SPECIAL DXING ISSUE

QST

DEVOTED ENTIRELY TO AMATEUR RADIO

October 2012 WWW.ARRL.ORG

DX Adventures
—Then and Now

QST reviews:

Inside:

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Official Journal of ARRL The national association for AMATEUR RADIO®

OCTOBER 2012 QST Vol 96 No 10

YAESU

The radio

Choice of the

Covering HF and 6 meters the FT-DX9000 Series answers the call for the ultimate DX base station.

FT DX 9000MP

No other Amateur transceiver offers you 400 Watts of transmitter power for the biggest, cleanest voice on the bands. And switching to Class-A operation at 100 Watts of output, you enjoy the benefits of ultra low distortion others can't match at 100 Watts! 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 50V/24 A Switching Regulator Power Supply and Speaker with Audio Filters.

FT DX 9000D

The "Fully loaded" model represents the total FT DX 9000 experience. Included is the large TFT display, along with 1.8-14 MHz high-Q "μ" front-end RF tuning circuit, utilizing a large-diameter 1.1" (28mm) ferrite core and precision motor drive. Its Q of over 300 provides razor-sharp RF tuning-ideal for today's crowded bands! 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.

FT DX 9000 Contest

The FT DX 9000 gives you the opportunity to build up your radio to match your operating style and competitive requirements. World-class ergonomics combine with leading-edge performance to put more QSOs in your log faster. This is what Amateur Radio is about: building the best, so you can be your best! 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.

FT-2000, FT-2000D, FT-950 and the FT-450D

FT-2000 and FT-2000D

This rugged DX hunter has power and performance to spare. The FT-2000 provides a full 100 Watts RF output on 160 through 6 meters with an internal power supply, but the FT-2000D version doubles down with 200 Watts and an external supply. The impressive feature list for both versions includes dual receive capability for effortless split frequency operation; a receiver front-end VRF (Variable RF Tuning) preselector; 1st IF roofing filters (3/6/15 kHz) for superb dynamic range; variable IF bandwith and IF Shift; receiver DSP with Auto-Notch, Manual Notch, Digital Noise Reduction; and a continuously-variable passband contour control.

YAESU USA
6125 Phyllis Drive, Cypress, CA 90630
(714) 827-7600
http://www.yaesu.com

Top DXing Rig Picks

World's top DX'ers

FT DX 5000 Series

The FT DX 5000 Series HF/50 MHz 200 Watt Transceivers are a premium Class of Yaesu radios with 2 Independent Receivers plus many options and accessories designed for the serious DXer.

With 112 dB dynamic range and an IP3 [3rd Order Intercept Point] of +40 dBm (CW, 500 Hz BW), you'll find extra sharp roofing filters for VFOA/Main receiver are selectable between 300 Hz (optional on some versions), 600 Hz, 3 kHz, 6 kHz and 15 kHz.

Three electro-luminescent sub-displays indicate sub frequency, graphical wave and menu functions. Additional features: Parametric Microphone Equalizer; Dual Receive In Band Function Contest-ready Antenna Selection; Manual and Automatic Digital Notch; High Speed Automatic Antenna Tuner; DSP Noise Reduction.

FT DX 5000MP
Station Monitor SM-5000 included; 0.05 ppm
OCXO included; 300 Hz
Roofing Filter included

FT DX 5000D
Station Monitor SM-5000 included; 0.5 ppm
TCXO included; 300 Hz
Roofing Filter optional

FT DX 5000
Station Monitor SM-5000 optional; 0.5 ppm
TCXO included; 300 Hz
Roofing Filter optional

FT-950

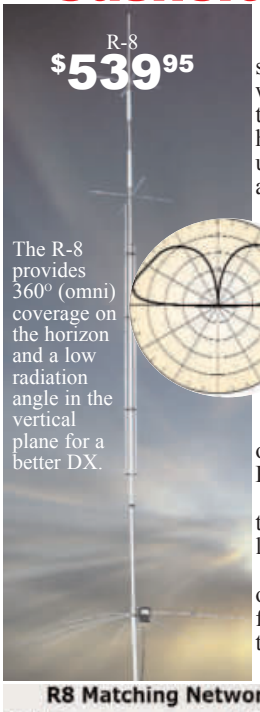
Whether you're a serious or casual DXer, the Yaesu FT-950 should be at the top of your list. The FT-950 packs a 100 watt punch on 160 through 6 meters and includes a built-in antenna tuner; triple-conversion superheterodyne receiver; three factory-installed 1st IF roofing filters; variable IF bandwidth and IF shift, manual IF notch filter, an Automatic Digital Notch Filter (DNF) and many other expanded features available with optional DMU-2000 Data Management Unit.

FT-450D

This easy-to-pack radio is a DXpeditioner's dream come true – a lightweight, high performance transceiver spanning 160 through 6 meters with 100 Watts RF output. When it's time to wade into the pileups, you'll appreciate the FT-450D's 10 kHz bandwidth roofing filter in the 68 MHz first IF, right after the first mixer. This filter provides outstanding selectivity when the going gets rough – a feature rarely found in rigs in this price range!

Cushcraft R8 *8-Band Vertical*

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



The Cushcraft R8 is recognized as the industry gold standard for multi-band verticals, with thousands in use worldwide. Efficient, rugged, and built to withstand the test of time, the R8's unique ground-independent design has a well-earned reputation for delivering top DX results under tough conditions. Best of all, the R8 is easy to assemble, installs just about anywhere, and blends inconspicuously with urban and country settings alike.

Automatic Band Switching: The R8's famous "black box" matching network combines with traps and parallel resonators to cover 8 bands. You QSY instantly, without a tuner!

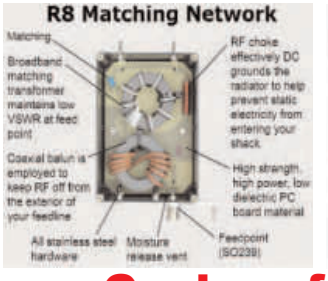
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

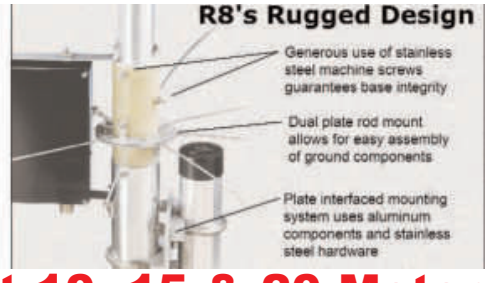
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

Legal-Limit Power: Heavy-duty components are contest-proven to handle all the power your amplifier can legally deliver and radiating it as RF rather than heat.

The sunspot count is climbing and long-awaited band openings are finally becoming a reality. Now is the perfect time to discover why Cushcraft's R8 multi-band vertical is the premier choice of DX-wise hams everywhere!

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





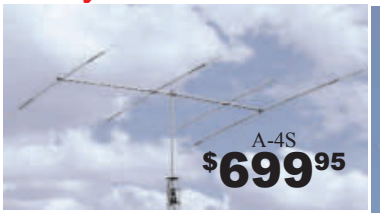
MA-5B *5-Band* Beam

Small Footprint -- Big Signal

The MA-5B is one of Cushcraft's most popular HF antennas, delivering solid *signal-boosting directivity* in a bantam-weight package. Mounts on roof using standard TV hardware. Perfect for exploring exciting DX without the high cost and heavy lifting of installing a large tower and full-sized array. Its 7 foot 3-inch boom has less than 9 feet of turning radius. Contest tough -- handles 1500 Watts.

The unique MA-5B gives you 5-bands, automatic band switching and easy installation in a compact 26-pound package. On 10, 15 and 20 Meters the end elements become a two-element Yagi that delivers solid power-multiplying gain over a dipole on all three bands. On 12 and 17 Meters, the middle element is a highly efficient trap dipole. When working DX, what really matters are the interfering signals and noise you *don't hear*. That's where the MA-5B's impressive side rejection and front-to-back ratio really shines. *See **cushcraftamateur.com** for gain figures.*

Cushcraft 10, 15 & 20 Meter Tribander Beams



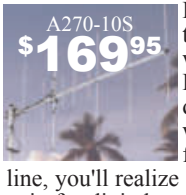
Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to success comes from attention to basics. For example, element length and spacing has been carefully refined over time, and high-power traps are still hand-made and individually tuned using laboratory-grade instruments. All this attention to detail means low SWR, wide bandwidth, optimum directivity, and high efficiency -- important performance characteristics you rely on to maintain regular schedules, rack up impressive contest scores, and grow your collection of rare QSLs!

It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the difference.

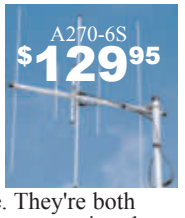
The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS**, **$499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

Cushcraft Dual Band Yagis

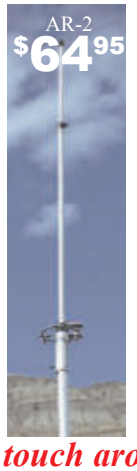
One Yagi for Dual-Band FM Radios

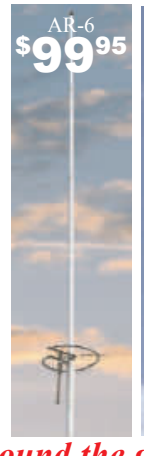


Dual-bander VHF rigs are the norm these days, so why not compliment your FM base station with a dual-band Yagi? Not only will you eliminate a costly feed line, you'll realize extra gain for digital modes like high-speed packet and D-Star! Cushcraft's A270-6S provides three elements per band and the A270-10S provides five for solid point-to-point performance. They're both pre-tuned and assembly is a snap using the fully illustrated manual.



Cushcraft Famous *Ringo* Compact FM Verticals





W1BX's famous *Ringo* antenna has been around for a long time and remains unbeaten for solid reliability. The Ringo is broad-banded, lighting protected, extremely rugged, economical, electrically bullet-proof, low-angle, and more -- but mainly, it just plain works! To discover why hams and commercial two-way installers around the world still love this antenna, order yours now!

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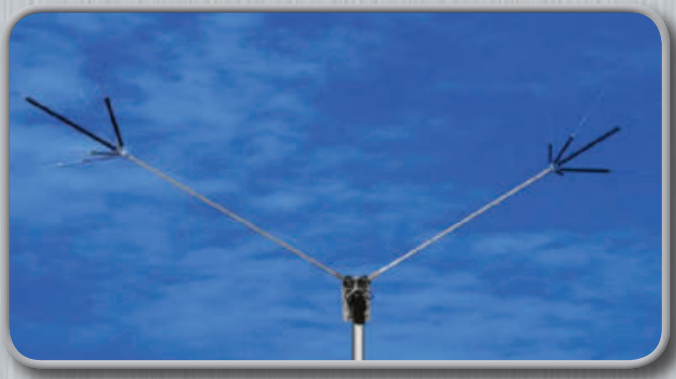
Life is a JOURNEY. Enjoy the ride!

The engineering staff at COMET Antenna Company presents three new products!

CMX-2300 *TWIN Cross-Needle SWR/Power Meters*

Left Side Meter 1.8-200MHz: Max Power 3kW
Right Side Meter 140-525MHz: Max Power 200W

Average and PEP power selector switch
FWD, REF, SWR readings displayed simultaneously.
Separate ANT/TX connectors allow both meters
to be used at the same time - Low loss circuitry - Illuminated



CHV-5X *40/20/15/10/6M Rotatable Dipole*

HOA antenna restrictions? Limited space? Want to operate with a low profile? Need a small, multi-band HF/6M antenna for portable/ emergency use?... The CHV-5X is a great choice! Lightweight, compact, rotatable half-wave center fed dipole. Assembles in several configurations: “V”, “horizontal”, or as a “ground plane”. Each band tunes independently with sliding tuning stubs

Length: Approx 13 ft (assembled horizontally)

Weight: 5 lbs 14ozs (inc mounting plate and balun)

Max Power: 40/20M: 150W SSB 15/10/6M: 220W

CAA-500 *Cross Needle SWR and Impedance Analyzer*

Dual cross-meter real-time analog display of SWR and total impedance with high accuracy.

Seven frequency ranges (Including 222 MHz!) extending up to 500 MHz!

Thumb-wheel frequency adjustment for effortless sweeps of antenna operating range.

Two antenna jacks, "SO-239" and "N" (above 300 MHz).

Internal battery power or external DC (8 - 16 Volts).

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COMET™

Our mission: To promote and advance the art, science and enjoyment of Amateur Radio.

In This Issue

October 2012 Volume 96 Number 10

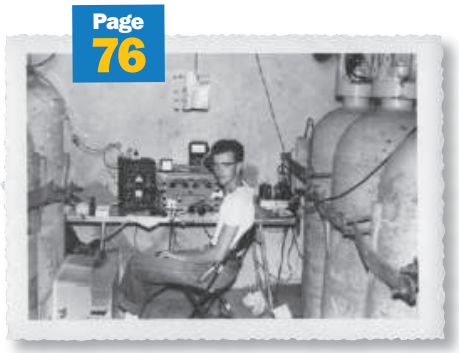
Technical

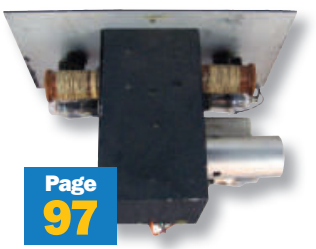
News and Features

Our Cover

This month, head out on a DXpedition to Malpelo, Rotuma and Navassa — all from the comfort of your armchair — with our annual DX issue. Discover DXpeditions of lore and legend, as well as a look at how DX spotting came to life. This month's cover features the 2012 HKØNA DXpedition to Malpelo, an island located about 235 miles off the coast of Colombia. Beginning on page 73, Bob Allphin, K4UEE, recounts how 20 hams from six countries activated this #12 most-wanted DXCC entity.

Radiosport





Columns

Departments

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October 2012
Volume 96 Number 10

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

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

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Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

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GPS / APRS® / Bluetooth® Features
FTM-350AR

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

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

FTM-350AR NEW

220 MHz 1 W (USA version only)

New Features of The FTM-350AR

1. New Vacuum Cup-Mounting Bracket with Angle Adjustment

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

2. Expanded APRS® functions

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

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

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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.

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- Memories to store 30 APRS® messages
- DIGI-PATH routing indication function
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- APRS® Symbol Icon pre-set function
- Clearly displayed APRS® Beacon Messages
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DUAL BAND DIGITAL TRANSCEIVER

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- Large Dot Matrix LCD
- Wideband Receive Capability
- Built-in GPS Antenna
- Vibrate Alert Function
- Internal AM Bar Antenna

***GSM** (Group Short Message)*
***Snapshot Function** (Image data transfer)*
Digital ARTS
Data back up
USB connector
***E2O** (Easy to Operate)*
E-GPS, GPS data transferring function

ACTUAL SIZE

C4FM FDMA Digital Transceiver FT1D R/E

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The FT1DR/E has not been approved by the FCC. This product may not be sold or leased, or offered for sale or lease until FCC approval has been obtained.

*E for European Version

David Sumner, K1ZZ – dsumner@arrl.org
ARRL Chief Executive Officer

Remembering Joel Kleinman

"Dozens of people participate in the process that results in QST reaching ARRL members each month. For most of the past 35 years Joel Kleinman, N1BKE, has played an essential role in that process. With deep regret we must report that this is the last issue that will bear Joel's special touch."

QST Managing Editor Joel Kleinman, N1BKE, died August 18 as a result of a fire at his home in Meriden, Connecticut that also injured his wife Jayne. The ARRL staff was shocked and inexpressibly grieved by the news. Those of us who enjoyed the privilege of working closely with him know all too well that we have lost a brilliant editor and an irreplaceable, devoted colleague.

Joel began his career at the ARRL in June 1976 when he was hired for a program to introduce space science to students using amateur satellites – a precursor to today's Amateur Radio on the International Space Station (ARISS) program. At the time he was unlicensed but soon became WA1ZUY. He was active in local clubs and particularly enjoyed the teamwork and camaraderie of Field Day.

A gifted writer and editor with a master's degree in journalism and newspaper experience, Joel moved into an editorial position less than a year after joining the ARRL staff. He moved up rapidly, becoming *QST* editorial and production supervisor in 1978. In 1988 he was named to head the team responsible for the editing and production of the ARRL's books and audio media.

In 2001 Joel returned to his first love, *QST*, as Managing Editor. He occupied that position on the masthead for more than 11 years, maintaining the highest editorial standards while helping to guide the evolution of our membership journal. With the rest of the *QST* staff he had recently accepted the new challenge of producing a digital edition, adding another dozen deadlines to the annual editorial calendar.

We will miss Joel's good nature and dry humor, his intelligence and wide range of interests, and even his inexplicable fondness for the New York Yankees. He possessed two traits that are seldom found together: an obsession with quality and accuracy coupled with even-temperedness. He was as forgiving of others as he was demanding of himself. Badly injured 30 years ago when a car cut in front of his motorbike and forced a collision, he lived with the resulting limp and other medical challenges without complaint. Joel had particular empathy for Dick Paton, the author of the April 2012 *QST* article that won the Cover Plaque Award for that month, after Dick was injured in an accident very similar to Joel's soon after the article appeared. Joel and I visited Dick to present his award at the hospital where he was undergoing rehabilitation.

The cause of the fire that took Joel's life is under investigation at this writing and we do not presume to know exactly what happened, but the circumstances bring to mind another tragedy that struck the Amateur Radio community in Germany last year. The Deutscher Amateur Radio Club lost the chairman of its DX and HF Contesting Committee, Dr. Lothar Wilke, DL3TD, to a fire that apparently started in the power supply of his personal computer. These days it is a rare household that does not have multiple pieces of electronic equipment plugged in and continuously powered on. Equipment can fail, unpredictably and unexpectedly, in ways that cause fires. These two tragedies may not have been avoidable, but they should remind us of what we should do to protect ourselves and those we love.

The basic rules of fire safety are not difficult or expensive to follow. Smoke detectors should be installed on every level of every home, especially in or near bedrooms, and their batteries replaced every six months. Fire extinguishers should be well maintained and readily available – including in the ham shack – and every adult member of the household should know how to use one, although fire safety experts emphasize that getting everyone out safely and gathered together in one place is the top priority.

In the coming weeks and months we will work hard to make sure that *QST* continues to meet Joel Kleinman's high standards. Without him it won't be easy, but it's the least we can do to pay tribute to our departed colleague and friend.

Electronic Voting

ARRL Full Members in the Hudson and Northwestern Divisions will be the first to have the opportunity to vote electronically in an ARRL election. This year there are contested elections for Director in both divisions and for Vice Director in the Northwestern. The incumbents in the Central, New England, and Roanoke Divisions have been re-elected without opposition, along with the Vice Director of the Hudson Division.

Around October 1, every Full Member in the Hudson and Northwestern Divisions for whom we have a valid email address will be sent a message explaining the voting process. All other Full Members in the two divisions will be sent a paper ballot by mail as in the past, although the format will be somewhat different than for previous elections and the ballots will be returned to an address in Minnesota. Section Manager balloting is unchanged for now, and will continue to be conducted with paper ballots mailed back to Newington.

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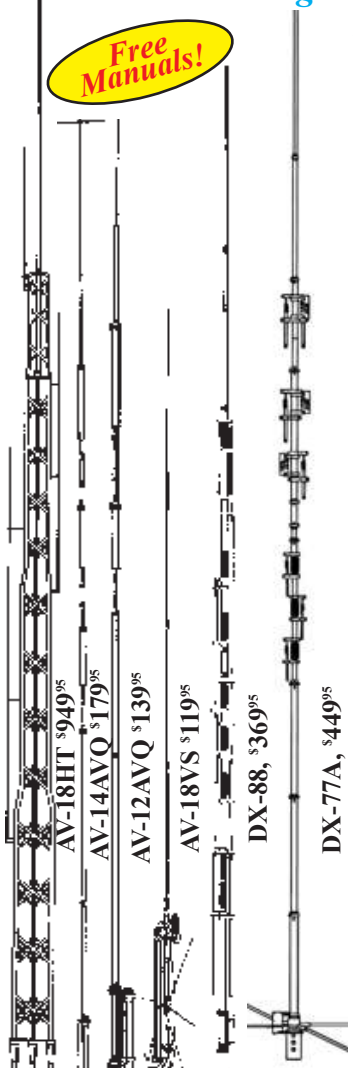


hy-gain(R) Classics

All hy-gain multi-band vertical antennas are entirely self supporting -- no guys required.

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 band-switching (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.

Includes all stainless steel hardware. Recessed SO-239 prevents moisture damage.

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

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

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

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

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

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

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

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

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

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

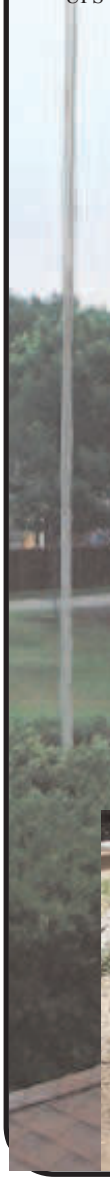
Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$179.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$139.95	10,15,20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$119.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

Hy-Gain 160-6 Meters Self-Supporting Vertical

Full 1500 Watts, 43 feet, includes base mount

New! AV-6160 **$399.95** UPS SHIPPABLE

Operate all bands 160-6 Meters at full 1500 Watt with this self-supporting, 43 feet high performance vertical! It assembles in less than an hour and its low profile blends in with the sky and trees -- you can barely see it . . .



Exceptional Performance

The entire length radiates to provide exceptional low angle radiation 160-20 Meters and very good performance on 17-6 Meters. You can shorten it by telescoping it down for more effective low angle radiation on higher bands.

Just talk with automatic tuner!

A wide-range automatic or manual antenna tuner *at your rig* easily matches this antenna for all bands 160-6 Meters. There's no physical tuning adjustments on the antenna -- you simply put it up!

An optimized balun design allows *direct coax feed* with negligible coax loss (typically less than 1/2 dB 60-6 Meters and less than 1 dB 160-80 Meters with good quality, low-loss coax).

Extremely low wind loading

With just 2 square feet wind load, the AV-6160 has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D.and .120 inch thick walled tubing bottom section makes it incredibly strong.

Just 20 lbs., uses super-strong *6063 aircraft aluminum tubing.* Stainless steel hardware.

Assembles in an hour

Ground mounting lets you hide antenna base in shrubbery. Requires ground system -- at least one radial. More extensive ground work better.

Stealth Operation

Low profile. Hide behind trees, fences, buildings, bushes. Use as flagpole. Easily telescopes down during the day.

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The radio

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NEW! Coming Soon!

These devices have not been approved by the FCC. These devices may not be sold or leased, or offered for sale or lease, until FCC approval has been obtained.

$70 Coupon

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100 Watts of power output on SSB, CW, and FM (25 Watts AM carrier).

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2M/440 50W
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APRS & WIRES Ready
GPS (optional)

$20 Coupon

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state of the art
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world class performance,
easy to use

$20 Coupon

FT-897D
HF/6/2/440 all mode
Portable 100W HF/6,
50W 2M, 20W,
440MHz

$20 Coupon

FT-817ND
HF/6/2/440

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FTM-10R
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FT-8800R
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FTDX-5000/D/MP Series
Shown above withSM5000 Station Monitor (optional on some versions).

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Coupons good through October 1, 2012.

NEW! TS-990S Coming Soon!

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$200 Coupon TS-2000S
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IF/stage DSP on
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Joel P. Kleinman, N1BKE – jkleinman@arrl.org

In Brief

- NASA's Mars Rover *Curiosity* landed August 6. Engineers will use the Morse code J P L imprinted on its wheels to determine how far it roams.
- ARRL President Kay Craigie, N3KN, has appointed James Millsap, WB4NWS, to fill the remainder of the term of Southeastern Division Vice Director Andrea Hartlage, KG4IUM, who resigned because she is moving out of the division.
- The Ontario section split into four parts effective September 1. See the article on page 80.
- International Lighthouse/Lightship Weekend 2012 took place in August.
- NOAA has updated its 2012 Atlantic hurricane forecast to increase the odds for an above-normal season. The season ends November 30.
- The FCC has denied a *Petition for Reconsideration* regarding the reassignment of call sign previously held by a deceased California amateur. Details appear in this month's Happenings column.
- The FCC also denied a *Petition for Reconsideration* to create a nationwide emergency calling frequency.
- The National Conference of Volunteer Examiner Coordinators held its annual meeting via teleconference in July.
- The FCC increased the cost of a 10 year vanity call sign from $14.20 to $15 effective September 4.
- Ivica Dačić, YU1YU, was elected Prime Minister of Serbia in late July.
- Two special event call signs were on the air during the London 2012 Olympic Games: 2O12L from London and 2O12W from Wales. Both stations will be active August 29-September 9 during the Paralympic Games.
- Heathkit Educational Systems declared bankruptcy in July, ending the latest attempt to resurrect the company.
- The winner of the July *QST* Cover Plaque award is Carl Luetzelschwab, K9LA, for his article "Our Recent Solar Minimum and Sunspot Cycle 24 Progress."

Media Hits

Allen Pitts, W1AGP – apitts@arrl.org
Media & Public Relations Manager

- While things calmed down after the incredible success of Field Day, July's heat still percolated many good media hits in print and on the airwaves. The Blue Ridge Amateur Radio Club in Henderson (NC) got in the *Hendersonville Times-News* when the #1 item listed of the "top five things to do on the weekend" was to learn about Amateur Radio. Ed Best, AK4W, also in NC, scored with "When all is dark, ham radio never fails" in the *Chapel Hill News*. Jessica Jones of the *Gulf Coast News Today* (AL) caught the enthusiasm in "Hams love frequency." She wrote, "Some curl up with books, or enjoy latest movies; some take voice and instrument lessons and lift up beautiful notes for audiences to enjoy. But 'hams,' or amateur radio enthusiasts, enjoy an exact and useful hobby as they communicate through frequencies." Jenny Heyden, writing for the **ShorewoodPatch.com** expanded this with "An International Radio Station in Your Basement" and pointed out "Ham radio is alive and well, and despite cell phones and the Internet, is still the best way to run a parade, marathon, or send information during a catastrophe."
- This unique mixture of hobby and meaningful community service activity may be common for hams, but is unusual for almost any other hobby activity. David Henderson, KF4VCA, noted it well in his article "Members of the baby boomer generation spring into action during emergencies" on **Boomercafe.com**.
- Individual initiatives by hams included Charles Hargrove, N2NOV, appearing on air in "The Bronx Report" show on WVOX and Wayne Yoshida, KH6WZ, did a (one man?) booth at the Orange County Maker Faire (CA). But one of the best ones was a letter from PIO Tracy Stephens, KI4OZG, of the Calhoun County Amateur Radio Association who simply sent a public thank you to the *Anniston Star* (AL). By thanking the Red Cross, sheriff and local scouts in the papers, she not only got club publicity but also made excellent relationships with others.
- Hawaii's hams also got media coverage. The *Lahaina News* happily reported on three new hams at the Maui Prep Amateur Radio Club station. Some weeks ago in *CONTACT!* (the online ARRL newsletter for PIOs) we suggested that clubs publicize the success and names of new hams in the local newspapers and it apparently works well.
- With over 705,000 licensees in the US and still climbing, you would think everyone had gotten the message by now. But to be sure, Steve Kadel wrote "Ham Radio Lives On" for the *Twin Falls Times-News* (ID). "Like Mark Twain's purported death, the demise of ham radio has been greatly exaggerated." "There is a terrible rumor that ham radio is dead," said Kelly Klaas of the Magic Valley Amateur Radio Operators Club. "The truth is**..."** "Local hams are still on the air," wrote the *Shore News Today* (NJ) citing recent emergency activities and "Ham radio operators stay tuned in," read the *Sonoma Valley Sun* (CA).
- The resourcefulness and dedication of hams was in the *Pueblo Chieftain* (CO) news when "With little or no sleep, we were contacted by the ARES District Manager Mike McQueen," said Amanda Alden, K1DDN. "He told us the situation was looking grim for communications." The hams came off Field Day action and, "in the blink of an eye, they were put to the test at the Waldo Canyon Fire." Well done! But then — this is what hams do. It seems to be genetically encoded in us. Perhaps that is why "Culture of Ham Radio Story Tops Patch's Most Read (article) in July" was so pleasant to read at the end of the month. (Remember Jenny Heyden from paragraph one above?) Finally, a rather long but well written explanation of Amateur Radio was "Johnson County Hams Cruising the air waves for fun and service" in *Best Times* (KS).
- You can read shorts of most of the July 2012 media hits at **www.arrl.org/media-hits** and please don't forget JOTA is coming up this month on October 20-21.

Head to the ARRL National Convention October 12-14

There's still time to make plans to head to this year's ARRL National Convention at Pacificon 2012, to be held at the Marriott Santa Clara, Santa Clara, California. It's the perfect opportunity to enjoy a world-class convention along with all that the Silicon Valley has to offer. ARRL Expo will feature a wide range of forums, presentations, ARRL products and much more. Details are at **www.arrl.org/2012-arrl-national-convention**.

ARRL General Counsel Chris Imlay, W3KD, will co-present a seminar on legal issues facing Amateur Radio operators at ARRL Expo, part of the 2012 ARRL National Convention in Santa Clara.

Father and son "complete England" in Summits on the Air: As of July 29, Tom Read, M1EYP, and Jimmy Read, 2E0EYP, have activated each of the 176 summits currently in the English (G) SOTA Association. They have been climbing together since 2005. Here, they're on the summit of Pike of Blisco, G/LD-024, in the Lake District. See **www.sota.org.uk** for more information about Summits on the Air. [Tom Read, M1EYP, photo]

Tiny Niue now has its own call sign block: In August, an update to the ITU Table of International Call Sign Series reflected a change for Niue, a small South Pacific island that is in free association with New Zealand. Formerly ZK2, Niue now has the entire E6 prefix block. [Wikimedia Commons]

Inside HQ

Harold Kramer, WJ1B – hkramer@arrl.org
ARRL Chief Operating Officer/*QST* Publisher

Submitting Paper QSL Cards

Got cards? Here's what to do with them to apply for DXCC® credit.

You finally worked that rare DXpedition, and at long last you received their paper QSL card. How do you get that rare QSL card, and the other paper cards that you have collected, into your DXCC record and receive your award?

This past April, we created a more efficient and faster option for paper card submissions. Rather than filling out the traditional paper forms, you can now use the *Online DXCC* Application: **https://p1k.arrl.org/onlinedxcc/**. Using this system results in a more legible and accurate submission. Enter the data from your paper cards into the application and print out the form. If you are not using the Online DXCC system, then you need to download, print and complete the DXCC Award Application and DXCC Record Sheet. These PDF files can be found at **www.arrl.org/dxcc-forms**. In either case, sort your cards by band and then mode within the band.

Someone still has to view and verify the actual QSL cards. Your first option is to bring your cards and forms to an ARRL Card Checker. Our volunteer Card Checkers do a great job. To locate one, use **www.arrl.org/dxcc-card-checker-search**. Card checking is also usually available at hamfests and conventions. Be sure to bring both the Application Form and the Record Sheet. If you hand-write the forms, remember that the more legible the forms and the more accurately the cards are sorted, the faster your application can be checked.

Your other option is to send your cards, along with the completed forms, to HQ. For USA applicants, we prefer that you use *US Postal Service Priority Mail*. We'll take good care of your cards and send them back to you in four to six weeks after we check, edit and process them. For international applications, our preferred route is *First Class, International Registered Mail*. If you have a particularly large number of cards, contact us ahead of time and we will help you determine the best way to send them. If you have used the new *Online DXCC* application, your cards will already be entered into our system when we receive them. This saves us considerable time in processing your application.

You can also bring your cards to HQ. It typically takes about an hour for us to process a DXCC application of about 100 cards. If you are wheeling in a suitcase full of cards (and this has happened more than once), however, give us some advance notice and be prepared to leave them with us.

If you need to verify that we have received your application, you can check here for a listing of DXCC applications received: **www.arrl.org/dxcc-applications-received**.

If that rare DX station uses Logbook of the World, and you have both uploaded your QSO, the resulting match will give you the DXCC credit as soon as the match occurs. Of course, you still need to complete the online LoTW application:

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ARRL as an Advocate — www.arrl.org/regulatory-advocacy

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Logbook of the World – **www.arrl.org/lotw**

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Radio Clubs (ARRL-affiliated clubs) – **www.arrl.org/clubs**
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ARRL Field Organization – **www.arrl.org/field-organization**

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Books, Software and Operating Resources – **www.arrl.org/shop**

Quick Links and Resources

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QEX – *A Forum for Communications Experimenters* – **www.arrl.org/qex**
NCJ – *National Contest Journal* – **www.arrl.org/ncj**
Support for Instructors – **www.arrl.org/instructors**
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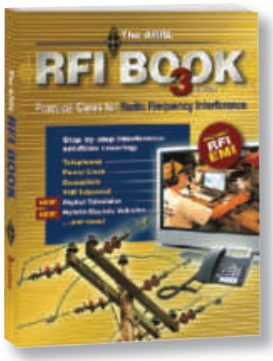
Joel P. Kleinman, N1BKE, upfront@arrl.org

RFI Problem Solved

Bill Clark, NØMAM



For those looking to expand their RFI savvy, *The ARRL RFI Book* is a comprehensive source of practical information. It's available through the ARRL Store, order no. 0915. Web resources can be found at **www.arrl.org/radio-frequency-interference-rfi**.

A radio frequency interference problem that had been interfering with the operation of garage door openers in all five houses on a cul-de-sac in a St Louis suburb was solved after several weeks of tracking down the culprit. All five homes on Westhampton View Court in St Charles, Missouri began experiencing problems with their garage door openers — they were not responding to their remote control units.

Four of the homes had the same make and model of garage door opener, but one was from a different manufacturer. Both types are older models that operate on the single frequency of 315 MHz; newer models use multiple frequencies to avoid interference.

Each of the homeowners replaced the batteries in their remote control units and reset the codes. When they contacted the two manufacturers they were advised to look for electronic devices in the immediate area that may be emitting RFI that might be interfering with the remote control signal getting to the receiving unit.

The five neighbors met for coffee one day and questioned one another about pieces of new electronic equipment any of them might have purchased as Christmas presents. There was only one new TV on the street and it was ruled out.

At one point they went searching the neighborhood for Amateur Radio antennas thinking that this might be the source. Of course, any of us hams could have told them that the more likely culprit would be some cheaply made household device.

When I learned they were considering ham radio equipment, I followed the story as it unfolded. In February it was announced that they had found the source. One homeowner is an electrical contractor. With the help of another neighbor, he started at his own house and turned off all his circuit breakers except the one supplying power to his garage door opener. As he did so, his neighbor tried the garage door opener remote and the opener was once again responding. They stayed in cell phone communication as the contractor turned his circuit breakers back on one at a time. Eventually the RFI interference returned and the garage door opener remote stopped working again.

They eventually determined that the interference was coming from the 24 V transformer from the contractor's landscape lighting system. The system is several years old and had developed the problem over time.

Two stories about the RFI hunt appeared in the *St Louis Post-Dispatch*, one describing the unusual problem and the other reporting on the solution.

And they're on sale! Mark Lunday, WD4ELG, of Greensboro, North Carolina saw these handy containers in a local food store. He writes: "Not sure if they are for DXCC QSL cards or to hold computer disks with MP3 files of DX QSOs made. Either way, I am sure I can find a use for them!"

Crutchzilla: The WV7T Field Day team made up of ham students and their mentor wanted to do something different, and Crutchzilla was the answer. Hearing so many stories of outlandish antennas and having a set of unused crutches, the dipole was quickly thrown together. The antenna tuner was very happy and ¾ of all our FD contacts were made with it. — *Mike Anderson, WV7T* [WV7T photo]

Vacation Station

I designed this station to take on a mobile vacation to the Florida Keys during Christmas week. It has both HF and 2 meters. I started by strapping the gear — Yaesu FT-900 CAT, MFJ 941 tuner, Salmex switching power supply and Yaesu FT-2200 2 m radio — together. Then I built a box out of cedar fence boards to keep the weight down. I then added the Naugahyde and the brass hardware.

I had a blast working low band from Marathon in the Keys. I used a 30 foot random wire thrown in a palm tree and a 20 foot counterpoise wire off the balcony. I worked 20, 17 and 10 meter phone all week. Hope to do it again this year. — *Jim Parr, W9OS, W Dundee, Illinois*

Jim Parr, W9OS, assembled this HF/VHF station for his vacation to the Florida Keys. [W9OS photo]

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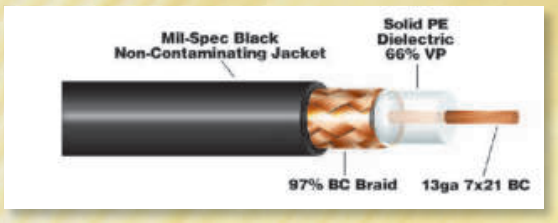
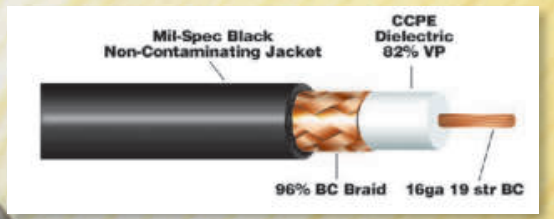


2213A RG213/U MIL-SPEC
Non-contaminating Direct-Burial Ultra-Violet Resistant Jacket.
W/SILVER-TEFLON PL259 & WEATHERPROOF HST each end.

Attenuation per 100ft	Power Rating	Efficiency%
• 0.6dB @ 10MHz	3.43kW	87%
• 1.0dB @ 30MHz	1.95kW	79%
• 1.4dB @ 50MHz	1.5kW	73%

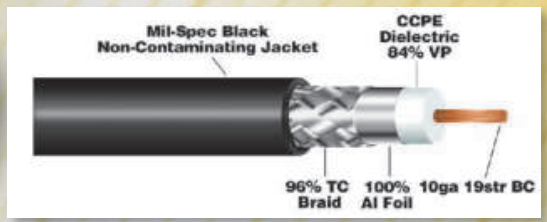
Part #	Length/Ft	Price/ea
2213A-PL-3	3	$12.95
2213A-PL-6	6	$16.95
2213A-PL-50	50	$62.95
2213A-PL-75	75	$87.95
2213A-PL-100	100	$108.95
2213A-PL-150	150	$157.95



218XA RG8X (240F)
Non-contaminating Direct-Burial Ultra-Violet Resistant Jacket.
W/SILVER-TEFLON PL259 & WEATHERPROOF HST each end.

Attenuation per 100ft	Power Rating	Efficiency%
• 0.9dB @ 10MHz	2.16kW	80%
• 1.4dB @ 30MHz	1.24kW	69%
• 2.1dB @ 50MHz	0.96kW	62%

Part #	Length/Ft	Price/ea
218XA-PL-3	3	$10.95
218XA-PL-6	6	$11.95
218XA-PL-18	18	$16.95
218XA-PL-50	50	$29.95
218XA-PL-75	75	$39.95
218XA-PL-100	100	$48.95
218XA-PL-150	150	$68.95



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• 0.8dB @ 30MH	2.77kW	83%
• 1.1dB @ 50MHz	2.14kW	78.5%
• 1.8dB @ 150MHz	1.22kW	65.4%
• 3.3dB @ 450MHz	0.69kW	47.3%

Part #	Length/Ft	Price/ea
25400F-PL-3	3	$13.95
25400F-PL-6	6	$16.95
25400F-PL-18	18	$28.95
25400F-PL-35	35	$48.95
25400F-PL-50	50	$60.95
25400F-PL-75	75	$91.95
25400F-PL-100	100	$109.95
25400F-PL-150	150	$164.95

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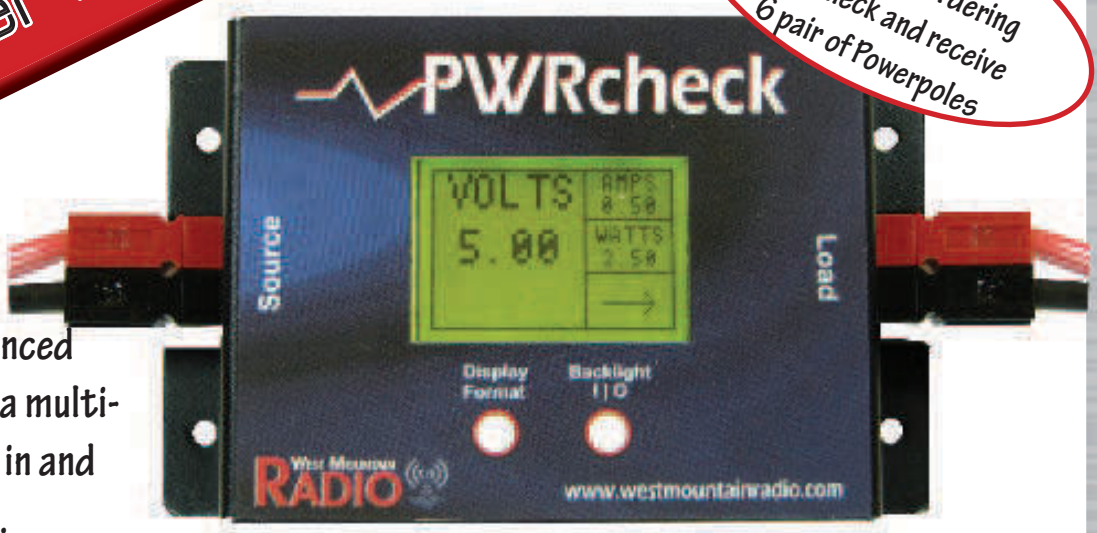

PWRcheck is an advanced monitoring tool with a multitude of applications, in and out of the ham shack.

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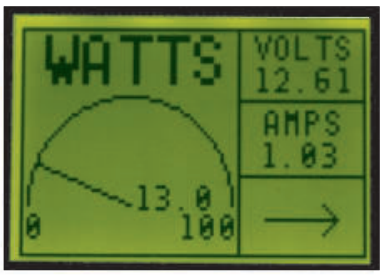

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Amp-Hour gauge shows approximate battery capacity remaining. Battery size is user definable.

PWRcheck Features

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Letters from Our Members

Fanning the Flames

I enjoyed the short article by *QST* Editor Steve Ford, WB8IMY, about computer dust ["Eclectic Technology: Keeping Your Station Computer Clean," Jun 2012, page 62]. It brought to mind a forensic engineering case my consulting firm worked on a few years back. Our assignment was to determine the cause and origin of a fire in an office. What we learned should serve as a warning for all computer users.

A desktop computer left on overnight had a circuit failure which caused a resistor to overheat and ignite the layer of dust which had coated the inside of the computer; the flames were fanned by a draft caused by the cooling fan located at the back of the computer. Since the fan was an exhaust fan, the flames were sucked out through the fan, like a blow torch. The flames eventually melted the blades of the fan, but not before they and ignited a curtain nearby. From there, the building burned to the ground.

Ever since that case, I have made it a company policy that all of my technicians vacuum out dust from every PC they open. If you think about it, the dust is kept warm by heat of the circuits, and there is a constant breeze across it created by the cooling fan(s). Over time, the dust becomes highly flammable (think dryer lint) and only lacks a little extra heat to ignite. Every PC I've seen seems to have the main cooling fan set up to exhaust air (or flames) out the back. This is the perfect setup for an "electronic" blow torch. If you remove the dust, you remove the all highly flammable fuel.

All PCs accumulate dust, but those in offices where smoking takes place are the worst. I use a special IBM vacuum in the field, but I have found that an upholstery attachment (used to clean between cushions) on my antique Electrolux vacuum will do a pretty good job at home.

Frank Ingle, KG4CQK
Jacksonville, Florida

Helping a New Ham

In July, a 12 year old boy named Eli Shover passed his Technician exam and received the call KD8SVO. Young Eli borrowed some money and bought an HF rig (and will pay it all back over the course of a year). But Eli lacked an antenna, power supply, paddles (he loves CW), cables and an antenna tuner. Using an online service on Eli's behalf, I put out requests for these items and said we were looking for discounted prices.

