QST

DEVOTED ENTIRELY TO AMATEUR RADIO

June 2010 WWW.ARRL.ORG

ARRL Field Day and the June VHF QSO Party

Unparalleled Outdoor Fun!

QST reviews:

Inside:

2010 ARRL FIELD DAY — EXPLORE the WORLD!

$4.99 US $6.99 can.

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Official Journal of ARRL the national association for AMATEUR RADIO™

JUNE 2010 QST Vol 94 No 6

★ Field Day Essentials ★

Bug Spray. They find you. Always do. Just how remains a mystery. Zap 'em.

Doughnuts. One of the major food groups. Some might say the most major.

Stout Tent. Note: not for sleeping. Up! UP!! It's 3:30 hours, only 13.5 more to go!

Camp Lantern. Never works right. Good for attracting bugs. See "Bug spray".

Spatula. Metal only, with a comfortable grip. Note: non-stick is for sissies.

Midnight Chili. And plenty of it. Protein helps keep those vocal cords spry during the wee hours.

Coffee. The cheaper, the better. Battery acid in a can. Latte? For sissies.

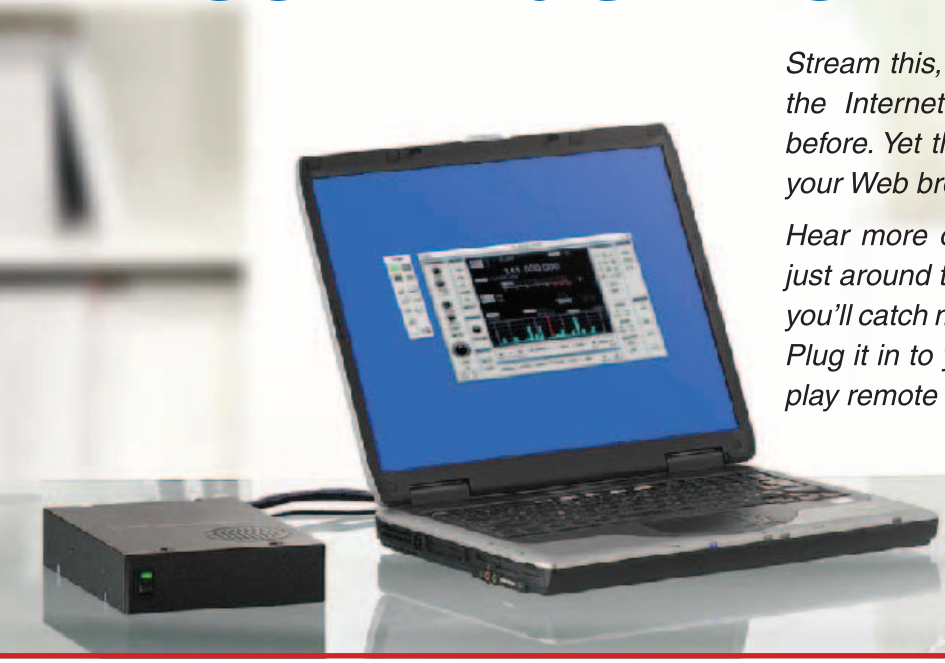
Pillow. Preferably, the good one off the living room couch. Beats a rolled-up coat any day.

IC-7200. HF + 6M. Compact and powerful. Perfect for the rugged outdoors. Or a city park.

Summer's here. Get out there.
For the love of Ham Radio.

Brought to you as a public service announcement by ICOM

Icom Black Box Receivers



Stream this, app that: From offbeat to everyday, the Internet has opened up radio like never before. Yet there's still plenty of active spectrum your Web browser can't cover!

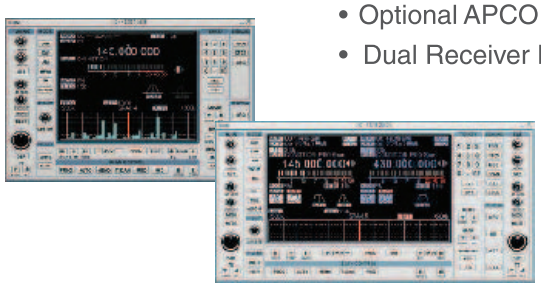
Hear more of what's going on. No matter if it's just around the corner or clear across the globe, you'll catch more with an Icom black box receiver. Plug it in to your PC or control it with the plug 'n play remote control head. Don't miss the action!

IC-R1500

- 0.1 ~ 3299.99 MHz*
- AM, FM, WFM, CW, SSB
- Single Receiver
- Mobile or PC Controlled

IC-R2500

- 0.1 ~ 3299.99 MHz* (Main)
  50 to 1300 MHz* (Sub)
- AM, FM, WFM, CW, SSB
- Dual Wideband Receiver
- Mobile or PC Controlled
- Optional APCO 25 and D-STAR
- Dual Receiver Diversity



Bundled with RadioCom 4.5

Icom's black box radios now come bundled with Bonito's RadioCom 4.5. With Radio-Control, Equalizer-Filter-Analyzer, AudioRecorder, RTTY-, CW-, WFAX-, SatFax, SSTV-, PSK- and Time Signal Decoding, Frequency- and Schedule-Manager, as well as SatTracking...(whew), you have EVERYTHING in one program.

Bonito

THE WORLD IN YOUR HAND:

IC-R20

ADVANCED OPS
0.150 – 3304.0 MHz*

IC-R6

SHIRT-POCKET COMPACT
0.1 – 1300.0 MHz*

Visit your authorized Icom dealer today!
Free literature: 425.450.6088
www.icomamerica.com

ICOM®

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

hy-gain ROTATORS

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

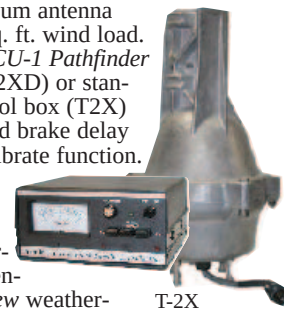
HAM-IV

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

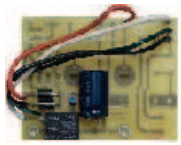
DCU-1 $749.95

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.

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

hy-gain

Antennas, Rotators & Towers

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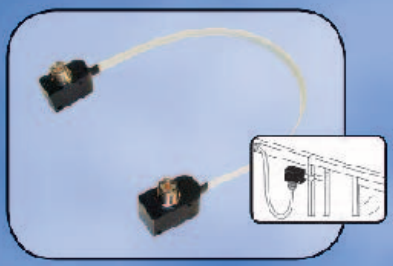
Life is a JOURNEY, Enjoy the ride!



NEW! COMET CTC-50M
Window Gap Adapter!

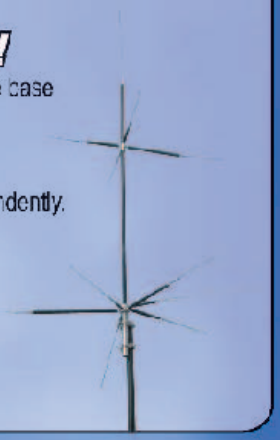
Max Power: HF 100W PEP
VHF: 60W FM
UHF: 40W FM
900MHz - 1.3GHz: 10W
VSWR: <500MHz 1.3:1
>500MHz 1.5:1
Impedance: 50Ohm
Length: 15.75"
Conn: 24k Gold Plated SO-239s

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: 5lbs 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



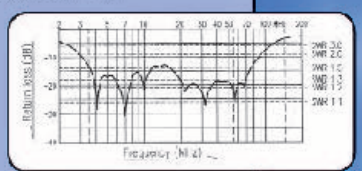
COMET CHA-250B
Broadband HF Vertical!

3.5 - 57MHz with SWR of 1.6:1 or less!

- *NO ANTENNA TUNER NEEDED*
- *NO RADIALS*
- *NO TRAPS*
- *NO COILS*

If you suffer in an antenna restricted area, must manage with space restrictions or you simply want to operate incognito you will be forced to make significant antenna compromises. The CHA-250B makes the most of the situation, making operating HF easy!

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



NEW! COMET H-422
40/20/15/10M compact, broadband, rotatable dipole!

Assemble in either a "V" or horizontal ("H") configuration
CBL-2500 2.5kW balun and heavy duty hardware included.

Max Power: 1000W SSB / 500W FM
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: 3.0 sq feet
Max Wind Speed: 67 MPH

COMET and Maldol

For a complete catalog, call or visit your local dealer.

Or contact: NCG Company, 15036 Sierra Bonita Lane, Chino, CA 91710
909-393-8133 • 800-962-2611 • FAX 909-393-6136 • www.natcommgroup.com

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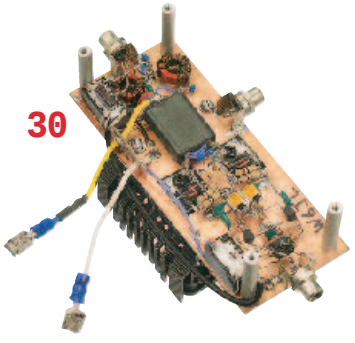
Technical



News and Features

Radiosport

Our Cover
Who wants to stay indoors on a beautiful June weekend when you can be outside with friends, food and radios — all in the name of fun on Field Day? June is also the month of the ARRL VHF QSO Party, another good reason to hop in the car and set up an outdoor operating location. Bruce Kripton, KG6IYN, of San Diego, California, took to the open road for that event in 2009 and headed 4900 feet above sea level to Mt Los Pinos in San Diego County. Using 10 radios, 16 antennas and even a dish for 10 GHz, Bruce set a Section record for his class and won the West Coast Regional class. Photo by Bruce Kripton, KG6IYN.

Departments

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

NEW

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

FTM-350R

*220 MHz 1W (USA Version only)

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

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

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

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

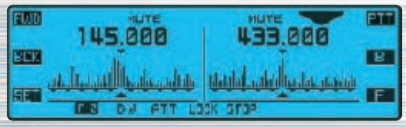
NEW Huge memory channel management capability! 500 Independent Memory channels + 9 Programmable Band Limit Memory Scan channels + 1 Rewritable Preferred channel for each L and R Band

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

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

Exclusive Built-in Barometric Pressure Sensor

Screen Example

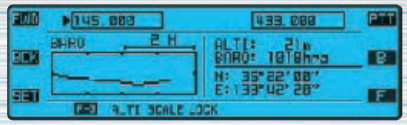


Dual Band (Spectrum Scope function)

Navigation (with GPS antenna unit attached)

Mono Band (Spectrum Scope function)

APRS®



Barometer

Timer

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

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http://www.vertexstandard.com

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

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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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10900 Walker Street Cypress, CA 90630 (714) 827-7600

Ride Cycle24 to the Top with Yaesu

The radio... FT DX 9000

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

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

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

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

HF/50 MHz Transceiver
FT DX 9000 Contest
Custom-Configurable Version
Two Pairs of Meters, plus LCD Window, VRF Input Preselector Filter, Three Key Jacks, and Dual Headphone Jacks, 50 V/12 A Internal Switching Regulator Power Supply

Display color (Umber or Light Blue) may be selected at the time of purchase. Modification from 200- to 400-Watt version not available.

Loaded with Leading-edge Performance Capabilities. . .
The First Triumph in the 2nd Generation of the FT DX 9000 Lineage:
The Powerful FT-2000!

Shown with after-market keyboard, and monitor (not supplied).
Optional Data Management Unit (DMU-2000)

HF/50 MHz Transceiver
FT-2000D
200 W Version (External Power Supply)

HF/50 MHz Transceiver
FT-2000
100 W Version (Internal Power Supply)

"The Best of the Best Just Got Better"

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

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

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Public Service

Advocacy

Education

Technology

Membership

‘It Seems to Us’

Our New Web Site

“On April 13 the ARRL presented a brand new face of Amateur Radio and our national organization to the world with the unveiling of our new Web site.”

Migrating from the old to the new hasn’t been easy. It’s one of the largest endeavors we have ever taken on at ARRL Headquarters. But it needed to be done, and now, finally, we can share it with you.

The ARRL is hardly a newcomer to the World Wide Web. In 1995 we were one of the first membership associations to embrace the Web as a means of communicating with our members and the general public. It was a natural fit for a technology-based organization. The ARRL Web site soon became a primary source of information about Amateur Radio. It has grown to include tens of thousands of pages and has continuously evolved as we have learned new and better ways of using the ever-expanding capabilities of the Internet.

A couple of years ago we realized that the Web site had outgrown its conceptual design and needed to be rethought. So, we asked our members what they would like to see in a new ARRL Web site, designed from the ground up using the latest Web tools. Then we set out to deliver it.

With Fathom, a Hartford design firm, we developed the top-level architecture of the site to reflect members’ interests and what they and others are looking for when they visit. We found a close correlation with the five pillars that grace the left-hand margin of this page: public service, advocacy, education, technology, and membership. Inviting amateurs to get on the air and to get involved in the ARRL as active volunteers and supporters are the goals of two of the top-level sections. And of course, we retained and improved the news and features that were the heart of the old home page as well as the online store.

While the ARRL is a member-centric organization, the Web site also must explain the ARRL and Amateur Radio to diverse audiences. One of our goals was to make our association and our avocation more accessible and understandable to prospective amateurs, government officials, community leaders, and friends and neighbors.

For the ARRL staff the most exciting part of the new site is what you don’t see: the tools that will help us keep it up to date, fresh, and continually growing in size and in the benefits that we can bring to our members. Generating the initial content for the new site was a lot of work, but it was also a lot of fun and gave us experience with the multi-faceted content management system provided by Fathom. While we expect the basic structure to stand the test of time (we don’t want to go through another top-to-bottom revision any time soon!) there is a lot we can do to tailor the site to your changing needs and interests.

One problem that is common to most large Web sites is that over time, the content becomes inaccurate, obsolete and stale. Our site is not immune, but staff members are empowered to manage the content in their areas of expertise on an ongoing basis.

As you explore the new site you will find that you can customize it to match your needs and interests in Amateur Radio. You may also find a few things that don’t work quite the way you expect, or that you can’t locate something that you know must be there someplace. If that happens, look for the “Having Trouble?” link near the bottom of most pages. This will take you to a contact form where you can ask questions or offer suggestions.

As the saying goes, if you like it, tell others; if you don’t, tell us. Your feedback will help us fix the glitches that inevitably creep into a project of this size and will improve the experience for everyone who visits the site in the future. And please be patient; with 156,000 members all navigating the learning curve at the same time, things will be a bit hectic for a while.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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Self-supporting -- no guys required . . . Remarkable DX performance -- low angle radiation, omnidirectional . . . Handles 1500 Watts . . . Low SWR . . . Automatic band switching . . . Aircraft quality aluminum tubing . . . Stainless steel hardware . . . Recessed SO-239 connector . . . Two year limited Warranty . . .

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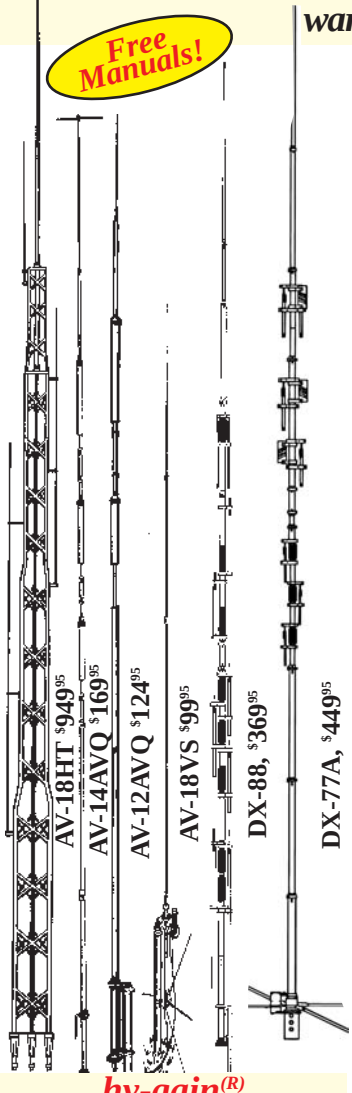

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They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

All handle 1500 Watts PEP SSB, have low SWR, automatic bandswitching (except AV-18VS) and include a 12-inch heavy duty mast support bracket (except AV-18HT).

Heavy duty, slotted, tapered swaged, aircraft quality aluminum tubing with full circumference compression clamps is used for radiators.

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

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

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

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

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	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$124.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$99.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 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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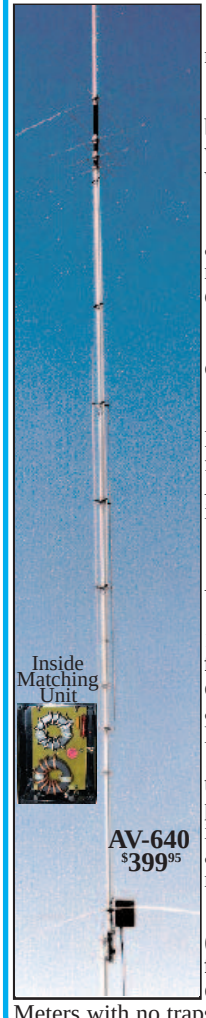
Hy-Gain's new PATRIOT HF verticals are the best built, best performing and best priced multiband verticals available today. For exciting DX make full use of your sunspot cycle with the PATRIOT's *low 17 degree angle* signal.



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High wind survival of 80 mph. Broadband matching unit made from all *Teflon*R insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

hy-gain*R *warranty

Two year limited warranty. All replacement parts in stock.

AV-640, $399.95. (6,10,12, 15,17,20,30,40 Meters). 25.5 ft., 17.5 lbs. The AV-640 uses quarter wave stubs on 6, 10, 12 and 17 meters and efficient end loading coil and capacity hats on 15, 20, 30 and 40 meters -- no traps. Resonators are placed in parallel not in series. End loading of the lower HF bands allows efficient operation with a manageable antenna height.

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

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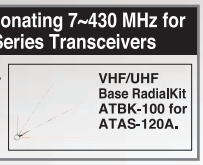

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

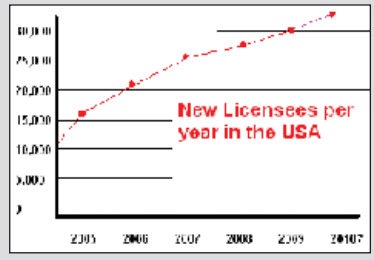
- The redesigned ARRL Web site, **www.arrl.org**, launched April 13.
- In late March, ARRL President Kay Craigie, N3KN, signed a new *Memorandum of Understanding (MoU)* with the American Red Cross at ARC National Headquarters in Washington, DC.
- In late March, a hiker in Great Smoky Mountains National Park summoned help on his 2 meter FM transceiver after he came upon an injured fellow hiker.
- Emergency Preparedness and Response Manager Mike Corey, W5MPC, has joined the ARRL HQ staff.
- In the wake of the powerful earthquake that struck Qinghai Province April 13, the Chinese Radio Sports Association requested that 7.050 and 7.060 MHz be kept clear to allow for emergency communications. Ham radio operators were involved with the rescue effort soon after the quake hit.
- The FCC has FCC released a *Notice of Proposed Rulemaking and Order (NPRM)* seeking to lower the fee for Amateur Radio vanity call signs.
- In early April, the FCC released a *Notice of Proposed Rule Making and Order* proposing to amend the rules with respect to Amateur Radio operations during government-sponsored emergency preparedness and disaster readiness drills and tests.
- The City of Manassas, Virginia has pulled the plug on its foray into broadband over powerline (BPL). Details are in Happenings, this issue.
- In March, the ARRL submitted comments and additional proposals to the FCC concerning the FCC's proposed changes to the way vanity and club call signs are assigned.
- In April, the ARRL filed comments on the FCC *Public Notice* concerning the ability of hospital employees who are amateur operators to participate in certain emergency drills.
- The ARRL has also filed a *Petition for Reconsideration* over the FCC's grant of a waiver for a non-amateur device that operates in the 70 cm band. Details are in this month's Happenings column.
- New editions of the *Ham Radio License Manual* and the *Tech Q&A*, covering exams that will be effective July 1, are available for sale.
- The first ARRL Rookie Roundup took place April 18.
- The winner of the *QST* Cover Plaque Award for March is Rudy Severns, N6LF, for his article "An Experimental Look at Ground Systems for HF Verticals."
- Registration remains open through May 23 for these online course sessions beginning June 4: Amateur Radio Emergency Communications Level 1, Antenna Design and Construction, RF Propagation, Analog Electronics, and Digital Electronics.

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

- Slowly, glacially slowly, the media world is learning that Amateur Radio is far from dying out. While we have known that for many years, the predictions and eulogies of a few misguided people maintained the image. If you remember the AOL blog from a few years ago in which Amateur Radio was listed as one of the things "disappearing from America," you might chuckle as it appears that AOL itself could be disappearing from the scene instead. The growth of Amateur Radio over the past years is now news. It may be "we told you so" in its tone, but it's still news.
- This was brought home to America by no less than NPR's show *All Things Considered* on April 5. "Only a few years ago, blogs listed ham radio alongside 35 mm film and VHS tape as technologies slated to disappear. They were wrong."

Very wrong indeed, as the numbers continue to climb due to several factors, the biggest one being the dedication of those ham volunteers who reach out and help new people. Last year there were over 30,000 new hams in the US and 2010 is already setting even higher records.



Among the hams heard in the NPR audio clips were St Louis Suburban Radio Club's Helen Schlarman, WØAK; , Stephen Schmitz, WØSJS; Jonathan Dunn, KDØHSL, and Steven Dunn, KDØHGH, along with ARRL's VEC Manager Maria Somma, AB1FM.

- Another problematic parroting we hear is that Amateur Radio is "old fashioned technology." Again, we know that is not exactly true. Hams, like car enthusiasts, like all kinds of equipment from vintage boat anchors to the latest software defined radios. But too many reporters keep painting us as antiques — that is, until something like the Lincoln Blackout happens.

On April 1, the City of Lincoln, Nebraska and 15 counties lost communication following a double relay failure in their phone systems.

"Lincoln, surrounding county 911 services disabled" reported the *Lincoln Journal Star*, which interviewed Gary Elstun, KDØHZM, as he manned the intersection of 10th and O Streets. Ham radio operators had stepped in to provide the missing 911 services. "Windstream Communication Outage" and the amateurs' services were reported by WOWT-TV. "911 outage hits 15 counties" wrote the *Omaha World-Herald*, also noting the hams' protection. Even the Web site DSLReports.com noted the hams' role in covering the crisis.

Oddly, not one of these reports called us "old fashioned technology" that day. Perhaps when the "new" technology breaks down and lives could be at risk, we're not so old after all.

- That was the prediction of Kathy Boyd's article, "So much more than a hobby: Ham radio essential for emergency communication," which had been republished on TMC Net three weeks before. She wrote, "If anyone thinks ham radio is outdated, think again."

E. ALLEN BROWN, KZ3AB

Red badge lineup: **Among those representing the ARRL at the Maryland State Convention in Timonium (Baltimore) in late March were (from the left) Atlantic Division Director Bill Edgar, N3LLR; MDC Section Manager Jim Cross, WI3N; ARRL President Kay Craigie, N3KN, and ARRL CEO David Sumner, K1ZZ. —** ***tnx E. Allen Brown, KZ3AB, MDC Assistant Section Manager***

ARRL Foundation Awards Prestigious Goldfarb Scholarship to Kyle Ebersold, KB1MNN

The Board of Directors of the ARRL Foundation has proudly awarded the 2010 William R. Goldfarb Memorial Scholarship to Kyle Ebersold, KB1MNN, of Holland, Massachusetts. Ebersold is a senior at Tantasqua Regional High School in Fiskdale, Massachusetts, carrying a 4.31 GPA. He has been recognized on the Honor Roll every quarter while participating in varied activities, serving as Editor-In-Chief of the school newspaper, The Tomahawk, performing with the Choraleers, the school's a capella chamber choir and participating in the Tri-M Music Honor Society.

Ebersold was first licensed in August 2005 and holds a General class Amateur Radio license. He is a member of several Amateur Radio organizations, including the ARRL, The Hampden County Radio Association and FISTS Club. He operates SSB, CW and PSK31 with most contacts on 17, 20, 40 and 80 meters.

His interest in ham radio began in December 2004 when he received a short wave radio as a gift. Inspired by stories from his grandfather, who operated in the 1960s as a Novice, Ebersold was bitten by the bug! He plans to attend Bryant University in Smithfield, Rhode Island where he will pursue studies in business.

BILL WHITE, W4VW

Youngster works 100: **Eight-year-old William Ferguson, KJ4EYZ, of Virginia Beach, Virginia has achieved what many older hams are still shooting for: DXCC. Virginia DX Century Club Vice President Ron Young, W8RJL, presented young William with his certificate at its March 16 meeting. William is the son of Rich, N2XQM, and the sister of Carissa, KJ4EZA. His achievement makes him the youngest full member of the VaDXCC and one of the youngest members of the DX Century Club. —** ***tnx Don Lynch, W4ZYT***

Inside HQ

New Web Site Up and Running

It took us about 90 days longer than we expected and a few false starts, but after much work and a more than a few bottles of antacids, our new Web site is finally up and running. The magnitude of the project surprised all of us. The site has about 1500 flat pages and tens of thousands of generated pages. It also had hundreds of database and other applications that had to be migrated from the new old site to the new site. We knew about most of these applications, but a few of them surprised us since either they had been very lightly used or we did not know that they were there in the first place! Despite the massive amount of data on the new site, you should find it user friendly and easier on the eyes. We believe that it will contribute to your enjoyment of Amateur Radio and make it easier to find information about and interact with the services and programs that the ARRL provides for its members.

We also want to thank all of the members who have contributed feedback and comments about the new site. We have implemented many of these suggestions and we will continue to listen to what you have to say. Ultimately, users determine the content and functionality of any Web site. We built this site primarily for our members. However, it was also built for the worldwide Amateur Radio community to showcase who we are and what we do as radio amateurs. Despite all the foibles and tribulations at pre and post launch, I believe that we have accomplished that goal.

Welcome Aboard!

Speaking of new events here inside HQ, we have brought aboard some new employees this month. First we have added Mike Corey, W5MPC, to our staff as Manager of Emergency Preparedness and Response. Mike will be representing Amateur Radio and the ARRL with served agencies, first responders, professional emergency management organizations, the ARRL Field Organization and ARES®. He will also be helping us to improve our internal HQ training, planning and resources for disasters, and providing resources and support for other related activities. Mike is the author of a new ARRL book, *Storm Spotting and Amateur Radio*.

In addition, our Education Services Department, under the leadership of Debra Johnson, K1DMJ, has added two new employees. Jennifer Knapp is the new administrator for our continuing education courses including the new "EmComm for Managers" online course that is now live. She will also provide administrative support for our educational outreach programs including the seven Teachers Institutes on Wireless Technology that we will be conducting throughout the country this year. The other new employee in Education Services is Jenny Hawran, whose background is in Web design and journalism. Jenny has come on board to help with communications and resources coordination particularly for our Web site. If you are an ARRL Licensing Instructor or a student in one of our online courses, you will probably be touching base with Jenny or Jennifer.

73,

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

Guide to ARRL Member Services

ARRL, 225 Main Street ♦ Newington, Connecticut 06111-1494, USA

Tel: 860-594-0200, Mon-Fri 8 AM to 5 PM ET (except holidays)
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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 who could gain financially from the shaping of its affairs is eligible for membership on its Board.

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

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

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

Officers, Division Directors and Staff

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

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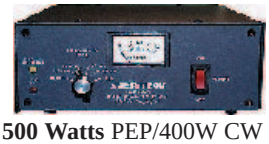

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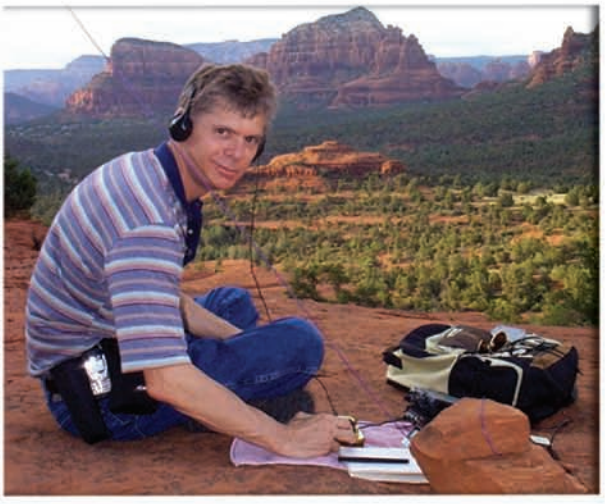

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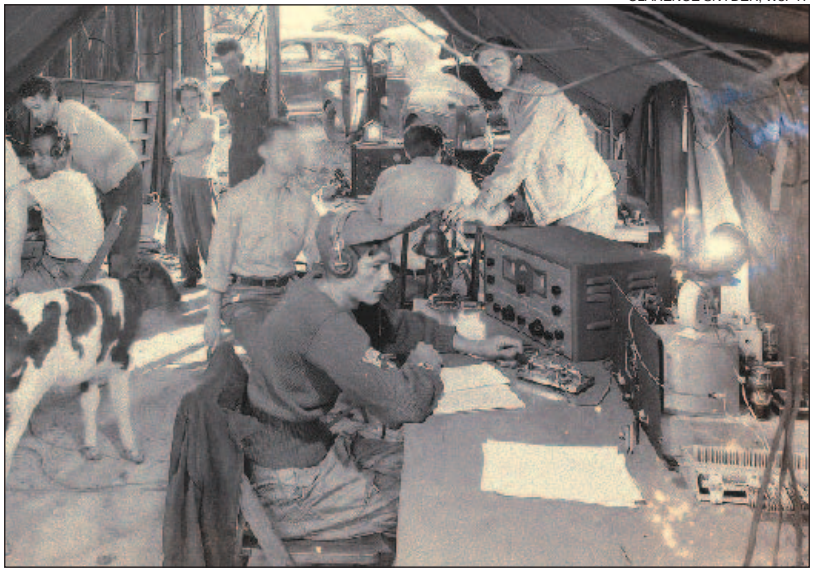
This year's opportunity to freeze, boil, swat mosquitoes — and have a blast — is June 26-27. There's much more about Field Day elsewhere in this issue. Enjoy!

CLARENCE SNYDER, W3PYF



Bovine FD: **The Delaware Lehigh ARC operated W3OK from a farmer's pasture in this photo, circa 1948. Clarence Snyder, W3PYF, was a life member of ARRL, a former EPA SCM, and a professional photographer. "Clearly," writes Mel Snyder, the photographer's son who now holds his call sign, "the calf had no intention of leaving, and judging by the looks of the hams there, by the time the contest was in full swing, it was just part of the QRM!" Mel has posted his father's color home movie of the 1950 W3OK FD effort at www.youtube.com/watch?v=haSYVkzVWvY.**

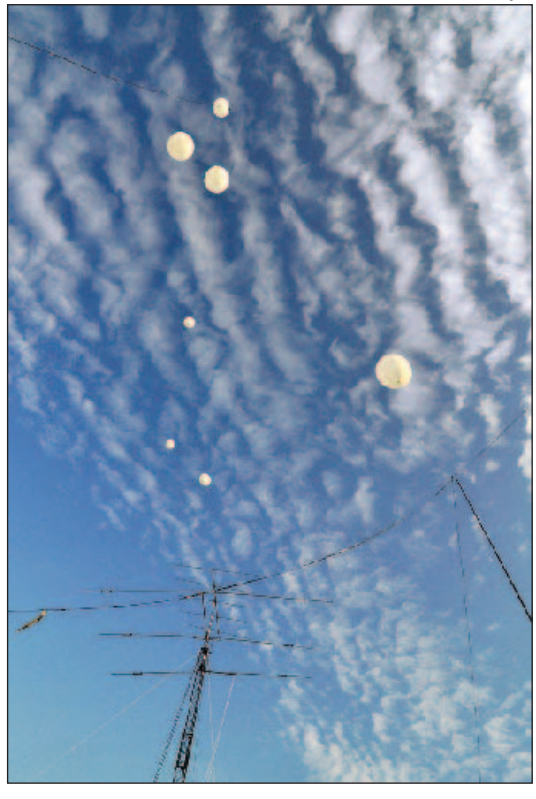
FRANK LABARBA

Late night QSOs: **El Dorado Park, Long Beach, California hosted FD2009.**

ANDREW DAVENPORT, KB1NYS

50 year anniversary for W1HP: **Founded back in 1960, what is now the Philips Amateur Radio Club, based in Andover, Massachusetts, joins forces each Field Day with the Pentucket Amateur Radio Club. The club call sign is a nod to one of its former names, the Hewlett-Packard Andover Radio Club. Many current members were first "bitten by the bug" at a W1HP Field Day as unlicensed guest operators, and then went on to get their licenses. In the photo, a youngster enjoys his first FD at W1HP. —** ***tnx Larry Banks, W1DYJ, and Tony Brock-Fisher, K1KP***

JEFF CUMMINGS, N7QOB



Looking up: **The antenna system of W7S, Sammamish, Washington. Looking directly up at the 80 meter end-fed Zepp and Cobra dipole (both on weather balloons). A tower trailer supports the HF tri-band and 6 meter beams.**

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75 WATTS

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VICTORY IN MANASSAS

As I write this, I can't help but smile. On April 7, the City of Manassas voted to discontinue BPL service because of the financial burden BPL has placed on the city ["Happenings," this issue, pages 72-75]. The Manassas amateur community has "battled" this BPL monster since 2004. I can say with certainty that we won. We provided meaningful data and presented facts on the devastating results of BPL ingress to ham radio and other licensed services, presenting it to the BPL Consortium, COMtek, the Manassas City Council and the FCC — they all ignored us. Their belief was that they could buy time and as the BPL deployment grew, the voice of the public would override the ham community.

This BPL issue could have gone in a completely different direction. Some say that BPL would die on its own. I say no! If not for us hams, BPL would have grown much larger and stronger. We provided the needed data; we proved that not only does BPL interfere, it was highly susceptible to RF ingress and could be brought down by ham and other RF means. We educated the BPL Consortium on RF, provided spectrum analysis (this even they couldn't do) and proved time after time that we amateurs were more technically astute than their engineers. We spent hundreds of hours monitoring, surveying, meeting, documenting and reporting the devastating effect of this "flawed technology" — and it was all worth it.

Hams will pull resources and work together when spectrum is threatened. We are all in this together and we all benefit from the outcome. Fortunately, we persevered, persisted and won for all of Amateur Radio! Thank you to each and every one of you who took time to fight this battle. Thanks also to the ARRL and ARRL General Counsel Chris Imlay, W3KD, for their support.

GEORGE TARNOVSKY, K4GVT
Manassas, Virginia

SWIFT SERVICE

I just wanted to say "thank you" to ARRL VEC Manager Maria Somma, AB1FM, and her staff for the great service in renewing my license for me. I signed the form to the ARRL and about a week and a half later, I noticed that my license had been renewed for another 10 years. Considering that I applied for my renewal via "snail mail," that was very fast.

AVERY FINN, KØHLA
Hopkins, Minnesota

Editor's Note: The ARRL VEC will process non-vanity call sign renewals free of charge for ARRL members. For those members with vanity call signs, the ARRL VEC charges a small fee (in addition to the vanity call sign fee) for renewals. Visit **www.arrl.org/call-sign-renewals-or-changes** *for more information.*

PILEUP PROBLEMS

I would like to compliment Randy Johnson, W6SJ, on his astute comments regarding the status of DX CW pileups ["Op-Ed: DX Etiquette," Mar 2010, page 100]. For the most part, I think he has hit the nail on the head. In addition, I think that some of the problems come from substituting technology for good operating skills. With today's technology, some operators depend on machines to copy code and decide when to send their call sign — it's almost always going to cause interference. It is obvious that many operators can't copy the simple instruction UP or know when the DX station has turned it over to a particular station for a response. For the benefit of everyone, I encourage budding DXers to develop their basic operating skills to the point where they can follow the dynamics of a CW pileup.

FRANK GETZ, N3FG
Media, Pennsylvania

THE POWER OF CW

It has taken me more than a year to write this letter. My lifelong friend, Dave Gray, K3UAV, and I became like brothers when we were both 13 years old and working on our Novice licenses. He became a Silent Key at the young age of 60 after two back-to-back heart attacks and a stroke.

Dave's wife, Patti, WA3TFI, and I together went to the ICU after she made the difficult decision to disconnect the ventilator. The doctors said there was no hope that he would ever recover and that brain damage was obvious. When we got to the room, his blood pressure was around 60/40, barely enough to sustain life. As Patti and I entered the room, I blurted out DIT DIT DIT DIT/DIT DIT. Dave's whole body turned toward us and his eyes opened ever so slightly. I said, "Patti, he's in there!" and began to have a one-way conversation with Dave in CW. As Patti stroked his arm, I watched the readout on the blood pressure monitor come up each time it automatically pumped up and released. By the time we left several hours later, his BP was in the "normal" range of 130/80.

Dave passed away the following day as the doctors had predicted, but there is no doubt in my mind that his life was extended by the touch of the woman and the sound of the hobby he loved. The nurse stationed outside the door of Dave's room said, "I've seen a lot of things in my career but this is the first time I've ever seen a patient resuscitated by Morse code!"

DUKE WARD, K3QWO, ARRL Life Member
Ellicott City, Maryland

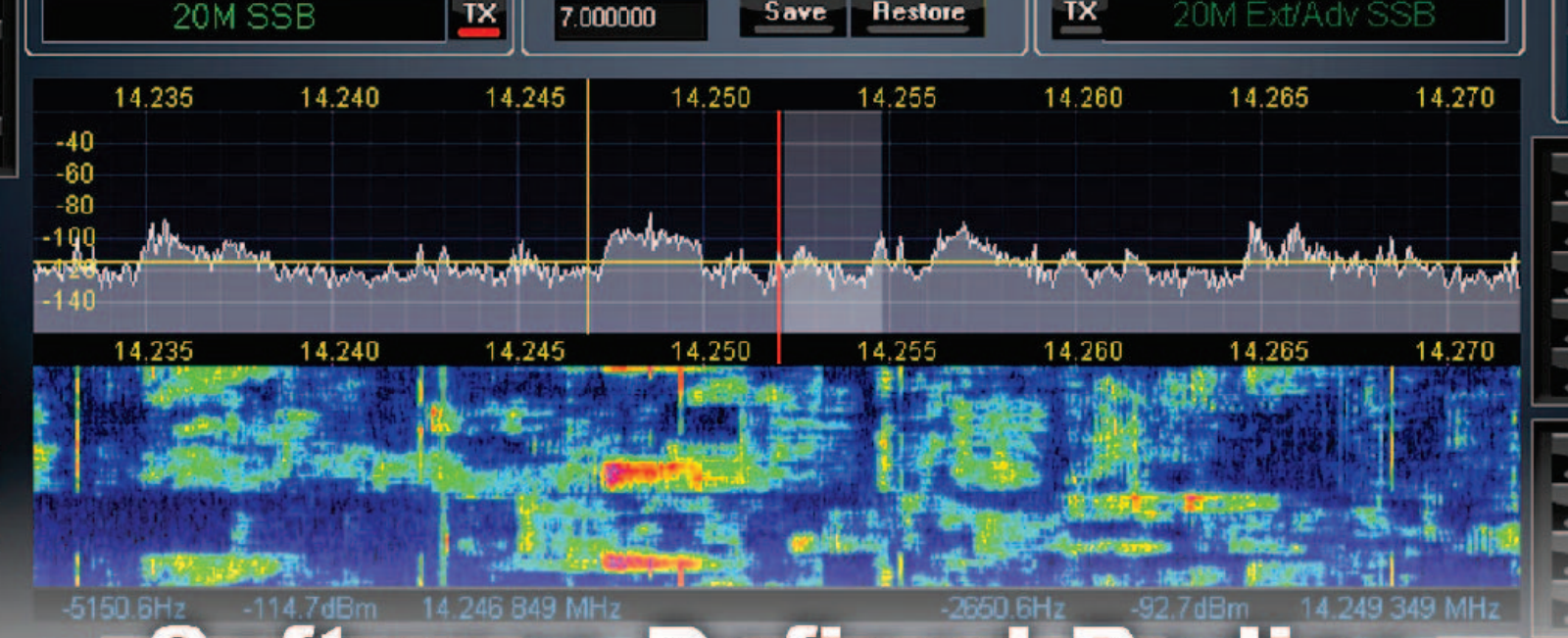
APRIL ANTICS

Okay, so now moles are helping us improve our ground systems ["Hints & Kinks," Apr 2010, page 67]. A year ago, squirrels were enlisted to scamper up trees, raising our antennas to dizzying heights. I miss the prolific Larsen E. Rapp, WIOU, whose articles generally included a schematic and parts list so we could duplicate his ideas. A classic was the VFO that was so stable that it didn't change frequency until sometime after the tuning knob was turned ["A Radical Approach to VFO Design," Apr 1956, pages 24-25, 118]. Toward the end of the article, Rapp surmised that this amazing stability might have been due in part to the piece of rubber surgical tubing he had used as a shaft coupling.

TED BERGSTROM, W1IQW
Mashpee, Massachusetts

*Editor's Note: ARRL members can access the Rapp Repository by visiting the ARRL Periodicals Archive (***www.arrl.org/arrl-periodicals-archive-search***) on the ARRL Web site. Just enter* WIOU *in the call sign field.*

Your opinions count! Send your letters to "Correspondence," ARRL, 225 Main St, Newington, CT 06111. You can also submit letters by fax at 860-594-0259, or via e-mail to **qst@arrl.org**. We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. 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.



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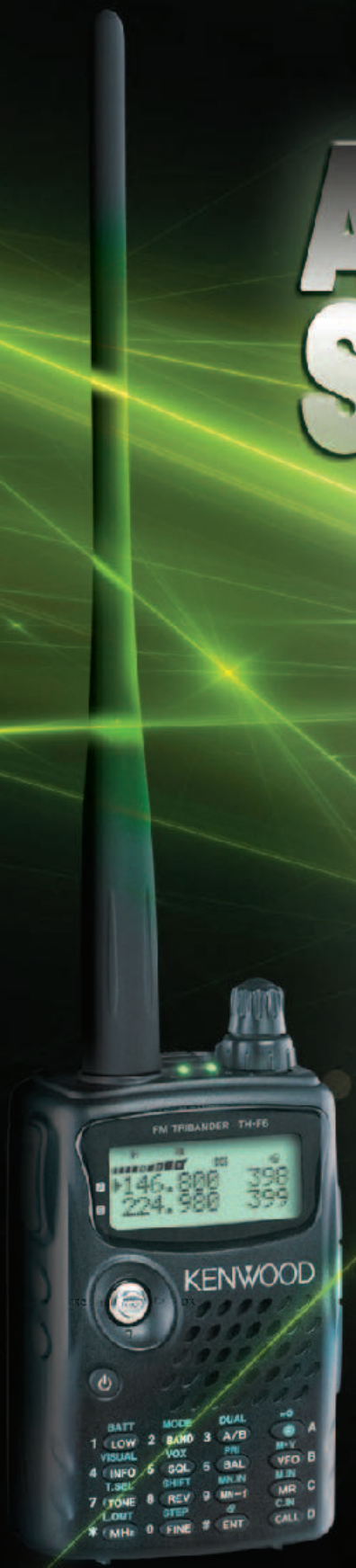
[1]Note that certain frequencies are unavailable. [2]5W output



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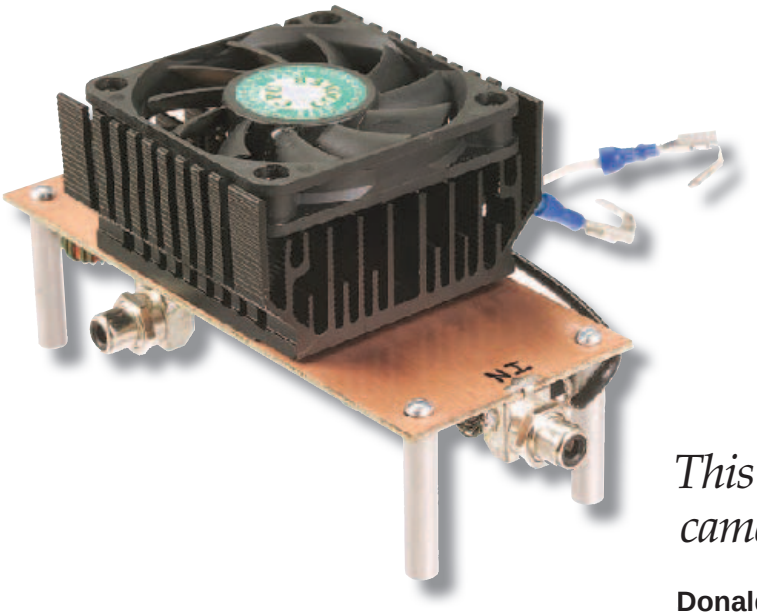


Homebrew Challenge II
Winner #1 — The Lowest Cost Entry

This entry met all requirements and came in with a price tag of $28.36.

Donald W. Huff, W6JL

This amplifier was designed and built by the author as an entry in the ARRL's 2009 Homebrew Challenge contest. The requirements of the amplifier are that it be a 40 meter band 50 W output linear amplifier to be driven by a 5 W output transmitter or transceiver. In addition it must be built for less than $125 of readily available parts and also must meet a number of specified performance criterion.

Mechanical Design

Bare copper clad material, and "ugly construction" methods minimize cost and provide excellent RF grounding of circuitry. This amplifier is a nearly ideal candidate for ugly construction (see Figure 1). Only a single side of the copper clad material is used for mounting components, thus either double-sided or single-sided copper clad material (less expensive) may be used.

The copper-clad material is drilled for three #4-40 mounting screws threaded into matching drilled and tapped holes in the heat sink. Also, the heat sink is drilled and tapped for two #4-40 threaded holes for the MOSFET mounting screws. Last, the copper clad board is drilled with four #4-40 screw clearance holes in the corners, used for four #4-40 screws and threaded spacers to act as supports above the table top when in use.

Two rectangular cutouts about ⅛ inch larger all around than the TO-220 device packages, are centered on the base material's length and width, and cut out using a drill and a hand nibbler tool or a file. An inexpensive but very effective personal computer Pentium processor heat sink and fan is used. This maximizes cooling effectiveness required by the relatively poor thermal conductivity of the TO-220AB package of the International Rectifier IRFZ24N power MOSFET.

The key to low cost is the use of these very inexpensive devices, which are intended for switch-mode power supplies and other switching applications, not RF service. As hams have historically done, I am using whatever is readily and inexpensively available that will meet my needs. A reasonably stocked junk box can keep the out-of-pocket cost for this amplifier under $10.

Electrical Design

There is really no original design work here. But for any builder it is important to understand what the components do, and how they were chosen. The circuit used in this amplifier (see Figure 2) is a conventional and often used push-pull broadband transformer coupled architecture. No RF negative feedback is used, for simplicity and to provide high gain while still meeting the minimum IMD requirement of –28 dBc (at least 22 dB below 12.5 W tones). No complex mechanical assemblies are required and most components are mounted by their leads as usual in ugly style construction. I used inexpensive solder down RCA type connectors for INPUT, OUTPUT and PTT/KEYING, and direct wire connections for a 13.8 V dc supply. Extensive design notes, a sourced and priced parts list, a description of the amplifier test methodology and results are shown on the QST In-Depth Web site.[1]

Power Amplifier Device Design

Operation is class AB for linear applications such as SSB and PSK. The amplifier bias is easily changed to permit class B operation for CW use if, desired. A bias control potentiometer for each MOSFET allows user variation of operating point to enable optimization of operation for a particular mode or for optimizing performance.

Limited temperature compensation of the bias point is provided by gluing pairs of 1N4148 diodes (costing as low as 2 cents each from at least one supplier) to the plastic cases of the MOSFET devices and utilizing their known forward voltage vs temperature characteristic (about –2 mV/°C) to reduce forward bias as MOSFET junction temperature increases. The diodes run at a constant current. This is accomplished by making simple current sources using a PNP transistor at Q1 and Q2 with associated biasing resistors.

Why use a current source? Because, if driven from a voltage (low resistance) source, the temperature variation of diode forward voltage will be reduced by the divider formed between the diodes' changing forward voltage and the other resistors in the circuit. With a current source, the current through the diodes is maintained over a wide range of voltages and variation in diode forward voltage, thus preserving the variation in voltage due to the diodes' changing temperature. The absolute value of the bias voltage depends on the magnitude of the current from the current source, and the setting of the bias pot. How does the current source work?

Zener diode D1 maintains a fixed voltage of about 4.8 V across the base emitter junction of Q1 and Q2, plus emitter resistor of Q1 and Q2 (the Zener has a tolerance of ±5%, so its voltage can vary from 4.75 to 5.25 V depending on the accuracy of any given diode). The current flowing in

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

the emitter and collector circuits of Q1 and Q2 is determined by this voltage, minus 0.7 V drop emitter to base, divided by the emitter resistance. Thus, in the prototype circuit the current is (4.8 – 0.7)/1.2K or 3.3 mA. This value is not critical, and will vary from unit to unit depending on Zener tolerance and resistor R1 and R2 tolerances. Potentiometers R4 and R5 adjust gate bias on the MOSFETs over a range from about 2.9 to 4.5 V, which for most IRFZ24N devices will cover operation from Class B (no quiescent drain current), up to class AB (up to a few hundred mA of drain current for each MOSFET).

Input and Output Circuitry

The gates of the two MOSFETs are heavily loaded at RF frequencies by the pairs of 20 Ω, ½ W resistors, connected from gate to RF ground via C2 and C5. These values were chosen somewhat arbitrarily, and reduce the gain in addition to partially swamping out the high input capacitance of the MOSFETs. The lower the values of these resistors, the higher the required input drive power (and the lower the power gain) of the amplifier. They also act to help stabilize the input impedance, so that the driver sees approximately a 50 Ω load. Transformer T1 steps the 20 Ω of push-pull gate impedance up to about 50 Ω, thus requiring a 50/20 or 2.5:1 impedance step up from gates to input. Recall that for any transformer the impedance ratio is equal to the turns ratio squared, $Z1/Z2 = (N1/N2)^2$. This requires a turns ratio $\sqrt{2.5}$, or 1.6.

The inductance of the secondary or primary must be at least 4 times the working impedance of the circuit. For the secondary, this impedance is 20 Ω. So we need an inductive reactance of at least 80 Ω, at the lowest frequency we plan to use, say 1.8 MHz. Using an Amidon FT-37-43, we find the AL value to be 420 mH/1000 turns. For a little margin I chose 5 turns, making the primary 1.58 × 5 or 8 turns, rounded to the nearest turn.

The output transformer T2 is determined similarly, but we need to know what drain-to-drain load resistance we need. This is easily determined from a consideration of the supply voltage and output power that the MOSFETs can sustain. For this amplifier, the drain to drain impedance can be determined to be 7.6 Ω.

The voltage swing on the MOSFET drains will be about twice the supply voltage, or about 28 V. The rated 55 V maximum drain-source voltage of the IRFZ24Ns thus provides adequate margin, as long as the load is connected to the amplifier. Some mismatch is tolerable of course, but it is good practice to assure that the amplifier is looking into a relatively low impedance at all times. Since transformer T2 has a single turn primary, the available ratios are integer ratios only. The closest integer ratio is 1:3 which provides a 1:9 impedance step up, (or 9:1 impedance step down the other way, from output to input. With a 50 Ω load resistance, this works out to 50/9 or 5.6 Ω at the input, which is close enough to 7.6 Ω for our purpose. Why is a single turn chosen for T4's primary? We need a primary inductive reactance greater than 4 times the drain-to drain impedance so as not to significantly load the circuit with the transformer's primary inductance, at the lowest frequency of operation. This means no less than 22 Ω of inductive reactance, at 1.8 MHz or 1.9 µH. Using the Amidon BN-43-3312 ferrite two hole balun core gives us 0.6 turns. The closest we can get is a single turn, so that should do, even for 160 meters.

The method of building T4 is nothing new, using the braid from a short piece of RG-58 coax, and looping the braid through to make the single turn primary (a single turn in a binocular core passes through both holes). The braid does not have to be insulated, because the ferrite core is a non-conductor for all practical purposes. The braid is kept open and a hole is enlarged through it at the center of the output side to enable threading three turns of insulated wire through the inside of the braid, around the input holes (staying always inside the braid), and with the final turn exiting the braid through the hole.

This takes longer to describe than to construct and can be seen in Figure 1. Another way is to use the common method of two brass tubes that fit the core holes to make the primary, shorting the ends at the output side, and connecting the MOSFET drains to the two tubes at the input side. Then the secondary is threaded through the brass tubes. Either way is equivalent.

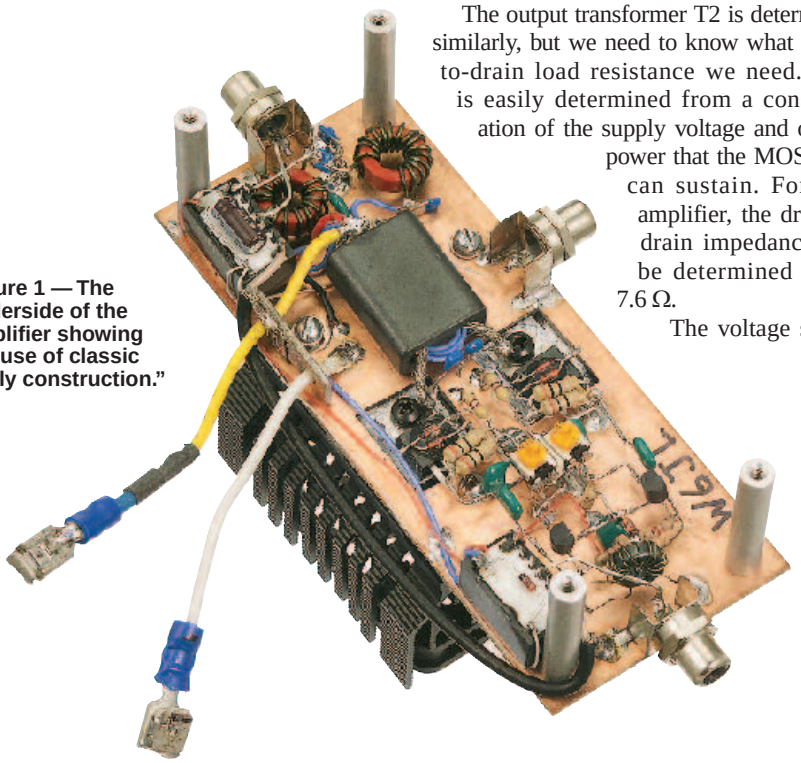


Figure 1 — The underside of the amplifier showing the use of classic "ugly construction."

Harmonic Reduction

Push-pull operation tends to cancel even harmonics if well balanced, but odd harmonics are still significant, a price we pay for untuned, broad band amplifier circuits such as this. The usual 40 meter "half wave" low-pass filter is included here for further harmonic suppression; other bands will require different low pass filter component values. These are easily determined and available components (the reactance of each L and C is chosen to be equal to the load impedance of 50 Ω), see Table 1 for list of components for filters on other bands.

If you have a selective antenna system

Table 1

Component Values for Half Wave Filters for Other Bands

Band (Meters)	*Inductance (µH)*	*Construction (Turns on Core)**	*C9 (pF), C12 (pF)*	*C10+C11 (pF)*
160	4.2	18 on 106-2	1500	3000
80	2.5	14 on 106-2	820	1500
30	1.2	15 on 50-2	330	560
20-17	0.58	12 on 50-6	180	330
15-10	0.33	9 on 50-6	100	180

*Wire sizes are not given, as they are non-critical. It is best to use the largest wire size (or equivalent-area multifilar smaller gauge wires) for which the required number of turns will fit as a single layer on the toroidal core.

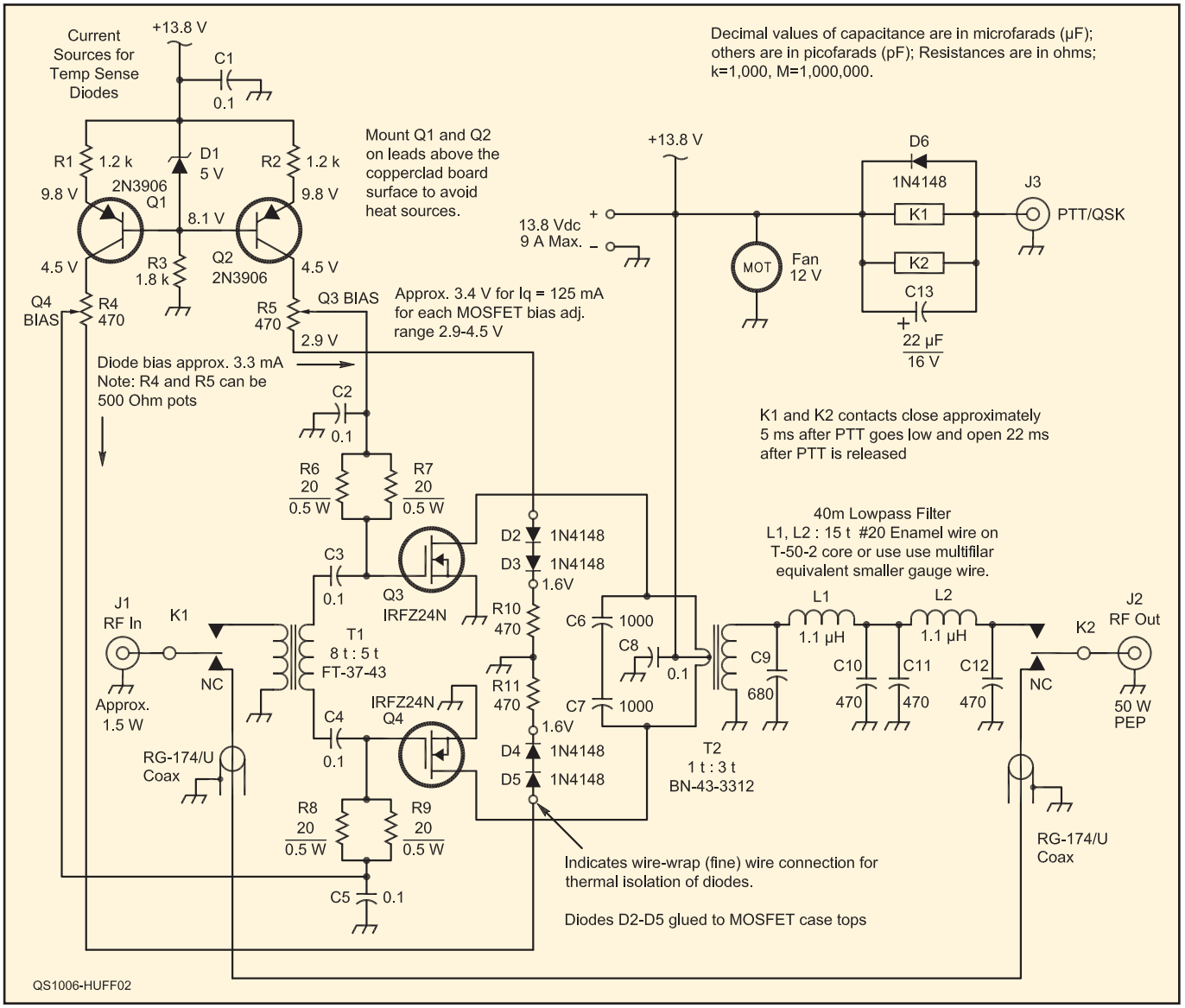


Figure 2 — Schematic diagram of the 50 W, 40 meter linear amplifier. A detailed sourced and priced parts list is provided on the QST-In-Depth Web page. Primary of T2 is a single turn of braid from RG-58/U coax cable with secondary of three turns of #20 AWG inside braid.

or antenna tuner, if you calculate how much harmonic suppression you have with the total radiating system, you may find that on some bands you will have sufficient harmonic filtering due to an appropriate antenna systems's selectivity, to eliminate or greatly simplify the low pass filtering of harmonics. This is an often overlooked capability. I have a two element Yagi on 40 meters for example, which is a very high Q (narrow band) radiator, offering significant attenuation outside of the band and poor radiating (and receiving) efficiency at harmonic frequencies.

Transmit Receive (TR) Switching

Simple relay TR switching is provided. On MAKE (key down), the small Omron relays chosen close after a less than a 7 ms delay after key down and, with a 22 µF capacitor across the coils to slow the current decay in the coils, open again after 20 ms of delay following key-up . This enables QSK at up to about 30 WPM with no hot switching in the amplifier if the exciter does not have RF build up before about 7 ms from key down, and if the RF output does not last more than 20 ms after key up.

Use of a lower-rated coil voltage relay, operating at 13.8VDC, can speed up the MAKE time in some relays. This is no problem if key down time is limited. (Do not be afraid to misuse a component in a known and intentional way; we are not building an amplifier for mass production here; we just need reliable operation for this one to work.) The higher voltage (and hence, coil current) on MAKE can speed up the armature movement to the closed condition. The TR relay switching was also modeled using LTSpice, after measuring the relay resistance and inductance. It turns out the inductance is insignificant and the relay opening time stretch is determined by the resistance and the coil drop out current, in conjunction with the shunt capacitor value.

Turn On and Testing

There is not much to do before turn on except verify all connections and parts values; look carefully, in good light. Measure the resistance of the 13.8 V line to ground to check for shorts. Set bias potentiometers to their minimum (counterclockwise, if wired similar to the original, but check beforehand); the bias voltage should read less than 3 V on the two gates. It is useful to be able to vary the 13.8 V supply up from 0 V slowly, watching the current. That way any problems can be corrected without damage to the circuit.

Setting MOSFET Bias

Short the PTT line to ground to energize the relays. At 13.8 V, with the PTT grounded, the fan and relays should draw about 200 mA total, so this will be the minimum current drawn before adjusting the bias pots. With a 13.8 V supply, adjust the bias potentiometers R4 and R5 one at a time carefully such that 13.8 V current increases by about 100 mA for each potentiometer. Total idling supply current will then be around 400 mA.

RF Amplifier Tests

The amplifier is now ready for use for linear operation. For CW only operation, you can set the bias at about 2.95 V or just at the point at which MOSFET drain current starts to flow. This will be operating in Class B. Connect a load reasonably close to 50 Ω, preferably a 50 W or greater dummy load through a directional wattmeter to start. Connect a driver and apply drive power carefully, not to exceed 5 W and preferably much less to start, observing output on whatever directional wattmeter you normally use. On 40 meters it should not require over 2 W of RF power for 50 W output if biased for AB1 (100 mA per MOSFET), or 3 W for Class B, as described above. On CW you can drive the amplifier to about 63 W output with 5 W of drive in Class B. Higher drive powers will increase the dissipation in the gate loading resistors, so caution should be exercised to not hold drive power above about 3 W for extended periods of time due to heating of these resistors, but they are quite forgiving.

Linearity Testing

This amplifier was tested using a regulated 13.8 V dc bench supply capable of up to 10 A, an oscilloscope, the usual digial VOM and, for documenting the IMD, a 35 year old HP141T / HP8553B spectrum analyzer. Adjustment for optimum performance can be accomplished without recourse to a spectrum analyzer with a little practice by observing the two-tone RF output envelope on the oscilloscope.

Performance

The amplifier is usable on all HF bands 160 through 10 meters, but optimum performance, and full output of 50 W, is achieved only on the 80 through 20 meter bands, with IMD of –30 dBc or better. On 40 meters, IMD approaching –36 dBc was measured. Maximum output on 80 through 20 meters meets or exceeds 50 W with up to 5 W of drive. This makes this amplifier a very useful addition to any QRP station when more power is required for the QSO and propagation path at hand. In normal use there should be no problems with overheating. A key down test was made with the CPU cooler's fan turned off, and MOSFET temperatures rapidly rose to 100°C in less than 3 minute's time. So keep that fan running! Detailed performance figures are illustrated in the graphs on the QST-In-Depth Web site, based on the test data taken on the prototype.

Output of 50 W or more is available from 80 through 20 meters, with reduced output on 160 meters (about 25 W), 15 meters (about 40 W) and 10 meters (only about 12 W). The relatively high capacitances and consequent long switching times of these inexpensive MOSFETs limit the output on the highest HF bands. Even more output could be obtained on several bands by using higher supply voltages (respecting the 55 V maximum breakdown voltage of the device) and optimizing components for another band. There is much opportunity for further experimentation with this design; no doubt the output can be improved on 160 meters, for example.

Total material cost should be under $30 if all parts are purchased new (not including shipping costs and taxes), and under $10 for a reasonably-stocked junk box containing the common components such as resistors, capacitors and scrap PC board material; likely available to anyone who has done any modern homebrewing. The two most important components, the MOSFETs, are some of the least expensive items required. This is one thing that makes homebrewing today so great! So build, and enjoy. Then, build some more!

Acknowledgment

Thanks to my old friend and fellow homebrewer Bob Friess, N6CM, for alerting me to the Pentium heat sink/coolers available at low cost online, and for persuading me to enter the contest with my amplifier. The heat sink is the heart of this amplifier, in that one needs plenty of cooling capability to enable use of the inexpensive TO-220 packaged devices at these power levels, especially with nearly unlimited key down times. And, yes, the MOSFETs are beryllium-oxide free, as with all plastic cased low cost devices. Also, if it matters, they are available lead-free if you purchase the IRFZ24NPB part number.

