA 90290
(310-455-1138); **n6aa@arrl.org**

Vice Director: **Marty Woll, N6VI**
21301 Candice Pl, Chatsworth, CA 91311-1404
(818-773-9655); **n6vi@arrl.org**

West Gulf Division

Dr David Woolweaver, K5RAV*
2210 S 77 Sunshine Strip, Harlingen, TX 78550
(956-425-3128); **k5rav@arrl.org**

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(512-282-7851); **n5aus@arrl.org**

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Eastern Pennsylvania: Eric Olena, WB3FPL, 284 Blimline Rd, Mohnton, PA 19540 (610-775-0526); **wb3fpl@arrl.org**
Maryland-DC: James E. Cross III, WI3N, 16013 Dorset Rd, Laurel, MD 20707-5314 (301-725-6829); **wi3n@arrl.org**
Northern New York: Thomas Dick, KF2GC, 11 Jenkins St, Saranac Lake, NY 12983 (518-891-0508); **kf2gc@arrl.org**
Southern New Jersey: George Strayline, W2GSS, 10 E Pacific Ave, Villas, NJ 08251-2630 (609-741-8322); **w2gss@arrl.org**
Western New York: Steve Ryan, N2ITF, 3036 Route 394, Ashville, NY 14710-9734 (716-763-7555); **n2itf@arrl.org**
Western Pennsylvania: John Rodgers, N3MSE, 803 S Main St, Butler, PA 16001 (724-287-0424); **n3mse@arrl.org**

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Illinois: Tom Ciciora, KA9QPN, 1887 Irene Rd, Sandwich, IL 60548 (815-498-4929); **ka9qpn@arrl.org**
Indiana: John Poindexter, W3ML, 204 S Main St, Knox, IN 46534-1620 (574-772-2772); **w3ml@arrl.org**
Wisconsin: Donald Michalski, W9IXG, 4214 Mohawk Dr, Madison, WI 53711 (608-274-1886); **w9ixg@arrl.org**

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North Dakota: Lynn A. Nelson, WØND, 6940 4th St SW, Minot, ND 58701 (701-839-8200); **w0nd@arrl.org**
South Dakota: Scott Rausch, WAØVKC, 15362 Canyon Trl, Piedmont, SD 57769-7286 (605-787-7566); **wa0vkc@arrl.org**

Delta Division (AR, LA, MS, TN)

Arkansas: Dale Temple, W5RXU, 5200 Timber Creek Circle, North Little Rock, AR 72116 (501-771-1111); **w5rxu@arrl.org**
Louisiana: Gary L. Stratton Sr, K5GLS, 8424 Kaw Court, Shreveport, LA 71107 (318-309-0023); **k5gls@arrl.org**
Mississippi: Malcolm Keown, W5XX, 64 Lake Circle Dr, Vicksburg, MS 39180 (601-636-0827); **w5xx@arrl.org**
Tennessee: Glen Clayton, W4BDB, 238 Old Parksville Rd NE, Cleveland, TN 37323; (423-472-7751); **w4bdb@arrl.org**

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Kentucky: Jim Brooks, KY4Z, 7099 Louisville Rd, Cox's Creek, KY 40013 (502-349-2099); **ky4z@arrl.org**
Michigan: Dale Williams, WA8EFK, 291 Outer Dr, Dundee, MI 48131 (734-529-3232); **wa8efk@arrl.org**
Ohio: Frank J. Piper, KI8GW, 496 Hillview St, Pickerington, OH 43147-1197 (614-589-4641); **ki8gw@arrl.org**

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NYC-Long Island: Mike Lisenco, N2YBB, 1635 E 46th St, Brooklyn, NY 11234-3604 (917-865-3538); **n2ybb@arrl.org**
Northern New Jersey: Richard Krohn, N2SMV, 23 Sweetmans Ln, Manalapan, NJ 07726; **n2smv@arrl.org**

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Iowa: Tom Brehmer, NØLOH, 1114 East Tenth St, Muscatine, IA 52761 (563-263-3097); **n0loh@arrl.org**
Kansas: Ronald D. Cowan, KBØDTI, PO Box 36, LaCygne, KS 66040 (913-757-3758); **kb0dti@arrl.org**
Missouri: Dale C. Bagley, KØKY, PO Box 13, Macon, MO 63552-1822 (660-385-3629); **k0ky@arrl.org**
Nebraska: Art Zygielbaum, KØAIZ, 6601 Pinecrest Dr, Lincoln, NE 68516-3573 (402-421-0839); **k0aiz@arrl.org**

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Eastern Massachusetts: Phil Temples, K9HI, 125 Coolidge Ave, Apt 803, Watertown, MA 02472-2875 (617-331-0183); **k9hi@arrl.org**);
Maine: William Woodhead, N1KAT, 68 Madison St, Auburn, ME 04210 (207-782-4862); **n1kat@arrl.org**
New Hampshire: Alan K. Shuman, K1AKS, PO Box 681, New Boston, NH 03070-3520 (603-487-3333) **k1aks@arrl.org**
Rhode Island: Bob Beaudet, W1YRC, 30 Rocky Crest Rd, Cumberland, RI 02864 (401-333-2129); **w1yrc@arrl.org**
Vermont: Paul N. Gayet, AA1SU, 11 Cherry St, Essex Junction, VT 05452 (802-878-2215); **aa1su@arrl.org**
Western Massachusetts: Ed Emco, W1KT, 37 Bullard Ave, Worcester, MA 01605 (508-853-3333); **w1kt@arrl.org**

Northwestern Division (AK, EWA, ID, MT, OR, WWA)

Alaska: Jim Larsen, AL7FS, 3445 Spinnaker Dr, Anchorage, AK 99516-3424 (907-345-3190); **al7fs@arrl.org**
Eastern Washington: Mark Tharp, KB7HDX, PO Box 2222, Yakima, WA 98907-2222 (509-965-3379); **kb7hdx@arrl.org**
Idaho: Edward Stuckey, AI7H, 2300 W Polo Green Ave, Post Falls, ID 83854-9680 (208-457-0354); **ai7h@arrl.org**
Montana: Doug Dunn, K7YD, 216 Fiddle Creek Rd, Livingston, MT 59047-4116 (406-686-9100); **k7yd@arrl.org**
Oregon: Bonnie Altus, AB7ZQ, 7770 Harmony Rd, Sheridan, OR 97378 (971-237-0711); **ab7zq@arrl.org**
Western Washington: Jim Pace, K7CEX, PO Box 1602, Centralia, WA 98531 (360-508-8437); **k7cex@arrl.org**

Pacific Division (EB, NV, PAC, SV, SF, SJV, SCV)

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Nevada: Joe Giraudo, N7JEH, 720 Holyoke Dr, Spring Creek, NV 89815-5306 (775-738-7110); **n7jeh@arrl.org**
Pacific: Bob Schneider, AH6J, PO Box 131, Keaau, HI 96749-0131 (808-966-8146); **ah6j@arrl.org**
Sacramento Valley: Ronald D. Murdock, W6KJ, 998 Bogue Rd, Yuba City, CA 95991-9221 (530-674-8533); **w6kj@arrl.org**
San Francisco: Bill Hillendahl, KH6GJV, PO Box 4151, Santa Rosa, CA 95402-4151 (707-544-4944); **kh6gjv@arrl.org**
San Joaquin Valley: Dan Pruitt, AE6SX, 4834 N Diana St, Fresno, CA 93726 (559-779-2974); **ae6sx@arrl.org**
Santa Clara Valley: Phil Steffora, K6TT, PO Box 657, Los Altos, CA 94023-0657 (650-793-4970); **k6tt@arrl.org**

Roanoke Division (NC, SC, VA, WV)

North Carolina: Bill Morine, N2COP, 101 Windlass Dr, Wilmington, NC 28409-2030 (910-452-1770); **n2cop@arrl.org**
South Carolina: Marc Tarplee, N4UFP, 4406 Deer Run, Rock Hill, SC 29732-9258 (803-327-4978); **n4ufp@arrl.org**
Virginia: Carl Clements, W4CAC, 4500 Wake Forest Rd, Portsmouth, VA 23703 (757-484-0569); **w4cac@arrl.org**
West Virginia: L. Ann Rinehart, KA8ZGY, 1256 Ridge Dr, South Charleston, WV 25309 (304-768-9534); **ka8zgy@arrl.org**

Rocky Mountain Division (CO, NM, UT, WY)

Colorado: Jack Ciaccia, WMØG, PO Box 21362, Boulder, CO 80308-4362 (303-587-0993); **wm0g@arrl.org**
New Mexico: Donald D. Wood, W5FHA, 9100 Wimbledon Dr NE, Albuquerque, NM 87111 (505-828-0988); **w5fha@arrl.org**
Utah: Mel Parkes, NM7P, 2166 E 2100 North, Layton, UT 84040 (801-547-1753); **nm7p@arrl.org**
Wyoming: Garth Crowe, N7XKT, 1206 Avalon Ct, Gillette, WY 82716-5202 (307-686-9165); **n7xkt@arrl.org**

Southeastern Division (AL, GA, NFL, PR, SFL, VI, WCF)

Alabama: David Drummond, W4MD, 5001 Lakehurst Dr, Northport, AL 35473 (205-339-7915); **w4md@arrl.org**
Georgia: Gene Clark, W4AYK, 1604 Lynwood Lane, Albany, GA 31707 (229-888-1090); **w4ayk@arrl.org**
Northern Florida: Paul L. Eakin, KJ4G, PO Box 625, Panacea, FL 32346 (850-591-0442); **kj4g@arrl.org**
Puerto Rico: Roberto Jimenez, KP4AC, PO Box 360536, San Juan, PR 00936-0536 (787-567-7373); **kp4ac@arrl.org**
Southern Florida: David Fowler, K4DLF, 2702 Starwood Ct, West Palm Beach, FL 33406-5145 (561-676-3007); **k4dlf@arrl.org**
Virgin Islands: John Ellis, NP2B, PO Box 24492, Christiansted, St Croix, VI 00824 (340-773-9643); **np2b@arrl.org**
West Central Florida: Dee Turner, N4GD, 10132 64th St N, Pinellas Park, FL 33782 (727-548-7474); **n4gd@arrl.org**

Southwestern Division (AZ, LAX, ORG, SDG, SB)

Arizona: Thomas J. Fagan, K7DF, 10650 E Bridgeport St, Tucson, AZ 85747-5925 (520-574-1129); **k7df@arrl.org**
Los Angeles: David Greenhut, N6HD, 5260 Darro Rd, Woodland Hills, CA 91364-1933 (818-992-5507); **n6hd@arrl.org**
Orange: Carl Gardenias, WU6D, 20902 Gardenias St, Perris, CA 92570 (951-443-4958); **wu6d@arrl.org**
San Diego: Stephen M. Early, AD6VI, 4724 Maple Ave, La Mesa, CA 91941 (619-461-2818); **ad6vi@arrl.org**
Santa Barbara: Robert Griffin, K6YR, 1436 Johnson Ave, San Luis Obispo, CA 93401-3734 (805-543-3346); **k6yr@arrl.org**

West Gulf Division (NTX, OK, STX, WTX)

North Texas: Walt Mayfield, KE5SOO, 305 Broken Arrow, Krum, TX 76249-7502 (940-368-4659); **ke5oo@arrl.org**
Oklahoma: Kevin O'Dell, NØIRW, 1405 N 7th St, Perry, OK 73077-2206 (580-220-9062); **n0irw@arrl.org**
South Texas: Lee H. Cooper, W5LHC, 2507 Autrey Dr, Leander, TX 78641 (512-260-7757); **w5lhc@arrl.org**
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RCS-10 Remote Coax Switch…$179.95

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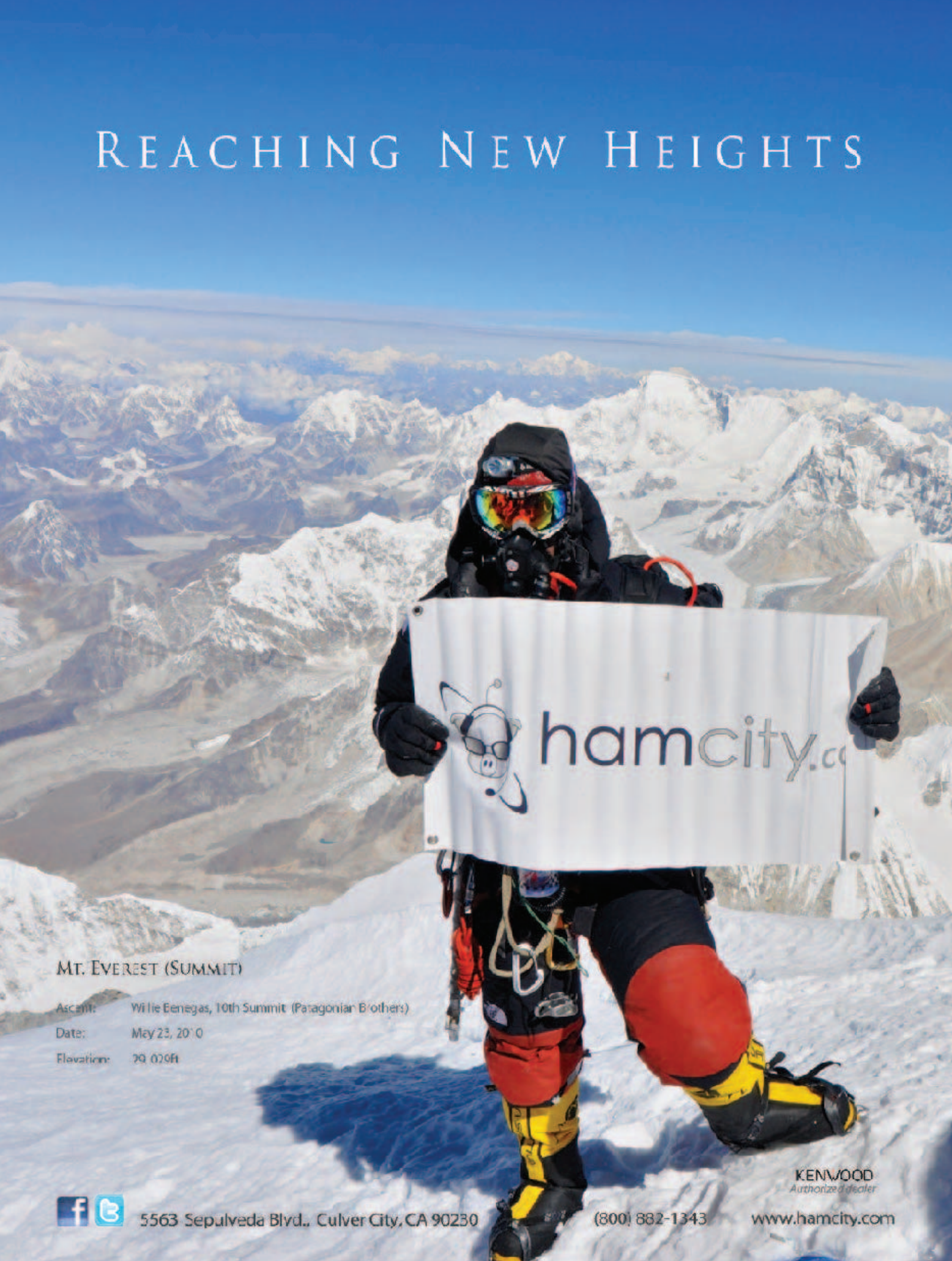

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Up Front in QST

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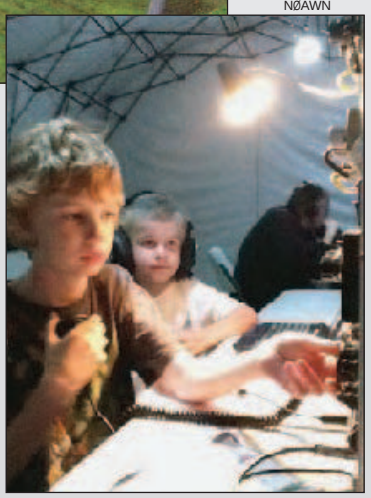
Field Day 2011 – Another Year, Another Record

PAUL GERARDI, KE4TP

Publicity counts! **The Museum of Science and Industry ARC in Tampa, Florida (KMØSI 2A Commercial) let passersby know that something special was going on inside the Museum during FD weekend.**

RALPH BIERBAUM, NØAWN



The Anoka County RACES group operated WØANA 2A MN.

MEL SUTTON, KB7PVW

The Oregon Tualatin Valley ARC (W7OTV 4A OR) operated from scenic L. L. "Stub" Stewart State Park west of Portland.

GUY PITZEL, AC7FB

Tuning it up: **The Island County ARC, W7AVM 4A, did Field Day from Whidbey Island, Washington. From the left: Sean McDougald, KF7NSY, Wayne Jeffers, WJ7H, and Megan Jeffers, KF7MMI.**

Once again this year, a record number of Field Day participants, almost 40k, took to the hills, dales, glades and mountaintops to enjoy Amateur Radio's premier annual event. Here's a glimpse of a few stations. Find your reading glasses and check out the 2011 Field Day Results article that appears elsewhere in this issue.

Enter the Second ARRL Video Contest!

Have a video cam? Many of us do, and here's a chance to put it to good use. Shoot a ham radio-related video and send it our way for the **Second ARRL Video Contest**. We will be posting the best entries on our website. We're looking for a few good videos (but only one per ARRL member) relating to the joy and excitement of Amateur Radio.

A Few Rules and Regs

Deadline: Entries must be postmarked by February 29, 2012. Burn your video to a CD or DVD using the appropriate software and mail it to ARRL Video Contest, 225 Main St, Newington, CT 06111.

Subject: Anything that illustrates the joy and excitement of Amateur Radio. Videos must be in good taste. They will be judged on overall quality and composition.

Specs

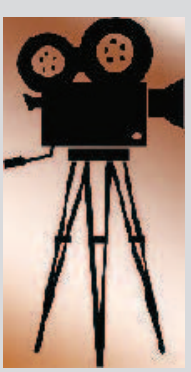
Maximum length: 5 minutes

Format: AVI, WMV or MPEG (including MPEG4), 320 × 240 minimum resolution. Bigger is almost always better.

Miscellanea

All entries must include the following information: where the video was recorded, a description of the subject of the video, and the names and call signs (if any) of any persons shown. A release form must be included for anyone under the age of 18. See **www.arrl.org/video-contest** for details.

Rights: The ARRL automatically owns non-exclusive rights to all videos submitted for the contest. This means that by sending a video you are granting us the right to use your video in any lawful manner. But, you still retain the original rights to your video and can do with it as you please — even sell or publish it elsewhere.



Prizes: There are two entry categories — Professional and Amateur — each with 1st, 2nd and 3rd place winners. Prize amounts are the same for both: 1st place $500, 2nd place $250, 3rd place $100. Winning videos will be displayed on the ARRL website.

Winners of last year's competition are ineligible to enter the current year's competition.

More details appear on the Video Contest website, **www.arrl.org/video-contest**.

Questions? Just e-mail **qst@arrl.org**.

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CORRESPONDENCE

STRUCK BY THE CONTRAST

♦ I am always struck by contrasts. The "Eureka! moment" experienced by Sean Doran, W8OKN ["LoTW: Like Taking Your QSLs to the Bank," Oct 2011, pages 76-77] was similar to mine when I first read of the then-planned Logbook of The World. I became one of the early users and fully understood that acceptance of LoTW would be a slow process. I knew, however, that as more people utilized it, more people would have the experience of "instant" QSLs after a contest or the upload of a new log. A year or so ago, I felt we had begun to reach a critical mass where the use of LoTW began to be the norm, rather than the exception. Imagine my disappointment when I read the last sentence announcing the PJ4E DXpedition that "No LoTW upload is planned" ["The World Above 50 MHz," Oct 2011, pages 91-93]. Abrupt and definite. Certainly among the 999 stations they worked, there are many who will be greatly disappointed. I know I would have been. I may be struck by the contrast but I'm certainly not thrilled.

JIM BURROUGH, N5DTT
Bellaire, Texas

POWERING CHANGE

♦ David Sumner, K1ZZ, was spot on about requirements for power to run our radios ["It Seems to Us: Power," Oct 2011, page 9]. It got me thinking about what could be done to get backup power solutions to the most number of people. I would like to make a suggestion to help us take positive action to follow up on this excellent article: A contest or idea exchange column that presents methods — including specific directions, parts lists and such — to create backup power alternatives. ARRL members probably have many ideas and solutions to address their own power problems now. It may be interesting and beneficial to request members to submit their ideas, schematics and plans for these solutions and get an exchange of information going. These ideas could be grouped into turn-key, some-assembly-required and start-from-scratch systems, subdivided into cost levels. This would provide a wide variety of solutions allowing enthusiasts to pick a solution that fits their personal needs.

MITCH MELLEN, KJ4UBX
Arlington, Virginia

PRIVACY CONCERNS

♦ I was surprised to see an article about national medical entities using Amateur Radio that did not mention the Health Insurance Portability and Accountability Act, otherwise known as HIPPA ["Optimizing Amateur Radio Resources for Major Disasters," Sep 2011, pages 30-34]. This is good stuff, but something very important appears to be missing. This article describes three hospitals using Amateur Radio. As far as I know, there has been no movement at the FCC to allow encryption for emergency communications using Amateur Radio. How do they plan to enforce HIPPA rules? One of the key reasons given by many government entities for not utilizing Amateur Radio is that there is no guarantee of privacy.

If you wish to better bind amateurs to governments for emergency communications, then get the FCC to allow hams to use encryption *in these very limited circumstances* to comply with HIPPA while moving patient and other private traffic.

RICH PAINTER, ABØVOA
Colorado Springs, Colorado

AMATEUR RADIO SKILLS BUILD INTO SOMETHING MORE

♦ Amateur Radio gives students the ability to crawl out of an introverted shell, build communication skills and learn about real life applications of electronic theory. Technically minded high school and college students would be well advised to engage in Amateur Radio not only as a fun thing to do, but also as a resume builder. Today more than ever, technical employers are searching for candidates with real life bench experience. Colleges and universities inundate students with abstract theory these days, often failing to teach students real life applications of the theory. You would be surprised at how many electrical engineers graduate today with little or no soldering skills. I can personally attest to the opportunities I have had for job interviews — and later being hired — after speaking about my ham radio projects. I would suggest that ham clubs across the country look to this fertile crop of potential new operators to reinvigorate the lifeline of our hobby.

MIKE SWIATKOWSKI, AA9VI
Northbrook, Illinois

NO MORE LOFTY HEIGHTS

♦ I have been a ham for more than 52 years and I must say that I have enjoyed each and every day of this wonderful hobby. Starting out as a young boy of 10 made me realize the fantastic things that we could accomplish if we set our minds to it. I jumped in with both feet and together with my friend, Dave McLaughlin, WØZY, helped many, many hams with their antenna projects. Since we were young and strong, we felt invincible, even at extreme heights on towers.

Many years have passed, and since that time we have become unable to climb those towers we loved, due to health reasons. Unfortunately, no youngsters have stepped up to take our places. There used to be a certain bond amongst hams where they joined together to help other hams in need, but that bond does not seem to be there anymore. Nobody wants to help, or if they do, they want to charge a fellow ham a fortune to do so. I miss the "good old days" when you could make a few telephone calls or put out a call on the local repeater telling people that you were having a tower party next Saturday and you would have a whole back yard of hardworking fellow hams there to assist you for no more than a few pizzas and sodas. I realize that times have changed but, in these parts, they have changed for the worse.

Chuck Sudds, KØTVD
Missouri Valley, Iowa

DX ON THE STREET

♦ I think only another ham would appreciate this. The UN Building is only a few blocks away from where I work. Because there is so much security in the area, from the New York City Police, the FBI with their bomb-sniffing dogs and even the Secret Service, if the President is in town, one can feel like a suspect. Because of the tight security, the only vehicles allowed to park by the building are those belonging to the delegates. As I pass by these cars, all with their country affiliation on a big sticker on the front reading Gabon, South Africa, Nigeria and more, I said to myself, "Worked it, worked that one, worked them, too, ha ha!" The wonderful world of Amateur Radio!

HANK GOLDMAN, WA2OVG
The Bronx, New York

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

Seasons Greetings!

To Our Friends and Customers:

Each year during the holiday season, we take great pleasure in setting aside our regular work and sending a heartfelt message to all our best friends and customers.

How joyful we are that this time has come again to extend to you our sincere gratitude, because it is good friends and customers like you that make our business possible.

May your holiday be filled with joy and the coming year be overflowing with all the good things in life.

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- Gerald Youngblood, K5SDR
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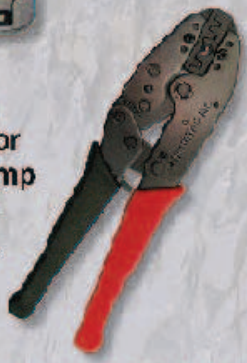

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— Sonny Alfman, W8FHF

Photo by Sonny Alfman, W8FHF

W8FHF DX QSO'S Since January 1, 2011 at QRP 5 Watts

1. Finland
2. Namibia
3. USA
4. Antarctica
5. Belgium
6. Austria
7. Luxembourg
8. Guatemala
9. Germany
10. Sudan
11. Canary Islands
12. Jamaica
13. England
14. France
15. Trinidad Is.
16. Brazil
17. Cuba
18. S. Africa
19. Denmark
20. Bulgaria
21. Czech Rep.
22. Poland
23. Netherlands
24. Georgia
25. Grenada
26. Italy
27. Serbia
28. Svalbard
29. Japan
30. Dominica
31. Bermuda Is.
32. Nevis Is.
33. Bolivia
34. Scotland
35. Russia - Eu
36. Slovakia
37. Slovenia
38. Azores
39. Canada
40. Spain
41. Switzerland
42. N. Ireland
43. Faroe Island
44. Lithuania
45. S. Cook Is.
46. Alaska
47. Puerto Rico
48. Angola
49. El Salvador
50. Zimbabwe
51. Haiti
52. Chile
53. Argentina
54. Venezuela
55. Mexico
56. Belize
57. Peru
58. Columbia
59. Australia
60. Am. Virgin Is.
61. Dominican Rep.
62. Romania
63. Panama
64. Norway
65. Barbados
66. Nicaragua
67. Sweden
68. Hungary
69. Belarus
70. Ukraine
71. Oman
72. Cyprus
73. Estonia
74. Gambia
75. S. Shetland Is.
76. Hawaii
77. Gibraltar
78. Rodriguez Is.
79. New Zealand
80. Wales
81. Bosnia
82. Honduras
83. Turkey
84. Crete
85. Latvia
86. Israel
87. Croatia
88. Madeira Is.
89. Greenland
90. Costa Rica
91. Greece
92. Russia - As.
93. Isle of Man
94. St. Helena Is.
95. Bahamas
96. Guadeloupe
97. Azerbaijan
98. Lesotho
99. Ecuador
100. Portugal
101. Dubai, UAR
102. Kuwait
103. Surinam
104. Paraguay
105. Uruguay
106. Moldova
107. Cameroon
108. India
109. Madagascar
110. Guam
111. Br. Virgin Is.
112. Martinique
113. Dodecanese
114. Sardinia
115. San Marino
116. Morocco
117. Curacao
118. Andorra
119. Ireland
120. St Lucia
121. Macedonia
122. Falkland Is.
123. Bonaire
124. Montserrat
125. Cayman Is.
126. Mauritius
127. S. Orkney Is.
128. Aruba
129. Fr. St. Martin Is.
130. Solomon Is.
131. Taiwan
132. Djibouti
133. Cape Verde Is.
134. Malta
135. Tonga
136. Saba Is.
137. Sao Tome Is.
138. Ceuta
139. French Polynesia
140. Western Kiribati
141. Tanzania
142. Saudi Arabia
143. St. Vincent Is.
144. Senegal
145. Mozambique
146. Chad
147. Algeria
148. Montenegro
149. Antigua
150. Turks & Caicos Is.
151. St. Maarten Is.
152. Iraq
153. Bahrain
154. Iceland
155. Balearic Is.
156. Corsica
157. Cocos-Keeling Is.
158. Guantanamo Bay
159. Lebanon
160. Revilla Gigedo Is.
161. Sable Island
162. Tajikistan
163. Mongolia
164. St. Pierre Is.
165. Isle of Jersey
166. S. Korea
167. Kaliningrad
168. Hong Kong
169. Indonesia
170. Isle of Guernsey
171. Kenya
172. Liechtenstein
173. Liberia
174. Ethiopia
175. Ascension Is.
176. Thailand
177. Vietnam
178. Franz Josef Land
179. Sierra Leone
180. New Caledonia
181. Armenia
182. W. Malaysia
183. Jordan
184. Central Africa Rep.
185. Market Reef
186. Philippines
187. Uganda
188. Guyana
189. Nigeria
190. Pakistan
191. Palau Is.
192. Sri Lanka
193. Afghanistan
194. Rotuma Is.
195. Aland Is.
196. E. Kiribati Is.
197. Uzbekistan
198. Kazakhstan
199. Reunion Is.
200. Vanuatu

a. Total QRP DX Qso's since 01/01/2011: **331**. All contacts are true QSO's, no contests /nets.
b. Countries are listed in the order that they were worked. QTH: Norwich, Ohio.
c. Worked **168** countries on **SSB**, and **32** countries on **CW**. Antenna: 4 Element Stepp IR.
d. All contacts were Called and Worked with **5 Watts** output. Rig: Icom 746 Pro.
e. Started 5 watt QRP on Jan 1, 2011 & completed **100 countries on JAN 17, 2011**
f. Total countries worked running QRP 5 Watts since 01/01/2011 is **227** Countries.

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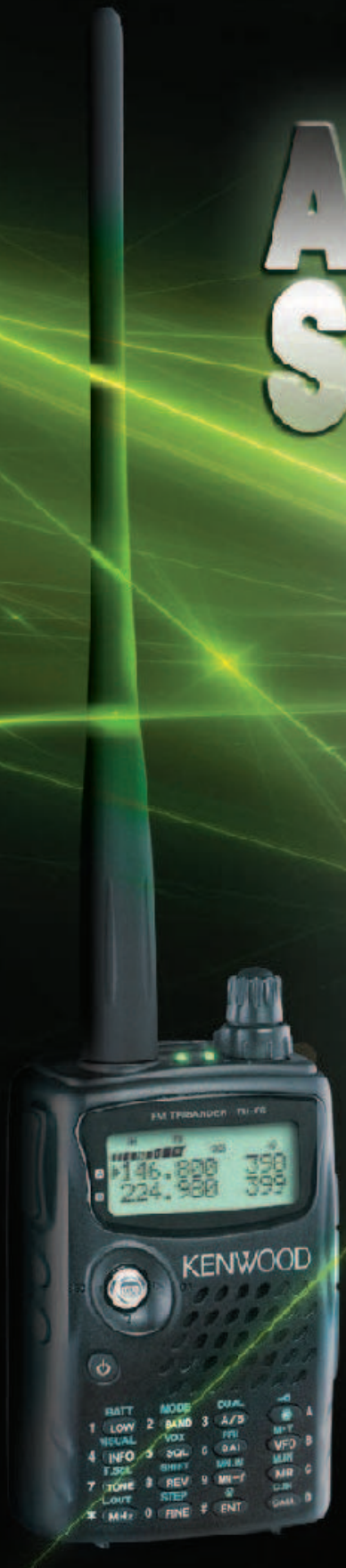

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[1]Note that certain frequencies are unavailable. [2]5W output

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Stan Levandowski, WB2LQF

I designed this laptop low power (QRP) CW station to fill a void. In practice, it has provided me with a new fourth operating dimension beyond fixed, conventional portable and mobile. I like to call this fourth dimension *half fixed-half portable*.

My definition of half fixed-half portable is operating casual QRP CW with a higher level of comfort, convenience, efficiency and reliability than ordinarily enjoyed under typical QRP portable conditions. The objective is to be able to move out of the shack without having to break down the fixed station and cart half of it off to some remote location.

A Different Mousetrap

While this project idea is similar to a go kit, there is a fundamental philosophical difference. The typical go kit is primarily concerned with providing emergency communications, frequently with emphasis on VHF/UHF. Go kits necessarily need to deal with the potential for rough handling during transport, rough usage during an emergency and interoperability issues.

On the other hand, casual portable operation usually means gathering up station components, putting them into an appropriate container for transport and then laying out and hooking up the station at the destination. Operating away from the fixed station location means that the operator needs to plan for and assemble station components in advance.

What power source will you use? Have you packed the correct cables? Did you remember your BNC/SO-239 adapter? Do you need a speaker or will headphones be enough? Where will you set up? How about your key or paddle? Don't forget your paper and pencil. Will you have an appropriate surface upon which to place your key or paddle? Where will you write? And last, but not least, where will you set your coffee cup?

To Everything There is a Season

I have a modern fixed station built around my Elecraft K2 and a good multiband doublet. I also have a spirited little Elecraft KX1 trail radio. Sometimes, I may not feel like sitting alone in my shack. I may not feel like roughing it in the field on six AA batteries, a 1 W transmit output and a 25 foot wire for an antenna either!

Instead, I can carry my laptop station outside to my backyard, toss a wire up into a tree, plug into an outside ac outlet and recline in my favorite lounge chair. I'm on the air working DX while the baby back ribs slowly simmer on the nearby BBQ. In the dead of winter, I can carry my laptop station to the living room, plop down in my favorite chair in front of the fireplace, hook up a coax patch cable from my fixed station's multiband antenna and become a very comfy and toasty warm armchair adventurer. If I so desire, my laptop station can also go with me to the local park, where I almost always manage to score a few publicity points with interested onlookers, see Figure 1.

Getting Started

I got the idea for this article when my local club, The QSY Society (K2QS)

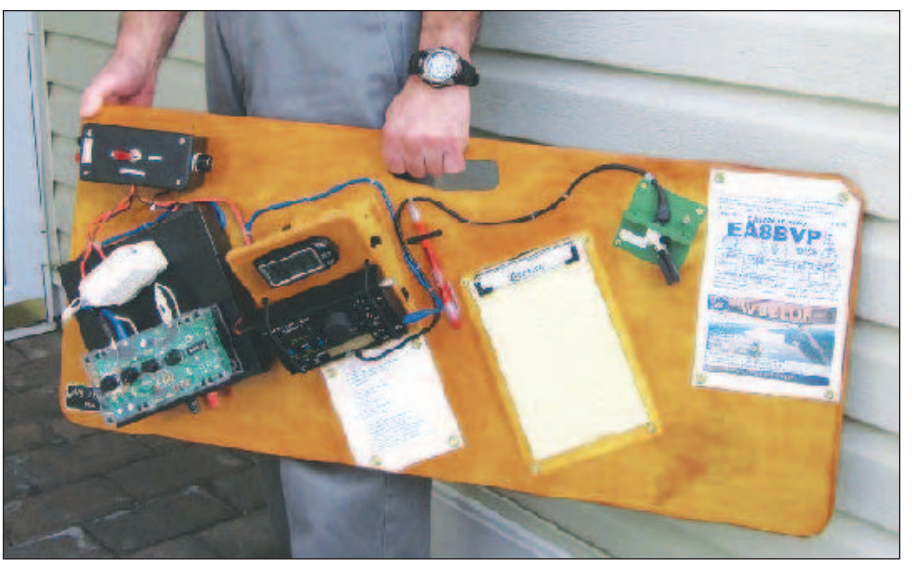


Figure 1 — The laptop portable station ready for travel — or just staying at home.

located here in the Mid-Hudson Valley area of New York, held a *QRP in the Park* day. I brought my laptop station and several of my fellow amateurs offered comments such as, "what a great concept," "nifty," "organizes everything nicely," "why didn't I think of that," and "how come you never brought that thing to show 'n' tell at the club?"

This isn't meant to be a construction article per se. By its very nature, a laptop station begs to be designed and built to accommodate its owner's unique wants and needs. Depending upon the skill level of (and tooling available to) the builder, a laptop station project can emerge as a work of ultimate craftsmanship or simply as a functional platform to enhance certain aspects of portability. The builder may elect to build all, or part, of the station's components. Goals can be established and prioritized.

Will it be as physically small and lightweight as possible, or does it really matter? So consider this as an idea generator for a personalized approach to creating your own laptop station. If, for example, you have a different transceiver with conventional front panel controls you might want to consider a reverse ramp to raise the front for improved visibility.

I decided that I wanted my laptop station to be wide enough to fit across the arms of all my favorite chairs, to be usable from either my lap or a standard height table, and to be easily carried in one hand. Furthermore, it had to look and feel like a pseudo fixed station and it had to operate seamlessly from either ac or dc power sources. A final objective was to incorporate equipment and parts I already had available in order to minimize cost.

As shown in the lead photo, while I sit at my operating position, the transceiver is conveniently located to my left and above it is a digital clock set to UTC. A clipboard with writing paper is just to the right and the CW paddle is in the upper right section. Near the left front corner is an ac power supply and bolted to the top of it is an amplified speaker that can be swiveled. In front of the speaker is a compact active audio filter. At the upper left rear is a homebrewed switching center that allows power source selection of either line or battery and includes polarity protection, a fuse and a dropping resistor for the amplified speaker.

The only raw material needed was a single 2 × 4 foot piece of ½ inch birch plywood. I cut the birch ply 34 inches wide and 15 inches deep. The corners were rounded for safety and a carrying handle was cut out at the top center. A light sanding and two coats of amber shellac gave a nice warm tone to the wood. Shellac dries within minutes and can be buffed out and shined up with a good quality furniture grade paste wax, if desired. Four generously sized rubber feet ensure that the two protruding bolt heads, used to secure the power supply, will not inadvertently scratch any surface the laptop station might be set on.

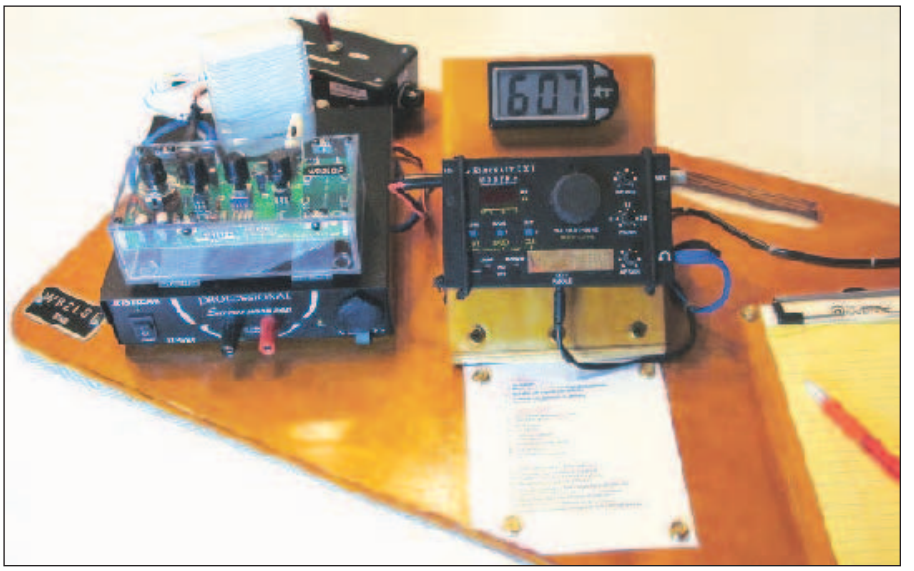


Figure 2 — Layout of the laptop station. The transceiver and clock are in the center, at appropriate angles and in clear view. Beneath the radio, an RST chart or other operating aid, mounted under plastic. On the left is a power supply, audio filter, amplified speaker and power source switch.

Transceiver

I designed my laptop station around my Elecraft KX1. Since the KX1 has top mounted controls, I used some scrap birch ply to build a ramp that brings the controls into full view and also made it more comfortable to operate from either a normal sitting or a semireclined position. I'm thinking here about my chaise lounge or perhaps a reclining sand chair at the beach. The optimum viewing and operating angle for me turned out to be 45°.

Mounting the KX1 took some thought. I did not want to alter the little transceiver in any way and I wanted to preserve my ability to just pick it up, screw on the paddle, stuff it into my pocket and head out on the trail. The mounting had to be sturdy and foolproof, however, because I surely didn't want the transceiver falling off when I picked up the laptop station to transport it.

The solution was actually quite simple. I drilled four 3⁄16 inch holes through the ramp, just inboard of the top and bottom corners of the KX1. Small diameter bungee cord was then passed through the holes and knotted. The KX1 is quite secure if attached in this manner, yet can easily be slipped out if desired.

Above the KX1 seemed like a good place for a digital clock. The local drug store had one for $2.99. It sticks on with hook and loop fasteners and also displays the month, day and year at the touch of a button. I really would have preferred a 24 hour time display but couldn't find a suitable product locally.

Since I'm right handed, I secured the KX1 to the motherboard at the correct angle and distance by sitting in a chair and simulating a bit of operating. It also occurred to me that perhaps the most useful feedback a QRP operator can get is an accurate signal report. There's just way too many 599 signal reports going back and forth these days to suit me. Since I'd prefer to be part of the solution, rather than part of the problem, I slipped a copy of the RST chart under a piece of ⅛ inch thick clear plastic. Mounted right below the KX1, the chart remains always within my clear and unobstructed view (see Figure 2).

Paddle the Night Away

To a dedicated CW op, few things are more important than a key (or bug or paddle) that's in the right spot and securely mounted. Once again, I went through my simulation exercise until I was certain that I was completely satisfied with the placement, angle and distance to the key while sitting in an operating posture. The KX1 has an integral front mounted paddle, which is great for its intended purpose while operating on the trail. Clearly it wouldn't work with this layout. The paddle, officially designated by Elecraft as the KXPD1, is actually quite a nice little product, requiring virtually no movement to operate and providing a very comfortable feel through its rubberized finger pieces. I wanted to incorporate the

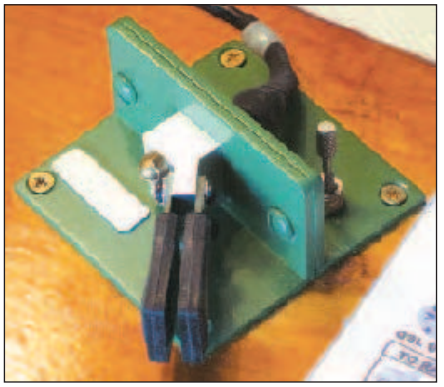


Figure 3 — A solidly mounted set of paddles is key to good CW operation. Here the paddles that normally are used on the KX1 transceiver are mounted to the right side of the board instead.

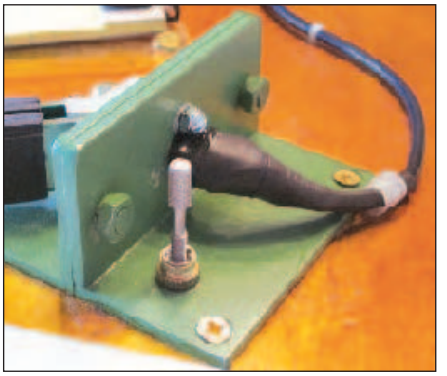


Figure 4 — Rear view of the paddle. The thumbscrew designed to hold the paddle in the KX1 is in its dedicated storage location so it will be there when needed for the trail.

KXPD1 into this project and that meant I had to fabricate a way to mount it. Figures 3 and 4 show my homebrew mount.

The base is made of two back-to-back pieces of ⅛ inch aluminum angle stock cut to 3 inch lengths with corners rounded for safety and then bolted together. On the KX1, the KXPD1 is designed to plug into a ⅛ inch stereo jack and then it is fastened with a single #6-32 thumbscrew. I countersunk and mounted a ⅛ inch stereo jack at a depth that brought it flush with the front of the paddle base and used a #6-32 stud and acorn nut to mount it. The original thumbscrew that connects the paddle to the KX1 can be seen safely screwed into its special storage area. It's not a good thing to have cables flopping around, falling off, or incurring damage while operating away from the home station. To this end, I took extra care to route and secure the paddle cable. A series of ⅛ inch holes under the cable allowed small tie wraps to be passed up, over the cable and then back down through the hole. A quick snip and the cable is attractively secured. The same procedure was followed for all the other wires and cables.

To finish the right side of the laptop station, I predrilled a 6 × 9 inch acrylic clipboard in each corner and fastened it with small brass wood screws and decorative washers at a comfortable angle based on my normal operating posture. Before tightening the screws, I made a copy of my license and slipped it beneath the see-through clipboard. See Figure 5. I have a habit of misplacing my pens and pencils. Two holes and a small bungee cord solved that problem — now I can slip a couple of pens under the cord and I've got backup!

Power and Sound

I wanted to be able to operate from either an ac or a battery source. When the KX1 operates on its six internal AA batteries, the power output is about 1 W. On a 12 V battery, I'm good for about 2.9 W until the battery starts to get tired. At 13.9 V from an ac operated supply, the little KX1 puts out well over 4 W all day long — more than enough to work the world! I had a Jetstream JTPS-28 switch mode power supply that was just sitting forlornly on a shelf. At 28 A, it was a bit of overkill, but it was lightweight and reasonably compact. Since minimizing weight was not an overwhelming priority to me, I decided to incorporate it. The JTPS-28 fit very nicely to the left of the KX1 and a couple of ¼ inch bolts through the bottom made sure it would stay put. See Figure 6.

A seamless transition between ac or dc operation was important to me. I also wanted it to be as foolproof as possible. RadioShack had a 2 × 5 inch plastic enclosure into which I figured I could build a nice switching center. Plastic meant less worry about shorts. Shown to the rear of the power supply in Figure 6 is a DPDT center-off toggle switch mounted on the top. The center position is connected to the KX1 and to the accessories through a 1.5 A fuse (see Figure 7). Reverse polarity protection is furnished by a 1N4004 diode. I connected the diode across the source rather than in series with the positive lead in order to avoid the forward voltage drop. While operating QRP, one dwells on these details!

The left side of the switch is connected to the 13.9 V dc output from the JTPS-28; the right side is connected to the battery input. The battery input consists of binding posts and a type N coaxial dc jack connected in parallel. With this arrangement I can use ac when it's available or I can plug in my mobile type N cable, my external battery pack N cable, or hook up any other dc source via the binding posts. Hidden beneath the black electrical tape in Figure 7 is a dropping resistor to reduce the voltage to the amplified speaker. Figure 8 is a schematic of the switching center.

The Elecraft AF1 audio filter can be seen

Figure 5 — The right side of the board includes the key, mounted at the correct angle for comfortable operation, a clipboard and a brag board to show off my latest QSL card.

Figure 6 — The rear of the board's left side includes the power source switch to allow the station to be run from ac or dc power.

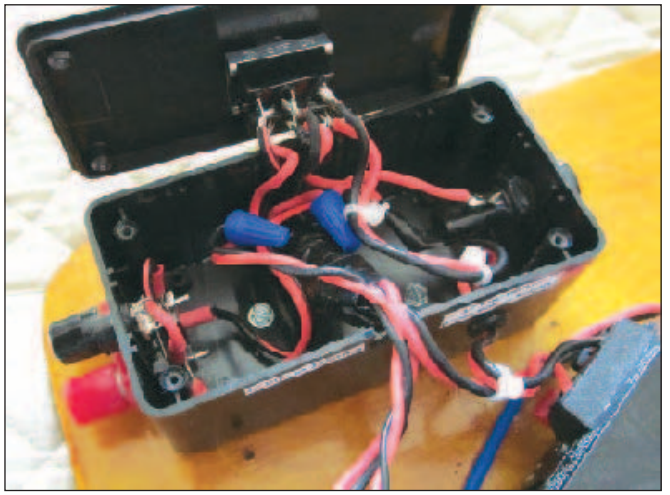


Figure 7 — The inside of the power switch box. The resistor I needed to drop the voltage for my audio amplifier is within the tape below the wires in the center.

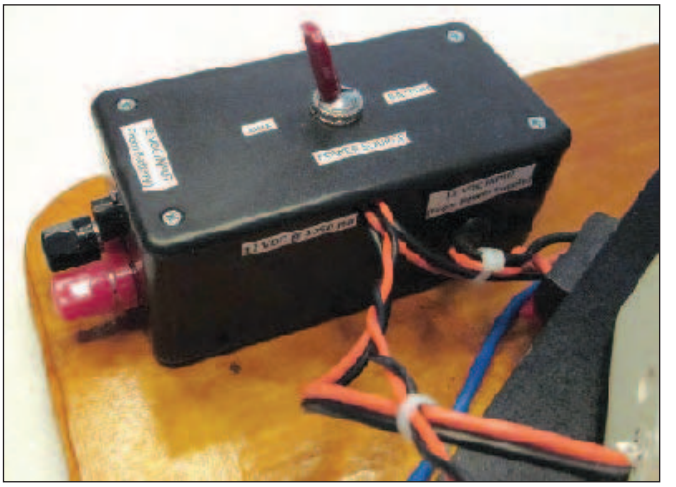


Figure 8 — The buttoned-up switch box. The terminals on the left allow easy connection of battery power.

attached to the top front of the power supply enclosure (see Figure 2) with two strips of high quality hook and loop fasteners — the commercial variety used to hold highway toll transponders on auto windshields. My operating experience suggests that fixed stations operating with all their bells and whistles and filters, and connected to their proper fixed antennas, sometimes have an easier time hearing my QRP signal than I have hearing them. The addition of the audio filter has measurably improved my ability to clarify and separate their signals.

Although I generally prefer a headset for CW QRP operation, there are times when a speaker is nice to have. The KX1 has no speaker, only a ⅛ inch stereo output for earbuds or headphones. I had an unused RadioShack miniature amplified speaker and decided it would do just fine for this application. Since the speaker was designed for 9 V dc I added a dropping resistor to its line.

The KX1 can now produce room-filling volume, which is just the thing needed at club QRP events or while attempting to attract some attention in a public place. I always make it my business to act like a recruiter when operating around the general public and loud Morse code seems to be a real attention-getter. Interesting and colorful QSL cards also help to initiate conversations in public places, so I fabricated a small acrylic trophy center under which I can slip my *QSL of the week*. I also included my own QSL card. It's positioned perfectly to serve double duty as a convenient coaster for my coffee cup. See Figure 5.

Conclusion

This entire project cost me less than $20 because I chose to use, or reuse, stuff I already owned. Doing so also saved time and put a couple of retired pieces of gear back online to once again work productively. Clearly, one could easily construct his or her own power supply and LM386 IC-based audio amplifier.

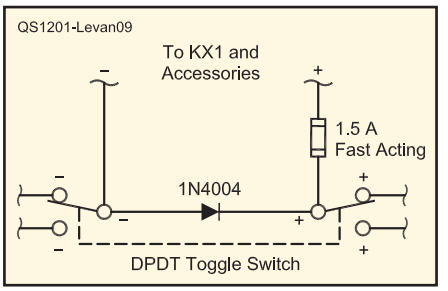


Figure 9 — Schematic diagram of the switching arrangement to change between power sources. Not shown is the resistor that may be needed to reduce the voltage for some accessories, such as the author's audio amplifier.

Anyone contemplating a similar project will discover that this is quite a worthwhile and satisfying effort. There are countless variations on this theme, depending upon one's equipment, interests, and creativity.

Photos by the author.

Stan Levandowski, WB2LQF, an ARRL member, earned his Novice license WN2LQF in 1960. He is now an Amateur Extra class operator devoted to 100% HF QRP CW. When not hamming, he enjoys kayaking with his wife, Sue, and spending time with their grandchildren. Stan holds an undergraduate degree in business and earned his MBA from Long Island University. He retired from a 30 year IBM career where he was a software development manager, and from Nyack College where he taught organizational management classes for 20 years. Stan is a member of The QSY Society and the Mount Beacon Amateur Radio Club. You can contact Stan at 6 Chatham Ct, Fishkill, NY 12524 or at **wb2lqf@arrl.net**.

New Products

NIFTY E-Z GUIDE TO ECHOLINK OPERATION

♢*Nifty E-Z Guide to EchoLink Operation* by Bernie Lafreniere, N6FN, from *Nifty Ham Accessories* features simple and clear-cut explanations and illustrations. This book not only explains how the EchoLink system is configured and operates over the Internet, but also provides a detailed step-by-step guide to EchoLink installation and operation. Individuals wishing to use their own computer as a personal node, as well as those interested in configuring VHF/UHF transceiver based EchoLink nodes and repeaters will find much useful information in this book. Price: $13.95. For more information, visit your favorite dealer or **www.niftyaccessories.com**.

Inverted V Wire Yagi with Switchable Pattern Rotation for 14 MHz

A two element rotary beam antenna without moving parts.

Ashraf Abuelhaija and Klaus Solbach, DK3BA

Yagi or quad, beam antennas are well established antenna types for improved directivity and gain compared to a single dipole antenna.[1] Using an electromechanical rotator, these antennas can be turned toward the desired direction in ±180° of azimuth. Due to the considerable inertia involved in most practical beam antennas, however, rotation is fairly slow. This makes it difficult under typical short wave propagation conditions, for example, to switch between two different directions while listening to an ongoing conversation, or to find the direction of a station that makes short transmissions.

An alternative is offered by phased array antennas, in which the beam can be rotated by the switching of feed networks. With different phase excitations of the elements of the array, different beam patterns can be provided. The popular *four square* array of four vertical ground mounted monopole antennas with about quarter wave spacing and that provide four beam directions with 90° separation in azimuth is an example of such a system.[2]

A comparable alternative with horizontal polarization has not been available, to the knowledge of the authors. A phased array of four horizontal dipoles arranged in a square is not a good idea because of the orientation and coupling of the dipoles arranged under an angle of 90°. Also, this array would require four poles to carry the dipoles high above the ground.

A simpler configuration was found that requires only one support pole and that uses inverted V wire dipoles to create a two element Yagi antenna that can be remotely switched in its beam direction in steps of 60° in azimuth. The result is shown in Figure 1.

Figure 1 — Inverted V wire switched beam array antenna on the roof platform. The dipole wires have been colored for better visibility.

The Inverted V Wire Yagi

This two element inverted V based wire Yagi requires four wires of exactly the same length, each sloping from the top of a support pole or tower. Each is oriented with the same 30° elevation angle (measured from the horizontal) and spaced 60° and 120° apart in azimuth. Two wires are combined to form the driven element and the other two wires are combined to form a director element. Each pair combines two wires at an angle of 120° and both pairs are separated by an angle of 60°. Simulations were performed using *EZNEC5+* and the azimuth and elevation patterns are shown in Figures 2 and 3, respectively.

The combination of wires #2 and #4 driven by the RF source while the combination of wires #1 and #5 is center loaded by a series capacitance to electrically shorten the element to form a director. Mutual coupling between the two dipoles is strong in this configuration due to the short distance between the elements. Thus, we can adjust the phase, and also the amplitude to some extent, of the parasitic element current by choosing a frequency slightly above or below the half-wavelength resonance in combination with the choice of a series reactance load.

Our design employs a wire length of about 0.26 wavelengths and a series capacitor load to create a director element. The design and the realized radiation patterns look similar to the inverted V wire Yagi described by VE7CA in *The ARRL Antenna Book*.[3] Our antenna, however, uses equal length wires and reactive loading and wires radially extending from the apex while the referenced design uses parallel wires with reflector and driven elements of different length.

We tested the theoretical design by building a model for 1 GHz and measuring the reflection coefficient and the radiation patterns in our anechoic chamber. Results were quite satisfactory and this allowed us to proceed in building a full size version for 14 MHz.

Peak gain and the elevation angle of the peak critically depend on the height over ground. In the simulation, a height of 40 feet was assumed as an example. The pattern shows a half-power beamwidth in azimuth of about 65°, broad sidelobes and a relatively low front to back ratio between 10 and 15 dB, depending on elevation angle.

Although this certainly is not the perfect pattern of a two element Yagi, the antenna concept is useful since it can be extended into an antenna design with switch selectable beam directions.

[1]Notes appear on page 37.

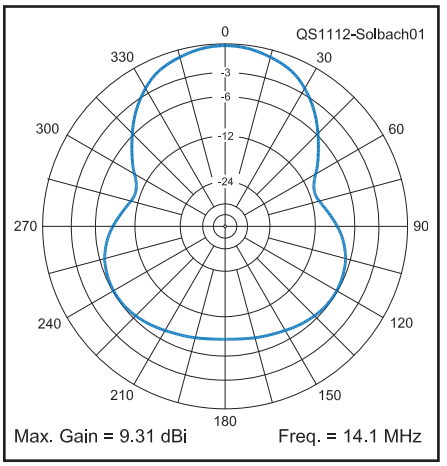


Figure 2 — *EZNEC5+* azimuth pattern of the two element inverted V wire Yagi at a height of 40 feet over typical ground (conductivity 0.005 S/M, relative dielectric constant 13). Wires 2 and 4 are driven, wires 1 and 5 form the director.

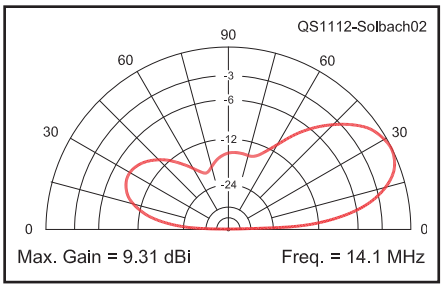


Figure 3 — Elevation pattern under the same conditions as in Figure 2.

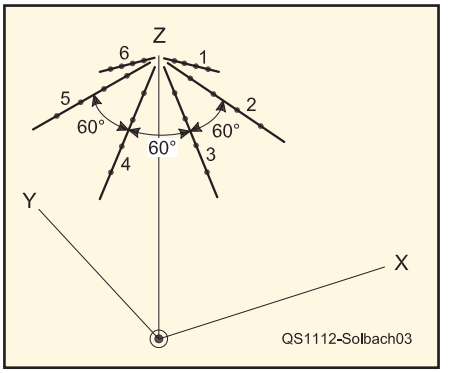


Figure 4 — Six wire arrangement of the switched beam array.

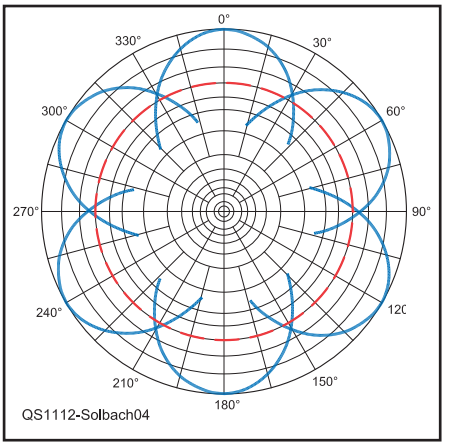


Figure 5 — Sketch of principal patterns created by six selections of wires for the two element inverted V wire Yagi array.

Hamspeak

dBi — Decibels with a reference to an ideal isotrpic antenna. A way of indicating antenna gain in comparison to an antenna with uniform radiation in all directions.

EZNEC — Antenna modeling software that provides a user friendly interface to the powerful *Numerical Electromagnetic Code* (NEC) calculating engine. Several versions of *EZNEC* antenna modeling software are available from developer Roy Lewallen, W7EL, at **www.eznec.com**.

Inverted V — Common name for a center fed dipole antenna in which the center is supported at a higher point than the ends, giving the appearance of an inverted letter V. Such antennas operate in a manner similar to a horizontal dipole at a height about ⅔ as high.

Monopole — Single vertical antenna element, typically a quarter or more wavelengths long. Often used as a transmit and receive antenna, singly or in combination with other similar antennas.

Quad — Multielement directional antenna array in which the elements are made of square, rectangular or round loops approximately 1 wavelength in circumference.

Transceiver — Radio transmitter and receiver combined in one unit. In many cases some circuitry is shared between the two functions.

Yagi — The name of a multielement narrowband directive antenna array using multiple parallel dipole type elements. It is more properly called a Yagi-Uda array, named after its inventors.

The Switched Beam Antenna

Our switched beam antenna is comprised of six wires spaced equally by 60° in azimuth as shown in Figure 4. Using remotely activated switches, we select one pair of wires for the driven inverted V dipole and one pair for the director inverted V dipole. The four selected wires represent the two operating elements, with the two unused wires sitting exactly on the symmetry axis of the driven and the parasitic dipoles. Thus there is no net mutual coupling to the unused wires and they are virtually invisible to the operating elements. We can cyclically interchange the selection of wires to create six different combinations which produce six different patterns rotated in azimuth by steps of 60°. See Figure 5.

It is seen that the six beam positions cover the 360° azimuth range and that the beam cross-over level is slightly above –3 dB; thus, while scanning the antenna around, the worst case pointing loss for any direction is less than 3 dB.

The switching in and out of dipole wires has to be accomplished at the center of the array where the wires are fastened and electrically connected and from where the six wires stretch out radially. Figure 6 shows one of six routing configurations for the connection of two wires to the coaxial feed for the driven dipole and two wires to the reactive load for the director dipole.

For this switch unit we use electromechanical relay switches of SPDT type (Takamisawa SY-12W-K) and DPDT type (Omron G5V-2) arranged on a circular 12 cm diameter circuit board (Rogers RO4003, 0.5 mm thickness) with 50 Ω microstrip lines connecting the wires, relay terminals, capacitor, coaxial cable and the five wire control lines as shown in Figure 7. The relays are conventional miniature sealed signal relays with low capacitance (about 1 pF) between contacts and voltage handling of several hundred volts and load current up to 1 A. Power handling has been tested with 100 W of carrier power in short transmit periods, but high duty-cycle power handling and higher peak power have not been tested.

The six dipole wires are electrically connected and mechanically fixed to the board by eyes at the periphery while the RF coaxial cable and the five wire control cable thread through openings in the middle. With the switch unit and dipole wires in place at the top of our tower, the control cable and the coaxial cable run downward from the board — the RF transmission line with a cable choke balun just below the board. At the other end of the cables, the relays are actuated by a rotary switch with six positions controlling a digital encoding and interface circuit as shown in Figure 8.

Our antenna is mounted on a 23 foot mast placed centrally on the roof platform of our building (see Figure 1): The tower also carries a microwave dish antenna below the top. Other VHF, UHF and microwave antennas also are present on the platform and a three element Yagi is placed at a distance of 40 feet from the tower. The switch unit is mounted on a short PVC tube just above the top of the metal tower and an inverted plastic salad bowl is used as a top cover to protect the unit from rain (see Figure 9).

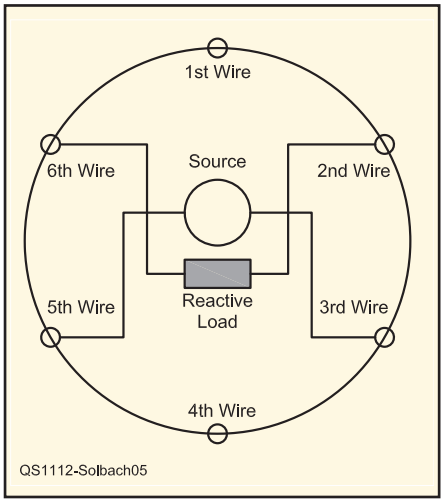
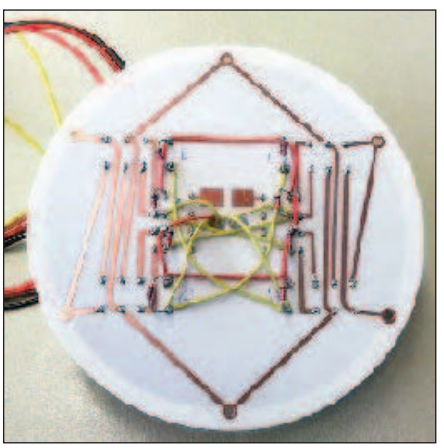


Figure 6 — Routing configuration of the switch unit for a beam pointing to 90° azimuth.



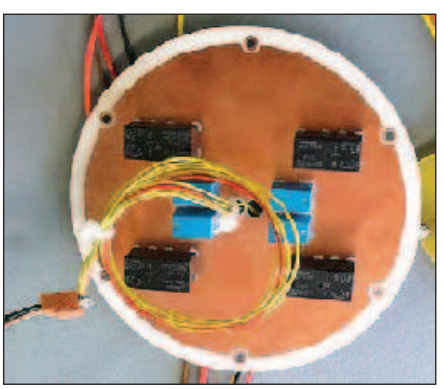


Figure 7 — Switch unit with eight relays to switch six dipole wires at their periphery. At the top is a view of the wiring side showing the use of microstrip lines for the RF connections. At the bottom is the relay side.

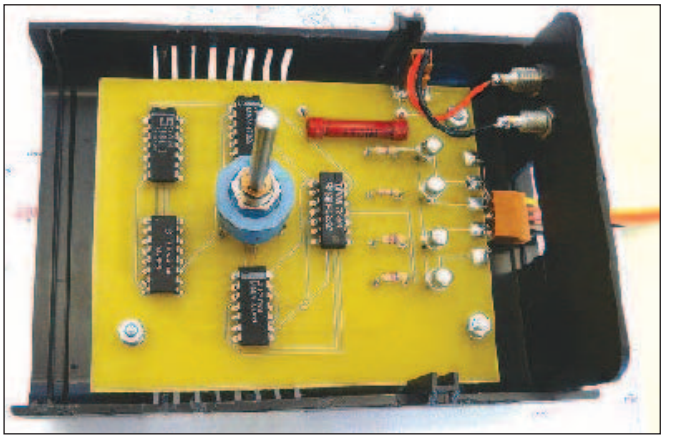


Figure 8 — Relay digital control unit with rotary switch.

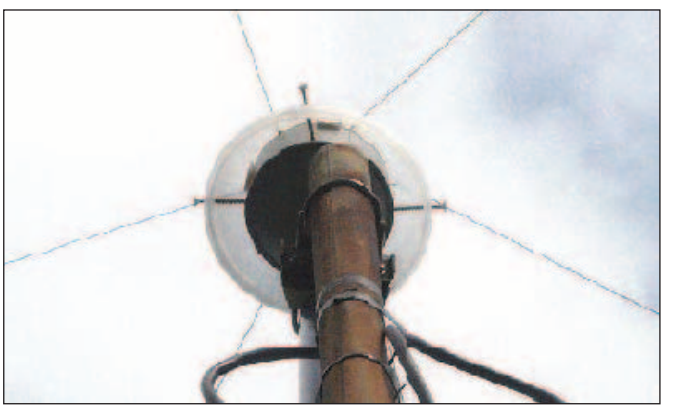


Figure 9 — Switch unit with dipole wires and weather protection cover placed on top of the supporting mast.

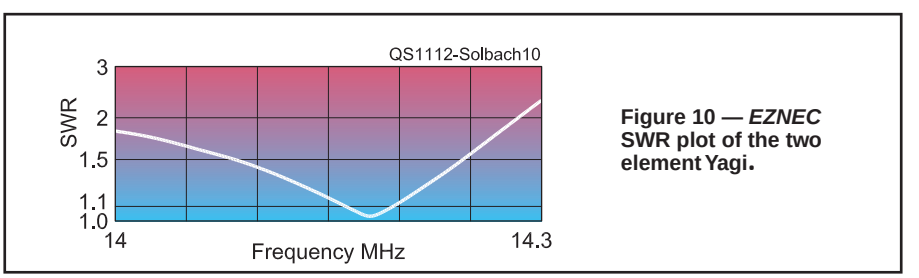


Figure 10 — *EZNEC* SWR plot of the two element Yagi.

To keep the weight low, we used thin insulated copper stranded wire of 0.42 mm diameter [approximately #26 AWG—*Ed.*] for the dipole arms (expected conductor loss of about 1 dB) and supported the open ends at an equal height of 14 feet by ½ inch PVC pipes which were fastened to the railings of the platform. Some wires had to be extended by Nylon string to reach their supports.

From simulation with *EZNEC5+*, an optimum wire length of 18.4 feet was calculated with the director loaded by 120 pF. The model assumed an infinite conducting ground and projected a maximum gain of 7.44 dBi under 45° elevation.

Since the roof of our 13 story concrete building is about 165 feet above ground, the ground plane assumption is much too pessimistic as it applies to the far-field pattern and we can expect higher gain at lower elevation angles. The antenna feed-point impedance was as predicted, after we cut the dipole wires by about a foot to adjust the resonant frequency (Figure 10). Within a bandwidth of about 200 kHz, the SWR is below 2:1 and the pattern has acceptable variation in gain and beam shape over the range.

Operating Experience

The antenna was operated using an FT-101 transceiver from our University club station, DLØUD. While we observed the signal strength indicator we rotated the pattern by turning the switch through all six positions within a few seconds or fast toggling between two positions in order to find the maximum indication for CW stations in the 20 meter band. Although the antenna patterns indicate only a moderate front-to-back ratio, a clear maximum position was found in most cases and also a clear minimum position at the opposite beam direction. Correspondence of antenna beam direction and theoretical azimuth could also be verified in most cases.

We compared the switched beam antenna to our rotatable three element Yagi by quickly switching between the two antennas. This tended to be frustrating because often the rotatable beam took more time to move to the optimum direction than the duration of transmission of the observed amateur station. Unfortunately, the comparison can give only a very rough indication of the actual antenna gain, since we are not sure about the gain of the rotatable Yagi.

The rotatable beam is operated under inferior conditions compared to our switched beam antenna as it is situated 40 feet west of the tower at the edge of our roof platform only 10 feet above the platform level. Including additional cable loss, this should reduce the gain by about 2 dB. Nevertheless, comparisons using signals from the Eastern Hemisphere tended to give one-half up to one S-meter unit advantage for the switched antenna while signals from the Western Hemisphere tended to give equal signal strength with both antennas. The difference may be explained by the mutual coupling and diffraction effects when the Yagi radiation has to pass through the switched beam and vice versa. As a rough estimate of the gain from these results, we conclude that the switched beam antenna would come close within a few dB of the traditional Yagi if both were in the same position.

Conclusion

The six wire switched beam antenna has been found to be a useful antenna for shortwave operation due to its inertialess beam rotation and simple construction based on the inverted V design. A four wire version has also been investigated but this presents only four beam directions while an eight wire version promises more interesting features with eight beam directions based on six wires selection to create a three element Yagi array rotatable through eight directions. The presented concept could be expanded to multiple bands operation be using wires with traps and multiple capacitors.

Additional construction details are provided on the QST-in-Depth website.[4]

Notes

[1]R. D. Straw, Editor, *The ARRL Antenna Book,* 22nd Edition, Chapters 11 and 12. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Tel 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[2]See Note 1, "A "Four Square Array," p 8-27.

[3]See Note 1, "40-Meter Wire Yagis," p 15-18.

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

Klaus Solbach, DK3BA, started in Amateur Radio as SWL in 1965 at the age of 14 years, and received his full license 4 years later. His amateur work led him to study electrical engineering, which he finished with Dipl-Ing and Dr-Ing degrees. He worked for 17 years as an engineer at the Radar Systems department of EADS, responsible for RF Systems and Antenna development. In 1997, he became the chair of RF and Microwave Engineering at the University of Duisburg.

His university research group supports contest station DFØUD, repeaters, some Amateur Radio beacons and the university FM broadcast station (see **hft.uni-duisburg-essen.de/amateurfunk/amateurfunk_en.shtml***). You can reach Klaus at University Duisburg-Essen, Bismarckstrasse 81, 47048 Duisburg, Germany or at* **klaus.solbach@uni-due.de**.

Coauthor Ashraf Abuelhaija is from Jordan. He received the BSc in Communications and Electronics Engineering in 2002 at the Applied Science University in Amman, Jordan and worked 6 months as a Laboratory Technician and Supervisor at the Department of Electronics and Computer Engineering at the same university. He came to Germany to receive his MSc in Electrical and Electronics Engineering (Communication Engineering) at Duisburg-Essen University.

This article is based on his Master's thesis, "Development of a Novel Switched Beam Antenna for Communications," selected from the Amateur Radio projects offered by the department and through this had his first ham radio experience.

A 2 W Logic Chip Transmitter

Give low power CW operation a try with this easy to duplicate transmitter.

Lew Smith, N7KSB

For the past 20 years, I have enjoyed the challenge of chasing DX with transmitters that used a single logic chip as the only active device. My original circuit used a 74HC240 octal inverting buffer IC to generate ½ W output.[1] Using an elevated vertical antenna, this transmitter and similar 10 and 17 meter ½ W rigs have been used to work 72 countries to date.

As the sunspots declined, I needed more power than my one chip transmitter would provide. Usually I add a MOSFET amplifier when the need for more power arises, but this time I wanted to see how much power I could get out of a logic chip final amplifier. The logic chip transmitter described in this article is the result. It puts out nearly 2 W of clean CW on 17 meters.

[1]Notes appear on page 40.

Using Logic Chips in Low Power Transmitter Projects

It is fun to say *your 1.5 kW final sounds great. Using a 2 W logic chip amplifier here, OM,* but there are other reasons for using

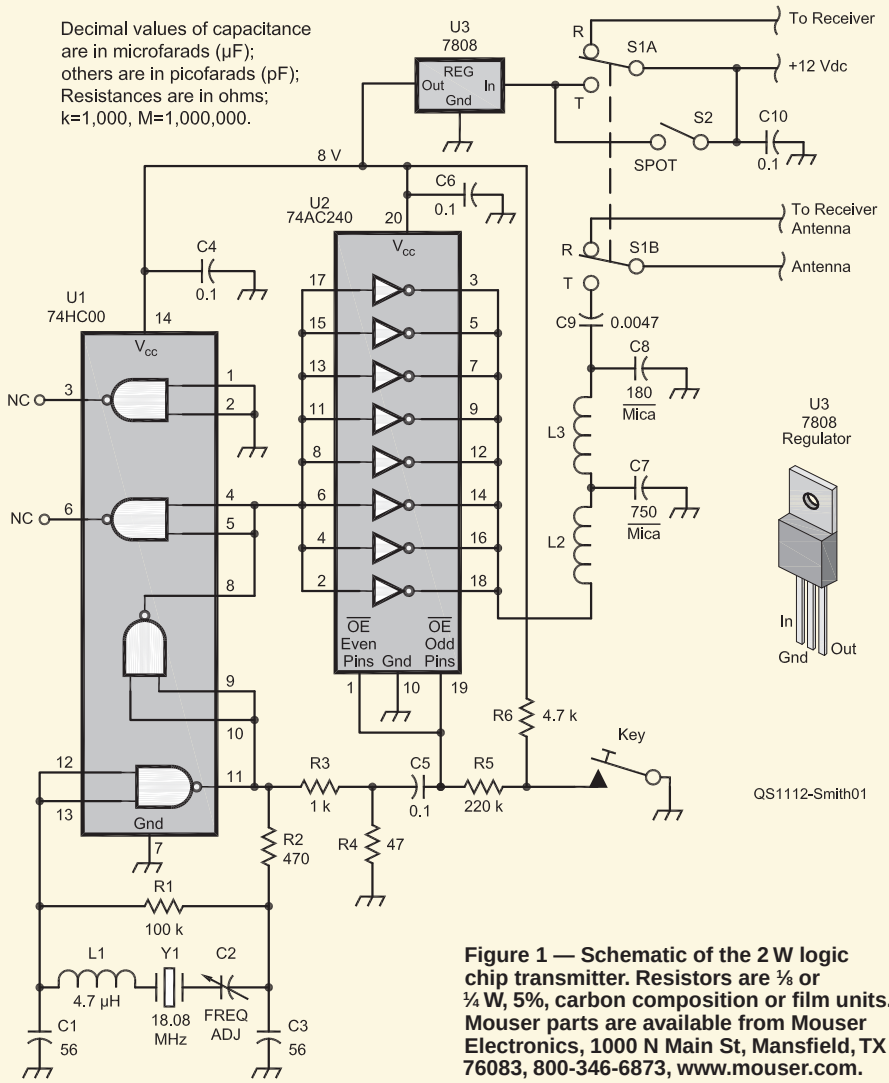


Figure 1 — Schematic of the 2 W logic chip transmitter. Resistors are ⅛ or ¼ W, 5%, carbon composition or film units. Mouser parts are available from Mouser Electronics, 1000 N Main St, Mansfield, TX 76083, 800-346-6873, www.mouser.com.