We received almost 10 replies: Some quoted market prices, a few quoted discounted prices and more than a few donated the items, asking for shipping costs only. In one case, the "seller" donated everything, including the shipping costs! All of the responses were greatly appreciated, especially by Eli, who will be working odd jobs over the next year to pay for all of this.

How refreshing it is to see that Amateur Radio still has a strong sense of generosity and concern for new hams. I started in 1951 with the help of Willie, W8GDQ, and others who donated parts, books and most importantly, time to teach me.

Jack Hubbard, NI8N
Milan, Ohio

Remembering Steve

Thanks for noting the death of Steve Powlishen, K1FO, on the ARRL website [**www.arrl.org/news/noted-em-qst-em-author-steve-powlishen-k1fo-sk**]. Steve and I met in Connecticut in 1978 and we were friends all the way. Steve — who was three years younger than me — operated some HF as a teenager (what he called a "Johnny Novice"); he even briefly had a low HF tribander up at his parents' house. But HF just wasn't enough challenge for him. When I visited him at his parents' in 1978, Steve had a 2 meter moonbounce array perched on 10 feet of tower in the tiny back yard. But 2 meter EME wasn't enough of a challenge either, so as soon as he built a house for himself (and got married), he moved to 432 MHz EME with a monster array at 90 feet using Yagis and an amplifier of his own (famous) design. Steve was an operator, too, pretty good at CW, and he sort of lost interest in EME when the new digital modes came along. Not long before he died, Steve told me that he thought a human should be able to copy the signal without computerized "help," which, I guess was "not enough of a challenge." RIP, Steve.

Jim Cain, K1TN
Crivitz, Wisconsin

Grounding Out

In the article "Power Carts for Scouts and Field Operations" [Sep 2012, pages 36-40], the authors mentioned that the ground fault circuit interrupters (GFCI) would not reset on battery power. One likely reason is because most 12 V dc-to-120 V ac inverters have a "hot" neutral; GFCIs expect the neutral power lead to be at or near ground potential. The modern, small, high efficiency and cheap inverters have an ungrounded neutral which is about 65 V ac above ground. A GFCI will typically consider this a fault condition.

Please do not attempt to ground the neutral of an inverter without first consulting the inverter manufacturer's literature. Most inverters have no output isolation and grounding the neutral will, if you are lucky, shut down the inverter. If you are not lucky, the inverter will continue to operate and will put a 65 V ac or more common mode voltage on the 12 V dc input connections. The 12 V loads may operate normally, but anyone who gets between ground and any 12 V wiring — even the negative lead — will receive an unexpected shock.

The safest way to use an inverter under the conditions described in the article is to place a good isolation transformer on the inverter output — then a safe, grounded neutral can be established at the transformer output. The GFCIs should then work as intended and the negative side of the 12 V system could be grounded for additional protection against inverter induced voltages.

Francis J. Wehner Jr, W1FJW
Groton, Connecticut

The Newest Digital Mode

Kudos and many thanks to ARRL for the digital edition of *QST*! I'm reading my September *QST* on my Kindle Fire and like it very much — so much so that I'm going to opt out of the print edition as soon as I submit this note.

Dale Martin, KG5U
Houston, Texas

Editor's Note: If you would like to opt out of receiving the print edition of QST *every month and receive only the electronic edition, please visit* **www.arrl.org/QST-Print-Edition-Opt-Out-Form**. *Choosing to opt out of the print edition of* QST *is voluntary and will not result in a refund or reduction of ARRL membership dues. Any savings will be used to extend the ARRL's reach in the areas of public service, education, advocacy, technology and membership.*

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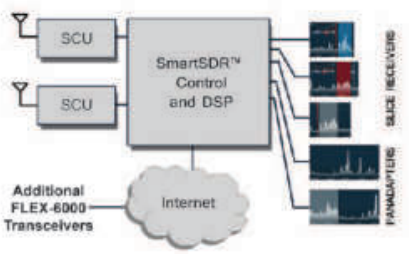

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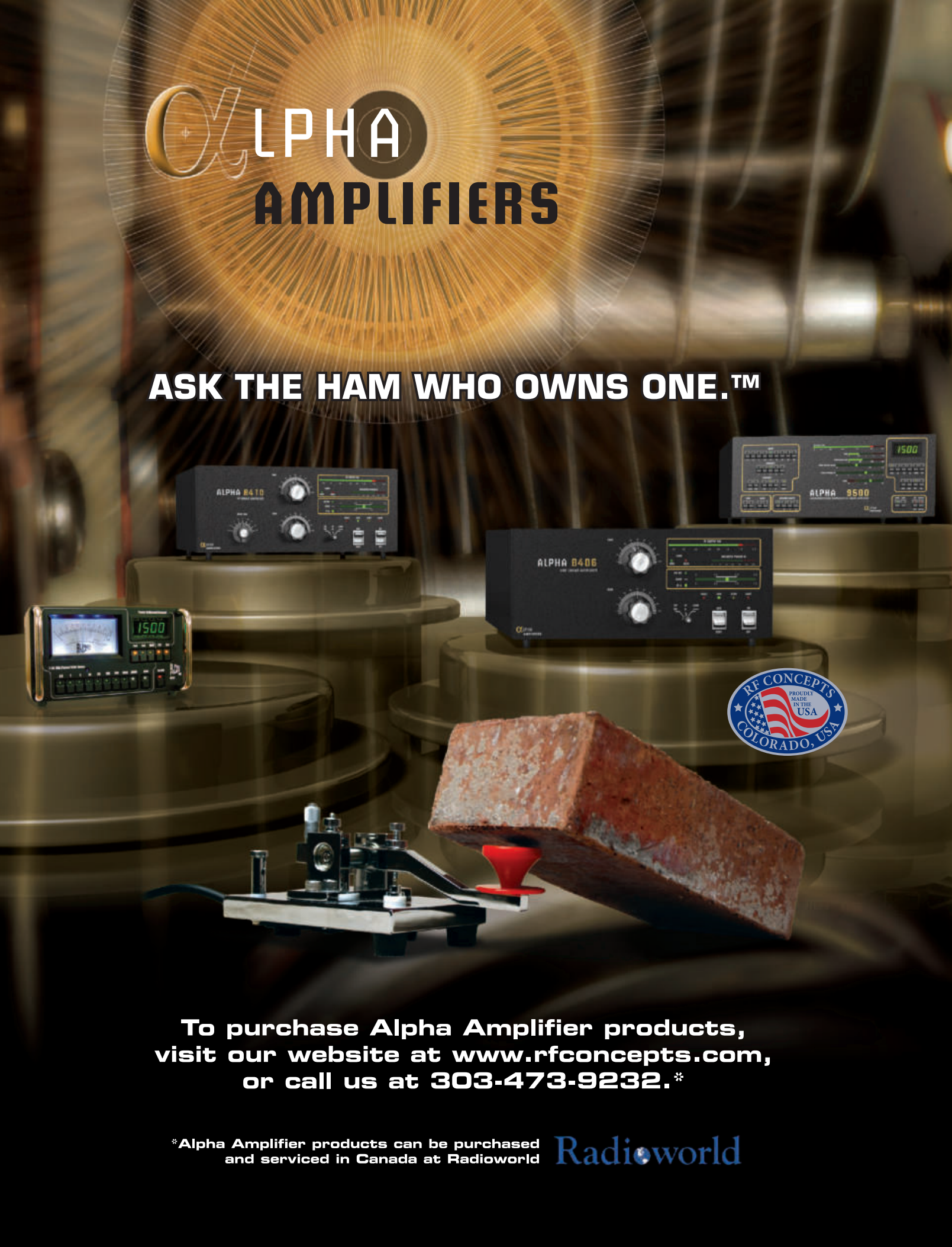
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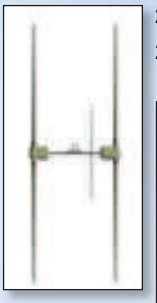
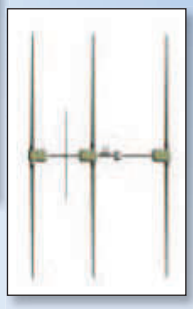


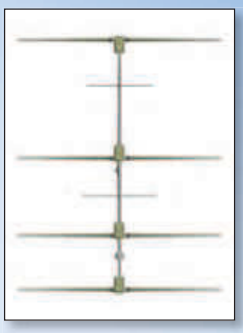
2 Element 20m-6m Yagi

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



3 Element Yagi 20m-6m

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



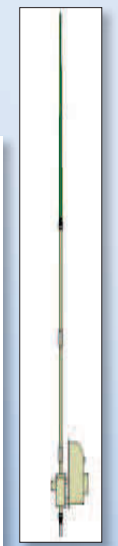
4 Element Yagi 20m-6m

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

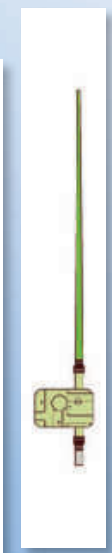
Vertical and Dipoles

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

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



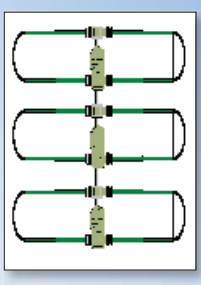
SmallIR Vertical Antenna 20m-6m
20m-6m continuous coverage, 18 ft total length, 12 lb weight, 1 sq ft wind load; EIA-222C wind rating without guys.



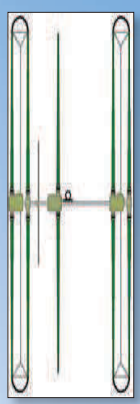
20m-6m Dipole
20m-6m continuous coverage dipole; 36 ft element length; Comes with SDA 100 controller.

Dream Beam Series Yagi's

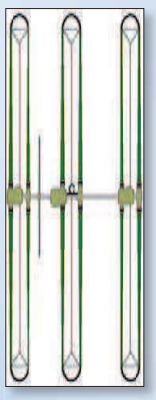
The Dream Beam series offers antennas for both space limited Hams as well as the "Big Guns" who have the space and want the very best.



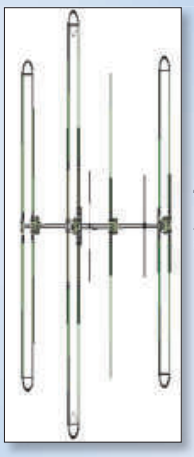
DB11 Yagi Antenna
DB11 Yagi, 18.5 ft element length, 11 ft boom, 10.8 ft turning radius, 61 lb, 5.9 sq ft wind load; 2 active elements on 20m; 3 active elements on 17, 15, 12, 10, 6m.



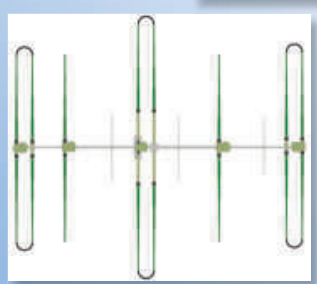
DB18 YAGI
Dreambeam DB18 yagi, 3 el on 20m-6m, 2 el on 40/30m, 18 ft boom; Does not include optional 6m passive element kit; Includes SDA100 controller.



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



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



DB46 DreamBeam Pro Yagi
5 elements on 20m-6m and 3 elements on 40/30. DB42 provides coverage from 80m through 6m (with optional 80m dipole kit). The DB42 has a 49 ft looped driven element. End loop elements only 39 feet long, yet the performance is as if all 3 of the loop elements are 49 feet long. 29 ft turning radius, 19.9 ft wind load. Includes basic SDA100 electronic controller, connector junction box and Astron LS3 power supply with cable.

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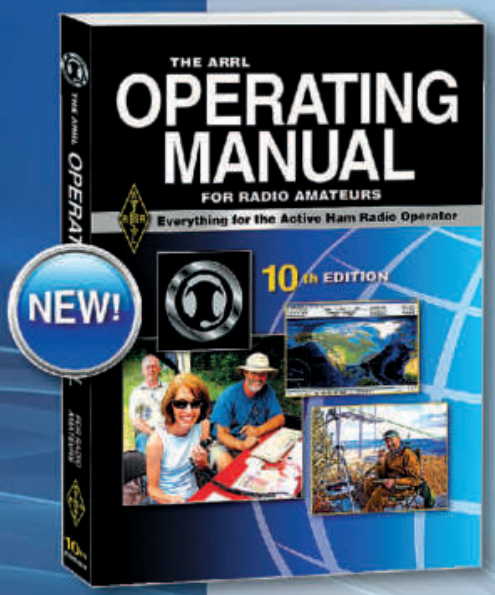

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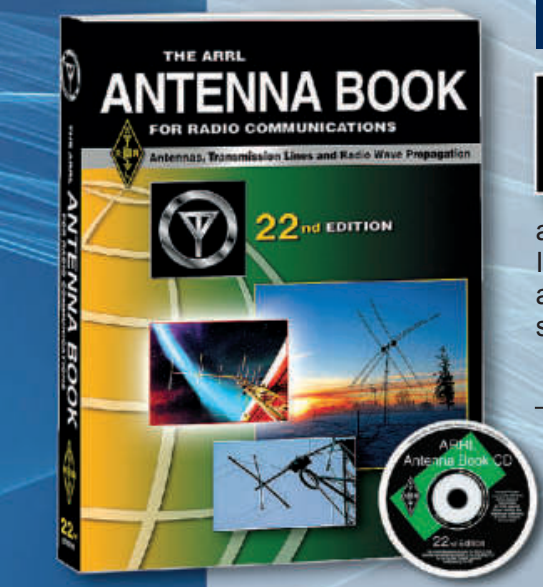

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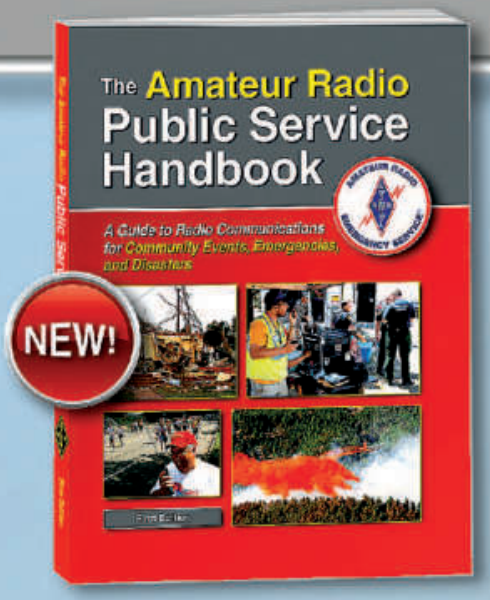
*System Requirements: Windows® 7, Windows Vista®, or Windows® XP, as well as Macintosh® systems, using Adobe® Acrobat® Reader® software. The Acrobat Reader is a free download at www.adobe.com. PDF files are Linux readable. The ARRL Antenna Book utility programs are Windows® compatible, only. Some utilities have additional limitations and may not be compatible with 64-bit operating systems.

Communications



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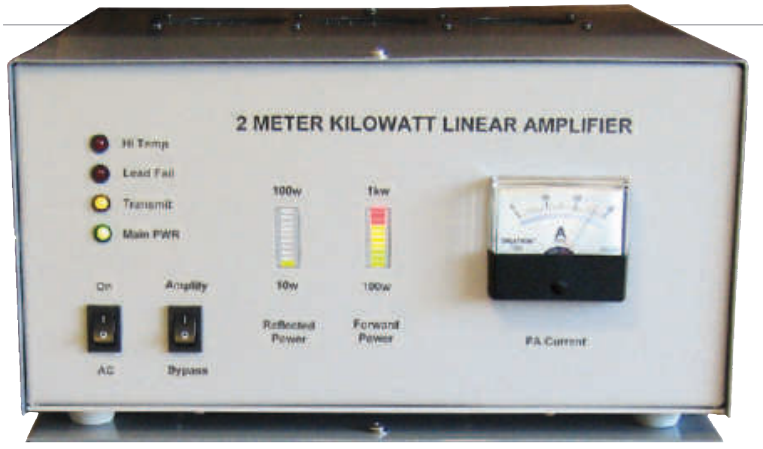


Solid State 1 kW Linear Amplifier for 2 Meters

This high power amplifier does it all with a single RF device.

James Klitzing, W6PQL

Five years ago, if someone had said they could build a kilowatt linear amplifier for 2 meters using a single semiconductor, it would have been tough to convince me. But not only is this possible right now, you can even make the core amplifier assembly as small as 3 × 5 inches, drive it with as little as 2 W, and enjoy efficiencies around 75%. How wonderful is that?

The Secret is in the Device

Freescale Semiconductor makes a wide range of LDMOS (laterally diffused metal oxide semiconductor) transistors, one of which is a new generation 50 V device designed for high mismatch applications such as plasma exciters.

This device is very rugged, touted as able to withstand short duration VSWR mismatches as high as 65:1. Normally they are used in a push-pull configuration (it's a dual device part). The data sheet lists a usable frequency range of 1.8 to 600 MHz (it's not internally matched), lending it to applications over a wide range of amateur bands. The part number is MRFE6VP61K25H, and it currently sells for around $270 in small quantities, making it relatively inexpensive compared to equivalent tube alternatives. It's available from several popular distributors, including Mouser and Digi-Key.[1]

The amplifier described here is very stable, clean and quiet in operation yet it is compact and full-featured. It has over 27 dB gain, and can deliver a little over 1200 W saturated at higher drive levels, but 1 kW is the practical limit for linear operation.

A Design Evolves

The original work on the 2 meter amplifier core was developed and written up in the April 2010 issue of *DUBUS* magazine by Lionel Mongin, F1JRD, and much information can be retrieved with an Internet search on his call sign.[2] As of this writing, a kit containing the more difficult-to-get parts can be purchased for about $130 from RFHAM.[3] Additional information on this is on the F1JRD website.[4] I built the amplifier subassembly (see Figure 1) as documented there with just a few minor changes, and there were no unexpected problems — it worked as published.

Deciding on the Features

Once I had the core amplifier pallet built and tested, I had to decide what features I wanted in a complete amplifier package. The things that seemed important to me were a compact cabinet design (6.5 × 12 × 12 inches), matching other station equipment in shape and color, full VSWR and over-temperature protection and metering for PA current with peak-reading LED bar graph meters for forward and reflected power.

In addition, I wanted automatic TR sequencing, low loss antenna relays and an ALC output available to control the driver. In order to accommodate a wide variety of driving radios, rear panel jumpers are included to select low power drive levels or, for up to 50 W drive, using a built-in 50 W, 10 dB attenuator. I also required low noise, temperature-controlled cooling fans and a front-panel ac POWER switch to control the external power supply.[5]

Lots of Features means Lots of Pieces

This article describes the complete set of features and how to implement them, but you can certainly add or remove anything according to your own requirements (see Figure 2). First, let's take a look at the finished amplifier and see how all of these features are packaged in there.

Removing the cabinet cover and looking down from the top (see Figure 3), the RF pallet can be seen mounted to a large piece of heat sink secured to the cabinet floor at back center. At front center is a surplus Narda dual directional coupler, a 30 dB coupler normally used at 900 MHz. This coupler is quite broadband, and has a coupling factor of about 42 dB at 144 MHz — just right for monitoring forward and

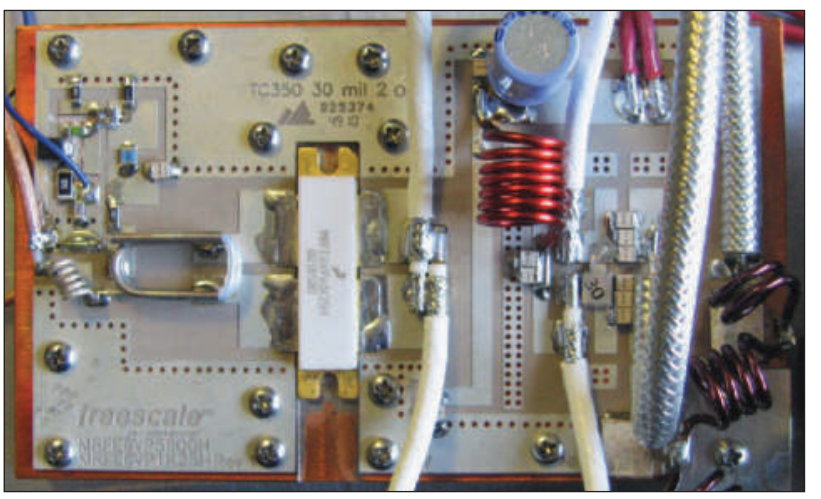


Figure 1 — The single transistor amplifier assembly, based on the F1JRD design, is the heart of the amplifier.

[1]Notes appear on page 36.

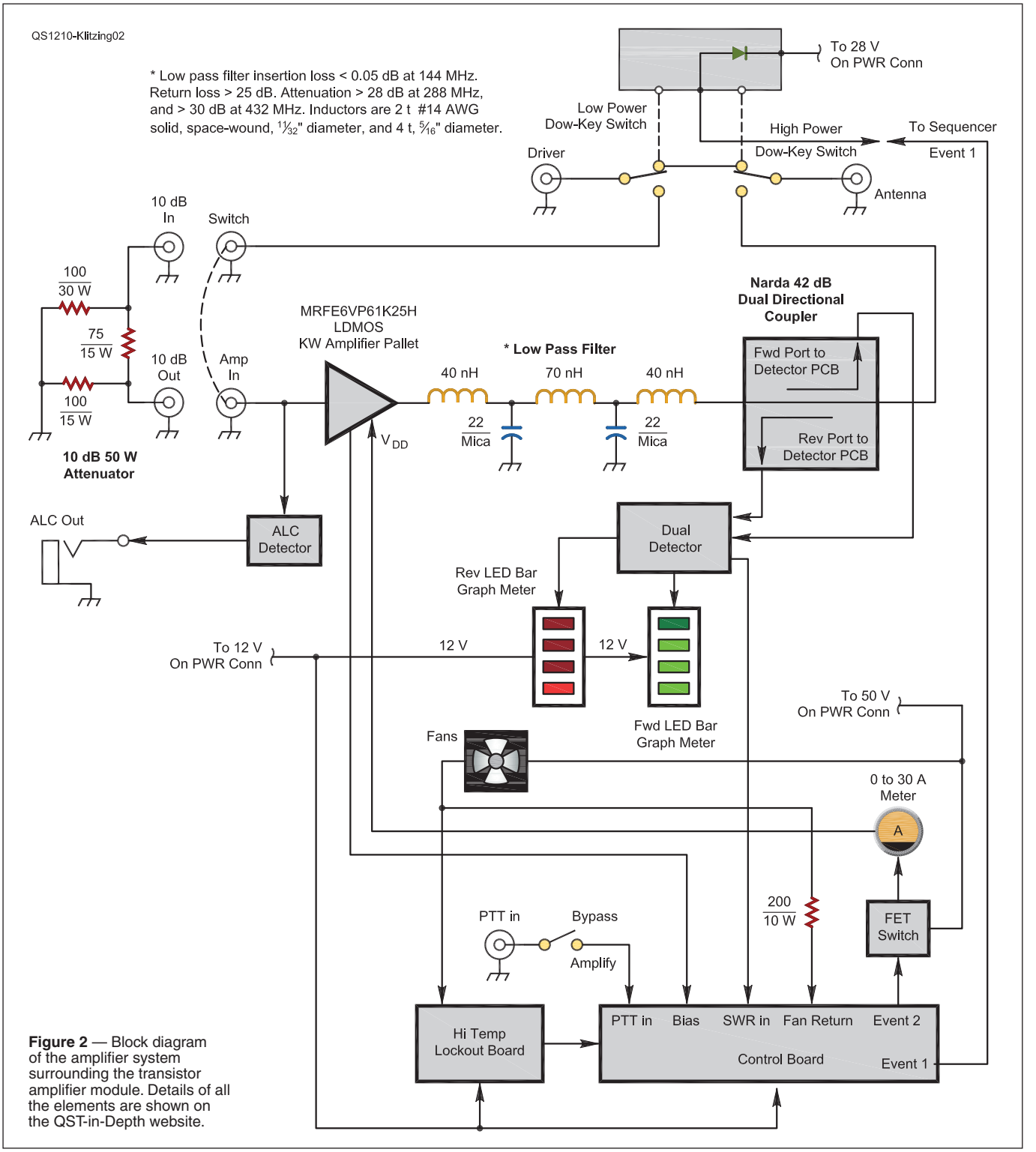


Figure 2 — Block diagram of the amplifier system surrounding the transistor amplifier module. Details of all the elements are shown on the QST-in-Depth website.

reflected power at the 1 kW level.[6] The sampled signals are routed to a detector board shown later. Brackets for holding the directional coupler to the cabinet floor are made from 0.060 inch aluminum sheet and secured with machine screws.

Note the use of ferrite beads and bypass capacitors on the power connector pins and the ALC and PTT connectors. For the POWER connector, a small single-sided PC board was etched with the proper pattern, slotted with a rotary grinding tool, passed over the pins, pressed against the connector body and soldered into place. Detailed subassembly schematics, fabrication drawings and additional photos are on the QST-in-Depth website.[7] The active pins were bypassed using chip capacitors. Since this is for 2 meters, not the microwave bands where I usually use this method, it would have been okay to eliminate the PC board and just use disc ceramic bypass capacitors with very short leads. The ALC and PTT connectors, ammeter and LED meters are fed using this latter method. All these connections have ferrite beads on the wires

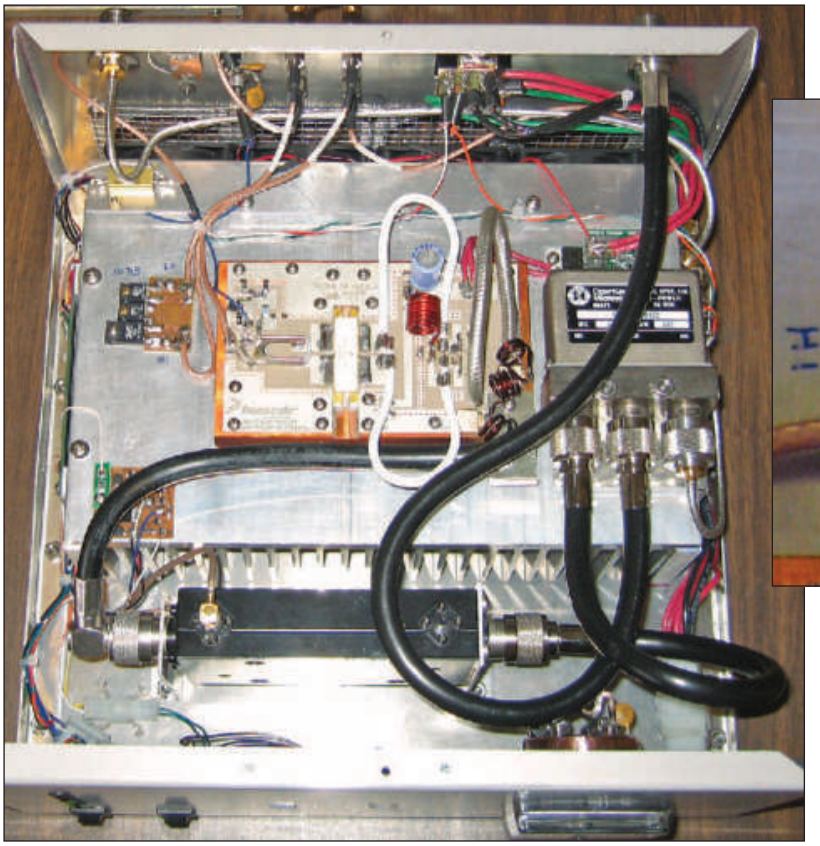


Figure 3 — Top view of the amplifier with the cover off. The amplifier module is clearly shown in the back center, as are the other major subassemblies.

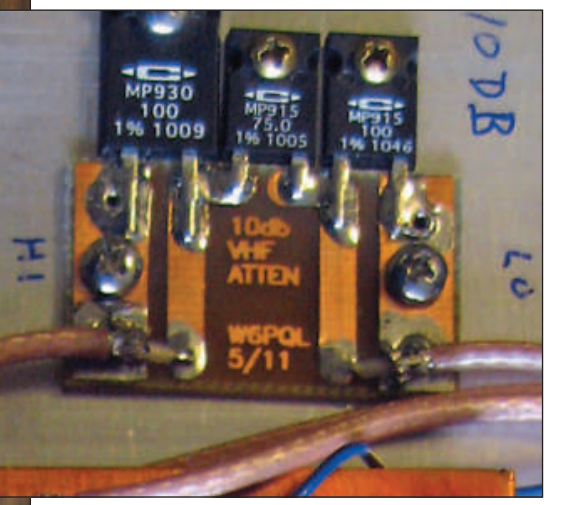


Figure 4 — Close-up view of the 10 dB, 50 W attenuator provided to reduce medium power exciter output to the 3 W drive needed.

very close to the connection points.

On the amplifier pallet just to the left of the copper spreader is the 50 W, 10 dB, attenuator used for higher power drivers. This attenuator is made using non-inductive (at 2 meters) TO-220 style resistors routed in via rear panel bulkhead connectors (see Figure 4). The attenuator is out of the bypass path, and only in circuit following the input antenna switch. It's then routed back through the input jumper quad to the amplifier board.

LMR-400 low loss coax is used for all of the high power jumper connections (good to 1.5 kW continuous at 150 MHz). Though UHF connectors are common at this frequency, I used type N and SMA everywhere. This is just a personal choice. BNC and UHF connectors could be used with minimal issues if you prefer.

The three small coils at the output of the RF pallet next to the output antenna relay (see Figure 5) are part of a low-pass filter built on a small piece of tin sheet and held in place with a couple of the PC board mounting screws. The capacitors are metal-mica types, and are soldered directly to the ground foil of the PC board. They are sturdy enough to support the inductors, which are routed between them. The last one feeds the center conductor of the LMR-400 jumper with its shield soldered securely to the piece of tin sheet. Details for constructing this filter, and its measured specifications, are on the schematic on the QST-in-Depth website.

Lettering on both front and rear panels is made using an inkjet printer and a clear label sheet. The finished label is protected with clear enamel spray, and each label cut and trimmed to size before applying. Clear labels allow the panel color to show well through the borders, and is a good substitute for silkscreening, which many builders, including me, lack the tools to do.

Looking at the rear panel (see Figure 6) shows the connectors provided for moving the 10 dB attenuator in or out of the input path. There is also a screwdriver adjustment for setting the ALC level.

Also visible here are the four small cooling fans behind the screened vent holes. Cool air is drawn in here, forced through the heat sink fins inside, then expelled out the top of

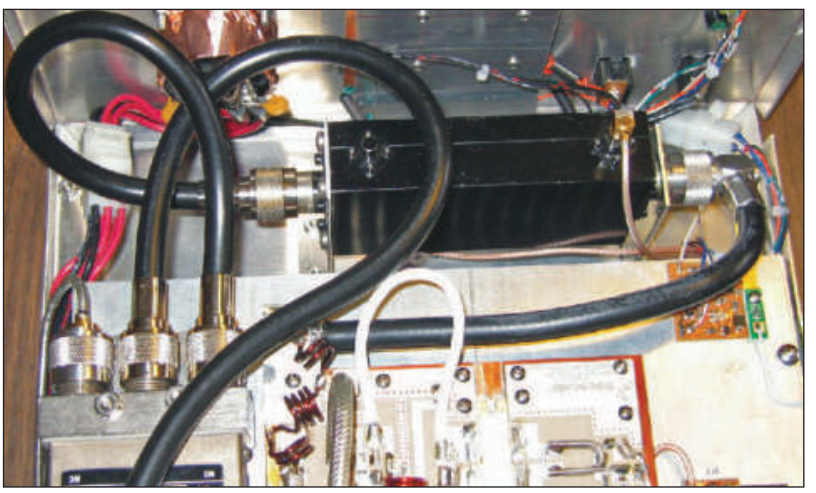


Figure 5 — The three small coils on the left end of the amplifier module are part of a low-pass filter built on a small piece of tin sheet and held in place with a couple of the PC board mounting screws.

Figure 6 — View of the rear panel showing the connectors provided for moving the 10 dB attenuator in or out of the input path. There is also a screwdriver adjustment for setting the ALC level.

the cabinet through additional screened vents (just visible here in the cabinet cover). These fans run at reduced speed (to keep them quieter) during the transmit cycle, and will also run continuously if the heat sink temperature rises above 115°F. Should the temperature rise above 130°F, the fans will run at full speed, and the amplifier will lock itself into bypass mode until it cools down to about 120°F. It will then unlock itself again and operate normally. I haven't been able to get it that hot yet, but the extra protection is there just in case.

A high-current FET switch board, shown just to the right of the large antenna relay, gates the 50 V (V_{DD}) to the amplifier. This allows the sequencer on the control board to turn it on and off at the correct times.

There is a small bracket holding the LED bar graph meters in place on the front panel, mounted in a way that avoids having to drill mounting holes into the panel. It's held in place to the top and bottom lips of the panel with counter sunk 2-56 screws.

On the left side, the control board is visible at bottom center (see Figure 7), as is the RF detector board to its left, which is used to detect the signals from the directional coupler and drive the power meters and SWR lockout switch on the control board.

Even though the LDMOS transistor will handle 65 to 1 VSWR without failing (it's very tough), many of the other components, including the antenna switches and coax, can't survive the extreme voltages this would place on the transmission lines. Thus, I set the SWR lockout adjustment at 100 W reflected power, or about 2:1 VSWR at 1 kW out. When tripped, this feature will lock the amplifier in bypass mode until it is manually reset. The main power must be turned off for several seconds to reset it.

I'm sure glad I put that SWR lockout in there. While doing some offline testing, I forgot to hook up the output coax. I really didn't intend to test the amplifier at 1 kW without a load, but it happened, and it locked out the amplifier just like it was supposed to do. No damage, even after I managed to do it again about an hour later.

The small PC board on the heat sink above and to the right of the control board is the HIGH-TEMP LOCKOUT switch. There is also a smaller (green) board there, fastened by one of the lockout board mounting screws; this is the fan sensor (a thermistor), used to signal the control board to force the fan on at 115°F.

Power Requirements

Power requirements for this amplifier are 50 V at up to 30 A, 28 V at less than ½ A, and 13.5 V at less than ½ A (see Figure 8). My personal power supply was constructed using four 12.5 V, 30 A switching PSU modules placed in series, and thus it has all of these outputs available. It runs on standard house current (120 V at about 15 A) or can also run on 230 V. You could easily use a single 50 V supply and step-down regulators for the 28 V and 13.5 V requirements. The regulators could be located in the amplifier on the main heat sink, since there's plenty of room in there. Other builders are making use of surplus 48 V computer-type "blade" switching supplies, although these run only on 230 V.

Operating the Amplifier

If constructed with all of the features described, set the rear panel input jumpers according to the drive power that will be used. For drive levels up to 5 W, the input attenuator need not be used (ALC will be used for overdrive control). However, if you use a driver capable of 15 W or more, it is probably capable of a reduced power output setting. Be certain to check the initial key-up power, as some of the older radios will emit a burst at full power when keyed up, and then drop back to your reduced setting. If this is the case with yours, use the input attenuator and an input relay capable of hot switching drive levels of 50 W or so (a Dow Key SPDT type 402 or four port 412 transfer switch will do this). The input relay shown in this amplifier (type 401) can hot-switch only about 15 W. Hook up the PTT line, and don't be like me and forget to hook up the antenna or dummy load.

Turn on the POWER switch, and the dc power LED should be on. Place the AMPLIFY/BYPASS switch in the AMPLIFY position, and when you key on your driver, the transmit LED should be on. The common practice of switching the amplifier in or out while transmitting is safe to do. The control board will handle all of the internal sequencing and timing operations, preventing damage to the amplifier and the antenna switches. Here is a brief rundown of the sequencing, which happens at 50 ms intervals:

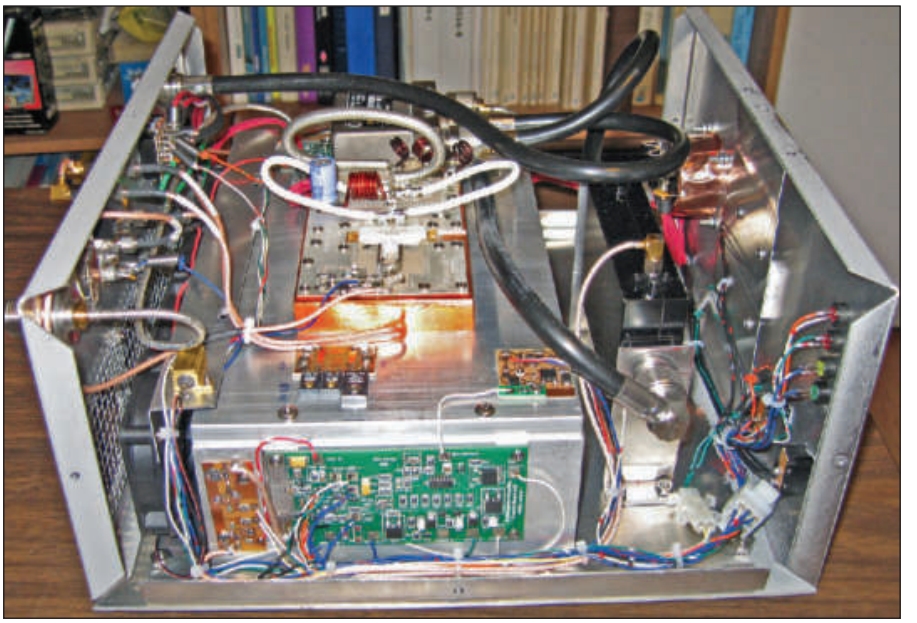
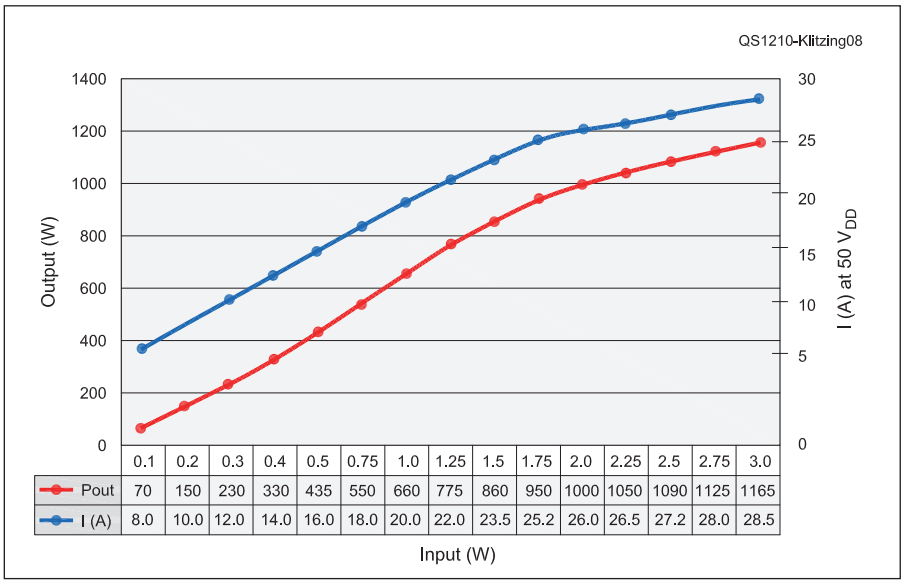


Figure 7 — The left side of the amplifier. The control board is at the bottom center, as is the RF detector on its left.



	0.1	0.2	0.3	0.4	0.5	0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.5	2.75	3.0
Pout	70	150	230	330	435	550	660	775	860	950	1000	1050	1090	1125	1165
I (A)	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	23.5	25.2	26.0	26.5	27.2	28.0	28.5

Figure 8 — Power output and current drain versus drive level.

Event 1 — Antenna relays switch over and fans come on.

Event 2 — 50 V (V_{DD}) and bias are turned on.

These events are repeated in reverse order when the driver is unkeyed, spaced apart briefly in time.

A snow load or other antenna problem that causes the SWR to reach unacceptable levels will cause the LOAD FAIL LED to come on, and the control board to sequence the amplifier into bypass mode and lock it there. To reset, you'll have to shut down the main POWER switch for a few seconds; this persistent lockout is designed to encourage an investigation of the problem.

The other trouble indicator is the HIGH TEMP LED, which comes on if you get the amplifier too hot for safe operation, or for your comfort level (above 130°F for me). This switches the unit into bypass mode just as does the LOAD FAIL function, runs the cooling fans at full speed and will reset by itself when the temperature drops about 10°. You cannot do a manual reset on this one.

Under normal operation, the amplifier will draw about 27 A at 1 kW out. On SSB, as with any other class AB linear amplifier, a good rule of thumb is to adjust drive levels for about half of that (13-15 A) on voice peaks. An even better indicator is the forward power LED bar graph display, which will illuminate all segments at 1 kW output. This meter is peak reading, so you can adjust voice peaks until the last segment just illuminates while speaking into the microphone.

The REVERSE POWER bar graph display indicates up to 100 W reflected, and works the same way, giving a relative indication of the health of the load. If your SWR is high enough to illuminate the last segment, the load fail function will engage.

You'll hear the fans running whenever in transmit mode, and they will also run continuously when the heat sink temperature rises above 115°F; as the heat sink cools to 110°F or less, they will again run only in transmit mode.

This amplifier has met all my operational requirements as well as all my objectives for monitoring, control and equipment safety. I believe it is an excellent solution for those who find high power tubes expensive and difficult to find and want an efficient and linear high power amplifier. While this unit is for 2 meters, the platform could be adapted to other bands as well.

Notes

[1]**www.mouser.com**, **www.digikey.com**

[2]**www.dubus.org**

[3]**www.rfham.com**

[4]**www.qsl.net/f1jrd**

[5]The author's station power supply for all-solid-state amplifiers is multioutput and universal, and can be remotely located and switched on from the front panel of a given amplifier.

[6]The surplus Narda model 31119 coupler was purchased on an Internet auction site. As of this writing, there are lots of them available for around $35.

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

ARRL member and Advanced class licensee James Klitzing, W6PQL, was first licensed in 1964 as WB6MYC. He has been a meteorologist for both the US Air Force and Hewlett-Packard Company. He is currently manager of engineering services at Agilent Laboratories in Palo Alto, California.

Jim has always enjoyed building his own equipment including a kW SSB/CW transceiver as well as VHF through microwave transverters and antennas.

You can reach him at 38105 Paseo Padre Ct, Fremont, CA 94536-5207 or at **jim@w6pql.com**. Jim's website, **www.w6pql.com**, has any updates to the project and versions for other bands.