ARRL Member Don Huff, W6JL, started homebrewing radio gear at age 11 with crystal sets and one tube receivers. He learned CW with a J-38 key and doorbell buzzer and obtained his Novice class license (KN6KDE) just after his 15th birthday in 1955. He has been a CW and homebrew fan ever since. His first transmitter was a homebrew tritet 6V6 oscillator from a 1946 QST *article. Four months later Don obtained his General class license and became K6KDE.*

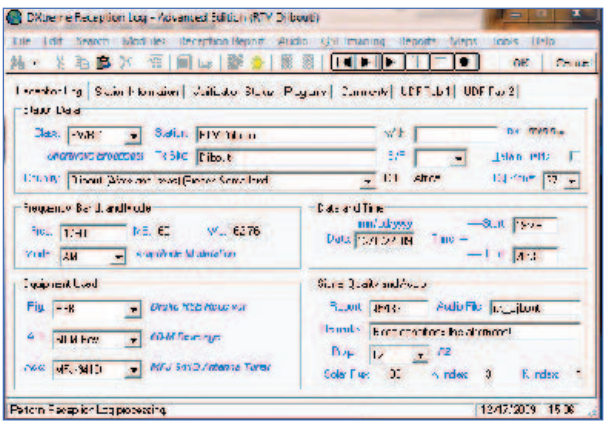
Don started his first electronics job in a transformer factory just out of high school. There he met his first engineers and his future wife, Linda. With Linda's help, he worked his way through college and earned a BSEE and then an MSEE. He joined Hewlett-Packard's research and development team and worked there for 39 years until he retired in 2005.

Don has always been active and on the air even through college and other interests including owning and flying airplanes, raising two children and building their house together. He has always enjoyed working with his hands and is a CW only and homebrew only operator. You can reach Don at 643 Tumble Creek Ter, Fallbrook, CA 92028 or at **w6jl@sbcglobal.net**.

New Products

DXTREME RECEPTION LOG SOFTWARE

◊ *DXtreme Reception Log — Advanced Edition Version 6.0* is a *Windows* logging program for radio and TV monitoring enthusiasts. In addition to the usual logging functions, an embedded audio feature lets users create and maintain an audio archive of stations heard. A Schedule Checker imports schedules from the EiBi Web site and displays schedule data according to user specified filter criteria. The program also features an integrated QSL imaging facility that that allows users to scan physical QSL cards and capture electronic QSLs received over the Internet. *Reception Log* saves both types of QSLs as digital images to view at any time. The software includes a customized reception report generator and integrates with Afreet *OmniRig* and *Ham Radio Deluxe* rig control programs. Price: $79.95. For more information, or to order, visit **www.dxtreme.com**.



A Quick-Start Guide to ALE400 ARQ FAE

Don't let the alphabet soup moniker spook you. This is error-free HF communication with your computer sound card … and it's free.

By Anthony Bombardiere, K2MO

The HF bands are difficult territory for digital communications. Hams have devised a number of ingenious ways to deal with the noise, fading and interference that tend to garble data, but few guarantee 100% error-free transfers. PACTOR is one solution, although it requires the purchase of external hardware and some of these devices can be expensive.

Fortunately, there is an alternative that offers error-free communication using nothing more than your computer sound device and a common interface to connect to your transceiver, the same sort of interface manufactured by *QST* advertisers such as West Mountain Radio, TigerTronics, MFJ, microHAM and many others.

Enter *MultiPSK*

Patrick Lindecker, F6CTE, is the author of a multimode digital software package known as *MultiPSK*. This free *Windows* application supports a large number of modes, including one developed by Patrick called *ALE-400 ARQ FAE*.

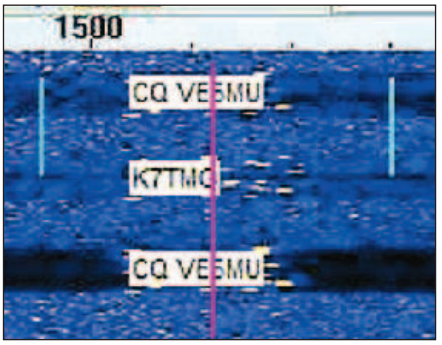
When used as a keyboard chat mode, ALE-400 ARQ FAE works much like a pseudo "full-duplex" system in which each station types at the same time. This makes operation similar to a live Internet chat.

The "ARQ" in the title stands for Automatic Repeat reQuest. If a burst of data arrives with errors (or doesn't arrive at all), the receiving station automatically requests a repeat. This means that the operators see nothing on their screens but clean text — plus any typos caused by clumsy fingers.

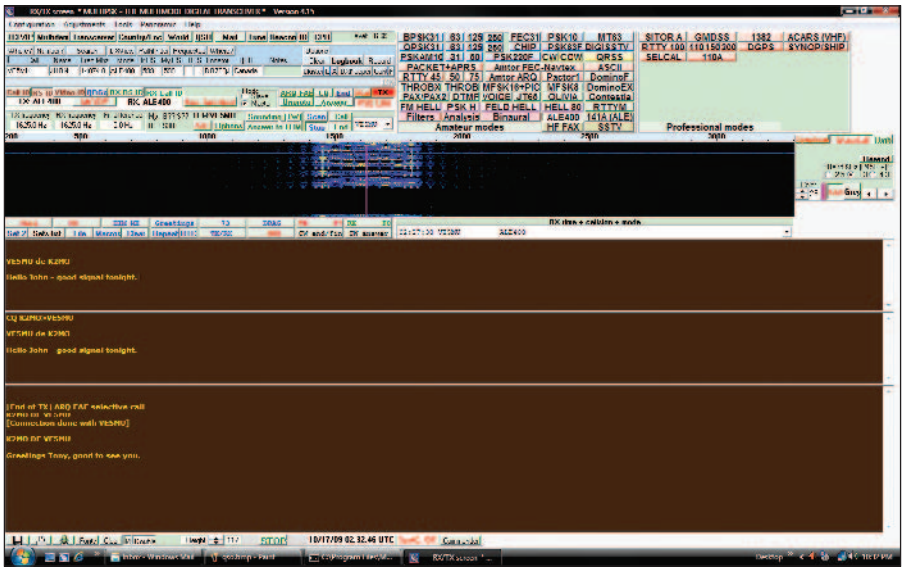
The advantages of ALE-400 compared to conventional chat-modes are pretty obvious: One is that there is no need to wait for the other station to un-key in order to change the subject or interject a quick comment since the change-over happens in a matter of seconds. The other advantage is that because the exchange takes place so often, it gives the ARQ a chance to check for errors that may occur as the band changes.

Another unique feature about ALE-400 is its ability to send messages to the *MultiPSK* Mail Box while in chat mode. This means that stations can swap short files *during* their conversations.

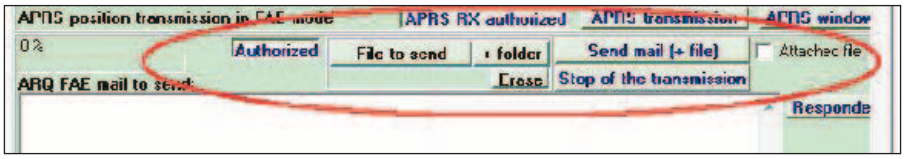
Patrick's ALE-400 ARQ FAE does everything standard ALE (Automatic Link Establishment) software can do including messaging and link quality analysis, although for the purposes of this article we'll concentrate only on the keyboard-to-keyboard and file swapping aspects. The Soft ARQ Memory developed by Patrick works to reduce the number of repeats and improve throughput while the FAE or Fast Acknowledgement Exchange allows the process to happen quickly. At an approxi-



You can see the CALL ID, transmitted with Reed Solomon error correction, being decoded at K2MO. John, VE5MU and Sholto, K7TMG had both sent their CALL IDs a few seconds apart.



This screen was captured during an ALE-400 QSO with John, VE5MU. The top window shows outgoing text from K2MO and the bottom shows the incoming text from VE5MU. The connect confirmation line within the receive window [Connection done with VE5MU] is Patrick's French-to-English translation of "You (K2MO) are connected with VE5MU." The middle window shows throughput progress and, in this case, the outgoing text.



A close up of the AUX FUNCTION window buttons used for mail transfers. Files sent from here will end up in the other guy's *MultiPSK* mailbox.

mate bandwidth of 400 Hz, ALE-400 is also spectrum-friendly running at 50 baud with a carrier spacing of 50 Hz.

Setting up *MultiPSK*

At the time this article was written, ALE-400 was only offered in the *MultiPSK* application. So, your first step is to get on the Web and go to **http://f6cte.free.fr/index_anglais.htm**. Download the latest version, but do not install the program from the desktop. Copy the *MultiPSK* ZIP file to a temporary folder and click the INSTALL.EXE file. By default, the program will be installed in the *MultiPSK* folder.

The program should open the configuration screen when you run it for the first time. If not, click CONFIGURATION located in the upper left corner of the main window and click CONFIGURATION SCREEN.

In the Configuration screen, click SERIAL PORT to select your PTT COM PORT. This is the port *MultiPSK* will use to communicate with your sound card interface and switch your radio between transmit and receive. Now click SOUND CARD INPUT / OUTPUT to configure your sound card. Click RX/TX SCREEN button to return to main window.

The next step is to enter your personal information. In the upper left corner of the main window, click CONFIGURATION / PERSONAL DATA. Enter your call sign, name, locator and so on. Click SAVE.

MultiPSK supports RSID — Reed/Solomon Identification. This is a handy means to let other hams know what sort of mode you are using. If they are running *MultiPSK*, *Ham Radio Deluxe's DM780* or *Fldigi*, they will see a notice when they tune across your signal and can tell right away that you are using ALE-400.

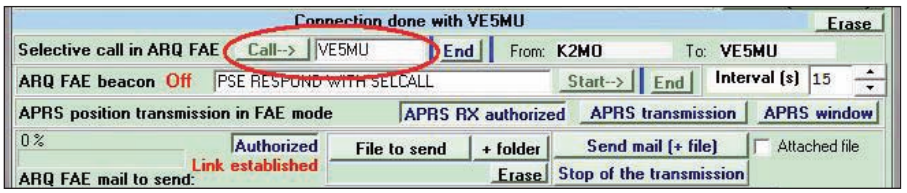
To set up RSID in *MultiPSK*, click CONFIGURATION / MANAGEMENT OF THE IDENTIFIERS, then TRANSMISSION OF YOUR CALL SIGN + LOCATOR in the popup window. At the top of this window, click CONTINUOUS under DETECTION MODE. Click QUIT to return to the main program window.

The RSID buttons are located in the upper left side of the main program window just above the waterfall. The following RSID buttons will remain active once clicked. Unclick to deactivate.

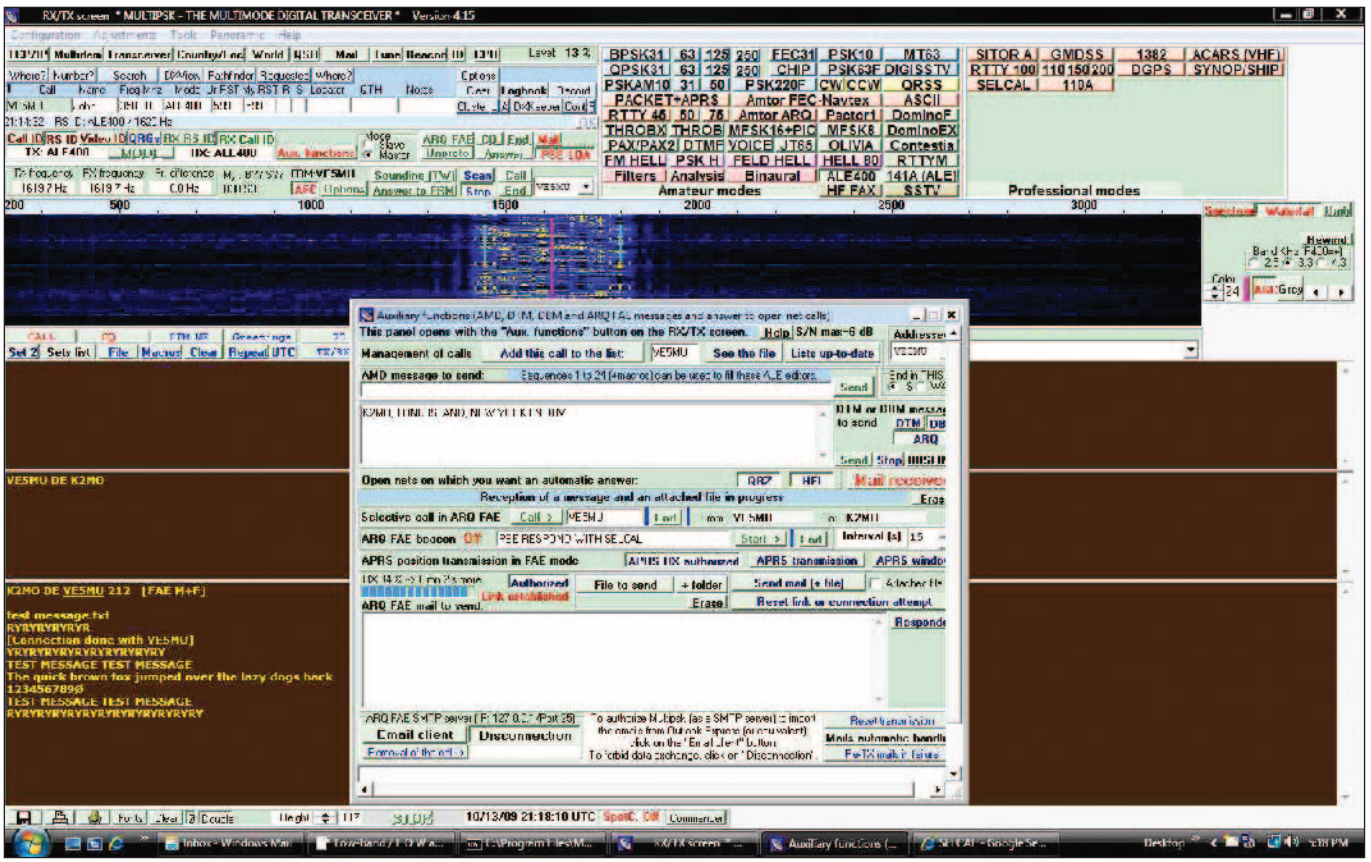
RSID — This button transmits the Reed Solomon mode identifier when clicked. In ALE400, the Reed Solomon ID is automatically sent so this button stays in use.

RX RSID — When active, this button allows *MultiPSK* to automatically switch modes upon RSID reception.

RX CALL ID — This button activates the reception of the CALL ID allowing you to see the other station's call sign and locator or CALL ID. It will appear inside the waterfall once decoded. Clicking the CALL ID button (located on the far left of side of the main window) will send your CALL ID, which is your call sign and locator. It will appear in the waterfall at the receiving station. The *MultiPSK* Map will automatically appear upon the reception of the transmitting station's CALL ID and will show that station location.



The SELECTIVE CALL box (located in the AUX FUNCTIONS window) used to call a specific station. In this case, I'm calling VE5MU.



This screen capture shows VE5MU sending mail to K2MO. The blue watermark shows file transfer progress.

Other Settings

Waterfall — Waterfall controls are located on the right side of the main window. Make sure WATERFALL / HIGH is clicked for best results. Adjust the waterfall color and contrast using the up/down COLOR buttons.

Appearance — Font type, color and window size buttons are located on the bottom left of the main window. Click FONTS / HEIGHT to adjust to your preference.

Macros — Patrick has already configured the *MultiPSK* macros. The user information for each macro is taken from the PERSONAL DATA section where your call sign, name and locator are stored. If you'd like to customize the macros, right click on the macro buttons. Remember to click SAVE AND CLOSE when finished.

On the Air

For your first time out, it is probably best to set up a sked with a similarly equipped friend. Try meeting at about 14.074 MHz USB since that is where most ALE-400 activity seems to be occuring at the moment.

You can start by clicking on the ALE 400 mode (not 141A ALE) in the main *MultiPSK* window and then the ARQ FAE button located in the middle of the window (buttons stay pushed in).

Click the CQ button next to ARQ FAE button to send a CQ. The CQ will go out as soon as the button is pressed; transmitting for 6 seconds and listening for 7 seconds. To end the call, click the END button next to the CQ button. Note that the CQ must finish before you can end the call.

MultiPSK will connect automatically once the ALE-400 signal is detected by another station (the ANSWER button must be clicked). The station's call sign will appear in the RX window confirming a connection.

The top window is where you enter your outgoing text. It will be transmitted as soon as the first character is typed, unless the other station is transmitting. If that is the case, there will be a short wait period while receiving the signal before the TX/RX change-over.

It is normal to see the same text repeated on occasion if signals are weak or if there is interference on the frequency. This is where the ARQ comes into play by requesting repeats for the missing data. The ALE-400 ARQ mode operates at 60 WPM; 85 WPM in a back-and-forth bilateral exchange (42 WPM each way).

Selective Calling

Selective calling allows you to call and connect to a specific station. To do this, you'll need to click the AUX FUNCTIONS button which is located in the middle of the main program window.

In the AUX FUNCTIONS window, enter the station call sign you wish to call in the SELECTIVE CALL IN ARQ FAE box and click the CALL button.

You'll know the connection is made when the PC speaker beeps and by the connect confirmation in the RX window. To end the contact, click the END button in the main window.

Sending Messages to the Radio Mailbox

Messages can be sent to the *MultiPSK* Radio Mailbox while in chat mode. The station sending mail will still be able to copy incoming keyboard chat from the station receiving the message. Normal two-way keyboarding will automatically resume once the message completes.

To send a message to the *MultiPSK* Radio Mailbox, click the AUX FUNCTIONS / FILE TO SEND and select the file. Click ATTACH FILE and then SEND MAIL + FILE.

The software will indicate the message transfer time and progress as it's being sent. A 100 word message will complete in just under two minutes. The time to send a message will increase if the HF channel is poor.

Give It a Try!

This mode is purely experimental, but it has potential. If you have some free time this weekend, I'd encourage you to give it a try. If you're already set up for HF digital such as PSK31, trying ALE-400 will cost you nothing. If you're not, maybe this is a good time to expand your horizons. Pick up a sound card interface and a copy of the *ARRL HF Digital Handbook* and get started!

Tony Bombardiere, K2MO, is an ARRL member. He became licensed in 1990 and his Amateur Radio activities have included CW, digital operating and satellite communications. Thanks to the assistance of Carl Luetzelschwab, K9LA, Tony has pursued research on the effects of the ionosphere on digital communications. He lives in Kings Park, New York with his wife Maria, his daughter Tonimarie and his son, Anthony Jr. You can contact Tony at 215 Hawthorne Rd, Kings Park, NY 11754-3244; **dxdx@optonline.net**.

Feedback

◊ The item about Bharathi Prasad, VU2RBI, in the May 2010 issue ["This Just In," p 13] erroneously states that the National Institute of Amateur Radio is the IARU Member-Society for India. The IARU member society is actually the Amateur Radio Society of India (ARSI), **www.arsi.info/**. *QST* regrets the error.

◊ In "Easy to Make 4:1 Coreless Balun" [Apr 2010, pp 33-36], there is an error in Figure 3. The tank coil and antenna tuner coil should have been shown as air core inductors, reflecting WWII practice.

◊ In "Product Review—International Radio Roofing Filter for the IC-756PROIII" [Apr 2010, pp 58-59], Table 2, the entry for preamp off, 2 kHz spacing with a measured input level of –44 dBm, should show a calculated IP3 of –17.5 dBm.

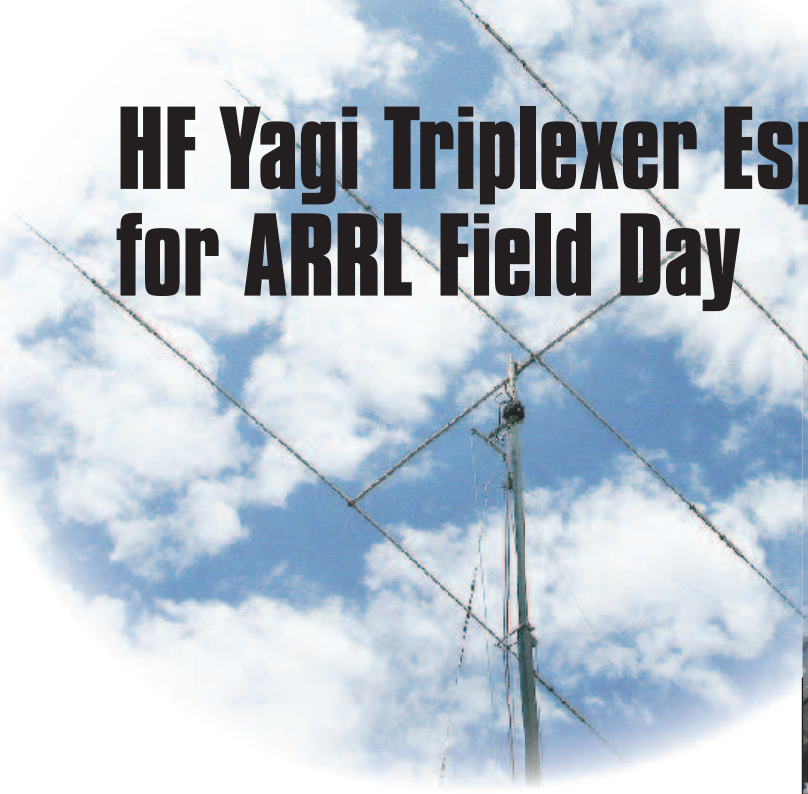
◊ The letter entitled "Paradise Revisited" [Correspondence, May 2010, p 24] was actually written by Jerry Salzer, KD2KC, of Colonia, New Jersey.

New Products

REMOTE TEMPERATURE SENSORS FROM PLUM VALLEY SYSTEMS

◊ The PVS12 series of electronic remote temperature sensors from Plum Valley Systems are based on the National Semiconductor LM34 and LM35 devices. Components are mounted on a PC board that is placed in a stainless steel housing ⅝ inch diameter and 1½ inches long. The housing is then filled with a special temperature conducting epoxy. Two versions are available: one calibrated for Celsius (PVS12C based on the LM35) and one calibrated for Fahrenheit (PVS12F based on the LM34). Operating range is specified at –55 to +125°C (–67 to +257°F). These devices are intended to bridge the gap between inexpensive plastic consumer temperature monitoring devices and expensive industrial temperature control products. Interface is via three wires (ground, $+V_{CC}$ and the signal output). A 5-30 V power supply is required. The signal output is an analog voltage linear representation of the temperature at the sensor, calibrated in 10 mV steps. In other words, if the temperature of the sensor is 74.2 degrees, the signal voltage will be 742 mV. With the addition of a negative voltage bias, negative temperatures can also be measured. The PVS devices can be interfaced with analog monitoring and control systems, or they can be used with an A/D converter in a computer control system. Price: $29.95 for either version. For more information and applications, or to order, visit **www.pvsoregon.com**.

HF Yagi Triplexer Especially for ARRL Field Day



This easy-to-build project lets up to three transceivers on 10, 15, and 20 meters share the same antenna.

Gary Gordon, K6KV

K6KV

Figure 1 — Kenneth Finnegan, W6KWF, in foreground and Phil Verinsky, W6TQG, at Phil's station, competing in the July 2009 NAQP contest in the multioperator two transceiver category. Using the triplexer standing on the table between them, Kenneth and Phil operate on both 20 and 15 meters sharing Phil's triband antenna.

It all started during a WVARA ARRL Field Day discussion.[1] Svend Jensen, KF6EMB, was asking Jim Peterson, K6EI: "If a triband Yagi works on three bands, why do three transceivers need three separate antennas? Why can't they all share the same antenna?"

Whoa — connect my receiver to your transmitter's antenna? It sounded like asking for big trouble. Even with separate antennas, just having one station near to another can cause plenty of interference. Unless precautions are taken, signals from one station will invariably find their way into the other and cause overload or possibly damage.

Fortunately, the nearby radio problem was solved years ago with the introduction of band-pass filters. You connect one between each rig and its antenna, and they'll block signals on other bands from getting through. It's little surprise they've become standard fare on most contest outings.

You might wonder if simply paralleling several band-pass filters together might allow different rigs to share the same antenna. Unfortunately it won't, partly because more isolation is required but mainly because their design is such that they'd simply short out each other's signals. What will work, however, is using a decoupling network in conjunction with band-pass filters as described in this article.

This article describes two designs, one rated for 5 or 10 W and the other for 100 W. Both use commercial band-pass filters to greatly simplify the project. Each has insertion losses, including the band-pass filters, of less than 1 dB. The 100 W triplexer was contest proven during the 2009 NAQP RTTY and SSB contests at W6TQG (see Figure 1). Both versions were used during WVARA's 2009 QRP Field Day. With a triplexer, every transceiver could be operated as though it owned the antenna, even to the point of tuning it for minimum SWR. There was never a hint of interference, and all that was left for the operators to decide was where to point the antenna. One limitation, of course, is that it a single antenna can only point in one direction at a time.

Rig Protection

By now you might be asking, just how safe is my receiver? The short answer is, as long as the band-pass filters stay connected to the decoupling network of this article, it's virtually impossible to come up with any scenario that could damage a transceiver. Rigs are generally safe with overloads up to approximately 1 W of RF power at their antenna connectors; crosstalk from using a triplexer is far below this level. Under the worst conditions with 100 W transmitters, a receiver will never see more than 2 mW of RF, or 1/500 of the damage level.

During normal operation, signals from other transmitters are attenuated approximately 50 dB through the action of both the band-pass filters and the decoupling network portion of the triplexer. Although not immediately obvious, the risk is equally benign should you inadvertently tune your receiver to a band where another rig is transmitting, because 2 mW of RF just isn't hazardous. If another rig inadvertently transmits on your band, your receiver will see even less than 2 mW, because besides the normal isolation the triplexer provides, the offending rig will shut down from being unable to find an impedance match.

If a component fails or arcs over, perhaps caused by running excessive transmitter power, a resonant circuit in the triplexer will either short out or open up. Artificially introducing these failures only lowered the crosstalk, which never measured more than 0.1 mW.

We can also calculate the stress on the feed line. With 100 W PEP transmitters, the feed line might see average power levels around 100 W, and peak potentials of 300 to 500 V.

[1]Notes appear on page 40.

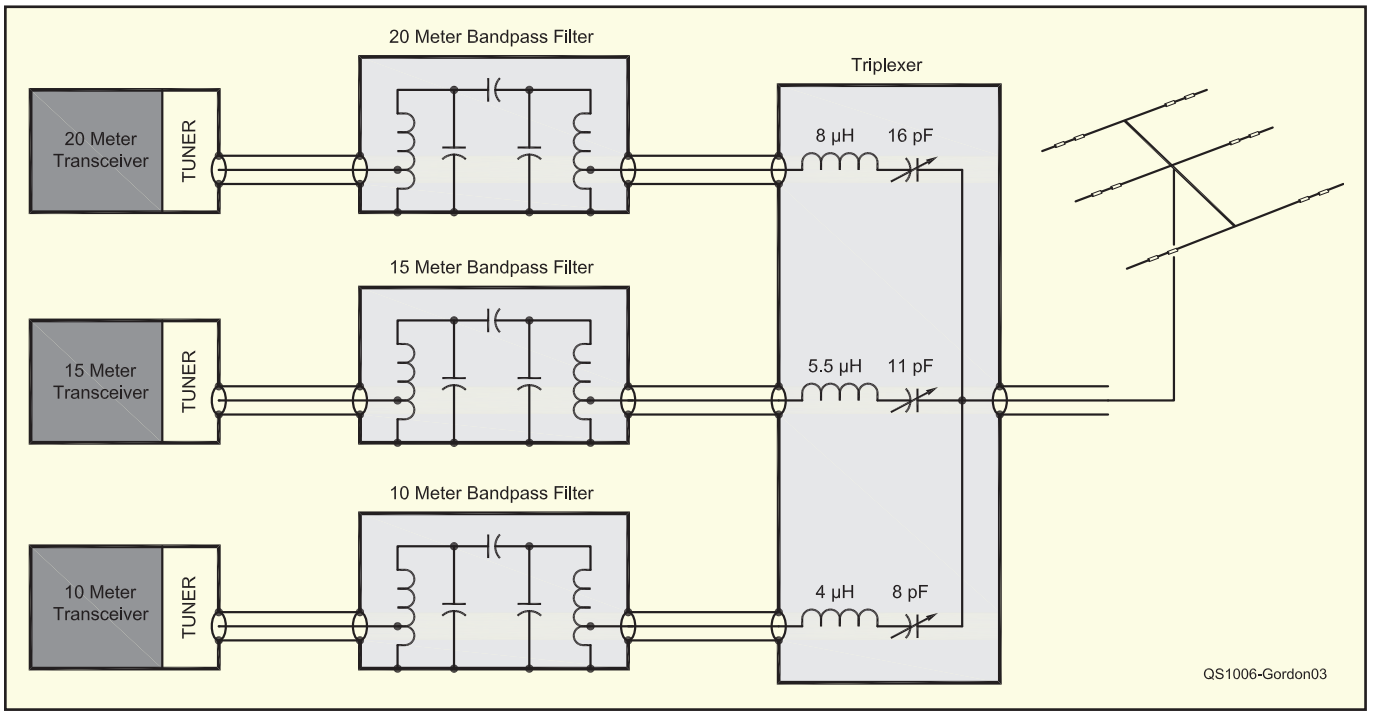


Figure 2 — Triplexer schematic. See the article regarding choosing the capacitors and winding the inductors.

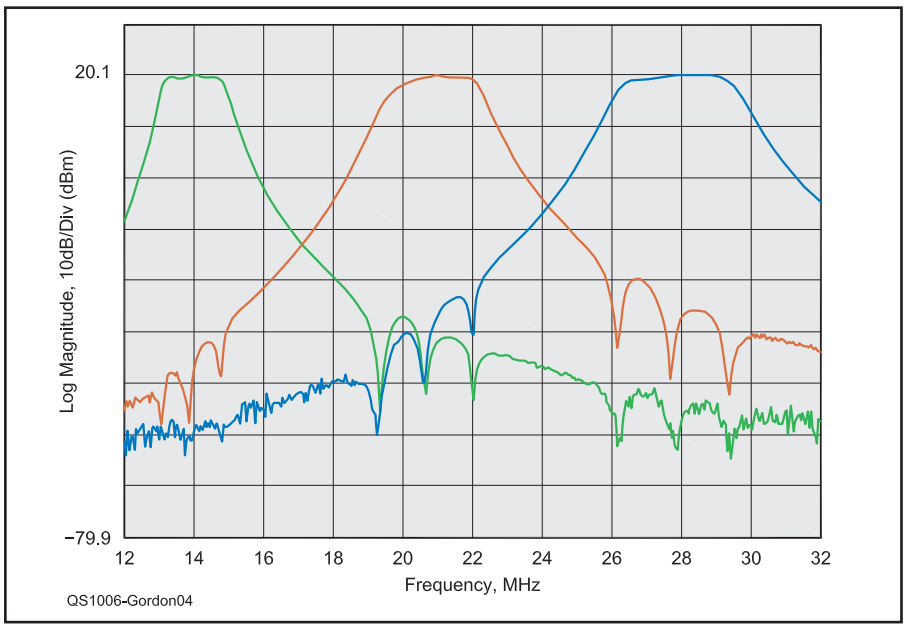


Figure 3 — Frequency response of the triplexer decoupling network and band-pass filters. Next-band signals are attenuated by approximately 50 dB.

These are safely within the 430 W rating for 0.2 inch diameter RG-58/U coax cable and the 1000 V rating for PL-259 UHF connectors.

Note that the portion of this project that you can build, the decoupling network box, is not the entire triplexer, and will not by itself protect transceivers. Only when band-pass filters are connected to it will the transceivers be safe. If you plan to try any automatic antenna or band switching, then be sure to do it outside this regime. That said, it seems inconceivable that any component failure, loose connector or band switching mistake could put a transceiver at risk. With this setup, a receiver should never be subjected to a power level any stronger than 2 mW.

Circuit Description

The decoupling network portion of the triplexer uses three series resonant circuits, one between each input and the common antenna feed line connector (see Figure 2). For example, the 20 meter (top) series tuned circuit is tuned to resonance at 14 MHz to pass signals on the 20 meter band while attenuating signals on all other bands. Each resonant circuit has a loaded Q of 5, chosen to keep insertion losses low while providing sufficient other band attenuation. Figure 3 shows the frequency response for the three channels of the triplexer with Dunestar model 300s band-pass filters, as measured on an HP 2588A spectrum analyzer.[2]

Table 1 shows the insertion losses at five frequencies across the 20 meter band, measured using a JRC JST-245 transceiver, a Daiwa CN-620B power meter, and an MFJ-264 dummy load. Except for the top end of the 10 meter band the insertion loss never exceeded 1.0 dB, one sixth of an S-unit. Figure 4 shows the SWR measurements for the three bands, which rarely exceeded 1.5:1, as measured using an HP 8591E Spectrum Analyzer and a directional coupler.

Construction

Figure 5 shows a 100 W version of the triplexer. A 5 W version was also built. The only differences between them are the voltage ratings of the variable capacitors and the way they are mounted. Either version can be built in a die cast or other metal enclosure that provides shielding and ground continuity between the inputs and the output. An example is the Hammond 1590E boxes that are available as Digi-Key part number HM155. The input and output connectors are SO-239 UHF jacks. Their ⅝ inch mounting holes can easily be drilled using a step drill or ⅝ inch countersink.

Table 1

20 Meter Insertion Losses for the 100 W Triplexer Decoupling Network and Band-pass Filter

Frequency (MHz)	*Transmit Power (W)*	*Filter Loss (dB)*	*Triplexer Loss (dB)*	*Total Loss (dB)*	*Power Out (W)*
14.00	175	0.70	0.30	1.00	139
14.10	175	0.68	0.29	0.97	140
14.20	175	0.68	0.29	0.97	140
14.30	175	0.68	0.30	0.98	139.5
14.35	175	0.73	0.27	1.00	139

Table 2

Winding Specifications for Inductors Suitable for Power Levels up to 150 W

See text. All coils 1 inch in diameter.

Inductor	*Band (Meters)*	*Inductance (µH)*	*Turns*	*Wire Size (AWG)*	*Winding Pitch (TPI)*
L1	20	8	19.5	20	17.5
L2	15	5.3	13.5	18	13
L3	10	4	12	16	11

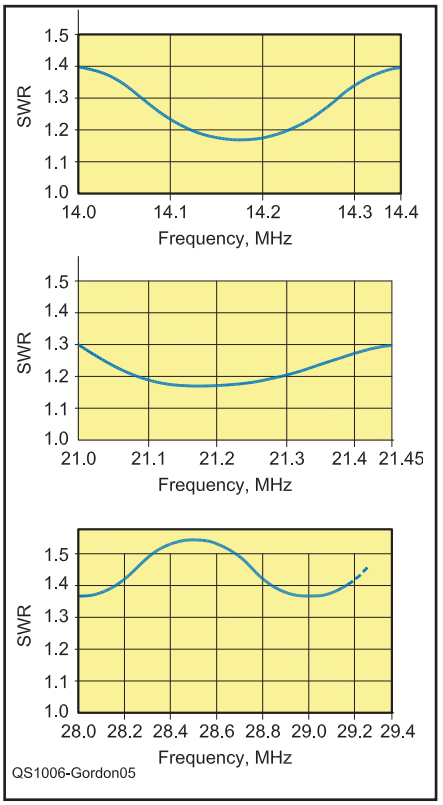


Figure 4 — SWR measurements for the triplexer decoupling network and band-pass filters

Inductor Details

The inductors can be wound on 2 inch lengths of 1 inch polycarbonate tubing (not brittle polystyrene), available from Tap Plastics (**www.tapplastics.com**). Small holes can be drilled near the ends of the forms to provide for anchoring the ends of the windings. Short lengths of ¾ inch polycarbonate rod can be glued into one end and tapped for mounting screws.

The wire can be bare, enameled, tinned, or Teflon insulated wire, depending on what is available. The suggested wire gauges in Table 2 do not need to be followed exactly. A wire kit is being offered by VE2VBR that consists of 25 foot lengths each of #16, 18 and 20 AWG wire. Alternately, short lengths may be available on Internet auction sites and in stores.[3]

If your wire is either bare or has thin insulation, the coil turns should to be spaced apart slightly. You can space the coil turns by interspersing fishing leader between them, added after the wire has been wound, and then coating everything with an adhesive. For my inductors I used a threading lathe to cut a shallow 0.03 inch spiral groove across much of the length to guide the wire, something a machinist could do in half an hour. In either case winding the coil is much easier if the wire is first straightened. Cut generous lengths, perhaps 7 feet for the 10 meter coil and 10 feet for the 20 meter coil, anchor one end to a vice or anything rigid and then use pliers to give the other end a sharp yank, stretching the wire an inch or so. If your wire has Teflon insulation, the turns do not need to be spaced apart.

Capacitor Details

Look for variable capacitors with maximum capacitances ideally of 20 or 30 pF or slightly more.[4] For the 5 W version) the first choice is the miniature APC style. These variable capacitors are compact, inexpensive, relatively available as industrial and military surplus, and adjusted using a screwdriver. Look for capacitors with 500 V or higher ratings, such as the Fair Radio Sales 35 pF 1G-35.

Higher power triplexers call for capacitors with larger plate spacings since, for example to handle 100 W, they will be subjected to at least 1200 V peak. One excellent choice for this power level is the RF Parts 41 µF 48APL41S.

Table 2 lists the recommended voltage ratings for different power levels, and how to estimate the voltage rating based on the plate spacing. If you come across capacitors with higher than optimum maximum capacitances, you might consider modifying them by removing either rotor or stator plates by sawing off a fraction of the lengths. I'll mention in passing that a completely different but more complicated way to make tuned circuits is using fixed capacitors and toroidal inductors that are adjusted by sliding their turns, as described in a *QST* article.[5]

The variable capacitors are not panel mounted but instead insulated from the metal box. In the 100 W version shown in Figure 5, they are mounted to a 1 inch wide strip of aluminum. The aluminum strip is insulated from the box by stand off insulators such as the threaded phenolic spacers manufactured by Keystone. These are available in the ¾ × ¼ inch size from Digikey as part number 386K. This mounting method also provides electrical continuity between the three capacitors. The previously suggested 41 pF part has a ¼ × ⅜ inch shaft, which should be slotted for screwdriver adjustment access through ¼ inch holes drilled into the box. Recessing the adjustment in this manner will discourage knob twiddling, since once the capacitors have been initially tuned they never again need to be touched.

Band-pass Filters

To complete the project you'll need a set of three 40 dB band-pass filters. These are available commercially, or can be home made.[6-9] If you really want to build your own filters I recommend using the step-up transformer approach used in the commercial products and in the referenced articles in order to achieve sufficient Q, although my strongest recommendation is to keep this a simple project by borrowing or buying a set.

Note that band-pass filters have their own power limitations. Those manufactured by Dunestar are rated for intermittent use with transceivers up to 200 W, and with the additional advice that they be operated into low SWRs and with an antenna always connected.

I must reemphasize that in order to protect the transceivers from damage, band-pass filters must be attached to the decoupling network box of this article, and a note to this effect should be placed on your unit. To ensure they stay a permanent part, screw their free ends down to a strip of wood or metal, which also protects connectors from getting broken if

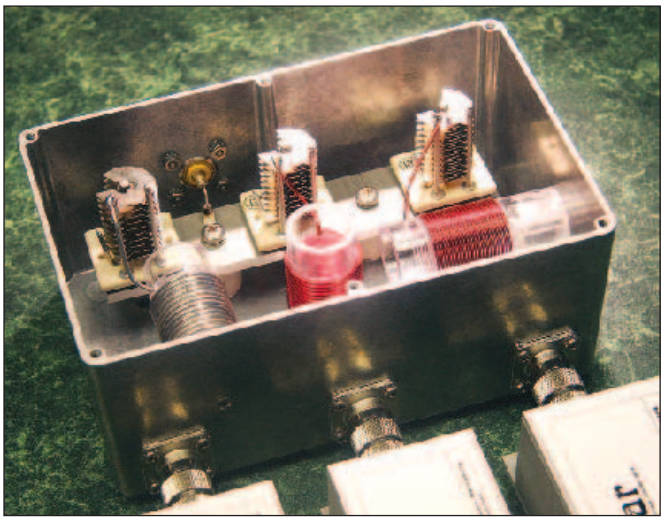


Figure 5 — The 100 W triplexer decoupling network with its cover removed.

cables get yanked on. It would seem a good idea to also label the outboard end of each filter's feed line with its intended band.

Adjustment

Tuning the triplexer's decoupling network consists of adjusting each tuned circuit for resonance on its particular band. The easiest way is to do this is to connect it to a dummy load and adjust the capacitors for maximum power to the load. Start by connecting a transceiver to the input of the 20 meter band-pass filter and the triplexer's output to a power meter and dummy load. You can set your transceiver frequency to either the center of the band or in your favorite segment, although its bandwidth will be wide enough to cover the entire band. Set a low power level, and turn off any antenna tuner.

With the power meter set to a sensitive range, transmit a CW signal and adjust C1 for maximum power using an insulated screwdriver. If you are using an analog power meter, increase the transmitter power if necessary to move the needle up the scale and make the adjustment more sensitive.

The 15 and 10 meter circuits are tuned in a like manner. If your three variable capacitors are identical you should see their engagement angles look something like those in Figure 6, where the capacitance values will be roughly 8, 11, and 16 pF. As a final check of performance, confirm that the insertion losses are not higher than approximately 1 dB (20%), by comparing dummy load power readings with and without the triplexer.

First On Air Test

Since the concept was inspired by ARRL Field Day 2009, the first tests took place at that event, at an open space preserve atop Mora Hill in Cupertino, California. Needing to adjust to the park ranger's new and more restrictive rules regarding how much aluminum we could have, we decided on two gain antennas, one triband Yagi each for CW and SSB. Since the skip was always to the East, neither antenna needed to be rotated, although that advantage might not apply to your location. Each antenna ended up servicing three separate transceivers, giving us nearly the firepower of six monoband Yagis. We placed 12th overall nationally, second in our division and third nationally in the low power (QRP) category.

No Interference (Really?)

Before Field Day arrived, Jim Peterson, W6EI, and I ran a series of interference tests using six different midrange transceivers each running 100 W. The short takeaway is that as long as his triband Yagi was connected we saw no interference whatsoever, regardless of how we mixed and matched the rigs and bands.

That made us curious as how much safety margin existed, and since it wasn't possible to increase transmitter power, we decided instead to eliminate atmospheric noise by replacing his antenna with a dummy load. While this represented an artificial situation, nonetheless it was a useful way to expose underlying interference issues, which we did see in most cases. The only exception was an absence of any interference between two Elecraft K3 transceivers.

Interference can be caused by both transmitters and receivers. If you're looking for a clean transmitter, look for one with low phase noise, as revealed by having low "composite transmitted noise" in the ARRL Product Reviews. For a resistant receiver, according to Elecraft, look for one that has a high out-of-band signal rejection, as measured by its second order intercept point (IP2). That and other useful transceiver specifications can be found at **www.elecraft.com/K2_perf.htm**. Nonetheless, while it's smart to test one's equipment before any important event, you should not expect to encounter any interference whatsoever when using this triplexer with modern transceivers.

Table 3

Recommended Minimum Capacitor Ratings for Different Transmitter Power Levels

Transmit Power (W)	*Capacitor Rating (V)*	*Plate Spacing (inches)*
150	2500	0.062
100	2000	0.050
25	1000	0.025
6	500	0.015

Conclusion

This is an easy to build construction project that will reduce the amount of antenna hardware you'll need for your next multioperator contest. I look forward to others sharing their experiences and improving upon the design.

I am pleased to acknowledge the encouragement and testing help provided by Jim Peterson, K6EI, and to Rene Morris, K6XW, of Elecraft for the frequency response test of Figure 3.

Notes

[1]WVARA, West Valley Amateur Radio Association, San Jose, California. **www.wvara.org**.
[2]**www.dunestar.com**
[3]Wire: Conception R.B., **www.conceptionrb.com/boutique/index.php?cPath=46**, **www.conceptionrb.com/boutique>English>Catalog**.
[4]Variable capacitors: RF Parts, Fair Radio Sales (see their 1G-35) and eBay.
[5]E. Wetherhold, W3NQN, "Clean Up Your Signals with Band Pass Filters," Part 1, *QST*, May 1998, pp 44-51, Part 2, *QST,* Jun 1998, pp 39-42.
[6]**www.arraysolutions.com/Products/wx0bbpf6.htm**
[7]See Note 2.
[8]E. Wetherhold, W3NQN, "Receiver Band-Pass Filters Having Maximum Attenuation in Adjacent Bands," *QEX,* Jul 1999, pp 27-30.
[9]See Note 5.

ARRL member Gary Gordon, K6KV, took a liking to electricity in grade school after reading a copy of The Boy Electrician. *A few years later in Milwaukie, Oregon he built his first Tesla coil and in 1955 became WN7ZKG. The following year, finding war surplus parts both cheap and plentiful, he picked up several 803 pentodes for $.50 apiece and built a 300 W linear amplifier. That, a full size antenna and a swamp front location made for a quite respectable signal on 80 meters.*

Gary went on to study electrical engineering at University of California at Berkeley, and Stanford University. He then enjoyed a productive career at Hewlett Packard where, among other things, he co-invented the optical computer mouse. You can reach Gary at 21112 Bank Mill Rd, Saratoga, CA 95070 or at **gary1@gary-gordon.com**.

A Fan Dipole for 80 through 6 Meters

The parallel or fan dipole can be effective if you keep a few facts in mind.

Richard P. Clem, WØIS

While variations on the design have appeared many times in *QST* over the years, many newer hams (and more than a few old timers) are unaware of the simple antenna design shown in Figure 1, variously referred to as fan, fanned or parallel dipoles.[1] This antenna requires neither tuner nor switching for operation on multiple bands, and requires only a single coaxial feed line.

The mechanical details of this antenna are not critical. It can be adapted to a variety of configurations to take advantage of existing support structures, or to operate on different bands. The configuration shown in Figure 1 has been in use at WØIS for a number of years, and provides good results on 80, 40, 20, 15, 10 and 6 meters, and a sufficiently acceptable SWR on 30 and 17 meters to allow for occasional ventures onto those bands.

Antenna Concept

This antenna consists of four dipoles, all sharing the same coaxial feed line. These dipoles are cut for the approximate centers of 80, 40, 20 and 10 meters. Essentially, the signal from the transmitter "sees" only the antenna that is resonant, since the antennas for the other bands present a high impedance.[2] The 40 meter element is ½ wavelengths on 15 meters, and ½ wavelengths on 6 meters, so the antenna is also resonant on those bands. I have the antenna installed in inverted V fashion, with the center supported by a mast made of schedule 80 PVC pipe secured to the house and extending a few feet above the top support. The eight half dipole legs run to convenient points on the house and trees.

Most of the previous *QST* references to similar antennas show the elements running parallel to one another and in close proximity. For example, ON4UF shows construction with 300 Ω ribbon cable, and W9DOS shows the use of four conductor rotator cable. One comment I've heard from users of similar antennas is that if the elements are tightly coupled, while the completed antenna uses less real estate, there is a great deal of interaction between adjacent elements. Such an antenna requires a great deal of careful trimming to achieve resonance on all bands.

Table 1

Final Element (Half Dipole) Lengths for Each Band

Band (Meters)	*Length (Feet)*
80	66
40	32.5
20	16.5
10	8.25

The WØIS Version

At WØIS, the eight wires are run in all directions, each spaced approximately 45° from the next element. This provides a certain amount of mechanical stability to the PVC mast. More importantly, this has greatly reduced interaction between the various elements.[3] Each side of each dipole was simply cut according to the familiar formula

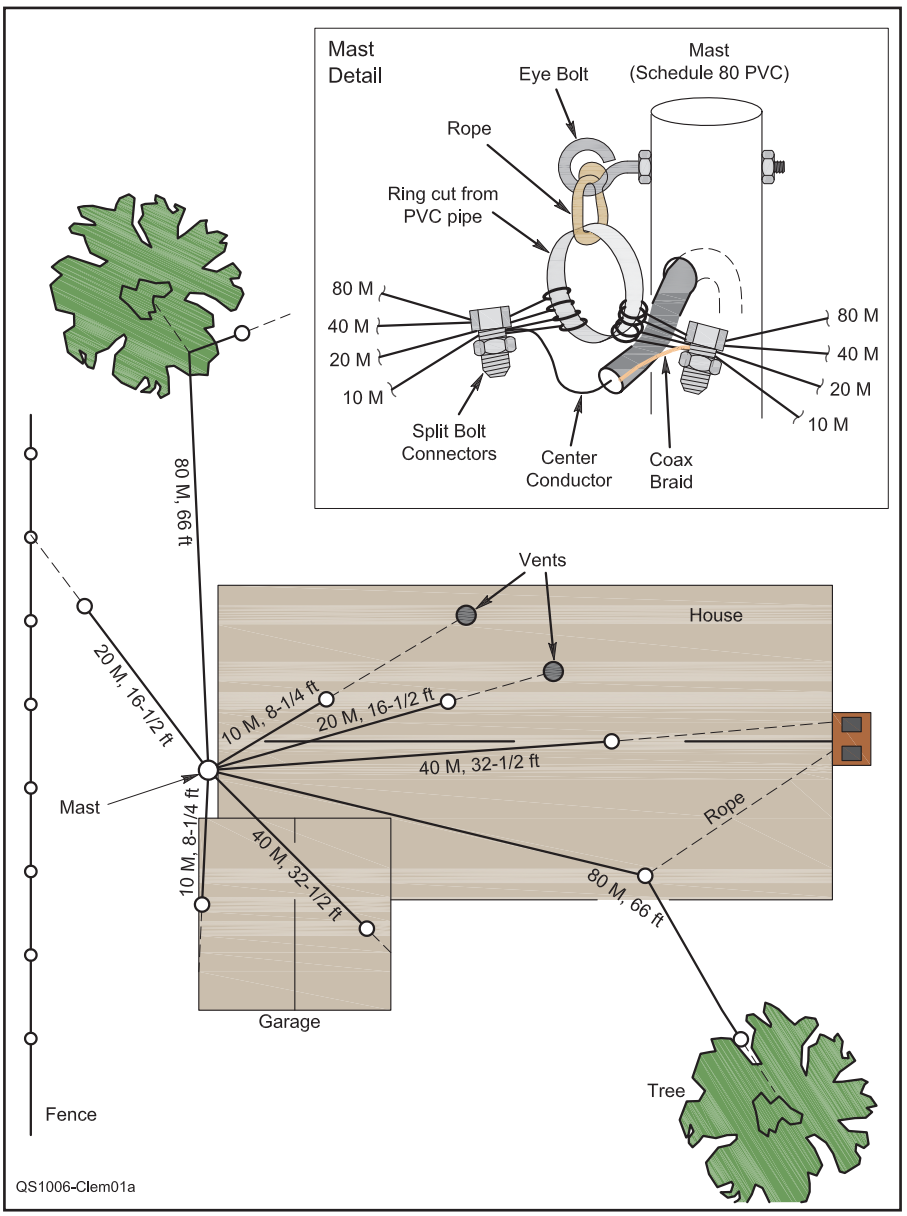


Figure 1 — Aerial view of WØIS fan dipole. The inset shows detail of center connections.

[1]Notes appear on page 42.

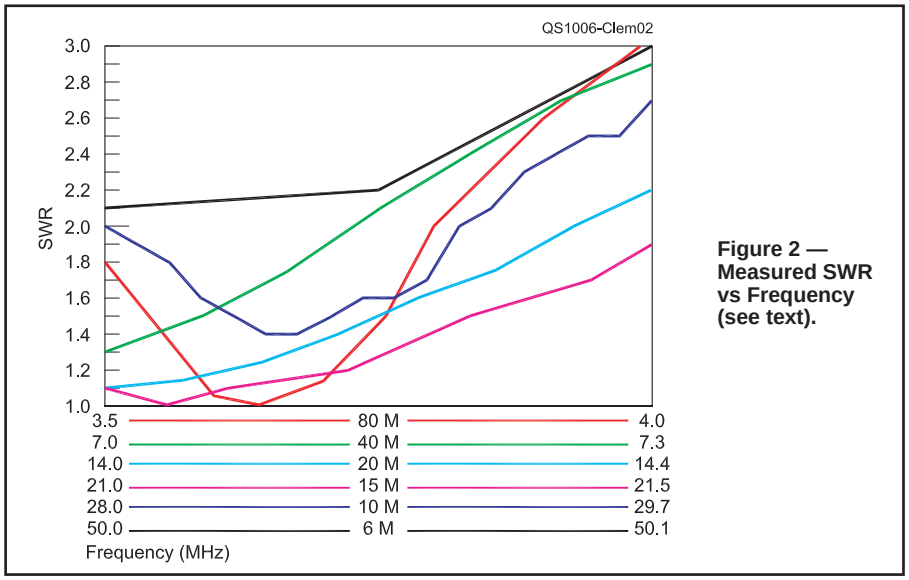


Figure 2 — Measured SWR vs Frequency (see text).

L=234/f, where L is the length in feet, and f is the frequency in MHz.

The only tuning that was necessary in my case was lengthening the 80 meter dipole by about 4 feet on each side. On all other bands, there was an acceptable SWR across the entire band.

I believe that the reason I had to lengthen the 80 meter elements had nothing to do with the fact that the other elements were present. As can be seen from Figure 1, I needed to zigzag the 80 meter dipole somewhat, and this probably accounted for the fact that they needed to be longer than the value derived from the formula. The final lengths for each element (that is, the length of one half of each dipole) are shown in Table 1.

The final SWR curves are shown in Figure 2. My intention was to tune the antenna for optimum SWR in the middle of each band. As installed, the SWR actually favors the bottom of the band. Since I operate mostly CW, I actually preferred this result, and didn't do any further tuning. For those who will do most of their operating higher in the band, it might be advisable to shorten the elements for the higher bands for optimum SWR. Note that my old SWR meter is optimistic above 2:1.

Surprisingly, even though no effort was made to make this antenna function on 30 or 17 meters, the SWR on those bands is also marginally acceptable (approximately 3:1). I suspect this is because those frequencies are close enough to being an odd multiple of 3.5 MHz. In my antenna, the SWR is unacceptably high on 12 meters.

The same design could be used on different bands simply by removing elements or adding elements of different length. This is a very versatile design, and is the ultimate in operating convenience — to change bands, absolutely no tuning or switching is required.

Building Your Own

The construction details are not critical. I used some available #18 AWG stranded copper wire. While a balun could be used, and is generally recommended, I did not use one. Instead, I cut a small piece of PVC pipe to use as the center insulator. All of the elements are secured to this center insulator merely by twisting a loop around the insulator. The coax is connected to the elements with a split bolt connector a few inches away from the center insulator.[4] The center conductor of the coax is connected to the four elements running in one direction, and the shield of the coax is connected to the four elements running in the other direction. [It is a good idea to put sealer on the exposed braid. — *Ed.*] The split bolt connector compresses the five wires together. This connection is not soldered, and has continued to work well for several years. The coax should run initially upward from this point, to prevent water from entering the coax. I used type RG-8X coax; however, any 50 Ω coax can be used with type depending on tolerable loss and power level.

The various elements are secured to convenient points on or near the house, such as the gutters, the chimney, vent pipes, a fence, and trees. The ends are secured with rope, either tied directly to the antenna wire, or to insulators made from rings formed by cutting PVC pipe.

A Few Additional Notes

Many of the early *QST* references to an antenna of this type contain an editor's note pointing out that such an antenna has absolutely no harmonic suppression capabilities. If a 7 MHz signal is generating a harmonic on 14 MHz, then the 14 MHz signal will have an efficient radiator at its disposal. One should be aware of this possibility; however, if a modern rig complies with FCC spectral purity requirements, it shouldn't be necessary to rely on the antenna for additional attenuation.

An antenna of this type is infinitely adaptable. For example, the design could be adapted by those needing a "stealth" antenna by hiding the coax and using materials such as thin gauge wire and monofilament line. I frequently use a similar antenna for low power operation while camping. I use a piece of coax terminated with a PL-259 UHF plug on one end and two alligator clips on the other end. To erect an antenna, I merely measure sections of wire for the bands I'm interested in (often using an 8 foot picnic table as a convenient measuring stick), and then erect them in trees or whatever other supports are available, using string, or simply draping them over branches.[5] In the center, I attach one alligator clip to one set of wires, and the other alligator clip to the other set of wires. The result is a dipole that can be erected in minutes.

This type of antenna is one of the simplest ways to construct a multiband antenna. It does requires a fair amount of wire in the air. However, the fact that the placement of the elements is not critical makes it very adaptable to most real estate.

Notes

[1]For example: H. Berg, W3KPO, "Multiband Operation with Paralleled Dipoles," *QST*, Jul 1956, pp 42-43; J. Grebenkemper, KA3BLO, "Multiband Trap and Parallel HF Dipoles—A Comparison," *QST*, May 1985, pp 26-31; S. Wysocki, W9DOS, "Using Four-Conductor Rotator Cable in Paralleled Dipole Antennas (Hints and Kinks)," *QST*, Sep 1958, p 50; L. Richard, ON4UF, "Parallel Dipoles of 300-Ohm Ribbon," *QST*, Mar 1957, p 14.

[2]See discussion in H. Berg, W3KPO, "Multiband Operation with Paralleled Dipoles," *QST*, Jul 1956, pp 42-43.

[3]Grebenkemper (Note 1) does show some interaction between elements at a 45° angle, but less than for parallel radiators. In my experience, this lesser interaction is not so severe as to require adjustment of the element lengths.

[4]Halex Company part number 32403B or equivalent.

[5]Having insulated antenna wire actually touch the trees is acceptable at low power levels. At higher power levels, however, care should be taken, since it might be possible for such an arrangement to actually set fire to the tree.

ARRL member Richard Clem, WØIS, was originally licensed in 1974 as WNØMEB, and later as WBØMEB. He holds an Amateur Extra class license and has held his current call sign since 1977. He is an attorney and ARRL Volunteer Counsel. The antenna described in this article was recently used to win ARRL Triple Play award #215, which included working all states on PSK-31 with 5 W. You can reach Richard at 1616 N Victoria St, St Paul, MN 55117 or at **w0is@arrl.net**.

Receiver Sensitivity — Can You Have Too Much?

Sensitivity plays a big part in dynamic range. You don't want too much of a good thing.

Joel R. Hallas, W1ZR

There was a time in the early days of vacuum tube superhet receivers when sensitivity seemed to be the key performance indicator. Modern technology can easily provide any level of sensitivity we need for an HF transceiver, so focus has shifted to other parameters that are harder to achieve. Nonetheless, even though it doesn't get the press it once had, we do need to have a certain level of sensitivity to achieve our desired performance.

Measuring Receiver Sensitivity

Sensitivity is expressed in terms of input signal required to achieve a specified signal-to-noise ratio (SNR). This is measured in the ARRL Laboratory using a signal generator into a receiver with an audio power output level meter plugged into the speaker jack and the automatic gain control (AGC) turned off. The noise power from the receiver is noted with a 50 Ω termination on the antenna terminals and no signal present. The resistor is removed and the signal generator is connected in its place. The signal amplitude is increased until the receiver output power is twice that of the no-signal level. This corresponds to the signal level equal to the noise or a 1:1 or 0 dB SNR. This level is considered the receiver's *minimum discernible signal* or MDS in our Product Review data tables.[1]

Real Receiver Meets Real World

If we now connect an antenna to the receiver, we might expect to be able to comfortably receive signals somewhat above the measured MDS. Unfortunately, on HF what we hear is noise — lots of it. This noise is generated by a combination of effects, in many areas mostly by RF energy from lightning strikes in the HF spectrum propagating around the world, wherever propagation is working. In some areas, particularly areas of high population density, to that atmospheric noise we add man-made noise from light dimmers, fish tank pumps, plasma flat screen TV sets, electric fences, fluorescent signs and other electrical equipment.

In order to hear a signal comfortably, it now needs to be well above the real background noise level that is coming in from the antenna. This means that the sensitivity from above the internal receiver noise that we measured in the lab, to the sensitivity compared to noise from the antenna is effectively wasted — we can't make use of it even though it's "built in."

So How Much is Enough?

To know how much sensitivity we need, we need to know how much external noise we will be up against. Figure 1 shows typical man-made noise levels versus frequency from various sources in decibels compared to a milliwatt (dBm) in a 500 Hz bandwidth. There are a few observations to keep in mind throughout this discussion:

Noise Levels Shown are Typical

Use the values shown as a guide. On some days the noise level will be higher, on some days lower, depending on a myriad of factors. Typically, tropical regions will have more lightning based noise, even if propagation is poor.

HF Noise Tends to be Inversely Proportional to Frequency

Note (see Figure 1) that as the frequency increases the noise level drops, the internal receiver noise becomes the major factor in determining usable sensitivity.

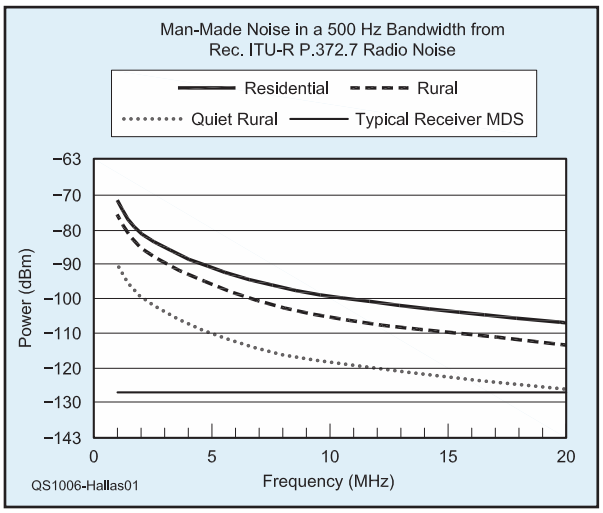


Figure 1 — Typical man-made noise levels versus frequency for various environments.

Note also that in the V/UHF range, the receiver noise usually predominates, although there are galactic sources that can be limiting. The "signals" to a radio telescope are just noise to us communicators.

Noise is Proportional to Bandwidth

If the noise is uniform over frequency, the wider the bandwidth, the more noise we receive. Figure 1 is for a 500 Hz bandwidth, typical for CW reception. If you are using a 2500 Hz filter for SSB, for example, the noise power will be five times (7 dB) stronger. For best reception in noise, the bandwidth should be matched to the required bandwidth of the signal, even if there is no interference.

So, How Much Sensitivity is Enough?

If the external noise is at least 10 times the internal noise, you will be in the realm of being limited by external noise. You can do a quick check by switching the receiver input to a matched dummy load and noting the level. If you switch back to the antenna and the noise level goes up by a factor of 10, about two S-units, you are in the right range.

What Happens if There's Too Much?

Each receiver has a certain *dynamic range* — the difference between the weakest and strongest signal it can handle without distortion. If signals are near or above the highest that can be handled, overload will occur somewhere. Sometimes this results in noticeable distortion, but more often as spurious signals due to the dreaded *intermodulation distortion*. If the sensitivity is too high, the part of the dynamic range between the receiver's lab sensitivity and its usable sensitivity is essentially wasted.

What Can You Do About It?

If the sensitivity is higher than needed, first turn off any preamp. Then put in attenuation until you have the noise sensitivity where you want it, maintaining the same level of listening comfort.

Joel R. Hallas, W1ZR, is Technical Editor of QST. *You can reach him at* **w1zr@arrl.org**.

[1]See the Product Review section of the ARRL Web site for the complete *ARRL Lab Test Procedures Manual.*

A Vehicle Mounted Mast for Field Operating

This inexpensive mast gets you extra range from your parked vehicle without an extra footprint.

Geoff Haines, N1GY

This project actually came about because of a little visit to one of those charity operated thrift shops that are very common in many parts of the country. After dropping off our donations to the cause, I was just scanning the room when my eyes lit on a bright yellow object in a corner. It turned out to be one of those telescopic poles with a spring loaded light bulb changer basket on top. The less than $5 price was irresistible, so I paid the bill and took it home. The project was already taking shape in my head.

I have always liked to be able to operate from my car at a park or beach. The only problem with setting up my big telescopic mast, as described in a *QST* article, was the need to set up the base, then drive the car onto the base, then mount the mast, extend it, guy it down and only then be able to hook up the coax and begin to operate.[1] While this can be a one person job, it is much easier with two or more. The guying also takes up a fair amount of room around the car, which can be a problem.

A New Approach

This new mast would have to be designed to be totally contained within the footprint of the car. No guy ropes, no separate base — just erect the mast and antenna and get on the air. My SUV already has a trailer hitch stud on the rear bumper. A length of 1 inch inside diameter PVC pipe fit both the hitch stud and the lower section of the light bulb changer mast perfectly (see Figure 1). The next job would be to convert the changer basket to something that could accommodate a V/UHF antenna such as the one I described in August 2006 *QST*.[2]

Amazingly, once I removed the light bulb changing basket's components, I was left with a screw-on base that, after a little work with a narrow chisel, was ready to be mated with the PVC T at the base of my antenna. Four short sheet metal screws were used to secure the screw-on base to the antenna. Now the antenna can be simply screwed onto the top of the mast and secured with a small setscrew that was included with the base.