C1, C3 — 56 pF, 50 V ceramic capacitor (Mouser 140-50S2-560J-RC).
C2 —2 to 70 pF homemade variable compression capacitor; see Figure 2 and text.
C4-C6, C10 — 0.1 µF, 50 V monolithic ceramic capacitor (Mouser 80-C320C104K5R).
C7 — 750 pF, 300 V or greater, mica capacitor (Mouser 598-CD15FC751JO3F).
C8 — 180 pF, 300 V or greater, mica capacitor (Mouser 598-CD15FD181JO3F).
C9 — 0.0047 µF, 1000 V, ceramic capacitor (Mouser 140-102P9-472K-RC).
L1 — 4.7 µH epoxy coated inductor (Mouser 542-5300-09-RC).
L2 — 4 turns, #18 enameled wire, ⅜" ID, stretched to peak output (see text).
L3 — 9 turns, #18 enameled wire, ⅜" ID, ½" long.
R1 — 100 kΩ resistor (Mouser 299-100K-RC).
R2 — 470 Ω resistor (Mouser 299-470-RC).
R3 — 1 kΩ resistor (Mouser 299-1K-RC).
R4 — 47 Ω resistor (Mouser 299-47-RC).
R5 — 220 kΩ resistor (Mouser 299-220K-RC).
R6 — 4.7 kΩ resistor (Mouser 299-4.7K-RC).
S1 — DPDT toggle switch.
S2 — SPST toggle switch
U1 — 74HC00 quad NAND gate, DIP package (Mouser 595-CD74HC00EE4).
U2 — 74AC240 octal three state buffer, DIP package (Mouser 512-74AC240PC).
U3 — 7808 8 V regulator, 1 A, TO-220 package (Mouser 512-LM7808CT).
Y1 — 18.08 MHz crystal (Mouser 549-016758). Note: This may not be in the catalog. Try the online catalog or speak to an operator. This is a low cost part made by Crystec for Atmel wireless systems.

CMOS logic chips. These readily available, extremely low cost and very robust integrated circuits can simplify the design, construction and troubleshooting of low power (QRP) projects. CMOS offers high impedance inputs, low impedance outputs and an unusual degree of symmetry. These features greatly simplify, or eliminate, output and interstage filtering and coupling networks.

CMOS logic chips also have ESD (electrostatic discharge) protection diodes on every pin. These greatly reduce the possibility of accidentally destroying the chip during assembly or troubleshooting. These ESD protection diodes also limit overvoltage swings that often occur if the antenna is accidentally open or short circuited. The downside of logic ICs is that they were not meant to be used in analog circuits. In the case of a CW QRP transmitter, this means that key click and oscillator startup issues need special attention.

Circuit Details

As shown in Figure 1, a 74HC00 logic NAND gate (pins 11,12 and 13 of U1) is hooked up as an inverter to make a Pierce crystal oscillator. I used the 74HC integrated circuit family because oscillators built with these medium speed devices are less likely to start up in unwanted overtone modes than circuits that use the very fast 74AC types. A very inexpensive 18,080 kHz crystal is coaxed into oscillating from 18,071 to 18,093 kHz, under control of C2 and L1. Another gate (pins 8, 9 and 10 of U1) drives the final. To prevent chirp, the oscillator is not keyed, but turned on whenever the TR switch is on transmit. S2 turns on the oscillator for spotting purposes.

The 74AC family is somewhat more powerful than the 74HC chips, and thus are a better choice for a power amplifier application. All eight of the inverters in a 74AC240 octal inverting tri-state buffer are connected in parallel to serve as the final. Most CMOS logic ICs have symmetrical input and output stages. This results in a symmetrical waveform with very low second harmonic content. This means that a very simple harmonic filter is all that is needed to meet the latest, rather stringent, FCC rules.[2] The L-Pi filter also transforms the 50 Ω antenna impedance down to 4 Ω for a better match to the final amplifier. The final amplifier's tristate-enable inputs are used for keying. If these inputs are held high, both the pull-up and pull-down transistors in the output stage are turned off and no RF is produced. If the enable inputs are held low, the output transistors cycle on and off to produce RF.

As long as the R5, C5 time constant is made very large, the pull-up transistor is

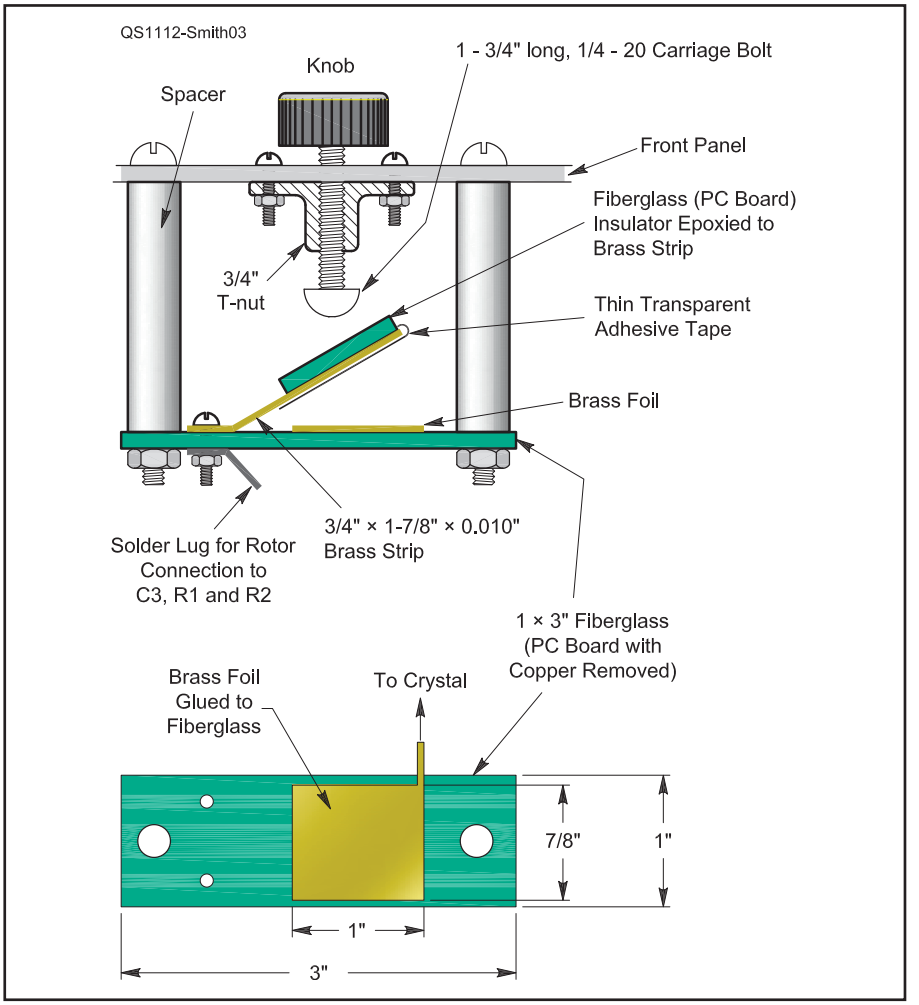


Figure 2 — Detailed view of homebuilt variable compression capacitor used for adjusting frequency.

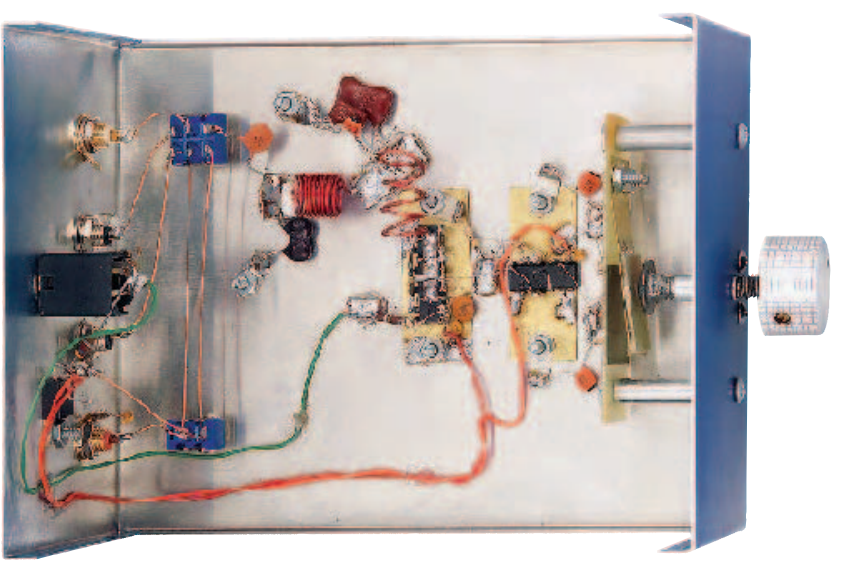


Figure 3 — Inside view of transmitter. Note the small pieces of printed circuit board material used to mount the parts "Manhattan" style. Parts mounted on the rear panel (from top to bottom): phono jack for the antenna, phono jack for receiver antenna, key jack, phono jack for receiver power and partly hidden R6, U3, C10 and phono jack for power. S2 and S1 (the blue objects) are to the right. Moving farther to the right, components are C9, C8, L3 and several paralleled capacitors that comprise C7. Still farther to the right: the stretched out L2, U2 (mounted on a piece of brass), R4, C5, R5 and C6. U1 is mounted on the next piece of brass. R3, R2 and C4 are wired to U1. Next come C3, R1, L1 and C1, all mounted "Manhattan" style. The crystal is glued to the back of the compression capacitor and blocked from view.

enabled and disabled smoothly without key clicks. The pull-down transistor was more troublesome. I had to inject some square wave RF into the enable inputs to trick the pull-down transistor into clicking on a millisecond before the pull-up transistor began to be enabled. The injected RF also lets the pull-down transistor click off a millisecond after the pull-up transistor has become completely disabled. Since *both* output transistors must be enabled to produce RF, no key clicks will be transmitted.

Pin 11 of U1, R3 and R4 inject RF into the enable inputs. (I tried pin 6 of U1, but pin 11 gave better results.) The component values do not seem to be at all critical, but good RF grounds are important. Although battery power adds a special mystique to QRP, I wanted to use a standard power supply and added U3, an 8 V power regulator. Most CMOS chips will survive 8 V even though the recommended maximum is 6 V and the absolute maximum rating is 7 V. If desired, this transmitter can be built with a 6 V regulator, but the output will drop to just over 1 W.

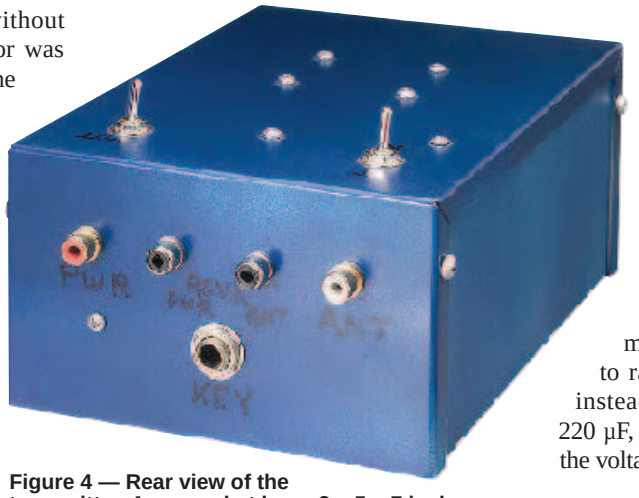


Figure 4 — Rear view of the transmitter. A somewhat large 3 × 5 × 7 inch aluminum enclosure (Mouser 546-1411QU) was used to avoid crowding.

Construction

I use aluminum ground plane construction for most of my RF projects. Printed circuit board ground plane construction (also known as *ugly* construction) can be used, but aluminum offers better heat sinking, looks nicer and does not get loaded up with large gobs of hard to melt solder. Considering that the usual printed circuit board has to be mounted in an aluminum box anyway, it is often easier to bolt or glue the parts to the box and eliminate the board. This method works particularly well with *very* simple circuits such as this minimum part count project.

As shown in the photos, the ICs were epoxied *dead bug* style to small pieces of brass and then bolted to the aluminum box. This technique is convenient for both heat sinking and for making very short ground leads. Regardless of the construction method, be sure to heat sink the 74AC240 and keep its ground and supply bypass capacitor leads as short as possible. Ground lugs are bolted as needed for grounding. The C7 and C8 grounds should be on separate ground lugs. As shown in Figure 2, a homebuilt compression capacitor was used for C2.[3] I find it superior to anything I can buy. To get optimum performance out of the oscillator, minimize the stray capacitance at the junction of the compression capacitor and the crystal. It is best to do without a crystal socket and solder the crystal directly to the stator of the variable capacitor.

Test Results

Because the L section of the filter has a moderately high Q of just over 3, L2 needs to be tweaked for maximum output. I usually wind L2 with about half the number of turns of L3 and stretch it to peak the output. The power on this transmitter peaked at 1.9 W when L2 was stretched to $^{13}/_{16}$ inches. The key down power supply current was 480 mA. Peaking the output is much easier if you use a small wooden stick with a ferrite bead glued to one end and a copper, brass or aluminum $^{3}/_{16}$ inch diameter cylinder on the other end. Inserting this tuning aid into L2 will let you know whether to stretch or compress the coil.

Part 97.307(d) of the FCC rules now require harmonics to be down 43 dB for a 2 W transmitter. I found the second harmonic to be down 58 to 60 dB. I did not measure the third or higher harmonics, but a quick calculation shows that they should also easily meet the FCC requirement. There is a 53 dB down *backwave* present when the TR switch is on transmit and the key is up. I consider this to be an acceptable imperfection and did not fix it. The problem is caused by the stray capacitance of the intertwined input and output pins of the 74AC240.

The pinouts of the somewhat similar 74AC540 octal buffer are much better, and substituting it for the 74AC240 (with the following wiring changes: connect pins 2 through 9 as inputs, and pins 11 through 18 as outputs) should eliminate the backwave.

Oscillator Start-up Issues

Although this transmitter did not have oscillator start-up problems, many crystal oscillators start up and get stuck in an overtone mode. If you observe erratic startup behavior, the oscillator is probably starting up in an overtone mode. If you have start-up problems, experiment with the value of R2. If R2 is made too large, the oscillator will not have enough gain to oscillate at the high end of the tuning range. If R2 is made too small, the oscillator may start up in an overtone mode. If startup problems persist, try to ramp up the supply voltage slowly instead of abruptly switching it on. A 220 µF, low ESR capacitor at the output of the voltage regulator will accomplish this.

Operation on Other Bands

This 17 meter transmitter can be operated on the other high frequency bands provided that appropriate changes are made to the L-Pi output network and the crystal. L1 in the oscillator will have to be optimized for each band, or alternatively, it can be eliminated at the sacrifice of some of the tuning range.

On 10 meters, a few more changes are needed: Eliminate L1, change both C1 and C3 to 22 pF and use a half scale version of the tuning capacitor. Additionally, it may be necessary to parallel R2 with a 10 pF capacitor. Y1 can be a low cost cylinder crystal (Mouser 695-CSA309-28).

On-The-Air Results

This transmitter was first put on the air in 2006. Using a vertical mounted on an upstairs balcony, the prefixes of the first dozen contacts worked were W, DS, J, XF (Revilla Gigedo), ZL, VP2M, J, KH6, CU (Azores), HI, PP and OZ. This 17 meter logic chip rig is fun to operate and has been trouble-free ever since those first contacts.

Notes

[1]L. Smith, N7KSB, "An Experimental 1/2 W CW Transmitter," Hints and Kinks, *QST*, Nov 1994, p 84.
[2]Verified in the ARRL Lab.
[3]L. Smith, N7KSB, "A Simple 10 Meter QRP Transmitter," *QST*, Mar 2000, pp 43-46.

Lew Smith, N7KSB, was first licensed in 1947 at age 12. After receiving a BSEE and MSEE from MIT in 1959, he spent 33 years designing analog and analog-to-digital circuits. Lew is now retired and enjoys hiking and paragliding in addition to ham radio. He likes to chase CW DX with a variety of homebrew rigs. You can contact Lew Smith, N7KSB, 4176 N Soldier Trail, Tucson, AZ 85749 or at **evieandlewsmith@gmail.com**.

Dual Band VHF/UHF Slim Jim Antenna

You may want to try this variation on an old favorite antenna design.

Al Peter, AC8GY

As I was setting up my Amateur Radio station, one requirement was for a 2 meter and 70 cm antenna that could be hung from a nearby tree. Since I like making things, my first choice was a homebrew antenna. Hanging the antenna from a tree presented several constraints such as a strong symmetrical design that would hang straight vertically and preferably would not require a ground plane system. An Internet search turned up the venerable *Slim Jim* design, described by FC Judd, G2BCX, as the "2BCX Slim Jim" in a 1978 publication.[1]

Slim Jim Design and Theory

The Slim Jim is usually characterized as an end fed vertical folded dipole, derived from the J-Pole.[2] End fed dipoles have a high impedance at the feed point, so some sort of transformation is necessary to match to 50 Ω coax. The Slim Jim uses a *J match*, as does its cousin the J-Pole. All the metal Slim Jims I found were for a single band and, although there is a commercial dual band Slim Jim feed line version with integral traps, I could find no other dual band designs described in either the Internet literature or in my technical library. I found a very useful Slim Jim antenna calculator online that I used for the initial dimensions.[3] The final version of my dual band Slim Jim (DBSJ) is shown in place in Figure 1.

The key features of my Slim Jim are:

- Low angle of radiation,
- Unobtrusive, low wind resistance,
- Rugged construction — no radials to break or bend,
- Fully weatherproof when made of copper plumbing pipe,
- 50 Ω input impedance, and
- Low SWR — 1.5 or lower across the 2 meter band.

[1]Notes appear on page 43.

Figure 1 — Dual band Slim Jim in place hanging from a tree at about 40 feet. The antenna is clear of any branches and is about 30 feet from the house.

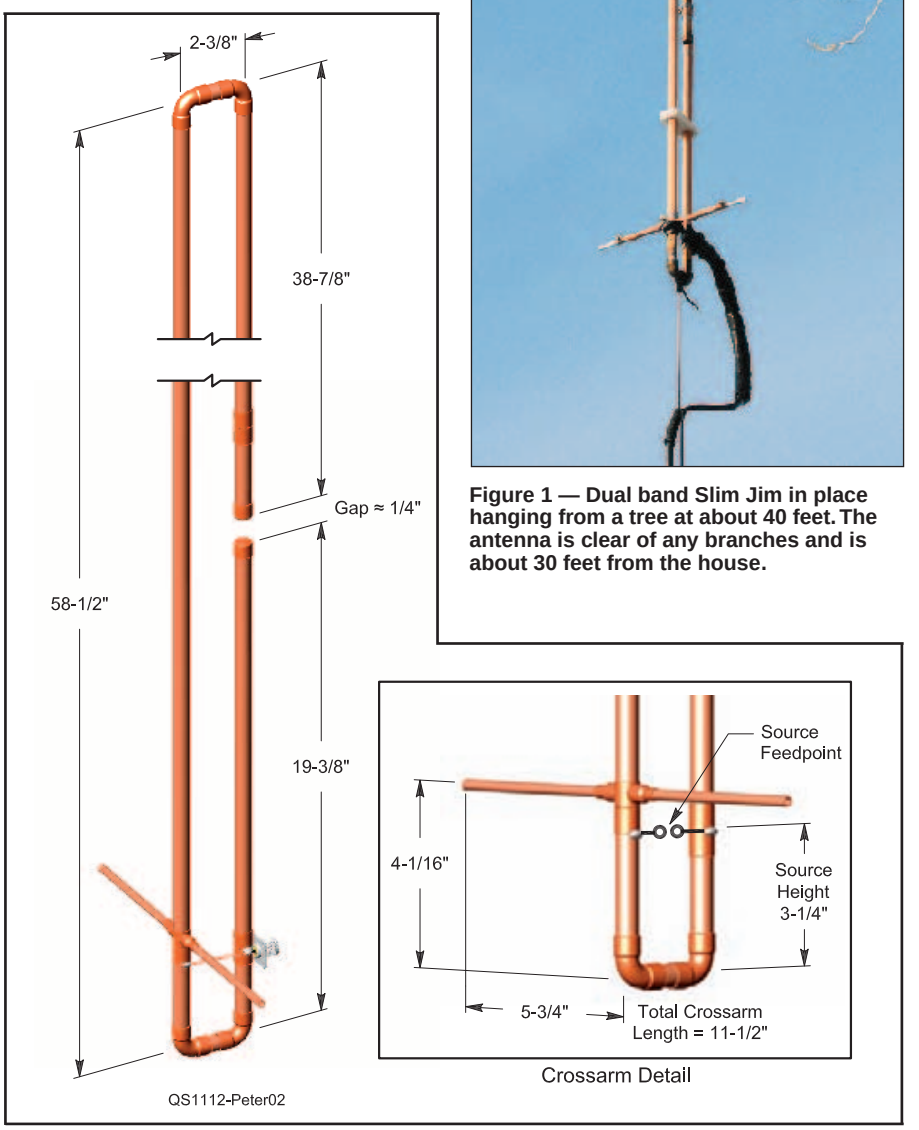


Figure 2 — Dual band Slim Jim center-to-center dimensions as built. The required parts are listed in Table 1. All connections are soldered or clamped. Approximate dimensions are indicated for the variable elements. Feed source for initial modeling is conventionally placed between the uprights, shield to the arm with the gap, coax center conductor to long upright.

Table 1
DBSJ Parts List

Quantity	Part
10'	Copper pipe, ½" diameter
4	Copper elbows, ½"
2	Copper pipe caps, ½"
3	Straight copper couplings, ½"
2	Copper couplings, ¼ to ⅜"
2'	Copper tubing, ¼"
4	Small stainless pipe clamps
Plastic spacers approximately 1½ × 3"	
4 to 8	FB-43-1024 ferrite beads (Amidon)
1	SO-239 chassis mount female UHF jack

Disadvantages:

- Subject to feed line radiation — benefits from a common mode choke, and
- Most designs are for a single band.

Quest for Dual Band Capability

The third harmonic of 146 MHz should fall in or near the 70 cm band; however, both modeling in *EZNEC* antenna modeling software and measurements showed the 70 cm resonance to be above the band.[4] Still, wanting a dual band antenna and being curious, I decided to try my hand at modifying the Slim Jim. Starting with the 2 meter Slim Jim *EZNEC* model, I tried a number of variations, including resonant parasitic elements parallel to the uprights and ¼ wave stubs. Finally, I hit upon crossarm elements perpendicular to the uprights, as shown in Figure 2. These added elements are approximately ¼ wave in length and are arranged in a plane perpendicular to the axis of the antenna. The crossarms appear to add capacitance that lowers the UHF resonant frequency into the 70 cm amateur band.

Modeling the Dual Band Slim Jim

The *EZNEC* Slim Jim model was first tuned for performance on 2 meters with the crossarms attached. I found that the antenna length had to be decreased slightly to get the resonance within the band, consistent with added capacitance. SWR was calculated to be below 1.4:1 from 144 MHz to 148 MHz, with a minimum SWR of 1:1 at 146 MHz. Maximum radiation was 4.8 dBi at 3.2° elevation. In azimuth, the response is omnidirectional within 1.2 dB. For these first models, I placed the source directly between the uprights. No feed line elements were used.

The DBSJ at 70 cm

Once the model was tuned for 2 meters, I calculated the SWR for 70 cm. Without the crossarm assembly, the SWR is above 3:1 for most of the band, which would not be acceptable to most transceivers. The minimum SWR was above 450 MHz, outside of the 70 cm amateur band. Adding the two ¼ wave crossarm elements reduces the resonance to around 440 MHz. The model was tuned for minimum SWR on 70 cm by varying the length and position of the crossarms, while leaving the other parameters alone. This allowed the response on each band to be optimized independently.

As mentioned, the effect of the crossarm element appears to be equivalent to adding a small amount of capacitance near the feed attachment point. Replacing the crossarms with a small capacitance also lowered the resonant frequency and reduced the SWR as predicted by *EZNEC*. The currents in the two halves of the crossarms are equal and opposite, indicating that these elements probably do not radiate. Elevation and azimuth radiation patterns at 70 cm are very similar to the response at 2 meters. Minimum SWR on 70 cm is below 1.1:1 and the radiation pattern in elevation has a strong low angle pattern much like the regular 2 meter Slim Jim or a J-Pole. The maximum gain was calculated to be 6.29 dBi at 1.2°. Responses at 2 meters and 70 cm are shown in Figure 3.

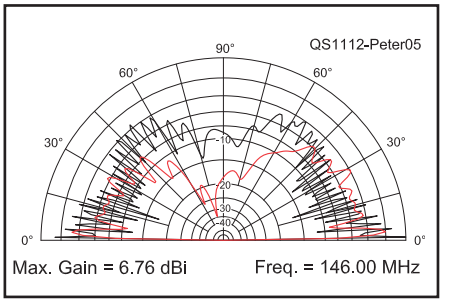


Figure 3 — Calculated far field radiation in elevation along the x axis. Antenna is 25 feet above ground. No feed line included. Red is 2 meter pattern, black is 70 cm.

Although I was happy with the first model's results, in order to more closely reflect the real world, a transmission line, radiating feed line, and common mode choke were included in the model. Details of the crossarm in the *EZNEC* model of the (DBSJ) is shown in Figure 4. Transmission lines in *EZNEC* are balanced and non-radiating, so adding a wire with the diameter of the coax running parallel to the transmission line simulates the radiation of the coax feed line.[5] Finally, a common mode choke equivalent to adding eight ferrite beads (FB-43-1024) distributed along the feed point (total load equal to 0 –*j*2000 Ω) was included. Transmission line loss parameters were for Belden 9913 low loss coax. The *EZNEC* ground type was set to *real* and the antenna base was modeled to be at a height of 25 feet.

Adding the transmission line, choke and the radiating portion of feed line didn't change the results on 2 meters. At 70 cm, however, the radiation from the feed line is much more significant, somewhat mitigated by the addition of a CM choke. It does appear that modeling feed lines is difficult, the results being an approximation of the actual behavior.[5] Placement of the ferrite beads has a considerable effect on the results. I tried to get as close to modeling physical placement as possible, within the limitations of *EZNEC*.

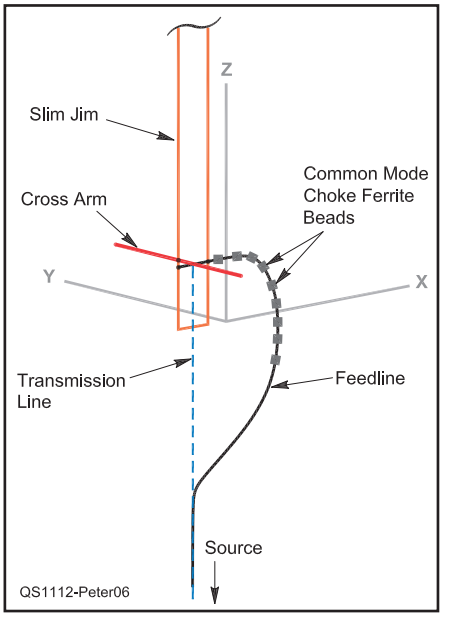


Figure 4 — *EZNEC* geometry detail showing the location of the crossarms, feed line wire and common mode choke ferrite beads. An attempt was made to model the coax path and approximate placement of the beads. A single load was placed at the center location of each bead. Segmentation limitations in *EZNEC* prevented exact locations; however, this is fairly representative of the final configuration.

Constructing the Dual Band Slim Jim

Computer models are fun, but there is nothing like a real antenna. I constructed mine from ½ inch copper plumbing pipes and fittings. The crossarms were fabricated using a ½ inch coupling, two ⅜ to ¼ inch fittings and lengths of ¼ inch copper tubing. The ⅜ to ¼ inch fittings were filed to fit the ½ inch coupling and soldered in place, allowing the crossarm assembly to be easily moved up and down for tuning. The assembly details are shown in Figure 5. Aluminum rods, ⅛ inch thick, were used to allow easy adjustment of the crossarm length. The gap was also made variable using a coupling and clamp, again for tuning. The straight couplings were split and clamps were used to attach the feed line. The final dimensions are shown in Figure 2.

The antenna should first be tuned for 2 meters by altering the overall length, varying the attachment point location up or down and changing the gap width. The resonant frequency was close, so I left the length alone.

Tuning for 70 cm is accomplished by moving the crossarm up and down and varying the length of the arms. Crossarm length has the more effect than height, so I made the length easily adjustable. If you make one

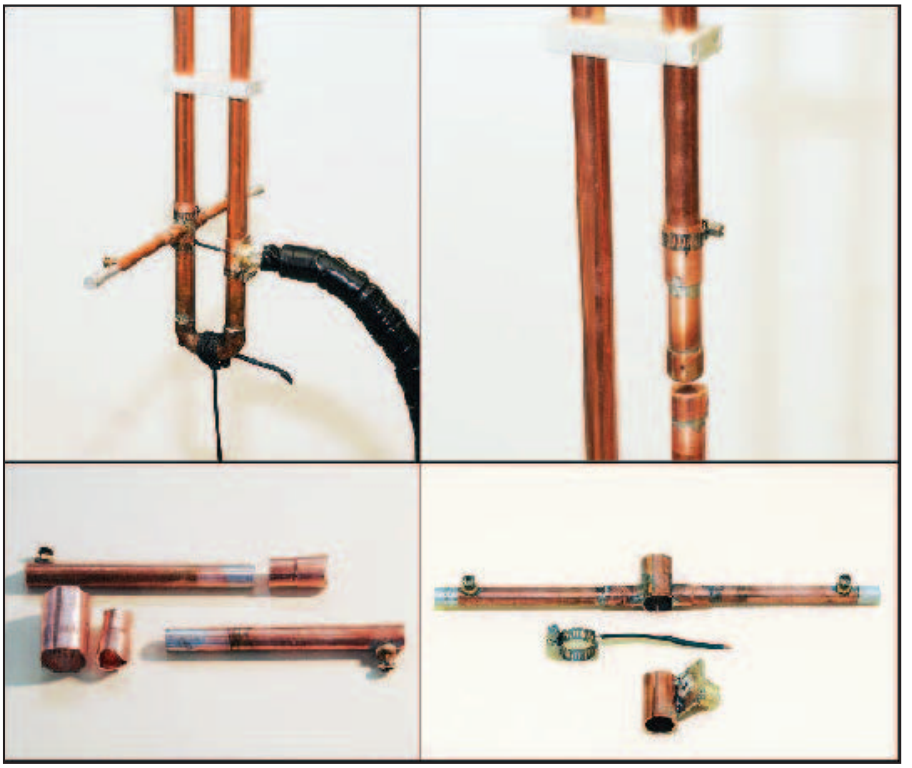


Figure 5 —The crossarms were fabricated of copper pipes and fittings, cut and filed to shape and soldered using a propane torch. The SO-239 chassis mount jack was soldered to a split straight coupling and the feed wire from the coax is attached to a stainless pipe clamp. The upper split arm is made variable using a straight coupling and clamp. End caps are used to increase the capacitive coupling between the sections for tuning.

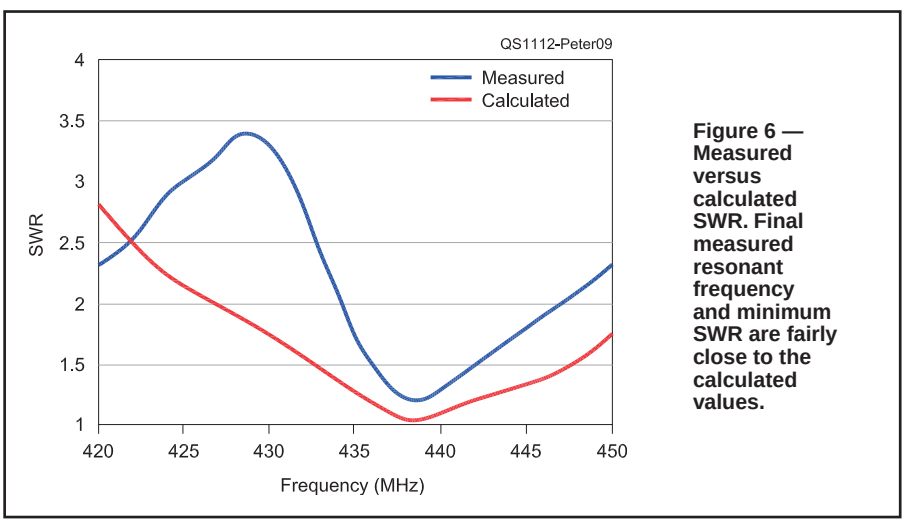


Figure 6 — Measured versus calculated SWR. Final measured resonant frequency and minimum SWR are fairly close to the calculated values.

of these, you could start with slightly longer arms and cut off the ends ⅛ inch at a time to get the best match. When the minimum SWR frequency is close to the desired center frequency, move the crossarm up and down to obtain a fine adjustment for minimum SWR. The spacers shown are plastic and placement does affect the SWR. Just move them up and down to get minimal change to the SWR.

The required parts are listed in Table 1. The total cost is about $25, not including the ferrite beads, which are about $2.50 each. Most of the parts are available from your local plumbing supply or hardware store.

Performance

Initial checkout after tuning showed that the 2 meter SWR performance was much as expected. The 2 meter response was optimized by iterative adjustments of the feed point location and gap length, which brought the SWR down to satisfactory levels. Performance on 70 cm was optimized by changing the crossarm length and height. The measured SWR results using an MFJ 269 Antenna Analyzer are shown in Figure 6.

Measured SWR on the 2 meter band was below 1.5:1 across the whole range from 144 to 148 MHz, with a broad minimum SWR of 1.1:1 centered on 146 MHz, as designed. On the 70 cm band, SWR was below 2.5:1 from about 433 to 450 MHz, with a minimum of 1.2:1 at about 438 MHz — not ideal, but usable.

Finally, on-air operation proved that the antenna could be used to bring up the local 2 meter repeaters as well as several 70 cm repeaters in a 30 mile radius using low to mid power levels with an mobile transceiver. A number of contacts around the area on both bands confirmed performance.

Conclusions

The dual band version of the Slim Jim antenna met my requirements as set out at the beginning of the project. Performance on both 2 meter and 70 cm appeared to be satisfactory. The antenna is easy to build, rugged, quite compact and can readily be hung from a tree. Copper pipe construction means the antenna is quite strong and fairly immune to damage. Tuning can be accomplished almost independently on each of the bands. The antenna works just fine for me since 2 meter is my preference, but if optimum performance on 70 cm is necessary, perhaps a separate dipole for 70 cm would yield lower SWR.

Notes

[1]**www.hamuniverse.com/g2bcxslimjimantenna.html**

[2]**www.cebik.com/content/a10/vhf/sj.html** (requires free registration).

[3]**www.m0ukd.com/Calculators/Slim_Jim/index.php**

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

[5]**guests.antennex.com/rooms/w4rnl/col0606/amod100.html**

Photos by the author.

ARRL member Al Peter, AC8GY, is a relatively new ham, but has a physics and engineering background and has been an active electronics experimenter for more than 50 years. After working in the engineering software and consulting field for over 30 years, Al is retired, lives in Cincinnati, Ohio and is active in the Milford Amateur Radio Club, MARC. You can reach Al at 2707 Lakewood Pointe, Cincinnati, OH 45244, or at **afp.ac8gy@gmail.com** *or through his website at* **www.ac8gy.com**.

TECHNICAL CORRESPONDENCE

BAOFENG UV-3R 2 M/70 CM HANDHELD TRANSCEIVER

◊The ARRL Laboratory obtained a Baofeng UV-3R 2 m/70 cm handheld transceiver for testing purposes. A key test we perform on every transmitter is the spectral purity test; that is, we measure all spurious emissions with our HP-8563E spectrum analyzer to see if the transmitter passes FCC Part 97 spurious emission standards.

Initial results of our test with the UV-3R showed a strong harmonic while transmitting on the Amateur Radio 2 meter band. FCC Rule 97.307(e) states in part, "For a transmitter having a mean power of 25 W or less, the mean power of any spurious emission supplied to the antenna transmission line must not exceed 25 μW and must be at least 40 dB below the mean power of the fundamental emission, but need not be reduced below the power of 10 μW. A transmitter built before April 15, 1977, or first marketed before January 1, 1978, is exempt from this requirement".

The specified power output of the Baofeng UV-3R is 2 W. For this transceiver to meet the requirement that any spurious emission must be less than 25 μW, then the second harmonic would have to be at least 49 dB below the fundamental. The unit we tested had a spurious emission level that was only 32 dB below the fundamental, or 1250 μW. See Figure 1.

The UV-3R running low power (measured at 25 mW) on 2 meters, fared no better, with a harmonic at 15 dB below the fundamental, or, 790 μW, as shown in Figure 2.

The ARRL Laboratory obtained a second radio for this same test. The results were worse, measured at only 26 dB below the fundamental while running 2 W on 2 meters. See Figure 3. In this case, the second harmonic has an RF power of 5000 μW. Both units, therefore, have the potential to cause harmful interference to Government mobile, satellite and fixed services outside of the Amateur bands. To legally transmit with these radios in the 2 m band, you would have to add a second harmonic low-pass filter at the antenna jack.

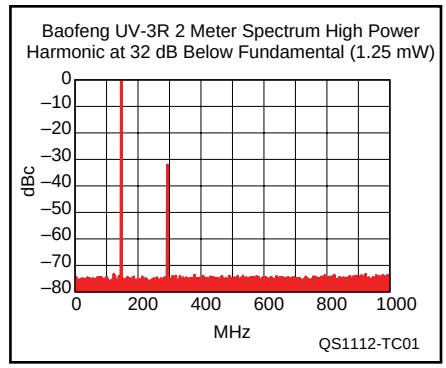


Figure 1 — The spectral output of the Baofeng UV-3R handheld transceiver operating at high power (2 W). The second harmonic of the 144 MHz signal is only 32 dB below the power of the fundamental. This is a transmitted second harmonic of 1.25 mW.

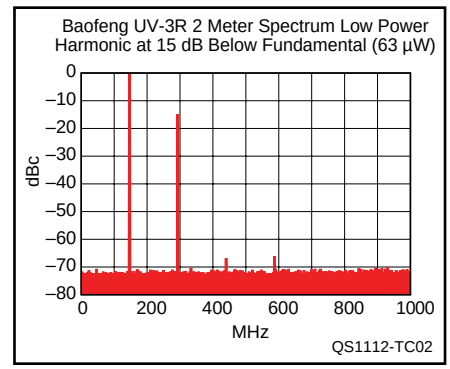


Figure 2 — The spectral output of the Baofeng UV-3R handheld transceiver operating at low power (25 mW). The second harmonic of the 144 MHz signal is only 15 dB below the power of the fundamental. This is a transmitted second harmonic of 790 μW.

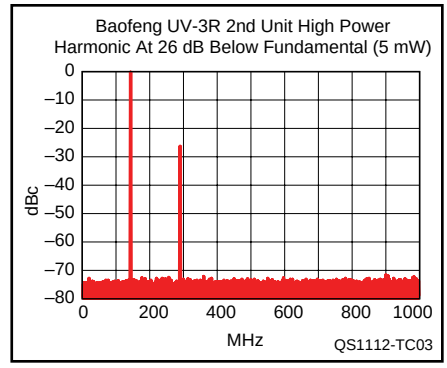


Figure 3 — The spectral output of the second Baofeng UV-3R handheld transceiver we tested, operating at high power (2 W). The second harmonic of the 144 MHz signal on this radio is only 26 dB below the power of the fundamental. The transmitted second harmonic from this radio is 5 mW.

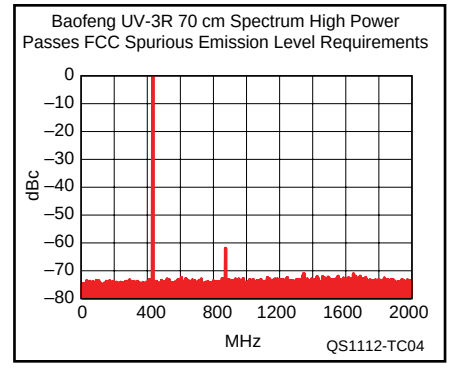


Figure 4 — Both of the Baofeng UV-3R transceivers we tested met the FCC spectral purity requirements on the 70 cm band. Here, the second harmonic of the 420 MHz signal is 62 dB below the 2 W fundamental signal. That's a transmitted second harmonic of only 1.25 μW.

Both Baofeng radios passed FCC Part 97 spurious emission requirements while operating in the 70 cm band, as shown by Figure 4. — *Bob Allison, WB1GCM, ARRL Lab Test Engineer*; **ballison@arrl.org**

"WA5ZNU shows us a modification for acceptable harmonic suppression": http://wa5znu.org/2011/06/uv3r-lpf/

Larry D. Wolfgang, WR1B ♦ Senior Assistant Technical Editor ♦ tc@arrl.org

New Products

NHRC-3.1 REPEATER CONTROLLER

◊The NHRC-3.1 is the third generation of the NHRC-3 Repeater Controller. The NHRC-3.1 offers many improvements over previous versions, including free *Windows*-based serial programming, an alarm input, an audio test function, active-high and active-low inputs, two digital outputs and two courtesy tone select inputs. The controller is programmable by sending DTMF sequences over the air, or with NHRC's free *Windows*-based programming software. The CW ID, hang time, ID timer, timeout timer and tail message counter are all user-programmable. Real speech ID and other messages can be recorded over the air. All programming is password-protected and stored in nonvolatile EEPROM memory. The NHRC-3.1 easily integrates with any repeater using either high- or low-going signaling. It has eight 30-second, user-recordable, nonvolatile voice messages that are used as three ID messages, two tail messages, a timeout message, a alarm-tripped message and a test message. It can also operate as a simplex repeater controller, storing and repeating up to 90 seconds of audio. Price: $179. For more information, or to order, visit **www.nhrc.net**.

PRODUCT REVIEW

FlexRadio Systems FLEX-1500 Software Defined HF+6 Meter QRP Transceiver

Reviewed by H. Ward Silver, NØAX
ARRL Contributing Editor
n0ax@arrl.org

While I've used software-defined radios (SDRs) before, I'd never had a chance to put one in my shack for an extended period. If you've not used an SDR, it's a "brave new world" of radio similar to what the operators of the 1940s must have encountered as post-World War II surplus gear flooded the market. In addition, the radio is now split in two — the receiver front end and transmitter output chain are in one box (the RF package) while everything else lives on a PC. Your interface to the radio is a computer screen and all of the gadgetry used to interact with it — a mouse or trackball and a keyboard, primarily.

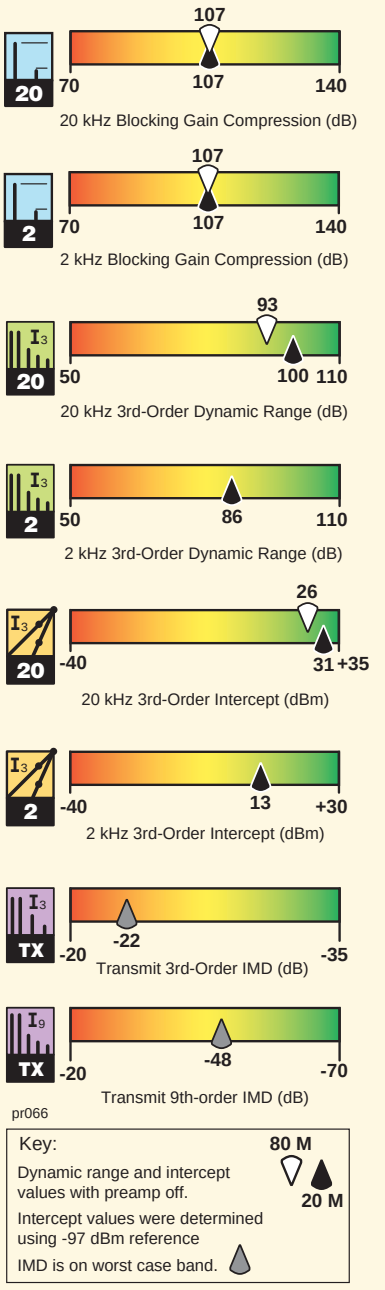
Just as the front panel of a traditional *BKAD* (big knob and display) radio essentially defines the radio's personality and suitability for different types of operating, the PC host software defines the SDR. In this case, the *PowerSDR* software package provided by FlexRadio Systems (**www.flexradio.com**) is the face of the FLEX-1500. The radio and the PC host work together, so I'll refer to them as the *FLEX-1500 system*.

The good news about the PC-based SDRs is that you have control over essentially everything. The bad news about them is also that you can control essentially anything! Managing that complexity to not get in the way of usability (also referred to as ergonomics) is part of successful radio design just as it is for any sophisticated technology. With SDR being so new to Amateur Radio, it's clear that we haven't begun to scratch the surface of its possible applications. Indeed, we're still figuring out what questions to ask!

QST has previously reviewed two other models in the current FlexRadio product line — the FLEX-5000A and FLEX-3000.[1,2] Those two models include 100 W transmitters and are designed to compete with traditional desktop transceivers. The FLEX-1500 is a very compact 5 W output transceiver for the QRP crowd. In addition, it includes features that make it useful as an IF for VHF

[1]R. Lindquist, WW3DE, "FlexRadio Systems FLEX-5000A HF/50 MHz Transceiver," Product Review, *QST*, Jul 2008, pp 39-45. *QST* Product Reviews are available to ARRL members online at **www.arrl.org/product-review**.
[2]S. Sant Andrea, AG1YK, "FlexRadio Systems FLEX-3000 Software Defined HF/50 MHz Transceiver," Product Review, *QST*, Oct 2009, pp 45-51.

Key Measurements Summary



Bottom Line

The FLEX-1500 provides excellent performance at an entry level price, assuming you have a satisfactory PC to host it. The Flexers, an active community of SDR enthusiasts, will become your best friends.

If you want a portable or mobile radio or don't like to use computer interface devices, I'd recommend staying with a traditional standalone rig. However, if you want to experiment and jump into SDR the FLEX-1500 makes for an easy route.

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

and UHF transverters.

During the previous FlexRadio transceiver reviews, we used various versions of *PowerSDR 1.x*. This review was our first opportunity to review an SDR with *PowerSDR 2.x* (specifically, version 2.2.3), which looks substantially different and more modern than the original version. *PowerSDR* is freely downloadable from FlexRadio's website and is updated regularly to improve performance and add features. The software went through several significant upgrades during late 2010 and 2011.

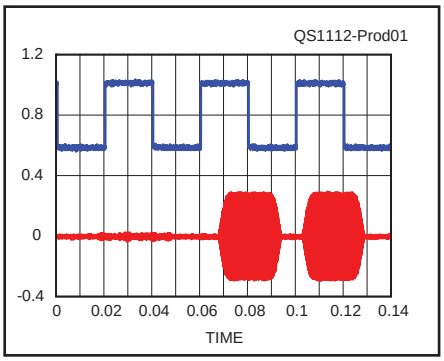


Figure 1 — CW keying waveform for the FLEX-1500 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 5 W output on the 14 MHz band. There is considerable delay between a key closure and the output of RF and sidetone audio — about 50 ms or 1½ dits in this case. Caused by latency in the USB interface, this can make sending CW difficult. Using an external keyer eliminates this problem.

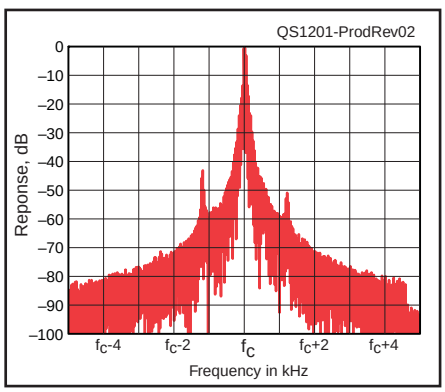


Figure 2 — Spectral display of the FLEX-1500 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 5 W PEP output on the 14 MHz band. This plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

Table 1
FlexRadio FLEX-1500, serial number 3010-0674

Manufacturer's Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 0.01-60 MHz; transmit, 1.8-2.0, 3.5-4, 5.3305, 5.3465, 5.3665, 5.3715, 5.4035, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive and transmit, as specified.
Power requirement: 13.8 ± 10% V dc; receive, 0.4 A (typical); transmit, 2.0 A (5 W out).	At 13.8 V dc: receive, 358 mA (max audio; transmit, 1.9 A (5 W out), 940 mA (50 mW out). Operation confirmed at 12.4 V dc (4.5 W output).
Modes of operation: SSB, CW, AM, FM, Digital	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity: 500 Hz bandwidth, 14 MHz MDS, preamp 0 dB, –116 dBm; preamp 20 dB, –127 dBm; 50 MHz, preamp 30 dB, –138 dBm.	Noise floor (MDS), 500 Hz DSP filter: *Preamp 0 dB* *10 dB* 0.137 MHz –104 dBm –115 dBm 0.505 MHz –111 dBm –120 dBm 1.0 MHz –115 dBm –125 dBm 3.5 MHz –114 dBm –124 dBm 14 MHz –116 dBm –126 dBm 50 MHz –114 dBm –126 dBm *Preamp 20 dB* *30 dB* 0.137 MHz –122 dBm –122 dBm 0.505 MHz –124 dBm –117 dBm 1.0 MHz –131 dBm –124 dBm 3.5 MHz –131 dBm –124 dBm 14 MHz –132 dBm –130 dBm 50 MHz –134 dBm –138 dBm
Noise figure: Not specified.	14 MHz, preamp 0/10/20/30 dB: 31/21/15/17 dB
AM sensitivity: Not specified.	10 dB (S+N)/N, 1-kHz, 30% modulation, 6 kHz bandwidth: *Preamp 0 dB* *10 dB* 1.0 MHz 14.3 µV 4.67 µV 3.8 MHz 13.2 µV 4.46 µV 50.4 MHz 13.5 µV 3.46 µV *Preamp 20 dB* *30 dB* 1.0 MHz 2.09 µV 1.80 µV 3.8 MHz 1.90 µV 1.80µV 50.4 MHz 1.55 µV 1.00 µV
FM sensitivity: Not specified.	For 12 dB SINAD: *Preamp 0 dB* *10 dB* 29 MHz 5.55 µV 1.60 µV 52 MHz 5.55 µV 1.00 µV *Preamp 20 dB* *30 dB* 29 MHz 0.76 µV 0.62 µV 52 MHz 0.58 µV 0.40 µV
Spectral display sensitivity, preamp 0/10/20/30 dB: Not specified.	–118/–128/–133/–132 dBm.
Blocking gain compression: Not specified.	Gain compression, 500 Hz bandwidth:* *20 kHz offset* *Preamp 0/10/20/30 dB* 3.5 MHz 107/107/104/87 dB 14 MHz 107/107/103/91 dB 50 MHz 106/107/107/101 dB *5/2 kHz offset,* *Preamp 0 dB* 3.5 MHz 107/107 dB 14 MHz 107/107 dB 50 MHz 106/106 dB
Reciprocal mixing (500 Hz BW): Not specified.	20/5/2 kHz offset: better than 107 dBc.**

First Impressions

The shipping carton is really small — the radio part of the system weighs just two pounds (see Table 1) and has no knobs or displays. No hand mike is provided (a Yaesu MH-31ABJ works — thanks to Jim, N5MU, for the loan). The coaxial power plug has a 2.5 mm center pin — larger than most but still a standard connector — and polarity is not marked on the case, so be careful if you're rolling your own. The user's manual with other documentation and a recent version of *PowerSDR* software are provided on a CD-ROM or USB thumb drive. It's a good idea to check the FlexRadio website regularly for the latest information.

The front panel holds the power switch along with connections for a USB computer

Receiver

Receiver Dynamic Testing

ARRL Lab Two-Tone IMD Testing (500 Hz DSP bandwidth)†

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–21 dBm	–114 dBm	93 dB	+26 dBm
		–18 dBm	–106 dBm		+26 dBm
14 MHz/Off	20 kHz	–16 dBm	–116 dBm	100 dB	+34 dBm
		–15 dBm	–106 dBm		+31 dBm
14 MHz/10 dB	20 kHz	–31 dBm	–126 dBm	95 dB	+17 dBm
		–27 dBm	–106 dBm		+13 dBm
14 MHz/0 dB	5 kHz	–30 dBm	–116 dBm	86 dB	+13 dBm
		–27 dBm	–106 dBm		+13 dBm
14 MHz/0 dB	2 kHz	–30 dBm	–116 dBm	86 dB	+13 dBm
		–27 dBm	–97 dBm		+13 dBm
50 MHz/0 dB	20 kHz	–18 dBm	–114 dBm	96 dB	+30 dBm
		–15 dBm	–106 dBm		+31 dBm

Second-order dynamic range: Not specified.	Preamp 0/10/20/30 dB: 14 MHz, +71/+63/+63/+63 dBm; 52 MHz, +71/+69/+69/+69 dBm.
DSP noise reduction: Not specified.	Variable, 14 dB maximum.
Notch filter depth: Not specified.	Auto notch: >60 dB single tone and two tones; attack time: 140 ms single tone, 200 ms two tones.
Adjacent channel rejection: Not specified.	20 kHz offset, preamp 10 dB: 29 MHz, 56 dB; 52 MHz, 58 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	10 MHz channel spacing: 29 MHz, 91 dB, 52 MHz, 92 dB.††
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: 53 µV (all preamps).
Squelch sensitivity: Not specified.	At threshold, preamp 10 dB, SSB, 1.3 µV; FM, 29 MHz, 0.8 µV; 52 MHz, 0.8 µV.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth):‡ CW (500 Hz filter): 332-868 (536 Hz); Equivalent Rectangular BW: 494 Hz; USB: (2.4 kHz): 265-2745 (2480 Hz); LSB: (2.4 kHz): 255-2740 (2485 Hz); AM: (6 kHz): 43-3092 (6098 Hz).
Image rejection: >70 dB (amateur bands).	100 dB.

Transmitter

Transmitter Dynamic Testing

Power output: 0.05-5 W PEP nominal.	CW, SSB, Digital, typically 0.05-5 W PEP on all modes and bands.
Spurious-signal and harmonic suppression: >48 dB on HF, >60 dB on 50 MHz.	HF (80 m, worst case), 56 dB; 50 MHz, 68 dB. Meets FCC requirements.
SSB carrier suppression: 55 dB.	65 dB.
Undesired sideband suppression: 55 dB.	53 dB.
Third-order intermodulation distortion (IMD) products: >32 dB below PEP at 14.2 MHz 7 MHz was the worst case.	3rd/5th/7th/9th order 5 W PEP: 7 MHz, –22/–38/–48/–48 dB; 14 MHz, –31/ –41/–51/–60 dB; 50 MHz,–32/–46/–55/<–60 dB.
CW keyer speed range: Not specified.	1 to 60 WPM.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Iambic keying mode: Not specified.	Mode A and B, menu selectable.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 210 ms.‡‡
Receive-transmit turnaround time (tx delay):	SSB, 200 ms; FM, 204 ms.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 2 × 4 × 6 inches; weight, 2 pounds.

Price: $649.

*Blocking level exceeds the threshold of ADC clipping.
**No reciprocal mixing occurred up to the threshold of ADC clipping.
†IMD input level exceeded the threshold of ADC clipping with preamp set to 20 or 30 dB at MDS and for –97 dBm measurements. ARRL Product Review testing 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 "IP3" column is the calculated Third-Order Intercept Point. Second-order intercept points were determined using –97 dBm reference.
††IMD input level exceeds threshold of clipping for 12 dB SINAD response at 20 kHz channel spacing.
‡Default values. Bandwidth and cutoff frequencies are adjustable via DSP. DSP set to 300-2700 Hz (SSB), –3500-3500 Hz (AM).
‡‡Turnaround time will not support PACTOR.

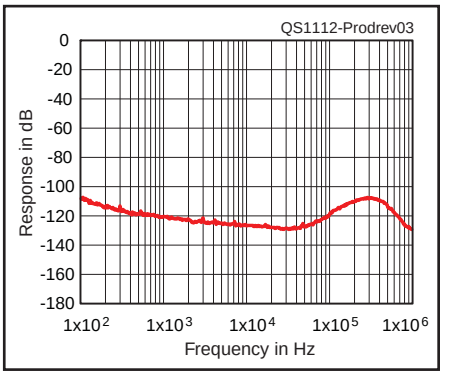


Figure 3 — Spectral display of the FLEX-1500 transmitter output during composite noise testing. Power output is 5 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

interface, headphones or speaker, microphone and key. Given that this enclosure will likely live somewhere under the desk, having the cables sticking out the front isn't the problem it would be on a BKAD rig.

In the back are the RF connections — antenna, transverter TX and RX ports and an external 10 MHz frequency reference input for high stability operation. The FlexWire port (not a FireWire interface) is a standard 9 pin DB style connector similar to the accessory ports on standalone radios. It contains line level audio input and output, PTT in and out, a low power 5 V output, and an I^2C serial interface for FlexRadio accessories.[3] There is no port that indicates what band the radio is on so band decoders for accessories will have to be controlled by the host PC.

PowerSDR installs and upgrades in a more-or-less standard way. Be sure any computer you intend to use meets the performance requirements and has the necessary ports for the radio and for all other accessories or interfaces. (See the discussion below on PC Dependencies.) *PowerSDR* can run in *Windows* emulators on Macintosh OS PCs. This is not supported by FlexRadio, however. (A group is working on *Linux* compatible host software.)

Part of the "first impressions" for the system is expected participation in the large FlexRadio user community of "Flexers." Hosted by FlexRadio, there are a large number of forums, support documents and FAQs with many active users who are willing to help with a problem. FlexRadio staff also monitor and participate in the discussions — a plus for radio manufacturers. Again in the good news-bad news category, while it's

[3]Inter-Integrated circuit, a simple two wire interface bus used to connect peripherals. See **www.i2c-bus.org**.

great that so much enthusiastic help is available, it's also an indication of the complexity (some might say "richness") of the system.

The Receiver and Transmitter

How does the FLEX-1500 system play as a radio? With all the software running and using the default settings, I found it to be very capable. The receiver sounded clean and the filtering is very good and smoothly adjustable — there are 10 preset widths for AM/SSB/CW/digital modes and two variable width settings for custom filters.

As you can see from the ARRL Lab measurements in Table 1, receiver performance is quite good. I spent some time steering the Flex around some very strong signals and found that while I could get it to "crunch," it took a very strong signal very close by. (I did find that Noise Blanker 1 is also prone to creating artifacts.) The Sherwood Engineering receiver evaluation tests (**www.sherweng.com/table.html**) confirm that the FLEX-1500 is "contest grade," currently ranked 10th in order of the demanding narrow spaced dynamic range performance.

I live in an urban area with plenty of noise sources, so the two noise blankers and the noise reduction feature got a workout on line noise, atmospherics and other miscellaneous junk. I also found the various notch filters — automatic and manual — to be useful. Audio output quality seems fine.

One of the nicer SDR type receiver features is the ability to select binaural or BIN mode in which one ear receives the I (in-phase) signal and the other ear gets the Q (quadrature) signal. The phase difference between channels gives the audio a quality in which the signal stands out more clearly from the random background noise, particularly on CW. (See *The ARRL Handbook* chapter on DSP and SDR for more on I/Q modulation techniques.)[4]

Transmitting on SSB is straightforward — plug in the microphone, tune to the desired frequency, and you're on the air. There is no VOX, per FlexRadio due to digitizer limitations. Mic gain, compression, and transmit audio filtering are all easily controlled through the *PowerSDR* slide controls. On the air audio reports were good.

Unfortunately, even after a number of improvements over the past year, CW performance using the internal keyer remains a problem because there is a significant delay (see Figure 1) between the fingers and what is sent over the air and as a sidetone. At any speed over 20 WPM, the delay made sending difficult for me even after optimizing the USB interface control settings. This is due to USB interface issues not under the control of *PowerSDR* as noted in the section below on PC Dependencies. I was able to use an external keyer with the FLEX-1500 sidetone turned off.

Figure 4 — The rear panel of the FLEX-1500.

Break-in operation causes clicks in the audio and sudden display changes that can be distracting. I'm sure this would become less objectionable with time but was still a problem for me after several days of use. There is a bit of a spur on the CW output as you can see in Figure 2, but overall, the composite noise output as shown in Figure 3 is low.

During initial testing in the Fall of 2010, our FLEX-1500 transmitter stopped working on 6 meters and we returned it to the factory for service. After repair (a bandpass filter had failed), testing revealed several issues including the CW keying latency discussed above, sidetone glitches, mediocre worst case transmit IMD on 40 meters and poor unwanted sideband rejection on transmit.

Subsequent versions of *PowerSDR* improved operation, and FlexRadio provided an alignment generator to adjust unwanted sideband suppression. The alignment procedure took about 5 minutes and increased the unwanted sideband suppression from 44 dB to 53 dB and the carrier suppression from 63 dB to 65 dB. All radios shipped in 2011 have had this alignment performed at the factory, and FlexRadio will provide an alignment generator on loan to those who have a FLEX-1500 shipped in 2010. Transmit IMD on 40 meters was still not great, but typical performance on the other bands is good.

Integrating the FLEX-1500 with Digital and Logging Software

Since the FLEX-1500 is already 99% digital, you would think that operating on the digital modes would come naturally. Well, not really. *PowerSDR* makes all the necessary signals available to digital engines that generate and process modulated digital signals, but you must first integrate the third party software. This is not trivial.

Connecting *PowerSDR* to popular digital packages such as *FLDigi* or *MMTTY* requires first installing and configuring a *virtual* serial port (VSP) then using the virtual audio cable (VAC) — both available from third party suppliers — to route the audio stream to your digital program. This process is documented reasonably well online — click FLEXRADIO WIKI on the FlexRadio home page. You will be directed through the process including troubleshooting and tips for new users. As of late September, instructions are available for nearly 20 different popular digital and logging software packages, including the *WSJT* suite of programs, *N1MM* and *N3FJP* contest logging programs, the popular *Ham Radio Deluxe* software, *Winlink 2000* and others.

Using FLEX-1500 with Transverters

I was able to use the radio with a Down East Microwave L222-28 transverter for the 1.25 meter band (222 MHz).[5] Use with transverters is a major feature of the FLEX-1500 and it did a good job. *PowerSDR* can store the system configuration for up to 15 different transverters, including LO offset, frequency range, gain, power and other parameters. These settings make *PowerSDR* look like you have a dedicated radio for that band. Having separate TX and RX ports is very useful.

Performance was fine and the interface consisted of one RF jumper cable plus a keying connection from the FlexWire port to the transverter. I used the 28 MHz band for the IF but a 2 meter IF would be more useful for microwave transverters. A 10 MHz frequency reference will provide adequate stability with the expense of an accessory GPS receiver or other laboratory reference. As it stands, the stock configuration FLEX-1500 will serve as an IF for operation through 1296 MHz.

[4] *The ARRL Handbook for Radio Communications,* 2012 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 6672 (Hardcover 6634). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[5] H. Ward Silver, NØAX, "Down East Microwave L222-28 1¼ Meter Transverter," Product Review, *QST*, Jul 2011, pp 50-51.

Configuration Tested

The FLEX-1500 was serial number 3010-0674. *PowerSDR* version 2.0.22 was used for ARRL Lab testing and version 2.2.3 was used for final operating evaluation. The laptop used was an HP ProBook 6540b running *Windows 7 Professional* with an i5 M520 CPU running at 2.4 GHz with 2 GB of RAM.

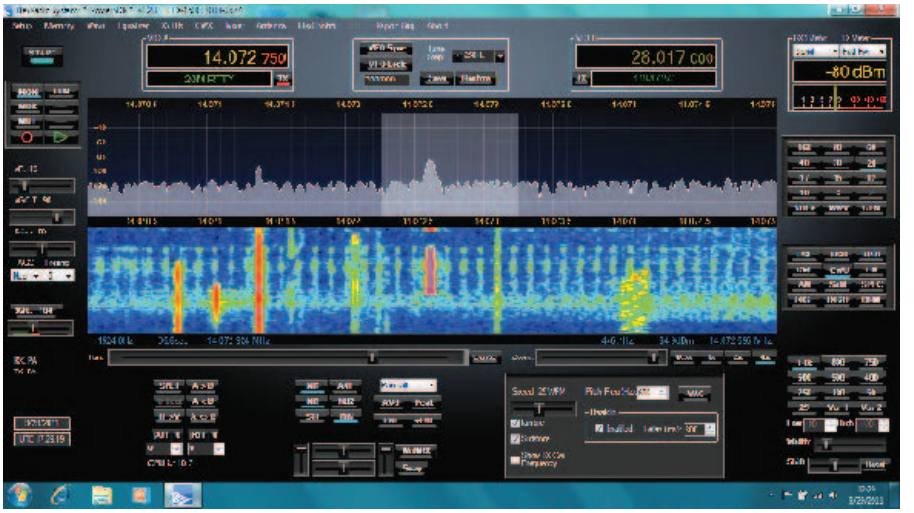


Figure 5 — The *Panafall* display combines the spectrum display of a panadapter in the top window and a waterfall on the bottom. This display shows several PSK31, RTTY and other digital signals on 20 meters around 14.072 MHz.

Figure 6 — A Panascope display shows both frequency domain (in the panadapter window) and time domain as an oscilloscope style trace on the bottom window. This is useful for CW and other keyed signals.

PowerSDR Features and Notes

A significant advantage of *PowerSDR* is its ability to present the spectrum in several different ways — for different operating styles. Figure 5 shows the *Panafall* display for several SSB signals on 17 meters, combining a panadapter (top) and a waterfall. Most operators will find this display mode best suited to traditional tune-and-call operation. Figure 6 shows a CW signal on the display in *Panascope* mode, pairing a panadapter with an oscilloscope style window showing filter output audio in the time domain.

In addition, the *Spectrum* mode zooms in to show the spectrum of just the filter output. *Histogram* mode shows the distribution of energy within the filter output over time. Two phase displays provide additional information for digital mode signals. Averaging and peak hold functions smooth and track longer term variations.

The user interface portion of *PowerSDR* has the functions and features one expects of a current radio, including a "second receiver" function (MULTIRX) that allows you to listen to two channels at once. Thankfully, the screen controls all use standard abbreviations and here's something you won't find on a BKAD rig — mouse-over labels appear when the cursor hovers over a control with a text explanation of the control function! I like that a lot!

Since *PowerSDR* is, after all, a PC program, you can set up a whole lot of memories, record signals directly off the air, and program all manner of messages. No third party applications are necessary — it's all integrated into the software.

PowerSDR uses a series of tabs to configure the system. This includes general configuration, memories and audio files, an audio equalizer, transverter interface configuration, and so forth. I prefer the PC screen to a series of nested one line menus.

There are still bugs to be worked out. Occasionally, the USB audio stream connection is lost and *PowerSDR* has to be taken in and out of standby. *PowerSDR* also completely lost contact with the radio more than once, requiring a full PC power cycle to recover. FlexRadio works hard to fix bugs in the system but there are a lot of layers to keep straight.

PC Dependencies

Without a doubt, the abilities of the host PC and its USB interface are the key to whether the FLEX-1500 will work properly and satisfactorily. DSP functions depend on the PC CPU clock speed and available memory — be sure you have enough horsepower to do the job or you'll be disappointed. You must have enough CPU capacity and memory available to *PowerSDR* —running other PC programs at the same time can degrade performance. The FLEX-1500 system will require a direct USB connection to your PC, not one through an external hub.

The CW latency is caused by limitations within the USB interface chosen by the PC manufacturer. Some PCs exhibit little or no latency problems while others are almost unusable at any speed. FlexRadio is working on this problem and there is a lot of discussion of it among the Flexers — but you should be aware that no matter how fast your CPU, if the USB system isn't implemented well, there will be latency issues with both CW and audio.

Philosophical Considerations

Whether the FLEX-1500 system will be right for you depends to some degree on your *radio weltanschauung* or view of the world. Is the system a platform for experimentation or a communications tool? The system's basic performance is good — it's well instrumented and very flexible. For use as a spectrum analysis tool, it makes a very nice piece of lab equipment! As a techie, I loved the multiple displays, meters and controls.

Flex 1500

If you own a tablet or smartphone with the appropriate application, scan this QR Code to see a video overview of the Flex 1500 transceiver. You can also watch this video on your computer by going to:

www.youtube.com/watch?v=uozpOaKnsog

They were so cool, it was almost more fun to tune around the band than to make contacts — and there's the rub.

A competitive operator will find the user interface too busy and the many controls simply too disjointed to operate without having to think about them, disrupting concentration. For example, using the CLICK-TUNE feature moves the spectrum across the display to center the filter in a fixed location. It's fast but all of the waterfall information has to be rebuilt. Does the operator move across the spectrum or vice versa? These and similar questions never had to be answered before SDR became a reality.

Certainly, there are knob style interfaces for the FLEX-1500 in the form of the FlexControl and the PowerMate but with all that computer power, using a knob feels like putting a set of reins on a motor car — it's obsolete in this new environment. What interfaces make more sense in an environment that displays wide swaths of spectrum? For example, DH1TW has adapted a DJ style interface as an SDR control. (**www.dh1tw.de/powersdr-ui**) This is a step in the right direction, freeing the operator from the BKAD interface developed 80 years ago.

I get the distinct impression as SDR implementations continue to evolve, that we are in an era very much like the early automobiles during which many driver "interfaces" were tried, some copied from sailboats, some from the horse and buggy and others completely new — such as the steering wheel. The FlexRadio series of radio systems have one foot in the past and another in the future. It will depend very much on the tastes, preferences and traditions of the operators as to which foot they prefer.

Manufacturer: FlexRadio Systems, 4616 W Howard Ln, Suite 1-150, Austin, TX 78728; tel 512-535-4713, fax 512-233-5143, **www.flex-radio.com**.

Feedback

◊ Mario Sousa, KB1DMT, of Newington, Connecticut, was erroneously listed in "Silent Keys" [Oct 2011, p 103]. It was Mario's father, who shared the same name and city, who actually passed away.

◊ In "The Care and Feeding of a 3-500ZG Amplifier" [Oct 2011 pp 40-41] there were a few errors in the approach that will be discussed in detail in "Technical Correspondence" for January 2012. Of particular note is that the design filament voltage is actually 5.0, not 4.8 V. In addition, the article did not account for the additional drop in the ac power feed when the amplifier is at full power. The example amplifier, the Ameritron AL-80B, includes taps for multiple line voltages that should be used to establish proper amplifier operating conditions, as described in the manual.

◊ In "A Four Tone SSB Test Generator" [Nov 2011, pp 38-41] there are two connections missing from Figure 4. There should be a connection from the common connection of S3 to the junction of R4 and C3 and C5, and a similar connection from the common connection of S4 to the junction of R6 and C7 and C9.

◊ A photo caption in "ARRL Board of Directors Looks Ahead to 2014 — and Beyond" [Oct 2011, p 78] incorrectly identifies Dwayne Allen, WY7FD, as Rocky Mountain Division Director. Dwayne is actually the Vice Director.

◊ The front cover description of the CE9 DXpedition [Oct 2011] should have more precisely referred to the DXpedition islands as Subantarctic.

◊ *Clarification:* "Automating the Ameritron RCS-10 Remote Antenna Switch" [Oct 2011, pp 34-36] says that band data in BCD form are available from Kenwood, Yaesu and Elecraft transceivers. It appears that Kenwood transceivers do not provide band data in that format.

In The November/December 2011 Issue:

- Tom Apel, K5TRA, describes the construction of 902 and 1296 MHz coaxial collinear antennas with the coaxial elements wrapped into a helix in "A New Horizontal Polarized High Gain Omnidirectional Antenna".
- Dave Gordon-Smith, G3UUR, presents "The Design of Mixed-Coupling LC Band-Pass Ladder Filters" with third, fourth and fifth order design examples. Tables of normalized design coefficients are included.
- Ian Cowan, VK1BG, describes the steps he took to quiet the RF noise generated by an inexpensive switch mode power supply that he purchased to operate a broadcast receiver and a Yaesu FT-897 Amateur Radio transceiver in "Taming the SMPS Beast." This article has been picked up from *Amateur Radio*, the monthly journal of the Wireless Institute of Australia.
- Ralph Gable, WA2PUX, describes the hardware and software he uses with an RS-232 Ethernet adapter and phone patch for "Remote Rig Operation."
- Ron Skelton, W6WO, examines "Multi-Band Operation of Near-End-Fed Wire Antennas." This article reports on further research as a follow-up to his March/April 2009 *QEX* article on near-end-fed wire antennas.
- Ray Mack, W5IFS, introduces an inexpensive DSP development platform, the Texas Instruments TMS320C5535 eZdsp board in his "SDR: Simplified" column. Ray explains how to install the software for this evaluation kit, and describes a basic DDS implementation. Then he shows us how to create a simple FM transmitter using the DSP chip on the evaluation board.

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**.

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New Products

COMET CHV-5X MULTIBAND ROTATABLE DIPOLE

◊The CH-5VX from Comet is a rotatable dipole for the 40, 20, 15, 10 and 6 meter bands. This compact antenna is approximately 13 feet long and weighs less than 6 pounds. It can be assembled in a V, horizontal or ground plane configuration. Each band may be tuned independently. The rated 1.5:1 SWR bandwidth ranges from 22 kHz on 40 meters to 140 kHz on 10 meters to 1.8 MHz on 6 meters. Maximum power is 150 W SSB on 40 and 20 meters, and 220 W SSB on 15, 10 and 6 meters. Construction uses aluminum elements and stainless steel hardware and a balun is included. A mast 1 to 2.5 inches diameter is required. Price: $340. For more information, see your favorite dealer or **www.cometantenna.com**

W1ZR

THE DOCTOR IS IN

Q Michael, NØHPU, asks: I have taken down my tower and removed my antennas. I am now thinking of rebuilding the triband HF and 2 meter Yagis. If I have the antennas anodized to reduce corrosion, what effect will this have on the radiating properties of the antennas? The tuning and contact points will not be anodized because anodizing these points would make them non-conductive. I am worried about skin effect as the radiating surface will no longer be conductive. I checked with the company I will be using to do the anodizing and they say to figure a relative dielectric constant of 8 under real conditions and coating thickness of 0.001 inch.