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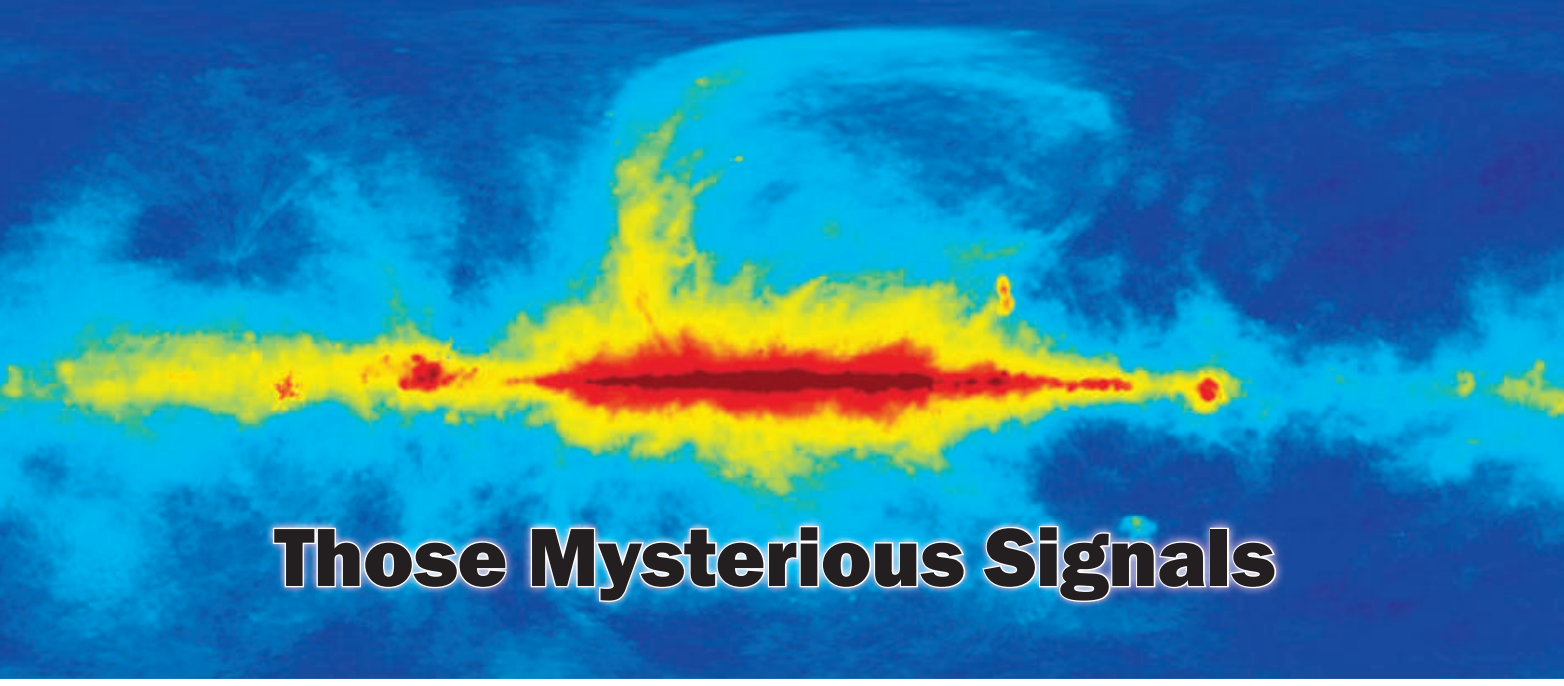
Bonito 1102S RadioJet Software Defined Receiver

The Bonito 1102S RadioJet SDR shortwave receiver covers 40 kHz to 30 MHz. Modes include LSB, USB, CW, AM, FM and stereo DRM. The supplied software and features include an integrated frequency database, IF/AF spectrum analyzer and oscilloscopes, variable filters, audio and IF recording and playback, a calibrated S meter and online updates. Price: $784. The Bonito 1102S is available from Computer International and select dealers. For more information, visit **www.computer-int.com**.



Those Mysterious Signals

Courtesy NASA's Data Center for Cosmic Microwave Background Research

They may sound like noise to us, but to radio astronomers they are the desired signals.

Arch Doty, W7ACD

Every Amateur Radio operator who uses the high frequency (HF) bands has noticed that there is a low level of "signals" present, 24 hours a day on all of those bands, even though the bands may be devoid of man-made signals.

Depending on frequency, these mysterious signals may come from one of two entirely different sources, and are propagated by one of two entirely different modes.

Cosmic Noise — What Is It and Where Does It Come From?

Cosmic noise is broadband electromagnetic radiation that emanates from many different sources. At HF, Cygnus A and Cassiopeia A are major sources of cosmic noise.[1] Lower level signals come from quasars, pulsars and other remote objects. A comprehensive discussion of these sources is beyond the scope of this short article. The Internet will provide a wealth of references to documents that can be read by anyone interested in obtaining in-depth information.

Most amateurs view cosmic noise as a complex type of electromagnetic radiation studied by scientists with the aid of monstrous rotatable parabolic dish antennas such as those at Green Bank in West Virginia, Jodrell Bank in England and a few other similar sites around the world.

The truth is quite different: Every amateur who operates on the HF bands can hear cosmic noise at any time of the day or night by listening on frequencies not drowned out by amateur signals or atmospheric noise.

Cosmic noise is certainly the ultimate DX! Receiving a QSL card, however, might be a bit of a problem. The strongest noise that you will hear on 10 meters, for example, will often be from the galactic center of the Milky Way, and was created about 27,000 years ago. Then there is the "late arrival" cosmic noise from Cygnus A, which started its journey to you 760 million years ago. (These interesting facts courtesy of Darrel Emerson, AA7FV.)

Cosmic Noise Signal Levels

A summary of the level of broadband radio noise that may be expected in typical receiving environments is contained in the International Telecommunication Recommendation ITU-R P.372.[2] A copy of Illustration 2 from that recommendation is shown as Figure 1. On this graph the signal strength of cosmic noise (D) and atmospheric noise (between A and B) are plotted against frequency.

In viewing this figure, and the following description of the tests that I have conducted, it must be remembered that it is hard to determine the precise frequency at which the signal strengths of cosmic and atmospheric noise cross over because that frequency will depend on the time of day, whether the galactic center is above or below the horizon, the state of the ionosphere and a host of other factors.

What's the Real Story?

As I wanted to obtain more precise data than can be obtained from the ITU illustration, I decided to make measurements of my own. The main problem facing anyone wishing to measure the strength of cosmic noise is differentiating it from the atmospheric noise that is discussed later in this article. They both sound the same and look the same on a computer screen. The answer to this problem is the arrival direction of the signals. As also discussed later in this article, during the two years that I have been making measurements, cosmic noise has arrived predominantly from the northern quadrant, while atmospheric noise came from the south.

Thus, in my test series, I measured the radiation received from the northeast (where cosmic radiation was arriving from when I performed the tests) and from the south-southeast (arrival direction for atmospheric noise) on 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 25, 35 and 40 MHz. I determined that the predominant low level background signals received above 15 MHz, including those on the 6, 10, 12, 15 and 17 meter bands, were from cosmic sources.

For the reasons enumerated above, the relative level of cosmic noise may vary considerably over time. On several occasions after these original tests were conducted,

[1]Notes appear on page 39.

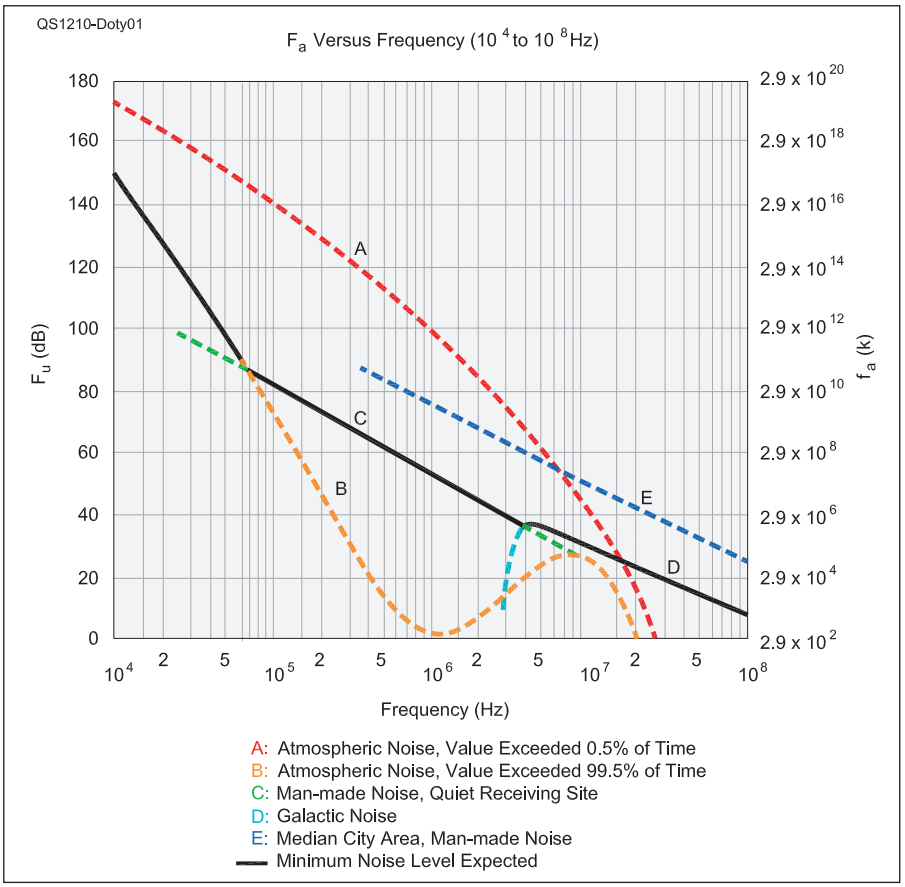


Figure 1 — Signal strength of cosmic noise (D) and atmospheric noise (A) plotted against frequency. From ITU Recommendation ITU-R P.372.

there were times when cosmic noise was dominant on 20 meters.

My next objective was to determine the difference between daytime and nighttime signal strength levels of cosmic noise.

Table 1 shows what was recorded on 28.6 MHz. Incidentally, the readings taken from midnight to 6 AM were no problem. People of my age are often up at regular intervals during the night — even if not primarily for the purpose of taking signal strength readings.

Table 1
Recorded Noise Strength Level (dB below S-9) at Different Times of the Day

Time (PDT)	Noise Strength	Time (PDT)	Noise Strength
1700	–8.0	0200	–8.4
1800	–7.9	0300	–8.5
1900	–8.0	0400	–8.5
1941	Sunset	0500	–8.4
2000	–7.9	0600	–8.0
2100	–7.0	0638	Sunrise
2200	–7.0	0700	–8.0
2300	–8.4	0800	–8.2
2400	–8.6	0900	–8.8
0100	–8.5	1000	–8.8

How is Cosmic Noise Propagated?

Cosmic noise is received on Earth directly from the cosmos. It is thus subject to discontinuities resulting from its passage through the Earth's ionosphere and atmosphere. As cosmic noise is of a relatively low level it is commonly hidden by communications signals, and atmospheric noise from local or distant sources. At times of poor ionospheric HF propagation on the higher frequency bands, the less dense ionosphere allows cosmic noise to pass through with less attenuation.

What Direction Does Cosmic Noise Arrive From?

Cosmic noise originates, as described above, from a wide area of our galaxy and beyond. As a matter of curiosity I made 10 tests from August 2010 to January 2011 to learn the direction from which cosmic noise arrives at my Oregon location. In these tests the signal strength of atmospheric noise was measured as my three element beam antenna at the top of a 75 foot tower was rotated 360°. All of the tests were made at approximately the same time of day.

All 10 of those tests showed that the maximum strength of cosmic noise arrived from between north and northwest. In all of the tests there was zero signal coming from southern directions. [If you try this, you may find that your noise readings peak more to the south. In most areas the maximum upper HF and VHF cosmic noise will be from our Galaxy, the Milky Way, and the peak will be in the direction of the southern constellation Sagittarius from your location. — *Ed.*]

At other locations, at different seasons, or at a different time of the day, however, the arrival direction of cosmic noise may vary considerably because the Earth rotates but the sources of cosmic noise do not.

Atmospheric Noise — What Is It, and Where Does It Come From?

As noted in an earlier *QEX* article, "atmospheric noise is the result of the very broadband electromagnetic impulses that are caused, primarily, by the 100 lightning flashes that occur every second somewhere in the world."[3] These impulses (sometimes called *sferics*, or *spherics*) may propagate for thousands of miles in whatever fashion desired signals on the same frequency would propagate. VLF and LF signal components from the lightning source will propagate without major attenuation in the Earth-Ionosphere waveguide.

Antennas operate by intercepting electromagnetic waves (including those created by lightning) and converting them into electrical current for the receiver to amplify and detect. Thus there is a direct correlation between atmospheric noise levels and the signal strengths indicated by a communications receiver.

Atmospheric noise may thus be visualized as bursts of radio waves transmitted by 100 multimegawatt radio stations each second. The thunderstorms that produce lightning are truly awesome. The energy released by a typical thunderstorm is in the same order of magnitude as that which was released by early atomic bombs. A substantial amount of this energy is released as broadband electromagnetic waves — the same type of radiation as used by amateurs for communication.

The chart in Figure 2 shows where lightning is occurring around the world. This data may be accessed in real time on the Internet by searching for "TOGA Lightning" and then select "TOGA Network Global Lightning Maps."[4] These maps clearly show that the

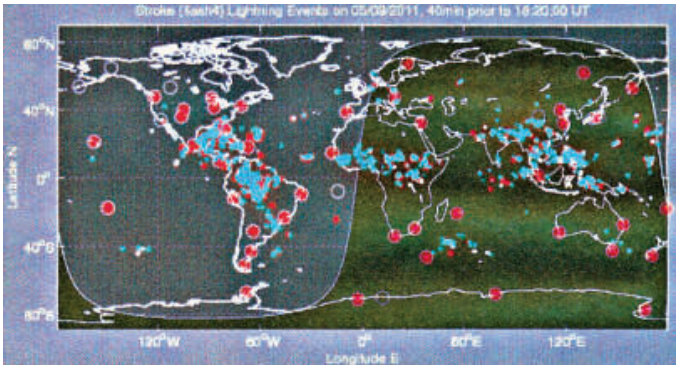


Figure 2 — Where lightning is occurring around the world. Blue indicates the most recent lightning strikes while green indicates earlier strikes and yellow, even earlier strikes. Red indicates the oldest strikes, those from 30 to 40 minutes earlier.

vast majority of global lightning discharges are in the tropical region, which is, of course, south of Oregon.

Earlier in this article, I mentioned the series of tests that I conducted to determine the relative levels of cosmic and atmospheric noise at a series of frequencies between 9 and 40 MHz. The results were that the predominant low-level background signals received below 15 MHz, including those on the 20, 30, 40, 80 and 160 meter amateur bands, were atmospheric noise. As discussed earlier, the relative signal levels of atmospheric and cosmic noise vary over time for many reasons. Thus I have noted times when cosmic noise dominated on 20 meters.

How is Atmospheric Noise Propagated?

More than half a century ago, during WW2, I was piloting a four engine transport from India to China over the Himalayan "Hump" route.[6] Although we were hundreds of miles from any radio station, an S-9 signal suddenly activated my radio, and I found myself talking to the airport tower operator in Nome, Alaska — on approximately 135 MHz. This is a frequency that normally provides only a few miles of line-of-sight communications. After I convinced the operator that I really did not want landing instructions, we had a nice chat for several minutes. He was a ham, incidentally, but he never sent a QSL card for our contact.

Atmospheric noise is propagated worldwide — via whatever propagation modes support the frequency components. Some may propagate through ducting, or more likely sporadic E layer propagation as supported my VHF signal to allow me to contact Alaska from high above the Himalayas. Electromagnetic ducting is still the subject of scrutiny by scientists. For the purpose of this article it may be visualized as a waveguide having the earth as its bottom element and the cloud of electrons that constitutes the ionosphere as the upper element.

What Direction Does Atmospheric Noise Arrive From?

As shown above, the thunderstorms that generate atmospheric noise are, to a major extent, located in the tropical region of the world. The propagation processes that carry atmospheric noise signals around the world are affected by many factors, however, just as they affect our desired signals.

There are a great number of references in the literature to estimates of what the signal level of atmospheric noise might be at various global locations and at different frequencies. All of these estimates depend on exotic models and formulas that are far from comprehensible by most people. During the 2 years that I have been investigating cosmic and atmospheric noise, the atmospheric noise signals have always arrived from a southerly direction.

Methodology

The data presented above was obtained using a specially calibrated ICOM IC-756 PRO 3 receiver augmented by a Ramsey RF broadband preamplifier, when necessary.

In Closing

This article is, as far as I can tell, the first comprehensive description of cosmic and atmospheric noise that has appeared in an Amateur Radio publication, and it certainly leaves many questions unanswered. I hope that this article will be of sufficient interest to encourage further investigation by radio amateurs into the composition and transmission of cosmic and atmospheric noise, and that they will be able to add to the current paucity of knowledge of these interesting types of electromagnetic radiation.

This article could not have been written without the greatly appreciated assistance of Darrel Emerson, AA7FV/G3SYS.[6] Dr Emerson was the only reader who questioned the reference, in my recent *QEX* article, to "atmospheric noise."[7] His question lead to the new series of tests referred to above that showed that this reference is correct when applied to frequencies below 15 MHz, but not to the higher frequencies that were discussed in that article. An appreciable amount of the information on cosmic noise presented in this article was either provided by Darrel, or was obtained from the references that he supplied.

In my view, his two part *QST* article provides the most comprehensive data on radio astronomy that has ever been published in an Amateur Radio publication.[8] Darrel's expertise in radio astronomy is exceeded only by his kindness to his fellow Amateur Radio operators.

Sincere thanks also to Bill Conwell, K2PO, for providing additional references, advice and editing of this article. The help of Dr Howard Diamond, Director of the World Data Center for Meteorology at NOAA's Climatic Data Center was very useful.

Notes

[1]**www.nasa.gov/milky way**

[2]International Telecommunication Union Recommendation ITU-R P.372 (Radio Noise), ITU, Geneva, Switzerland, 2009.

[3]A. Doty Jr, W7ACD, "The Effect of Ground Conductivity on Antenna Radials," *QEX*, Mar/Apr 2011, pp 15-18.

[4]"Lightning Activity for Earth," **wwllb.net/toga-networks-global-maps.htm**.

[5]A. C. Doty Jr, W7ACD, *The Diary of a Pilot*, Booklocker Press, 2007. (Available at **www.amazon.com**.)

[6]Private e-mail communications, D. Emerson to A. Doty, Sep 16 to Oct 4, 2011.

[7]A. Doty, Jr, W7ACD, "The Effect of Soil Properties on the Performance of Antenna Radials," *QEX*, Sep/Oct 2011, pp 8-13.

[8]D. Emerson, AA7FV, G3SYS, "The Radio Sky," Part 1, *QST*, Jun 1996, pp 32-35; Part 2, *QST*, Jul 1996, pp 28-31.

Arch Doty, W7ACD, holds an Amateur Extra class license and is a Life Member of the ARRL and a member of its Diamond Club. He is a former Director of the Radio Club of America, the Quarter Century Wireless Association and the US Marconi Foundation. He is a Senior Life Member of the IEEE, and has been a member of the Institute's Antenna and Propagation Society for more than 40 years. He has also been a member of the SAE Electromagnetic Compatibility Committee for over 50 years. Arch has worked more than 100 countries on 160 meter phone and thinks that he has probably spent more hours on that band listening to atmospheric noise than to amateur signals!

You can reach Arch at 21370 SW McCormick Hill Rd, Hillsboro, OR 97123-8724 or at **archd@aol.com**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

Satellite CAT Interface for Working the Analog Birds

Expand your satellite operations from FM to SSB and add a new dimension to your skill set.

Mark Spencer, WA8SME

FM amateur satellites, basically repeaters in the sky, have proven to be very popular. They are easy to access with standard dual band FM radios, a simple directional antenna, a lot of listening and a lot of practice. There are times, however, when the FM birds have become the victims of their own success. The declining number of these high altitude, single channel repeaters has resulted in overcrowding and fierce competition for contacts, marginalizing many who have enjoyed operating the FM satellites, particularly low power and portable stations.

Expand Your Satellite Operations

An alternative to the FM repeating satellites are the wideband analog birds that retransmit a whole sub band of SSB and CW signals. These birds are equally capable and instead of a single channel they use transponder technology that transmits a wider band of frequencies in which multiple contacts can be retransmitted simultaneously (each signal sharing the available bandwidth and RF power of the satellite). The use of transponders and SSB/CW, however, requires more precise frequency control to find the other station, and then to accurately track the other station with its Doppler shift — not a major concern with the FM birds.

Software Brings it All Together

Current satellite tracking software not only tracks the location of the satellite, but also can tune the radio to provide Doppler shift frequency correction (computer aided tuning or CAT). While this helps, it is not essential for operating through the analog birds. It can be argued, however, that being able to hear the downlink while transmitting (full duplex) is critical to successful operations on the analog birds. While the wideband analog satellite alternatives to the FM birds have a lot of capabilities, they are underutilized. There have been many passes on the analog birds when I have been talking to myself while I have been unable to get a word in edgewise on the next FM bird pass. What gives?

I think the answer includes:

- The lack of readily available (both functional and affordable) all-mode, dual band VHF/UHF, full duplex radios.
- It takes more operator skill and practice to operate the analog birds once the investment is made in the equipment. Shown above is Teachers Institute Instructor Matt Severin, N8MS, communicating through a wideband satellite.

The alternative to an expensive full duplex radio is obtaining two all band transceivers (or a transverter for the downlink in combination with an HF rig for the IF), one for the uplink, the other for the downlink thereby achieving full duplex. Admittedly this is an expensive alternative.

An Interface to Bring It All Together

After this lengthy introduction, I come to the point of this article. What follows is a description of an interface project that will allow you to operate the analog birds with a single non full duplex, all-mode VHF/UHF transceiver. While the circuit and the software are designed for a specific radio (the popular, compact, multimode, Yaesu FT-817 HF/VHF/UHF portable transceiver) and satellite tracking software package (*SatPC32*), it serves as an example that can be adapted to other radios and other tracking software — left only to the imagination of the builder. This project is not, however, the ultimate alternative to a full duplex all mode transceiver setup, but it will facilitate your exploration of the analog birds more affordably.

First Pick a Radio

I evaluated the suitability of a number of radios for use by teachers to bring space technology into their classrooms while developing the *ARRL Education and Technology Program Teachers Institute-2 Space* (TI-2) course. The rig that floated to the top was the FT-817. This is a relatively affordable low power, all band, all mode transceiver that can be battery operated or operated from a fixed power supply. What

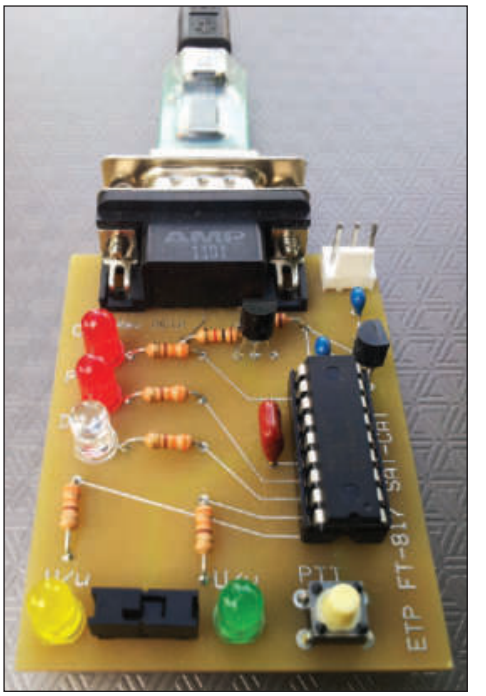


Figure 1 — The Sat CAT Control Interface prototype for use with a Yaesu FT-817.

attracted me most to this transceiver is that it can operate in all modes, has split frequency capabilities (dual VFOs), can be CAT controlled and can operate crossband in the VHF and UHF bands. It is not, however, a full duplex radio.

I apparently am not alone in my favorable opinion of this radio as there are a number of satellite operators who are using this rig (some use two FT-817s to allow full duplex operation). During the TI-2, the teachers use the FT-817 to copy the CW telemetry transmitted by many of the CubeSat satellites, to monitor the analog birds and to make contacts through the FM birds.

Then Pick the Software

The satellite tracking software package that I adopted for the TI-2, as well as for my personal use, is *SatPC32* (there are many other equally capable software packages). *SatPC32* tracks the location of the selected satellites the operator wants to monitor, sends out antenna positioning commands that can be used with a rotator control interface to keep directional antennas pointed at the birds (numerous rotator control interface circuits have been published), sends out radio specific CAT commands to tune the connected radio transceiver to the operating frequencies and keeps those frequencies on track for Doppler correction.

It sounds like *SatPC32* should be able to make a non-full-duplex transceiver work for the analog birds. I have found that the combination of single FT-817 and *SatPC32* is lacking in some respects. The problem is that when updating the receive and transmit frequencies, *SatPC32* toggles between the VFO A and VFO B functions of the radio. This action, which chops up the reception, makes the radio unusable. Because the frequency updates happen regardless of the status of the PTT of the radio, there is a possibility that the operator will key up to transmit while the transceiver is on the VFO assigned for receive. This could blow out a receive preamplifier if one is used. *SatPC32* can control two radios at one time so it works perfectly with two FT-817s, one for uplink, the other for downlink. But with one FT-817 it is lacking.

Enter the Sat CAT Control Interface

The FT-817 Sat CAT Control Interface (prototype shown in Figure 1) described here is designed to intercept the radio tuning commands being sent by *SatPC32* and allow only the receive frequency updates to be passed to the transceiver while in the receive mode and to pass only the updated transmit frequency while the rig is transmitting. This prevents the constant toggling between VFO A and VFO B while receiving, making reception normal and prevents the inadvertent transmission on the receive frequency during a contact. The interface consists of two parts, the hardware and the software.

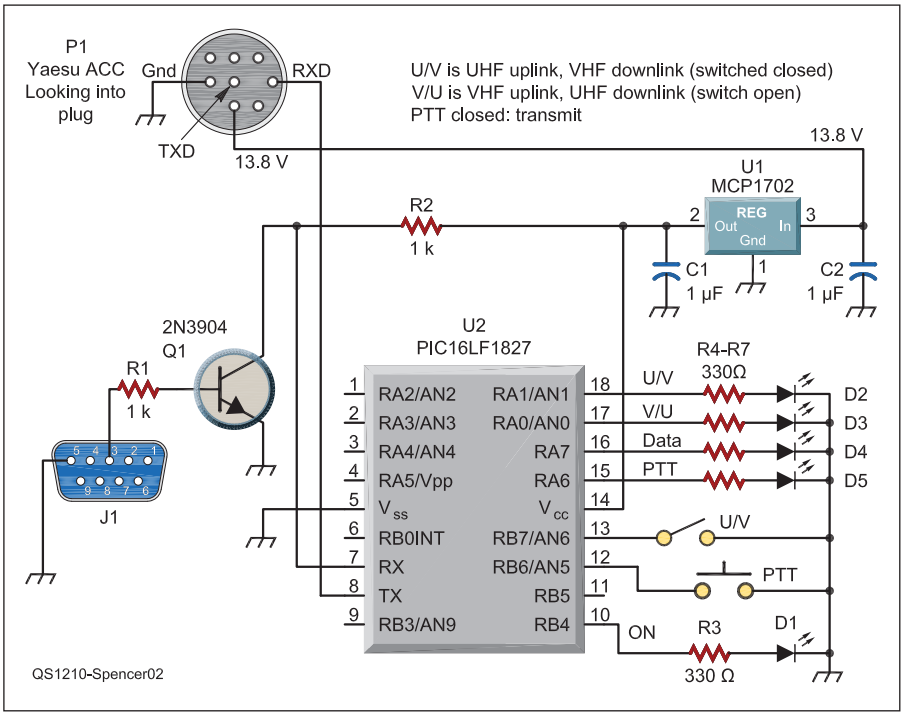


Figure 2 — Schematic diagram and parts list for the interface hardware, based on the PIC16LF1827 microcontroller. Digi-Key parts are available from **www.digikey.com**.

C1, C2 — 1 µF, 50 V electrolytic capacitor (Digi-Key 445-2865-ND).
D1-D5 — LED [Digi-Key 67-1105-ND (Red), 67-1112-ND (Green)].
J1 — 9-pin D-sub jack (Digi-Key A35107-ND).
P1 — Plug to match radio ACC jack (Digi-Key CP-2080-ND).
Q1 — 2N3904 or equivalent transistor (Digi-Key 2N3904FS-ND).
R1, R2 — 1 kΩ, ¼ W resistor.
U1 — MCP1702 3.3 V regulator IC (Digi-Key PIC16LF1827-I/P-ND).
U2 — PIC16LF1827 microcontroller (Digi-Key MCP1702-3302E/TO-ND).

Control Interface Hardware

The interface hardware (Figure 2) is based on the PIC16LF1827 microcontroller. This device has USART functionality that makes it easy to connect the microcontroller to other devices serially. The output of the computer running *SatPC32* is at serial RS232 levels (±12 V) while the input to the PIC16LF1827 is at transistor-transistor logic (TTL) voltage levels (3.3 V), so some voltage level conversion is required. This is accomplished by the 2N3904 NPN transistor and current limiting resistors. The CAT input to the FT-817 is at TTL levels, so no voltage conversion between the PIC and the radio ACC connection is needed. There are a number of indicator LEDs mounted on the board as labeled in the circuit diagram for operator convenience and for operation and mode verification. The PTT switch of the circuit is used instead of the microphone PTT switch on the FT-817 microphone.

Control Interface Software

The real meat of the project is in the microcontroller software. The microcontroller software for this project is written in the C programming language and is available for download on the QST-in-Depth website as well as from the author upon e-mail request.[1] Before the logic of the microcontroller software can be discussed, a review of the output CAT command format from *SatPC32* is in order. This would be a good time to dig out the *FT-817 Operator's Manual* and review pages 70-73. (Those who are adapting this project to a different transceiver will have to study their specific radio CAT command format and author software to match.)

To control the FT-817 via a computer, specific commands in a specific format must be transmitted by the computer to the radio ACC jack through a CAT interface. The Yaesu interface is the CT-62 option — basically a voltage level converter between RS232 and TTL levels. These commands are contained in a 5 byte structure with the individual bytes sent LSB first, MSB last at user specified baud rates (this interface is based on 9600 baud). The first 4 bytes of the command structure are parameters (data such as frequency to be set) or dummy place-fillers and the last byte is the actual command *Opcode* as shown in Table 1.

The decimal values of the parameters are

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

Table 1
Data Command Structure

Parameter				Opcode
P1	P2	P3	P4	CMD

constructed in binary coded decimal (BCD) format with the first nibble (4 bits) of the byte containing the first decimal digit (0-9), and the second nibble of the byte containing the second decimal digit. The combination of the two nibbles, a byte, in turn is converted to a single decimal value for transmission. While this can be intimidating for the computer novice, my point is to illustrate that it will take some thought and study to understand the formats used by both the controlling software and the radio being used.

Here is an example. Let's assume the controlling software is sending a frequency of 435.345 MHz to the radio. The first two decimal digits of the frequency (43) are converted into BCD. The binary code for 4 is 0100. The binary code for 3 is 0011. Putting the first decimal digit into the high nibble and the second decimal digit into the low nibble creates the byte 0100 0011 or 0x43 hexadecimal or 67 decimal (0x## indicates hexadecimal). You can use the scientific calculator that is an accessory to *Windows* to convert from one numbering system to another. I use it all the time.

A sample of the relevant FT-817 commands for this project is contained in Table 2. The command format to set the frequency to the radio is P1:P2:P3:P4:01 where the P#'s make up the frequency in BCD, the 0x01 is the hexadecimal Opcode to set the frequency.

Table 2
Data Transfer Example

Set Freq Hex				Opcode
0x43	0x53	0x45	0x00	01
Set Freq Decimal				**Opcode**
67	83	69	00	01
Upper Nibble		***Lower Nibble***		
Decimal	1	4		
Hex	0x1	0x4		
Binary	0001	0100		
Byte	20			
Parameter				**Opcode**
P1	P2	P3	P4	CMD
Set Freq				**Opcode**
0x14	0x59	0x17	0x00	0x01
Toggle VFO A/B				0x81
PTT ON				0x08
PTT OFF				0x88

Table 3
***SatPC32* CAT Command Set with FT-817 Radio for VO52 Satellites**

Command	Function
0000000002	WAKE UP
0000000081	TOGGLE VFO
8A0000000A	CTCSS OFF
0000000081	TOGGLE VFO
00000000F7	READ RX STATUS (NO EQUIPMENT ATTACHED)
1459170001	RX FREQUENCY
0000000081	TOGGLE VFO
4352449201	TX FREQUENCY
0000000081	TOGGLE VFO
0152449207	OPERATING MODE
0000000081	TOGGLE VFO
0152449207	OPERATING MODE
1459170001	RX FREQUENCY
0000000081	TOGGLE VFO
4352449201	TX FREQUENCY
**********	SEQUENCE CONTINUES
0000000081	TOGGLE VFO
8080808080	*SatPC32* TRACKING OFF, CMD LOCK OFF

Translating this into hexadecimal the five byte command would be: 0x43 0x53 0x45 0x00 0x01. The decimal values of the five byte sequence would be: 67 83 69 00 01.

The other relevant commands needed to control the FT-817 for this project are TOGGLE VFO, PTT ON and PTT OFF.

Let's now take a look at the command set that is conveyed to the FT-817 from *SatPC32*. Table 3 is a sample.

Notice that the program commands the transceiver to toggle the VFO and then sends the frequency. There are other commands that set the operating mode. This is why *SatPC32* doesn't perform well with a single FT-817. All of these commands also complicate the software for the interface. The command set for an older Yaesu radio, such as an FT-736, is similar to the command set for the FT-817, but it is also simpler. Table 4 is a sample of the command set for the FT-736.

In this case, the *SatPC32* software only sends the alternating transmit and receive frequencies and does not send commands to toggle the VFO (this is because the older FT-736, an early satellite capable transceiver, was full duplex capable with two independent VFOs and therefore did not need to be toggled). You can sample the commands coming from *SatPC32* with a terminal program such as *HyperTerminal* or *Putty*, but you need to do some conversion between numbering systems. The command set transmitted by *SatPC32* is in decimal format. The number 1 is the actual decimal value for number 1, the number 127 is the actual decimal value for 127.

Terminal programs use the ASCII format to represent the character being transmitted. So to display the number 1 in the HyperTerminal screen, the transmitting system needs to send the ASCII representation for the number 1, which is the ASCII value of 49, not the decimal value 1. To display the decimal value 127, the transmitting system would have to send the ASCII representations for the decimal numbers 1, 2 and 7 of the ASCII values of 49, 50 and 55. To capture the *SatPC32* commands as displayed above, I actually authored a PIC program dedicated to the translation of decimal values into ASCII that are in turn sent to *HyperTerminal*.

Talking Through the Software

The thought process behind the PIC software that is loaded into the microcontroller of the interface project goes something like this:

- Determine the operating mode desired from the setting of the mode switch of the interface, either U/v (UHF uplink/VHF downlink) or V/u (VHF uplink/UHF downlink).
- Wait for and read valid frequency commands from *SatPC32*.
- Store the frequencies into temporary variables for VHF frequency and UHF frequency as appropriate.
- Check the status of the PTT switch on the interface board.
- If the PTT switch is open (in receive mode), send the appropriate receive frequency to the

Table 4
***SatPC32* CAT Command Set with FT-817 Radio for VO52 Satellites**

Command	Function
0000000000	CMD LOCK ON
000000008A	CTCSS?
1458992001	RX FREQUENCY
4352529401	TX FREQUENCY
0152529407	OPERATING MODE

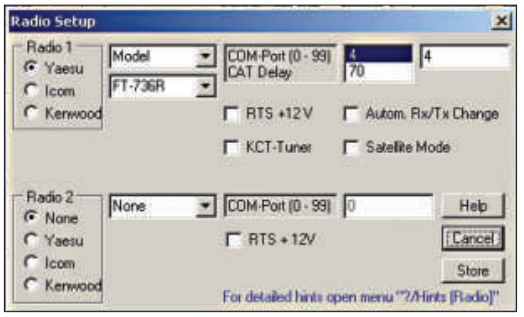


Figure 3 — *SatPC32* radio setup menu.

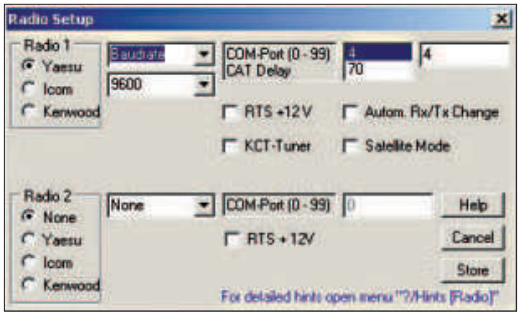


Figure 4 — Select the 9600 baud rate as illustrated.

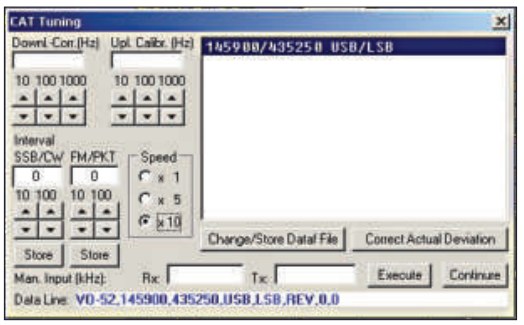


Figure 5 — Click on CAT in the menu bar and set the interval frequency to 0 for both SSB/CW and FM. Also select X10 speed as shown.

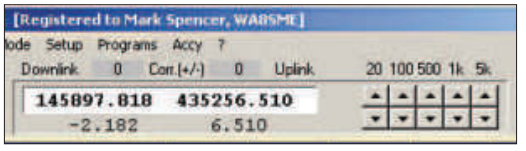


Figure 6 — Tune the radio frequency with the up and down arrows on *SatPC32*, not with the main tuning knob of the transceiver as shown.

FT-817 (depends on the MODE switch).

- a(1) Go back to step 1.
- If the PTT switch is closed (radio switched to transmit), send a command to toggle the VFO and then send the appropriate transmit frequency to the FT-817.
- Send a command to cause the FT-817 to begin transmitting.
- Hold the transmit mode until the PTT button is released.
- Go back to the first step.

This sequence may seem complicated, but if you take a moment to think about how you operate your radio manually, these are exactly the steps that you take. If programming a computer to do the work for you, you are just translating the things that you would do into commands that you want the computer to mimic.

Interface Connection

The interface draws power from the FT-817 ACC jack. This current source is always on and is not controlled by the rig's power switch. Because there is no ON/OFF switch for the interface, it is on and drawing current whenever it is plugged into the FT-817. Be aware of this and don't leave the interface plugged into the radio when not in use or you'll deplete the radio batteries. Use a standard USB to serial converter to connect the interface to the computer USB port. Set the FT-817 VFOA (RX) and VFOB (TX) to the correct band and modes for the satellite you are going to use. Set the correct operating mode for the satellite of interest, either V/u or U/v.

SatPC32 Setup

Use the Yaesu FT-736 radio in the Radio Setup menu of *SatPC32* as illustrated in Figure 3. Select the appropriate serial port for your computer setup. Select the 9600 baud rate as illustrated in Figure 4. Make sure that you also set the CAT baud rate of the FT-817 to 9600 baud. Click on CAT in the menu bar and set the interval frequency to 0 for both SSB/CW and FM. Store this setting for later use. Also, select X10 Speed (Figure 5). This setting makes the interface much more responsive during operation. Unfortunately this speed setting is not saved and defaults to X1 Speed each time *SatPC32* is launched, so you'll have to reset this each time you start the program. If you forget, the interface will act sluggish, but it will operate. When you want *SatPC32* to control your FT-817, click on the C icon in the upper left of the *SatPC32* menu bar.

Radio Operation

The *SatPC32* should start updating the frequency for the selected satellite. The data LED will flash in step with the frequency updates. You tune the radio frequency with the up and down arrows on *SatPC32*, not with the main tuning knob of the transceiver (see Figure 6). This may take a little getting used to. Start with the higher Hertz intervals for gross tuning and transition to the lower hertz tuning for fine tuning. Having up-to-date Keplerian data is more critical when using the interface to control the radio since you will not be able to hear your downlink to compensate for any Keplarian data erosion or computer clock inaccuracies.

With the radio tuned in to the desired receive frequency with the *SatPC32* tuning arrows, the program will calculate the proper uplink frequency. Once you have the receive frequency set, use the FT-817 RIT adjustment to make minor adjustments of the receiver frequency, to clarify the signal and compensate for minor adjustments for Doppler shift.

When you want to transmit, press the PTT switch on the interface board, not the PTT on the rig microphone (the interface does not read the status of the rig microphone PTT switch). There is a slight delay for the PIC to toggle the VFO and set the transmit frequency before the rig is put into transmit mode. Because the FT-817 does not allow for CAT frequency adjustments while the rig is in transmit mode, keep your transmissions short (this normally isn't a problem for satellite contacts). When done transmitting, simply release the PTT switch on the interface board to return to receive. The *SatPC32*/interface combination will return the rig to receive on the proper VFO and proper Doppler adjusted receive frequency.

Conclusion

Ideally, to operate the analog satellites you would want a full duplex radio that would allow you to monitor your downlink frequency while transmitting to permit you to track for Doppler shift. The interface described here, while not the ideal solution to operating a non-full duplex radio, can help you operate the analog birds with a non-full duplex radio, in this case the FT-817 being controlled by *SatPC32*. The interface concept serves as a model that can be adapted to other radios and satellite tracking software. CU on the birds.

Mark Spencer, WA8SME, is the ARRL Education and Technology Program Director. You can reach him at **mspencer@arrl.org.**

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

The Shared Apex Loop Array

This compact directional wideband receiving antenna can reduce interference.

Mark Bauman, KB7GF

Effective receiving antennas are becoming an indispensible part of our amateur arsenal as we battle interference from both natural and man-made sources. Many of us do not have the acreage to erect directional antennas, especially on the lower bands, so we use shortened verticals and low hanging dipoles, which provide essentially omnidirectional response. As a result, our ears are bombarded with signals and interference from all directions when our transmitting antenna doubles as our receiving antenna.

Antenna Concept

To assist in this battle, I designed a compact directional receiving antenna that effectively reduces interference over a wide frequency range. The array described here is compact, having a loop spacing of only 2 inches, a 10 foot tall mast, an array length of 20 feet and a base height of 6 inches. In this configuration, the array delivers directivity over a frequency range of 500 kHz to 22 MHz and exceptional sensitivity above 6 MHz.

A ground mounted version of the shared apex loop array is shown in Figure 1 and schematically in Figure 2. The antenna utilizes two closely spaced loops that are interconnected via a delay line to deliver healthy front to side and front to back ratios over a wide frequency range. A non-conductive mast guides the vertical side of two identical right-triangular-shaped wire loops to form a common or shared apex. Each loop is draped in a symmetrical manner about the mast, oriented in a common vertical plane, and held in tension by an anchor forming a horizontal base that is spaced a few inches above the ground.

Each loop is constructed as an endless wire loop that is routed through a group of ferrite cores forming a current transformer acting as a coupling link. The coupling link is positioned at a distance from the mast and is connected so that the anchor side of the transformer is connected to the center coax conductor of a loop feed line. The loop feed line from loop 1 is connected to a reference line. The opposite end of the reference line connects to an input port of a combiner amplifier that will be described later in this article.

I designed a compact directional receiving antenna that effectively reduces interference over a wide frequency range.

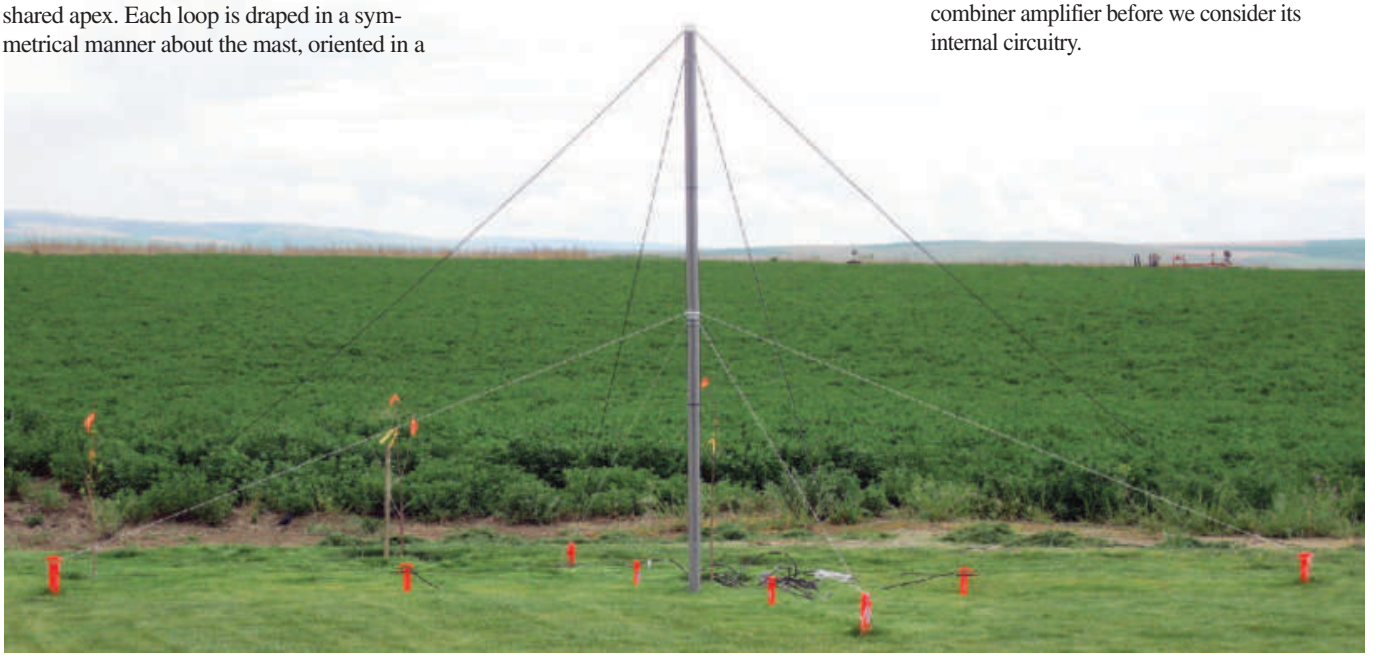
The loop 2 coupling link is positioned at a distance from the mast and is connected so that the anchor side of the transformer is connected to the center coax conductor of a loop feed line. The opposite end of the feed line is connected to a delay line. The opposite end of the delay line is connected to a second port of the combiner amplifier. The output signal from the array is delivered from the combiner amplifier to the receiver.