Mounting the Mast to the Vehicle

The next task was to ensure that the mast, which in its stock form extends about 11 feet, was rigidly mounted and stable. This is important because once the PVC pipe is added to the bottom of the telescoping mast and the antenna is added to the top of the mast, the whole assembly is 21 feet from the ground to the top of the antenna. That ought to add some range compared to the magnetic mount antenna on top of the car's roof.

In looking around the SUV, I discovered that the adjustable crossbar at the rear of the rooftop rack has tie down loops at each end. Some scrap ½ inch diameter aluminum tubing that was left over from some long dead antenna provided enough material for two braces that run from those tie down loops to a pipe clamp attached to the PVC pipe. The ends of the aluminum tubing were flattened and bent to the appropriate angle. Holes were drilled in each end to accommodate stainless steel bolts with self locking nuts at the ends that go into the tie downs (see Figure 2) and a ⅜ inch stud attached to the pipe clamp (see Figure 3). A ⅜ inch wing nut secures the braces to the pipe clamp and the bolts at the other end of the braces slip into the tie-down rings. These ends are secured with a bungee cord across the luggage rack and the braces, exerting downward pressure to keep the braces in position. Another bungee cord is run from the wing nut and stud down under the rear bumper to again apply downward pressure to keep the mast assembly in position.

The length of the aluminum tubing braces was carefully measured after experimentation to ensure that the mast assembly is truly vertical in all planes when erected on a level parking spot. Adjustment fore and aft is achieved by sliding the pipe clamp up or down the PVC pipe and side to side adjustment by twisting the pipe clamp left or right before securing the clamp to the pipe. These adjustments are relatively narrow in scale, so careful measurement of the length of the braces is vital. Once all the adjustments are completed, the setup is done.

Figure 1 — The mast setup without an antenna.

Taking it Down

Disassembly and removal of the mast and braces should not result in having to readjust again. In setting the system up, once a suitable parking location is reached, one simply assembles the braces and mast (with the antenna mounted) and the mast will always be vertical if the vehicle is level. Only if the parking spot is not flat and level will more adjustment be required. The entire system breaks down into seven pieces:

- One 1 inch inside diameter PVC pipe.
- One telescopic mast.

[1]Notes appear on page 45.

- Two aluminum braces.
- Two bungee cords.
- A dual band antenna.

All of this fits easily into the back of my SUV along with my emergency go-kit and the other stuff I have accumulated. Using the smaller mast means that the setup is completely contained within the space of the vehicle. This makes setting up and breaking down much easier and takes less time.

Wrapping Up

There are a couple of caveats that come with this project. First, under no circumstances should one try to drive the vehicle with the mast erected. Contact with overhead power lines could be fatal. Second, because of the light duty nature of the mast, only relatively small and light VHF or UHF antennas are suitable. Larger antenna arrays need larger and more rugged mounting systems to be safe.

My costs were minimal because I already had the PVC pipe and the aluminum tubing on hand. Besides the cost of the telescopic light bulb changer, which should be available at any home improvement store, I spent another $10 or $11 on stainless steel fasteners and the pipe clamp. The contents of your junk box may vary but I doubt that you could spend more than $50 on the project even if everything had to be purchased new.

This might make a good first project for a newer ham. The extra range that a 21 foot high antenna gives the operator over the usual mobile antenna will come in very handy, particularly if they get involved (as they should) with their local ARES® group or public service event support.

Notes

[1]G. Haines, N1GY, "The Octopus — Four Band HF Antenna for Portable Use," *QST,* Dec 2007, pp 36-38.

[2]G. Haines, N1GY, "A Neat Dual Band Antenna," *QST,* Aug 2006, pp 50-51.

Figure 2 — The bottom end of the PVC pipe slips over my trailer hitch stud. It could easily be a regular bolt and nut through the bumper if one does not have a tow hitch on the vehicle.

Photos by the author.

ARRL member Geoff Haines, N1GY, was first licensed in 1992 as N1LGI. Geoff upgraded to Amateur Extra class in 2005 and obtained his current call sign. He retired after a career in respiratory care. Geoff currently holds several ARRL appointments in the West Central Florida Section, including Assistant Section Manager, Technical Coordinator and Net Manager among others. Geoff is President of the West Central Florida Group, operators of the NI4CE repeater system, a past president of the Manatee Amateur Radio Club, and a member of several ham radio clubs both in Florida and Connecticut. In his spare time, Geoff is the Editor of the quarterly e-magazine The Experimenter *for the West Central Florida Section. Geoff is active in designing small projects such as antennas and accessories suitable for the new ham He also finds time to update his Web site:* **www.n1gy.com** *on a regular basis. Geoff can be reached at 904 52nd Avenue Blvd, W Bradenton, FL 34207, or* **n1gy@arrl.net**. QST

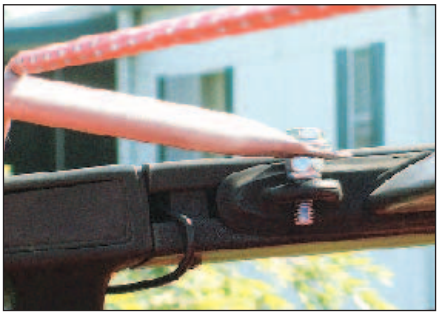


Figure 3 — This detail shows the end of one of the braces, with the end slipped into a tie down loop on the luggage rack. The bungee cord exerts downward force on the brace to keep it securely in the tie-down loop.

Figure 4 — The braces attached to the PVC pipe via the pipe clamp. The bungee cord connects to the rear bumper of the vehicle to exert downward force keeping the mount in place.

New Products

EMERGENCY COMMUNICATIONS BOXES FROM CUTTING EDGE ENTERPRISES

◊Cutting Edge Enterprises has created a line of ready-to-go communications boxes for amateurs involved in emergency communications. You provide a handheld or mobile VHF/UHF FM transceiver, and the Emergency Communications Box includes popular accessories. Six different models offer a broad range of power, amplification and charging options. The "First Response" kit includes a 12 Ah sealed battery, two outlets for 400 W ac, three dc cigar lighter outlets, Anderson PowerPole connectors, a 35 W RF power amplifier and ½ wave mag-mount antenna for 2 meters, a fast charger and an optional 25 W solar powered charger. The "Bare Bones" model is more basic, with an 8 Ah sealed battery, automatic charger, Anderson PowerPole connectors and three dc cigar lighter outlets. All kits are housed in waterproof, high impact boxes and include notebook, pen, LED flashlight, Amateur Radio message forms, nylon cord, a laminated ITU phonetic alphabet card, suction-cup mic hook, hook-and-loop wire ties and rain poncho. Prices range from $89.95 to $785.95. For more information, or to order, visit **www.powerportstore.com**.

PRODUCT REVIEW

Yaesu FT-250R and FT-270R Handheld 2 Meter FM Transceivers

Reviewed by Richard K. Palm, K1CE
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Yaesu's latest handheld 5 W transceivers for 2 meter FM are the FT-250R, which replaces the VX-150, and the FT-270R, which replaces the VX-170.[1,2] Both radios use an FNB-83 NiMH battery pack (7.2 V, 1400 mAh). The FT-270R comes with a 10 hour "overnight" wall charger, while the FT-250R includes a drop-in rapid desk charger. *Windows* programming software with a USB cable is available for each radio, as are a variety of mic, earphone and power options. A 440 MHz version, the FT-277R, is available as well.

Both transceivers come with modest price tags. As this was written, with discounts and promotions the FT-250R was available for around $120, and the FT-270R sold for around $135. Incredible, when you look at handheld FM radio prices of the past: The iconic IC-2AT, for example, reviewed in January 1981 *QST* (yes, almost 30 years ago), sold for $250.

My background is in ARES® based emergency communications, so naturally I tended to review these transceivers in terms of values that would be critically important in a demanding disaster environment. Ruggedness, size, ease-of-operation in the dark of night or brightness of day, RF power and audio output in high ambient noise backgrounds are all key. The review units did not disappoint.

[1]J. Bottiglieri, AA1GW, "A QST Roundup: 2-Meter Handheld FM Transceivers," Product Review, *QST*, Aug 2000, pp 69-72. Past *QST* Product Reviews are available to ARRL members at **www.arrl.org**.

[2]D. Henderson, N1ND, "Yaesu VX-120 and VX-170 2 Meter Handheld Transceivers," Product Review, *QST*, Feb 2006, pp 74-77.

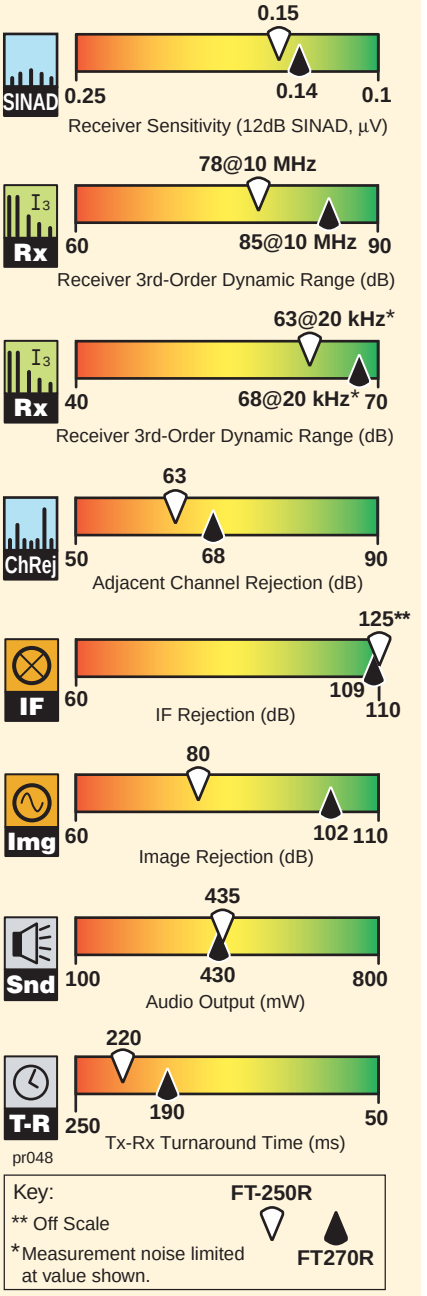
YAESU FT-270R

The FT-270R is easy to use, although I did have to revert to studying the manual to program in a CTCSS tone for the local repeater. It's compact, but not ridiculously small as are some units. The transceiver is made of a hard shell plastic that seems extremely durable, more so than my previous Yaesu FT-50R that I used for eight years. I like this radio a lot better. The keypad buttons are larger for one thing, and the display screen is larger also — good features for this aging ham with declining eyesight and dexterity. The lighted keypad buttons work well in the dark, a condition encountered frequently on a disaster scene or during search and rescue missions.

Power is turned on by the top panel's VOLUME/POWER knob (inner, top knob). The display shows dc supply voltage first for two seconds, then the operating frequency is displayed. (Lab measurements indicated that the internal meter reads 0.3 V low.) To increase or decrease the audio output, turn the same knob.

Audio output was more

Key Measurements Summary



Bottom Line

The FT-250R and FT-270R are well-built, and rugged, with plenty of audio for noisy environments. The FT-270R has a larger display and keypad buttons and more features, but the FT-250R includes a desktop charger and sells for a bit less. Either of these radios would be a fine addition to your equipment belt.

than adequate in high ambient noise. I tested this by walking on a big bridge over the traffic on I-95 in east coast Florida, and making contacts via simplex and a repeater. (I received more than a few stares from drivers — probably wondering if I was a counterterrorist operative.) The ability to hear your radio's loudspeaker is an important characteristic in potentially high noise disaster environments.

My transmitted audio reports were fine, but I had to speak closely to the microphone and talk rather loudly to communicate. Reportedly, this is because there is a waterproof membrane across the microphone. The manual indicates that the entire unit can be submerged in water to 3 feet deep for as long as 30 minutes, a good thing for emergency communications outdoors in harsh weather environments. We didn't submerge the FT-270R, but other Yaesu handhelds with submersion ratings have performed as advertised.

Controls and Settings

The squelch is set by pressing the F/LOCK key, followed by the MONITOR switch just below the PTT switch on the left side of the transceiver, and then rotating the outer knob on the top panel for appropriate squelch setting. My personal preference is for a separate squelch knob on the top panel to make it more convenient to change the squelch setting. Call me old fashioned, perhaps. I would prefer to see the external mic/speaker jack on the top panel moved to the side panel and replaced with a traditional squelch knob. It probably won't bother most users, but for me opening and closing the squelch is a frequent action, warranting a knob dedicated to the function.

The DIAL knob (outer concentric knob) is used for setting the operating frequency and other functions. Press the F/LOCK key to change the frequency in 1 MHz steps for efficiency in tuning through a wide frequency range. Frequencies can also be entered by the keypad, of course. Pressing and holding the UP or DOWN keys selects frequencies in the scanning mode.

Changing the transmitter power level is accomplished by pressing the F/LOCK key once again, pressing the LOW key, and rotating the DIAL knob on the top panel for high power (5 W), mid power (2 W) and low power (0.5 W). The user can store power levels for each programmed memory frequency, which is a nice feature. The keypad and various functions can be locked out using the F/LOCK key, which prevents inadvertent frequency shifts and changes to other settings, a "must" function for frenetic disaster conditions.

Repeater operation employs the convenient automatic repeater offset function found in most modern radios, although offsets can also easily be set manually and nonstandard splits programmed in. The user can also change the default repeater shifts as necessary. Checking the repeater input frequency is possible as well.

The FT-270R includes continuous tone coded squelch system (CTCSS) and digital coded squelch (DCS) subaudible tones, both decode and encode. The user can search for the tone, too, although some repeaters do not retransmit user tones. The FT-270R also has the usual dual tone multi frequency (DTMF) tones for autopatch and other tone modulated functions.

A new feature is Yaesu's enhanced paging and tone squelch system (ECPS) that uses one CTCSS pair for sending and another pair for receiving. A tone pair is sent to the receiving station when paging. If the tone pair matches those stored in the receiving radio, its squelch will open. During a disaster, you could have different transmit tone pairs on different channels (with all other settings the same) to page operators at various locations.

Memories and Scanning

The FT-270R has a vast array of memory functions, with 200 standard memory channels, a *Home channel* (the one you primarily use), band edge memories for scanning functions, 10 memory banks and 10 weather channels. As an ARES operator, I like the weather channel capability and the severe weather alert function that opens under the NOAA 1050 Hz tone system.

Memory channels can store frequency and offset, tones and power output. I tested the basic memory programming and was able to program in a few repeater frequencies and one simplex frequency in just a minute or two, but if you do a lot of this the optional ADMS-270 programming software would make life easier.

The typical array of scanning functions also applies to this radio. You can scan just the memory channels, the entire operating band or a portion of the band. The SMART SEARCH operation loads frequencies automatically when activity is encountered during a scan, and the information is stored in a special memory bank.

Table 1
Yaesu FT-250R, serial number 9F030325

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 140-174 MHz; transmit, 144-148 MHz.	Receive and transmit, as specified.
Modes: FM, NFM.	As specified.
Power requirements: 7.2 V dc (battery) or 6-16 V dc external dc input. Receive, 130 mA, 37 mA (saver off), 23 mA (saver on). Transmit, 1.6 A (high), 800 mA (mid), 500 mA (low).†	Receive, battery power, 242 mA (max vol no signal), 42 mA (standby), 11-42 mA, (saver on). Transmit, battery power, 1.24, 0.69, 0.37 A at 8.4 V dc (high, mid, low); dc power, 1.09, 0.6, 0.28 A at 13.8 V dc.
Receiver	**Receiver Dynamic Testing**
FM sensitivity: 12 dB SINAD, 0.16 µV.	For 12 dB SINAD, 0.15 µV; 0.16 µV at 162 MHz.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 63 dB*; 10 MHz offset: 78 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 81 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset: 63 dB.
Spurious response: Not specified.	IF rejection, 125 dB; image rejection, 80 dB.
Squelch sensitivity: Not specified.	At threshold, 0.04 µV, 0.55 µV (max).
Audio output: 400 mW at 10% THD into 8 Ω.**	435 mW at 10% THD into 8 Ω. At 1 V RMS, 0.65%.
Transmitter	**Transmitter Dynamic Testing**
Power output: 5.0 W with battery or external 13.8 V dc power.	Battery: 4.7, 2.0, 0.54 W (high, mid, low); 13.8 V dc: 5.2, 1.8, 0.31 W.
Spurious signal and harmonic suppression: >60 dB.	60 dBc.*** Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 220 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	136 ms.
Size (height, width, depth): 4.3 × 2.3 × 1 inches (w/o knob and antenna); weight, 12.4 oz.	
Price: FT-250R, $120; ADMS-250 programming software and USB cable, $40.	

†FNB-83 battery pack (7.2 V, 1400 mAh NiMH) and VAC-10B drop-in rapid charger supplied. Available options: Replacement FNB-83, $50. FBA-25 battery holder (6 AA cells), $20; EDC-5B cigarette lighter plug, $25.
*Measurement was noise limited.
**Rated at 700 mW to 16 Ω internal speaker.
***External dc power, low power output position, spurious emissions <25 µW.

Table 2

Yaesu FT-270R, serial number 9F480017

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 137-174 MHz; transmit, 144-148 MHz.	Receive and transmit, as specified.
Modes: FM, NFM.	As specified.
Power requirements: 7.2 V dc (battery) or 6-16 V dc external dc input. Receive, 165 mA, 45 mA (saver off), 20 mA (saver on, no signal). Transmit, 1.5 A (5 W output) at 7.2 V dc.†	Receive, battery power, 310 mA (max vol no signal), 46 mA (standby), 15-46 mA, (saver on). Transmit, battery power, 1.43, 0.8, 0.4 A at 8.4 V dc (high, mid, low); dc power, 1.32, 1.01, 0.61 A at 13.8 V dc.
Receiver	**Receiver Dynamic Testing**
FM sensitivity: 12 dB SINAD, 0.16 µV (140-150 MHz); 0.2 µV (137-140, 145-174 MHz).	For 12 dB SINAD, 0.14 µV; 0.18 µV at 138 and 162 MHz.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 68 dB*; 10 MHz offset: 85 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 73 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset: 68 dB.
Spurious response: Not specified.	IF rejection, 109 dB; image rejection, 102 dB.
Squelch sensitivity: Not specified.	At threshold, 0.14 µV, 0.47 µV (max).
Audio output: 400 mW at 10% THD into 8 Ω.**	430 mW at 10% THD into 8 Ω. At 1 V RMS, 1.7%.
Transmitter	**Transmitter Dynamic Testing**
Power output: 5.0 W with battery or external 13.8 V dc power.	Battery: 4.8, 2.0, 0.45 W (high, mid, low); 13.8 V dc: 3.9, 2.0, 0.45 W.
Spurious signal and harmonic suppression: >60 dB.	> 70 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 190 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	100 ms.

Size (height, width, depth): 4.7 × 2.4 × 1.3 inches (w/o knob and antenna). Weight, 13.8 oz.

Price: FT-270R, $135; ADMS-270 programming software and USB cable, $40.

†FNB-83 battery pack (7.2 V, 1400 mAh NiMH) and NC-88B 10 hour wall charger supplied. Available options: Replacement FNB-83, $50. FBA-25A battery holder (6 AA cells), $20; EDC-5B cigarette lighter plug, $25; VAC-370 desktop rapid charger, $75.

*Measurement was noise limited.

**Rated at 800m mW to 16 Ω internal speaker.

Emergency channel operation is a feature that may be useful if another operator is monitoring your home frequency. It's activated by pushing and holding the RPT key for 1 second. The radio switches to the home channel, emits a loud alarm sound and flashes the LCD keypad lamp. The user then pushes the PTT switch to transmit on the Home channel.

Other features include Internet repeater connectivity schemes such as WiRES (Wide-Coverage Internet Repeater Enhancement System) and Yaesu's ARTS (Automatic Range Transponder System) feature. ARTS uses digital tones to inform the user if another ARTS equipped station is in range. This feature is touted as useful during search and rescue missions when it is important to stay in contact with other members of the team.

Conclusions

Here's what I liked about this radio: Its price tag is number one. It's more capable, yet far less expensive than previous generations of radios I've owned. Once you're familiar with the controls and menus, it is easy to program and operate. It seems very rugged, with a good, hefty feel to it. The screen display is big enough for us old geezers with fading eyesight. The keypad and keys are also big enough, and backlit for low light situations. I didn't like the lack of a separate SQUELCH knob, and you do have to have to talk closely to the microphone and speak loudly, sometimes an advantage in a noisy environment.

YAESU FT-250R

The FT-250R is the little sister of the FT-270R, with fewer exotic functions (fine by me) and an even lower price tag. It includes a rapid drop-in desk charger — a nice touch. It is slightly smaller in size and about an ounce lighter. The FT-250R is ruggedly built but not waterproof as is the FT-270R. (The FT-250R does not have a submersion rating.) Both radios uses the same long lasting NiMH battery pack, but many of the accessories are not shared between the two radios.

The FT-250R is operated in much the same way as the FT-270R. The FT-250R's keypad buttons and the screen are smaller. I found them a little harder to use and more difficult to read. I liked the fact that the squelch is adjusted by a knob instead of the F/LOCK key.

The audio output is very loud, which is once again good for high ambient noise conditions found in the field. The FT-250R doesn't seem to require speaking as loudly into the microphone as the FT-270R, probably because it does not have the same waterproof membrane. Adjustable power output is 5 W maximum, with the same steps as the FT-270R. As shown in Tables 1 and 2, the '270R offers slightly better receiver performance.

Memory channels and full featured scanning capabilities are standard. The ARTS function described above is retained in the FT-250R. CTCSS operation, of course, is included, as are DCS functions. Tone search scanning is also retained, as is the smart search operation for automatically loading frequencies where activity is found.

Final Thoughts

The FT-250R and FT-270R are both well built, and rugged. They both have a nice hefty feel to them. Audio transmitted and received seemed fine to me, although as noted above I had to speak louder into the FT-270R mic. Basic programming of memories, squelch, power and scanning are easy to implement. If I had to choose, it would be the FT-270R because of its larger size, larger screen and larger keypad buttons. The FT-250R works great and offers a lot of value too. Although digital voice, data and repeater systems are making inroads for emergency communications, analog FM is still the workhorse mode. Either of these radios would be fine additions to an ARES operator's belt.

One final opinion: The amount of functionality built in to modern VHF transceivers can get in the way of easy use of the basic radio functions. If I were an emergency coordinator on a disaster scene, I would want a radio that can be operated out of the box by anybody within seconds, not after reading the fine print of a manual. There may be a niche for a 2 meter FM handheld with only the most basic of functions: frequency selection via keypad or knob, CTCSS, and 10 memory channels on a larger, rugged chassis with big knobs and key buttons and a BNC connector antenna. You could achieve something similar with the FT-250R or FT-270R by programming a memory bank with emergency channels and settings in advance and cloning those settings to all radios in use by your ARES group.

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

Popular Dual-Lever Keyer Paddles — *Part 2*

Reviewed by Bruce Prior, N7RR
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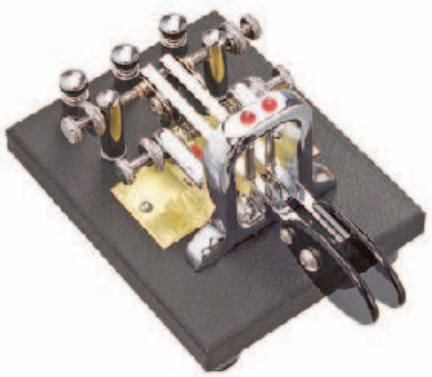
This is the second part of a review of popular dual-lever keyer paddles. The first part appeared in May 2010 *QST*.[3] This month we'll look at two heavy keys of classic design and two low volume keys from newer companies. Three of the keys are ready to operate out of the box. The other is a rather challenging kit.

All four of these paddles have flat bases with projections beneath and no machined channel for the keyer cable, so their rubber feet cannot be removed and replaced by a semi-permanent mounting system. The dislodging force figures in Table 3 are therefore especially important for evaluating them. All four paddles in this review perform better when placed on a high friction pad.

Special thanks to Margaret Prior, K7MWP, and Stan Schmidt, N7OC, for their considerable help in preparing for this review.

VIBROPLEX IAMBIC STANDARD

My wife Margaret, K7MWP, gave me the Vibroplex Iambic Deluxe as a wedding present, so it is a sentimental favorite. Vibroplex produces four different dual-lever paddle models in the Iambic series. Their working mechanisms are almost identical, differing mostly in aesthetics. The Iambic Standard (reviewed here) has a textured black powder coated, cold rolled steel base, and its needle bearings are non-jeweled. The Iambic Deluxe has a chrome base and jeweled bearings. The Iambic Presentation adds a gold plated brass plate on its chrome base. The Iambic Gold sports a brushed 24 karat gold plated base.



Do the non jeweled bearings of the Iambic Standard make a difference? I cannot tell any difference between the new Iambic Standard action used for this review and that of my 20 year old Iambic Deluxe paddle. Twenty years from now may tell a different story. The jeweled bearings will probably stand up better in the long term.

The design of the Iambic paddles bears a close resemblance to the Vibroplex Original Bug. The pivots are mounted close to the front, so a relatively small motion applied to the fingerpieces controls rather long levers with the compression springs about midway and the contacts toward the back. That arrangement of moving a fair amount of mass with each stroke gives the Vibroplex Iambic a bug-like swinging feel if adjusted with moderate tension and wide spaces between its silver contacts. Each stroke produces a characteristic vibration, typical of heavy long levered paddles. Using three feet rather than four gives the Iambic series paddles excellent stability on any operating surface, just as with Vibroplex bugs.

The customer supplied electrical cord requires no soldering. Cable wires are attached to three finger-screw posts at the very rear on the top of the paddle. The fingerpieces are mounted quite high (1.4 to 2.3 inches above the operating surface), almost identical to the thumbpiece height of the Vibroplex bug in my collection. That's probably too high for long term ergonomic comfort for some operators, especially those who are finger squeezers rather than wrist rotating slappers.

Years ago, it was said that Vibroplex Iambic paddles are best suited for operators with long semiautomatic bug experience who wish to make the transition to iambic electronic keying. That's because they can be adjusted to produce a feel very similar to a bug, with rather strong return tension and wide contact spacing. The big surprise, however, is that this paddle can be adjusted very quickly down to extremely light return force and close spacing. Left and right paddle spring tension and contact space adjustments are accomplished easily with readily accessible finger screws and lock nuts. Tension can be adjusted down to such a light setting that the lever will close when the paddle is turned 90° sideways. Contact spacing can be adjusted to extremely close stable gaps.

No wonder the Vibroplex Iambic series has achieved the status of a classic.

Manufacturer: The Vibroplex Company, 2906 Tazewell Pike, Suite A2B, Knoxville, TN 37918; tel 800-840-8873; **www.vibroplex.com**.

ELECRAFT SPECIAL EDITION HEXKEY

The Elecraft HexKey is identical to the Bencher Hex Iambic Paddle (**www.bencher.com**) with the addition of the Elecraft brand label and special serial numbers beginning with E. The HexKey is a heavy paddle firmly in the tradition of the N2DAN Mercury and Bencher

Mercury reviewed in March 2009 *QST*.[4]

The HexKey uses attracting magnetic returning gold plated silver contacts, a stylish hexagonal black powder coated leaded steel base and lengthy, heavy levers made of chrome plated brass. Those levers produce the same sort of vibration with each stroke characteristic of both Mercury paddles. Three rubber feet grip nicely to the operating surface. The feet look similar to those on the Vibroplex Iambic paddles, but their rubber is softer. Although the HexKey doesn't slide, the high profile and soft rubber feet impart a slight twisting motion to the paddle while keying. That's not the case with the Vibroplex Iambic paddles and their harder rubber feet. From Table 3 it is evident, however, that the softer HexKey feet stick to the operating surface better than the harder feet do.

The HexKey is a solidly designed paddle. An example of special attention to detail is the provision of separate grounding braid attached to each lever to prevent transient keying. The keying is quite smooth, thanks to miniature precision ball bearing races for movement

A soldered cable must be installed by the customer to three terminals beneath the paddle. For an extra $10.95, Bencher offers a universal hookup kit, which includes a 4 foot cable, ¼ inch and ⅛ inch stereo plugs plus pre-soldered push-on terminals. A strain relief bracket is already included beneath the paddle base, so an installed cable should be trouble free for years.

[3]B. Prior, N7RR, "Popular Dual-Lever Keyer Paddles," Product Review, *QST*, May 2010, pp 49-52.

[4]B. Prior, N7RR, "High End Dual-Lever Keyer Paddles," Product Review, *QST*, Mar 2009, pp 49-52.

Bottom Line

This concludes our overview of popular dual-lever paddles. Whether you prefer a light or heavy touch, one of these paddles reviewed this month or last month is sure to find a place in your station.

Table 3
Summary — Popular Dual-Lever Paddles — *Part 2*

Model	*Return, Bearings and Base*	*Hardware and Contacts*	*Dislodging Pressure**	*Levers and Fingerpieces*	*Weight (lb)*	*Price (plus s/h)*
Vibroplex Iambic Standard	Compression spring; return; jeweled needle pivots; black powder-coated steel base	Chrome-plated brass hardware; silver contacts	7 oz/ 14.4 oz	Chrome plated brass levers; black plastic fingerpieces 35 to 59 mm high	2.8	$160
Elecraft HexKey	Attracting magnet return; precision ball bearing races; black powder-coated steel base	Chrome-plated brass hardware; gold-plated silver contacts	12.3 oz/ 15.5 oz	Chrome plated brass levers; dark translucent acrylic fingerpieces 19 to 55 mm high	3.2	$200
K8RA P-2	Two adjustable compression; springs; four miniature precision ball bearings; lacquered brass base	Brass hardware; silver contacts	10.9 oz/ 14.4 oz	Long brass levers; wood fingerpieces 18 to 61 mm high (acrylic fingerpieces also included)	2.7	$120
W5JH Black Widow Kit	Single return compression spring plus two attracting magnets; four ball bearings; brass base	Brass hardware; silver plated screw contacts	5.3 oz/ 7.7 oz	Medium length brass levers; thin plastic fingerpieces 5 to 40 mm high	1.4	$58

*Lateral finger pressure required to move the paddle on a laminate surface (first figure) and with a friction mat. See text.

When the Elecraft HexKey paddle arrived, it had clearly been well packaged and there was no sign of damage in shipment. Nevertheless, one of the stanchions that secures one of the two contact assemblies was detached from the paddle. Attempts to reattach the stanchion failed because the 1 inch machine screw used to secure it is very slightly too short. We contacted Elecraft and Bencher about the problem. It turns out that some minor recent component changes introduced a slight size increase. I was able to saw down a locally available substitute 1¼ inch machine screw to 1$\frac{1}{16}$ inches, which fixed the problem. Elecraft and Bencher are now alert to the situation, and they will happily send longer screws to any customer who experiences a similar problem.

Adjustments can be made independently to the left and right paddle contact distance and magnetic return force on the HexKey. The adjustments must be locked into place by tightening hex screws. A matching hex wrench is included with the paddle. The wrench is attached to the underside with a fahnestock clip so it's readily available when needed. Getting those adjustments just right can be impractical during a busy operating session, so HexKey users should take the time to adjust the paddle properly before operating it on the air. Once locked in place, the adjustments are very stable.

Return tension for left or right levers is accomplished by changing the gap between two strong magnets. The tension on the high end can be very strong, indeed. On the low end, it cannot be made as light as the spring tension on the Vibroplex Iambic paddles.

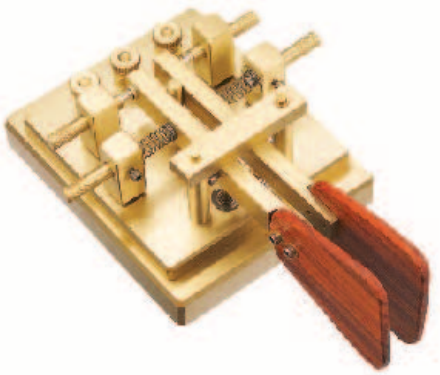
Operators who prefer very light touch action will want to look for paddles with levers that are shorter and lighter than the ones on the HexKey. Those who would like the feel of the classic N2DAN or Bencher Mercury paddles at a reasonable sticker price should seriously consider the HexKey.

Manufacturer: Elecraft, PO Box 69, Aptos, CA 95001; tel 831-662-8345; **www.elecraft.com**.

K8RA P-2

The K8RA P-2 paddle came with padauk wood fingerpieces mounted, plus two extra clear acrylic fingerpieces and a hex driver for securing both the fingerpieces and the setscrews. This aesthetically pleasing gem is equipped with four miniature precision sealed ball bearings, rendering its action exceptionally smooth. Since the levers are made of brass rather than some lighter alternative, a fair amount of mass must be moved with each stroke. The difference is probably most noticeable if using relatively wide lever spacing.

Each P-2 paddle is crafted individually by Jerry Pittenger, K8RA. An experienced builder with an eye for detail, his multiband HF amplifier appears on the cover of the 2006 *ARRL Handbook*.



The best comparison product for the K8RA P-2 is the Scheunemann Der Morse Dirigent, which was reviewed in Part 1. Both are precision instruments with a lacquered finish that shows off their beautiful brass to fine effect.

The measured dislodging force for the P-2 is slightly less than for the HexKey. K8RA sells other similar paddles that weigh more, so they are more likely to stay in place when operated by an energetic fist. Since each is handcrafted, Jerry is willing to shape fingerpieces according to a customer's specifications to achieve different heights above the operating surface. That kind of personal attention is a significant advantage of dealing with a low volume manufacturer such as K8RA.

Adjustment of spring tension and contact spacing is a straightforward process, but locking the adjustments in place does require the use of the nice handled hex wrench included with each paddle. Borrowing an idea from the HexKey, a user could attach a matching right angle hex wrench to the bottom of the P-2 using a Fahnestock clip, since the long hex wrench supplied with the paddle might go astray over time.

Spring tension can be quite strong on the high end, and on the low end it cannot be adjusted to be as light as the Vibroplex Iambic series. The springs are the weakest part of the K8RA design, since they are rather long and could easily become dislodged in a busy operating environment, launching themselves into space. On the other hand, the springs are quite accessible and could easily be replaced by stronger or weaker ones if desired.

The precision action of the P-2 makes it a fine choice for operators who prefer close contact spacing and (perhaps with weaker substitute springs) very light tension for high

speed iambic keying. The beauty of the P-2 is stunning.

Manufacturer: Jerry Pittenger, K8RA, 6930 Cook Rd, Powell, OH 43065; **www.k8ra.com**.

W5JH BLACK WIDOW PADDLE KIT

The W5JH Black Widow is the most economical paddle in this review, but by no means the lowest in quality. Its low cost is possible since it is not a finished product, but rather a kit with lots for the builder to do.

The kit includes a manual on a CD-ROM with text in Microsoft *Word* format, including integrated illustrations. The inventory list is not keyed to individual items in the one page components picture.

Tools needed for assembly include a drill bit for deburring, two grades of sandpaper, an ohmmeter, soldering equipment, thread, needle nose pliers, screwdriver, epoxy, a vise, a spray can of lacquer, metal polish and cotton gloves. I decided to not lacquer the review paddle, so the lacquer, metal polish and cotton gloves were not used.

The thread has an interesting use: it's to keep the central lever tension spring from launching itself into some inaccessible corner of the ham shack during installation. I left the thread tied to the spring permanently to serve the same function during normal operation. The spring is tied with an overhand knot, and the two thread ends are poked through two holes in the base that are designed to accommodate two silver ground wires. The thread ends are then joined on the bottom of the paddle base with a surgeon's knot. A better long term solution would be to replace two zinc plated ¼ inch 4-40 magnetic attracting screws on the levers with ⅜ inch screws which would then extend through two sides of the spring, inhibiting its loss.

The hardest labor is sanding the brass components, especially the heavy base, whose scratched surface needed many strokes. In the end, without a power sander I had to be satisfied with a less than optimal finish.

I wasn't impressed by the paddle's action when I first finished it. Then I took it apart a bit to bevel the seat holes for the four steel balls that constitute the paddle bearings. The difference was impressive. I was amazed that such an economical paddle operated so smoothly.

The tension return system is most unusual. The W5JH Black Widow combines two forms of return force. The basic form is that single compression spring seated between the two levers which I disciplined with a thread. The spring is not adjustable, so it constitutes the minimum return force. Additional force is produced by left and right adjustable attracting magnets. Return force can be made extremely strong when the magnets are adjusted very close to the attracting screw heads on the levers. For minimum return force, the magnets can be removed.

All adjustments use the red knurled finger-screws, and are very easy to perform with little fuss. Equipped with the supplied nonadjustable spring, the minimum return force is slightly limited. For a lighter touch, the lowest threshold can be decreased by shortening the spring. Contact spacing is stable down to very close distances. The thin white fingerpieces each attached to the lever with a single screw, so their height can be changed by the operator.

The W5JH Black Widow Paddle Kit makes a dandy project for an amateur with an inclination for do-it-yourself work. The reward is the satisfaction of operating a quality paddle with a good portion of sweat equity built in. A properly finished Black Widow is worth far more than the cost of the kit.

Manufacturer: Jerry Haigwood, W5JH, 11402 N 98th Dr, Sun City, AZ 85351; **www.w5jh.net**. QST

QEX
A Forum for Communications Experimenters

In The May/June 2010 Issue:

■ David Bern, W2LNX, describes his effort to learn how to program a PIC microcontroller to create a useful project. The result is "A PS/2 Keyer: Using a Keyer Paddle to Emulate a PS/2 Keyboard and Mouse." Replace the keyboard and mouse with a keyer paddle to control your computer, or take a paddle, NUE-PSK modem and radio on your next outing for even more portability. David's program is available on the Downloadable Files section of the *QEX* Web site (**www.arrl.org/qexfiles/**).

■ Rubens Ramos Fernandes, ex-PY2QE, shows his "Frequency Counter for the Experimenter." This handy piece of test equipment uses a PIC 16F876A microcontroller and the prescalar in a National Semiconductor LMX 2326 RF synthesizer to create a frequency counter that covers 30 Hz to 55 MHz in one range and 55 MHz to 2.8 GHz in the second range.

■ Byron Blanchard, N1KEV, explains the process of "Adjusting Bipolar Junction Transistor Crystal Oscillator Amplitude" output in his article. With a series of graphs and dc measurements, N1KEV shows us how to set the output amplitude of a basic oscillator circuit, and then explains why this technique works.

■ Mark Spencer, WA8SME, uses small 433 MHz transceiver modules to demonstrate remote telemetry techniques in The ARRL Education and Technology Program. These modules have no squelch function, which limits their usefulness for a data link. Mark added a squelch function as a way of "Solving Random Noise Issues n TRM-433-LT Data."

■ Gary Steinbaugh, AF8L, presents "An Inexpensive Laboratory-Quality RF Wattmeter." This calorimetric design uses a thermistor temperature sensor inside an oil-filled dummy load, and foam insulation to isolate the system from outside temperature fluctuations. Because the system is not frequency sensitive, it can be calibrated using low frequency ac or even dc power sources.

■ Jon Wallace and Richard Flagg, AH6NM, bring us another "Amateur Radio Astronomy Project." This time we learn how to listen for "Radio Signals from Jupiter." You may have already heard these signals around 18 to 28 MHz. There is even computer software to help you display the signals and share them in real time with other amateur astronomers on the Internet.

■ Dr. Sam Green, WØPCE, solves the problem of taking photos of an oscilloscope display with "An Oscilloscope Camera Mount." His camera mount ensures that the camera lens is centered in front of the oscilloscope screen and properly aligned for the best pictures. Using digital photo editing software, he is able to convert the images into negative format and create gray scale images that are ideal for publication.

■ Bob Kopski, K3NHI, presents a short "Tech Notes" item about the characterization of Analog Devices 8307 logarithmic amplifier ICs. Bob's "Simple RF Power Calibrator" circuit (Jan/Feb 2004 *QEX*) used this amplifier, and was easily calibrated using a 10 MHz square wave signal. Recent performance changes in these ICs requires a revised circuit and calibration method, which Bob describes in this Note.

■ Ray Mack, W5IFS, is back with another installment of his software defined radio column. In this installment of "SDR: Simplified," Ray describes the steps required to set up a *Linux* computer to run the Analog Devices Blackfin BF537 DSP IC and Stamp evaluation board software. We are getting close to running some actual DSP experiments on the Blackfin 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**.

W1ZR

THE DOCTOR IS IN

Q Kevin, KB9WVI, asks: I am one of many radio amateurs operating with the restrictions apartment living imposes. I have done passably well from my second floor balcony with a horizontal dipole made from two mobile whips, but had thought of trying a simple random wire of a very small diameter that would not be visible from a reasonable distance.

The question becomes how small is too small? I have not found any reference to the limit of output wattage compared to wire gauges. Id like to run up to about 50 W on 40 meters so I'm wondering if a wire thin enough to be invisible would vaporize in a puff of smoke under those conditions.

A I think the limits may be more mechanical than electrical. Obviously, the resistance increases as you reduce the wire thickness, but that may not be too critical, compared to the inherent losses in your current short dipole arrangement. There was a classic *QST* article on the subject that is worth reading.[1] It's available on the QST archive Web site. A representative sample is shown in Figure 1.

To get a handle on the requirements, if your antenna is at least ¼ wavelength long, about the lowest impedance you will encounter would be around 30 Ω. The actual impedance will likely be higher due to ground and wire loss. With that Z, the current will be about 1.3 A at 50 W — not an awful lot. Keep in mind that the performance of an end fed ¼ wave (Marconi) or random wire antenna is very dependant on the effectiveness of the ground system.

Give it a go, I'll bet you will have good luck, especially on the lower bands, in comparison to a loaded dipole.

[1]T. Gordon, W6RVQ, "Invisible Antennas," *QST*, Nov 1965, pp 87-88.

Q John, N5BPU, asks: I have heard about hams loading up a rain gutter for an antenna but I wonder if anyone actually routinely uses such an arrangement. I live in an antenna restricted subdivision and my house has seamless rain gutters about 42 feet long with downspouts or leaders. Is it really an option to load up my rain gutters to make a 40 meter antenna — or is this urban legend? What influence will the other parallel rain gutter have if it is possible to load up one gutter?

A It is certainly possible to use almost any metallic object as an antenna. The issues with "antennas of opportunity" are usually in four categories:

- Is there a straightforward way to apply power. Put another way — how will I connect to it and what will be the load impedance of the "antenna?"

I can see two fairly straightforward approaches to this concern. Perhaps the easiest is to connect the lowest point of the gutter/leader system to the terminal of a wide range antenna tuner designed to feed random wire lengths. Then you will need a ground system to connect the ground terminal to. This could be wires at or just below the ground surface. See Rudy Severn's recent *QST* article about ground systems.[2]

The other approach would be to split the gutter and connect a transmission line to each side of the split. A nonconductive insulating material will be needed to keep the gutter from leaking (right on to the end of the line!). This would also require an antenna tuner, unless the gutter happened to be resonant on some band.

- What fraction of the power will be radiated into space, and where will the rest of it go?

The typical gutter (in my neighborhood, at least) is connected to the house via long nails driven into the soffits. These nails will make some contact with the wood, especially if wet and may make intermittent contact with the gutter depending on the state of the finish under the nail. The wood will be lossy, and any current going that path will not be efficiently radiated. How much goes there will depend on the wood condition. I guess it would be possible to insulate the gutters from the house, but I would guess that would be quite a job. In addition, there may be other pipes or wires close to the areas of the gutter. They will pick up and reradiate RF to some extent.

[2]R. Severns, N6LF, "An Experimental Look at Ground Systems for HF Verticals," *QST*, Mar 2010, pp 30-33.

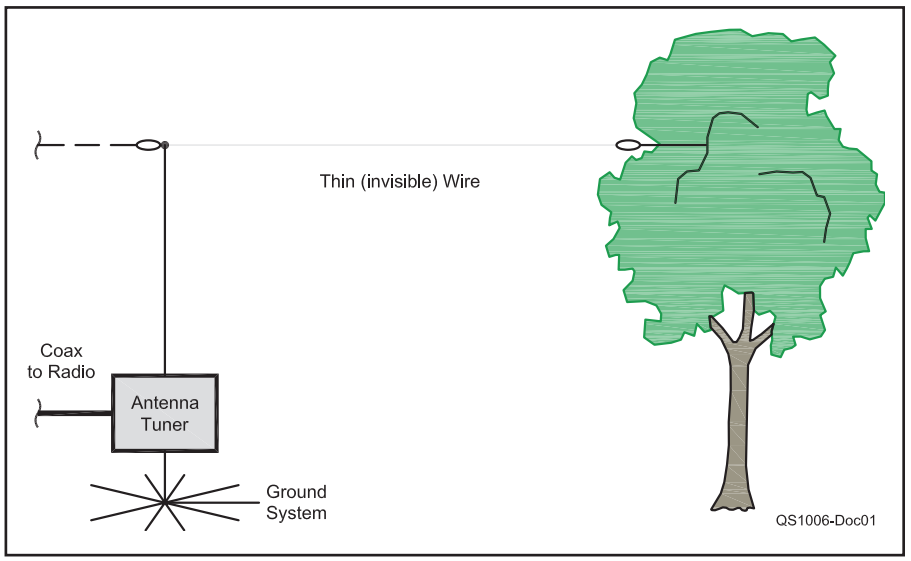


Figure 1 — "Invisible antenna" as seen by neighbors and birds.

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

■ Will there be solid connections everywhere, or will there be loose and corroded joints that will cause erratic operation and possibly generate unwanted signals?

In my experience, even seamless gutters have some seams, always at leaders, for one thing. The gutters are often enameled and thus the seams will likely not make good contact unless there are a few tight sheet metal screws holding them together. Make sure such screws are the same metal as the gutters to avoid galvanic corrosion. A connection between a leader and gutter may require a strap with screws at each end. Any seam that can't be tightened should be made so it can't make intermittent contact — perhaps with a layer or two of insulation.

■ Will there be any damage to structures or people due to putting RF where it wasn't intended, at least by the gutter people?

The primary concern here is RF safety. The gutters will be going along the structure potentially near people. A careful RF safety assessment should be conducted, and low power should be employed. In addition there may be coupling to alarm or other systems inside the house. I can reset the kitchen radio memories any time I operate on 160 meters using a wire near my house! These concerns will be very much dependant on the individual geometry and will be similar to anyone having an attic or indoor antenna system.

In my opinion, none of these are insurmountable, although for any given arrangement, there may be an easier solution using dedicated (perhaps thin "invisible") wire. I would bet there are folks doing it, probably some more successfully than others. Perhaps some will let me know?

Other gutters may well exacerbate the problem if they are close, since they will pick up some RF and either radiate it or warm wood, as above.

Q John, K2CF, asks: What is the reason for the *idle* plate current in an amateur linear amplifier? My amplifier plate current meter shows current whenever the amplifier is turned on, even with no drive from my transceiver.

A Amplifier tubes, or transistors for that matter, draw current depending on the bias (voltage for tubes or FETs, current for bipolar transistors). In most tubes, a negative bias is required to "cutoff" the plate current. If the bias is set so that it is just turned off if no signal is present, it is referred to as "Class B" operation. In that case, for half of each cycle of RF, the grid is driven more positive than without drive, and the amplifier draws current only if there is drive. Class B stages are sometimes used for amateur linear amplifiers.

In Class A, the amplifier bias is adjusted so that the RF amplifier not only conducts if the input is positive, but also conducts throughout the input cycle. This usually provides the most linear operation, but the efficiency is less than 33%, because the tube (or transistor) is drawing lots of current all the time. Class A stages are frequently encountered in low level stages in which the power levels are low enough that it doesn't matter.

Most high power linear amplifiers are operated in Class AB — in between A and B. There are variations such as AB1 and AB2, but all operate with the tube drawing some current even without RF drive. These are more efficient than Class A amplifiers, usually between 50 and 60% and more linear than Class B.

A Class C amplifier, used for CW, FM and for the modulated stage of an AM phone transmitter, in comparison, is operated with the bias far beyond cutoff, so it conducts only on the very peaks of the input waveform. It is very much non-linear, and thus not useable for SSB, or PSK modes, but can be more than 70% efficient. There are other specialized types of amplifiers that are even more efficient than Class C.

Q Chris, AG4AX, notes that: I found Rudy Severns' recent *QST* article on ground systems for vertical antennas very helpful.[3] Proper radial construction was always a bit of a gray area to me and this article cleared everything up. I buried my radials in the ground for my 10 through 80 meter vertical but according to the article four elevated radials per band are as good as many more radials on or under ground. My only question is, is there any noticeable differences between using bare versus insulated wires for an elevated radial system?

A Note that the author observed that four or more elevated radials act about the same as 32 or more buried or on ground radials. So the resonant elevated radials will likely perform better than a buried radial system of fewer than 32 radials. Note further that if elevated, a set is needed for each band — not the case with buried or on ground radials. So if it's a multiband antenna, you can pretty quickly get up to 32 radials (for all eight bands between 80 and 10 meters, for example) and the best answer is not obvious — it may also depend on how many people or deer need to walk through the area.

Insulated elevated radials should work every bit as well as bare ones — but keep in mind that the elevated radials must be insulated just like antenna elements in order to work properly. They should be resonant, and as with other antenna structures, if insulated, will need to be typically 1 to 2% (depending on thickness and type of insulation) shorter than bare wires to be resonant at the same frequency. This is not terribly critical, and either the radials or the antenna can be trimmed to make the antenna resonant.

[3]See Note 2.

Q Terry, K8TLS, asks: I own a current 5 W dual band VHF handheld transceiver. It worked flawlessly until last night. While I was talking, the transceiver apparently overheated, gave off a beep, and the word HEAT appeared on the display. The operating manual does not appear to discuss this indication. The only recent change is that there is 1 foot of snow at the base of the outside vertical antenna. I have no means of checking the antenna system or the radio. Have you any ideas as to what's happening and what I can do about it?

A While pure snow and ice can be an insulator, it has an extremely high dielectric constant that will concentrate fields close to the surface of the conductor, perhaps upsetting normal operation of many antenna types. It may have changed the antenna impedance resulting in a higher than specified SWR at the radio. One result of such a mismatch can be that the final transmitter stages draw more current than usual resulting in additional heat dissipation. Since the radio seemed to detect that, let's hope the protection circuitry kicked in before anything was damaged.

You will want to inspect the antenna and make sure that that it is clear of snow and ice. You should also inspect it for signs of damage. The feed line could also be damaged — it isn't unusual for small animals to chew on feed lines, damaging them with the same effect. A good way to tell is to invest in or borrow a VHF SWR meter or analyzer.

If you can more easily obtain a 50 Ω dummy load and put it on the output of the transmitter, transmit into it and see what happens. If the transmitter operates without problems, you know that the issue is with the antenna system. If you then disconnect the far end of the line from the antenna and hook it to the dummy load and repeat — if all is well — that confirms that the transmission line is okay leaving just the antenna.

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

Miracle Mixed-Mode Dipole

End-fed antennas are nothing new; they've been around since the earliest years of radio. The two attractions of end-fed designs are that you need only one support for the antenna (any structure — natural or manmade — will do) and, for a half wave antenna, no radials are required. It's the latter attribute of the end-fed antenna that tends to spark controversy.

Truth is, the RF current applied to the end of an end-fed antenna must be equaled by the same level of current flowing into another conductor, typically a ground or counterpoise system. As Tom Rauch, W8JI, states in his excellent analysis of end-fed designs, "An end-fed antenna *must have* the outside of the coax shield, the feed line, or something attached to the feed point that carries the same current away from the feed point as the current flowing into the antenna. This is true no matter how many series traps or choking devices we add at the feed point. If we add chokes at the feed point, voltage across the choking device increases until the same end-current flows."

As Tom points out, this doesn't mean an end-fed antenna won't work or is a bad antenna. It *does* mean that the feed line is part of the radiating portion of the antenna.

The feed point of the MMD-20 under test in my back yard.

How is the Miracle Dipole Different?

The Miracle Mixed Mode Dipole (MMD) may look like a traditional end-fed antenna, but it is substantially different. Its design has more in common with the classic sleeve (or "coaxial") dipole in which the feed line runs *inside* the lower half of the antenna. To this end (no pun intended), the MMD uses a radiator comprised of RG-174 coaxial cable.

The MMD design exploits the fact that RF currents can flow in *differential* and *common* modes simultaneously (hence the "mixed mode"). The Miracle Dipole's coaxial radiator is fed at the end through what they call a Current-Mode Discriminator (CMD). According to their literature, "… the differential signal on the feed line passes freely through the CMD (with almost zero loss) at one end of the antenna and continues along the dipole leg (which is also coax) to the antenna's center feed point. One 'half' of the antenna current continues on to the end of the antenna, the other 'half' flows from the center back along the coax in common mode until it meets the CMD, where the dipole leg is electrically terminated for any common-mode current. Thus the coax both delivers the current to the center in differential mode and carries the antenna current back along the coax to the CMD in common mode, without any interaction between them."

This gives the MMD a distinct advantage over typical end-fed antennas. This not to say that some RF won't end up on the outside of the feed line anyway, but unlike most antennas that are fed at the end, the Miracle Dipole claims to keep such currents to a minimum.

How Does it Work in the Real World?

The Miracle Mixed-Mode Dipole would seem to be an obvious candidate for portable operating. Rated at 100 W PEP, the antenna comes completely preassembled, including a 16 foot feed line with a male BNC connector. For this review I tried the 20-meter model, the MMD-20, which is 33 feet in length. Although this is a single-band antenna, it is possible to use it on other bands so long as you keep the feed line very short (no more than the 16 foot length) and run reduced power (less than 50 W) with an antenna tuner.

My first test was to simply connect the top of the antenna to a third-story window frame and slope the rest down into my back yard. With a few exceptions, the SWR remained at less than 2:1 across the band.

Using a 2.5 W MFJ Cub transceiver I began calling and answering CQs. Stations often answered immediately, giving me good reports. With only 2.5 W I wasn't loud, of course, but fully copyable. I quickly switched the Cub to my 130 foot inverted L antenna and noticed little, if any, difference in received signal levels.

Going back to the MMD, I upped the ante by dragging out my 100 W rig. Once again, the MMD appeared to perform quite well. Best of all, I didn't notice RF "bites" or other strange behavior that you might expect if the feed line back to the radio was overly "hot."

Summary

The Miracle Mixed-Mode Dipole seems like a worthy choice for outdoor hamming. You can simply throw it into a backpack with your low power transceiver and hit the trail. When this review was written, Field Day was still three months away, but I definitely plan to make the Miracle Mixed-Mode Dipole part of my operation. And if you're tight on space and don't mind the single-band aspect, there is no reason why you couldn't use a Miracle MMD as a permanent station antenna.

Manufacturer: Miracle Antenna, 2705 Bates Rd, #303, Montreal, Quebec, Canada H3S 1B4; tel 866-311-6511; **www.miracleantenna.com**. *$105 - $180, depending on band. The MMD-20 purchased for this review sells for $110.* QST

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

NØAX

HANDS-ON RADIO

Experiment #89 — Overvoltage Protection

Every summer hams head to the hills, operating from all manner of power sources. Some are well-regulated, but away from the relative stability of the utility power grid, all sorts of things can go wrong. One of the most common problems is excessive supply voltage, or *overvoltage*, caused by sudden drops in load, failure of a regulator, or short- or open-circuits in the power distribution wiring. Regardless of why excessive voltage occurs, the effect on connected equipment can range from a blown fuse to "fire in the hole" — even if the equipment is switched OFF at the time!

Just in time for ARRL Field Day and other summer adventures, we're going to review overvoltage protection circuits at the heart of two projects in the "Power Supplies" chapter of *The 2010 ARRL Handbook*.[1] The first is a *crowbar* circuit for dc power sources, such as a linear or switchmode supply. The second is intended for ac power, such as from a generator or inverter.

Commercial equipment is specified to operate from a range of input voltages, such as 9 to 15 V, or at a nominal input voltage with some tolerance, such as 12 V ±5%. Any voltage above those specified ranges (>15 V or >12.6 V) can be considered overvoltage.

Dropping the Crowbar

DC power supplies can create output overvoltage for many reasons. In a linear power supply, it is not uncommon for a *pass transistor* that regulates the flow of output current to fail as a short circuit or low resistance, placing the full rectifier output voltage on the power supply output terminals. For the common 12 V supply this can be 18 V or more, placing severe stress on attached equipment. Regulator circuits can fail in either linear or switchmode supplies, as well.

Since it is assumed that the power supply is unable to control its output voltage, an external device must limit the voltage and remove power from the supply. The crowbar circuit does this by placing a short circuit directly across the output terminals whenever excessive voltage is detected. This is intended to blow fuses or trip circuit breakers in the supply and to discharge any filter capacitors in the supply's rectifier or output circuits.

The usual choice for the device that does the discharging is a silicon controlled rectifier (SCR). As described in Experiment #10, an SCR acts as an open circuit between its anode and cathode until it is triggered by current flowing from the gate to the cathode.[2] It then conducts current from the anode to the cathode until the current level drops below the *holding current*, I_H, even if gate current is interrupted. Once anode-to-cathode current is halted, it is necessary to retrigger the SCR.

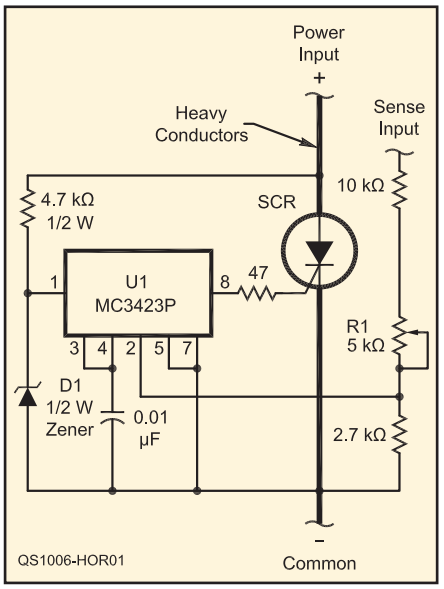


Figure 1 — Schematic diagram and parts list for the overvoltage crowbar circuit. Unless otherwise specified, resistors are ¼ W, 5% tolerance carbon composition or film units. A PC board is available from FAR Circuits (www.farcircuits.net).

D1 — Zener diode, ½ W, 6 to 9 V for a 12 V supply.
R1 — 5 kΩ, PC mount trimmer potentiometer.
SCR — C38M stud mount (TO-65 package).
U1 — MC3423P integrated circuit, 8 pin DIP.

While conducting, SCRs have a low forward voltage drop and can safely handle high currents of dozens of amps for short periods, even without heat sinks. This is enough to cause most amateur power supplies to blow their input power or rectifier fuses.

An SCR Overvoltage Protector

Figure 1 shows the circuit for the SCR based crowbar found in section 17.16.8 of *The 2010 ARRL Handbook*. Simpler circuits use current through a Zener diode to trigger the SCR — when the input voltage increases to a sufficient level, the Zener begins to conduct and the current flows through the SCR gate, triggering the SCR.The trigger level of these circuits drifts with temperature and Zener voltage. Using the MC3423 IC allows much better control of the input voltage at which the SCR fires.

Begin by browsing to **www.onsemi.com**. Enter MC3423 into the SEARCH window then download the MC3423 PDF datasheet. Find Figure 2, the representative block diagram. The key item in Figure 2 is found at the lower left — the 2.6 V internal voltage reference. (Some older versions of this chip have a 2.5 V reference.) This is the MC3423's activation threshold. Whenever the voltage at the SENSE 1 input is *less* than 2.6 V, the output of the left hand comparator is HIGH, turning on the transistor whose collector is connected to pin 4. Note that in the *Handbook* circuit, pin 4 is connected directly to pin 3, the SENSE 2 input to the right hand comparator. If the transistor is ON, the right hand comparator's output is LOW and the output circuitry connected to pin 8 is OFF. (Comparators are discussed in Experiment #11.)

If the voltage at SENSE 1 is *greater* than 2.6 V, however, the left hand comparator output goes LOW, turning the transistor OFF, and the right-hand comparator output goes HIGH, turning the output circuitry ON. In our circuit, this triggers the SCR.

The circuit is based on Figure 5 of the

[1]*The ARRL Handbook for Radio Communications,* 2010 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1148). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[2]All previous Hands-On Radio experiments are available to ARRL members as downloadable PDF files at **www.arrl.org/hands-on-radio**.

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

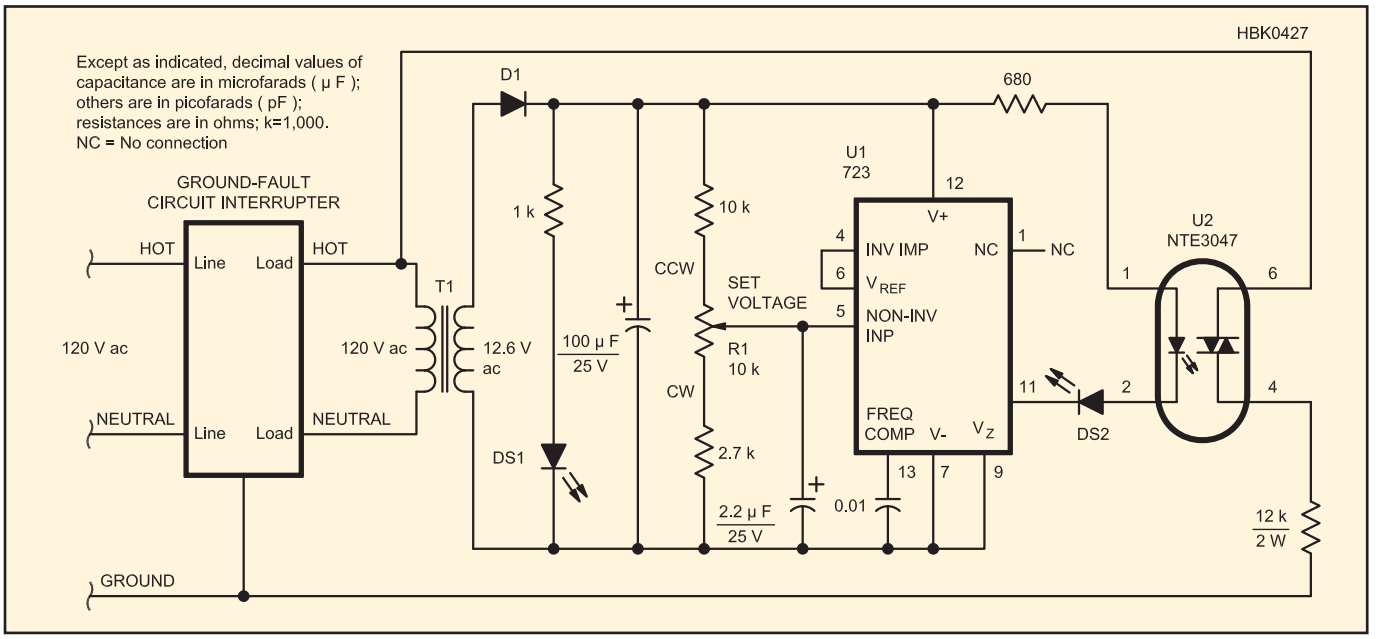


Figure 2 — Schematic diagram and parts list for the Field Day equipment overvoltage protection circuit. The circuit must be used with a separate ground fault interrupter at each station. DS2 illuminates briefly on overvoltage. Unless otherwise specified, resistors are ¼ W, 5% tolerance carbon composition or film units. A PC board is available from FAR Circuits (www.farcircuits.net).

D1 — 200 PIV, 1 A diode, 1N4003 or equivalent.
DS1, DS2 — Small LEDs.
R1 — 10 kΩ, PC mount multi-turn trimmer potentiometer.
T1 — 12.6 V transformer.
U1 — 723 adjustable voltage regulator integrated circuit.
U2 — Optoisolator with TRIAC output, NTE3047 or equivalent.

MC3423 datasheet. The combination of the 4.7 kΩ resistor and D1, the Zener diode, is *not* a sensing input. It is a power supply for the IC. Why? Because if the power supply and sensing input are the same, when the crowbar fires, the chip loses its power supply! This is okay in most cases because the SCR will stay on until it has discharged the power supply and current falls below I_H. By separating the chip's power supply from the sensing input, the crowbar circuit can be applied in many configurations.

The SENSE 1 input is pin 2 and is connected to the voltage divider adjusted by R1. The values in the string of resistors result in a voltage of 2.6 V at SENSE 1 when the sense input voltage is 15 V with the 5 kΩ potentiometer at mid travel. Figure 4 of the datasheet shows how to calculate the resistor values for any desired threshold voltage.

As shown in Figure 6 of the datasheet, the 0.01 μF capacitor at the junction of pins 3 and 4 serves to delay triggering, both to reduce susceptibility to RFI and to keep the circuit from triggering on very short transients. This value requires the overvoltage condition to exist for $12 \times 10^3 \times 0.01 \times 10^{-6} = 120$ μs before the circuit triggers.

Why all the complexity? The IC's cascaded comparators allow the circuit designer to monitor more than one input signal or to use other signals to inhibit or enable the circuit. Note also that pin 6 (Indicator Output) can sink current through an LED or lamp to provide a visual indication that the circuit has activated.