A My version of *EZNEC Pro* allows me to model insulated conductors and I used that to made a comparison of the performance of 20 and 2 meter dipoles of aluminum tubing with and without the insulating coating. I also included the loss tangent of aluminum oxide at RF (0.0003), so it should be a fairly complete picture.

Insulated wire antennas have a lower resonant frequency than bare wire by typically 1 to 2%. I expected to observe this effect to some extent and did. The 1 inch diameter 20 meter element had its frequency lowered by about 5 kHz — probably not noticeable in most circumstances. A 2 meter element of ½ inch diameter was lowered by about 75 kHz, a similar percentage, but perhaps noticeable in a large, narrowband array. Shortening the elements just a bit (about 0.01 inches on each side) should get you back to the same place.

The even better news is that *EZNEC* predicts that the signal level is unchanged on both bands, at least to within its resolution of 1/100 dB.

Q Mike, KF6KXG, has heard advice to not hook up more than one transceiver to an antenna switch. He would like to use two switches, one to select transceivers and the other to select an antenna as shown in Figure 1, using only one transceiver and one antenna at a time. The transceivers range from 5 to 100 W PEP output. The concern is that the power coming back through the unused switch ports may be enough to damage the input circuitry of modern transceivers. The switches he will use are specified at 60 dB isolation. He asks: Do you think I will have damage to one transceiver while transmitting on another?

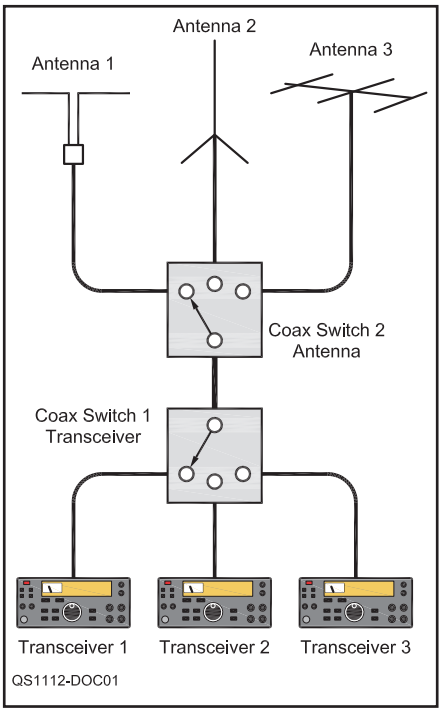


Figure 1 — The use of two coax switches to select among multiple transceivers and antennas. The port-to-port isolation of the transceiver switch is the most important for receiver protection and the unused transceivers should be switched to a different band from the transmitter and be powered down.

A Well, the short answer is that there is always a possibility of damage — as is also the case with two transceivers each connected to its own antenna. One problem is that I have almost never received an answer from a manufacturer as to what the safe limit is for RF into an amateur receiver — and I think I have asked them all. We can easily test for overload, but, by its nature, damage testing requires destruction of equipment. The one exception is the 1950s vintage 75A4. It had a sticker on the antenna connector that said "Do not exceed 50 V." That translates to 50 W at 50 Ω, or 47 dBm. I'm sure that most solid state equipment has a much lower threshold.

It is also true that, depending on the front end design, many transceivers will be more likely to suffer damage at a given level if turned on than if turned off. The push to more linear RF amplifiers and mixers for good IMD performance has one downside — the amplifiers tend to amplify even very strong signals. If powered off it is mostly the first stage at risk, while a transceiver that is turned on may subject downstream stages to even stronger signals.

One data point we do have is that we routinely go up to a +10 dBm input level in our Product Review blocking and third order dynamic range testing. Thus any radio we've tested in recent years has been able to handle that. We have also measured signals as high as +20 dBm at W1AW between antennas while code practice is sent at 1 kW and we "listened" on every other antenna with a microwattmeter. We have lost front ends of some equipment over the years, but can't pinpoint the blame, so the safety of this level is questionable.

Your 100 W transceiver and 60 dB isolation switch should result in a maximum of 50 dBm (100 W output) – 60 dB (isolation) or –10 dBm at the receiver. Based on +10 dBm as a presumed safe level, that gives you a 20 dB margin — but only if all is operating per spec. There are a number of things that could go wrong:

- A switch failure. The likelihood of this depends on switch construction.
- The 60 dB isolation specification likely assumes a proper load termination. A high SWR, for example if a transmitter is switched to an antenna for the wrong band, could result in more power than you thought coupling at the switch.
- Loose coax connectors can result in sneak paths around the switch.

I was just talking to Test Engineer Bob Allison. He reports that he has been doing exactly what you are talking about at his station for years with up to 400 W PEP and has never had a problem. He has been using an old B&W coax switch — probably not as fancy as yours.

If you are concerned about this problem, an alternative approach is to make a patch panel with ports for antennas and for transmitters. If you make them in two separate rows, there should be little room for confusion — this is what is used at W1AW (see Figure 2). To be even safer, use different type connectors — say UHF type jacks for

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

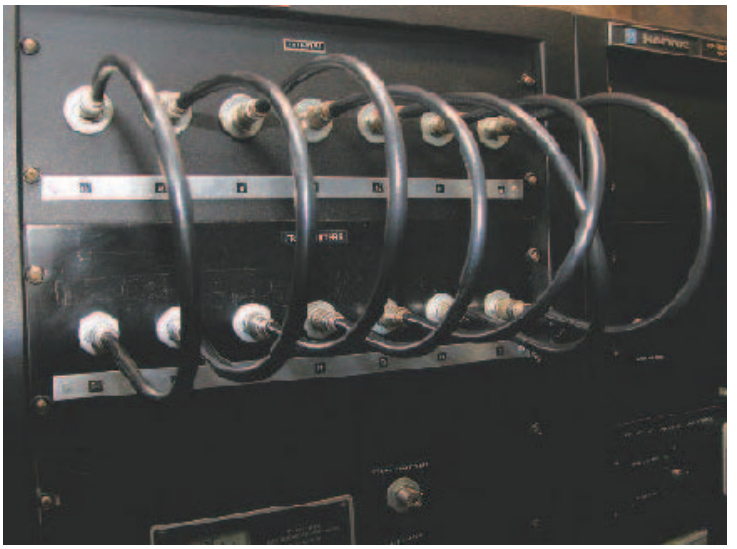


Figure 2 — The patch panel at W1AW is used to interconnect transceivers (bottom row) and antennas (top row) without the need for switches.

transceivers and BNC jacks for antennas. With patch cables with a UHF plug on one end and BNC on the other, you (or more likely a guest operator) will be unable to accidentally connect two transceivers together.

Q Jim, NØESD, asks: Is it feasible to splice coax without the use of fittings and a barrel connector?

A Well, I know it's feasible because I've done it. I made a thin "Western Union" style splice (Figure 3) of the inner conductor, carefully wrapped it with electrical tape and then pushed the shield segments over the tape and soldered them in a ring surrounding the splice. I then covered the whole splice with a good layer of tape.

From an electrical standpoint, I think it is about as good as using the usual "barrel" connector (PL-258) with UHF plugs (PL-259). That combination is not particularly impedance matched either.

The reason that this is not recommended is that there are a number of mechanical limitations. The most serious, in my experience, is that the inner splice always seems to have some high or pointed ends. These will try to work through the tape and short out, or at least reduce the breakdown voltage. This is especially true if the joint gets flexed a time or two. It is also more subject to moisture penetration than a properly sealed PL-258/9 arrangement.

I view this as an "emergency use only" solution. The consequences of a sudden short can be disastrous to a transmitter, and don't help much on receive either!

Q Frank, W2NJ, asks: We know that the loss in a coax transmission line can increase dramatically with increasing SWR. Generally, the SWR is a result of a mismatch between the transmission line and the antenna at a given frequency. But what about over-the-air signals at that frequency which arrive at the antenna and present a voltage at the antenna input end of the coax? If the transmission line is matched to the transceiver through an antenna tuner, do these signals see a low SWR and lower loss in the direction?

The question came to me as I was chasing a DX station on 20 meters. I was switching between antennas. One antenna (a 20 meter dipole) is fed with low-loss open-wire line, but points in the wrong direction. The other is a coax fed vertical wire designed for 40 meters that has high SWR that my tuner can compensate for. Nonetheless, the latter gave me the stronger received signal. So, if reciprocity applies in this case, I should stay with the vertical antenna even though logic would suggest otherwise. But, the question is, does reciprocity apply in this case?

A Good question. There are a couple of parts to this. First, at the receiver the load of the coax is the input of the receiver side of the transceiver. The antenna tuner, if carefully adjusted on transmit, will also match the antenna system to a 50 Ω load on the receive side. The antenna side of the antenna tuner, however, will not be at 50 Ω, but will equal the impedance of the antenna as transformed by the mismatched coax. Thus that load will be a mismatch of about the same magnitude that the coax sees at the antenna and the losses in the coax will be comparable. The total effect is such that the application of the reciprocity theorem is appropriate and the antenna with the strongest signal should be selected.

Note that the strongest signal is not necessarily the one you can hear the best. Any noise or interference that is received by your antennas will be different from that heard at the far end, so the antenna that has the strongest S-meter reading is the one to pick. This is because you are trying to maximize the signal-to-noise ratio at the distant station, not at your receiver.

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

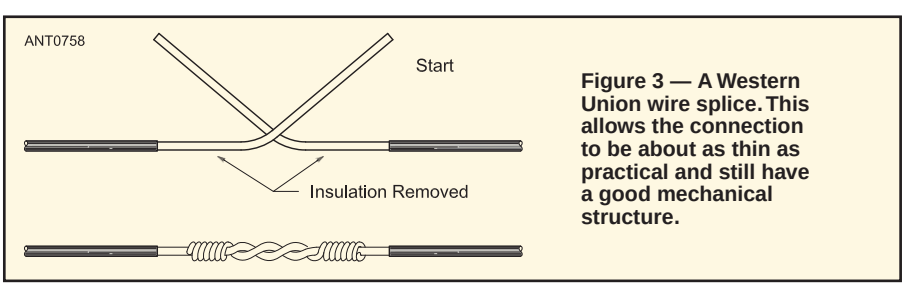
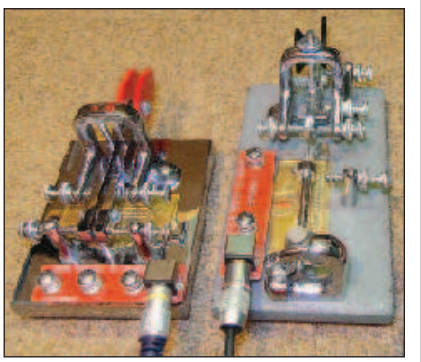


Figure 3 — A Western Union wire splice. This allows the connection to be about as thin as practical and still have a good mechanical structure.

New Products

CABLE TIDY FROM G3LIV

◊CableTidy from Johnny Melvin, G3LIV, is designed to provide a neat and clean cable termination for Vibroplex keys. CableTidy is a PC board with connections to suit the following Vibroplex keys: Iambic, Original Bug and J-36. The PC board is double sided, silver plated with plated through holes and available in red or black to match the Vibroplex fingerpieces. It is terminated in a 4 pin Mini DIN jack and a cable is supplied for rig connection. Price: £20 (about $33). For more information, or to order, see **www.g3liv.co.uk**.



NØAX

HANDS-ON RADIO

Experiment 107
PCB Layout — *Part 1*

We've done quite a few simple tasks with the *LTspice* circuit simulation package and I hope many of my readers have added it to their ham radio toolset.[1] This month we are going to embark on a multicolumn adventure of learning to use the next set of computer based electronic tools, the schematic editor and PC board layout program. The result will be a practical gadget for the mobile or portable operator!

Ready, Fire, Aim!

Not so fast — don't fire up the web browser just yet! If you'd like an overview of the schematic-entry and PCB CAD (printed circuit board/computer aided design) process, check out the Computer-Aided Circuit Design chapter of *The ARRL Handbook* in which Dale Grover, KD8KYZ, lays out a comprehensive overview of the use of PCB CAD tools.[2] This particular set of columns will teach with a specific example. We'll take a circuit from concept, through simulation, all the way to the schematic editor and PCB layout software. Ordering circuit boards and then populating them with components will result in a working model of our "product." Ready? Okay, let's begin.

The Product Definition

The product will be a means of detecting when battery voltage drops below some predetermined level, disconnecting the load and preventing running down the battery any further. Those form our three *functional requirements* for the product. Let's go further and come up with electrical *performance specifications* for those requirements.

Most automotive batteries are considered discharged when terminal voltage falls to 10.5 V at some level of current. We'd like our device to disconnect the load before we reach that level since it would be nice to be able to start the car. Since not all of us have the same comfort level about discharging our battery nor do we want to use expensive precision components, we'll make the *setpoint* for the circuit adjustable. Let's design for a range of 10.5 to 11.5 V.

Another characteristic of batteries is that their terminal voltage changes with load current due to internal resistance: the higher the load current, the lower the terminal voltage. If we simply sense when battery voltage falls below a certain threshold, that might happen on a single transmitted code element or spoken syllable. The battery would still have plenty of charge, even though its voltage might drop for short periods. To prevent prematurely disconnecting the load, the circuit should wait until battery voltage falls below the selected threshold for some minimum amount of time. Because of the wide variety of batteries and loads, let's take a relaxed approach and allow 30 seconds before disconnecting the load.

If the circuit continues to draw current, it might discharge the battery on its own! We want the circuit to operate only when activated by the operator, and once it disconnects the load we want the circuit to de-activate and stay that way until the operator turns it back on. This is called a *latching* function — it turns off and stays off!

Voltage Sensing

Sensing voltage can be performed by a *comparator* circuit as described in Hands-On Radio Experiment 11. A simple voltage-sensing comparator circuit is shown in Figure 1 after you enter it into *LTspice*.

We'll use the LT1841 dual, general-purpose comparator for this circuit. With LTspice running, you can find that part by clicking on the COMPONENT symbol in the tool bar. Scroll to the left in the parts list and you'll see [COMPARATORS]. Double click this label to access the list of comparators provided with *LTspice* and select the LT1841.

With the schematic created, be sure to add labels to the various connections or "nets" as shown by right clicking the wire line, select LABEL NET, enter the label in the provided window, then press ENTER. The text label box will appear and can be assigned to a wire or net by positioning the connection dot of the box on the wire and clicking once.

Battery voltage is represented by the voltage source, V1, which is set to 12 V. A voltage reference for the comparator, V_{REF}, is established by a 6.2 V Zener diode, D1. Select ZENER from *LTspice*'s list of components, place it on the schematic, then right click and select PICK NEW DIODE to find the exact part in the figure. (We're going to change this diode to a different part number when we design the final circuit, but this part was in the *LTspice* component library.) R3 limits the current through D1 to (12 – 6.2 V) / 10 kΩ = 0.58 mA. C2 acts as a noise and RFI filter.

R1 and R2 divide the battery voltage with C1 acting as a noise and RFI filter. (Note

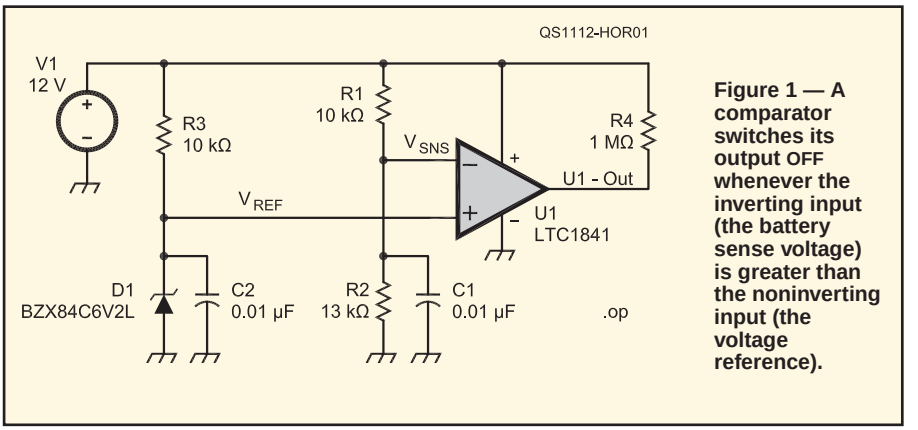


Figure 1 — A comparator switches its output OFF whenever the inverting input (the battery sense voltage) is greater than the noninverting input (the voltage reference).

[1] *LTspice* is discussed in Hands-On Radio experiments 83-86 and 105-106. All previous experiments are available to ARRL members at **www.arrl.org/hands-on-radio**.

[2] *The ARRL Handbook for Radio Communications,* 2012 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 6672 (Hardcover 6634). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

H. Ward Silver, NØAX ♦ 712 Jefferson St, St Charles, MO 63301 ♦ n0ax@arrl.org

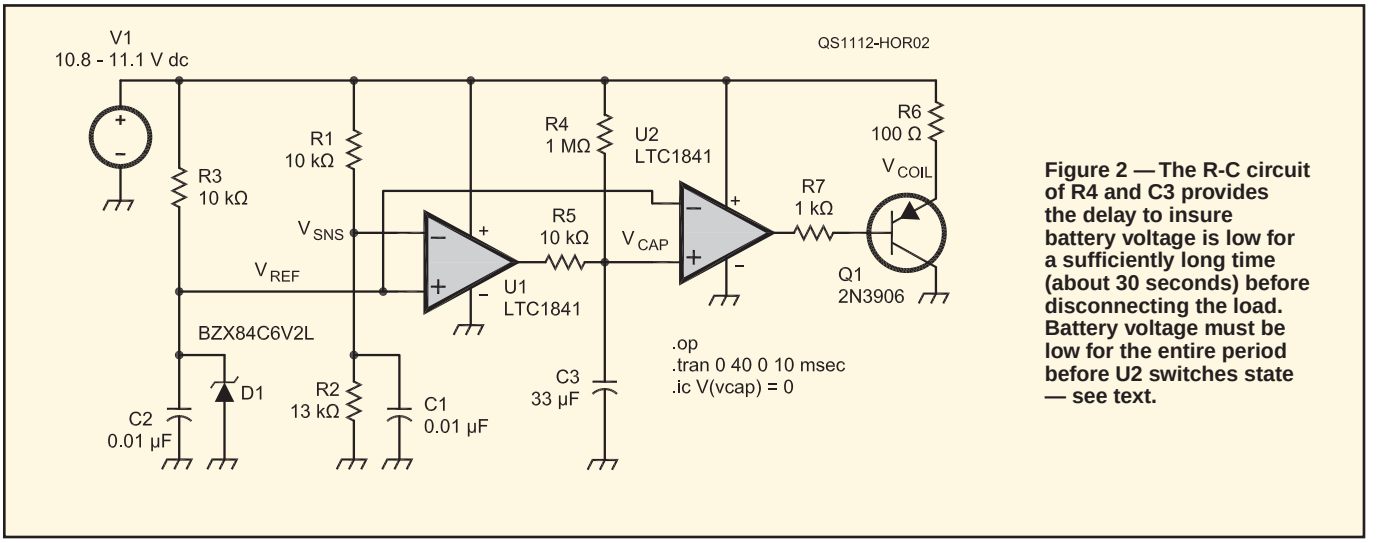


Figure 2 — The R-C circuit of R4 and C3 provides the delay to insure battery voltage is low for a sufficiently long time (about 30 seconds) before disconnecting the load. Battery voltage must be low for the entire period before U2 switches state — see text.

that adding these small capacitors costs little and can save a lot of grief if using sensitive circuits in environments where there is likely to be strong RF.) I arbitrarily set R1 to 10 kΩ and solved for R2 so that the battery sense voltage, V_{SNS}, will equal V_{REF} when the battery voltage is 11 V, exactly in the middle of our sensing range of 10.5 to 11.5 V.

$$R2 = 6.2\ V \times 10\ k\Omega / (11 - 6.2)$$
$$= 62 / 4.8 = 12.92\ k\Omega$$

A standard value of 13 kΩ will be fine.

Because V_{REF} is connected to the comparator's noninverting (+) input, whenever V_{SNS} is greater than V_{REF}, U1's open-drain output circuit will turn ON and pull the voltage at R4 low, labeled U1-OUT.

Simulate this circuit by selecting EDIT SIMULATION CMD from the SIMULATE menu. Select the DC OP PNT tab and click OK. Place the simulation symbol anywhere on the schematic and op. will appear when you click. Select RUN from the SIMULATE menu and the OPERATING POINT LIST will appear in a small window. In the list of node voltages, you'll see V(V_{REF}): 6.15858 VOLTAGE. This is the voltage reference value, V_{REF}. Also look for V(V_{SNS}) and V(u1–out). V_{SNS} will be slightly greater than V_{REF} and so the comparator's open-drain output will be ON and the voltage will be close to ground.

Now lower the battery voltage in steps of 50 mV, starting at 11.1 V. Rerun the simulation at each step and watch V(u1–out). At some point, the comparator output voltage will jump to nearly 11 V as the comparator's output turns OFF. In my circuit, that occurred when the battery voltage reached 10.85 V. The difference from 11 V is mostly due to the value of R2 being 13 kΩ instead of the exact value required.

Delays, Delays

Now we need a circuit that will detect when U1's output is OFF for the prescribed period of time. A comparator will do this job, too, with U2 and the basic R-C circuit of Figure 2. The simplest method of switching large currents is an electromechanical relay, but since *LTspice* doesn't include a model for a relay, I've simulated the relay's coil with R6, a 100 Ω resistor. To carry the 50 mA or more typical of 12 V dc relay coils, a 2N3906 PNP transistor (Q1) is used to do the heavy lifting.

When the battery voltage is above the setpoint, the open-drain output of U1 is ON, keeping C3 discharged through R5 and the output of U2 ON and close to ground. This allows base current to flow in Q1 — about (11 – 0.7) / 1 kΩ ≈ 10 mA — turning it ON and allowing current to flow through R6.

If the battery voltage drops below the setpoint, U1's output is turned OFF and becomes an open circuit, allowing C3 to charge through R4. When the voltage on C3 exceeds V_{REF}, U2 switches its output to an open circuit. This also turns OFF Q1 as shown by Figure 3, in which you can see C3 charging and U2's output turning OFF.

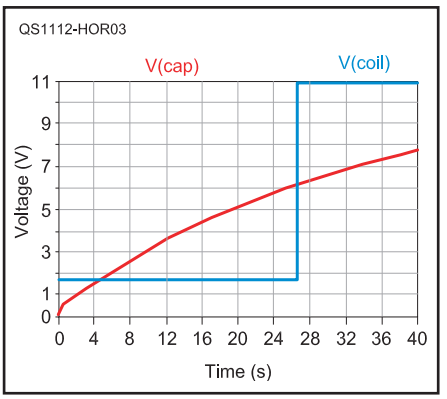


Figure 3 — As the R-C circuit charges, the voltage on C3 eventually exceeds the voltage reference, V_{REF}, at 6.2 V. At that point, U2 switches its output to an open circuit, turning off Q1 and the current through R6, which simulates a relay coil.

It's All About Timing

How large must C3 be to charge from 0 V to V_{REF} in 30 seconds? To find out, we'll need to solve the equation for capacitor voltage in our R-C circuit:

$$V_{REF} = V_{BATT}\left[1 - e^{\frac{-t}{RC}}\right] \qquad \text{[Eq 1]}$$

where V_{BATT} is the battery voltage. Having selected R = 1 MΩ, the solution is:

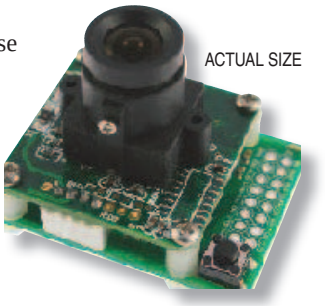
$$C3 = \frac{-t}{R4 \times \ln\left(\frac{V_{BATT} - V_{REF}}{V_{BATT}}\right)}$$
$$= \frac{-30\,s}{1\,M\Omega \times \ln\left(\frac{4.8}{11}\right)} = 36.2\,\mu F \qquad \text{[Eq 2]}$$

where ln is the natural logarithm, $\log_e$. The closest standard value for C3 is 33 µF and that will result in a charging time of about 10% less than 30 seconds, which is acceptable.

If battery voltage climbs back above the setpoint while C3 is charging, U1 will turn ON again, discharging C3 through R5. R5 is required to limit the current through the open-drain output to no more than V_{BATT} / 10 kΩ = 12 mA which is a safe value for IC outputs.

To simulate the entire circuit, you'll need to configure the TRANSIENT SIMULATION command. Set the STOP TIME to 40 seconds and the MAXIMUM TIMESTEP to 10 ms. The timing capacitor should also be discharged at the start. This can be done with a *Spice* directive to SET INITIAL CONDITIONS for the voltage across C3. Click the SPICE DIRECTIVE symbol on the toolbar (op.) or select SPICE DIRECTIVE from the EDIT menu and enter IC. V(VCAP)=0, then click OK and place the text on the schematic. Now, when you run the transient simulation, it will begin with C3 discharged. QST

Argent Data Systems SSTVCAM



As I've probably stated before in these pages, I am a lover of clever electronic gadgets. The Dayton Hamvention® is ham gadget central, so it was fitting that Argent Data Systems would use this year's gathering to pull the wraps off a new device that snagged my attention in a heartbeat: the SSTVCAM.

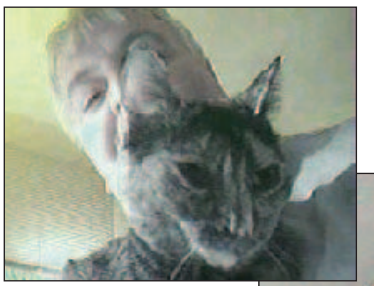
For those not familiar with SSTV, a brief introduction is in order. Slow Scan Television, or SSTV, is 50 year old technology that takes a still image and encodes the visual information into a series of tones that can be transmitted by any analog voice transceiver. If you eavesdrop around 14.230 MHz, you'll likely hear the rhythmic screeches and pulses of SSTV transmissions. At the receiving end these tones are decoded and the resulting image is displayed in all its glory.

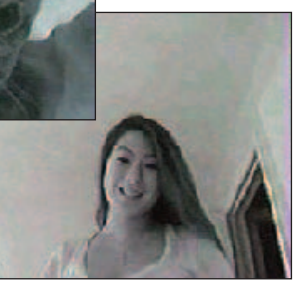
From its inception until the mid 1970s, the only way to view an SSTV image was to use a special "long persistence phosphor" monitor. The monochrome image would display slowly, beginning at the top of the screen and scrolling downward over several seconds. By the time the bottom of the image was visible, the top was fading. Then the cycle would repeat.

The introduction of microprocessor technology allowed images to be captured and frozen for easy viewing, and in color no less. At the turn of the 21st century, computer sound cards revolutionized Amateur Radio digital communications and spurred a plethora of new modes such as PSK31. SSTV benefited from sound card technology as well. Within a couple of years, hams were using sound-card-equipped computers to swap SSTV images, often using free software such as *MMSSTV* (**http://hamsoft.ca/pages/mmsstv.php**). Soon afterward digital SSTV arrived on the scene, but that's a separate story for another time.

SSTVCAM

SSTVCAM is a tiny 1.5 × 1.28 inch module that consists of two circuit boards stacked atop one another and crowned with a digital camera lens. When the SSTVCAM is triggered, either by physically pressing a button on the circuit board or by grounding the SEND line, the camera snaps an image of whatever is in its field of view at that moment. Depending on how you've configured the SSTVCAM, it will store that image in memory (it has room for up to eight images) or encode the image into the desired SSTV format and send the resulting audio tones to your radio. The SSTVCAM is also equipped with an open-collector Push-To-Talk (PTT) line so it can automatically toggle your radio into the transmit mode.





The author and his cat send an SSTVCAM image on 2 meter FM simplex.

The author's daughter strolls into the room just as the SSTVCAM timer triggers a transmission on 10 meter SSB.

SSTVCAM can also be configured to send images automatically at intervals ranging from once every 10 seconds to once every 20 minutes. The automatic function has obvious applications for projects such as high altitude balloons.

The SSTVCAM draws a mere 75 mA from a 9 V battery when transmitting and 3.5 mA when idle. It weighs only a third of an ounce.

Out of the Box and On the Air

The SSTVCAM arrives in a suitably miniscule box with no documentation whatsoever. You need to get on the Internet and print the instructions at **http://wiki.argentdata.com/index.php/SSTVCAM**.

With the instructions at hand, your next task is to construct a cable to connect the SSTVCAM to your radio or any other devices of your choosing. Even if you are blessed with 20/20 vision, I can almost guarantee you'll need a magnifier to help you find the proper connection points on the circuit board. The connection points are very close together, so you must take care and use a soldering iron with a fine tip. An alternative approach is to use a 16-pin header to make the connection.

While I can't say the SSTVCAM is a plug-and-play device, once you have the wiring in place, it works quite easily. For this review I used a Yaesu FT-817 transceiver and connected my homebrewed cable to the DATA port on the radio's rear panel.

My first test was on 2 meter FM simplex with the FT-817 in the DIGI mode. I pressed the button on the SSTVCAM and about 8 seconds later it keyed the FT-817 and sent an image. I used *MMSSTV* software with my Kenwood TS-2000 transceiver to receive and decode several images. Next I set up the SSTVCAM to capture and send images every 10 minutes on 28.700 MHz SSB. Again, it worked perfectly. See the accompanying screen captures.

If you are savvy enough to set up serial communications between the SSTVCAM and a suitable terminal program on your computer, you can also embed your call sign into the SSTVCAM's memory and this will display at the top of the frame when you send an image in one of the Scottie modes.

Lots of Potential

SSTVCAM has uses only limited, as the cliché goes, by your imagination. Someone is bound to put one of these in a high-altitude balloon payload, or set it up on VHF or UHF as a remotely triggered camera. Considering the size and weight, plus the fact that it can be hooked up to any voice transceiver, the SSTVCAM is hard to beat.

Manufacturer: Argent Data Systems, 543 W Betteravia Rd, Suite H, Santa Maria, CA 93455; **www.argentdata.com**, *$80* QST

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

AG1YK

HINTS & KINKS

A SIMPLE TAP GUIDE

◊When tapping threads into metals or other materials it is important to control the angle the tap makes with the material surface. If the angle isn't correct the result could be a broken tap or a screw, if it has to pass through a thick cover piece, might not engage the threads without stripping or binding. In the vast majority of cases, the tap should enter the material perpendicular to the surface. I find doing this by eye can sometimes result in a large angular error. [A drill press, operated manually, can be used as a tap guide if the work space permits.—*Ed.*] So, I made a simple handheld guide to align the tap while starting the threads.

I drilled a series of five equally spaced holes in a bar of aluminum 3⅜ inches long (see Figure 1). The aluminum bar has a cross-section measuring ½ inch wide by ¼ inch thick. The bar should be wide enough to fit flat against the surface to be tapped, yet narrow enough to fit in relatively close spaces. A thicker bar would prevent the tap from entering the tap hole very far before the expanded portion of the tap shank is blocked by the guide hole. A thinner bar would allow a nonperpendicular entry angle.

ELLEN FRANKE

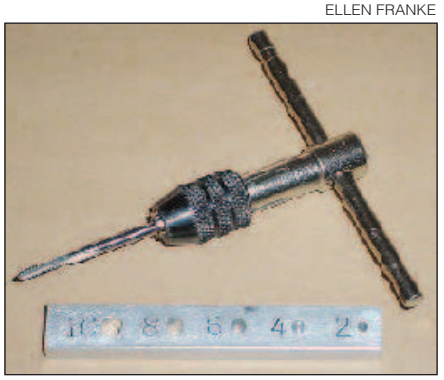


Figure 1 — The tap guide helps to keep the tap tool perpendicular to the work project's surface.

ELLEN FRANKE

Figure 2 — Holding the tap guide against the work while starting to tap the hole will prevent the tap from entering the work at an angle, distorting the threads.

Although I used aluminum, any other metal, including brass, iron or stainless steel, could be used. The guide holes are spaced approximately ⅝ inch apart. The spacing is not critical. The hole diameters *are* critical. The holes should be close fit clearance holes for the screw sizes you most often use. I primarily use 2-56, 4-40, 6-32, 8-32 and 10-32 hardware, so the holes were drilled with #43, 32, 27, 17 and 9 drill bits, respectively. I used number stamps to label the holes and filled the stampings with black paint to improve contrast. Decals or even hand lettering could be used.

In use, the guide is held against the surface, cutting fluid is applied, the tap is inserted into the appropriate hole and the tapping effort goes forward (see Figure 2). For screw sizes with expanded shank taps, the threads are cut until the expanded portion of the tap shank gets close to the guide. Then, the tap is backed out, the guide removed and the tap is reinserted in the hole. Then tapping continues to the desired depth. This tool helps reduce the number of broken taps and gives a more professional look to the job. — *73, John Franke, WA4WDL, 4500 Ibis Ct, Portsmouth, VA 23703,* **jmfranke@cox.net**

ROUGHING UP MICROPHONE CONNECTORS

◊If you've ever had to install a new connector on a handheld microphone, you probably had a problem with obtaining a good grip on the outer jacket in the clamp of the connector. I had to replace the microphone on my 2 meter rig. After soldering the wires to the connector and tightening the clamp all the way so that the two pieces were fully merged, I figured I was done and could enjoy years of trouble-free service. Just a few contacts later I noticed that I was pulling the jacket out of the clamp and straining the conductors.

I tried adding a bit of outer jacketing to clamp the outer jacket more firmly. That didn't work. Clamping pressure wasn't the problem; the outer jacket was just too slippery. I tried some black electrical tape and that didn't work either — the outer jacket slipped right past the clamp and tape. I needed to add something that would grip the outer jacket very securely — something a bit abrasive.

JIM KOCSIS, WA9PYH

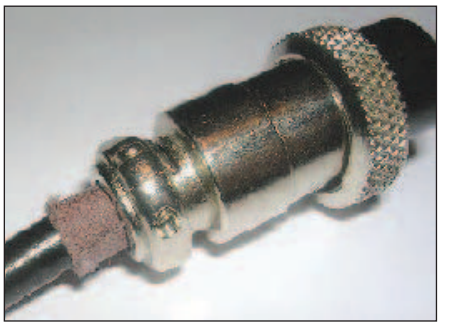


Figure 3 — A small piece of emery cloth helps to prevent the microphone cable from being pulled from the connector.

After a brief scan of my workshop I saw the solution: emery cloth. (Note: This is not sandpaper. The material must be cloth backed abrasive. The paper backed abrasive will rip and disintegrate with time and pressure.) I cut a piece ½ × 1 inch and curled it to fit around the outer jacket where it went through the clamp. The long dimension is wrapped around the cable and the abrasive side must be on the inside so that it touches the outer jacket. I tightened the clamp so the two pieces of the connector were fully merged (see Figure 3).

Three years later the outer jacket is still where it was when I assembled it — it hasn't moved. A few times I've pulled so hard on the microphone cable that the rig began moving across the table — still the clamp holds the cable securely. Problem solved. — *73, Jim Kocsis, WA9PYH, 53180 Flicker Ln, South Bend, IN 46637,* **wa9pyh@arrl.net**

RESTORATION HINTS

◊I have had quite a bit of trouble keeping the workbench clean during the initial clean up of older tube-type equipment. The clean up process can be very messy when removing old grease, grit and cigarette nicotine deposits. I urgently needed to contain the mess and not let it spill over into other projects. What I came up with is a sheet metal water heater drip pan with a pipe plug drain on one side (Figure 4). This allows containment of the cleaning process and a drain for residue. There's also enough room for an oven rack to hold the equipment off the pan bottom. Even though plastic drain pans are available, they may not be resistant to solvents, making

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

JIM SANTEE, KF7NE

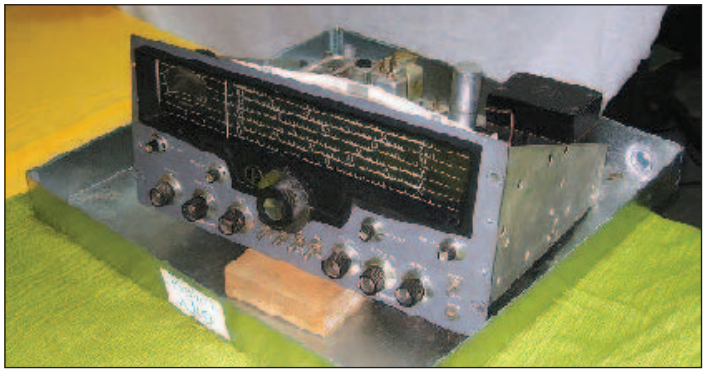


Figure 4 — The Hallicrafters SX-101 sitting in the water heater tray ready for the chemical cleaning part of its restoration.

them unusable as a cleaning tank.

The other issue I have to deal with is that I cannot pick up heavy items. I have a VA disability that prohibits heavy lifting and I am not about to give up my Hallicrafters HTs [the Hallicrafters HT series refers to vacuum-tube transmitters manufactured from the late 1940s to the early 1960s, not handheld transceivers — *Ed.*]. So I had to come up with a solution and ultimately found a hydraulic lift table on wheels that I can move around my work area. The lift table comes to nearly the same height as a work bench, which allows considerable flexibility in dealing with heavy items. Sliding heavy projects at waist height is very easy.

The lift table is a generic unit from Harbor Freight, item 93116-2VGA (**www.harborfreight.com**). The drip pan is from my local building supply dealer, City Lumber (**www.citylumber.com**). The price was slightly under $30 — *73, Jim Santee, KF7NE, 42162 Bagley Ln, Astoria, OR 97103-8416*, **kf7ne@arrl.net**

MORE ON THE PIGGYBACK RF AMMETER

♢In the October "Hints & Kinks" column the hint on the "Piggyback RF Ammeter" contained an error that needs some explanation.[1] The reference to the RF ammeter should have been for an RF voltmeter (see Figure 5). The connection for the meter as shown is in parallel with the antenna. An ammeter placed in this configuration will be overloaded and probably burn out or, at least, will significantly distort the impedance viewed by the transmitter or tuner. For an RF ammeter to work in this setup, it would have to be placed between the ANTENNA COAX connector and the transmission line with the WIRE connector left open.

In Mark's setup, he mentions using a military surplus meter that is marked as an "RF Ammeter." Steve Noskowicz, K9DCI, commented that the meter assembly may actually be an RF voltmeter that was intended to be used with a current-to-voltage probe. Since Mark is using his setup successfully, this is probably the explanation. Surplus military and commercial gear can be a great bargain but you need to make sure you understand exactly how the unit was originally designed to be used.

Connected between the WIRE connector and ground as shown, an RF voltmeter, assuming a 100 W output and a 50 Ω antenna, would see a voltage of about 70 V, so a 0-100 V RF voltmeter would be needed for accurate measurements.

In the case where a lamp is placed between the WIRE connector and ground, the lamp will also need to handle about 70 V. Several low voltage lamps can be placed in series to achieve a higher voltage level; that is, three 25 V lamps in series will be equal to one 75 V lamp.

The lamp(s) should have as low of a power/current draw as possible, preferably below 5 W. At that power level the lamp's current draw will be small enough to have a minimal effect on the antenna impedance. Remember, the voltmeter or lamp is being placed in parallel with the antenna. So, in effect, you have a 50 Ω resistor (the antenna) in parallel with some unknown resistor (the lamp). The lower the current draw of the lamp, the higher its effective resistance and the closer the combined parallel resistance the transmitter sees will be to 50 Ω and a SWR of 1:1. Find more information on resistors in parallel in the "Electrical Fundamentals" chapter of *ARRL Handbook*.[2] — *73, Steve Sant Andrea, AG1YK*, **ag1yk@arrl.org**

PLUMBING BRACKET GROUND

♢In the July 2010 *QST*, Jim Talens, N3JT, presents a nice plan for a station grounding panel made from a copper plate.[3] There is a ready-made alternative that may work for many hams.

I am an electrician apprentice and on a large commercial job I discovered that the plumbers were using a bracket to position water feed lines behind sinks. It's the Holdrite brand (**www.holdrite.com**) of pipe bracket, made by Hubbard Enterprises. A specifications sheet I found online states: "The Holdrite #101-18-R and #101-26-R are Copper-Bonded steel brackets with extruded holes. The #101-18-R has ⅝" holes on 2" centers. The #101-26-R has ⅝" holes on 2" centers and 2⅞" holes on 8" centers."

Those ⅝ inch holes work perfectly for coax bulkhead connectors. The brackets are 18 and 26 inches in length, so there is room for quite a few connectors. These could be used for grounding where coax lines enter the shack. They are steel, but do feature a heavy copper cladding.

The manufacturer has detailed information available online and I expect that the brackets can be found at plumbing supply houses, if not the big-box home improvement stores. — *73, Ray Parsons, KG2B, 74 The Crossway, Delmar, NY 12054-3529*, **kg2b@arrl.net**

[1]M. Starin, K1RMC, "Piggyback RF Ammeter," *QST*, Oct 2011, p 62.

[2]H. W. Silver, NØAX, Ed., *The 2012 ARRL Handbook for Radio Communications* (Newington: 2011), p 2.7.

[3]J. Talens, N3JT, "A Simple and Effective Approach to Station Grounding," *QST*, Jul 2010, pp 40-41.

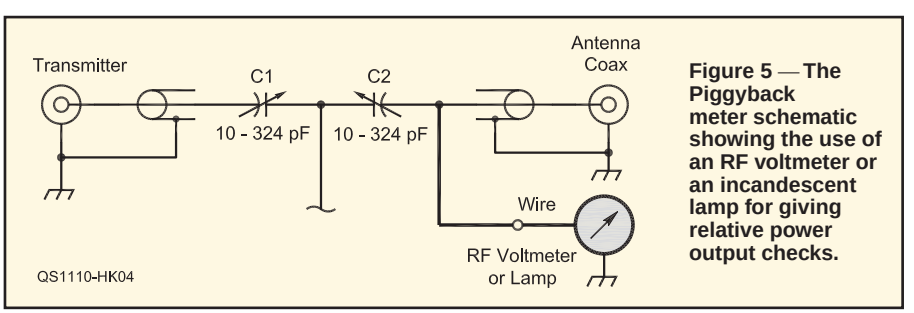


Figure 5 — The Piggyback meter schematic showing the use of an RF voltmeter or an incandescent lamp for giving relative power output checks.

"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

Ham History SOS

At ARRL HQ, volunteer archivists work to preserve Amateur Radio's historic treasures.

Michael Marinaro, WN1M

Hiram Percy Maxim, Clinton DeSoto, Hugo Gernsback, Bill Orr and Mary Texanna Loomis. If you have been a ham for any amount of time you will know these names. If you are new to ham radio, you will soon hear of them.

While many activities conducted at the League's Headquarters are highly visible, some are in the background. One of the programs that does not receive a great deal of attention is the endeavor to preserve and conserve the many artifacts held in the ARRL archives. These archives contain paper documents, publications, media and equipment of those notables mentioned above and of many others.

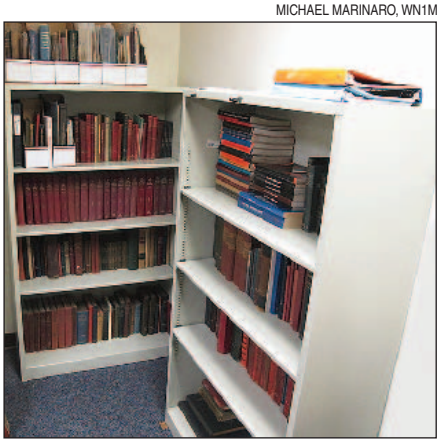
With the ARRL approaching its 100th anniversary, the ongoing effort to preserve this huge collection of historical material has taken on a new importance. The Historical Committee of the ARRL Board is responsible for preparing the League archive to be a valuable resource for our next hundred years.

The Historical Committee directs the ARRL Historic Preservation Fund (**www.arrl.org/historic-preservation-fund**). The Committee is presently chaired by Joyce Birmingham, KA2ANF. With the help of volunteers at Headquarters, the program is focused on identifying and conserving the materials that pertain to the history of Amateur Radio and the heritage of the ARRL.

Putting It All Together

At the beginning of the 21st century historical artifacts were stored in a random manner in several locations throughout the Headquarters complex, with the majority in the third floor attic of the main building and the cellar of the W1AW building. Recognizing the need to centralize, identify, properly store and preserve these collections, the Board of Directors created the ARRL Historical Committee at its January 2000 meeting. Then-President Jim Haynie, W5JBP, appointed Director Tom Frenaye, K1KI, chairman and Director Jim Maxwell, W6CF, and staff member Steve Mansfield, N1MZA, members, with Steve acting as staff liaison. These three were later joined by Jim McCobb, K1LU, and external member Al Cohen, W1FXQ. The committee was assisted by volunteer "curator" Joe Carcia, NJ1Q, W1AW Station Manager.

MICHAEL MARINARO, WN1M



Part of the League's historical book collection. Some of the volumes go back to the 19th century and the very beginning of radio and electronics.

The committee, aided by volunteers such as Charles Griffen, W1GYR, began the enormous task of inventorying the collections. By late 2001 the result of these inventories was an estimate that there were 450,000-600,000 sheets of paper contained in file drawers and open boxes — equivalent to more than 125 file drawers of material in the attic alone, not including photographic negatives, prints and publications.

From The Old Man to AMSAT

By July 2002, construction of a dedicated

S. SANT ANDREA, AG1YK

The effect of "vinegar syndrome" is clearly visible on this negative. Many negatives in the archive are in need of restoration.

S. SANT ANDREA, AG1YK

The negative of a *QST* equipment photo that is, so far, in pristine condition. Moving such negatives into a proper storage environment is a priority for the Historical Committee.

MICHAEL MARINARO, WN1M

One of the many folders of *QST*-related documents that make up the half-million pages that need proper archival storage.

Second Century Celebration

The Board of Directors and various committees at Headquarters are planning for the commemoration of the centennial and the League's second century. Our preserved collections will form the basis for exhibits, audio-visual programs and chronicles.

The many volunteers who have worked and are working on the project have accomplished much in the past 11 years, supported by leadership contributions from the YASME Foundation since 2006. In order to continue moving forward, to continue with our efforts to preserve the hundred years of ham history stored in the ARRL archive, support is needed. We have support from the volunteers who work here at Headquarters, but we also need support from you, the members of the ham community at large. If you believe our history is worth preserving then please help our efforts by making a contribution to the preservation project. For information please contact Mary Hobart, K1MMH, at **mhobart@arrl.org** or you can go directly to the donation form at **www.arrl.org/arrl-donation-form** to add your tax-deductible contribution to the Historical Preservation Fund.

MICHAEL MARINARO, WN1M

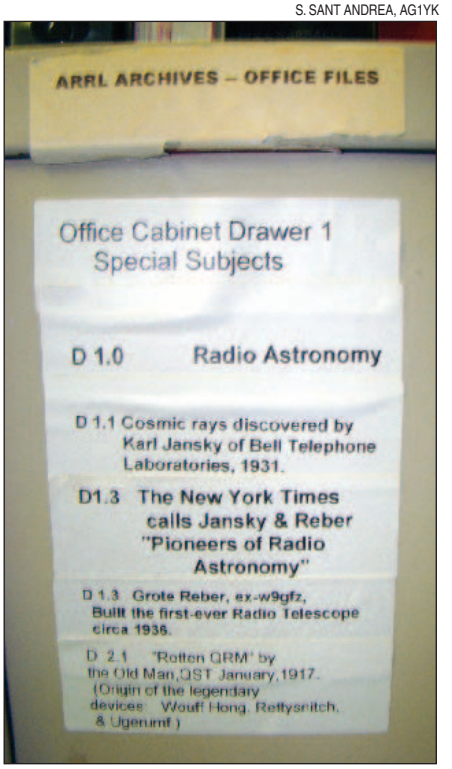
Here are a variety of *QST* negatives stored in archival packaging under cold conditions to help preserve them from the effects of "vinegar syndrome."

area, referred to as the "cage," was begun in the second floor warehouse area of the Headquarters building. This was made possible by a significant donation from Barry, W5GN, and Judith Spencer Merrill and an allocation from the League's Historic Preservation Fund. By September 2002, most of the material had been centralized, the "cage" was opened and Perry Williams, W1UED, was on board as part-time archivist. The ongoing project was and is concerned with cataloging the paper collections using the system devised by Jim Maxwell, which identified files based on when they were first discovered. This is a sampling of the files to be found in the paper archives:

- Correspondence of Hiram Percy Maxim
- Correspondence of Clarence Tuska
- Minutes and Description of the First National ARRL Convention, Chicago 1921
- Correspondence of League Presidents and Directors, 1921-1964
- Information Concerning the MacMillan Arctic Expedition of 1924
- Amateur Radio Licensees, 1913-1917, History and Calls
- Early AMSAT Correspondence

My experience with this project since July 2009 has been as volunteer historian. As I have proceeded with my work I have developed an admiration and respect for the dedicated "historians" who preceded me and the donors who have supported them. Their accomplishments have made an unrecognized but significant contribution to the history of Amateur Radio.

S. SANT ANDREA, AG1YK



The ARRL archive holds history in every drawer.

New Ways to Preserve the Old

My initial assignment was to digitize the paper record collections and catalog them in a museum-type program known as *Past Perfect* under the tutelage of Art Goddard, W6XD. As mentioned above, archiving and basic cataloging of these documents had begun some 7 years prior with the direction and encouragement of Jim Maxwell, W6CF. The effort was sustained with generous funding by the YASME Foundation (**www.yasme.org**) and League fund raising campaigns. The activities have been conducted by archivist Perry Williams, W1UED, and long-time volunteer Charles Griffen, W1GYR. Both Perry and Charles have recently retired and should be recognized for their exceptional service in archiving the paper records.

A computer, scanner and pertinent software were donated by the YASME Foundation specifically to complete the digitization project. After examination of all the collections it was discovered that other mate-

rials were seriously deteriorated and in more immediate need of stabilization and preservation. Foremost among the many deteriorating items were the more than 2000 sheet film and plate negatives. These negatives were made from cellulose triacetate, which degrades over time releasing acetic acid, the key ingredient in vinegar. This gives affected negatives an acidic smell, which resulted in the problem becoming known as "vinegar syndrome." Some of the League's negatives were badly affected and were literally cracking up; others were perfect and seemed unaffected. Unfortunately, the deteriorating negatives were contaminating the good ones.

These negatives represent the covers, equipment and other studio setup pictures that appeared in *QST* in the 1940s, '50s and '60s. The negatives are important not only for their images but as examples of fine photographic art. The equipment pictures, particularly, have a three dimensional quality created by the photographer "painting with light." These negatives, the good and the bad, have been placed in individual archival envelopes and segregated by condition. The envelopes were then placed in archival boxes and stored in a freezer. They are cataloged by *QST* issue on the League's internal network for ease of retrieval.

The Many Fronts of the Preservation War

Having taken steps to stabilize the League's collection of photographic negatives, we switched our efforts to other urgent projects such as:

- Preserving first issue copies of *QST* from inception through the 1920s and first issues of League publications that had been previously stored in a bank vault.
- Preserving and cataloging over 2000 journals issued by foreign radio associations such as the RSGB (Radio Society of Great Britain). These incomplete collections have been identified and boxed.
- Centralizing and shelving bound *QST* issues and other publications.
- Centralizing and cataloging over 200 antique hard cover books and pamphlets concerning electricity and radio, some from the 19th century. Included in this library are copies of *Electromagnetic Theory* by Oliver Heaviside (1891), the discoverer of the ionosphere; *Short Lectures To Electrical Artisans* by J. A. Fleming (1894), the inventor of the first practical vacuum tube, and *Father Of Radio — Autobiography Of Lee De Forest*, signed by the author (1950). These have been shelved and form a unique collection.
- Identification and preservation of ARRL and AWA slide/synchronized cassette tape programs and individual tapes, which were distributed by ARRL for educational purposes.
- Protection and preservation of the collection of mint ARRL 50th anniversary postage stamps and first day covers of Amateur Radio stamps issued by foreign countries.

As each of these projects was completed the collection was placed in a dedicated, partially climate-controlled room. The listings of the material contained in the collections established to date are updated as items are added. The ARRL history archive currently consists of the following collections:

Antique Book and Pamphlet — Collection I
ARRL Early Publications — Collection II
Foreign Journals and Booklets — Collection III
QST Plate Negatives — Collection IV
ARRL Slide/Cassette Programs — Collection V

Currently, we are preserving nine file drawers of black and white prints of images that appeared in *QST* in the 1950s, '60s and '70s. Each issues' images are placed in an individual archival file and each print is separated by archival tissue. Concurrently, we are digitizing the ARRL's 35 mm slide collection utilizing a slide scanner donated by YASME. In the near future we will begin to identify and prioritize the accumulations of movie films and video tapes.

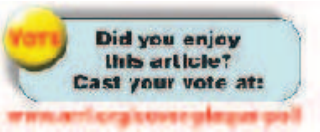
Preserving History Today for Better Understanding Tomorrow

In addition to its many other roles, the ARRL is a public history institution. It is the League's responsibility to conserve those documents and artifacts pertinent to the history of Amateur Radio not only for ourselves but for the public. This extends beyond the curatorship and exhibiting of antique and vintage equipment. It involves the interpretation of significant events in Amateur Radio history in a manner meaningful to the public. I think the "history" project pioneers were motivated by these concepts. Additionally, these are concepts to keep in mind as we reorganize the Headquarters museum and during preparations for the upcoming ARRL centennial.

The end of the League's second 50 years will be marked in 2014. The first 50 years saw the sound of the spark gap replaced by CW, the transatlantic tests, AM and amateurs serving in the armed forces during the silent periods of two world wars. These last 50 years have been marked by leaps in technology — the OSCAR satellites, digital radio, SSB, EME and the voices of astronauts from space. These archives preserving ham radio's past will provide us with a solid foundation and clear direction as we look forward to our next century of progress.

Michael W. Marinaro, WN1M, an ARRL member, was first licensed in 1952 as KN2CRH. He has been licensed continuously since then and now holds an Amateur Extra class license. Mike graduated from the City University of New York and worked in the financial industry till his retirement. He recently completed a master's degree in History from Central Connecticut State University. Mike has three stations, one of which is a Collins S-Line, that he uses to operate CW and RTTY on all HF bands.

Mike is currently the volunteer archivist working to organize and preserve the history of ham radio as told by the League's extensive collection. He can be reached at PO Box 404, 250 Cold Brook Rd, S Glastonbury, CT 06073-0404, **wn1m@arrl.net.**



New Products

REPEATER FINDER APPLICATION FOR THE ANDROID FROM W2CYK

◊ *Repeater Finder* (*RFinder*) is an application for the Android smart phone that allows the user to find repeaters based on current location or a specified location. It allows sorting by distance or by Trustee call sign as well as filtering by band and radius in miles or kilometers. *RFinder* taps into a user supported repeater database that includes information on repeaters as well as IRLP and Echolink connections in the US and other countries. The application only stores information for repeaters within approximately 80 miles of the current location to conserve resources on the handheld device. It uses geolocation via cell tower triangulation, GPS or manual location entry (to look up the repeaters used while traveling). Price: $4.99. For more information, contact **bobg@w2cyk.net** or visit the Android Market at **market.android.com** (search for W2CYK).

How About an HF Beam Under Your Holiday Tree?

Joel R. Hallas, W1ZR

As we discussed last month, a vertical can be a reasonable antenna for operating over long distances if at the right height, and if over the right ground.[1] Still, you may have noticed the comparison to a horizontal dipole at least a half wavelength high — a reasonable approach for many, especially on the higher "DX bands," 20 through 10 meters. The elevation angle of peak gain is about the same as an on-ground monopole, but the gain at that elevation is more than 8 dB higher than a low monopole. It also beats out any of the verticals at 5 and 10°, although not by as much. The down side of the horizontal dipole is that a number of such bidirectional antennas are needed to cover all azimuths.

Enter the Rotary Beam

One win-win solution to the directional limitation is to have a single antenna that can be turned to any azimuth and beam its energy there. This is called, for obvious reasons, a beam antenna. If at least half a wave high, it not only will beat out the monopole at low angles, it will have an additional gain of up to 7 dB compared to the horizontal dipole — comparable to a medium size linear amplifier on transmit and able to reject undesired signals on receive.

Too Good to be True?

Perhaps so. With a monopole or wire dipole, it doesn't take a lot to get it up and on the air. If you have a convenient tree branch — two for a horizontal dipole — you can get that wire vertical, inverted V or dipole up and on the air mostly for the cost of the antenna or its parts. If you don't have a tree, self-supporting multiband monopoles are available from most antenna manufacturers that require just a small piece of ground, or a porch railing.

To get that beam antenna up in the air, a more serious support is required. The ideal is a tower of some sort that may require zoning and building permits, the services of a civil engineer and a building contractor and perhaps an attorney to get through all the local permitting before you even start. The effort can be daunting and can cost many times the expense of the antenna itself.

Past the Hard Part — How do I Pick the Antenna?

With zoning and building permits, contracts or other solutions in hand you now need to select an antenna that goes with your support solution. There are lots of choices out there in all sizes and weights. Your support solution will narrow down some choices, but there are others that will remain open. We can describe some categories and ramifications.

■ *Rotatable Dipole* — Rotatable dipoles, sort of a one element bidirectional "beam," are a real option. While they don't provide any gain over a dipole, they can be pointed in the right direction for a signal. They are available from a number of manufacturers in multiband form, require one support and avoid the need for multiple dipoles to cover all azimuths. They tend to be small enough to not need much in the way of support, and some can be grown into Yagis by adding additional elements later. Check Cushcraft (**www.cushcraft.com**), MFJ (**www.mfjenterprises.com**), Mosley (**www.mosley-electronics.com**) and NCG (**www.cometantenna.com**), to name a few.

CUSHCRAFT CORPORATION

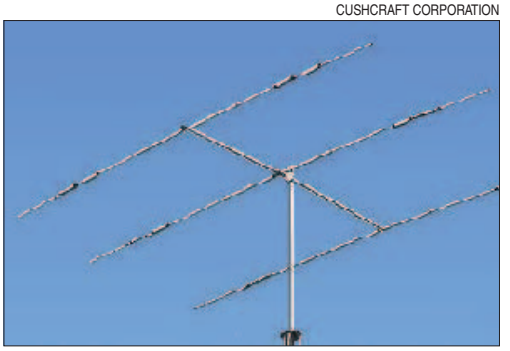


Figure 1 — A Cushcraft (www.cushcraft.com) A3S triband (20, 15 and 10 meters) trap Yagi. Such antennas are also available from Hy-Gain (www.hy-gain.com) and Mosley (www.mosley-electronics.com). Force 12 (www.texasantennas.com) offers tribanders using coupled resonator technology.

TENNADYNE CORPORATION

Figure 2 — A two element cubical quad from Cubex (www.cubex.com). Quads are also available in a diamond shape — mostly a matter of personal preference.

■ *Full Size, Junior or Miniature Beam* — A "full size" beam generally has elements around ½ wavelength long on its lowest band, and a boom typically from ⅓ to ½ wave long, for a three element model such as in Figure 1. Some manufacturers offer "junior" versions, almost full size but somewhat lighter and with a lower power rating. Miniature beams (minis) are around half full size. I am not aware of any full size, or even junior beam that doesn't work better than the best of the minis. The minis give up some gain, front to back and bandwidth — not their fault — they're up against the laws of physics. Still, if that's all you can put up, it will provide some benefit compared to a rotatable dipole. Some sources are Bencher (**www.bencher.com**), Cushcraft, Light Beam Antennas (**www.lightbeamantenna.com**), Mosley and TGM (**www.tgmcom.com**). The juniors can work well, but they generally don't save much size or cost over their full sized counterparts and may give up some strength in the bargain.

■ *Yagi or Quad* — A beam can be made from straight dipole-like elements about half a wave long or from loops around a full wave in diameter. A beam with rectangular or diamond shaped loop elements is called a quad (see Figure 2). A full wave loop is only half as wide (but a lot taller) than a half wave dipole, so the quad can be more compact, at least in one dimension. A full wave loop has about 1.8 dB gain over a dipole, so a quad with the same length boom and same number of elements will have about 1.8 dB gain over the Yagi. In practice for a beginning "beamer" this means a two element quad will offer similar performance to a three element Yagi and have a shorter boom, as well as not being as wide.

A multiband quad usually has separate loops for each band, giving it an imposing look after the first few bands. Because of their

[1]Notes appear on page 62.

ROSALIE WHITE, K1STO

Figure 3 — The Spiderbeam is a two element Yagi with bent wire elements supported by fiberglass spreaders (www.spiderbeam.com). Another stressed wire multiband Yagi is the Hexbeam. First offered by Traffie (www.hexbeam.com), versions are now also available from others.

H. WARD SILVER, N0AX

Figure 4 — An innovative multiband antenna from SteppIR (www.steppir.com). A motor driven arrangement at the center of each element pushes a metal tape back and forth within the housing of each element to adjust the length for optimum performance on any frequency within its range. Some models have trombone like elements, as in the center of this model, that allow the elements to be shorter than full size on the lower frequencies.

wire, rather than tubing, elements, quads tend to have less wind resistance and less weight than Yagis made of tubing. Yagis can also be made from wire, constructed a lot like a quad element on its side (see Figure 3). To my mind, it's mainly a matter of mechanical preference, although there are some subtle performance differences. All other things being equal, if one fits better, use it.

■ *Two, Three or More Elements* — The biggest increase in gain in a well designed antenna comes with the first element added to the dipole, typically around a 3 dB improvement. The next element, typically one reflector and one director surrounding the driven element can add slightly less, but typically about another 2 dB. Each properly spaced additional director adds something, but none quite as much as the first. Still, a properly designed three element Yagi allows close to optimum front to back (F/B) rejection tuning with good forward gain and a reasonable match. A two element generally has to focus on the optimizing of one or another design choice. Of course each element adds additional weight, wind load, boom length and cost. Beware of beams with extra elements that don't have longer booms — boom length is generally the more important parameter.

■ *Single or Multiple Bands* — A single band beam has many advantages over a multiband antenna. The spacing of the elements and the feed system can be optimized for that band — no compromises here. A single bander is also easier for the home craftsman to fabricate and tune. Of course the downside is most hams want to operate more than one band.

Modern competitively manufactured full size multiband Yagis are indeed compromises, but generally have performance close to single band arrays of comparable size. On the lowest band, typically 20 meters, they will have a shorter boom than the typical single-bander with the same number of elements, so will have proportionately less gain. On the higher frequency bands, they will be a bit longer than optimum. In the middle perhaps they will be just about right. Some add dedicated elements for the higher bands that are optimally spaced and thus make them work even better at the high end. Of course each added element adds all the unwanted features as well — weight, windload and cost.

The log-periodic design offers wideband operation over a whole range of frequencies — not just the ham bands. The typical log periodic is somewhat wider and half again as long as a typical monobander for the lower frequency end, and gives gain typically like a two to three element Yagi across the whole range. They may be a good choice for those who want coverage between the bands for shortwave broadcast listening, for example. They do tend to be heavy, expensive and have a lot of wind load.

In a class by themselves are the multiband antennas sold by SteppIR (see Figure 4). These antennas have variable length metal tape elements within fiberglass radome tubing. Many of their models look a lot like a single band Yagi from the outside, but a motor driven actuator at the center of each element moves each element in or out to select the appropriate length for optimum operation on each band. Some models feature one or more trombone-like elements that fold back on themselves on the lower bands to reduce the width. A computerized controller allows quick setting to the optimum position for each band, or even for frequencies out of the ham bands. This system is a clever arrangement that works well. They are not the least expensive antennas, but considering all they do, they may make sense for many.

■ *Triband, Five or More Bands* — Multiband trap beams became popular in the 1950s when there were three "DX bands," 20, 15 and 10 meters. Now we have added 17 and 12 meters in the same range, as well as 6 meters on the high frequency side and 30 meters on the low. Someone chasing DX in the last decade and beginning of this one could be forgiven for thinking that 20 and 17 meters would be plenty — but when the sunspots are high, the higher frequency bands come alive. The weekend before I wrote this I was looking for contacts for the Connecticut QSO Party on Saturday afternoon. I thought I might find someone local on 10 meters — I didn't but I worked an African station who was booming in. Hopefully, in a few years, this will be more common.

Most contests do not permit contacts on 30, 17 or 12 meters, so if you are mainly a contester, the traditional 20, 15 and 10 meter tribander will be a good fit for your station. Many manufacturers of long standing have well established triband designs going back to the days before the other bands were added. They offer good value and good performance on the bands they support and have lower weight and wind load than many with more bands. Still, all else being equal, if I could afford an antenna with more bands and had a support that would hold it up, I'd opt for more bands even if it cost a dB or two on each. Being able to operate on the band that has the signals seems more worthwhile to me than having a few more dB on the band that doesn't.

Notes

[1]J. Hallas, W1ZR, "How High Should Your HF Vertical Be?" *QST*, Nov 2011, p 51.

[2]J. Hallas, W1ZR, "Add 6 Meters to Your Triband Yagi," *QST*, Sep 2011, pp 40-42.

[3]*The ARRL Antenna Book,* 22nd Edition, p 26-11. 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**.

Sunday Drivers

Contesting in the slow lane can add a little spice to your ham life.

Rick Lindquist, WW3DE

RICK LINDQUIST, WW3DE

"Sunday drivers" enjoy contesting without really being *in* the contest.

In 1995 my ARRL Headquarters friend and colleague Glenn Swanson, KB1GW (SK) wrote "The Casual Contester."[1] With the 2011 "contest season" under way, it's an apt occasion to revisit this evergreen topic, albeit from a slightly different perspective.

In contesting parlance "Sunday drivers" are non-contesters who get on the air on the second day of a contest to hand out a few contacts to the madding crowd. As Glenn asked, "Who says that a ham radio contest must be dead serious at all times?" Indeed, but with so many already engaging in *some* version of extreme ham radio contesting these days, where does this leave the Sunday driver?

Contest? We Don't Need No Stinkin' Contest!

A frequent gripe is that contests and contesters swamp entire bands, overwhelm attempts at casual operating and nudge nets and roundtables out of the way. There's no excuse for discourteous operating, of course. Yet lots of activity certainly cannot be a *bad* thing, especially in an era when some consider Amateur Radio outmoded (pun intended). The 30, 17 and 12 meter bands do not entertain contesting, providing some spectrum that's free of such weekend invasions. Most operating events are mode-specific too, so there's always a safe harbor somewhere.

It's also okay just to jump in and work as many contest stations as you'd like, without becoming a contesting convert; you don't have to submit a log (although it's considered good form to do so) or even stick around for the whole event. Hard-bitten contesters brag about maximizing "butt time in the chair," but for some Sunday drivers this operating style gets old very fast, thank you.

Many believe that contesting means having to invest heavily in top-tier equipment, huge antennas and expansive tracts of real estate. Some do, but it's not necessary to go whole hog in order to have a terrific time. Even modest stations can enter the fray.

Some may feel they don't measure up in terms of experience and skill, but even the top competitors had to start somewhere. Contesting — like traffic handling and similar endeavors — enhances a skill set that extends to everyday operating.

Ops who turn the knobs themselves and log on paper shouldn't shy away either. A small number of top contesters still log by hand and/or eschew station automation. Even if you're running vintage gear, making contest contacts is within your grasp.

One weekend decades ago when I was running a separate transmitter and receiver and a ratty, low-slung piece of wire for an antenna, I ran headlong into the ARRL November Sweepstakes (SS) CW buzz saw. My code skills were pretty lame back then (I was still using a straight key!), but the participants' excitement was palpable. Checking the rules and writing down the lengthy exchange as a template, I worked a few stations, including one local — Ernie Piche, N1SW (SK) — an avid SS aficionado. Ernie took a few moments away from the radio to get on the telephone and infect me with his enthusiasm and I've been a CW Sweeps fan ever since. Most experienced contesters enjoy mentoring newcomers and even Sunday drivers.

Contesting Without Becoming a Contester

The next time a contest interrupts your typical operating pattern, consider mingling with the crowd. Determine the contest rules and exchange. All are available on the Internet (the ARRL website has a generic contest calendar, as does each issue of *QST*). Listen to get an idea of the rhythm and pace. Tune at first for the walkers or joggers rather than ops running full tilt boogie and drop in your call sign. If the other station comes back, copy the exchange and reply with your own. *Be brief*! An unofficial rule of contesting is that *everybody* is 59 or 599. Contesters aren't looking for real reports, just contacts. Once you gain some confidence, try "running" (calling "CQ contest"). As the weekend wears on, the regulars will look for new stations to work, so you might even start a pileup.

Put your Sunday driving to good use in achieving some of your operating goals, whether it's WAS or DXCC. QSO Parties and domestic events such as SS offer opportunities to snag some needed states, while DX contests always feature a few rare ones.

Variations on the Theme

On occasion I've found myself on the road during a major contest, yet still wanting to take part. No problem! Even if your signal is puny, a lot of participants will hear you and be happy to put you in their logs. (For my own part, either my wife keeps the log or I record and transcribe the contacts afterward.) Contests give low power ops a chance to see what they can work when the bands are thick with signals. State QSO Parties typically generate far more modest traffic jams and can be loads of fun for seasoned contesters and Sunday drivers alike.

Just a handful of contest participants will "win." Most are just having a good time and you could be among them, instead of feeling like a wallflower. Next time a contest threatens to upend your weekend's ham radio enjoyment, consider taking part. It's more fun than whining and you can test your skills and the limits of your station at the same time.

Rick Lindquist, WW3DE, has been on the air for 53 years. He holds an Amateur Extra class license and is the managing editor of NCJ. He lives in lower slower Delaware with his spouse Jean, N1MJC, and their two cats. Rick can be reached at 25483 Jamie Ct, Seaford, DE 19973-8310, **ww3de@arrl.net**.

[1]G. Swanson, KB1GW, "The Casual Contester," *QST*, Aug 1995, pp 64,70.

Check Out the New Edition of *The ARRL Antenna Book*

Learn, apply, build.

Ward Silver, NØAX

About twice every decade the venerable *ARRL Antenna Book*, first published in 1939, is updated in a new edition and this year sees the 22nd edition "go up" like our latest skyhook. As antennas have always been one of ham radio's hotbeds of building and experimenting, it's no accident that the *Antenna Book* is the next-largest technical reference to *The ARRL Handbook*.

Remodeling and Good Bones

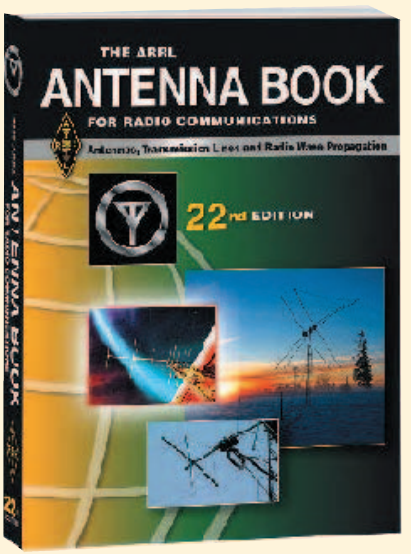
The fundamentals of the *Antenna Book* are as strong as ever — this house has "good bones" to support this edition's remodeling. Previous editors, most recently Dean Straw, N6BV, did yeoman's work in bringing new material to the book, addressing topics of concern to the modern ham and providing many useful software tools. That tradition has been maintained, and we have updated every chapter and created several new ones, as well.

A section numbering scheme will help you navigate the material, which has been rearranged in recognition of the book's triple mission of presenting education, application and good practices. The book begins with chapters on Antenna Fundamentals and the theory behind different types of antennas, the middle sections present practical antenna applications and designs, followed by a section of supporting topics and how-to information. The index has been overhauled and adds an Authors Index and Product Index to help you find what you need.

In With the New

One of the biggest changes in the book is a brand-new chapter on Putting Up Antennas and Towers by Steve Morris, K7LXC. A long-time professional tower worker, Steve has thoroughly reworked the topic from the ground up, so to speak, including extensive discussions on the proper and safe use of rigging and climbing equipment. There is much more on building towers, including site planning and permitting, getting the antennas up and on them, and maintaining the whole thing once you're done.

Another major change is a complete revision and update of the Effects of Ground chapter by its original author, Rudy Severns, N6LF. Rudy has done *a lot* of research and testing in this area since the last edition and you'll get the full benefit of his labors, including spreadsheets to derive your own charts and graphs. He also rewrote his section on HF Maritime Antennas.



Available Now

The 22nd edition of *The ARRL Antenna Book* is available in both hardcover (order no. 6801) and softcover (order no. 6948) from the ARRL Store at **www.arrl.org/shop** or call 1-888-277-5289. A special bonus offer — order the hardcover book at the softcover price — available while supplies last. This bonus offer also applies to the new 2012 *ARRL Handbook for Radio Communications*.

Throughout the book there are fresh treatments of important topics:

- Alan Applegate, KØBG, contributes a new chapter on HF Mobile Antennas and VHF/UHF Mobile Antennas.
- Stan Stockton, K5GO, developed an entirely new set of half-element designs for HF Yagis made from aluminum tubing.
- Antenna expert Tom Schiller, N6BT, leads the way in a brand-new chapter on Antenna System Troubleshooting.
- Authors from Radio Society of Great Britain (RSGB) and Wireless Institute of Australia (WIA) make this edition a global one.
- A system-level treatment is now applied to HF and VHF/UHF Antenna Systems to help the station designer look at the "big picture."
- Lots of new projects will wet your workbench whistle in the Antenna and Transmission Line Measurements chapter.

EZNEC-ARRL

Antenna modeling is ubiquitous these days — and easier than ever. The 2011 Dayton Technical Achievement Award honoree, Roy Lewallen, W7EL, has updated the free version of *EZNEC-ARRL* to include the performance of the standard in amateur design software, *EZNEC 5.0* (**www.eznec.com**). A copy of the software is included with the CD-ROM shipped inside every copy of the book. Antenna models to support the chapter on Antenna Modeling are included, too.

Supporting Cast

Along with the CD-ROM that comes with the book, *The Antenna Book* now has its own website — **www.arrl.org/antenna-book**. Here's where you'll find software tools and utilities, spreadsheets, supplemental files and links to references. By using the website, you can find updates at any time between editions.