The array operates using the true-time-delay principle of operation by combining signals from loop 1 with delayed signals from loop 2. Using this principle, a time delay difference is selected so that signals arriving from a direction that is opposite the favored direction, when combined, are maximally attenuated. If the array is configured in this manner, signals arriving from the favored direction are attenuated less than signals coming from other directions. This directional effect is largely frequency independent up to a maximum frequency.

The array also benefits from its employment of electrically small loop elements that exhibit a profoundly bidirectional characteristic, with lobes off of their ends and sharp nulls to their broadside. The combination of the small loop element and true time delay operation join together to provide the horizontal response as modeled with *4NEC2* and shown in Figure 3. This pattern shape is largely preserved over the frequency range, but the forward gain decreases significantly as the operating frequency is lowered.

Combiner Amplifier

The combiner amplifier shown in Figure 2 is a three terminal device that must provide proper termination for the delay and reference lines, port-to-port timing and amplitude accuracy as well as amplification. It is essential to understand the port characteristics of the combiner amplifier before we consider its internal circuitry.



The input impedance of PORT A and PORT B of the combiner amplifier must closely match the characteristic impedance of the coax line (in this case 75 Ω) over the operating frequency range. This is essential to maintain a consistent time delay through the delay line, and help to ensure that signals are absorbed rather than reflected. The input impedance must also be maintained at PORT A and PORT B even though the source impedance from each loop may vary widely over the operating frequency range. So, it is beneficial that PORT A and PORT B be isolated from one another. Also, the input impedance of PORT A and PORT B must be maintained despite various OUT loading conditions.

In addition, the group delay and amplitude for signals entering from PORT A and PORT B to the OUT terminal should be closely matched over the frequency range to ensure proper operation. For this array, a group delay accuracy of 2 nanoseconds or better and an amplitude accuracy of 5% are desirable over the frequency range.

A block diagram of a matched amplifier version of the combiner amplifier is shown in Figure 4. The signal from PORT A is routed to the input of amplifier A1, and delivered to a winding of the transformer T1. The signal from PORT B is connected to the input of amplifier A2, and is delivered to a second winding of transformer T1. The OUT port is connected to a third winding of T1 and represents the sum of the signals from loop 1 and loop 2. For best results, both amplifiers should offer isolation between the input and output, be balanced to minimize second order harmonics and should have a high compression point.

Another version of the combiner amplifier utilizing a passive input combiner (C1) is shown in Figure 5. Here, the signals from PORT A and PORT B are combined in coupler C1. One suitable circuit for such a coupler can be found in an early edition of *The ARRL Handbook for Radio Amateurs*.[1] The output from the combiner is connected to the input of amplifier A1. Control of the group delay and amplitude accuracy between PORT A and PORT B and the output of the combiner C1 is essential for proper operation. For best results, amplifier A1 should offer isolation between the input and output, be balanced to minimize second order harmonics and have a high compression point.

Each implementation of the combiner amplifier has advantages and disadvantages. The matched amplifier version shown in Figure 4 offers more sensitivity at the expense of increased complexity, challenging inter-

[1] *The ARRL Handbook for Radio Communications*, 1994 edition, Chapter 25, p 37.

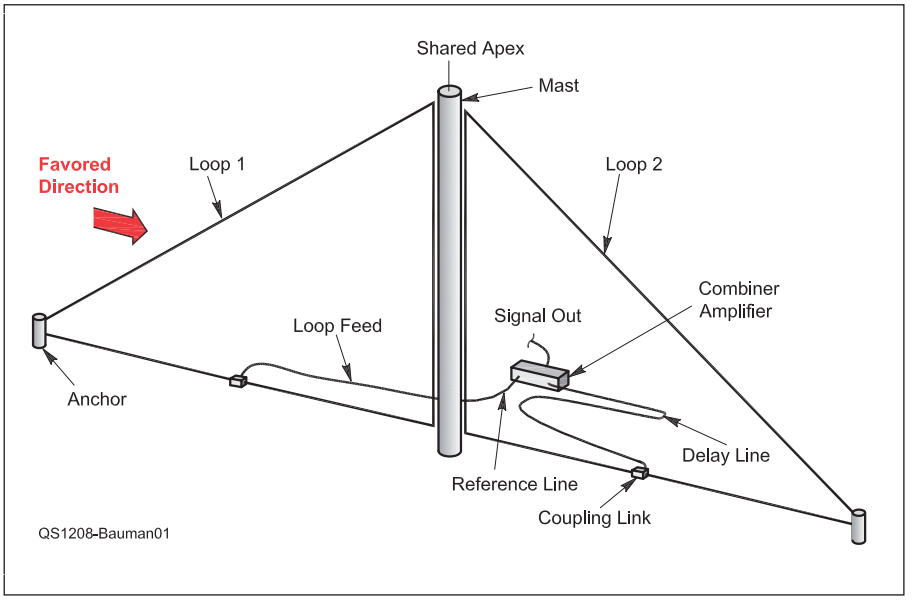


Figure 1 — Sketch of a basic two element shared apex loop array.

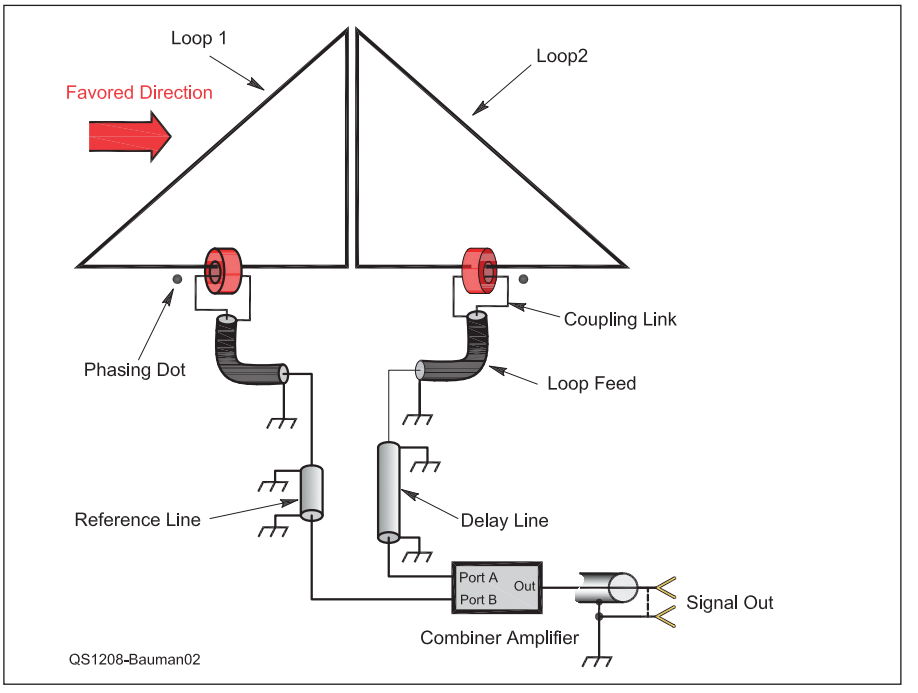


Figure 2 — Schematic of the basic array.

amplifier matching, and susceptibility to AM broadcast band intermodulation products. The passive combiner version shown in Figure 5 provides better immunity to AM broadcast band intermodulation products (since the signals are combined and attenuated before amplification). However, this version has reduced sensitivity (due to the 6 dB loss of the combiner, which adds to the overall noise figure of the system), and may exhibit compromised amplitude and group delay accuracy when applied over a wide frequency range.

Remember that any group delay difference between PORT A and PORT B must be combined with the delay difference provided by the combination of the reference line and the delay lines. For best results, it is helpful to measure the delay of the combination before deployment. Specifically, the delay can be measured by employing a function generator as a trigger input for an oscilloscope and routing the function generator signal between the delay line and the reference line to measure the time delay through the system. For this array, and using the combiner amplifier,

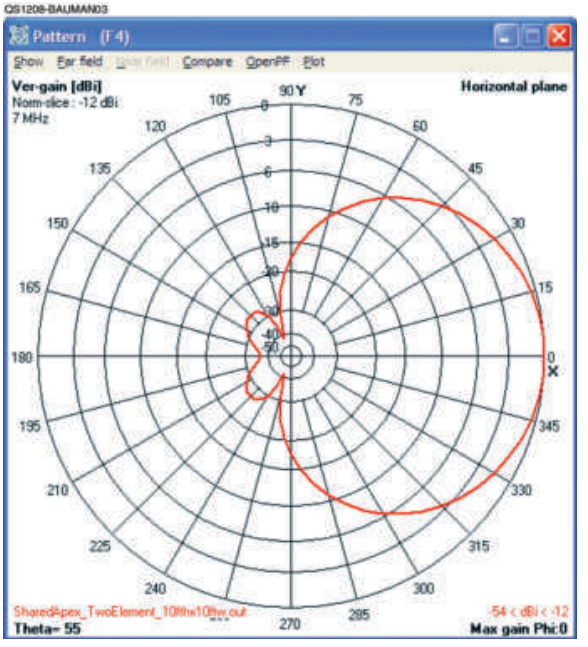


Figure 3 — Horizontal response of the array using a *4NEC2* Model at 7 MHz.

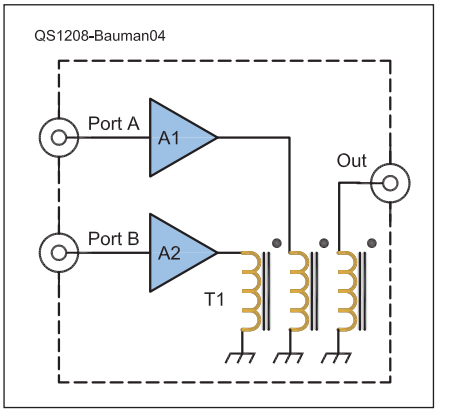


Figure 4 — Block diagram of an active version of a matched combiner amplifier.

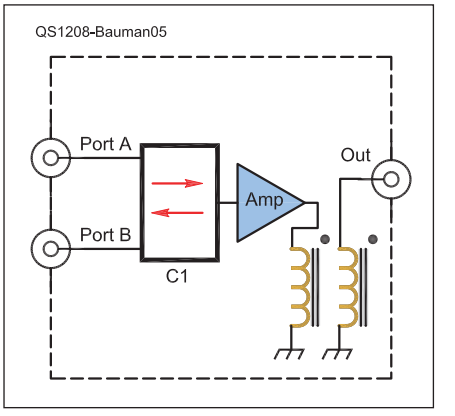


Figure 5 — Block diagram of a passive version of a combiner amplifier.

the combination time delay difference was measured to be 8 ns.

Loop Construction

The construction of a shared apex loop array is relatively straightforward and will be described in detail below. A close-up view of a coupling link is shown in Figure 6. The link is prepared by first selecting a group of six ferrite cores (Laird Technologies FB095051-000 available from Digi-Key, PN#240-2277ND) from a supply of cores, and stringing them together in a line to test their combined inductance using a single turn of wire. At room temperature, use a target inductance of 70 ±1 µH. To achieve this, it is often necessary to replace individual cores from the string with other cores, since individual core permeability can vary by as much as 30% from core to core. Once the proper inductance has been achieved, stack the cores on a dowel. Use a piece of heat shrink tubing or electrical tape to retain the cores. Then, route a piece of #18 AWG hookup wire through the cores and connect each end to a coax connector to form a secondary winding. Mark the end of the link that is connected to the center of the coax connector with a red piece of electrical tape to indicate the phase of the transformer. Prepare a second coupling link in a similar manner.

Next, prepare the mast by first obtaining a 10 foot length of 2 inch, schedule 40 PVC pipe. Drill a pair of ⅜ inch holes, spaced about 1 inch apart and near the top of the pipe, and 12 inches from the bottom of the pipe keeping the holes in vertical alignment along the pipe as shown in Figure 7. Also, perform this operation on the opposite side of the pipe so there are a total of eight holes drilled in the pipe. At this point, if you desire to make the antenna portable, you may cut the length in half and use a pipe coupler to reassemble the pipe so that it can be disassembled and easily transported in a car.

Now, prepare the loop wires for loop 1 and loop 2. It is important that each loop be constructed so that each has an identical length and shape. To accomplish this, first pre-cut two lengths of #18 AWG wire to a length of 32 feet 5 inches. Then, take one of the wires and route it through the guide holes formed in the mast so that the loop wire exits as shown in Figure 7. Take the same loop wire and route it through the pair of vertically aligned guide holes near the bottom of the mast so that the loop wire exits from the mast from the bottom-most hole. Repeat these steps for the second loop wire.

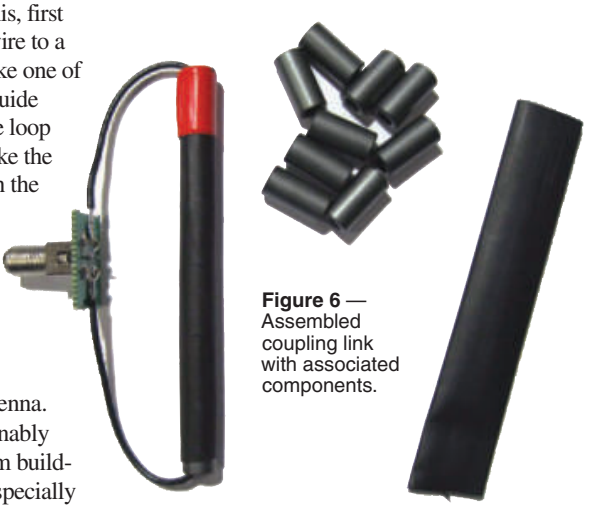


Figure 6 — Assembled coupling link with associated components.

Next, select a location for your antenna. Ideally the ground should be reasonably flat and as far away as feasible from buildings and other structures. This is especially important for operation below 2 MHz, where a distance of at least 20 feet is recommended. Obtain four stakes to act as anchors for the guy ropes for the loop as shown in Figure 8, and secure the guy ropes at mid-level to the mast. Select a mast location and an orientation for the loop. Position each anchor at a quadrant and at a distance 11 feet from the

Figure 7 — Top mast section showing guide holes and loop wire routing.

mast location. Next, secure the guy ropes and adjust the mast using a level so that it maintains a vertical stance.

Now, route the first loop wire through one of the coupling links so that the phasing dot is oriented to the anchor side of the loop. Next, splice the two ends of the loop wire to form an endless loop as shown in Figure 9. Then, take a short section of guy rope and prepare a loop tether and secure the tether to one of the anchors. Repeat these steps to prepare the second loop and position it so that it is in the same plane as the first loop. Adjust the loop tethers to ensure the mast continues to maintain its vertical stance.

Figure 8 — Partially constructed array during mast alignment.

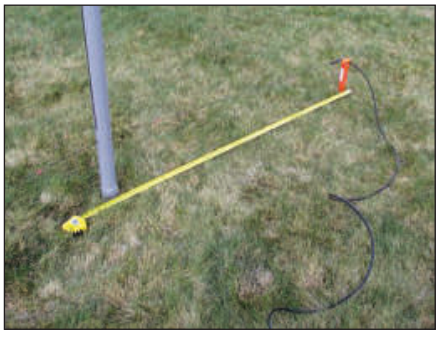


Figure 9 — Base of completed array showing link distance and loop splice.

Figure 10 — Coupler stake and coupling link with phasing dot toward anchor.

Now locate a pair of coupler stakes that will support the loop feed and coupling links. Position each of these at a link distance of 60 inches from the mast. Secure the loop feed for each loop to the coupler stake as shown in Figure 10. You may use any suitable length of coax cable, although it is important that both loop feeds be identical. In this array, I used an 8 foot RG-6 cable (75 Ω) with F-Type connectors for each of the loop feeds. Connect a reference line, in this case a 3 foot RG-6 cable, to the loop feed for the favored direction and connect this to PORT B of the combiner amplifier. Also connect the delay line, which is a 12 foot RG-6 cable, to the other loop feed and connect it to PORT A of the combiner amplifier. Finally, route the output signal to the receiver.

We can enhance the operation of this array by adding a switch module to the system as shown in Figure 11. Here, the switch module is located between the loop feed lines and the

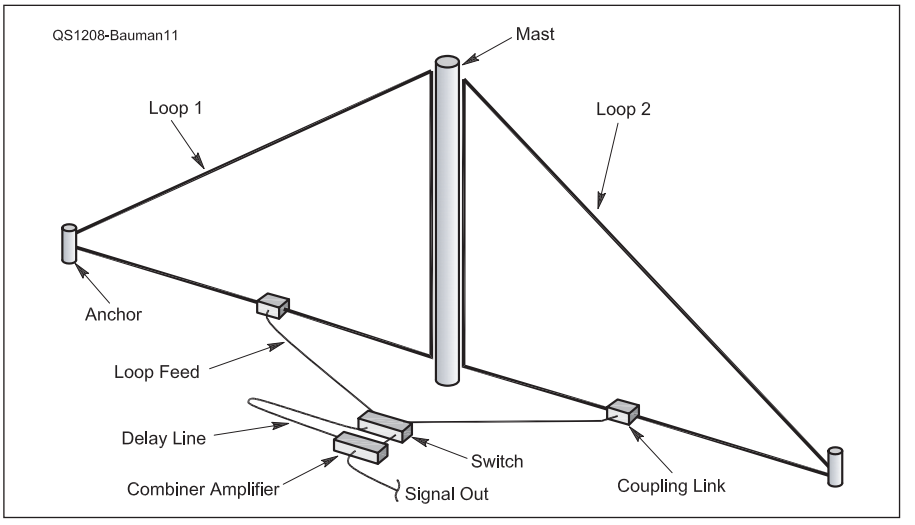


Figure 11 — Sketch of an enhanced two element shared apex loop array with a switching module.

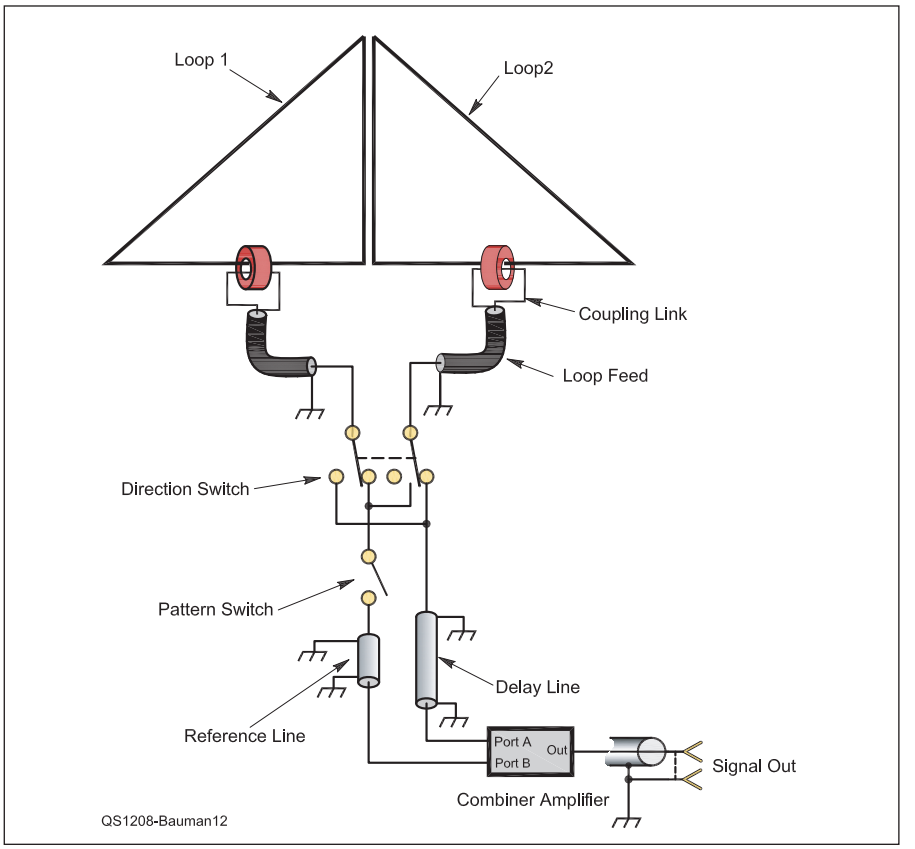


Figure 12 — Sketch of the enhanced array.

Figure 13 — Switching module, combiner amplifier and cabling for the enhanced array.

Figure 16 — Completed four element shared apex loop array utilizing two orthogonally positioned arrays identical to those described in this article.

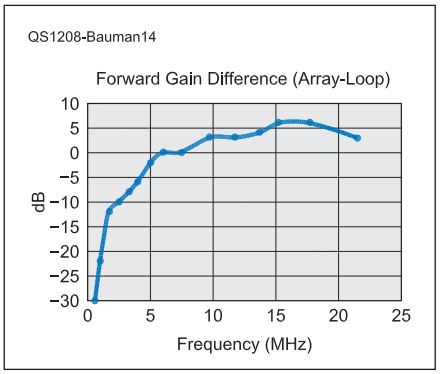


Figure 14 — Graph of the forward gain difference between the described array and single loop element over the operating frequency range.

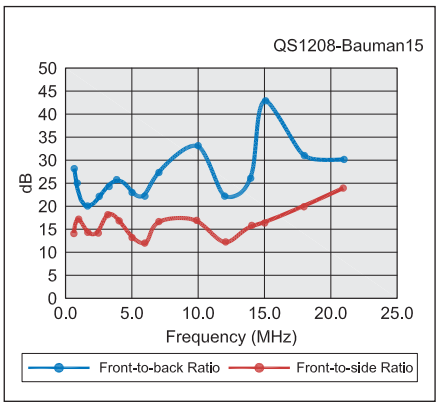


Figure 15 — Graph of the front to back and front to side measurements over the operating frequency range.

patch and delay lines as shown in Figure 12. In this configuration, the delay line is connected to PORT A and the reference line is connected to PORT B of the combiner amplifier. A double pole double throw (DPDT) DIRECTION switch is connected to each of the loop feed lines and acts to select the direction of the array. Signals coming from the direction of the loop that is connected to the reference line will be favored.

A second switch, in this case a single pole single throw (SPST) switch, can be used to select between a unidirectional pattern or bidirectional pattern as shown. This is especially helpful at frequencies below 3 MHz where the sensitivity of the array is much less than that of a single loop. The switch can be implemented as a manual or a relay switch directed by a remote control.

Cabling for the enhanced array is shown in Figure 13. All cables are 75 Ω, RG-6 using Type F connectors. In this picture, the loop feed lines are shown as connected to the switch module (in this case, a remote controlled relay switch). The delay and reference lines are connected between the switch module and the combiner amplifier. The signal out line from the combiner amplifier runs from the array to a receiver in the shack.

As mentioned earlier, the forward gain of the array decreases with decreasing operating frequency. To quantify this effect, I measured the difference between signals received by the array and a single loop element in the array over the frequency range as shown in Figure 14. By inspection, the zero gain point where the gain of the array is equal to a single loop element occurs at about 6 MHz. Above this frequency, the array exhibits some gain over the single loop element. Below this frequency, the forward gain drops dramatically, reaching a low of –30 dB at 500 kHz.

In practice, the noise figure of the combiner amplifier can become the limiting factor during quiet band conditions for frequencies below 5 MHz. During these conditions, and at lower frequencies, it is helpful to be able to remotely switch from the array to the single loop element to hear weak DX. When interference is prevalent, however, the array is useable even down through the entire AM broadcast band where it can parse competing stations sharing the same frequency. The antenna can even be scaled in size to improve the quiet band performance by increasing the size of the loops, increasing the distance from the coupling loops to the mast and increasing the delay line length.

In Figure 15 the front to back and front to side ratios are each plotted over the frequency range. The data used here has been gleaned from over the air testing of the array and an ICOM IC-R71A receiver using manual peak observation readings from the S-meter (assuming 6 dB per S-unit). The data conforms approximately to the chart generated by the *4NEC2* model shown in Figure 3 and confirms the wideband performance of the array.

Other Possibilities

A variation combines two of the two element arrays in an orthogonal manner to cover each of four primary directions. Such an array is shown in Figure 16. Another variation includes using balanced feed lines rather than coax feed lines. Here, the balanced feed lines connect to the coupling link on one end, and the opposite end is connected to a balun. The output of the balun connects to the switch as in Figures 11 and 12.

There is nothing magical about the aspect ratio and size of the loops, and they can be adjusted to meet individual needs. A smaller version would provide even less forward gain, but a higher frequency range. Some aspects of the array are novel. Although I have filed a patent on these features, I encourage amateurs to build and experiment with the shared apex loop array. My hope is that your ears will be pleased with the results.

An article in the September/October 2012 issue of *QEX* will provide additional design information including information on a suitable preamp. This article is available to all ARRL members by clicking on the sample issue at **www.arrl.org/this-month-in-qex**.

ARRL member and Amateur Extra class licensee Mark Bauman, KB7GF, has been licensed as an Amateur Radio operator since 1978. He is also licensed as a professional electrical engineer in the state of Washington and is a registered patent agent. He works as an electrical engineer and patent agent for Nelson Irrigation Corporation and is a small business owner. He lives with his wife and their four children in an antenna challenged neighborhood in College Place, Washington. You may contact Mark at 1910 SE Sunflower Ct, College Place, WA 99324-1781 or at **kb7gf@arrl.net**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

6 + 2 = 1

Enjoy 6 and 2 meters with a single antenna you can build in less than 30 minutes.

The 6/2 dipole up and running at Field Day. I used it for CW and SSB with good results.

Steve Ford, WB8IMY

Last year *QST* Technical Editor Joel Hallas, W1ZR, exploited the venerable skeleton sleeve antenna design to create some nifty dual band HF dipoles that anyone could put together with minimal effort. All that was needed was an appropriate length of 450 Ω windowed ladder line. The designs were published initially in the May 2011 *QST*, and then expanded in the October 2011 issue of *QST*, page 48. ("A Folded Skeleton Sleeve on Other Ham Bands.")

Joel's antennas were so easy to build, and worked so well, I started calling them the "W1ZR Miracle Antennas," much to Joel's chagrin. I imagined TV infomercials offering the amazing antennas for sale. ("You've got a problem? We've got a *Miracle Antenna!*") Everyone seemed to love Joel's dipoles and I never let him forget it.

But Then I Needed a Miracle

Field Day 2012 was looming and I suddenly realized that I had nothing in the air for 6 or 2 meters. Time was running short. I needed a quick-to-construct 6 and 2 meter combo antenna that I could feed with a single coaxial line — anything simple and omnidirectional would do.

I humbly approached Joel and requested a miracle.

"Of course," he replied with a satisfied smile. "There is no reason why my dual band HF models can't be rescaled to a 6 and 2 meter design."

Minutes later Joel supplied the dimensions, which you can see in Figure 1. All I needed was about a 110 inch hunk of 450 Ω line. Luckily I already had this on hand. If you aren't as fortunate, you can purchase 450 Ω window line from several *QST* advertisers. Window line is great stuff to have around and it is relatively inexpensive, too. It never hurts to stock up since you never know where your antenna adventures may take you.

Wire Cutters, a Blade and Solder

Follow the diagram in Figure 1. First cut the entire transmission line to about 109 inches. This will give you 3 inches at each end to wrap into the insulators, leaving the total length of 103 inches. It never hurts to go a little longer so you can trim the length for best SWR.

Pick one wire and install an SO-239 or Type N coaxial connector at the exact center of the antenna. Now make two cuts in the wire *opposite* the one you've chosen for the connector. Make one cut 17¾ inches to the left of center and another 17¾ inches to the right (35 inches total length). This creates the coupled resonator 2 meter element.

With a sharp box cutter or other implement of your choosing, *carefully* slice through the plastic insulation that separates the two wires, working from the ends back toward center and stopping as you reach the cuts in the 2 meter wire. Be careful not to cut through to the wire. Throw away this unneeded insulation and wire. Your goal is to end up with the 2 meter element uniformly separated from the 6 meter wire and supported by the remaining insulation.

It's a Miracle!

By golly it worked. I hauled up the antenna and quickly swept it with an analyzer. The SWR on 6 meters was well below 2:1 from 50 to 52 MHz. On 2 meters I enjoyed an SWR below 2:1 across the entire band. No need to trim the antenna at all. For best results put a few ferrite beads on the coax transmission line adjacent to the plug on the antenna end.

Although this dipole is terrific for portable applications (it quickly rolls up and packs into almost any container), it can also function as a permanent antenna. If your interests run more toward FM operating, you may want to trim the antenna a bit shorter to move the low SWR point higher in the band. Cut about an inch from each end of the 6 meter wire and then check the SWR, trimming more wire if necessary. Chances are you won't need to trim the 2 meter element at all.

For FM you should hang the dipole vertically with the coaxial feed line running perpendicular to the antenna for at least 5 feet. Vertical polarization is the custom for FM on VHF frequencies and being in sync with your fellow hams makes a big difference in signal strength at both ends of the path (as much as 20 dB).

Joel's antenna worked well for me, even at relatively low heights. After Field Day I simply packed it away in a small box for future use. For sheer frugality and ease of assembly, this little VHF dipole is indeed a miracle.

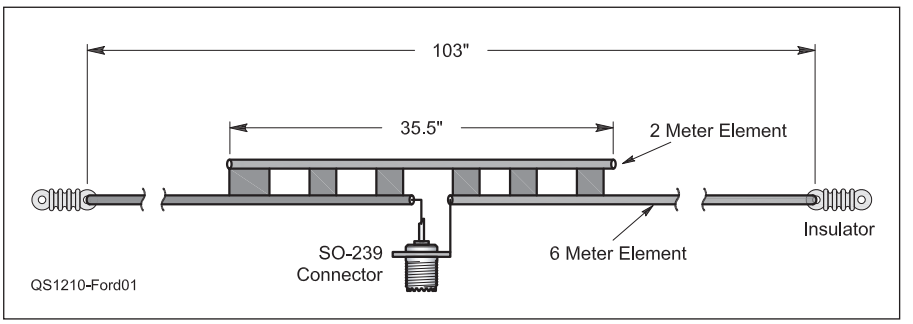


Figure 1 — The W1ZR skeleton sleeve dipole with dimensions for 6 and 2 meters.

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

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

Mark J. Wilson, K1RO, k1ro@arrl.org

Alinco DJ-V57T Handheld Dual Band FM Transceiver

A refreshingly basic FM transceiver for 2 meters and 70 cm.

Reviewed by Bob Allison, WB1GCM
ARRL Test Engineer
wb1gcm@arrl.org

Choosing a handheld transceiver can be quite a challenge these days, even for this radio amateur of 38 years. I purchased a multiband handheld transceiver with endless gadgets 3 years ago. I ended up with a compact, somewhat pricey radio with an incredibly thick manual. It had amazing features, if I could remember all of them! This small radio also had small buttons; pressing only one button at a time was a hit or miss proposition. It was impractical for my casual operating requirements, so I sold it.

I recently purchased another handheld and took a minimalist approach — few buttons, light weight and small size, all at a rock bottom price. It's easy to use, but its quality appeared to commensurate with its rock bottom price. Coincidently, it fell out of my shirt pocket while hiking at an old granite quarry and met its demise — after hitting rock bottom.

Down a handheld FM radio, I was delighted to have the opportunity to review the Alinco DJ-V57T. At first impression, it fit my needs of being reasonably priced and simple to operate. A big plus: the keypad is compatible with my wide fingertips.

The DJ-V57T is a fairly basic, no-frills radio that's built to sell for about $140. It covers 2 meters and 70 cm with some receiver coverage outside the ham bands. Transmit power is adjustable — up to 5 W — and the radio includes CTCSS (continuous tone coded squelch system) encode and decode as well as DCS (digital coded squelch). You won't find GPS, crossband repeat, dual receivers, National Weather Service channels or alerts or other features common on today's high-end handhelds. This radio is for hams who want a sturdy handheld for simply talking on the local repeater or on simplex channels. The one compromise that bothered me is the low capacity of the standard battery pack, but that can be rectified with one of several available options (more on this later).

Bottom Line

Alinco's DJ-V57T dual band handheld offers a nice selection of basic features and good transmit and receive performance at a reasonable price. The standard battery pack is fine for casual use, but consider one of the optional high capacity packs if you expect to transmit frequently.

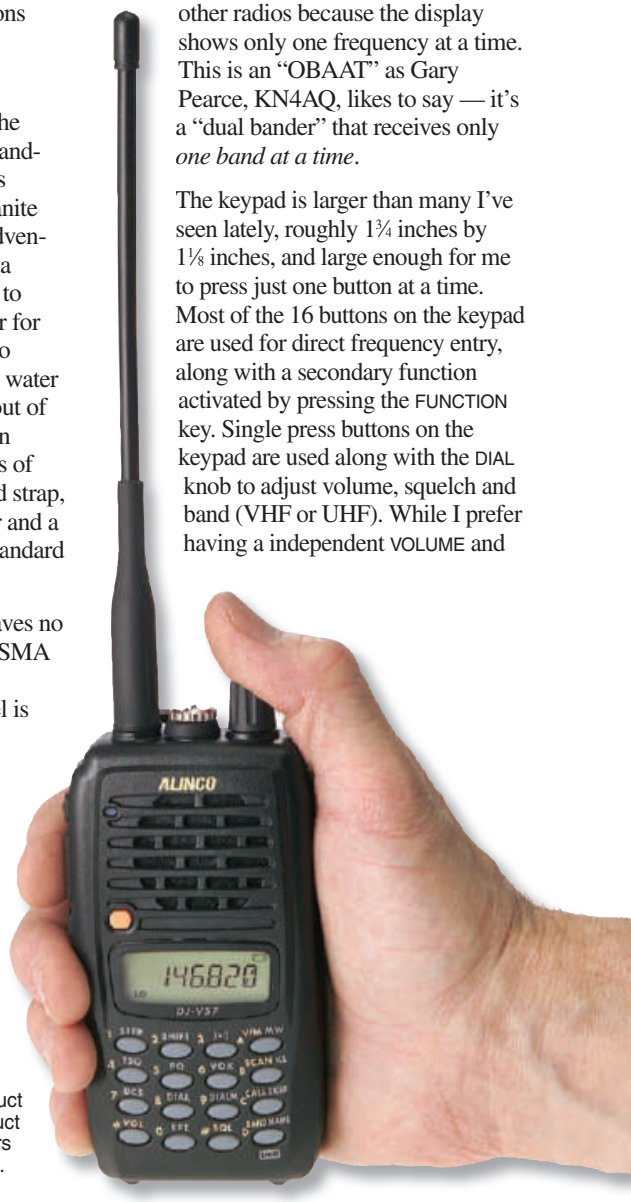
Out of the Box

The DJ-V57T has the same "solid in the hand" feeling of other recent Alinco handheld transceivers I've tried.[1] Indeed, its polycarbonate body felt as solid as granite and might even survive my next misadventure in a quarry. It should also survive a heavy rainstorm because it's specified to withstand a 3 foot submersion in water for up to 30 minutes. Still, Alinco warns to avoid needlessly dropping the radio in water and, if that happens, to pull the radio out of the water immediately and dry it off. In addition to the transceiver, the contents of the box yielded a usable belt clip, hand strap, manual and schematic. A wall charger and a 7.2 V dc, 700 mAh battery pack are standard features.

The layout of buttons and switches leaves no surprises. The DJ-V57T has a female SMA connector for its nearly 7 inch flexible antenna. At the middle of the top panel is the connection for the microphone/speaker jack, which when not used, is covered by a heavy duty screw and rubber gasket that keeps out water from unexpected moisture events. This connection also doubles as the memory programming jack. On top is the DIAL knob, which rotates to select the frequency, memory channel and other parameters.

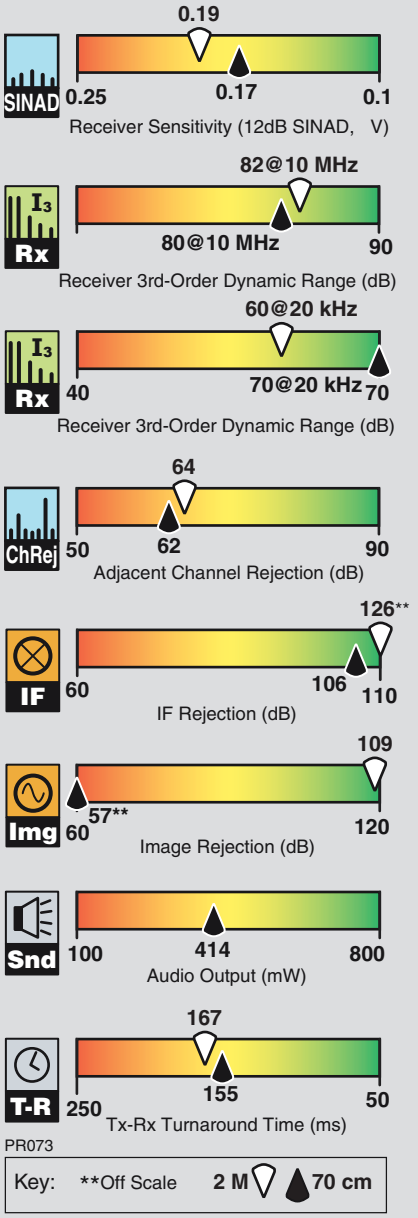
At the top left of the front panel is a small but adequately bright LED that lights red while transmitting and green while receiving. The front facing speaker dominates the top of the front panel and is nearly 1½ inches in diameter. In the center of the front panel is a 1½ inch wide by ½ inch tall liquid crystal display (LCD), comparable in size to that on other models. The display characters are larger in the DJ-V57T than in some other radios because the display shows only one frequency at a time. This is an "OBAAT" as Gary Pearce, KN4AQ, likes to say — it's a "dual bander" that receives only *one band at a time*.

The keypad is larger than many I've seen lately, roughly 1¾ inches by 1⅛ inches, and large enough for me to press just one button at a time. Most of the 16 buttons on the keypad are used for direct frequency entry, along with a secondary function activated by pressing the FUNCTION key. Single press buttons on the keypad are used along with the DIAL knob to adjust volume, squelch and band (VHF or UHF). While I prefer having a independent VOLUME and



[1]B. Allison, WB1GCM, "Alinco DJ-G29T Dual Band Handheld Transceiver," Product Review, *QST*, Jul 2012, pp 44-47. Product Reviews are available to ARRL members online at **www.arrl.org/product-review**.

Key Measurements Summary



SQUELCH controls, pressing the assigned button and rotating the knob worked smoothly every time.

Holding the FUNCTION button down for 2 seconds will enable the SET mode, used to adjust 18 different operating parameters via a menu. To scroll through the SET mode, press the FUNCTION button momentarily until the desired parameter/function is found. That may seem confusing at first but I got used to it quickly.

Below the FUNCTION button is the PTT switch and below that is the MONITOR KEY.

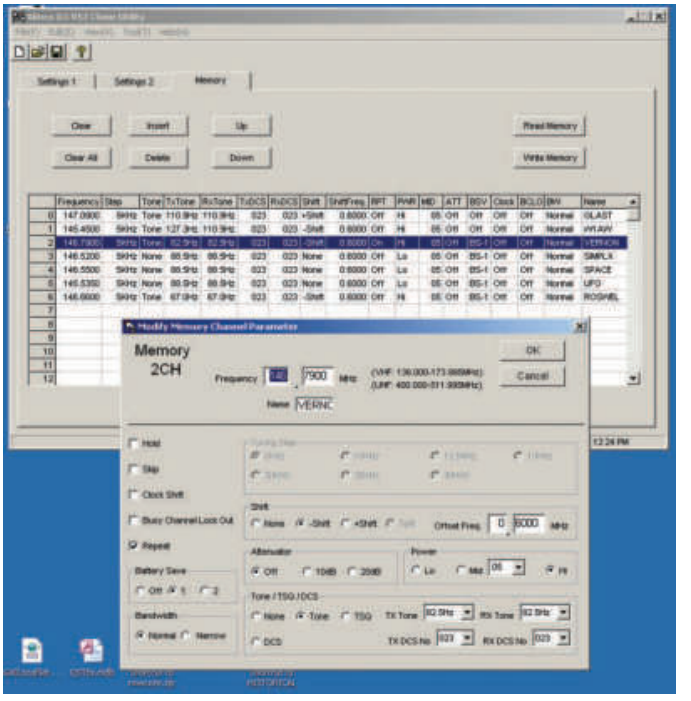


Figure 1 — The Alinco *DJ-V57T Clone Utility* software allows programming of memories and operating parameters. The software is free but an optional cable is required.

Pressing the MONITOR KEY button will disable the squelch. Pressing FUNCTION and then MONITOR KEY will turn on the green backlighting for the LCD and keypad buttons. I call the backlighting *aurora* green because the display matched the color of the Northern Lights viewed at my Coventry, Connecticut, home after an X class solar flare. While the backlighting is hardly visible under normal lighting conditions, it is adequate in the dark and will not ruin night vision while star gazing.

The right side of this handheld features the DC INPUT jack, which accepts a variety of optional chargers or an external dc power source of 7 to 16 V dc. The DJ-V57T can be used with several optional rechargeable lithium-ion (Li-ion) or nickel metal hydride (NiMH) battery packs or with a battery case that holds six AA alkaline cells. The transceiver must be programmed for the type of battery used. This is done by holding down the 0 key for 2 seconds and then selecting the battery type with the DIAL knob on top.

Lab Testing

Overall, the test results were good, with one exception: Image rejection is only fair on the 70 cm band. Alinco has added a two position attenuator that can be switched in line to reduce unwanted images. In the Lab I found that attenuator positions one and two added 3 and 12 dB of attenuation respectively on 2 meters, and 4 and 15 dB on 70 cm. The attenuator feature is also useful for reducing intermodulation products generated within the receiver that might be a problem if you are operating in the vicinity of several high powered transmitters. There were no show stoppers during testing. The transmitter passed the FCC requirements for spurious emission with flying colors.

On the Air

As always, I engaged a half dozen radio amateurs and asked about the transmitted audio quality. Reports of "loud and clear" and "fine" were typical. Received audio was quite good, depending (of course) on the transmitted signal. Reception with the flexible antenna was comparable to the other handhelds in the shack my wife Kathy, KA1RWY, and I share. So far so good, but....