How does one choose an SCR for a crowbar circuit? The *Handbook* circuit uses a C38M SCR rated at 35 A forward current, but the peak non-repetitive surge current rating (the value used for a one-time shorting of a power supply) can be much higher, depending on how long it takes to discharge the power supply and blow its fuses. For most transceiver power supplies, an SCR rated at 30 A or more will suffice. Note that the power leads are shown as thick lines — this wire should be heavy enough to handle the load without melting or igniting the insulation during the short discharge period — #18 AWG or larger.

See also the article by Phil Salas, AD5X, in the April 2010 issue of *QST* that uses a high current Zener as a crowbar.[3]

An AC Overvoltage Protector

The basic idea of the ac overvoltage protector is the same — when overvoltage is detected, trip the power source's protective circuit breaker and remove power. You wouldn't want to short circuit most ac sources because of the high surge currents that would result. In the case of the *Handbook* project in section 7.16.7, a ground fault circuit interrupter (GFCI) circuit breaker handles the high current instead of a semiconductor device.

Figure 2 shows the overvoltage protector circuit. The GFCI breaker is wired to supply both the overvoltage protector circuit and whatever ac powered equipment it protects. The common 723 voltage regulator IC is used as the voltage sensor. (Its datasheet is available for download at **www.national.com/ds/LM/LM723.pdf**.) A 12.6 V transformer steps the input voltage down and D1 and the 100 μF capacitor form a half-wave rectifier to power the circuit. The voltage threshold is set by the adjustable voltage divider labeled SET VOLTAGE and connected to pin 5 of the IC. The 723 uses a 7.15 V internal reference to control a single *error amplifier* that takes the place of the comparators in the MC3423. The circuit configures the 723 so that if the input voltage exceeds the threshold, the V_C output (pin 11) conducts current to ground.

Instead of an SCR placing a short circuit across power supply terminals, the ac overvoltage protector uses an optically isolated TRIAC to trip the GFCI circuit breaker. (Opto-isolators are described in Experiment #14.) Note the connection between the HOT terminal of the breaker, through the TRIAC, through a 12 kΩ resistor that limits current to about 10 mA to safety ground. When the TRIAC conducts (when the V_C output of the 723 sinks current to ground) the GFCI senses the resulting imbalance between HOT and NEUTRAL currents and trips, removing power from the overvoltage protection circuit and anything else connected to its LOAD terminals. (GFCI breakers are designed to trip at fault currents of 5 mA.)

As the *Handbook* notes, you'll need one overvoltage protector circuit and GFCI for each ac-powered circuit. Be extra careful when wiring the TRIAC and be sure to follow the regular color code of black for HOT and white for NEUTRAL — safety first! QST

[3]P. Salas, AD5X, "Compact Voltage Protector and Fuse Assembly for 100 W Transceivers," *QST*, Apr 2010, pp 30-32.

AG1YK

HINTS & KINKS

HARVEY LAIDMAN, W8DX

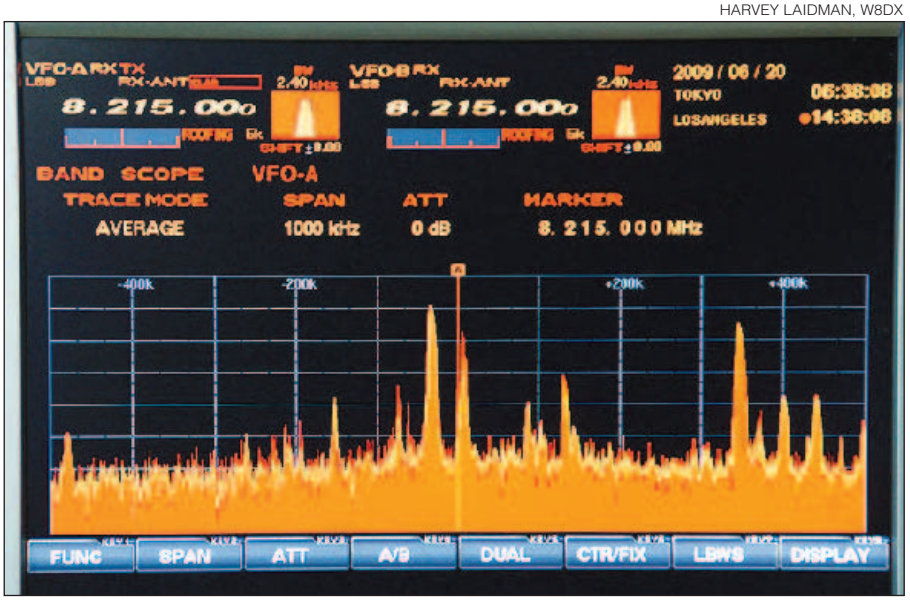


Figure 1 — A view of the FTDX-9000D's bandscope display of the K3's IF channel.

SPECTRUM SCOPE FOR YOUR K3

◊The K3 is my second radio. I obtained it for the joy of building and using it. It is my traveling radio and my standby radio. As a matter of fact, it would be my only radio if it had a spectrum scope. I'm so into watching those signals pop up on the band. I can see at a glance if 15 meters is open. I got used to having one of these gadgets long ago and I'm addicted.

What is a spectrum scope anyway? It's a wide band receiver that monitors the IF of another receiver and presents the signal to a display that sweeps across the IF bandwidth and displays any signals as amplitude spikes that are encountered along the way.

Digital control of the oscilloscope and sweep generator allow you to display the relative frequencies, change the width and sweep rate. The recommended spectrum scopes for the K3 are actually software defined receivers operating at the K3's 8.215 MHz IF frequency.[1] Using a software defined receiver allows you to integrate the display into a digital oscilloscope that can, using data from the K3, combine all kinds of extra stuff into the display like filter bandwidth, second receiver data, "click and tune," etc.

Hmmm. Don't I have an 8.215 MHz general coverage receiver around here somewhere? Is there one with a built-in spectrum scope? That FTDX-9000D monster sits on my desk and watches tolerantly when I use my K3. I can just hear it sigh as that lightweight Elecraft borrows its antennas. Would my 85 pound '9000D like a job? It receives 8.215 MHz and has a spectrum scope with a 2.5 MHz bandwidth. (A bit wider than the digital, software defined 192 kHz.)

The other two requirements:

1) The K3 has the KXV3A transverter and IF output module

2) The transceiver operating as a spectrum scope has a separate, switchable receive-only antenna input. (Don't, I say, don't use the transceiver antenna jack. Okay? Accidentally transmitting into the IF channel is not healthy for your radio.)

So here's how to put it together: Use a BNC to UHF cable to attach the K3 IF output to the transceiver's receive-only antenna input. Okay, so I lied. It's not exactly free. You need a BNC to UHF cable. Tune the transceiver's general coverage receiver to 8.215 MHz and enjoy your new spectrum scope (see Figure 1). You did turn the K3 on didn't you?

There was enough drive from the K3 IF for a satisfactory display on 40 meters and below, but not quite enough above 20 meters. That's when I went out to the garage and hooked up my old Heathkit active antenna — just to "nudge" the IF output. The active antenna amplifier is peaked at the 8 MHz and the gain control is a handy display amplitude control. Any wideband or tunable preamp could be used.

The Elecraft IF output seems to "roll off" at 1 MHz bandwidth. The IF center frequency is offset by the mode at which the transceiver is operating. Where this would normally be handled digitally with computer control, you could tweak the IF receiver frequency to center up the signals on the display.

I really liked the spectrum scope on the Kenwood radios, especially the CRT system used with the TS-950SDX, not that blocky digital look.

Obviously, you're not going to take this setup out to your cabin in the woods, but if the K3 is just exchanging enigmatic looks with the heavyweight on your desk, this little experiment will cost you (practically) nothing. — *73, Harvey S Laidman, W8DX, 22918 Crespi St, Woodland Hls, CA 91364-2807,* **w8dx@arrl.net**

QUICK AND DIRTY ANTENNA SUPPORT

◊Aesthetic concerns placed many limits on the size and configuration of the antenna farm allowed at my station. In my case, the "design tolerances" allowed limited me to vertical antennas that would blend in as much as possible with the color scheme of the house. As such, I was required to use white for antennas, coax cable and mounting hardware to blend in with the trim color and the color of the PVC plumbing pipes that pierce the roof in several locations.

I find the boating industry has already solved many of these same problems faced by amateur operators. Shakespeare Electronic Products Group sells the Style 408-R Upper Bracket (**www.shakespeare-marine.com/**

[1]For example, see J. Hallas, W1ZR, "Product Review — Telepost LP-PAN Software Defined IQ Panadapter," *QST*, Feb 2009, pp 44-47.

RANDY KULZER, N2CUG

Figure 2 — The Shakespeare style 408-R upper bracket.

RANDY KULZER, N2CUG

Figure 3 — The 408-R used as a support bracket.

mountshow.asp?findmount=408-R) that can support antennas (or antenna extension masts) of 1 inch (using the insert provided) to 1½ inches.

I've used this bracket in two ways: as the mount for short no-ground plane antennas and as the support bracket for heavy duty TV masts used to support longer vertical antennas (see Figures 2 and 3). The brackets are mounted to the fascia using ¼ inch lag bolts and lock washers. I try and make sure that the lag bolt on one side of the bracket is screwed into a roof joist inside of the fascia. Shakespeare is also a source for white RG-213 coax cable and gold plated PL-259 connectors that I used to build a spouse approved cable.

Both uses of this bracket have survived several fairly windy storms here at my station. Of course, mounting the antennas so they do not extend above the roofline also helped. As with anything else, your mileage may vary when using this bracket.

I'd like to thank Syed Ali, WB2AFA, my Amateur Radio mentor and friend for encouraging me to publish this article. — *73, Randy Kulzer, N2CUG, 2235 Allenwood Rd, Wall, NJ 07719,* **rkulzer@usa.net**

ANTENNA QUICK CONNECT

♢Like most of you, I unscrew the antennas coming into my shack upon the threat of a lightning storm. Living in the Tampa Bay area of Florida has brought with it a more intense challenge, as this is the lightning capital of the nation.

Screwing and unscrewing PL-259s after almost every use of my equipment has worn my fingers to the nub. I therefore sought a better alternative system for disconnecting my antennas. At first my mind was blank, then I remembered back 40 years ago when I was a General Radio Sales Engineer (peddler). General Radio, or GR, invented a connector during WWII that was and still is unique. This is the GR874 series of connectors.

The GR874 was a sexless connector (hermaphrodite) where one just pushed into its mate. This connector still has extraordinary characteristics as it covers dc to 9 GHz with minimal loss and can handle 1500 V peak. This permits it to handle full legal limit power plus into a 50 Ω load without any sweat. This connector comes in a full range of adapters such as PL-259 female to GR874 and PL-259 male to GR874, which is what I am using. It also comes in N series adapters that have far superior electrical properties than an N connector.

I do not believe anyone is manufacturing the GR874 anymore, but they are available at many outlets. All one has to do is an Internet search on "GR874 Connector" and a host of suppliers will pop up.

So gentle persons, save your fingers and a lot of time as this ancient connector from the 1940s will save your fingers. — *73, Burt Yellin, K2STV, 1813 Columbine Pl, Sun City Center, FL 33573,* **k2stv@copper.net**

A PORTABLE HAM SHACK FOR FIELD OPERATIONS

♢If you have ever spent any time operating in the field for Field Day or on a low power outing you have likely run into a cold wind, a light rain or night dew settling on everything to become a nuisance. To beat this, consider making a sheltered one or two person operating position for your field operations using an inexpensive pop-up "Privacy Tent" of the type normally used as a shower or a portable toilet in the field. The Outback Porta-Privy is a typical tent of this type that will work well for amateur field use (see Figure 4). It sells for $59 to $69 at Bass-Pro Shops, Cabela's and Emergency Essentials among others. Here are some features for this model that makes it a good portable ham shack:

- Pops up in under a minute — no assembly. (Just toss it out.)
- Generous 54 × 54 × 80 inch interior holds a 4 × 2 foot folding table for rig(s), laptop, logbook and up to two people.
- Weatherproof nylon lining keeps dew off equipment.
- Large ventilation screens.
- Removable waterproof floor.

ROBERT PATTERSON, K5DZE

Figure 4 — A camping privacy tent that could make a quick and easy portable shack for Field Day or any other portable operation.

Add a 4 × 2 foot lightweight folding table and a folding chair or camp stool and you have a nice operating position for Field Day, a low power outing, or an EmComm deployment. More information can be found at **www.k5dze.net**. — *73, Robert Patterson, K5DZE, 110 Charles Givens Dr, Dry Ridge, KY 41035,* **k5dze@arrl.net**

BATTERY PROTECTION

♢I was just reading my May 2008 *QST* and saw the article on using a Y-cable for emergency battery power. While it is true that this will work on many linear power supplies such as the Astron, be warned that this is not safe for all power supplies.

I own an Alinco DM330MVT switching power supply (**www.alinco.com**), which has an over voltage protection circuit on the output. This circuit effectively shorts the outputs to ground when ac power is removed.

If you use a Y-cable to directly connect a battery to the Alinco DM330MVT, you will quickly drain the battery — or worse — when power is removed from the supply. (Don't ask me how I know this...)

Use of a blocking diode is required in this case (see Figure 5). Care will need to be taken that the diode is of a proper current rating for the application and one should be chosen with as low of a forward voltage drop as is possible, to reduce wasted power and generated heat. A diode with a forward current rating of 30 A or more is required for most 100 W transceivers. A suitable heat sink may be required for the

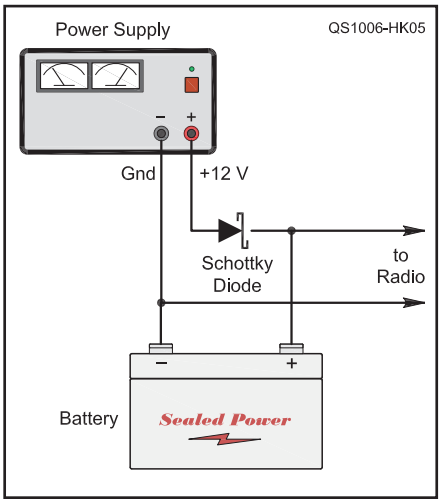


Figure 5 — A schematic of the blocking diode arrangement used to prevent damage or discharge to a battery when connected to a load and power supply in a Y arrangement.

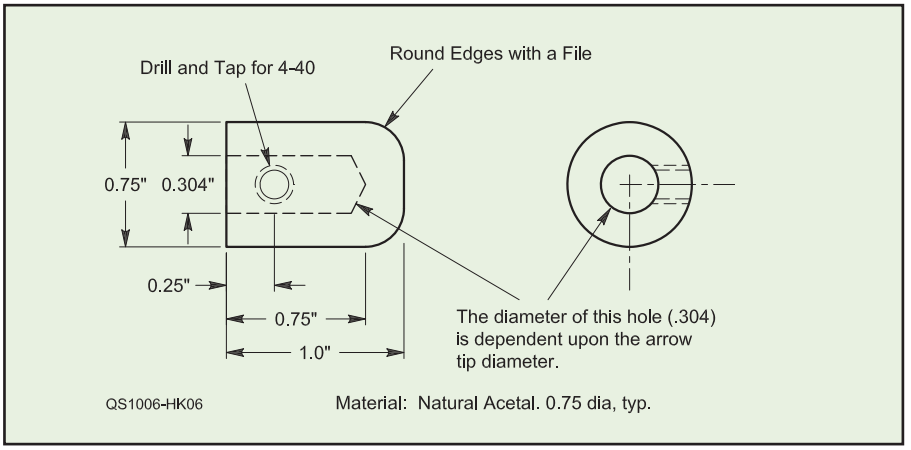


Figure 6 — Diagram of how to shape a safety tip for arrows to be used for placing antenna lines.

diode. Even a 0.5 V forward drop at 30 A is 15 W of power. — *73, Russell Hoffman II, N3WDZ, 200 School St, Wabash, PA 15220-2718*, **n3wdz@arrl.net**

KEYER PADDLE BASE FOR THE HEAVY-HANDED

♢I must confess that in the middle of a CW contest, when I have to use the keyer paddle, I am heavy-handed. So much so that I often slide the keyer paddle sideways, because the base is not heavy enough to resist the first hit.

I have an N2DAN Mercury paddle, which is a dual lever type for iambic keying. I learned electronic keying in the early '60s when there were no iambic keyer squeeze paddles, only single lever paddles that required you to push the lever back and forth to make dits and dahs. A pal who learned the same way told me he went back to an old Vibrokeyer single lever paddle (**www.vibroplex.com**) to take advantage of his hard-learned muscle memory, because he never quite got the hang of iambic keying. I felt the same way.

I tried an old Vibrokeyer single lever paddle, but it slid around the table, too. I bought a nice new Begali Simplex (single lever) paddle (**www.i2rtf.com**), which works great, but in the heat of battle I started sliding that one, too. I had to do something to stabilize the situation.

I had created a circular steel base for my portable low power rig's mini-paddle. I found an online supplier of die-cut steel disks about ¼ inch thick and 4 inches in diameter. The disk was a little rough, so I took it to a local powder coating place and had them sand blast and powder coat it red. I thought this base might be heavy enough (13 ounces) to stabilize the Begali key.

The little magnets on the bottom of the mini-paddle started me thinking: What if I got stronger magnets to mount the Begali atop the red steel disk? The Begali's base is ferrous metal (that is, magnetizable) so I looked online and found a supplier of neodymium magnets (K&J Magnetics, Inc; **www.kjmagnetics.com)** slightly smaller than quarter coins, which exert a force of 46 pounds each when placed between two steel plates.

I flipped the Begali paddle over, used quarter coins to see how many circular magnets would fit on the bottom, then ordered five neodymium circular magnets ⅞ inch diameter × 3⁄16 inch thick (the Begali could have accommodated six magnets). At 3⁄16 inch thick (your keyer paddle may be different), the paddle's height would not be raised too much by the magnets. The magnets' thickness was just enough to raise the Begali's four corner feet above the base, so the magnets would be making contact between the Begali and the circular base, exerting the magnets' full force between them.

I also wanted to put a thin layer of cork under the red circular steel base, so I ordered a small sheet of 3⁄64 inch thick cork from a music store (**www.MusicMedic.com**), traced it around the circular base, cut the cork circle out slightly smaller so it couldn't be seen at the edges of the red base and secured the cork with strips of double-sided plastic carpet tape (ACE Hardware #50106).

Ta-dah! It worked like a charm. Now I can slam the keyer paddle as hard as I want and it doesn't budge. If you are even heavier handed then I, you can look to **www.americanmorse.com**, which sells a rectangular, black steel base that weights 32 ounces. That, plus the original weight of the keyer paddle should satisfy the heaviest-handed of us.

Note, the neodymium magnets are *very* strong and come with all kinds of warnings about not getting your fingers caught between them and keeping them away from ferrous metal objects, magnetic computer media and all electronic appliances, TVs, radios, DVD players, VCRs, etc. The entire steel mass of the key paddle and the steel base become strongly magnetized, so keep them away from everything else in the shack. — *73, Larry Serra, N6NC, 750 B St, Ste 3300, San Diego, CA 92101-8188*, **n6nc@arrl.net**

ARROW SAFETY TIP

♢Many areas of the country, such as my area, Long Island, New York, consider the "Sling-Shot" a "Fire-Arm." I know it's crazy but that's how politicians keep messing with us. So how do you get that antenna up in the top of that *big* tree without getting arrested? Well here, at least not yet, a kids bow and arrow set is *not* considered a lethal weapon.

Sports Authority sells a neat kids archery set. It comes with a bow, 2 target arrows, target, arm guard and a quiver. Now you need to put a safety tip on those arrows. When installed it is easy and relatively safe, to put some fishing line up in the tree. Then pull up the supporting lanyard for the antenna. Locate some Acetal/Delrin [a type of plastic with a low coefficient of friction giving it less of a tendency to get hung up in branches or leaves — *Ed.*] and make a couple of tips for the arrows (see Figure 6). — *73, Charles Rankin, WA2HMM, 165 Hickory Ln, Smithtown, NY, 11787*, **crankin@dialup4less.com**

More on the Unistrut

♢Tim Fuller, KC5TCF, is also an aficionado of Unistrut [Hints & Kinks, *QST,* Apr 2010, p 66] and wants to add that it is available in stainless steel and fiberglass. These are excellent for weather and corrosion resistance with the non metallic fiberglass providing obviously desirable characteristics for antenna support.

General Patton and His Use of ULTRA

Was General Patton's World War II success partly due to the ULTRA wireless intelligence provided by British Code Breakers?

Geoffrey Pidgeon

[Although there was no Amateur Radio during WWII, wireless communication played a significant role in the outcome of the war. This article, written by one who was part of the UK's code-breaking efforts, provides details on an under-reported aspect of the story. — *Ed.*]

I am the author of *The Secret Wireless War* and the recently published *Edgar Harrison — Soldier — Patriot and Ultra Wireless Operator to Winston Churchill*.[1,2] I was a member of MI6 (Section VIII) during World War II. Section VIII was the communications arm of Britain's Secret Intelligence Services (SIS). It was militarized in June 1940 under the title Special Communication Units (SCUs) but remained outside the control of the British Army. Its head was Richard Gambier-Parry and his HQ was in Whaddon Hall a Georgian mansion some 5 miles west of Bletchley Park — the high security installation in England where British cryptologists received German encrypted transmissions and deciphered them.

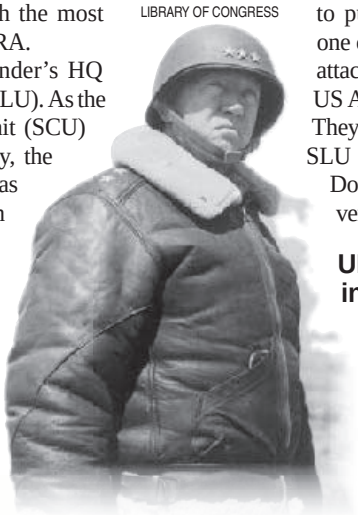
Amongst its many roles, Section VIII was responsible for the dissemination of the ULTRA intelligence from Bletchley Park to Allied Army Commanders in the field. This intelligence arose from the thousands of wireless messages sent daily by the German military using their Enigma cipher machines. Bletchley Park then deciphered, analyzed and graded these messages with the most important classified as ULTRA.

At each Army Commander's HQ was a Special Liaison Unit (SLU). As the Special Communication Unit (SCU) provided its wireless facility, the whole outfit became known as an SCU/SLU. The role of an SCU/SLU was to provide each Army Commander, be it Generals Bradley, Montgomery, Simpson, Patton or others, in their field headquarters with up-to-date and vital intelligence from Bletchley Park on the movements, status and plans of the German forces facing them.

ULTRA intelligence is widely believed to have shortened the war and it certainly saved the lives of hundreds of thousands of Allied servicemen. Historians writing about Patton's success largely ignore its existence and put it down to his "brilliance and sixth sense." That is unfair to the tens of thousands working to provide ULTRA information to him.

This article is the joint effort of myself with my wartime colleague Wilf Neal, to put the record right. He was one of our four wireless operators attached to General Patton's Third US Army in the invasion of France. They worked in shifts in the SCU/SLU wireless vehicle built into a Dodge ambulance, placed in the very heart of Third Army HQ.

LIBRARY OF CONGRESS



Lt General George S. Patton Jr in March 1943.

ULTRA Decodes in WWII

Historians should take note of the *Cadre Papers No 10* entitled *XIX TAC and ULTRA — Patton's Force Enhancers in the 1944 Campaign in France* by Major Bradford Shwedo of the USAF, published by Air

[1]Available from your local ARRL dealer, or from the ARRL Bookstore, ARRL order no. 0262. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/; pubsales@arrl.org**.

[2]Available from your local ARRL dealer, or from the ARRL Bookstore, ARRL order no. 0270.

BRIAN PAGE, N4TRB

The Bletchley Park complex in England where the ULTRA code breakers worked.

University Press, Maxwell Air Force Base, Alabama. Throughout its 142 pages there are continuous and highly detailed references to the use made of ULTRA. In one passage it refers to Patton's daily ULTRA meetings with his intelligence officers as follows:

"The operational value of the services was so impressive that General Patton never passed a special briefing. If he was unable to attend the regular meeting, he always saw to it during the day that the recipients (ULTRA officers) came over to his caravan to make their showing."

The two American Third Army SLU officers *appointed and trained by Bletchley Park*, to Third Army G2 (Intelligence) Section, were Major Melvin Helfers with Major Warrack Wallace as his assistant.

In the document he quotes a number of instances where, as a result of advance ULTRA intelligence, preventative measures were put into place to avoid seriously jeopardizing the position of forward troops. This document attributes the following comment to Major Wallace: "An army has never moved as fast and as far as the Third Army across France, and ULTRA was invaluable every mile of the way."

The following comment by Group Captain F. W. Winterbottom (RAF), the senior British ULTRA officer, is on page 25 of this document and reads: "Patton studied every ULTRA signal and knowing where every enemy soldier was in his path, would thread his way round or through them and find the undefended spot. He had done it in Sicily and then all the way from Brittany to the Rhine."

One should note that Group Captain F. W. Winterbottom — already head of MI6 (Air) — was appointed by Winston Churchill to ensure the total secrecy of the Bletchley Park intelligence output throughout the world. When Winterbottom refers to ULTRA signals he is referring to the original meaning of absolutely top-level intelligence. These crucial messages were, in turn, graded from Z1 through to Z5. A message Z5 at night would be enough for Major Helfers to rouse Patton from his sleep.

There are more instances of Patton's positive use of ULTRA in the *Cryptologic Almanac* issued by the United States National Security Agency and Central Security Service. It can be downloaded from the Internet under a heading —*General Patton and COMINT* — it is the third article. (COMINT — Communications Intelligence).

One of these recalls the daily meeting at 0900 of about 40 officers in the Third Army War Tent. "...at the conclusion of the briefing the meeting broke up, but seven officers remained behind. Then Majors Helfers or Wallace would spread the ULTRA map over the war map and brief Patton on the enemy situation as seen in COMINT.... "All seven of these Third Army officers had been inducted into the ULTRA secret, namely: General George Patton, Major General Hugh Gaffey, Brigadier General Hobart Gay, Colonel Oscar Koch, Colonel Robert Allen and of course, Majors Helfers and Wallace.

The British Special Liaison Units

Now let me turn to the part played by Wilf Neal during World War II. He served in the Royal Corps of Signals with a small British SLU attached to the G2 section of the forward headquarters of the United States Third Army. The unit, being part of SCU/SLU/8 totaled some 15 or 16 men — the communications team was made up of a sergeant, two drivers, four wireless operators and the remaining members, including the officer in charge, were responsible for the cipher operation.

SLUs were part of the British Secret Intelligence Service (MI6), formed in 1940 to convey ULTRA intelligence to British and later to US Army Commanders in the field. SLUs, working in the utmost secrecy, were only attached to those Commanders cleared to receive ULTRA. They comprised two Sections. British Army signals personnel manned the SCU wireless operation and Royal Air Force (RAF) personnel manned the vehicle handling the ciphers.

During the invasion of Europe all US Army Commands entitled to take ULTRA used an ULTRA Representative — all of them officers — in the US Army whose task was to receive the deciphered signals from the SLU. After summarizing the information in them, he presented it to the Army Commander, or the *very* few senior officers entitled to see it. These American officers, who served as part of the Command's G2 section, were not part of the British SLU, but were trained and indoctrinated at Bletchley Park. They totaled probably less than 25 across all of the US Army Commands. The principal officer attached to Third Army was Major Melvin Helfers, the only regular US Army Officer among them.

It has been said that US Army Officers were appointed to the US Commands "in case of language problems" but as far as the Third Army was concerned, it was more likely that Winterbottom was aware of the antipathy shown by Patton towards British Army personnel.

The intelligence was gathered by thousands of service men and women wireless operators, in what was known as the "Y" service (Wireless Intercept — Wi or Y). The Y Service task, 24 hours a day — often under harsh conditions — was to listen to the vast amount of Morse traffic created by the thousands of Enigma cipher machines of the German military. The Y Service units were spread across the whole of the UK. Many of these Service wireless interceptors worked in huts in bleak locations and most of them with inadequate heating in winter months.

It must be remembered that just prior to the outbreak of war, all British amateur wireless operators had their licenses revoked, transmitting gear removed and impounded, but were allowed to retain their receivers. Many of these amateurs were recruited in the RSS (Radio Security Service) to listen for German agents in the country but soon were employed listening to the German intelligence service — the Abwehr. RSS was later incorporated into the MI6 (Section VIII) organization and designated SCU3.

GEOFFREY PIDGEON

A 2002 photo of Wilf Neal standing beside a US Army Dodge Ambulance of the type converted at Whaddon Hall for use in the SCU/SLU for Patton's Third Army. Wilf was one of the wireless operators working to provide ULTRA to US Army Commanders.

BRIAN PAGE, N4TRB

This is an Enigma machine used in different forms by the German Army and the Abwehr — the German Secret Service.

BRIAN PAGE, N4TRB

Three of the famous National HRO radio receivers whose superb selectivity made them ideally suited to intercept German wartime Morse code communications.

Code Breakers and Wireless Workshops

Thousands of these messages, from the German military forces via the Y Service and from SCU3, still in code, were sent daily to the famous code breakers at Bletchley Park for deciphering and analysis. There were upwards of 11,000 staff at "The Park" working round the clock in three shifts. The intelligence thus obtained about enemy movements and plans was listed as Secret, Top Secret and Most Secret but later the highest level was listed as ULTRA — although that has recently become the generic word used for all the Bletchley Park output. ULTRA intelligence reports were limited to a very few army commanders and their senior G2 intelligence officers.

In the grounds of Whaddon Hall were workshops that produced much of the equipment used within the SCU organization. This included spy suitcase transceivers, many of which were used by MI6 agents, and various types of transmitters. Immediately facing the mansion was a wireless station operated under the code name of "Main Line." This small station handled covert and non-covert traffic to some of our embassies and missions abroad as well as Winston Churchill's messages when he was overseas. The dissemination of the ULTRA traffic deciphered at Bletchley Park was Section VIII's most important task so a short distance away on the edge of Whaddon village was another station on Windy Ridge. It was from here that enciphered messages from Bletchley Park were transmitted out to SCU/SLU units in the field.

Also based at the Hall was the Mobile Construction unit. I was a member of its team of about nine under the leadership of Dennis Smith, a brilliant engineer, who played a major role in designing much of our most successful equipment. From the early days of the war the unit fitted wireless equipment into vehicles used by the units attached to forward military headquarters. Vehicles converted in the early days included Packard Sedan motorcars, some Humber Estate cars, Guy 15 cwt wireless vans and US Dodge ambulances. The latter two were used with mobile units assigned to British, Canadian and American Army Commanders in the invasion of Europe. Dodge vehicles were assigned to the US forces and Guy vans to the others. This was one of the unit's priorities in early 1944.

Under the code name "Ascension" we also installed wireless gear in Lockheed Hudson's, Venturas and other aircraft at Tempsford airfield (UK). This was VHF to enable voice contact to our agents in occupied territory quickly and easily from aircraft. We fitted wireless on Motor Gun Boats and Torpedo Boats used to carry agents and equipment onto the coasts of occupied Europe.

Wilf Neal with the Third Army

Wilf's own service with the Third Army was as an SCU/SLU wireless operator attached to the forward headquarters G2 Section, "Lucky Forward," joining them at Peover Hall, Knutsford, Cheshire. The converted Dodge ambulances were equipped with a Whaddon MkIII transmitter, National HRO receiver with associated coils and a Marconi naval key. To make them totally mobile they carried an Onan generator for the daytime power supply and two banks of 12 V batteries for night work.

On June 29, 1944 Patton's SCU/SLU had left Knutsford with the HQ, boarding the Liberty ship *J. F. Stefan* at Southampton and sailing for Utah beach where it disembarked on the evening of July 6, then moved to the village of Nehou the following day. Third Army was activated on August 1, 1944, this being the start of the swift drive across France before becoming stalled in Nancy and Luxembourg City during the winter. Once conditions eased in February/March 1945 they moved into Germany, crossed the Rhine at Mainz and were in Regensburg at the time the war ended. At this point, service with the Third Army ended and within a day or two they traveled to their respective HQs in Versailles.

Apart from when moving between sites, which occurred every few days between the beginning of August and end of September, the station worked 24 hours a day, every day. The batteries were charged during the day using the Tiny Tim petrol driven charger. The Onan and Tiny Tim were of US manufacture. They also had aerial poles and gear stowed in the lockers over the wheel arches. The aerial was of the long wire variety.

When they were later able to move to more permanent cover, like in eastern France and Germany, it was possible to remove the desk complete with its wireless equipment and install it inside and hook up to the internal power supply. The converted ambulances had the Red Cross markings obliterated and all the vehicles bore US identification numbers. The cipher van was also a converted Dodge ambulance but the total *need-to-know* secrecy that existed in our unit meant that the wireless operators were never allowed to even peer inside.

Thirty Years of Secrecy

For 30 years after the end of the war, due to the existence of the Secrecy Act, we were mostly unaware of the true nature of the work in which we had been involved. It was not until the publication in 1975 of articles relating to the activities at Bletchley Park that we became aware of the vital importance of our work. At this stage, Wilf started to take an interest in researching his unit's history, although little information was available at the time. It was only when he started to attend reunions around 1997 and met up with men who served in other spheres within SCU and the RSS that a much broader picture of our activities emerged. It was also as a result of these reunions and the subsequent information that emerged that *The Secret Wireless War* was written.

There is no doubt that General Patton was one of the outstanding Generals of World War II. However, many of the brilliant maneuvers and victories attributed to him were undoubtedly achieved utilizing the ULTRA intelligence fed to him by Bletchley Park.

Geoffrey Pidgeon was involved with the manufacture and installation of classified radio equipment during WWII. He worked at Whaddon Hall, the headquarters of MI6, to fit communications equipment into a diverse array of vehicles ranging from aircraft and torpedo boats to Dodge trucks. Geoffrey is retired from his family business, which has been involved with bathroom fixtures since his great uncle was apprenticed to Thomas Crapper in 1871. Geoffrey can be reached at 3 Arundel House, Courtlands, Sheen Rd, Richmond, Surrey, TW10 5AS, United Kingdom, **geoffrey.pidgeon@virgin.net**.

Kids Day 2010: On the Air June 19

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 hopefully 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 QSOs.

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 information can be found at **www.arrl.org/kids-day**.

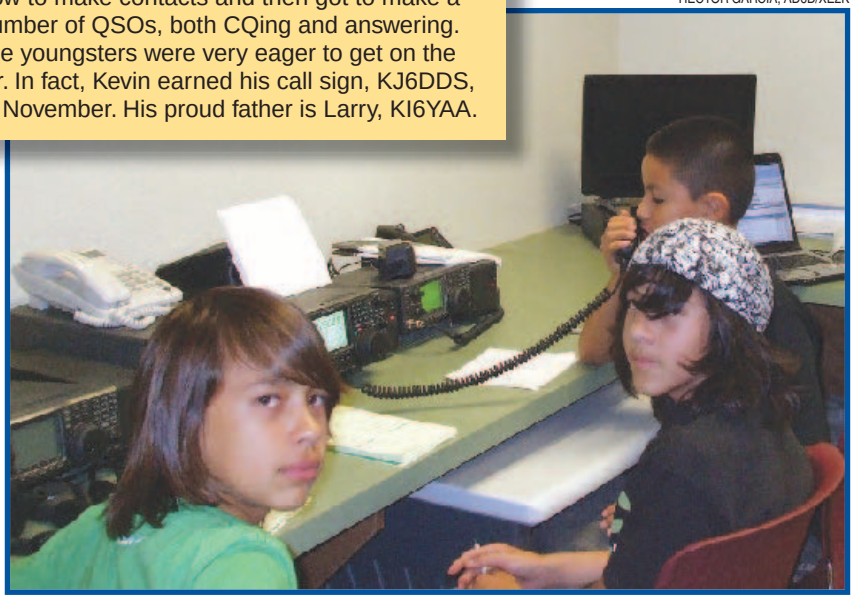
SoCal Fun!

Kids Day is alive and well along the Southern California border thanks to Hector Garcia, AD6D/XE2K, and the Imperial Valley Emergency Operations Center group in Heber, California. Last June Hector, Bruce Thompson, N7TY, Dennis Ambrose, WB6CGJ, and Rosa Hernandez activated the group's ARES/RACES station, W6ICR, and gave three boys, Kevin Teran and Aaron Jaime, both 13 years old, and Luis Alberto Garcia, age 9, a chance to find out about ham radio firsthand.

The boys were given a basic training in how to make contacts and then got to make a number of QSOs, both CQing and answering. The youngsters were very eager to get on the air. In fact, Kevin earned his call sign, KJ6DDS, in November. His proud father is Larry, KI6YAA.

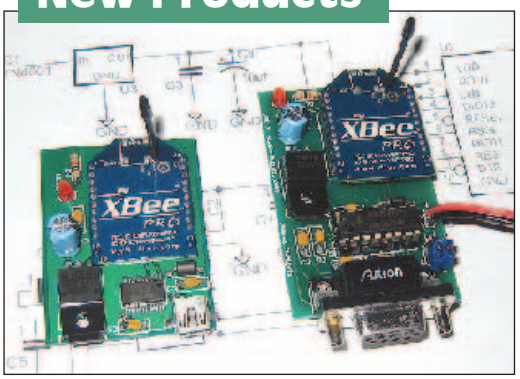
Saturday, June 19 1800 UTC – 2359 UTC

HECTOR GARCIA, AD6D/XE2K



Aaron Jaime, Kevin Teran (now KJ6DDS) and Luis Alberto Garcia enjoying Kids Day in June 2009 at the Imperial Valley Emergency Operations Center's RACES station, W6ICR in Heber, California.

New Products



VSC-X WIRELESS SERIAL CABLE FROM COASTAL CHIP WORKS

♢The VSC-X wireless virtual serial cable from Coastal ChipWorks is designed to allow users to reprogram the mobile radios in their cars from the computers in their homes without any wired connections. VSC-X uses 50 mW XBee Pro data radios to provide a 9600 baud virtual serial connection between the PC's USB port and the radio's serial data port. It supports radios that have RS-232 ports (such as the Kenwood TM-D700 and TM-D710) and radios with TTL level ports (such as the Yaesu FT-8xxx series radios and most ICOM radios). It is not necessary to add either a USB-to-serial converter on the computer side or a TTL-to-RS-232 level converter on the radio side because these are both built into the VSC-X modules. In addition to reprogramming radios, VSC-X can be used to replace serial cables anywhere a wired connection is undesirable. Price: $110 per pair. For more information see, **www.vsc-x.com**.

NASA

Ground Control to Major Tom...

You can listen to, and even contact, the International Space Station with your FM transceiver

Steve Ford, WB8IMY

An astounding number of active amateurs own 2-meter FM transceivers. These may be handheld rigs, mobile radios or desktop transceivers that include VHF capability. If you're part of the FM multitude, chances are you're using the radio to chat through local repeaters, or perhaps enjoy a direct (simplex) conversation or two.

But did you know that you could use that same radio to make contact with the International Space Station?

Hams in Space

No doubt you've heard of the International Space Station, often referred to by the acronym *ISS*. It's that huge complex of crew habitats, laboratories and solar arrays that's cruising about 250 miles above the planet. It streaks over your rooftop several times each day. It is so big, you can actually *see it* when conditions are favorable. Go to the Heavens Above Web site at **www.heavens-above.com** and create a free account. Once you've registered and entered your approximate location, the site will generate a list of upcoming "visible" passes. During the best passes the Space Station appears as a bright star moving across the sky. It is an impressive sight.

As hams we can do much more than simply gape at this amazing spacecraft. In fact, AMSAT, ARRL, NASA and space agencies in Japan, Russia, Canada and Europe have teamed up to create *ARISS*: Amateur Radio on the International Space Station. Thanks to the ARISS project, there is an Amateur Radio station aboard the ISS. The station operates primarily on 2 meters and with several watts of output power its signal is surprisingly loud. The height of its antennas helps a bit, too!

The main ARISS mission is to support educational events that involve contacts with the ISS crew, but that doesn't stop the astronauts and cosmonauts from using the equipment to make random contacts. The ARISS station also functions as a packet radio repeater, or occasionally as an FM voice repeater. At other times you may hear the sounds of Slow Scan TV transmissions as well.

WB8IMY

An SSTV image of Richard Garriott, W5KWQ, received on 2 meters.

Try Listening First

When you're exploring a new aspect of Amateur Radio, it's best to spend some time listening before you do anything else. The same is true for the ISS.

Of course, the Space Station isn't available 24/7. Think of it as a cosmic bus that only shows up at certain times. Just like terrestrial transportation, the trick to "getting aboard" is determining when it will arrive in your neighborhood.

Go to the AMSAT-NA Pass Prediction Web page at **www.amsat.org/amsat-new/tools/predict/**. Select the ISS from the drop-down menu, then enter either your grid square or your approximate latitude and longitude. Click the PREDICT button and you'll see a list of upcoming ISS passes for your area. Pay particular attention to the "Maximum Elevation" column in the resulting chart. You want to look for elevations of about 40 degrees or more. This will place the station high in your local sky (90 degrees is the maximum — directly overhead at its highest approach).

When you check the start times (AOS or *Acquisition of Signal*) and end times (LOS, *Loss of Signal*), you'll realize that you have, at best, only a 10-minute window of opportunity. This is due to the fact that the station orbits at such a low altitude, relatively speaking.

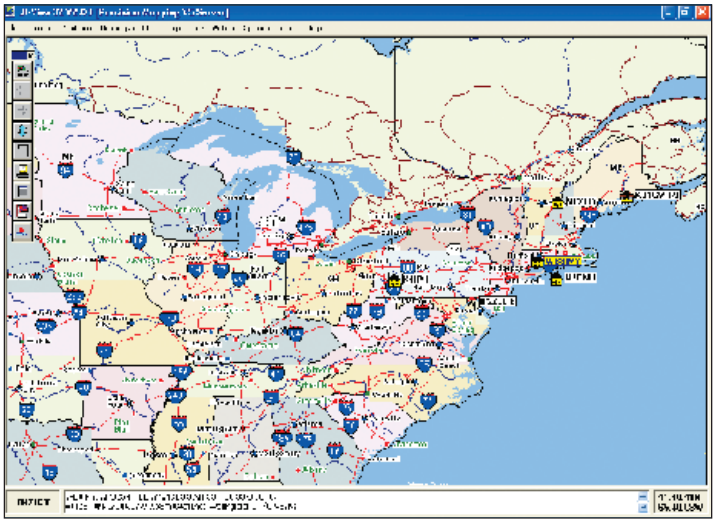
Pick a pass time and get your radio ready. Set your FM receive frequency to 145.800 MHz and turn off the squelch. If the ARISS station is on the air, you'll start hearing signals not long after the ISS pops over the horizon. If you've picked a high-elevation pass, you should hear strong, full-quieting signals within a few minutes. If you hear nothing, switch to 145.825 MHz where you may pick up digital activity.

One important note concerning antennas: If you're using a handheld transceiver with a typical "rubber duck" antenna, you may only hear activity for a minute or so at the station's highest elevation. These antennas were never intended for satellite work, so they tend to be pretty dreadful for this application. You'll enjoy much better results if you can attach the rig to a full-sized antenna such as a telescoping whip, J-pole or groundplane. I've had good success with ordinary mobile antennas as well.

NASA

Commander Mike Fincke, KE5AIT, makes FM voice contacts from the International Space Station.

WB8IMY



Several APRS stations appeared on this map as the Space Station made its way over the Eastern United States. Their packet bursts were relayed through the ISS digital repeater on 2 meters.

But What Will You Hear?

The type of activity you'll hear depends on the station's operating schedule. If there is a spacecraft docking or a spacewalk taking place, you'll hear nothing at all. The ARISS station is usually off the air at these times. It is also off the air when the crew is doing certain experiments or installing new equipment. Except for scheduled school contacts, getting on the radio is a leisure break for the crew, so activity can vary quite a bit.

It is difficult to keep up to date with the ever-changing ARISS operations. One of my favorite ways of staying on top of things is to regularly visit the ISS Fan Club Web site at **www.issfanclub.com**. Reports about the status of ARISS operations are available right on the home page. With a glance you can see which mode is active and a mouse click will reveal a list of reports with details about what individual hams have heard (and when).

Slow Scan Television (SSTV)

Personally speaking, I get excited when the crew decides to send images from the ISS. There is something about receiving pictures directly from the Space Station that almost makes my hair stand on end. As with many other ARISS transmissions, SSTV also takes place on 145.800 MHz. ARISS images are overlayed with the call sign NA1SS.

Most FM transceivers have an external speaker or headphone jack. To catch a glimpse of these amazing images, all you have to do is attach an audio cable between this jack and the LINE or MIC input of your computer sound card. The sound card will convert the analog FM signal to digital data. There is free software available that will decode the data and display the images on your computer monitor. If you are a *Windows* aficionado, try *MMSSTV* at **http://mmhamsoft.amateur-radio.ca/mmsstv/**, or the multimode program *Ham Radio Deluxe* at **www.ham-radio-deluxe.com** (the *Digital Master 780* module) or *MultiPSK* (**http://f6cte.free.fr/index_anglais.htm**).

Whichever program you choose, be sure to select the Robot 36 mode when receiving ISS images. Depending on signal strength, the images may be noisy, but they are still a thrill to see.

APRS Via Space Station

The ARISS packet repeater is commonly used for relaying APRS (Automatic Packet/Position Reporting System) signals. These bursts of data contain the locations of the APRS transmitting stations along with other information. At the receiving end, APRS software decodes the data and displays the station positions as icons on computer-generated maps.

When the ISS is over North America, APRS stations transmit to the repeater on 144.490 MHz and receive on 145.825 MHz. The call sign of the ARISS digital repeater is RSØISS-3.

To do justice to the topic of APRS, I'd need to burn through many more *QST* pages. Instead, I'd recommend you pick up a copy of the *ARRL VHF Digital Handbook*.

Voice Operations

If you're lucky enough to find an ISS crewperson on the air, they'll be transmitting on 145.800 MHz, but they will be listening on 144.490 MHz. So, you'll need to configure your transceiver accordingly. Most FM rigs will allow you to store split-frequency configurations in memory channels. The best thing to do is create a dedicated "ISS" memory slot that you can access quickly when needed.

If the ARISS voice repeater is active, it usually operates in crossband mode, listening on 437.800 MHz and retransmitting on 145.800 MHz, or vice versa.

Whether it is an individual crewperson or the FM repeater, remember that users have just 10 minutes or less to make contact. This means that conversations must be *very* short to give everyone a decent chance. The crew tends to operate in "contest mode," giving out signal reports and little more. Don't attempt to engage them in conversation unless they initiate it. And if you're operating through the ISS repeater, keep your own contacts as brief as possible.

And finally, yes, the ISS crew does QSL! Hams in the United States can send their cards to ARRL Headquarters with a self-addressed, stamped return envelope. Mail your card to:

ARRL Headquarters, ARISS QSL, 225 Main St, Newington, CT 06111-1494

Steve Ford, WB8IMY, is the Editor of QST. *You can contact him at* **sford@arrl.org**.

Will the *Real* Field Day Please Stand Up?

Field Day — contest, EmComm event or something else?

Warren L. Rothberg, W4WR

BEN JOHNSON, N7OGM

The Washington County (Oregon) ARES information booth set up for Field Day 2009. From left: Kristin Tomson, K7KWT; Steve Sanders, KE7JSS, and Tom Dixon, KE7FTE.

Let's test your knowledge of Field Day (FD). Ready? Field Day is

A. An EmComm drill

B. A social gathering

C. All of the above with something missing

The correct answer? It's C. But I'll keep you in suspense as we examine the other answers.

Field Day has seen quite a few changes over the years. Some consider FD a contest and that's how it started out back in 1933, but today's event resembles a contest only superficially.

The EmComm Side

As early as the 1930s, the ARRL held that FD was an exercise in Emergency Communications. In 1961 F. E. Handy, W1BDI, wrote:

"Emergency Operating, the Field Day and You. If Amateur Radio is all things to all people then the ARRL 'FD' is even more so. A testing of emergency equipment is decreed"[1]

In 1970 George Hart said "What is Field Day all about?…More than any other single thing, it is about emergency preparedness."[2]

I live in south Florida, a disaster waiting to happen. A close friend of mine said, "When a communication crisis hits here in southeastern Florida, hams don't usually end up operating from farmers' fields, mountain top pavilions, 50 foot air conditioned EmComm vans or even tents — many end up in their own houses without commercial electricity and with their outdoor antennas either nonexistent or downed by the bad weather."

Showing Off

Originally, I said the correct answer was C. But what was left out? Will the real FD please stand up? Field Day is our annual public relations event. Your Public Information Officer (PIO) should be the most important player. The PIO should call all of your local town, medical and emergency officials. Call the newspapers, TV and radio stations to advertise and invite the general public.

Prepare exhibits and "hands on" projects for the kids. Dedicate a significant part of your resources to an information table, understandable handouts and well spoken representatives to explain our contributions to the community.

Field Day is an opportunity that only comes once a year. We have to take advantage of the occasion to blow our own horn, to let the public know we are here, what we do and why we do it.

Torn jeans and stained T-shirts are *not* the order of the day. Look sharp. Wear your club or ARRL badge. Let the public know we are not a bunch of ragtag geeks. We are lawyers, engineers, teachers, real estate agents and telephone linemen. We are people who make things happen.

Paul Harvey said, "America's quiet warriors are the legion of ham radio operators, 700,000 of them, who are always at ready for backup duty in emergencies – amateur, unpaid, uncelebrated, civilian radio operators, during and after floods and fires and tornadoes.….and right now, at this moment, they are involved in homeland security to a greater degree than you would want me to make public."[3]

Those words did more for Amateur Radio than a thousand FDs could do. Now, imagine a thousand FDs doing what Paul Harvey did — speaking out for our tremendous commitment to volunteerism and the community.

With all your preparations for FD, are you prepared to deal with the important officials you have invited? This should be a topic of discussion at your club meetings before FD so *everyone* is prepared to explain the "who, what, why, where and how" of Amateur Radio.

Field Day is our annual PIO weekend. Let's hear it for the "unsung" heroes, our under-appreciated PIOs in the Field. Field Day is their day!

Notes

[1]F. E. Handy, W1BDI, "Operating News," *QST*, Apr 1961, pp 82-83.
[2]G. Hart, W1NJM, "Amateur Radio Public Service," *QST*, May 1970, pp 64-68.
[3]P. Harvey, "News and Comment," ABC Radio, Mar 19, 2003.

Warren L. Rothberg, W4WR, an ARRL Life Member, was first licensed in 1978 and now holds an Extra class license. He has been active in NTS and holds a BPL medallion, A-1 Operator, DXCC and WAS. Warren has held a variety of ARRL Field appointments and was actively involved with ARES® and SKYWARN. He resides in Florida with his wife, Donna, W4DLR, a General class licensee. He can be reached at 9 Waterford A, Delray Beach, FL 33446-1515, **w4wr@arrl.net**.

A Safe Field Day Is a Fun Field Day

When you are doing Field Day — remember these safety points.

Dan Henderson, N1ND

The fourth weekend in June always brings out the best in the amateur community as they flock by the thousands to Field Day sites across our country. Whether you're a FD "newbie" or "veteran," attention must be given to making FD not just fun — but safe.

Every FD setup is different, yet each has potential risks to be addressed during the planning. Do not wait for the accident to happen that weekend — keep an eye toward safety from square one. Appoint an FD "safety officer" charged with insuring an accident-free event. Potential problems need to be assessed realistically right from the beginning .

Don't Overlook the Obvious

More people are killed by 120 V ac from wall sockets than by any other voltage. Unfortunately, many people don't realize that your generator is just as lethal. Don't take any chances! Ground anything and everything. Never use "three-prong" adapters to defeat safety grounds.

At many FD locations, equipment fails. Our instinct is to open it up and troubleshoot the problem. Do you realize that the stored energy in your power supply can potentially be lethal? An old trick to use any time you open a rig is to keep one hand firmly in your pocket while poking around. Do not make yourself part of the circuit! Always kill all power completely before opening a piece of equipment — don't rely on interlocks. Never allow anyone else near the power switch while you're working on something. Never try to fix something while you are tired or sleepy. When working on any tube-type gear always unplug the unit from the ac mains and wait at least 5 minutes before you begin. Never wear watches or jewelry when you are working on gear.

Aside from electrical dangers, there are numerous physical hazards to be addressed. When erecting a temporary tower always make sure it is securely "planted" or firmly set with a base. Make sure any moveable tower is guyed adequately. Don't forget the increased foot traffic. It can be easy to accidentally walk into a guy rope or wire. Adequately mark them with small flags or signs to alert people to their presence.

Never — Never

We often get careless when working in temporary conditions, but there are a few absolutes that everyone needs to remember. Never climb an unguyed tower. Never work on a tower alone. Don't climb any tower without a hard hat and a climbing belt. Also, as much as we sometimes want that tall, cold one, alcohol and towers do not mix! If you drink, don't climb!

Make certain all mechanical connections are tight and secure before erecting a tower. What is easy to fix on the ground could be dangerous in the air. When erecting a tower,

George Noble, KK7FM, second from right, helps future ham Bob Zimmerman with a late night contact at the WØAK FD Get on the Air station at Big Creek State Park near Polk City, Iowa.

KEVIN SANDERS, KØDSM

take your time and make certain you have sufficient help to "muscle" the tower into the air. It is far too easy for someone to be caught on something or have fingers or toes in the wrong place at the wrong time. Make certain any "spectators" are a safe distance away. Most important of all: make sure there are no power lines nearby.

Always insure your guys are anchored securely and that they are sufficiently taut. Make certain that the tower bases are secure and unlikely to shift in high winds.

Mother Nature

Mother Nature has a habit of sending special "gifts" to various FD sites each year. Watch out for lightning! At the first sign of a storm, disconnect all antennas, shut down the generators and head for shelter. An extra few contacts are not worth the potential disaster of a lightning strike. Also remember that you don't have to take a direct hit in order to sustain damage or electrical shock.

A weather alert radio can help you monitor any brewing weather systems. Summer thunderstorms are accompanied by high winds and rain, which can cause poorly installed antennas, tents and dining flies to blow down.

Prevention is the Best Cure

More groups operate FD from generator power than any other source — which presents its own set of risks. Before the event, make sure to thoroughly clean and test the generator. Generators should always be set up outdoors to prevent the possibility of exhaust and gas fumes building up.

Speaking of generators, when laying out your Field Day site make sure, even outdoors, they are positioned in well-ventilated areas away from places where people will operate or congregate. They emit harmful fumes and exhaust. And don't forget that extra fuel for the generator needs to be stored away from ignition sources and from where visitors to the site (especially children) might accidentally happen upon them.

Always keep a multipurpose fire extinguisher by the generator. Never fuel a running generator. Never smoke around a generator. Keep the fuel in a separate place. Designate someone to be responsible for monitoring the generators.

Another basic safety tip for any Amateur Radio group event: always have someone available qualified in First Aid and CPR. A well-stocked first-aid kit is also a must-have for all Field Day operations. Accidents happen — so remember the Boy Scout motto — "Be Prepared."

Check all your extension cords prior to set up and discard any that show even the slightest wear. Make sure they are adequate to handle the load. Waterproof all outlets. You don't want a cloudburst to dump water onto your power junction box.

By now you get the picture that a good, fun FD is safe and well planned. So as you plan your participation in our largest annual on-the-air operating event, make sure you pay attention to making it one full of great memories — not one marred by accidents.

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

QST

US/Canada Section Abbreviation List

Those new to the ins and outs of Field Day will find this list of Section abbreviations useful — for those in the US and Canada, they're an important part of the FD exchange, along with station call sign and class. Be sure to bring a copy of this Section Abbreviation List with you to FD 2010.

1

Connecticut	CT
Rhode Island	RI
Eastern Massachusetts	EMA
Vermont	VT
Maine	ME
Western Massachusetts	WMA
New Hampshire	NH

2

Eastern New York	ENY
Northern New York	NNY
NYC / Long Island	NLI
Southern New Jersey	SNJ
Northern New Jersey	NNJ
Western New York	WNY

♦ Non US/Canadian stations should be logged as DX for Field Day.

3

Delaware	DE
Maryland – DC	MDC
Eastern Pennsylvania	EPA
Western Pennsylvania	WPA

4

Alabama	AL
Southern Florida	SFL
Georgia	GA
Tennessee	TN
Kentucky	KY
Virginia	VA
North Carolina	NC
West Central Florida	WCF
Northern Florida	NFL
Puerto Rico	PR
South Carolina	SC
Virgin Islands	VI

5

Arkansas	AR
North Texas	NTX
Louisiana	LA
Oklahoma	OK
Mississippi	MS
South Texas	STX
New Mexico	NM
West Texas	WTX

6

East Bay	EB
San Diego	SDG
Los Angeles	LAX
San Francisco	SF
Orange	ORG
San Joaquin Valley	SJV
Santa Barbara	SB
Sacramento Valley	SV
Santa Clara Valley	SCV
Pacific	PAC

7

Alaska	AK
Nevada	NV
Arizona	AZ
Oregon	OR
Eastern Washington	EWA
Utah	UT
Idaho	ID
Western Washington	WWA
Montana	MT
Wyoming	WY

8

Michigan	MI
West Virginia	WV
Ohio	OH

9

Illinois	IL
Wisconsin	WI
Indiana	IN

Ø

Colorado	CO
Missouri	MO
Iowa	IA
Nebraska	NE
Kansas	KS
North Dakota	ND
Minnesota	MN
South Dakota	SD

Canada

Maritime	MAR
Saskatchewan	SK
Newfoundland/Labrador	NL
Alberta	AB
Quebec	QC
British Columbia	BC
Ontario	ON
Northern Territories	NT
Manitoba	MB

On 15 Years as Field Day Chairman

Advice and anecdotes to help you get the most from your Field Day.

Jim Riley, KB9CYL

In the spring of my 41st year I started taking Novice classes from the Hamfesters Radio Club of Chicago (**www.hamfesters.org**). All I wanted to do was work the distant stations I'd heard on my parents' Grundig years before. Our instructors taught us not only what we needed to pass the test, but let us in on their experiences as amateurs. I passed the 5 WPM code test and the written exam and became Amateur Radio Station KB9CYL.

One part of that new world was Field Day (FD) and the stories of open air operating as a team for 24 hours really fascinated me. My old friend Gordon Lakomy, WM9T, was in charge of the Hamfesters group and invited me to see what it was all about. I felt instantly at home as everyone welcomed me but it was at the Novice/Technician station where it all began. Jim McGovern, KA9STV, asked me to log for him — no computers then, just paper logs and dupe sheets. After a little while he saw that I was able to copy the calls and exchanges without his help and asked me to take the microphone. I did, reluctantly, but was soon hooked as I made my first HF contact ever, racking up points from all across North America.

In the ensuing years I split my FD time between Hamfesters and the Argonne Amateur Radio Club (**www.qsl.net/w9anl**), learning the FD ropes from some very experienced operators. Five years after my first FD contact, Hamfesters needed a FD chairman. I took the job hoping the experience of the prior 5 years would stand me in good stead.

Well, I've learned a thing or two since then and I'd like to share my experience with you.

The author is ready to deploy his G5RV antenna.

Surround Yourself with Good People

This is Rule Number One. I'm not very technical. My main contribution to FD is to reserve the site and order the Porta-John. I own a small business that has nothing to do with electronics, but gives me plenty of organizational skills and the ability to deal with people. I knew I had to get help and lots of it.

Hamfesters President Bob Koran, N9JYX, and Joe Kratky, KA9KBU, two guys who can fix just about anything, have kept us up and running more than once when generators or power supplies went south. Matt Sobczak, K9MS, knows everything there is to know about antennas and has brought out some interesting homebrew skyhooks, including a Sterba curtain. We've had some pretty good brass pounders over the years, especially the legendary Bob Truhlar, W9LNQ, who can send and receive at 50+ WPM while simultaneously talking to visitors. Our current operators, Ray Paschke, NW9S, on 20 meters and Don Sommerfeld, K9KNZ, on 40, do an outstanding job too. To top it all off we're blessed with the services of professional photographer Don Pointer, KC9EQQ, who documents our operations every year.

Have an Outstanding GOTA Station

Brian Davis, W9HLQ, and Gregg Rosenberg, AB9MZ, have done just that. For visitors to our site, the Get On The Air (GOTA) station is their first introduction to Amateur Radio. It's located right outside our canopy tent and next to our public information booth. As we explain to visitors what we're all about they can see an actual demonstration. Everything is user friendly and nervous newbies are aided by our encouraging operators. Brian and Gregg even have a phonetic alphabet cheat sheet so first-timers can understand what the other stations are saying. We've garnered a few new hams and club members this way.

Protect Your Crew (Somewhat) from the Weather

Our white and yellow tent is visible all up and down 86th Avenue, letting passersby know something is going on here. It provides 800 square feet of protection from the intense summer sun and the occasional light rain, not so much from wind. One year a strong gust came close to making it airborne, but some quick action by those sitting under it kept it from sailing across the road.

Make Sure There's Plenty of Food

If an army travels on its stomach, a FD group stays put and fills theirs. In the early days, Bob Brower, KF9QI, was our cook. Donuts and coffee for the set-up guys; lunch of sloppy joe just before operations started; Saturday supper including pasta, bratwurst or burgers on the grill with a couple of side dishes, and his outstanding fat French toast with eggs and sausage for Sunday morning breakfast.

The Hamfesters make sure their operating positions are well protected from bad weather and annoying insects. Holding the tent, from the left Steve Peters, K9KXT; Don Sommerfeld, K9KNZ; Tom Gulick; Brian Davis, W9HLQ, and Ron Carlson, KB9ZBN.

Alas, Bob ran into health problems and had to quit but others have taken over and we never go hungry. In fact, sometimes we just sit under the tent eating and hoping the other stations don't bother us too much. Even my wife Judy, who's not a ham, provides her world famous FD roast beef sandwiches for Saturday supper. That brings me to my next point.

Never Marry Anyone Whose Birthday Coincides with Field Day

This may not apply to everybody but it's something to consider before a ham gets married. Obviously I wasn't a ham when I married Judy or I would have known the consequences of being married to a nonham born on June 26. When her birthday and FD coincide I have a serious decision to make, but I wind up going to FD anyway. She's a good sport and even brings us her roast beef sandwiches before going out to celebrate with her sisters.

Be Prepared for Anything

I'm not talking about weather and balky generators or even running out of duct tape; I'm talking about serious stuff, like when they sell your site out from under you. One spring morning I passed by our site and noticed construction was underway on some very large houses. I had to find a new site — quickly.

Fortunately, one of the deans at Moraine Valley Community College in Palos Hills, Illinois, is an old friend and he set me up with our new site, but in 2006 we lost our access to it and I had to scramble again. My friend was out of town and phone call after e-mail after fax to the other deans, directors and custodians at the college were getting me nowhere.

At the last minute one of my many e-mails was spotted by the Athletic Director of the college. He was kind enough to set us up with a spot near one of the baseball fields the Friday night before FD.

Don't Try to Move a Porta-John in a Ford Ranger

Another problem that may crop up, as rare as it might sound, is when they put your Porta-John in the wrong place. For FD 2000 the Porta-John people put our unit, aka the FD chairman's office, about a quarter mile from where it was supposed to be and we couldn't get hold of anyone from the company to move it. My Ranger was the only vehicle capable of carrying something that big so Emil Balzano, AB9DD, and I set out to get it. We couldn't stand it up because of the Ranger's wheel wells, so we laid it on its back with the bottom on the tailgate.

We had no rope or bungee cords (see previous paragraph about being prepared) so Emil hung out the window and held it. We had to go on the main road for part of the trip, which included a slight incline. Emil lost his grip and I learned that a Porta-John can withstand a fall from a Ford Ranger without any damage and land in an upright position.

No photographic record exists because our guys were too busy pointing and laughing. Emil and I eventually got it to its proper location and a Hamfesters FD legend was born.

Get a Place that Drains Well

At our FD 2000 site, the rain started falling and the field turned into a quagmire. We couldn't operate because of the lightning so we sat under the canopy, ate all the good food and drank beer. Mixing beer, pouring rain, a distant Porta-John and women in the group resulted in a holding pattern of cars near the facilities. Next morning we learned another lesson: *It takes two big vehicles with tow ropes to pull a car out of the mud*.

Let Everyone Who Wants to Operate, Operate

Field Day is not a contest, so it's best to demonstrate what we do, let visitors new to contesting and Amateur Radio give it a try and not worry about points.

We've gained some new club members and some good FD operators by giving up the microphone to visitors and helping them through their shaky first contact without a thought about how many points we might be missing. Besides, the night crew can usually operate unencumbered by visitors and pick up any contacts they might have missed during the day.

Have Fun

If you take nothing else away from this just remember to enjoy yourself. Field Day is the most fun you can have as an Amateur Radio operator so get out in the fresh air and have a blast. Enjoy the teamwork of setting up antennas, generators and operating positions; relish the camaraderie of a meal shared in the great outdoors; soak up the lore as veteran operators share the glories of Field Days past. Some parts of those stories might even be true. While you're at it maybe you'll be a part of some new experiences that will go down in your club or group's history. With the passing years and a few embellishments, you may become the stuff of legend. Most of all, be sure to look for W9AA (Whiskey Nine America America) 3 Alfa Illinois.

Photos by Don Pointer, KC9EQQ.