On the CD-ROM, you'll find dozens of articles supporting the book's print material, such as original articles that provide complete construction plans and drawings. Articles and papers referenced in the book can in many cases be found on the CD-ROM. The full set of software by N6BV is here, too: *HFTA*, *TLW* and *YW*, along with his original set of propagation tables. Hal Kennedy, N4GG, painstakingly updated the vendor and distributor list, now in spreadsheet form, to make it easier for you to sort and search. Of course, PDF files of the entire book are included, too, including all the graphics.

Ready, Set, Build!

Are you ready for your own new copy? I hope you'll enjoy leafing through its pages, imagining each antenna high above your QTH or proudly keeping you in touch on your travels. Your next project might be only pages away!

Ward Silver, NØAX, an ARRL contributing editor, served as lead editor of the new ARRL Antenna Book. *You can reach him at* **n0ax@arrl.org**.

US Amateurs Now 700,000 Strong!

As the third quarter of 2011 came to a close, ARRL VEC Manager Maria Somma, AB1FM, began calculating the number of licensed Amateur Radio operators in the US, as well as the number of new licensees. "At the end of September, I saw that the number of hams in the US was high," she said. "When I started comparing that number with other years, I found that it was an all-time high." For the first time, there are more than 700,000 radio amateurs in the US.

"When looking at the three current license classes — Technician, General and Amateur Extra — these numbers are impressive," Somma explained. "The number of Technicians peaked in March 2011 at 342,572, while in September 2011, we saw both Generals and Extras peak at 159,861 and 125,661, respectively. As new Technicians earn their Amateur Radio licenses, and current Technician licensees move on to General and Generals upgrade to Extra, this can cause up-and-down fluctuations for these totals."

Somma said these high numbers mean that hams are upgrading and renewing in larger numbers and staying interested in hobby: "These are compelling statistics and I am thrilled to see the highest number of amateur radio licensees ever! When I began working at the ARRL back in the mid 1980s, there were approximately 450,000 amateurs in the US. Our VEC program conducted an average of 55 sessions a week. Today, we administer approximately 150 exam sessions each week, and our total number of licensees across all three license classes continues to grow each year."

FCC LICENSEES BY LICENSE CLASS

Year	Ending Month	Extra	Advanced	General	Tech*	Novice	Total
2011	Sep	125,661	58,324	159,861	341,658	14,817	700,221
2010	Dec	122,951	59,367	155,781	342,191	15,751	696,041
2009	Dec	113,439	60,758	150,270	334,245	17,054	682,497
2008	Dec	115,929	62,164	144,592	322,659	19,343	663,584
2007	Dec	112,022	65,366	142,580	319,314	22,468	655,842
2006	Dec	109,229	70,015	141,224	320,673	25,853	656,089
2005	Dec	107,440	74,421	139,267	319,125	26,747	662,600
2004	Dec	106,090	77,348	138,292	319,742	29,765	671,837
2003	Dec	104,804	82,134	141,408	322,621	32,812	684,059
2002	Dec	103,257	84,326	139,548	321,605	35,072	685,308
2001	Dec	97,977	86,948	138,222	318,736	40,135	683,037
2000	Dec	89,007	90,703	134,144	316,071	45,522	682,240
1999	Dec	73,382	100,471	110,306	336,753	52,375	677,382

There are now more than 700,000 radio amateurs in the US, the highest number ever. This chart reflects Amateur Radio's growth since 1999. Note that as the number of total licensees grows, so do the number of Technician, General and Amateur Extra class licensees. *The number of new Technicians peaked in March 2011 at 342,572 (Source: www.ah0a.org/FCC/Licenses.html).

In the past 40 years, the number of Amateur Radio operators in the US has grown at a steady rate:

- December 1971: 285,000
- December 1981: 433,000
- December 1991: 494,000
- December 2001: 683,000
- September 2011: 700,221

Source: 1971, 1981, 1991 — print editions of Radio Amateur Callbook. *2001, 2011 —* **www.ah0a.org/FCC/Graphs.html**. *Please note: While the number of licensees has grown considerably over the years, we realize that these numbers include some who are no longer active in Amateur Radio.*

"As technology changes and advances, it is especially vital to keep up or be at the forefront," Somma said. "I believe that Amateur Radio has done just that! The measurable results are our indisputable license numbers. It amazes me after all these years how important and relevant Amateur Radio remains. I am proud to be one of the 700,221 licensees and to see this historic and important milestone."

EUROPEAN PROPOSAL FOR AMATEUR SECONDARY MF ALLOCATION CLEARS IMPORTANT HURDLE

In preparation for the 2012 World Radiocommunication Conference (WRC-12), the CEPT Project Team C approved a draft European Common Proposal (ECP) for an 8-kHz-wide secondary amateur band between 472 and 480 kHz at its September meeting. This draft ECP will now go to CEPT's Conference Preparatory Group for formal ratification in November. This breakthrough — at the 11th and final meeting of the project team — occurred with the submission by the UK's Ofcom of an RSGB-drafted compromise ECP proposal supported by France and Sweden.

Agenda Item 1.23 calls for WRC-12 delegations 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. "While an 8 kHz allocation does not fully meet our objective of 15 kHz, having a European Common Proposal for an amateur allocation is a major step toward possibly achieving one at WRC-12," said ARRL Chief Executive Officer David Sumner, K1ZZ. WRC-12 is scheduled for January 23-February 17, 2012 in Geneva, Switzerland.

According to Colin Thomas, G3PSM, the prospect of an agreed CEPT position is good progress, representing a 48 country block vote going into next year's WRC-12.

"It needs to be noted that the draft ECP comes with significant caveats to avoid interference to the primary user, as well as the existing secondary user services," he explained. "These are the maritime and aeronautical radionavigation services, respectively. As secondary users, we would also not be afforded any protection. It should be acknowledged that we have had support from a number of Region 1 IARU Member-Societies in getting to this position." Thomas is the CEPT Coordinator for this agenda item.

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

ARRL Briefs White House Staff on Amateur Radio's Capabilities During Emergencies

On September 12, at the invitation of White House Cybersecurity Coordinator Howard A. Schmidt, W7HAS, the ARRL briefed several members of the National Security Staff on the capabilities of the Amateur Radio Service to communicate in emergencies. "The White House is looking for ways that the great work of Amateur Radio operators can continue to support emergencies in the future with particular attention to increased use and dependency on Internet based technologies," Schmidt said. The ARRL presentation, conducted by Emergency Preparedness Manager Mike Corey, W5MPC — along with President Kay Craigie, N3KN, and Chief Executive Officer David Sumner, K1ZZ — focused on Amateur Radio's current and evolving capabilities to provide Internet messaging connectivity.

White House Cybersecurity Coordinator Howard A. Schmidt, W7HAS (left) invited the ARRL to the White House to brief staff on the part that Amateur Radio plays in emergencies. Standing with Schmidt outside the West Wing are ARRL President Kay Craigie, N3KN, ARRL Chief Executive Officer David Sumner, K1ZZ, and ARRL Emergency Preparedness Manager Mike Corey, W5MPC.

HIGH SOLAR FLUX NUMBERS IS GOOD NEWS FOR HIGHER HF BANDS

On September 24, the solar flux reached 190 — the highest we've seen in Solar Cycle 24 — and the higher HF bands are definitely feeling the effect. The Space Weather Prediction Center (SWPC) is forecasting solar flux levels to be at or around 130 for most of 2012. Higher solar flux levels can mean higher sunspot levels and this is good news for radio amateurs, especially Technicians. The 10 meter band is the only HF band where Techs have phone privileges.

"Techs can get use their voice privileges from 28.300-28.500 MHz," explained W1AW Station Manager Joe Carcia, NJ1Q. "If you don't have your own HF rig, find someone in your local radio club who does or call your Elmer. Without a doubt, you don't want to miss this opening. Who knows how long it will last or when it will come back? So get on the air while you can and experience the magic of 10 meters."

What is solar flux? The radiation from the Sun is measured at several different radio frequencies. One of these, 2800 MHz, or a wavelength of 10.7 cm, is most commonly used. The signal at this frequency is called the *solar flux*, and there is a rough relationship between this value and the number of sunspots. By measuring the solar flux, we can determine a general idea of the amount of radiation from the Sun that affects the ionosphere. Higher solar flux levels generally indicate that higher frequencies can propagate.

The solar flux hit its peak in the middle of September's CQWW RTTY Contest. "During the contest, both 10 and 15 meters were definitely hopping," said ARRL News Editor S. Khrystyne Keane, K1SFA. "I've only been licensed since 2006, and I've heard all the older hams tell me about how wonderful 10 meters could be, but I never saw it myself until the contest. Wow! It was better than I ever imagined, and I'm told it will only get better. I've never seen more than a handful of contacts on 10 meters during a contest, but we had almost 1100 contacts on the band during the 48 hour contest. We worked Senegal, Kenya, New Zealand, South Africa, Europe and Asia, and even Japan on 10 meters. I couldn't believe how hot the band was!"

QST Editor Steve Ford, WB8IMY, agreed. "I got on the radio for the CQ WW RTTY Contest and tuned to 20 meters out of habit. I was surprised at the lack of activity on 20, so I tuned up to 15 meters. So that's where everyone was! I couldn't believe the slew of activity on the higher bands."

But it wasn't only East Coast hams who experienced these spectacular conditions. Chip Margelli, K7JA, of Garden Grove, California, told the ARRL that "the high bands were a delight from out here on the West Coast. In the late afternoon and evening, 10 meters brought in loud stations from Asia, the Pacific, the Caribbean and South America. Japan, China, Australia, New Zealand, Guam, Saipan, and other juicy catches kept my rotator working fast. But the real highlight was the massive opening to Europe and Africa that I enjoyed on Sunday, when I had some time to operate. Not only was I able to work into Western Europe, such as Spain, Portugal, France and England, but 'deeper' Europeans were very loud, as well: Romania, Bulgaria, Hungary, Poland, the Baltics, the Czech Republic and Slovakia were all thundering in. Weaker signals were coming in from European Russia, Ukraine and other places I haven't heard for seven or eight years on 10 meters out here in California. I do not have an amplifier for 10 meters; I use 200 W and a homebrew 5-element Yagi about 60 feet high."

Also on the West Coast, Greg Howe, KI6IUJ, of Laguna Hills, California, did some experimenting with the openings on 10 meters. "I decided to take full advantage of the conditions by doing some very low power QRP work. After working several European stations at 1 W, I decided to really go QRP — 25 mW, the same power-level of most remote-control garage door openers. I established contacts running about 1 kW with the T32C Christmas Island DXpedition station and EA8CEQ in the Canary Islands. With their okay, I then reduced my power-level down to 25 mW. You don't need lots of power or a fancy antenna when 10 meters really opens up. Exercise a little patience, be persistent and go have some fun!"

"This is just the beginning of the fun and excitement that await us on 10 meters," Margelli said, "but what a beginning it was."

For a look at the predicted solar flux index, please visit the SPWC's website at **www.swpc.noaa.gov/ftpdir/weekly/Predict.txt**.

S. KHRYSTYNE KEANE, K1SFA

With the solar flux at levels not seen in years, there's a lot of activity on the higher HF bands.

FCC News

• **FCC Upholds $17,000 *Forfeiture Order* to Tennessee Ham**: In March 2009, the FCC issued a Notice of Apparent Liability for Forfeiture (NAL) in the amount of $17,000 to David Edward Perka, KA3PRB, of Lewisburg, Tennessee. The FCC alleges that Perka "willfully and repeatedly violat[ed] section 301 of the Communications Act of 1934, as amended, by operating without a license in the Maritime Radio Service and willfully violat[ed] Section 333 of the Act by maliciously interfering with the United States Coast Guard on the International Distress, Safety and Calling Channel in Annapolis, Maryland." Perka, who admitted to the findings, requested a reduction in the forfeiture amount, based on his inability to pay, but in a Forfeiture Order released by the FCC on September 21, 2011, the Commission refused to lower the amount.

In April 2008, agents in the FCC's Columbia Office determined that Perka operated on Marine Channel 16 (156.800 MHz), the International Distress, Safety and Calling Channel for stations operating in the Maritime Radio Service. According to the *Forfeiture Order*, even though Perka is a licensed radio amateur, he does not hold a license to operate in the Maritime Service. "The unauthorized transmissions on April 6, 2008 consisted of Perka making threatening statements to the USCG," the FCC stated in the *Forfeiture Order*. "Perka later admitted to FCC agents that the transmissions on April 6, 2008 were intentionally transmitted to harass the USCG. The unauthorized transmissions on April 7, 2008 consisted of tones from a Dual-Tone Multi-Frequency (DTMF) keypad." In March 2009, the FCC issued a *Notice of Apparent Liability for Forfeiture* (*NAL*) in the amount of $17,000 to Perka.

The FCC considered Perka's response to the *NAL*, but because he did not dispute any of the findings in the *NAL*, the FCC found that Perka "willfully and repeatedly violated Section 301 and willfully violated section 333 of the Communications Act. Enforcement Bureau staff provided Perka an additional opportunity to submit documentation in support of his request for a reduction based on an inability to pay," the FCC noted. "Although we have evidence that Perka received the letter, we have not received a response. We therefore have no basis for assessing Perka's financial situation and find that a forfeiture in the amount of $17,000 is warranted."

YAESU DONATES FT DX 5000 TRANSCEIVER TO W1AW

Thanks to the generosity of Yaesu, W1AW, the Hiram Percy Maxim Memorial Station, now boasts Yaesu's premier transceiver — an FT DX 5000 and SM-5000 Station Monitor. Dennis Motschenbacher, K7BV, Executive Vice President of Yaesu's Amateur Radio Sales Division, visited ARRL Headquarters in August to present the radio. ARRL Chief Executive Officer David Sumner, K1ZZ, accepted the radio on behalf of the station. Sumner also serves as W1AW trustee.

"Yaesu is thrilled to continue its long support of the ARRL by donating our new premium class FT DX 50000 transceiver," Motschenbacher said. "We understand this transceiver scored some of the best receiver performance numbers ever measured during ARRL Lab product testing, so ARRL Headquarters guests will now be able to slip into one of the W1AW operating studios to get on the air and spin the knobs on one of the best radios ever manufactured for the enjoyment of Amateur Radio."

W1AW Station Manager Joe Carcia, NJ1Q, thanked Yaesu for their donation: "This radio is installed in Studio Three and is available for use to Amateur Radio operators visiting W1AW. The Yaesu Quadra amplifier, DMU-2000 and Yaesu SM-5000 Station Monitor are all attached and make for an excellent operating spot. The FT DX 5000 certainly complements the station."

Motschenbacher remarked that returning to Newington to make the presentation "was a wonderful personal experience for me. I was so happy to see many old friends inside HQ, friendships made during the four and half years I spent with ARRL before joining Yaesu. It didn't take me long to see that the staff is very busy supporting its membership and Amateur Radio as a whole!"

S. KHRYSTYNE KEANE, K1SFA

Dennis Motschenbacher, K7BV, Executive Vice President of Yaesu's Amateur Radio Sales Division (left), visited ARRL Headquarters on August 26 to present the FT DX 5000 to W1AW. ARRL Chief Executive Officer David Sumner, K1ZZ, accepted the radio on behalf of the station. Sumner also serves as W1AW trustee.

HEATHKIT RETURNS TO THE KIT BUSINESS

Heathkit Educational Services, well-known to all Amateur Radio operators of a certain age, re-entered the kit business in late August. Heathkit announced a couple of kits, including the Garage Parking Assistant (GPA). This kit lets you build your own system that uses ultrasonic sound waves to locate your car as it enters the garage. The system signals to the driver using LED lights mounted on the wall when the car is detected and in the perfect spot for parking. Next on the market will be a Wireless Swimming Pool Monitor kit, followed by many more.

On its website, Heathkit asked kit builders to submit their suggestions for kits. Even though Heathkit wasn't initially interested in re-entering the Amateur Radio kit market, the overwhelming response from hams convinced the company to change its mind.

"When we made the announcement on our web page, we had no intention of entering the Amateur Radio kit market," Ernie Wake, Heathkit's Director of Marketing and Sales, told the ARRL. "The response was really overwhelming, exciting and scary. The scary part is that the brand name has so much loyalty that we don't want to disappoint the people who have such fond memories. We are working on developing a few Amateur Radio kits. Initially, the kit line will include a few 'accessories' like kits for a Dual Watt Meter, Antenna Tuners and the Cantenna. Once we are a little more 'settled,' I think we will develop a QRP receiver. We won't rush to market just to get there. We want to develop a line of kits in the tradition of Heathkit. I'm hoping to have one or two kits by the end of the year."

After several decades of successful kit manufacturing, Heathkit left the kit business in 1992. Heath sold Amateur Radio equipment, at first only kits and later its own line of non-kit products, from 1954 to 1992. The company has been sold a number of times since its founding back in 1912 as an aircraft company. QST

National Weather Service / ARRL SKYWARN Recognition Day

The 13th annual SKYWARN Recognition Day (SRD) is scheduled to be Saturday, December 3, 2011. 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 co-sponsored 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.

SKYWARN Recognition Day this year will be held from 0000 UTC to 2400 UTC on Saturday, December 3, 2011. To learn more, check the NOAA website at **www.wrh.noaa.gov/mtr/hamradio**.

The ARRL Ham Aid Program

In the aftermath of Hurricane Katrina's destruction in the Gulf region in 2005, many Amateur Radio manufacturers donated equipment to the Amateur Radio response effort and ARRL agreed to serve as custodian of the equipment. Funds in the form of private donations and a grant from the Corporation for National and Community Service (CNCS) helped make the Ham Aid program a reality. Hard shelled, professional gear cases made by Pelican were purchased and packed with the donated communications equipment.

Some of the equipment is optimized for VHF/UHF use (local/tactical communications) and some equipments is set up for High Frequency (long and medium range) base station operations. All kits include radio, power supply, coaxial feed line, antenna tuner and antenna. There is even a kit that is optimized for digital communications.

Ham Aid kits are not intended to replace your own local efforts and resources. Rather, the idea is to provide basic equipment for a temporary response to an emergency communications effort and to equip quick-response individuals with portable equipment to supplement what they have. The kits are available for any disaster or emergency, either underway or anticipated. They are also available for approved training, educational missions, selected expositions and demonstrations.

How does one obtain a Ham Aid Kit? Please contact your Section Manager to initiate the request. ARRL Section Managers can read more about the Ham Aid program by checking out the Ham Aid Program guidelines in the "Section Managers Only" area of the ARRL website. Section Managers are able to request the kits by completing an online form found there or, alternatively, he or she may contact **emergency@arrl.org**, or Headquarters by telephone (860-594-0227).

Earlier this year, during the aftermath of the tornadoes in Tuscaloosa and the flooding in Vermont, the Ham Aid Program provided radio equipment that was used to support different mobile and fixed operations within those disaster areas. Since they were first deployed during Katrina in 2005 and later for Haiti in 2010, Ham Aid kits have proved a valuable resource in dealing with disasters of all descriptions. — *Ken Bailey, K1FUG, ARRL Emergency Preparedness Assistant*, **k1fug@arrl.org**

ARRL Invites Nominations for 2011 International Humanitarian Award

Nominations are open for the 2011 ARRL International Humanitarian Award. The award is conferred upon an amateur or amateurs who demonstrate devotion to human welfare, peace and international understanding through Amateur Radio. The League established the annual prize to recognize Amateur Radio operators who have used ham radio to provide extraordinary service

STEVE EWALD, WV1X

This Ham Aid kit is optimized for digital communications.

STEVE EWALD, WV1X

This Ham Aid kit has a set of handheld transceivers with batteries.

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

2008 International Humanitarian Award was awarded to the Chinese Radio Sports Association.

to others in times of crisis or disaster.

A committee appointed by the League's president recommends the award recipient(s) to the ARRL Board, which makes the final decision. The committee is now accepting nominations from Amateur Radio, governmental or other organizations that have benefited from extraordinary service rendered by an Amateur Radio operator or group.

Amateur Radio is one of the few telecommunication services that allow people throughout the world from all walks of life to meet and talk with each other, thereby spreading goodwill across political boundaries. The ARRL International Humanitarian Award recognizes Amateur Radio's unique role in international communication and the assistance amateurs regularly provide to people in need.

Nominations should include a summary of the nominee's actions that qualify the individual (or individuals) for this award, plus verifying statements from at least two people having first-hand knowledge of the events warranting the nomination. These statements may be from an official of a group (for example, the American Red Cross, The Salvation Army, a local or state emergency management official) that benefited from the nominee's particular Amateur Radio contribution. Nominations should include the names and addresses of all references.

All nominations and supporting materials for the 2011 ARRL International Humanitarian Award must be submitted in writing in English to ARRL International Humanitarian Award, 225 Main St, Newington, CT 06111 USA. Nomination submissions are due by December 31, 2011. In the event that no nominations are received, the committee itself may determine a recipient or decide to make no award.

The winner of the ARRL International Humanitarian Award receives an engraved plaque and a profile in *QST* and other ARRL venues.

Ron Tomo, KE2UK, from New York, was the recipient of the 2010 ARRL International Humanitarian Award. Tomo's life exemplified Public Service through Amateur Radio, from providing phone patches during the Vietnam War, providing communications support during 9/11 with MARS and the United States Service Command, as well as serving in the US Coast Guard Auxiliary as a communications officer playing a pivotal role during Hurricanes Katrina and Rita.

For an additional reference on this award, visit **www.arrl.org/international-humanitarian-award**.

NTS Resources on the ARRL Web Page

The ARRL National Traffic System Resources web page is a part of the "Public Service" portion of the ARRL website. The specific link to the NTS Resources is **www.arrl.org/nts**.

On this web page, you'll also find a variety of links to resources such as the *NTS Methods and Practices Guidelines* — NTS MPG (**www.arrl.org/appendix-b-nts-methods-and-practices-guidelines**). This is the working reference manual on traffic net and message handling procedures in the ARRL National Traffic System (NTS). It also serves as an appendix to the *ARRL Public Service Communications Manual* (**www.arrl.org/public-service-communications-manual**), which is also on this same web page. According to the *NTS MPG's* editor, Al Nollmeyer, W3YVQ, "the methods presented are a reasonably accurate snapshot of current practices. They are indeed practices and not strict rules but the beginner, Section, Region, Area and Transcontinental Corps net operators and management alike will find it beneficial to have a uniform protocol reference to be used by operators."

The National Traffic System—An Introduction is a PowerPoint presentation that provides an introduction to the National Traffic System (NTS) including an introduction to National Traffic System Digital (NTSD). Thanks to Greg Szpunar, N2GS (ARRL Official Relay Station and NTS Digital Relay Station) and to Dave Struebel, WB2FTX (ARRL Section Traffic Manager of Northern New Jersey and NTS Eastern Area Digital Coordinator) for writing and creating this program. To see and download the program, click on the link for the NTS Resources web page.

An Instructors Guide to Training Traffic Handlers by Mark W. Rappaport, W2EAG, is also available on the NTS Resources web page. This guide is written for the volunteers who are willing to train Amateur Radio operators about traffic handling. These volunteer instructors know that their efforts may bring new traffic handlers to the nets.

Reminder About 2011 SET Reports

Thanks to the Field Organization Leaders who have been submitting their 2011 Simulated Emergency Test (SET) reporting forms and/or ARRL Emergency Coordinator Annual Reports.

If you are an ARRL Emergency Coordinator (EC), District Emergency Coordinator (DEC), Section Emergency Coordinator (SEC), Net Manager (NM), Section Traffic Manager (STM) or other leader who has been designated and/or is responsible for reporting your 2011 Simulated Emergency Test results, there is time to send in your reports by February 1, 2012.

Links to the 2011 SET reporting forms and the EC Annual Report are available at **www.arrl.org/public-service-field-services-forms**. When logged on to this web page, scroll down until you see these links titled: Form A: EC Simulated Emergency Test Report; Form B: NM Simulated Emergency Test Report; Form C: EC Annual Report. Once you fill out the form, save it and then e-mail the form or forms to ARRL Headquarters via **sewald@arrl.org**.

Photographs showing your SET activities are welcome, too. Please consider sending some of your best pictures of the event and include a caption that identifies who is pictured and who took the photo.

If you mail reports to ARRL Headquarters via the US Postal Service, the mailing address is via ARRL Headquarters, Attention Steve Ewald, WV1X, 225 Main St, Newington, CT 06111-1494. Thank you!

Looking for ARRL EmComm on Twitter? Please visit **twitter.com/arrl_emcomm**

twitter

WB8IMY

ECLECTIC TECHNOLOGY

Reverse Beacons

Here in the US, the Federal Communications Commission allows amateurs to establish unattended beacon stations within various frequency ranges beginning at 28.200 MHz. If you take a quick spin through the beacon subband on 10 meters, for instance, you'll likely hear the Morse code IDs of several beacons, assuming the band is open.

Reverse beacons turn the traditional beacon concept upside down.

In the land of reverse beacons, there are no unattended transmitting stations, although there may be plenty of unattended *listening* stations. These listening stations monitor the bands for CW and digital signals. The signals may be from stations engaged in conversations, or from stations calling CQ. Whenever a listening station decodes a call sign, it notes the frequency, time and occasionally the signal strength and then forwards the information automatically to a website for everyone to see.

The Reverse Beacon Network (RBN) maintained by Pete Smith, N4ZR, and Felipe Ceglia, PY1NB, depends on volunteer listening stations that use *CW Skimmer* software developed by Alex Shovkoplyas, VE3NEA, to comb the HF bands for CW activity. You'll find the RBN at **www.reversebeacon.net**.

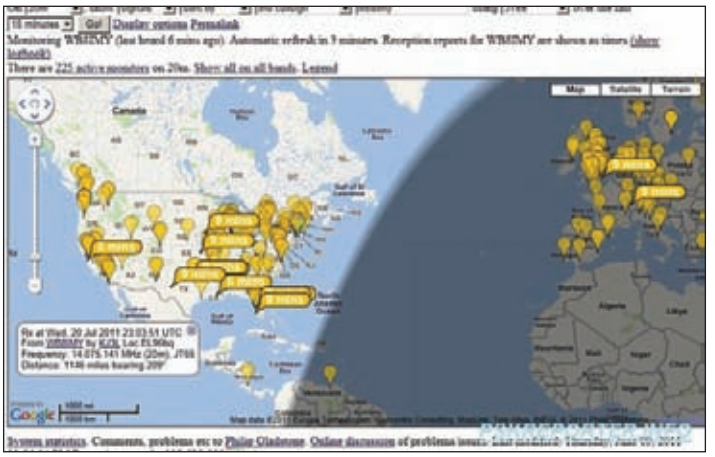
Another network, and one of my personal favorites, is PSKReporter maintained by Phil Gladstone, N1DQ, at **http://pskreporter.info**. Don't let the name of the site fool you. This reverse beacon network is about much more than PSK. Phil's site aggregates reception reports of many different kinds of modes from CW to JT65 and displays the results on a near-real-time map. There are dozens of listening stations contributing reports to PSKReporter at any given moment.

I enjoy operating JT65 on the HF bands and use *JT65-HF* software by Joe Large, W6CQZ. It is utterly fascinating to try different antennas or power levels and see the results on PSKReporter. I can make a contact or call CQ and within 60 seconds I'll see reports on the network. A glance at the map tells me which stations heard me and where they are located. Joe maintains his own JT65 reverse beacon network as well at **http://jt65.w6cqz.org/receptions.php**.

WSPRnet is yet another take on the same idea, but this network is built around stations using K1JT's *MEPT-JT* mode at very low power levels. The reporting website at **http://wsprnet.org/drupal/** also offers an informative map display.

Remember that you don't have to be sitting at your radio to contribute reports to any of these networks. You aren't transmitting; you are simply listening. All you need is an Internet connection and the appropriate software depending on which network you wish to join. I routinely activate the reporting function in *JT65-HF*, park my rig on a JT65 frequency (such as 14.076 MHz) and walk away for hours. While I'm out running errands or puttering around the yard, I'm also rendering a service to my fellow hams. Such a deal!

The Reverse Beacon Network at www.reversebeacon.net.



After making a contact on 20 meters using JT65 with just 1 W to a mobile antenna, I quickly jumped to the PSKReporter site and saw that a surprising number of other stations had heard me as well.

The WSPRnet propagation map.

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

CONTEST CORRAL

in association with the *National Contest Journal*

DECEMBER 2011

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Website 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 2, 0200Z - Dec 2, 0300Z	1.8-14		SNS and NS Weekly Sprints		✘		Serial, name, and S/P/C	www.ncccsprint.com/rules.html
Dec 2, 2200Z - Dec 4, 1600Z	**1.8**		**ARRL 160 Meter Contest**		✘		**RST and ARRL/RAC section if US/VE**	www.arrl.org/contests
Dec 3, 0000Z - Dec 3, 2400Z	1.8-28		TARA RTTY Mêlée			✘	RST and State/Province or serial	www.n2ty.org/seasons/tara_melee_rules.html
Dec 3, 1600Z - Dec 4, 1559Z	3.5-28		Top Operators Activity Contest		✘		RST, serial, and TOPS/PRO number	www.procwclub.yo6ex.ro
Dec 3, 2300Z - See website	3.5,7		AWA Bruce Kelly QSO Party		✘		RST, Xmtr type, power, name	www.antiquewireless.org
Dec 6, 0200Z - Dec 6, 0400Z	3.5-28		ARS Spartan Sprint		✘		RST, S/P/C, and power	www.arsqrp.blogspot.com
Dec 7, 1300Z - See website	3.5-14		CWops Monthly Mini-CWT Test		✘		Name and member number or S/P/C	www.cwops.org/onair.html
Dec 10, 0000Z - Dec 11, 2400Z	28		28 MHz SWL Contest	✘	✘		Log ARRL 10 Meter Contest QSOs	swl.veron.nl/swlcontest.htm
Dec 10, 0000Z - Dec 11, 2400Z	**28**		**ARRL 10 Meter Contest**	✘	✘		**RS(T) and State/Prov or serial**	www.arrl.org/contests
Dec 10, 1700Z - See website	1.8-7		UBA Winter Contest	✘	✘	✘	RS(T) and UBA section or serial	www.uba.be/en/hf/contest-rules
Dec 10, 2300Z - See website	3.5,7		AWA Bruce Kelly QSO Party		✘		RST, Xmtr type, power, name	www.antiquewireless.org
Dec 11, 0000Z - Dec 11, 2359Z	3.5-28		SKCC Weekend Sprintathon		✘		RST, S/P/C, SKCC nr or power	www.skccgroup.com
Dec 11, 2100Z - Dec 11, 2259Z	14		Great Colorado Snowshoe Run		✘		RST, S/P/C, class, CQC number or power	www.cqc.org/contests
Dec 11, 0000Z - Dec 15, 0200Z		50-222	NA High-Speed Meteor Scatter Contest			✘	Both calls, grid square, acknowledgement	www.ykc.com/wa5ufh
Dec 14, 0130Z - Dec 14, 0330Z	3.5-14		NAQCC Monthly QRP Sprint		✘		RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
Dec 15, 2100Z - Dec 15, 2300Z	1.8		Russian 160 Meter Contest	✘	✘		RS(T), serial, square ID (see website)	www.radio.ru/cq
Dec 17, 0000Z - Dec 17, 2400Z	3.5-28		Feld-Hell Happy Birthday Sprint			✘	RST, S/P/C, Feld-Hell member nr	www.feldhellclub.org
Dec 17, 0000Z - Dec 18, 2400Z	3.5-28		OK DX RTTY Contest			✘	RST and CQ Zone	www.crk.cz/ENG/DXCONTE.HTM
Dec 17, 0000Z - Dec 17, 2359Z	1.8-28	50,144	RAC Winter Contest	✘	✘		RS(T) and province or serial	www.rac.ca/en/rac/programmes/contests
Dec 17, 0001Z - Jan 2, 2359Z	1.8-28	50,144	Lighthouse Christmas Lights QSO Party	✘	✘	✘	Serial or ARLHS number	arlhs.com
Dec 17, 1400Z - Dec 18, 1400Z	1.8-28		Croatian CW Contest		✘		RST and serial	www.9acw.org
Dec 17, 1500Z - Dec 18, 1500Z	1.8		Stew Perry Top Band Distance Challenge		✘		4-char grid square	jzap.com/k7rat/stew.rules.txt
Dec 18, 1800Z - Dec 18, 2359Z	**3.5-28**	**50**	**ARRL Rookie Roundup**		✘		**Both calls, name, check, S/P/XE or "DX"**	www.arrl.org/contests
Dec 18, 2000Z - Dec 18, 2359Z	1.8-28		Holiday Spirits Homebrew Sprint		✘		RST, S/P/C, ARCI number or Power	qrparci.org/contests
Dec 19, 0200Z - Dec 19, 0400Z	1.8-28		Run For the Bacon		✘		RST, S/P/C, Flying Pig nr or power	www.fpqrp.org
Dec 25, 0000Z - Dec 25, 1200Z	3.5-28		RAEM Contest		✘		Serial and lat/long in degrees	www.raem.qrz.ru
Dec 25, 0830Z - Dec 25, 1059Z	3.5-7		DARC Christmas Contest	✘	✘		RS(T) and DOK or special station code	www.darc.de/referate/dx/contest/xmas/en
Dec 28, 0000Z - Dec 28, 0200Z	1.8-28	50	SKCC Straight Key Sprint		✘		RST, S/P/C, name, SKCC nr or power	www.skccgroup.com
Dec 29, 0130Z - Dec 29, 0330Z	3.5-14		NAQCC Milliwatt Sprint		✘		RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
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 websites 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

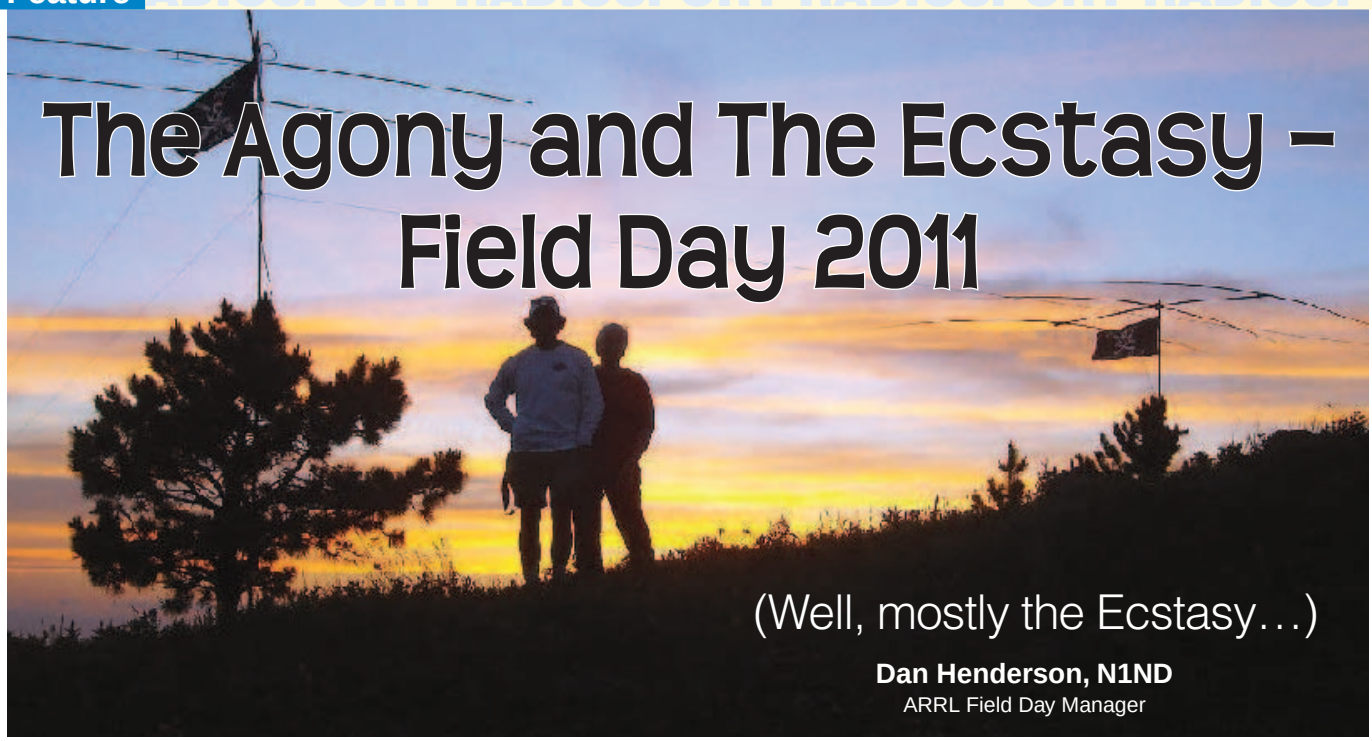
Sean's Picks

Contest Manager Sean Kutzko, KX9X

All dates/times are in UTC.

- **State QSO Parties This Month:** None.
- **QRP Contests This Month:** QRP-ARCI Top Band Sprint (December 2), ARS Spartan Sprint (December 6), NAQCC monthly QRP Sprint (December 14), QRP-ARCI Holiday Spirits Homebrew Sprint (December 18), Flying Pigs Run for the Bacon (December 19), NAQCC Milliwatt Sprint (December 29).
- **ARRL 160 Meter Contest (December 2-4):** Top Band takes top shelf the first weekend in December. If you've never worked 160 meters before, you'll be surprised how easy it is to work stations there. Load up whatever wire you have, break out the CW paddle and have fun!
- **TARA RTTY Melee (December 3):** The Troy Amateur Radio Association has a great RTTY contest the first weekend of December. A great event to get your digital feet wet in.
- **ARRL 10 Meter Contest (December 10-11):** If you haven't noticed recently, 10 meters has been on fire since September. Even 100 W stations with simple antennas can do well when the band is open….and *boy*, has it been open! Do not miss this event, folks.
- **NA High-Speed Meteor Scatter Contest (December 11-15):** Meteor scatter allows long-range contacts on the VHF/UHF bands. With a horizontal beam for 6-222 MHz and a digital interface, you too can make long-range QSOs with the free *WSJT* software. It's not that difficult! Try it.
- **RAC Winter Contest (December 17):** Our good friends to the north sponsor this event every December. Lots of fun in a low-pressure environment. Have at it!
- **Stew Perry Top Band Distance Challenge (December 17-18):** Distance-based scoring rules the roost on 160 meters this weekend. Exchange is your Maidenhead grid square. The greater distance your QSO, the more points you earn.
- **ARRL CW Rookie Roundup (December 18):** Newcomers to CW have a 6 hour contest all for themselves! If you've been licensed for 3 years or less you can enter this event as a Rookie. Old-Timers work the Rookies and give back to the newly licensed. Score summaries are due within 72 hours. More info at **www.arrl.org/rookie-roundup**.

The Agony and The Ecstasy – Field Day 2011



(Well, mostly the Ecstasy…)

Dan Henderson, N1ND
ARRL Field Day Manager

In 1897, the great American author Samuel Clemens (better known as Mark Twain) wrote to a friend concerning Clemens's ill cousin "The report of my illness grew out of his illness, the report of my death was an exaggeration." This oft-used quote came to mind while I was preparing the results for the ARRL's largest on-the-air Amateur Radio operating event — the ***Sound and the Fury*** known as ARRL Field Day. During my travels, I frequently hear the tales lamenting the pending demise of our hobby. When I look at the numbers and stories that make up ARRL Field Day 2011, however, I believe that the stories of the demise of Amateur Radio are, to quote Clemens, "an exaggeration." That connection led to other famous authors and great works of literature to tell the tale of Amateur Radio at its best in the year 2011…

For many, the fourth full weekend of June evolves into a fleeting ***Utopia*** — a place where all is right and good in the world. For an all-too-short period, tens of thousands of amateurs across the US, Canada, and seven other countries around ***The Good Earth*** found unique ways to blend everyday life and their passion for radio into a unique demonstration of public service, operating skills and fun. The ***Revolutionary Road*** of Field Day runs through every state in the Union and all 80 ARRL Sections. This year a reported 39,246 participants looked ***Beyond the Horizon*** to share in the unique spirit that is Field Day. That is a record number of participants and is an increase of 4% from the previous high set just last year. Aside from a record number of participants, a record 2666 entries arrived at ARRL for inclusion in this year's event.

Top 10 Claimed Scores

Call Sign	Score	Class
W3AO	38,764	25A
W9CA	23,014	3A
K6EI	20,845	7AB
W0CQC	19,130	2AB
K1R	18,850	5A
W4UNC	17,035	9AB
K7UM	16,668	4A
W4DW	16,606	9A
K8UO	16,410	14AB
K4LRG	16,400	5A

Field Day allows groups and individuals to participate at their own pace and in their own style. Each entry is an effort to see if they have ***What It Takes***. Some look to activate stations familiar and comfortable, while others look at this as a chance to see the ***Return of the Native*** environment. Whether setting up at ***Washington Square*** in the city, on ***Walden*** Pond in the country or across ***The Great Bridge***, many participants chose to wander through the ***Leaves of Grass*** to make the weekend event memorable. Sixteen-hundred thirty-four (1634) groups answered ***The Call of the Wild*** and set up in true Field Day spirit in the various Class A and B categories away from the creature comforts of home. As usual, the standard Class A stations led the way with 1316 entries — 49.4% of all entries received. The next largest number of entries was the 420 Class D entries. Many people choose to operate from home as Class D or E stations because of a variety of reasons. These two classes represent 27.5% of all entries and demonstrate that home stations do not represent a ***Paradise Lost***. On the contrary, the skills developed by the home (and EOC) stations have a vital role to play, as are participants end up as ***The Good Companions***. There is no reason to have a sense of ***Pride and Prejudice*** about any operating class — especially when the bottom line for Field Day is to maximize the fun of the weekend!

Above: Not your normal "pirates"… These are fully licensed amateurs whose only intent was plundering golden QSOs during a Wyoming Field Day.

So many elements go into a successful Field Day and in most cases, the starting point for the ***Pilgrim's Progress*** through the weekend is the group's Field Day chair. Before the first contact is ever made, there is always a ***Discourse on Method*** of the best way to "do it" this time around. Many details are addressed once you start the planning. Some groups pride themselves on being self-contained once they arrive at their site, knowing that ***You Can't Go Home Again***. Safety is always a concern, because Field Day is not where you necessarily want to do ***Experimental Researches in Electricity***. Praying for ***Deliverance*** from a passing thunderstorm or severe weather event is no

substitute for planning and preparation. If you have not thanked the club officials or Field Day chair for their efforts, remember to do so. Their efforts hopefully saved your group from experiencing ***The Divine Comedy*** of being visited by Murphy.

One of the most important components of Field Day is publicity. There is value to seeing the story of Amateur Radio told — whether on the television, web-based news outlets, print newspapers or even in an ***American Tabloid***. The efforts of the ARRL Public Relations Committee and the hundreds of state and local PIOs and PICs paid off this year. This ***Midsummer Night's Dream*** opportunity led to more media hits than the ARRL has ever had reported. Amateur Radio was visible on the video board in New York's Times Square as well as active with local journalists from ***Our Town***. Many thanks go to the dedicated women and men who actively use their talents and skills to help promote the Amateur Radio story.

The actual Field Day period itself can be as exciting as opening the ***Gift of the Magi*** or as potentially troublesome as experiencing the ***Grapes of Wrath***. Whether things for your group ran as smoothly as ***A Clockwork Orange*** or was reminiscent of ***One Flew Over The Cuckoo's Nest,*** another of the key components of the weekend is to have an ***Advancement of Learning*** for all participants. Nearly one-third of all groups claimed the Educational bonus. Hundreds of groups hosted representatives from served agencies and local governmental officials. Showing these important visitors that Amateur Radio has ***The Right Stuff*** is an ongoing exercise in ***The Expanding Universe*** of today's world.

Dozens of ARRL officials — Division Directors, Vice-Directors, Officers, Section Managers and Section Emergency Coordinators — made the effort to visit sites in their areas and show support to the amateurs in attendance. They logged more miles than covered in ***Gulliver's Travels***, but did so because they love the experience of sharing in the enthusiasm. At ***Parade's End*** they may be tired, but have learned a great deal that helps them better represent the amateurs they represent and serve. The added perk? ***A Moveable Feast*** of Field Day cuisine that is hard to describe — or resist.

Once the actual operating begins the ***Doors of Perception*** open. Digital contacts increased by 7.4% — further evidence that new technologies and equipment allow amateurs to keep pace with the time. As for the belief that CW is dying? Well, we can once again use the Clemens' quote that the report of the death of CW is "exaggerated" — by the end of Field Day, the most CW contacts in the last 17 years were entered into ***The Golden Notebook***. A total 1.4 million contacts were reported. That's an average of almost 1000 QSOs per minute logged. Think about that one a second.... Thanks to ***Midnight's Children*** and those who know ***The Sun Also Rises*** for staying in the chairs and keeping the bands active. That amount of activity shows the operator at most sites was not the ***Invisible Man***.

Alas, Field Day ultimately comes to ***This Side of Paradise,*** and the operating ends. But that does not mean it is over. After ***The Power and The Glory*** of the event subsides, Field Day is truly ***The Never Ending Story***. The Field Day reports must be assembled and submitted to ARRL. For several years, the simplest and easiest way to do this has been to send the summary via the **www.b4h.net/cabforms** website provided by volunteer Bruce Horn, WA7BNM. Nearly three-quarters of all Field Day entries are handled by this site. This allows a more accurate handling of the data. If you know Bruce, pass along a big "thanks" for his dedication and contribution to this event.

Eventually there is the final treasure of Field Day — the ability to share you and your group's individual story with thousands of others. When you visit the ARRL Online Soapbox at **www.arrl.org/soapbox** you will find over 100 participants have left their ***Remembrance of Things Past*** for others. Visit the site and read some of the funny and educational experiences. You may find some hints or ideas to try next year. While you are there, leave your own experience to share with others. You may find yourself inspired.

When all is said and done, there are few experiences in Amateur Radio that rival Field Day. The challenge is finding ways to maximize participation and fun. For some, it is tough to find ***The Will To Power*** on the radio that weekend. Others do not want to stop because it is so hard to say ***So Long See You Tomorrow***. We can each be the ***Master and Commander*** of our own operation, or we can become one of the ***Brothers Karamazov*** with our friends in the local club. Whichever you choose, here is hoping you have fun on the bands June 23-24, 2012. After all, it isn't a matter of ***War and Peace*** — it is ARRL Field Day! 73…

Participation By ARRL Section

Section	Entries
AB	8
AK	7
AL	36
AR	29
AZ	59
BC	22
CO	65
CT	37
DE	8
DX	8
EB	21
EMA	29
ENY	31
EPA	61
EWA	20
GA	63
IA	31
ID	19
IL	79
IN	55
KS	34

Section	Entries
KY	26
LA	22
LAX	39
MAR	11
MB	6
MDC	53
ME	19
MI	92
MN	49
MO	51
MS	25
MT	19
NC	73
ND	6
NE	13
NFL	49
NH	24
NL	2
NLI	32
NM	27

Section	Entries
NNJ	42
NNY	13
NTX	60
NV	12
NWT	1
OH	134
OK	19
ON	78
OR	49
ORG	49
PAC	9
PR	6
QC	29
RI	12
SB	8
SC	33
SCV	34
SD	6
SDG	24
SF	10

Section	Entries
SFL	25
SJV	26
SK	4
SNJ	19
STX	69
SV	31
TN	60
UT	26
VA	75
VI	2
VT	10
WCF	22
WI	53
WMA	15
WNY	49
WPA	50
WTX	11
WV	17
WWA	74
WY	6

General Field Day Statistics

Year	2011	2010	2009	2008	2007	2006
CW QSOs	577,181	540,419	556,525	506,139	511,580	518,799
Digital QSOs	45,099	41,872	38,340	27,869	22,112	21,459
Phone QSOs	812,083	747,419	765,536	702,847	679,240	696,567
Total QSOs	1,434,,363	1,329,710	1,360,401	1,236,855	1,212,932	1,236,825
Total Entries	2,666	2,648	2,642	2,409	2,331	2,199
GOTA	463	467	470	447	467	432
Participants	39,287	37,764	37,592	35,798	34,833	32,506

Entries by Class

1A	149	1AC	9	1D	385
2A	387	2AC	36	2D	19
3A	349	3AC	33	3D	12
4A	125	4AC	13	4D	2
5A	83	5AC	8	5D	2
6A	37	6AC	3	1E	253
7A	21	9AC	2	2E	30
8A	10	1B1	35	3E	17
9A	7	1B1B	160	4E	9
10A	3	2B1B	1	5E	3
11A	1	1B1C	17	8E	1
25A	1	1B2	19	13E	1
1AB	18	2B2	9	1F	38
2AB	17	1B2B	36	2F	74
3AB	9	2B2B	11	3F	47
4AB	8	1B2C	8	4F	19
5AB	1	2B2C	3	5F	8
7AB	1	1C	62	6F	5
8AB	2	2C	7	9F	1
9AB	1	3C	1	10F	1
14AB	1			12F	1

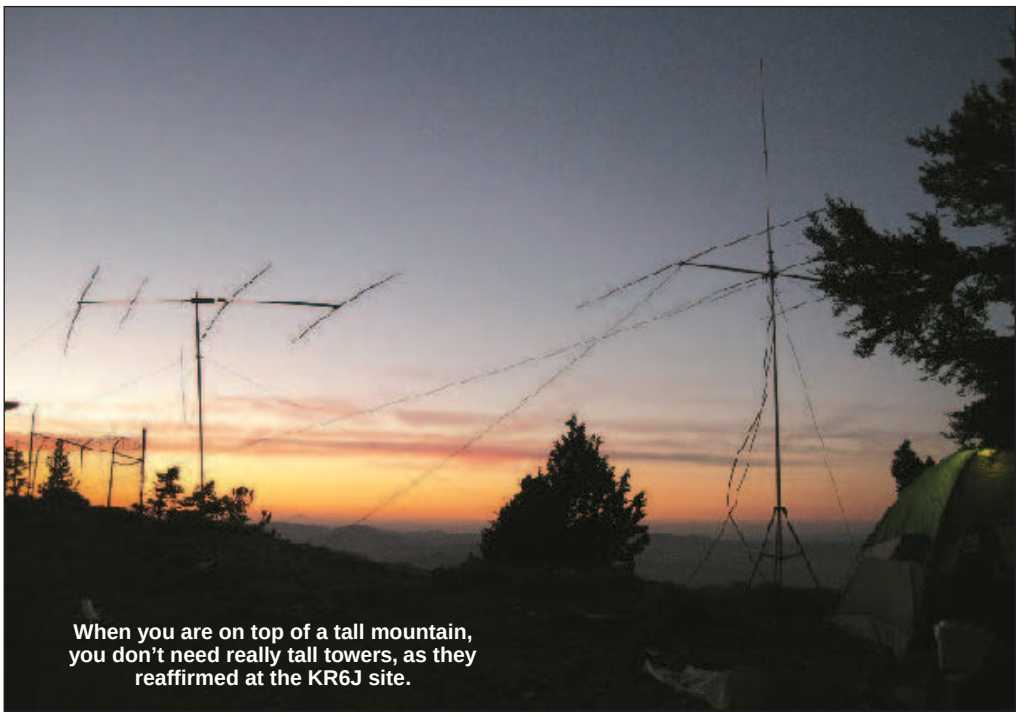
Scores

Class A stations are clubs or groups operating with three or more participants. Score listings are grouped according to the number of transmitters in simultaneous operation. The listings show club or group name, call sign(s) used, total number of QSOs, 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 and 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.

Class A Three or More Person Portable Stations

1A

SPAWAR Team					
K6AM	3610	2	6	11,134	SDG
K5WA	1894	2	4	7,438	STX
WØICT	2091	2	3	6,898	KS
Robert F Heytow Memorial RC					
K9YA	1375	2	4	6,250	IL
Lafayette DX Assn					
W9LDX	1717	2	11	6,066	IN
Murphy's Law Radio Group					
K5KJ	1489	2	7	5,544	NTX
Case ARC					
W8EDU	1569	2	5	5,520	OH
Hoosier DX & Contest Club					
KJ9D	1276	2	10	5,482	IN
Federation of Am Radio Operators					
K9ZA	1457	2	3	5,398	IL
Oconee District 17 FD Group					
W9DC	1449	2	7	5,332	SC
Wayne ARC					
W8AV	1308	2	8	5,170	OH
Sam Houston AR Klub					
AI5M	1263	2	25	4,962	STX
Bozo and the Lids					
W9TG	1031	2	5	4,772	IN
Greer ARC					
W4IT	1298	2	10	4,574	SC
VE2FET	997	2	7	4,556	QC
Neurosa Gopher Munchers					
AE6C	997	2	3	4,478	SV
FAULT					
K1LT	1058	2	5	4,358	OH
NC Contesters					
N4PY	1262	2	3	4,304	NC
Motorola ARC-Schaumburg					
K9MOT	1433	2	15	4,264	IL
Union Metropolitaine des Sans-filistes de Montreal					
VE2UMS	1185	2	40	4,218	QC
West Island ARC/Montreal ARC/Concordia Univ ARC					
VE2CUA	1125	2	20	4,110	QC
N4A	935	2	4	3,990	NC
Associated RA of SE New England					
W1AQ	1163	2	16	3,920	RI
South Georgian Bay ARC					
VE3SGB	1360	2	6	3,690	ON
Newton ARA					
WØWML	650	2	8	3,450	IA
Dr Loomis Memorial Jr Mechanics League					
W3KDR	1070	2	7	3,318	MDC
Texas DX Soc					
K5DX	1091	2	10	3,252	STX
Pitkin ARC					
WØCO	883	2	7	3,150	CO
Tucker Co FD Group					
K9NO	1045	2	6	3,134	WV
Benton ARS					
K5NE	947	2	18	3,100	AR
JJ&V Contesters					
WAØVPJ	1467	2	5	3,086	MN
IOOK Vice Presidents					
W8ED	792	2	12	3,002	WV
N5JB	684	2	3	2,974	NTX
Page Valley ARC					
K4PMH	779	2	14	2,922	VA
Athens Co ARA					
W8MHV	547	2	15	2,896	OH
Eastern Panhandle ARC					
K8EP	779	2	12	2,608	WV
Fort Madison Amateur					
WFØRT	497	2	25	2,566	IA
RC of Redmond					
N7KE	660	2	14	2,490	WWA
WPPS RC					
W7POE	414	2	3	2,206	MT
W4SEC	464	2	3	2,206	NFL
Sandia National Laboratories ARC					
W5MPZ	618	2	18	2,206	NM
Juneau ARC					
KL7JRC	492	2	22	2,154	AK
Hattiesburg ARC					
K5PN	921	2	25	2,152	MS
Club Radioamateur de Beauce					
VE2CRB	441	2	8	2,094	QC
Santa Barbara ARC					
K6TZ	432	2	16	2,076	SB
ARA of Bremerton					
W7VE	518	2	6	2,060	WWA
KU9Z	557	2	15	2,056	IL
Acadiana ARA					
W5DDL	449	2	47	2,028	LA
MalibuSix					
KI6J	720	2	6	2,016	LAX
SCVRA					
KØCD	367	2	15	1,918	WI
Lanark-North Leeds ARES					
VE3LCA	508	2	8	1,908	ON
Marshall Co ARC					
WØGCJ	348	2	15	1,902	KS
Bitterroot AR Contest Group					
K7A	409	2	4	1,870	MT
First State ARC					
K3QBD	462	2	30	1,848	DE
KB9OFM	597	2	3	1,844	WI
W7AZO	402	2	40	1,818	AZ
Loudon Co ARES					
W4FLO	400	2	11	1,810	TN
Hanburger's Helpers ARC					
K3HH	437	2	3	1,650	MDC
NØSFF	520	2	11	1,646	IA
SUHFARS					
N9EP	533	2	14	1,606	IL
Greater Lansing DX Group					
W8HNI	335	2	3	1,590	MI
SPARC					
KH6EL	1102	1	12	1,552	PAC
KEØRR	320	2	3	1,532	MN
Covey Hill ARC					
VE2CYH	325	2	15	1,528	QC
Wiregrass Hams					
KC4HW	255	2	5	1,488	AL
Lost Park Loggers					
WNØB	542	2	6	1,458	CO
N4VG	600	2	9	1,450	AL
Iowa City ARC					
WØJV	275	2	16	1,408	IA
Mayerthorpe Flying Dinosaurs					
VE6FD	594	1	13	1,388	AB
Utica ARC					
K2IQ	248	2	12	1,374	WNY
Vicksburg ARC					
K5ZRO	536	2	8	1,372	MS
Halton ARC					
VE3OD	197	2	12	1,348	ON
Wireless Society of Southern ME					
WS1SM	208	2	10	1,290	ME
Bawating ARG					
VE3LSC	213	2	10	1,218	ON
Stanly Co ARC					
K4OGB	268	2	32	1,184	NC
Great River ARC					
WØDBQ	252	2	17	1,154	IA
Lake Chelan RC					
W7CH	350	2	3	1,150	EWA
Burlington ARC					
VE3CJ	210	2	10	1,138	ON
Parma RC					
W8PRC	254	2	32	1,122	OH
Texins ARC/Richardson Wireless Klub/ UTD ARC					
K5DM	343	2	14	1,112	NTX
TERAC					
K7AUO	421	2	4	1,112	WWA
Tidelands ARS					
K5BS	162	2	25	1,078	STX
Maui ARC					
KH6RS	1020	1	10	1,070	PAC
Groupe Radio VE2RMP RG					
VE2CUR	1014	1	12	1,069	QC
Kewaunee Co ARES/RACES					
N9NX	250	2	6	1,048	WI
Smoky Mountains AR Team					
N4GSM	117	2	3	1,044	NC
Tioga Wireless Club					
W4TWC	283	2	14	1,028	NFL
Bitterroot ARC					
W7FTX	211	2	25	1,020	MT
Midwest ARS					
W9MAR	77	2	12	1,014	IN
North Shore ARC					
VE7NSR	296	2	30	1,010	BC
Decatur Cty ARC					
KW4DC	244	2	20	1,008	TN
Three Amigos					
W4ZQ	256	2	10	962	KY
ARC of the Univ of AR					
K5GOE	167	2	10	918	AR
LaredoHams ARC					
W5LRD	77	2	15	916	STX
K3VIN	350	2	3	900	OH
Louisville American Red Cross RC					
W4ARC/9	104	2	3	886	IN
Goodyear ARC					
WA8UXP	317	2	4	884	OH
NB3O	221	2	3	872	VA
Estes Valley ARC					
WØKG	54	2	10	858	CO
Scott Co ARES					
NØBHC	145	2	6	840	MN
Harry Potter ARC					
NS7F	86	2	7	830	AZ
N4DT	217	2	3	830	NC
LOWARS					
VE3JJF	252	2	6	814	ON
Low Tide DX Club					
W6LTR	260	2	15	790	SJV
Amargosa ARC					
NV7AV	236	2	6	742	NV
CRA Rive Sude de Montreal					
VE2CLM	33	2	13	716	QC
Levy's Renegades					
W9HDG	125	2	4	700	WI
Jefferson Co ARC					
KBØTLL	57	2	20	684	MO
Northern MI ARES					
NM8ES	62	2	15	684	MI
Mobile Ohm Volunteer Examiners					
N9OQT	55	2	5	684	IL
545 GANG					
WA3SEE	114	2	4	672	MDC
Presque Isle Coy ARC					
WB8TQZ	160	2	4	650	MI
K9 Search and Rescue					
KJ4HMV	29	2	5	648	VA
Hualapai ARC					
WB6RER	145	2	4	640	AZ
Pike Cty ARC					
W9UL	112	2	11	624	IN
Arkansas Radio Em Services					
N5AT	127	2	15	604	AR
Mount Joseph Contest Group					
K7JAN	220	2	4	590	OR
Southern Nye Cty ARES, Inc					
W7NYE	91	2	8	582	NV
Arkansas Diamond					
KE5FSY	32	2	50	564	AR
The Woodlands ARC					
W5WFD	19	2	8	558	STX
Novi ARC					
N8OVI	152	2	6	556	MI
Interconnect Telecomm Corp ARC					
W5QOD	84	2	3	550	STX
AAEXTEK					
AC7FT	84	2	3	546	OR
WØVFW ARC					
WØVFW	168	2	3	544	CO
North Texas Homeschoolers ARC					
NT5HS	120	2	5	536	NTX
Watertown ARC					
N9HR	107	2	16	516	WI
KØARF	178	2	3	506	MN
Virgin Islands RC					
KP2D	201	2	5	502	VI
Sandusky Radio Exper League					
W8LBZ	221	2	15	492	OH
WI7J	166	2	3	482	UT
LBCECG					
N3RAY	138	2	3	476	EPA
CRAM, Inc.					
VE9CRM	101	2	25	442	MAR
K8QQQ	130	2	5	430	OH
Oregon Coast Emergency Repeater, Inc.					
W7FLO	12	2	12	424	OR
VE7IHL	110	2	3	420	BC
WBØTEV	111	2	5	412	NTX
Chiggeritaville					
K4RET	127	2	3	408	VA
NØOMC	49	2	3	398	KS
N4BM	139	2	3	382	KS
Weare Field Day 2011					
K1Q	89	2	12	334	NH
Foothills ARC					
W3LWW	41	2	9	332	WPA



When you are on top of a tall mountain, you don't need really tall towers, as they reaffirmed at the KR6J site.

Possum Hollow Rednecks
WD8MQN 102 2 15 314 VA
Halifax Em Comm Krewe
N2JFS 22 2 3 294 VT
NKDXE
WA4ZKO 30 2 4 260 KY
St. Mary's ARC
VE3SDF 52 2 5 204 ON
Healing Springs Mtn VHF Soc
W4PAR 21 2 20 192 NC
Transformers
KJ4DLP 12 2 3 174 SC
W8SGZ 25 2 3 150 MI
Country Cabin RC
WØAXT 25 2 7 100 IA

2A

Radio Amateurs Of Northern VT
W1NVT
(+W1PU) 5467 2 23 16,320 VT
Raytown ARC
KØGQ
(+WØAO) 4025 2 42 13,764 MO
Batesville ARC
K5UZ
(+KD5J) 4179 2 15 12,784 AR
KR6J
(+WK6O) 4156 2 5 12,212 ORG
Mui's Marauders
W2RA 3068 2 3 12,076 WNY
Falmouth ARA
K1RK
(+W1HQH) 3330 2 45 11,430 EMA
MN Wireless Assn
WØAA
(+NØKK) 2793 2 12 11,154 MN
Tampa ARC
N4TP
(+N4SEX) 3000 2 65 11,088 WCF
The Sakonnet 49'ers
W1LY
(+W1SYE) 2849 2 47 11,014 RI
Louisiana Cane Field CC
W5ZR
(+W5RZY) 2692 2 30 10,986 LA
Randallstown ARC
N3IC
(+K3MZ) 3182 2 18 10,398 MDC
K5CM
(+NN5Q) 2479 2 15 10,116 OK
AA6PW 2705 2 5 10,064 ORG
Saratoga ARA
K6SA
(+K6NN) 2659 2 24 9,784 SCV
Sierra Chapter-Northern California CC
K6NV
(+K6ST) 2711 2 15 9,724 SV
Twin City Ham Club
W5EA
(+N5LCC) 3284 2 55 9,704 LA
Canton ARC
W8AL
(+AK8CC) 2522 2 36 9,648 OH
Northern Ohio DX Assn
W8DXA
(+NO8DX) 2878 2 25 9,128 OH
Big Bend ARC
K5FD
(+AD5BB) 2613 2 21 8,928 WTX
W/K ARC of Greater Milwaukee
N9AW 2341 2 9 8,736 WI
Central Virginia CC
W4ML
(+KJ4IT) 2612 2 46 8,460 VA
Harvard Wireless Club/MIT Radio Soc
W1AF
(+W1PL) 2287 2 19 8,352 WMA
Williamson Co ARC
WC5T
(+W5T) 2319 2 43 8,280 STX
Smith Chart ARS
K4OO 2327 2 20 8,238 NC
Mining RC/St Paul RC
WØMR
(+KØAGF) 2634 2 37 8,206 MN
Pacific Co ARC
W7R
(+W7Y) 2157 2 30 8,192 WWA
Massanutten and Valley ARA
W4XD
(+K4MRA) 2473 2 66 8,132 VA
PARC & PRA
W1HP
(+KD1NA) 2162 2 15 7,956 EMA
Schaumburg ARC
N9RJV
(+AB9YC) 2254 2 72 7,890 IL
Lake Co ARC
W9LJ
(+W9EMA) 1965 2 27 7,532 IN
Portland Radio Contester Club
KK7PR 2534 2 10 7,454 OR
Northern AZ DX Assn & Coconino ARC
W7TB
(+KC7KCN)2012 2 22 7,364 AZ
Pikes Peak DX Group
WØGG 1994 2 6 7,190 CO
KH6J
(+KH6CE) 1846 2 10 6,878 PAC
Williamsburg Area ARC
K4RC
(+AJ4XV) 1945 2 41 6,752 VA
Arrowhead RAC
WØGKP 1684 2 25 6,732 MN
Delaware ARA
K9NN
(+W9DUK) 1528 2 18 6,660 IN
Lynchburg ARC
K4CQ
(+W3CQ) 1716 2 52 6,626 VA
Minden ARA
N5RD 2265 2 15 6,560 LA
Escondido ARS
N6SD
(+N6WB) 1625 2 63 6,490 SDG
Rochester DX Assn
W2RDX
(+W2AN) 1825 2 30 6,458 WNY
Victor Zulu Field Day Group
N3VZ
(+KC3WX) 1722 2 8 6,450 EPA
MS State Univ ARC/Magnolia ARC
W5YD
(+N5F) 1494 2 20 6,362 MS
Monroe Co Radio Comm Assn
W8PI
(+W8DWL) 1714 2 30 6,322 MI
Montrose ARC
KØIIT
(+KCØQXX)1636 2 46 6,228 CO
Billerica ARS
W1HH 1717 2 11 6,196 EMA
N2XJ
(+W2FMI) 2062 2 37 6,120 NNJ
Des Moines Radio Amateurs Assn/AR Technical Soc
WØAK
(+WØSCI) 1448 2 41 6,112 IA
Lakes Region Repeater Assn
W1UR
(+W1BST) 2165 2 15 6,104 NH
Nashoba Valley ARC
N1NC
(+K1BG) 1530 2 55 6,022 EMA
Hill Country ARC
N5HR
(+K5HV) 1844 2 35 5,980 STX
Meriden ARC
W1NRG
(+W1FD) 1441 2 30 5,978 CT
NARS
W5NC
(+KE5IOV) 1604 2 57 5,972 STX
Explorer Post 599
WA2DFI
(+W7BSA) 1853 2 23 5,840 AZ
Cape Fear ARS
K4MN 1427 2 30 5,818 NC
NN5Z 1472 2 7 5,722 OK
Mountaineer ARA
W8SP 1641 2 21 5,590 WV
Crawford ARS
W3MIE
(+N3QQH) 1444 2 39 5,578 WPA
Scorpion Ranch
WS4Y 1709 2 6 5,426 KS
Boulder ARC
WØDK
(+KH6HTV)1741 2 45 5,386 CO
San Mateo RC
W6UQ
(+N1DID) 1731 2 25 5,376 SCV
Tri County ARC
W9MQB
(+W9FIB) 1282 2 18 5,292 WI
Trojan ARC
NWØK 1484 2 4 5,278 KS
Hancock ARC
W9ATG
(+N9TT) 1463 2 43 5,198 IN
Sarasota Co ACS/Suncoast ARS
WC4EM 1531 2 12 5,192 WCF
South Canadian ARS
W5NOR
(+WB5ULK)1150 2 35 5,114 OK
KØLIR 1430 2 16 5,114 MO
ARC Em Comm Svc
WB2QBP
(+K2ARC) 1546 2 20 5,018 NLI
Stonewall Jackson ARA
K8DF
(+K8TPH) 1485 2 27 4,972 WV
Twin Cities Repeater Club
WØBU
(+WBØJMG)1243 2 23 4,950 MN
Blackstone Valley ARC
W1DDD
(+W1TBR) 1391 2 35 4,910 RI
Montgomery ARC
W4AP
(+AK4FP) 1339 2 52 4,864 AL
Vintage Iron RC
N3KR
(+N3OD) 1591 2 6 4,796 NNJ
Heart O'Texas ARC
W5ZDN
(+W5TSA) 1280 2 30 4,736 NTX
Owensboro ARC
K4HY 1032 2 15 4,698 KY
Kennebec Co Em Response Team
K1XI 1815 2 34 4,692 ME
WJ4N 1113 2 17 4,630 SFL
Schuylkill Am Rep Assn
W3S 1076 2 12 4,516 EPA
Palos Verdes ARC
K6PV 1156 2 21 4,492 LAX
Ellsworth Am Wireless Assn
W1TU
(+KB1CEJ) 1070 2 28 4,462 ME
Utah ARC
W7SP
(+K7LO) 1059 2 11 4,434 UT
Los Angeles ARES NW & SW
WA6P 1246 2 70 4,430 LAX
Olive Branch ARC
W5OBM
(+K5RCF) 1331 2 33 4,404 MS
Palatine ARES/RACES Group
W9P
(+WX9PAL) 993 2 49 4,384 IL
Candlewood ARA
W1QI 1435 2 20 4,376 CT
Derangers
N6MI 1235 2 7 4,334 SCV
Massillon ARC
W8NP
(+KC8RPE)1179 2 25 4,290 OH
Mid-Missouri ARC
NØSS
(+KØETY) 1155 2 49 4,262 MO
TN Valley DX Assn
W4PL 938 2 27 4,260 TN
California City RC
KE6RN
(+WA6KEK)1151 2 3 4,254 SJV
Fox Cities ARC
W9ZL 1232 2 40 4,250 WI
NØTA 1306 2 3 4,228 CO
Kent Co ARC
W3HZW
(+AA3ZH) 1122 2 30 4,226 DE
Tippecanoe ARA
W9REG 1108 2 31 4,222 IN
MARCA
W7MOT
(+AA7OO) 1114 2 20 4,174 AZ
St Charles ARC
KOØA
(+WBØHSI) 831 2 79 4,028 MO
Motor City RC
W8MRM
(+W8GTZ) 1116 2 20 4,006 MI
Montgomery ARC
KV3B
(+W3EXP) 868 2 54 3,984 MDC
Ottawa ARC
VE3RC 979 2 55 3,940 ON
Gallatin Ham RC
W7ED 1242 2 20 3,828 MT
Carteret Cty ARS
W4YMI 1493 2 32 3,806 NC
Hannibal ARC
WØKEM 895 2 24 3,804 MO
Big Island ARC
KH6EJ
(+NH6PE) 1000 2 44 3,712 PAC
Anderson RC
N4AW
(+N4SBA) 972 2 18 3,702 SC
Northeast Tarrant ARC
N5EOC
(+KE5MC) 771 2 20 3,664 NTX
York Pirates Contest Group
NN9L
(+W9YK) 1347 2 10 3,652 IL
Tyler ARC
K5TYR
(+W5ETX) 1094 2 62 3,638 NTX
Harris Intersil ARC
K4HRS
(+K6TY) 1056 2 16 3,636 SFL
Johnson City ARA
W4ABR 1248 2 21 3,628 TN
Bristol Co Repeater Assn
W1ACT
(+N1JOY) 1143 2 12 3,518 EMA
Anaconda ARC
W7VNE 917 2 13 3,514 MT
Sierra Blanca ARC
KR5NM
(+K5RIC) 707 2 16 3,422 NM
Algoma ARC
VE3SOO 1088 2 6 3,394 ON
Rockingham Co ARC
N4IV 671 2 20 3,394 NC
The Villages ARC
K4VRC
(+N8RW) 717 2 54 3,334 NFL
ARC of Amite Co
W5CCW 1029 2 6 3,310 MS
Heart of Dixie ARS
W4HOD 675 2 12 3,288 AL
N6IPD
(+K6PB) 966 2 40 3,218 ORG
RATS/RARC
W4RAT
(+W4ZA) 1159 2 45 3,148 VA
Barnstormers Contest Group
NZ1U 734 2 6 3,144 CT
Tallahassee ARC
K4TLH 765 2 25 3,132 NFL
Goddard ARC
WA3NAN
(+KB3PEE) 893 2 13 3,122 MDC
Marietta ARC
W8HH 907 2 12 3,102 OH
Green Valley ARC
WE7GV 642 2 59 3,082 AZ
Hospital Disaster Support Comm System
W6PA
(+WB6JBI) 594 2 99 3,070 ORG
Peterborough ARC
VE3RB
(+VE3KRG) 940 2 32 3,030 ON
Garland ARC
K5QHD 648 2 27 3,016 NTX
Jones Co ARC
WØCWP 776 2 12 3,012 IA
East Greenbush ARA
W2EGB
(+WB2HPR)1018 2 32 3,006 ENY
Morris RC
W2YD 699 2 8 3,006 NNJ
Chickasaw ARA
W5GWD
(+W5F) 807 2 8 2,950 MS
EPCOM
VE7PCE
(+VA7ACT) 983 2 25 2,946 BC
Samuel F Morse ARC
N6MQL 543 2 20 2,946 SV
Amateur Radio Transmitting Soc
W4CN 763 2 25 2,940 KY
Oh-Ky-In ARC
K8SCH
(+N8YC) 798 2 35 2,938 OH
Kaw Valley ARC
WØCET 802 2 30 2,916 KS
Decatur ARC
W4ATD
(+KK4CLF) 872 2 20 2,850 AL
Eastern WA Contest Club
N7MO 661 2 3 2,844 EWA
Palms West ARC
W4SS 634 2 15 2,836 SFL
Paso Robles ARC
W6T
(+N6KKS) 1500 1 21 2,832 SCV
North Augusta-Belvedere RC
K4NAB 676 2 35 2,802 SC
Hiawatha Valley ARC
NØDH 903 2 25 2,800 MN
Heartland DX Assn
NIØDX 755 2 16 2,784 NE
Sioux Empire AR
WØZWY
(+WØFSD) 1000 2 20 2,772 SD
Trident ARC
N4EE 739 2 10 2,760 SC
Tuscaloosa ARC
W4XI
(+W4JBB) 693 2 11 2,752 AL
Pine State ARC
N1ME 631 2 35 2,748 ME
Franklin Co ARC
WE4A 783 2 23 2,732 NC
Ole Virginia Hams
W4OVH
(+W4PVA) 552 2 40 2,704 VA
Richmond ARC
VE7RAR 499 2 20 2,680 BC
Bonac ARC
K2EC
(+K2DQ) 1045 2 18 2,680 NLI
NHC Em Prep Group
NC4NH
(+KJ4WNC) 597 2 41 2,654 NC
Pamlico ARS
N4PRS
(+AI4WL) 626 2 56 2,630 NC
West Allis RAC
W9FK 921 2 15 2,626 WI
FISTS Along The Mohawk ARC
W2FAM 626 2 3 2,620 WNY
Calgary ARA
VE6NQ 506 2 20 2,614 AB
Knob Hill Krew
N5WLA 705 2 3 2,612 NTX
Peekskill/Cortlandt ARA
W2NYW 879 2 14 2,602 ENY
Fidelity ARC
W1MB
(+K1NQG) 702 2 10 2,590 RI
Wilderness Road ARC
W4CDA
(+WQ4Z) 495 2 19 2,588 KY
Seattle ACS/West Seattle ARC/PSRG
W7ACS 391 2 68 2,546 WWA
Los Alamos ARC
W5PDO 654 2 15 2,534 NM
Sudbury ARC
VE3AR
(+VE3MND) 701 2 38 2,532 ON
San Jose ARES/RACES/ACS
W6SJC
(+KF6IIY) 541 2 34 2,508 SCV
Hellgate ARC
W7PX 620 2 10 2,506 MT