After a few contacts, the DJ-V57T's battery indicator was showing low. I had transmitted using the medium power setting (2 W RF output) while engaging in a few rag chews, and I had the impression the battery pack gave out a bit early. After a recharge using the standard EDC-146 wall charger, I experienced less than expected battery life. Only then did I realize the standard battery pack has 700 mAh capacity, on the order of 50 to 60% of the capacity of the standard packs on my other handhelds. Even my rock bottom, lost-in-the-quarry radio had a higher battery capacity. Alinco does offer a 2000 mAh NiMH battery pack for about $50, and it

Table 1
Alinco DJ-V57T, serial number M000597

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 136-173.995, 400-511.995 MHz; transmit, 144-147.995, 420-449.995 MHz.	Receive and transmit, as specified.
Modes: FM.	As specified.
Power requirements: Receive, 70 mA (standby 146 MHz), 80 mA (standby 440 MHz), 27 mA (battery save); transmit, 1.6 A (5 W, 146 MHz), 1.9 A (5 W, 440 MHz).†	With 8.0 V dc battery power (full charge): Receive, 146 MHz: 228 mA (max volume, lights on), 101 mA (standby, backlight on), 65 mA (standby, backlight off), 11-65 mA (battery save).* Transmit, 146 MHz, 1.41 A (hi), 0.78 A (med), 0.42 A (low); 440 MHz, 1.59 A (hi), 0.84 A (med), 0.46 A (low). With 13.8 V dc external power: Receive, 146 MHz, 238 mA (max volume, backlight on), 69 mA (stand by, backlight off).* Transmit, 146 MHz, 1.10 A (hi), 0.66 A (med), 0.40 A (low), 440 MHz, 1.38 A (hi), 0.81 A (med), 0.46 A (low).
Receiver	**Receiver Dynamic Testing**
Sensitivity: 0.2 µV (146 MHz), 0.25 µV (440 MHz).	12 dB SINAD, 0.19 µV (146 MHz), 0.17 µV (440 MHz).
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 60 dB (146 MHz), 70 dB (440 MHz). 10 MHz offset: 82 dB (146 MHz), 80 dB (440 MHz).
FM two-tone, second-order IMD dynamic range: Not specified.	84 dB (146 MHz), 107 dB (440 MHz).
Adjacent-channel rejection: Not specified.	20 kHz offset: 64 dB (146 MHz), 62 dB (440 MHz).
Spurious response: Not specified.	IF rejection, 126 dB (146 MHz), 106 dB (440 MHz); Image rejection, 109 dB (146 MHz), 57 dB (440 MHz).
Squelch sensitivity: Not specified.	At threshold, 146 MHz, 0.14 µV (min), 0.5 µV (max); 440 MHz, 0.13 µV (min), 0.4 µV (max).
Audio output: At 10% THD, 400 mW into 8 Ω load (external speaker).	414 mW at 10% THD into 8 Ω; THD at 1 V RMS, 1.0%.
Transmitter	**Transmitter Dynamic Testing**
Power output: battery power, 146 MHz 5/2/0,5 W (hi, med, low, 146 MHz), 4.5/2/0.5 W (hi, med, low, 440 MHz), External 13.8 V dc: 5/2/0.5 W (hi, med, low).	Battery power (8 V dc, full charge): 146 MHz, 5.1/2.1/0.51 W (hi, med, low); 440 MHz, 4.8/2.0/0.48 W (hi, med, low). External 13.8 V dc power: 146 MHz, 5.7/2.0/0.52 W (hi, med, low); 440 MHz, 5.7/2.1/0.53 W (hi, med, low).
Spurious signal and harmonic suppression: ≥60 dB.	Typically, >70 dB; worst case, 68 dB (ext dc power, 440 MHz). Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 167 ms (146 MHz), 155 ms (440 MHz).
Receive-transmit turnaround time ("tx delay"): Not specified.	109 ms (146 MHz), 121 ms (440 MHz).

Size (height, width, depth): 4.3 × 2.3 × 1.3 inches (w/o protrusions); antenna, 7.0 inches. Weight: 9.6 ounces (with battery and antenna).

Price: DJ-V57T, $140; ERW-7 USB programming cable, $50; EDS-10 adapter, $15.

†EBP-65 7.2 V, 700 mAh NiMH battery and EDC-146 wall adapter supplied. Available options: extra EBP-65 battery, $29; EBP-66 7.2 V, 2000 mAh NiMH battery, $50; EBP-63 7.4 V, 1100 mAh Li-ion battery, $45; EBP-64 7.4 V, 1600 mAh Li-ion battery, $65; EDC-159 rapid charger (required for Li-ion batteries), $45; EDC-160 rapid charger for NiMH batteries, $45; EDH-34 battery case for 6 AA cells, $20; EDC-36 cigarette lighter dc power cable with filter, $25.

*Receive current was typically 10 mA higher at 440 MHz.

works with the supplied wall charger. According to the manual, it takes about 30 hours to charge, so the optional EDC-159 rapid charger will be of interest.

Two high capacity Li-ion battery packs are also available, but they require an additional optional charger. The optional EBP-64 1600 mAh Li-ion battery pack and the matching EDC-160 rapid charger add about $100 to the cost of this transceiver. For those on the other side of the pond, an 1100 mAh Li-ion battery pack is a standard feature with the DJ-V57E (European version).

Manual programming of memories (200, plus a call channel) is very simple. After dialing in the frequency and operating parameters in the VFO mode, there are only four steps to complete the programming of a memory channel. Each memory channel may be labeled alphanumerically, up to seven characters, instead of a frequency display.

Other features worth noting are an auto dialer with nine DTMF memories and a VOX function. The PROGRAM SCAN function allows for up to three programmable scanning ranges. There's a somewhat annoying ALERT function that transmits alternating DTMF tones for 5 seconds. I don't think that would go over well on my local repeater.

Software

While Alinco offers free *DJ-V57 Clone Utility* software (Figure 1) for download from their website, the optional ERW-7 USB programming cable and EDS-10 adapter must be purchased. A serial cable is also available.

The software installation is simple enough, but I recommend the user carefully read the instructions. I found the software to be unsophisticated and not intuitive. To enter the CLONE UTILITY mode, the PTT switch must be pressed three times while holding down the MONITOR button. In this mode, memory channels may be added, removed or edited and operating parameters can be adjusted with the utility software.

A setup step that some may trip on is selecting the computer COM port. I found the correct one by going into the *Windows* control panel and clicking on ADMINISTRATIVE TOOLS, then COMPUTER MANAGEMENT, then PORTS. My USB port is called COM 5 and the serial port is COM 1.

Conclusion

Overall, I enjoyed my experience with the DJ-V57T. Simple and rugged, it would be very suitable for public service communications. The new ham, or even the seasoned

ham who just wants to talk, would find this handheld a pleasure to use. For more than casual use it would benefit from a higher capacity battery pack.

US distributor: GRE America, 425 Harbor Blvd, Suite B, Belmont, CA 94002; tel 650-591-1400, fax 650-591-2001; **www.greamerica.com** or **www.alinco.com**.

See your digital edition of *QST* for a video overview of the Alinco DJ-V57T.

Kenwood TH-K20A Handheld 2 Meter FM Transceiver

Reviewed by Richard K. Palm, K1CE
ARRL Contributing Editor
k1ce@arrl.org

Kenwood's TH-K20A 2 meter FM handheld transceiver is lightweight, sleek and contoured to fit well in the hand. The radio has the basic functions needed, without a lot of the frills that sometimes bog down ease of use in other models. One of my first tests of any radio is how fast I can get it working once out of the box and unwrapped — I was rag chewing on my local repeater with this radio within a minute or two.

The TH-K20A is a 2 meter handheld with 5.5 W maximum output and some extended receive frequency coverage. It features CTCSS (continuous tone coded squelch system) encode and decode as well as DCS (digital coded squelch) and an internal voice operated transmit (VOX) function. It receives the NOAA weather channels and is compatible with NOAA Weather Alert.

The radio comes with a flexible antenna that attaches to the radio by means of an SMA connector — not my favorite connector, but that is a matter of personal preference. To me, a BNC connector is more useful, especially if the radio is paired with an external antenna. Outdoor or mobile magnetic mount antennas typically have BNC connectors on the end of their cables, although adapters are available.

The radio also comes with a lithium-ion battery pack (KNB-63L) and battery charging stand with ac adapter (KSC-35S). Charging time is about 3 hours. Kenwood claims 6 hours, 8.5 hours and 10.5 hours of battery life on high power (5.5 W), medium power (2 W), and low power (1 W), respectively, based on a duty cycle of 6 seconds transmit, 6 seconds receive, 48 seconds standby. Although nobody really operates exactly like that, I was pleased with battery life between charges. It's a far cry from the limited battery capacity and power hungry radios of the early days.

Layout and Controls

The keyboard is laid out in a straightforward fashion with the buttons and labels large enough to read and operate easily. The logic of programming the radio, while not being completely intuitive for me, is still quick to learn. Intuitive operation of 2 meter rigs, however, was probably thrown out after the first generation handhelds faded into the sunset years ago.

There are two separate, not concentric, knobs on top of the radio — a great feature in my opinion that makes the radio easier to use. The knob closest to the antenna (PWR/VOL) clicks on the radio and controls the volume. Audio output is adequate and distortion free except at very high volume. Good quality audio at high volume levels is important to operators in high ambient noise environments such as a busy city street or a disaster scene with the noise of other radios and emergency vehicles lumbering around. This is one area that could use more attention from manufacturers.

The other knob, called the ENC control, is turned to select various parameters such as operating frequency, memory channel, menu number or menu setting value. It's also used to change the scan direction. For a small radio, the knobs are easy to access and turn. The standard PTT switch and MONITOR button are found in the usual place on the left side of the radio. The PTT switch has a nice solid, soft feel as does the MONITOR button. There is a MIC/SP jack on the right

Bottom Line

Solidly built and easy to operate, Kenwood's TH-K20A 2 meter handheld has long battery life and great receiver performance.

side of the radio that also serves as the jack for the optional PG-4Y PC interface cable.

The keypad is used to program the radio functions. In the manual, there is an excellent matrix that is easy to follow, allowing the operator to quickly come up to speed on programming. For example, push the F key to enter the MHz tuning mode; push the VFO key to enter VFO mode; push the MR key to enter the memory channel mode; and hold the VFO or MR or CALL keys down for 1 second to start their respective scanning functions. Push the MENU key to enter the menu mode. Push the TONE key to enter, you guessed it, the tone or signaling functions menu. You've got the idea by now.

Squelch operation varies from radio to radio and is one that is open to the very subjective whim of the operator. I tend to be a sentimentalist, and lament the reduction of the squelch function to a push button, although on the Kenwood, you push the SQUELCH button first, and then turn the ENC knob on top of the radio to actually adjust it. In actuality, it's probably better to have the push button activate the squelch function to reduce the chances of an inadvertent maladjustment, a bane of the older radios that employed just the turning knob. Remember those early handhelds, with the two large knobs on the top of the radio, one for volume and one for squelch? Yeah, I loved those old battle axes, but today it's necessarily function and form over nostalgia.

The display is large enough, and the backlighting good enough, for even my elderly eyes to read without my reading glasses on, which is really saying something. All of the basic function icons are present, and none seemed frivolous or unnecessary. The display is plain and simple to read, not complicated by so many icons that the operator has to squint to figure out the most basic operating parameters.

Using the TH-K20A

The current standard set of basic features expected from modern handhelds is present. The same applies to the menu operation, which is also pretty much standard today: on the Kenwood radios. The operator pushes the MENU button, turns the ENC knob on top of the radio to select the parameter he/she wants to change, pushes the F key to enter the mode where the parameter can be changed, rotates the ENC knob once again to actually change the parameter, presses F again to store it and PTT to exit the menu mode. There are 35 functions that can be modified from the menu list. A PF key on the keypad can be changed to a user-selected function based on personal preference.

A total of 200 memory channels are available, more than enough for even the most demanding operator. Memory channels can be named versus just displaying the operating frequency. Scanning capability is also pretty much standardized: the operator can scan all frequencies, scan frequency ranges between frequencies selected by the operator, scan memory channels only, scan the call channel (a channel selected by the operator, usually the most used repeater or simplex frequency) and VFO or memory channel and scan for activity on a priority channel every 3 seconds.

Audio reports from repeater contacts were all fine, but, of course, the repeater itself can affect the apparent audio quality. Simplex contacts reported fine audio quality as well. I am most interested in what comes out of the radio's loudspeaker, and the TH-K20A didn't disappoint. There was plenty of audio output with some distortion at the highest volumes. The Lab measured a healthy maximum 515 mW of audio output at 10% distortion.

One of the auxiliary functions I particularly liked was the programmable VFO. The operator can limit the operating frequencies within a certain range by programming the upper and lower limits. This limits the radio's operation to the frequencies the operator is really interested in, and avoids superfluous frequency ranges that can reduce operating efficiency.

Lab Tests

In the Lab, the TH-K20A gets high marks for receiver sensitivity, dynamic range, adjacent channel rejection and IF rejection. In other words, the radio hears well and performs well in the presence of unwanted strong signals. The transmitter slightly exceeded its high power specification and easily met FCC spectral purity requirements.

Key Measurements Summary

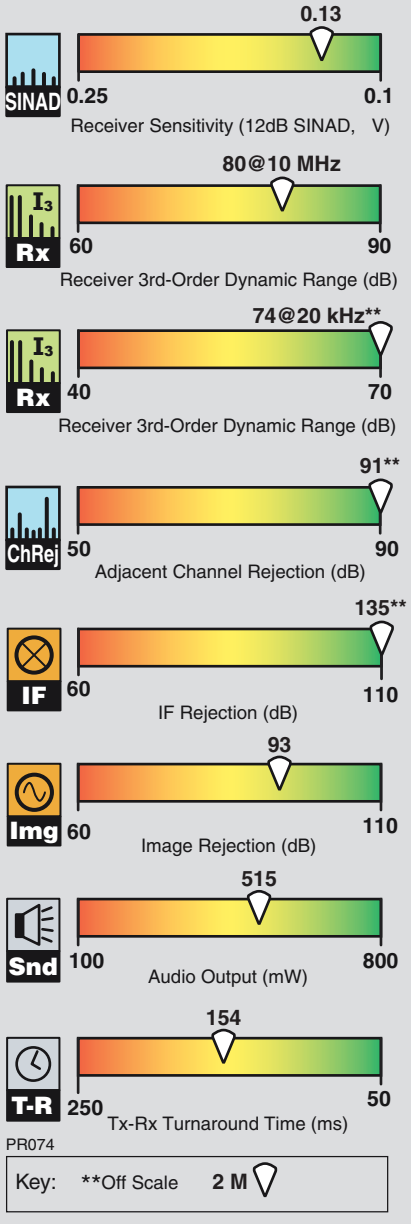


Table 2
Kenwood TH-K20A, serial number B1B00547

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 136-174 MHz; transmit, 144-148 MHz.	Receive as specified; transmit, 144.0-147.995 MHz.
Modes: FM, NFM.	As specified.
Power requirements: 6.0-9.0 V dc (battery power only).†	Receive, 304 mA (max volume, no signal), 56 mA (standby), 97 mA (standby, backlight on), 15/56 mA (battery save on); transmit, 1.27 A (high), 0.8 A (medium), 0.62 A (low) at 8.2 V dc (full charge).
Receiver	**Receiver Dynamic Testing**
FM sensitivity: 12 dB SINAD, 0.16 µV.	For 12 dB SINAD, 0.13 µV (146 MHz), 0.14 µV at 162 MHz.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 74 dB*; 10 MHz offset: 80 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 91 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset: 74 dB.
Spurious response: Not specified.	IF rejection, 135 dB; image rejection, 93 dB.
Squelch sensitivity: Not specified.	At threshold, 0.11 µV (min), 1.24 µV (max).
Audio output: >400 mW at 10% THD into 8 Ω.	515 mW at 10% THD into 8 Ω. THD at 1 V RMS, 2.7%.
Transmitter	**Transmitter Dynamic Testing**
Power output: 5.5 W (high), 2 W (medium), 1 W (low).	6.0 W (high), 2.2 W (medium), 1.2 W (low) at full charge.
Spurious signal and harmonic suppression: >60 dB.	>70 dB (high and medium), 65 dB (low). Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 154 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	60 ms.

Size (height, width, depth): 4.4 × 2.1 × 1.0 inches (w/o protrusions); antenna, 4.2 inches. Weight: 7.4 ounces (with battery and antenna).

Price: TH-K20A, $150; PG-4Y programming cable (serial port), $35.

†KNB-63L 7.4 V, 1130 mAh Li-ion battery and KSC-35S drop-in charger supplied. Available options: extra KNB-63L battery, $35; BT-16 battery case for 6 AAA cells, $25.
*Measurement was noise limited at the level indicated.

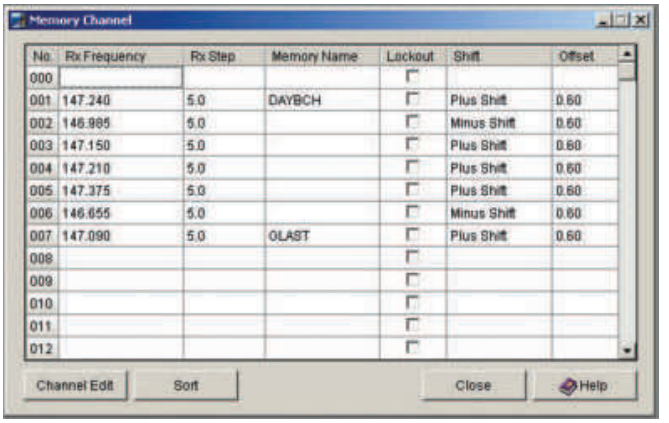


Figure 2 — Kenwood's *MCP-5A Memory Control Program* can be used to manage the memory contents, as well as control other transceiver functions.

Software

Kenwood's *MCP-5A Memory Control Program* (Figure 2) can be used with the TH-K20A and an optional cable to manage memories and control other functions. This *Windows* software is free and can be downloaded from Kenwood's website.[2] You need to be able to download and extract compressed files in order to set up the software, and *Windows XP* users must have the appropriate versin of *Microsoft .NET Framework* installed.

Although the software is free, you need to buy the appropriate cable to connect the TH-K20A to your PC. Unfortunately, I couldn't try the optional PG-4Y programming cable and *MCP-5A* software because my computer does not have the required serial port. Kenwood's *MCP-5A* information sheet mentions a KPG-22U USB programming cable, but we didn't find that model listed in Amateur Radio dealer catalogs. (Aftermarket USB cables and programming software are available from RT Systems — **www.rtsystemsinc.com**.)

ARRL Test Engineer Bob Allison, WB1GCM, does have a computer with serial port and offered to test the TH-K20A with *MCP-5A*. Once the software loaded, Bob found it very intuitive. He says, "It not only reads and writes memory channels easily — memory channels can be sorted by name or by frequency, in ascending or descending order. This makes programming more flexible than other software I've used. Operating parameters of the TH-K20A can also be adjusted. One adjustment that I especially appreciate is the AUTOMATIC POWER OFF TIME, since I have left my handheld on time and time again, only to find a dead battery when needed."

TH-K20A Versus My "Daily Driver"

Over the years I've owned a number of handheld radios from different manufacturers. Comparisons between the TH-K20A and my personal 2 meter handheld were inevitable. Here's what I found: After removing both battery packs, the TH-K20A felt lighter, thinner and narrower. (Both units fit nicely into my Pelican Model 1030 Micro Case, a great way to carry and store your radios.) The keypad on the Kenwood unit was a bit easier to use, but the display characters are smaller (although easily readable as described earlier). My usual radio employs a BNC antenna connector, which I prefer (see discussion above). On the air, I found that the receive audio sounds

[2]**www.kenwood.com/i/products/info/amateur/software_download.html**

slightly more distorted on the TH-K20A at the highest volume levels — although the quality is typical of many handheld radios. An earphone or speaker/mic would help if you use the radio in noisy environments.

So what is remarkable about this radio? It's lightweight, yet seems rugged enough for even the most demanding field environments. The functionality was very well thought out by the engineers at Kenwood. It is very easy to use, very easy to program and has no frills that get in the way of the first two qualities. The keypad buttons are big enough for some of us hams that, well, let's just say have larger fingers than others. It will not disappoint the purchaser.

US distributor: Kenwood USA Corp, 3975 Johns Creek Ct, Suite 300, Suwanee, GA 30024; tel 310-639-4200, fax 310-537-8235; **www.kenwoodusa.com**.

See your digital edition of *QST* for a video overview of the Kenwood TH-K20A.

In The September/October 2012 Issue:

■ Mark Bauman, KB7GF, explains the details of changing the antenna pattern of his "Shared Apex Loop Array" by moving the feed point along the bottom wire. This is a companion article to Mark's *QST* article this month. The *QEX* article will be the Sep/Oct *QEX* sample article. Find it at **www.arrl.org/this-month-in-qex** after the issue goes to press.

■ Dr. Sam Green, WØPCE, revisits his November/December 2008 *QEX* article with "A Fully Automated DDS Sweep Generator Measurement System — Take 2." Sam gives construction details for this indispensible piece of test gear and describes a variety of measurements that we can make with it.

■ Robye Lahlum, W1MK, introduces us to a series of excess noise measurements, F_a, made by the International Telecommunication Union (ITU). He then describes the "Measurement and an Application to Receive Antenna Design." Depending upon the F_a measurements at your location, you may not need more gain for your separate receive antenna.

■ Theodor Prosch, DL8PT, describes how digital biphase networks can take the place of a Discrete Fast Fourier Transform (DFFT) to perform a Hilbert Transform in software defined radio signal processing. His example uses the *GNU Radio Companion* software package to perform the digital signal processing.

■ Ray Mack, W5IFS, gives us another installment of his SDR: Simplified column. This month Ray gives us another lesson in digital filters. He shows us a simple SSB transmitter and receiver.

■ You will find all this and more in the September/October 2012 issue of *QEX*!

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

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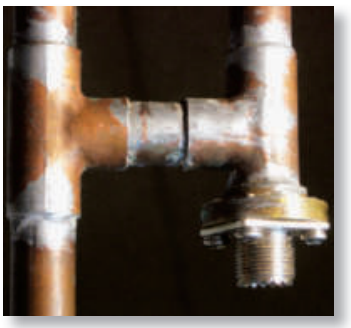
New Products

J-Pole Antenna Adapter from AF6TR

Dennis Bartholomew, AF6TR, offers a kit to help with assembly of a 2 meter/70 cm copper J-pole antenna. The kit includes a specially machined adapter, SO-239 chassis mount connector, screws, lock washers and detailed instructions. The builder adds copper pipe and some fittings that may be purchased locally from a hardware store or home center. The J-pole adapter is machined



from solid brass and is designed to be soldered to the base of the antenna. The SO-239 is then attached to the adapter using stainless steel screws to make a secure connection, with no loop in the coax. In the photo, the adapter is on the right and is soldered directly to a copper tee. Price: $13.95. For more information, antenna assembly instructions, or to order, visit **www.jpoleadapter.webs.com.**

Joel R. Hallas, W1ZR, w1zr@arrl.org

$1 of Prevention Beats a $1000 Cure Anytime!

Q Ed, K6ELE, asks: I read the *QST* Product Review of switching power supplies in the February 2012 issue.[1] It is mentioned that the supplies were protected from short circuits at the output and current overload, but overvoltage protection is not discussed. Do switching power supplies need overvoltage protection to give the load, in my case an HF transceiver, protection from overvoltage?

A Overvoltage protection is a very good idea. I would recommend external protection even if the manufacturer claims it is built in, since I don't want to have an expensive transceiver at the mercy of a $100, built to price, power supply. It is very simple and inexpensive to add. I would put it in every mobile setup as well as any regulated or switching supply.

Phil Salas, AD5X, wrote a great *QST* article describing an externally deployed protector and fuse assembly designed to provide the protection you want.[2] The key device is a solid state voltage protector (around $1 each) that effectively turns into a crowbar (short circuit) if the voltage exceeds 15 V. This causes a fuse in the assembly to blow before the device melts.

I bought a dozen or so and, for a supply with a fused output, I put the diode right across the output terminals or, if easier, it can be put on the transceiver power input terminals as long as there is a fuse between the power supply and the radio. This is particularly good for a mobile setup that otherwise is at the mercy of the vehicle voltage regulator.

Q Stanley, WA6LVC, notes that he has reentered the amateur ranks and is confused by the two FM deviation plans, called narrow (NFM) and wide FM (WFM) by manufacturers. He wonders why radios use WFM as the default, since NFM should be more efficient. Are there any requirements? Should we set everything to NFM to save bandwidth?

A Amateur use of FM on the VHF bands has closely followed the use of VHF FM on the municipal and public service bands. While NBFM was briefly used on amateur HF bands during the 1950s before SSB became popular, it mainly became widely used on VHF starting in the 1960s. It was then that the FCC mandated that public service FM radios shift from ±15 kHz deviation on channels separated by 60 kHz to the use of ±5 kHz deviation and 25 kHz channel spacing to more than double the number of available channels. While some radios were able to be easily converted (generally turning down the TRANSMIT DEVIATION control and replacing the receive filter), most early radios were scrapped and replaced with new narrowband equipment. The great piles of readily available surplus channelized FM radios provided the impetus for the Amateur Radio VHF FM movement.

Manufacturers were quick to adapt their public service 25 kHz channel equipment to amateur use to increase their economies of manufacturing scale. The resulting amateur gear tended to share the features of commercial gear but with more channel capability. Since 2004, new commercial public service FM gear must be capable of operating with 12.5 kHz channel spacing, although most also support the existing 25 kHz base with bandwidth switching. Amateur gear tends to offer the same feature, since the manufacturers tend to use the same platforms. By January 1, 2013, 25 kHz channel use by commercial users will no longer be allowed, and all must switch their radios to 12.5 kHz channel spacing.

None of these requirements apply to Amateur Radio. Just as we used wider band FM in the '60s when the commercials had to narrow up, we can continue to use 25 kHz spacing until narrower channel spacing becomes in vogue. While the FCC does say that we should use good engineering judgment and occupy the minimum bandwidth necessary to communicate our information effectively, it makes no sense from a technical perspective to use a narrow transmitter into a 25 kHz spaced repeater, or even another radio on simplex, unless they are also set up to use narrow band. If a narrow transmitter is used into a wide receiver, the receiver audio gain will need to be increased to maintain the same audio level. That will inconvenience other stations if others in the conversation are using their 25 kHz settings. In addition, since the noise will be the same, the S/N will be reduced somewhat. The repeater will retransmit using WFM anyway, so nothing is gained.

All this suggests to me that there is no point in switching to NFM until repeaters change their acceptance bandwidth to match. This may well happen over time, but will likely occur regionally based on congestion levels and deliberations of coordinating committees.

Q Joseph, KD2AAU, has a few questions: First, how does autopatch work? His current VHF FM transceiver appears to support this feature, but there is not much information in the documentation to explain it.

A An autopatch is a device usually at a VHF repeater station. If the repeater supports it, and has a dedicated phone line, the sending of a special (identified by the repeater group) tone from a DTMF microphone, will cause the autopatch to be connected to the repeater. Once connected, you hear a dial tone, dial a phone number using the mic buttons, and when the person answers, you can have a phone call from your car. Note that unlike a regular phone call:

- Obscene language is not permitted.
- Business cannot be conducted.
- The other person needs to know that you are using push to talk, so they can't interrupt while you are talking. It's best to coach them to say "over" when they are done talking.
- A different code is used to disconnect (drop) the autopatch.

[1] M. Wilson, K1RO, "Product Review — Four 25 A Switch Mode Power Supplies," *QST*, Feb 2012, pp 56-59.

[2] P. Salas, AD5X, "Compact Voltage Protector and Fuse Assembly for 100 W Transceivers," *QST*, Apr 2010, pp 30-32. See also the feedback item in Sep 2010 *QST*, p 47, which provides a substitute part.

Autopatch operation was very popular in the days before cell phones. Now, as far as I know, none of my local repeaters still have one operational, although there may be some in your area. It can still be very useful in emergencies at which time cell phone networks often are overloaded.

Q Joseph, KD2AAU, also wonders what the "grid system" is that he read about in a recent *QST* column.

A Grid squares are based on the Maidenhead Locating System, a technique that divides the earth into squares based on latitude and longitude. Each "square" represents 1° of latitude and 2° of longitude — far from a square at the equator, but closer at high or low latitudes. This is an English idea, and was used to define an award system for use by V/UHF operators. The idea is that for most V/UHF operators DXCC, WAC and WAS are not in the cards, but working 100 grid squares (on 6 or 2 meters, 50 on 70 cm) and thus earning the VUCC award may be manageable. The concept has been described in *QST*.[3] It's available to ARRL members on our website at **www.arrl.org/arrl-periodicals-archive-search**.

Q Joseph, KD2AAU, also wonders how does one use UTC?

A Universal Coordinated Time (UTC) is the same as 24 hour time at the observatory in Greenwich, England, the 0° meridian. It is the same as miltary "zulu" time. For the US Eastern time zone, it is 5 hours ahead of EST, 4 hours ahead of EDT (daylight saving time). Most Amateur Radio logging, particularly on HF, is conducted in UTC since it is much easier for stations in other time zones if we all use the same zone. Note that the day changes for us in the east at 7 PM (8 PM in EDT).

Q Al, W1XH, asks: I seem to have collected many of those little coax-to-twin lead TV adapters that appear to be VHF 4:1 baluns. I was thinking of using one as a balun for a Field Day 6 meter folded dipole. I took one apart and there appears to be a small toroid and one or two windings that look like a typical balun. I don't plan on running a lot of power. I built a test folded dipole using one of these and it looked okay on my antenna analyzer.

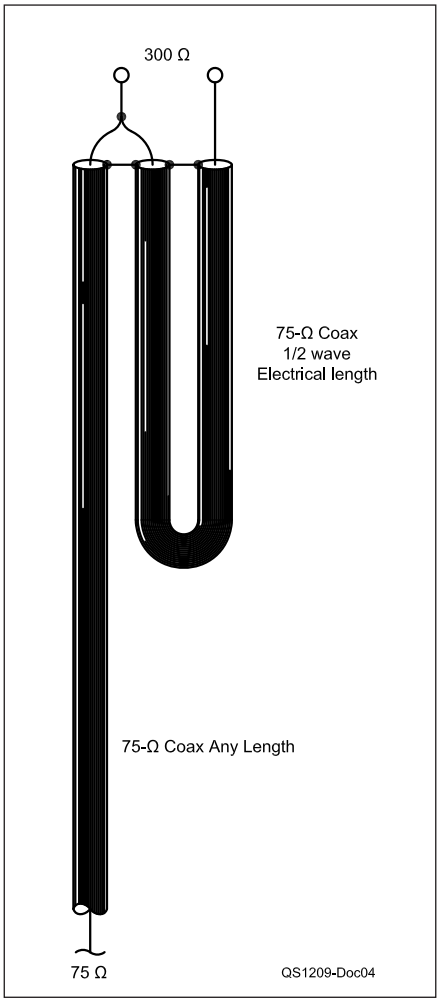


Figure 1 — An easy to make 4:1 balun for a single frequency range can be constructed from a half wave (electrical length) piece of coax as shown.

Is there something I'm missing that will keep this from working as a balun for a temporary 6 meter folded dipole?

A Well, I have successfully used such devices, or even better the dual balun coils found in an ancient TV receiver that go from the balanced antenna terminals to the tuner's coax input jack. I find them great for use with 1950s (and earlier) vintage HF receivers that are really designed for a 300 Ω balanced input.

They should work fine for transmitting as well, but who knows what the power rating is. The real question might be, how will your transmitter or transceiver respond to its load going from 1:1 to infinite SWR in a single puff. If it were me, to be safe, I'd consider a ½ wave coax loop balun (see Figure 1) instead. If you are worried about bulk or weight, consider thin coax such as RG-193.

Q Jerry, WAØH, asks: I need to feed coax cable through a wall. In terms of standing wave ratio (SWR), is it better to use a bulkhead adapter, or just run the cable directly through a hole in the wall?

A In terms of SWR, at least on HF, it makes absolutely no difference whether or not a bulkhead connector is used. On the other hand, there are some other benefits to using one if we're talking coming through an exterior wall. For interior walls, I don't think it matters at all, except it will allow breaking the connection to use for some temporary interconnection. I find this helpful on some occasions — if I want to operate from a different room, for example.

If it's an exterior wall, there are a couple of significant benefits to having a bulkhead especially if it's on a metal "entrance plate." It is best if it is close to ground level and is tied to the station and service entrance grounds. This makes it very easy to ground the shield as it enters the building. If the ground connection is low impedance (short) it will be beneficial for lightning protection and is a good place to install an arrestor. This tends to keep a sizable fraction of lightning-induced current outside the house, where you want it.

It allows the use of a "drip loop" to keep water out of the inside of the wall and building. Even if a drip loop is made on initial installation, without a bulkhead connection the cable tends to migrate or get pulled in, often eliminating the drip loop. It also helps keep out insects and other critters and reduces damage to interior walls. As noted, none of this changes the SWR, except a bit at VHF and above.

The only downside is that there are other potential failure points with the multiple connectors associated with the bulkhead arrangement. While coax connectors don't often fail, they can, especially if outside and not waterproofed.

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**.

[3]A. Curtis, K3RXK, "VUCC — 20 Years and Counting," *QST*, Feb 2003, pp 48-51.

Steve Ford, WB8IMY, wb8imy@arrl.org

Scout Regen Receiver by Hendricks QRP Kits

Looking for something different to do this evening?

Consider the Scout Regen, a neat little shortwave receiver kit that you can put together in 90 minutes or less. All you need is a soldering iron and a pair of wire cutters (a multimeter is useful for testing, but not strictly necessary).

The Scout Regen pays affectionate homage to the days when listeners surfed the airwaves with *regenerative receivers*. Those classic "regens" bathed their listeners in the warm glow of vacuum tubes. You won't find tubes in the Scout's all-solid-state design, but the principles remain the same. In a nutshell, a regenerative receiver relies on positive feedback — the "regeneration" of the received signal — to cause an enormous increase in the Q of its tuned-circuit detector. The result is a very sharp direct-conversion receiver.

When tuned correctly, a regenerative receiver can offer a surprising amount of sensitivity and selectivity. The trick, however, is to carefully tweak the amount of feedback. The circuit Q is highest just before the stage breaks into oscillation. The goal is to get as close as possible to that breaking point.

The Scout Regen is a two-band receiver with coverage from about 3.5 to 5 MHz in the "low" band and 5 to 10 MHz in the "high" band. The receiver measures just 6 × 3 inches and everything is supplied with the kit, including the front-panel decals. Rather than hiding the circuitry in an enclosure, the Scout Regen uses an "open" design with a brushed aluminum chassis. You can certainly build the Scout into a case, but I found the open approach to be more atheistically pleasing, not to mention a good conversation starter!

Building the Scout

Before you begin building, you'll need to visit the Hendricks QRP website and download the manual. The manual is in PDF format and it is richly illustrated with detailed color photographs. Whoever authored the manual had beginners in mind; every step is carefully described and nothing is left to chance.

I'm a slow builder and yet it took me only about 90 minutes to assemble the Scout. The most challenging aspect was winding the regenerative detector coil. You have to tape a paper template to the supplied PVC cylinder and use a hand drill to bore the individual holes. Then, you must wind the wires onto the coil, being careful to wrap them in the proper directions. The manual spends about six pages on this step — not because it is overly difficult, but because the coil is so critical to the operation of the receiver. Once again, it is obvious that the author had first-time builders keenly in mind.

See your digital edition to hear the Scout Regen in action.

Applying the decals reminded me of building model airplanes in my youth. You trim the decals from the sheet, soak them in water and then slide them onto the chassis. With a 9 V battery firmly in place on the PC board, you're all done. There is also a socket for connecting to an external 12 V power source.

Operation

If you've never played with a regenerative receiver before, the Scout will be a new experience. With headphones or ear buds plugged in, you advance the VOLUME control until you hear a hiss. Advance the REGEN control slowly, increasing the positive feedback until you suddenly hear the Scout break into oscillation. Gently reverse the REGEN knob until the oscillation stops. Now you can switch to the main tuning knob and explore the band, although you may find that you have to occasionally re-adjust the regeneration.

The tuning technique requires a little practice, but you'll get the hang of it quickly. Just imagine how it must have been for shortwave listeners in those early days of radio as they tuned and tweaked their receivers while listening to broadcasts from around the world.

With just a 40 foot length of wire I was able to pick up a number of shortwave broadcast stations. I'd tune in the signal initially with the main tuning knob and then adjust the REGEN control for maximum strength and clarity. Despite the "primitive" nature of the radio, the audio quality was surprisingly good.

Enjoyable...and Educational

A couple of hours with a soldering iron yields a great deal of satisfaction with the Scout, even for veteran amateurs. No matter how long you've been licensed, there is nothing like the pleasure of finishing a kit and hearing it come alive in your headphones.

The Scout is also a good kit for non-hams, especially if there is an experienced builder at hand to guide them through the process. There are only 23 electronic components (eight resistors, eight capacitors, two diodes, a molded choke, the regen coil, two transistors and a single IC). The PC board is clearly labeled and the layout is sufficiently open for easy soldering. The chassis is pre-drilled for the potentiometers and variable capacitors, and circuit board standoffs are included.

What better way to spend an autumn evening?

Manufacturer: Hendricks QRP Kits, 862 Frank Ave, Dos Palos, CA 93620; tel 209-704-3522; **www.qrpkits.com**. $50.

H. Ward Silver, NØAX, n0ax@arrl.org

Experiment 117

Laying Down the Laws

Most amateurs tend to think of *wireless* as beginning with Marconi in the mid-1890s — he transmitted a message over a distance of a bit less than 2 miles in 1895. The historically minded ham might travel farther back through the experiments and papers of well known and not so well known names such as Nikola Tesla, Heinrich Hertz, Nathan Stubblefield and Mahlon Loomis to arrive at James Clerk Maxwell's electromagnetic theory, published in 1864. Yet their work required, as Isaac Newton had characterized it, "standing upon the shoulders of giants" who explored the *terra incognita* of electricity and magnetism from the early 1600s. Who were these giants and what did they discover?

My interest in prewireless was sparked, so to speak, by a recent article in the *IEEE Antennas and Propagation Magazine* giving a chronology of how wireless communications came to be.[1] (The article may be available through your local library or from an *IEEE* member.) A huge number of discoveries and explanations of basic concepts were required before Maxwell could synthesize them into his theory of electromagnetic waves.

For many of us, our electrical education began with Ohm's law, first stated by Georg Ohm in 1827.[2] We know it today as the familiar I = E / R, but R was a brand new idea in those days. In fact, Ohm's ideas were not well received at all! From Ohm's law, we progressed through the equation for power (P = E × I) and then into circuitry such as capacitance, inductance, reactance and impedance that quickly followed. But capacitance and inductance are treated as *givens* in equations we memorize for time constants, turns ratio, resonant frequency and so forth. Where do these *proto wireless* concepts come from?

In this column, we'll begin reviewing several of the most important advances listed in the article then progress to some simple experiments you can do yourself. The goal is to more fully understand what is meant by the familiar symbols and units in the design equations and in schematics. It is one thing to memorize an equation or paragraph and quite another to experience it for yourself on the workbench!

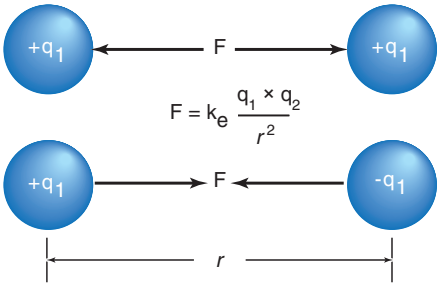


Figure 1 — Coulomb's law describes the force, F, between two electrically charged particles (q_1 and q_2). The force is proportionally weaker with the square of the distance between the particles, r. If the charges have the same polarity, the force is positive and they repel each other. If they are oppositely charged, the force is negative and attracts the particles together.

The Beginnings

There is a long history of experimentation with static electricity and magnetism leading to the invention of the capacitor in the mid 1700s. Perhaps the best known example of an early capacitor is the Leyden jar.[3] Since static electricity was fairly easy to generate, the capacitor and its ability to store electrical energy were well known by the end of the 18th century. The relationship between electricity and magnetism, however, was quite unclear and that relationship lies at the root of electromagnetic phenomena — such as wireless.

The IEEE article begins its journey to wireless with Charles-Augustin Coulomb's determination in 1785 that electric forces varied proportionately to the inverse square of distance — now known as Coulomb's law (Equation 1) as illustrated in Figure 1.

$$F = k_e \frac{q_1 q_2}{r^2} \qquad \text{[Eq 1]}$$

where

F = the electric force between two particles with charges, q_1 and q_2,
r = the distance between them, and
k_e = a "constant of proportionality." It is this constant that turned out to have the most for reaching implications because it is determined solely by the properties of free space:

$$k_e = \frac{1}{4\pi\varepsilon_0} = \frac{c^2\mu_0}{4\pi} \qquad \text{[Eq 2]}$$

where

c = speed of light in vacuum
ε_0 = the permittivity of free space (roughly, the ability of free space to contain electrical energy) and
μ_0 = the permeability of free space (the ability of free space to contain magnetic energy).

As it turns out, the speed of light (electromagnetic energy) traveling in free space is also determined by these two quantities:

$$c = \sqrt{\frac{1}{\varepsilon_0\mu_0}} \qquad \text{[Eq 3]}$$

Not only does Coulomb's simple relationship contain the beginnings of wireless but it is also the first step in the studies of electromagnetic waves that led to relativity and its profound effects on our understanding of the universe. Coulomb did not know this at the time, of course. He only knew that he had discovered a relationship between electrical charge and electrical force.

Meanwhile (as the narrator often intones) other investigators were developing new ways of creating electricity. Up until this time, electrical experiments had to be performed with static electricity created by mechanical friction. In 1799, Alessandro Volta created an electrochemical *battery* based on chemical principles.[4] This was a major advance because experimenters then had a source not only of what Volta called the *electromotive force* (abbreviated *EMF*) but a source of

[1] Salazar-Palma, *et al*, "The Father of Radio: A Brief Chronology of the Origin and Development of Wireless Communications," *IEEE Antennas and Propagation Magazine*, Vol 53, No 6, Dec 2011, pp 83-114.

[2] en.wikipedia.org/wiki/Ohm's_law

[3] en.wikipedia.org/wiki/Leyden_jar

[4] en.wikipedia.org/wiki/History_of_the_battery

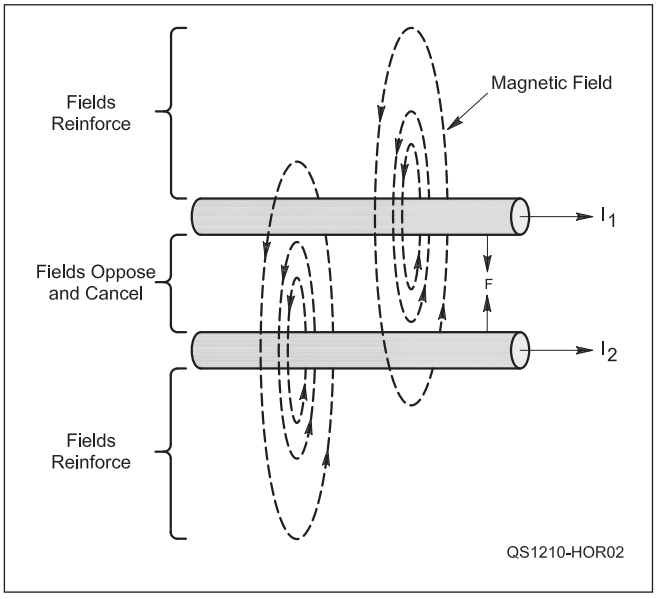


Figure 2 — Ampère's force law describes the force between two parallel, current-carrying wires. If the currents are flowing in the same direction, the fields are oriented in opposite directions between the wires, partially cancelling each other. Since the fields reinforce elsewhere, the result is a force pushing the wires together.