Jim Riley, KB9CYL, an ARRL member, was licensed in 1989. He has been a member of the Hamfesters Radio Club Board of Directors for 19 years, served as president and vice president. Jim is a severe weather spotter and a lieutenant in the Homer Glen Emergency Management Agency. Off the air, Jim operates Riley's Trick Shop a family business that sells tricks, jokes, magic items and costumes. He is married to a very ham radio tolerant wife, Judy, and has four children and eight grandchildren. Jim can be reached at 12121 W Venetian Way, Orland Park, IL 60467, **kb9cyl@hotmail.com**.

US Amateur Radio Bands

US AMATEUR POWER LIMITS

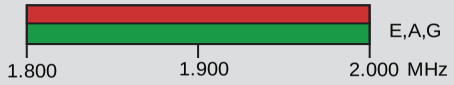
At all times, transmitter power should be kept down to that necessary to carry out the desired communications. Power is rated in watts PEP output. Except where noted, the maximum power output is *1500 Watts*.

Effective Date
May 6, 2008

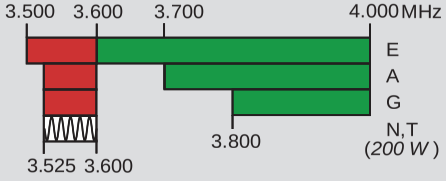
Published by:
ARRL *The national association for AMATEUR RADIO*™
www.arrl.org
225 Main Street, Newington, CT USA 06111-1494

160 Meters (1.8 MHz)

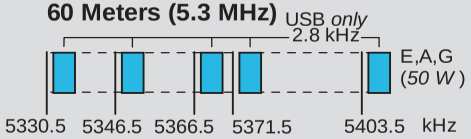
Avoid interference to radiolocation operations from 1.900 to 2.000 MHz



80 Meters (3.5 MHz)

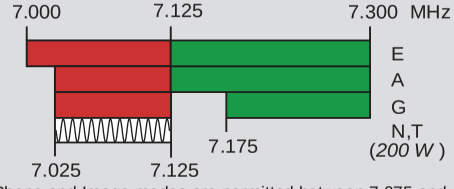


60 Meters (5.3 MHz) USB *only*



General, Advanced, and Amateur Extra licensees may use the following five channels on a secondary basis with a maximum effective radiated power of 50 W PEP relative to a half wave dipole. Only upper sideband suppressed carrier voice transmissions may be used. The frequencies are 5330.5, 5346.5, 5366.5, 5371.5 and 5403.5 kHz. The occupied bandwidth is limited to 2.8 kHz centered on 5332, 5348, 5368, 5373, and 5405 kHz respectively.

40 Meters (7 MHz)

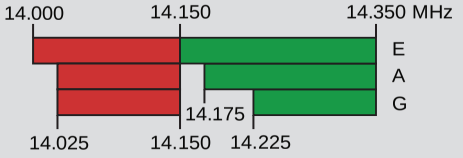


Phone and Image modes are permitted between 7.075 and 7.100 MHz for FCC licensed stations in ITU Regions 1 and 3 and by FCC licensed stations in ITU Region 2 West of 130 degrees West longitude or South of 20 degrees North latitude. See Sections 97.305(c) and 97.307(f)(11).
Novice and Technician licensees outside ITU Region 2 may use CW only between 7.025 and 7.075 MHz and between 7.100 and 7.125 MHz. 7.200 to 7.300 MHz is not available outside ITU Region 2. See Section 97.301(e). These exemptions do not apply to stations in the continental US.

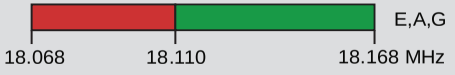
30 Meters (10.1 MHz)

Avoid interference to fixed services outside the US.

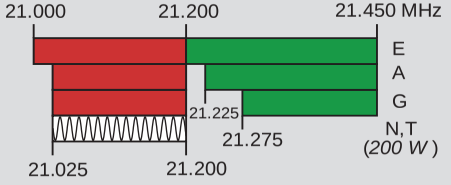
20 Meters (14 MHz)



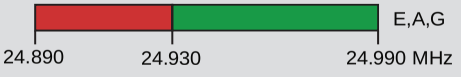
17 Meters (18 MHz)



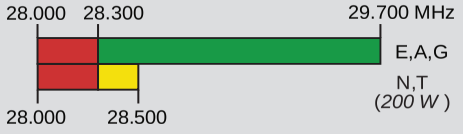
15 Meters (21 MHz)



12 Meters (24 MHz)



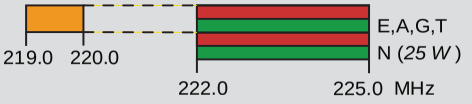
10 Meters (28 MHz)



6 Meters (50 MHz)

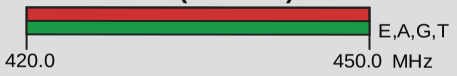
2 Meters (144 MHz)

1.25 Meters (222 MHz)

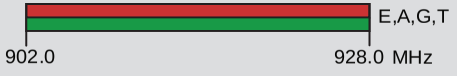


*Geographical and power restrictions may apply to all bands above 420 MHz. See *The ARRL Operating Manual* for information about your area.

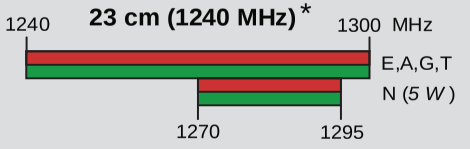
70 cm (420 MHz)*



33 cm (902 MHz)*



23 cm (1240 MHz)*



All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

KEY

Note:
CW operation is permitted throughout all amateur bands except 60 meters.

MCW is authorized above 50.1 MHz, except for 219-220 MHz.

Test transmissions are authorized above 51 MHz, except for 219-220 MHz

- = RTTY and data
- = phone and image
- = CW *only*
- = SSB phone
- = USB phone *only*
- = Fixed digital message forwarding systems *only*

E = Amateur Extra
A = Advanced
G = General
T = Technician
N = Novice

See *ARRLWeb at www.arrl.org* for detailed band plans.

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ARRL, Red Cross Sign *Memorandum of Understanding*

MICHAEL HALSTON, ARC

ARRL President Kay Craigie, N3KN, signs the new *Memorandum of Understanding* as American Red Cross President and CEO Gail McGovern looks on.

On March 25, ARRL President Kay Craigie, N3KN, signed a new *Memorandum of Understanding* (*MoU*) with the American Red Cross (ARC) at ARC National Headquarters in Washington, DC. The *MoU*, which replaces an earlier *Statement of Understanding* that expired in 2007, provides a "broad framework for cooperation" between the ARRL and the ARC "in preparing for and responding to disaster relief situations at all levels in rendering assistance and service to victims of disaster, as well as other services for which cooperation may be mutually beneficial."

The ARRL Board of Directors approved the signing of the *MoU* at its January 2010 meeting following the completion of negotiations. The Red Cross requires the completion of a criminal background check to participate in Red Cross activities and provides a process by which a volunteer may have a criminal background check performed at no cost to the volunteer. In the case of ARRL volunteers, the Red Cross has agreed to accept an alternative process: ARRL volunteers may arrange, at their own initiative and expense, to have the criminal background check performed by a state or local law enforcement agency.

The Red Cross also has agreed that ARRL volunteers shall not be asked or required to consent to credit checks, mode of living investigations or investigative consumer reports in order to provide a communications function.

The ARRL and the Red Cross encourage interested volunteers in their respective organizations to become members and to participate in the activities of the other organization. ARRL volunteers should be aware that if they wish to become Red Cross volunteers, they may be required to consent to additional background checks in accordance with Red Cross policy that may include credit checks, mode of living investigations or investigative consumer reports.

Per the *MoU*, "both ARRL volunteers and ARC workers will work cooperatively at the scene of a disaster and in the disaster recovery, within the scope of their respective roles and duties as recommended." During a Red Cross Disaster Relief Operation (DRO) and depending on their training and qualifications, ARRL volunteers may perform in one or more of several roles, including Amateur Radio Liaison, Communication Equipment Operator, Communication Equipment Installation/Repair and Disaster Assessment. ARRL volunteers who are assigned roles by the Red Cross during a DRO will be provided with Red Cross credentials as required by the role, consistent with Red Cross policy.

"Because of the importance of emergency communications, we are happy to be able to continue the League's long-standing relationship with the American Red Cross," said Craigie. "The ARC and other served agencies give Amateur Radio operators the worthwhile missions in our communities that allow us to thank America for the privilege of being hams."

The MoU is available on the ARRL Web site (**www.arrl.org/files/media/News/ARRL-ARC_MoU.pdf**).

CITY OF MANASSAS TO END BPL SERVICE

Once touted as "the most successful BPL deployment in the nation," the City of Manassas, Virginia has decided to get out of the BPL business, once and for all. At a Special Meeting on April 5, the Manassas City Council — acting on a recommendation from the Manassas Utilities Commission — unanimously voted to discontinue Broadband over Powerline (BPL) Internet service as of July 1, 2010. Approximately 520 residents and businesses who currently subscribe to the service were told that they have until that time to find a new Internet service provider.

According to Manassas City Clerk Andrea Madden, there was no discussion on the resolution to discontinue service and the motion was passed "without incident."

With the motion made by Councilman Jonathan Way and seconded by Mark Wolfe, the City Council cited three reasons for discontinuing BPL service: a declining customer base, an annual income deficit of almost $166,000 from providing Internet service, and a determination that AMI [Advanced Metering Infrastructure] platforms don't require BPL. Way and Wolfe favored shutting down the BPL system in November 2009, the last time this matter was brought to the Council's attention. "The City needs to get out of BPL forthwith," Way said back in 2009. "It's not a good product. The whole business is not financially sound and it never has been."

Manassas residents pay $24.95 each month to receive Internet service via BPL. In November 2009, the Utility Commission showed the Council that little more than 500 residents and 46 businesses currently subscribed to the service, which since 2008, has been run by the City. "It's costing a little more to maintain the system than we projected in the budget," Manassas Director of Utilities Michael Moon told the Council. "The original projections were that the customer base would be double this." In September 2008, the Manassas City Council voted to assume control of the BPL service from COMTek, the private company that served (back then) approximately 675 residents.

In January 2009, there were 637 residential and 51 commercial BPL subscribers in Manassas. In February 2010, those numbers had shrunk to 457 residential and 50 commercial subscribers. The Utilities Commission said that the total revenue brought in by BPL for FY2010 was almost $186,000, but the expense of keeping up the City-owned system was costing the ratepayers a little

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

more than $351,000, resulting in a net loss of almost $166,000.

"In October 2003, the Manassas City Council was told that it could expect as much as $4.5 million in revenue from awarding a 10 year BPL franchise," said ARRL Chief Executive Officer David Sumner, K1ZZ. "Instead, six months later, BPL had turned into a money pit for the City of Manassas. Anyone thinking of investing in BPL would do well to learn from the Manassas experience."

In November 2009, Manassas' Assistant Utilities Director (Electric) Gregg Paulson told the ARRL that they had "every intention of putting BPL Internet service in the budget and the Council can decide its fate as they work through the budget process." Paulson also said that while Internet service to consumers would "probably" be the only thing that would be cut if the Council decided to forego BPL, he left the door open as to using the BPL infrastructure for other purposes: "We still own the BPL network, but we may or may not use this network for utility monitoring or other AMI purposes."

But according to the resolution passed by the Council, the Manassas Utilities Department will not be using BPL for AMI, but instead will use "a combination of fiber and wireless technology exclusive of the BPL." According to the Agenda Statement for the Special Meeting, the BPL equipment will be removed from the system and "inquiries will be made regarding the salvage value."

KIM HAGAR

Sumner said that the ARRL's concern was not with the business plan — that he termed "obviously flawed" — but with "the interference to licensed radio services — and in particular the Amateur Radio Service — inevitably caused by putting radio frequency energy on unshielded, unbalanced conductors. Manassas was touted as 'the most successful BPL deployment in the nation' when FCC Chairman Michael Powell visited the site with much fanfare — and, the ARRL maintains, in violation of the FCC's own rules — on the eve of the FCC's vote to adopt inadequate protection for licensed radio services against interference from BPL systems. The taxpayers and ratepayers of Manassas are not the only ones who benefit from the end of this ill-considered foray into BPL. Radio amateurs in the Manassas area have good reason to celebrate, for they have spent countless hours documenting the widespread interference caused by the system."

BPL technology uses the electricity grid in a city and the wiring in individual homes to provide direct "plug in" broadband access through electricity sockets, rather than over phone or cable TV lines. Because BPL wiring is physically large, is often overhead and extends across entire communities, these systems pose a significant interference potential to over-the-air radio services, including Amateur Radio.

2010 TEACHERS INSTITUTES BEGIN WITH A BANG IN TUCSON

The ARRL Teachers Institute on Wireless Technology (TI) began its 2010 sessions in February with a Teachers Institute course designed specifically for teachers in the Tucson (Arizona) Unified School District (TUSD). Taught at Jefferson Park Elementary School, 21 educators — including the school principal, school counselor and three resource personnel — took part in five Saturday sessions, working through an expanded 45 hour Teachers Institute (TIs usually are done in about 32 hours). The teachers completed homework assignments that included building the clock kit, building a flashing LED Santa and reading the first two chapters of *What's a Microcontroller?* In addition, five parents attended the TI as observers. TI Instructor Miguel Enriquez, KD7RPP, taught the course; he teaches at Pueblo High School in the TUSD.

According to Enriquez, breaking the TI into four out of five contiguous Saturdays had its advantages and disadvantages. "The biggest advantage was that we were able to cover more material than normal because I was able to enlist the assistance of two Elmers: Katherine Larson, KF7GFG, and Alex Thome, KF7GFF," he said. "Their assistance made it possible to have 21 teachers and five parents attending the TI. Both Alex and Katherine also presented some additional material, with Katherine using material provided by ARRL Education & Technology Program Coordinator Mark Spencer, WA8SME, on how to instruct the teachers to effectively make use of Elmers, and Alex presenting and demonstrating D-STAR."

Four Elmers assisted with the TUSD TI. One presented information about astronomy and will provide the opportunity for Jefferson Park students to use remote imaging via the Internet to get students interested in radio astronomy. A second Elmer demonstrated and assisted with VHF and HF contacts. A third Elmer attended the TI to meet the teachers and begin a discussion of an ATV network for the Jefferson Park students and students from a school in a district 30 miles away. A fourth Elmer conducted and explained the practice of satellite contacts. "We made a satellite contact with Mark Spencer, WA8SME, in California that proved to be both dramatic and inspiring to the group," Enriquez said.

The Teachers Institute on Wireless Technology is a four-day, expenses paid in-residence learning opportunity designed for motivated teachers and other school staff who want to learn more about wireless technology and bring that knowledge to their students. A variety of topics are covered during the TI, including basic wireless technology literacy, electronics, the science of radio, radio astronomy, how to bring space into the classroom ham radio operation introduction to micro controllers and basic robotics. Participants do not need to have an Amateur Radio license to attend a TI session.

There are three more ARRL Teachers Institute sessions in 2010: June 14-17 at Walhalla High School, in Walhalla, South Carolina; June 21-24 at Parallax Inc in Rocklin, California, and July 19-22 at ARRL Headquarters in Newington, Connecticut.

MIGUEL ENRIQUEZ, KD7RPP

More than 20 educators and five Elmers participated in the first Teachers Institute on Wireless Technology, held over five Saturdays in February and March at Jefferson Park School in Tucson, Arizona.

FCC News

ARRL Responds to FCC's *NPRM* Calling for New Rules on Vanity, Club Call Signs

♦In November 2009, the FCC issued a *Notice of Proposed Rule Making* (*NPRM*) — WT Docket No 09-209 — seeking to amend the Commission's Amateur Radio Service rules in an attempt to clarify certain rules and codify existing procedures governing the vanity call sign system, as well as revise certain rules applicable to club stations. In March, the ARRL submitted comments and additional proposals to the FCC to update the Amateur Service's call sign assignment system and provide for continued growth of the Amateur Radio Service, as well as enhance the pride and satisfaction of licensees in their personal achievements in the radio art. The ARRL's positions were developed by the Executive Committee at its March 13 meeting.

With the exception of the FCC's proposal to limit the number of license grants and call signs a single club can be assigned, the ARRL supports the proposals contained in the *NPRM*: the ARRL supports the license cancellation procedures for deceased licensees; the timing of the availability of the deceased licensee's call sign; the proposed exception to the two-year waiting period for former holders of a call sign, and the proposed definition of an "in-law".

The ARRL agrees that a two-year waiting period should not apply to a call sign that has been surrendered after assignment to an ineligible applicant; however, there should be a 30 day waiting period after the Commission's staff updates the licensing database, for the same reasons that such notice period applies when a deceased licensee's call sign is made available for reassignment.

The ARRL noted in its comments that there should continue to be an exception to the two year waiting period for an *in memoriam* club station call sign when a close relative has consented to the assignment, provided that the deceased licensee was a *bona fide* member of the club at some time during the decedent's life and that the Commission should clarify that it is not necessary that the decedent be a member of the club at the time of the decedent's death. It should also be clarified what attestations are required for the assignment of an *in memoriam* call sign to a club. As to club station license modifications, two officers of the club, neither of which should be the new trustee, should be required on any application to change a club trustee; other modifications should be made only by the trustee of that club license. The ARRL agreed that Novice class Amateur licensees could be able to serve as a club station license trustee.

The Commission should not limit an amateur club to one station license grant and one call sign. ARRL offered alternative proposals for making available new call signs in preferred formats address the root problem, which is the scarcity of such preferred call sign formats.

These proposals include the prohibition, except for *in memoriam* call signs, of Group A call signs to club stations and expanding the pool of available Group A call signs to make available for assignment those in which the first character of a two character suffix is a numeral, in addition to those in which the first character of the suffix is a letter (Group A call signs are in the 1×2 and 2×1 format, and a 2×2 format beginning with AA-AG prefixes and AI-AK that are not sequentially assigned).

In offshore areas, prefixes that are assigned to locations without postal addresses and prefixes that are unassigned should be made available in the offshore areas that do have postal addresses. New applicants for Group A vanity call signs should be required to affirm from this point forward that they are United States citizens. The ARRL would also like the Commission to make available the 2×3 call sign block beginning with N to vanity call sign applications, and it should permit the issuance of three letter suffix call signs with the prefixes WC, WK, WM, WR and WT.

The League's comments reflect that there are aspects of all three amateur call sign assignment systems that justify additional revisions in the rules that would eliminate "certain inequities" that now exist. "These issues are not specifically related to the proposals contained in the *Notice*, but they derive from the same circumstances."

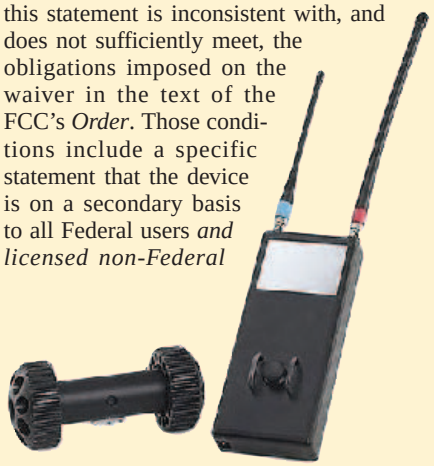
ARRL Files *Petition for Reconsideration* over Waiver for Non-amateur Device in 70 cm Band

♦In January 2008, ReconRobotics filed a request with the FCC for a waiver of Part 90 of the Commission's Rules with respect to their Recon Scout product. A waiver is required to permit licensing of the Recon Scout because the device operates in the 430-448 MHz band, which is allocated to the Federal Government Radiolocation service on a primary basis, as well as the Amateur Radio Service and certain non-federal radiolocation systems on a secondary basis. The ARRL opposed the waiver on the grounds that the device has a significant potential to interfere with amateur stations and that the company is simply trying to avoid redesigning for the domestic market a device that was originally designed for military use overseas.

In comments filed in May 2008, the ARRL called on the FCC to deny the ReconRobotics waiver request, "either permanently or even temporarily," and to require ReconRobotics to "initiate a rulemaking proceeding if it feels that the Part 90 or Part 15 rules governing analog devices are not sufficiently accommodating and should be changed, and could be changed consistent with interference avoidance. Repeatedly granting waivers for analog devices which do not meet the fundamental interference avoidance requirements of the existing rules is bad spectrum management and ill-serves the Amateur Service." Despite opposing comments, the FCC granted the waiver request in the form of an *Order* (WP Docket No 08-63), subject to certain conditions.

In its *Petition for Reconsideration*, the ARRL states that it is, of course, in favor of the development and use of technology in support of first responders and law enforcement efforts. The ARRL has no concern with the deployment by law enforcement personnel and first responders of video and audio surveillance devices *per se*. However, in its *Petition* the ARRL asserts that in this instance the Wireless Bureau and the Public Safety and Homeland Security Bureau have granted the waiver precipitously and without due consideration of the interference potential and interference susceptibility of the subject devices. The ARRL *Petition* further argues that the *Order* failed to address a number of pertinent issues raised in submitted comments. The failure to do so characterizes the resulting *Order* as arbitrary and capricious.

The *Petition* also raises the issue of practical errors in the *Order* that would need to be corrected prior to any marketing of the equipment. For example, the FCC *Order* requires that Recon Scout transmitters be labeled with the following statement: "This device may not interfere with Federal stations (*sic*) operating in the 420-450 MHz band and must accept any interference received." The ARRL *Petition* states that this statement is inconsistent with, and does not sufficiently meet, the obligations imposed on the waiver in the text of the FCC's *Order*. Those conditions include a specific statement that the device is on a secondary basis to all Federal users *and licensed non-Federal*



The Recon Scout — manufactured and marketed by ReconRobotics — is a remote-controlled, maneuverable surveillance robot designed for use in areas that may be too hazardous for human entry. ReconRobotics was recently granted a waiver by the FCC for the device to operate between 430-448 MHz.

users. The ARRL *Petition* demands that the label be modified accordingly.

In addition, the FCC *Order* requires that the following statement be placed in the instruction manual: "Although this transmitter has been approved by the Federal Communications Commission, there is no guarantee that it will not receive interference." The ARRL *Petition* argues that this language is insufficient; it should be modified to explain the conditions of operation more clearly. For instance, there is nothing in that language that explains to the user who experiences interference what that user's expectations should be. Instead, the notice in the manual should read: "Although this transmitter has been approved by the Federal Communications Commission, it must accept any interference received from Federal or non-Federal stations, including interference that may cause undesired operation."

Finally, the ARRL *Petition* alleges that there is evidence of illegal marketing of the Recon Scout, which should by itself trigger a re-evaluation of the waiver.

ARRL Files Comments in Response to Hospital Association Seeking Blanket Waiver Request for Amateur Radio Drills

♦In February 2010, the American Hospital Association (AHA) filed a request with the FCC for a blanket waiver of Section 97.113(a)(3) of the Commission's Rules "to permit hospitals seeking accreditation to use Amateur Radio operators who are hospital employees to transmit communications on behalf of the hospital as part of emergency preparedness drills." On March 3, the FCC issued a *Public Notice* — WP Docket 10-54 — seeking comments if the Commission "should grant AHA's request for a blanket waiver of Section 97.113(a)(3) to permit amateur operators who are hospital employees to participate in emergency drills that are conducted by hospitals for accreditation purposes and that are not government-sponsored." Section 97.113(a)(3) specifically prohibits amateur stations from transmitting communications "in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer." In April, the ARRL filed comments regarding the blanket waiver request.

While not opposing the grant of a waiver, the ARRL urged the Commission "to carefully delineate limits on the types of communications that can be provided by employees of hospitals for accreditation purposes or otherwise pursuant thereto." The ARRL pointed out that AHA's waiver request was not "sufficiently specific to preclude any possible misunderstanding by Amateur Radio licensees (and hospital administrators) about what is permitted and what is not. The Commission's notice alleviates some, but not all of these concerns."

The ARRL believes that if the conditions attached to the blanket waiver are very specific and limit the radio transmissions to be made by hospital employees "for the benefit of the hospital to those '*necessary to participation in emergency preparedness and disaster drills that include Amateur operations for the purpose of emergency response, disaster relief or the testing and maintenance of equipment used for that purpose,*' the purposes of Section 97.113 would not be frustrated, and the public interest furthered by grant of the waiver."

The ARRL maintains that such a specific limit on the waiver authority in this case "would not compromise the non-pecuniary character of the Amateur Service, or permit an employer to pressure an employee to exploit the Amateur Service for the commercial benefit of that employer. The key is to prohibit the conduct of hospital operational, business or business restoration communications by Amateur Radio licensees who are employees of the hospital, but to permit and facilitate the involvement of the hospital as a key participant in *bona fide* Amateur Radio emergency and disaster relief communications drills and exercises."

The ARRL suggests in its comments that the blanket waiver sought by AHA should be granted, but only subject to the following specific conditions:

- The waiver is independent of, and is without prejudice to any action that might be taken in WP Docket 10-72, and will be in effect only until the time that final action is taken in that proceeding.
- That the transmissions made by Amateur Radio licensees pursuant to the blanket waiver be at all times limited to those "*necessary to participation in emergency preparedness and disaster drills that include Amateur operations for the purpose of emergency response, disaster relief or the testing and maintenance of equipment used for that purpose*," and no other purpose.

FCC Issues *NPRM* on Government Disaster Drills and Amateur Radio

♦On March 24, the FCC released an *NPRM* proposing to amend the Commission's Amateur Radio Service rules "with respect to Amateur Radio operations during government-sponsored emergency preparedness and disaster readiness drills and tests." While current rules provide for Amateur Radio use during emergencies, the rules prohibit communications where the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer. In October 2009, the FCC released a *Public Notice* clarifying the Commission's rules relating to the use of Amateur Radio by licensed amateurs participating in drills and exercises on behalf of their employers. To date, the FCC has granted several dozen waivers under this new policy.

The FCC is seeking comments on whether to amend the rules to permit Amateur Radio operators to participate in government-sponsored emergency and disaster preparedness drills and tests, regardless of whether the operators are employees of the entities participating in the drill or test. The proposed rule would preclude the need for a waiver in such instances by allowing employees of public safety agencies and other entities to operate amateur stations for testing and drilling of emergency communications preparedness.

The FCC also proposes that the emergency tests and drills must be sponsored by federal, state, or local governments or agencies "in order to limit the narrow exception to ensure that drills further public safety." The Commission does understand, however, that there may be circumstances where conducting emergency drills for disaster planning purposes, even if not government-sponsored, would serve the public interest. Accordingly, the FCC seeks comment on whether it should permit employee operation of amateur stations during non-government-sponsored emergency drills "if the purpose of the drill is to assess communications capabilities, including Amateur Radio, in order to improve emergency preparedness and response."

The complete *NPRM* — including instructions on how to file comments — is available on the FCC's Web site (**http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-45A1.pdf**).

FCC Looks to Lower Fees for Vanity Call Signs

♦The FCC released a *Notice of Proposed Rulemaking and Order* on April 13 seeking to lower the fee for Amateur Radio vanity call signs. Currently, a vanity call sign costs $13.40 and is good for 10 years; the new fee, if the FCC plan goes through, will go down to $13.30 for 10 years, a decrease of 10 cents. The FCC is authorized by the *Communications Act of 1934 (as amended)* to collect vanity call sign fees to recover the costs associated with that program. The vanity call sign regulatory fee is payable not only when applying for a new vanity call sign, but also upon renewing a vanity call sign for a new term. The vanity call sign fee has fluctuated over the 13 years of the current program — from a low of $11.70 in 2007 to a high of $70 (as first proposed in the FCC's 1994 *Report and Order*). In 2007, the Commission lowered the fee from $20.80 to $11.70. The FCC said it anticipates some 14,800 Amateur Radio vanity call sign "payment units" or applications during the next fiscal year, collecting $196,840 in fees from the program.

A Digital Simulated Emergency Test

Dave Kleber, KB3FXI, O'Hara Township, Pennsylvania Emergency Management Agency, **kb3fxi@yahoo.com** *and Harry Bloomberg, W3YJ, Assistant Section Emergency Coordinator, Western Pennsylvania ARES,* **w3yj@arrl.net**

Ice Storm

Conditions at UPMC (University of Pittsburgh Medical Center) St Margaret hospital in Pittsburgh were bad and they weren't getting any better. An ice storm had glazed western Pennsylvania in a sheet of shimmering ice an inch thick. Commercial power was down as were landline telephones and the fiber-based Internet connection. The cell phone and 3G digital networks were overloaded. Much of the hospital's radio system had failed because of a new and untested backup power supply and what still remained on the air was busy with traffic from emergencies. On top of this a Greyhound bus had gone over an embankment on the nearby Pennsylvania Turnpike. Fifty survivors would be arriving soon and the ER was running low on supplies.

A UPMC administrator took Steve Conomikes, KB3EYY, aside and handed him a USB drive. An *Excel* spreadsheet on the drive contained a list of 37 required medications such as hydrochlorothiazide, methocarbamol and diazepam flexeril. Associated with each pharmaceutical was a required quantity and the hospital department that needed the medication.

The administrator looked Steve in the eye. Could he not only transfer this very important data to the outside world, could he also guarantee that the spreadsheet would arrive uncorrupted with each and every pharmaceutical spelled correctly?

Steve responded that he practiced this very task nearly every Sunday night and that yes, he could do this.

Integrating Digital Technology into the SET

The ice storm and the resulting communications nightmare at UPMC St Margaret were simulated but everything else was real. The ARRL Western Pennsylvania Section had spent the past 18 months training in digital emergency communications using the Narrow Band Emergency Messaging System (NBEMS).[1] The 2009 Simulated Emergency Test would be our first attempt to put our training to use in a drill. We would be testing not only our ability to send and receive data but to interoperate with voice nets.

For our scenario, we picked an ice storm. We don't get hurricanes, earthquakes or other widespread calamities in Steeler country but an ice storm seemed like a real possibility. We organized ourselves into four nets. We held a local voice net on our ARES repeater on 147.09 MHz. We conducted a local mixed digital and voice net on the University of Pittsburgh repeater on 443.45 MHz. We also checked into two western Pennsylvania section-wide nets on 80 meters. One HF net was a directed voice net for passing traffic in NTS format. The other HF net was something new — a digital net using Olivia.

Net control for both digital nets was located at Skyview Radio Society, an Official Emergency Station, which would be a test of the club's capabilities. As we shall see, hosting net controls for the UHF and HF digital nets at the same location would simplify passing data between the two nets. Net control for the voice net on 147.09 was located at the Allegheny County EOC in Pittsburgh using a station that had been permanently installed there.

In addition to hams at the Allegheny County Emergency Operations Center (EOC) and UPMC St Margaret, we also stationed hams at the Aspinwall Volunteer Fire Department and the O'Hara Township Municipal Building. These hams were all equipped with laptops loaded with the *Fldigi* and *Wrap* components of NBEMS. A station whose task was to act as a liaison between the UHF combined digital and voice net and the HF voice net was activated at Steel City Amateur Radio Club, W3KWH, using Steel City's excellent contest station.

Stations at Steel City and Skyview used hard-wired interfaces like RIGblasters and SignaLinks between their radios and computers. But most of the stations in the field used acoustical coupling. That is, to transmit, they held their radio's microphone up to the computer's speakers and held the push-to-talk button while *Fldigi* generated the digital signals. To receive messages, they simply placed their radio's speaker in front of the computer's internal microphone. This method has the advantage of being very simple and therefore very reliable. It also makes it very easy to go between voice and digital modes.

Computers used in the drill ranged from pricey business-class dual core laptops to inexpensive netbooks costing $200-300. Operating systems were a mix of *Windows* and *Linux*, with *Linux* working particularly well on a $200 netbook.

The Action Starts

We called all our nets to order at exactly 9 AM. After check-ins were complete, Glenn Rockhill, KS3IFT, at the Aspinwall VFD checked into the UHF combined voice and digital net and informed us that they had a report of a roof collapse. He then transmitted a detailed bulletin using MT63-2000. As more details on this collapse came in, he kept us updated with additional digital bulletins.

There are major advantages of transmitting digital bulletins over a repeater. One advantage is that all traffic is recorded and logged so that no information is lost. With all the messages stored with date and time stamps in a single directory on a computer, it's easy to go back and recreate an incident without having to read handwritten notes that were sloppily put to paper in haste. Another advantage is that it's possible to set up an unattended receive-only station to receive bulletins.

As the situation with the roof collapse worsened, Glenn composed a message

[1]"Public Service," *QST*, Aug 2009, pp 73-74.

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to send to ARRL Section Manager John Rodgers, N3MSE. This was sent digitally over the UHF net where it was received at W3KWH, put into a radiogram format and passed over the HF voice net.

In the meantime, O'Hara Township was beginning to open shelters for those without power. Juan Manfredi, NAØB, at the O'Hara Township Municipal Building, transmitted a comma-separated (*CSV*) spreadsheet listing names, phone numbers and addresses of evacuees on the UHF combined voice and digital net. Why a comma-separated spreadsheet? One of our training points is to use plain text whenever possible to minimize transmit times. A spreadsheet containing data for 25 evacuees in *CSV* format takes approximately 2 minutes to transmit using MT63-2000. Sending the same data in *Excel's* binary format would take much longer, maybe as long as 10 minutes. Likewise, if we are asked to send a *Word* document, we train our operators to convert the document to text-only before transmitting.

Juan processed the *CSV* file with the *Wrap* utility before transmitting the *CSV* file. *Wrap* embeds a checksum in the file that is transmitted. The receiving station then computes a checksum on the data that is received and compares it to the embedded checksum. If the two checksums are identical we can be 100% certain that the file was received without error. For many plain-text messages, this is overkill, but for a spreadsheet, any corruption could prevent us from loading the data or worse, result in an error in potentially critical data.

As all this was happening, Glenn and Juan were keeping the Allegheny County EOC informed of updates on the VHF voice net.

Hams Save the Day at St Margaret

Meanwhile, Steve at UPMC St Margaret transmitted his *CSV* spreadsheet of required pharmaceuticals over the UHF digital net to net control at Skyview. Net control could be certain that none of the long drug names were misspelled because Steve had processed the spreadsheet with *Wrap* and the resulting checksum computation indicated no file corruption. The UHF net control copied the *CSV* file onto a USB drive and handed the drive to the HF net control who was sitting nearby at the Skyview clubhouse. The *CSV* file was then transmitted on 80 meters using Olivia to Lynn, KB3FN, in western Maryland who regularly joins us on our HF digital training nets. The Internet was up at Lynn's location, so he took the *CSV* file and e-mailed it to Western Pennsylvania Section Manager John Rodgers, N3MSE.

Steve then transmitted a *CSV* spreadsheet containing names, phone numbers and addresses of the survivors of the bus accident on the Pennsylvania Turnpike. This was also verified using *Wrap*.

Lessons Learned

What did we learn from our drill? We learned that digital methods can be used successfully under duress to send data that would be nearly impossible to transmit using voice modes. Imagine how long it would take to phonetically spell "hydrochlorothiazide" by voice. Multiply this by 37 and you can see that sending UPMC St Margaret's required list of drugs could be done realistically only with digital methods. Traditionally our capabilities have been limited to sending short tactical messages by voice. With the addition of digital methods we now have the ability to send more detailed logistical messages.

We learned how to interoperate between voice and digital nets. We also demonstrated that it is possible to send evacuee rosters and bulletins digitally through a voice repeater using handheld transceivers and inexpensive netbooks without a hardwired interface between the computer and radio. The utility of HF was reinforced when we were able to send complex data out of the affected region.

The workload at the digital net control stations was greater than expected, so we will have additional staffing next year.

National Traffic System and the tried-and-true ARRL Radiogram format are well suited for sending 25 word text messages. But it is not possible to send more complex forms of information such as spreadsheets. We believe work needs to be done on how to enhance our traditional message formats and techniques for the digital era.

Regular training in digital methods is essential so that you're not fumbling about during an incident. We hold multiple training nets per week including two weekly Olivia nets on 80 meters and an MT63 oriented net on a UHF repeater.

But the biggest lesson we learned was that it's important to have lots of tools available. We used HF SSB, digital HF, VHF, UHF, MT63, *Fldigi*, *Wrap*, spreadsheets, netbooks, *Linux*, *Microsoft Windows* and ARRL Radiogram forms. There is still and will always be a major role for traditional voice communications methods, particularly with short tactical messages. But the more tools you have available, the greater the odds you'll have the right tool for the job.

NEIGHBORHOOD HAMWATCH

Norm Lauterette, WA4HYJ
ARRL Public Information Officer
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When nature delivers a major disaster with extended power failures and destruction, neighborhood areas can become isolated and inaccessible to first responders and local authorities. Communication becomes paramount for authorities as well as residents. Public communication failure after a severe storm resulting from fallen trees, downed wires and floods can cripple emergency access, block information flow and restrict resident escape from heavily damaged neighborhoods. The health, welfare and life saving needs of those living within the affected neighborhood are in jeopardy.

Dealing with the unknown can hinder fire-rescue and law enforcement response. It also weighs heavily on the emotions of residents and their loved ones outside the area. It doesn't take much thought to realize the value and need for a flow of organized communication to and from an affected area and local government Emergency Management.

Neighborhood Watch for Hams

Amateur Radio clubs, nationwide, can help provide that safety link by adopting a new program created and under development since 2009 by Andy Gausz, KG4QCD, and implemented by the Lake Monroe Amateur Radio Society (LMARS) in Seminole County, Florida. Neighborhood HamWatch (NHW) continues as a supplement to the ARRL Northern Florida Section Emergency Communication Plan as a means for all hams, especially those who are unable to deploy or actively participate in conventional Amateur Radio Emergency Service (ARES®) activities, to contribute.

Although the NHW program is designed to operate independently from the ARES, it is designed to work in full cooperation and understanding with them as a communication link, feeding information to EOCs. In all cases, NHW will enable ARES Net Control stations to connect emergency managers with the neighborhoods in their communities. ARES directly supports the County EOC with emergency communications from county approved school shelters and selected outposts. Grassroots reports from the core of storm-affected neighborhoods are the missing link. What are the health and welfare situations within numerous ravaged neighborhoods? What are property conditions and personal needs? Is immediate emergency response needed at an identified location? In most scenarios, a network of coordinated NHW radio amateur volunteers can provide that information.

Neighborhood HamWatch operates using simplex net protocol and have net control and relay stations supporting the NHW amateurs monitoring their affected neighborhood. By not using repeaters, NHW will avoid conflict with official emergency traffic and demonstrate the value of not being dependent upon outside resources. Fixed or

mobile, NHW net control stations can feed field-reported neighborhood information to the ARES nets using simplex or, if necessary, the ARES repeater frequency.

NHW amateurs will seek input from neighborhood volunteers and residential Neighborhood Watch Programs. Some neighborhoods may have more than one participating resident ham. Consider that an additional benefit with the opportunity to go handheld portable supporting volunteers or covering various sections of the neighborhood better. The neighborhood amateur's shack will be the drop off point for information gatherers.

Neighborhood hams can transmit vital emergency information that is relayed to government officials and receive EOC support information and directions in return. Standard operating procedures will be established with the leaders of active Neighborhood Watch groups. These group leaders, plus walk-up volunteers will be the resident amateur's link to neighborhood conditions and needs.

People Helping People

LMARS has a membership of over 100 active amateurs; most own handhelds, mobile rigs and battery backup powered home stations. They live in neighborhoods scattered throughout Seminole County. There is also a reservoir of additional hams throughout the county not affiliated with LMARS or ARES. With planning and a little legwork, these hams can be recruited for neighborhood support and perhaps expand their interest in Amateur Radio. Think of the benefits that an organized countywide team of radio amateurs could bring at the neighborhood level with eyes, ears and emergency powered communication ability. This is how we believe our ARRL founder, Hiram Percy Maxim envisioned the role of Amateur Radio in emergency situations at the community level; people helping people.

Since LMARS began this program, it has grown strong roots. The home location of LMARS members have been GPS recorded and each location is numerically pinned on our large county map. This will help us with assignments and allow emergency managers to visually realize the extent of county and neighborhood ham saturation. The NHW program is beginning to receive ARRL recognition as it spreads in the Northern Florida Section thanks to the support of our ARRL Northern Florida Section Manager, Paul Eakin, KJ4G. ARRL Public Information Officer Norm Lauterette, WA4HYJ, gave a brief summary of Neighborhood HamWatch at the Orlando Hamcation's Northern Florida Section Forum February 2009.

LMARS goal is supporting the residents of Seminole County by being a good neighbor in times of need and for NHW to become nationally recognized and implemented. This program is flexible to meet community needs.

The Three Elements of HamWatch

The NHW program design consists of three levels of participation. The first level is nothing more than ham's communicating with each other during the recovery period for the purpose of sharing information and relieving communication isolation associated with an extended power outage. Just hearing another ham's voice from a different neighborhood can help ease the suspicions that grow from not knowing what is going on outside your immediate area.

The second level of participation is establishing a NHW net and communicating with local EOCs through their ARES station and operator. This is the information relay tool that connects emergency managers with the neighborhoods in their community.

The third level will allow hams with Winlink capability to directly send welfare traffic at the request of their neighbors to extended family outside the stricken area to relieve concerns and reduce clogging of commercial cell phone and telephone systems. Winlink allows hams to send e-mail directly to message recipients without stressing the National Traffic System with routine or welfare traffic requests.

For more information about Neighborhood HamWatch, contact Andy Gausz, KG4QCD, at **kg4qcd@arrl.net**.

NORM LAUTERETTE, WA4HYJ

LMARS President Andy Gausz, KG4QCD, addresses senior citizens about Neighborhood HamWatch at Lake Kathryn Estates senior community center.

VHF/UHF Century Club Awards

Compiled by Sharon Taratula
Administrative Manager

The ARRL VUCC numbered certificate is earned by amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid locators (indicated in italics) for each band listing. The numbers preceding call signs indicate total grid locators claimed. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from February 1, 2010 to March 31, 2010.

The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the VUCC Web site at **www.arrl.org/vucc**. An SASE to ARRL is required if you cannot download these forms. Send questions relating to VUCC to **vucc@arrl.org**.

50 MHz
100

1703	NI5F
1704	W3FEY
1705	W4TKI
1706	KB5ZEA
1707	KI7BP
KB5ZEA	125
KD7WPJ	125
KI7BP	125
W4TKI	125
W3FEY	150
K6UM (CN85)	175
WA4NVM	250
K4MIJ	275
K9AAA	300

222 MHz
50

143	N4JQQ

1296 MHz
25

WW2R	120

2.3 GHz
10

WW2R	55

5.7 GHz
5

60	WBØJQQ
WBØJQQ	10

Satellite
100

N5ZNL	525

This Month in Contesting

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

THE FIVE TENETS

I get a lot of e-mail. A lot of it asks the basic question: "How do I put more QSOs in my contest log?" There are many things that you could throw money at: bigger antennas, better radios, and all of that stuff. Yes, buying those things would make a difference, but the more important things can be done with little or no money — simple, practical stuff that anyone can apply, no matter if their station is big or little. If you're comfortable in the role of "Casual Contester," these may not be for you. If you're seriously interested in improving your efforts in contests, these five basic principles will absolutely work.

1) Stay in the chair. You work a few stations, then get up and go take care of some errands or chores, come back a few hours later, work a few more stations, watch a movie, work a couple more. At the end of the contest, you wonder why you didn't do better.

You can't work stations if you're not in front of your rig. It really is that simple. Yes, we all have other obligations in life: family, church, work, or whatever the case may be. Sometimes those things simply take priority, but priorities can be managed. Negotiate with your family, take care of the chores during the week, and wait until the weekend is over to watch that movie. More time on your bottom will add to your bottom line.

2) Call CQ. Yes, you can work plenty of stations by spinning the dial and answering CQs. But you can work a lot more if you are the person that calls CQ. The vast majority of people that make QSOs in contests are casual operators that don't call CQ. They spin the dial and listen for others calling CQ. By calling CQ, you are making yourself available to the majority of contest participants. Why let such a large, untapped reservoir of points go unclaimed? Call CQ and watch your totals go up.

3) Keep your exchanges short. I call CQ in contests a lot. Lots of people answer my CQ. It works well, but sometimes things could go a little more efficiently. Oftentimes, the exchange would go something like this:

Me: CQ CONTEST, KX9X
Them: WB1XXX
Me: WB1XXX 59 CONNECTICUT
Them: THIS IS WB1XXX, THANKS FOR THE 59 CONNECTICUT, PLEASE COPY 59 IDAHO, 59 IDAHO, QSL?
Me: THANKS, KX9X, CONTEST

Remember that the point of a contest is brevity; it's a race against time, so it really does pay off in the long run to maximize your efficiency. When answering CQs, give your call phonetically one time. Use standard phonetics. If you're acknowledged and get a report (like 59 CONNECTICUT), there's no need to give your call sign again unless the station you're working miscopied it. If you copied the station's information correctly, there's no need to repeat it back to them; they know what information they sent you. A simple THANKS or QSL will let them know you copied their exchange info okay. When sending your own contest exchange info, there's no need to preface it with "please copy…" Just send your exchange information one time. If the other station didn't get it or they need a fill, they will ask for one.

An ideal contest exchange would go like this:

Me: CQ CONTEST, KX9X
Them: WB1XXX
Me: WB1XXX 59 CONNECTICUT
Them: THANKS, 59 VERMONT
Me: THANKS, KX9X, CONTEST

Simple, neat, tidy and efficient. If this seems silly or trivial, look at it this way: If you can drop a contest exchange from 15 seconds to 5, you're saving 67% of your time per QSO. Over a 48 hour contest period, that adds up to some serious minutes that can be spent working other stations and adding to your total score. Even if you're a casual operator and you feel it doesn't pertain to you, remember that the majority of stations whose CQ you answer are likely being competitive. They will appreciate your efficiency.

4) Learn basic propagation. Spend some time learning about the different characteristics of the ionosphere, the 11-year solar cycle, and what time different bands are open to different parts of the country or world. This will allow you to spend more time working stations on an open band, rather than calling CQ on a band that is marginal. All this will make you more efficient with your time and put more QSOs in your log.

There are a couple of Web sites that are good for every contester to have in their shack. The first is the Near Real-Time MUF page, found at **www.spacew.com/www/realtime.php**. This will show you the Maximum Usable Frequency between two points on the globe. There's a bit of a learning curve, but well worth the time to help determine what band is going to produce for you the best.

Another good thing to know is the sunrise and sunset times of various places around the world. You can track the position of the sun at **dx.qsl.net/propagation/greyline.html**, which will show what parts of the world are in sunlight versus darkness.

5) Constantly challenge yourself. The best competitors in all sports train and study to make themselves better in their sport. Even if you're not interested in becoming the best contester on Earth, studying your past performances and trying to better yourself the next year will motivate you to improve. Learn how to read your Log-Checking Report (see the October 2008 *QST* Radiosport supplement), look at past logs to see if you could have make better operating decisions, and ask a lot of questions of your local or regional contest club.

No matter what your level of interest, utilizing these five basic principles will result in more QSOs in your contest log. That could result in some good consequences, such as more fun, more interest in radio, and possibly an awards certificate or plaque. As I've always said, keep it fun…that's what it's all about.

Operating Tip of the Month

*"**Join The Club!** A club that is focused on contesting will give you access to lots of people who share your interest in contesting. You can find experts to help answer your questions, give you tips and advice, and build lasting friendships. Look into your local or regional contest club today."*

In the May/June "Contesting 101"

Mistakes....we all make 'em. Kirk, K4RO, shows you how to learn from past mistakes and how to use one of the great tools for reviewing mistakes: your Log-Checking Report. "Contesting 101" can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

CONTEST CORRAL

in association with the *National Contest Journal*

JUNE 2010

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site
Jun 4, 0200Z - Jun 4, 0300Z	1.8-14		Weekly NCCC SNS & NS Sprint		✘		Serial number, name, S/P/C	www.ncccsprint.com/rules.html
Jun 5, 0000Z - Jun 6, 2400Z	28		Ten-Ten Open Season			✘	Call, name, S/P/C, member numbers	www.ten-ten.org
Jun 5, 0400Z - Jun 6, 2000Z	3.5-28		DigiFest			✘	RST, grid square	www.mixw.net
Jun 5, 1200Z - Jun 6, 1200Z		50	UKSMG Summer Contest				RST, member number, grid square	www.uksmg.org
Jun 5, 1200Z - Jun 6, 1200Z	3.5-28		SEANET Contest	✘	✘	✘	RS(T), serial	www.sabah.net.my/seanet/the_contest.htm
Jun 5, 1500Z - Jun 6, 1459Z	1.8-28		IARU Region I Field Day		✘		RST, serial	IARU Society Web sites
Jun 5, 1600Z - Jun 6, 0400Z	1.8-28		Alabama QSO Party	✘	✘		RS(T) and county, state, province, or 'DX'	www.alabamaqsoparty.org
Jun 6, 1100Z - Jun 6, 1700Z	28		DARC 10 Meter Digital Contest			✘	RST, serial number	www.darc.de/referate/ukw-funksport/
Jun 9, 1100Z - Jun 10, 0400Z	3.5-14		CWops Mini-CWT Test		✘		Name and member number or S/P/C	www.cwops.org/onair.html
Jun 12, 0000Z - Jun 12, 2359Z	1.8-28	50,144	Bill Windle QSO Party		✘		RST, name, FOC number	www.g4foc.org
Jun 12, 0000Z - Jun 13, 2359Z	1.8-28		WFF Green Days	✘	✘	✘	RS(T) and WFF number if available	wff44.com/en/contest/
Jun 12, 0000Z - Jun 12, 2400Z	3.5-28		Portugual Day	✘	✘		RS(T) and serial or district code	portugaldaycontest.rep.pt
Jun 12, 0600Z - Jun 13, 0600Z	3.5-28		Australian Shires Contest	✘	✘		RS(T) and VK Shire or CQ Zone	groups.yahoo.com/group/vkshires
Jun 12, 1100Z - Jun 12, 1300Z	14-21		Asia-Pacific Sprint	✘			RST, serial	jsfc.org/apsprint/aprule.txt
Jun 12, 1500Z - Jun 13, 1500Z	3.5-28		GACW WWSA CW DX Contest		✘		RST, CQ zone	gacw.no-ip.org
Jun 12, 1600Z - Jun 13, 1600Z		50	REF DDSM Six Meter Contest	✘	✘		RST, serial number, grid square	concours.ref-union.org
Jun 12, 1800Z - Jun 14, 0300Z		**50+**	**ARRL June VHF QSO Party**	✘	✘	✘	**Grid square**	www.arrl.org/contests
Jun 12, 2000Z - Jun 12, 2359Z	14-28		BARTG Sprint 7**5**			✘	Serial number	www.bartg.org.uk
Jun 13, 0900Z - Jun 13, 1500Z		50	WAB 50 MHz Phone	✘			RS, serial, WAB square or DXCC entity	www.worked-all-britain.co.uk
Jun 16, 0900Z - Jun 16, 1000Z	7		SARL Youth Day Sprint	✘			RS and age	www.sarl.org.za
Jun 19, 0000Z - Jun 20, 2400Z	1.8-28		All-Asian DX Contest		✘		RST, operator age (YL may send 00)	www.jarl.or.jp/English
Jun 19, 0000Z - Jun 20, 2359Z		50	SMIRK QSO Party	✘	✘		Call sign, SMIRK number, grid square	www.smirk.org
Jun 19, 1600Z - Jun 20, 0200Z	3.5-28		West Virginia QSO Party	✘	✘	✘	RS(T), WV county or S/P/C	www.qsl.net/wvsarc
Jun 19, 1800Z - Jun 19, 2400Z	**3.5-28**		**Kid's Day**	✘			**Name, age, location, favorite color**	www.arrl.org/kids-day
Jun 20, 0600Z - Jun 20, 1200Z	3.5-28		Spanish Islands Contest	✘	✘	✘	RS(T), DIE number or serial	www.ea5ol.net/die
Jun 26, 1200Z - Jun 27, 1200Z	1.8-28		His Majesty King of Spain	✘			RS, serial or EA province	www.ure.es
Jun 26, 1400Z - Jun 27, 1400Z	1.8-28		Marconi Memorial HF Contest		✘		RST and serial number	www.arifano.it/Contest_Marconi.htm
Jun 26, 1800Z - Jun 27, 2100Z	**1.8-28**	**50+**	**ARRL Field Day**	✘	✘	✘	**Category, ARRL/RAC section or DX**	www.arrl.org/contests
Jun 26, 1800Z - Jun 27, 2100Z	1.8-28	50+	QRP ARCI Milliwatt Field Day	✘	✘	✘	Category, ARRL/RAC section or DX	www.qrparci.org
Jun 27, 1300Z - Jun 27, 1600Z	7	144	SARL Digital Contest			✘	RST and serial number	www.sarl.org.za
Jun 28, 0000Z - Jul 4, 2400Z	28		Ten-Ten Spirit of 76 QSO Party	✘	✘	✘	Call, name, member number, S/P/C	www.ten-ten.org

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

- **State QSO Parties This Month:** Alabama, West Virginia.
- **Digifest (June 5-6):** A digital contest specifically for non-conventional digital modes like OLIVIA, Hellschreiber and BPSK63. Exchange is a signal report and your 4-digit grid square.
- **ARRL June VHF QSO Party (June 12-14):** The biggest VHF+ event of the summer sporadic-E season. 6 and 2 Meters will be hopping with activity. Join in on the fun that the VHFers have known about for decades!
- **SMIRK QSO Party (June 19-20):** 6 meters takes center stage in this contest in the middle of sporadic-E season! Technician class licensees, you have full operating privileges on 6 meters, so get active on a great band.
- **ARRL Field Day (June 26-27):** Technically, it's not a contest, but it sure is fun! Operate from home, a meadow or a mountaintop, get involved with your club's effort or go solo. However you choose to participate, Field Day remains at the top of all ARRL on-the-air events. Look for more Field Day-related items elsewhere in this issue.

2009 ARRL November Phone Sweepstakes Results

Record participation = record fun!

Steve London, N2IC
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Just when you thought that interest in Sweepstakes couldn't possibly beat the record set just last year, 2009's 76th edition proved everyone wrong. The number of submitted entries increased by 9.5% over 2008 to a total of 2048 logs. Add to that the number of stations who were active, but did not submit a log and you get 5266 participants! All of this activity filled the New Records table with 32 new section and 14 new division records, turned up many Clean Sweeps and resulted in some very highly contested races. Every year, the bar gets set higher.

Solar Cycle 24 finally injected some welcome life into the higher bands with QSO totals on 15 meters rivaling those of 20 meters. There was even some surprising propagation to Alaska on 10 meters and short-skip conditions on 15 meters. Figure 1 shows how many QSOs were made on each band during every hour of the contest. For many participants, 40 meters was a pleasure, thanks to the absence of shortwave broadcast stations below 7200 kHz. On 75 meters, having 400 kHz of breathing room allowed for nighttime usage by contesters and non-contesters alike.

The Elusive Clean Sweep

Not everyone can set a new personal, section or division record. But Sweepstakes does provide a challenging and meaningful goal for all — the "clean sweep" (working at least one station in each of the 80 ARRL sections). Despite the challenges, 282 earned a clean sweep this year, an increase of 24 over 2008, and 134 participants came so close, missing only one section. Who was the first to earn a clean sweep this year? That honor goes to N6XI, only 6 hours and 13 minutes into the contest. Rick's last section? Los Angeles!

Not surprisingly, 32 missed Newfoundland-Labrador, despite activity from VO1KVT, VO1HP, VO1HE and VO1TA. Yukon and the Northwest Territories are always difficult and this year was no exception, even with significant efforts from VY1EI, VE8EV, VY1RST, VY1JON and VE8GER. Puerto Rico tripped up a few folks, although it was well-represented by KM3T/KP4, WP3R, NP4Z and KP4BD. Many thanks to those ops for making their rare sections available. In the next tier of uncommon sections, the Virgin Islands, Mississippi and North Dakota were in demand. In a reversal from last year, the Los Angeles section and South Carolina were easily worked.

COURTESY LU ROMERO, W4LT

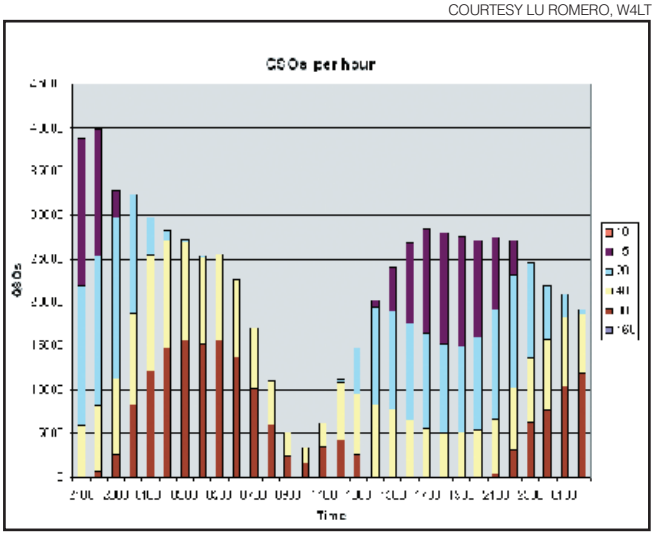

Figure 1 — This chart shows how many QSOs were made on each band during every hour (UTC) of the contest. It's easy to see the effects of propagation on activity.

Close Races

This year, the most exciting close race was for number one in the Multiop category in the Maryland-DC section. There was a four-way horse race between W3IDT, N3OC, WR3Z and K3MIM. W3IDT finished only four QSOs ahead of N3OC, 25 QSOs ahead of WR3Z and 50 QSOs ahead of K3MIM. In Virginia's Unlimited category race, John, W4NF, finished with a seven QSO lead over Bob, W4MYA.

Minnesota is always a hotbed of competition. In the QRP category NØUR finished with a 10 QSO lead over NDØC and in the Multiop category the KTØR team bested the KØFVF team by 25 QSOs.

High Power Category

In the High Power category, 2009 was a rematch between three of the top four finishers from 2008. Taking full advantage of his Hawaii location and years of top-flight SS experience, Bill, KH7XS, conclusively took the #1 spot with a margin of 149 contacts and a new division record. Congratulations Bill!

The next two spots were a battle between Dan, W7WA, and Bruce, AA5B, operating from N2IC. It was neck-and-neck for the first 6 hours, with the lead changing three times. (The online version of this article includes a chart comparing the two stations.) The late night hours were great for Bruce, racking up hour-after-hour of 100+ QSOs on 40 meters. At the same time Dan struggled on 40 and 80 meters for any kind of rate. When Bruce took his first time off at 0911Z,

Single Operator, QRP

K5NZ	102,226
KC5R	100,160
NX9T	92,640
NØUR	76,692
NDØC	75,050
NN7SS (K6UFO, op)	73,440
NØKE	68,960
VA3DF	59,130
KIØOV	53,700
K4XU	51,350

Single Operator, Low Power

N4PN	222,400
K1BX	199,360
NØKK (@NØAT)	191,840
NA4K	186,880
KØRH	183,280
K7ZSD	177,592
VE5ZX	177,120
N8AA	174,880
K1HTV	159,840
W7ZRC	155,840

Single Operator, High Power

KH7XS	379,840
W7WA	356,000
N2IC (AA5B, op)	354,080
KDØS (WDØT, op)	338,752
NR5M	334,170
K5TR	323,900
WB9Z	322,080
NØQO	315,520
N8II	312,320
NN3W (@N4RV)	303,040

Single Operator, Unlimited

K7RL	333,760
K3MM	312,160
W7RN (WX5S, op)	281,760
WB1GQR (W1SJ, op)	273,280
N4ZZ	272,640
N6DE (@K6IDX)	265,440
K1KD	257,540
W4NF	255,486
N2BJ	255,200
W4MYA	253,920

Multi-operator

W6YI	404,960
WP3R (KE3Q, op)	352,024
K5NA	312,320
N5DO	293,280
WØNO	284,480
NØNI	279,520
K2NNY	277,920
WA7U	277,920
KA1ARB	273,920
W5RU	262,880

School Club

KØHC	250,240
NØUNL (WDØBGZ, op)	184,954
W8EDU (KB3HTS, op)	110,560
W6RFU	80,850
K2CC	71,680
W4UAL	66,560
W5YM	51,982
KØVVY	48,180
W1YK	47,424
KD5VVI (N5AIU, op)	47,158

Lu, W4LT, winning West Central Florida with help from a junior-op.

he had built up a 153 QSO lead over Dan.

Dan had a few tricks up his sleeve, though. Just like he did last year, Dan took nearly all of his required time off in one chunk. When Dan came back on at 1432Z, Bruce had built up a monstrous 275 QSO lead on Dan. Then things got interesting. Bruce still had 3 hours of off time to use and the daylight hours were not kind to him. Bruce split his operating between 15 and 20 meters, while Dan operated almost exclusively on 20 meters. Dan's hourly rates were consistently better than Bruce's. This combination allowed Dan to steadily eat away at Bruce's lead. By 0141Z, the contest was over for Bruce — he had used his full 24 hours and his lead had shrunk to 55 QSOs. Like the Energizer bunny, Dan just kept pushing on until 0259Z, taking the #2 spot by a 12 QSO margin.

The next two spots in the Top Ten were also a close race, with Todd, WDØT, operating at KDØS edging out George, NR5M, by 29 QSOs. Todd also set a new division record. These close races seem to go in pairs with George, K5TR, taking the #6 spot over Jerry, WB9Z, by only 11 QSOs. A great job was turned in from the Midwest by Jerry and a new division record to boot. The #8 spot went to newcomer Ken, NØQO, from Colorado. The rest of the Top Ten was filled out by great scores from the East Coast – Jeff, N8II, from West Virginia and Rich, NN3W, from Virginia. Jeff's score also set a new division record.

Low Power Category

The Low Power category continues to be the most popular category for SS participants with 995 submitted logs, almost as many as all other categories combined. Those making the Low Power Top Ten came from all parts of continental North America.

Veteran contester Paul Newberry, N4PN, easily won the Low Power category with 1390 QSOs from Georgia. Paul moved up from a 4th place finish in 2008. Congratulations Paul! Art, K1BX, moved up from 3rd to 2nd place in 2009 from his New Hampshire location. Kirk, NØKK, proved that being in Minnesota was no disadvantage this year, taking the #3 spot. Steve, NA4K, took 4th place, also advancing relative to his 2008 placing. In the "most improved" category was Jim, KØRH, from Kansas, taking the #5 slot this year. Brad, K7ZSD, had a tough time this year from Oregon, but still took 6th place. Syl, VE5ZX, made everyone happy with the Saskatchewan multiplier, placing #7. John, N8AA, moved up one position to #8 this year. Rich, K1HTV, placed #9 and Rod, W7ZRC, finished out the Top Ten.

QRP Category

Even with good antennas, operating the Phone Sweepstakes with QRP is a test of skill and determination. This year, 82 entries were received in this challenging category and we have a new winner! Mike, K5NZ, put his skill and station to the test, making 647 QSOs and missing only Delaware (!) for the clean sweep.

The next two places are familiar calls to the Q category. After three consecutive wins, Al, KC5R, was dethroned, but put in a fine 2nd place showing only 21 QSOs behind K5NZ and with a clean sweep. In 3rd place, Jeff Keller, NX9T, did a great job with 579 QSOs, a clean sweep and a new division record. The #4 and #5 slots were a tight finish between two Minnesota entries — Jim, NØUR, and Randy, NDØC.

Mark, K6UFO, operating from NN7SS took the #6 slot and Phil, NØKE, placed 7th. Both of these fine ops earned Clean Sweeps. Doug, VA3DF, overcame a difficult start and placed 8th overall. The 9th and 10th places were awarded to Dan, KIØOV, and Dick, K4XU.