South Kitsap ARC
N7IG 545 2 23 2,488 WWA
N4FL 497 2 48 2,474 SFL
Winona ARC
WØNE 548 2 14 2,472 MN
Howell Cty ARC
WØHCA 563 2 10 2,470 MO
South AL RC
WC4M 410 2 10 2,440 AL
Jasper RC
K4ACW
(+N4MIC) 463 2 23 2,408 GA
SW MS ARC
W5WQ 414 2 16 2,392 MS
Blossomland ARA
W8MAI
(+W8KIT) 505 2 35 2,392 MI
Mid-Atlantic ARC
W3NWA 642 2 24 2,378 EPA
Sportsman's Paradise ARC
K4WAK
(+KI4PRX) 417 2 12 2,364 NFL
Zero Beaters ARC
WAØFYA 760 2 10 2,330 MO
Valencia Co ARA
K5OUR
(+KC5OUR) 357 2 91 2,328 NM
Franklin Co ARC
AC1L
(+KB1MSU) 531 2 25 2,296 WMA
Milwaukee RAC
AB9CD
(+AB9PN) 463 2 3 2,278 WI
Goochland Co ARES/VA Capitol District 6 ARES
N4MI 571 2 24 2,274 VA
Dayton ARA
W8BI
(+W8HEQ) 728 2 35 2,242 OH
KM4I 535 2 3 2,240 TN
Okaw Valley ARC
KK9N
(+W9KXQ) 501 2 19 2,216 IL
Spokane DX Assn & Panoramaland ARC
K7SDX 596 2 20 2,210 EWA
Gateway Tech College Student ARC
N9GTC 502 2 6 2,200 WI
Kamloops ARC
VE7UT 473 2 24 2,172 BC
K7EUG 663 2 3 2,166 OR
Middle Peninsula RAC
W4HZL 610 2 43 2,150 VA
Royal George ARC
NCØA 458 2 7 2,148 CO
Beach Boys ARC
AE6ZV
(+KI6QDH) 655 2 11 2,134 SB
Bloomington ARC/Ind Univ ARC/ Bloomington HS South ARC
K9DIY
(+K9SOU) 377 2 52 2,132 IN
Glynn ARA
N4FD 470 2 12 2,130 GA
LeFrog
W9FRG
(+KC9ONY) 481 2 10 2,120 WI
Littleton Area Radio Klub
K1EME
(+N1ALL) 413 2 45 2,108 NH
Lake of the Ozarks ARC
NØZS 698 2 22 2,096 MO
Keystone RA of PA
W3BD 429 2 4 2,086 EPA
Sonoma Co Radio Amateurs
K6SON
(+W6SON) 400 2 32 2,074 SF
Eastern Shore ARC
K4BW 459 2 25 2,056 VA
Mich-A-Con ARC
KC8VC
(+W8JWN) 490 2 10 2,044 MI
McPherson/Newton ARC
NØNK 524 2 22 2,040 KS
Club Radio Amateur de la Vallee du Richelieu
VE2CVR 456 2 12 2,034 QC
W6QET 454 2 21 2,016 LAX
Club Radio Amateur de Quebec
VE2CQ
(+VE2CDX) 533 2 32 2,012 QC
W9F
(+N9RPN) 429 2 17 1,982 IL
Alabama Historical RS
W4AUP 505 2 3 1,962 AL
Whitley Co ARC
WC9AR 756 2 17 1,962 IN
Springhill ARC, Inc.
N5II 589 2 7 1,952 LA
Tri-States ARC
W4GTA
(+W4LMS) 449 2 7 1,948 GA
Lincoln Co Volunteer Communications
NC4LC 423 2 29 1,940 NC
Shelby Co ARES
K8ZUK 495 2 14 1,920 OH
Half Moon Bay ARES
WR6HMB 468 2 20 1,914 SCV
High Sierra FD Group
WB6ZQZ 782 2 8 1,914 SJV
Boone AR Klub
NØN
(+KBØTLM) 445 2 12 1,884 IA
Northwest Ohio ARC, Inc.
W8EQ 388 2 14 1,882 OH
Oak Grove Hamsters
KBØNHW
(+NØPVZ) 226 2 8 1,882 MO
SC4ARC
W6SCF 294 2 72 1,880 SCV
Boeing Employees ARS
K7NWS
(+N7XTL) 374 2 12 1,876 WWA
OARS
KD8SQ 775 2 7 1,850 OH
Issaquah ARC
W7BI 269 2 14 1,848 WWA
AF4I 481 2 20 1,844 AL
Saint Lucie Co AR Serv
W4SLC
(+KK4AXK) 459 2 45 1,836 SFL
Southwest LA AR Club
W5BII
(+WA5LQZ) 489 2 33 1,828 LA
Ellis Co ARC
WD5DDH
(+K5ASU) 448 2 35 1,826 NTX
W5BCS 534 2 35 1,818 STX
Michigan City/LaPorte/Porters Co Clubs
W9SAL 476 2 43 1,812 IN
Renton Em Com Serv
K7FDF
(+AC7VL) 219 2 19 1,810 WWA
Jefferson Co ARC
W7PT 398 2 9 1,806 WWA
Moreno Valley ARA
AB6MV
(+KJ6JKT) 444 2 54 1,802 ORG
NHRC ARS
W1CUM 634 2 8 1,798 NH
Kansas Antenna Club
KØANT
(+KCØNYS) 561 2 8 1,792 KS
Vashon/Maury Island RC
W7VMI 184 2 49 1,792 WWA
Story Co ARC/Cyclone ARC
WØYL 356 2 44 1,786 IA
M&M ARC
W8PIF 912 1 57 1,778 MI
Metuchen RC
K2YNT
(+W2DZ) 386 2 14 1,772 NNJ
Riverside Co ARA
W6TJ 320 2 24 1,760 ORG
Ellijay ARS
KE4GC 458 2 25 1,754 GA
Anoka Cty RACES
WØANA 544 2 12 1,754 MN
435 Hammers
K2AOQ 413 2 13 1,752 WNY
The Spark Gaps
KB3RAZ 461 2 7 1,750 MDC
W6SF
(+WB6NVB) 553 2 19 1,732 SJV
Bedford ARC
K5BED
(+KE5DUO) 236 2 47 1,732 NTX
ARC of Augusta
W4DV 220 2 40 1,730 GA
South Park Marauders
ABØIM 461 2 12 1,708 CO
N9TO 362 2 6 1,706 IL
Huron ARA
WØNOZ 489 2 13 1,688 SD
Prescott-Russell ARES
VE3PRR 477 2 18 1,684 ON
Deep East Texas ARC
W5IRP 344 2 17 1,684 STX
W3MUM 683 2 16 1,678 MDC
South Towns ARS
WB2ELW 372 2 21 1,670 WNY
Ogden ARC
W7SU 258 2 40 1,656 UT
Mountain ARC
NXØG 488 2 15 1,650 CO
K5RKW 317 2 25 1,634 NTX
Neptune ARC
W2NRC 306 2 10 1,614 NNJ
Moose Horn ARC
KL7AN 312 2 53 1,612 AK
Kanawha ARC
W8GK
(+W8SI) 180 2 47 1,610 WV
UCSC ARC
AC6P 320 2 14 1,608 SCV
Snoring Beagle Ranchers
K4DKW 434 2 3 1,592 MI
Englewood ARS
N4EAR 335 2 15 1,592 WCF
Cherry Creek Young ARC
NØARA 381 2 77 1,588 CO
Androscoggin Valley RC
K1AVR 291 2 5 1,572 NH
North Rapides RC
AC5PW 239 2 17 1,568 LA
Tech ARA
KC5ORO 481 2 20 1,568 NM
Indian Hills RC
W8DDD 391 2 17 1,542 OH
Palouse Hills ARC
W7NGI 243 2 14 1,536 ID
Shiawassee ARA
W8QQQ 297 2 7 1,528 MI
Brownwood ARC
K5BWD
(+KF5GWK) 200 2 16 1,500 NTX
W7EI 415 2 35 1,500 AZ
Chesapeake Bay RA
WD3E 373 2 5 1,494 MDC
ARA of Nebraska
WØWWV 283 2 25 1,486 NE
Cabarrus Amateur Radio Society
K4WC 309 2 20 1,484 NC
Triple A ARA
N3TN 278 2 21 1,480 WPA
Alhambra High School ARC
K6R 298 2 6 1,480 ORG
Crown RG
W3RP 389 2 10 1,474 WPA
North Arkansas ARS
NO3L
(+AD5DX) 318 2 75 1,458 AR
KZ9B 319 2 6 1,444 WI
Theodore Roosevelt ARC
KØND 347 2 10 1,444 ND
Maple Valley ARC
KC7KEY 307 2 24 1,432 WWA
Fullerton ERC
N6ER 399 2 30 1,420 ORG
Three Rivers ARC
WØEND 310 2 15 1,418 ND
Moore Co ARS
NC4ML
(+KJ4ZEK) 169 2 27 1,408 NC
KD4RF 206 2 8 1,376 NC
Central MO RA
KØSI
(+NØAXZ) 233 2 45 1,370 MO
Muskingum Co ARES
KD8LGV 229 2 15 1,366 OH
Harrisburg Radio Amateurs Club
W3W 285 2 20 1,366 EPA
MRAC/MAARS
W9RH 353 2 14 1,360 WI
River Cities ARA
K4K 306 2 20 1,352 KY
Northwest AR & Electronics Assn
NØMFC 318 2 34 1,350 MO
Rappahannock ARA
K4YM 273 2 8 1,348 VA
Oroville ARS
W6AF 309 2 25 1,342 SV
Tusco ARC
W8ZX 318 2 41 1,336 OH
Pleasant Hill CERT
N6VV 436 2 15 1,322 EB
Ogdensburg ARC
K2RUK 211 2 15 1,322 NNY
Ocean State ARG, Inc.
K1OS 357 2 6 1,314 RI
Laguna Beach Em Comm Team
N6L
(+WO1S) 191 2 65 1,312 ORG
Greater NE ARL
KØGNE 330 2 3 1,310 NE
Brazoria Cty ARES
KF5ADC 295 2 10 1,308 STX
SARES
K6SNY 170 2 55 1,308 SCV
KA3PMW 524 2 3 1,298 WPA
KG8CO 427 2 5 1,292 MI
Barrie ARC
VE3GCB 371 2 20 1,292 ON
Coastside ARC
WA6TOW 382 2 15 1,284 SCV
Meewasin ARS
VA5DR 284 2 8 1,278 SK
Filipino-American ARS of San Diego
ND6U
(+ND6U) 368 2 20 1,276 SDG
Ashe Co ARC
W4FD
(+W4APP) 224 2 21 1,268 NC
Red River RA
WØILO 335 2 10 1,266 ND
Heart Of Texas DX Soc
W5DXS 452 2 4 1,254 NTX
Port Lavaca ARC
W5KTC 127 2 8 1,234 STX
Puerto Rico FD Group
KP4FD
(+WP4NPC) 255 2 19 1,222 PR
K3NE 300 2 10 1,212 WPA
TARA
K3TAR 425 2 6 1,200 EPA
MC ARES/MCARA
K4ZK
(+WX4MC) 247 2 50 1,194 SFL
W5AUU 261 2 25 1,194 AR
Greenwood ARC
VE1ARC 240 2 20 1,182 MAR
K8DDG
(+W4TLB) 200 2 33 1,170 OH
Highline ARC
NC7G 312 2 15 1,160 WWA
Washington Area ARC
WØARC 229 2 20 1,148 IA
Hammin' Sams
KØHSC
(+WØMHP) 241 2 9 1,140 CO
Eimac RC
W6AY 438 2 3 1,126 SV
AD9L
(+W9GRS) 90 2 18 1,114 IL
Clinton Co ARC
K9DGS 163 2 12 1,096 IN
Ogle Co ARES
W9GD 317 2 7 1,084 IL
Razorback Radio ARC
WU5PIG 315 2 9 1,080 AR
Juniata Valley ARC
K3DNA 226 2 11 1,078 WPA
KK6I 413 2 10 1,076 SDG
Kauai ARC
KH6E 225 1 15 1,075 PAC
Wexaukee ARC
K8CAD 214 2 14 1,072 MI
KE6F 230 2 3 1,056 SV
Piatt Co Radio Amateurs
K9IYP 184 2 9 1,018 IL
W6PS 252 2 4 1,016 SV
Grant ARC
W8STZ 126 2 28 1,010 OH
Pearland ARC
K5PLD 127 2 25 1,004 STX
Tupelo ARC
KK5K 186 2 15 1,004 MS
Moncton Area ARC
VC9M 211 2 30 964 MAR
Harney Cty RA
KE7YLC 109 2 13 960 OR
Beaufort RA Group
W4BFT 121 2 32 932 SC
DeGray ARC
KD5ARC 90 2 8 930 AR
Brookhaven National Laboratory ARC
K2BNL 217 2 10 924 NLI
Martinez ARC
KF6HTE 227 2 25 908 EB
El Paso ARC
W5ES 128 2 11 906 WTX
Uncle Bill's RC 4 Kids
NJ1E 166 2 18 900 IL
Pioneer AR Fellowship
W8CTT 272 2 7 898 OH
Crescenta Valley ARC/Glendale Em AuxiRadio Serv
AD6IZ
(+KE6PFV) 157 2 30 888 LAX
BSA Venturing Crew 80
W3BSA 168 2 10 886 MDC
U off Mississippi ARC
W5UMS 240 2 15 882 MS
Lake Oswego ARES
WA7LO
(+KD7ZDO) 73 2 50 882 OR
Mohawk Valley ARA
KC2AUO 271 2 6 842 NNY
Uniontown ARC
W3PIE 267 2 17 834 WPA
Phillips Cty ARC
WØZXN 136 2 15 832 KS
Eureka Repeater Group
K7BIR 311 2 18 822 MT
Aeronautical Center ARC
W5PAA
(+KW5FAA) 98 2 47 810 OK
Apple City ARC
W7TD 65 2 25 780 EWA
Portland Amateur Wireless Assn
W1KVI 147 2 15 762 ME
Indiana 807 Club Contesters
WG9F 508 1 3 758 IN
Navarro ARC
N5VO 104 2 22 758 NTX
CRA Laval Laurentides
VE2CRL 135 2 30 752 QC
W4FAR 100 2 6 750 NC
South Side ARC
NØHV
(+KØCMD) 120 2 18 750 MO
Delaware Valley Ragchew Club
N2HQX 72 2 15 744 SNJ
W3LRC 187 2 12 724 MDC
Area AR Operators
W9YPS 131 2 6 712 IL
Yellowknife ARS
VE8YK 64 2 14 700 NWT
Salem Area ARA
K8BTP 57 2 23 684 OH
Woodchuck RC
W8KU 213 2 25 676 OH
Benton Co ARES
K7CVO 4 5 13 675 OR
WAØH
(+AI4DB) 33 2 10 666 TN
Hall of Science ARC
WB2JSM 145 2 15 660 NLI
Carolina ARES
WX4SC 46 2 8 642 SC
U of Southern Cal ARC
W6YV 141 2 3 632 LAX
Nantucket ARA
K1AU 64 2 9 612 EMA
TCARES
K7MOO
(+K7ICT) 60 1 10 610 OR
Greene Co ARC
WT2C 174 2 8 598 ENY

KE5TRB 56 2 10 582 STX
Skyline RC
W7SUR 185 2 9 570 UT
Southeastern MA ARA
W1AEC 109 2 20 568 EMA
Clarksville Amateur Transmitting Soc
KF4L 106 2 8 562 TN
Pacific Area Naturists ARS
NU6DE 128 2 4 552 SDG
RADOPS of El Jebel Shrine
KØFEZ 139 2 9 528 CO
Lower Yellowstone ARC
W7DXQ 60 2 6 520 MT
Colusa Co Comm Reserve Unit
W6VNQ 71 2 8 500 SV
Hamilton Co ARPSC
K8YOJ 49 2 7 448 OH
Luce Moose-caters
W8NBY 95 2 7 440 MI
KC5IMN 75 2 4 440 MS
W4WCQ 37 2 6 424 NFL
VA2CMQ 46 2 10 380 QC
Brookings Radio Research Club
WBØBXO 114 2 22 278 SD
Lake of the Wood Repeater Assn
KCØIGT 110 2 5 270 MN
Knox Co ARC
W9GFD 40 2 5 230 IL

3A

CorTek Radio Assn
W9CA
(+N9KK) 6374 2 25 23,014 IL
MS Valley ARA
W9MVA
(+W9FCC) 4531 2 16 14,962 WI
North Shore RRC
K9OR
(+K9RST) 3239 2 75 11,976 IL
OCARS
W8TNO
(+K8O) 4016 2 27 11,652 MI
Redneck Riviera Radio Sport Models
N4OX
(+KR4Z) 3870 2 7 11,430 NFL
Twin City FM Club
WØEF
(+WBØN) 3430 2 50 11,200 MN
North Shore Radio Assn
NS1RA 2882 2 40 10,800 EMA
Greater Norwalk ARC
N1EV
(+W1NLK) 3298 2 40 10,752 CT
Providence Radio Assn
W1OP
(+W1PRA) 3549 2 17 10,558 RI
Sterling Park ARC
K4NVA
(+NQ4K) 2797 2 25 10,054 VA
Stamford ARA
W1EE
(+K1FC) 3004 2 49 9,816 CT
Albany ARA
K2CT
(+KM2O) 2961 2 53 9,592 ENY
REDXA & Marin ARS
W6KB
(+W6SG) 2878 2 36 9,556 SF
Indianapolis RC
W9JP
(+W9RCA) 2996 2 55 9,440 IN
McMinn Co ARC
NA4K 2588 2 57 9,426 TN
N4N Field Day Group
N4N
(+KE4UW) 2708 2 12 9,376 GA
South Lyon Area ARC
N8SL
(+K8BRF) 2869 2 27 9,276 MI
Mills County ARC
K5TRO
(+N5QBU) 2232 2 29 8,876 NTX
Rochester ARC
WØMXW
(+KØRGR) 2507 2 25 8,808 MN
Sussex Co ARC
W2LV
(+KC2VWI) 2472 2 22 8,364 NNJ
Fauquier ARA
W4VA
(+KW4VA) 2268 2 34 8,244 VA
Magnolia DX Assn/Great Southern DX Assn
K5MDX
(+W5NO) 2615 2 41 8,018 MS
599 DX Assn
NA5NN 2245 2 23 7,982 MS
PRARL
KP4ES 2031 2 37 7,486 PR
South Orange ARA
K6SOA
(+K6WO) 1932 2 74 7,058 ORG
Douglas Co ARC
WØUK
(+NØTOY) 2133 2 37 6,992 KS
Edmond ARS
K5EOK
(+KE5VOF) 1797 2 10 6,932 OK
CODXC
N7LE 1713 2 15 6,794 OR
Barnstable ARC
K1A
(+W1EXP) 1810 2 24 6,734 EMA
Clay Center ARC & Waltham ARA
W1CLA
(+W1MHL) 1939 2 75 6,450 EMA
AR River Valley AR Foundation
K5PXP
(+N2WV) 1405 2 25 6,420 AR
Jefferson Co ARC
W7JCR 1432 2 52 6,128 WWA
Lincoln ARC
KØKKV 1910 2 50 6,112 NE
Fond du Lac ARC
W9EBV 1454 2 25 6,012 WI
Carbon ARC
W3HA 1575 2 8 5,966 EPA
Johnson Co RAC
WØERH 1619 2 38 5,916 KS
Southern VT ARC
K1SV
(+WT1B) 2012 2 20 5,782 VT
ARC of the National Electronics Museum
K3NEM
(+W3GR) 1474 2 15 5,780 MDC
Blue Ridge ARC
W4YK 1352 2 25 5,752 NC
San Andreas Faultline Survivors
W6SW
(+K6F) 1763 2 15 5,726 SJV
Ski Country ARC
KØRV
(+KQØC) 1487 2 54 5,678 CO
Baton Rouge ARC
K5DF
(+W5YW) 1536 2 35 5,636 LA
Eastern Connecticut ARA
K1MUJ
(+KZ1M) 1604 2 20 5,440 CT
CRES ARC
W8ZPF 1546 2 26 5,398 OH
Kankakee ARS
W9AZ
(+N9FD) 1371 2 28 5,320 IL
WØLI 1217 2 12 5,302 CO
McKinney ARC
W5MRC
(+AE5IT) 1220 2 67 5,276 NTX
W7PIG 1410 2 59 5,186 WWA
Pen Bay ARC
W1PBR
(+NY1B) 1048 2 12 5,184 ME
Yonkers ARC
W2YRC
(+KF2FK) 1189 2 44 5,072 ENY
Forx ARC
NØGF
(+NØGFK) 1343 2 20 5,026 ND
Muscatine ARC
N2AM
(+KØBDU) 1329 2 19 5,024 IA
Ashtabula Co ARC
K8CY
(+KD8OSZ) 1445 2 20 4,982 OH
Dial RC
K8PI
(+W8BLV) 1350 2 30 4,964 OH
Reelfoot ARC
K4RFT
(+N4MJ) 1046 2 12 4,958 TN
Radio Farm
NØMA
(+NØMMA) 1539 2 20 4,864 IA
Cumberland Plateau ARC
W4CV
(+K3HK) 1015 2 26 4,854 TN
Davis Co ARC
K7DAV
(+AL7AA) 1081 2 10 4,828 UT
QSY Society
K2QS
(+WB2LQF) 1309 2 10 4,824 ENY
Nixa ARC
WØA 1671 2 51 4,792 MO
Paducah ARA
W4NJA 1292 2 16 4,748 KY
Coquitlan AR & Em Serv Soc
VE7SCC 1374 2 40 4,648 BC
Alamance ARC
K4EG
(+W4VGZ) 1082 2 25 4,622 NC
Morrow Co ARES
W8NL 1049 2 10 4,604 OH
Goshen ARC
N9HZ
(+K9WJU) 1131 2 20 4,560 IN
Tristate ARS
W9OG
(+WA9C) 1249 2 25 4,556 IN
Naval Postgraduate School ARC
K6LY
(+K6NPS) 1270 2 27 4,540 SCV
W9EX 1388 2 50 4,538 IL
Scranton/Pocono AR Klub
K3CSG
(+WX3A) 1022 2 45 4,424 EPA
Rip Van Winkle ARS
WD2K
(+K2RVW) 992 2 32 4,386 ENY
Dickson Co ARC
K4J
(+N4J) 1093 2 23 4,378 TN
RVARC & JCARES
W7DTA
(+KD7EHB) 1147 2 35 4,364 OR
Saratoga Cty Races Assn, Inc.
K2DLL
(+W2BEW) 1522 2 20 4,344 ENY
Hamfesters RC
W9AA
(+W9KXT) 1087 2 45 4,328 IL
Hambuds
KK5E 1202 2 13 4,322 STX
Lake Area Radio Klub
WØWTN 1073 2 35 4,284 SD
Keystone VHF Club & Hilltop Transmitter Assn
W3HZU
(+W3ZGD) 980 2 31 4,200 EPA
Alliance ARC
W8LKY
(+KD8QCF) 1071 2 13 4,184 OH
Central MI ARC
W8MAA
(+K8YHH) 1113 2 30 4,166 MI
Not Quite Workable FD Group
AA8BV 1280 2 8 4,110 OH
Guilford Co ARES
NA4GC
(+AJ4DV) 1247 2 20 4,078 NC
Blue Ridge ARS
W4KA 972 2 47 4,062 SC
Coshocton Co ARA
W8CCA 842 2 9 4,054 OH
Foothills ARS
K6YA
(+NE6RD) 1075 2 25 4,000 SCV
Fluvanna Co ARES Group
W4XR 1104 2 15 3,996 VA
Quinte ARC/ Prince Edward RC
VE3RL 1287 2 18 3,976 ON
Putnam Em Amateur Repeater League
K2PUT
(+K2PC) 1122 2 20 3,966 ENY
Milton ARC
W4VIY 921 2 12 3,916 NFL
Monessen ARC
W3CSL 1245 2 38 3,902 WPA
Memphis Ham Clubs
(Delta, MARA & TriState)
W4BS 1007 2 80 3,900 TN
BARC Jr.
KDØMXT 1436 2 66 3,898 CO
Boeing ARS — St Louis
WØMA 921 2 22 3,854 MO
Clark Co ARC
W7AIA
(+K7JAO) 1044 2 21 3,816 WWA
BCARA
W3UDX
(+AA3YW) 941 2 8 3,760 WPA
East Bay ARC
W6CUS
(+K6YV) 858 2 41 3,750 EB
Overlook Mountain ARC
N2LL
(+WA2MJM) 729 2 14 3,748 ENY
Surrey/Langley Clubs
VE7LSY
(+VA7SRY) 779 2 30 3,720 BC
W8VP 828 2 35 3,688 OH
Anchorage ARC
KL7AA
(+KL7G) 1417 1 31 3,599 AK
Scottsdale ARC
K7TR 991 2 10 3,590 AZ
Shenandoah Valley ARC
W4RKC 1028 2 27 3,548 VA
7 HAMS San Diego
NA6L 1442 2 6 3,536 SDG
Kilocycle Club of North TX
W5SH 812 2 18 3,500 NTX
Snohomish Co Hams Club
WA7LAW
(+KD7EJI) 592 2 14 3,470 WWA
Albemarle ARC
W4DO 931 2 32 3,464 VA
VE3SAR 905 2 24 3,452 ON
Oklahoma City Autopatch Assn
W5MEL
(+NE5S) 755 2 33 3,406 OK
Franktown FD Club
NØUA 1112 2 20 3,394 CO
Xerox ARC
W2XRX 1094 2 16 3,344 WNY
SMARTS-CW
WIØS 713 2 3 3,298 MN
Spring Hill ARC
N4WO 622 2 32 3,286 NFL
Milford ARC
W8MRC 863 2 36 3,266 OH
North East WY ARA
NE7WY
(+KO4QT) 700 2 45 3,262 WY
Western Lake Co ARS
W9WLC 1297 2 10 3,250 IL
Liverpool Am Repeater Club
W2CM
(+WB2BJW) 757 2 74 3,248 WNY
GNARC
N6FR 873 2 15 3,196 SV
Wilson's Wonders
N7KN 771 2 3 3,182 EWA
San Joaquin Valley ATS
N6V
(+N6RBT) 660 2 35 3,154 SJV
Arlington ARC
K5SLD
(+W5JCK) 649 2 49 3,154 NTX
Northeast Wireless RC
K2FY 905 2 50 3,126 NLI
Northeast Wireless RC
NW2C 905 2 50 3,126 NLI
New River Valley ARC
N4NRV 709 2 14 3,102 VA
Rolla Regional ARS
WØGS 736 2 35 3,096 MO
Ottawa Valley Mobile RC
VE3RAM 820 2 25 3,064 ON
Lakeland ARC
K4LKL
(+K1DU) 568 2 22 3,034 WCF
Genesee Co RC
W8ACW
(+K8KZB) 790 2 13 3,028 MI
W1GLO
(+KB1PGH) 699 2 57 3,002 EMA
Gaston Co ARS
N4GAS 883 2 33 2,990 NC

ARRL WY Section Manager Garth Crowe, N7XKT, with a group of scouts. The boys are completing their "Ham Radio Passports" — an idea used in Sundance to help them experience different operating modes and styles.

Tri-County ARC
WX4TC 854 2 43 2,954 GA
Bloomfield ARC
W1CWA
(+AB1OD) 568 2 75 2,938 CT
Chenango Valley ARA
W2RME 614 2 20 2,926 WNY
Brandon ARC
K4TN 598 2 34 2,896 WCF
Jayhawk ARS
WØLB
(+KDØGIE) 701 2 30 2,846 KS
Lockheed Martin ARC
W5IU
(+K5PHD) 542 2 26 2,836 NTX
Kennehoochee ARC
W4BTI
(+KK4CCH) 642 2 68 2,832 GA
Benzie AR Friends
W8BNZ 837 2 42 2,816 MI
Mt. Magazine ARC
W5MAG 1092 2 12 2,804 AR
Burlington Co RC
K2TD
(+AK2S) 614 2 26 2,796 SNJ
Austin ARC
W5KA
(+K5LBJ) 502 2 62 2,784 STX
Hernando Co ARA
K4BKV 366 2 11 2,730 NFL
Huntington Co ARS
K9HC 709 2 20 2,720 IN
Oakland Radio Comm Assn
WW6OR 713 2 79 2,700 EB
Southern Peninsula AR Klub
W4QR 772 2 53 2,678 VA
WØIN 537 2 26 2,672 MO
Randolph Co Emergency RC
K4RAN 750 2 7 2,608 AL
Parkersburg AR Klub
N8NBL 558 2 41 2,592 WV
Nashville ARC
K4CPO 387 2 50 2,570 TN
Big Rapids Area ARC
N8OE 730 2 11 2,556 MI
Lake Erie ARA
WB8CQR 603 2 38 2,540 OH
Bristol TN/VA ARC
W4UD 504 2 52 2,530 TN
Tri-County ARA
K6AGF
(+WA6BSW) 552 2 29 2,512 ORG
Broward ARC/Davie Cooper City ARC
W4AB
(+KJ4URW) 481 2 45 2,506 SFL
Wasatch Back Tri-Co AR Group
K7GL
(+K7NAL) 804 2 20 2,498 UT
W8M 772 2 16 2,486 MI
Black Diamond Radio Group
KX9M 727 2 22 2,482 WI
Senoia ARC
AG4F 511 2 3 2,464 GA
Elko ARC
W7V 682 2 15 2,444 NV
South Bay ARC
W6SBA
(+W6ATT) 590 2 29 2,408 LAX
Southern Berkshire ARC
W1BAA/2 462 2 26 2,390 ENY
Convair /220 ARC
W6UUS 511 2 20 2,336 SDG
Int Radio Consortium of the Mystical Town of Waugh
N9IZ 727 2 9 2,330 IN
West Coast ARA
VE7VCC 548 2 10 2,328 BC
Ramapo Mountain ARC
WA2SNA 772 2 7 2,324 NNJ
Hocking Valley ARC
K8LGN
(+AA8BJ) 497 2 29 2,312 OH
Regina ARA
VE5NN 579 2 14 2,310 SK
Jackson ARC
W5PFC
(+N5DU) 428 2 25 2,308 MS
NEØS 622 2 3 2,304 MO
DCARS
K8PL 490 2 20 2,300 MI
Corona PD CSV Team
W6CPD 670 1 19 2,284 ORG
North Port ARC
W4NPT 346 2 11 2,262 WCF
WR1VT 455 2 30 2,262 VT
Shelby ARC/ARES of Cleveland Co
N4C 617 2 17 2,260 NC
Chattanooga ARC
W4AM 783 2 41 2,228 TN
West Palm Beach ARC
W4HAW
(+W2CB) 433 2 20 2,226 SFL
WAFAR
W9FT 736 2 28 2,222 IL
Hendricks Co ARS
N9HC 471 2 45 2,212 IN
W6CX 617 2 50 2,208 EB
Cherryville Repeater Assn II
W2CRA 461 2 28 2,202 NNJ
Athens RC & North East GA ARC
W4G 543 2 45 2,184 GA
Cotton Hill Group
WB2UEE 748 2 4 2,136 NNY
Irving ARC
N5BB 344 2 36 2,120 NTX
Fort Armstrong Wireless Assn
K3TTK 654 2 5 2,116 WPA
Peoria Area ARC
W9UVI
(+KB9NW) 533 2 45 2,116 IL
Arlington Radio PSC
W4AVA 669 2 20 2,108 VA
Wattsburg Wireless Assn
K3WWA 446 2 36 2,096 WPA
Reading RC
W3BN 422 2 40 2,068 EPA
W9D 648 2 14 2,056 SB
Victor Valley ARC
K6QWR 293 2 15 2,044 ORG
Fredericton Arc
VE9ND 345 2 15 2,040 MAR
NV8E 563 2 4 2,038 OH
Silvercreek ARA
W8WKY 534 2 5 2,016 OH
Onslow ARC
NC4OC 523 2 3 2,014 NC
Toronto ARC
VE3TNC 453 2 12 2,010 ON
Haywood Cty ARC
KI4SLZ 653 2 68 1,994 NC
Kings Cty RC
W2RAK 421 2 10 1,988 NLI
Starke Co ARC
W9JOZ 316 2 35 1,982 IN
Holmesburg ARC
K3FI 462 2 12 1,982 EPA
Associated RA of Long Beach
W6RO 534 2 53 1,974 LAX
Bellevue ARC
WØWYV 472 2 22 1,962 NE
Lenoir ARC
KF4WOD 515 2 12 1,960 NC
South Texas ARC
N5CRP 272 2 40 1,956 STX
Grays Harbor ARC
W7ZA
(+W7HF) 527 2 30 1,952 WWA
Kings Co RC
WB2BXO 421 2 10 1,938 NLI
San Gorgonio Pass ARC
W6PRC
(+WA6NTA) 266 2 25 1,926 ORG
Wyandot Area Ham Operators Org
KD8BNV
(+KF4HZV) 328 2 10 1,912 OH
Shoreline ACS
W7AUX 337 2 20 1,910 WWA
Cleveland Co AR Serv
NA4CC
(+W4JNH) 307 2 10 1,864 NC
W7SST 481 2 3 1,840 OR
ARC of Alameda
K6QLF 280 2 32 1,834 EB
W2LCA
(+K2CC) 397 2 12 1,830 NNY
AARG/LVSRA
AA3RG 587 2 40 1,826 EPA
K3FLT
(+K3WJH) 346 2 18 1,822 EPA
W9WWI
(+N9UGP) 396 2 60 1,818 IN
Mason Co ARC
N7SK 314 2 20 1,812 WWA
W4DOD 400 2 11 1,810 TN
Randolph ARC
NC4ZO 425 2 47 1,800 NC
KØDCA 339 2 27 1,796 MO
New Mexico High Desert ARC
NM5HD 355 2 35 1,786 NM
Kent Comm Support Team
K7CST
(+N7MU) 187 2 32 1,786 WWA
N3IS
(+W3PRK) 258 2 15 1,784 EPA
The FPL Group
K8ESQ 409 2 4 1,782 MI
Green Bay Mike and Key
K9EAM 372 2 12 1,776 WI
Sun City ARC
K5WPH 356 2 20 1,776 WTX
Assn Radio Amateur de Portneuf
VE2CSP 374 2 35 1,754 QC
Lake Wales Repeater Assn
W4D
(+K4KH) 221 2 51 1,746 WCF
NJ2GC 367 2 38 1,738 SNJ
Lillian AR Group
K4DEY 290 2 11 1,730 AL
Bainbridge Island ARC
N7BI 537 2 8 1,726 WWA
3 Rivers ARC
KK3ARC 203 2 34 1,696 ID
Club Radio Amateur Outaouais
VE2CRO 562 2 44 1,692 QC
KBØSSR 264 2 19 1,690 KS
Charleston ARS
WA4USN 395 2 20 1,670 SC
Genesis ARS
N1ZIZ
(+KB1FVR) 190 2 40 1,662 EMA
Winnipeg ARC
VE4BB 405 2 11 1,660 MB
LCSARO
W7EUG 403 2 22 1,656 OR
Binghamton ARA
W2OW 466 2 53 1,656 WNY
Wild Horse Desert Hams ARC
K5WHD 163 2 17 1,650 STX
Cleveland ARC
W4GZX 254 2 60 1,636 TN
Cascades AARS
W8JXN 392 2 10 1,636 MI
K5R 433 2 12 1,636 NM
Arizona Outlaws CC
K7FA 328 2 7 1,618 AZ
Seneca RC
W8ID 339 2 8 1,614 OH
Hoosier Hills Ham Club
W9GUS 282 2 11 1,610 IN
Chisholm Trail ARC
WD5IYF
(+K5WPN) 227 2 10 1,608 OK
VE7OGO 398 2 9 1,586 BC
K3IR 416 2 7 1,582 EPA
Southern Oregon ARC
K7LIX
(+WM7K) 324 2 26 1,570 OR
Fallbrook ARC
N6FQ 440 2 63 1,570 SDG
Buffalo AR Repeater Assn
W2EUP 450 2 16 1,556 WNY
Dubois Co ARC
N9NAU 308 2 34 1,546 IN
Aroostook ARA
K1FS 434 2 32 1,542 ME
Schenectady Museum ARA
W2IR
(+KC2VWW) 343 2 19 1,540 ENY
VECTOR
VE7VCT
(+VA7VCT) 161 2 40 1,540 BC
Coronado Em Radio Operators
W6MLI
(+W6SH) 226 2 8 1,522 SDG
Honeywell-Glendale ARC
K7HON
(+KC9TKC) 423 2 5 1,516 AZ
VO1AA 112 2 25 1,496 NL
Humboldt ARC
KD6LM
(+W6ZZK) 284 2 40 1,486 SF
Fulton Co ARC
K9ILS 318 2 18 1,482 IL
Northern Lakes ARC
KØGPZ 373 2 30 1,464 MN
Insurance City Repeater Club
K1DFS 348 2 16 1,456 CT
Yuma DX Assn
N7YDX
(+NJ6T) 111 2 75 1,444 AZ
SMARTS RC/Sibley Cty ARES
WBØRMK 298 2 5 1,444 MN
Rio Hondo ARC
W6GNS 358 2 18 1,438 LAX
Jackson Co ARA
N5OS
(+W5WA) 337 2 57 1,404 MS
Mid Rio Grande ARC
NM5MR 220 2 15 1,402 NM
Olympia ARS
NT7H 383 2 26 1,402 WWA
Lewis and Clark RC
K9HAM 210 2 23 1,400 IL
West Central OH ARA
WC8OH
(+W8COH) 208 2 23 1,376 OH
Coastline ARA
N1EG 463 2 50 1,376 CT
N8ARA 301 2 42 1,352 OH
Issaquah Comm Support Team
K7ISQ 137 2 29 1,350 WWA
Paulding ARC
W4TIY 170 2 14 1,344 GA
Flint Hills ARC
KBØVAC 246 2 7 1,344 KS
Metropolitan ARC
K8NOW 301 2 9 1,342 MI
Peace River Radio Assn.
W4DUX 285 2 31 1,340 WCF
W2MO 217 2 14 1,336 WNY
Holiday City ARC
W2HC 287 2 9 1,334 SNJ
Cuerpo de Radioaficionados Voluntarios
WP4OGK 101 2 30 1,328 PR
Chatham-Kent ARC
VE3CRC 164 2 20 1,300 ON
Disney Emergency AR Service
WD4WDW 334 2 44 1,298 NFL
Edison AR Network
W6SCE 424 2 7 1,298 LAX
Panther ARC
W3HRK 252 2 6 1,280 WPA
Durant ARA
KO5D 261 2 18 1,272 OK
Hermosa Beach ARA
K6HBC 276 2 4 1,260 LAX
Skyline ARC
K2IWR 365 2 25 1,238 WNY
Northside ARC
AAØNC 282 2 13 1,220 MO
W8SAI
(+KB8OPY) 238 2 6 1,218 OH
San Juan Co ARS
N7JN
(+KE7KMN) 143 2 52 1,206 WWA
TOTAH
NØSRF 490 2 4 1,202 CO
New Bern ARC
W4EWN 250 2 10 1,200 NC
Glenn ARS
KJ6HCG 153 2 75 1,196 SV
Grande Ronde Radio Amateurs Assn
W7GRA 342 2 7 1,180 OR
Mendocino Co AR Comm Serv
NC6MC 214 2 32 1,178 SF
Spencer Co ARC
KC9FTG 321 2 9 1,172 IN
Great Bay Radio Assn
W1FZ 299 2 12 1,168 NH
Capital City ARS
AA3DC 316 2 4 1,162 MDC
Laurel ARC
KG4LKY 174 2 20 1,158 KY
Calvert ARA
K3CAL 113 2 14 1,156 MDC
NW Georgia ARC
W4VO 140 2 8 1,130 GA
Ouachita Repeater Assn
W5HUM 288 2 10 1,126 AR
Sunset Empire ARC
W7BU 125 2 15 1,122 OR
Shore Points ARC
W2HRW/K2B 151 2 25 1,118 SNJ
Palestine/Anderson Co ARC
K5PAL 133 2 25 1,116 NTX
N8AVX 280 2 7 1,110 MI
Lakeway ARC
W2IQ 189 2 36 1,110 TN
Christian Co ARES
W4K 89 2 22 1,108 KY
Blue Springs ARC
NXØU 172 2 21 1,106 MO
Mile High RC
KJ6KTW 57 2 21 1,090 ORG
Nortown ARC
VE3NAR 519 2 7 1,088 ON
Winnebago Co ARES/RACES
KC9LYF
(+KC9SDK) 9 2 18 1,088 WI
Lodi ARC
N6SJV 220 2 20 1,088 SJV
Tuscola Co ARA & ARES
KC8CNN 172 2 13 1,084 MI
WM7RC 108 2 7 1,082 AZ
WØBBO 300 2 3 1,018 CO
GOBARC
WD8DX 112 2 8 1,016 MI
Miamisburg Wireless Assn
WA8NKY 302 2 20 1,002 OH
Portsmouth ARC/ARES
W4POX 218 2 42 996 VA
Red River Valley ARC
WB5RDD 123 2 23 996 NTX
Allegan Co ARC
AC8RC 125 2 12 996 MI
AmateurLogic.TV Group
W5JDX 206 2 7 992 MS
Murray Co ARC
KDØIXB 116 2 14 982 MN
Pahrump AR Repeater Assn
N7P 157 2 10 982 NV
Pontotoc Co ARA
KE5BWG 77 2 9 968 OK
Rocky Mountain Hamsters
KDØNQG 56 2 11 962 CO
Old Post ARS
W9EOC 128 2 12 952 IN
Lockport ARA
W2RUI
(+KC2VUB) 123 2 16 948 WNY
Independent RC
WA6IRC 197 2 35 946 ORG
Madison Co DX Club
KKØG 247 2 6 944 IA
Easton ARS
K3EMD 167 2 15 918 MDC
Natchaug ARC
NA1RC 173 2 25 908 CT
Hill Billy Hams
AB2JT 284 2 6 888 WNY
Kachina ARC
W7EH 127 2 18 884 AZ
Yolo ARS & Yolo ARES
W6YAR 145 2 29 864 SV
USS Hornet ARC
NB6GC 106 2 6 862 EB
Redlands Amateurs
AF6NV 53 2 8 856 ORG
Orinda Radio Interest Group
K6ORI 102 2 8 854 EB
Southern California Japanese Ham Club
K6JP 117 2 3 834 ORG
Tri-Cities ARC
W7AZ 183 2 8 828 EWA

Ozark Mtn ARC
KCØYCU 173 2 39 816 MO
San Juan EmComm
NM5SJ 249 2 12 798 NM
Mystic Valley ARG
N1MV 33 2 50 766 EMA
Maple Ridge ARC
VE7CMR 181 2 25 752 BC
Jonestown Mtn Repeater Assn
N3CSE 139 2 8 748 EPA
OFOG Group
NØTK 94 2 5 736 CO
Grundy Co ARC
KB9SZK 141 2 7 732 IL
Thunderbolt ARA
KJØT 35 2 20 670 CO
Dist. 5 WWA Medical Services Em Comm
AD7AW 73 2 3 596 WWA
Sacramento ARC
W6AK 113 2 24 576 SV
Northeast Iowa Radio Amateur Assn
WØMG 75 2 21 478 IA

4A

Utah DX Assn
K7UM
(+KF7P) 5363 2 32 16,668 UT
Albuquerque DX Assn
W5UR
(+K5HAB) 4163 2 19 15,482 NM
Delaware ARA
K8ES
(+W8JK) 4445 2 76 15,172 OH
Palo Alto ARA
W6ARA
(+W6OTX) 4356 2 75 14,066 SCV
Huntsville ARC
K4BFT
(+N7KDT) 3990 2 60 13,792 AL
Contoocook Valley RC
K1BKE
(+K1DFQ) 4016 2 60 10,922 NH
North Fulton AR League
K4JJ
(+NF4GA) 3177 2 26 10,464 GA
Portage Co ARS
K8BF
(+KD8VT) 3568 2 22 10,078 OH
N2OB
(+N2CW) 3023 2 35 9,972 SNJ
Vienna Wireless Soc
K4XY
(+K4HTA) 2719 2 14 9,296 VA
Westchester Em Comm Assn
N2SF
(+W2UL) 2728 2 25 9,284 ENY
United Radio Amateur Club
K6AA 2941 2 30 9,194 LAX
Nassau ARC
K2VN 2546 2 52 8,792 NLI
Murgas ARC
K3YTL
(+W3MTP) 2669 2 30 8,650 EPA
Fort Smith
(AR) Area ARC
W5ANR 2478 2 35 8,170 AR
North Richland Hills ARC
K5NRH
(+W5HAU) 2079 2 86 7,966 NTX
White Mtx ARC
W1KJ 1639 2 27 6,916 NH
Peel ARC
VE3XR
(+VA3POR) 2072 2 25 6,834 ON
LARC-FARL
K8UNS 1995 2 59 6,802 MI
Roanoke Valley ARC
W4CA
(+AB4A) 1855 2 41 6,632 VA
Lake Monroe ARS
N4EH
(+KB2CUX) 1850 2 78 6,488 NFL
W7OTV 1353 2 13 6,156 OR
Dog Hollow Contest Group
AK9D
(+WGØTA) 1702 2 27 6,154 MO
Warminster ARC
K3DN 2161 2 32 6,102 EPA
Green Mtn Wireless Soc
N1VT
(+AB1CH) 1626 2 32 5,926 VT
San Lorenzo Valley ARC & Santa Cruz Co ARC
K6MMM
(+W6NN) 1478 2 69 5,782 SCV
Northern Berkshire ARC
N1WM
(+N1MWJ) 1382 2 20 5,644 WMA
Phil-Mont Mobile RC
W3EM
(+W3PSH) 1675 2 52 5,516 EPA
Delaware Lehigh ARC
W3OK
(+WX3MAS) 1518 2 50 5,300 EPA
St. Clair ARC/Prime ARA
K9GXU 1724 2 12 5,250 IL
Medina 2 Meter Group
W8HN
(+W8EOC) 1364 2 26 5,236 OH
Franklin Co ARC
W4FCR 1042 2 9 5,224 VA
Mt Vernon ARC
K8EEN 1209 2 22 4,892 OH
Hamilton ARC
VE3DC
(+VE3ATX) 1489 2 52 4,764 ON
Troy ARA
N2TY 1252 2 40 4,484 ENY
Granite State ARA
N1QC
(+KB1NH) 997 2 24 4,374 NH
All ARC
W7PU
(+KR7DX) 994 2 7 4,320 WWA
Penn Wireless Assn
W3SK 1110 2 16 4,120 EPA
Tipp City AR Group
K8ZC
(+WD8CMD) 848 2 11 3,838 OH
Antelope Valley ARC
K6OX
(+K6A) 950 2 95 3,834 LAX
Central New Hampshire ARC
W1JY
(+W1CNH) 763 2 21 3,802 NH
North Ottawa ARC
W8CSO
(+KC8UNY) 722 2 16 3,800 MI
Alford Memorial RC
W4BOC
(+WA4YCX) 720 2 89 3,778 GA
Marion ARC
W8GVB 714 2 8 3,732 OH
W3GV 1071 2 28 3,628 WPA
Long Island Mobile ARC
W2VL
(+WV2LI) 813 2 79 3,616 NLI
WI9MRC
(+K9VS) 978 2 10 3,596 WI
Orange Park ARC
K4BT 873 2 43 3,588 NFL
Hot Springs ARC
KØHS 764 2 20 3,540 SD
Meeker Co ARC
KØMCR
(+KCØYGD) 973 2 12 3,484 MN
T-CEP Disaster Radio Team
K6TI
(+K6YXH) 795 2 50 3,432 LAX
CCDX ARC
AD1T
(+W1WWW) 878 2 12 3,374 NH
Columbia-Montour ARC
WC3A
(+K3BD) 681 2 26 3,324 EPA
Triangle ARC
K8BLP
(+K8HGY) 844 2 8 3,320 OH
Maury ARC
W4GGM 566 2 32 3,312 TN
Highlands Co ARC
K4W
(+W4CBS) 758 2 20 3,270 WCF
Ham Association of Mesquite
WJ5J 894 2 49 3,264 NTX
Wayne Co ARA
W4HS
(+W4GOL) 751 2 15 3,234 NC
Santa Fe Trail ARC
KSØKS
(+ACØKN) 880 2 23 3,144 KS
VE3ORF 1086 2 15 3,110 ON
Wireless Assn of South Hills
N3SH 754 2 15 3,010 WPA
So PA Communications Group
K3AE 721 2 51 3,008 EPA
Nutley Armature RS
W2GLQ 819 2 16 2,996 NNJ
RA of Greater Syracuse
W2AE 638 2 71 2,948 WNY
Plano AR Klub
K5PRK
(+WA5UP) 706 2 30 2,790 NTX
Island Co ARC
W7AVM
(+K6ZY) 542 2 52 2,790 WWA
St Croix Valley ARC
WW1IE
(+K1BSA) 485 2 20 2,786 ME
Starved Rock RC
W9MKS
(+K9ZQ) 562 2 70 2,784 IL
West Chester ARA
WC8VOA 1104 1 29 2,780 OH
Pasadena RC
W6KA 565 2 40 2,760 LAX
Panhandle ARC
W5WX
(+KE5ZRT) 803 2 26 2,690 WTX
Bladen ARS
W4BLA 676 2 25 2,662 NC
Yakima ARC
W7AQ 561 2 10 2,598 EWA
Bay Area ARC
WB8ICU
(+KC8SDL) 510 2 23 2,568 MI
Coos Co RC
K7CCH 688 2 34 2,530 OR
Bankhead ARC
N4IDX 703 2 10 2,384 AL
Golden Spike ARC
K7UB 562 2 30 2,368 UT
Elk Cty ARA
N3NIA
(+K3TMD) 592 2 23 2,356 WPA
Chicago Suburban RA
N9BAT 520 2 35 2,324 IL
Boston ARC
W1BOS 468 2 40 2,246 EMA
San Angelo ARC
W5QX
(+W5UI) 558 2 40 2,242 WTX
Valley of the Moon ARC
W6AJF 481 2 15 2,240 SF
RAS of Norfolk
W4NPS
(+KJ4YKE) 359 2 32 2,222 VA
South Bay ARS
K6QM 633 2 20 2,208 SDG
Montachusett ARA
W1GZ 495 2 15 2,116 WMA
Queen Annes ARC
K3PG 312 2 16 2,092 MDC
Cumberland Valley ARC
W3ACH 353 2 50 2,078 WPA
Emerald ARS
WA7FQD 374 2 12 2,062 OR
Land of Lakes ARC
K9HD 567 2 17 2,034 IN
Wilson ARC
WC4AR 442 2 27 1,992 TN
Lower Columbia ARA
W7DG 460 2 19 1,982 WWA
Clallam Co ARC
W7FEL
(+WX7RIK) 395 2 25 1,978 WWA
Middlesex ARS
W1EDH 495 2 12 1,974 CT
Brightleaf ARC
W4AMC 311 2 23 1,934 NC
Sky Valley ARC
W7SKY 434 2 12 1,874 WWA
Lincoln Co ARC
N7OY
(+K7BJ) 207 2 30 1,800 OR
Sierra Foothills ARC
W6EK
(+KG6LSB) 382 2 18 1,762 SV
Central Kansas ARC
WØCY 593 2 18 1,736 KS
Columbia Co ARC
N7EI 342 2 20 1,734 OR
Pilot Knob ARC
KSØLV 282 2 16 1,716 KS
Southern Michigan ARS
W8DF 541 2 27 1,688 MI
Regional EmComm & WX Assn
WW2FD 431 2 6 1,584 ENY
Mohave ARC
K7MPR 476 2 25 1,544 AZ
Semo ARC
WØQMF 302 2 10 1,526 MO
RA of the Gorge
W7RAG 99 2 38 1,520 OR
KC2RA 284 2 15 1,466 NLI
North GA Tri-State ARC
W4NGT
(+K4CNG) 254 2 11 1,458 GA
Skyview Radio Soc
WX3SKY
(+NU3Q) 227 2 7 1,434 WPA
N7HRC
(+N7HRC) 135 2 10 1,420 UT
NC State Univ ARS
W4ATC 370 2 6 1,376 NC
Suffolk Co RC
W2DQ 237 2 37 1,364 NLI
Chelsea ARC
WD8IEL 229 2 15 1,348 MI
Rural Iowa ARC
WØI 255 2 10 1,340 IA
Lake Area AR Klub
K5LRK 426 2 10 1,332 NTX
Palisadse ARC
W9IW 271 2 11 1,320 IL
N4SVC
(+N4SVC) 127 2 18 1,296 NFL
Elliot Lake ARC
VA3TOP 309 1 8 1,292 ON
Gotha Home Brew Soc
NØEN 374 2 5 1,212 MN
NBC Burbank ARC
N2EW 258 2 4 1,156 LAX
York Co ARS
KK4AWY 273 2 16 1,022 SC
York Co ARS
K4YTZ 273 2 16 1,022 SC
Snake River ARC
K7SI 93 2 8 876 ID
KF7CIA 148 2 18 768 WWA
Mile Highlands Group
W4MHG 25 2 4 712 TN
Mt Shasta ARC
W6BML 184 2 5 584 SV

5A

Port City ARC
K1R
(+W1WQM) 6112 2 50 18,850 NH
Loudoun AR Group
K4LRG
(+KJ4BRN) 5063 2 75 16,400 VA
Ozaukee RC
W9LO
(+AA9W) 4863 2 40 14,908 WI
Woodbridge Wireless
W4IY 4090 2 50 13,392 VA
Boarrs RC
NG5A 3207 2 25 11,446 NTX
Lake Co ARA
N8BC 3023 2 23 10,530 OH
Cuyahoga Falls ARC
W8VPV 2423 2 23 9,198 OH
Va Beach ARC and VADXCC
W4UG
(+K4IX) 2426 2 60 8,948 VA
KK5W
(+K5AUS) 1851 2 45 7,266 STX
Hazel Park ARC
W8HP
(+W8JXU) 1961 2 30 6,942 MI
Arrow/UMARC FD Team
W8UM
(+W8PGW) 1580 2 43 6,684 MI
Washington Amateur Comm
WA3COM 1537 2 58 6,454 WPA
RC of Tacoma
W7DK
(+W7OS) 1849 2 90 6,328 WWA
Smoky Mtn RC
W4OLB 1507 2 22 6,300 TN
SPRARC-BCRC
VE3OW 2327 2 43 6,036 ON
L'Anse Creuse ARC
N8LC 2003 2 20 5,934 MI
St Petersburg ARC
W4TA 1185 2 65 5,466 WCF
York Region ARC
VE3YRA
(+VE3YRK) 1537 2 66 5,302 ON
Cambridge ARC
VE3SWA 1145 2 5 4,800 ON
Western Carolina ARS
W4MOE
(+NN4BC) 1053 2 42 4,708 NC
Owatonna Steele Co ARC
NØUW 1486 2 30 4,706 MN
Alexandria RC
W4HFH
(+KK4CBL) 1392 2 35 4,676 VA
Schenectady ARA
K2AE
(+KR1CKM) 869 2 30 4,422 ENY
20/9 Radio Club
K8TKA 940 2 25 4,200 OH
Findlay RC
W8FT 889 2 10 4,166 OH
Holland ARC
K8DAA 1077 2 15 4,058 MI
Denver RC
WØTX
(+WØOUI) 1043 2 51 4,058 CO
Jessamine AWS
K4HH 776 2 47 4,002 KY
RF Hill ARC
W3AI 1090 2 25 3,974 EPA
Orange Co ARC
W2HO
(+NE2Z) 1081 2 75 3,884 ENY
Kern Co Central Valley ARC
W6LIE 1024 2 46 3,698 SJV
Intercity ARC
W8WE
(+W8WER) 675 2 25 3,500 OH
GCARES
K3EE 623 2 15 3,486 MDC
Littleton Radio Amateurs
KØBO 826 2 10 3,370 CO
Iredell Co ARS
W4SNC 773 2 15 3,160 NC
Midland ARC
W8KEA 693 2 20 2,920 MI
Kitchener Waterloo ARC
VE3IC
(+VE3EOS) 928 2 29 2,896 ON
South Bay ARA
KU6S
(+AE6YN) 1334 1 53 2,869 EB
Wood Co Em Comm
WC8EC 505 2 30 2,868 WV
Plattsmouth ARC
KBØSMX 446 2 25 2,832 NE
Kalamazoo ARC
W8VY 1088 2 30 2,826 MI
Radio Amateurs of Skagit Co
N7GDE
(+W7ABF) 519 2 52 2,816 WWA
Chesapeake AR Service
W4CAR
(+W4FOS) 690 2 40 2,806 VA
Nevada Co ARC
W6DD 480 2 50 2,790 SV
Navarre CERT ARC
KC4ERT 524 2 30 2,728 NFL

Clinton/Highland AR Group
W8O
(+W8GO) 724 2 75 2,718 OH
Maryland Mobileers ARC
W3CU 498 2 39 2,658 MDC
Kokomo ARC
W9GO 589 2 19 2,648 IN
Bellbrook ARC
W8DGN 595 2 50 2,610 OH
Riverside Radio Amateurs
WA8RRA 732 2 17 2,588 MI
Warren ARA
W8VTD
(+AB8ZT) 804 2 21 2,518 OH
Thunderbird ARC
WG7J 594 2 23 2,458 AZ
St Joseph's/Candler Radio Clubs
K4SJH
(+W4LHS) 604 2 35 2,454 GA
Siskiyou Co ARA
K6SIS 408 2 6 2,450 SV
Susquehanna Co ARC
N3SRC 707 2 40 2,446 EPA
W7IVM 488 2 50 2,394 UT
San Antonio RC
W5SC 444 2 31 2,380 STX
Southern IN Mobile Em Comm
KB9NEJ 612 2 11 2,374 IN
North Kitsap ARC
KC7Z 539 2 21 2,340 WWA
Lake Washington Ham Club
K7LWH 375 2 60 2,310 WWA
Victoria ARC
W5DSC 286 2 25 2,258 STX
RAC of Knoxville
W4BBB 428 2 28 2,182 TN
Mountain ARC
W3YMW 315 2 25 2,112 MDC
Northern OH ARS
K8KRG 545 2 32 2,062 OH
Citrus Belt ARC
W6JBT 528 2 35 2,036 ORG
Ft Vanango Mike and Key Club
W3ZIC 333 2 15 1,990 WPA
Maxim ARC
KE7NCT 920 1 7 1,981 OR
Anoka Co RC
WØYFZ
(+AEØAL) 322 2 33 1,874 MN
Coachella Valley ARC
NR6P 357 2 12 1,870 ORG
Bear Bait RC
KC2ZZO 322 2 11 1,780 NNY
Toledo Mobile Radio Association
W8HHF 617 2 34 1,780 OH
Sun Country ARS
W4CW 222 2 9 1,658 NFL
ARES LAX — Northeast Section
K6UD 387 1 15 1,647 LAX
Cherokee Capital ARS
K4WOC 300 2 20 1,576 GA
K8OAR 336 2 19 1,484 MI
Yellow Thunder ARC
WB9FDZ 404 2 15 1,458 WI
TCARES
K6TUO
(+KJ6KNK) 263 2 35 1,416 SJV
Tri-County Amateurs
KC9OLF 109 2 20 1,224 IN
Winnebago Co ARES/Skywarn
WX9WAS 196 2 8 1,222 IL
San Francisco ARC
W6PW 152 2 20 1,070 SF
Whitby ARC
VE3WOM 402 2 5 1,054 ON
Mount Vernon ARC
K4US 73 2 10 654 VA
The World RC
W3WRC 183 1 5 235 SV

6A

Mike & Key ARC
K7LED
(+AE7G) 4695 2 64 14,482 WWA
South Jersey Radio Assn
K2AA
(+W2EA) 4076 2 46 13,120 SNJ
Central Ky ARS
AA4NJ 3042 2 17 9,424 KY
Fort Wayne RC
W9TE 1846 2 40 7,344 IN
Orange Co ARC
W6ZE
(+W6BAC) 2110 2 50 6,504 ORG
Beloit ARC
W9PN 1756 2 15 6,104 WI
Central MA ARA
W1BIM 1460 2 12 5,650 WMA
Andrew Johnson ARC
W4WC 1308 2 22 5,416 TN
W6TRW ARC
W6TRW 2092 2 34 5,248 LAX
South Pickering ARC
VE3SPC 1190 2 12 4,734 ON
Kendall ARS
KB5TX 1076 2 20 4,504 STX
Fountain Valley Am Comm/West Coast ARC
WA6FV 1092 2 16 4,448 ORG
Orlando ARC
K1AA 788 2 31 4,128 NFL
RASON
N1NW 899 2 32 4,066 CT
Fort Myers ARC
W4LX
(+KK4BQN) 872 2 25 4,002 SFL
Bolingbrook ARS
K9BAR 1116 2 45 3,592 IL
Saginaw Valley ARA
K8DAC
(+KD8KDP) 663 2 23 3,346 MI
Copper Country Radio Am Assn
W8CDZ 596 2 26 3,074 MI
SE Metro ARC
WØCGM 662 2 14 3,068 MN
Antietam Radio Assn
W3CWC
(+W3HAG) 577 2 32 2,982 MDC
Whitman ARC, Inc.
W1N 574 2 37 2,750 EMA
Waterville Area Wireless Assn
WA1WA 651 2 6 2,676 ME
Sierra Nevada ARS
W7TA 618 2 44 2,626 NV
Fort Herkimer ARA
W2FHA 482 2 17 2,568 WNY
Beaver Valley ARA
W3SGJ 647 2 40 2,472 WPA
East River ARC
W8MOP 422 2 20 2,400 VA
Brantford ARC
VE3BA 701 2 7 2,334 ON
Barrow ARC
WR4BC 474 2 21 2,264 GA
Kent ARS
K3ARS 263 2 18 2,248 MDC
Lakeside ARC
K6SEE 445 2 25 2,042 SDG
Stanislaus ARA
W6ERE
(+K6SUU) 362 2 70 1,996 SJV
Ak-Sar-Ben ARC
KØUSA 558 2 20 1,904 NE
WA6BGS 346 2 54 1,774 SDG
Somerset Co ARC
K3SMT 343 2 20 1,700 WPA
Caribbean ARG, Inc.
WP4CRG 118 2 22 1,560 PR
Long Island AR Simplex Club
W2LIS 266 2 8 1,232 NLI
Sequoia ARG
N6KRV 67 2 7 988 SJV

7A

West Valley ARA
K6EI
(+W6ZZZ) 2252 5 25 20,845 SCV
Lake ARA
K4FC
(+KT4Q) 4730 2 44 14,582 NFL
Hampden Co RA
W1NY
(+N1KXR) 3817 2 45 12,054 WMA
Two Rivers ARC
W3OC 2580 2 45 9,870 WPA
Fox River RL
W9NE
(+W9CEQ) 2264 2 35 8,602 IL
Big Bear ARC
K6BB 1957 2 17 7,458 ORG
Columbus ARC/Russell Co. RC
W4AN 1535 2 63 6,944 GA
Muskegon AR Council
W8ZHO 1578 2 60 5,766 MI
Niagara Peninsula ARC
VE3VM
(+VA3NRS) 1728 2 40 5,544 ON
Mobile Sixers/Marple Newtown/
Delaware Co ARC
W3AWA 1305 2 63 5,420 EPA
Fulton Co ARC
K8BXQ
(+KD8JBS) 1135 2 12 4,160 OH
CGARC/MGRA
W4R
(+W4CBA) 1098 2 75 4,078 GA
Calaveras ARS
N6FRG
(+KJ6LBW) 513 2 14 3,252 SJV
W4CAE
(+AL7MO) 620 2 35 3,248 SC
Sangamon Valley ARC
W9DUA 623 2 40 2,834 IL
Crawford Co ARC
W8BAE 574 2 21 2,420 OH
CORE Group
AA4TA 364 2 15 1,982 TN
Delta ARS
VE7SUN 249 2 11 1,808 BC
K8BMI 297 2 42 1,804 MI
Western Reserve ARC
W8WRC 160 2 42 1,700 OH
VE3WE 299 2 16 1,588 ON

8A

Gloucester Co ARC
W2MMD 3558 2 46 12,438 SNJ
Rappahannock Valley ARC
K4TS
(+KK4AUW) 3013 2 40 10,584 VA
Cuyahoga ARC
W8BM 2549 2 35 9,184 OH
Gwinnett ARS
W4GR 2652 2 12 8,746 GA
DuPage ARC
W9DUP
(+K9DEE) 1847 2 70 6,922 IL
Salem ARC
W7SAA
(+AK7EE) 1669 2 45 6,556 OR
Mahoning Valley ARA
W8QLY
(+W8IZC) 1832 2 15 5,818 OH
Silverado ARS
W6CO
(+KO6FR) 948 2 38 4,212 EB
Lancaster NY ARC
W2SO 828 2 10 3,058 WNY
Hewlett-Packard Boise ARC
W7I 576 2 56 2,988 ID

9A

Raleigh ARS
W4DW
(+W4RNC) 5152 2 61 16,606 NC
Carroll Co ARC & Carroll Co Contesters
K3PZN 4847 2 20 15,164 MDC
Nashua Area RC
N1FD 3729 2 30 13,508 NH
Greater Wichita Field Day
NØW
(+KØW) 1407 2 81 5,780 KS
Wabash Valley ARA
W9UUU 1377 2 50 5,554 IN
Conejo Valley ARC
AA6CV 626 2 47 3,540 SB
El Dorado Cty ARC
AG6AU 902 2 30 2,784 SV

10A

VE3MIS 2806 2 30 8,690 ON
Anne Arundel RC
W3VPR 2293 2 74 8,404 MDC
Tulare Co ARC
WA6BAI 295 2 30 2,320 SJV

11A

Ventura Co ARS
N6R 1343 2 14 5,278 SB

25A

Potomac Valley RC & Columbia ARA
W3AO
(+KE3Q) 12158 2 90 38,764 MDC

1A Battery

Chew's Ridge Gang
K6MI 1127 5 6 12,215 SCV
K4RUM 561 5 3 5,730 SFL
QCWA Fresno Chpt 213
W6GV 479 5 5 5,235 SJV
K2YG 407 5 3 4,310 NNJ
Bolingbrook Area Radio Contesters
NA9US 244 5 3 2,690 IL
MN QRP Soc
WQØRP 149 5 15 2,420 MN
Hiawatha ARC
KØJKS 151 5 18 2,040 KS
Pinyon Mesa FDS
KØG 149 5 3 1,840 CO
Flying Pigs QRP Int North Central TN
Chapter
WA4PIG 141 5 5 1,560 TN
CRA SOREL/TRACY
VE2CBS 172 5 8 1,530 QC
North Georgia VHF Society
K4NGA 179 5 6 995 GA
Atchison Cty AR Service
KØHK 46 5 8 715 KS
Pennsylvania Knightlites
KA2QPG 59 5 12 665 WPA
W7FC 33 5 3 580 OR
KG7HQ 43 5 3 565 WWA
KC2SVS 18 5 3 470 NNJ
K2JF 27 5 3 365 NLI
N3AZ 27 5 3 345 AL

2A Battery

Colorado QRP Club
WØCQC
(+KØFEI) 1943 5 9 19,130 CO
Grand Mesa Contesters of CO
NØKE 885 5 4 8,890 CO
Explorers RC
NA3DX
(+NA1DX) 664 5 12 6,215 MDC
VE3NR 527 5 3 5,530 ON
Sierra Vista Contesting Group
W7SVD 406 5 8 5,295 AZ
Walton RA
W2LZ
(+W2CD) 389 5 8 4,145 WNY
Ottawa Valley QRP Soc
VA3OVQ 345 5 12 4,045 ON
Just Havin' Fun QRP Club
W8WOO 403 5 5 3,830 OH
Rochester ARC -QRP
WØLLN 322 5 16 3,405 MN
Colorado QRP Club
NØCQC 228 5 11 3,015 CO
Barstow ARC
WA6TST 242 5 31 2,450 ORG
W3PBC 180 5 4 2,110 EPA
Marconi ARC of Newfoundland
VO1MRC 95 5 3 1,785 NL
Nova QRP
WA4MM 109 5 6 1,290 VA
Bedford Cty ARS
K3NQT 64 5 9 1,060 WPA
N4ZAK 93 5 3 815 NC
Wage Peace RG
W1PAZ 2 5 3 70 VT

3A Battery

Eight-Peat
W5YA 1582 5 7 15,165 NM
Reno QRP Group
W7FST 381 5 11 4,390 NV
Houston QRP Club
W5MSQ 333 5 15 3,560 STX
Pueblo West ARC
NAØPW 261 5 15 3,065 CO
Androscoggin ARC
W1NPP 258 5 12 3,020 ME
4 State QRP Group
NØTU 201 5 4 2,160 MO
Elgin ARS
VE3RSE 154 5 12 2,025 ON

The Linn County ARES group operating at Cheadle Lake Park in Lebanon, Oregon during this year's Field Day appear to really be "lighting up the ether" while using their beam.