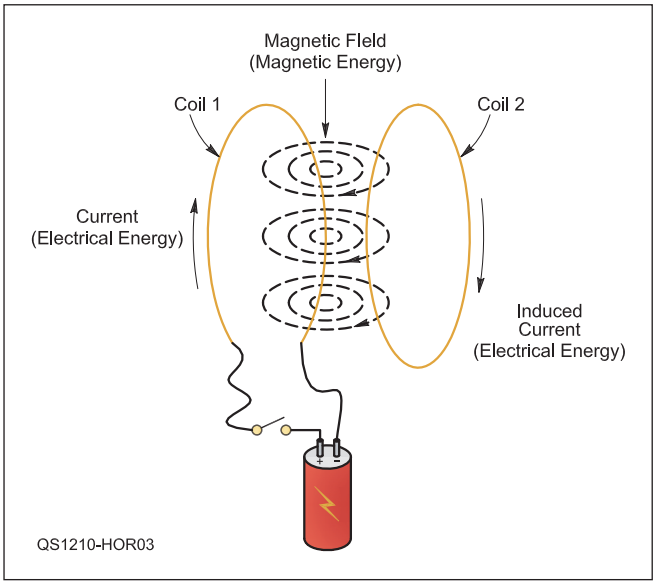


Figure 3 — Faraday demonstrated electromagnetic induction by showing how changing current in one coil induces a similar current in a second coil through a shared magnetic field. When the switch is closed, current in coil 1 will cause the current shown in coil 2. Lenz's law states that the current in coil 2 will be oriented to oppose the magnetic field from coil 1.

current they could then control and study. Prior to that current was mostly available as pulses from electrical discharges — *sparks*.

Magnetism was considered a separate phenomenon from electricity until 1820 when Hans Christian Ørsted discovered that current flowing through a wire caused a magnetic compass needle to deflect and created a circular magnetic field around the wire.[5] François Arago then demonstrated that not only did current flowing through a wire affect a magnet but that the current carrying wire itself became a magnet! Within days, André-Marie Ampère also demonstrated that parallel currents attract each other and opposing currents repel due to those magnetic fields:

$$F = 2k_a \frac{I_1 I_2}{r} \qquad \text{[Eq 4]}$$

where k_a - $k_e/4\pi$,

with similar definitions to Coulomb's law and illustrated by Figure 2. Note the similarity of Ampère's force law and Coulomb's law above.

The linkage of electricity and magnetism through the motion of electrical charge — current — led Ampère to create a theory of *electrodynamics* that is at the heart of wireless. After all, it is the continual acceleration and deceleration of electrons in our antennas that cause electromagnetic waves to be radiated. The movement of electrons in response to incoming waves allows us to hear those waves in our receivers. 1820 was a very good year!

In 1825 and 1826, Ampère published a collection of material on magnetism including what is now known as Ampère's law, the general relationship between currents and magnetic fields. This relationship was extended by Maxwell and forms one of Maxwell's equations that describe electromagnetic fields.

Getting Ready for Maxwell

Almost immediately, Ørsted's discovery and Arago's extension of it led to practical inventions. In 1821, American physicist Joseph Henry invented the *electromagnet* by winding the current carrying wire into a coil. While doing these experiments, he also discovered the need for insulation between the wires making up the coil. His experiments led to refinement of the electromagnet into the *electromagnetic telegraph* in 1831.

The really big news of that year, however, came from Michael Faraday, a self taught scientist who had been experimenting with electricity and chemistry since 1812. Faraday demonstrated *electromagnetic induction* by showing how changing currents in one circuit (later *ac current*) could induce similarly changing currents in another circuit without any direct connection between them.[6]

Figure 3 shows that in doing so, Faraday converted the electrical energy of current in the first circuit into magnetic energy in the surrounding field and back into electrical energy in the second circuit. This led Faraday to predict the existence of electromagnetic waves, as well.

Faraday refined his explanation of induction into the following formula known as Faraday's law:

$$\varepsilon = -\frac{\text{change in } \Phi_B}{\text{change in time}} \qquad \text{[Eq 5]}$$

where ε is the electromotive force (or *EMF*) and the fraction represents the change in magnetic flux (Φ_B) with time. The faster the magnetic flux changes or the larger the amount of change in one circuit, the larger the voltage that is *induced* in the other circuit.

The minus sign in the equation means that the current caused by the changing magnetic field flows in the direction that creates an *opposing* magnetic field. This is otherwise known as Lenz's law and it describes the *back EMF* we observe in motors and the *kickback voltage* in a relay coil when the relay is deenergized. If you look closely at Figure 3, you can see that the induced current flows in the opposite direction to the current caused by the battery.

In the next experiment, we will follow in the steps of Coulomb, Ampère, Ørsted and Faraday by performing some simple experiments that demonstrate the various effects they described. Is this purely a historical exercise? Not at all! These phenomena are at the heart of every radio — without them we would be wireless less.

[5]**en.wikipedia.org/wiki/Hans_Christian_%C3%98rsted**

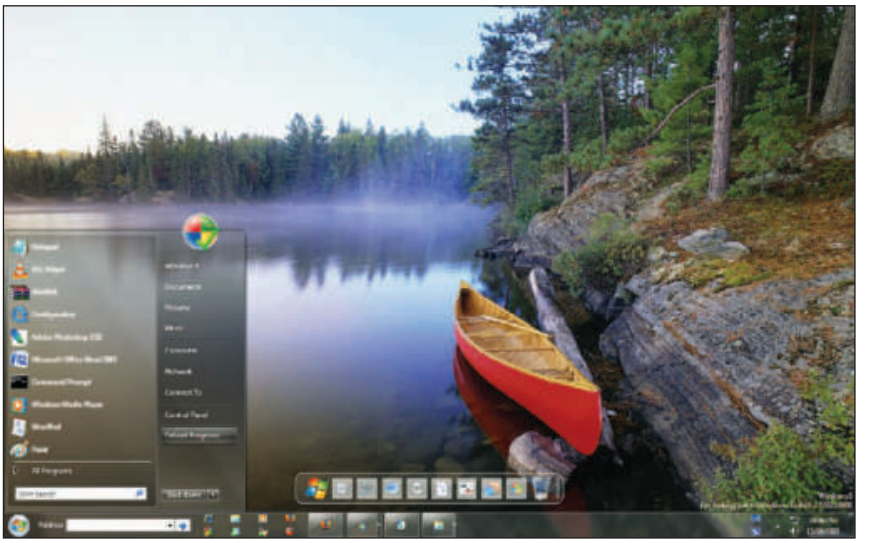
[6]**en.wikipedia.org/wiki/Electromagnetic_induction**

Steve Ford, WB8IMY, wb8imy@arrl.org

A Peek at *Windows 8*

Just when you were becoming comfortable with *Windows 7*, we have *Windows 8* looming on the horizon. According to the latest word from Microsoft, full installs and upgrade packages could be available for retail sale by October.

In *Windows 8* Microsoft is attempting to make PCs work more like smartphones and tablets. Earlier this year, Microsoft launched what it called a "consumer preview" of *Windows 8*. I had a chance to play with the *Windows 8* preview on a 2 GHz desktop machine and except for a few irritations, it was rather impressive.



The *Windows 8* preview desktop with interface minimized.

Prepare to conquer a new learning curve because *Windows 8* exists as a two-part system. There is a new interface and there is also a traditional desktop. The desktop interface looks and works much as it did in *Windows 7*. The interface, which Microsoft developed originally for its *Windows Phone* operating system, is composed of a series of application squares or "tiles" arrayed on a flat background. The app tiles are more than just static program icons; they can display bits of updated information, such as your next appointment or the current temperature. The purpose of the tile approach is to give you immediate access to applications you use the most.

When you launch an application designed for the interface, it runs full-screen by default, not inside a window. You can split the screen between two applications, but that's it. Unlike with the desktop, you can't see more than two applications at a time on a single interface screen.

I found myself frequently flipping back and forth between the interface and the desktop, which was somewhat confusing at times. Closing a program that's running in the interface is very different, by the way. Instead of clicking on an X in the upper right corner of an application window, you have to move your mouse cursor to the top edge of the screen, click and hold until the screen becomes a thumbnail, and then drag the thumbnail image to the bottom of the screen. I hope they improve this action in the final version. In the preview there was nothing to "grab" at the top edge of the screen, and the interface gave no indication of what you should do with the thumbnail once you grabbed it.

My grumblings aside, *Windows 8* has some definite benefits. I found it to be significantly faster than *Windows 7* when running my various applications. It also booted up and shut down in rapid-fire order.

From what I've heard from Microsoft, any ham software application that runs in *Windows 7* should run in *Windows 8* without difficulty. That's been my experience as well …so far.

RFI and Electric Cars

Sales of all-electric vehicles and hybrids are on the rise, along with gasoline prices. Any ham who has tried his or her hand at mobile operating knows that these vehicles can present a challenge. They not only radiate signals across the bands, they are susceptible to interference from our transmissions. The most recent edition of the *ARRL RFI Book* devotes a number of pages to addressing the problem.

Auto manufacturers are well aware of the issues. RFI impacts not only Amateur Radio activities, but consumer electronics as well. They've been attempting to mitigate the interference, but it can be an expensive proposition. That's why it is interesting to hear that in Berlin, Germany the Fraunhofer Institute for Reliability and Microintegration has been working on ways to significantly reduce the cost of tracking down and eliminating RFI.

Dr Eckart Hoene, director of the Power Electronic Systems research group and his team have developed tools and methods for RFI reduction. These include new software simulations and calculation methods to determine where a vehicle's electronic components should be positioned to keep their electromagnetic interactions to a minimum.

In a recent interview Dr Hoene said, "The size and position of individual components — including the electric motor, the battery, the air-conditioning compressor, the charging system, the dc/dc converter and so on play crucial roles. How and in what direction cables are installed is just as important, as is the thickness of their insulation."

He believes that their new simulation techniques can allow engineers to pinpoint interference sources and determine how the signals are being radiated. In addition to advising German manufacturers, Dr Hoene states that his team is also assisting American and Japanese companies. With luck our mobile future will be much quieter.

Paul Wade, W1GHZ, w1ghz@arrl.org

Antenna Measurements — the Antenna Range

One of the things you can do at UHF and microwave frequencies that is difficult at other frequencies is to experiment with antennas and actually measure the results. A modest antenna range can be set up in a backyard or park and yield reasonably accurate antenna gain measurements. At lower frequencies, most antenna measurements are limited to VSWR because of size and space constraints.

Since the 1960s (see photo), good antenna measurements at various VHF conferences, Microwave Update and other gatherings have resulted in significant improvements in antenna design and availability. Conversely, some poor designs and products have faded into oblivion — perhaps you have wondered why no one uses the xxx antenna anymore. These antenna measuring sessions continue today, with one scheduled at Microwave Update 2012 (**www.microwaveupdate.org**).

I don't think I can describe antenna measurements adequately in two pages, so this topic will be broken into two parts: the antenna range in this column, and the measurement equipment and techniques in the next Microwavelengths.

Antenna Range

Accurate measurement of antenna gain requires measurement in the far field, as it would be for a signal far away. If the signal source is too close, the wavefront from the source will not appear as a plane wave, but will be curved, resulting in a phase error that reduces the gain. The Rayleigh distance is the distance at which this phase error becomes small, less than λ/16, so that the error in measured gain is less than 1 dB. This distance is usually considered the beginning of the far field.

Rayleigh distance = $2D^2/\lambda$

where

D = the diameter of the dish aperture and
λ = the wavelength

For a modest sized 2 foot dish at 10 GHz, the Rayleigh distance is about 85 feet, so we would need an antenna range at least this long for gain measurement. The length increases as the square of the diameter, so a 4 foot dish would need 340 feet. For other antennas, the aperture, or capture area, is not as obvious as a dish, but the largest dimension is a rough estimate — for a Yagi antenna, the boom length might be a good approximation for the aperture diameter. A range longer than the Rayleigh distance will have a flatter phasefront and reduce gain error. A range set up for the largest antenna to be measured will work fine and give even more accurate results for smaller ones.

Antenna measuring session on the West Coast in the 1960s. Can you identify these hams? [W6PO photo]

In most practical environments, stray reflections will be present and result in unwanted signals arriving at the test antenna to produce errors in measurement. If a long enough path with no reflecting surfaces can be located, then we have a free-space antenna range. A good approximation is an elevated range with height much greater than the signal path so ground reflection is minimized. This might be possible with two tall towers or the roofs of two tall buildings, as shown in Figure 1, but most of us must work on the ground and manage the reflections.

The slant antenna range elevates the one end of the range high enough so that the ground reflection angle is well away from the main beam of a high-gain antenna, as shown in Figure 2. Typically, the range is at an angle of 45 degrees, so that the required height equals the horizontal distance at the Rayleigh distance divided by the square root of 2 (1.414). This can be fairly high, but is sometimes practical — at Microwave Update 2010, the signal source was located on top of the conference hotel.

In most locations, only a ground-reflection range is possible. In this case, instead of trying to eliminate the reflection, we realize that the ground reflection is predictable and choose a geometry that controls the ground reflection. (Of course, the range should be clear of other reflecting objects for a good distance in all directions.) The path length of the ground-reflected signal to the receiving antenna increases with antenna height, while the direct path length is constant. As a result, at some heights the reflected signal is in phase and adds to signal strength, while at others it is out of phase and subtracts. Figure 3 is a sketch of a ground-reflection range showing how the receive amplitude varies with test height due to ground reflection. We choose the lowest in-phase height for maximum signal strength.

The height of the desired maximum is controlled by the height of the source (transmitting) antenna:

Source height:

$$H_{Source} = \frac{\lambda}{4} \bullet \frac{Rangelength}{H_{Test}}$$

In practice, the ground is not perfectly flat and uniformly reflecting, so the source height may need some adjustment.

The final constraint is the height of the test (receiving) antenna, which should be at least four times its aperture diameter above the ground, and the source height is calculated and adjusted to place the maximum received signal at this height.

Test height: $H_{Test} = 4 \bullet D$

For example, our 2 foot dish should be measured at least 8 feet above the ground. For maximum 10 GHz signal at this height with a range length equal to the Rayleigh distance, the source antenna height would be about 3 inches.

The source antenna should have a radiation pattern with a beam narrow enough to reduce sidelobes that might result in stray

reflections, but broad enough that the test antenna is reasonably uniformly illuminated. An aperture diameter for the source antenna of about ⅓ of the test antenna aperture is a ballpark number, not critical.

Polarization

For a ground reflection range, horizontal polarization is preferred because reflections are consistent and predictable. Ground reflection of vertical polarization suffers from amplitude variation and phase reversal at low incidence angles, so results are unpredictable over imperfect surfaces. Circular polarization is best measured using a fixed linearly polarized source with horizontal polarization, rotating the CP antenna to measure circularity.

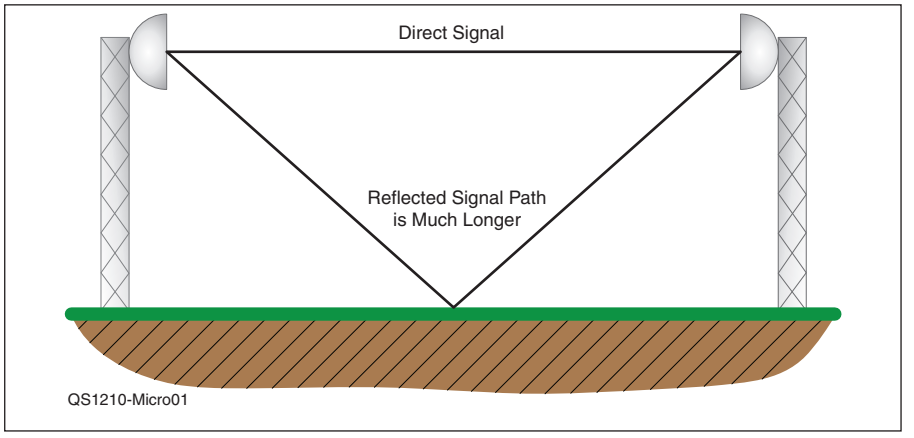


Figure 1 — Elevated antenna range requires high structures and clear path.

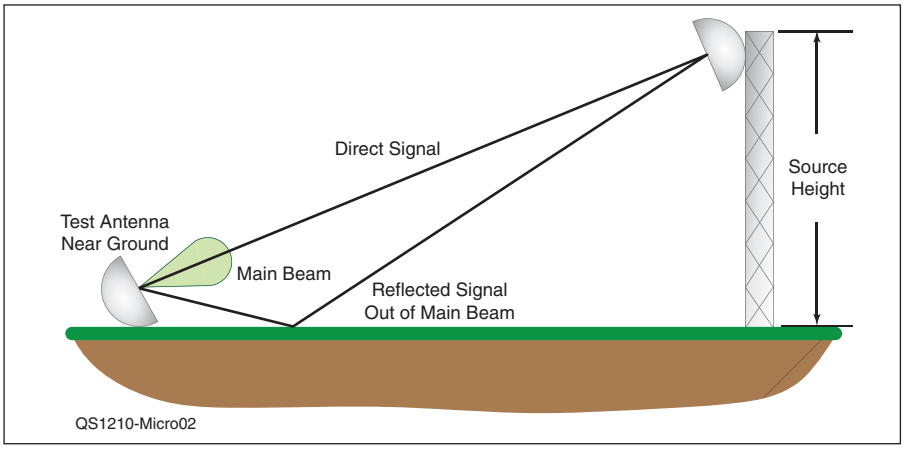


Figure 2 — Slant antenna range needs one high structure.

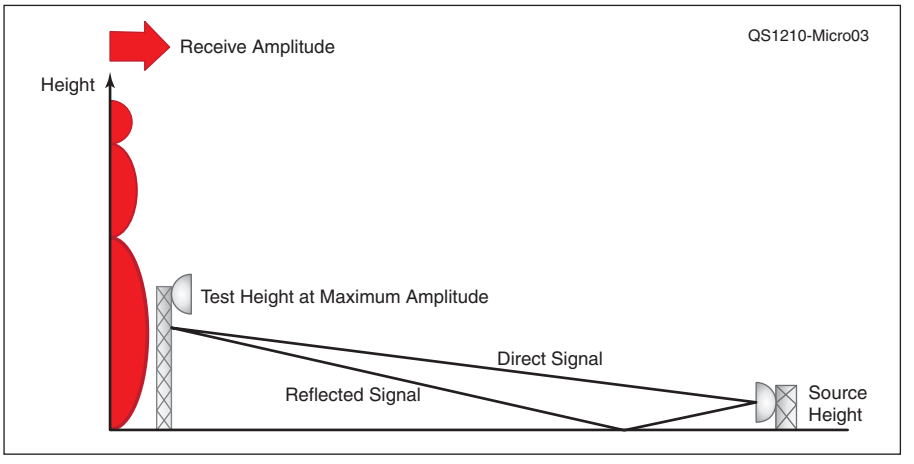


Figure 3 — Ground-reflection antenna range for management of reflections.

Path Loss

How much power is necessary for an antenna range? We can easily estimate the path loss using the Friis equation:

$$\text{Path Loss} = 10 \bullet \log\left(\frac{4\pi \bullet Rangelength}{\lambda}\right)^2 - Gain_{Transmit} - Gain_{Receive}$$

The first term is the loss between two isotropic antennas — the total path loss includes the gain of the transmitting and receiving antennas. The loss over our 85 foot range is about 80 dB at 10 GHz, but a good 2 foot dish might have 33 dBi gain. If the source antenna is a modest horn with 17 dBi gain, then the received signal would only be about 30 dB weaker than the transmitted signal. However, we also need some margin for cable loss, and a standard gain horn might have only 20 dBi gain. So planning for 50 or 60 dB of path loss would be reasonable, for this example. Longer ranges do not have much greater loss, since doubling the distance only increases loss by 6 dB, according to the inverse square law.

Frequency Scaling

Suppose you have a great idea for a 6 meter antenna, but the dimensions for an antenna range would require a football field? Or you have an idea for a 24 GHz antenna, but only have test equipment at 1296 MHz? A scale model of the antenna made for the test frequency will work identically, as long as *all* dimensions are scaled by the wavelength ratio. So a 6 meter antenna design could be evaluated at 432 MHz, or a 24 GHz design evaluated at 2304 MHz.

More Reading

This column is a brief discussion of antenna ranges. For an in-depth treatment, the *IEEE Standard Test Procedures for Antennas* (IEEE Std 149) is recommended. One that is more accessible for ARRL members by Dick Turrin, W2IMU, is available on the *QST* archives: "Antenna Performance Measurements," *QST*, Nov 1974, pp 35-41.

Accuracy and Compromises

Most amateur antenna ranges aren't perfect — we make some compromises and don't meet all the guidelines above. As a result, the measurements aren't truly accurate, but they are good relative numbers — comparisons of comparable size antennas are pretty good. So when we compare an unknown antenna to a known good one, or one with a known gain, we can get reasonable results. And we can learn how well an actual antenna works — something that computer simulations can only promise.

Steve Sant Andrea, AG1YK, hk@arrl.org

Arcing Caps, Whipping Coax and Low-voltage RFI

Cure for Amplifier Arcing

Tube-type linear power amplifiers often develop arcing somewhere in the plate tank circuit. This can be the result of improper operation, improper load impedance or circuit faults. Depending upon the cause, the arcing can occur at multiple locations in the plate tank circuit. When arcing occurs, immediately stop operating the amplifier to determine and correct the cause, since extensive damage can occur if the arcing continues. This hint explains a form of permanent repair to the damaged capacitor plates that is effective once the problem causing the arcing is corrected.

When a tuning capacitor arc occurs in a high power tank circuit, huge currents flow through the arcs causing melting of the edges of the aluminum plates. Typically, this occurs when operating on the higher frequency bands, when the plates are mostly or completely unmeshed. Once the plates have melted, the edges become deformed and develop sharp spots instead of the factory smooth edge. The deformed shape decreases the spacing at that location in the capacitor. The sharp edges at the melted points increase the local electric field density and both of these changes further reduce the breakdown voltage of the capacitor well below its original rating. This is why once the capacitor arcs, it will continue to arc, even after the original fault is corrected. For normal operation, the capacitor must be restored to its original breakdown rating.

The usual method to repair a damaged capacitor involves using small jeweler's files to carefully file the raised edges and restore the edge to a smooth shape, restoring the spacing and eliminating sharp points. Carefully remove these filings since they can cause further arcing. Often it is nearly impossible to do an adequate job and the capacitor continues to arc.

To make a successful repair first perform the usual repair discussed above. Then, before the amplifier is returned to service, applying Kapton (polyimide) tape to the damaged capacitor edges can be effective in preventing further arcing. Kapton tape is available from toroid and balun kit manufacturers such as Amidon (**www.amidoncorp.com**). It has an extremely high breakdown voltage with a single 2.7 mil thickness able to withstand 7000 V.

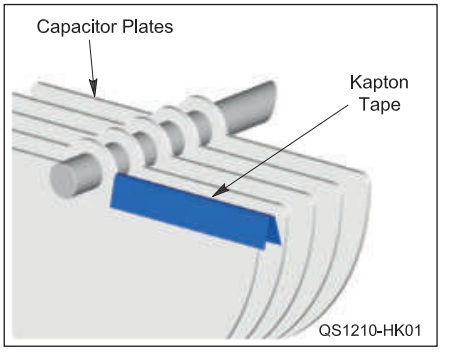


Figure 1 — Apply the tape over the damaged edge of the air-variable capacitor to help prevent further arcing.

Use a piece of tape with a width at least double the spacing of the capacitor plates. Cut a length that is slightly longer than the radius of the damaged plates. Set the capacitor so it is completely unmeshed. Using tweezers, center the tape on the edge of the damaged plate so it covers the damaged areas all the way from the shaft extending past the outer edge of the plate (see Figure 1). Then fold the tape down between the neighboring plates and stick them to the damaged plate.

When properly applied, the tape should cover the entire damaged area and be stuck to the plate on both sides. Stick the tape to itself where it extends past the outer edge of the plate and cut it off with scissors, leaving about 0.1 inch extending past the edge of the plate. Check that this will clear the fixed parts of the capacitor throughout its range. It is not necessary to apply tape to every edge; only the damaged plates need to be covered.

The very high breakdown voltage of the tape will prevent any arcs from starting in the damaged areas and help restore the capacitor to its original breakdown voltage. I've used this method on an Amp Supply LK-500ZB amplifier, which did yeoman's duty through both the CW and phone sections of the ARRL® DX Contest without arcing. The addition of the Kapton dielectric does not appreciably change the capacitor tuning characteristics. — *73*, *Tony Brock-Fisher*, *K1KP, 15 Webster St, Andover, MA 01810-1109*, **k1kp@arrl.net**

Whipping Coax

A discussion I saw on a radio oriented forum focused on how to hang coax from the center insulator of a dipole antenna. A main concern was what would happen to the cable if it was bent too tightly over the support. The tight bend radius and tension involved could lead to shorting the center conductor to the shield.

The discussion caused me to remember a simpler method of hanging cable from a support using a technique called "whipping." This technique is normally used to keep twisted rope from fraying.

As shown in Figure 2, a loop of line, usually

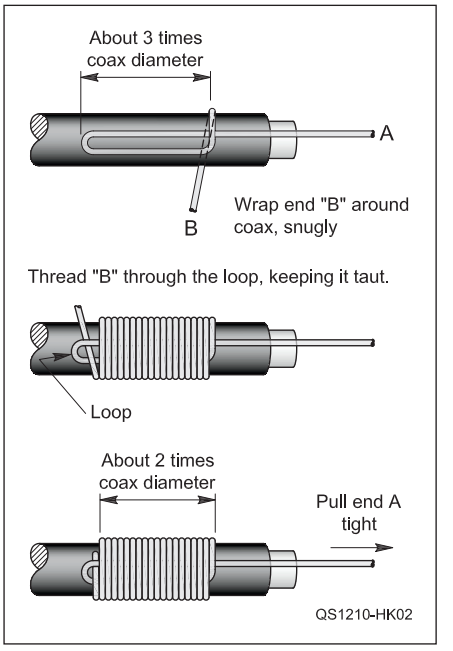


Figure 2 — This schematic diagram shows the process for tying a whipping knot on a piece of coax.

3/16 inch diameter for RG-8, is laid along the side of the cable. The free end "B" is then wrapped snugly many times around the cable. The length of the coiled turns should be roughly twice the diameter of the cable, then the end "B" is threaded through the loop and end "A" is pulled tight.

The end "A" of the support is held in place by the captured end "B" and by the same tension that holds the cable in place. One of the forum's correspondents commented that this is similar to a Kellem's grip, a woven steel cable support used in industry.

While whipping, when applied to the end of a rope, involves cutting the ends "A" and "B" close to the turns, if end "A" is left long, it can be used to tie the cable to the dipole antenna's center insulator, taking all the strain off the exposed wires and connections. The multiple turns, while only snug, hold the cable in a vise-like grip without deforming it, similar to how your hand would hold and turn a screwdriver, each finger contributing to the overall grip.

Since all you need to make this support is some small rope this technique lends itself to impromptu installations, like a Field Day outing. End "B" could be doubled over through the loop like a shoelace, which would allow the grip to be easily untied after the antenna is taken down. This knot is also suitable for more permanent installations if weatherproof rope is used. [For additional useful knots, take a look at the *QST* article, "The Knots of Ham Radio,"[1] available to members online through the Periodicals Archive. — *Ed.*] — *73*, *Stanley Labinsky*, *K2STN*, *524 Plains Rd*, *Wallkill*, *NY 12589-4005*, **k2stn@arrl.net**

Heathkit Drive Belts

My favorite part of the ham radio hobby is restoring vintage (tube) gear. I especially enjoy bringing 1960s and '70s Swan and Heathkit gear "back from the dead." I found an HW-101 transceiver at a hamfest that needed a lot of restoration. It "spoke" to me, so I took the plunge after haggling an agreeable purchase price.

A very common problem with the HW-100/101 and SB-100/101/102 is the dry rot that causes the rubber drive belts for the driver/preselector variable capacitors to split and eventually break. Then, of course, they fall off. This HW-101's belt set was no different.

Several sources on eBay regularly sell replacement belt sets for about $4, plus shipping. Not bad, but there's an easier, more convenient and less expensive source. Take a trip to the store of your helpful "hardware man" and rummage through his collection of O-rings.

Figure 3 — The photo shows how inexpensive O-rings can be used as an alternative to the more expensive drive belts when restoring Heathkit transceivers.

For 59 cents apiece, I found suitable replacements for my HW-101. They are 2½ inch OD, 1 15/16 inch ID and 3/32 inch thick. This makes them a bit thinner than the ⅛ inch originals, but they work just as well. For about a buck and a quarter, including sales tax, you're back in business.

By the way, ever since building my first Heathkit GR-64 receiver in 1970, I learned early how much I *hated* stringing spring-tensioned dial cords. Well, my newly acquired HW-101 had no dial cord strung for its plate-loading capacitor. So, another O-ring to the rescue.

Looking deeper into the hardware store's collection, I found a suitably larger diameter O-ring, 3/16 inch thick, for another $1.15. I was able to coax this third belt around the variable capacitor's lower and upper drive wheels by slightly stretching it, totally avoiding the need for a replacement dial cord.

All three new belts are shown in Figure 3. All work just great and will be equally cheap and easy to replace again in another 10 or 15 years. — *73*, *Tony Bogusz*, *W9MT*, *10536 S Coyote Melon Loop*, *Vail*, *AZ 85641*, **w9mt@arrl.net**

Tower Mount a TV Rotator

Many small VHF/UHF antennas don't require a heavy-duty ham antenna rotator. Tower mounted TV rotators may be adequate for the job and cost about $100 including an IR remote control!

Inline rotators like the Channel Master CM-9521A are designed to be clamped onto a stationary tubular mast with the antenna mounted on a short rotating top mast. The rotator becomes part of the antenna support and wind gusts can produce damaging side loads.

These types of rotators are not designed to mount inside a triangular tower like the Rohn 25 but using a homemade adapter plate makes such an installation possible. In addition, the bushing at the top of the tower section provides substantial lateral support for the system.

The adapter plate is shown in Figure 4. Remove and replace the rotator's four lower mast mounting studs with four stainless steel mounting bolts and lock washers. If the adapter plate is cut from ¼ inch aluminum plate and a 1¼ inch mast is used, the rotator's output coupling will match perfectly with the tower's top thrust bushing. This takes advantage of the rotator offset between top and bottom. Secure the adapter plate to the inside of the tower legs using four U-bolts.

You can use other rotators in place of the CM-9521A. The RadioShack 15-1245 is another inexpensive and popular rotator that will work interchangeably with this bracket. If you come across a rotator with a different offset or use a different mast diameter, you may have to make some adjustments.

A smaller diameter mast or a rotator with a smaller offset may require some spacer

Figure 4 — This arrangement of the rotator and mounting plate lines up with the mast bushing on a Rohn 25 tower top section. [Jack Morgan, KF6T, photo]

[1]R. Collins, WX3A, "The Knots of Ham Radio," *QST*, Jun 2006, pp 57-58.

washers between the rotator body and adapter plate to get proper alignment with the tower top bushing. Alignment is not super critical — just make sure the rotator turns the mast 360 degrees without binding up. Be sure to use a little waterproof lube inside the bushing.

If you use a larger mast or rotator with an even greater offset, you could mount the plate on the outside of the tower and use spacers to achieve proper alignment. — *73*, *Jack Morgan*, *KF6T*, *2040 Pheasant Hill Ln*, *Auburn*, *CA 95602-9673*, **kf6t@arrl.net**

Improved Deburring Tool

Drilling holes in metal leaves raised edges and burrs particularly in soft alloy and non-tempered metals such as 2024 aluminum. In the past, I have always grabbed a larger diameter twist drill and used it to clean the holes by slowly twisting the bit by hand. The technique did remove the chips and excess material, but left a somewhat roughened, unprofessional edge. I could feel the bit grabbing as I rotated it. After all, the clearance or trailing angle of the bit was designed to grab and cut into the metal. What was needed was a bit with a smaller clearance angle. I found a solution in an ordinary six-flute countersink bit. Twisting the bit in the hole, I could feel the bit cutting smoothly and leaving a smooth chamfer.

One problem I encountered was that most countersinks have a short shaft, which makes it hard to hold the bit in close places or to reach deep inside a chassis. Since the countersink I selected had a ¼ inch shaft, I merely added a shaft extension I had in my junk box. The tool is usable for tap and clearance size holes for number 6 to ¼ inch hardware. I have a smaller version for number 2 and 4 hardware. To make the bit easier to turn, I added a knob to the free end of the shaft extension. The completed tool is shown in Figure 5. Although I used a one-piece shaft extension, a shaft coupler and shaft would work equally well. — *73*, *John Franke*, *WA4WDL*, *4500 Ibis Ct*, *Portsmouth*, *VA 23703*, **jmfranke@cox.net**

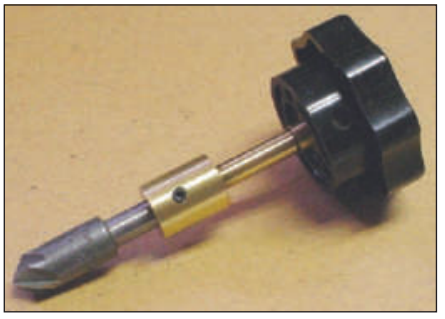


Figure 5 — A countersink, shaft extension and handle make deburring jobs easier and more professional. [John Franke, WA4WDL, photo]

Low Voltage Lighting RFI

Most of us who use the HF bands have experienced RFI problems from solid-state power supplies, even in our own houses. One of the most common examples is the router. Increasingly popular are the low-voltage lighting systems, which have been appearing in remodels and new construction. They may be single lamps or a bar with four or six lamps. Most often, these are powered by a solid-state supply, contained in the fixture for convenience. This is a rapidly increasing and major source of RFI. It's characterized by repeating noise peaks at regular intervals.

Since many states are regulating against the use of incandescent lighting, homeowners are attracted to these devices as a decorative choice, such as the colorful pendants seen in light stores. They are not energy saving devices. A regular magnetic transformer, instead of the solid-state type that typically radiates RF noise, could power these lamps. Most manufacturers offer this option but the nonradiating magnetic type is too large to contain within the fixture.

Here in California, kitchens must now be designed with 51% or more energy saving lamps — fluorescent or LED. Many opt for the low-voltage lighting for the other 49%.

I had a neighbor one block away who installed two bars of six low-voltage lamps with a solid state power supply. They were made by George Kovacs Co. I was paralyzed with noise on 40 meters. The neighbor was not about to go to any expense to replace the transformer. I finally asked an electrician to place a two section Corcom EMI filter (**cor.com**) in the back box of each bank of lights. They barely fit but eliminated the problem completely.

If you know someone who is contemplating a remodel, ask them to use a magnetic transformer in all low-voltage lighting systems. — *73*, *Jim McCook*, *W6YA*, *1029 Passiflora Pl*, *Encinitas*, *CA 92024-2308*, **w6ya@cox.net**

Door Stop Mount

I purchased a nightstand to use as an operating station. I am using a mobile UHF/VHF radio as my fixed station in my RV and I did not want to cause damage to the nightstand by bolting the mobile mounting bracket to the tabletop. I found a couple of wedge shaped rubber doorstops for less than $1 each and some hardware for less than $2, and attached the mounting bracket to the doorstops. The new table top mount is very stable, will not tip over and does not slide across the smooth table surface. Additionally, the angle of the mount is perfect to make the LCD display easier to read. — *73*, *Chris Seright*, *KE5ZRT*, *1414 Sunrise Dr*, *Space 2b*, *Amarillo*, *TX 79104*, **ke5zrt@gmail.com**

Lightweight Surplus Headset

Looking for a lightweight headset with great audio you can wear all day long? Try to find an old Dictaphone headset (see Figure 6) on the surplus market. They are still available and definitely worth the search. — *73*, *Joe Morse*, *AD4W*, *317 Westlawn Rd*, *Columbia*, *SC 29210-5622*, **ad4w@sc.rr.com**

Figure 6 — Dictaphone headsets are lightweight and have excellent sound quality. [Joe Morse, AD4W, photo]

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

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

Five-Nine-Nine, I Presume?

Hams, Hallicrafters and the Mountains of the Moon — a grand DX adventure.

Ward Silver, NØAX

The Diamond DXCC Challenge (**www.arrl.org/diamond-dxcc**) is a time machine for DXers linking the old — entities on the original DXCC List in 1937 — with the new — today's equivalent DXCC entities. Comparing those lists, nowhere were there more political changes, the old names more mysterious, images more wild and untamed than on the African continent — particularly in the remote and mountainous interior of eastern Africa.

The expedition landed in Mombasa, Kenya on the Indian Ocean and traveled west to Mt Kilimanjaro, Lake Victoria and the Mountains of the Moon. The trip west was around 1200 miles and took about 6 months. [Gatti-Hallicrafters Expedition, Bob Leo, W7LR, scan]

Those call signs of yore send shivers along the spine of the DXer even today: VQ, CR, FL and ZD. DXpeditions still form to visit these exotic lands, whatever their current call signs. Just as hard to activate today as before WWII are the Mountains of the Moon — the Rwenzori Range — on the border between the present-day countries of Uganda (5X) and The Democratic Republic of Congo (9Q). Just imagining one of those prefixes answering a CQ DX is enough to send a DXer into a prolonged state of reverie.

The Pre-DXpedition Era

When today's DXpeditions are getting organized, one of the first orders of business is to line up commercial sponsors for radios, antennas, towers, generators — all of the equipment needed to fill logbooks around the world. It wasn't always quite that way. In fact, for one of the most famous of all early DXpeditions, sponsorship was completely backwards: The manufacturers went looking for hams! Before WWII, though, there were only "expeditions" and the "DX" wasn't added until much later.

Amateur Radio has a long tradition of association with exploration and scientific expeditions. The first such collaboration, while successful, had to overcome many challenges. The March 1924 issue of *QST* describes the difficulties of maintaining communication with radio amateur Don Mix, 1TS, operating WNP, the MacMillan Arctic Expedition's radio station on the schooner *Bowdoin*.[1-3] Canadian amateur (9BP) and his American counterpart (7DC) had quite a bit of difficulty hearing WNP's faint signals on 185, 220 and 300 meters in the midst of "violent fading" even during January, one of "the best radio periods of the year." (There were numerous *QST* articles about the MacMillan expedition in 1923 and 1924. A sidebar explains how to find articles about expeditions in the ARRL's online archives.

[1]Notes appear on page 70.

In November 1947, Bob Leo, W6PBV (now W7LR, standing) and Bill Snyder, WØLHS, were just getting familiar with the state-of-the-art Hallicrafters equipment before leaving on the 6 month adventure. This photo, from July 2004 *QST*, was taken at a press party in New York City. [photo courtesy Bill Snyder, WØLHS]

Nevertheless, hams went on to link expeditions led by famous explorers like Byrd, Lamb, Wilkins and others throughout the 1930s and on into the 1960s. Even if the amateurs weren't using Amateur Radio, their skills were valued in getting the message through under trying circumstances. There are echoes of those early days in today's DXpeditions that team up with scientists or research facilities in unusual and rare locations such as Desecheo (K5D), Macquarie (VKØ/M) and the numerous research bases on the Antarctic continent.

The DXpedition is Born

What was that about a "backwards" expedition? Before WWII, commercial sponsorships of expeditions were common for all sorts of equipment. Radio manufacturers, in particular, realized the public was interested in these adventure stories, creating valuable advertising opportunities. During the war, of course, there were no major expeditions.

Once the war was over and government orders dried up virtually overnight, radio companies were looking for new markets to replace military product lines. When approached by Attilio Gatti, a flamboyant Italian adventurer, Hallicrafters sensed a market-opening opportunity. Gatti had organized a number of pre-war expeditions that involved Amateur Radio, such as his 1938 endeavor to the Belgian Congo to study "African elephant herds…the Manbettu…and

the Mulahu, the mysterious and still unknown fifth anthropoid." Using the call sign OQ5ZZ, the expedition made many contacts on the 14 Mc band.

The interest of DXers had been piqued and with equipment having been improved dramatically by wartime advances, the time was ripe to resume and expand the on-the-air facets of journeys to terra incognita. The March 1947 issue of *QST* announced the launch of the famous Kon-Tiki expedition with the call sign LI2B and the game was on![4]

The Gatti-Hallicrafters Expedition Contacts in 1948

Call	Start	End	QSOs	W6PBV	WØLHS	Countries	Zones	States
VQ4EHG Kenya	Jan 21	Feb 16	942	620	322	51	24	42
VQ3HGE Tanganyika	Feb 20 Jul 6	Jun 13 Jul 9	2629	2447	182	122	39	47
VQ5GHE Uganda	Jun 20 Jun 26	Jun 21 Jun 27	233	233	0	19	13	30
VQ5HEG Uganda	Jun 27	Jun 27	18	18	0	3	4	7
Total	Jan 21	Jul 9	3822	3318	504	123	39	48

The Gatti-Hallicrafters Expedition of 1948 intended to explore the mountainous regions of East Africa and conquer Mount Kilimanjaro, all the while reporting back home via Amateur Radio. To do so, the expedition needed an experienced hand at the controls so a contest was announced on pages 4 and 5 of the May 1947 *QST* for interested amateurs: "WANTED – One highly qualified amateur operator to accompany the Gatti-Hallicrafters Expedition to the Mountains of the Moon in Africa." Note that only one ham was to be chosen. Commander Gatti, Hallicrafters President Bill Halligan and F. E. Handy of the ARRL would review the applications.

As it turns out, the search was narrowed to two men, Bob Leo, W6PBV (now W7LR) and Bill Snyder, WØLHS (SK). They were both summoned to meet Gatti in Vermont for the final interview and happened to be on the same train. Striking up a nearly instant friendship as is common among hams, Leo and Snyder decided to convince Gatti to take them both as the job was obviously too big for just one person. They were successful. So the first post-war DXpedition set sail from New York City on Nov 29, 1947 aboard the SS *African Pilgrim*.

Around the Horn and On the Air

After stops at Cape Town and Durban (ZS), Dar es Salaam (VQ3), and Zanzibar and Tanga (VQ1), the ship docked in the Kenya Colony's (VQ4) Indian Ocean port of Mombasa on January 15, 1948. After unloading the 700-odd crates and vehicles, they departed a week later. The expedition's itinerary shows that they planned to cross the Serengeti with a stop to climb Mount Kilimanjaro. They would then skirt the northern shore of Lake Victoria and head west to the Mountains of the Moon on the border of the Uganda Protectorate (VQ5) and the Belgian Congo (OQ) — a trip of at least 1200 miles — before returning east. As is often said, it's nice to have a plan, but it is also said that no plan survives contact with reality!

The expedition ground along on dirt roads through the African back country. There would be no "Here we are at the airport…" banquet slides afterwards! The total expedition included as many as 42 people. At each of the eight base camps, African workers would erect a rhombic antenna. Bob and Bill would fire up, working hundreds of stations around the world as shown in the table of contacts made from each location.

The two "Bs" (Bob and Bill) were required to be on the air at least 6 hours a day from the truck-based station (when not moving) and often operated for up to 8 hours. Their HT-4 (aka BC-610) transmitter was allowed to output 150 W on 7, 14 and 28 Mc, 25 W on 58.5-60 Mc and 10 W on 1.8 Mc — the usual authorization for British colonies in Africa. The log was paper and the CW sent by hand using a bug — no laptops!

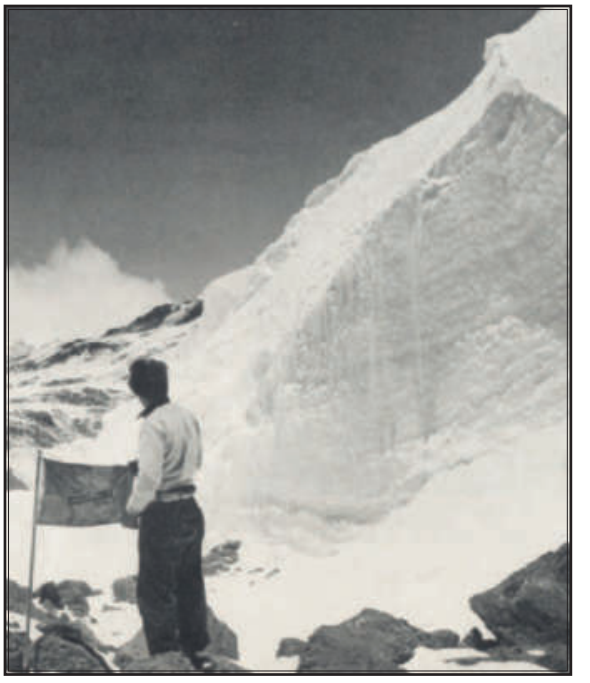
Most of the contacts were CW but many were AM, especially on 10 meters. In 1948 it was the peak of Cycle 18 and 10 meters was wide open. Snyder remembered seeing the Hallicrafters SX-42 and panadapter displaying "a colossal jumble of signals" around the listening frequency of 28.5 Mc. Leo recalls laughing, "If we could weigh those signals, we'd have a couple tons!"