Affiliated Club Competition

Unlimited Category	*Score*	*Entries*
Potomac Valley Radio Club	24,356,974	302
Northern California Contest Club	22,712,498	332
Society of Midwest Contesters	10,906,648	189
Minnesota Wireless Assn	8,196,786	130
Yankee Clipper Contest Club	8,017,768	107
Mad River Radio Club	5,042,494	63
Alabama Contest Group	4,229,956	51
Tennessee Contest Group	4,121,478	62
Florida Contest Group	3,407,356	52

Medium Category	*Score*	*Entries*
Southern California Contest Club	3,949,274	50
Frankford Radio Club	3,819,782	49
Central Texas DX and Contest Club	3,475,648	25
South East Contest Club	3,296,454	44
Arizona Outlaws Contest Club	3,110,762	50
Grand Mesa Contesters of Colorado	2,570,978	24
Contest Club Ontario	2,414,168	46
Western Washington DX Club	2,106,510	25
North Texas Contest Club	1,783,016	17
Willamette Valley DX Club	1,215,680	24
Louisiana Contest Club	1,212,400	10
Rochester (NY) DX Assn	1,164,872	23
Hudson Valley Contesters and DXers	1,066,360	19
Saskatchewan Contest Club	854,038	9
CTRI Contest Group	840,178	14
Utah DX Assn	831,662	9
BC DX Club	763,436	10
Maritime Contest Club	760,188	14
Northern Rockies DX Association	701,660	6
Kentucky Contest Group	673,238	15
Order of Boiled Owls of New York	590,334	12
Contest Group Du Quebec	575,704	12
Allegheny Valley Radio Association	552,812	12
North Coast Contesters	482,554	5
Motor City Radio Club	402,818	17
Carolina DX Assn	352,218	10
Missouri DX and Contest Club	312,370	5
East Coast Canada Contest Club	225,074	5
Oklahoma DX Assn	176,806	6
Mississippi Valley DX/Contest Club	106,592	5
Eastern Iowa DX Assn	100,944	4

Local Category	*Score*	*Entries*
Spokane DX Association	462,188	7
Alberta Clippers	446,456	3
Kansas City DX Club	417,386	5
New Mexico Big River Contesters	308,596	3
Sussex County ARC	304,664	9
Western New York DX Assn	303,718	7
Delaware ARA (Ohio)	292,622	5
Redmond Top Key Contest Club	282,424	4
Lincoln ARC	271,362	6
Portage County Amateur Radio	227,438	7
Falmouth ARA	222,966	3
West Park Radiops	220,782	8
Bergen ARA	191,568	7
Low Country Contest Club	190,520	4
Skyview Radio Society	180,068	4
Radio Club of Tacoma	175,350	3
Central Arizona DX Assn	172,848	3
West Allis RAC	161,646	4
Sterling Park ARC	123,510	8
Panhandle ARC	111,976	5
Pocatello ARC	108,008	4
Northern Arizona DX Assn	107,414	5
Wireless Association of South Hills	104,344	3
Meriden ARC	100,202	3
Texas DX Society	95,188	4
Central Michigan ARC	90,508	7
OH-KY-IN ARS	86,908	3
South Texas DX and Contest Club	76,674	3
Western Lake County Amateur	75,920	6
Fort Wayne Radio Club	73,896	3
Hazel Park ARC	72,952	5
Saginaw Valley ARA	61,796	4
Fox River Radio League	50,644	3
Albemarle ARC	45,092	7
Southern Berkshire ARC	35,658	3
Arrow Communications Assn	22,410	3

Unlimited Category

The Unlimited category continues to be extremely popular, with 398 entries this year. Congratulations to Mitch, K7RL, who again ran away from the pack, with 2086 QSOs. This is beginning to look like a dynasty for Mitch with his fourth consecutive win! Like many stations in the Pacific Northwest, Mitch was hampered by static from heavy rains and high winds.

Operating from the "right" coast of North America, Tyler, K3MM, had a personal best score, taking 2nd place and setting a new division record. Tyler credits the excellent conditions on 20 meters for his success. Back to the "left" coast, Matt, WX5S, operating W7RN in Nevada, moved into 3nd place this year.

Making sure that Vermont was easy, Mitch Stern, WB1GQR, took the #4 slot, only four QSOs ahead of Don, N4ZZ. Don's 1704 QSOs set a new division record. Dean, N6DE, piloted the K6IDX station to 6th place. From Minnesota, Grant, K1KD, took 7th place, setting a new division record. Jack, W4NF, placed 8th. Operating from Illinois, Barry, N2BJ, set a new division record while taking 9th place. The Top Ten was rounded out by perennial stalwart Bob, W4MYA.

Multioperator Category

The Multioperator category continues to be extremely popular, with 195 entries

Sponsored Plaque Winners

We are pleased to announce that the Overall and Division Leaders in each category receive a sponsored Sweepstakes plaque. ARRL is grateful to ICOM America and numerous clubs and individuals for sponsoring Sweepstakes awards.

ICOM PRINCIPAL AWARDS SPONSOR

Division/Plaque Category	Winner	Plaque Sponsor
Overall		
Single Operator High Power Phone	KH7XS	ICOM America
Single Operator Low Power Phone	N4PN	ARRL Contest Branch - Ken Adams, K5KA Memorial
Single Operator QRP Phone	K5NZ	QRP Amateur Radio Club International
Single Operator Unlimited Phone	K7RL	ICOM America
Multioperator Phone	W6YI	ICOM America
School Club Phone	KØHC	ICOM America
Atlantic		
Single Operator High Power Phone	N3RR	North Coast Contesters
Single Operator Low Power Phone	W3GH	Potomac Valley Radio Club
Single Operator QRP Phone	KF2U	ICOM America
Single Operator Unlimited Phone	K3MM	ICOM America
Multioperator Phone	K2NNY	Mark Sickmeyer, KB3GJ Memorial
School Club Phone	K2CC	ICOM America
Central		
Single Operator High Power Phone	WB9Z	Society Of Midwest Contesters
Single Operator Low Power Phone	KBØOWD	Society Of Midwest Contesters
Single Operator QRP Phone	N9NE	Sean Kutzko, KX9X
Single Operator Unlimited Phone	N2BJ	ICOM America
Multioperator Phone	N9SJ	ICOM America
School Club Phone	N9UC (WO9S, op)	ICOM America
Dakota		
Single Operator High Power Phone	KDØS (WDØT, op)	Minnesota Wireless Association
Single Operator Low Power Phone	NØKK (@NØAT)	Minnesota Wireless Association
Single Operator QRP Phone	NØUR	Tod Olson, KØTO
Single Operator Unlimited Phone	K1KD	Minnesota Wireless Association
Multioperator Phone	KTØR	In Memory of Jim Dokmo, KØFVF — Minnesota Wireless Assn
School Club Phone	KØVVY	Minnesota Wireless Association
Delta		
Single Operator High Power Phone	N8OO	ICOM America
Single Operator Low Power Phone	NA4K	ICOM America
Single Operator QRP Phone	KC5R	ICOM America
Single Operator Unlimited Phone	N4ZZ	ICOM America
Multioperator Phone	W5RU	ICOM America
School Club Phone	W5YM	ICOM America
Great Lakes		
Single Operator High Power Phone	K8AO	North Coast Contesters
Single Operator Low Power Phone	N8AA	Mad River Radio Club
Single Operator QRP Phone	K8IR	Mad River Radio Club
Single Operator Unlimited Phone	W8MJ	ICOM America
Multioperator Phone	N8HR	ICOM America
School Club Phone	W8EDU (KB3HTS, op)	ICOM America
Hudson		
Single Operator High Power Phone	N2NC	ICOM America
Single Operator Low Power Phone	KS2G	ICOM America
Single Operator QRP Phone	AA2VK	ICOM America
Single Operator Unlimited Phone	W2GDJ	ICOM America
Multioperator Phone	NO2X	ICOM America
School Club Phone	No Entrant	
Midwest		
Single Operator High Power Phone	WW2Y	ICOM America
Single Operator Low Power Phone	KØRH	Society Of Midwest Contesters
Single Operator QRP Phone	KIØOV	ICOM America
Single Operator Unlimited Phone	KØOU	ICOM America
Multioperator Phone	WØNO	ICOM America
School Club Phone	KØHC	ICOM America
New England		
Single Operator High Power Phone	W1XX	ICOM America
Single Operator Low Power Phone	K1BX	CTRI Contest Group
Single Operator QRP Phone	KA1LMR	QRP Club of New England
Single Operator Unlimited Phone	WB1GQR (W1SJ, op)	ICOM America
Multioperator Phone	W2PV	ICOM America
School Club Phone	W1YK	ICOM America
Northwestern		
Single Operator High Power Phone	W7WA	ICOM America
Single Operator Low Power Phone	K7ZSD	ICOM America
Single Operator QRP Phone	NN7SS (K6UFO, op)	ICOM America
Single Operator Unlimited Phone	K7RL	ICOM America
Multioperator Phone	WA7U	ICOM America
School Club Phone	W7UQ	ICOM America
Pacific		
Single Operator High Power Phone	KH7XS	ICOM America
Single Operator Low Power Phone	N6NF	ICOM America
Single Operator QRP Phone	K6MI	ICOM America
Single Operator Unlimited Phone	W7RN (WX5S, op)	ICOM America
Multioperator Phone	K6LRG	ICOM America
School Club Phone	No Entrant	
Roanoke		
Single Operator High Power Phone	N8II	Potomac Valley Radio Club
Single Operator Low Power Phone	K1HTV	Raleigh Amateur Radio Society — W4DW
Single Operator QRP Phone	NX9T	ICOM America
Single Operator Unlimited Phone	W4NF	ICOM America
Multioperator Phone	KA1ARB	ICOM America
School Club Phone	W4UVA	ICOM America
Rocky Mountain		
Single Operator High Power Phone	N2IC (AA5B, op)	Grand Mesa Contesters of Colorado
Single Operator Low Power Phone	WØETT	ICOM America
Single Operator QRP Phone	NØKE	Colorado QRP Club
Single Operator Unlimited Phone	AD1C	ICOM America
Multioperator Phone	WY7SS	ICOM America
School Club Phone	No Entrant	
Southeastern		
Single Operator High Power Phone	K4SSU (NA4BW, op)	ICOM America
Single Operator Low Power Phone	N4PN	ICOM America
Single Operator QRP Phone	AA4W	ICOM America
Single Operator Unlimited Phone	K1ZZI	ICOM America
Multioperator Phone	WP3R	ICOM America
School Club Phone	W4UAL	ICOM America
Southwestern		
Single Operator High Power Phone	K6NA (N6ED, op)	ICOM America
Single Operator Low Power Phone	WAØKDS	ICOM America
Single Operator QRP Phone	N7IR	N6HE and W6DLD
Single Operator Unlimited Phone	K6LL	ICOM America
Multioperator Phone	W6YI	Inland Empire ARC
School Club Phone	W6RFU	ICOM America
West Gulf		
Single Operator High Power Phone	NR5M	Ken Adams, K5KA
Single Operator Low Power Phone	WD5K	Ralph Gator Bowen, N5RZ
Single Operator QRP Phone	K5NZ	ICOM America
Single Operator Unlimited Phone	KJ5T	ICOM America
Multioperator Phone	K5NA	ICOM America
School Club Phone	KD5VVI (N5AIU, op)	ICOM America
Canada		
Single Operator High Power Phone	VE4EAR	ICOM America
Single Operator Low Power Phone	VE5ZX	ICOM America
Single Operator QRP Phone	VA3DF	Frank Merceret, NA4CW
Single Operator Unlimited Phone	VE6EX	ICOM America
Multioperator Phone	VE6AO	ICOM America
School Club Phone	No Entrant	

For more information on awards sponsorship, or to order a duplicate plaque, contact ARRL Contest Branch Manager Sean Kutzko, KX9X, at 860-594-0232 or by e-mail at **kx9x@arrl.org**. Plaques cost $75 each, which includes all shipping charges.

New Section and Division Records

Call	Score	Category	Section	Division	Division Record
WB9Z	322080	B	IL	Central	Yes
KH7XS	379840	B	PAC	Pacific	Yes
W1XX	283040	B	RI	New England	
KDØS	338752	B	SD	Dakota	Yes
NN3W	303360	B	VA	Roanoke	
NC1I	276026	B	WMA	New England	
N8II	312640	B	WV	Roanoke	Yes
NX9T	92640	Q	NC	Roanoke	Yes
VA3DF	59130	Q	ON	Canada	
K5NZ	102226	Q	STX	West Gulf	
VE6EX	215840	U	AB	Canada	
N6ML	251040	U	EB	Pacific	
K3MD	172378	U	EPA	Atlantic	
WE8P	96408	U	IA	Midwest	
N2BJ	255200	U	IL	Central	Yes
KD4SN	103332	U	KY	Great Lakes	
K3MM	312160	U	MDC	Atlantic	Yes
K1KD	257856	U	MN	Dakota	Yes
N9NC	173440	U	NH	New England	
N6HC	202714	U	ORG	Southwestern	
KH6LC	158652	U	PAC	Pacific	
N6DE	265440	U	SV	Pacific	
N4ZZ	272640	U	TN	Delta	Yes
K5RQ	201120	U	WCF	Southeastern	
W5JJ	202398	M	AR	Delta	
K6LRG	203840	M	EB	Pacific	
NØNI	279840	M	IA	Midwest	
KA1ARB	273920	M	NC	Roanoke	Yes
K2NNY	277920	M	NNY	Atlantic	
WP3R	352024	M	PR	Southeastern	Yes
W6YI	404960	M	SDG	Southwestern	Yes
N5DO	293280	M	WTX	West Gulf	
WY7SS	232260	M	WY	Rocky Mountain	
W4UAL	66560	S	AL	Southeastern	
KØHC	250560	S	KS	Midwest	Yes
KØUNL	184954	S	NE	Midwest	
K2CC	71680	S	NNY	Atlantic	
W8EDU	110560	S	OH	Great Lakes	Yes
KØVVY	48180	S	SD	Dakota	

in 2009. It's a great chance to operate with friends! The W6YI team of W6YI, K6AM, N6MJ and N6KI, did it again. Not only did their 2531 QSOs win the category and set a new division record, but also set a new all-time record for the category. These guys have clearly figured out the system!

Moving into a new category, KE3Q was joined by WP3R, launching the WP3R station into 2nd place and a new division record. K5NA's team of K5NA, K5DU, KU5B and N5ZC placed 3rd this year. The West Texas team at N5DO (N5DO and KE5OG) turned in their best performance ever, moving up to 4th place. Another repeat performer was the Kansas team of WØNO, operated by KØWA, ABØTX and WØNO taking the #5 slot. They reported excellent conditions on 40 meters.

The next three scores were very closely separated. The NØNI team of NØNI, NØAC and NØXR placed 6th. Only 10 QSOs behind was the Montana team at WA7U, operated by WA7U, KB7Q and N7BJS. Just two QSOs down from WA7U was the Northern New York team at the K2NNY station, operated by K2DB, W1TY, K2CS, N2TWI, N2ZN and AF2K. Thanks for making this rare multiplier easy!

A new division record was set by the two man team of KA1ARB and WB1ADR, operating from KA1ARB in North Carolina, taking 9th place. Finishing the Top Ten was the Louisiana team at W5RU operated by KN5O, K1DW, W5RY and W5KB.

School Club Category

It's great to see increasing activity from school clubs. Twenty-six schools competed in the School Club Category in 2009. The Hesston College Amateur Radio Club, KØHC, again won the School Club category, with 1566 QSOs, new division and School Club category records — a great job by WØBH, NØLRA, KØWHY and a not-yet-licensed club member.

Operating only on 40 meters, the University of Nebraska club, NØUNL, operated by Alan, WDØBGZ, placed 2nd. In her first solo contest effort, Yvette, KB3HTS, piloted the Case Western Reserve club station to 3rd place and a new division record! Congratulations!

In their first entry in the School Club category, the University of California, Santa Barbara, W6RFU, operated by AC6T, KG6K, KI6WEL and KI6BMA, had a very respectable 4th place finish. The Clarkson University Amateur Radio Club, K2CC, made 448 QSOs and a clean sweep taking the #5 slot. KC2LRC, KC2SGA, KC2URR, WP4NYQ, KC2WBS, N4TW, KC2WBU and KB1OTE did a great job.

Other schools making the Top Ten were the University of Alabama, W4UAL; the University of Arkansas, W5YM; the South Dakota School of Mines, KØVVY; the Worcester Polytechnic Institute, W1YK, and Nacogdoches School Amateur Radio Club, KD5VVI.

Club Competition

Many thanks to the clubs who beat the drums to get their members on the air for Sweepstakes. It's not an exaggeration to say that there would be hundreds fewer stations active in SS without the promotion by clubs. Fall is a crowded time of year in contesting and it takes lots of commitment by club organizers and, of course, club members to put in the hours in the two modes of SS. This year, 2035 participants submitted their CW and Phone SS scores towards club aggregate scores.

As they have done for many years, the Potomac Valley Radio Club and the Northern California Contest Club battled for the top spot in the Unlimited Club category. This year, the mid-Atlantic-based PVRC was victorious with 302 entries and over 24.4 million points! Only 7% behind was the NCCC, with 332 entries and 22.7 million points. The Society of Midwest Contesters again took 3rd place, with 189 entries and 10.9 million points.

The Medium Club Category was quite competitive in 2009. The Southern California Contest Club took 1st place with 50 entries and nearly 4 million points. With one less entry, the Frankford Radio Club was only 129,492 points behind. It doesn't get much closer than this in the club category! Only 344,134 points behind these titans was the 25 entry showing of the Central Texas Contest and DX Club. Imagine what they could have done with 10 more entries? The 4th place Southeast Contest Club was 179,194 points down with their 44 entries. Kudos to the newly-formed Arizona Outlaws Contest Club, taking 5th place with 50 entries and a showing of 185,692 points back.

There was a new winner in the Local Club category this year. Congratulations to the Spokane DX Association! Only slightly down in 2nd and 3rd places were the Alberta Clippers and the Kansas City DX Club.

Acknowledgments

Many thanks to "Tree" Tyree, N6TR, for his hard work checking the logs. In addition, AA5B, K1UQT, K5OT, K9JK, K9PG, KA1RWY, KX9X, N5OT, N6TV and NN1N painstakingly typed in 120 handwritten logs, with 17,693 QSOs so they could be properly adjudicated. It is with great sadness to report that Ken Adams, K5KA, the ARRL Sweepstakes Manager, has become a Silent Key. Ken was a class act and worked very hard, both in public and behind-the-scenes, to promote and improve Sweepstakes.

Want More Stuff to Sweep?

The online version of this article at **www.arrl.org/contests** includes photos, more graphics and tables on accurate operating and clean sweep winners.

JUNE 2010 W1AW QUALIFYING RUNS

W1AW Qualifying Runs are 10 PM EDT Friday, June 4 (0200Z June 5) and 7 PM EDT (2300Z) Wednesday, June 16. 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 PDT (2100Z) Saturday, June 12 (40-10 WPM).

Results, 2009 ARRL 160 Meter Contest

Excellent conditions + record participation = maximum fun!

Gary Breed, K9AY
k9ay@k9ay.com

The 2009 ARRL 160 Meter contest (December 4-6) was an historic event! Here are a few numbers that fit into the "maximum fun" equation:

2 — stations breaking the 2000 QSO barrier for the first time ever!

87 — section records broken

95 — stations with more than 1000 QSOs

112 — stations with more than 100 multipliers

1366 — log submissions, another all-time high

Hopefully, good conditions will once again align with the dates of the next ARRL 160 Meter Contest, scheduled for December 3-5, 2010.

Single Operator, High Power

The station of Tom, W8JI, operated by Dan, K1TO, finished in first place with an all-time high 2,046 QSOs. Dan observes, "The top tier of the 160 community has certainly assembled a dazzling array of antennas on FB QTHs…" Fitting that description is John, K9DX, who used his "dazzling array of antennas" to achieve a close second place finish, also surpassing the 2,000 QSO mark.

Third place was gained by Peter, K3ZM, who emphasized working DX and ended up with well over 400 5-point QSOs in his log. Farther north, John, VE3EJ, put in another strong performance to earn a fourth place finish. The battle for fifth and sixth place was fought in the Maine section, with Paul, K8PO, edging out Paul, N1BUG.

The top 12 finishers surpassed the old records for their sections and there were 29 new section records, including some record-setting performances in the western US from "Tree," N6TR, operating with the club call K7RAT (OR); Ed, W5TM (OK), and George, WØUA, piloting KØRF (CO).

Single Operator, Low Power

Julius, N2WN, repeated his 2008 Low Power victory with a new Tennessee record, noting, "…my personal best for an ARRL 160." Also repeating as runner-up is Greg, K9IG, who boosted his Indiana record by nearly 25 percent despite persistent local noise.

The remaining Top Ten Low Power finishers represent most of the North American continent from different sections; MI (K8FH), WI (WE9V), MT (KB7Q), KY (K4FT), VA (K1HTV), OH (WB8JUI), EMA (K1EP) and NTX (WØUO).

Single Operator, QRP

Succeeding at QRP power level on the 160 meter band is especially rewarding. Glenn, WØGJ, guided his Bemidji, MN station to a repeat victory. Mike, W3TS continued his successful QRP efforts with a second place finish from Eastern Pennsylvania, with Werner, N8BB in Michigan not far behind in third. Paul, KØPK, joined the Top Ten box with his fourth place finish. Other notable QRP performances were Gary, N7IR (AZ); Jack, K4CNW (SC); Todd, N9NE (WI), and Tom, AA1CA (NH).

Multioperator

The crew of operators at KC1XX was the best of the four northeast US efforts that topped this category, not only winning but raising the US/VE Multioperator record by 41k points. They were followed by teams at K1LZ (EMA), W2GD (SNJ) and W2FU (WNY).

Farther west, WB9Z (IL) captured fifth place, just short of the 2000 QSO mark with 1930 contacts. The highest score west of the Mississippi was made by the operators at NØNI (IA) in ninth place.

DX Results

In North America, 6Y7J, operated by Andy, UU4JMG, was the High Power winner, the top DX score overall and a new North American record. Bob, N4BP, traveled to the Bahamas as C6AKQ in the Low Power category, reaching a new continental record and the overall Top Ten before winds blew down his antenna. VP5CM had an excellent Multioperator score, finishing second among all DX stations.

In South America, the Multioperator entry from PJ2T was tops in that category with

The Top 10

W/VE

Single Operator, QRP

WØGJ	140,798
W3TS	102,640
N8BB	100,813
KØPK	88,776
N7IR	82,000
K4CNW	81,923
N9NE	74,962
NK8Q	63,492
AA1CA	53,088
W4TMR	51,696

Single Operator, Low Power

N2WN	260,610
K9IG	258,358
K8FH	250,818
WE9V	212,515
KB7Q	202,410
K4FT	199,300
K1HTV	197,870
WB8JUI	197,600
K1EP	193,347
WØUO	184,239

Single Operator, High Power

W8JI (K1TO, op)	695,960
K9DX	674,325
K3ZM	655,819
VE3EJ	621,158
K8PO	602,615
N1BUG	568,490
AA1K	530,140
K1LT	514,304
K5NA	513,549
W5MX	484,500

Multioperator

KC1XX	639,653
K1LZ	591,429
W2GD	585,982
W2FU	577,330
WB9Z	561,467
WE3C	517,370
N1LN	516,864
K3WW	499,356
NØNI	487,080
W4MYA	475,008

DX

DX Single Operator, QRP

JH4UYB	2

DX Single Operator, Low Power

C6AKQ (N4BP, op)	187,356
EI4CF	6,264
XE2YWH	3,520
G4AFS	3,422
UT7UW	2,000
SP5CJY	1,848
OK6Y (OK2PTZ, op)	1,512
GM3YEH	1,188
F1UVN	1,102
JE1SPY	1,040

DX Single Operator, High Power

6Y7J (UU4JMG, op)	204,768
HC8GR (K6AW, op)	165,426
ZF2AH	126,450
XE2S	77,380
OM2VL	62,952
ON4UN	62,098
CT1JLZ (OK1RF, op)	50,688
G5W (G3BJ, op)	48,944
G3LET	45,828
HC2SL	39,456

DX Multioperator

PJ2T	191,724
VP5CM	163,394
F5IN	30,348
OL5R	18,900
UW2M (URØMC, op)	15,752
E77DX	15,228
ES5RY	15,200
EA1DR	12,696
5J1A	12,126
JA3YBK	10,640

Division Winners by Category

Single Operator, QRP

Atlantic	W3TS	102,640
Central	N9NE	74,962
Dakota	WØGJ	140,798
Delta	K4RST	18,941
Great Lakes	N8BB	100,813
Hudson	KR2Q	42,432
Midwest	WTØA (KE5RX, op)	18,720
New England	AA1CA	53,088
Northwestern	KX7L	9,408
Pacific	K6EI	43,810
Roanoke	K4CNW	81,923
Rocky Mountain	KT5E	43,310
Southeastern	N4AX	20,094
Southwestern	N7IR	82,000
West Gulf	N4IJ	28,152
Canada	VE7VV	38,640

Single Operator, Low Power

Atlantic	WY3A	160,724
Central	K9IG	258,358
Dakota	K7RE	148,680
Delta	N2WN	260,610
Great Lakes	K8FH	250,818
Hudson	K1NK	106,026
Midwest	KØDI	155,400
New England	K1EP	193,347
Northwestern	KB7Q	202,410
Pacific	N6RK	123,120
Roanoke	K1HTV	197,870
Rocky Mountain	ACØDS	139,318
Southeastern	K4CWW	80,975
Southwestern	W7RH	159,936
West Gulf	WØUO	184,239
Canada	VE3KF	146,500

Single Operator, High Power

Atlantic	AA1K	530,140
Central	K9DX	674,325
Dakota	K9DU	237,120
Delta	N8OO	459,900
Great Lakes	K1LT	514,304
Hudson	W2XL	240,563
Midwest	NØTT	240,856
New England	K8PO	602,615
Northwestern	K7RAT (N6TR, op)	351,216
Pacific	W7RN (KY7M, op)	266,640
Roanoke	K3ZM	655,819
Rocky Mountain	KØRF (WØUA, op)	345,690
Southeastern	W8JI (K1TO, op)	695,960
Southwestern	AC6DD	149,865
West Gulf	K5NA	513,549
Canada	VE3EJ	621,158

Multioperator

Atlantic	W2GD	585,982
Central	WB9Z	561,467
Dakota	KDØS	226,464
Delta	N4VV	147,105
Great Lakes	W8MJ	397,880
Hudson	N1EU	226,050
Midwest	NØNI	487,080
New England	KC1XX	639,653
Northwestern	W7CT (@NK7U)	224,200
Pacific	NR6O	212,420
Roanoke	N1LN	516,864
Rocky Mountain	WØGG	246,335
Southeastern	K4TD	394,524
Southwestern	N6MA	86,856
West Gulf	NX5M	345,695
Canada	VA3DX	311,562

Affiliated Club Competition

	Score	*Entries*
Unlimited Category		
Yankee Clipper Contest Club	6,924,804	58
Society of Midwest Contesters	6,773,425	76
Potomac Valley Radio Club	6,714,918	69
Minnesota Wireless Assn	3,977,934	60
Medium Category		
Frankford Radio Club	5,215,768	35
Contest Club Ontario	3,448,319	33
Tennessee Contest Group	2,597,177	31
Mad River Radio Club	2,429,687	21
Northern California Contest Club	1,940,834	44
Florida Contest Group	1,587,914	20
South East Contest Club	1,493,338	16
Alabama Contest Group	1,402,156	18
Grand Mesa Contesters of Colorado	1,269,124	15
Rochester (NY) DX Assn	1,110,756	8
Central Texas DX and Contest Club	1,090,531	8
Arizona Outlaws Contest Club	1,017,179	23
Western New York DX Assn	861,390	7
North Texas Contest Club	778,648	6
Contest Group Du Quebec	659,121	5
Hudson Valley Contesters and DXers	605,333	11
Southern California Contest Club	404,383	13
Kentucky Contest Group	362,628	5
CTRI Contest Group	334,024	6
Willamette Valley DX Club	313,814	6
Order of Boiled Owls of New York	277,884	7
Western Washington DX Club	272,543	9
BC DX Club	244,101	4
Carolina DX Assn	241,707	6
North Coast Contesters	223,818	4
Utah DX Assn	219,542	4
Texas DX Society	113,861	4
Local Category		
Central Virginia Contest Club	1,405,088	9
Kansas City DX Club	441,335	6
Spokane DX Association	329,686	5
Mother Lode DX/Contest Club	318,603	6
Delaware ARA (Ohio)	278,067	4
Maritime Contest Club	276,985	6
Skyview Radio Society	265,079	3
West Park Radiops	113,320	6
Midland ARC	89,231	3
Allegheny Valley Radio	80,408	3
Southeastern DX Club	77,548	3
Magnolia DX Assn	64,332	3
Metro DX Club	44,174	3

JERRY ROSALIUS, WB9Z

The WB9Z multi-op crew established a new IL Section and Central Division record with 1930 QSOs and 127 multipliers. Top: Jerry, KE9I, Mike, AJ9C, Ralph, K9ZO, Jerry, WB9Z. Foreground: Mike, K9XZ.

HC8GR (operator Steve, K6AW) achieving the second place DX score for High Power.

Europe provided the majority of DX QSOs and multipliers. Leslie, OM2VL's 523 QSOs were enough to beat John, ON4UN's 514 QSOs for the top European in High Power. G5W (operated by G3BJ) and G3LET each worked more than 400 US/VE stations, while CT1JLZ (operated by OK1RF) came close with 390 QSOs. In Low Power, the two best European entries were Niall, EI4CF, and Terry, G4AFS, who managed to make 148 QSOs between them. Mike, F5IN, used the spotting network to reach the top of the European Multioperator list.

Although conditions to Asia were less than stellar in 2009, JH4UYB managed a contact and submitted the only DX QRP entry in the contest. In Low Power, JE1SPY made 28 QSOs as the top Asian score. JA8NFV was the best High Power entry from Asia, while the crew at JA3YBK pulled 136 US/VE call signs from the noise to be the top Multioperator entry. Several UA9/UAØ stations and JT1CO provided more than 100 DX QSOs and multipliers.

FO8RZ was the only entry from Oceania with just two QSOs, but there were reports of ZL and VK activity. No logs were received from Africa, but a few logs contain QSOs from this continent. Of course, we would like all DX entrants to submit a log for log-checking purposes and to gauge worldwide activity.

Club Competition

The Unlimited Club competition was incredibly close, with the three top clubs having a spread of just 210,000 points out of nearly 7 million. This year's winner is the Yankee Clipper Contest Club, whose 58 entries totaled 6.92M points. Close behind is the Society of Midwest Contesters who had the greatest participation with 76 logs, but hoped for a few more to add to their 6.77M point total. In third, with 6.71M points from 69 entries, was the Potomac Valley Radio Club. The final club to reach the required 50 entries was the Minnesota Wireless Association, with 57 stations represented.

In the Medium Club competition, the 32 logs submitted for the Frankford Radio Club totaled 3.83M points, earning the top spot in this category. The largest group in the Medium Club category was assembled by the Northern California Contest Club, with 44 participants.

The Local Club category saw the Central Virginia Contest Club at the top spot, with a total of just over 1M points by eight members.

Summary

At the bottom of an extended solar minimum, sooner or later great conditions on the 160 meter band will coincide with a major contest weekend — and that's what happened in 2009! The steady increase in worldwide activity was evident, as well. Many Soapbox comments and Internet group posts talked about "first time" entries, significant station improvements and personal best performances. Scores and participation were at an all-time high.

Good conditions to various parts of the world can occur almost anytime in the solar cycle, and hopefully, will once again align with the dates of a future ARRL 160 Meter Contest. The next event is scheduled for December 3-5, 2010.

Online Expanded Results

The version of this write-up on the ARRL Web at **www.arrl.org/contests** contains a complete table of all new records, more commentary and analysis, and three interesting sidebars.

The 2010 IARU HF World Championships

1200 UTC Saturday, July 10 – 1159 UTC Sunday, July 11

The summer's biggest international HF contest! Use SSB, CW or a mixture of both! Work as many stations as you can in ITU zones all around the world. National Amateur Radio organizations will activate their "HQ" stations. How many can you contact? It's 24 hours of intense fun!

With Cycle 24 finally on the upswing, will 10 meters open and produce DX QSOs? There's only one way to find out!

RAMON SANTIAGO V., XE1KK

- Logs must be received by 1200 UTC Tuesday, August 10, 2010. E-mail logs to **iaruhf@arrl.org**.
- Complete rules may be found at **www.arrl.org/contests**

"We'll listen for you during IARU!"

SPECIAL EVENTS

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

May 13-May 16, 1000Z-2200Z, W8H, Dayton, OH. Feld Hell Club, Special Event Station W8H operating at Dayton Hamvention. 21.073 14.063 10.135 7.073. QSL. Louis Wulfekuhler, 11070 Bishop Hwy, Lansing, MI 48911. **www.feldhellclub-w8h.webs.com**

May 14-May 16, 1200Z-1200Z, Dayton, OH. Eagles Landing Radio Club, N8D. Dayton Hamvention Event Station. 14.250 14.100 7.250 7.100. QSL. Paul Zadonia, 5636 S Huron Rd, Pinconning, MI 48650. **wd8cjn@arrl.net**

May 15, 1600Z-2100Z, W2K, New York, NY. Coast Guard Auxiliary 014-05. Wounded Warriors by the Coast Guard and CG Auxiliary. 14.250 7.150. QSL. John Kiernan, KE2UN, 110 Cabrini Blvd, Apt A, New York, NY 10033-3446. **ke2un@msn.com**

May 15-May 31, 0000Z-0000Z, W9IMS. Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club. 2010 Indianapolis 500. 21.340 14.240 7.240 3.840. QSL. Indianapolis Motor Speedway ARC, PO Box 18495, Indianapolis, IN 46218-0495. Certificate and QSL available. **www.w9ims.org**

May 21-May 24, 0001Z-1159Z, K6M, San Mateo, CA. Blackberry REACT. *Maker Faire*, fair for arts, crafts and engineering do-it-yourselfers. 14.250. QSL. Phil Stripling, 301 S Grant St, San Mateo, CA 94401. **www.makerfaire.com**

May 29-Jun 25, 0000Z-2300Z, PC1ØØAR, Amersfoort, Netherlands. Alfa Romeo. Activation Premio Centinario 100 ALFA ROMEO by PC2F. 14.200 7.100 3.700. QSL. Frans de Bles, Gaardendreef 20, Amersfoort NL-3824AT, Netherlands. **pc2f@veron.nl** *or* **www.qrz.com/db/pc100ar**

May 31, 0830Z-1700Z, K6V. Santa Cruz, CA. Veterans Emergency Radio Room. Memorial Day, Remembering Our Own. 14.280 7.250 21.30 CQ100 20 m primary. QSL. Maurice Ricketts, Veterans Memorial Building, 846 Front St, Santa Cruz, CA 95060. **robertspencer@cep.com**

Jun 1, 1330Z-1930Z, WX8J, Dresden, OH. Dresden Elementary Amateur Radio Station. Hunting DEARS On The Air! 146.52 14.225 7.225. Certificate. Dresden Elementary School / DEARS, 1318 Main St, Dresden, OH 43821. **jmayercak@tvschools.org**

Jun 1-Jun 6, 0001Z-2359Z, N6M, Monterey, CA. West Coast DX Group. Monterey, CA 240th Anniversary 1770-2010. 21.250 18.150 14.250 7.250. QSL. G. Costello, WC6DX, PO Box 1332, Monterey, CA 93942. **wc6dx@arrl.net**

Jun 4-Jun 5, 1400Z-0000Z, AEØRO, Colorado Springs, CO. Aerospace Employees Radio Organization – COS. Celebrating 50th anniversary of The Aerospace Corporation. 50.150 28.450 14.250 7.250. Certificate. AERO-COS Club, c/o The Aerospace Corp, 7250 Getting Hts, M/S COS-1000, Colorado Springs, CO 80916. **www.aeaclubs.org/ae0ro**

Jun 4-Jun 6, 2000Z-1700Z, K2BSA/Ø, St Louis, MO. Boy Scouts of America. Scout-Quest from Forest Park. 14.290 14.060 7.190 7.090 7.030. QSL. Richard Grady, NØJYU, 5976 Keith Pl, St Louis, MO 63109.

Jun 4-Jun 6, 2359Z-2359Z, TCSWAT/TC2Ø1ØRKM, Istanbul, Republic of Turkey. Koç Museum. All Bands. Certificate. TCSWAT/Op. A.K. Tevfik, TA1HZ, PO Box 73 Karakoy, Istanbul 34421, Republic of Turkey. *Contacts can be used toward Istanbul 2010 European Capital of Culture Award.* **www.ta0u.com/2010/eng/pdf/TC2010RKM.PDF**

Jun 4-Jun 8, 1900Z-0750Z, K7G, Astoria, OR. Sunset Empire Amateur Radio Club. *Goonies* 25th Anniversary. 146.580 14.285 7.185. Certificate. Dan Hensley, 2945 W Fullerton Ave, Chicago, IL 60647. **kc9ncf@yahoo.com**

Jun 4-Jul 3, 0001Z-2359Z, VE3RCN/CF3NAVY, Welland, ON. 100th Anniversary of Royal Canadian Navy. 14.025 7.025 3.525 1.825. QSL. Kevin Clements, 585 First Ave, Welland, ON L3C 1Z2, Canada. *Two special Naval anniversary postage stamps to be used on outgoing QSLs. Some operations may be off of a warship.* **ve3rcn@rac.ca**

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

Jun 5, 1300Z-2000Z, NC4ZO, Asheboro, NC. Randolph Amateur Radio Club. NC Aviation Museum Fly-In & War Bird Display. 21.350 14.260 7.250. Certificate. Butch Simpson, WS4H, 6747 King Mtn Rd, Asheboro, NC 27205. **butch@atomic.net**

Jun 5, 1400Z-1900Z, NC4MC, Badin/Albemarle/Troy, NC. Montgomery Amateur Radio Society. 66th Anniversary of the Crash of the *Badin Bomber* in 1944. 14.250 7.250 146.985 147.090. QSL. Donald Grady, 120 Woodline Dr, MARS QSL REQ, Troy, NC 27371.

Jun 5-Jun 6, 0000Z-2359Z, Whitefish Point, MI. International Museum Ship Weekend, KG8EF. Edmund Fitzgerald Memorial - Lighthouse USA-887. 14.260 7.260 3.860 also CW. Certificate. Chuck Hanneman, 2250 Elm Rd, Hudson, MI 49247. **www.kg8ef.com**

Jun 5-Jun 6, 1400Z-2145Z, W5KID, Baton Rouge, LA. Baton Rouge and USS *Kidd* Amateur Radio Clubs. Museum Ships. Gen bands CW in QRP bands. QSL. W5KID, 305 S River Rd, Baton Rouge, LA 70802. *Primary frequency is 20 m.* **www.lsu.edu/brarc/uss_kidd.htm**

Jun 5-Jun 6, 1400Z-2100Z, NB9QV, Manitowoc, WI. USS *Cobia* Amateur Radio Club. WW II Submarine USS *Cobia* AGSS-245 on the air. 21.300 14.260 7.250. QSL. Fred Neuenfeldt, W6BSF, 4932 S 10th St, Manitowoc, WI 54220-9121. **www.qrz.com/db/NB9QV**

Jun 5-Jun 6, 1400Z-2000Z, VE3MIS, Mississauga, ON. Mississauga Amateur Radio Club. The Streetsville Bread and Honey Festival. 28.480 21.315 14.240 7.230. Certificate. Michael Brickell, VE3TKI, 2801 Bucklepost Cres, Mississauga, ON L5N 1X6, Canada. **www.marc.on.ca/marc/events/events_bread_honey.asp**

Jun 5-Jun 6, 1600Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV 41) Museum Radio Operations Room. International Museum Ships Radio Weekend and US Army Birthday 1775. SSB 14.320 7.250 CW 14.060 7.055 PSK-31 7.070 D-STAR 2 m/70 cm SOCAL rptrs. QSL. USS *Midway* Radio Room, 910 N Harbor Dr, San Diego, CA 92101-5811. **kk6fz@arrl.net**

Jun 5-Jun 6, 2000Z-2000Z, W6ZZK, Eureka, CA. Humboldt Amateur Radio Club. D-Day and Museum Ships Weekend. 14.260 7.260 3.860 3.539. QSL. 1091 D-Day Special Event, 2605 R St, Eureka, CA 95501-3135. **www.humboldt-arc.org**

Jun 5-Jun 7, 1200Z-0000Z, W1AW, Newington, CT. United States Power Squadrons Amateur Radio Club. In celebration of National Safe Boating Week. 28.590 21.390 14.290 7.290. QSL. W1AW, American Radio Relay League, 225 Main St, Newington, CT 06111-1494. **www.usps.org**

Jun 11-Jun 12, 1700Z-2100Z, WØS, Bloomfield, MO. Bootheel and SEMo Amateur Radio Clubs. Commemorating 149 years of the *Stars & Stripes* Newspaper. 14.260 7.260 3.950. Certificate. Stars & Stripes, PO Box 98, Jackson, MO 63755.

Jun 11-Jun 13, 2359Z-0200Z, WA6FV, Fountain Valley, CA. Fountain Valley Amateur Communications Team. Fountain Valley Annual Summerfest and Classic Car Show. 14.268 7.268. QSL. Fountain Valley Amateur Communication Team, 15849 Los Reyes St, Fountain Valley, CA 92708. **www.qsl.net/fvraces**

Jun 12, 1400Z-2300Z, NØC, Albert Lea, MN. Low Bucks Car Club. Eddie Cochran Days, hometown of this '50s rock star. 14.240 7.240. QSL. Larry Shaunce, 1001 Skylark Ln, Albert Lea, MN 56007. **www.freewebs.com/cochrancarshow**

Jun 12-Jun 14, 1200Z-0500Z, K7P, Historic Site of Riverbed Pony Express Station, UT. Davis County Amateur Radio Club. 150th Anniversary of the Pony Express. 40 20 15 m SSB PSK. Certificate. Dave Harris, PO Box 160012, Clearfield, UT 84016-0012. **www.dcarc.net/go/index.php/pony-express**

Jun 13-Jun 19, 1900Z-2300Z, W9AWE, Mendon, IL. Western Illinois Amateur Radio Club. Scouts earn radio merit badge during Saukenauk Scout Week. 28.350 21.350 14.250 7.250. QSL. WIARC-QSL, POB 3132, Quincy, IL 62305. **www.w9awe.org**

Jun 14-Jun 20, 0000Z-0000Z, N8QA, Portsmouth, OH. Portsmouth Radio Club. 71st Anniversary of the Portsmouth Radio Club. 28.400 21.240 7.240 3.840. QSL (Certificate on request*). PRC, PO Box 266, Portsmouth, OH 45662. **n8qa@arrl.net** or **www.portsmouthradioclub.com**

Jun 19, 0800Z-1400Z, NA1RL, Newington, CT. Newington Amateur Radio League. Hamfest and Flea Market. 28.380 21.380 14.280 7.280. QSL and Certificate. Richard Lawrence, KB1DMX, 335 Lloyd St, Newington, CT 06111. **www.narl.net**

Jun 19-Jun 20, 0500Z-1300Z, NM8RC, Gaylord, MI. Top of Michigan Amateur Radio Club. Annual Otsego County Air Show. 21.350 14.280 7.240 3.900. Certificate. TOMARC, PO Box 15, Gaylord, MI 49745. **wd8dx@yahoo.com** *or* **www.nm8rc.org**

Jun 19-Jun 20, 1400Z-0200Z, W7P, Fort Laramie, WY. Great Plains Amateur Repeater Association. 150th Anniversary of Pony Express at Fort Laramie. 18.130 14.300 7.230 3.850. Certificate. Lenny Noyce, 903 16th St, Wheatland, WY 82201. **ae7ln@arrl.net**

Jun 19-Jun 20, 1400Z-1800Z, NY2SF, Watkins, IA. Benton County ARC/Lincoln Highway ARG. Celebrating *97 Years on the Lincoln Highway*. 14.260 7.260 3.860 Various CW. Certificate*. Lincoln Highway Amateur Radio Group, 1212 20th St SW, Cedar Rapids, IA 52404. *Operation from Youngville Cafe.* **becker2@imonmail.com**

Jun 20, 1400Z-2300Z, WØKY, Kearney, NE. Midway Amateur Radio Club. Commemorating the 150th Anniversary of the Pony Express. 14.295 7.275. Certificate. Midway ARC, PO Box 1231, Kearney, NE 68848-1231. **www.w0ky.kearney.net**

Jun 23-Jun 28, 1800Z-1800Z, W3S, Amity, PA. Boy Scouts of America, KA3PMW and N3TRF. Field Day at Camp Anawana for the 100th Anniversary of Boy Scouts. 28.400 21.300 14.200 7.200. QSL. Dave Alexander, PO Box 153, Marianna, PA 15345-0153. *Troops from SW PA will be participating and cooking for the hams.* **www.w3sfieldday.com**

Jun 24, 1500Z-1900Z, KA3WSQ, Irondale, MO. Zombie Squad Amateur Radio Club. Ham radio demonstration at ZombieCon 2010. 14.260. QSL. Tom Thompson, KA3WSQ, 1314 Mt Pleasant Rd, West Newton, PA 15089. **ka3wsq@comcast.net**

Jun 25-Jun 28, 1800Z-1800Z, N6R, Simi Valley, CA. Ventura County Amateur Radio Society. Field Day: Commemorating lives of President & Mrs Ronald Reagan. 21.042 14.280 7.185 3.850. QSL. VCARS c/o Peter Heins, N6ZE, 1559 Norwich Ave, Thousand Oaks, CA 91360. *VCARS will be joined by Simi Settlers Amateur Radio Club, Ventura County Amateur Radio Club and Conejo Valley Amateur Radio Club for this event.* **www.qrz.com/db/n6r** *or* **www.vcars.org**

Jun 25-Jul 5, 0000Z-2300Z, Marlborough, MA. Algonquin Amateur Radio Club, N1M. 350th Anniversary of the City of Marlborough, MA. 14.250 7.250. QSL. AARC, PO Box 258, Marlborough, MA 01752. **www.n1em.org**

Jun 26, 1600Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV 41) Museum Radio Operations Room. Amateur Radio Field Day. SSB 14.320 7.250 CW 14.060 7.055 PSK-31 7.070 D-STAR 2 m/70 cm SOCAL rptrs. QSL. USS *Midway* Radio Room, 910 N Harbor Dr, San Diego, CA 92101-5811. **kk6fz@arrl.net**

Jun 26, 1600Z-2359Z, WR7UKC, South Cle Elum, WA. Upper Kittitas County Amateur Radio Club. 101st Anniversary of Milwaukee Rail Road Service to the Pacific Northwest. PSK31 14.268 7.268 3.880. QSL and certificate. WR7UKC, Upper Kittitas County ARC, PO Box 603, South Cle Elum, WA 98943. **www.qsl.net/wr7ukc/specialevent.htm**

Jun 26-Jun 27, 1200Z-2200Z, W4W, Sevierville, TN. Sevier County Emergency Radio Service. Field Day 2010 at Northview Park. 28.400 14.240 7.240 3.840 Digital. QSL. Sevier County Emergency Radio Service, 2005 Spence Mountain Loop, Sevierville, TN 37876. *Please note the call sign of the station you work on your QSL card.* **n4jtq@live.com**

Jun 26-Jun 27, 1800Z-2100Z, W4D, Cookeville, TN. Buck Mountain DX Club. Field Day 2010 with QSO Radio Show Ted Randall LIVE. 80 40 20 15 m. QSL. Dr Michael Barrett, 756 Mountain View Dr, Cookeville, TN 38506. **transworldantennas@aol.com**

Jun 26-Jun 28, 1800Z-1800Z, W2GSB, Lindenhurst, NY. Great South Bay Amateur Radio Club. Field Day. 14.225 7.175 3.850 14.070 PSK. QSL. W2GSB Field Day, PO Box 1356, West Babylon, NY 11704. **www.gsbarc.org**

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9 ×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's Web site.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form, at **www.arrl.org/special-events**. A plain text version of the form is also available at that site. You can also request a copy by e-mail or send a self-addressed, stamped envelope (SASE) (Special Requests, ARRL, 225 Main St, Newington, CT 06111; write "Special Events Form" in the lower left-hand corner). Off-line completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **Aug** *QST* would have to be received by **Jun 1**. In addition to being listed in *QST*, your event will be listed on the *ARRLWeb* Special Events page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through April 10. You can view all received Special Events at **www.arrl.org/special-events**. QST

W3UR

HOW'S DX?

Trade Secrets for Beginning DXers

I thought I'd start off this month's column with a few trade secrets for DXers. Having been a DXer now for over 30 years, I have learned some of these tips on my own through trial and error, some through reading different DX publications and others through my friends and fellow DXers.

New DX Publication

Speaking of reading, the famed DX author Bob Locher, W9KNI, has a new book out called *A Year of DX*, which is expected to be available May 1 of this year. Bob as many of you know is the renowned author of *The Complete DX'er*, which is now in its third edition and has sold over 28,000 copies. His latest publication is sure to be another masterpiece and full of great tips and secrets covering the range from those just beginning to the seasoned DXer. For more information see **www.idiompress.com/yearofdx.php**.

Amplifier or Tower?

One of the age-old questions in DXing has been which to get first — an amplifier or a tower? Over the years we all have heard beginner DXers saying they were getting ready to buy or had just bought an amplifier, thinking this would help them work some new countries. As we all eventually realize that amplifier, despite how much power it will get you, is not going to help you hear the DX and if you can't hear it you aren't going to work it. Shortly after your editor purchased his first single family home he realized the limitations it presented. He came face-to-face with the issue realizing he didn't have enough money to go all out, purchase an amplifier and put up a real antenna in his no-covenant new abode.

At the time my good friend Frank, W3LPL, who lived about 2 miles northwest of our new home, had a used tower. I purchased it and even got some help putting it up shortly after moving into the new quarters. It was small by LPL standards, but that Rohn 45 comparable tower at 70 feet with a TH7 triband Yagi on top was amazing on the receiving side of things.

With a new home and budding family it was a year or so before I was able to afford a small amplifier. I can remember one specific time hearing and working the late Jim Smith, VK9NS, when he was in Thimphu, Bhutan operating as A51JS. At the time A5 was very rare and many of my local DX competitors could not hear Jim. Jim was very weak but came right back to me. The guys with their amplifiers and lower antennas could not even hear him. A couple of days later I worked him again, this time on SSB with 100 W. So for those with beginning stations if you have a choice of raising your antenna or raising your power, make the right choice!

Bands and Modes

Shortly after moving into our Glenelg 1 acre location I had a contact with the world famous DXer Dr Bob Eshleman, W4DR. This was probably several years before the announcement of the ARRL DXCC Challenge Award. We got on the subject of DX quickly but more specifically what to do in between times of waiting for that next all-time new one. Bob told me that he, and I'm sure others were doing it at that time also, tried to work every country on each band (1.8 through 28 MHz) on CW and SSB. I believe this was just before Bob got active on 6 meters, which would eventually also count for the DXCC Challenge award.

After considering it I thought okay that is a little too much for me but working every country on each band, now that was something I could and would be willing to do. I had already been trying to work each country on CW and SSB. So my point is to encourage the beginning DXers that when these DXpeditions happen, make sure you work them on each mode and band you can. One day, when you are just over 300 countries, working and waiting for that next DXpedition you will have something else to do in between the DXpeditions to the rare ones. After you work them all on mixed mode, what are you going to do? Given up Amateur Radio and DXing? I hope not, as DXing is a journey.

When to QSL?

After you work a new country, whether for an all-time mixed counter, a band point or for a certain mode it is always a good idea to QSL as soon as possible. Most, but not all, DX stations and DXpeditions answer the first QSL cards based upon their arrival.

But is it possible to QSL too fast? After working that new one you need to ask yourself are you going to work him again on another band or mode within a short amount of time or before the DXpedition ends? If so, hold off on QSLing him until you have determined the DXpedition to be over or that you probably won't work that station again anytime soon. So if you have worked a certain DXpedition on all your missing band/modes slots and the DXpedition is still going on, it's okay to go ahead and QSL. You want to get in line, so to speak, before the other guys have a chance to get in the QSL Q.

It is advisable to QSL as soon as you can for a few reasons. Number one, the job is not done until the paper work gets turned in. With the rising age in DXers these days one doesn't want to wait too long or they may not ever be able to confirm said QSO, if you know what I mean (SK). And lastly the faster you QSL the faster one will come back.

Well, that should be enough for this month. What about you? Do you have any trade secrets for our readers? If so, send them in (**Bernie@dailydx.com**) for possible inclusion in an upcoming issue.

An Entire Month of Sunspots

February 2010 was the first time in 3 years (since January 2007) to have sunspots during every single day of the month. After such a long solar minimum we are finally starting to see a rise in solar activity. In early March NASA's STEREO mission was tracking "at least six active regions around the circumference of the sun."

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DX NEWS FROM AROUND THE GLOBE

6 METER E-SKIP SEASON

Hopefully by the time you read this column the 6 meter E-skip season will have already begun. For new 6 meter operators, and even those who haven't been on 50 MHz for a while, it would be a good idea to refresh your memory by reading last June's "How's DX?" column on the Magic Band (p 87). If you find someone who needs a little guidance by all means make sure you are polite and identify. If they don't heed what you say, leave it alone and let someone else do the same. Otherwise they are probably just going to be a stick in the mud.

As of press time none of the usual suspects have given their plans for their June-July, 6 Meter DXpeditions. But we do know that KD2JA and WB2REM will be on from VP5 — Turks and Caicos from June 10-17 (see last month's How's DX? column). KB7Q is heading to Alaska (BP40da) for activity as KL7/KB7Q from mid June to mid July.

Craig, KB3RHR, reports two members of the Midwest 6 Meter DX Group (**www.6meterdxgroup.com**) will be operating from St Vincent (NA-025) between June 28 and July 5, 2010. Look for 50 MHz activity from Dave, J8W9DR, and Mike, J8W8IF, in grid locator FK93ja. Nope, that is not a typo as there will be no "/" in their call signs. QSL via KB3RHR.

G3USR, GM4FDM, PA1AW, PA1BDO, PA3EWP and PA5F plan a 6 meter DXpedition, with some activity also expected on 1.8 through 28 MHz on SSB, CW and possibly RTTY from the State of Jersey (GJ) between June 29 and July 5. The emphasis of this operation will be to concentrate activity on 50 MHz (grid locator IN89ve) using a "big beam and maximum legal power." Each team member will use their own call and you should QSL via their home call. They have a Web site at **www.jersey-2010.info**.

8Q — MALDIVES

8Q7TB on Embudu with Tom, PF4T, operating, will be active June 5-25. He will be on 40 and 20 SSB, RTTY and BPSK31 and will also try 17, 15 and 10 meters. He says if you want a quick QSL you can QSL direct. Be sure to include a self-addressed envelope with one US dollar if you are in Europe; outside of Europe include $2 US to cover postage. QSL via the bureau. Mark the card "via PAØLEY or PF4T" to make sure he gets it. No eQSL. Direct cards will have the priority. He will have an FT-897D transceiver, 100 W, to a Windom and inverted V, 20 meters up in a palm tree, 10 meters from the ocean. QSL to PF4T, Tom Braam, Hondsrug 210, 8251 VB Dronten, The Netherlands.

CYØ — SABLE ISLAND

NØTG and other planners of the coming October 2010 CYØ Sable Island DXpedition are taking along one of the legendary "Battle Creek Special" antennas for 160 meters. They say, "We hope to do all we can, given the unique CYØ logistical challenges to maximize 160 meter Qs." Check the progress of their planning and preparations at **www.CY0dxpedition.com**.

DX GATHERING

The Lone Star DX Association (LSDXA) is once again sponsoring the W5DXCC DX Dinner, which will be held in conjunction with the 2010 Ham-Com. The dinner will be on Friday, June 11 at the Plano Centre in the Windhaven Room. This year's speaker will be Tom Harrell, N4XP, who will be talking about the October 2009 DXpedition to Midway Island — K4M. For complete details on Ham-Com check out **www.hamcom.org**.

E4 — PALESTINE

The upcoming E4X expedition to Palestine is expected between May 28 and June 6. K6GNX and W6ENZ have been added as pilot stations for the North American West Coast. Keep an eye on their Web page at **www.dxfriends.com/e4x**.

OHØ — ALAND ISLANDS

Hans, OHØ/PAØVHA; Steve, OHØ/PA2A; Wim, OHØ/PA2AM; Teun, OHØ/PB5A; Jack, OHØ/PA3BAG; Wil, OHØ/PA3ALK, and Martin, OHØ/PA2VMA, will be QRV from the Aland Islands (EU-002) May 15-28. Look for activity on all bands, with the majority on 12, 17 and 30 meters on CW, SSB and RTTY. They will also be QRV on 6 meter EME using JT65A using the call OHØ/PA2AM. QSL via their home calls.

PACIFIC ODYSSEY 2010

The UDXT, Ukrainian DXpeditioners Team, has a new project, "Pacific Odyssey 2010." On the team are UXØHX, RK3FA, UT5UY, UT1HF, US7UX, UR3HR and SWL Yuriy Grushevskiy. The plan: 5WØOX on Samoa, May 18-19; T31X, Central Kiribati, May 22-June 1; and ZK3X, Tokelau, June 2-6. T31 is ranked most needed #7 in Europe, #19 worldwide. Tokelau is #29 in Europe and #35 worldwide. Donations are appreciated because costs are expensive to these far-flung islands. They have a Web site at **www.uz1hz.com/pacificodyssey.html**.

PY — BRAZIL

PW8J, Lencois Island, SA-041, will be June 9-15, followed by PW8L from Sao Luis Island, SA-016, June 16-18. Preparations and planning are under way. Support has come in from IREF, the Island Radio Expedition Foundation; CDXG, the Clipperton DX Group; GDXF, the German DX Foundation and "some Brazilian groups," but more support is needed. The expenses are $7000. Their Web page can be found at **www.pw8j.com**.

T3Ø — WESTERN KIRIBATI

Haru, JA1XGI/W8XGI, is making another trip to Western Kiribati where he will have the T3ØXG or T3Ø/T32XG call sign. This will be June 3-9 on 40-6 meters. He plans to operate CW and digital. QSL direct or bureau to JA1XGI.

TR — GABON

I1HJT and teammates are working on a new African destination. Alfeo says, "After 9G, 9L and J28 we are [in] the early phase, targeting Gabon, TR. We expect to be there for a couple of weeks [in] October, 2010. Low bands will be one of our major goals." **www.hamradioweb.org/forums/memberlist.php?langid=1**. Alfeo would like to hear your input as to needed bands and modes, at this Web address: **www.i2ysb.com/joomla5/index.php?option=com_pollxt&Itemid=162**.

VQ9 — DIEGO GARCIA

Jim, ND9M/VQ9JC, is returning to Diego Garcia "for another fun-filled four-month tour" on or about April 9. Jim says the log periodic that was refurbished with new hardline replacing the old RG-8 should work well. Jim says with the slight increase in sunspot activity, the antenna system should put out a good signal. He also expects to get a special prefix again. He says the Diego Garcia licensing office has been very cooperative over the years. He expects to get the call sign VQ9ØJC for late May and early June and will use that call in the CW WPX.

A special thanks to I1HJT, KE3Q, ND9M and *The Daily DX*, for making this month's column possible. Until next month, see you in the pileups! — *Bernie, W3UR*


W3ZZ

THE WORLD ABOVE 50 MHz

Divergent Philosophies In VHF and HF Contesting

As many of you know, although I started as a weak signal VHF operator I spent many of my early years as an HF contester and DXer, particularly in the multi-multi realm. So, I have experienced contesting in both worlds. Contrary to what some VHF weak signal operators think, the differences between VHF and HF contesting are not very great. The objective is the same: work as many stations during the contest period as you can, as fast as you can, accumulating as many multipliers during that time as possible.

When I returned to serious weak signal VHF in 1981 after a hiatus of some 15 years, I found the transition to VHF contesting not very difficult. Yes, the activity on VHF was not as great — there were no 190 hours on CW or 250 hours on SSB as I had done as a DX station — but the techniques and technologies were very similar. Either you called CQ if you were loud enough to attract answers or you searched and pounced (S&P) looking for stations you had not worked. The major impediments were somewhat different. On HF the problem was establishing a run frequency if calling CQ, or being heard in a pileup if S&P. On VHF interference was rarely the issue; the problem was being loud enough to be heard at all. In both cases success depended on the quality of your station and your operating capabilities — no differences there.

With the passage of time I did notice a very different operating philosophy. While contesting requires both *finding* and working stations, the vast majority of HF contesters consider finding stations the key to contesting. Finding meant using your radio without outside help. Whether this be by copying answers to your CQs, or ferreting out new stations by S&P once you have found someone, your chances of working them was quite high.

For many, but not all VHF contesters by any means, this aspect of contesting has been strongly deemphasized. To them how you find a station to work does not matter. In fact, your radio and antenna may be the least of your tools. You should use every means of allowable outside help you can find. That means packet spots, chat nets, APRS to track rovers, any other form of Internet assistance — anything that is not prohibited by the rules. Of course most of these forms of outside assistance are not allowed by rule but many VHFers think they should be. For most VHFers the essence of a contest is actually working the stations they have found, many, they wished, with outside assistance well beyond what is currently allowed by the rules (see Table 1).

I would like to discuss these differences and the reasons for them.

Finding Stations

To me, as with almost all HF contesters, finding stations during a contest is the essence of contesting. The fascination is never knowing what the propagation will be or who you will work. In a run it means copying calls and reports in interference and static. While VHF interference is normally only a serious factor during sporadic E (E_s), both HF and VHF contesting on 6 meters are quite similar, an important point since the HFer's introduction to VHF contesting is likely to be on 6 meters.

S&P contacts are difficult on a crowded band such as exists in many places on HF, yet VHF S&P is probably even more difficult because antenna beamwidths are narrower and patterns are cleaner. Thus workable stations may not even be heard if one's antenna is not pointed directly at them — and *vice versa*. The challenge is to move the antenna around sufficiently that you miss few if any of these stations, and similarly when calling CQ spread your RF around sufficiently that you will attract calls — and hear those stations.

On VHF most contesters could care less about finding stations to work by themselves using only their radios and their wits. They truly would rather have stations and their calls fed to them by some other means. Many of these forms of assistance are listed in Table 1. Some of these are nonspecific and are used in all forms of contesting. For instance HF DXpeditions usually announce their intentions in advance of the contest through contest reflectors or DX bulletins. Similarly serious VHF stations often announce their contest intentions and portable locations, if applicable, on contest reflectors or through club reflectors.

Rovers are critical sources of VHF activity so rovers are encouraged to announce their tentative routes in advance through the same means including times and a frequency where they may be found and what bands they have. Surprisingly, not all rovers announce their routes in advance. There are well in excess of 50 rovers in any contest but one would be lucky to see even half of those posting their routes and times.

Some forms of assistance are limited to multioperator stations. Yet, given how much most VHF contesters love assistance, packet

Table 1

Allowed and Prohibited Forms of Assistance

Allowed	*Prohibited*
Projected rover routes	Packet self-spotting
Prior schedules	Specialty bulletin boards[1]
Passive packet spotting[2]	Real time cell phones
APRS[2]	
HamIM (W2EV "simplex" APRS)	

[1]eg, Ping Jockey, EME
[2]Multioperator only

This Month

June 12-13	ARRL VHF QSO Party
June 19-20	SMIRK QSO Party
*June 6	Moderate EME conditions
June 26-27	ARRL Field Day

*Moon data from W5LUU

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spotting has not become nearly the force it is in HF contesting. Prior notifications of rover routes are not enough. Most VHF contesters would like APRS spotting where the rover's exact location can be known 24/7 so working him is absolutely guaranteed. Why waste time and effort finding him? APRS is legal for multiops but not for single ops because it involves networks and repeaters. W2EV's "simplex" APRS system *HamIM* is allowed although its range is severely limited because it is simplex.

What about other forms of assistance? Prior schedules are allowed for both HF and VHF contests. On HF, contacts resulting from such schedules often do not happen because one or both stations forget about the schedule. Besides, the practice has gotten a bad name from a few groups who made schedules by telephone in real time *during* the contest — a practice now banned in all American contesting.

Still, VHF contesters often make schedules. Partially this depends on the mode. Digital meteor scatter contacts are very difficult to do randomly because signals are audible for such short periods; while there are protocols one can use, they have not been very successful so far. Random digital EME contacts are feasible thanks to MAP65 but these interpreters are technically not at all trivial to implement. On the other hand, SSB and CW contacts do not require specific schedules and the HF operator would call such unethical although legal. Other forms of assistance are illegal during the contest period. That means no self spotting, no chatting on chat nets, no use of Ping Jockey and the EME boards, and no cell phones.

Finally we should be aware that the vast majority of all VHF contacts above 2 meters — and therefore a goodly portion of our scores — are made via real time on-the-air scheduling from contacts on 6 or 2 meters. As a single op or a rover when is the last time you made more than a small handful of contacts on 222 MHz and above in a contest without moving a station from 6 or 2 meters? For that matter on the microwave bands we normally employ a liaison frequency on 2 meters or 432 MHz where we set up the microwave contact before we make it. In some cases the talking on the liaison frequency reaches a point where it is not clear whether the contact was made on the microwave frequency or on 432 MHz.

Working stations

To the HF operator, once you have found a station there is a very high probability that you will work him. There are exceptions. The major problem is interference like that generated by a packet pileup — if the propagation does not favor you, you may not get through. Secondly your station may not be good enough or you may not be a good enough operator. In those cases you need to improve your station or your operating capabilities — not complain that you could have made the contact if you had scheduled it. Or perhaps you are deliberately competing as a low power station and you are just not loud enough to be heard or get through the pileup. Anyone who has operated low power knows the frustration of calling a loud station and having him call CQ in your face. Finally, the operator at the other end may be very poor. There is nothing you can do about that.

The VHF operator believes all of contesting is actually working the stations that are found. For reasons I don't understand this is considered a major feat. There is a law of reciprocity. If you hear someone running the same power as you 20 dB above the noise, he will hear you, 20 dB above the noise if his noise level is comparable to yours. Yes, there are exceptions. Maybe his noise level is 20 dB greater than yours. Maybe he has a receiver with very poor strong signal handling capabilities and he has a neighbor 3 miles away desensing his receiver by more than 20 dB, or there is interference at his location that you cannot hear. Maybe his receiver has a 20 dB noise figure. Or maybe he is just a bad operator.

You cannot do anything about any of these except improve your station and that may not help. And for at least some of us it is physically impossible to improve our stations much more than we already are. We are already running maximum legal power and we don't have the space to improve our antennas or the resources to move to a nearby mountaintop. I rarely encounter anyone who thinks he could work more stations by improving his station or his operating, although that is the *first* thing you should think about.

I do believe that I am missing something here. While I do not work everyone I hear, I understand why that is so and I don't think I miss many more on VHF than I do on HF — and for the reasons I have stated above. Most VHF contesters would disagree with my thinking. So working people on VHF must be more difficult than I think.