Capital City ARC
W7TCK
(+AE7AP) 91 5 21 1,335 MT
QCWA Chapter 162
K9AKG 110 5 12 1,300 WI

4A Battery

Zuni Loop Mountain Expeditionary Force
N6GA 905 5 7 9,275 LAX
St Louis QRP Soc
NFØR 458 5 22 5,410 MO
Portland ARC
W7LT 462 5 16 4,765 OR
McMinnville ARC/YCARES
W7YAM 308 5 8 3,575 OR
Friends of the 045 Repeater
W6V 302 5 11 3,020 EB
North Georgia QRP Club
NO4GA 199 5 5 2,840 GA
Seaside Tsunami ARS
WA7VE
(+WA7FIV) 104 5 55 1,565 OR

5A Battery

North Coast ARC
N8NC 269 5 33 2,620 OH

7A Battery

Forsyth ARC
W4NC
(+W4WS) 417 5 30 4,045 NC

8A Battery

Durham Region QRP Club
VE3QDR 1219 5 9 12,320 ON
David Sarnoff ARC
N2RE 303 5 38 3,620 SNJ

9A Battery

Orange Co RA/Durham FM Assn
W4UNC 1779 5 64 17,035 NC

14A Battery

USECA ARC
K8UO 1620 5 10 16,410 MI

1A Commercial

Callaway ARL
KSØB 392 2 11 1,540 MO
Pathfinders ARC
VA4PAR 548 2 15 1,326 MB
Waupaca ARES
W9WAP 330 2 21 1,124 WI
Free State ARC
WG3R 55 2 10 660 MDC
Hawkins Co ARES
KM4XE 176 2 23 646 TN
Suncoast ARC
WA4T 36 2 6 362 WCF
Hewlett Packard Boise ARC
AB7HP 96 1 9 246 ID
Elmendorf ARS
KL7AIR 110 2 3 220 AK
South Tidewater AR Klub
W4HDW 66 2 8 182 VA

2A Commercial

Order of Boiled Owls of NY/Radio Central ARC
KW2O
(+W2RC) 2411 2 22 7,814 NLI
Macon Cty ARC
NØPR
(+ABØC) 780 2 12 3,564 MO
West Texas Consortium
K5M 899 2 3 3,238 WTX
MOSI ARC
KMØSI
(+KE4TP) 646 2 50 2,572 WCF
Kootenai ARS
K7ID 534 2 49 2,380 ID
Spartanburg ARC
K4II 651 2 32 2,152 SC
Columbia Co ARC
K4KNS 370 2 10 1,980 GA
N4HAI 486 2 4 1,650 OH
Nassau Co Police ARC
NC2PD 477 2 17 1,584 NLI
Grumman ARC
WA2LQO 547 2 15 1,518 NLI
Speculator ARC
KC2WI 281 2 8 1,484 NNY
Community Service RC
KCØYNE
(+K5EST) 250 2 7 1,464 MO
Hiawatha ARC
KDØNEB
(+NØQIX) 286 2 40 1,368 IA
Stillwater ARA
WØJH
(+KBØSCE) 373 2 31 1,250 MN
Yavapai ARC
W7YRC 369 2 11 1,220 AZ
Central OH Operators Klub Extra-Novice
W8FD 408 2 19 1,106 OH
Quad Co ARC
N3QC
(+W3TM) 303 2 29 1,076 WPA
Champaign Cty ARES
K7GUN
(+WB8UCD) 236 2 10 912 OH
Chicago FM Club
WA9ORC 212 2 25 874 IL
Northeast AR RC
K5NEA 197 2 10 844 AR
Wantagh ARC
W2VA 33 2 14 840 NLI
N4VU 303 2 5 838 GA
Tobacco Valley ARC
K7EUR 121 2 16 832 MT
King's Point ARC
W4KPR 270 2 24 798 WCF
Lewes ARS
W3LRS 146 2 7 684 DE
NS3HS 186 2 7 582 WPA
Mora Open Repeater Assn
KDØCI 80 2 10 556 MN
Wellesley ARS
W1TKZ 101 2 17 480 EMA
Club Radio Amateur de l'Estrie
VE2RAE
(+VA2DJ) 155 2 12 470 QC
Fullerton RC
W6DQ 77 2 18 404 ORG
Westside ARC
W5ABD 52 2 5 400 LA
East AL ARC
W4LEE 139 2 22 362 AL
AA2GV 154 2 10 358 WNY
Piedmont ARES
K4PAR 46 2 11 296 GA
Walton Cty ARC
WF4X 116 2 12 232 NFL
Hinesville AR Emergency Society
KG4OGC 38 2 7 176 GA

3A Commercial

Zamora RC
W4ZHR
(+N4DKD) 1727 2 20 6,976 AL
Licking Co Contest Group
W8EA
(+K8SM) 1364 2 24 4,870 OH
North Franklin ARS
N2NNY 934 2 10 4,090 NNY
Henry Co ARC
W9OB 1731 2 40 3,908 IN
Splitrock ARA
K2RF
(+W2PJ) 1191 2 20 3,480 NNJ
JF Drake State Tech College ARC
N4DTC 1295 2 6 2,790 AL
Cherokee ARS
WX4CAR
(+KJ4PQX) 721 2 73 2,688 GA
Fourlanders VHF Contest Team
W4NH 922 2 20 2,602 GA
Cascade RC
W7EK 516 2 20 1,972 WWA
Radio Assn of Western NY
W2PE 557 2 15 1,962 WNY
Cumberland ARC
K3IEC 534 2 14 1,914 EPA
New York City Transit ARC
K2IRT 534 2 15 1,832 NLI
Eastern NM ARC
KA5B 504 2 25 1,830 NM
MS Coast ARA
W5SGL 525 2 33 1,802 MS
Cape May Co ARC
N2CMC
(+W2CMC) 397 2 40 1,716 SNJ
The Albemarle ARS
K4WO 452 2 30 1,610 NC
Hillsdale Cty ARC
K8HRC 416 2 10 1,604 MI
Tompkins Co ARC
AF2A 349 2 6 1,342 WNY
Sussex ARA
KB3BHL 445 2 20 1,166 DE
ARC of Sabine
K5MNY 453 2 13 1,146 LA
Anthracite Repeater Assn
W3SJI 263 2 15 1,106 EPA
Georgian Bay ARC
VE3OSR 352 2 17 1,074 ON
Volusia Co ARES
KV4EOC
(+K4DMH) 151 2 70 1,072 NFL
High Point ARC
W4UA 343 2 19 984 NC
Coon Valley ARC
NØNAF 282 2 4 878 IA
Trinity Trails Field Day
AB5VP 253 2 6 790 NTX
AB8VV 177 2 3 742 MI
Tryon ARC
K2JJI 108 2 16 686 NNY
KB3WCE 120 2 4 680 MDC
Ste. Genevieve Co ARC
WØJET 89 2 14 650 MO
W6IER 135 2 10 432 ORG
NP2CB 81 2 5 324 NFL
Bluff Country DX Assn
W9W 107 2 3 264 WI

4A Commercial

SARA ARC
N4NE 1779 2 91 5,748 GA
RL Drake ARC
K8UU 1383 2 15 4,106 OH
Pottstown Area ARC
K3ZMC
(+N3WXW) 1118 2 46 4,072 EPA
CBF ARC
W8CBF 1730 2 30 4,038 OH
Milledgeville ARC
W4M 589 2 13 2,882 GA
PG ARES
W3PGC 458 2 43 2,272 MDC
Lakes Area ARC
W5JAS 271 2 17 1,690 STX
Sylvan Springs ARC
KJ4SWD 346 2 28 1,568 AL
Black River ARC
K8BRC 331 2 28 1,364 MI
N4IQ 723 1 4 1,240 SC
Beach & Inland Group of the Em Am Repeater System
NE4SC 198 2 15 1,186 SC
ARA of the Southern Tier
W2ZJ 165 2 30 1,186 WNY
Calhoun Co ARA
WB4GNA 53 2 37 656 AL

5A Commercial

Tishomingo Co ARC
W5TCR 498 2 11 2,372 MS
Wisconsin ARC
W9CQ
(+KC9PIF) 507 2 12 2,088 WI
Frontenac Radio Group
VE3FRG 1014 2 5 2,080 ON
Flagler Palm Coast ARC
W4FPC 330 2 25 1,654 NFL
Atlanta RC
W4DOC 353 2 21 1,292 GA
Bedford Co ARS
KI4NJJ 205 2 14 1,130 TN
Cherokee Co ARC
K5JVL 303 2 27 874 NTX
Blackdiamond ARC
WV8BD 149 2 23 870 WV

6A Commercial

LaGrange ARC
AB4KE
(+AB4GA) 853 2 69 3,060 GA
AR of Southwest FL
W4F 880 2 29 2,446 SFL
Foothills ARS
VE6FAR
(+VE6TK) 402 2 22 1,548 AB

9A Commercial

Ashland Area ARC
N8IHI 525 2 10 2,380 OH
WA5AR 89 2 18 954 STX

Class B — One or Two Person Portable Stations

1B-1 Op

N7OU 1230 2 1 5,170 WWA
K5LG 1086 2 1 4,494 AR
K3TM 938 2 1 3,902 MDC
K9CJ 799 2 1 3,446 IN
W6MM 962 2 1 3,420 ID
K7RE 638 2 1 2,702 WY
KIØE 277 2 1 1,908 ND
KE7NO 658 2 1 1,856 MT
WA9Z 467 2 1 1,696 IA
N4UF 307 2 1 1,378 NFL
KB8UHN 610 2 1 1,320 OH
W9KHH 267 2 1 1,266 WI
KØNR 412 2 1 974 CO
W6BIV 188 2 1 924 LAX
WG5F 165 2 1 910 OK
K6KS 209 2 1 768 SV
KC7O 209 2 1 622 SB
N7CFO 103 2 1 606 EWA
WA4JA 90 2 1 530 TN
WB8RFB 100 2 1 492 IL
KB2UGW 64 2 1 478 EWA
KE9G 93 2 1 450 WI
KF4VRS 170 2 1 440 NFL
K2EFG 60 2 1 420 ENY
N1EDU 55 2 1 362 NH
WB5LRP 102 2 1 354 STX
KBØYTO 33 2 1 316 NE
KS6A 101 2 1 302 OR
WØSG 34 2 1 284 CO
K7SWE 66 2 1 282 EWA
AAØQZ 20 2 1 240 WWA
K2HVE/P 20 2 1 240 NNJ
KB7PVU 12 2 1 124 NM
WA7TPB 5 2 1 110 WWA
KB3TIJ 26 2 1 102 EPA

1B-1 Op Battery

N4TY 835 5 1 8,500 KY
W3TS 638 5 1 6,830 EPA
N5CW 531 5 1 5,610 MS
K5WNH 517 5 1 5,520 NTX
N8BB 520 5 1 5,350 MI
KEØG 504 5 1 5,190 MN
KXØR 469 5 1 5,040 WY
W2FU 482 5 1 4,815 IA
AA4GA 449 5 1 4,740 GA
K5WX 404 5 1 4,290 STX
WA7LNW 355 5 1 3,700 UT
AA4Q 340 5 1 3,550 AZ
K8AB 339 5 1 3,540 OH
NØEVH 310 5 1 3,450 MO
W9NJY 291 5 1 3,260 WI
KW9R 264 5 1 2,890 WI
VA3YT 232 5 1 2,870 ON
NZ5A 214 5 1 2,690 STX
W2JLK 230 5 1 2,650 NNJ
KA2OUO 693 2 1 2,456 MDC
KV2X 551 2 1 2,354 NNY
AC7A 225 5 1 2,350 AZ
KD2JC 213 5 1 2,330 NNJ
KB4QQJ 207 5 1 2,325 NC
AA5CK 216 5 1 2,320 OK
NS2X 202 5 1 2,270 TN
N6CMF 221 5 1 2,260 ORG
W9FHA 211 5 1 2,260 KY
N5LZ 203 5 1 2,180 UT
AC3V 205 5 1 2,165 EPA
NN2L 200 5 1 2,100 NNY
KE4QZB 186 5 1 2,060 NC
WØXR 450 2 1 2,050 CO
N3ZP 191 5 1 2,010 EPA
N3AB 180 5 1 1,900 EPA
W3TUA 175 5 1 1,900 NNY
K4CHE 152 5 1 1,870 DE
KW4M 158 5 1 1,830 GA
KIØII 145 5 1 1,800 CO
W5LL 306 5 1 1,780 NTX
NQ7R 143 5 1 1,680 AZ
NR8Z 141 5 1 1,660 OH
K1PDY 131 5 1 1,660 NH
W4UX 360 2 1 1,578 TN
N8TD 126 5 1 1,560 OH
AB4EL 140 5 1 1,550 NC
VE3ENG 115 5 1 1,550 ON
VE2JCW 142 5 1 1,470 QC
K3WGR 317 2 1 1,452 EPA
K3STL 316 2 1 1,384 WPA
WUØL 113 5 1 1,380 NE
K8ZT 105 5 1 1,340 WV
VA7XN 121 5 1 1,320 BC
AA1PL 114 5 1 1,295 RI
N2DM 124 5 1 1,295 WNY
KB5FIO 82 5 1 1,270 STX
KB7LJP 101 5 1 1,260 WWA
AC2C 111 5 1 1,260 MDC
K6CU 101 5 1 1,260 ORG
N8XMS 100 5 1 1,250 MI
WR8S 118 5 1 1,230 WV
KA5GIS 111 5 1 1,210 AR
VE3HG 115 5 1 1,200 ON
VE3GTC 73 5 1 1,180 ON
W6GA 82 5 1 1,170 ORG
KFØQS 101 5 1 1,160 CO
W3WT 80 5 1 1,150 EPA
N8MFN 99 5 1 1,140 OH
KD2MU 97 5 1 1,135 NLI
N7WY 96 5 1 1,110 WY
WD5HNI 91 5 1 1,100 STX
WB3CEG 80 5 1 1,050 STX
AD7L 78 5 1 1,030 OR
WA4MXF 78 5 1 1,030 TN
K3TW 50 5 1 950 NFL
K5RCR 322 2 1 938 LA
K9IA 67 5 1 920 NFL
VE6ZC 77 5 1 920 AB
K7VK 78 5 1 895 MT
VE3TAZ 70 5 1 875 ON
KA9VHG 71 5 1 860 WI
NKØE 70 5 1 850 CO
ACØPR 50 5 1 850 ND
N7XW 62 5 1 835 WWA
K7EW 63 5 1 830 OR
NØRP 101 5 1 805 MO
KB1OIQ 45 5 1 800 EMA
AH6V 59 5 1 790 PAC
K5CAO 71 5 1 760 SV
AE6N 45 5 1 750 AZ
K2NNY 65 5 1 700 NNY
N7JI 45 5 1 700 OR
AD7DD 51 2 1 690 EWA
W9SRB 85 5 1 675 IL
W5GHZ 40 5 1 650 OK
KU4MH 125 2 1 650 VA
K2KGJ 44 5 1 640 ENY
W2EB 25 5 1 600 WNY
AK4BH 70 5 1 590 SC
W1IE 87 5 1 585 VA
K4KO 32 5 1 570 TN
KF7HB 31 5 1 560 OR
KO5Q 76 2 1 554 GA
AC7CJ 50 2 1 550 EWA
W8NNC 50 5 1 550 OH
KE4KE 80 5 1 550 MN
N8XA 77 5 1 500 OH
WB5PJB 103 2 1 500 CO
AE7HS 73 2 1 496 ID
K3VTS 24 5 1 490 WPA
WD9EWK 27 5 1 485 AZ
KB9UIY 67 5 1 485 OH
KK1J 43 5 1 465 AZ
KI6TPX 42 5 1 460 LAX
NØBHT 140 2 1 430 CO
KD8NJZ 35 5 1 425 OH
K4PP 27 5 1 420 AL
N5CSU 51 5 1 405 NTX
WB4MNK 25 5 1 400 NFL
W5HLP 72 2 1 394 NTX
WBØRXX 23 5 1 385 MN

KD8EPR	24	5	1	370	OH
W3HZZ	22	5	1	370	OH
YV5HUJ	22	5	1	370	DX
KJØP	19	5	1	355	MN
VE3XAM	51	5	1	355	ON
W1INC	20	5	1	350	NH
NW7U	21	5	1	350	WWA
VA3BPO	40	2	1	350	ON
KØWRZ	39	5	1	345	KS
KCØQAS	43	2	1	336	KS
AF4O	28	5	1	315	TN
AI6K	130	2	1	310	SJV
VE3HHT	30	5	1	300	ON
K1EP	24	5	1	290	ME
AH6JD	20	2	1	290	PAC
WU1B	16	2	1	282	WMA
K5RXQ	39	2	1	282	STX
K5YQF	13	5	1	280	STX
AG3BI	15	2	1	280	MDC
KL7/WA4DOX	12	5	1	270	AK
WB2URF/PJ4	5	2	1	260	DX
KD8DJB	16	5	1	250	MI
KJ4WFS	50	2	1	250	AL
K3LGM	35	2	1	220	NTX
N2GDS	7	5	1	220	SDG
KC2TND	33	2	1	216	WNY
KE3FL	6	5	1	210	MDC
VE2AHH	11	5	1	210	QC
VE4DET	22	2	1	194	MB
W4TTU	3	5	1	180	WY
KA3VFT	6	5	1	180	MDC
V2KY	64	2	1	178	QC
W7JAZ	5	5	1	175	OR
N2ESE	7	5	1	170	NNJ
KB1QKB	13	5	1	165	NH
N9DRB	5	2	1	160	WI
AB9WO	1	5	1	160	WI
KI4OHR	5	5	1	125	VA
NØDOS	11	5	1	105	WWA

2B-1 Op Battery

W5CYF	18	5	1	330	MS

1B-1 Op

WC7Q	356	2	1	1,474	EWA
W5RMB	337	2	1	1,348	AL
K5OA/6	260	2	1	1,090	SDG
K7WA	207	2	1	966	WWA
KJ4LQX	128	2	1	816	SFL
AI4BJ	139	2	1	600	KY
N4NTO	116	2	1	514	NC
WA4IZK	148	2	1	346	NH
WA9JHH	122	2	1	294	MI
N4KHI	46	2	1	242	SFL
KJ4SRE	29	2	1	208	SFL
W9ROB	58	2	1	166	IN
KØVG	20	2	1	130	MN
AA1LL	25	2	1	100	ME
KB9GEG	44	1	1	94	AR
N1GNV	1	2	1	52	CT
KØFNS	36	1	1	36	CO

1B-2 Op

K9CT	1593	2	2	6,522	IL
N8NN	1181	2	2	4,836	WV
VE6KZ	944	2	2	4,026	AB
W8SIO	760	2	2	3,290	MI
K7GGG	1006	2	2	3,230	AZ
WØOTV	685	2	2	2,484	KS
K7RF	411	2	2	1,588	OR
VE7JKZ	286	2	2	1,294	BC
WT7B	450	2	2	1,050	ID
N2PJ	209	2	2	968	VA
N7LT	248	2	2	782	MT
N7VZU	246	2	2	642	EWA
WX7G (+N7BW)	125	2	2	578	UT
KB7XP	161	2	2	572	AZ
W5BEE	13	2	2	476	STX
N2DD	87	2	2	424	WNY
ACØFQ	102	2	2	354	CO
KDØGUY	41	2	2	332	CO
KI4QIW (+KI4YVC)	50	2	2	220	SC

2B-2 Op

W1LN/VY2	1393	2	2	3,006	MAR
K9PMV	559	2	2	2,374	IL
KC5JFO (+K5PAR)	804	2	2	2,372	NTX
N7CQQ	498	2	2	2,012	AZ
WA9STI	391	2	2	1,412	SJV
K6BUM	419	2	2	1,138	LAX
K2OAK	257	2	2	1,010	NNJ
W5ENG	171	2	2	692	STX
K2HM	152	2	2	554	WWA

1B-2 Op Battery

VA3DF	646	5	2	6,230	ON
NI8N	558	5	2	5,830	OH
N3CU	451	5	2	4,760	WPA
VA3YV	403	5	2	3,975	ON
W7EL	354	5	2	3,890	OR
K2WNY	326	5	2	3,860	WNY
K1DFT (+KA1RM)	307	5	2	3,105	ME
W4RRW	251	5	2	2,660	GA
K4RDU	248	5	2	2,580	VA
N4RE	225	5	2	2,400	NC
WK4P	139	5	2	1,960	SC
W1BYH	500	2	2	1,872	WMA
KB8ELW	405	2	2	1,702	MI
W3SW	658	2	2	1,666	WNY
N6JF	380	2	2	1,462	LAX
W5WHN	229	2	2	1,416	NM
NK8I	97	5	2	1,320	OH
NØJDC	222	2	2	1,138	CO
NA7UT	130	5	2	1,100	UT
K2QR	37	5	2	1,020	WNY
AI2T	71	5	2	1,010	WNY
AB6S	422	2	2	994	EB
KC5PXW	107	5	2	905	NC
W9ARG	64	5	2	670	WI
WA6RC	58	2	2	666	LAX
N6MDV	72	5	2	610	LAX
N6IV	113	2	2	544	SJV
KEØCT	121	2	2	492	CO
WA2EZG	24	5	2	370	NNJ
K9MEV	27	2	2	358	IL
KC9TZO	24	5	2	270	WI
KC8MLB	3	2	2	256	OH
KBØNAS	1	2	2	252	CO
W8ON	28	2	2	210	MI
KBØG	7	5	2	205	CO
KD7NNQ	18	2	2	186	OR

2B-2 Op Battery

KW8N	1341	5	2	13,065	OH
K9AY	872	5	2	9,170	WI
N8EFO	373	5	2	3,380	OH
K3ZZ	453	5	2	3,135	MDC
NUØP	203	5	2	2,180	IA
N8E	132	5	2	1,670	OH
NØUY	367	2	2	1,628	MN
N6MBY (+K6RHB)	96	5	2	880	SB
W6R	173	2	2	796	SB
NU6T	55	5	2	695	SV
KE7UQL	50	5	2	600	NV

1B-2 Op

K7DR	929	2	2	3,128	MI
K5PA	151	2	2	400	STX
K2POF	101	2	2	354	ENY
W3FME	139	2	2	278	DE
WB4JFA	15	2	2	230	SFL
W6OFM (+WA6HZT)	59	2	2	200	SF
K7YJ	6	2	2	162	EWA
KE8E	97	1	2	147	OH

2B-2 Op

NE7D	574	2	2	2,346	OR
KM5VI	2200	1	2	2,250	STX
N1ZQ	504	2	2	1,900	CT

Class C — Mobile Stations

1C

AA6DP	555	2	2	2,414	LAX
K7VO	590	2	1	1,430	WWA
W9XS	291	2	1	1,370	IL
WA7ZZB	265	2	1	980	WWA
K2NV/VE3	213	2	1	952	ON
AF5Q	106	2	1	926	OK
NB1RI	144	2	1	838	RI
N8RA/MM	175	2	2	776	CT
K3MT	101	2	1	744	VA
W1LQ/M	147	2	1	716	ME
W9ZSJ	102	2	1	658	IL
W7CGA	84	2	1	586	ID
K7UQH	96	2	1	534	WWA
NA1GB	133	2	2	450	WMA
W4ZPR/M	62	2	1	448	VA
KK4PQ	71	2	1	446	GA
N5DPK	127	2	1	404	NTX
K7UWR	109	2	1	368	CO
N7DLV	2	2	1	354	WWA
KA3KSP	85	2	1	320	WPA
W9WI	75	2	1	288	TN
WB7D	68	2	1	286	GA
NT7R	31	2	1	274	MT
ABØYM	47	2	1	272	CO
K6BBQ	7	2	1	264	SF
K9GAJ/M	80	2	1	260	NM
W2RI/M	105	1	1	255	ENY
W2RI	105	1	1	255	ENY
N3AWS	50	2	1	250	MS
K5VHH	74	2	1	248	STX
NE9G	45	2	1	240	IL
KJ4LTC	43	2	1	236	KY
AE5KJ	42	2	1	234	STX
W7BBO	61	2	1	222	WWA
KE5TSW	34	2	1	218	MO
WA4CHJ	30	2	1	210	VA
N8HS	76	2	1	202	MI
NF8M	13	2	1	202	MI
K1GAH	25	2	1	200	MDC
W6GJB	72	2	1	194	SCV
WA3BKD	9	5	1	190	WV
KK7BR	35	1	1	185	WY
NE9T	32	2	1	178	IN
K3MAF	12	2	1	174	IL
N3TG	10	2	1	174	MO
KB9BPF	9	1	1	159	MO
WB2EMS	4	2	1	158	WNY
KDØKYR	3	2	1	156	NE
KB7RNX	17	2	1	134	ID
KA1KNW	17	2	1	134	CT
WS9C	40	2	1	130	IN
N6IGI	40	2	1	130	ORG
VE4RDO	12	2	1	124	MB
K7JKM	1	2	1	102	OR
KI7T	23	2	1	96	WWA
N5VWN	11	2	1	90	SJV
AD6AF	17	2	1	84	LAX
KM7SM	14	2	1	82	ID
KO7X/6	3	2	1	62	EB
KD8EVL	3	2	3	56	OH
KJ4JXO	2	2	1	54	GA
KTØKT	2	2	1	54	CO

2C

KG6IYN	632	5	2	3,530	SDG
W5PF	521	2	4	2,116	STX
N8BOA	578	2	2	1,758	MI
VA3DHX	235	2	3	686	ON
KB1CTC	33	2	2	682	CT
K8LL	59	2	1	368	OH
PJ2OF	8	2	1	66	DX

3C

KZ3AB	30	2	3	500	MDC

Class D — Home Stations Commercial Power

1D

K3WW	1326	2	1	5,018	EPA
N9TK	1009	2	2	4,186	IL
K9LJN	1187	2	2	3,908	IL
N3AD	1691	1	1	3,068	EPA
KN9N	747	2	1	3,030	IL
AA2BJ	744	2	2	2,732	EPA
WA1ENO	1191	2	2	2,432	EMA
WA6KHK	737	2	1	2,368	ORG
N2JDQ	544	2	1	2,226	WNY
NØHR	831	2	1	2,168	IA
KB3LIX	508	2	1	1,946	WPA
K7RL	1041	1	1	1,935	WWA
VE3XAT	464	2	1	1,906	ON
W9LHG	464	2	1	1,906	WI
W1HR/3	563	2	2	1,830	WPA
N2RI	400	2	1	1,750	NLI
AA8IA	489	2	1	1,728	OH
W8VM	478	2	15	1,724	OH
VE3MGY	416	2	3	1,718	ON
KT8K	414	2	1	1,706	MI
W4NHO	354	2	2	1,666	KY
W6AEA	831	1	1	1,662	EWA
N7KQ	442	2	14	1,472	AZ
W7GVE	350	2	1	1,400	AZ
KB8O	639	2	1	1,362	OH
VA3EC	326	2	1	1,354	ON
WA3AAN	351	2	1	1,348	EPA
K3ATO	643	1	1	1,336	EPA
WZ8T	625	2	1	1,300	MI
WA2JQK	516	2	1	1,278	ENY
W6SX	590	1	1	1,230	SJV
W8TK	277	2	1	1,158	AZ
NQ5K	275	2	1	1,150	STX
ACØBH	274	2	1	1,146	MO
AC5O	1076	1	1	1,126	LA
WB3ESR	279	2	1	1,116	EPA
NW2K	256	2	1	1,074	WNY
WØYHE	275	2	1	1,072	AZ
N8XI	270	2	1	1,038	MI
N1OPF	328	2	2	1,010	EMA
KØPK	238	2	1	1,002	MN
KK1F	476	2	1	1,002	CT
K2MK	468	1	1	981	SNJ
WA4YHA	247	2	1	922	VA
W9AV	284	2	1	898	WI
K4DJ	206	2	1	874	NC
K3TN	179	2	1	860	MDC
W5PQ	210	2	1	840	LA
K7E	235	2	1	826	AZ
WB5A	405	2	1	810	NM
KA2FHN	218	2	1	810	WNY
KR2AA	376	1	1	802	NLI
W7QN	185	2	1	790	WWA
N7FF	184	2	1	786	AR
NØEKM	364	2	11	778	MN
VA3GUY	362	2	1	774	ON
VE3FJ	181	2	1	774	ON
K7BX	180	2	1	770	WWA
W8TM	223	2	1	766	OH
NG1O	220	2	1	740	MO
WØPV	180	2	1	718	WCF
VE9HF	346	1	1	713	MAR
W2DXE	158	2	1	680	WNY
VE2QV	132	2	1	678	QC
AA2JZ	190	2	1	672	NFL
N6WG	154	2	1	666	EB
WB8NNJ	141	2	1	664	OH
N1NN	153	2	1	662	EMA
WQ1C	175	2	1	662	STX
AC5CW	153	2	1	662	LA
NO8C	159	2	1	654	OH
VA3GKO	300	2	1	650	ON
KB2MN	125	2	1	650	SNJ
W2RR	300	1	1	626	WNY
AE5TF	241	2	19	612	AR
KD2MX	139	2	1	606	NNJ
AC3P	69	2	1	602	MDC
KI6WD	224	2	7	598	ORG
W9ZRX	251	2	1	592	IN
W8IQ	146	2	1	584	OH
N5OTY	206	2	1	582	NM
AA5VU	131	2	1	572	STX
KJ4IWZ	142	2	1	568	TN
WB2REM	515	1	1	565	SNJ
K8ZZU	127	2	1	556	MI
ND2E	124	2	1	546	TN
WØSAA	42	2	11	540	MN
K4FTO	149	2	1	538	VA
W1XH	134	2	1	536	EMA
N5LH	120	2	1	530	AR
WKØX	174	2	11	528	MN
K3WWP	119	2	1	526	WPA
VE1RGB	118	2	1	522	MAR
W3SFG	134	2	1	518	MDC
KC2MBV	153	2	1	508	NLI
WØWFX	114	2	1	506	MO
KE7A	449	1	1	499	NTX
NØDSN	222	2	2	494	MN
WAØBJR	147	2	4	488	MO
VE3CX	139	2	1	486	ON
W5GAI	171	2	1	478	STX
KC2RXS	81	2	1	474	ENY
W2JU	127	2	1	472	EMA
KD3SB	211	2	1	472	WPA
N4EMP	91	2	4	468	AL
VA3SB	117	2	1	468	ON
VA3FN	101	2	1	454	ON
N9JCA	139	2	1	446	IN
KJ4WD	99	2	1	446	NC
W4NBS	100	2	1	436	AL
N6DW	140	1	1	430	SV
AK6D	188	2	2	426	ORG
K5SS	105	2	1	420	NTX
VE6SQ	110	2	1	416	AB
N2BZP	91	2	1	414	NV
NJ1F	103	2	1	412	ENY
K6CSL	102	2	1	412	SJV
AD5MD	357	1	1	407	STX
VY2DM	100	2	1	400	MAR
AC3F	10	2	1	390	MDC
WA6URY	234	1	1	390	LAX
WA3SWA	84	2	1	386	MDC
KD8LNM	168	2	1	386	MI
KCØRRS	165	2	2	380	KS
WA7YNU	161	2	1	378	MT
AG6EP	129	2	3	370	SV
WO2N	79	2	1	366	NLI
WA4MIY	80	2	1	366	SC
KK7Z	106	2	2	362	IL
KE3MX	76	2	1	354	SNJ
W9WXN	51	2	1	352	IN
N1MD	65	2	1	350	MDC
NK3Y	145	2	1	344	EPA
WJ2D	226	1	1	344	NC
W4TFR	72	2	3	338	GA
K1KO	84	2	1	336	VA
AF6IF	81	2	1	336	SCV
KG2NI	141	2	1	332	WNY
KV5WS	89	2	1	328	STX
K8CPA	69	2	1	326	MI
WA8FRE	276	1	1	326	MI
N8BJQ	139	1	1	326	OH
WØPAN	138	2	1	326	AZ
W6CT	44	2	1	324	SCV
WB4OMM	60	2	1	322	NFL
KA5VZG	68	2	1	322	TN
KB1CKT	91	2	1	320	NH
KAØAIG	113	2	3	316	MO
W2KRD	86	2	1	316	SNJ
W4JHU	65	2	1	310	VA
K5VRC	77	2	1	308	AR
W1GAT	125	2	1	300	TN
KO6OP	122	2	1	294	SJV
K9KLO	120	2	2	290	GA
KO8S	80	2	1	290	MI
VE3AUO	145	2	1	290	ON
KB8TWM	118	2	1	286	MI
WO3T	143	2	2	286	WPA
AB1BW	70	2	1	282	CT
VE7RLE	87	2	1	274	BC
KD8DKG	61	2	1	274	MI
W3CDI	96	2	2	272	MDC
ND3R	91	2	1	266	WPA
N1DBS	54	2	1	266	CT
W1RM	131	1	1	262	CT
W4KYM	3	2	1	262	NM
WB9LRK	106	2	1	262	IN
KB9YGD	80	2	1	258	IN
AK7O	52	2	1	258	UT
W4HAY	64	2	1	256	TN
N3GGT	50	2	1	250	EPA
W6DPD	50	2	1	250	SJV
WA7YAZ	61	2	1	250	UT
W6MMG	62	2	1	248	SCV
KE4RUG	99	2	1	248	GA
N2YHQ	49	2	1	246	WNY
KN8DMK	49	2	1	246	OH
AG6AN	86	2	1	242	LAX
W8IDW	45	2	1	242	WV
NF7T	192	1	2	242	ID
AD5XR	190	1	1	241	MS
K7ING	60	2	1	240	AZ
AH6RR	61	2	1	240	PAC
N3UA	65	2	1	240	VA
N9UY	117	2	1	234	WI
W7KG	116	2	1	232	MT
K3FS	91	2	1	232	WPA
N9GC	45	2	1	230	MN
WB9FJO	40	2	1	230	MI
KTØP	76	2	1	226	VA
NU1O	226	1	1	226	WMA
N2WN	45	2	1	224	TN
ACØPP	85	2	1	220	MO
VE2UM	45	2	2	216	QC
N2SLO	82	2	1	214	NLI

K3WQ	82	2	1	214	MDC
N5ZRE	81	2	2	212	WTX
N5HMH	105	2	1	210	LA
KA1GYB	14	2	1	206	CT
WA5DSS	61	2	1	206	STX
KD4QMY	155	1	1	205	GA
VA3OR	50	2	1	204	ON
KB3KKG	47	2	4	204	WPA
WV7P	76	2	1	202	UT
WØNEB	100	2	1	200	KS
W2PQG	24	2	2	198	NNJ
VE3TW	37	2	1	196	ON
UA4LCH	22	1	1	194	DX
WS7R	95	2	1	190	AZ
KF5LFR	60	2	1	190	AR
KS4FE	51	2	1	190	KY
NC4PK	58	2	2	186	NC
KJ6BBS	68	2	1	186	ORG
K6III	90	1	1	185	SV
K2MFW	67	2	1	184	SNJ
WB9KPT	67	2	1	184	EPA
AG6DI	33	2	1	182	LAX
WA4HWT	90	2	1	180	GA
KC8ACO	62	2	2	174	MI
K7STU	61	2	1	172	NV
K2PS	58	2	1	172	MDC
WA2OQJ	60	2	1	170	NLI
KF6FIX	20	2	1	168	ORG
WA4SWJ	59	2	1	168	NFL
N3KN	69	1	1	168	VA
AC6TU	29	2	1	166	LAX
NN5NN	43	2	1	164	IA
N2LPC	57	2	1	164	AL
W4GFY	52	2	1	164	TN
W7HMV	80	2	1	160	NV
NC4MI	55	2	1	160	NC
WØNFS	54	2	1	158	MO
KC2LSA	37	2	1	158	VA
KS4X	52	2	1	154	TN
KJ4QAN	51	2	1	152	NFL
N1EVV	51	2	1	152	EPA
KDØOTQ	50	2	1	150	IA
VE3YX	50	2	1	150	ON
NJ2X	50	2	1	150	NNJ
KDØCPA	48	2	1	146	CO
KB1MU	48	2	1	146	WMA
VE2HIT	46	2	1	142	QC
W7EKG	46	2	1	142	ID
K4GOP	71	2	1	142	NFL
AC2Y	45	2	1	140	CO
NS4H	59	2	2	138	NFL
KR6BG	43	2	1	136	SDG
W8KNO	41	2	1	136	OH
VE7EOI	43	2	1	136	BC
KF4DVF	42	2	1	134	NFL
N7CKJ	41	2	1	132	EWA
K4IJK	40	2	1	130	RI
KC5UWS	40	2	1	130	NTX
NM5I	20	2	1	130	OK
KE9EX	39	2	1	128	IL
KJ4KTW	19	2	1	126	STX
AC8ZX	37	2	1	124	MI
VA3ZDX	124	1	1	124	ON
NØIBT	18	2	1	122	CO
N6BHX	18	2	1	122	EB
WB9MII	18	2	1	122	IL
N3TCH	23	2	1	122	VA
N4BFR	35	2	1	120	GA
N7RCN	35	2	1	120	UT
W9SRC	10	2	4	120	ID
KU1Q	57	2	2	114	CT
KF4IBU	28	2	1	112	NFL
K2JX	62	1	1	112	NLI
VE3JGL	30	2	1	110	ON
WB4QNG	30	2	1	110	KY
VA3TQX	29	2	1	108	ON
KØCQ	46	2	1	108	IA
K7VBY	14	2	1	106	OR
KE1R	28	1	1	106	NM
WA6GFR	14	2	1	106	ORG
KQØJ	27	2	1	104	NE
W7YVK	51	2	1	102	OR
AAØK	26	2	1	102	CO
WE5T	51	1	1	101	NTX
N3HWH	50	2	1	100	EPA
K9LDW	25	2	1	100	NTX
KBØUAZ	25	2	1	100	MN
KØRRP	25	2	1	100	NC
WR8R	25	2	1	100	MI
W4SY	99	1	1	99	SFL
WA7BME	12	2	1	98	UT
N4IOZ	24	2	1	98	NC
KB9AFW	49	2	1	98	MI
NA3M	15	2	1	98	MDC
KJ4YHC	23	2	1	96	VA
KG6YPH	23	2	1	96	SCV
WB3FTQ	23	2	1	96	MDC
AB9OS/W9	32	1	1	94	MT
KØPIR	47	2	1	94	SD
N8QVT	21	2	2	92	IL
VA3RJ	23	2	1	92	ON
KC2CHN	10	2	1	90	SDG
W2AJW	20	2	1	90	AZ
KG4RUL	20	2	1	90	SC
KB7SKZ	20	2	1	90	AZ
KF5SA	10	2	1	90	STX
W3WOT	45	2	1	90	NC
KCØVFP	20	2	1	90	MN
VE2NFX	20	2	1	90	QC
KCØFUE	15	2	1	90	KS
KC2JRQ	19	2	1	88	NLI
VK4GH	37	1	1	87	DX
WB7ULW	18	2	1	86	AZ
AC2GE	18	2	1	86	NNY
N1YIS	17	2	1	84	ME
N3LP	17	2	1	84	MDC
VE6RI	16	1	1	82	AB
KA1PPV	8	2	1	82	CT
N6RWT	15	2	1	82	EB
KD8GRG	40	2	1	80	MI
WY6L	14	2	1	78	SJV
WA5YNE	78	1	1	78	OK
KDØMXC	13	2	1	76	CO
N9NUZ	13	2	1	76	WI
N8KOJ	25	1	1	75	OH
KI4VCT	75	1	1	75	VA
WA3YZD	37	2	1	74	EPA
WB4ALM	12	2	1	74	WCF
WØIE	11	2	1	72	KS
K3EYL	11	2	2	72	IL
W6CDA	9	2	1	72	LAX
N6AYU	11	2	1	72	EB
KK4CME	5	2	1	70	WCF
KD4K	10	2	1	70	GA
KØVFW	10	2	1	70	KS
VE5DLM	35	2	1	70	SK
N8PVL	32	2	1	68	MI
KCØRNS	9	2	1	68	WI
KU4RC	9	2	1	68	NTX
W1WAB	4	2	1	66	WCF
KA9QPH	32	2	1	64	WI
KD8DVR	7	2	1	64	OH
KD8OAH	7	2	1	64	MI
W8CQD	3	2	1	62	MI
KF6EOJ	6	2	1	62	LAX
AI3G	15	2	1	60	DE
W1VCM	30	2	10	60	CT
AF6VG	5	2	1	60	LAX
W1BJ	4	2	1	58	EMA
KC2WMR	4	2	1	58	NLI
NØICV	4	2	1	58	IL
AG6V	2	2	1	58	SF
AB1HD	2	2	1	58	EMA
KG6YOR	3	2	1	56	SCV
W6LLP	3	2	1	56	EWA
KC9TZY	3	2	1	56	IL
KF7PKL	3	2	1	56	AZ
AE6SF	3	2	1	56	SF
WA6GFY	5	1	1	55	SCV
WA4NOT	27	2	1	54	NC
VE7JRX	2	2	1	54	BC
KK4CNM	2	2	1	54	GA
KM5VZ	1	2	1	52	NTX
KD8COO	1	2	1	52	OH
KE4PT	1	2	1	52	SFL
K3LAB	25	2	1	50	WPA
VE2GLA	13	2	1	48	QC
KD7SWL	23	2	1	46	UT
AJ4HK	23	2	1	46	NC
WA9VIQ	21	2	1	42	NFL
KB7TBT	41	1	1	41	GA
VK2HOT	20	2	1	40	DX
N4MM	11	2	1	40	VA
KA2IBN	20	2	1	40	ENY
K3ESS	37	1	1	37	NFL
VE2POU	15	2	1	36	QC
WA5WFE	18	2	1	36	WTX
WE5ET	18	2	1	36	STX
WB7CLF	17	2	1	34	WWA
N1IBM	12	2	1	30	SNJ
KK7CG	30	1	2	30	OR
K9SQG	22	1	1	22	OH
N7NTM	9	2	1	18	AZ
KA6WBQ	9	2	1	18	NLI
KCØVFP	18	1	1	18	MN
W7JAM	16	1	1	16	WWA
W2JC	4	2	1	8	NNJ
NØKDI	1	2	1	4	CO
W2ACO	1	2	1	2	NNJ
VE3OM	87	2	1	ON	

2D

W4CUE	1169	2	24	3,808	AL
W8NJH	959	2	4	3,188	MI
WAØDX	547	2	6	1,654	IA
W4NUN	423	2	3	1,552	GA
K5PO	1079	1	3	1,447	AR
K2VK	115	2	4	416	NNJ
W5RRR	220	1	9	416	STX
W1NHS	136	2	2	394	CT
K4TAK	53	2	1	358	TN
K8RJW	116	2	2	302	OH
N8CMQ	87	2	2	224	MI
VA2UT	67	2	2	194	QC
N9ZWY	81	2	2	162	WI
AJ4UX	54	2	2	158	NC
W2SZ	41	2	2	132	ENY
KE4ZIP	34	2	8	118	WCF
WE4HOE	17	2	5	84	AL
W3ONA	14	2	2	78	SC
KB3INE	10	2	2	70	SC

3D

W1IS	618	2	40	2,674	EMA
N5KWN	558	2	15	2,074	STX
W5RTA	623	2	6	1,934	STX
NY4S	576	2	3	1,684	TN
WD8LC	440	2	9	1,654	WV
NO8N	431	2	5	1,530	OH
NK5G	213	2	4	902	STX
WT9H	261	2	10	572	IL
NF6T	147	2	4	542	ORG
W5BMC	76	2	16	402	LA
KW1R	167	2	5	384	CT
AE6NN	17	2	3	202	LAX

4D

W4V	2191	2	11	4,432	AL
K9UXZ	687	2	12	1,814	IL

5D

K4GSO	769	2	15	2,352	NFL
VE3LSR	515	2	8	1,432	ON

Class E — Home Stations Emergency Power

1E

AA3B	2362	2	1	9,698	EPA
W2BC	1901	2	6	7,954	WNY
K3PH	777	5	2	7,840	EPA
W5CT	1847	2	3	6,434	STX
VE3KI	517	5	3	5,230	ON
K4QPL	1269	2	2	5,216	NC
KU6W	496	5	1	5,110	SCV
W1ECH	506	5	1	4,795	VT
W9TS	439	5	1	4,640	IL
W9HB	977	2	2	4,058	WI
WA2EQF	939	2	6	3,762	NNJ
K2XT	353	5	2	3,665	NNJ
AF4OX	331	5	1	3,520	SC
K1DW	1063	2	2	3,470	LA
K7IA	699	2	1	3,110	NM
W7WA	1206	2	2	3,086	WWA
K9OM	720	2	1	3,030	WI
NQ2W	267	5	1	2,920	ENY
K1TN	687	2	1	2,872	WI
W3HGT	1047	2	6	2,738	TN
K4KSR	234	5	1	2,690	VA
K2ZR	582	2	1	2,378	WNY
AA1O	232	5	1	2,370	EMA
W3ANX	221	5	1	2,360	WPA
K4AXF	219	5	1	2,340	VA
WF4W	209	5	1	2,240	GA
KB3FJJ	180	5	1	2,150	EPA
K4WOP	464	2	2	2,100	VA
K4WW	510	2	1	2,050	KY
K4PB	530	2	2	2,032	SFL
KD4RLH	359	5	2	2,030	NC
VE3GSI	483	2	1	1,982	ON
K5AXW	169	5	2	1,975	STX
WA1VKO	629	2	1	1,908	NH
NW3H	678	2	3	1,846	EPA
KH6RZ	841	1	3	1,838	PAC
W8AWE	512	2	3	1,830	MI
VE2SG	403	2	1	1,740	QC
W9GHX	163	5	1	1,730	MO
NT4Y	783	2	3	1,706	NFL
N1CC	503	2	1	1,674	NTX
VA7ST	151	5	1	1,660	BC
K7EA	352	2	1	1,658	UT
VE2AWR	437	2	1	1,652	QC
W2DPT	153	5	1	1,635	NNJ
AB2DE	701	2	2	1,628	NNJ
K9MY	351	2	1	1,626	IL
VE3PKA	374	2	2	1,614	ON
KX1E	135	5	1	1,600	ME
KG2V	614	2	1	1,578	NLI
N5FPW	156	5	1	1,575	NC
W3HBM	128	5	1	1,530	ME
VA3QR	412	2	2	1,488	ON
WB8EJN	132	5	1	1,470	MO
N7NB	127	5	1	1,460	WWA
N1SV	653	2	1	1,456	EMA
NY6J	328	2	1	1,452	IN
K2OGT	293	2	1	1,422	EPA
K6KQV	293	2	1	1,384	SCV
K6XN	408	2	1	1,378	SV
WA4FOM	122	5	1	1,350	NNJ
N7MAL	267	2	1	1,318	AZ
KA8JBY	110	5	1	1,250	CO
AL9A	252	2	1	1,244	AK
AD4Z	296	2	1	1,238	SFL
K6WSC	268	2	2	1,222	AZ
K4LT	267	2	1	1,218	OH
KCØVFO	564	2	1	1,178	CO
KØRFD	292	2	2	1,172	CO
KC8IMB	503	2	1	1,170	OH
NU7B	201	2	2	1,130	AZ
AG4V	1015	1	2	1,115	TN
K7SEL	267	2	8	1,108	ID
K3RLL	100	5	1	1,050	WPA
NU6N	211	2	1	1,044	SJV
W7YMS	197	2	1	1,038	OR
NX9K	296	2	2	1,034	WI
W1REP	67	5	1	1,020	NC
W3AG	76	5	1	1,010	WPA
WG4FOC	65	5	1	1,000	NFL
N2MTG	423	2	1	996	ENY
K6NDG	415	2	1	980	SDG
AC1J	350	2	1	976	NH
W4ZKE	204	2	1	966	KY
VE4YU	234	2	1	942	MB
KK6TV	62	5	2	930	SDG
KU4A	105	5	1	910	KY
KFØUU	65	5	1	900	MN
K6UF	218	2	1	880	SCV
W3KS	361	2	1	872	DE
N4DXI	200	2	1	868	NFL
N5QJ	400	2	2	850	AR
VE3IFS/W2	491	1	1	845	NNJ
N6DXX	340	2	2	830	SV
NN4F	353	2	1	756	SC
W9JD/Ø	131	2	1	756	NE
W8TOM	114	2	1	740	MI
W4VG	67	5	1	720	VA
KØUU	55	5	1	700	MN
N6RK	196	2	1	692	SV
WA7LK	171	2	1	692	WWA
KD5QHV	256	2	1	690	WTX
W7ATC	160	2	1	670	ID
WW2DDM	57	5	1	670	VA
W9DKB	180	2	1	664	WI
KP2SJ	105	2	5	664	VI
K9OZ	155	2	1	662	IL
K8KSM	100	2	1	650	OH
KB5EZ	150	2	1	650	AL
KB5URQ	579	1	3	645	STX
AI4RA	133	2	1	632	AL
KK5JY	156	2	1	630	OK
KAØEIC	58	5	1	630	KS
KU4WD	263	2	1	626	TN
WB3JGP/6	104	2	1	626	EB
W7FD	258	2	10	616	SJV
K7NEW	56	5	1	610	WWA
WU6W	424	1	1	610	NV
W4PWC	253	2	3	606	VA
WW8ZZ	221	2	1	592	OH
W1VD	159	2	1	590	CT
N7VEA	84	2	1	572	ID
KB3ORR	211	2	1	572	WPA
K4FOY	46	5	1	560	VA
N4MUH	147	2	1	546	NFL
N4UHZ	144	2	1	542	TN
KE6VUS	85	2	1	540	SV
W9AEG	58	5	1	540	IL
CO6CBF	15	5	1	535	DX
AB5JR	138	2	1	526	NM
KØANS	28	5	1	525	CO
KNØBS	131	2	6	512	IA
W7TJ	105	2	1	512	EWA
N4YHC	130	2	1	500	IN
W7YSB	35	5	1	500	AZ
WU9Z	112	2	2	500	IN
W4GHS	399	1	1	499	VA
K3HX	98	2	1	492	WPA
KB2UUL	111	2	1	484	NC
W1GUA	106	2	4	482	AL
K3ORS	141	2	1	482	TN
KD5RSS	38	5	1	480	OK
K7DCO	163	2	2	476	AZ
AC4RF	110	2	3	470	NC
VE3LM	64	5	1	470	ON
AC5BX	79	2	1	466	NM
NA4O	38	5	1	465	GA
KI6EZ	104	2	1	458	ORG
WB4SON	19	5	1	440	RI
W6DMS	43	2	1	436	ORG
KC2LNC	143	2	1	436	NC
WA3SWJ	45	2	1	430	MDC
W3ELM	70	2	1	430	EPA
KQ6ES	77	2	2	430	ORG
K7VGF	69	2	1	426	WWA
W2MRD	86	2	1	422	ENY
WO3X	85	2	1	420	OH
N7EIE	67	2	1	418	WWA
W9CHD	77	2	1	408	WI
K7PIR	149	2	1	408	AZ
N7WWA	78	2	1	406	WV
AJ4EY	65	2	2	404	VA
K2FEO	126	2	1	402	WNY
VE5MX	168	1	1	386	SK
KCØFNS	35	5	1	385	CO
AB8RX	107	2	1	364	MI
N4LEC	53	2	1	362	GA
WØEB	70	2	1	358	KS
WB2VUO	101	2	1	356	WNY
KD5COL	52	2	1	354	TN
N5PU	75	2	1	350	MS
N5LXI	50	5	1	350	NTX
KI4EBD	23	2	1	342	NFL
K7FED	119	2	1	338	EB
NAØBR	51	2	1	338	CO
KI6CYT	11	2	1	334	EB
KBØLQJ	16	5	1	330	UT
KG4GWB	32	2	1	326	SV
K7KXO	38	2	1	326	WWA
KC7LN	87	2	1	324	OR
WAØZQG	87	2	1	324	IA
K7AV	20	2	1	322	AZ
W4LDA	27	5	1	320	GA
KG6TDP	21	2	1	318	SDG
W5KI	27	5	1	315	AR
N7FG	18	5	1	315	AZ
N5IAC	106	2	1	312	NM
AD7AN	40	2	1	308	MT
ACØVC	100	2	1	300	CO
WØPPA	75	2	1	300	MN
AD7T	74	2	1	298	WWA
WA1DRQ	123	2	1	296	EMA
KA6T	41	2	1	290	OR
N5JZD	34	2	1	286	NTX

In the spirit of an emphasis on VHF/UHF activity, Charlie, K4LF, of the K4PJ Oak Ridge Amateur Radio Club operated a trusty 28 year old IC-551D transceiver on 6 meters.

VE1ZA	118	2	1	286	MAR
AD7XV	58	2	2	278	WWA
KF6ROE	9	2	1	268	SDG
N4RWH	82	2	1	264	WCF
K2EIR	30	2	2	260	ENY
K7PSU	80	2	2	260	AZ
N6VNO	40	2	1	260	SCV
KG6LJO	77	2	1	254	NV
AB4SF	97	2	1	244	VA
KB2HSH	46	2	1	242	WNY
W6KYF	22	2	1	238	SCV
W5JBO	22	2	1	238	STX
N6MWX	40	2	1	230	NNJ
NM5DF	39	2	1	228	NM
KC4H	39	2	2	228	VA
AD4CS	87	2	2	224	SFL
KI4CVU	35	2	1	220	TN
K4CVU	35	2	1	220	TN
W4BMF	35	2	1	220	NC
W1MP	34	2	1	218	VT
W5UGD	31	2	3	212	SC
NV5M	6	5	1	210	NM
KC7PVD	28	2	1	206	UT
KØHAX	28	2	1	206	MN
N6KZ	47	2	1	206	AZ
VE4XM	25	2	1	200	MB
WØJP	23	2	1	196	MO
WB6MMQ	46	1	1	196	LAX
KFØF	19	5	1	195	MO
N1NAZ	20	2	1	190	NH
KF7PBM	20	2	1	190	EWA
WD4NIT	44	2	1	188	GA
W7EEI	18	2	1	186	OR
AA5UZ	21	2	1	184	LA
AA5UY	21	2	1	184	LA
N3ZZ	7	2	1	178	SCV
AC2BH	13	2	1	176	NNJ
KF7PLA	1	5	1	175	UT
NC6P	8	2	1	166	SV
KG4VHV	23	5	1	165	OH
WA8RUM	7	2	1	164	OH
KB3GMD	55	2	2	160	WPA
AB4YK	4	2	1	158	VA
AE5XB	29	2	1	158	NTX
W6ZX	27	2	1	158	ORG
KCØTDJ	54	2	1	158	IA
AJ4MJ	37	2	1	154	NC
NY6U	35	2	1	146	SCV
W3LL	46	2	1	144	MDC
VA2RIO	15	2	1	130	QC
K4GRE	11	2	1	122	SC
K1JW	33	2	1	116	ME
KD7QJL	21	2	1	110	OR
N1XQ	22	2	1	100	RI
AE4VQ	5	5	1	100	KY
KB3OPP	16	2	1	82	EPA
VE2WMA	2	5	1	70	QC
N5BF	5	2	1	60	LAX
AD7MC	4	2	1	58	WWA

2E

K2NJ	2993	2	4	12,322	NNJ
W4NT	3396	2	5	10,262	GA
KFØUR	1876	2	2	6,758	CO
N4UU	1500	2	2	6,050	NFL
K1EEE	587	5	3	5,690	NH
W3VPJ	1401	2	18	5,372	EPA
N3DUE	1240	2	3	4,170	MDC
K1MK	940	2	2	4,078	WMA
WA2SOC	299	5	2	2,220	NNJ
N1GN	732	2	4	2,050	NH
VA7MM	348	2	4	1,822	BC
N6OV	523	2	8	1,722	ORG
VE6FI	1206	1	5	1,556	AB
VE3GBY	478	2	6	1,540	ON
W4ISI	109	5	2	1,430	VA
W1ORS	270	2	13	1,300	CT
KG8IU	432	2	3	1,300	OH
N7AM	214	2	2	1,286	AZ
AA9UF	254	2	3	1,262	IL
K1EOS	203	2	11	1,038	CT
KØGEO	239	2	2	952	STX
KRØVER	203	2	10	836	CO
N9QID	239	2	2	828	IN
VE7JR	346	2	2	742	BC
W1ILB	157	2	2	692	SC
KØPRO	140	2	2	630	KS
NE3I	138	2	1	588	EPA
WZØH	143	2	2	540	AZ
W8VN	142	2	3	488	MI
N8PVC	66	2	2	404	OH

3E

W4DXA	2552	2	14	8,550	SC
KD5C	2461	2	44	8,094	WTX
W4UAL	2101	2	11	6,790	AL
W5ROK	1811	2	25	6,180	NTX
K2FA	597	5	3	6,055	WNY
W3KWH	2041	2	22	5,868	WPA
W8CCI	1023	2	20	4,684	OH
W7FLY	735	2	18	3,520	WWA
WØCS	725	2	16	3,004	IA
W5SSV	739	2	71	2,494	STX
N5BL	664	2	10	1,980	NM
W3GA	1001	1	10	1,590	WPA
WD6RAT	411	2	25	1,552	ORG
W8DYY	703	1	18	1,515	OH
W5FQ	138	2	24	1,270	MS
KD2JA	352	2	4	1,160	SFL
KØCLR	274	2	3	1,100	IA

4E

K3MJW	2299	2	14	7,420	WPA
K5SAR	1665	2	15	5,128	LA
W4GJ	1183	2	9	4,604	NFL
N8CV	1363	2	8	4,470	OH
N2MO	1046	2	23	4,456	NNJ
W5ROS	298	5	20	3,325	STX
KØJFN	437	2	8	1,758	NE
KL2R	200	1	10	1,634	AK
W8BAP	217	2	21	1,424	OH

5E

N2BJ	3070	2	5	10,452	IL
W5GAB	638	2	3	2,686	NM
WGØD	149	2	5	552	MN

8E

W7SA	1363	2	61	5,534	AZ

13E

WØNT	4055	2	43	13,060	CO

Class F — EOC Stations

1F

W6YX	2055	2	50	8,182	SCV
W9PC	944	2	6	3,946	IN
K9UW	949	2	3	3,402	WI
W2EF	565	2	12	2,866	NNJ
K9WM	553	2	16	2,430	IL
WØFT	561	2	10	2,292	CO
NØKGM	753	2	3	1,956	UT
WM4CC	402	2	3	1,770	TN
K8FAY	432	2	10	1,714	OH
W3BAL	425	2	12	1,534	MDC
W9LYA	357	2	22	1,434	IL
K5EPH	282	2	8	1,204	NTX
W7RIM	248	2	12	1,178	AZ
NC4CC	150	2	25	1,130	NC
WØQS	167	2	21	1,104	KS
VA3PES	259	2	8	1,068	ON
WR4MC	177	2	3	1,054	GA
N1NRA	176	2	4	1,002	VT
K2FN	504	1	8	1,002	NNJ
WØMI	101	2	8	896	KS
VE7NA	101	2	6	834	BC
W1BCG	113	2	26	776	CT
N9K	124	2	11	748	IN
W5ELM	81	2	3	712	LA
W4OHH	70	2	18	610	GA
W4BRK	120	2	5	590	SC
N7CVW	100	2	2	550	WWA
W3SAT	175	2	8	400	WPA
VE1WRC	163	2	14	376	MAR
N8EXV	55	2	3	360	STX
WC4WX	137	2	4	324	TN
8P6UK	123	2	1	296	DX
KE5UES	32	2	2	278	NTX
WA4NZD	99	2	10	248	AL
K4CCR	25	2	4	220	NC
W6TUW	138	1	4	188	SCV
KC2TXB	50	2	1	150	SNJ
K7HIO	30	2	1	130	OR

2F

AB5ER (+N5QS)	2124	2	51	7,800	AR
KY4KY (+W4KBR)	1623	2	71	6,296	KY
K9IQP (+W9QL)	1515	2	45	5,972	IL
W2ORC (+WA2DQL)	1167	2	29	4,794	WNY
W7ECA (+W7BZZ)	1139	2	34	4,488	MT
K4PJ	946	2	31	4,304	TN
VE1FO (+VE1TRI)	1001	2	30	3,080	MAR
W9EAU	812	2	16	2,872	WI
N4THM (+N4IF)	748	2	25	2,796	AL
K4EX	654	2	7	2,674	WCF
K4MSU (+W4GZ)	609	2	49	2,668	KY
K8YR (+KD8EJD)	568	2	20	2,586	OH
KI4HUS (+N4STW)	431	2	15	2,468	KY
K4TG (+KY4LAW)	412	2	15	2,440	KY
W9WIL	514	2	6	2,378	IL
WØRR	567	2	17	2,366	MO
KB6EOC	704	2	55	2,328	EB
KE5LOT (+AK5RS)	378	2	24	2,298	STX
K2ZV (+KB2LAV)	486	2	12	2,228	NNJ
K7DPS	736	2	14	2,214	AZ
W6ICR	556	2	8	2,178	SDG
KE8RV	482	2	11	1,978	OH
W2GSA	476	2	17	1,918	NNJ
W1LAS	682	2	12	1,914	CT
W9VMW (+W9LVY)	463	2	20	1,910	IN
K5ABI	412	2	35	1,870	WTX
W9TAZ	844	2	7	1,788	IL
N1VMJ	704	2	6	1,698	WMA
N9VI (+K8IAT)	308	2	15	1,680	IN
W4RYZ	267	2	40	1,674	NFL
W1KOO	422	2	19	1,654	VT
WØECA	498	2	6	1,646	MO
WCØAAA	326	2	14	1,602	MN
WX5FWD	607	1	7	1,577	NTX
W4MLB (+N4ADE)	379	2	10	1,536	SFL
W5NAC	401	2	19	1,502	NTX
AB8I	430	2	8	1,466	MI
WE4TT (+AI4ET)	491	2	15	1,402	WCF
KI4EXI	345	2	11	1,378	VA
W5LOC	297	2	6	1,352	STX
K1PQ (+WA1JMM)	102	2	14	1,336	ME
KB5MAR	229	2	22	1,314	NTX
VE3OKV	389	2	11	1,302	ON
WB9EOC	273	2	7	1,270	IN
K2PW	110	2	9	1,234	NNJ
K6KP (+WA2KDX)	108	2	16	1,232	SCV
K6CME (+KI6OYW)	185	2	10	1,230	SJV
W4CIT	254	2	10	1,218	NFL
AE5EE	28	5	10	1,200	AR
K5HLA	178	2	22	1,176	STX
KB1RDE	107	2	6	1,164	RI
WX8EMA	165	2	5	1,138	OH
KB4CC	243	2	6	1,088	GA
NC4AR	183	2	12	1,066	NC
W2ONT	121	2	15	1,030	WNY
KB4ACS (+KK4CJH)	392	2	9	1,014	TN
W4CQ	346	2	10	974	NC
N4SER	303	2	9	966	WCF
W6TOI	153	2	12	956	LAX
W7GDY	326	2	4	902	AZ
WX5EOC	44	2	10	878	OK
KMØHP	175	2	5	820	MO
W4DCG	163	2	13	802	NC
KA9FAJ	146	2	5	792	IL
KF6NNM	215	2	3	780	SV
W9YRC (+K9PLX)	195	2	20	746	IL
KC9RNO	241	2	4	734	IN
W7TED	45	2	10	692	WWA
W6RDX	209	2	27	688	SDG
AA5AR (+N5NTI)	140	2	17	600	AR
NP3M	28	2	10	356	PR
KJ6LCP	18	2	8	326	ORG
K7RDG	59	2	6	286	AZ
W5SLA	21	2	3	92	LA

3F

N4FR (+W4SQD)	2764	2	20	8,556	TN
W5WB (+W5AUY)	1190	2	52	5,866	NTX
W3KGN (+K3DCS)	1226	2	18	4,798	EPA
K9ESV (+KB9BNY)	1278	2	20	4,678	IL
W4SHL (+W5YXU)	1197	2	32	4,456	AL
W5ECO	766	2	12	3,374	STX
K6CCR (+K6RMP)	555	2	55	2,870	LAX
W5NEM (+K5ASA)	526	2	32	2,724	MS
KC4EM (+K4DNG)	557	2	39	2,716	TN
WV5D	1000	2	31	2,710	MS
WC1SW	553	2	15	2,614	WMA
WØWCL	721	2	20	2,584	MN
W4AAZ (+KI5FR)	533	2	20	2,528	NFL
W9AWE	719	2	20	2,498	IL
K4WD	541	2	25	2,474	SC
K8CHR	690	2	18	2,302	MI
KØKEX	513	2	40	2,292	MO
K1BCI	362	2	28	2,156	CT
N9XH	503	2	22	2,130	WI
W8VVL	554	2	17	2,094	OH
KP3RE	347	2	60	2,090	PR
W6PWT	416	2	11	2,050	ORG
W3OI (+W3GRD)	357	2	36	2,020	EPA
AC4IR	408	2	12	1,936	SFL
K3ZX	391	2	6	1,868	SC
W9VCF	680	2	15	1,732	IN
W4WVP	239	2	15	1,622	VA
W7IO	377	2	13	1,440	AZ
K2GE	286	2	24	1,426	NNJ
WR4CC	412	2	36	1,374	TN
W4BLT	276	2	21	1,292	AL
W4BKK (+KF5TA)	158	2	28	1,264	GA
W8B	316	2	23	1,236	OH
K6ZT	213	2	19	1,176	ORG
W4GS (+WG4MB)	285	2	27	1,172	SC
KJ4LOP (+W4GMF)	151	2	6	1,056	VA
KG4ULP	387	2	19	1,024	MI
K6SSF	93	2	12	998	SCV
W1ECV	466	2	10	982	CT
W6LY	313	2	9	972	ORG
K2OQ	182	2	8	944	WNY
KC9MAK	67	2	3	934	IL
K4GAR	125	2	20	888	GA
KB5A	115	2	22	848	NTX
WA9RDF	162	2	12	524	IN
WR4RC	137	2	6	298	VA
WC7ID	236	1	8	286	ID

4F

K2BAR (+KC2ZMA)	2282	2	43	7,300	NNJ
W4UCJ (+KI4PZS)	1630	2	70	6,632	GA
W8FY	2212	2	24	6,420	OH
W5NGU	1285	2	12	5,686	NTX
W1AW (+K1NO)	3376	1	11	5,415	CT
W6NWG	1729	2	40	5,394	SDG
N1EM	920	2	11	3,996	EMA
W9VT (+N9WDG)	762	2	12	3,466	IL
VE7CVA (+VE7RVC)	1017	2	23	3,440	BC
W1C (+WK1H)	815	2	27	3,342	WMA
W2SEX	556	2	33	2,302	WNY
W7S	427	2	35	2,208	WWA
W4FWD (+N4BWR)	206	2	12	1,684	GA
W9YPC	316	2	20	1,604	IL
ND5MS	232	2	7	1,476	OK
K5BAY (+KF5ETG)	309	2	18	1,344	STX
N4LEM	253	1	10	1,003	SFL
KBØUFL (+KCØBNY)	126	2	31	972	MO
K5FRC	132	2	32	950	NTX

5F

W2GSB (+W2TOB)	1742	2	83	7,190	NLI
K2BR (+AC2NJ)	1360	2	27	5,834	SNJ
K7CEM	691	2	25	2,636	WWA
AF2C	402	2	37	2,474	NFL
WA5CC	216	2	26	1,720	AR
KG4EOC	302	2	53	1,446	SFL
W7BAR	136	2	30	948	UT
K5GVL	180	2	16	856	NTX

6F

W8VA	955	2	57	5,088	WV
K8GC (+KD8PKI)	1169	2	23	4,802	MI
WØHF (+KFØX)	523	2	66	3,040	AZ
WA1RJI (+N1KT)	362	2	9	2,188	CT
N8SE	453	2	18	1,900	MI

9F

W1BRS (+K9OEM)	1219	2	24	4,286	CT

10F

W1SAT	211	5	40	3,720	ORG

12F

W6WC	1198	2	22	5,224	ORG

Checklogs: AA4PL, AC5TU, AJ4VE, EI2KA, KØTQ, K4OC, K5LAD, KAØZ, KB1GKN, KB3PSN, KCØRQH, KD8DMI, KI4LTO, N1CJS, N3GD, N4WZ, N6QZS, N8EN, N8YSZ, N9EWQ, NP2X, NP3CW, NP3D, NP3PR, VA3ZWT, WØBM, WØFLO, WØMN, WØVX, W6SBD, W7AEP, W9AAC, WA3GQU, WT5U,

2011 ARRL June VHF QSO Party Results

Dreams, schemes and themes.

Rick Rosen, K1DS
rick1ds@hotmail.com

I always enjoyed the Johnny Carson *Tonight Show* skit "Carnac the Magnificent." First, holding an envelope to his forehead, Johnny would name three things as the answer; then he'd rip apart the envelope and pronounce the question. In the spirit of Carnac: Dreams, Schemes and Themes!

Even before I got a look at the submitted scores, I had a suspicion that this year's event would prove to be great for some and a disappointment to others. As the current sunspot cycle is on the rise and the weeks prior to the event showed great E_s activity on 6 meters, many participants were planning to keep their rigs focused on that band. They anticipated lots of activity and grid-square multipliers. Other hams were busy completing antenna erection and making repairs to radios, amplifiers and preamplifiers. Rovers were getting their chariots readied and routes established. Big guns were soliciting and finalizing schedules for digital modes — meteor scatter and moonbounce contacts to enhance their scores.

Sandra, N2CEI and Steve, K4SME got a little more excitement than expected when they encountered a violent windstorm that removed half of the 6 meter Yagi reflector. Nevertheless, they persevered and activated 12 grids from Memphis to Florida.

Based on their previous successes, station improvements and operating prowess, many operators set their sights on bettering their scores from previous years and even breaking some records. The dream of George, K5TR was to work 2000 QSOs or more on 6 meters. He has worked hard to have a station and antennas that give him great propagation and listening capabilities. Six meters was very good for him again this year — not as good as last year but still very good.

Wayne, N6NB set out to score big as a QRP Portable station and to set a national record. His scheme was to optimize a 10-band station and have the team of similarly equipped Southern California Contest Club rovers cover as many grids as they could and make contacts with him. Brothers Dave, N2TEB and Andrew, K2FR set off hiking up Mt Beacon to fulfill their hopes of fun while portable contesting. One of the recurrent themes was that the weather that was not as cooperative as expected; despite some QRP thrills with E_s (sporadic E) contacts on 6 meters, their operation was cut short with rain. Inclement weather always seems to be a theme of contest problems.

In an attempt to promote more VHF contest activity, Paul, WØUC created some on-line tools for posting contest plans. There has been a rover reflector where rovers were encouraged to post their plans but this seemed to fade from popularity in favor of the **vhfcontesting.com** website, which has remained active and predictable. Todd, KC9BQA has a website for VHF contesting (**kc9bqa.com**) that is a helpful educational tool for newcomers to the VHF events. Several regional clubs have also encouraged FM contacts and calling hours for those hams whose gear was limited. With the wide availability of FM radios for the 146, 222 and 440 MHz bands, a lot of local activity can be generated. Once FM only ops get a taste of the excitement of the activity, they may even be converts to SSB and CW operation on these bands.

Weather was a feature for stations in an area from Oklahoma and stretching northeast up to the New England states, as bands of showers and thunderstorms tracked through much of Saturday. On Sunday, there was more unfriendly rain in the Midwest but most of it cleared out by Sunday evening. Many eastern stations reported power outages lasting several hours during the contest. Perhaps they were all saving their emergency power sources for the upcoming ARRL Field Day?

John, W6XM and Eric, KRØVER operated W6XM from the rare grid of CM93 on Santa Rosa Island off the coast of Southern California. They flew there on a small twin-engine plane and operated bands ABD[1] using battery power with Yagis on a 15 foot mast. From the write-up on their website (**w6xm.org/2011.jun-vhf**) it's apparent they had a fulfilling trip.

Mitch, W1SJ/WB1GQR operated from Mt Equinox in Vermont at an altitude of 3848 feet after enduring hours of waiting for the horizontal sheeting rain and winds of 35 mph to calm. Trying to stand without getting blown over was difficult. His patience was rewarded with 6 meter double-hop E_s to

Mexico and many of the western states.

Marshall and his Multiop team at K5QE are still dreaming that they will beat W2SZ. They added a low antenna to their previous 6 meter stack, enhanced the 3456 MHz station, and managed to link up with additional rovers Steve, N2CEI and Sandra, K4SME. Although Steve and Sandra encountered a windstorm (see photo), they managed to cover 12 grids from Memphis south to Florida.

Welcome to so many of you who reported that this was their first VHF contest. Hal, N4GG reported that he learned a lot and had fun in his first VHF event after 50 years in HF. Bob, W5KI commented that as newcomers in their first VHF contest, they are in for a rude awakening in future years as this year will surely spoil them.

In the spirit of recruiting more activity to VHF contesting, Dennis, KM9O from the Society of Midwest Contesters lined up several two-band FM ops from a local club. He got them to operate 146 MHz and 440 MHz FM with their units in a horizontal polarization for an extra 20 QSOs in the log. Perhaps some of those operators will gravitate toward more gear and effort in the future. Pete, NØOY found the right mix of local hams and college students to put WBØDRL on the air for an ML effort that netted 1300 contacts. He reported that it was an interesting weekend teaching the art of grid squares, antenna pointing, frequency use, and running rate to non-contesters. Chris, NV4B, operating QRP portable from the highest spot in Mississippi, was a ham ambassador to the many visitors to this spot as he introduced them to Amateur Radio. Have you done anything special to promote amateur radio and VHF activity?

DX

Logs were submitted by multiple DX participants, some of whom spent considerable effort to give the 6 meter opening a good ride and excite those of us stateside. C6ABB in Limited Multiop and C6AKQ in Unlimited Multiop each scored well over 100k. The Limited Multiops of COØOM had over 80k, and T48K had more than 50k. Low Power Single-Op Winston, CO2WF logged a score of 2.8k. Ted, HI3TEJ had close to 100k as a SOLP entry. Chuck, W5PR operating YN2PR in Nicaragua scored 85k and Jim, operating ZF2BI in the Caymans, had over 30k in his entry. Dave, VP5CW as a SOLP had an entry with a quarter-million-point score. Wayne, operating as PJ2/K8LEE, gave us another DX entity and Caribbean grid square. Fred, KH7Y managed to have 22 contacts in 15 grids with small openings to the mainland US and Japan. There were 51 logs from Canadian stations, including a whopping 1 million point entry from Unlimited Multiop VE3WCC. One Unlimited Multiop and four Single-Ops including Chuy, XE2N with over 60k in Mexico added another half million points to the action. Stations from HR, VP9, YS and KP4 also were logged.

Single Operator, Low Power

NØLL	381,860
W5SXD	379,872
K2DRH	342,681
N3LL (W5CW, op)	230,720
N4QWZ	198,171
KØSIX	197,024
K5RQ	189,267
NØPOH	167,420
NØHJZ	162,122

Single Operator, High Power

K5TR	501,714
NR5M	454,230
WDØT	412,383
WD5K	387,090
K5AM	384,120
K1RZ	367,334
K1TEO	358,001
WØUC	351,975
KØDU	346,912
K9MK	330,600

Single Operator Portable

N6NB	295,368
KA1LMR	67,662
KJ5RM	58,784
K9AKS	44,814
W9SZ	33,550
WD5AGO	24,244
N8XA	18,725
N6DN	16,856
NV4B/5	11,880
NØJK	10,488

Limited Multioperator

W5ZN	686,784
K9NS	633,552
K8GP	505,932
W3SO	435,754
W4NH	404,593
NØOY	394,434
WA7JTM	380,546
K2LIM	298,100
N5RZ	222,530
W4IY	218,086

Multioperator

W2SZ	1,183,446
K5QE	1,017,000
W3CCX	481,459
WØKVA	458,436
KBØHH	410,048
N6VI	408,100
K3EOD	239,334
K3YTL	152,092
WQØP	147,972
N4JQQ	127,333

Rover

K6MI/R	234,346
K6AH/R	209,935
W6XD/R	184,008
W6XDX/R	173,880
W1RT/R	114,838
VE3NPB/R	112,770
K6GEP/R	97,940
VE3SMA/R	87,912
K4SME	74,261
AG4V/R	63,204

Limited Rover

AL1VE/R	168,846
W6YLZ/R	76,416
K1TR	69,433
WAØVPJ/R	58,706
WØETT	46,158
N5QGH	45,220
K2QO/R	38,720
AF6AV	30,268
NØQE/R	27,132
K9JK/R	16,692

Unlimited Rover

N3IQ/R	83,974
WA3PTV	61,750
KK6MC/R	43,860
W6MTR	7,592
KCØP/R	5,194
NØHZO/R	3,510
N6TEB/R	3,360
NV6C/R	1,302
KC2IRO	864
N5AA/R	168

The Bands

Hail to the mighty 6 meter conditions. Dave, KØDI aptly renamed the weekend, "The June 6 Meter Contest." The band popped open intermittently all weekend with both single and double-hop E_s. Tom, K4MM cautioned "If you left the seat you missed a mult." The best hours appeared to be Sunday between 1200 and 1700 UTC. Reading some of the QSO rates from contestants during that span, there were highs close to 200 contacts per hour with 150 new grid multipliers added to some logs in that time frame. The DX window was active and there were fast moving pileups on the DX stations as they appeared.

Two meters was the next most popular band; once there were lulls in the 6 meter action, operators went back to that band to pick up more contacts and multipliers. Was there any 2 meter E_s? Sebastian, W4AS from EL95 in Miami had an 1107 mile QSO with Brett, WØBLD in EM37 in Missouri. Most stations reported limited conditions on the bands 2 meters and up. Activity on the higher frequencies was limited, especially because 6 meters was open on and off for most of the weekend and operators focused attention there.

Contacts on 222 MHz and up suffered because of all the action on 6 meters. To quote Rich, W5SXD, "Six was amazing! No time for the higher bands." Tree, N6TR said, "Best 6 meter score I have had — with worst score on the other bands." Paul, WØUC claimed he missed most of the local rover activity because he stayed on 6 meters. He still managed a 360k score with 6 bands.

The groups that made the most of 222 and up included the W2SZ Mount Greylock Expeditionary Force, their rovers, and N6NB operating as a QRP Portable supported by the Southern California Contest Club rovers. The Southern California Contest Club members maintained their focus on the higher bands with their theme of microwave roving and schemes of capturing top honors in as many categories as possible. Their rotatable toolbox transverters attached to antennas atop their vehicles are models of efficient mobile communication. The N6VI MU team also played the microwaves, using gear through 10 GHz at 8,000 feet elevation and catching many of the SCCC rovers. Brian, NJ1F/R did manage to make 4 contacts on 47 GHz.

The Competition

The final numbers show a total of 1233 submitted logs, an increase of 2% over 2011. Again, the biggest category with 716 entries was SOLP. The SOHP category had 215 entries. Limited Multioperator entries numbered 63, while the Unlimited Multioperators submitted 103 logs. Low-power Portable included 37 entries. Rovers are divided into three sections and there were 49 Classic Rovers, 40 Limited Rovers and 10 Unlimited Rover logs submitted. This distribution is similar to previous years. Forty-three section records were broken all over the map and in every category. N6NB set a new national record in the QRP portable category with 295k points. A complete listing of the records and extended contest information can be found at the online ARRL contest results section (**www.arrl.org/contests**).