To the Mountains

The expedition "from the top of Africa" is often remembered as having made contacts from the peak of Kilimanjaro. Not so — the only contact made from the top was between Bob, who climbed the mountain and Bill who remained behind, via some portable Motorola FM gear. They also made a "light wave" contact using flashlights from halfway up the mountain at the 10,000 foot level. Neverthe-less, Bill and Bob made many contacts from the base camp before pushing on across Bamboo Flats toward Lake Victoria.

The Nanga Point or Narwa camp on Lake Victoria was a way-station near Nairobi, Kenya where the expedition spent a few days. During that time they prepared for the 4 day push through Uganda to the Mountains of the Moon. Unfortunately, Bill had parted ways with the expedition, leaving Bob as the sole licensed amateur in the group. While at Narwa, Bob modified "The Shack on Wheels" to become a mobile station that would operate while in motion, although with the road conditions that would have been one bumpy ride! (Bob notes that even though the image is of wild and primitive Africa, modern comforts were not far away no matter where the expedition camped.)

Finally, the expedition reached Fort Portal in Uganda after some difficult driving and more difficult negotiations with the local District Commander about operating authority. Permission was granted, then withdrawn, then granted again and over 200 contacts were finally made at the westernmost point of



At 19,341 feet, Mt Kilimanjaro is the highest point in Africa and is snow covered year-round. Bob Leo did make the climb to very near the summit along with several others from the expedition. [photo courtesy Thomas Roscoe, K8CX]

Now-Deleted Entities Contacted by the Expedition

British North Borneo	VS4VR
Palestine	ZC6NN
Ceylon	VS7RM
Suez	MD5AF
French Morocco	CN8BK
French Cameroon	FQ3AT/FE
Aden	VS9AN
French West Africa	FF8FP
Somalia	MD4TH
British Guiana	VP5AR
French Equatorial Africa	FQ8SN
Gold Coast	ZD8AH
Trans-Jordan	ZC1L

Using the ARRL's Online Archives

To find the articles on the MacMillan expedition, use the keywords "macmillan" and "wnp" in the years 1923 and 1924. Entering the keyword "expedition" and clicking on the highest-numbered Results page will take you to the earliest articles.

the expedition's travels. Finally, on June 27, 1948 the final contacts were made, the "Big Switch" was pulled and the Gatti-Hallicrafters Expedition was one for the history books, having contacted many stations in countries that would no longer exist in a few year's time.

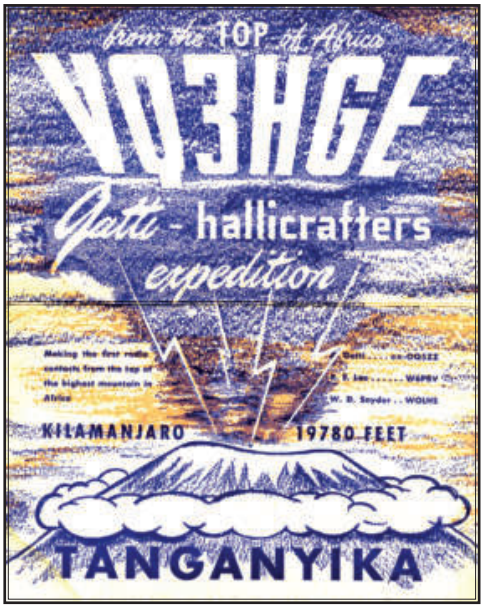
Headed home by the long path, Bob visited Robby, VQ4ERR, in Nairobi then took passage on a tanker to Arabia. In October 1949, Bob made another expedition, this time to Florence, Italy to marry Cobi, who he met on the train to Vermont, with Fortunato, I1KN, who made the expedition's first contact as Best Man.

An Epic Epilogue

At the conclusion of his long recounting on PAØABM's wonderful website, Bob muses about what the expedition would have been like today.[5]

> …the name of the expedition probably would be LYD, short for the 'Laine-Yaesu DXpedition.' The Commander of this happening would be, of course, the famous explorer Martti J. Laine, OH2BH. The adventure would be not much different from the story of Bill and Bob, but the reports would tell much more about radio, the average of QSOs an hour, etc. Why? Because one of the 12 members of the LYD-crew would be Bob, KK6EK, and the book Bob writes would have the title *DX from the Summit of Africa*.
>
> And James, 9V1YC, another crew-member, would let us, the DX community, enjoy his view of the DXpedition by taking another DVD titled *Out of Africa, Part II*. Steve, KU9C, would be the QSL manager, and Bernie, W3UR, and John, ON4UN, the pilots. AM would be replaced by SSB with Franz, DJ9ZB, behind the mike. And one of the CW operators, Trey, N5KO, would try to set again a new world record. And of course the hired porters would carry the equipment up to the top of the Kibo, and 5H2LYD, QRV from the summit of the famous Kilimanjaro could be heard and worked worldwide. And the pile up would cover the whole band, non-stop, 24 hours a day and history would repeat itself…

Breaking out of your reverie, this was quite a story don't you think? There is far, far more to tell. The reader should definitely browse the many pages on the website of Wino, PAØABM, from which several anecdotes have been recounted here. Tom, K8CX, has digitized numerous photos and QSLs from the expedition on his Ham Gallery web page.[6] The 1993 *QST* article by NØNLQ is also a gem with lots more information and photos.[7] And to put a wrap on the whole affair, Bob writes in *CQ* about receiving a QSL for one of the expedition's contacts — in 2011![8]



Although only one contact was made from the peak of Mt Kilimanjaro on VHF FM (with the base camp below), the expedition did make over 3800 contacts from several extremely rare DXCC entities. [photo courtesy Thomas Roscoe, K8CX]

The Adventure Starts at Your Mic

It makes you want to shake off the cobwebs, head for the radio and do some DXing — maybe finish up that Diamond DXCC Challenge! Who are the W7LRs and WØLHSs of today? Where is a team of operators grinding their way along a difficult path to put up a skyhook and fill their logs? Where is the "colossal jumble of signals"? I'll tell you — right behind the power switch of your radio — see you there!

These days, after 75 years of Amateur Radio, Bob is very active on the HF and VHF bands from his home in Bozeman, Montana. He and Cobi have two children and four grandchildren. [Bob Leo, W7LR, photo]

Notes

[1]K.B. Warner, 1BHW, "MacMillan Expedition Nears Arctic Daybreak (WNP)," *QST*, Mar 1924, p 27.
[2]**en.wikipedia.org/wiki/Donald_Baxter_.MacMillan**
[3]**hamgallery.com/Tribute/W1TS/Donald%20Mix%20W1TS.pdf**
[4]"Expedition Kon-Tiki," *QST*, Mar 1947, p 71.
[5]**www.qsl.net/pa0abm/ghe/00ghe.htm**
[6]**hamgallery.com** — search for "GHE" to find images of the various expedition QSLs.
[7]M. O'Brien, NØNLQ, "The Gatti-Hallicrafters Expedition: The First Grand Ham DXpedition," *QST*, Dec 1993, pp 59-63.
[8]B. Leo, W7LR, "The Long-Delayed QSL Exchange," *CQ*, Oct 2011, p 44.

Ward Silver, NØAX, is an ARRL Contributing Editor. He can be reached at **n0ax@arrl.org**.

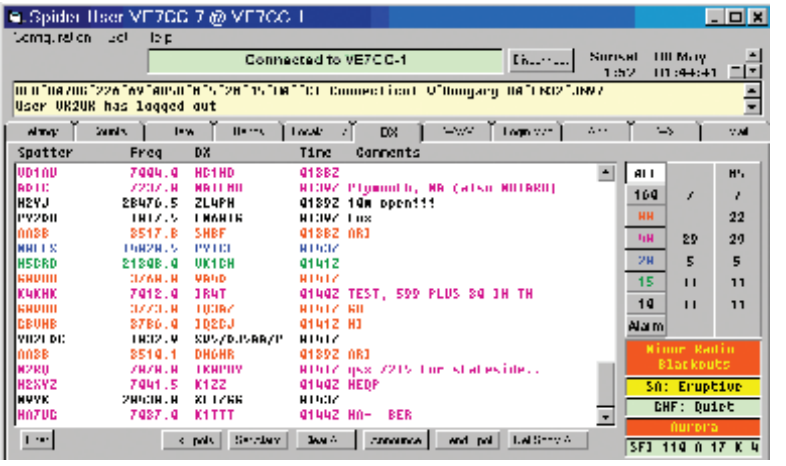
The Evolution of DX Spotting

From 2 meters to the smartphone, DX spotting keeps evolving.

Murray Green, K3BEQ

In the early days of DX spotting, well before DX clusters, the primary method of announcing DX stations was by voice, typically over a 2 meter simplex frequency. Tune around the HF bands, hear a choice DX station, work it or not, pick up the microphone and give the call sign and frequency plus comments. Although the number of spotters and users was very small in comparison to today, there was a closeness among them that only voice communications can bring. During lulls in the DXing the frequency was used to discuss "the one that got away" or "how I got a new one."

Using voice was a plus especially when mobile. I recall one early morning when we packed the car and started out for a vacation. About half a mile from the house, a voice spot came over the 2 meter rig (147.420 MHz) announcing one of the "terrible Ts" — Chad as I vaguely recall. I quickly made a U-turn, much to the chagrin of my spouse and kids, ran into the house, turned on the rig, made the contact and returned to the car and the trip. It was that fast. (Forty years later a new technology may present a similar opportunity — more on that later.)



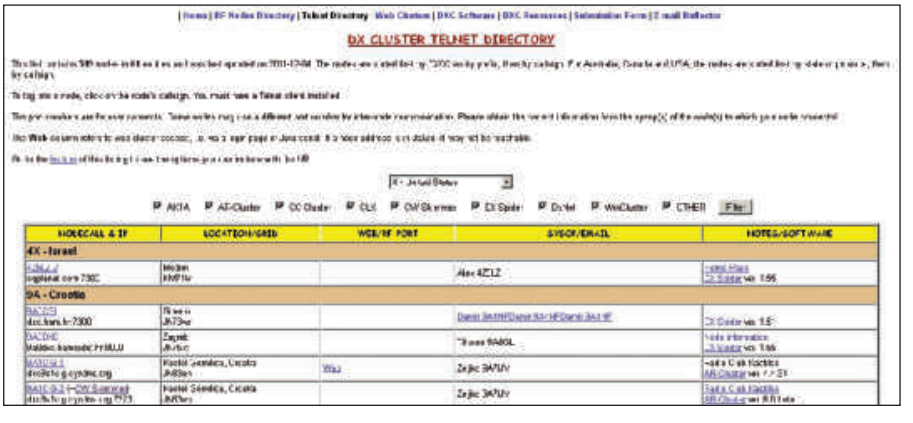
This sample of the *CC User* DX cluster program shows the type of information available to today's DXer. *CC User* can be downloaded at the VE7CC-1 CC Cluster website. [VE7CC-1 CC Cluster]

The Packet Clusters Era

Close on the heels of voice spotting came the 2 meter packet clusters, soon to outpace and retire voice spotting to the recesses of DX history. Spotting now elevated itself to the level of a large scale instant announcement. The packet clusters had a number of constraints:

- DX stations had to be manually detected
- The DX station's call sign and frequency had to be entered by keyboard
- You had to be at the packet monitor to determine if you needed the DX station
- You had to have packet equipment.

The clusters were dynamic and users grew by the hundreds. Subsequently certain cluster owners enabled users to access their systems via the Internet. Spotting became a worldwide activity. It was difficult not to be alerted to a DX station, courtesy of Amateur Radio interconnective technology, the progressive nature of the ham community and in particular those pioneers behind the cluster systems. (A large number of worldwide DX clusters can be viewed at **www.dxcluster.info/telnet/index.php.**)



This is a sample of the information that can be obtained from the Telnet Directory page of the **dxcluster.info** website. This page lists the many stations that provide telnet-based DX spot information. [dxcluster.info]

Enhancements

The evolution continued as clusters were updated and new ones activated. New features included:

- The bearing and distance to the DX station
- The capability of filtering out stations not needed
- Voice or tone alert announcements of DX stations that are needed
- Indication of stations using Logbook of The World
- Ability to monitor only selective frequencies, bands and modes
- The ability to click on a DX station and be taken directly to that station's **QRZ.com** page
- WWV data
- The ability to research past DX spots

(One such cluster, VE7CC-1 CC Cluster at **www.ve7cc.net**, is a favorite of the author.)

Automatic Spotting

Now something new and in my opinion exceptional has emerged from the DX spotting evolution: *A system that eliminates the manual detection and keyboard entry of CW DX stations and their frequencies.* This new system is the Reverse Beacon Network (RBN). The RBN is a network of amateur stations (called *splitters*) employing special software and dedicated equipment. These stations automatically monitor an entire

When visiting the Reverse Beacon Network's website, the DXer can see a real-time map of DX activity. In addition, the DXer can access both filtering and searching features to customize the display to their own DX interests. [**www.reversebeacon.net**]

portion of a CW band, filter out stations that are not considered choice DX, eliminate duplicates and, via a central server, send the spots to clusters worldwide through the Internet and packet systems.

The RBN has begun to revolutionize the spotting of CW DX. To see for yourself, go to the RBN main page at **www.reversebeacon.net/main.php**. Once there, you will see a table showing the DX stations currently being received by the splitter stations. The table shows the DX station's call sign, time and date, frequency, signal strength and CW speed. Turn the map feature on under the Options list and a map of the world appears showing the contacts in progress.

Please recognize that what you see is not necessarily what will be spotted to the clusters but what the splitters are receiving across a particular CW band(s). Filtering enables forwarding only choice DX and avoids duplication, but if the choice DX changes frequency or band it will be spotted. This is a definite plus to DXers and something to complain about to the "Big Brother is Watching You" crowd. The screen information changes approximately every 30 seconds but you can research past DX history.

An Added Attraction

A relatively new RBN feature enables a station to see how their signal is being received worldwide. Let me explain. While monitoring the RBN main network via the Internet, select a clear CW frequency on your HF station and call CQ. Within seconds all of the RBN stations (splitters) receiving your signal will display your call sign, frequency, time, date, speed and signal strength automatically. For the first time you can get first hand automatic CW reports from around the world.

According to Pete Smith, N4ZR, during the 2011 CQ World Wide CW contest the RBN "handled 1.578 million spots on Saturday and 1.691 million spots on Sunday or an average for the 48 hours of 18.9 spots/second…"[1]

At my station, I split my screen to monitor both an Internet DX cluster (VE7CC) and the RBN DX Spot page. I don't take any chances — and yes, I also wear a belt and suspenders. You can find a complete rundown of the RBN at **reversebeacon.net/index.php**, but you really have to try it to get a better feel for the features. The more software inclined can go to **reversebeacon.blogspot.com** and **www.dxatlas.com/CwSkimmer**. There are other RBNs with similar features that can be viewed at **pskreporter.info**, **jt65.w6cqz.org/receptions.php** and **wsprnet.org/drupal**.

"I Don't Like Changes" Say the Fearful

New changes are not without complaint. Only two have been noticed and in your author's opinion both lack credibility. One DXer complained that there were too many spots from one (splitter) station. ***Not duplicates*** mind you since the RBN filters them out. I have heard it all when a DX station complains about too many choice-DX spots because it originates from one station. He did not mention all of the spots from other splitter and nonsplitter stations.

The one other complainant did not like the idea that a splitter station put out a choice-DX spot just when he was about to work it. Seems it got too crowded for him, not thinking that other stations would also make the same spot. I guess he wanted a head start but…

Spotting has and continues to be instant. It never ceases to amaze me, even in today's high-speed electronic environment, how quickly the DX community homes in on a choice DX station's frequency within seconds of the spot. That is where operating skills come in.

What's Coming?

At the beginning of this article, I reminisced about spotting DX via VHF voice and the ability to receive spots in our mobiles. Now there are smartphone apps providing Internet access to DX clusters. If you are operating HF mobile and chasing DX, this would be a distinct advantage and physically easier than using a laptop with satellite Internet access. If not, you can always turn the car around and head for the home station as I did 40 years ago…

I can envisage an era where all spots — phone, CW and data — will be automatic. We have come a long way since the 2 meter voice DX spot announcements.

Epilog

Some may call it a revolution but like most technology it usually evolves from within. To those who were and continue to be at the forefront of spotting technology, the amateur DX community owes you a great deal of thanks. You are 599 +.

[1]Pete Smith, N4ZR, RBN blog.

Murray Green, K3BEQ, an ARRL® member, has been licensed for 60 years. He presently holds an Extra class license and is primarily interested in DX. He holds #1 Honor Roll for phone/mixed and is leisurely increasing his CW totals. Murray has authored numerous feature articles for *QST*® and *Popular Communications*. He is one of the founding fathers of Maryland's Green Mountain Repeater Association. Murray resides with his spouse in Cheverly, Maryland but could not get her to obtain her license, even after 58 years of wedded bliss and a lot of persuasion. He was more successful with his son David, W3SGE, and his granddaughter Jessica, KB3TZQ. Murray can be reached at 5730 Lockwood Rd, Cheverly, MD 20785-1127, **k3beq@arrl.net**.

Malpelo Island DXpedition 2012 — HKØNA

An international team of 20 men from 6 nations climbs The Rock and sets the all-time "Tent and Generator" QSO record.

Bob Allphin, K4UEE

Malpelo Island (Spanish: *Isla de Malpelo*) is located 235 miles west of Colombia's Pacific coast. It has a land area of only 86 acres of mostly vertical, barren rock and is uninhabited, except for a small military post manned by the Colombian Army, established first in 1986.

There have been periodic ham radio DXpeditions to the island, which became a DXCC entity in 1961. Over the years, landings on the island had been very difficult and dangerous. In fact, one DXpedition team suffered a near fatality in the shark-infested waters. In the *DX Magazine*'s latest list of DXCC "most wanted," Malpelo ranked #12 overall and much higher in Asia.

Malpelo is the home to an abundance of hammerhead sharks, dogfish sharks, spectacular whale sharks and the giant devil manta ray. This makes it a very popular scuba-diving location. In 2006, Malpelo was declared by UNESCO as a natural World Heritage Site. Any visitors need a written permit from the Colombian Ministry of Ecology as well as the Colombian Navy. The necessary permits for HKØNA took five years to obtain.

Only One Flat Spot... and It's RF-Challenged

The island consists of near vertical, sheer and barren rock with three high peaks, the highest being 980 feet. The only flat spot on the island is located on the eastern side, about ⅓ of the way up where the Colombian Army has their small base. Unfortunately, this location is blocked radio-wise from about north through west all the way to south as the steep mountain walls rise sharply another 600 feet. For many ham radio operators in W6/W7, JA, the Pacific, VK/ZL and others in that part of the world, their only hope for a QSO is by long-path propagation.

In October 2011, three team members conducted a recon trip to the island. While they were there, the Colombian Army contingent showed Jorge, HK1R, the DXpedition organizer, Faber, HK6F and Sal, HK1T, how to climb to the top of the highest peak on island. Now with stations on top of the mountain, Jorge decided that we had a chance to break the world QSO record for a non-hotel, non-fly-in type of DXpedition set by VP6DX (Ducie Island) in 2008.

After their return from the reconnaissance visit, Jorge contacted Gregg, W6IZT, and me and said we should expand the scope of the DXpedition to include more operators, radios, amplifiers, antennas, generators, and so on. Originally, there were to be six Colombian (HK) operators and four foreign operators. Gregg and I had been invited to join the team in June 2011.

Our Team Grows to 20

With the decision to go for the record, the die was cast. I quickly issued some invitations and we grew the team to 20 operators. Like most DXpedition leaders, I have a list of people that I have been on DXpeditions with previously. These are people who are compatible and that I can trust to do a good job under difficult circumstances. The youngest on the team was 24 (LU9ESD) and the oldest was 75. This was to be a physically tough adventure for most of us.

Gregg, George, N4GRN, and I flew to Cartagena, Colombia the first week of November to meet with our Colombian counterparts to make some critical decisions. We decided that safety would be our #1 consideration and we would do everything possible to protect our team from injury or worse. Faber, HK6F, is a safety/rescue expert in his profession and George, N4GRN, was on a cave rescue team years ago. Together they devised a plan to install a winch system to hoist people and equipment safely onto the "El Tangon" rope ladder and catenary.

The Advance Team Arrives

In a bold move, Jorge, HK1R, convinced four of our team to go to Malpelo prior to the full team's arrival in order to establish the operating sites, put up the antennas, and set up the radios, amplifiers and generators. They left home on Christmas Day and traveled to Malpelo on the monthly Navy resupply ship.

They would stay a full six weeks on the island. Although the dry season was supposed

"The Rock" as seen from our charter vessel, the *Sea Wolf*. [Faber, HK6F, photo]

to begin in December, it rained almost every day and some days it poured. They did manage to completely prepare Op B (Baja or low) and get about 40% of the antennas and equipment up to Op A (Alto or high) on the mountaintop. On January 10, when it was apparent that they had done about all they could do and further progress was strictly weather-dependent, we told them to begin using the official HKØNA call sign on the air. Previously, they had used their own call signs and made about 1200 QSOs. After they began using HKØNA, they made about 11,500 QSOs prior to the main team arriving on January 21. This decision was part of our overall strategy to break the VP6DX record, but more importantly that decision gave DXers more time to get into the log.

The main team met in Bogotá the evening of January 18. It was the first time that some members of the team had met and it was quite fun and festive. Next morning we flew to the port city of Buenaventura and were checked in to our hotel by noon. We began our first team meeting shortly afterward. This was the first time that we could all be together to discuss the itinerary, safety procedures, equipment, antennas, power, computer logging, meals, sanitary issues, pileup procedures and how to safely get on and off the island.

The doctors each talked with us about our responsibilities to both ourselves and to our teammates. The biggest concern was a fall, possibly a broken limb and sun-related illnesses. Several guys had a problem on Desecheo and we didn't want to go through that again. It is all about staying hydrated. We were cautioned over and over to look for warning signs in our teammates.

"El Tangon" [Gustavo, HK3ORE, photo]

Our charter vessel, the *Sea Wolf*, was normally used to transport scuba divers to Malpelo. We left the hotel at midnight and boarded the vessel about 0100. After a quick briefing we hit the sack and the *Sea Wolf* departed at 0400. When we were in the open sea, the motion of the boat changed significantly. We had rough seas all the way and most of the fellas slept late and missed breakfast.

Manu, LU9ESD, on the treacherous climb to Op A. [Gustavo, HK3ORE, photo]

First Glimpse

At 0500 the following morning, we heard the engines slow and we raced topside to get our first glimpse of "The Rock." It looked just like the pictures except bigger. As the sun rose, we began ferrying men and their personal gear to El Tangon. Some climbed the rope ladder; most were hoisted up like sacks of potatoes using the hoist system. Then, usually in groups of two or three, people would begin the climb to the Army base, the location for our Op B. A few of our team made it in 25 minutes or so and bragged that they made no stops….I, on the other hand, took 45 minutes and made eight stops to rest and hydrate.

Eventually everyone was up to Op B and we saw our home for the next 16 days. All the antennas were up, the radios and amplifiers were neatly placed on tables that lined the wall of the small building Jorge had negotiated for our use. Six stations in all…ready to go because four guys (HK1MW, HK6F, HK1N and HK1T) went early to do the setup. We call them the "Fabulous Four" and for good reason. We are all indebted to them and thankful for their sacrifice. That should include DXers worldwide because you had a longer opportunity to work us…and hopefully put a "new one" in your logs.

While Gregg, W6IZT, loaded the final version of *N1MM* into all the computers, several men set up the sleeping tents and others made interference checks among the stations. We were on the air at noon (local) the same the day we arrived. The pileups were huge as the #12 "most wanted "DXCC entity came on the air with six stations simultaneously. We implemented the computerized schedule that had been so painstakingly developed and began to settle into "DXpedition mode," that is, sleep, eat, operate and do chores. The pileups would continue nonstop for 15 days.

We still had to get Op A up and running at top of the mountain. We had purchased a sturdy operating tent at the last minute and checked it as "excess" baggage on the trip down. We were uncomfortable with the existing complement of tents because the "Fabulous Four" had experienced 60 mph winds at the mountain top the previous week. The new tent, a single generator, a couple of antennas, masts and personal gear were carried to the top. Several of our guys and four or five marines did the heavy lifting.

Op A (for Alto)

The site was 600 feet above Op B, and the climb was circuitous and dangerous. In those places where a slip and fall would have sent a man tumbling down the mountain, the Fabulous Four had installed safety lines. It was the last 60 feet that were the scariest. It was virtually straight up and you pulled yourself up with a rope that had been tied in place. I was warned never to look down and I didn't until I reached the top. I only went to Op A once and am glad I did because I can appreciate the difficulty of the climb and the danger that some very special team members undertook to keep those four stations on the air. There were 6-8 guys who basically manned Op A off and on for 12 days. They would go up and stay 2 or 3 days, operate and operate and sleep very little. Then they would come down, shower, eat a meal or two, get some sleep and go back up. I began referring to them as the "Iron Men." They were Jorge, HK1R, the DXpedition organizer; Franz, DJ9ZB, and Manu, LU9ESD. Peter, PP5XX, primarily; Ralph, KØIR; Glenn, WØGJ; Steve, VE7CT; Bob, N6OX; Sal, HK1T; Faber, HK6F, and Bolmar, HK1MW, spelled them on occasion.

From Op B we had a clear shot to US east coast, Europe and Africa. Signals were loud

on Malpelo and we were loud on their end. Stations "behind" the mountain were significantly weaker, but workable, if they could hear us. Asia was our biggest challenge, but from Op A it was a chip shot. I was told over and over that JAs were 10-20 dB over S-9 on some bands while barely readable below at Op B. All told we put made 12,500 QSOs with Japan and for many of them it was a "new one" for sure.

Because not all of our team was either able or inclined to pull shifts at the mountaintop, our computerized scheduling plan that had all been done in advance was out the window. We took a step back in time and used pen, paper and the chart on the wall method. The fellas at Op A did their own scheduling based upon who was "on top" and kept the three HF stations and a 6 meter station on the air almost around the clock. They had fewer operators to share the duty...they worked harder and rested less.

QSOs begin at Op B. From the left: Sal, HK1T; Bolmar, HK1MW; Jorge, HK1R, and Pedro, HK1X. [Gustavo, HK3ORE, photo]

Op A, 980 feet above the sea. [Bob Allphin, K4UEE, photo]

We Go for It

Down below, when we realized that the "tent and generator" QSO record was within reach, we had a meeting and I asked if we should modify the schedule and begin using our more experienced operators on more shifts and reduce the shifts of the less experienced guys.
To a man, they said yes…let's do it…let's go for it. So for the next five days, some of the team were pulling four to five 3-hour shifts each 24-hour period while others were reduced to 1 or 2. This enabled us to keep the daily rates high even as the demand for QSOs and the pileups began to diminish somewhat. I want to thank those fellas for sacrificing their enjoyment for the good of the team. They know who they are!

We would collect the logs at each station around noon each day and then post the cumulative QSO number. We were making between 12,000 and 15,000 QSOs each day but it seemed we would never get to the record of 183,686. We found it is easy to set a QSO goal, but you must actually make those QSOs…one at a time.

Op A was shut down on February 3 and our guys and some of the marines brought everything down the mountain. It was very sad because the "Iron Men" were literally at the top of world with a view and radio conditions that were unequalled.

Jorge and I agreed to send the Op A guys and a few others down to the *Sea Wolf*. They were entitled to some R & R and maybe a beer or two. The crew that had worked together at Op B for all those days stayed on the air another 36 hours and added thousands more QSOs to the logs. We kept four stations on the air until noon local time on February 5 and we were completely off the island by 7 PM local. The QSO total was 195,000 plus. We couldn't believe it ourselves….still can't!

Just a quick word about the team. We had 20 men from six different countries, with the majority coming from Colombia and the United States. We spoke four different languages, although English was the language of convenience. There were a few misunderstandings or differences of opinion but to the team's credit…we all went home as friends or as the Colombians prefer…*compadres* (translation…better than a friend, like a brother).

I feel I must say something about DXpedition funding, especially as it concerns the rare "most wanted" entities. They are rare for a reason…usually there are political restrictions or they are geographically difficult to reach — or both. As a result, they are quite expensive…..in the hundreds of thousands of dollars. It's common for the DXpedition team members to pay 50-70% of the total costs of these kinds of DXpeditions, but the remainder must come from DX Clubs, DXers and of course, DX Foundations. I urge you to please continue your support your favorite DX Foundations and DX Clubs and most importantly, make personal contributions to the DXpedition.

A Word of Thanks

I want to thank all of our financial contributors and those companies that supplied us with equipment. The Elecraft K3s worked flawlessly, as did the new KPA 500 amplifiers. The Alpha amplifiers that we used on the low bands just cranked out the power and QSOs. All the antennas, both commercial and homemade performed as expected — as did the water cooler and ice maker…very important equipment indeed.

It was a great adventure. Some of us did some physical things that we didn't know we could do, but thankfully there were no injuries and everyone returned home safely.

#1

Bob Allphin, K4UEE, a 50 year ARRL member, has visited 112 DXCC entities and operated from 63. He has participated in 37 DXpeditions and specializes in activating "top ten" most wanteds. So far he has 9 to his credit. They are Baker/Howland (#8), Heard Island (#4), Bhutan (#3), South Sandwich Islands (#6), South Georgia Island (#10), Peter I Island (#4), Lakshadweep (#2), Desecheo (#6) and Saba/St Eustatius (all-time new one). He has nine "DXpedition of the Year" plaques hanging on his shack wall. Since retiring in 1999 to pursue DXpeditioning more or less full time, Bob has participated in nine major DXpeditions that have made over 900,000 contacts. Bob has set five single operator/single band World Records and was a competitor in two World Radio Team Championship (WRTC) events, in 1996 and 2000. Bob can be reached at 4235 Blackland Dr, Marietta, GA 30067-4705, **k4uee@comcast.net.**

DX Determination

In 1954 three teenage hams put Navassa Island on the DX map.

J. Robert Eshleman, W4DR

This photo, taken from the loading platform, shows the 60 foot cliffs surrounding Navassa Island.

This photo shows the base of the Navassa Lighthouse. It is about 250 feet ASL and about a mile from the "gas house" where KC4AB was located.

The 1954 FO8AJ Clipperton Island DXpedition stimulated my desire to make a DXpedition of my own. I contacted my DXing pal, Don, W4VZQ, and found out that he had similar thoughts. Carl Shenk, soon to be WN4HBC, soon joined us. The June 1954 issue of *QST* set us off in a much better direction. It carried a notice that the FCC had allocated KC4AA-KC4AZ for Navassa Island and if someone put it on the air it would be considered for the ARRL® countries list.

A great deal of research revealed the following facts about Navassa. It is a pear shaped island with an area of 2 square miles. It is surrounded by 60 foot cliffs and there is no well-protected landing place. No one has lived on the island since 1930 and there is no safe water source. These facts were discouraging but also challenging.

We thought there would be very little red tape in getting the license and permission from the Coast Guard to visit the island. We were wrong. It took three trips to Washington and 2 months to get everything arranged. Our major stumbling block was our ages. Don and I were 19 and Carl was 17. Most of the officials either looked at us with scorn or were just plain amused. Carl and Don had done quite a bit of deep-sea fishing and I had traveled to Turkey and Israel with the Merchant Marines. We didn't feel as inexperienced as everyone thought we were.

The Pieces Fall Into Place

Finally on July 2 we were issued the call sign KC4AB and Coast Guard permission to visit the island. Don and I had to be back by September for college and with the coming hurricane season we decided we needed to leave no later than July 31. We had less than a month to locate a boat and assemble our gear.

Since Santiago, Cuba is a good-sized city and only 125 miles from Navassa it seemed the best place to start. We wrote a letter to Miguel R. Corral Perez, CO8CC, president of the local radio club and asked him if he could find a boat for us. At the same time we wrote to a well-known DXer, Val Lopez Banus, CO2BL, in Havana asking for help in clearing Cuban customs.

On July 19 we received a letter from Miguel, CO8CC, informing us that his neighbor, Jose Bosch Lamarque, president of the Bacardi Rum Company, would supply us with his 50 foot yacht *Hatuey* and crew free of charge. National Radio agreed to loan us a new NC-183D receiver and we would use Don's Harvey Wells TBS-50D transmitter because it was light weight and simple to operate. For antennas we had a 14 Mc ground plane, for 7 and 21 Mc we had dipoles and for 3.5 Mc we had 500 feet of #18 copperweld wire.

On Saturday, July 31 we began to pack. Thirty-one hours later we arrived in Miami and were met by Buck, W4RBQ. The next evening we sailed for Havana on the SS *Florida*. The next morning, August 3, we were met at the pier by Val, CO2BL. In spite of Val's planning the customs took our gear and would not release it that day. The next morning Val succeeded in getting our gear out of customs. We drove half way across the island and spent the next night as guests of Conrado Gonzalez Fraile, CO7KK, in Camaguey.

Navassa Island lies south of Cuba between Jamaica and Haiti.

Mounting Delays

On Thursday, August 5 we arrived at Santiago de Cuba expecting to sail within the next day or two. Unfortunately, Senior Bosch wanted his yacht compasses checked and it would be Tuesday until that could be done. We found rooms at a local boarding house.

On Tuesday, August 10 we learned that we could not leave for two more days due to a new law that required the *Hatuey's* crew to have their passports validated. The crew would dock in Haiti while we operated for 4 days. The passports came through late Friday evening and all that remained was to get the Haitian consulate to stamp them, but nothing could persuade the consulate official to stamp the passports until Monday. During these delays, which were now over a week, we kept nightly schedules with our home from Miguel's, CO8CC, station and kept the DX world informed of our setbacks.

By this time we were in trouble. Our money was running out and we all got sick from eating some bad fish. To make matters worse the KC4AA group sent us a message that the ladder used to scale the cliff had been damaged by a storm and until it was repaired no one could get on the island. We correctly

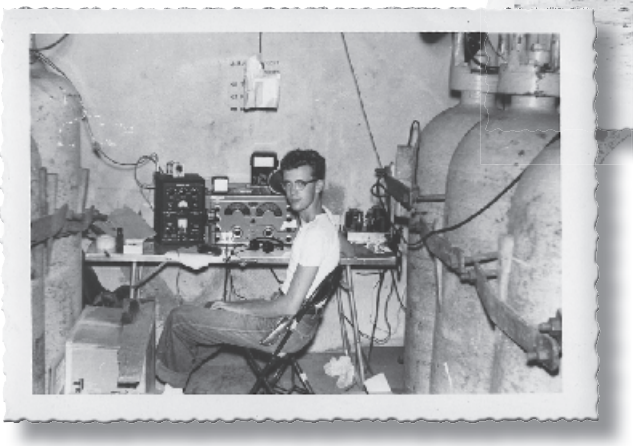
reasoned that this message was false to enable them to beat us to Navassa.

Casting Off

On Monday August 16 (11 days after our planned departure) we were ready to leave. At 6 PM we told our families we were going to sail. Since the sea is calmest at night the plan was to leave at 9 PM and arrive at dawn. The sea was far too rough for us to get any sleep, which we needed badly. In a short time we sighted Navassa. As we drew near the island we could see the waves break against the cliffs sending up spray 30 feet or more. It was a beautiful sight but looked dangerous.

Here is Bob, W4DR, at the base of the 20 meter ground plane. ➢

➢Don, W4VZQ, in the Navassa shack. On the left is the Harvey Wells transmitter next to the National receiver. The bottled gas on the right powers the Navassa light.



As we sailed around the west end of the island the seas became noticeably calmer. At 7:30 AM we sailed into Lulu Bay. It was just as the Coast Guard had described it, a buoy about 150 feet from the cliffs and a chain ladder hanging from a cantilevered platform in the cliff opposite the buoy. The captain tied up to the buoy and a crewmember rowed the lifeboat to the ladder and fastened a rope from the *Hatuey* to the platform at the top of the ladder. Carl was the first one to reach the platform, followed by me and then Don.

We immediately began to haul our ton of gear and supplies to the platform by hand. Since the captain and crew spoke only Spanish it was difficult for us to communicate and as a result they left the very heaviest item — the generator — till last. By this time our gloveless hands were raw and we were exhausted. As the generator neared the platform it caught in the ladder. While Carl and I held the line with our remaining strength Don crawled down the ladder and freed the generator and we safely landed it on the platform. A close call, since losing the generator would have ended the operation. We started the generator to make sure it would run and then waved to the *Hatuey* as it departed to Haiti.

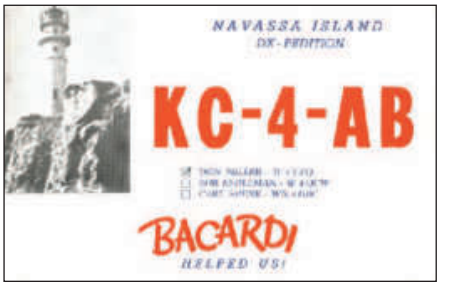
Getting on the Air

After a quick snack and some warm water we began hauling our gear to a small well shaded cement building about 75 yards from the landing. Our original plan was to go to the top of the island where we would have a clear shot in all directions, but considering the rough terrain, the distance and with only 4 days to operate, we decided to settle on this location near the landing. This meant we would not have a clear shot to the East Coast or Europe.

At 10:55 EST we were ready to go. Don won the right to make the first contact by a coin flip and he gave a short CQ on 14,100 kc. The first contact was KV4AA followed by KV4BB. W5RX was the first USA. At noon we worked our Cuban friends in Santiago on 40 phone to assure them that we were okay. On 20 meter phone our first contact was with W9NDA followed by W4ANE, KV4BB, W5MKD and CN8MM. We stayed on 20 meters until the band went dead at 22:05 EST. Then we switched to 40, but it was dead as well so we decided to get some much-needed sleep.

I got up at 5:30 Wednesday morning and put the rig on 40 meter CW. VE3DTN was the first and then W2QHH, KP4WD and W4LVV. At 6:30 I switched to 20 and worked my home station, W4QCW. It was a real thrill to hear my own signal. While I operated, Don and Carl put up an 80 meter long wire. During the wee hours Thursday morning we put the rig on 80 meter CW. First in line were KV4AA then W2QHH, W1ZL, W8PQQ and VE1ZZ. Activity was slow all day Thursday but a bright spot was that Carl made his first ever contact with WN4GMR on 40 CW.

While one of us would operate the other two would explore the island. The only wildlife we saw were many goats, hundreds of birds and some land crabs. During the day we made some improvements on our 80 meter antenna for the last night of operation. During a 30 minute period on 80 we worked WØJDV, W4BRB, ZL1BY, W4KWY and W4QDC/4. The next morning we made a contact with Don's station, W4VZQ on 20 phone. Because conditions were good we had to cut it short.



This is the KC4AB QSL card that was sent to confirm Navassa Island contacts. Note the Bacardi logo; Jose Bosch Lamarque, president of the Bacardi Rum Company supplied his private yacht for the DXpedition.

At 2 PM the *Hatuey* returned and we began to pack. We packed and loaded everything except the essentials to keep the station on the air. At 17:32 I pulled the switch after a contact with W1WK. The first post-war Navassa operation was on the history books and a new DXCC country was born. Four days later we were home to the great relief of six parents. Our final tally was 1357 contacts of which 344 were on AM.

Photos courtesy of J. Robert Eshleman, W4DR.

J. Robert Eshleman, W4DR, an ARRL Life Member, was first licensed as W4QCW in 1950 at age 14. He soon upgraded to Advanced and currently holds an Extra Class license. In 1954 Robert earned DXCC and also participated in the KC4AB DXpedition. In 1969 he received the #1 5BDXCC award and in 2001 the Clinton B. DeSoto Challenge Cup. Robert was elected to the *CQ Magazine* DX Hall of Fame and participated in the YK9A DXpedition to Syria. When not on the air, he is a Professor of General Dentistry at Virginia Commonwealth University. His spouse, Rosalie, N4CFL, and son Curtis, KK4HJ, have both followed in his ham radio footsteps. Robert can be reached at 1818 Manakintown Ferry Rd, Midlothian, VA 23113-9301, **w4dr@arrl.net**.

DXpedition to the Future

A DXpedition should make new hams along with giving out "new ones."

Paul S. Ewing, N6PSE

When you attend your next DX Club meeting or annual Amateur Radio DX Convention, take a look around the room. Yes, the ranks of us DXers are not getting any younger! There is reason for serious concern about the future of DXing and our ability to maintain our hobby into the coming decades. While some young people join the ranks of Amateur Radio operators each year, far fewer will actually become DXers. Some groups, like the Radio Arcala Group (**www.radioarcala.com**) have created an extremely elaborate contest station, complete with mega-antennas and avatars to attract youth into radio and contesting in Finland. Their concept invites young people to come to where we are, into our domain and to see what we can do.

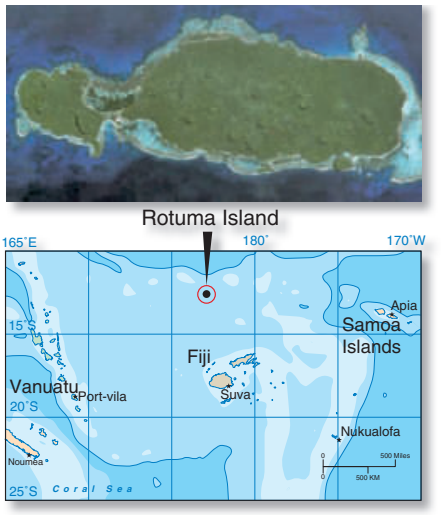
This article goes a step further. It takes radio to where the youths are and prepares them with real-world on-the-air experiences so that they may join our ranks as ready-made DXers. I call this concept Amateur Radio Youth Development.

I first saw Amateur Radio Youth Development during the 2010 YI9PSE DXpedition to the Kurdish region of Northern Iraq. While we were there, team member David Collingham, K3LP, and several members of the team visited a local Kurdish school to talk about Amateur Radio and technology in general. David created a school to school partnership with a classroom in California that continues to this day. We were also very glad to donate a complete station, including an HF rig, vertical HF antenna and feed line, and a logging laptop to our Iraqi team member Heathem Sabah, YI1UNH, who is now quite active with this equipment from his home in Baghdad.

During our visit to Juba, South Sudan with the STØR DXpedition in 2011, we proudly demonstrated Amateur Radio to 24 boys from the Juba Boys Secondary Academy. These students really enjoyed visiting the STØR shack and hearing the many contacts made around the globe.

Introducing Amateur Radio to Rotuma High School

Most DXpeditions have several goals in mind. Obviously, they include making many contacts to make the "deserving" happy. Our September/October 2011 DXpedition to Rotuma Island in the South Pacific as 3D2R (**www.yt1ad.info/3d2r/about.html**) had another goal in mind. We wanted to introduce Amateur Radio to the young people of Rotuma and we wanted to equip them accordingly so that a legacy of ham radio would remain behind, long after our visit.



During the voyage to Rotuma, our leaders, Hrane, YT1AD, and David, K3LP, shared with the team their desire to introduce Amateur Radio to the Rotumans. They asked for a team of volunteers to work with them during their rest periods to expose the younger people of Rotuma to Amateur Radio and ultimately to train them in making contacts. They also wanted to donate some of our equipment so an amateur station might be operational well after we were gone. After our arrival, Hrane shared his desire with the island chief and the principal of the Rotuma High School. He was invited to bring a team of trainers to the school and begin the introduction of Amateur Radio. The principal set up an assembly of all 200 students and allowed the DXpedition team to give a presentation on Amateur Radio to the entire school.