Solutions

Part of the need for assistance in finding stations is a feature of the modes used in VHF contesting. As previously noted, digital meteor scatter essentially requires knowing the frequency of the station on the other end (but not his call which the software will decode for you) and digital EME is a lot easier if you use both self-spotting and EME chat nets. Some of this is a basic incompatibility between digital and analog modes (CW is considered analog for purposes of this comparison). In no other type of contesting is, for example, RTTY mixed with CW. Because VHF signals at greater distances tend to be very weak, digital modes have become very popular.

One possibility is to create an assisted single operator class. These operators would be able to use passive assistance — posting and reading packet spots. These would serve two functions: stations within range on 2 meters and above in odd directions could readily be found; and band openings, primarily on 6 meters, would not be missed. Again it is surprising that this class does not exist in VHF contesting. For those who want to find everything by themselves, they remain unassisted single operators. For the rest, they have the option of looking at the packet spots. But this does not mean making real time schedules on chat nets or self-spotting.

On balance this is a discussion that has no end. You have to find people to work them. It's how you do the former that influences our thinking.

ON THE BANDS

6 meter TEP/F2. It's back! Several interesting non-US contacts were noted from Central America/Caribbean to South America (XE3 to CE Mar 6 and CE to TI Mar 10). Steve, VK3SIX, (QF12) worked DU7/PAØHIP in amongst many JAs on the 13th. Transatlantic F2 was reported from EA8 to 9Z4 on the 20th and to HC8 on the 21st (tnx NØJK).

The first transequatorial propagation (TEP) of Cycle 24 to the US was reported by several stations. March 20 KS7DX (DM26 ex-W7/VE3CDX) heard CE3AA/B and worked LU8WAG (tnx NØJK, K7XC). Terry, K4RX (EM70) worked CX5CR and 4 LUs. W4DR (EL86) worked an LU (tnx W4SO). Graham, KE4WBO (EL96) reports CE musica on Mar 18, 19, 20, 28, 29 and that radiosondes indicated a very high fof2 MUF along the dip-equator on the 20th. The prize for the farthest north US station goes to Bob, K6QXY (CM88) who worked CE3SX on Mar 22 via TEP/E_s; XE2HWB was in strongly at the time. On Mar 31 CE3SX worked into EL96 and EM50.

6 meter E_s. An unusual amount of off season E-skip continued this March. Ed, VP9GE (FM72) reports contacts into the Midwest from FN03 to EN50 on Mar 3 (tnx NØJK). On Mar 5 FL was into TX. On Mar 9 the Midwest from KS to WI was into FL and Jon, NØJK (EM17 mobile) worked into LA. On the 10th W9 worked into XE and NM worked AL. On Mar 22 AZ, KS and the Gulf coast were working into northern Mexico. March is normally a very poor E_s month so we will wait to see what relationship this has, if any, to the summer season.

Tropospheric ducting. John, W5UWB (EL17) enjoyed the initial instance of transgulf propagation in 2010 the morning of Mar 27 with

numerous Qs with Florida on 2 meters, EL86 on 222 and EL95 and 98 on 432. He had no luck on 1296. The opening appeared to end by 2330Z. Meanwhile Jim, K5YC (DM82 NM) worked into EM12 around the same time. Dan K3ZXL (EL87) reports working John on Mar 27. Since DXSherlock (**www.vhfdx.net/spots/map.php**) reports contacts between FL and EM00 in TX, west of EM12, a contact could have been supported between NM and FL on the 27th. While this is theoretically possible I have never seen a tropo contact reported between NM and FL. K3ZXL worked EL09 and W5UWB worked several FL stations on Mar 31.

EME. KP4AO, the Echoes of Apollo operation using the Arecibo 305 meter dish, was worked during a short testing period on Mar 22 around 22-23Z on 432.044/45. Given the huge amount of gain this antenna has, modest equipment like satellite stations should be able to work EME. More details next month on the results of this exciting operation. Lance, W7GJ, sends some results from the 8Q7QQ Maldives Island EME DXpedition. Five stations have made it on 6 meters: W7GJ, W1JJ, K6MYC, OH2BC, OH6BIC and at least 150 stations on 2 meters. Al, K2UYH, reports the first ever SSTV EME contact between PI9CAM and HB9Q on 23 cm during the February activity weekend. Finally, Greg, N8CJK (EN84), a small EME station using 800 W and a single 6M5X Yagi, worked 6 meter initial #10 OK1RD (OK1WD was running 1.5 kW and four 7 el Yagis).

HERE AND THERE

June ARRL VHF QSO Party. Usually the most exciting of the VHF contests and the most interesting to 6 meter newcomers, this year's June VHF QSO Party runs from 1800Z June 12 to 0300Z June 14. Lots of E_s can be expected. Details are in May 2010 *QST* or at **www.arrl.org/contests/rules/2010/june-vhf.html**.

BILL SIMPSON, N5YA

Figure 1 — The view from the DL88 site to the northeast. K5QE's intrepid group of Gridpeditioners moves from the mosquitoes in the swamplands of the Mississippi delta last year to the banditos of the Texas badlands this year.

FM Simplex Challenge. The KA2LIM Contest Group in FN12 is sponsoring a contest within the June VHF QSO Party for FM stations in NY and PA. The object is to work as many FM stations on 146, 223 and 440 MHz as possible between 3 and 4 PM and 7 and 8 PM local time June 12 and 13. See **www.ka2lim.com** for more details.

2010 SMIRK QSO Party. The Six Meter International Radio Klub (SMIRK) sponsors this 6 meter only contest, which starts 0000Z June 19 and ends 2400Z June 20. All 6 meter stations are welcomed. The exchange is grid square and SMIRK number (if you have one). Full details are at **www.smirk.org**.

DL88 Gridpedition. The group that gave us EL58 heads to the Texas badlands this year (see Figure 1). Marshall, K5QE; Bill, K5YG; Danny, N5OMG; Bill, N5YA, and Bob, WN2E, will operate DL88 from Jun 29 to Jul 1 and N5YA and K5QE will activate DL89 on Jul 2. They will have a 300 W TE brick and a small beam and will be operating mobile to and from those locations. QSL via W5TFW.

VQ5M Turks and Caicos Islands. Jim, WB2REM, and Glenn, KD2JA, will use the special call VQ5M from Providenciales Island (FL31vs) from June 11-13, during the ARRL June VHF Contest. QSL via KD2JA.

ON4KST Region 2 V/UHF Page. Alain Stievenart, ON4KST, has added a new Region 2 V/UHF page, to complement the earlier addition of a 50 MHz Region 2 chat (**www.on4kst.info/chat/login.php?band=8**). Posted as 144/432 Region 2 chat, it actually covers 144/222/432 with microwave users welcome. Register and log in. This should be fun. QST

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 accreditation. 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 contributions 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 are not a VE, become one! See **www.arrl.org/become-an-arrl-ve**.

Examiner Call	*Sessions*	*Accreditation Date*
Sammy Neal, N5AF	497	20-Nov-84
Harry Nordman, ABØSX	402	09-Jan-02
Royal Metzger, K6VIP	368	29-Apr-85
Karen Schultz, KAØCDN	349	06-Sep-84
Glenn Schultz, WØIJR	339	28-Sep-84
Kevin Naumann, NØWDG	332	17-Nov-02
Franz Laugermann, K3FL	330	01-Dec-91
David Bartholomew, ABØTO	313	22-Mar-02
Paul Maytan, AC2T	311	06-Sep-84
John Mackey, Jr, KSØF	309	01-Oct-90
John Moore, III, KK5NU	308	21-May-95
Victor Madera, KP4PQ	297	01-Mar-92
David Laurel, KA6RHF	287	22-Apr-85

Examiner Call	*Sessions*	*Accreditation Date*
John Hauner, KØIH	283	11-Jan-85
Gerald Grant, WB5R	280	04-Jan-85
David Fanelli, KB5PGY	278	01-Oct-91
Daniel Calabrese, AA2HX	276	01-Nov-91
Gary Mangels, AD6CD	271	30-Jul-97
Michael Faucheaux, N5KBW	268	15-Jul-96
Frankie Mangels, AD6DC	267	14-Oct-97
Scott Swanson, K6PYP	265	01-Dec-92
Leslie Dale, NI5S	263	06-Sep-84
Robert Hamilton, NØRN	262	19-May-87
Ralph Schutte, N6NAD	260	22-Aug-97
Roy Johnson, N1IKM	260	24-Jul-95
William Martin, AIØD	260	01-Nov-84

AMATEUR RADIO WORLD

IARU REGION 2 ASSISTS MEMBER-SOCIETY TO REPAIR EARTHQUAKE DAMAGE

In February, Chile suffered a severe earthquake that registered 8.8 on the Richter scale. The headquarters station for the Chilean Member-Society — Radio Club de Chile (RCCH) in Santiago — suffered major damage to its building and its antenna system. RCCH asked the Region 2 Executive Committee for monetary assistance from the Region 2 Relief Fund and the R2 EC agreed to assist the society with funds to help repair its HQ building and antenna system. "This is an excellent example of the IARU stepping in to help one of its Member-Societies in a time of need," said IARU Secretary Rod Stafford, W6ROD.

At the 2007 Triennial IARU Region 2 Conference, the General Assembly established a Region 2 Relief Fund. Like many other areas around the world, portions of R2 are situated in areas that are subject to numerous hurricanes, severe storms, floods, earthquakes and other types of natural disasters. During some of these natural disasters, Region 2 national Amateur Radio societies have suffered severe or extreme damage to their Society stations and buildings, including antenna systems. The Societies in Region 2 felt there was a need for a process of collecting donations and distributing donations to Region 2 Member-Societies that have suffered damage to their national Society stations or buildings that are due to natural disaster.

The resolution passed unanimously by the Region societies at the conference directed that funds accumulated in the Region 2 Relief Fund shall be distributed by the R2 Executive Committee solely to assist Region 2 Member-Societies for repairing or rebuilding stations and buildings, including antenna systems, because of damages resulting from natural disasters. Member-Societies that receive funds from the Region 2 Relief Fund must provide a report with the R2 Executive Committee detailing for the use of such funds.

WIRELESS INSTITUTE OF AUSTRALIA CELEBRATES 100 YEARS OF ORGANIZED AMATEUR RADIO

In 2010, the Wireless Institute of Australia (WIA) — the oldest national Amateur Radio society — celebrates its 100th anniversary. On March 11, 1910, the WIA had its beginnings when a group of wireless pioneers gathered at the Hotel Australia in Sydney. These early hams wanted to protect their interests and rights against what they considered to be harsh treatment by authorities — and a high license fee. The chairman of the founding meeting, George Taylor, proposed "the formation of an institution amongst experimenters and enthusiasts in wireless for their mutual benefit. A similar organization was formed in Melbourne — the Amateur Wireless Society of Victoria — on November 30, 1911 at a meeting attended by 50 enthusiasts. In 1913, it changed its name to the Wireless Institute of Victoria and then became the Wireless Institute of Australia, Victorian Division. Then followed The Wireless Institute of Queensland (formed in 1912) and the West Australian Radio Club (formed in 1913) became the Wireless Institute of Australia, Western Australia Section.

WIA President Michael Owen, VK3KI, said he would like the worldwide Amateur Radio community to join in the celebration. In May, WIA used a special call sign — VK1ØØWIA. Beginning in June and going through October, this special call sign will be used by WIA's many affiliated clubs around Australia. A commemorative QSL card will be issued for contacts with VK1ØØWIA between May and October. A limited edition operating award, the WIA Centenary Award, will also be available; two contacts with VK1ØØWIA are required to receive this award. Find out more information at **www.wia.org/au**.

IARU MEMBER-SOCIETY NEWS

■ The IARU welcomes a new Member-Society to its ranks: Union des Radioamateurs du Congo (URAC) in the Republic of Congo. This country (whose capital is Brazzaville) is not to be confused with the Democratic Republic of the Congo (whose capital is Kinshasa); that country's amateurs are already represented in the IARU by the Association des Radio Amateurs du Congo (ARAC). The Republic of the Congo was formerly a part of French Equatorial Africa and became independent in 1960. Its ITU-allocated call sign prefix is TN.

URAC was formed in Brazzaville on October 8, 2008. Its officers are President Mao Monguimet, TN5MM; Secretary General Ulysse Yinda, and Treasurer Chynauldat Bangue. The URAC lists 15 members on its roster, including three licensed radio amateurs.

■ An application for IARU membership has been received via IARU Region 1 from the Montenegrin Amateur Radio Pool (MARP). The application has been examined by the Region 1 Executive Committee and has been found to satisfy the requirements of the Constitution and Bylaws of the IARU. Based in Bar, Montenegro, MARP was formally organized on October 5, 2008. Its officers are President Ranko Boca, 4O3A, and Secretary Dragan Djordjevic, 4O4A. There are 31 licensed members of the Society, out of a total amateur population of 41.

The IARU Region 1 Executive Committee examined MARP's application and found it to be in order. Voting on the admission of MARP by the IARU Member-Societies is underway until August 17.

■ At the request of the Region 2 Executive Committee, the IARU Administrative Council reinstated the Radio Club of Paraguay (RCP) to full IARU membership status. Region 2 had previously requested that the Council place the rights of the Radio Club of Paraguay temporarily in abeyance on the grounds of having failed to meet their financial obligations.

■ At the IARU Administrative Council meeting in October 2009, delegates adopted a procedure to deal with the situation of non-existent or non-functioning Member-Societies. Under this newly adopted procedure, if the IARU regional organization determines that there is no evidence of the continued existence of the society for a period of five years, the regional organization may request that the Administrative Council publish a notice in the IARU *Calendar* its belief that the society has ceased to exist and call for the submission of any evidence to the contrary within 180 days of such publication. If no evidence of the continued existence is presented to the AC within the 180 day period, then that Member-Society shall be deemed to no longer exist. After that, if there is an amateur organization within the country that believes it can perform the duties of an IARU Member-Society, then it can apply for IARU membership. Three IARU Member-Societies in Region 3 appear to fall within this category of non-existent or non-functioning societies: Papua New Guinea (PNGARS), French Polynesia (CORA) and Burma (BARTS). The deadline for submission of evidence to the contrary is September 13. QST

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

K2TQN

VINTAGE RADIO

Early Factory-Built Transmitters

Last month I featured my 1937 Lafayette Trutest "25 W Jr" transmitter. Further digging into Lafayette catalogs revealed a 1938 big brother. This is the model 5B40P, a 3-unit, 40 W, 5 band phone and CW transmitter. The complete transmitter with cabinet and one coil set, but less tubes, was $142.50. A tube kit consisting of a 6C5, 6L6, 2-6L6-Gs, 2-6N7s, 6J7, 2-83s and the Raytheon RK37, less the 913 tube was an additional $16.71. The RCA 913 tube was an additional $5. Additional coil sets were $3.95 for each band.

The shipping weight was 125 pounds to give you an idea how big it is. The catalog didn't give the dimensions of the cabinet, but it appears to be 19 inches wide, by about 27 inches tall and 13 inches deep.

Because each unit, the transmitter ($71.50), modulator ($40.95) and antenna coupling panel ($27.75) were available separately, the amateur could buy them one at a time and assemble the pieces as his money became available. A single panel sized cabinet was also available for $5.17, if only one unit was wanted. Two and three panel sized cabinets were also available.

Lafayette specifications state that it covers the 10, 20, 40, 80 and 160 meter bands. The transmitter portion incorporates the "Les-Tet" harmonic oscillator using a 6C5 and 6L6, which drive an RK-37 final amplifier. The modulator uses a 6J7 driving 2-6N7s to 2-6L6s.

The modulator also utilized the newly designed 913 oscillograph tube, as a built-in oscilloscope for monitoring the modulated RF. (See my column in the August 2009 *QST* for more on this tube.)

Lafayette advertised that it is built on the "Add-A-Unit" principle. The amateur can start with the RF unit only. The modulator can be added later to make the rig suitable for both CW and phone. Each unit contained its own power supply, keeping it simple. The antenna panel could be added at any time. All the panels and cabinet were painted in a grey wrinkle finish making it a nice looking unit.

Lafayette 5B40P transmitter catalog page description.

The catalog page for the three big TEMCO transmitters.

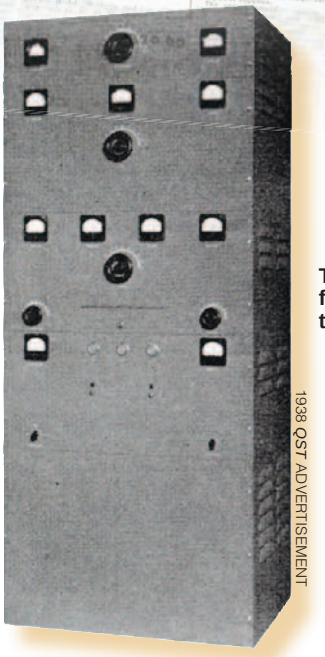
TEMCO, Heavy Iron

Also in the same 1938 catalog there were three different transmitters offered from the Transmitter Engineering Manufacturing Company, TEMCO. For sale were 100 W, 350 W and 600 W transmitters covering 10-200 meters. Also a 1000 W transmitter was offered, but you had to write for more information. They were priced $310, $765 and $1525 respectively. The 1000 W transmitter wasn't priced.

Their weights were 275 pounds, 650 pounds and 1100 pounds, with no weight given for the 1000 W transmitter.

Fit for a King

In the March 1938 *QST* TEMCO advertised their 1 kW transmitter. They said they recently shipped one "to an Oriental Potentate," and continued, "To its new owner this transmitter was symbolic — a transmitter for his personal use which was worthy of his station."



The Fit for a King transmitter.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

TEMCO also built radios for broadcast stations, the Boston Police and many other municipal police departments throughout the world.

National Youth Administration

Just before World War II, TEMCO came out with a real beauty, which I have factory photos of. This one was a kit radio, the TEMCO 100-A NYA kit. A three-panel set. The bottom unit is the high voltage and C-bias supply. Just above that was the speech amplifier-modulator unit. The top unit is the RF exciter and low voltage supply. From the interior photo you can see the neat layout of parts. Also, you may notice it is not wired yet.

The limited information which came with the photographs (marked 1941) says the transmitter is a "radio telephone and telegraph transmitter for operation over the frequency range of 1500 to 30,000 KC, supplied in kit form especially for NYA use."

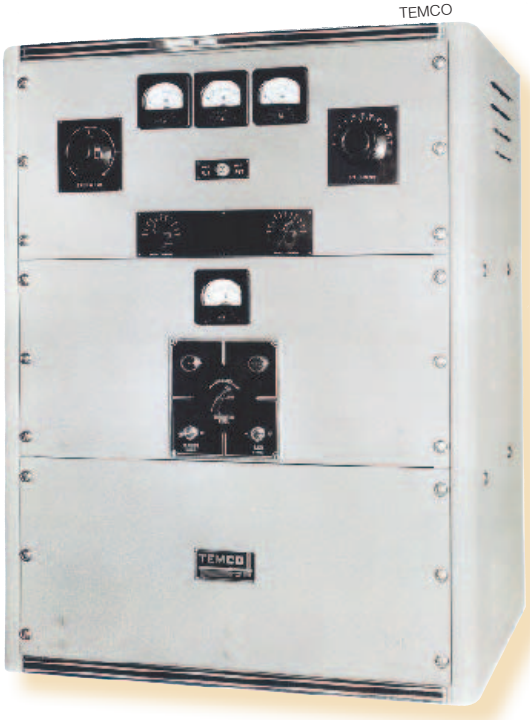
The National Youth Administration (NYA) was part of President Roosevelt's Works Progress Administration (WPA) program instituted during the Great Depression to provide jobs for public projects.

On November 19, 1941 Eleanor Roosevelt said in her "My Day" newspaper column, in part, "Yesterday afternoon, I went to the NYA resident center in Greenville, N. C., and was tremendously proud of what these North Carolina boys had achieved, for they built all of their own buildings! They have some excellent shops in wood-working, sheet metal work, radio, photography, etc.

"Much of their work is, of course, done for the Army, because the training in every NYA resident project is with a view of making these young men valuable in defense industries as quickly as possible."

So you can see that these very lucky youths in 1941 had a wonderful opportunity to learn and build some really nice radios, and at the same time contribute to the (then future) war effort.

TEMCO



A photo of the TEMCO 100-A NYA kit that was used by the National Youth Authority, a program of the WPA during the Great Depression.

TEMCO

Inside the TEMCO 100-A NYA kit, from the left: RF exciter with low voltage power supply, speech amplifier-modulator unit, high voltage and C bias supply.

JOE CRO, N3IBX

Joe Cro's, N3IBX, RA-150 transmitter.

TEMCO-RA-150

Joe Cro, N3IBX, sent a photo of his 1947-48 transmitter. The RF tube lineup is a 6SJ7 crystal oscillator or a 6SJ7 VFO to a 6SJ7 buffer to a 6AG7 to the final. The modulator uses quad 6L6s in PP-Parallel to modulate the single Eimac 4-65A final. The knob on the left of the front panel is the VFO. On the left and behind the telephone is the remote transmit-receive control panel.

After the War TEMCO continued to build large heavy transmitters for ham radio and commercial purposes. Every one I have seen advertised in *QST* is larger than most other comparable sets of the same power. They obviously believed in bigger is better. Based on the photos I have seen and the specifications advertised, any ham with enough room would be lucky to own one of these vintage behemoths.

Antique Wireless Association News

The annual AWA Conference is being held at the RIT Conference Center, 5257 West Henrietta Rd in Henrietta, NY. Starting at noon Tuesday, August 17, the Conference runs until Saturday, August 21. The conference promises to be bigger and better than last year.

Outside: It features a growing hamfest-like flea market with tailgating, plus an area under a huge tent. **Inside**: A major estate auction of an SK member's collection, an old equipment contest and interesting forums and presentations by some major collectors. Visit the Conference Web site **www. awaconference.org** for the latest information and online registration.

I would like to find a few photos of hams with their TEMCO transmitters. You can e-mail them to me at the address below. Also, please let me know if you use it on the air and how it works for you. If I receive any, I'll post them on my Web page, **www.k2tqn.com**. — *K2TQN*

OP-ED

Listen — For the Good of the Hobby

Dave Cox, NB5N

One of the most important techniques that I encourage my students to adopt when teaching them good operating practices is the "art" of listening. Anyone who has studied Amateur Radio has learned about the many benefits of listening. We have all been told to listen before transmitting to make sure that the frequency is not in use. This means listening for both sides of a conversation. Due to the variations in radio signal propagation, it's not always possible to hear both sides of a contact. But there are many more reasons that listening is important and we'll explore just a few.

Different Contacts Require Different Types of Listening

Once you have established contact and entered into your conversation, proper listening techniques are no longer important — or are they? Depending on the nature of your contact, careful listening may be crucial to achieving the goals of your contact. If you are simply ragchewing with a buddy, critical listening, while encouraged, is not that important. But if you are engaged in a net operation, handling traffic, contesting or just trying to snag that rare DX station, careful listening is absolutely critical.

The benefits of listening to net operations and traffic handling go without saying. Proper procedures and protocols for those activities are covered in the *ARRL Operating Manual* and various other publications available through the ARRL or on the Web. As for the other, less formal, aspects of the hobby, the following tips will hopefully result in more enjoyable and more productive exchanges.

Weekends are quite often the best time to add contacts to your log, but it's also the time when most contests are waged. If you are scanning the airwaves looking for contact opportunities, listen to make sure that the person you are preparing to call is interested in a casual contact and not engaged in the heat of battle.

If he is pouncing for points but you really need his state, then you will have to become a contester yourself. Listen to a few contacts to determine the proper contest exchange and use it — the other guy will insist on a proper exchange. He'll need it to receive credit for the contact; otherwise he has wasted his valuable time. Even if you are not interested in participating in the contest, follow the contest rules for the contact. If sequential numbering of contacts is being used, your sequence number will be 001 for the first contact, increasing for any others.

A Case of Two Frequencies

If your interest is in DXing, productive listening becomes a bit more of a challenge. Opportunities to snag that rare DX station that you so desperately need in your log may be rare. You must be patient and listen to improve your chances of making the contact and lessen your chances of embarrassment. The main reason is that many foreign stations operate "split" as a method of managing pileups.

Basically, operating split is when DX stations transmit on a frequency different than their receive frequency. If this is the technique being used by your rare DX, you will need to determine where he is "listening." The operator will usually say something like "up 5" or "down 5 to 10" to steer listeners to his receive frequency and he may also list his split on a DX cluster. With a little practice, you will learn to switch quickly back and forth between transmit and receive frequencies listening to the DX station and for the station he is in contact with. Once you have mastered this skill, your contact percentages will increase dramatically.

A common mistake that novice DXers make is to call a DX station operating split on their transmit frequency. Not only will he not hear you, but you may incite the fury of others who are trying desperately to hear him and provoke demeaning characterizations of your inadequate radio skills. Your first clue of this will be comments such as "Pay attention — He's operating split!"

Listening is important for everyone, since DX operators may occasionally switch between split and nonsplit operation. Once a DX station I was listening to switched to nonsplit after operating "down 5" for a while, so I called him on his transmit frequency. A self-appointed frequency cop, who obviously was not listening, told me the station was operating split. I informed the intruder otherwise and continued to call the DX station on his transmit frequency. I eventually made the contact, but not without two or three rude comments from the self-styled vigilante. After the DX station acknowledged my call attempt, the intruder apologized.

Whether you spend your operating time contesting, DXing, ragchewing or in other facets of the hobby, you can make your time much more productive if you practice a few simple listening techniques. Your contest scores and DX country count will go up, your missteps will go down and you will spend less time aimlessly loading up the airwaves with unproductive chatter.

Dave Cox, NB5N, an Extra class licensee and ARRL Life Member, has served in various offices with local Amateur Radio clubs in the Tulsa area and has held several ARRL section level appointments including Oklahoma Section Manager in the early 1980s. His amateur interests are many but his time is spent primarily in emergency communications and DXing. He is a Volunteer Examiner and enjoys teaching new hams about the hobby. You may contact him at **nb5n@arrl.net**.

Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions may be up to 900 words in length.

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111 or via e-mail to **qst@arrl.org** (subject line Op-Ed).

WB8IMY

ECLECTIC TECHNOLOGY

Wireless Power

File this item under "Tesla Could Have Told You So."

Hams have known for many decades what pioneers like Nikola Tesla first discovered: the fact that power can be transmitted wirelessly. After all, what is a radio signal but wireless transmission of power? Tesla took the concept to the limit, setting up power transmission experiments and patenting his techniques. He envisioned a wireless energy transmission system that would interconnect traditional wired power networks on a global scale. His approach turned out to be impractical, but his vision is no less viable.

RCA

RCA's Airnergy charges an internal battery by harvesting power from WiFi hotspots.

The *Edison* software by Verdiem lets you manage the power consumption of your station computer while showing you how much money you're saving.

Fast forward 100 years and you find that Tesla's ideas keep turning up. At the Consumer Electronics show in Las Vegas a few months ago, RCA unveiled its "Airnergy" device that converts ordinary network WiFi signals to dc power to charge its own internal lithium battery. According to RCA, you'd place the Airnergy unit in a WiFi hotspot and it would charge its battery over a period of several hours, depending on the strength of the WiFi signal, of course. When you need to recharge your cell phone or other device, you plug the Airnergy battery into the phone via USB to transfer the charge.

Harvesting electricity from signals in the air is not new, as anyone who ever built a crystal radio can testify, but until now no device has been able to harvest enough electricity to make it of practical use. In most modern cities WiFi signal hotspots abound, which might make the Airnergy device a reasonable option.

An Airnergy USB charger costing around $40, and about the size of a phone, is expected to be released later this year, with a WiFi-harvesting battery around the same size and price available shortly after.

Hungry Station PCs

As long as we're on the subject of power, I stumbled across an interesting bit of free *Windows* software that adds a new wrinkle to your ability to manage your computer power usage.

Some amateurs leave their station computers turned on around the clock. Others, like me, switch them on in the morning and off before bedtime. (No, I won't debate the wear and tear that daily on/off switching allegedly inflicts on a computer. That's a topic for another column.) Most of you know that *Windows* provides various power schemes that do such things as turn off your monitor after a certain amount of time has elapsed with no activity. The new *Edison* software by Verdiem does this as well, but it allows you to set up a highly flexible schedule with, let's say, more aggressive power savings in the daytime when you're less likely to use your station computer and more lax settings at night. Most intriguing of all, you can plug in the kilowatt-hour rate your utility charges for electricity and *Edison* will calculate how much you're saving by managing the power-hungry urges of your station PC. You'll find *Edison* at **www.verdiem.com/edison.aspx**.

Quantum Transistors?

For the first time, physicists have convincingly demonstrated that physically separated particles in solid-state devices can be quantum-mechanically *entangled*. This is similar to the quantum entanglement of light, except that it involves particles in circuitry instead of photons in optical systems. The experiment was reported late last year in *Physical Review Letters*.

If you're unfamiliar with quantum entanglement, prepare yourself for a truly mind-bending concept. In optical experiments, a pair of entangled photons may be separated via a beam splitter. Despite their physical separation, the entangled photons continue to act as a single quantum object. What happens to one happens to the other, *instantly*, regardless of the distance. The photons could be at opposite sides of a room or separated by thousands of light years. The result is the same.

A team of physicists from France, Germany and Spain performed a solid-state entanglement experiment that used electrons in a superconductor in place of photons in an optical system. As conventional superconductors are cooled, the electrons they conduct entangle to form what are known as *Cooper pairs*. In the new experiment, Cooper pairs flowed through a superconducting bridge until they reached a carbon nanotube that acted as the electronic equivalent of a beam splitter. Occasionally, the electrons part ways, but remain entangled. This opens the possibility of exploiting the entanglement as a means to control the state of electrons in solid material in ways (and at speeds) that are almost unimaginable.

Taken to the ultimate conclusion, you could theoretically end up with transistors that would have unlimited on/off switching speeds. Make a change to an electron at one point and the same change occurs instantly to its partner at the other point. The devices that could be built with such components would be the stuff of science fiction.

Of course, we're a long way from seeing quantum transistors in a parts catalog, but this experiment is an important first step.

QST

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

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

Alabama (Fort Payne) — Jun 12-13
D F H R T V
8 AM-1 PM. *Spr:* DeKalb County ARC. VFW Fairgrounds, 18th St NE. *TI:* 147.27 (100 Hz). *Adm:* $5/vendor; $5/carload. Tables: $5. Clay Patrie, KG4OZW, 6101-B Mitchell Rd NE, Fort Payne, AL 35967; 256-845-5444; **fortpaynehamfest@yahoo.com**; **w4gbr.org**.

California (Sacramento) — May 23 F H R
7 AM-noon. *Spr:* North Hills RC. Natomas High School, 3301 Fong Ranch Rd. *TI:* 145.19, 224.4 (both 162.2 Hz). *Adm:* Free. Tables: $20. Les Cobb, W6TEE, 4114 Horgan Way, Sacramento, CA 95821; 916-481-6040 (phone and fax by arrangement only); **w6tee@qsl.net**; **www.k6is.org**.

Connecticut (Newington) — Jun 19
D F H R S T V
8 AM-2 PM. *Spr:* Newington AR League. St Mary School, 625 Willard Ave. NARLFEST 2010. Hidden transmitter hunt. *TI:* 145.45 (127.3 Hz). *Adm:* $5, under 12 free. Tables: $10. Steve Ewald, WV1X, 436 Willard Ave, Newington, CT 06111-2352; 860-667-8199 (phone and fax); **wv1x@arrl.org**; **www.narlhamfest.org**.

Florida (Titusville) — Jun 19 D F H R T V
7 AM-2 PM. *Spr:* North Brevard ARC. Disabled American Veterans, 435 N Singleton Ave. *TI:* 147.33 (107.2 Hz). *Adm:* Free. Tables: $15. Bob Jones, N6USP, 4743 Cambridge Dr, Mims, FL 32754; 321-264-2622; fax 321-383-1864; **n6usp@bellsouth.net**; **www.northbrevardarc.org/tailgateparty2.htm**.

Idaho (Post Falls) — Jun 12 D F H R S T V
8 AM-3 PM. *Spr:* Kootenai ARS. American Legion Hall, 1138 E Poleline Ave. *TI:* 146.98 (100 Hz), 146.5. *Adm:* $4. Tables: $6. Allan Campbell, KE7DFT, 1803 N Idaho St, Post Falls, ID 83854; 877-877-0040; **agcamp@verizon.net**; **www.k7id.org**.

Illinois (Wheaton) — Jun 20 D F H R V
7 AM (gates open); 8 AM (buildings). *Spr:* Six Meter Club of Chicago. DuPage County Fairgrounds, 2015 Manchester Rd. 54th Annual Hamfest. *TI:* 146.97 (107.2 Hz), 146.52. *Adm:* advance $6, door $8. Tables: $15. Michael Huedepohl, WD9GJK, 3532 Raymond Ave, Brookfield, IL 60513; 708-485-5481 (6:30-8 PM CST); **wd9gjk@arrl.net**; **www.k9ona.com**.

Indiana (Indianapolis) — Jul 10 D F H R S T
6 AM-3 PM. *Spr:* Indianapolis Hamfest Assn. Camp Sertoma, 2316 S German Church Rd. *TI:* 146.76. *Adm:* advance $6, door $8. Tables: $15. Bob Blake, N9FIM, 11064 Indian Lake Blvd, Indianapolis, IN 46236; 317-261-6658; **bob9fim@att.net**; **www.indyhamfest.com**.

Massachusetts (Cambridge) — Jun 20. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Midland) — Jun 19
D F H R S T V
8 AM-noon. *Spr:* Midland ARC. Salvation Army Building, 330 Waldo Ave. *TI:* 147.0 *Adm:* $5. Tables: $5. Keith Johnson, KB8SOE, c/o Midland Hamfest, Box 1049, Midland, MI 48641; 989-488-4337; **kb8soe@arrl.net**; **www.w8kea.org**.

Coming ARRL Conventions

May 14-16
Dayton Hamvention®, Dayton, OH*

May 28-30
Rocky Mountain Division, Casper, WY*

June 4-6
Northwestern Division, Seaside, OR*

June 5
Georgia Section, Marietta*
Atlantic Division, Rochester, NY*

July 16-17
Arizona State, Williams

July 16-18
Montana State, Essex

July 23-24
Oklahoma Section, Oklahoma City

July 23-25
Central States VHF, St Louis, MO

August 6-7
Texas State, Austin

*See May *QST* for details.

Michigan (Monroe) — Jun 20 D F H R T
7:30 AM-1 PM. *Spr:* Monroe County Radio Communications Assn. Monroe County Fairgrounds, 3775 S Custer Rd. *TI:* 146.72. *Adm:* $6. Tables: $15. Fred VanDaele, KA8EBI, 4 Carl Dr, Monroe, MI 48162; 734-242-9487; fax 734-587-2250; **ka8ebi@yahoo.com**; **www.mcrca.org**.

New Hampshire (Rochester) — Jun 12
F H V
8 AM-2 PM. *Spr:* Great Bay Radio Assn. Rochester Community Center, 150 Wakefield St. Ham Radio and Electronics Auction. *TI:* 147.0 (100 Hz). *Adm:* Free. Tables: $10. Larry Inman, K1SRJ, 387 Salmon Falls Rd, Rochester, NH 03868; 603-335-4805; **printer238@yahoo.com**; **www.w1fz.org**.

New York (Chaffee) — Jun 12 D F H R T
8 AM-noon. *Spr:* Pioneer Radio Operators Society. Manion Park, 9990 Grove St. *TI:* 145.39. *Adm:* $5. Tables: 1 table with paid admission. Gary Tillinghast, KB2YAA, 180 Elm St, Springville, NY 14141; 716-592-9554; **kb2yaa@arrl.net**; **pioneerradiooperatorssociety.bravehost.com**.

New York (Cortland) — Jun 12 D F H R T V
7 AM-1 PM. *Spr:* Skyline ARC. Cortland County Fairgrounds, Fairgrounds Dr. *TI:* 147.18. *Adm:* advance $4, door $5. Tables: $10. Andrew Slaugh, KB2LUV, Box 5242, Cortland, NY 13045; 315-677-5242 (phone and fax); **k2iwr@arrl.net**; **www.skylineradioclub.org.**

New York (Queens) — Jun 13
D F H Q R T V
Set up 7:30 AM; public 9 AM-2 PM. *Spr:* Hall of Science ARC. New York Hall of Science Parking Lot, 47-01 111th St (Flushing Meadow Corona Park). Drop and Shop, free admission to museum from 10-11 AM or $6 after 11 AM with hamfest ticket, tune-up clinic. *TI:* 444.2, 145.27 (both 136.5 Hz). *Adm:* buyers $5, sellers $10. Stephen Greenbaum, WB2KDG, 85-10 34th Ave, Apt 323, Jackson Heights, NY 11372; 718-898-5599; **wb2kdg@arrl.net**; **www.hosarc.org**.

North Carolina (Kinston) — Jun 19
D F H R T V
8 AM-3 PM. *Spr:* Down East Hamfest Assn. Lenoir Community College Gymnasium, 231 Hwy 58 S. 20th Annual Hamfest, Friday eve welcome dinner for vendors, overnight camping available. *TI:* 146.685 (88.5 Hz). *Adm:* advance $4 each or 3 for $10; at the door $5 each or 3 for $12. Tables: $10 ($5 additional for electricity). Jean DuPree, KB4OHX, Box 1778, Kinston, NC 28503; 252-523-2703; **jeanhd@embarqmail.com**; **www.downeasthamfest.org**.

North Carolina (Salisbury) — Jul 10 F R T V
8 AM-3 PM. *Spr:* Rowan ARS. Salisbury Civic Center, 315 Martin Luther King Jr Ave S. Homebrew Contest. *TI:* 145.41 (136.5 Hz). *Adm:* advance $4, door $5. Tables: $5. Ralph Brown, WB4AQK, 1621 Emerald St, Salisbury, NC 28144; 704-636-5902; **rkbrown5902@bellsouth.net**; **www.rowanars.org**.

North Carolina (Winston-Salem) — Jun 12
F R T
6:30 AM-noon (outside); 8 AM-noon (inside). *Spr:* Forsyth ARC. Dixie Classic Fairgrounds, 421 W 27th St. *TI:* 146.64, 145.47 (both 100 Hz). *Adm:* $5. Tables: $15 (power $25). Ray D'Eau, W4NC, Box 11361, Winston-Salem, NC 27116-1361; 336-245-5740; **hamfest@w4nc.org**; **www.w4nc.com**.

Ohio (Milford) — Jun 19 D F H R S T V
Set up 6 AM; public 8 AM-2 PM. *Spr:* Milford ARC. Eastside Christian Church, 5874 Montclair Blvd. 20th Annual Hamfest. *TI:* 147.345. *Adm:* $5. Tables: $5. Jim Linn, WB8RRR, 5110 Romohr Rd, Cincinnati, OH 45244; 513-831-6255; fax 513-528-7270; **wb8rrr@arrl.net**; **www.w8mrc.com**.

Pennsylvania (Cleona/Lebanon) — Jun 19
D F H R S T V
Set up 6 AM; public 9 AM-dusk. *Sprs:* React of Schuylkill & Lebanon County and Appalachian AR Group. Cleona Park, 50 E Walnut St. *TI:* 147.315 (82.5 Hz). *Adm:* Free. Tables: $5. Joseph Ryan, KB3POC, 314 Tremont Rd, Pine Grove, PA 17963; 570-345-3586; **joeryankb3poc@verizon.net**; **kidsforkidsofpa.us/index.htm**.

Pennsylvania (Erie) — Jun 20. Dan Miller, K3UFG, 814-464-3664; **dmiller@erieredcross.org**; **www.erieredcross.org**.

Pennsylvania (Erie) — Jul 10 D H R T V
7 AM-noon. *Sprs:* Wattsburg Wireless and Union City Wireless Assns. Greene Township Municipal Bldg, 9333 Tate Rd. 9th Annual Hamfest. *TI:* 146.7 (186.2 Hz). *Adm:* advance

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

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

$4, door $5 (under 16 free). Tables: $5. Ron Rycek, KB3QBB, 1412 Grant Ave, Erie, PA 16505; 814-833-6829 (phone and fax); **kb3qbb@arrl.net**; **www.nw-pa-hamfest.com**.

Pennsylvania (Lime Ridge) — Jun 12
D H R T V
7 AM-1 PM. *Spr:* Columbia-Montour ARC. Lime Ridge Community Center, 6405 4th St. 20th Annual Hamfest. *TI:* 147.225 (203.5 Hz). *Adm:* $5. Tables: $10. Dave Schack, WC3A, 6020 Fort Jenkins Ln, Bloomsburg, PA 17815; 570-752-6851; **drs352478@verizon.net**; **www.qsl.net/cm-arc/hamfest.htm**.

EASTERN PENNSYLVANIA SECTION CONVENTION

July 3, Marysville
D F H Q R S T
The Eastern Pennsylvania Section Convention ("Firecracker Hamfest"), sponsored by the Harrisburg Radio Amateur Club, will be held at the Marysville Lion's Club Park, 105 Park Dr. Doors are open for setup Friday 6-9 PM, Saturday 6 AM; public 8 AM. Features include 38th Annual Event, largest tailgate ($5 per space) and electronics flea market in central PA, 80 covered commercial tables, new and refurbished equipment dealers, seminars all morning, DXCC and WAS card checking, special event station W3W in operation, breakfast and lunch, handicapped accessible. Talk-in on 146.76 (100 Hz). Admission is $5 (nonham spouses and kids free). Tables are $12 each (before Jun 1), $15 (after Jun 1). Contact Terry Snyder, WB3BKN, Box 355, Halifax, PA 17032-0355; 717-979-9515 or 717-896-0256; **hracw3uu@gmail.com**; **hrac.tripod.com**.

YLISSB CONVENTION

June 17-20, Columbia, SC
H R S
The YLISSB Convention, sponsored by the YL International Single Sideband System, will be held at the Embassy Suites Columbia-Greystone, 200 Stoneridge Dr. Doors are open 8 AM-10 PM. Features include workshops, membership and board meetings (Saturday), hospitality suite, visit to Zoo and Botanical Gardens (Thursday, $7 per person), visit South Carolina State Museum (Friday, $2-$6), social (Friday, 7 PM), banquet (Saturday, 6 PM; $35), Sunday brunch (8-10 AM, $18). Admission is $18 in advance (by Jun 1), $25 (after Jun 1). Contact Rose Rybachek, KL7FQQ, Box 954, Newman Lake, WA 99025; 208-699-1236; **kl7fqq@yahoo.com**; **www.ylsystem.org**.

TENNESSEE STATE CONVENTION

June 12, Knoxville
D F H Q R S T V
The Tennessee State Convention, sponsored by the Radio Amateur Club of Knoxville, will be held at the Kerbela Temple, 315 Mimosa St. Doors are open for setup Friday 1-6 PM, Saturday 6:30 AM; public 8:30 AM-4 PM. Features include 44th Annual Knoxville Hamfest and Electronics Exposition, outside flea market ($5 per space plus admission; setup on Saturday only at 7 AM), inside dealers and clubs, forums, exhibits, demonstrations, on site VE sessions, handicapped accessible, breakfast and lunch. Talk-in on 53.77, 147.3, 224.5, 444.575. Admission is $7 (under 13 free). Tables are $20 (8-ft) before Jun 4; $25 after Jun 4. Contact David Bower, K4PZT, 512 Elkmont Rd, Knoxville, TN 37922; 865-631-7553; **d.bower@ieee.org**; **www.w4bbb.org**.

WEST GULF DIVISION CONVENTION

June 11-12, Plano, TX
D F H Q R S T V
The West Gulf Division Convention (Ham-Com 2010), co-sponsored by Ham-Com, Inc. and other supporting clubs, will be held at the Plano Centre, 2000 E Spring Creek Pkwy. Doors are open Friday and Saturday 7 AM-6 PM. Features include indoor and outdoor flea markets; tailgate market; commercial exhibitors; vendors; workshops, programs, and forums; Boy Scout "One-Day" Merit Badge Program; ARCs and SIG displays; VE sessions (Friday and Saturday); Lone Star DX Dinner (Friday, Jun 11, 6:30 PM at the Plano Centre Windhaven Room, $42); special guests including ARRL Marketing Manager Bob Inderbitzen, NQ1R and Gordon West, WB6NOA; handicapped accessible; overnight camping available. Talk-in on 147.18 (107.2 Hz). Admission is $8 in advance, $10 at the door. Tables are $40. Contact Barry Goldblatt, WA5KXX, Box 260721, Plano, TX 75026-0271; 972-596-4669; fax 972-596-5078; **wa5kxx@verizon.net**; **www.hamcom.org/**.

Texas (Texas City) — Jul 10 D F H R S T V
8 AM-3 PM. *Spr:* Tidelands ARS. Doyle Convention Center, 2010 5th Ave N. Left foot CW contest, hidden transmitter contest. *TI:* 147.14 (167.9 Hz), 442.025 (103.5 Hz). *Adm:* advance $4, door $5. Tables: $7. Joe Wileman, AA5OP, 1010 24th Ave N, Texas City, TX 77590; 409-945-6794; **aa5op@yahoo.com**; **www.tidelands.org**.

Vermont (Windsor) — Jun 19 F H R V
Sellers 9:30 AM; buyers 10 AM-2 PM. *Spr:* Connecticut Valley FM Assn. Windsor High School, 19 Ascutney St. *TI:* 146.76 (110.9 Hz). *Adm:* Free. Tables: Free (contributions welcomed but not necessary). Ray Makul, K1XV, Box 56, Weston, VT 05161; 802-875-4525; fax 802-875-4698; **k1xv@arrl.net**; **www.cvfma.org**.

Virginia (Manassas) — Jun 13
D F H R S T V
7 AM-5 PM. *Spr:* Ole Virginia Hams ARC. Prince William County Fairgrounds, 10624 Dumfries Rd. 36th Annual Hamfest. *TI:* 146.97. *Adm:* $7. Tables: $25. Bruce Bryant, AB8CI, 6276 Occoquan Forest Dr, Manassas, VA 20112; 248-953-0274 (phone and fax); **ab8ci@comcast.net**; **www.w4ovh.com**.

Washington (Dryden) — Jun 11-13 H R T V
Friday noon-Sunday late morning. *Spr:* Apple City ARC. Dryden Gun Club, 7653 Saunders Rd. Wenatchee Hamfest, bunny hunts. *TI:* 146.68 (156.7 Hz). *Adm:* $7. Tables: Free. Judy Chrisco, KA7ZNA, 1812 SE Soden St, E Wenatchee, WA 98802; 509-884-1251; **ka7zna@msn.com**; **www.qsl.net/w7td**.

Wisconsin (Racine) — Jun 5 D F H R S V
7 AM-1 PM. *Spr:* Racine County ARES. Volunteer Center of Racine County, 6216 Washington Ave. *TI:* 147.27 (127.3 Hz). *Adm:* Free. James Markstrom, KB9MMA, 1639 Stoddard Ln, Racine, WI 53406; 262-909-3996; **ec@rcares.org**; **www.rcares.org**.

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online, donated ARRL gift 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 **June 1** to be listed in the **August** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's Web site for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRLWeb* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**. QST

Strays

THE NATIONAL GUARD VISITS GEORGIA CLUB

♢In March, two members of the 420th Signal Company, 560th BFSB GAANG, 1LT George Allen and SSG Anthony Daniel, visited the monthly meeting of the Gwinnett ARS in Lawrenceville, Georgia. They spoke about Modern Military Communications to 50 members and visitors. Lt Allen brought with him a pair of AN/PRC-152 Type-1 Multiband Mutimission Radios to show the latest technology being deployed to National Guard units. At the conclusion of the meeting Certificates of Appreciation were given to Lt Allen and Sergeant Daniel and numerous club members stopped by to thank them for their service to our country.

COURTESY BILL CHEREPY, WB4WTN

From the left: Bill Cherepy, WB4WTN; SSG Daniel; 1LT Allen, and Kyle Albritton, W4KDA, president of the Gwinnett Amateur Radio Society.

75, 50 AND 25 YEARS AGO

June 1935

■ The cover photo is an artsy light-and-shadow shot of a piece of breadboard ham gear.

■ The editorial discusses the oft-heard complaint that the ham bands are too crowded to accomplish any useful work. The editor opines that we need to improve our equipment, especially our receivers, to make things workable in our crowded ham bands.

■ P. L. Spencer, W1GBE, and R. M. Purinton, W2ICU, present "A Complete 20-Watt 'Phone Operating on 110-Volt D.C. Mains."

■ Ross Hull gives us the results of his experimentation at 5 meters, in "Air-Mass Conditions and the Bending of Ultra-High Frequency Waves."

■ "A New 100-Watt Type Zero-Bias Transmitting Tube" provides excellent information on how we can use the new type 838 tube in A.F. and R.F. applications.

■ Floyd Vanderpoel, W1WR, describes "A Portable Receiver that Delivers the Goods."

■ Results of the A.R.R.L. Copying Bee are announced. Three operators had 100% copy of the test message — W5ESK, W6GAH, and W9AIN. This test was "tricky," including groups of letter/number combinations and even misspelled words!

■ This month's "Amateur Radio Stations" column salutes W3SI, the station of Charlie Myers in Harrisburg, Pennsylvania. W3SI features one complete transmitter and antenna for each band.

June 1960

■ The cover photo of a Jeep, outfitted as a radio communication center, salutes "A Century of U.S. Army Signals."

■ The editorial, "Switch to Safety," comments on the recent deaths of two "high-school juniors who were killed instantly while stringing up a long-wire antenna — over a power line."

■ Major Sidney Rexford, W2TBZ and Chief of Army MARS, reports on "100 Years of Army Signals," with the centennial to be celebrated on June 21.

■ Walter Stiles, K5ENB/W7NYO, tells about his simple but effective "I.F. Noise Limiter."

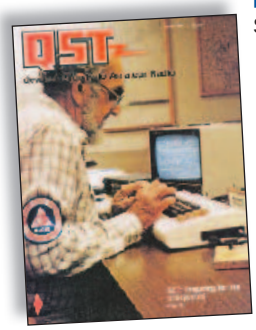
■ Lew McCoy, W1ICP, describes his latest band-switching transmitter for 50 and 144 Mc., in "The 'Tech' Special."

■ David Cabaniss, W1TUW, combines a surplus BC-696 transmitter with a BC-454 receiver, then adds a power supply and a slick homebrew T-R changeover system, to make "A Complete 80-Meter C.W. Station Using Surplus Units."

■ In "U.H.F. Coaxial S.W.R. Bridge," R. W. Burhans, W8FKC tells about his balanced bridge for 200 to 1300 Mc.

■ Gene Hubbell, W9ERU, tells us how to get on 80 meters by shunt feeding our towers, in "Feeding Grounded Towers as Radiators."

June 1985



■ The cover photo shows WD5JYE operating a station in last year's Simulated Emergency Test.

■ The editorial, "A Tale of Two Cities," compares two very different radio clubs — one is flourishing, while the other is dwindling. The editorial goes on to explain how to move your club from the latter category to the former.

■ Elmer Schwittek, K2LAF, and William Schwittek describe how to get "WEFAX Pictures on Your PC," so you can see satellite weather imagery first-hand.

■ "The Radio System Integrator," by Ki Negoro, WA6QJP, tells how the East Whittier Radio Club built a unit to provide a dual cross-band repeater unit to integrate 10 and 2 meter operation.

■ In Part 18 of the "First Steps in Radio" series, Doug DeMaw, W1FB, presents "Understanding FM Receivers."

■ Brian Edward, N2MF, discusses "Radial Systems for Ground-Mounted Vertical Antennas."

■ Mark Bacon, KZ9J, takes a new approach to an old idea, in "Designing a 2-Meter Portable Antenna."

■ Ed Lindberg, W2CIL, asks, "What Ever Happened to Esperanto?" (If you don't know what Esperanto is, you should look into that interesting linguistic concept.)

■ "How's DX?" by Ellen White, W1YL, looks into "Big-Time Low-Band DXing from Europe."

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

MARCH 2010

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program are at this Web page: **www.arrl.org/public-service-honor-roll**.

815
W7TVA
490
KØIBS
432
W4CAC
400
AK2Z
375
KB2FED
338
KT5SR
331
K2DYB
325
N2LTC
310
KA2ZNZ
NX8A
285
WB9FHP
WB8RCR
280
KA2TSC
261
KI4KWR
260
KT2D
254
KB2ETO
235
K7OAH
230
WB9YBI
K2HAT
222
W4LHQ
221
K4DND
216
W4AVD
212
WD8USA
200
WB9JSR
196
W7JSW
KØLQB
195
W5DY
NC4VA
194
K2ABX
192
WA2BSS
190
K8RDN
185
WD9FLJ
180
K2HJ
N1UMJ

W4AGA
175
KB2BAA
N7CM
170
WM2C
165
WB2KNS
K7EAJ
W4DNA
161
KC7ZZ
160
W5KAV
KC2SFU
KGØGG
157
W2DWR
155
NA9L
KE5HYW
153
W1PLW
150
K2GW
WB6OTS
146
WD8BCS
143
KF7CG
141
N4HUB
140
KK3F
WØLAW
138
KA8ZGY
137
K7BC
135
N9NVP
W3YVQ
N2GJ
132
N2DRB
130
K9LGU
K6JT
N2JBA
WB2FTX
K4IWW
W4FAL
KB8GT
125
NN7H
W7EKB
KB2RTZ
KB5PGY
N3RB
WB4GHU
122
N2YJZ
N1PYN

120
AC6C
KA4FZI
AG9G
K2UL
W8UL
W1GMF
KW1U
N1LKJ
117
W9WXN
115
K9EOH
N2GS
N7IE
KB1NMO
114
N2VC
KK7DEB
112
KK5NU
111
W7ELI
110
N7EIE
W7QM
N7BEC
AL7N
K5KV
KC5OZT
WI2G
K4GK
K1HEJ
N8IO
N7XG
N7YSS
N1IQI
K1YCQ
K2TV
W2EAG
K8VFZ
109
K2BRG
N8NMA
106
WA4UJC
KK1X
105
KCØM
KE4CB
KD1LE
W4TTO
101
WØSJS
WA4SHA
100
K4SCL
W7GHT
K5MC
AA3SB
WE2G
N1JX
K2AN
K4BEH
K4BG
WØCLS

NØMEA
WAØVKC
WG8Z
K3RC
N8OD
WB8SIQ
WB8VNV
N3SW
W3TWV
KS3Z
WB6UZX
W2DSX
KI4YV
W4KLB
N4ABM
N9MN
NR2F
W1SGC
WB8WKQ
98
KC5MMH
96
N8SY
95
W3CB
KA2EJD
W2KFV
AAØM
94
KI6RUW
93
KØBXF
91
KB9KEG
90
N9VC
NX9K
W9MBT
KB3LNM
K3IN
N3ZOC
WA2CUW
WA2NDA
N3KB
WB4BIK
W9WNE
KA1GWE
NIØI
N9AUG
WB8HHZ
WD8Q
W8DJG
N8DD
WD8DHC
W8CPG
N4MEH
K4MSG
K1JPG
K8KV
KA1EHR
NU8K
W3GQJ
88
W2CC
KJ7NO
NA7G
KI4JQB

86
K8DD
85
W5GKH
KB1NAL
KC2SYM
84
W7RRC
W7VSE
83
NS7K
W1PLK
81
N2DW
80
K7MQF
AD4BL
KB2CCD
N5EEO
WØADZ
KCØZDA
WA3EZN
KA3NZR
W4OTN
KJ4HGH
79
KE5PWL
WDØGUF
KC2OOA
78
K4DLF
77
KI4DHS
WB8OIF
76
W5ESE
W5XX
KC8WH
KD8CYK
73
KBØDTI
N2VQA
W8QZ
71
KK7TN
N2EB
70
K5GLS
KØDEU
NØDLK
NØDUW
NØDUX
NUØF
KAØFUI
KBØJKO
NØMHJ
N3NTV
KØPTK
KØOR
KØRXC
NØUKO
KD7ZUP
KA4SZQ
K4DHB
KC4PZA

The following stations qualified for PSHR in January, but were not properly recognized in this column: KK3F 140, K3CSX 135, W3YVQ 135, W3CB 103, AA3SB 100, K3IN 90, KB3LNM 90, N3ZOC 89, KB3LFG 79.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, CO, CT, ENY, EPA, EWA, GA, ID, IN, KS, LA, MDC, MI, MN, MO, NC, NFL, NLI, NNY, NTX, NNJ, OH, OR, ORG, SC, SD, SFL, SNJ, STX, TN, UT, VA, WCF, WMA, WNY, WPA, WI, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AZ, EWA, GA, IA, IN, KS, LA, MDC, ME, MI, MN, MO, MT, NC, NLI, NTX, SD, STX, SV, VA, WTX, WV.

Brass Pounders League

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

N1IQI 1864, KA9EKG 1345, W1GMF 1318, KK3F 1125, KW1U 993, W8UL 974, WD8Q 663, WB9JSR 645, WB8WKQ 633, N8IXF 554.

Stations earning BPL by Originations plus Deliveries: NM1K 115, K8LJG 107.

The following stations qualified for BPL in January, but were not properly recognized in this column: KK3F 1184.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

KB1BJA **King**, Carl S. Jr, Wakefield, RI
K1CG **Manning**, George A., Pembroke, MA
K1CSO **Eastman**, Frederick C., Andover, MA
N1FRV **Marinucci**, Michael J., Hernando, FL
W1GUN **Palm**, Joanne R., Palm Coast, FL
W1HAM **Eastman**, Donald, Franconia, NH
KA1HI **Brunton**, Anthony M. "Tony," Bay Shore, NY
KB1JZN **Bacon**, Henry K., Naugatuck, CT
K1TCO **Harding**, Walter R. "Doc," Provincetown, MA
W1TKO **Olsson**, Thomas K., West Greenwich, RI
KZ1V **Fales**, Henry H. Jr, Orleans, MA
W1VGE **Strick**, Harold A., Saugus, MA
♦K1VMI **Kent**, John E. Jr, Norwalk, CT
K2CVT **Eberhart**, Lloyd S., Green Valley, AZ
KC2GE **Fisher**, Douglas A., Brunswick, ME
WB2KQU **Tyther**, William E., Ogdensburg, NJ
WA2OAO **Fedor**, Edward L., Dunedin, FL
♦K2TTI **Kennedy**, Frank M., Plattsburgh, NY
W2VDZ **Thorne**, William S., Rutledge, TN
W3APK **Roscoe**, William, Sharpsville, PA
W3FIQ **Baker**, Sam E., West Springfield, PA
WA3LPF **Nordstrom**, Ronald F., Mechanicsburg, PA
KB3MCY **Glushakow**, Michael S., Ellicott City, MD
KA3SCF **Thomas**, Jo Howey, Wellsboro, PA
K3SUE **Persing**, Susan C., Trooper, PA
K3WNL **Burdge**, John E., Atlanta, GA
WA4CYH **Evans**, Walter E. "Gene," Macon, GA
♦N4DDR **Harding**, Kenneth P., Fort Lauderdale, FL
WB4DHI **Voelker**, Roy E., Jacksonville, FL
KF4EHH **Hunt**, Dr Albert C., Decatur, AL
N4GAR **Pitts**, Garner, Eight Mile, AL
WA4HIK **Earls**, Richard G., Ceres, VA
W4HXW **Yarber**, Stanley G., Statesboro, GA
K4JAA **Chaffee**, Norman C., East Ryegate, VT
K4JSE **Millner**, Raymond L., Palm Harbor, FL
K4KAT **Garrett**, Melissa A., Elliston, VA
W4KEM **Mallard**, Leo C. Jr, Kinston, NC
W4MQE **Watson**, Paul G. Jr, Richmond, VA
♦N4NFG **Tipton**, J. C., Charlotte, NC
NW4O **Davidson**, Dr John R. "Jack," Mocksville, NC
K4ODW **Terrill**, Ray N., Canton, GA
WA4PHY **Drinkard**, Samuel W., Martinez, GA
KE4PKW **Duncan**, Bradie "Gene" Jr, Asheville, NC
AD4PT **Gardner**, Donald E., High Point, NC
W4RQ **Dorsey**, Daniel R. "Bob" Jr, Charlottesville, VA
N4RSV **Elliott**, Porter G., Clearwater, FL
WA4SQB **Allgood**, Carney W., Greensboro, NC
KF4TWT **Schnell**, Walter F., Saint Augustine, FL
KF4VVH **Goldberg**, Sandra R., Gaylesville, AL
W4YJR **Crumley**, Richard W., Kents Store, VA
KM5A **Wheaton**, Stephen M., Keystone, SD
N5ADB **Lundgren**, William G., Richardson, TX
KD5AWO **King**, Mitchell M. Jr, Beaumont, TX
K5BXP **Moll**, Robert E., Albuquerque, NM
W5DMR **Roden**, Betty L., Hurst, TX
KC5EQW **Gunther**, Timothy T., Los Lunas, NM
KC5EXZ **Baker**, Denver, West Point, MS
W5IEA **Sumner**, Orthel C. "Tex," Amarillo, TX
W5JBD **Thoman**, William B., Dallas, TX
KA5JZG **Lessard**, Ola L., Picayune, MS
N5LNS **Wasielewski**, Maria G., San Benito, TX
N5OCK **Gould**, Robert H., Addison, MI
K5RM **Smith**, Lloyd N. "Smitty," LaPorte, TX
WA5TUH **Black**, Alexander W., Tulsa, OK
KB5VGV **Harris**, Fletcher W. Jr, Galveston, TX
KB5WHG **Morriss**, Fredric Tobias "Toby," Ponca City, OK
AC6AJ **Freeman**, Lee I., Marina Del Rey, CA
WB6CXX **Harter**, James "Keith," Fresno, CA
KH6D **Vittum**, Melvin, Kailua, HI
♦AH6F **Honda**, Paul S., Honolulu, HI
W6HVW **Tidyman**, Clayton R., Fresno, CA
WA6IKS **McCluer**, Darragh E., Acworth, GA
KF6INJ **Richards**, William Victor "Vic," Topanga, CA
♦K6IR **Miller**, Kenneth M. Sr, Rockville, MD
♦K6JGN **Karagozian**, Edward Jr, Newport Beach, CA
K6LEO **Brown**, Leo R., San Diego, CA
KA6LGN **Prys**, John A., Hanford, CA
W6LGQ **Hagopian**, Arthur G., Petaluma, CA
KA6LXM **Giliberto**, Augustine D. "Augie," Bakersfield, CA
KG6NH **Salcedo**, Renato V., Paso Robles, CA
KB6OAK **Spencer**, Theodore "Ted," Santa Barbara, CA
WA6SHD **McWethy**, Charles T., Happy Camp, CA
WA6UBE **Gibbons**, Patricia Elaine, Mount Hamilton, CA
KB6UYD **Haslam**, Billy J., McNeal, AZ
KI6VWI **Chapman**, Virgil A. "Skip" Jr, Sacramento, CA
WB6WPO **Hagopian**, John R., Petaluma, CA
NH6XR **Nelson**, Frank A., Kapolei, HI
♦W6YBP **Balyoz**, Harold, Mesa, AZ
KF6ZTK **Brogdon**, George H., Hesperia, CA
♦K7AMI **Linstruth**, Walter A. "Wally," Monticello, UT
KD7DLC **Cummins**, Deborah, McMinnville, OR
W7GZI **Heim**, Henry P. "Hank," Seattle, WA
NN7K **Foster**, Arthur Jim Jr, Sun Valley, NV
WA7PNO **Young**, E. Johnny, San Angelo, TX
WB7RES **Medeiros**, Earl C., Caldwell, ID
KL7TQ **Kelliher**, Mark J., Eagle River, AK
N8CSE **Nopola**, Gerald E., Watton, MI
K8CYY **Schumacher**, J. Clyde, Cuyahoga Falls, OH
KC8DUJ **Weldon**, David L., Sun City West, AZ
W8IIV **Gizzi**, Philip A., North Canton, OH
W8JEZ **Cohen**, Sandford H. "Sandy," Dayton, OH
W8MTC **Serotko**, Michael, Newton Falls, OH
WA8ORL **Bennett**, Ronald F., Brookfield, OH
N8RMU **Beyersdorfer**, James A., Cincinnati, OH
K8VI **Haase**, Stanley C., Parma Heights, OH
WD9BHR **Felker**, Jack L., Winamac, IN
W9CFI **Lanning**, Randolph G., Logansport, IN
K9CFJ **Johnson**, Cyrus F., Auburn, IN
KB9CNT **Snyder**, Robert J. Jr, Merrill, WI
WA9CPN **Ullrich**, Peter K., West Bend, WI
KA9DFW **Bellei**, Everett T., Lake Forest, IL
N9FMC **Higgins**, J. Edmond "Ed," New Carlisle, IN
ND9G **Bushman**, Stephen F., Des Plaines, IL
WA9HCU **Nydegger**, Charles F., Colfax, IN
W9HRI **Pruitt**, Michael D., Indianapolis, IN
♦K9HSK **Hade**, Richard A. "Dick," Princeton, IL
♦KA9I **Sanders**, John B. Jr, Bloomington, IN
KE9JJ **Seruga**, Edward A., Wind Lake, WI
KC9JXX **Rice**, Raymond Henry, Cambridge City, IN
W9KSC **Luffman**, Terry E., Portland, OR
WA9KZI **Cushman**, Alva B., Vista, CA
K9LOL **Beattie**, Ruth P., Leander, TX
KC9LVV **Durley**, Walter F. "Bud," Potosi, WI
♦WB9MMM **Harlan**, Eugene, Rockford, IL
KA9MUI **Meads**, Henry C., Canton, IL
KB9OVA **Rankert**, Jack S., Walkerton, IN
AJ9P **Halbman**, Robert L., Beloit, WI
♦K9QNA **Sample**, Robert, Bloomingdale, IL
W9RYA **Teske**, Verne D., Oak Creek, WI
W9RZW **Froehlich**, Erwin C., Pine River, WI
N9WUN **Savard**, Charles E., Two Rivers, WI
WB9YAE **Burr**, Stiles W. "Harvey" III, Skokie, IL
KA9YOK **Fleck**, John E. Sr, Bloomington, IN
WØBYH **Lippincott**, John C., Fulton, MO
WBØCYC **Brain**, Terry M., Cleburne, TX
WAØFCR **Mynatt**, Charles L., Mount Vernon, MO
KDØFRP **Speaks**, Dean K., Salina, KS
WØJUN **Buckles**, Clyde Nelson, Independence, KS
WØKI **Carl**, James E., Prairie Village, KS
KCØOG **Hurt**, Lyle Dean, Lincoln, NE
NØPYI **Hackett**, Jerry L., Dakota City, IA
KCØQON **Schaffner**, Donald R., Peculiar, MO
WAØRLH **Brewer**, Willis M., Blue Springs, MO
WØSEV **Ferguson**, Earl E., Longmont, CO
WAØUND **Mockey**, Ted, Chisholm, MN
KBØUVE **Erby**, William L., Colorado Springs, CO
WØVPM **Morris**, Robert A., Deerfield, IL
KCØYOM **Martin**, James A., Sikeston, MO
VE3AR **Loucks**, William Wentworth, Toronto, ON, Canada
G3FD **Connor**, Dermot, Tamworth, Staffs,

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Gail Iannone ♦ Silent Keys Administrator ♦ sk@arrl.org

Strays

At W9GRS, the Amateur Radio Station at the Glenn Raymond School in Watseka, Illinois, students Matt Thomas, Justin Moyer and Jake Anderson, KC9OQN, hold their new ARRL Worked All States awards after W9GRS worked all 50 states during the ARRL November Phone Sweepstakes. Billy Perce, KC9PGB, and Chris Jaworski, KC9RCD, also took part in the SS operation, but are not in the photo. Eighth grade science teacher Troy J. Simpson, W9KVR, and 7th grade science teacher Paul Wilson, KC9OVF, are at the rear. Matt and Justin are preparing for their Technician exams.