Single-Operator Scores

There were a total of 931 single-ops in both the low and high power categories. It is always exciting to see the numbers of folks that get on the air, even to dip their toe

Regional Winners

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

AF1T	152,040	A
W3PAW	130,269	A
K1KG	115,397	A
WB1GQR (W1SJ, op)	111,452	A
NZ3M	46,151	A
K1RZ	367,334	B
K1TEO	358,001	B
WA2FGK (K2LNS, op)	324,658	B
K3TUF	237,006	B
N3HBX	114,580	B
KA1LMR	67,662	Q
WB2AMU	3,080	Q
N1PRW	806	Q
N3YZ	36	Q
W3MEO	32	Q
W3SO	435,754	L
K2LIM	298,100	L
W2LV	212,568	L
N1WK	161,252	L
W1QK	112,255	L
W2SZ	1,183,446	M
W3CCX	481,459	M
K3EOD	239,334	M
K3YTL	152,092	M
N1JEZ	51,684	M
W1RT/R	114,838	R
NN3Q	48,950	R
W1AUV/R	39,695	R
AA1I/R	25,032	R
WA2IID/R	22,113	R
K1TR	69,433	RL
K2QO/R	38,720	RL
WB2SIH/R	9,604	RL
KM3T/R	9,000	RL
AB2YI/R	2,976	RL
N3IQ/R	83,974	RU
WA3PTV	61,750	RU
KC2IRO	864	RU

Southeast Region
(Delta, Roanoke and Southeastern Divisions)

N3LL	307,671	A
N4QWZ	198,171	A
K5RQ	189,267	A
N4QV	118,803	A
AA5AU	110,622	A
K2EK	296,431	B
W4WA	248,864	B
K4PI	204,884	B
K4SN	171,175	B
N4WW	170,178	B
NV4B/5	11,880	Q
N5DUH	6,664	Q
WØPV	5,220	Q
K3TW/4	513	Q
KC8KSK	480	Q
W5ZN	686,784	L
K8GP	505,932	L
W4NH	404,593	L
W4IY	218,086	L
WQ4M	74,784	L
N4JQQ	127,333	M
N4LR	99,330	M
W4TP	79,218	M
W4MYA	64,680	M
KD2JA	54,927	M
K4SME	74,261	R
AG4V/R	63,204	R
KS4S	5,605	R
W9WI	5,376	R
N4TZH	1,484	R
AD5OW/R	15,687	RL
WA4JA/R	5,766	RL
K6LMN/4/R	2,891	RL
AD4IE/R	1,200	RL
K4UUJ/R	144	RL

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

K2DRH	342,681	A
W9ZRX	91,043	A
W9GKA	88,704	A
N9ISN	80,410	A
VA3ZV	74,909	A
W0UC	351,975	B
WB9Z	307,008	B
K9CT	225,990	B
N9XG	184,338	B
K8MD	110,200	B
W9SZ	33,550	Q
N8XA	18,725	Q
AI9I	208	Q
K9PLS	78	Q
VA3RKM	18	Q
K9NS	633,552	L
N8ZM	160,080	L
W9RVG	98,566	L
AI9Z	81,200	L
N9TF	46,410	L
VE3WCC	86,335	M
N2BJ	83,985	M
N9UHF	56,760	M
K3WA	23,999	M
VE3EJ	23,219	M
VE3NPB/R	112,770	R
VE3SMA/R	87,912	R
W9SNR/R	42,959	R
KF8QL/R	18,564	R
N8OC	10,564	R
K9JK/R	16,692	RL
K9ZF	11,680	RL
K8DOG/R	7,776	RL
N9SS	1,216	RL
AC8HU/R	972	RL

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

NØLL	381,860	A
W5SXD	379,872	A
KØSIX	197,024	A
NØPOH	167,420	A
NØHJZ	162,122	A
K5TR	501,714	B
NR5M	454,230	B
WDØT	412,383	B
WD5K	387,090	B
K5AM	384,120	B
KJ5RM	58,784	Q
K9AKS	44,814	Q
WD5AGO	24,244	Q
NØJK	10,488	Q
NØKIS	2,964	Q
NØOY	394,434	L
N5RZ	222,530	L
NØKE	209,703	L
WA7KYM	185,814	L
N5XTR	167,640	L
K5QE	1,017,000	M
WØKVA	458,436	M
KBØHH	410,048	M
WQØP	147,972	M
N5LZ	112,690	M
WØBA/R	13,570	R
KDØS	9,301	R
KE5GAQ/R	2,910	R
KE5EXX/R	2,511	R
AL1VE/R	168,846	RL
WAØVPJ/R	58,706	RL
WØETT	46,158	RL
N5QGH	45,220	RL
NØQE/R	27,132	RL
KK6MC/R	43,860	RU
KCØP/R	5,194	RU
NØHZO/R	3,510	RU
N5AA/R	168	RU

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

WJØF	118,450	A
W7JLC	84,148	A
N7IR	77,175	A
VA6AN	72,808	A
W7ID	63,666	A
N7CW	262,194	B
K7CW	121,572	B
W7EW	112,128	B
AA7A	107,400	B
K5RR	93,795	B
N6NB	295,368	Q
N6DN	16,856	Q
KB5WIA	7,616	Q
K6TUJ	156	Q
WA7JTM	380,546	L
K7TM	61,288	L
K6LRG	53,192	L
VE7SCC	33,930	L
KY7M	32,893	L
N6VI	408,100	M
W6TV	98,968	M
N6SS	80,013	M
KB7Q	78,318	M
K7AWB	74,448	M
K6MI/R	234,346	R
K6AH/R	209,935	R
W6XD/R	184,008	R
W6XDX/R	173,880	R
K6GEP/R	97,940	R
W6YLZ/R	76,416	RL
AF6AV	30,268	RL
KI6CG	14,320	RL
N7CKJ/R	13,122	RL
N6ZE/R	9,639	RL
W6MTR	7,592	RU
N6TEB/R	3,360	RU
NV6C/R	1,302	RU

in the pool and see what it's like to swim in the contest. Although there is no one of the entry groups that can be credited with the greatest contribution to the activity, by sheer numbers those folks who operated casually and made a few dozen contacts certainly added to the fun of the weekend, especially when the propagation was favorable.

The 6 meter conditions in the central US gave a scoring advantage to those stations who kept that band working as much as possible. In first place in the SOLP category is Larry, NØLL in KS who scored 381,860 points. On the strength of his 6 meter 1174 contacts in 272 grids, combined with another 46 contacts on bands BCDE, he was able to beat his nearest competitor by 2000 points, about half of 1% of his submitted score. Rich, W5SXD in NTX took 2nd place with 379k. He had 117 more 6 meter QSOs and 273 multipliers but only 17 additional QSOs on bands BCD9E.

In first place in the Portable category was Wayne, N6NB. He sought to establish a new national, regional and sectional record and accomplished just that. Setting himself up in a strategically high location with a portable tower and outfitted with 10 bands, he was able to amass 653 contacts with 186 grid multipliers for a 295k total. The cooperative strategy of the Southern California Contest Club rovers was no doubt the major contributor to his effort and score.

Multioperator Scores

The top scoring Limited Multiop team this year was a group in AR manned by several of the ARRL staff and the immediate past president, Joel Harrison, W5ZN. Joel reported, "Early preparations were hampered by abnormal rain and storms during the spring which turned to higher than normal heat leading up to the contest; however the local radio club pitched in to get everything ready just prior to the start. A great group of operators injected diverse contesting expertise into the effort that allowed the W5ZN team to maneuver through a weekend of obstacles that included lost operating time due to severe thunderstorms and loss of electricity, equipment failure and even the death of an immediate family member of one of the ops. A true team effort proved these complications can all be overcome and still put forth a winning effort." Their score was 687k based on a 6 meter 1090/298 total with plenty of contacts and grids on the other three bands. In second place the K9NS team in IL scored 633k, also capturing plenty of the 6 meter excitement in addition to 69 grids on 2 meters! The K8GP gang in VA placed 3rd with 506k, managing to find 451 contacts on 2 meters. Late Sunday afternoon they lost their commercial power due to storms and had to call it quits early.

The Unlimited Multiop competition seemed to line up as it has been for the past few years with perennial winner W2SZ in 1st place again with 1.183 million points. The 12-band effort with a mega-station atop Mt Greylock, one of the best VHF spots in the northeast, coupled with the population density of the area and their multiple rovers has kept this group in the leading spot in this category for many years. Snapping at their heels with a 1.017 million point score is the K5QE team, headed by Marshall in the STX section. Their 8-band station made use of the great 6 meter conditions with a 1421/302 band total. They also had 205/98 on 2 meters and 75/35 on 432 MHz, an impressive feat considering the wide open spaces of their geography.

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 thanks 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 Low Power	Society of Midwest Contesters	NØLL
Overall Single Operator QRP Portable	Dave Carlson, AA9D	N6NB
Overall Multioperator	Randy Stegemeyer, W7HR	W2SZ
Overall Limited Multioperator	K1TEO, W2GKR, W2GKO, KA1FVG	W5ZN
Atlantic Division Rover	Potomac Valley Radio Club	W1RT/R
Hudson Division Single Operator Low Power	From Jay, NY2NY – In Memory Of Dick, W2GFF	K2KIB
Northwestern Division Single Operator High Power	Boring, OR Amateur Radio Club	K7CW
Northwestern Division Single Operator Low Power	Mike Coogan, KB7ME	W7ID
Northwestern Division Multioperator	Randy Stegemeyer, W7HR	KB7Q
Roanoke Division Rover	Potomac Valley Radio Club	KS4S
Southwestern Division Single Operator High Power	W5UWB – In Memory of John Chambers, W6NLZ	N7CW

Unsponsored plaques may be purchased by the plaque winner. If you wish to purchase an unsponsored or duplicate plaque, please contact ARRL Contest Branch Manager Sean Kutzko, KX9X at 860-371-8877 or by email at **kx9x@arrl.org**. Plaques cost $75 each, which includes all shipping charges.

Affiliated Club Competition

Club Name	*# of Logs*	*Score*
Unlimited Club		
Society of Midwest Contesters	73	2,197,185
Medium Club		
Potomac Valley Radio Club	39	2,119,961
Southern California Contest Club	22	1,839,996
Grand Mesa Contesters of Colorado	15	1,723,169
Florida Contest Group	18	1,665,347
Mt Airy VHF Radio Club	24	1,394,628
Northern Lights Radio Society	15	1,270,653
Nacogdoches ARC	7	1,047,246
Central Texas DX and Contest Club	7	1,035,743
North East Weak Signal Group	18	854,814
Arizona Outlaws Contest Club	26	842,156
Contest Club Ontario	20	529,900
Yankee Clipper Contest Club	16	401,233
Pacific Northwest VHF Society	18	353,813
South East Contest Club	14	352,588
Badger Contesters	12	315,251
Tennessee Contest Group	16	301,848
Roadrunners Microwave Group	4	292,953
Northern California Contest Club	23	205,237
North Texas Microwave Society	5	183,462
Minnesota Wireless Assn	12	155,564
Utah DX Assn	4	139,740
Alabama Contest Group	10	117,489
Louisiana Contest Club	4	114,692
Mad River Radio Club	6	77,456
Carolina DX Association	10	72,682
Frankford Radio Club	5	65,496
ORCA DX And Contest Club	4	32,400
Willamette Valley DX Club	3	24,046
CTRI Contest Group	3	17,801
Western Washington DX Club	3	17,391
Hilltop Transmitting Assn	4	12,117
Contest Group Du Quebec	4	8,274
Alaska VHF-UP Group	3	634
Local Club		
Mt Frank Contesters	4	673,128
Murgas ARC	4	495,034
Lone Star DX Assn	5	486,816
Chippewa Valley VHF Contesters	3	242,496
Florida Weak Signal Society	10	236,933
Eastern Connecticut ARA	3	164,263
Spokane DX Association	4	114,328
Bristol (TN) ARC	8	83,961
Stoned Monkey VHF ARC	7	56,952
Bergen ARA	8	53,879
Delara Contest Team	4	28,146
Raritan Bay Radio Amateurs	5	22,081
Portage County Amateur Radio Service	5	18,836
Burlington County Radio Club	4	6,122

Rover Activity

Despite varying weather and road conditions the rovers always seem to be in demand and having fun. The Classic Rover category is still the most popular and one third of them were equipped with 10 bands or more. Their contact totals on the microwave bands account for a large percentage of all of the contest activity in the centimeter wavelengths. Because so many of the fixed stations kept their band switches on 6 meters, in many instances rovers had to plead with other stations to "run the bands." Again, the Southern California Contesting Club rovers were out in force; using their scheduled travels over 10 grids and neat "bands in a box," they captured the top four spots in this category.

The Limited Rovers are challenged to use only bands ABCD; most of them made use of the four bands although there were several entries in this category with only two or three bands, often dropping 222 MHz or 432 MHz. With 40 entries in this category, it remains quite popular and is a good entry category for operators with a multi-band rig who want to get on the road, provide plenty of action for many of the fixed stations and see what propagation they can find from different locations. Topping the 40 entries was Tim, AL1VE centered in CO who managed to capitalize on the 6 meter activity with 781/205 and only 5 contacts across the other three bands for a score of 169k. In 2nd place was another SCCC rover, Mike, W6YLZ who covered 10 grids and scored 76k.

On to the Unlimited Rover category — those who declared themselves as "Unlimited" and those who did not fit the rules of the other two rover categories. There were 10 entries in this category; the team of Brian, ND3F and David, N3XUD operating the N3IQ rover were first in this category with 84k using 6 bands across 7 grids. Joe, WA3PTV from WPA was second with 62k based on a 10-band effort in 4 grids. Third place was earned by Jim, KK6MC from NM with a score of 44k from a 5-band effort, heavily weighted with 6 meter contacts and grids.

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		

Club Competition

The club competition is important; there is subtle peer pressure to get the maximum number of potential club participants for an aggregate club score. There were 541 logs in total for all the club entries or about half of all the participants, considering that there were Multiop stations that added into the club scores. On a roll for the past few years, the Society of Midwest Contesters picked up another first place as the uncontested leaders in the Unlimited Club category. They managed to get 73 member logs for a 2.2 million point club total.

There were 33 entries for the Medium Club category. The Potomac Valley Radio Club won top spot in this section with 39 entries and a total of 2.1 million points; two strong Multiop stations, K8GP and W3SO, are major contributors to their success.

The Local Club category had 14 entries; the Mt Frank Contesters in Illinois were first with 4 logs and 673k.

The Future

Next year's June VHF QSO Party will be held on June 9-11, 2012 and there is no doubt that many of you have already booked the time and are already making preparations. The challenge will be to introduce some newcomers to the fun and activity and make them feel part of the broader VHF community. Various websites and the VHF contesting reflector are always great sources of assistance for all types of questions or ideas, as well as for buying and selling used radio gear. Most VHF radio clubs have well organized websites and they are good local resources for amateur operators seeking membership or assistance with their projects or station building. It is also a delight to see your posts on various reflectors including your station pictures in the ARRL contest Soapbox. (**www.arrl.org/soapbox**).

In Conclusion

I am grateful to my wife Jani, who serves as editor of these articles and to Curt, K9AKS for assisting with the contest records research. Thank you both.

Now back to the original answer I posed at the beginning: Dreams, Schemes and Themes! The question inside Carnac's envelope: Name three things that VHF operators enjoy before, during and after the June ARRL QSO Party.

The 2012 ARRL DX Contest

CW: 0000 UTC Saturday February 18 – 2359 UTC Sunday, February 19

Phone: 0000 UTC Saturday, March 3 – 2359 UTC Sunday, March 4

- 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! And with solar cycle 24 finally coming to life, 15 and 10 meters should be open wide!
- W/VE stations send a signal report and their state or province; DX stations send a signal report and their transmit power.
- Be sure to tell your ARRL DX story at **www.arrl.org/soapbox**!

STEVE COLE, GW4BLE

Veteran contester Steve Cole, GW4BLE, has a very potent signal out of Wales. Many have worked Steve in a contest for their very first GW QSO.

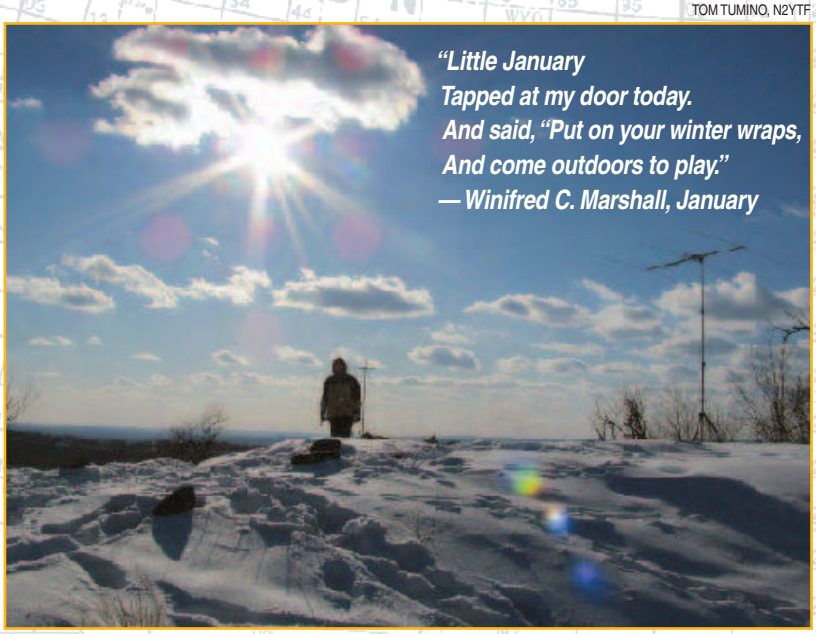
CW log submission deadline: 2359 UTC Tuesday, March 20, 2012
Phone log submission deadline: 2359 UTC Tuesday, April 3, 2012

Complete rules for both contests may be found at www.arrl.org/contests

The 2012 ARRL January VHF Sweepstakes

1900 UTC Saturday, January 21 – 0400 UTC Monday, January 23

TOM TUMINO, N2YTF



Jesse Lapin, KC2YUG, climbed to the top of Hook Mountain, near Nyack, New York in FN31 for his first VHF contest in January 2011. Jesse entered the QRP Portable category and finished 4th in the Hudson Division.

- A VHF contest? In January? You bet! 6 meters and up will be full of activity on the third 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 possible over hundreds of miles! 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 22, 2012. E-mail Cabrillo-formatted electronic logs to **januaryvhf@arrl.org**. Paper logs go to ARRL January VHF Sweepstakes, 225 Main St, Newington, CT 06111.

"See you on 50 MHz and up in January!"

2012 ARRL Straight Key Night

January 1, 2012 0000 UTC – 2359 UTC

Rod Bunn, KA6ROD of Big Bear Lake, California returned to Amateur Radio after a 20 year absence. For SKN 2011, he used his childhood J-38 along with his reconditioned Heathkit HW-100 and had a blast!

- New Year's Eve and New Year's Day are the time to recall and participate in the joy that is hand-sent CW. Break out your J-38s, Lionels, military surplus keys or bugs and have fun!
- SKN is not a contest, but an activity night to get on the air and enjoy leisurely CW QSOs with code sent by hand. Many amateurs use this occasion to operate vintage gear, but this is not required. Be sure to submit your votes for "Best Fist" and "Most Interesting QSO" along with your log.
- All reports must be received by January 31, 2012. E-mail reports to **straightkey@arrl.org**, or send paper reports to ARRL Straight Key Night, 225 Main St, Newington, CT 06111.

Complete rules can be found at www.arrl.org/straight-key-night

THE 2012 ARRL RTTY ROUNDUP

1800 UTC Saturday, January 7 – 2359 UTC Sunday, January 8, 2012

- Start 2012 off in digital fashion! Stations from all around the world will be on the digital modes the first weekend in January. Digital modes continue to grow in popularity, so if you've never made a digital mode QSO, you're missing out!
- New to RTTY? Check out rttycontesting.com for a primer!
- All logs must be postmarked no later than 2359 UTC Tuesday, February 7, 2012. E-mail Cabrillo-formatted electronic logs to rttyru@arrl.org.

ROBERT WOOD, W5AJ

Robert Wood, W5AJ, operated the 2011 RTTY Roundup from Aruba as P4ØP. His efforts were good enough for 3rd place World in the Single Operator, Low Power category.

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

2012 Kids Day Announcement

Kids Day returns January 7, 2012 from 1800 to 2400 UTC.

Kids Day is an on-air event to encourage young people (licensed or not) to have fun with Amateur Radio. It is designed to give on-the-air experience to youngsters and foster interest in getting a license of their own. It is also intended to give older hams a chance to share their station and love for Amateur Radio with their children.

Suggested exchange: Name, age, location and favorite color. Be sure to work the same station again if an operator has changed. To draw attention, call "CQ Kids Day."

Suggested frequencies: 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). Be sure to observe third-party restrictions when making DX contacts.

Reporting: Logs and comments may be posted on the Internet. Those without Internet access may forward comments to the Boring Amateur Radio Club (see address below).

Awards: All participants are eligible to receive a colorful certificate. You can download this certificate for free, customized with the youngster's names, after filling out the Kids Day Survey. Alternatively, you can send a 9 × 12 inch self-addressed, stamped envelope to Boring Amateur Radio Club, PO Box 1357, Boring, OR 97009. You can also join an e-mail reflector for Kids Day. More info can be found at **lists.contesting.com/mailman/listinfo/kids**.

Are you ready to get some of the kids in your life on the air? Lloyd Cabral, KH6LC, certainly is! In fact, last January they made 125 contacts. They will be hosting local kids again at the station on the big island of Hawai'i. And from the shack they'll be streaming live video on **Justin.TV**. Curt Knight, AH6RE, wrote: "Lloyd had streaming video running of the Kids Day operation and Matt, Alex, and Nathan had a pretty big fan club before the day was over." Check out the station website at **www.kh6lc.com** for more information and pictures. — *David Hodge, N6AN,* **davidchodge@gmail.com**

Don't forget that you can share your experiences, submit photographs, print certificates, fill out an online survey, and read about other participants by logging on to **www.arrl.org/kids-day**. We want to hear your story!

kidsday@arrl.org

CARL BYCK, KH7BB

Carl Byck, KH7BB, shows Johnny, Kailey and Joan Scanlon how to make QSOs.

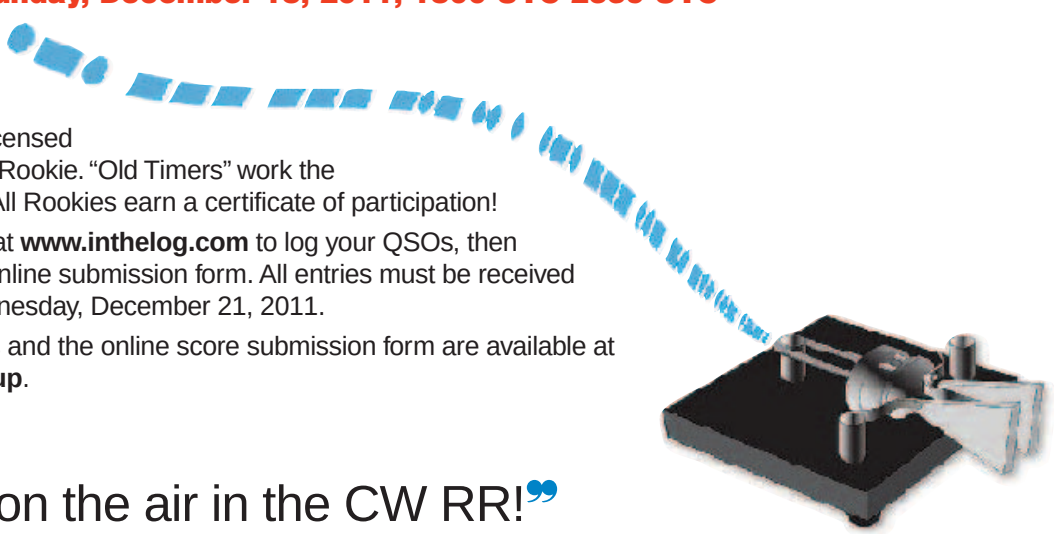
PETE YOES, KH7HI

Lucy likes Kids Day! She is 7. Dad KH7HI is proud!

2011 ARRL December Rookie Roundup

Sunday, December 18, 2011, 1800 UTC-2359 UTC

- The "RR" returns for the third time in 2011, with CW as the mode! Any amateur licensed in 2009-2011 can enter as a Rookie. "Old Timers" work the Rookies and act as Elmers. All Rookies earn a certificate of participation!
- Use the free online logger at **www.inthelog.com** to log your QSOs, then report your score using the online submission form. All entries must be received no later than 2359 UTC Wednesday, December 21, 2011.
- Complete rules, helpful tips and the online score submission form are available at **www.arrl.org/rookie-roundup**.



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

W3UR

HOW'S DX?

The DX Bully Pulpit

The term "bully pulpit" was coined by Theodore Roosevelt during his second term as President of the United States. The word bully is used as an adjective meaning first rate, good, fine or excellent. A pulpit is an important podium or high "reading desk," or in the case of Roosevelt and other politicians or people of "prominent public position," an office or position. The President realized his awesome responsibility to advise, teach and motivate others from his position of authority.

The bully pulpit has since been used in other aspects of life, including churches, elected offices, Hollywood and other organizations to bring forth issues or topics close to the heart of significant people within those communities.

Being the editor of the How's DX? column has always been an honor, which basically fell at my feet some 13 plus years ago. With that position there is a tremendous responsibility. Since September 1998 the column has been used to give you the reader upcoming DX news announcements, DXpedition wrap-ups, tips, hints and kinks of DXing and on occasion the do's and don'ts of Amateur Radio DXing. The latter has always been difficult for me, not because I don't know them but because it can appear "preachy." And yes there are a select few who write to your editor or their Director saying the How's DX? column is not the proper venue for such reprimands.

I disagree! *QST* goes out to over 155,000 members and How's DX? is one of the most read columns in the publication. Both DXers and non-DXers read the column with a worldwide audience. Many IARU societies read the column and highlight items from *QST* in their national magazines. So, yes, the How's DX? column is one of many proper places to bring up issues important to the DX community at large.

Now I'm not going to name names or point the finger at an entire population, first to keep certain lawyers off my case but secondly because not all from a certain region have the same bad practices. Also it is my hope that you the readers, some who write their IARU society DX column and others who edited their general purpose, DX or contest club newsletters, will pick up on this thread. We all have a responsibility to point out not only the bad, but the good practices in DXing. So here we go.

Confirming QSOs — Am I in His Log?

Everyone who has been DXing for more than a few minutes has worked a DX station and then afterward wonders to themselves and even to others "was that a good QSO?" Whether on SSB, CW, RTTY or the other digital modes, it happens. The DX station will say something like W3U YOU ARE 599. You come back and give your full call one or more times, hoping the DX station gets it this time, and then give the DX station a report back. This is immediately followed by the DX station sending TU or thank you as he continues along his way through the pileup. Seconds later you are left scratching your head wondering did he get my full call sign correct or not? All he said was thanks and went back to the pileup. Even your friends won't be able to help you to know for sure that the DX station indeed got your full call.

So how do you make sure the DX station gets your full correct call sign? Here's a trick I learned from my good friend and next door neighbor Frank Donovan, W3LPL. Never, and I mean never, give the DX station a signal report until you know he has your call sign correctly. So when the DX station says, for example, W3U YOU ARE 599, call him again giving only your call sign and not a report. Wait for him to give your full call and report again. Once you are sure he has your full and complete call sign then give the report. If everyone in the pileup of the DX station did this, the DX operator would eventually figure it out.

The DX station on the other hand is not at fault for sending W3U YOU ARE 599. After all he may not have copied the full call sign and it is his job to keep the pileup moving. Sending W3U? just gets many to continue calling because some don't listen carefully enough. Instead, the DX station needs to get as much of the call sign as possible and then give the report to keep the rest in the pileup "thinking and having the feeling" that this op knows how to operate. At the same time it is extremely important for the DX station to send the full call sign of the station he just worked and some kind of confirmation such as TU on CW or THANK YOU on Phone.

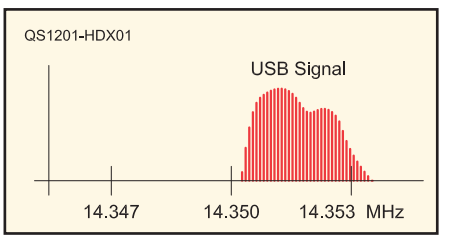
Listening Up

It's amazing how often one hears a DX station running a split pileup on CW, Phone or even RTTY giving their call sign and saying LISTENING UP. They never give a number or say how high up they are listening. Just up! Up where and how far? This is a great way to confuse those you are trying to work if you are the DX station. Now granted you can't say your call sign and listening up 1-2 or whatever in between every contact, but occasionally it is important to give those listening carefully for your directions some kind of clue as to the best way to work you, the DX station. Also as the DX station operating split (and those calling in the pileup) you need to know the band limits and mode limits. For example, US stations cannot transmit on RTTY above 18.110 MHz! So if a DX station is on 17 RTTY transmitting on 18.105 MHz and listening up 5-7 kHz, US stations cannot call, as they will be out of the band! Same thing on 12 meters, as the upper limit on RTTY is 24.930 MHz.

SSB Signals

A typical SSB (USB or LSB) signal is a bit less than 3 kHz wide. With this in mind, a DX station operating split on SSB should always listen a minimum of 3 kHz up or down and never less, because that will only cover up the transmit frequency of the DX station!

Another question that often comes up



A 3-kHz-wide USB signal transmitted with a dial frequency of 14,350 kHz.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

with SSB emissions deals with the band edges. FCC rule 97.307(b), Emission Standards, states, "Emissions resulting from modulation must be confined to the band or segment available to the control operator. Emissions outside the necessary bandwidth must not cause splatter or keyclick interference to operations on adjacent frequencies." Again, SSB transmissions are typically 3 kHz wide. On upper sideband (USB), if the transmitter is properly adjusted and not overdriven, all of the emissions are above the suppressed carrier frequency. So, let's say a properly adjusted and well calibrated transceiver is transmitting on 14,150.0, your signal would be in the US Extra class phone band, but why not move up 2 kHz to be sure. However, on the upper limit of the 20 meter phone band you must keep all of your signal components below 14,350 kHz to be in band. While a (suppressed) carrier frequency of 14,346.7 kHz would keep a 3 kHz wide signal limited to 300 to 3300 Hz within band, that will only be the case if the filter is perfect and you don't generate intermod products. To be safe, with a low distortion, well calibrated and drift free transceiver, I'd stay well below 14,345 kHz to stay in the US phone band and avoid report from an ARRL Official Observer (OO) or worse a pink slip from the FCC.

On lower sideband it is the exact opposite. On LSB all of the emissions are below the suppressed carrier frequency. On 40 meters (7125-7300 kHz) you can safely operate LSB up to about 7298 kHz and no lower than 7130 kHz. For a more detailed answer, see *The ARRL Handbook*. Watch the band limits!

Who is the DX Working?

Every once in a while on the air you'll hear a "DX assistant" trying to get someone in the log of a DX station. In this situation the DX station or the DXer can't quite make the QSO on their own. The "DX assistant" will tell either the DX station or the DXer to call again or give the call sign of one of the two stations. There is an ethical DX line that should not be crossed. Most DXers don't want to be helped into the log of the DX station — they want to earn the QSO. Otherwise, why not just ask the "DX assistant" to work the DX for you?

DX NEWS FROM AROUND THE GLOBE

5V — TOGO

5V7MA from Togo will be December 19-January 4 with Arnauld, F4FOO, operating in his free time. He plans to be QRV 20-10M SSB only. QSL to his home call.

CYØ — SABLE ISLAND

Al, VE1AWW, is heading back to work on Sable Island. Listen for CYØ/VE1AWW in his spare time through the end of December.

E4 — PALESTINE

E44PM is the Palestine call sign issued to Peri, HB9IQB, by the Ministry of Telecommunications & Technology in Ramallah. Peri now plans to start his operation at 0001Z December 16, possibly a few hours earlier. He has a web page at **www.hb9iqb.ch/palestine.html**.

EL — LIBERIA

This is the 23rd straight year for the VooDoo Contest Group's DXpedition and contest operations. This year they go to Liberia for the CQWW CW Contest in November. They will be EL2A, multi-multi, from a QTH just south of Monrovia, the capital. Here are the personal call signs they will put on the air starting November 21: Ned, AA7A — EL2NS; Roger, G3SXW — EL2A; Fred, G4BWP — EL2WP (QSL via G5LP); Mike, KC7V — EL2MF; Lee, KY7M — EL2LF, and Bud, N7CW — EL2CW.

QSL via their home calls except, apparently, for EL2WP. And, says G3SXW, "LoTW uploads will be fast!" And, he thanks the Liberian Radio Amateur Association for their wonderful support. Last year the group operated as 9L5VT from Sierra Leone.

GJ — JERSEY

GJ6UW on Jersey is a joint Anglo-Japanese expedition. G3ZAY and G7VJR will team up with JA1LZR, JF1PJK and JQ2GYU for the operation December 2-7. They will be on CW, SSB and RTTY. They will emphasize 160 and 80 meters to Asia and Japan. There will be a Beverage to Japan, an 80 meter vertical array and a 40 meter four-square. They hope to use the club station on the island for the other HF bands. QSL via MØBLF. The logs will also be on Club Log and LoTW while the expedition is still in progress.

MAURICE SCHIETECATTE, PJ2/N4LZ

Wayne, PJ2/K8LEE (left) and Kirk, PJ2/W8QID in Willemstad, Curaçao found an opening on 80 meters in the middle of the day!

VP6 — PITCAIRN ISLANDS

Pitcairn Island is the destination of four Frenchmen and a Brit. After the success of TX4T in French Polynesia in February 2010 Jacques, F6BEE; Gilles, VE2TZT, and Nigel, G3TXF, are teaming up with Michel, FM5CD and Vincent, F4BKV for a January 2012 DXpedition as VP6T. Plans are to be QRV on 1.8 through 28 MHz on CW, SSB and RTTY from January 20-29. They will be focusing on the low bands as well as Europe and the US East Coast. Three stations are expected to be active around the clock. See Table 1 for the suggested frequencies.

The VP6T team will have four Elecraft K3 transceivers and four amplifiers. For antennas they will be using an inverted L on 160 meters, two phased quarter wave verticals on 80, 40 and 30 meters, and two 5 band Spiderbeams for 20 through 10 meters. QSL cards for VP6T go via G3TXF and they plan to upload to the ARRL LoTW during the operation "via satellite-phone Internet" or immediately afterward if they are unsuccessful while on the island. They have a website at **www.vp6t.org**. QST

Table 1
Suggested Frequencies for the VP6T DXpedition

Band	CW	SSB	RTTY
160	1831.5	1842	
80	3503 or 3523	3790	3588
40	7003 or 7023	7085	7038
30	10,103 or 10,123	10,144	
20	14,003 or 14,023	14,170	14,088
17	18,073 or 18,078	18,130	18,108
15	21,003 or 21,023	21,280	21,098
12	24,893 or 24,898	24,960	24,928
10	28,003 or 28,023	28,490	28,098

NØJK

THE WORLD ABOVE 50 MHz

The Sunspots Are Back, F2 On 6 Meters!

Perhaps the first "single-hop F2" openings on 50 MHz in North America during solar cycle 24 occurred September 9 and again on the 26th. On the afternoon of the 9th a major geomagnetic storm was in progress as a result of a CME from sunspot 1283. Six meters suddenly popped open to Central America and northern South America around 2100Z. Stations from the East to the West Coast of the lower 48 states had a path to the south.

HC1HC, HK7AAG, TI7/N5BEK, YS1AG, numerous YVs and many Caribbean stations were 59++. HK7AAG (FJ36) was worked by K1TOL, Maine; KØHA, Nebraska; W9BF, Texas, and AA4SC, South Carolina. Fred, NØXA (EM28) logged HC1HC at 2128Z with 599 signals. HC1HC worked across the US from Lefty, K1TOL (FN44) in sunny New England to Chip, N6CA (DM03) in smoggy southern California. W4GCB logged HC1HC, HK7AAG and several YV5s from Georgia (see Figure 1).

Some wondered if this was sporadic E (E_s). The widespread footprint, extremely strong signals and the occurrence of the opening during a geomagnetic storm are consistent with F2 rather than multihop E_s. The K-index peaked at 6. The opening lasted a couple of hours then stopped at 2300Z about as suddenly at it began. The timing of this particular opening was intriguing. Had it been 1 day later it would have taken place the Saturday afternoon of the September VHF QSO Party.

On Saturday September 24, "behemoth sunspot 1302" launched a huge CME toward earth during a X 1.9 class solar flare. The CME reached earth around 1200Z on September 26 and struck a glancing blow. The B_z remained stubbornly north most of the day until 2000Z when it abruptly swung south. This allowed the solar wind particles to impact on the earth's magnetic field and aurora began.

The K-index peaked at 8 at 2100Z (see Figure 2). Aurora contacts were spotted by VE2XK, W3EP, K8JA, KA9FOX, K2AXX, KF6A and others on 50 MHz around 2030Z. At 2100Z the OA4TT/b (FH16) on 50.077 MHz suddenly appeared and was spotted by K1TOL, K2AXX, K2MUB, K8NXI, AC4TO, W3UR, K9RX (DM41), WZ8D, VE2XK, VE3KU and others. A few minutes later 9Y4D called CQ on 50.120 MHz and was worked by WØWOI, K9PPY, VE2XK, VE3EN and W5YI.

The widespread footprint again supports F2 as the propagation mode. The 4 W HK6FRC/b (FJ37) on 50.060 MHz was heard by N4BAA, NØJK, VE3EN, NØKE and many other stations beginning at 2140Z. This beacon was not spotted on the 9th — perhaps it was off the air while HK7AAG was QRV? 9Y4VU, who missed the F2 opening on the 9th, was ready for business this time and sent QRZ? on 50.100 CW followed by a large pileup. TI7/N5BEK was booming into the desert southwest "10 over S-9" for N7AMA on 50.115 MHz. HC1HC showed up at 2200Z on 50.097 MHz and ran a monster CW pileup. Eventually he went split, up 1-2 kHz, which helped, as many of the stations calling him were strong on backscatter. It was difficult at times to tell who he went back to — the backscatter signals were that loud.

N3LL (EL86) heard WA7JTM (DM33) on backscatter peaking at 190° at 2157Z. I copied AC4TO (EM70) 579 on 50.105 MHz CW via backscatter. HC1HC was spotted by WJ6T (DM05) California to K5CM (EM25) Oklahoma, then east to AA4SC, South Carolina and north to NØJK (EM28), K1MOD (EN40), K2ZD and KF6A (EN73) and the states in between. NP4A (FK68) was about 55 to Kansas on 50.140 MHz

This Month

December 13-14	Geminids meteor shower
December 17-18	Good EME conditions

*Moon data from W5LUU

DX SHERLOCK

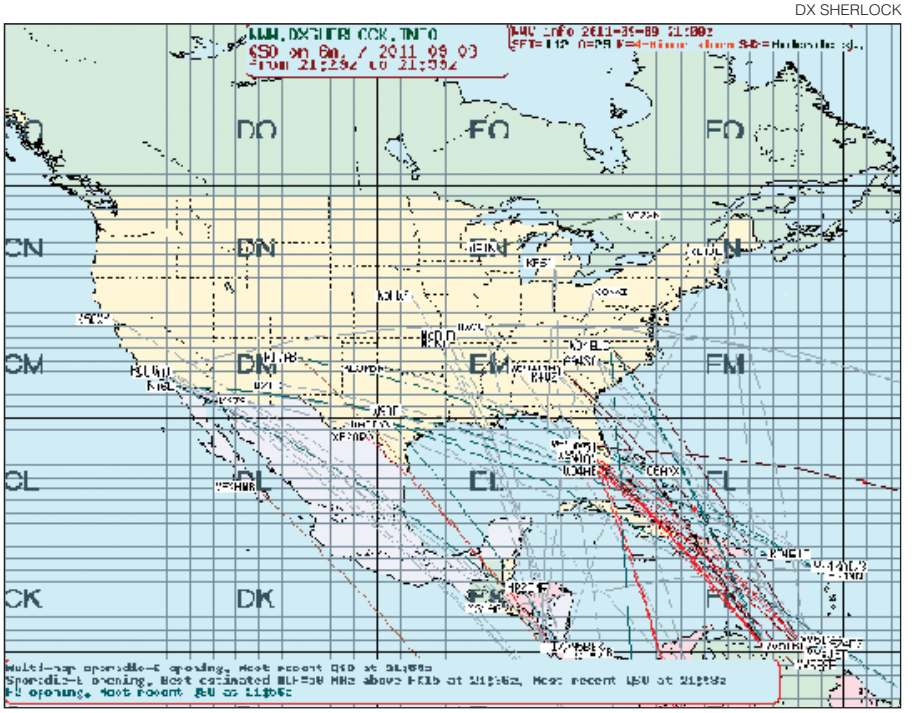


Figure 1 — Here is the DX Sherlock map of the 6 meter F2 opening of September 9. Note that the opening spread itself across the whole southern tier of the US.

Jon Jones, NØJK ♦ 5212 Eisenhower Pl, Lawrence, KS 66049 ♦ n0jk@arrl.net (316-655-4331)

NOAA/SWPC

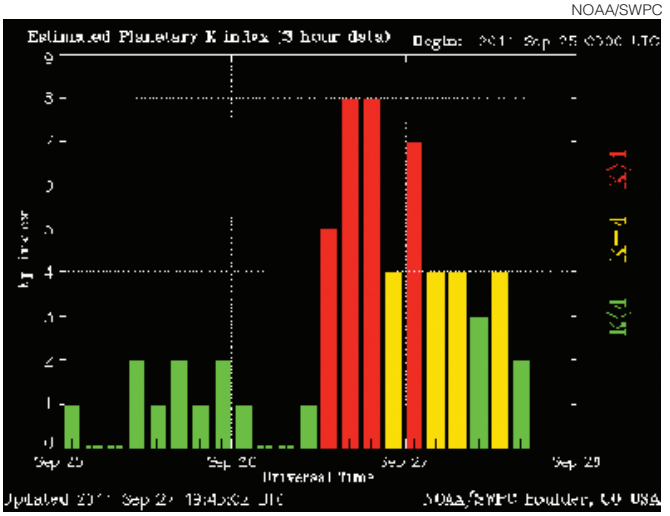


Figure 2 — The estimated planetary K index chart for September 26 shows the abrupt jump in the index between 1200Z and 1500Z from 1 to 5 and then to 8.

DX SHERLOCK

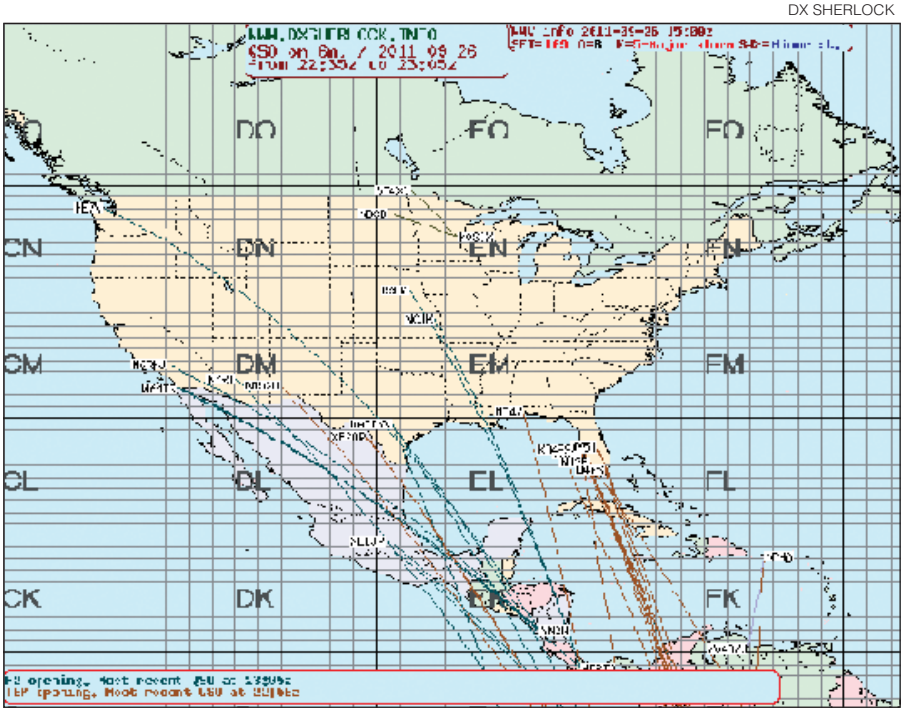


Figure 3 — On September 26 another F2 opening occurred on 6 meters. This opening stretched not only coast to coast but up into the Pacific Northwest.

SSB via F2 sidescatter at this time working California and Arizona stations on direct F2. VE6ZT Alberta, Canada, reports hearing the OA4TT/b at 2157Z.

Louis, HP3TA, from Panama set up on 50.085 MHz CW and was 599 for KØGU (DN70) at 2205Z. Larry, NØLL (EM09) logged Louis at 2220Z followed by K3PA (EM29). I heard HP3TA, with a weak hollow sounding signal working K3PA and called Louis after their contact. He started to fade, but we exchanged reports at 2230Z! NØLL e-mailed me that he "heard him work you 339!" Larry also heard TI7/N5BEK and the TI2NA/b. My contact with Louis may have been via F2 back or sidescatter. I am nearer to Panama than KØGU, NØLL or K3PA, perhaps too close in for a direct F2 hop?

HP3TA reported F2 contacts with AZ, CA, CO, KS, NM, NV and OK. From southern California, Chip, K7JA, logged NP4A S-9, YS1AG (20 over!), PP5KR and PY1ZV S-9. N6CA and KS7S worked PP5KR around 2225Z. These were the only Brazil contacts I saw spotted. There were many CX and LU spots. KG6STU made his first ever 6 meter F2 contact logging TI5XP. KØHA (EN10) spotted TI7/N5BEK at 2234 followed by HP3TA at 2239Z. YN2N and YS1AG were reported by West Coast stations at this time with very loud signals.

Larry, NØLL, heard YS1AG faintly. NØAH in Colorado could hear Andy, YS1AG, well but "QSB pile up ughh!" At 2240Z the direct F2 signals disappeared for most stations. Strong TEP signals were reported by XE2OR; south Texas and Florida stations made contacts with CX, LU and PY for another 20 minutes before fading out. Perhaps the most interesting spot during the F2 opening was this one by LU5FF:

VYØSNO/B 11/09/26 2256Z 50048.0
FP53 559 IN FF99 LU5FF

Aurora

Aurora then reappeared for northern tier stations such as K1TOL, N8XA, KØSIX, etc on 6 and 2 meters. Chip, K7JA (DM03) spotted YN2N at 0025Z for one the last F-layer spots by a stateside station on 6 meters during this opening. Chip runs a modest station using an IC-7800 at 200 W to a 9 element OWA Yagi at 72 feet.

The September 26 opening was similar to the one on the 9th. Both started around 2100Z, favored paths from "coast to coast" to Central America, the Caribbean and northern South America and lasted about 2 hours (see Figure 3). TEP from California, Florida and the Gulf Coast to CX, LU and PY were noted toward the end of the opening on the 26th. Some of the DX footprints were smaller on the 26th — KØHA, NØLL and KØGU had strong signals to HP and TI, but they were weak in EM28.

Less than a hundred or so miles between stations can make a significant difference on shorter F2 paths as they can be very sensitive to the MUF. The southern California and Arizona stations had a pipeline to TI, YN and YS. Overall the opening on the 26th had more selective paths than the 9th. September one-hop 50 MHz F2 openings tend to occur in the afternoon on days with geomagnetic storms from the mid USA to Central and South America. These two openings followed that pattern.

TEP (transequatorial propagation) is F-layer propagation, too, and has been worked by stateside stations since last spring. It is different than one-hop F2 because TEP involves two chordal hops off the F-layer. The ionization required in the F2-layer for a classic single hop to occur is higher than needed for TEP at a given frequency. Actual single-hop F2 propagation requires higher ionization for the MUF to climb over 50 MHz and is usually not seen unless the solar flux is very high and/or the geomagnetic field is active to storm levels.

Does this mean solar cycle 24 will be better than predicted? Perhaps. The high solar flux and numerous coronal mass ejections from active sunspots are encouraging.

ON THE BANDS

TEP. TEP began to occur almost every evening in September after the equinox. Florida and Central America had contacts with CX, LU and PY on 50 MHz. In the Pacific, a path from

Hawaii to the South Pacific and then the far East occurred. On September 5 KH7Y worked A35CT, who was S-5 from 0700 to 0930Z running 15 W and an HO loop. On the 18th KH7Y logged 10 W E51USA and FO4BM. E51USA's IC-706 is broken and he is using an IC-726 on 6 meters. He worked Charlie, VR2XMT, in Hong Kong at 0717Z followed by BD7OH and BA7IO. Then 3 DUs and 15 JAs! Fred says the 49.749 MHz video carrier was S-9 + 30 for 2½ hours.

On September 20, N5DG in Texas and N4QV in Florida worked CE6RC (FF30) at 2222Z. N5DG also worked LU1DO and CX9AU. Other Florida stations worked LU8DWR. EA8AQV worked Brazil and LU5FF Argentina. Julio, NP3CW, worked EA8AJY at 2006Z. On the 21st, W4GCB in Georgia logged PY1RO. NP3CW logged many in South America on the 23rd including ZP9SC and ZP5SNA in Paraguay. No Bolivian stations? K4QI (EM85) found LUs and CX9AU on the 24th.

Chris, K1KC, in Atlanta, GA heard AC4TO (EM70) working TEP to South America the afternoon of September 25. He listened carefully on 50.110 MHz and began hearing the DX. He worked LU4FW, LU7FHS, LW6DG, LU8EEM, LU9DO and CX9AU (GF15). Atlanta is far north for TEP, perhaps an E_s link? An unusual TEP contact was reported by Ed, N5DG, in Texas who contacted FK8CP (RG37) on September 25 at 0224Z on both CW and SSB! This is 11,920 km for Ed. Phil, AF6AV, in San Diego also logged FK8CP that evening. Phil runs 100 W and a 4 element Yagi on the roof of his home. Some of the best days for TEP were those with low geomagnetic activity.

KH7Y reported working Randson, BV2DQ, at 0324Z on September 22 and LU5FF at 0512Z at 11,000 km. On September 28, Fred worked 21 VK4s including VK4MA, VK4BKP and others. All in the 4th VK district only. On the 29th Ned, KH7JJ, KH6HI and NH7RO reported working VKs and FK8CP between 0200-0300Z (4-5 PM local time in Hawaii). On September 30 KH7Y logged TI7/N5BEK, rare ZP5SNA, LU5FF and several PYs. Peter, PP5XX, worked KH7Y with S-9 signals followed by BV2DQ on long path over 20,000 km ODX! Fred notes "that 20,000 km QSO between PP5XX and BV2DQ is exciting for sure!" PP5XX is ex-PY5CC. He worked FM8DY on 144.201 MHz via TEP with 599 signals on September 28 at 0100Z.

E_s. Sporadic E was reported on 50 MHz September 4 from Florida to the Caribbean Islands and northern South America starting at 1300Z. N3LL and W9DR found P49T on 50.115 MHz. FG4NN, NP3XF, KP4YI, XE3N, ZF1EJ, NP4A and KP4EIT worked into Florida. Russ, K4QI (EM85) logged FM5AA on double-hop E_s. Out west, N5JEH (DM65) in NM logged XE1GZU (DL80) at 1447Z. Later that evening KE4EE in Georgia made 74 contacts via E_s including VE6SV (DO33) via double hop E_s. He uses an ICOM 7200 running 80 W to a 4 element Yagi at 60 feet. On September 6 K5SW (EM25) worked N4QWZ at 0338Z, a short path contact.

On September 10 stations in Florida had E_s in the morning to Central America and Venezuela. KE4WBO reports V44KAI/b, TI2NA/b, YV4AB/b, YN2N and TI5XP on 6 meters. There was a brief 50 MHz E_s opening at the start of the September VHF QSO Party. Sam, K5SW (EM25) worked XE1FAS and XE2NBW on E_s September 10 about 20 minutes after the contest started.

E_s — TEP links. E_s appeared again September 13, this time along the Eastern Seaboard in the afternoon. This allowed E_s links to TEP to occur as stations in Florida, such as W9DR, were already working Argentina via TEP. K1SIX spotted W9DR and N3LL at 2155Z, minutes earlier W9DR (EL86) worked LU2DEK (GF02). At 2151Z K1TOL (FN44) worked CE6RC (FF30) via E_s — TEP. At 2212Z Lefty worked HC5T (FI07). VE3EN noted the C6AFP/b at 2215Z, confirming the E_s link. VE3EN heard the LU7YS/b at 2232Z, also E_s — TEP and worked Walt, LW3EX, at 2234Z. Others spotting Argentina via E_s links were KB3RHR, WA3TTS, K2MUB and VE2XK. WB2AMU was active and worked a number of stations in Florida and Georgia via single-hop E_s. But Ken was not in the right spot this time for E_s to connect with South America. Ken has an online article that describes how E_s can link to TEP at **www.cq-vhf.com.** See the "Summer Issue Highlights Section."

Aurora. Fred, K3ZO, worked VE3EU on 2 meter aurora and KF6A (EN73) on 6 meters September 10. The day before numerous aurora contacts were made across the northern states during the CME impact. Vince, KØSIX (EN35) made ten 6 meter SSB contacts on Saturday afternoon of the September contest. Best DX was EM79, EN10 and EN73. Many aurora contacts were also reported along the northern tier states the afternoon of September 26. There have been few reports of 2 meter aurora contacts compared to 6 meters this month.

Tropo. Dave, N7DB, sent in a fascinating report that W7KKE (CN75) and W7EME in Oregon heard the KH6HME 2 meter beacon Friday evening September 10 around 0400Z. Signals peaked well over S-9 but no contacts were reported. Dave sent satellite weather pictures that show a continuous cloud deck from Hawaii to the Pacific Northwest. W7KKE also heard the 432 MHz Hawaiian beacon. Paul, KH6HME, did not make the long trip up to the beacon site this time. The beacon was still being heard Saturday morning but by the time the contest started the marine layer to Hawaii broke up. As with the F2 opening that same day, a day later would have been during the VHF QSO Party. Imagine if Paul had been up at the site running stations during the contest…

Sunday evening September 11 tropo was noted in the Midwest. K2DRH (EN41) and WØUC/9 (EN44) had strong signals to KS and OK and north to Michigan on 144 MHz up through 1296 MHz. On 432 MHz, rover Bruce, W9FZ, in the super rare western NE grid DN82 worked KFØM (EM17), NØLL (EM09) and 10 W NØJK (EM28) on tropo during the last hour of the September VHF QSO Party.

September 13 K4QI (EM85) found good tropo to Florida with N4TUT (EL98) "20 over S-9" on 1296 MHz running only 5 W.

EME. Herb, K2LNS, operating at WA2FGK worked Mike, KL6M, on 222 MHz EME CW on August 30. KL6M runs 400 W to a 30 foot dish and WA2FGK uses a seven wavelength Yagi and 1200 W.

Rain Reflection Scatter. Brandon, N8PUM (EN66) in upper Michigan reports working KB8U (EN82) (of FFMA fame giving W5OZI FFMA #1) and WA8VPD (EN82) on 10 GHz using rain reflection scatter. These signals sound much like aurora. Brandon also heard NE8I (EN64) and K2YAZ (EN74). He was running 2 W to a 24 inch dish. He pointed his dish at a thunderstorm supercell located over lower Michigan.

HERE AND THERE

Geminids Meteor Shower. There is a predicted visual and radio peak the evening of December 13 and after midnight December 14. Peak ZHR of 140.

The Geminids meteor shower is named after the constellation Gemini, which is located in roughly the same point of the night sky where the Geminids meteor shower appears to originate from. That means the Geminids radiant is overhead most of the night.

Geminids are pieces of debris from comet 3200 Phaethon, a rocky skeleton that has lost most of its outer covering of ice after too many close encounters with the sun. Each December, Earth passes through the debris cloud left by the comet. The Geminids are relatively slow meteors at 35 km/s compared to the Perseids at 61 km/s. Thus the ionization left by the meteors is less than that of the Perseids. It is a good shower for 6 meter SSB/CW and WSJT digital contacts on 50, 144 and 222 MHz. SSB/CW contacts are possible on 144 MHz during the Geminids at its peak. This shower tends to favor North-South paths. QST

December 2011 W1AW Qualifying Runs

W1AW Qualifying Runs are 10 PM EST Friday, December 2 (0300Z December 3) (10-40 WPM) and 9 AM EST (1400Z) Tuesday, December 13. The West Coast Qualifying Run will be transmitted by station K6KPH on 3581.5, 7047.5, 14,047.5, 18,097.5 and 21,067.5 kHz at 2 PM PST (2200Z) Saturday, December 10 (10-40 WPM). Unless indicated otherwise, speeds are from 10-35 WPM.

In the November/December "Contesting 101"

NCJ **"The importance of finding and curing RFI in the contest station."** Kirk, K4RO, discusses RFI in the shack, how it can ruin a good contest operation and what to do to eliminate it. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

SPECIAL EVENTS

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

Nov 25, 1400Z-2100Z, W1P, Eastham, MA. Marconi Cape Cod Radio Club. Steamship *Portland* Commemorative Event. 14.320 14.267 7.260. QSL. Henry Brown, 19 Sao Paulo Dr, East Falmouth, MA 02536.

Nov 26-Nov 27, 1300Z-1900Z daily, WA1NPO, Plymouth, MA. Whitman Amateur Radio Club. The First Pilgrim Landing at Plymouth. 18.160 14.260 7.260 3.860 Echo-Link: WA1NPO-R IRLP:8691. Certificate & QSL. Whitman ARC, PO Box 48, Whitman, MA 02382. **www.wa1npo.org**

Nov 26-Dec 17, 0000Z-2300Z, W9G, Louisville, KY. Louisville Astronomical Society Club Station. Celebration of the Centennial of the Birth of Grote Reber, W9GFZ (SK). 14.260 14.030 7.245 7.030 . QSL. Mark S. Williams, K9GX, POB 5973, Elizabeth, IN 47117. *Various Kentucky and southern Indiana radio clubs also participating.** **www.stargeezer astronomy.com** *or* **louisville-astro.org**

Nov 26-Dec 17, 0000Z-2300Z, W9O, Louisville, KY. Louisville Astronomical Society Radio Club. Celebration of the 50th Anniversary of the Launch of OSCAR 1 Ham Sat. 14.260 14.030 7.245 7.030. QSL. Mark S. Williams, K9GX, POB 5973, Elizabeth, IN 47117. *Various Amateur Radio clubs in Kentucky and southern Indiana also participating.* **www.stargeezerastronomy.com** *or* **louisville-astro.org**

Dec 3, 1000Z-1700Z, W1BEW, Maryville, TN. Amateur Radio Clubs of the Southeastern Conference. SEC Championship Football Game Special Event. 14.250 7.250. Certificate & QSL. QSL: club contacted; Certificate: Bobbie Williams, W1BEW, 2703 Chantay Dr, Maryville, TN 37803.* **www.qrz.com/db/aa4ut** *or* **www.qrz.com/db/w1bew**

Dec 3, 1300Z-1900Z, W8VA, Huntington, WV. Tri State Amateur Radio Association. Sinking of the USS *West Virginia*, 70th Anniversary. 14.290 7.290. QSL. TARA, PO Box 4120, Huntington, WV 25729. *USS* West Virginia*, Pearl Harbor, December 7, 1941*

Dec 3, 1700Z-2200Z, WE7GV, Tumacacori, AZ. Green Valley Amateur Radio Club. 41st Annual Fiesta de Tumacacori. 14.244 14.242. Certificate & QSL. Green Valley Amateur Radio Club, 601 N La Canada Dr (SAV), Green Valley, AZ 85614. **gvarc.us**

Dec 3-Dec 4, 1500Z-2130Z, N4WIS, Virginia Beach, VA. USS *Wisconsin* Radio Club. USS *Wisconsin*-Pearl Harbor Special Event. 14.264. QSL. N4WIS-USS *Wisconsin* Radio Club, PO Box 6682, Virginia Beach, VA 23456. **www.n4wis.org**

Dec 3-Dec 4, 1700Z-1700Z, WR4BC, Bethlehem, GA. Barrow Amateur Radio Club. 2nd Annual Bethlehem Christmas Special Event Station. 28.465 14.265 7.265 3.875. QSL. Barrow Amateur Radio Club, PO Box 951, Auburn, GA 30011. **barrowhamradio.org**

Dec 4-Dec 7, 1400Z-2200Z, W2W, Baltimore, MD. National Electronics Museum. Pearl Harbor Commemoration. 14.241 14.041 7.241 7.041. Certificate & QSL. W2W, PO Box 1693, MS4015 , Baltimore, MD 21203. Other bands/modes possible, K3NEM will spot W2W. **k3nem.org**

Dec 7, 0000Z-2100Z, NI4BK, Wilmington, NC. Azalea Coast Amateur Radio Club. Pearl Harbor Day. 14.250 7.250. QSL. Azalea Coast ARC, PO Box 4044, Wilmington, NC 28406. Battleship *USS North Carolina* will be on the air by members of the Azalea Coast ARC in the general band of 20 m and 40 m, SSB and CW. **www.ac4rc.org**

Dec 7, 0200Z-1200Z, W5LEX, Corpus Christi, TX. South Texas Amateur Radio Club. USS *Lexington* (CV-16) Pearl Harbor Day. 28.485 14.325 14.265 7.275. QSL. South Texas Amateur Radio Club, USS *Lexington* (CV-16) W5LEX, PO Box 2182, Corpus Christi, TX 78403. **www.n5crp.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 freqs 20 m SSB 40 m CW preferred other bands possible. QSL. W5KID, 305 S River Dr, Baton Rouge, LA 70802. **www.lsu.edu/brarc/uss_kidd.htm**

Dec 9-Dec 11, 0000Z-2359Z, W6W, Santa Ana, CA. Anaheim Police Radio Club. WWII Battle of Wake Island, 70th Anniversary. 14.253 18.150 7.250. QSL. Mark McMullen, KM6HB, PO Box 27271, Santa Ana, CA 92799. **www.qsl.net/w6apd**

Dec 10, 1000Z-2200Z, WD4WDW, Orlando, FL. Disney Emergency Amateur Radio Service. Walt Disney Birthday. 28.360 14.260 7.260. Certificate & QSL. DEARS, PO Box 22346, Orlando, FL 32830. **wd4wdw.org**

Dec 10, 1500Z-2300Z, AK5D, Deming, NM. Mimbres Valley Radio Club. Museum of Space History. 21.270 18.150 14.270. QSL. Mimbres Valley Radio Club, PO Box 654, Deming, NM 88031. **mimbresvalleyradioclub.com**

Dec 10, 1600Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Radio Operations Room. Pearl Harbor Remembrance Day; Fleet Marine Force Established 1933. SSB 14.320 7.250 PSK31 14.070 D-STAR 012C 2 m 70 cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101-5811. **kk6fz@arrl.net**

Dec 10, 1700Z-2359Z, N5W, Fayetteville, AR. Gary Darnell. National Wreath Laying Day. 14.235 14.030. QSL. Gary Darnell, 825 N Fox Hunter Rd, Fayetteville, AR 72701. Honoring our US Veterans. Volunteers will place memorial wreaths throughout US National Cemeteries, including Arlington National and Fayetteville (AR) National, and those overseas.

Dec 10, 2030Z-2300Z, W2HO, Newburgh, NY. Orange County Amateur Radio Club. 7.200 3.920 147.500. QSL. Orange County Amateur Radio Club Santa Net, PO Box 624, Cornwall, NY 12518. *Santa will speak to all good girls and boys on the HF bands across the US and locally in and around the special event site on 2 m simplex. Santa's elves will be sending QSL cards immediately after the event to the children involved at the address listed in the FCC's database for the call sign used. Santa talks ONLY on the radio; children conversing with Santa at the venue will receive a QSL card on the spot. Santa comes to OCARC every year to help promote Amateur Radio and the spirit of the season! He is considering equipping Rudolph with APRS.* **w2trr@ocarc-ny.org** *or* **www.ocarc-ny.org**

Dec 10-Dec 11, 1400Z-0200Z, WX3MAS, Nazareth, PA. Christmas City and Delaware/Lehigh Amateur Radio Clubs. Holidays from the Twin Christmas Cities of Nazareth and Bethlehem. 21.365 14.265 7.270 3.850, PSK31 on 20 40 m, 10 15 m if conditions permit. Certificate. Christmas City Amateur Radio Club, RR 8 Greystone Bldg, Nazareth, PA 18064. **www.dlarc.org** *or* **www.qrz.com/db/WX3MAS**

Dec 10-Dec 17, 1530Z-2259Z, W9H, Elkhart, IN. HCJB Global Technology Center. 80th Anniversary of Shortwave Station HCJB Quito, Ecuador and 25th Anniversary of the HCJB Global Technology Center Elkhart, IN. 21.365 14.265 7.265. QSL. HCJB/W9H, PO Box 9, Elkhart, IN 46515. *No Sunday operation. Special Anniversary QSL and Brochure will be sent*. **info@hcjbtech.org** *or* **www.hcjb.org**

Dec 11-Dec 24, 0000Z-2359Z, W6S, Bakersfield, CA. WI6J. Santa's Work Shop. 14.270 7.180 3.900. QSL. Mark E Slater, 247 Bighorn Meadow Dr, Bakersfield, CA 93308. **www.wi6j.com**

Dec 31-Jan 1, 1315Z-1900Z, K1R, Northfield, MA. 72 Rag Chew Group. New Years Special Event. 7.272 7.271. Certificate. Robert Lobenstein, WA2AXZ, 1958 E 36th St, Brooklyn, NY 11234. **www.ragchewers.com**

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-application**. A plain text version of the form is available at that site. You may also request a copy by mail or e-mail. 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 Event page. Note: All received events are acknowledged. If you do not receive an acknowledgement within a few days, please contact us.

Special Events listed in this issue include current events received through Oct 10. You can view all received Special Events at **www.arrl.org/special-event-stations**.

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

K2TQN

VINTAGE RADIO

Washington Island's Ham Radio Treasure

W9EVT

Aerial view of W9EVT's ham radio haven.

I met guest author Fred Lloyd, AA7BQ, at the Glacier-Waterton hamfest last summer. He reports this story, which I was unable to cover on my road trip.

Last summer my wife and I had the rare opportunity to visit the ham shack of George Ulm, W9EVT, and were treated to an experience that may well be unique in all of Amateur Radio.

George has been active in ham radio since 1938. Originally licensed as K1ABU, like all other hams he put the hobby on hold during World War II. After the war, he was granted the call sign W9EVT, which he holds to this day. In the 70+ years that George has been a ham, he has achieved a number of firsts in the hobby that many of us can only dream of. Some of his more notable achievements include building the first repeater system in Chicago, being the first person to hold a reciprocal call sign in Mexico and having worked nearly every country in the DXCC list, including several that no longer exist. George's call sign can be found in the 1947 Radio Amateur Callbook and in every issue printed since.

George lives on Washington Island, Wisconsin, a small community located in the middle of Lake Michigan. It takes about 2 hours to get there by car from Green Bay and that includes a 30 minute ferry ride across Death's Door Strait. Once considered treacherous, as its name implies, crossing the 5 mile passage these days is safe, pleasant and scheduled on the hour during the summer months.

George's home, which sits on about 500 acres of the northern part of the island, consists of a farm house, several barns and a few guest cottages that were once part of an apple and cherry orchard. George's shack is situated in one of those cottages and is about the size of a four bedroom home. There are five or six large towers on the property and some wire and loop antennas that stretch over 1000 feet. More than 30 pieces of coax gather these into the shack and terminate at the main operating desk, which runs the length of the long, rectangular main room.

Radio History — Collins to Yaesu

Stepping into the shack, the enormity of George's achievement becomes evident. Here is, quite simply, what could be the most extensive collection of working Amateur Radio gear ever known. George's first radio from 1938 is there, as is nearly every make and model by all of the popular brands spanning the past 70 years.

Eight foot high shelves line three of the four walls in the main room and are stacked with rack after rack of Hammarlund, Hallicrafters, Collins, Drake, Ten-Tec, Kenwood, ICOM, Yaesu, HRO, National, Henry, Heathkit and, well, everything.

As you gaze down this nearly 40 foot cor-

Here is the main operating position at W9EVT where you can operate the most modern equipment while being surrounded by ham history.

Those microphones on the right aren't just for show. These are some of the vintage stations ham guests can operate.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

ridor, your jaw drops and you begin to get a sense of the immensity of the collection. Just around the corner is a smaller, living-room sized space and in it you find an unbelievable collection of Collins radios stacked on several tables and racks. In the corner also sits a refrigerator sized Collins broadcast transmitter. Opposite that, you spot a Johnson Desk Kilowatt, which is literally a large metal desk with a built-in kilowatt amplifier! I've certainly never seen one before and yet, here it was, 100% complete and looking as if time had stood still for the past 50 years.

Then, after seeing all of this, you're hit with an almost unimaginable fact: You've just seen only a third of the collection. There are at least another 500 pieces still in storage! Next, George treated me to a visit to his "workshop" where I saw a portion of the radios that weren't yet on display. Again, I saw row upon row of radios stacked floor-to-ceiling, in a garage space big enough to hold three or four cars. In addition to the stacks of radios there is a complete machine and electronics repair shop.

Due in part to its out-of-the-way location, George's shack doesn't get a great number of visitors. He estimates that about 400 or so guests come by each year and stay at the bed and breakfast cottages that he and his wife operate on the property. Few of these visitors are hams so there is great excitement when someone from our community stops by for a visit.

All ham visitors are encouraged to sit down at the console and burn up some air waves. The only problem here is deciding which radio, amplifier and antenna combination you will use. Will it be the ICOM IC-7800, the Alpha 9500 and a 20 meter, 8 element beam? Perhaps you'd rather operate the Yaesu FT-2000 or maybe the FlexRadio FLEX-5000. In all, there are dozens of radios, amplifiers and antennas to choose from. Want Vintage? No problem. Fire up a Collins S-Line or the KWM-380, or any of about a dozen other classic glow-in-the-dark radios.

You can even sleep in the shack's fully furnished guest quarters or stay up all night chasing DX that you've only dreamed of entering into your log. Whatever your dream station is made of, it's all there waiting for you to push the button and start talking. And don't be afraid because George will be right there with you, helping with antenna switching and offering guidance of all sorts.

Hamcation Location

If you're looking for a DX vacation located on a beautiful island that is right here in the USA, then this is it. Available for your enjoyment are a private beach, fishing, a boat house, hiking trails, biking, nice restaurants and some of the most beautiful lakefront property anywhere.

George is one of the most gracious hosts I've ever met. His first concern is your comfort and he and his wife make sure that your time on the farm is as pleasant as it can possibly be. This isn't hard since the accommodations are simply beautiful and include premium satellite TV, wireless Internet, a full kitchen, books, games, everything. These cabins are first rate, spacious and painstakingly clean.

George remains very active in Amateur Radio and hosts or participates in a number of daily nets on the air. He will also keep you interested for hours on end with stories and accounts of the way radio was back in the early days and everything in-between, right up to today.

During my visit, I couldn't help but feel that I was being treated to not only a mind boggling collection of vintage and modern amateur equipment but also to the man himself. George is a veritable encyclopedia of Amateur Radio and the evolution of the hobby over the past 70 years. Being able to spend time with him was in itself a treat.

Looking to the Future

By now you've probably guessed that George isn't exactly a spring chicken. It is one of his great wishes that his collection find a permanent home after he's gone so that future generations can enjoy and appreciate ham radio history for many years to come.

Finding a permanent home for this gear will be no small task. All total, there are nearly 1000 pieces to be displayed. A huge portion of these are "boat-anchor" sized and very heavy. George is not interested in selling the collection but would instead be very happy to donate it to an appropriate organization. He would like to find a venue near a major airport that could fulfill his dream of putting the entire collection on permanent display.

We're all hoping that a dedicated museum or preservation organization will step forward to take on the task. Sure, it's a big collection but it's nothing compared to a battleship or a submarine museum, several of which are on display. All it will really take is a group with the right goals and determination to make it work.

Alas, I have run out of awe inspiring words to describe the breadth and importance of George's collection, his personal friendliness and his contribution to the hobby. I feel truly fortunate to have spent 2 days poring over the collection and having him as my personal tour guide with an encyclopedic memory.

If you ever get the chance, Greengate Farm is a ham radio destination that simply cannot be missed. Check out the links below to contact the Farm and be sure and mention that you're a ham and would like to have George show you around. It will be an experience that you'll never forget.

Visit George's web page at **www.qrz.com/db/w9evt** for more photos and information.

Even after 73 years, George Ulm, W9EVT, enjoys getting on the air every day.

No rest for the weary. A group of vintage radios awaiting restoration.

All photos by Fred Lloyd, AA7BQ, except as noted.

Fred Lloyd, AA7BQ, an ARRL member, has been an Amateur Radio operator since 1987. He is best known as the founder of the website QRZ.com that was started in 1993. Fred is a programmer and has written most of the software that runs the site. He worked as a staff engineer at a large UNIX computer company until 2007 when, after a layoff, he began operating QRZ as a full time occupation. He also holds a GROL (General Radiotelephone Operator License) and is a certified flight instructor. He enjoys a variety of hobbies including flying, playing guitar and attending ham radio events with his wife Robin in their 45 foot motor home, affectionately known as "The Zed."

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

Arizona (Phoenix) — Jan 7 D F H R T V
7 AM-noon. *Spr:* Thunderbird ARC. Northwest Community Church, 16615 N 43rd Ave. *TI:* 146.7 (162.2 Hz), 446.15 (100 Hz). *Adm:* $2. Tables: $10 for parking spot; $5 for additional spots. Pete Decker, K7IJR, 3340 W Sweetwater Ave, Phoenix, AZ 85029; 602-564-6684; **pdecker3@mindspring.com**; **www.w7tbc.org/hamfest.html**.

Florida (Orlando) — Dec 10 D F H R T V
6-11 AM. *Spr:* Amateur Electronic Supply Orlando. AES Parking Lot, 621 Commonwealth Ave. *TI:* 444.125 (103.5 Hz). *Adm:* Free. Tables: Bring your own tables, chairs, and shade. Jim Stout, W9QC, c/o AES, 621 Commonwealth Ave, Orlando, FL 32803; 407-346-4235; fax 407-894-7553; **w9qc@arrl.net**; **www.aesham.com**.

Louisiana (Minden) — Dec 17 D F H R S V
8 AM-2 PM. *Spr:* Minden ARA. Minden Civic Center, Broadway St. *TI:* 147.3 (186.2 Hz). *Adm:* $5. Tables: $5. John Beck, KB5LE, 3457 Harbor Ln, Shreveport, LA 71107; 318-636-5845; fax 318-221-3922; **kb5le@arrl.net**; **www.n5rd.org**.

Michigan (Harrison Township) — Dec 4
D F H R V
8 AM-noon. *Spr:* L'Anse Creuse ARC. L'Anse Creuse High School, 38495 L'Anse Creuse St. *TI:* 147.08 (100 Hz). *Adm:* $5. Tables: $15. Gregg Crump, N8GEO, 29729 S River Rd, Harrison Township, MI 48045; 586-477-0364; **n8geo@arrl.net**; **www.N8LC.org**.

Missouri (Springfield) — Jan 7 D F H R V
8 AM-1 PM. *Spr:* Ozark Mountain AR Group. Faith Lutheran Church, 1517 E Valley Water Mill Rd. *TI:* 146.775 (D-Star). 146.52. *Adm:* $5. James French, KCØTQD, 1505 E Glenwood St, Springfield, MO 65804; 417-425-9962; **kc0tqd@gmail.com**; **www.w0omd.org**.

NEW YORK CITY/LONG ISLAND SECTION CONVENTION

January 8, Bethpage
H S V
The New York City/Long Island Section Convention (13th Annual Ham Radio University), co-sponsored by the ARRL New York City/Long Island Section and the Kings County Repeater Assn, will be held at Briarcliffe College, 1055 Stewart Ave. Doors are open 7:30 AM-4 PM. Features include "Ham Radio University 2012" ("Spreading Ham Radio Knowledge and Know How" - a day of education to share ideas, experiences, knowledge, and fellowship among Amateur Radio operators); forums about different aspects of Amateur Radio, focus will be "hands on" with many demonstrations and emergency communications; Keynote speaker ARRL Member and Volunteer Programs Assistant Manager Norm Fusaro, W3IZ; Amateur Radio Club and organization tables; Special Event Station W2V; VE sessions; handicapped accessible; refreshments. Talk-in on 146.85 (136.5 Hz). Admission is by $3 suggested donation. Contact Tom Carrubba, KA2D, 226 Sheffield Ave, W Babylon, NY 11704; 631-422-9594; **ka2d@arrl.net**; **www.hamradiouniversity.org**.

Wisconsin (Waukesha) — Jan 7 D F H R V
8 AM-2 PM. *Spr:* West Allis RAC. Waukesha County Expo Center Forum, 1000 Northview Rd (County Trunk FT). 40th Annual Midwinter Ham Radio, Computer, and Electronics Swapfest. *Adm:* advance $4 (5 for $18 or 10 for $35 before Dec 28), door $5. Tables: 8-ft, $18 (before Nov 1), $20 (between Nov 1 and Dec 28), $23 (Dec 29 and after), electrical outlet $21 (advance only). Send #10 business size SASE for advance reservation by Dec 28 to WARAC Swapfest, Box 1072, Milwaukee, WI 53201. Phil Gural, W9NAW, 414-425-3649; **janphil68@att.net**; **warac.org**.

Coming ARRL Conventions

November 19-20
Indiana State, Fort Wayne*

December 3-4
West Central Florida Section, Palmetto*

January 8
New York City/Long Island Section, Bethpage

January 21-28
Quartzfest, Quartzsite, AZ

January 27-28
Mississippi State, Jackson

February 4
South Carolina State, Ladson
Virginia State, Richmond

February 10-12
Northern Florida Section, Orlando

*See November *QST* for details.

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

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. Sanctioned conventions are also listed in the *ARRL Letter*. In addition, events receive 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 **Nov 1** to be listed in the **Jan** 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 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 ARRL Web banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

Strays

I would like to get in touch with...

♢anyone who has material, including photos, of early Amateur Radio operators working for the Forest Service. — *Michael Levine, K2JNE,* **mtnmike@qnet.com**

♢someone with a PDF of the data sheets that came with the Kenwood SP-430, SP-40 and HS-7 headset, as well as a PDF copy of the TS-430S sales brochure. — *Martin Campbell, KBØHAE,* **kb0hae@arrl.net**

QST congratulates...

♢Tom Taormina, K5RC, of Virginia City, Nevada, whose 11th book, *Foreseeable Risk*, has been published by Lawyers & Judges Publishing.

♢Chris Smith, CEM, KC7PZS, who has been appointed Chief of Emergency Management/Homeland Security for the state of Nevada.

♢Theodore (Ted) Cohen, N4XX, on the release of his sixth novel, *House of Cards: Dead Men Tell No Tales*. Published by Outskirts Press of Parker, Colorado, this is Cohen's second murder mystery based on real events that features NYPD homicide detective Louis Martelli. For details, see **www.theodore-cohen-novels.com**.

75, 50 AND 25 YEARS AGO

December 1936

■ The cover's humorous photo montage shows a face looking at us from the inside of a panel meter. The antenna R.F. current meter, of course, is off scale at the top end!

■ The first sentence of the editorial states, "With this issue, *QST* comes of age" — the first issue of our fine journal having been sent to its members in December 1915.

■ George Grammer, W1DF, shows us how to build "An Inexpensive Five-Band Low-Power Transmitter" that will produce 20 watts' output from a pair of 42s.

■ The next article (10+ pages!), by Walter Grosselfinger, W2ATQ, and Thomas Presser, describes "A Versatile Crystal-Controlled U.H.F. Transmitter" that runs 100 watts on 14, 28, and 56 Mc (the last one being the U.H.F. band).

■ "Operating Notes on the Transmitting-Type Beam Power Tube," by George Grammer, W1DF, tell us how the new 807 tube can be used in transmitters.

■ James Millen, W1HRX, provides a new approach to coil changing in multiband receivers, with "A Moving-Coil Tuning System for the High-Frequency Receiver."

■ A transmitter that uses a push-pull pair of RK39s in the final, is presented by G. Mathis, W3BES, and J. B. Carter, "An All-Band 'Phone Transmitter Using Beam Power Tubes."

■ Karl Miles describes his receiver for 56 Mc. in "Circuit Design of a Modern Amateur U.H.F. Superheterodyne."

December 1961

■ The cover photo shows a great array of HQ hams' call-sign QSL cards, with "Season's Greetings" superimposed across them.

■ The editorial, "Marconi's Miracle," notes that on December 12, 1901, Guglielmo Marconi lofted a kite to support 400 feet of wire as an antenna, and copied the first transatlantic radio signals, transmitted from his station at Poldhu, England. History was made….

■ Joseph Galeski, W4IMP, presents his all-transistor S.S.B. exciter, "The 'IMP-TR'."

■ Pete Czerwinski, W2JTJ, describes his design of "A Novel Antenna for 40 and 80 Meters."

■ Raphael Soifer, K2QBW, explains "The Mechanisms of Space Communication" in simple terms.

■ In "Unit-Type Receiver Construction," Philip Hatfield, W9GFS, tells about his use of plug-in subassemblies.

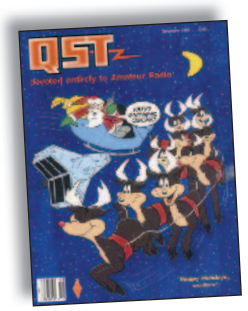
■ John Troster, W6ISQ, spins the tale of a ham and his wife discussing the possibility of Christmas gifts, in "The Red Polka Dot Paralyzer."

■ "The Two-Way Power Supply," by Arthur Hahn, WA2RMA, shows us how the simple addition of one SPDT switch can change the voltage output of a simple power supply between two voltages (in a 2:1 ratio).

■ Lew McCoy, W1ICP, comes up with a single gadget that serves as "A Combination Band Checker, Field-Strength Meter, and Monimatch."

■ Louis Breyfogle, WØMOX, tells us how to get "Top Efficiency at 144 Mc. with 4250Bs."

December 1986



■ N2EST's cover cartoon shows Santa saying "Happy Birthday, OSCAR," as he and his reindeer fly through the winter's night. (It was 25 years ago that Amateur Radio entered the space age, courtesy of OSCAR I.)

■ The editorial reminds of what has happened during "A Quarter-Century in Space."

■ Continuing on the same subject, Jan King, W3GEY; Vern Riportella,WA2LQQ; and Ralph Wallio, WØRPK, present "OSCAR at 25: The Amateur Space Program Comes of Age."

■ Michael Masterson, KA2HZA, describes three small single-band transmitters for 80, 490, and 30 meters, in his amusingly titled article, "Three Fine Mice — MOuSeFET CW Transmitters." You can build them and see how they run….

■ Wayne Overbeck, N6NB, tells about "A Universal Grid-Locator Program for Your Personal Computer."

■ Fred Williams presents "Digital Signal Processing — A Modern Audio Filter."

■ Andrew Tripp, KA1JGG, describes the "ARRL Museum and Visitors' Center," now being planned.

■ "The Slipup," by Bruce Vaughan, NR5Q, tells the tale of an old-timer and his special Christmas gift.

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

SEPTEMBER 2011

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**.

460
KT2D
444
KD8EBY
388
AC6C
340
WE2G
325
KA2ZNZ
295
K8RDN
282
WB9YBI
276
K8OLY
275
W2MTA
NX8A
267
KT5SR
255
N9VC
WB9JSR
246
K2DYB
238
KB2ETO
228
WB8RCR
215
K2HAT
205
NX9K
201
N4HUB
200
KB5SDU
KB2KOJ
W7FQQ
195
W9WXN
194
WD8USA
190
WA3EZN
186
N4HUB
182
N9WLW
180
N7EIE
K7BFL
179
KJ4KZ
WA2BSS
WB9FHP
177
N8OSL

175
WA9LFO
N8IO
173
W4LHQ
171
W9YQ
170
W5DY
167
W4AVD
166
KA4IZN
165
KE5HYW
160
KGØGG
155
K4JGA
150
K6HTN
WD9FLJ
KD1LE
KK3F
145
K9LGU
W4TTO
142
KC2PSN
KC2SYM
140
K4GK
K4BEH
KB2RTZ
KB2BAA
K2TV
KB8RCR
KD8GLN
WK4P
138
W4LHQ
137
WM2C
135
N7CM
K5CRX
KF5IOU
W3YVQ
134
KA8ZGY
130
K6JT
KW1U
K2ABX
K4IWW
127
NC4VA
126
N2RDB
125
NN7H

WØLAW
K7EAJ
124
KK5NU
123
KC2SFU
120
WS6P
KJ6RJA
KA4FZI
AG9G
KCØM
WI2G
AA2SV
N2JBA
WB8HHZ
W8UL
WA5LOU
WB8WKQ
W4DNA
118
WX4RON
117
W2DWR
115
WA4UJC
W8DJG
113
K6FRG
110
W7QM
KE4CB
KC5OZT
N1IQI
N1LKJ
K7BDU
K4BG
W7GB
N9MN
N7XG
N7YSS
KB1RGQ
KB1NMO
K4JUU
W2EAG
109
AE5VY
107
WX4ON
105
KØVTT
K1EIC
102
WØSJS
NA9L
100
AL7N
W6WW
WØCLS
NØMEA
KD7ZUP
NC3F
N5OUJ

N5EEO
K4SCL
KA8IAF
N8CJS
WD8Q
WG8Z
WB8SIQ
KI4AAN
NR2F
NU8K
KT4YA
WB6UZX
N3SW
W3TWV
AA3SB
WB4FDT
KC2YDT
K8VFZ
W8QZ
W8CPG
99
W3CB
98
AD4BL
97
K5MC
N7IE
95
NW8E
94
KE8BP
92
KD8KWG
91
NA7G
90
N3KB
N2WKT
WB4BIK
W8MAL
N8DD
N4ELI
W2GQJ
KA1G
KJ4HGH
W8IM
KZ8Q
K3IN
KB3LNM
N3ZOC
W9MBT
KM2CMJ
KD8LZB
N5ASU
KD8CYK
88
KE5YTA
KK7DEB
85
KC5MMH
N2VC
KJ7NO

84
N2DW
83
KB9KEG
82
KC4PZA
81
W5GKH
N2VQA
80
K7MQF
KØDEU
NIØI
NØMHJ
NØUKO
KFØXO
N1TF
N2YJZ
KB8HJJ
K8KV
KK7TN
N2RTF
79
KG4GPJ
78
KB5PGY
WB8YYS
W4BKG
77
W4AVD
76
KK1X
WDØGUF
KC2UMX
75
K1HEJ
KD8AAD
74
K5AXW
73
KO6V
W1PLK
N8SY
KBØDTI
72
KC4PZA
K2GW
N2RQ
71
KC2YFN
70
WØAYN
KØDLK
NØDUW
NØDUX
WØFUI
N3NTV
KØPTK
KØRXC
WAØVKC
KCØZDA
W2KFV

The following stations qualified for PSHR in previous months, but were not recognized in this column: (Aug) N2VC 108. (July) WA9LFO 200.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, CO, CT, EB, EMA, ENY, EPA, EWA, GA, IL, IN, KS, LA, MDC, MI, MN, MS, NC, NFL, NLI, NNY, NTX, OK, OR, ORG, SD, SFL, SJV, SNJ, STX, TN, UT, WCF, WI, WNY, WPA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: IA, IN, GA, KS, MDC, MI, MN, MO, MT, NNJ, NLI, NM, NTX, OH, OK, SFL, STX, SD, SV, TN, WTX, WV, WWA.

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.

KK3F 3205, WB9FHP 1974, N1IQI 1383, KW1U 996, KZ8Q 982, K7BDU 872, WB9JSR 690, K6HTN 627, W8UL 620, WD8Q 617, NX9K 602, N4ELI 590, WB5NKC 593, N9VC 579, W7QM 532, WB8WKQ 525, KA4FZI 502. QST

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

KC1AG **Shipp**, William S., Suffield, CT
WA1AOH **Motroni**, Robert L., Raynham, MA
WB1BQJ **Soares**, Francis C. Jr, Southwest Harbor, ME
WB1CQS **Helder**, Gerard, Beverly Hills, FL
W1CR **Staiano**, Andrew J., Rockland, ME
K1DRL **Lawson**, David R., Portland, ME
N1DYO **Kierstead**, William L., Peabody, MA
W1EGX **Scott**, George A., East Hampton, CT
♦W1GC **Brill**, Robert F., West Haven, CT
AA1HI **Collins**, Charles R., Columbus, OH
WA1HLT **Oliver**, Harold H., Deatsville, AL
AA1IF **MacInnes**, Craig S., Cranston, RI
WA1KZT **Chaddock**, Earle H., Provincetown, MA
♦W1MH **Harris**, Michael G., Pound Ridge, NY
W1NRY **Potts**, Thomas J. Jr, Rowley, MA
KC1RI **Nelson**, Judith A., Johnston, RI
W1RVW **Pedersen**, Rollin E., Springfield, MA
K2AN **Clark**, Howard C., Wyoming, NY
K2GIE **Spiro**, Stanley J., Hewlett, NY
K2GTW **Butler**, Townsend E. Jr, Pine Beach, NJ
♦W2GU **Wiehe**, Will, Tarrytown, NY
NV2J **Volino**, Anthony, Elmira, NY
N2LEX **Wright**, John A., Schenectady, NY
WA2LUQ **Boyack**, Richard W., New Bern, NC
WB2NOG **Cooke**, Warren D., Baldwinsville, NY
ex-W2QBO **Greatbatch**, Wilson, Williamsville, NY
WI2O **Sterling**, Joel J., Roslyn, NY
W2SE **Fulton**, Wilbur D., Westminster, MD
NY2U **Eddy**, William J., Troy, NY
K3CCF **Hollock**, Michael R., Shickshinny, PA
K3CZH **Kramer**, Walter W., Allentown, PA
N3DML **Litterer**, David, Philadelphia, PA
W3HRF **Hansen**, Wilbur O., Erie, PA
N3IVJ **McKinley**, James S., Rockville, MD
WB3J **Hopkins**, James B., Clayton, DE
W3JEF **Lynch**, Jeffrey D., Greece, NY
♦W3OGY **Riling**, Raymond J., Philadelphia, PA
♦W3PEO **Yugovich**, Paul J., Verona, PA
W3WDL **Leddick**, Walter D., Philadelphia, PA
N3WPN **Navarre**, Dorothy A., Wescosville, PA
K4ANJ **Williams**, John O., Ocala, FL
K4CFT **Peery**, Richard N., Roanoke, VA
KJ4COR **Beckworth**, Tommy Sr, Gray, GA
ex-KA4CPM **Bryant**, William, Calhoun, GA
♦KF4DCS **Rice**, Barton S. III, Asheville, NC
WB4DUN **Stroud**, William M., Lakeland, FL
KA4DXE **Bryant**, Andrew J., Cayce, SC
KQ4IC **Hatfield**, Theodore R., Marietta, GA
WB4JLZ **Smith**, Sammy C., Ooltewah, TN
♦K4MRZ **Weller**, Charles S. Sr, Morehead City, NC
WA4NUY **Woodward**, Harold A., Augusta, KY
♦W4OBQ **Blunk**, Billye B., Warner Robins, GA
N4ORN **Fivey**, Robert J., Fort Lauderdale, FL
KD4SDU **Kockentiet**, Kenneth L. Jr, Lizella, GA
N4TVJ **Anderson**, Fay T., Harpersville, AL
WA4YDO **Anderson**, Thomas A., Mayfield, KY
KJ4YMT **Hudson**, Michael D., Collinsville, AL
N4ZJS **Pagats**, Stephen Jr, Kissimmee, FL
K5ANG **Story**, Raymond "Pete" L., Irving, TX
W5DEZ **Sanchez**, John T., Tijeras, NM
KB5DPM **Taylor**, Alice F., Elmendorf, TX
N5EY **Turner**, Thomas W. Jr, Sugar Land, TX
W5FXS **French**, Homer L., Lumberton, TX
W5HMN **Nolen**, Herbert M., Georgetown, TX
WA5MJU **Scroggin**, James V. Jr, McKinney, TX
WB5MSH **Park**, Bob, Weatherford, TX
WA5RSI **Cloud**, Jack G., Freeport, TX
ex-W5RUO **Holmack**, George A. "Tex," Jr, El Paso, TX
KA5WGV **Adams**, Alfred C., Cypress, TX
KF5XT **Songy**, Raphael N. Jr, Kenner, LA
KF5ZN **Newcomb**, Aaron E., Heber Springs, AR
K5ZUZ **Galligan**, Leslie E., Council Bluffs, IA
WB6BZZ **McGowen**, Virginia L., Fresno, CA
N6FW **Wyatt**, Frank T., Scotts Valley, CA
KD6ISJ **Machado**, John B., Montecito, CA
KB6ISK **Davis**, Charles N., Norwalk, CA
K6LHI **Miller**, Edward R., Reno, NV
KF6LIZ **Jameson**, Christine, Palos Verdes Estates, CA
W6MSD **De Armond**, David S., San Jose, CA
♦W6NAA **Zeiter**, Robert F., Glendora, CA
KB6NAN **Killeen**, Dianna R., Pescadero, CA
WA6PVC **Fraser**, Edward J., Pescadero, CA
KB6QZI **Miranda**, Armida H., Covina, CA
K6RDQ **Langer**, Oliver G., Tyrone, PA
WA6SWT **Bruce**, Charles M., Keller, TX
K6TLN **Nicholson**, James L., Paradise, CA
KE6URZ **Olliff**, James W., Glendale, CA
KG6ZAW **Tepper**, Samuel, Rancho Palos Verdes, CA
KC7BAL **Hughes**, Tressie L., Puyallup, WA
♦KL7DWE **Hildreth**, Joseph K., Anchorage, AK
ex-W7EBF **Reinke**, Edward E., Tacoma, WA
W7HQO **Faris**, James M., Spokane Valley, WA
N7HSO **Robinson**, Terry J., Baker City, OR
K7OLU **Parker**, Donald R., Blythe, CA
W7PK **Gilmore**, Thomas E. Jr, Dash Point, WA
♦K7QCA **Edens**, Jim B., Prescott, AZ
KA7TDC **Kilgore**, Dan I., Spokane, WA
KD7UWB **Murray**, Ted E., Las Vegas, NV
♦W7ZMD **Sues**, Nicholas Wesley, Phoenix, AZ
WB8DYV **Buben**, Kenneth M., Flushing, MI
N8HUE **Foreman**, Larry L., Galena, OH
NS8I **Oldaker**, Paul N., Irvine, KY
KB8JLW **Whistler**, John L., Clarkston, MI
W8NBH **Vitucki**, Roger A., Scottville, MI
W8OQT **Kail**, William F., Aurora, OH
N8PGC **Shiltz**, Patricia A., South Amherst, OH
N8PYE **Hulce**, Diane E., Marietta, OH
WB8WZR **Chastain**, Thurman C., Dayton, OH
KC9AHY **Hurless**, William E. Jr, Chippewa Falls, WI
WA9CEA **Campie**, Don, Mansfield, MO
W9DML **Leininger**, David M., Mahomet, IL
WA9KHT **Siegert**, Manfred J., Roselle, IL
♦K9KLO **Hunsaker**, Keith G., Woodstock, GA
WB9LHU **Knodle**, Scott, Rockford, IL
KB9NVS **Oliver**, Gerald A., Terre Haute, IN
KC9ZD **Jackson**, Jesse H., Owensville, IN
NØCKT **Conrad**, Edward A., Belton, MO
WØCWW **Schafer**, Edmund G., White, SD
KBØEOC **Jacobson**, Warren "Jake" E., Clear Lake, IA
KØEXA **Vainio**, John M., Whitewood, SD
♦WØFCL **Hays**, David L., Great Bend, KS
WAØFHW **Landwehr**, Eugene H., St Louis, MO
KBØGU **Bigham**, Gene A., Lees Summit, MO
♦WØHOM **Stucky**, N. Paul, North Newton, KS
WØJJL **Monk**, James L., Norfolk, NE
WØKGV **Rodeffer**, Charles "Gene" E., Tempe, AZ
WAØLUD **Allen**, Thomas J., Burlington, IA
KCØPIK **Taylor**, Dean A., Holt, MO
NØQEU **Fisher**, Phyllis F., Conway Springs, KS
WAØRJU **Zwicki**, Donald R., Washington, IA
NØRKO **Wege**, Beverly S., Wheaton, KS
KCØSHJ **Clemens**, Jacqueline R., Eveleth, MN
WØVUN **Silverstein**, Jack, West Des Moines, IA
♦WAØWOB **Skaptason**, J. S., "Skip," Overland Park, KS
NKØY **St John**, Donald R., Fort Collins, CO
KAØYPS **Nicholls**, Richard K., Saint Paul, MN
SM7MPM **Glückman**, Tore, Falsterbo, Sweden

♦ 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

Silent Keys Administrator ♦ sk@arrl.org

Strays

***QST* congratulates…**

♢Andrew Barber, N7ASB, of Williams Field High School, Gilbert, Arizona, who has been recognized as a 2011-2012 Discus Award winner for his achievements in the areas of Academics, Work and Other Achievements.

♢John Kovac, KØVAC, of Hermosa Beach, California, on the publication of his Amateur Radio-themed novel, *Blackbird*. It is available on **Amazon.com**.

♢Don Keith, N4KC, of Pelham, Alabama, whose new book, *Undersea Warrior*, tells the story of a legendary WWII submarine skipper. The publisher is NAL/Caliber, an imprint of Penguin Group USA.

♢Dr Alex Hills, AL7K, whose book, *Wi-Fi and the Bad Boys of Radio*, tells the story of how a teenage ham went on to build the world's first Wi-Fi network. See **www.dralexhills.com**.

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	*Sessions*	*Accreditation Date*
Sammy Neal, N5AF	512	20-Nov-84
Harry Nordman, ABØSX	478	9-Jan-02
David Bartholomew, ABØTO	383	22-Mar-02
Kevin Naumann, NØWDG	378	17-Nov-02
Franz Laugermann, K3FL	373	1-Dec-91
Royal Metzger, K6VIP	368	29-Apr-85
Karen Schultz, KAØCDN	367	6-Sep-84
John Moore III, KK5NU	353	21-May-95
John Mackey Jr, KSØF	338	1-Oct-90
Paul Maytan, AC2T	328	6-Sep-84
William Martin, AIØD	327	1-Nov-84
Victor Madera, KP4PQ	318	1-Mar-92
Gerald Grant, WB5R	309	4-Jan-85

Examiner	*Sessions*	*Accreditation Date*
John Hauner, KØIH	302	11-Jan-85
Richard Morgan, KD7GIE	302	11-Aug-00
David Fanelli, KB5PGY	300	1-Oct-91
Jeanette Nordman, ABØYX	297	21-Aug-03
Daniel Calabrese, AA2HX	292	1-Nov-91
Michael Faucheaux, N5KBW	283	15-Jul-96
Gary Mangels, AD6CD	282	30-Jul-97
Robert Hamilton, NØRN	280	19-May-87
Frankie Mangels, AD6DC	278	14-Oct-97
Adolph Chris Koehler, K5VCR	278	29-Sep-95
Loren Hole, KK7M	278	6-Sep-84
Roy Johnson, N1IKM	275	24-Jul-95

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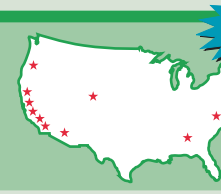

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Handles 10 sq.ft. at 50mph
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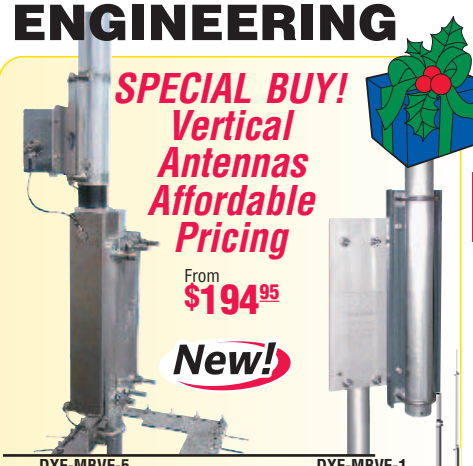

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- Stainless steel element clamps

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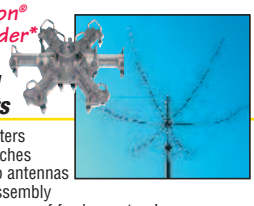

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- 5 bands 20 through 10 meters
- Low noise results—approaches performance of closed loop antennas
- Pre-slit fiberglass—easy assembly
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New!

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Heavy Duty, Highest Quality—Cut to Your Length

DXE-CW8-HD 2 #16, 6 #18 AWG ..per ft. **$0.89**
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Genuine Synthetic Textiles Brand Antenna Rope

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- Flat tinned copper with ring terminals and heat shrink tubing

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West Mountain Radio RIGblaster

Connect the RIGblaster Advantage to your radio's microphone connector and a computer USB connector and you'll have access to over 100 existing and future ham radio sound card software programs! You'll also get over 20 exciting modes that your radio could not otherwise operate. The Advantage also links your computer software and radio using CAT, CI-V or DB9 interfaces cables.

WES-RB/AD/CUSB	RIGblaster Advantage	$199.00
WES-CIV/CBL	RIG Control Cable for CI-V (Icom & TenTec) Radios	$9.95
WES-CAT/6D/CBL	CAT Cable for Yaesu FT-736/747/767/990/1000	$13.95
WES-CATMINI/CBL	CAT Cable for Yaesu FT-100/100D/817/857/897	$13.95
WES-58214-1295	Rigblaster DB9F to DB9F Serial Cable	$9.95

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COM-BAL-11130E

Better Performance,
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COMTEK W2FMI Series Baluns

Design inspired by Jerry Sevick W2FMI and perfected by DX Engineering's balun R&D department.

- High voltage compensating capacitors for unequalled low SWR—a DX Engineering innovation!
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- Special coated toroid core handles close coupling without extra stress
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- Typical insertion loss: less than 0.2 dB
- Power handling: 3 kW continuous to 5 kW+ intermittent depending on model
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COM-BAL-11130T	3 kW, top studs/wingnuts	$49.95

1:1 Coax/Single Core

COM-BAL-11150E	5 kW, side eyebolts	$49.95
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COM-BAL-11150S	5 kW, side studs/wingnuts	$49.95
COM-BAL-11150T	5 kW, top studs/wingnuts	$49.95

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COM-BAL-11140T	5 kW, top studs/wingnuts	$69.95
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1:1 Coax/Dual Core

COM-BAL-11150DS	5 kW, side studs/wingnuts	$69.95
COM-BAL-11150DT	5 kW, top studs/wingnuts	$69.95

4:1 Dual Wire/Single Core

COM-BAL-41130E	3 kW, side eyebolts	$59.95
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COM-BAL-41130T	3 kW, top studs/wingnuts	$59.95
COM-BAL-41130S	3 kW, side studs/wingnuts	$59.95

4:1 Dual Wire/Dual Core

COM-BAL-41150T	5 kW, top studs/wingnuts	$89.95
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Contact DX Engineering Customer Support for recommendations for your application.

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Great for wire antenna spreaders or insulated stacking frames! Build your favorite antenna design!

50 Ft. Telescoping Fiberglass Tubing Mast Kit

- Tubing custom made just for DX Engineering
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- Neutral light gray color
- Uses DX Engineering Stainless Steel Element Clamps to assemble slit lengths

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- 1/8" nominal wall x 8 feet long

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DXE-FT1000-8	1.000" O.D.	$9.95
DXE-FT1250-8	1.250" O.D.	$11.95
DXE-FT1500-8	1.500" O.D.	$18.95
DXE-FT1750-8	1.750" O.D.	$20.95
DXE-FT2000-8	2.000" O.D.	$25.95

Tubing with One End Slit

DXE-FT0750-8S	0.750" O.D.	$13.95
DXE-FT1000-8S	1.000" O.D.	$14.95
DXE-FT1250-8S	1.250" O.D.	$16.95
DXE-FT1500-8S	1.500" O.D.	$23.95
DXE-FT1750-8S	1.750" O.D.	$25.95
DXE-FT2000-8S	2.000" O.D.	$30.95

PSK-31 SSTV WSJT

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- *RF Sensing*
- *Tunes Automatically*
- *No Interface Cables Needed*

NEW! AT-200ProII

The AT-200ProII now includes LEDs to show antenna position and if the tuner is in bypass. A two position antenna switch stores 2000 memories per switch. Handles up to 250 watts SSB or CW on 1.8 to 30 MHz and 100 watts on 54 MHz. Rugged and easy to read LED bar graphs simultaneously show RF power and SWR. Includes a six foot DC power cable.

Suggested Price $259.99

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 six foot DC power cable.

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.

Suggested Price $129.99.

We have a tuner that will work for you!

We make tuners that will work with any transceiver. Don't know which one is right for you? Give us a call or see the Tuner Comparison Chart on our web site for more selection help!

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***

AT-600Pro

The AT-600Pro handles up to 600 watts SSB and CW, 300 on RTTY (1.8 – 30 MHz), and 250 watts on 54 MHz. Matches 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 it with longwires, random wires and antennas fed with ladder line just by adding a balun. Two antenna ports with a front-panel indicator, and separate memory banks for each antenna. LED bar-graph meters shows 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 six foot DC power cable.

Suggested Price $359.99

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 six foot DC power cable.***Suggested Price $159.99***

LDG Electronics, Inc. 1445 Parran Road, St. Leonard, MD 20685 ***Phone 410-586-2177 • Fax 410-586-8475***

The #1 Line of Autotuners!

Designed to handle the higher power of the Tokyo Hi Power HL-45B.

NEW! Z-817H

The ultimate autotuner for QRP radios including the Yaesu FT-817(D) with addition of the Tokyo High Power HL-45B. Interfaces to the CAT port (ACC) on the back of the radio with the provided cable. One button push on the tuner and the Z-817H takes care of the rest. Will also function as a general purpose antenna tuner with other QRP radios or QRP radios with up to 75 watt HF amps. Powered by four AA internal Alkaline batteries (not included). 2000 memories cover 160 through 6 meters.

Suggested Price $159.99

- ***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 six foot DC power cable.

Suggested Price $229.99

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 six foot DC power cable.

Suggested Price $599

IT-100

Matched in size to the IC-7000 and IC-706, for either manual or automatic tunes, and status LEDs. 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. For your Icom radio that is AH3 or AH-4 compatible. ***Suggested Price $179.99***

YT-100

For Yaesu FT-857, FT-897 and FT-100 (and all D models) an integrated tuner, powered by the interface. Press the tune button on the tuner, and everything else happens automatically. ***Suggested Price $199.99***

KT-100

For AT-300 compatible Kenwood transceivers (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. ***Suggested Price $199.99***

YT-450

Designed for Yaesu's newest 100 watt radios. Interfaces directly with the Yaesu FT-450 and FT-950 radios. Press the tune button on the tuner and the rest happens automatically. 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! Seamless connection to a PC.

Suggested Price $249.99

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!

Suggested Price $249.99

FREE!

RBA-1:1 Balun or RU-4:1 Unun

When You Buy A S9V 43', 31' or 18' Multiband Antenna

Purchase an S9V 43', 31' or 18' antenna and fill out the included form. Mail it to LDG Electronics, and we will send you either a 200 watt balun or unun, your choice!

Antennas!

S9V 43' $199.99

80-6 meters *Fixed Operation*

The S9V 43' is a high-performance lightweight telescoping fiberglass vertical. The best value in high-performance 'tall' verticals!

S9V 31' $99.99

40-6 meters *Fixed or Portable Operation*

S9V 18' $49.99

20-6 meters *Fixed or Portable Operation*

The S9V 31' and 18' are tapered, ultra-lightweight fiberglass vertical antennas. Friction-locking sections and high-tech polymer tube rings allow the antenna to be quickly and safely deployed in practically any environment without tools!

S9RP $39.99

Aluminum Radial Plate

Includes 20 sets of stainless steel nuts & bolts

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LDG

hy-gain® ROTATORS

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

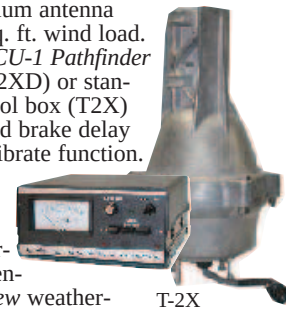
HAM-IV

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.**

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.**

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.**

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!*

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.**

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.**

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

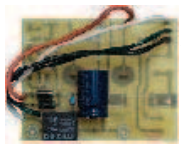
DCU-1 $749.95

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.

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.



RBD-5 $29.95

NEW! Automatic Rotator Brake Delay

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

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TH-K2AT 2M FM HT

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TH-F6A Triband FM HT

- TX: 144-148, 222-225, 430-450 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

TH-D72A 2M/440 FM HT Built-in GPS

- TX: 144-148, 430-450 • RX: 118-174, 320-524 MHz
- Power: 5/0.5/0.05W • Memories: 1000 • USB Port
- 1200/9600 bps packet TNC • SkyCommand and APRS
- Stand-alone Digipeater • Built-in High Performance GPS
- GPS logging - stores up to 5,000 points of track data
- Echolink® ready • KISS mode protocol

TM-281A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 65W • Memories: 200

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 G6 & EchoLink® ready

AvMap G6 APRS GPS Navigator

- Intergrates best with the TM-D710A and TH-D72A but also works well with the TM-D700A and TH-D7A
- Bright non-glare 4.8 inch color touchscreen
- Preloaded NAVTEQ street maps of N. America
- Text to Speech instructions • Lane Assistant
- Full bi-directional RS-232 APRS communication

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
- The optional RC-D710 can replace the TM-V71A control panel to enable all the features of the TM-D710A.

TS-480HX 200W HF/6M Mobile

- 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 100W with auto antenna tuner.

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
- Full/semi break-in CW • 10 Hz Dual VFO Display
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Intl *QST*	$62	$118	$167	Monthly *QST* via air mail for international members
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Family	$8	$16	$24	Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member.

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Source Code: QST 12/2011

FT-250R 2M FM HT

• TX: 144-148 MHz • RX: 136-174 MHz
• Power: 5/2/0.5W • Memories: 209

FT-60R 2M/440 FM HT

• TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 MHz (cell blkd) • Power: 5/2/0.5W • Memories: 1000

VX-8GR 2M/440 FM HT Built-in GPS

• TX: 144-148, 430-450 MHz • RX: 108-999 MHz (cell blocked) • Memories: 1200+ • Power: 5/2.5/1/0.05W
• GPS unit and antenna is built-in for APRS® data

FT-2900R 2M FM Mobile

• TX: 144-148 MHz • RX: 136-174 MHz
• Power: 75/30/10/5W • Memories: 221

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-8800R 2M/440 FM Mobile

• TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 MHz (cell blkd) • Power: 50/20/10/5W (2M), 35/20/10/5W (440 MHz) • Memories: 1000
• Crossband repeat • YSK-8900 included!

FT-8900R Quad-Band FM Mobile

• Same as FT-8800R but TX: 28-29.7, 50-54, 144-148, 430-450 MHz and RX: 28-29.7, 50-54, 108-180, 320-480, 700-985 MHz (cell blkd) • Power: 50/20/10/5W (10/6/2M), 35/20/10/5W (440 MHz) • YSK-8900 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 20W using optional FNB-78 13.2V @ 4.5 Ah NiMH battery packs

FT-950 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

FT-2000 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 MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-2000D RF output is 200W, PS 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" also 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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Radios by YAESU

IC-V82 2M FM HT

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 7W • Memories: 200
- D-Star upgradable with optional UT-118

IC-T70A 2M/440 FM Handheld

- TX: 144-148, 430-450 MHz • RX: 136-174, 400-479 MHz
- Power: 5/2.5/0.5W • Memories: 302
- Comes with NiMH Battery and Wall Charger

IC-92AD 2M/440 D-Star & FM HT

- TX: 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd)
- Power: 5/2.5/0.5/0.1W • Duel RX
- Optional HM-175GPS Speaker Mic adds GPS capabilities

ID-880H 2M/440 FM Analog & D-Star Digital Dual Bander Mobile

- TX: 144-148, 430-450 MHz • RX: 118-173.995, 230-549.995, 810-999.99 MHz (cell blkd) • Power: 50/15/5W
- Memories: 1052

IC-2820H 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • RX: 118-549.95, 810-999.990 MHz (cell blkd) • Power: 50/15/5W
- Packet ready (9600 BPS) • Upgradable D-Star DV (digital voice) & GPS capabilities w/optional UT-123

IC-7000 Multimode HF/VHF/UHF Mobile

- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 2-100W (HF/6M), 2-50W (2M), 2-35W (440)
- Memories: 503 • 41 band-widths with sharp or soft filter shape • RMK-7000 included!

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 & Audio In/Out

IC-7410 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- 15kHz 1st IF Filter and optional 3kHz & 6kHz filters to protect against strong unwanted adjacent signals
- Much faster DSP unit compared to the IC-746PRO
- Automatic antenna tuner • USB connector for PC control

IC-7600 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

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
- Real time spectrum scope

IC-9100 HF/6/2M/440 MHz All Mode

- TX: HF/6/2M/440 MHz • RX: 0.03-60, 136-174, 420-480 MHz • Optional 1.2 GHz, 1-10W Operation
- Power: 2-100W HF/6/2M & 2-75W 440 MHz
- Memories: 297 • Optional D-Star Board • Auto Tuner
- Optional 3 kHz & 6 kHz Roofing Filters (first IF)
- USB Port for CI-V Format PC Control & Audio In/Out

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MFJ-259B *World's* most popular Antenna Analyzer is super easy-to-use!

MFJ-259B
$289.95

The MFJ-259B is the world's most popular Antenna Analyzer and the easiest to use! Just select a band and mode. Set frequency. Your measurements are instantly displayed!

Handheld Antenna Lab

Owning the MFJ-259B is like having an entire antenna lab in the palm of your hand!

Measure SWR quickly or make sophisticated measurements such as Return Loss, Reflection Coefficient, Resonance, Complex Impedance (R+jX), Impedance Magnitude (Z) plus Phase in degrees. Covers 1.8 to 170 MHz -- no gaps.

Coax Analyzer

Determine coax cable velocity factor (Vf), loss in dB, coax length, distance to open or short plus detect wrong coax impedance.

Frequency Counter

Measure frequency of external signals using the separate BNC counter input.

Signal Generator

Use as a signal source 1.8-170 MHz with digital dial accuracy for testing and alignment.

Inductance and Capacitance

Measure Inductance (uH) and Capacitance (pF) at RF frequencies not at audio frequencies used by most L/C meters.

Digital and *Analog* Meters

A high-contrast backlit LCD gives precision readings and *two* side-by-side *analog meters* make antenna adjustments intuitive.

Smooth, Stable Tuning

Velvet-smooth reduction drive tuning and precision *air-variable capacitor* makes setting frequency easy and stable.

Battery Saver & More

Battery-saver, low-battery warning, battery voltage meter and charger are all built in. Use ten Alkaline, NiCad or NiMH AA batteries (not included) or 110 VAC with MFJ-1312D, $15.95. 4Wx6$^{3}/_{4}$Hx2D inches.

Here's What You Can Do

Find true antenna resonant frequency
Tune *antenna quickly for minimum SWR*
Match complex loads to your feedline
Adjust *mobile whips without stressing finals*
Determine safe 2:1-SWR operating windows
Adjust *tuners without generating QRM*
Find exact location of shorts and opens
Cut *stubs and phasing lines accurately*
Check cable for loss and contamination
Find *value of unknown coils and caps*
Test RF transformers and baluns
Troubleshoot *filters and networks*
Find self-resonance and relative Q
Check *patterns and compare gain*
MFJ-259B does all this and more!

MFJ Analyzer Accessories

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Special foam-filled fabric cushions blows, deflects scrapes and protects knobs and meters from harm. **MFJ-39C, $24.95.** Like MFJ-29C, but for MFJ-269.

MFJ-66, $24.95. Plug-in coils turns any MFJ Antenna Analyzer into a sensitive and accurate *band switched* dip meter. 2 coils.

MFJ-92AA10, $29.95. Ten MFJ *SuperCell*™ Ni-MH AA rechargeable batteries.

MFJ-99B, $88.90. ***Save $7!*** MFJ-259B Deluxe Accessory Pack: MFJ-29C Pouch, 10 Ni-MH batteries, dip coils, AC adapter. **MFJ-98B, $88.90.** Like MFJ-99B but for MFJ-269.

MFJ-99, $60.85. ***Save $5!*** Like MFJ-99B, less batteries, for MFJ-259B. **MFJ-98, $60.85.** Like MFJ-99 but for MFJ-269.

MFJ-99C, $40.90. ***Save $5!*** AC Adapter and 10 Ni-MH batteries for MFJ-259B/269.

MFJ-917, $29.95. Current balun lets you make balanced line antenna measurements on HF with your MFJ Analyzer. **MFJ-7702, $3.95.** MFJ-917 to MFJ Analyzer adapter.

MFJ-731, $99.95. Tunable RF filter allows accurate Antenna Analyzer measurements in presence of strong RF fields. 1.8-30 MHz.

MFJ-5510, $9.95. Cigarette lighter cord.

MFJ-269 ...1.8-170 MHz and 415-470 MHz plus 12-bit A/D!

The MFJ-269 does everything the MFJ-259B does - and much more!

Expanded Frequency Coverage

MFJ-269 adds UHF coverage from 415 to 470 MHz -- right up into the commercial band. With it, you can adjust UHF dipoles, verticals, Yagis, quads and repeater collinear arrays with ease -- plus construct accurate phasing harnesses and timed cables. Also use it as a signal source to check UHF duplexers, diplexers, IMD filters and antenna patterns.

Much Better Accuracy

New *12-bit* A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads *parallel* equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

MFJ-269
$389.95

CoaxCalculator™

Lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and coax loss with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Logarithmic Bar Graph

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Uses instrumentation grade N-connector to ensure minimum mismatch on all frequencies. Includes N to SO-239 adapter.

MFJ-269*PRO*™ Analyzer

MFJ-269PRO
$419.95

Like MFJ-269, but has extended commercial frequency coverage in UHF range ***(430 to 520 MHz)*** and *ruggedized* cabinet that protects LCD display, knobs, meters and connectors from damage in the field/lab.

MFJ-266 ...Wide range 1.5-185 MHz and 300-490 MHz!

New!

MFJ-266
$349.95

The compact MFJ-266 covers HF (1.5-65 MHz) in 6 bands, plus VHF (85-185 MHz) and UHF (300-490 MHz).

In *Antenna Analyzer* mode, you get Frequency, SWR, Complex Impedance (R+jX), and Impedance Magnitude (Z) *all displayed simultaneously* on a high-contrast backlighted LCD (SWR only on UHF).

In *Frequency-Counter* mode, the MFJ-266 functions as a 500-MHz counter with up to 100 Hz resolution and measures relative field strength of a signal and its frequency and can be used for tracking measurement interference.

MFJ-266 also functions as a 10 dBm signal source with digital-frequency readout. It can also measure inductance and capacitance at RF frequencies.

Features include solid-state band switching and electronic varicap tuning with a smooth 10:1 lockable vernier tuning drive.

Use eight AA *alkaline* batteries or 110 VAC with MFJ-1312D, $15.95. Includes N-to-SO-239 adapter. 3$^{3}/_{4}$Wx6$^{1}/_{2}$Hx2$^{3}/_{4}$D inches. 1.3 lbs.

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MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New *TrueActive*™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.

MFJ-989D $389.95

New *high voltage current balun* lets you tune balanced lines at high power with no worries.

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob ***Differential-T***™

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D ***compact*** kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$ x$10^{7}/_{8}$ in.

MFJ-969 300W ***Roller Inductor*** Tuner

MFJ-969 $219.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E ***deluxe*** 300 Watt Tuner

MFJ-949E $179.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3^{1}/_{2}$Hx$10^{5}/_{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E ***super value*** Tuner

MFJ-941E $139.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M ***mobile*** Tuner

MFJ-945E $129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 ***portable/QRP*** Tuner

MFJ-971 $119.95

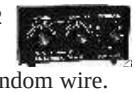
Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

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-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

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.

MFJ-1778 **$44.95**

200W...Weather-sealed

for Remote/Outdoor/Marine

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

MFJ-926B **$279.95**

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

MFJ-927 **$259.95**

Free MFJ Catalog

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Revisit the Ham Radio of Yesteryear!

Journey back to the classical era of Amateur Radio

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50 Years of Amateur Radio Innovation —Transmitters, Receivers and Transceivers: 1930-1980

This guided tour of more than 400 legendary radios from 1930 to 1980 depicts the "golden age" of American radio technology. Restored and gorgeously photographed by **Joe Veras**, **K9OCO**, each photo includes a brief description, the year the radio was introduced and its selling price at the time. Many of the radios are quite rare, sure to bring memories of equipment you may have owned yourself!

ARRL Order No. 0228..... **Only $39.95***

50 Years of Amateur Radio Innovation Supplementary CD

This CD-ROM includes over 800 fascinating images, photographed by Joe Veras, K9OCO, not featured in the book **50 Years of Amateur Radio Innovation** (sold separately). It contains a complete listing of the manufacturers and legendary equipment displayed. Many of the radios are quite rare. Others are sure to bring fond memories of equipment you may have owned yourself.

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- Transmitters
- Receivers
- Transceivers
- Amplifiers
- Tuners
- Keyers
- Other Accessories

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ARRL's Vintage Radio

Decades of Amateur Radio History from the pages of *QST*

This collection of *QST* articles covers the lure of vintage Amateur Radio gear between 1977 and 2003—equipment, techniques, personal experiences, restoration and more!

ARRL Order No. 9183..... **Only $19.95***

Gil Cartoon Book

A Collection of Classic Cartoons from *QST*

This publication is more than a book of illustrations. It is a tribute to a legend, a man who created more than 1500 pieces of art for *QST*. The work of **Philip "Gil" Gildersleeve**, **W1CJD**, became a tradition. In tribute to this talented, creative and devoted artist and ham, the ARRL presents in this book a reprint of a portion of the best of his work (this first edition was originally introduced in 1986).

ARRL Order No. 0364....**Only $15.95***

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QST 12/2011

MFJ 160-6 Meter Antenna

Self-supporting 43 foot vertical -- no guy wires required . . . 1500 Watts . . . exceptional performance . . . low-profile . . . includes base mount and legal limit balun . . . assembles in an hour . . .

MFJ-2990
$359.95

New!

Operate all bands 160 through 6 Meters at full 1500 Watt with this self-supporting, 43 feet high performance vertical! It assembles in less than an hour and its low-profile blends in with the sky and trees -- you can barely see it from across the street.

Exceptional Performance

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!

A wide-range automatic or manual antenna tuner *at your rig* easily matches this antenna for all bands 160-6 Meters. There's no physical tuning adjustments on the antenna -- you simply put it up!

An optimized balun design allows *direct coax feed* with negligible coax loss (typically less than ½ 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 thick walled tubing bottom section makes it incredibly strong -- it'll stay up!

Weighs just 20 pounds -- you can easily put it up by yourself because its corrosion resistant *6063 aircraft aluminum* tubing and stainless steel construction make it light *and* super-strong.

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

This very low-profile antenna is perfect for stealth operation in antenna restricted areas. Hide it behind trees, fences, buildings, bushes. Use it as a flagpole. Telescope it down during the day. Put it up at night and take it down in the morning before the neighbors even notice!

Quick and easy installation makes it great for DXpeditions, field day and other portable and temporary operations.

MFJ *Automatic* Tuners

MFJ-998
$699.95

For legal limit 1500 Watt SSB/CW amplifiers. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, amp bypass, matches 12-1600 Ohms, 1.8-30 MHz.

MFJ-993B
$259.95

Dual power range -- 300 Watt range matches 6-1600 Ohms. 150 Watt/6-3200 Ohms. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, 1.8-30 MHz.

MFJ *Manual* Tuners

MFJ-989D
$389.95

1500 Watts SSB/CW, 1.8-30 MHz. Active peak-reading Cross-Needle SWR/Wattmeter, balun, dummy load, antenna switch, aircore roller inductor.

MFJ-949E
$179.95

World's most popular tuner! 300 Watts, 1.8-30 MHz. Peak/Average Cross-Needle SWR/Wattmeter, 8 pos. antenna switch, dummy load, 1kV capacitors.

Window Feedthru

MFJ-4602
$69.95

Bring 3 coaxes, balanced line, random wire, ground thru window. Connectors mounted on *stainless steel* panel. ¾" thick *pressure-treated* weather-proof wood.

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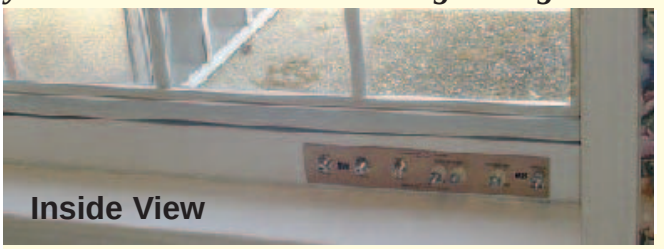
MFJ Weather-Proof *Window Feedthrough Panels*

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!



MFJ Weather-Proof *Window Feedthrough Panels* mount in your window sill. Lets you bring all your antenna connections into your hamshack *without* drilling holes through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. Connectors are mounted on inside/outside stainless steel plates and attached to a 4 foot long, 3½ inch high, ¾ inch thick *pressure-treated* wood panel. Has excellent insulating properties. Weather-sealed with a heavy coat of long-lasting white outdoor enamel paint. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Includes window locking rod.

Inside/outside stainless steel plates ground all coax shields. Stainless steel ground post brings ground in.

MFJ-4603 Universal Window Feedthru Panel

MFJ-4603 $89.95

Four 50 Ohm *Teflon*(R) SO-239 coax connectors lets you feed HF/VHF/UHF antennas at full legal power limit.

A 50 Ohm *Teflon*(R) coax *N-connector* lets you use any antenna up to 11 GHz, including 450 MHz, UHF, satellite, moon bounce and 2.4/5.8 GHz Wi-Fi antennas.

A 75 Ohm, 1 GHz *F-connector* makes it easy to bring in television, Satellite, HD, cable TV and FM radio signals.

A pair of high-voltage *ceramic feedthru insulators* lets you bring in 450/300 Ohm balanced lines directly to your antenna tuner.

Has random/longwire antenna *ceramic feedthru insulator*.

***5-way** binding posts* lets you supply 50 Volts/15 Amps DC/AC power to your outside antenna tuners/relays/switches.

Stainless ground post brings in ground connection, bonds inside/outside stainless steel panels together and drains away static charges.

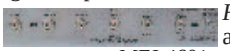
MFJ's exclusive *Adaptive Cable Feedthru*™ lets you bring in rotator/antenna switch cable, etc. without removing connectors (up to 1¼X1⅝ in). Adapts to virtually *any* cable size. Seals out rain, snow, adverse weather.

3 Coax, Balanced Line, Random Wire

Best Seller! 3 *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Separate high voltage *ceramic* feed-thru insulators for balanced lines and longwire/random wire, Stainless steel ground post.

MFJ-4602 $69.95

6 Coax



6 high quality *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Stainless steel ground post. Full 1500 Watt legal limit.

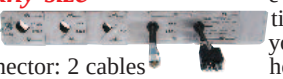
MFJ-4601 $59.95

4 Balanced Line, 2 Coax

4 pairs of high-voltage *ceramic* feed-thru insulators for balanced lines and 2 coax connectors.

New! MFJ-4600 $79.95

5 Cables, any-size



5 *Adaptive Cable Feedthrus*™. Pass any cable with connector: 2 cables with large connectors up to 1¼x1⅝ inches and 3 cables with UHF/N size coax connectors. Seals out weather.

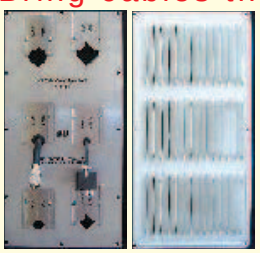
MFJ-4604 $99.95

All-Purpose FeedThru/CableThru™

***Stacks** MFJ-4603 **and** MFJ-4604!* Gives you every possible cable connection you'll ever need through your window without drilling holes in wall -- including UHF, N and F coax connectors, balanced lines, random wire, ground, DC/AC power and cables of any size for rotators, antenna switches, etc.

MFJ-4605 $159.95 New!

Bring cables thru eave of your house



MFJ-4616 shown with standard full-size vent (not included) it replaces. For *6 Cables* $26.95

MFJ-4613 shown with standard half-size vent (not included) it replaces. For *3 Cables* $14.95

Replace your standard air vents on the eave/sofitt of your house with these *MFJ AdaptiveCable™ Air Vent Plates* and…

Bring in coax, rotator, antenna switch, power cables, etc. *with connectors* up to 1¼x1⅝ inches!

Sliding plates and rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

AdaptiveCable™ Wall Plates

MFJ-4614 *For 4 Cables* $34.95

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls *without removing connectors* (up to 1¼x1⅝ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes *stainless steel* plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.

MFJ-4612 *For 2 Cables* $24.95

MFJ-4611 *For 1 Cable* $14.95

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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-461 $89.95

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.

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, tone, volume knobs, and tune, semi/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-407D $79.95

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. 4½x2⅝x5½ in.

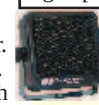
MFJ-422DX, $99.95.

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!

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these highly reliable 15, 22, 30, 40 or 75 Amp MFJ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies! MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

22 Amp Continuous

Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

MFJ-4125 **$84.95**

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

MFJ-4125P, $94.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

MFJ-4225MV **$99.95**

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

40 Amp Continuous

***MightyLite*™**

MFJ-4245MV **$149.95**

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

70 Amp Continuous

MFJ-4275MV **$249.95**

75 Amps maximum and 70 Amps continuously. Adjustable voltage 4.0-16 VDC. Short circuit, overload and over-temperature protection, 10.5 lbs. 9¾Wx5½Hx9½D". Great for Ameritron's ALS-500M mobile amplifier!

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a* single *DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

MFJ-1118 **$84.95**

MFJ-1116 **$59.95**

MFJ-1112 **$44.95**

MFJ-1117 **$64.95**

MFJ-1128 **$104.95**

MFJ-1126 **$84.95**

MFJ-1129 **$114.95**

MFJ-1124 **$64.95**

Versatile 5-Way Binding Posts

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

***All PowerPoles*™**

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. Extra contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles®, extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles*™ *AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles®*, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles®* & fuses -- *no extra cost.*

15 Amp Continuous

MFJ-4115 **$59.95**

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

30 Amps Continuous

Linear with 19.2 lb.Transformer

MFJ-4035MV **$149.95**

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

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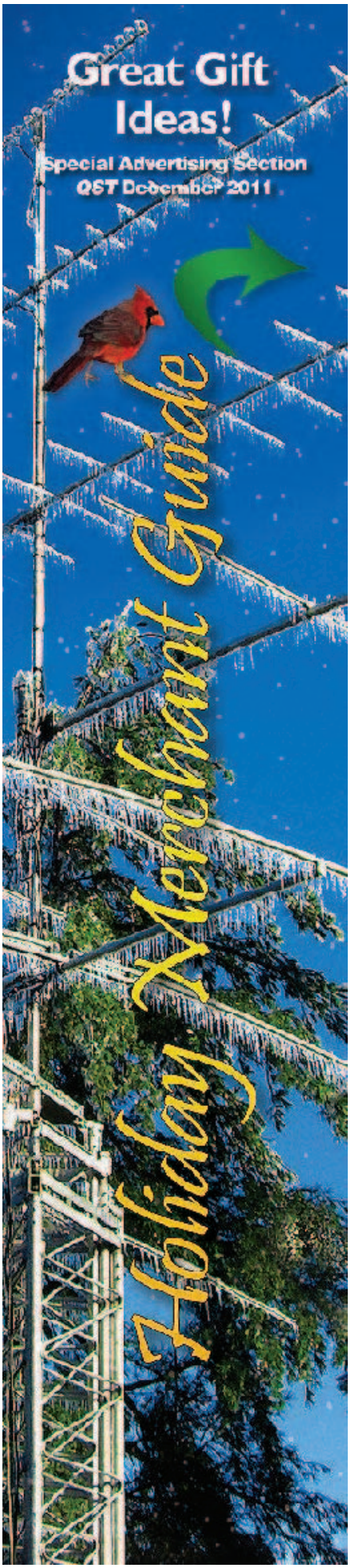

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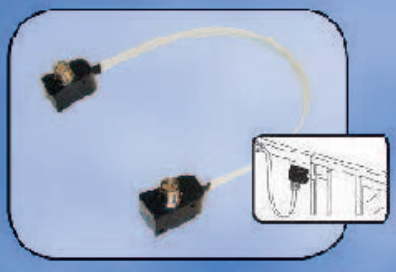

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Window Gap Adapter!

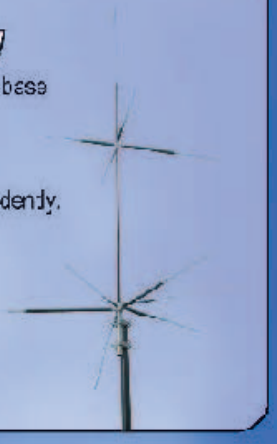
Max Power: HF 100W PEP
VHF: 60W FM
UHF: 40W FM
900MHz - 1.3GHz: 10W
VSWR: <500MHz 1.3:1
>500MHz 1.5:1
Impedance: 50Ohm
Length: 15.75"
Conn: 24k Gold Plated SO-239s

MALDOL HVU-8
Ultra-Compact 8 Band Antenna!

Unique ground radial system rotates 180 degrees around the base if building side mounting is required.

Max Power: HF 200W SSB/100W FM
6M - 70cm: 150W FM
TX: 80/40/20/15/10/6/2M/70cm
Impedance: 50 Ohm
Length: 8'6" approx
Weight: 5 lbs 7oz
Conn: SO-239
Max Wind Speed: 92MPH

Each band tunes independently.
Approx 2:1 band-width:
80M 22kHz
40M 52kHz
20M 52kHz
15M 134kHz
10M 260kHz



COMET CHA-250B
Broadband HF Vertical!

3.5 - 57MHz with SWR of 1.6:1 or less!

- *NO ANTENNA TUNER NEEDED*
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- *NO TRAPS*
- *NO COILS*

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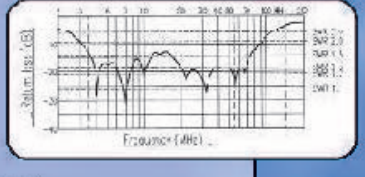
Max Power: 250W SSB/125W FM
TX: 3.5– 57MHz
RX: 2.0– 90MHz
Impedance: 50Ohm
Length: 23'5"
Weight: 7lbs 1 oz
Conn: SO-239
Max Wind Speed: 67MPH



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Assemble in either a "V" or horizontal ("H") configuration.
CBL-2500 2.5kW balun and heavy duty hardware included.

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SWR: Less than 1.5:1 at center frequency
Rotation Radius: "V" 12' 6" "H" 17' 5"
Length: "V" 24' 5" "H" 33' 10"
Weight: 11 lbs 14 ozs
Wind load: 3.01 sq feet
Max Wind Speed: 67 MPH

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2012 ARRL Calendar

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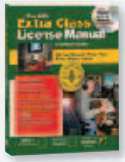

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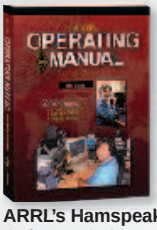

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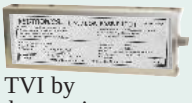

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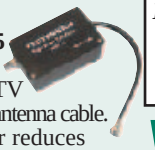

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$329

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Power Curve -- typical output power in Watts

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	--	--
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Watts In	.25	.5	3	5	8	10	15	25	35	50

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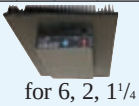

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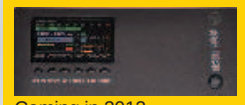

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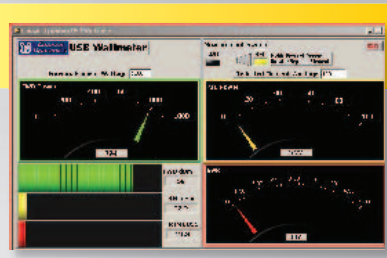

The model 81041 is a portable, self-contained RF Wattmeter that features a studio-quality analog meter and USB interface. Numeric, analog meter, and bar graph data are simultaneously displayed on a PC's monitor. The functions indicated are Forward and Reflected Power, both in Watts and dBm, plus an automatic calculation of SWR and Return Loss.

The internal dual socket line section and forward / reflected switch gives the user the ability to display either forward or reflected on the analog meter, while both are displayed simultaneously on the PC.

Our use of a rugged shock mounted meter with a mirror-backed scale along with superior taut band technology, provides reliable and accurate readings of either forward or reflected power on the meter.

The 81041 uses standard elements to detect average RF power from 100 mW to 10 kW and from 2 MHz to 2.3 GHz. Software and a detachable six foot USB cable are included for a simple installation on any PC using Windows® Vista, 2000, XP or NT. No additional cables, AC or DC power adapters, batteries or custom remote sensors are required.

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• Automatically Calculates SWR and Return Loss • Internal Dual 7/8" Line Section •
• Quick Match Connectors • Uses Standard Plug-In Elements • Two Year Limited Warranty •

Dual Socket Wattmeter
Model 81021

The Model 81021 Average Reading Dual Socket Wattmeter allows you to measure both Forward and Reflected RF power with the flip of a switch. The Model 81021 uses standard Elements to accurately detect average RF power from 100mw to 10 kW over a frequency range of 0.45 MHz to 2.3 GHz.

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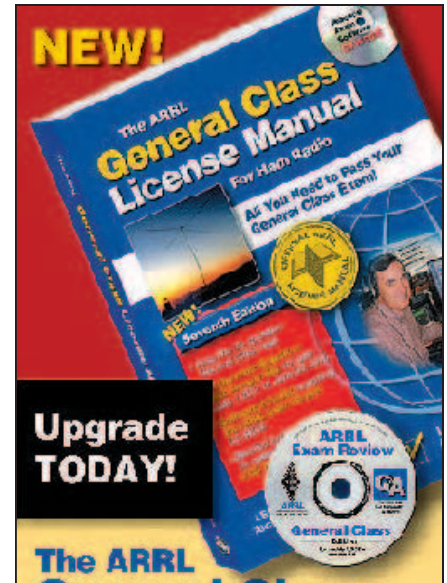

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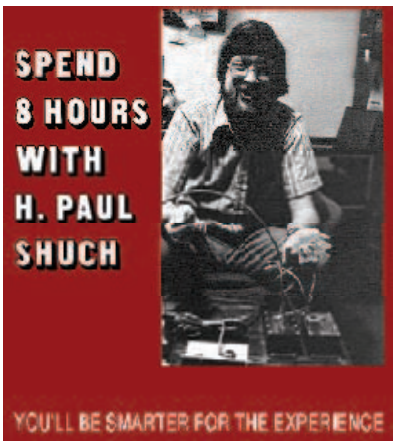

H.Paul Shuch *would be* 'the first' to create a *reproducible* 4GHz receiver (on sold to International Crystal/ICM), using the proceeds to purchase his first airplane. The 'Godfather' of SETI League has lived the 'good ham life'.

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There is more to 'amateur radio' than the DXCC list and nobody explores it as well as Coop!

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Visit the Icom website for details of the contest and rules.

The party runs from:

Nov 11 (Fri.) 00:00 (UTC) to Nov 13 (Sun.) 24:00 (UTC)

For more details visit:

http://www.icom.co.jp/d-starparty2011/

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ID-880H
/ IC-E880

IC-2820H
/ IC-E2820
(with UT-123 D-STAR UNIT)

ID-1

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D-STAR stands for Digital Smart Technology for Amateur Radio.

*Due to compliance and varying time requirements in different countries, awarding an ID-31A/ID-31E as a prize will be subject to a completed type approval of this radio in the country where the winner resides. If the required type approval is not completed by March 31, 2012, for whatever reason, an alternative prize will be awarded to that winner, as a replacement.

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Saturday December 10, 2011, 10AM – 4PM

Events:

Prizes this year:
Kenwood TS590S, $500 in Icom Gift Certificates, $350 in Yaesu Gift Certificates, and more!
Must be present to win prizes

Manufactures scheduled to attend this year:

Alinco, Ameritron, Comet, Cushcraft, GRE, Heil, Hustler, Hygain, Icom, Internet Labs, Jetstream, Kenwood, M2, MFJ, Mirage, Vectronics and Yaesu.

Take Your Ham Radio Test
8:00 AM FREE testing!

Presentations:

11 am – Noon:
Lets Adjust Your Audio! *By* ***Bob Heil***

Noon – 1 pm:
6 Meters, Perfect for Cancer Recovery *By* ***Dennis Motschenbacher*** *(Yaesu)*

1pm—4pm:
Beginning, Intermediate and Advanced Dstar
By ***Pat Marcy*** *(Icom),*
John Davis *(dstarinfo.com)*
Robin Cutshaw *(DVDongle & DVAPDongle)*
IC80AD w/GPS mic will be given away at the end of the Dstar presentation

Signalink

Once again Tigertronics sets the pace in digital operating! The new SignaLinkTM USB sound card - radio interface combines the legendary performance of our SL-1+ with a state of the art built-in low-noise USB Sound Card. This ground breaking innovation delivers optimum performance while eliminating the need to attach to your computer's existing sound card. Convenient front panel controls and simplified installation make this one of the most user-friendly interfaces on the market, continuing to show that the Tigertronics SignaLink is truly the "Ultimate sound card interface"!

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4 Position Coax Switch

DELTA4B New precision machined switch shaft and quadrant rotating mechanism for more ·accurate and stable switching performance. ·Higher strength, lower resistance silver bearing solder. ·Increased housing durability and abrasion resistance with powder coat finish. ·New brass ARC-PLUG (tm) housing for improved gas tube positioning. ·Same low loss micro-strip cavity design, positive detent switching, master ·antenna ground function, front panel removable ARC-PLUG (tm) surge protection ·module and excellent HF thru UHF performance as in previous DELTA switches.

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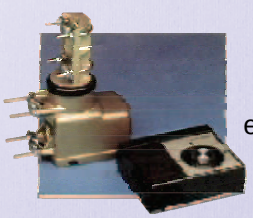

NTE Rotor

U105 Precision cut steel gears hardened for long service life, Rugged, one-piece cast aluminum housing designed for greatest strength in high stress areas, Large bearing surfaces and strong, reinforced mast for lateral load support, Ball bearing provided for thrust (vertical) load, Completely automatic control; indicator accurately shows orientation of antenna, Control designed for smoother, quieter operation

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QST QuickStats

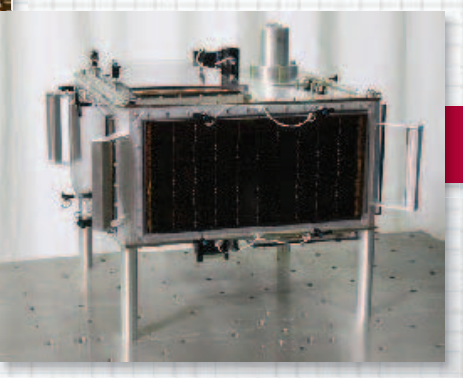
sta·tis·tics (st-tstks) n.
1. (used with a sing. verb) The mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.
2. (used with a pl. verb) Numerical data.

www.arrl.org/QuickStats

Online QuickStats Poll Results for September 11 through October 6.
Get on the web and vote today at **www.arrl.org/quickstats**!

What is the farthest you are willing to drive for a hamfest?

More than 100 miles: 43%
50 to 100 miles: 33%
25 to 49 miles: 19%
1 to 24 miles: 5%

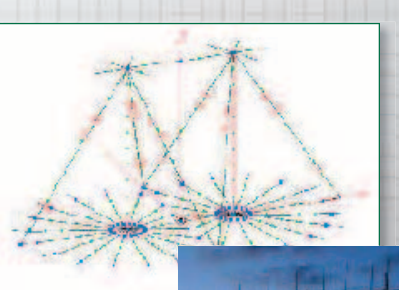


Have you monitored signals from the new ARISSat-1 satellite?

Yes: 13%
No: 83%
I've never heard of ARISSat-1: 4%

What is the longest time you've ever spent at your radio (including brief breaks)?

More than 24 hours: 18%
12 to 24 hours: 27%
6 to 11 hours: 25%
1 to 5 hours: 28%
Less than 1 hour: 2%



Do you analyze your antenna designs with modeling software before you build the antennas?

Yes: 19%
No: 68%
I've never heard of antenna modeling software: 1%
I don't build my own antennas: 12%

Make your gift to ARRL by December 31 and we'll send you a $10 Donor Rewards Certificate!

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Project #351

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- **The ARRL General Fund**
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For more information, contact:

Mary M. Hobart, K1MMH
Chief Development Officer
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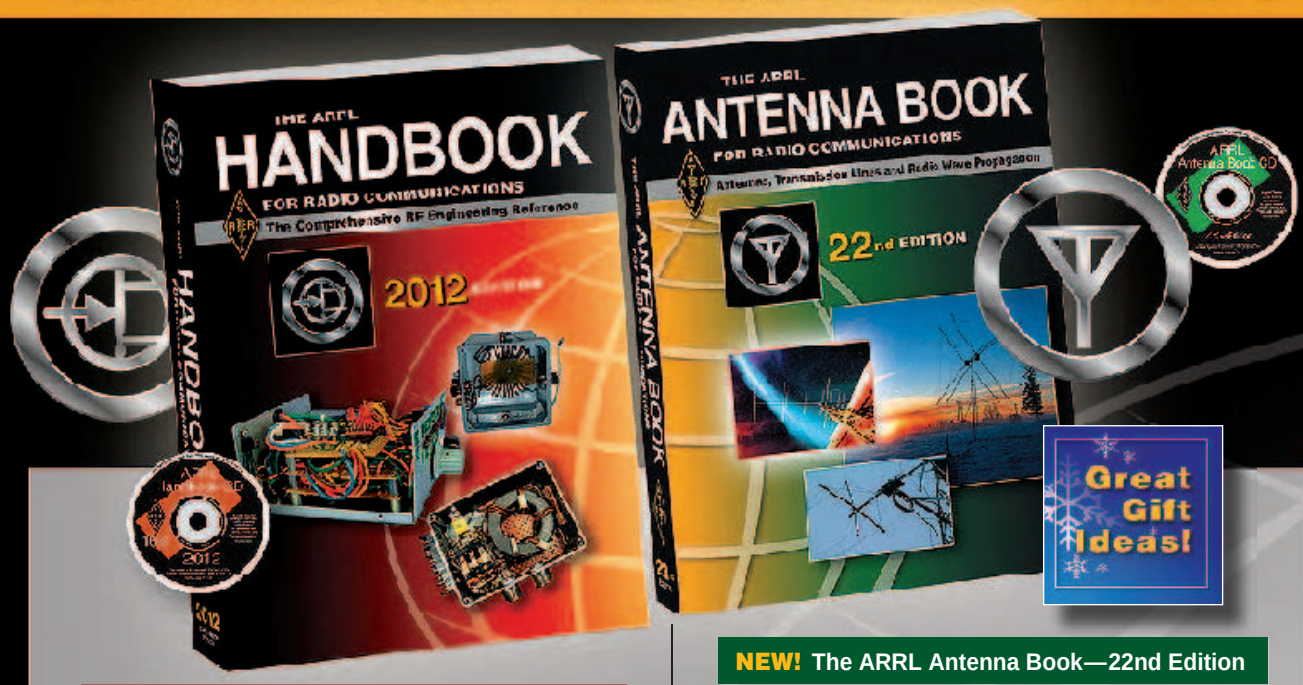

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- New projects, including **High-Power RF Samplers**, **RF Current Meter**, and a **Two-Tone Audio Oscillator** from the ARRL Lab
- Updated **Elsie**™ filter design software

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- New designs, including a **C-pole ground-independent HF antenna**, a **40 meter Moxon beam**, and **half-element designs for Yagis**
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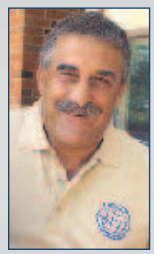

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V.S.W.R: <1.5
Length (M): 0.995
Weight(g): 260
Connecter: PL-259

Surman Max2 Antenna
Frequency (MHz): 144/430
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.92
Weight(g): 135
Connecter: PL-259

WP-115
Frequency(MHz): 144/430 MHz
Z (ohms): 50
Max Power W: 150
Length (mm): 400
Weight (g): 40
Connector: SMA Male or SMA Female

S-77BH
Frequency (MHz): 144/430
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.7
Weight(g): 135
Connecter: PL-259

KY-66
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Back Door
Mount
Color: Chrome
Weight: 168g

UL-01
Hatchback Door
Trunk Lid Mount
Color: Available in Black or Chrome
Weight: 270

S-850B
Frequency (MHz): 144/430
Max.Power(W): 150
V.S.W.R: <1.5
Length (M): 1.04
Weight(g): 350
Connecter: PL-259

SC-ECH
Mobile AntennaCable
Color: Black
Cable: RG-58
Length: 5M

SM-X1
Frequency (MHz): 146/440
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.5
Weight(g): 125
Connecter: PL-259

K-505
Magnetic Base
Coaxial Cable: RG-316 4M
Diameter: 120MM

UT-108 SMA
Male or Female
Frequency (MHz): 144/430
Max.Power(W): 100
V.S.W.R: <1.5
Length (M): 0.46
Weight(g): 246
Connecter: SMA

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Small External
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Cord: 4M
Plug: 3.5mm mono
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QST Ham Ads on the Web – Updated Monthly!
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