COURTESY W9KVR

HAMSPEAK

The following are brief descriptions of Amateur Radio related terms found in this month's issue of *QST*. More information on most can be found in *The ARRL Handbook*, or other specialized ARRL publications.[1]

The Doctor is IN

Horizontal dipole — Antenna erected parallel to the earth, often fed in its center and often approximately ½ wavelength long.

Linear amplifier — An amplifier that provides a constant multiple of the input signal resulting in a larger copy of all original input signals, and no additional signals, at the output. This is the idea case for many types of amplifiers.

Plate current — The current that flows from the positive anode to the cathode of a vacuum tube. In tubes with one or more grids, the plate current is controlled by the voltage between the control grid and the cathode.

RF safety assessment — Evaluation of intensity of radio energy emanating from a radio transmitter and comparison to allowed levels based on FCC requirements. Every Amateur Radio station is required to perform such an assessment. The process is described in an ARRL book and on the FCC Web site at **www.fcc.gov/oet/info/documents/bulletins/#65**.[2]

A Fan Dipole for 80 through 6 Meters

Balun — *BAL*anced to *UN*balanced transformer. Provides a transition between balanced antennas or transmission lines such as ladder line or open wire line and unbalanced transmission lines such as coaxial cable.

RG-8X — Coaxial cable type with 50 Ω characteristic impedance. RG-8X is of an intermediate size between RG-58 and RG-8. It has a foamed dielectric resulting in lower loss than RG-58. RG-8X can use a PL-259 plug with an adapter intended for RG-59 cable.

HF Yagi Triplexer Especially for ARRL Field Day

ARRL Field Day — An ARRL operating event in June of each year in which hams typically operate for 24 hours from temporary locations using emergency power and portable equipment to simulate emergency conditions and have fun.

NAQP — North American QSO Party. A casual, 12 hour long contest held once in January and February and again in July and August of each year, focused on the North American continent.

SO2R — Single-operator-two-radio. Contesting technique in which a single operator operates on two bands almost simultaneously. In SO2R operation, an operator will use one radio to "run" stations (soliciting contest contacts by calling CQ) and use a second radio to "search and pounce" for stations not already worked in the contest. Great care must be taken by the operator to ensure that only one transmitted signal is on the air at any given time, or the contest rules will be broken. This is most commonly achieved with an interface that electronically prevents both radios from transmitting at once.

Triband Yagi — Antenna that works on three bands, usually 20, 15 and 10 meters through the use of separate elements per band, traps or a combination. Directive antenna array in which one or more elements are driven by connection to a transmission line and the others are parasitically coupled.

Triplexer — Usually passive device that combines three distinct RF carriers of different frequencies onto a single transmission system, or splits a combined signal into three separate signals based on frequency.

Home Brew Challenge II Winner #1 — The Lowest Cost Entry

Class A — The *class* of an amplifier defines the operating conditions in terms of voltages and currents that result in certain operating characteristics. A Class A amplifier draws current throughout the input waveform, providing the most linear, but least efficient, operation.

Class AB — A Class AB amplifier is biased to draw current during only part, but more than half, of the input waveform, providing fairly linear, but more efficient operation than Class A.

Class B — A Class B amplifier is biased to draw current during half of the input waveform, providing fairly linear, but more efficient operation than Class AB. With no signal present, there is no current flow.

Gate bias — The addition of a dc voltage to a signal at the input of a field effect transistor that changes the signal's position on the device characteristic curve. This is how an amplifier "class" is established.

PSK — Phase-shift keying. Digital data encoding technique in which bits are represented by shifting of the phase of an RF carrier.

Push-pull operation — Amplifier circuit containing two active devices. One amplifies the positive portion of the input waveform while the other amplifies the negative going input waveform. The two outputs are combined to provide the output signal.

TO-220AB — A variation of the TO-220 solid state package. The TO-220 is a flat package for a three-terminal device that offers a mounting tab that can be fastened to a heat sink. The dimensions of the TO-220AB case can be found at **www.fairchildsemi.com/products/discrete/pdf/to220ab_dim.pdf**.

Ugly construction — A home shop electronic construction method in which the ground lead of components are soldered to copper clad PC board material. Other connections are suspended above the board and no mechanical supports, except the component leads are used.

Zener diode — A diode that conducts in the reverse direction after a certain specified voltage is exceeded. This is used for voltage regulation. See **hyperphysics.phy-astr.gsu.edu/hbase/solids/zener.html**.

A Quick Start Guide to ALE400 ARQ FAE

ALE — Automatic link establishment. A system that automatically sets the frequency of HF radios to the optimum of available channels by automatically exchanging test messages and measuring the received signal.

ARQ (Automatic Repeat reQuest) — A data transmission protocol, such as AX.25, in which the successful delivery of each individual data packet is confirmed by a short packet sent from the receiving station. Lack of reception of a receipt in a defined time, or receipt of a negative acknowledgment, results in the retransmission of the packet.

FAE — Fast Acknowledged Exchange. Definition of how data frames are structured and exchanged in the ALE400 protocol.

Full duplex — System that can transmit and receive simultaneously. An example is an ordinary telephone connection. Most amateur voice and data communication is *half-duplex* in which both directions of transmission are supported, but only one at a time.

Pactor — An amateur digital communications protocol that features an error correcting mechanism.

RSID — Reed Solomon Identifier. Short identifier automatically sent at the start of a digital mode transmission that is decoded by receiving stations to identify the data format in use.

RTTY — Radioteletype. Originally a communications system in which keyboard initiated data is sent to a mechanical key printer, like a typewriter.

Receiver Sensitivity — Can You Have Too Much?

MDS — Minimum detectable (or discernible) signal. A signal equal to the noise level or at a specified level (depending on system requirements) above the noise level. Any weaker signal is deemed unusable.

Signal-To-Noise Ratio (SNR) —The ratio of the strength of the desired signal to that of the unwanted signal (noise).

Superhet receiver — Short for superheterodyne. A classic receiver architecture in which an incoming signal is beat with, or heterodyned with, a signal generated by a local oscillator (LO) to translate the incoming signal to an intermediate frequency (IF) for processing.

[1]*The ARRL Handbook for Radio Communications,* 2010 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1448 (Hardcover 1462). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2]E. Hare, W1RFI, *RF Exposure and You*. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 6621. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

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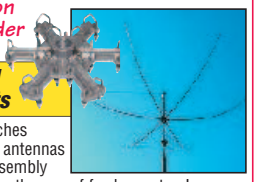

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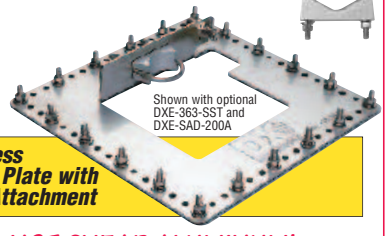

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LDG ELECTRONICS

NEW! AT-600Pro

The LDG AT-600Pro will handle up to 600 watts SSB and CW, 300 on RTTY (1.8 – 30 MHz), and 250 watts on 54 MHz. It will match virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use the AT-600Pro with longwires, random wires and antennas fed with ladder line just by adding a balun. It has two antenna ports with a front-panel indicator, and separate memory banks for each antenna. Easy to read LED bar-graph meters showing RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11 – 16 volts DC at 750 mA. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $359.99***

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required. A coax jumper cable is also induced for fast hook up. ***Suggested Price $129.99.***

KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199.99***

AT-200Pro

The AT-200Pro features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $249***

NEW! Z-11ProII

Meet the Z-11ProII, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11ProII uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $179.99***

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NEW! AT-100ProII

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch with LEDs, allowing you to switch instantly between two antennas. The AT-100ProII requires just 1 watt for operation, but will handle up to 125 watts. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $229.99***

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***

radio not included

FT Meter 2.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu. ***Still Only $49***

FTL Meter For Yaesu FT-857(D) and FT-897(D). 4.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu. ***Suggested Price $79.99***

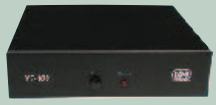
NEW! M-7600 For IC-7600. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7700 and the virtual meter on your radio can work together. ***Suggested Price $79.99***

M-7700 For IC-7700. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7700 and the virtual meter on your radio can work together. ***Suggested Price $79.99***

See ***AT-1000Pro Review in Nov. '08 CQ***

AT-1000Pro

The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $599***



YT-100

An autotuner for several popular Yaesu Radios. An included cable interfaces with your FT-857, FT-897 and FT-100 (and all D models) making it an integrated tuner, powered by the interface. Just press the tune button on the tuner, and everything else happens automatically: mode and power are set, a tune cycle runs, and the radio is returned to its original settings. It's the perfect complement to your Yaesu radio. ***Suggested Price $199.99***

Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $159.99***

IT-100

Matched in size to the IC-7000 and IC-706, the new IT-100 sports a front panel push-button for either manual or automatic tunes, and status LEDs so you'll know what's going on inside. You can control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. It's the perfect complement to your Icom radio that is AH3 or AH-4 compatible.

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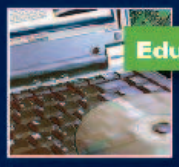

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Family	$8	$16	$24	Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member.

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If you are 21 or younger a special rate may apply. Contact ARRL for more details.

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RX-7-05
Wideband Receiver

- RX: 150 kHz - 1300 MHz (cell blkd)
- AM, FM Narrow & Wide Mode
- Memories: 1650
- Scans 100 Channels per second
- 1100mAh Lith-Ion Battery & Charger

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IC-706 MK II-G *Multimode Mobile*
- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 100W (HF/6M), 50W (2M), 20W (440 MHz)
- Memories: 107 • AF-DSP • IF Shift • Preamp/attenuator
- RMK-706 included • Quantities are limited!

IC-V80/SPORT

IC-80AD

IC-V80 *2M FM Handheld*
- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 5.5/2.5/0.5W • Memories: 207
- Comes with NiMH Battery and Wall Charger

IC-V80 SPORT *2M FM Handheld*
- Same but comes with AA Battery Case

IC-80AD *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 • Improved User Interface
- Optional HM-189GPS Speaker Mic adds GPS capabilities

IC-7600 *Multimode HF/6M Transceiver*
- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 101 • 5.8 inch color screen
- High-resolution real time spectrum scope using a dedicated DSP unit • Automatic antenna tuner
- Dual DSP units • 3, 6 & 15 kHz 1st (roofing) filters

IC-7700 *Multimode HF/6M Transceiver*
- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7 inch color screen
- Two 32-bit floating DSPs • Power supply built-in
- Three roofing filters • External VGA connector
- Automatic antenna tuner • USB memory drive socket

ID-880H *2M/440 FM Analog & D-Star Digital Dual Bander Mobile*
- TX: 144-148, 430-450 • RX: 118-173.995, 230-549.995, 810-999.99 MHz (cell blkd) • Power: 50/15/5W
- Memories: 1052 • D-Star Digital Ready
- Improved User Interface

IC-7800 *Multimode HF/6M Transceiver*
- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7 inch color screen • Two receivers
- Four 32-bit floating DSPs • Power supply built-in
- Three roofing filters • External VGA connector
- Automatic antenna tuner

ID-1 *1.2 GHz D-Star & FM Mobile*
- TX: 1240-1300 MHz • RX: 1240-1300 MHz
- Power: 10/1W • Memories: 105
- D-Star 128 kbps Data & 4.8 kbps Voice

PW-1 *HF/6M 1KW Linear Amplifier*
- TX: 160-15M/6M • Power: 1000W (180-264 VAC), 500W (90-132 VAC) • Automatic band change & antenna tuner • Two input & Four output connectors
- Easily connects to any current Icom HF transceiver

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Chief Development Officer
ARRL
225 Main Street
Newington CT 06111-1494
Telephone: **860-594-0397**
Email: **mhobart@arrl.org**

TM-271A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 60/25W • Memories: 200

TM-V71A Dualband FM Mobile

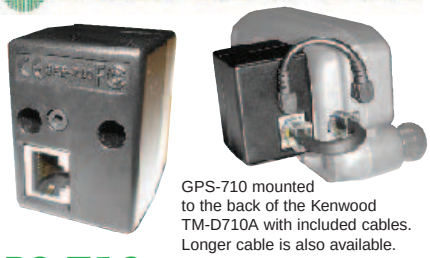
- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Cross-band repeat • EchoLink® ready

TM-D710A

Dualband FM Mobile w/TNC

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Built-in TNC for APRS (needs GPS)
- Cross-band repeat • AvMap G5 & EchoLink® ready

GREEN LIGHT LABS



GPS-710 mounted to the back of the Kenwood TM-D710A with included cables. Longer cable is also available.

GPS-710 GPS Unit for TM-D710A

- Plug-and-play adds GPS for TM-D710A & RC-D710
- Acquires GPS lock from cold start in under 60 seconds
- Quick and easy install typically in less then 5 minutes
- Longer cable sold separately to mount on vehicle's glass

TH-K2AT

TH-F6A

TH-K2AT 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/1.5/0.5W • Memories: 100

TH-F6A Triband FM HT

- TX: 144-148, 222-225, 438-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Dual band RX
- FM Wide/Narrow, AM, SSB and CW receive modes
- Power: 5/0.5/0.05W • Memories: 435

TS-480HX

200W HF/6M Mobile Transceiver

- TX: HF/6M • RX: 0.5-60 MHz
- Power: 10-200W (with two optional 22A PS's)
- Memories: 99
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-480SAT

100W version with built-in auto antenna tuner.

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.

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FT-270R

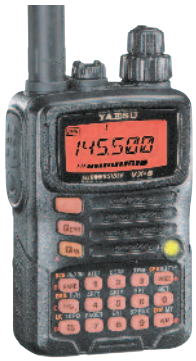
VX-7RB

FT-270R 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/2/0.5W • Memories: 200
- Extra large LCD display & speaker
- Increased AF output & added "Memory Only" mode

VX-7RB Tri-band Submersible FM HT

- TX: 50-54, 144-148, 222-225, 430-450 MHz
- RX: 0.5-999 MHz (cell blkd)
- Power: 5/2.5/1/0.05W (0.3/0.05W on 220 MHz)
- Memories: 900 • Submersible 3 feet for 30 minutes



VX-6R

VX-8R/DR

VX-6R 2M/440 FM Dual Band HT

- TX: 144-148, 222-225, 430-450 • RX: 0.5-999 (cell blkd)
- Power: 5/2.5/1/0.3W (1.5W on 220) • Memories: 900
- Submersible 3 feet for 30 minutes

VX-8R Quad-band FM HT

- TX: 50-54, 144-148, 222-225, 430-450 MHz
- RX: 0.5-999 MHz (cell blocked) • Memories: 1200+
- Power: 5/2.5/1/0.05W (1.5W on 220)
- Optional Bluetooth® kit BTK4 allows hands free operation
- Optional GPS Unit FGPS-2 with either CT-136 adapter or MH-74A7A hand mic provides you with APRS® data

VX-8DR APRS Enhanced VX-8R

Same as the VX-8R but includes more APRS features such as Smart Beaconing, new DIGI-PATH functions, Station List & APRS Message memories increased & heads up compass display to the GPS screen

FT-1900R 2M FM Mobile

- TX: 144-148 • RX: 136-174
- Power: 55/25/10/5W • Memories: 221
- Added "Memory Only" mode

Comes with a standard DTMF hand mic.

FTM-350R 2M/440 FM Mobile

- TX: 144-148, 430-450 at 50/20/5W and 222-225 at 1W
- RX: 0.5-1.8, 76-250 & 300-1000 MHz (cell blocked)
- Memories: 500 + 500 • Optional Bluetooth® kit allows hands free operation • Optional internal GPS unit FGPS-1 or external FGPS-2 & CT-136 adds GPS and APRS® features
- Large 5.2" x 1.6" and bright LCD screen has 8 selectable background colors is easy to read in almost any condition

FT-857D

FT-897D

FT-857D 100W HF/VHF/UHF Mobile

- TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz • Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200 • YSK-857 included!

FT-897D 100W HF/VHF/UHF Portable

- Similar to the FT-857D but can also operate using optional FNB-78 13.2V @ 4.5 Ah NiMH battery packs

FT-450AT

100W HF/6M Compact Transceiver

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 500 • IF DSP Technology
- Selectable AGC, IF width & shift, contour, digital noise reduction, manual notch filter and clarifier
- Includes Auto Antenna Tuner

FTDX-5000 Series – Covers HF and 6M;

Three different configurations all running 10-200W on CW, SSB, FM, RTTY & PKT and 5-50W on AM. • RX: 0.03-60 MHz • Memories: 99 • The "D" and "MP" model comes with SM-5000 Station Monitor that features an excellent bandscope • The "MP" comes with 300 Hz roofing filter

FTDX-5000 Basic Model
FTDX-5000D With Station Monitor
FTDX-5000MP With Station Monitor & 300 Hz Roofing Filter

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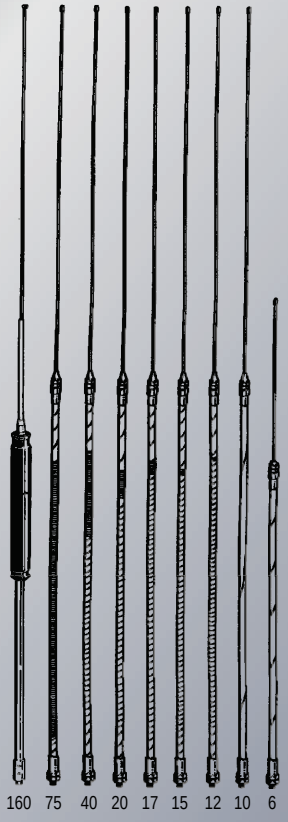
JETSTREAM

Mobile HF Sticks

Model	Band	Band Width	Price
JTMHF6	6 meters	1000KHz	**14.95**
JTMHF10	10 meters	500KHz	**14.95**
JTMHF12	12 meters	300KHz	**14.95**
JTMHF15	15 meters	200KHz	**14.95**
JTMHF20	20 meters	150KHz	**14.95**
JTMHF40	40 meters	60KHz	**14.95**
JTMHF75	75 meters	35KHz	**19.95**
JTMHF160	160 meters	12KHz	**49.95**



Jetstream mobile HF sticks are made of a black fiberglass lower section with integral coil, adjustable and removable stainless steel whip (except for JTMHF160). Standard 3/8 x 24 thread type mounting. Total length on all models is 96" (except JTMHF6, it is 58"). Power rating on all models is 300 watts PEP.

VX8R

Bluetooth Hands-Free Operation with GPS/APRS and Real RF-Dual Wideband Receive... The next generation Amateur Handheld transceiver from Yaesu, who has been introducing Leading -Edge Transceiver Technology for years.

BH1A Bluetooth Headset Stereo 84.95
BH2A Bluetooth Headset Mono 82.95
BU1 Bluetooth Unit 71.95
CD40 Charger Cradle BH1 & BH2 ..... 25.95
CD41 Rapid Charger Cradle 32.95
CSC93 Softcase 14.95
FBA39 Alkaline Battery Tray 26.95
FGPS2 GPS Unit 79.95
FNB101LI 7.4V 1100mAh LI-Ion 57.95
FNB102LI 7.4V 1800mAh LI-Ion 69.95
MH74A7A Speaker Mic 43.95
NC85B Wall Charger for CD40 ..... 16.95

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FT60R

The FT-60R includes wide receiver coverage, outstanding audio quality, the most CTCSS/DCS flexibility in the industry, and a new Emergency Automatic Identification (EAI) feature for search-and-rescue work.

ADMS1J Software/Cable 39.95
EDC5B DC Cable w/Noise Filter 23.95
EDC6 DC Cable 7.95
FBA25A AA Battery Case 21.95
FNB83 7.2V 1400mAh Ni-MH 39.95
MH34B4B Speaker Mic 33.95
VAC370B Rapid Charger 62.95

VX3R

The new ultra-compact VX-3R 2m/70cm FM HT Transceiver is loaded with convenience features. In addition to top quality performance on the 2m and 70cm, you will also be able to enjoy stereo FM and AM broadcast band.

ADMSVX3 Software/Cable 39.95
CSC92 Soft Case 14.95
EDC21 DC Cable w/Noise Filter 36.95
FBA37 AA Battery Case 17.95
FNB82LI 7.2V 1400mAh Ni-MH 34.95
MH34B4B Speaker Mic 33.95

FT8800R

If you're ready for the best in a Dual-Band FM Mobile Transceiver, the FT-8800R is ready for you! With easy operation, outstanding receiver performance, and cross-band repeat capability, the FT-8800R is the new standard of comparison!!

ADMS2I Software and cable 39.95
JTPS14M Jetstream Power Supply 49.95
MLS100 External Speaker 46.95
MMB60 Quick Release Mobile Bracket 29.95
YSK8900 Separation Kit 41.95

FT7900R

Yaesu's economically priced One-Touch Operation FT-7900R Dual band FM mobile. Back-lit push button controls ensure extraordinarily easy and safe operation while driving at night. The exceptionally wide receiver coverage provides all sorts of additional uses!

ADMS2K Programming software and cable ... 39.95
MEK2 Microphone Extension Kit 42.95
JTPS14M Jetstream Power Supply 49.95
MLS100 External Speaker 46.95
MMB60 Quick Release Mobile Bracket 29.95
YSK7800 Separation Kit 29.95

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FT2000/D

The FT-2000 (100 watts) and FT-2000D (200 watts) are the 2nd Generation in the proud lineage of the FTdx9000 Series! Featuring extensive DSP filtering, factory installed antenna tuner and power supply and a host of outstanding ergonomic and performance features, the FT-2000 series radios are destined to be the centerpiece of your HF/50 MHz station!

DMU2000 Data Management Unit ..... Call
FH2 Remote Keypad 84.95
SP2000 External Speaker 175.95
UTUNINGKIT A, B, or C model ..... Call
YF122C 500 hz CW filter 159.95
YF122CN 300 hz CW filter 164.95

FT950

The FT-950 has been developed to fit the needs of both the casual and serious DX enthusiasts as well as new licensees desiring a top notch first radio to discover the magic of the HF and 50MHz bands. This superb radio features DSP filtering, 100 Watts of power output, factory installed antenna tuner and many of the outstanding ergonomic and performance features first introduced in our FTdx-9000 and FT-2000 flagship radios.

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FH2 Remote Keypad 84.95
MD100A8X Desk top mic 129.95
MD200A8X Desk top mic 379.95
SP2000 External Speaker 175.95
UTUNINGKIT A, B, or C model ..... Call

FT450/AT

The FT-450(AT) is an amazing compact radio that bundles the most desirable IF DSP features of the FT-2000 and FT-950 into a convenient sized lightweight package. Suitable for home, portable, or mobile use, the economical FT-450(AT) is a rugged 100 watt HF/50MHz radio unequalled in its price class. Available with or without factory installed antenna tuner.

ATAS120 Auto tuning antenna 299.95
ATU450 Auto antenna tuner 149.95
FC40 Auto antenna tuner 249.95
MD100A8X Desk top mic 129.95
MMB90 Mobile mount 33.95

FT897D

The FT-897D is a rugged, innovative, multiband, multimode portable transceiver for the amateur radio MF/HF/VHF/UHF bands. Providing coverage of the 160-10 meter bands plus the 6 m, 2 m, and 70 cm bands and it's capable of 20-Watt portable operation using internal batteries, or up to 100 Watts when using an external 13.8-volt DC power source.

ADMS4B Programming software/cable 51.95
ATAS120 Auto tuning antenna 299.95
CT39 Packet Cable 9.95
CT62 Computer Interface Cable 32.95
FC30 Bolt on auto antenna tuner 189.95
FNB78 NiMH Internal Battery 115.95
FP30 Internal Power Supply 209.95
MD100A8X Desk top mic 129.95
MH59A8J Remote Control Mic 64.95
YF122S 2.3 kHz SSB Filter 164.95

FT857D

The FT-857D, the world's smallest HF/VHF/UHF mobile transceiver, provides base station-type performance from an ultra-compact package that's ideal for mobile or external battery portable work. Wide frequency coverage, outstanding receiver performance, and the convenience of optional remote-head operation make the FT-857D the expert's choice for high-performance mobile operation!

ADMS4B Programming software/cable 51.95
ATAS120 Auto tuning antenna 299.95
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CT62 Computer Interface Cable 32.95
FC30 Auto antenna tuner 189.95
JTPS28 Jetstream Power Supply 84.95
MH59A8J Remote Control Mic 64.95
YF122S 2.3 kHz SSB Filter 164.95
YSK857 Separation Kit 39.95

FT817ND

The world's first self-contained, battery-powered, Multi-mode Portable Transceiver covering the HF, VHF, and UHF bands! Providing up to five watts of power output, designed for operation on the 160-10m HF bands, plus the 6m, 2m, and 70 cm bands.

CSC83 Soft Case 23.95
CT39 Packet Cable 9.95
CT62 Computer Interface Cable 32.95
EDC5B Lighter Cable 23.95
FNB72 Ni-Cd Battery Pack 59.95
MH36E8J DTMF Mic 56.95
YF122S 2.3 kHz SSB Filter 164.95

FT2900R

Massive heatsink guarantees 75 watts of solid RF power, Loud 3 watts of audio output, 200 memory channels, CTCSS and DCS encode/decode built in.

JTPS14M Jetstream Power Supply 49.95
MLS100 External Speaker 46.95
MX2 Hustler 2m Mag Mount 32.95

FT1900R

The ruggedly built yet compact new FT1900R 2m transceiver brings you Yaesu's legendary mechanical toughness along with outstanding receiver performance and 55 watts with crisp, clean audio that will get your message through!

JTPS14M Jetstream Power Supply 49.95
MLS100 External Speaker 46.95
MX2 Hustler 2m Mag Mount 32.95

FT250R

Compact yet incredibly rugged, the FT250R 2-meter handheld is derived to perform under the most difficult operating conditions. It is packed with the leading-edge features you've come to expect from a Yaesu product. The FT250R's die-cast aluminum case houses a large, high-output speaker and the illuminated keypad provides easy viewing during night time operation.

SMAUHF SMA-UHF Adapter 3.50
SMABNC SMA-BNC Adapter 3.50
ADMS1F Software and cable 38.95
EDC5B Cigarette Lighter Cable 23.95
FBA25A AA Battery case 21.95
MH34B4B Speaker Mic 33.95
VC25 Vox Headset 62.95

FT270R

The FT270R is a compact, high performance submersible FM hand held providing up to 5 watts of RF power, along with loud audio output (800 mW) for the 2m or 70cm amateur bands. Submersible up to 3ft for 30 minutes. Long operating times thanks to the supplied 1400 mAh Ni-MH battery pack.

ADMSVX170 Software and cable 43.95
EDC5B Cigarette Lighter Cable 23.95
FBA25A AA Battery case 21.95
MH57A4B Speaker Mic 27.95
VC27 Earpiece Microphone 27.95

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More Powerpole Stuff Than
ANYBODY!

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That's right, ours does the 50 & 75A too!

Special Sale Price
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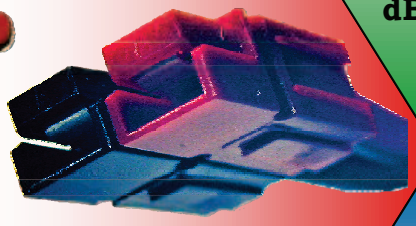
Regular price $50



New! Exclusively from Quicksilver Radio, these handy Powerpole splitters are great in the shack, in the field, or in your go-kit. Compact heavy duty units, built to last.

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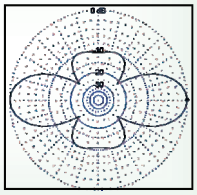
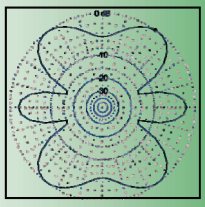
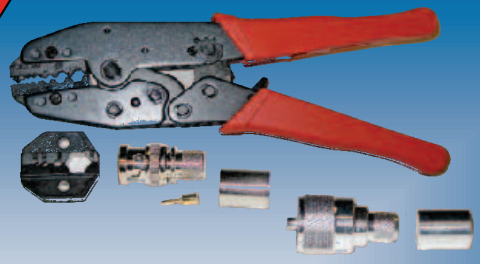
Give your signal a Stimulus with the new *Rocket 88™* antenna



EZNEC Rocket 88™ Antenna plot at 35 feet over typical ground on 20 Meters. 10.43 dBi gain (4.98 dBi free space).



EZNEC G5RV Antenna plot at 35 feet over typical ground on 20 Meters. 7.33 dBi gain. That's more than 3 dB *below* the Rocket 88™!



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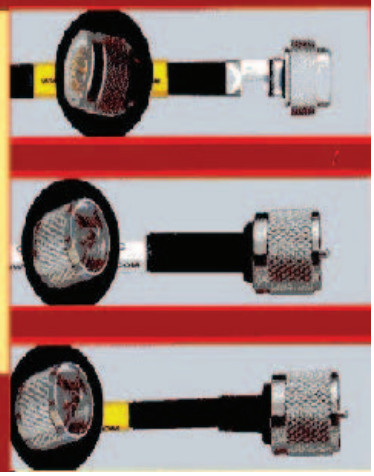

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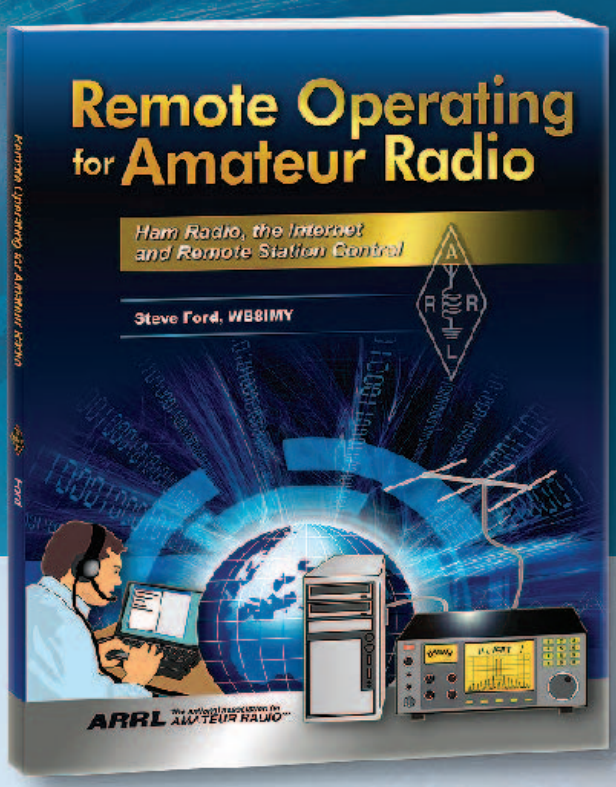

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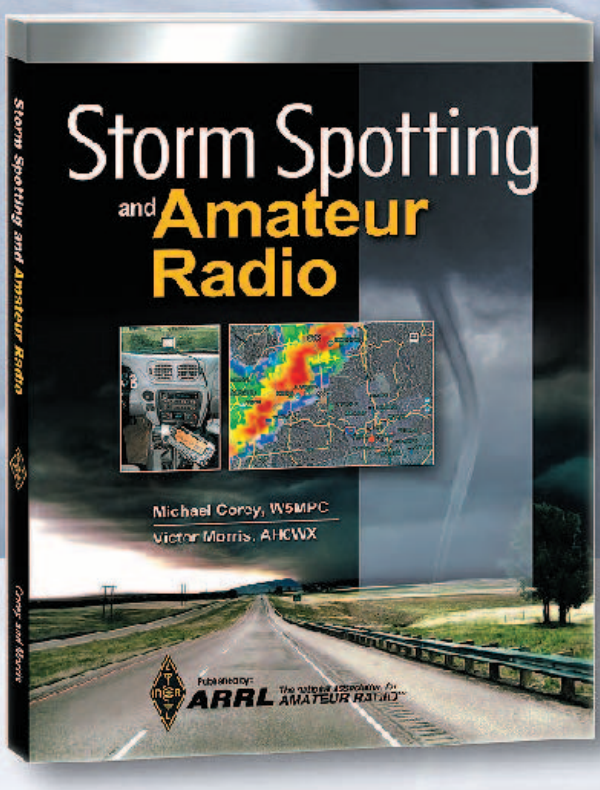

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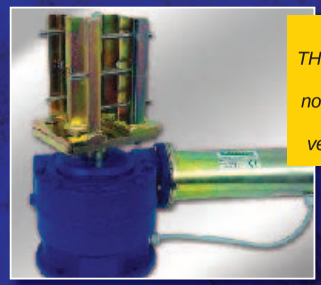

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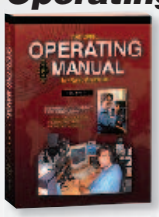

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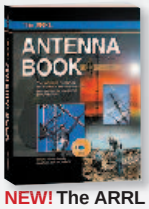

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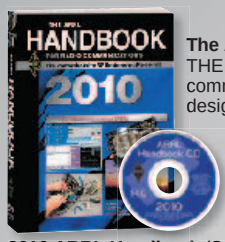

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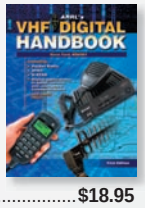

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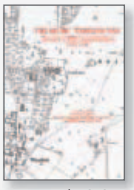

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B-1018-G	25	50	140	150	160	160	--	--	--	--
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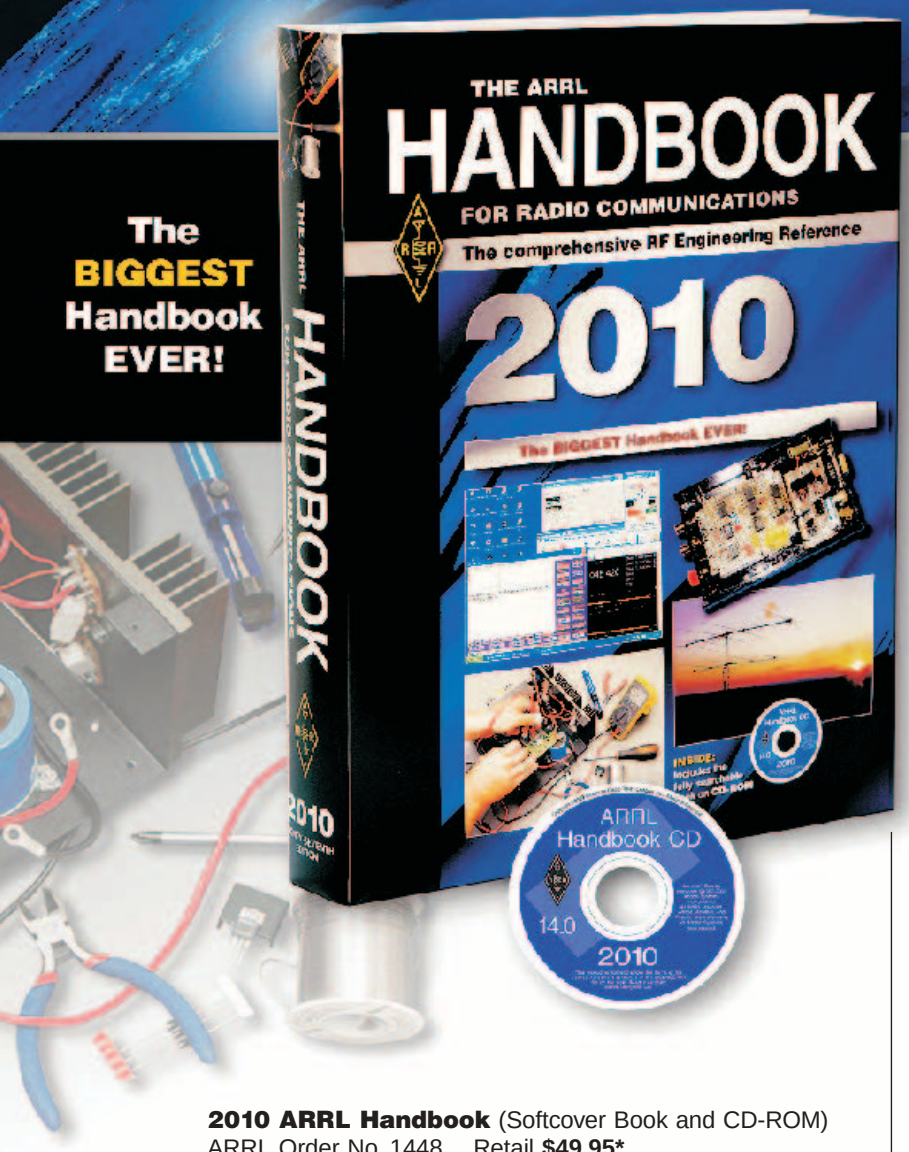

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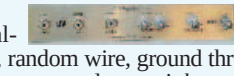

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MFJ *Single Band* Dipole Antennas

Ultra high quality center fed dipoles will give you trouble-free operation for years. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole. Heavy duty 7-strand, 14-gauge hard copper antenna wire. Extremely strong solderless crimped construction. Authentic *glazed ceramic* end insulators. Use as horizontal or sloping dipole or inverted vee. Handles full 1500 Watts. Simply cut to length for your favorite frequency with cutting chart provided.

MFJ-1779A
$69.95
160M, 265 ft.

MFJ-1779B
$49.95
80-40M, 135 ft.

MFJ-1779C
$29.95
20-6M, 35 ft.

True 1:1 Current *Balun & Center Insulator*

MFJ-918
$24.95

True *1:1 Current Balun/ Center Insulator* forces equal antenna currents in dipoles for superior performance. Reduces coax feedline radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots in your shack. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*® coax and *Teflon*® coax connector. Handles full 1.5kW 1.8-30 MHz. Stainless steel hardware with *direct* 14 gauge stranded copper wire connection to antenna. 5x2 inches. Heavy duty weather housing.

RF Isolator

MFJ-915
$29.95

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 5x2 in. Handles full 1500 Watts. Covers 1.8-30 MHz.

MFJ-919, $59.95. 4:1 current balun,1.5 kW.
MFJ-913, $29.95. 4:1 balun, 300 Watts.

Antenna Switches

MFJ-1704
$79.95
4-Positions

MFJ-1704 heavy duty *antenna switch* lets you select 4 antennas or ground them for static and lightning protection. Unused antennas automatically grounded. Replaceable lightning surge protection. Good to 500 MHz. 60 dB isolation at 30 MHz. 2.5 kW PEP. Less than .2 dB insertion loss, SWR below 1.2:1. SO-239 connectors. Handy mounting holes. 6¼Wx4¼Hx1¼D in.

MFJ-1702C
$39.95
2-Positions

MFJ-1702C Like MFJ-1704, but for 2 antennas. 3Wx2Hx2D"

MFJ-1700C
$99.95

MFJ-1700C *Antenna/ Transceiver Switch* lets you select one of six antennas and one of six transceivers in any combination. Plug in an antenna tuner or SWR wattmeter and it's always in-line for any antenna/transceiver combination. Has lightning surge protection. Handles 2 kW PEP SSB, 1 kW CW, 50-75 Ohm loads. Unused terminals are automatically grounded. 1.8 to 30 MHz. SO-239 connectors. 4¾W6½Hx3D inches.

MFJ-1701
$69.95

MFJ-1701 *Antenna Switch* like MFJ-1700C but lets you select one of six antennas only. 10Wx3Hx1½D inches.

33 ft. Telescoping fiberglass Mast

3.8 feet collapsed, 3.3 lbs.

MFJ-1910
$79.95

Super strong fiberglass mast has huge 1¾ inch bottom section. Flexes to resist breaking. Resists UV. Put up *full size* inverted Vee dipole/vertical antenna in minutes and get *full size performance!*

Make your own antennas

Dipoles, G5RV, Random Wire, Doublets, Beverage Antennas, etc.

MFJ-16C06, $4.56. 6-pack authentic *glazed ceramic* end/center antenna insulators.
MFJ-16B01, $19.95. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole.
MFJ-18G100, $24.95. 100 ft. of flexible, 7-strand, 14-gauge solid copper antenna wire.
MFJ-58100X, $49.95. 100 ft. 50-Ohm RG-8X with PL-259s on each end.
MFJ-18H100, $34.95. 100 feet, 450 Ohm ladder line, 18 gauge copper covered steel.

Lightning Surge Protectors

Ultra-fast gas discharge tube shunts 5000 amps peak. Less than 0.1 dB loss. Up to 1000 MHz. SO-239s. **MFJ-270, $29.95.** 400W PEP. **MFJ-272, $39.95.** 1500W PEP.

Free MFJ Catalog

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

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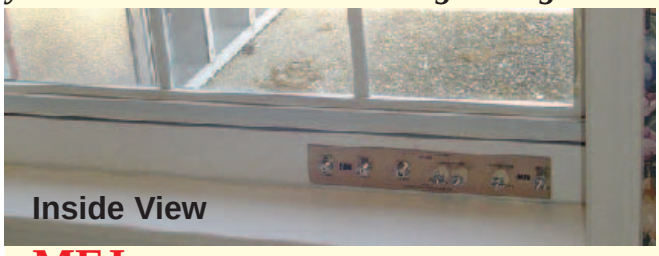
http://www.mfjenterprises.com for instruction manuals, catalog, info

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*® SO-239 coax connectors lets you feed HF/VHF/UHF antennas at full legal power limit.

A 50 Ohm *Teflon*® 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.

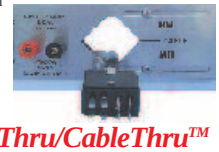
A pair of high-voltage *ceramic feedthru insulators* lets you bring in 450/300 Ohm balanced lines directly to your antenna tuner.

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*® 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*® 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.

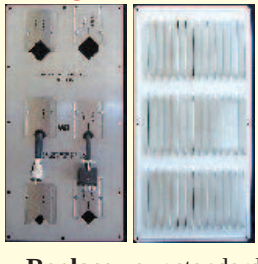
MFJ-4604 $99.95

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.

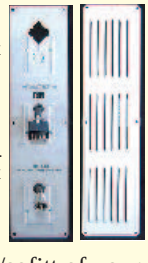
MFJ-4605 $159.95 New!

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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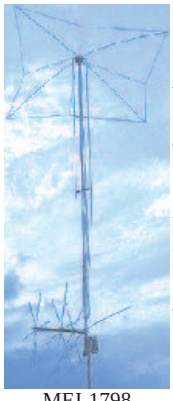
10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground system or radials. Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna . . . Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .



MFJ-1798
$299.95

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. In *phase* antenna current flows in all parallel radiators. This forms a very large equivalent radiator and gives you incredible bandwidths. Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands. Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation. You can mount it from ground level to roof top and get awesome performance.

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ *6-Band* Halfwave Vertical Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed

MFJ-1796
$229.95

MFJ-1796 is only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments, small lots, trailers. Perfect for field day, DXpeditions, camping.

Efficient end-loading, no lossy traps. Entire length always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands.

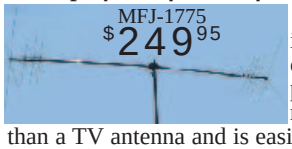
MFJ-1796W, $229.95. WARC band version for 12, 17, 30, 60 Meters only.

MFJ-1792, $189.95. Full size 1/4 wave radiator for 40 Meters. 33 ft., handles 1500 Watts PEP. Requires guying and radials.

MFJ-1793, $209.95. Like MFJ-1792 but has full size 20 Meter 1/4 wave also.

6-Band, 40-2 Meters *Rotatable* Mini-Dipole

Low profile 14 feet . . .7 ft. turning radius . . . 40, 20, 15, 10, 6, 2 Meters . . . 1500 Watts . . .



MFJ-1775
$249.95

MFJ-1775 is inconspicuous and low profile -- not much bigger than a TV antenna and is easily turned by a lightweight rotator like Hy-Gain's *AR-35*.

It's no Wimp! Its *directivity* reduces QRM/noise and lets you *focus* your signal in the direction you want -- work some *real* DX.

You can operate 6 bands -- 40, 20, 15, 10, 6 and 2 meters -- and run *full 1500 Watts* SSB/CW on all HF bands!

Features automatic band switching and uses highly efficient end-loading with its *entire length* always radiating. With 6 and 2 Meters thrown-in, you have ham radio's most versatile *rotatable* dipole!

Each HF band uses a separate, efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire, and capacitance hats at each end (no lossy traps). 6 and 2 meters are *full-length* halfwave dipoles.

Built-to-last -- incredibly strong solid rod fiberglass center insulator and 6063 T-6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

MFJ-1775W, $249.95. WARC band version for 12, 17, 30, 60 Meters only.

MFJ *80/40/20* Meter *Rotatable* Dipole

MFJ-1785
$369.95

Now you can operate the *low bands* on 80, 40, and 20 Meters with a true rotatable dipole that'll blend in with the sky! Take advantage of excellent low band propagation during this low sunspot cycle. Handles 1500 Watts SSB/CW. 80/40 meter end-loading coils are wound on fiberglass forms with *Teflon*™ wire, and resonated with capacitance hats to ensure extremely low-losses. Full-size on 20 Meters gives incredible DX. Balun included! 33 foot low-profile, inconspicuous. Easily rotatable with a medium duty rotator like Hy-gain's AR-40.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$419.95

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes. Enjoy DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- *gives you highest possible efficiency*.

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning. Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

Cover 40-15 Meters. MFJ-1788, $469.95. Like MFJ-1786 but covers 40 - 15 Meters continuous. Includes remote control.

MFJ's G5RV Antenna

MFJ-1778
$44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 M 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.

Dealer/Catalog/Manuals

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

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MFJ . . . the world leader in ham radio accessories!

MFJ *IntelliTuner*™ Automatic Tuners

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

MFJ-998 1500 Watt *Legal Limit IntelliTuner*™

Only the MFJ-998 gives you fully automatic antenna tuning for your legal limit full 1500 Watts SSB/CW linear amplifier!

MFJ-998 $699.95

Ultra-fast Automatic Tuning

Instantly match impedances from 12-1600 ohms using MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms with over 20,000 *VirtualAntenna*™ Memories.

Safe auto tuning protects amp

MFJ's exclusive *Amplifier Bypass Control*™ makes tuning safe and "stupid-proof"!

Digital/Analog Meters

A *backlit* LCD meter displays SWR, forward/reflected power, frequency, antenna selected, an auto-ranging bargraph power indication, and much more.

Has quick-glance auto-ranging Cross-Needle SWR/Wattmeter.

MFJ VirtualAntenna™ Memory

MFJ new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 switchable antenna coax connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total. Has binding post for end-fed long wire antennas.

Download & Upgrade Remotely

Download from internet and upgrade your MFJ-998 firmware as new features are introduced.

Plus Much More!

Built-in radio interface controls most transceivers.

Automatically bypasses with excessive tuning power.

Use balanced line antennas with external **MFJ-912, $59.95**, 1.5 kW 4:1 balun.

Small 13Wx4Hx15D inches easily fits into your ham station. 8 pounds. Requires 12-15VDC at 1.4 amps maximum or 110 VAC with **MFJ-1316, $21.95**.

for 600 Watt amps

AL-811/ALS-600/ALS-500

For 600 Watt amps like Ameritron AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. 10,000 *Virtual Antenna*™ memories. Cross-Needle SWR/Wattmeter. 10Wx2¾Hx9D inches.

MFJ-994B $359.95

No Matter What™ Warranty

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

300 Watt...Best Seller

Digital Meter, Ant Switch, Balun

The *world's best selling* automatic antenna tuner is *highly acclaimed the world over* for its ultra high-speed, wide matching range, reliability, ease-of-use! Matches virtually *any* antenna.

MFJ-993B $259.95

300 Watt...*Extra*...Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B $219.95

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 $219.95

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 $199.95

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

No *extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 $179.95

G5RV Antenna

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 $399.95

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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MFJ TUNERS

Ham Radio's *Most Popular* 300 Watt Antenna Tuner

More hams use MFJ-949s than any other antenna tuner in the world!

Why? Because the world's leading tuner has earned a world-wide reputation for being able to match just about anything.

Full 1.8-30 MHz Operation

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . Use coax, random wire, balanced lines. Has heavy duty 4:1 balun for balanced lines.

Custom inductor switch

Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*(R) insulating washers and proper L/C ratio gives you *arc-free* no worries operation

MFJ-949E $179.95

up to 300 Watts PEP transceiver input power.

The MFJ-949E inductor switch was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner.

8-Position Antenna switch

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

Lighted Cross-Needle Meter

Full *size* 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, *peak* or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

QRM-Free PreTune™

MFJ's *QRM-Free PreTune™* lets you pre-tune your MFJ-949E *off-the-air* into its built-in dummy load! Makes tuning your actual antenna faster and easier.

Plus Much More!

Full *size* built-in non-inductive 50 Ohm dummy load, scratch-proof Lexan multi-colored front panel, $10^{5}/_{8}$x$3^{1}/_{2}$x7 inches. Superior cabinet construction and more!

MFJ-948, $159.95. Econo version MFJ-949E. Has all features except for dummy load.

***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-989D ***Legal Limit*** Tuner

MFJ-989D $389.95

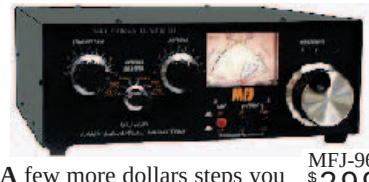
New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. Easily handles *full* 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. *New* 500 pF air variable capacitors. *New* improved *AirCore™* Roller Inductor. *New* high voltage current balun. *New* crank knob. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D".

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. $10^{1}/_{2}$Wx$3^{1}/_{2}$Hx$9^{1}/_{2}$D inches.

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.

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MFJ-902 $99.95

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

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

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MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

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.

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MFJ *Balanced Line* Antenna Tuner

Superb balance . . . Very wide matching range . . . Covers 1.8-54 MHz . . . Cross-Needle SWR Wattmeter . . . Handles 300 Watts . . . Compact size . . .

The MFJ-974HB is a* fully balanced true *balanced line antenna tuner. It gives you superb current balance.

Johnson Matchbox

For decades, the Johnson Matchbox has been the standard of comparison for balanced line antenna tuners. But, it had a severely limited matching range and covered only 80, 40, 20, 15 and 10 Meters.

***The** MFJ-974HB is its successor*. It meets today's needs and even surpasses the Johnson Matchbox outstanding performance.

Everything You Need

The MFJ-974HB gives you excellent current balance, very wide matching range(12-2000 Ohms) and covers 1.8 through 54 MHz *continuously* including all WARC bands, 160 Meters, 6 Meters and the new 60 Meter band. Handles 300 Watts SSB PEP and 150 Watts CW.

Tuning is fast and easy - - just three tuning controls. You can adjust for highly efficient broadband low-Q operation or use higher Q when you encounter extreme loads.

A large three-inch lighted Cross-Needle SWR/Wattmeter lets you read SWR, peak or average forward and reflected power *all at a glance* on 300/60 or 30/6 Watt ranges.

A ground post is provided to ground one output terminal so you can also tune random wires and coax fed antennas.

Compact 7½Wx6Hx8D in. fits anywhere.

Tunes any Balanced Line

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

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

Excellent Balance, Excellent Design

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

MFJ-974HB
$209.95

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

Balanced Line = Extremely Low Loss

Balanced lines give extremely low loss.

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

6-80 Meter Balanced Line Tuner

MFJ-974B
$189.95

MFJ-974B, $189.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $59.95. 102 feet doublet antenna covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for 450 Ohm ladder line (100 feet included). Authentic *glazed ceramic* end insulators. Handles 1500 Watts.

MFJ 1500 Watt ***Fully Balanced*** Antenna Tuner

Fully balanced MFJ-976 handles 1500 Watts legal limit . . . Extra-wide 12-2000 Ohms matching range . . . continuous 1.8 to 30 MHz coverage including all WARC bands . . . Four separate 500 pF in two gangs gives you a total of 2000 pF capacitance . . . Heavy duty 1:1 current balun . . . more!

MFJ-976
$499.95

The MFJ-976 is a 1500 Watt Legal Limit *fully balanced* antenna tuner.

You get *superb* current balance, very wide matching range (12-2000 Ohms) and *continuous* 1.8-30 MHz coverage including all WARC bands. Handles *full* 1500 Watts SSB *and* CW.

You can tune *any* balanced lines including 600 Ohm open wire line, 450/ 300 Ohm ladder lines, 300/72 Ohm twin lead -- shielded or unshielded. Also tunes random wires and coax fed antennas.

MFJ's *fully balanced* extremely wide-range T-network gives you simple, fast three knob tuning. No complicated switching between high and low impedance and switching in additional capacitance of L-networks.

Four separate 500 pF in two gangs gives you a total of 2000 pF for highly efficient low loss operation on 160 Meters.

You get superb 10 Meter performance due to MFJ's low minimum capacitance and exclusive *Self-Resonance Killer*™ high-Q *AirCore*™ roller inductor with silver plated contacts.

Heavy duty 1:1 current balun gives you *superb balance* and stays cool even at 1.5kW.

True *active* peak reading lighted Cross-Needle SWR/Wattmeter lets you read SWR, *true peak* or average forward and reflected power all at a glance on 300/ 3000 Watt ranges. 12Wx6Hx15¾D inches.

Ladder line, Twin lead, Insulators, Copper wire . . .

Super-strong fiberglass 450 Ohm ladder line insulators

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MFJ-16E01, $9.95. Feedpoint *End* Insulator. Double weave ladder line stress relief. Built-in SO-239 connector.

MFJ-16F01, $8.95. *Middle* insulator. High-strength coax connection at mid-point with SO-239, quadruple weave-through ladder line stress relief.

MFJ-16C06, $4.56. Authentic *glazed ceramic* Insulator, 6-pack.

450 Ohm Ladder Line

Extremely low loss, open-frame construction. Heavy duty black polyethylene. Solid 18 gauge wire. MFJ-18H050, **50 Ft.**, $19.95. MFJ-18H100, **100 Ft.**, $34.95. MFJ-18H250, **250 Ft.**, $89.95.

300 Ohm Twin-Lead

20 gauge stranded copper wire. Black polyethylene. MFJ-18T050, **50 Ft.**, $24.95. MFJ-18T100, **100 Ft.**, $44.95. MFJ-18T250, **250 Ft.**, $99.95.

Copper Antenna Wire

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World's most popular SWR analyzer is super easy-to-use

Reads SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . frequency counter . . . side-by-side meters . . . Battery charger . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . .

World's most popular SWR analyzer! ***The famous MFJ-259B gives you a complete picture of your antenna's performance. You can read your antenna's SWR and Complex Impedance from 1.8 to 170 MHz.***

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously.

You can read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance from HF to VHF -- 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

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Measure inductance and capacitance. Troubleshoot and measure resonant frequency and Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Call your favorite dealer for your best price!

MFJ-259B $289.95

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and more!

Free Manual: call, write or download

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1312D, $15.95. Its rugged all metal cabinet is a compact 4x2x6¾ in.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

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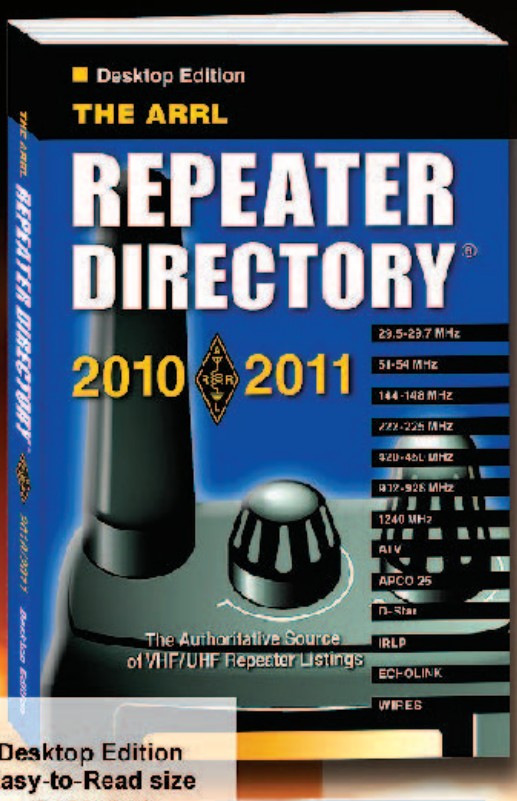

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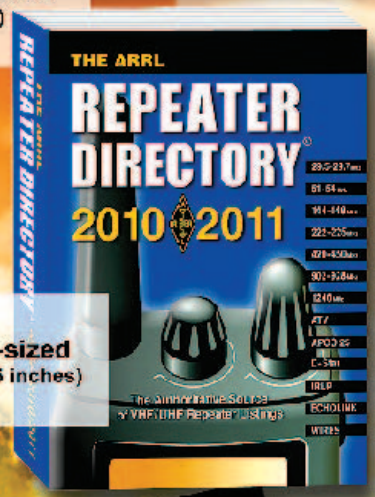

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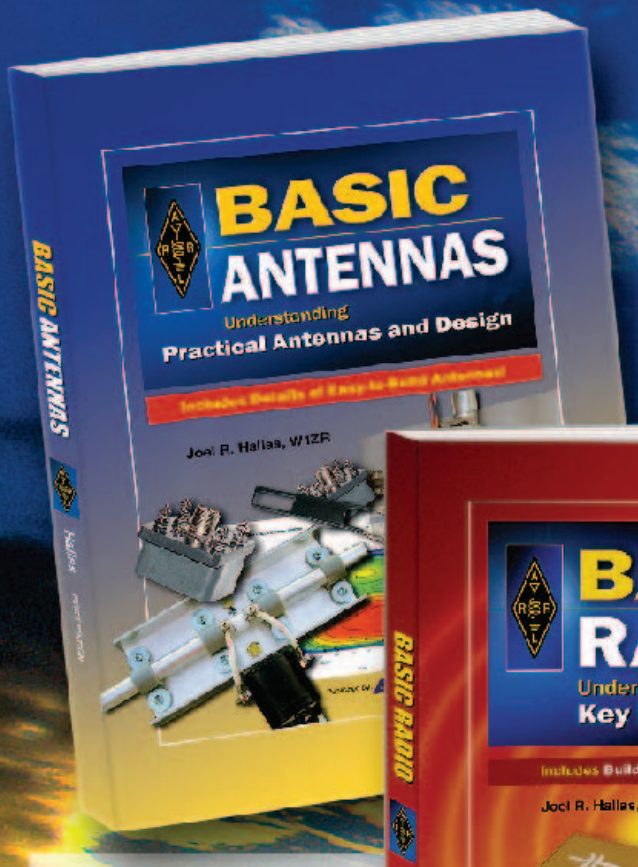

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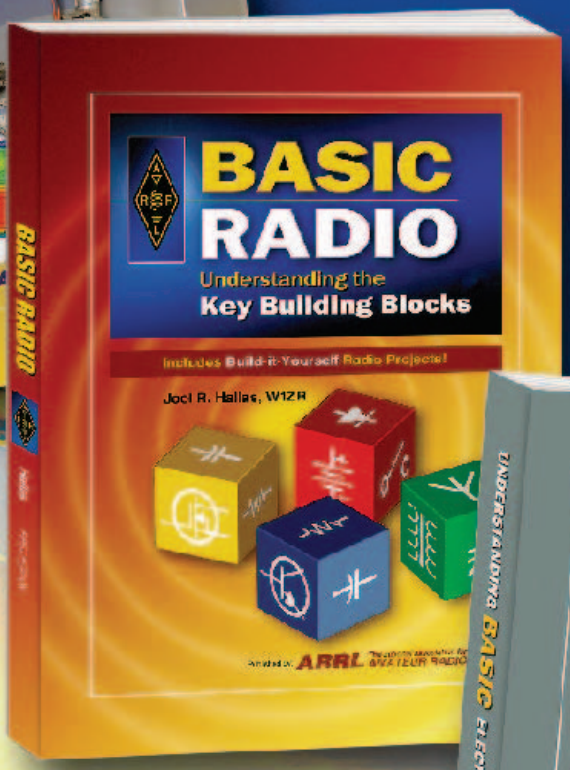

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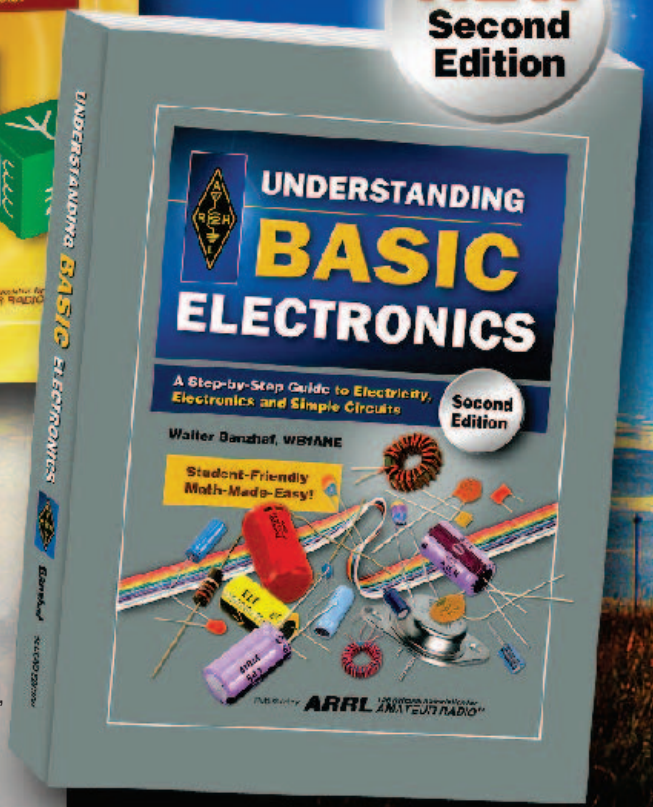

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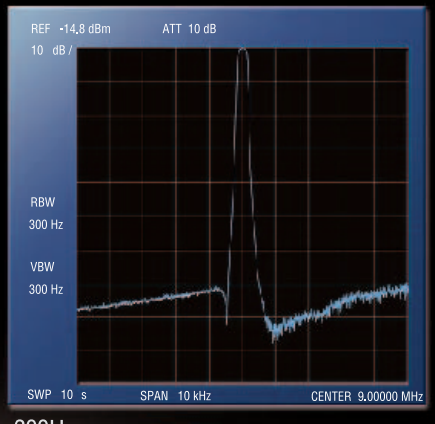

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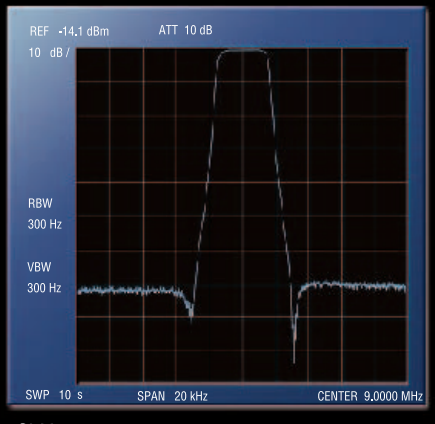

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