Soon, a group of 24 students and four teachers was assembled to go through daily Amateur Radio classroom training. The training started with a blackboard demonstration of the various components required to operate a station.

In the following days, the kids practiced making contacts with small VHF portable radios. The kids really got excited and picked up most aspects of ham radio very quickly. The high school principal and the island council chief also attended the ham radio training and took great interest in this project!

On the last days of our DXpedition, the teachers brought the students to our shack. They delighted in actually sitting down with the DXpedition team and making real contacts with the DX community on SSB. Each student and teacher made contacts and gave their name. Some were nervous, but they all enjoyed the activity and marveled at how easy

Atilano de Oms, PY5EG, teaches radio theory to the students at Rotuma High School.

David, K3LP (seated foreground) and Jose, EA7KW (seated rear) are lost in a sea of Juba students curious about the STØR station.

it was to speak to someone thousands of miles away.

Hrane, YT1AD, also arranged for the Fijian Communications authority to issue club license 3D2RI to Rotuma High School. As we were concluding our DXpedition, we delivered a complete HF radio station to the school including a Kenwood TS-570 radio, Cushcraft A3S triband Yagi, 200 feet of coax, a power supply, laptop computer for logging and Heil headset. We also gave them $1700 to help sustain the station for the future, arranged for them to receive 2000 QSL cards and have an Internet connection for a year.

We have delighted in the fact that the Rotuma club station has been active on many evenings since we have returned home. We are corresponding regularly with the staff and students to help them learn about this wonderful hobby of Amateur Radio.

David, K3LP (left) and Al, K3VN, watch over the Addis Ababa students while they take their Extra and General class exams.

With 57 new hams under their belts the VE team has a right to smile. Shown here from the left are Bill, N2WB; Paul, N6PSE; Dave, K3LP; Al, K3VN, and Sid, ET3SID.

Youth Development in Ethiopia

In December 2011 we finished another Amateur Radio Youth Development activity in Addis Ababa, Ethiopia.[1] Following our August 2011 STØR DXpedition to Juba, South Sudan, David, K3LP, visited Sid May, ET3SID, in Addis Ababa. Sid had been able to set up an Amateur Radio club station at Addis Ababa University. Unfortunately, there was no means within Ethiopia for the students to get their license and to become active from the club station.

David learned that Ethiopia has no government licensing or testing body and that it is virtually impossible for Ethiopians to obtain a license from their country. He did learn that there is a reciprocal licensing process for holders of foreign licenses to become licensed in Ethiopia. When David returned from Ethiopia, he set about forming a team of Volunteer Examiners (VE) and I became one of the members. David brought his team, consisting of Al Hernandez, K3VN; Bill Beyer, N2WB, and myself, to Addis Ababa in December 2011.

David had worked with Sid May, ET3SID, to prepare 62 students of the Addis Ababa University for the US Technician, General and Extra exams. Of the 62 students tested, five of them earned their Extra class licenses, 36 earned their General class licenses and 16 earned their Technician class licenses. Only five students failed to earn a license.

The five Extra class license holders, including Sid, ET3SID, are now being prepared by David to become VEs so that a long legacy of Amateur Radio can continue at Addis Ababa University.

In addition to arranging for the testing and licensing of the students, David agreed to pay all license fees, which will be approximately $1000 USD. David has also donated a significant amount of equipment to the Addis Ababa club station, ET3AA, including a new laptop computer for logging, an Ameritron amplifier, Heil headset, low band antennas and coax cables.

As you can see, Amateur Radio Youth Development can be very successful, particularly if you take the concept of Amateur Radio directly to the youths. If you give them real world on the air experiences and the means to obtain a license to use their new found skills, you are preparing them for a long and enjoyable experience as Amateur Radio operators.

As a final note, the five Extra class license holders and Sid, ET3SID, are all now ARRL VEs. They tell David, K3LP, that they are preparing to test 110 more students for their US Amateur Radio licenses.

This is the kind of activity that will best serve the future of Amateur Radio and DXing.

[1]J. DeLoach, WU0I, "Amateur Radio in Ethiopia," *QST*, Mar 2012, p 68.

Photos courtesy Paul S. Ewing, N6PSE.

Paul S. Ewing, N6PSE, an ARRL® member, is a retired Silicon Valley technology executive.

Paul has been an Amateur Radio operator since 1982. Since 1992 he has been a serious DXer and has operated from many countries in Europe and the Middle East, and from Vietnam. He has also operated from much of the Caribbean.

Paul led the April 2010 YI9PSE DXpedition and was coleader of the STØR DXpedition to the Republic of South Sudan. He was a member of the 3D2R-Rotuma Island DXpedition in September-October, 2011. Paul is a Life member of the ARRL and an A-1 Operator. Paul's proudest accomplishments are that his 13 year old son Ryan, N6RYN, and his 23 year old daughter Michelle, KJ6DOM, enjoy Amateur Radio almost as much as he does. Paul can be reached at 3052 Wetmore Dr, San Jose, CA 95148-3134, **n6pse@arrl.net**.

Ontario Times Four

You're going to have to sweep a little harder to clean up in November.

Ward Silver, NØAX

"Wait a minute…what was your section? Ontario what? Greater what?" Don't let that be you in the upcoming ARRL® November Sweepstakes and ARRL 160 Meter contests! VE3 stations will be giving out four brand-new Radio Amateurs of Canada (RAC) section abbreviations as part of their exchange. This can be mighty confusing to logging software that is expecting the old "ON" or "VE3." When did this happen? And why?

More People — More Sections

By any standards, the Ontario province of Canada is huge. With just over 1 million square kilometers of area, it is home to 13.4 million people — 39% of Canada's total population — and 60% of the country's amateurs.[1] Most of this population is concentrated in the city of Toronto and surrounding municipalities. By 2010, it had become clear that trying to manage Ontario as a single RAC section was becoming untenable. Imagine California as a single ARRL section and you have the same situation.

In August of 2011, the RAC Field Services organization formed the Ontario Section Restructuring Commission with the mission of "improving representation to our members and to ensure that the task of our section managers is realistic in terms of member access and service." Led by Bill Unger, VE3XT, the commission had to consider differences in needs and responsibilities for representation and leadership across the province. Comments were solicited from clubs and individuals throughout the province.

On February 6, 2012 the commission announced the Ontario section would be dissolved and replaced by four new provinces: Ontario North (ONN), Ontario East (ONE), Ontario South (ONS) and Greater Toronto Area (GTA).[2] Each new section would have its own management structure led by a section manager (SM). While GTA would be composed of municipalities, the three more rural sections would be formed from existing Emergency Management Operations (EMO) sectors as shown in Figure 1. The SMs would participate in an Ontario Council to manage field service functions that were most logically handled at the province level. Four new SMs were appointed and the transition process began. By September, the four new sections were up and running!

Figure 1 — The four new Ontario sections — Ontario North (ONN), Ontario East (ONE), Ontario South (ONS) and Greater Toronto Area (GTA) — are composed of smaller Ontario districts. A complete list of districts in each section is available at **https://www.rac.ca/en/rac/public-service/field-org-review/Ont_Section_Boundaries.pdf**. [Radio Amateurs of Canada]

CQ Sweepstakes

This would be entirely the business of the Canadian Field Services organization except for the small detail of the largest domestic radiosport event of the year — ARRL November Sweepstakes (**www.arrl.org/sweepstakes**). Attaining the coveted "Clean Sweep" mug requires contacts with each and every ARRL and RAC section from the Pacific (PAC) to Newfoundland (NL) and from South Florida (SFL) to the chilly combination of Yukon, Northwest Territories and Nunavut (NT). Many a Clean Sweep effort has foundered one Canadian province short of the goal!

With one easy-to-work section disappearing (Ontario) and being replaced by four new sections (ONN, ONE, ONS and GTA) the total number of sections is now 83 (80 – 1 + 4). It is likely that GTA will be the most common section heard on the air, with ONE and ONS close behind. What about the wide-open spaces of ONN? Sweepstakes veterans will recall the nervous beads of sweat as previous new sections Northern New York (NNY), West Central Florida (WCF) and Eastern Washington (EWA) remained unworked late in the contest. Plans have been made to make sure every one of the new sections is well-represented — but take nothing for granted!

Upgrade Now!

Along with prowling the bands for suddenly-rare VE3 stations, make sure your logging software is aware of them, too. Typically, the software uses a file containing lists of recognized abbreviations — if that file is out of date and you try to enter one of the new abbreviations, it's likely that you won't be able to convince the software to accept it. In the hurly-burly of a busy contest, this can be plenty frustrating!

All of the major contest logging software providers are well aware of the new sections and have amended their section lists. It is likely that new versions of general-purpose loggers are available, too. Don't wait until Saturday morning of the contest to upgrade — do it now or risk inviting Mr Murphy to visit your shack computer!

VE3 stations will be giving out four brand-new Radio Amateurs of Canada (RAC) section abbreviations. We don't anticipate hearing many VE3 stations giving out the old ON section. If you do, ask them for their district and use the map or website to suggest the correct new section. The log checkers will do their best to insure that everyone receives proper credit for what they've worked.

In case you experience software difficulties, it's not a bad idea to keep paper and pencil handy for notes about what station was giving out what abbreviation. After the contest you can edit your plain-text Cabrillo-formatted log to show the correct section.

Ready, Set Go!

No surprises during Sweepstakes and the 160 Meter Contest, right? Right! Good luck in the contest this year and we hope to be shipping you your brand-new, 83-section Clean Sweep Mug. Welcome to the four new sections — we'll be looking for you!

[1] **www.canadafacts.org**
[2] **www.arrl.org/news/rac-to-split-ontario-into-four-sections**

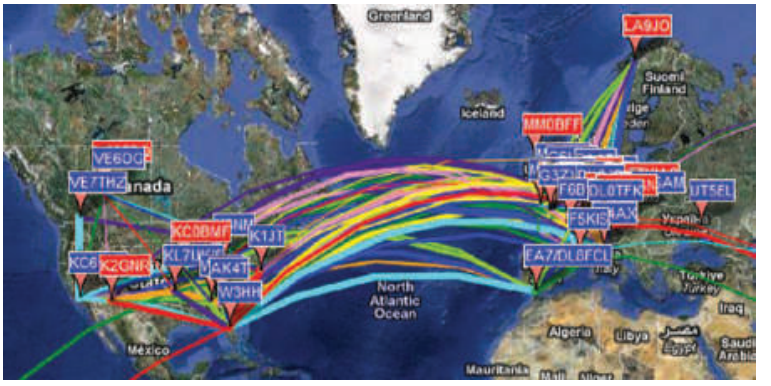
H. Ward Silver, NØAX, is an ARRL Contributing Editor. He can be reached at **n0ax@arrl.org**.

Zombie Bands

Dead bands can get up and walk.

Steve Sant Andrea, AG1YK

When was the last time you saw band conditions predicted to be excellent? Yeah, I can't remember either. Solar Cycle 24 hasn't been breaking any propagation records. Its predicted peak in early 2013 is not promising that 12 and 10 will spring to life for worldwide 5×9 communications and 20 meters open 24/7. This anemic situation is expected to continue throughout Cycle 24 and has caused a kind of population problem on 20 meters and below. The chance of an opening are much greater below 14 MHz, which means that under present conditions more than half of our HF bands are "dead" most of the time.



A WSPRnet map of 1 hour's activity. By focusing in on the US a sudden burst of activity can alert you to a dead band springing to life. [courtesy Joe Taylor, K1JT, and Bruce Walker, W1BW]

A band goes dead when the maximum usable frequency (MUF) is below the band. For example, if the MUF is at 15 MHz at your location then 20 meters will be open, but if you transmit on 21.300 MHz, above the MUF, the ionosphere will not act as an effective mirror for your signal and most of it will pass through the F layer into space.

Solar Cycle 24 hasn't been breaking any propagation records.

"So that's the end of that," you say. "It's time to drop down to 40 if I want to contact anyone." Not exactly. It's true, you probably won't log any great DX but short to medium range contacts are possible. We are still approaching a solar maximum. Even though it's predicted to be an underwhelming maximum, it still generates various types of intermittent propagation that can produce exciting contacts.

10 By 20

Recently, I was listening to 10 meter phone. Nobody was home. I spun the dial and nothing. I spun across the phone subband and kept hearing nothing but static. I set myself on a frequency around 28.5 MHz and called CQ for a while. Nothing. I gave up and moved down to join the crowd on 20.

Tuning around 20 I came upon a special event (SE) station that had a modest pileup going. I like to work SEs so I joined in. After about 15 or 20 minutes I was having no luck when the SE announced a change of operator and band. They were going to move up to 10 to try to hand out some contacts up there. Well, at first I figured the SE would be back in a few minutes. Why not just hang on this frequency and wait. It sounded like a plan, but then I had second thoughts. Old Miss Propagation (a great granddaughter of Mother Nature) can be a fickle gal.

I hit the A/B switch on my TS-2000 transceiver to switch to VFO B while leaving VFO A on the 20 meter frequency. I tuned B to the 10 meter frequency and listened. Lo and behold, there he was. He wasn't strong, maybe S4, but with the lower noise level (a dubious benefit of weak propagation), he was R4. There were other stations calling but not as many. I jumped in and had him in the log in 5 minutes. Now remember it had only been about a half an hour since I gave up on 10 for being "dead." Yet here I was with an SE a thousand miles away in the log, nice and easy.

Good, very good and excellent conditions will happen...

Zombie Jamboree

Whether the propagation conditions that permitted me to log my SE had been present a half an hour before when I came up empty, I can't tell. It's possible that the improved conditions only occurred just before the SE moved up to 10. That's the problem when propagation is weak. Good, very good and excellent conditions will happen, but they will occur over areas that are more limited and for shorter periods of time.

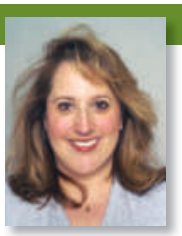
So how do we get the dead bands to jump up and dance? A good place to start is to hunt around for some of the beacons that are available on every band. The AC6V website has an excellent list of beacons at **www.ac6v.com/beacons.php**. Another useful site is WSPRnet (**wsprnet.org**). WSPRnet is more limited in that it only displays results submitted by stations running its software.

Nevertheless, you can see a map showing signals received, which is useful to determine if some ionospheric event may be occurring that is improving conditions on the dead band. Such events, such as sporadic E, are often fleeting but can allow good contacts across a fairly wide area. Also, remember ionospheric events such as sporadic E can *drift*. It might just drift your way. Lastly, the DX spotting websites such as **www.dxsummit.fi** have lists of stations spotted by band. This can also be helpful to determine just how "undead" a band might be.

When all is said and done, though, keying the transmitter is the only way to be sure how the band is behaving. You might not get a quick response to your call, but by putting a signal out there yourself, rather than waiting for the other guy, the two of you might breathe some life into the zombie.

If ol' Sol continues like this, "good" conditions may be the best we see for the next year or two. After that, it's downhill toward another minimum. So let's meet the challenge of raising the dead and not miss out when the dead spring to life.

Steve Sant Andrea, AG1YK, is an ARRL® Assistant Editor. He can be reached at **ag1yk@arrl.org**.



S. Khrystyne Keane, K1SFA, k1sfa@arrl.org

James Millsap, WB4NWS, Appointed ARRL Southeastern Division Vice Director

Andrea Hartlage, KG4IUM, resigns post to pursue her career outside the Southeastern Division.

On August 1, ARRL President Kay Craigie, N3KN, appointed James Millsap, WB4NWS, of Acworth, Georgia to the position of ARRL Southeastern Division Vice Director. Vice Director Andrea Hartlage, KG4IUM, resigned because she has accepted a job outside of the Division. Millsap's appointment runs until noon January 1, 2014.

"Although I will miss Andrea at ARRL Board meetings, I am extremely pleased that she received an excellent job offer right out of college," said Craigie. "In fact, the whole ARRL Board of Directors is proud of her success in taking the first step towards her professional career. I know she will continue to contribute to Amateur Radio in the future, because that's the kind of person she is. It's my pleasure to appoint Jim Millsap, WB4NWS, to complete the present term as Vice Director of the Southeastern Division. We are fortunate that Jim is able to step forward and join Director Greg Sarratt, W4OZK, on the Division's leadership team. Jim's background in the ARRL Field Organization will be an asset to the Board, and I appreciate his willingness to accept this opportunity to serve his fellow members of the ARRL."

ARRL Southeastern Division Vice Director Andrea Hartlage, KG4IUM (seen here at the AM station in the ARRL Lab's museum room), resigned from the ARRL Board of Directors August 1.

James Millsap, WB4NWS, the new ARRL Southeastern Division Vice Director.

Hartlage said that her decision to move outside the Southeastern Division was not an easy one and called it "one of the most difficult decisions I've ever had to make. I thought long and hard about it, but in the end, I had to look at the big picture and choose the path that puts me in a position to pursue my future goals, both personal and professional. It has been my pleasure serving as your Vice Director. I have thoroughly enjoyed meeting each of you at hamfests, attending club meetings, and helping to represent you to the ARRL Board. I want to express my deep and sincere appreciation to each one of you for your support over the past year and a half. Serving you and representing the Southeastern Division on the ARRL Board has been one of the most humbling and gratifying experiences of my life. I will miss you all."

Hartlage said that even though she will no longer be a member of the Southeastern Division or a Board member, she plans to remain involved in ham radio and to continue serving the Amateur Radio community and looks forward to becoming an active member of the Roanoke Division.

"It has been a pleasure working with Andrea," Sarratt said. "Her youth, energy and experience proved to be great assets to the Board, and she has been a very capable ARRL Vice Director.

Sarratt said that Millsap will be a "talented, qualified and capable ARRL Vice Director. Jim has been instrumental in bringing new hams into the hobby from 1980 to now. He has served as ARRL Assistant Emergency Coordinator for Cherokee County ARES since 2002, was appointed ARRL Emergency Coordinator in 2010 and has been the ARRL District Emergency Coordinator for Metro Atlanta District since 2011. Jim also serves as a Volunteer Examiner and is the Georgia Net Manager for the weekly Digital PSK-31 net. He was selected Georgia's 'Ham Operator of The Year' by his peers for his volunteer work in 2010 for Georgia ARES. Jim enjoys bringing new hams, both young and 'seasoned' into the hobby. He is active in working HF contests, voice and digital, weekly nets, is a VHF/UHF simplex enthusiast and enjoys building homebrew antennas, and is active in supporting annual Field Day and Simulated Emergency Tests; he strongly believes in building quality relationships with fellow hams and public safety organizations. Jim has a proven track record as a leader, mentor and instructor with an extensive background in the field of radio and telecommunications and specialized experience in disaster communications and recovery in support of state, regional and local emergency management agencies."

FCC Denies Petition Seeking to Designate Nationwide Emergency Calling Frequency

Saying that it believes that the Amateur Service "allows flexibility to provide emergency communications in a way that takes into account channel availability and other local conditions," the FCC denied a Petition for Rulemaking to create a nationwide emergency calling frequency. The *Petition* — filed by Bryan Boyle, WBØYLE, of Morrisville, Pennsylvania, and Jim Dixon, WB6NIL, of Alhambra, California — called upon the FCC to designate 146.550 MHz as a "non-exclusive nationwide Amateur Radio Service emergency communications channel using FM wideband modulation."

Doyle and Dixon noted in their *Petition* that other services, such as the Citizens Band Radio Service, the Aviation Service and the Maritime Service have specific channels set aside for emergency communications. They claimed that use of these channels "to good effect by those in distress [and that this] is a testament to the need for individual services to have a readily accessible and publicized" emergency communications channel. In denying the *Petition*, the FCC said in part that Boyle and Dixon "had not shown an existing problem that would be addressed by a rule change designating a nationwide Amateur Service emergency calling frequency."

The FCC told Boyle and Dixon that the rules of the Amateur Radio Service allow "an amateur station to transmit one-way messages necessary to providing emergency communications," maintaining that these messages may "be transmitted on any frequency authorized [by] the control operator of the amateur stations transmitting the messages. Additionally, the rules require that, at all times and on all frequencies, each control operator must give priority to stations providing emergency communications. Administration of these rules is accomplished primarily through voluntary frequency planning by, and cooperation among, Amateur Radio operators."

Pointing out that its Wireless Telecommunications Bureau had previously considered establishing a nationwide common calling or distress channel "in a service where transmission of such communications is permitted but not required... and the channels are shared by all users," the FCC said it had concluded that "it was not necessary to designate a Family Service Radio (FRS) channel for establishing emergency communications because emergency communications have a priority on all FRS channels and the record did not demonstrate that FRS users were having any difficulty establishing communications."

The FCC did note, however, that unlike channels in the Citizens Band Radio Service and the Maritime Service, channels in the FRS are not routinely monitored by emergency first-responders: "Like the FRS, the Amateur Service differs from the services in which our rules designate a nationwide emergency calling channel in that it is not routinely monitored by safety entities such as the police or the Coast Guard. Additionally, those services do not require an individual to have an operator license or otherwise demonstrate the ability to operate the station by performing such functions as selecting transmitting channels to avoid interference. Therefore, we believe the administration of these services primarily through operational rules that specify the use of a channel and transmitter technical standards is reasonable."

The FCC observed that under the current rules of the Amateur Radio Service, operators can use "multiple channels on the same or different amateur band if needed for an event, or use multiple channels in the same band when multiple, but different events occur." It also mentioned that the Boyle and Dixon's proposal "that the channel be a 'non-exclusive nationwide' channel is, substantively, no different from current channel priorities because all Amateur Service channels are shared and may be used for providing emergency communications. If such a 'non-exclusive nationwide' channel is needed, nothing in our rules prevents the amateur community from voluntarily agreeing to designate a channel for this purpose. We conclude, therefore, that you have not shown an existing problem that would be addressed by a rule change designating a nationwide Amateur Service emergency calling frequency."

Heathkit Declares Bankruptcy, Closes for Good (Again)

The July 19 edition of *The Herald-Palladium* — a newspaper serving the communities of Benton Harbor and St Joseph, Michigan — reported that Heathkit Education Company has declared bankruptcy and has officially closed its doors after defaulting on its lease. According to the paper, Heathkit employed more than 1800 people in its heyday after World War II; when it finally closed, its workforce totaled fewer than six people. This is the second time since 1992 that Heathkit Educational Services has shuttered its doors. In August 2011, Heathkit announced it was returning to the kit building business, and in September, that it would once again be manufacturing Amateur Radio kits.

Heathkit owner Don Desrochers told the newspaper that he has filed for bankruptcy and a bank now owns what's left of Heathkit; the bank is disposing of some items via online auctions. "The situation was purely one of the economy," he explained in the article. "Heathkit was primarily dependent upon federal and state funding for schools. Spending in education continued to drop down, and it was economically unfeasible to continue operating. When we got back into the kit business, we were losing the education business faster than we were growing the kit business. It was not sustainable."

According to the newspaper, Heathkit abandoned its lease around March, and in May, Phil Maki said he received notice that Desrochers had declared bankruptcy and that Heathkit would be closed. Maki is treasurer of Southshore Companies, the company that owns the building that Heathkit had leased a portion of. "It's a sad thing for the community," Maki said. "A lot of us grew up using Heathkit products, and it's sad they ended the way they did."

In May 2012, the ARRL reported there were rumors of the company's demise, but nothing was certain. Tom Ferriter, of Technical Education Products in Hampden, Massachusetts, told the ARRL at that time that "Heathkit is telling us [outside sales representatives] that they have temporarily closed, but that they are hopeful that they will be able to reorganize. While they're not telling us too much, they did say that they were having poor sales for a myriad of reasons and are hopeful that they will be able to refinance the company and negotiate with the bank to refinance some of the debt."

FCC News

Vanity Call Sign Fee Now $15: Effective September 4, the price of an Amateur Radio vanity call sign increased by 80 cents, from to $14.20 to $15. 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 10 year term. 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. According to the FCC, the fees that are collected from vanity call signs are used to offset the cost of monitoring and researching new call sign requests to prevent the issuance of duplicate call signs. When asked why the fee is payable upon renewal, the FCC stated in 2011 that "[m]ore than likely, fees that are collected only on new issues and at the time of changes in call signs will not generate sufficient revenues to offset the cost of managing and monitoring this work at the Commission. Therefore, we conclude that the basis upon which the Commission collects fees on Amateur Radio Vanity call signs will not change." In Fiscal Year 2012, the FCC expects to grant 14,300 vanity call signs, bringing in $214,500 from the vanity call sign program, and looks to recover a total of $339,844,000 in fees from all the Services that it regulates.

Nominations Open for George Hart Distinguished Service Award

The ARRL Board of Directors established the George Hart Distinguished Service Award in July 2009 to be given to an ARRL member whose service to the League's Field Organization is of the most exemplary nature. The Distinguished Service Award is named in honor of George Hart, W1NJM, the long-time Communications Manager at ARRL Headquarters and chief developer of the National Traffic System (NTS).

Selection criteria include:

- Operating record with the National Traffic System; or
- Participation within the Amateur Radio Emergency Service® (ARES®); or
- Station appointments and/or leadership positions held within the ARRL Field Organization.

Nominations for the George Hart Distinguished Service Award shall be accepted from anyone and shall be submitted to the Membership and Volunteer Programs Manager at ARRL Headquarters by November 1, 2012. Nominations should document as thoroughly as possible the nominee's lifetime activities and achievements within the ARRL Field Organization. It is expected that nominated candidates will have 15 or more years of distinguished service. The Programs and Services Committee will serve as the Review Committee, with the Board of Directors making the final determination at its Annual Meeting in January. Recipients will be given an engraved plaque and cover letter and will be profiled in *QST*.

Nominations for the George Hart Distinguished Service Award, including any related supporting material and letters of recommendation, may be e-mailed to ARRL Headquarters to the attention of ARRL Membership and Volunteer Programs Manager Dave Patton, NN1N, at **nn1n@arrl.org**, or to ARRL Field Organization Team Supervisor Steve Ewald, WV1X, at **wv1x@arrl.org**.

In Brief

- **Ivica Dačić, YU1YU, Elected Prime Minister of Serbia**: Former Serbian Internal Affairs Minister Ivica Dačić, YU1YU, was elected as that country's newest Prime Minister on July 27. He succeeds Mirko Cvetković, who served as Serbia's Prime Minister from 2008-2012. Dačić is the leader of the Socialist Party of Serbia (SPS); from 2008 until his election as Prime Minister, he served as First Deputy Prime Minister, as well as Minister of Internal Affairs. Dačić has served as president of the SPS since December 2006. He also served as the spokesman for the Socialist Party of Serbia, from 1992-2000. Dačić holds a degree in political science from the University of Belgrade. Fluent in both Russian and English, he is 46, married and the father of two children.

Section Manager Nomination Notice

To all ARRL members in Arizona, Arkansas, Iowa, Kentucky, Mississippi, Montana, North Texas, Orange and Wyoming: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. It is advisable to have a few more than five signatures on each petition. A sample nomination form is available on the ARRL website at **www.arrl.org/section-terms-nomination-information**. Nominating petitions may be made by facsimile or electronic transmission of images, provided that upon request by the Membership and Volunteer Programs Manager, the original documents are received by the Manager within seven days of the request.

We suggest the following format:

(Place and Date)

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

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

(Signature___ Call Sign___ City___ ZIP___)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on December 7, 2012. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 2, 2013, to full members of record as of December 7, 2012, which is the closing date for nominations. Returns will be counted February 19, 2013. Section Managers elected as a result of the above procedure will take office April 1, 2013.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 2013. If no petitions are received from a section by the specified closing date, such section will be resolicited in the April 2013 *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Membership and Volunteer Programs Manager. — *David Patton, NN1N, Membership and Volunteer Programs Manager*

Rick Palm, K1CE, k1ce@arrl.org

ARRL Partner: NWS/SKYWARN

Founder of SKYWARN Silent Key

Merle Kachenmeister, WA8EWW, who became a Silent Key in May, was the founder of the SKYWARN system.

It was April 1965, and the Palm Sunday Tornado Outbreak had just devastated a large portion of the heartland of America. According to the Storm Prediction Center database, 48 tornadoes stretched across Wisconsin, Iowa, Illinois, Indiana, Michigan and Ohio, killing 260 people. There were reports of 1500 to 3400 injuries that day. With 17 tornadoes rated as F-4, and it being the second deadliest tornado outbreak up to that time, a service assessment team of five people was deployed. The team published their findings three weeks later, in a 64 page report. Many significant findings of the assessment dramatically changed the way the warning program was run in the National Weather Service and within our communities.

Recommendations included the expanded use of civil defense sirens for tornadoes, an increase in the number of weather radars in the Midwest, the use of FM radio to broadcast warnings (later, the idea was to become the NOAA All-Hazards Weather Radio system), and the formal implementation of the terminology *Tornado Watch* and *Tornado Warning* along with the policy for their use. Dr. Ted Fujita also first noted suction vortices while reviewing the event afterward.

One final recommendation — "Increase the number of trained weather spotters to report severe weather to the local office" — led to the creation of the SKYWARN Weather Spotter Program. The program origins have been not as well-known nationwide until recently, when the granddaughter of Merle Kachenmeister, WA8EWW, reached out on the SKYWARN Spotter Facebook page to post that her grandfather, the creator of SKYWARN, had passed away on May 29, 2012.

In 1965, Mr Kachenmeister was employed at the National Weather Service Office in Toledo, Ohio. He was an avid Amateur Radio operator and a Navy veteran. Upon seeing the recommendation for the increase in trained weather spotters, he organized the "Tri-State Weather Network" based on a similar program from the south called "Skywatch." After the first year was a success, the program went on to nationwide implementation with the name "SKYWARN."

Kachenmeister retired from the NWSO Toledo office after serving the NWS for 20 years. An article on his retirement in the Toledo *Blade* on September 27, 1979 stated, "He has received many commendations during his 32 years as a weather forecaster, but he says that none mean more than the Bronze Medal awarded him in December, 1974, by the US Department of Commerce for organizing and operating the severe weather network."

Retired NWS personnel recall there being reports called in prior to 1965, but the formal organization of the network, and the name SKYWARN is credited to Kachenmeister.

— Tanja Fransen, Warning Coordination Meteorologist, NOAA/National Weather Service Glasgow, Glasgow, Montana

ARRL/NWS SKYWARN® Longtime Partners

The ARRL and the NWS have enjoyed a longstanding (since 1986) Memorandum of Understanding (MOU) that has served as a framework for coordination of services, facilities, and equipment in support of nationwide, state, and local early weather warning and emergency communications functions. The *MoU* was updated just last year. In May 2011, ARRL President Kay Craigie, N3KN, signed on behalf of the ARRL, and in June, NWS Office of Climate, Water and Weather Services' Director Dave Caldwell signed on behalf of the NWS.

The NWS acknowledged that Amateur Radio operators can be of valuable assistance in early severe weather warning and tornado spotting. Through its SKYWARN program, the NWS recognizes that Amateur Radio operators have assisted as communicators and weather spotters since the program began in the late 1960s. "In areas where tornadoes and other severe weather have been known to threaten, the NWS recruits volunteers and trains them in proper weather spotting procedures," the *MoU* states. "These dedicated citizens help keep their local community safe by conveying severe weather reports to their local NWS forecast office. SKYWARN spotters are integral to the success of our nation's severe weather warning system."

"All the National Weather Service personnel I've met throughout the country have told me how much they respect and depend on the Amateur Radio SKYWARN volunteers in their forecast areas," Craigie said. "This year's weather disasters underscore the importance of amateurs becoming trained severe weather spotters and participating in SKYWARN. It's a pleasure for me to work with the National Weather Service, both as an ARRL official and as a local SKYWARN volunteer."

"The relationship between the National Weather Service and the ARRL has been a model partnership for many years," said ARRL Emergency Preparedness Manager Mike Corey, KI1U.

Tropical Storm Debby Spawns Severe Weather and SKYWARN Response

On Sunday, June 24, 2012 Tropical Storm Debby spawned severe weather in Pinellas County, Florida, particularly in the Pass a Grille area of St Petersburg. The Pinellas County SKYWARN net was activated at 10:35 AM with the issuance of a Severe Thunderstorm Warning. The net remained active at several different alert levels for just over 11 hours, until 9:45 PM that evening. In all, 27 Amateur Radio operators checked in to the net and four operators rotated duties as net control.

The most significant event occurred in the evening, when one of 10 tornadoes spawned by Debby touched down in southern Pinellas. At 8:14 PM, a Tornado Warning was issued for the county as radar indicated a tornado near Ft Desoto Park, moving north. The Net was immediately moved from standby to code red. For Pinellas County, code red means severe weather is imminent. At 8:23 PM, Jack Satterfield, W4GRJ, reported multiple power transformers blowing in the Pass a Grille area and advised that his son's house located just south of his location had a window blown out. This report was relayed to the NWS within 1-2 minutes. The NWS put this report in a Severe Weather Statement released shortly afterward. Satterfield made follow up reports of roofs torn off of buildings and power lines down, all of which were relayed to NWS.

Post storm surveys by the NWS indicated an EF-1 tornado with winds of 80-85 mph had touched down in Pass a Grille at 8:21 PM and lifted at 8:25 PM. The tornado had a path length of 3.3 miles and a width of 50 yards. The tornado actually started as a waterspout that then moved onshore. Damage included a tourist rental building that had the top unit removed/destroyed; fortunately no one was in this top unit.

When asked about the way the reports were passed on to the National Weather Service, Justin McBride, KJ4REU, Pinellas SKYWARN Coordinator replied: "Our net maintained contact with the National Weather Service throughout the event using the NWS online chat system, which allows us to interact directly with the forecasters in real time and quickly relay reports received from our spotters." McBride added, "This event highlighted the unique ability of SKYWARN Amateur Radio operators to get reports to the NWS well ahead of other sources. The reports of the tornado damage in southern Pinellas from the spotter located in Pass a Grille were relayed to the NWS 10 minutes before 911 and the media received and/or relayed the information."

Asked to summarize the performance of the SKYWARN spotters, McBride said: "Our SKYWARN activation for Tropical Storm Debby underscored the value of training, organization, and frequent practice in our program, which allowed us to respond effectively to the situation. Although ultimately the damage and injuries associated with this storm system were only minor to moderate, the event gave us additional experience, which will better prepare us for future, more severe events." — *source: Kevin Poorman, KV4CT, West Central Florida Public Information Coordinator*

References

NWS Northern Indiana Palm Sunday 1965 History/Service Assessment References: **www.crh.noaa.gov/iwx/program_areas/events/historical/palmsunday1965/index.php**.

Storm Spotter program history: **www.cimms.ou.edu/~doswell/spotter_history/spotter_history.html**.

SKYWARN and Training: **www.nws.noaa.gov/skywarn/**.

The ARRL recommends its publication *Storm Spotting and Amateur Radio* as a resource for Amateur Radio operators seeking more information about severe weather reporting and SKYWARN. The book includes a state-by-state listing of SKYWARN websites: **www.arrl.org/shop/Storm-Spotting-and-Amateur-Radio/.**

Letters: On Mental Health Risks

◆I read your article *ARES, EmComm and Mental Health Risks*, July 2012 *QST*, on your experiences. Thank you for sharing them. I'm a Volunteer Firefighter, Rescue Diver, and member of a technical rescue team for the county. I'm also trained in Critical Incident Stress debriefing.

Unfortunately, at the time of your incident (1978) the attitude was just "suck it up and go on." Back then, many in the fire service learned ways to cope with the issues you describe by holding them in. Or, they used defense mechanisms that were acceptable to the internal culture at the time; eg, through the sharing of horror stories of calls present and past, often accompanied by dark humor. Those mechanisms, accompanied by the "family" concept of being there for each other, were all there were.

There are still casualties of emergency service today, of course. Your story may have helped many of those people. Today, we use semi-formal after-event counsel sessions that focus on education, acceptance, and the things we can do to help live with what we see. Critical incident stresses are unique to each individual. Some are obvious (death of a child or fellow firefighter) and others are not as obvious (someone or something on a call that triggers a personal memory). For most people, understanding and accepting the fact that the stressor won't be undone and that they are scarred, is healthy: they heal over time, talking about it helps, eating right and going through the steps of grief (be it for the victim of the incident or for your own personal, former innocence) helps. Sometimes the cost of helping others is a piece of yourself. — *The Rev Martin Walsh, KB3WFE, Member/Diver/Driver Susquehanna Hose Company; Member, Harford County Technical Rescue Team; Havre de Grace, Maryland*

◆You bring up some excellent points. You said you got mental health help but I am still concerned for you. There are excellent mental health professionals who are equipped to handle critical incident personal and group situations. There are also area organizations that specialize in helping emergency services personnel after "incidents."

As a volunteer fire fighter/EMT for 28 years and Carson City Emergency Management Coordinator for 12 years, my colleagues and I have had some difficult responses. In our early volunteer fire fighting years, we did not realize why some of our members just opted out. The terrible situations for them were never addressed and they/we had no prior briefings on what and how we might prepare ourselves for bad situations.

Today, Critical Incident Stress Management became available as national training and area response teams bought into the process. As a previous member of Sierra Nevada Critical Incident Management Response Team, we were requested by emergency response personnel many times. With the education and response protocols of this system, we were able to educate responders on what behavior they might experience and tell them how to take care of themselves with proper nutrition and exercise. We always encouraged further mental health help and indeed tried to steer those we really thought needed to follow up to resources.
— *Sheila Clement, KA7AJQ, Carson City, Nevada*

Contest Corral – October 2012

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

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

Start - Finish Date-Time		Date-Time		Bands HF / VHF+	Contest Title	Mode	Exchange	Sponsor's Website
2	0200Z	2	0400Z	3.5-28 / -	ARS Spartan Sprint	CW	RST, S/P/C, and power	www.arsqrp.blogspot.com
2	1600Z	2	See web	3.5 / 50, 144	OK1WC Memorial Contest	Ph CW	RS(T) and serial	www.hamradio.cz/ok1wc
3	7 PM	3	11 PM	- / 432	432 MHz Fall VHF Sprint	Ph CW Dig	4-character grid square	www.svhfs.org
5	0200Z	5	0300Z	1.8-14 / -	SNS and NS Weekly Sprints	CW Dig	Serial, name, and S/P/C	www.ncccsprint.com
5	1400Z	7	0200Z	1.8-28 / -	DX/NA YLRL Anniversary Party	Ph CW Dig	Serial, RST, and section/province/country	www.ylrl.org
6	0000Z	6	2400Z	1.8-28 / 50	PSK Rumble - The Fall Classic	Dig	Name and call area (see website)	www.n2ty.org
6	0000Z	6	2359Z	3.5-28 / -	Worked All Provinces of China	Ph CW	RS(T) and serial or province abbreviation	www.mulandxc.org
6	**0000Z**	**7**	**2359Z**	**- / 2.3G+**	**ARRL EME Contest**	**Ph CW Dig**	**Call signs, sig rpt, acknowledgement**	**www.arrl.org/contests**
6	0400Z	7	0359Z	1.8-28 / -	EPC Russia DX Contest	Dig	EPC member nr or serial and grid square	www.epc-ru.ru
6	0800Z	7	0800Z	1.8-28 / -	Oceania DX Phone Contest	Ph	RS and serial	www.oceaniadxcontest.com
6	1200Z	7	1200Z	14-28 / -	Worked All Britain HF Contest	Ph	RS, serial, DXCC entity or WAB area	www.worked-all-britain.co.uk
6	1600Z	7	2200Z	1.8-28 / 50,144	California QSO Party	Ph CW	Serial and state/prov/"DX" or CA county	www.cqp.org
6	1600Z	6	1959Z	3.5-14 / -	EU Autumn Sprint	Ph	Both call signs, serial, name	www.eu-sprint.com
7	0700Z	7	1900Z	21,28 / -	RSGB 21/28 MHz Contest	Ph CW	Serial and UK district	www.rsgbcc.org
10	0001Z	10	2359Z	28 / -	10-10 Sprint	Ph CW Dig	Call, name, 10-10 number, S/P/C	www.ten-ten.org
10	0030Z	10	0230Z	3.5-14 / -	NAQCC Monthly QRP Sprint	CW	RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
10	1300Z	11	See web	1.8-28 / -	CWops Monthly Mini-CWT Test	CW	Name and member number or S/P/C	www.cwops.org/onair.html
13	8 PM	13	2 AM	1.8 / -	Great Pumpkin Sprint	Dig	RST and S/P/C	www.podxs070.com
13	0000Z	14	1600Z	3.5-28 / -	Makrothen RTTY Contest	Dig	4-character grid square	home.arcor.de/waldemar.kebsch
13	0800Z	14	0800Z	1.8-28 / -	Oceania DX CW Contest	CW	RST and serial	www.oceaniadxcontest.com
13	1200Z	14	1200Z	3.5-28 / -	Scandinavian Activity Contest	Ph	RS and serial	www.sactest.net
13	1200Z	14	2359Z	1.8-28 / -	QRP ARCI Fall QSO Party	CW	RS(T), S/P/C, QRP ARCI number or pwr	www.qrparci.org/contests
13	1600Z	14	See web	3.5-28 / 50,144	Arizona Centennial QSO Party	Ph CW Dig	Name and S/P/C or year and AZ county	www.azqsoparty.org
13	1600Z	13	2000Z	3.5-14 / -	EU Autumn Sprint	CW	Both call signs, serial, name	www.eu-sprint.com
13	1600Z	13	See web	1.8-28 / 50,144	Pennsylvania QSO Party	Ph CW Dig	Serial and ARRL/RAC section	www.nittany-arc.net
13	1700Z	13	2100Z	3.5-28 / -	FISTS Fall Sprint	CW	RST, S/P/C, name, FISTS number or pwr	www.fists.org
14	**0000Z**	**14**	**0400Z**	**3.5-14 / -**	**North American RTTY Sprint**	**Dig**	**Both call signs, serial, QTH, name**	**www.ncjweb.com**
14	0000Z	14	2359Z	1.8-28 / 50	SKCC Weekend Sprintathon	CW	RST, QTH, name, SKCC nr or "none"	www.skccgroup.com
15	**1300Z**	**19**	**2359Z**	**1.8-28 / 50+**	**School Club Roundup**	**Ph CW Dig**	**RST, class and S/P/C**	**www.arrl.org/school-club-roundup-scr**
20	0000Z	21	1600Z	- / 50,144	Arucaria VHF Contest	Ph CW	RS(T) and 4-char grid square	www.avhfc.com
20	0000Z	21	2400Z	3.5-28 / -	JARTS WW RTTY Contest	Dig	RST and age (YL may send '00')	www.jarts.jp
20	0001Z	21	2359Z	28 / -	10-10 Fall CW QSO Party	CW	Call, name, 10-10 number, S/P/C	www.ten-ten.org
20	1000Z	21	1000Z	3.5-28 / -	Scandinavian YLRA Contest	Ph CW Dig	RS(T) and "88" (YLs) or "73" (OMs)	www.sylra.is
20	1400Z	20	2300Z	1.8-28 / 50+	Iowa QSO Party	Ph CW Dig	RS(T) and IA county, state/prov, or "DX"	www.wa0dx.org
20	1400Z	21	0200Z	1.8-28 / 50+	New York QSO Party	Ph CW Dig	RS(T), NY county, state/prov, or "DX"	www.nyqp.org
20	1500Z	21	1459Z	3.5-28 / -	Worked All Germany	Ph CW	RS(T) and serial or DOK code	www.darc.de/referate/dx/contest/wag
20	1500Z	21	1500Z	1.8 / -	Stew Perry Warmup Contest	CW	4-char grid square	web.jzap.com/k7rat/stew.rules.txt
20	1600Z	21	2359Z	1.8-28 / 50	W/VE Islands QSO Party	Ph CW Dig	RS(T) and S/P/C or island designator	www.usislands.org
20	1900Z	21	See web	1.8-28 / 50-432	Telephone Pioneer QSO Party	Ph CW Dig	Year of membership and chapter	www.tpqso.com
20	2000Z	20	2200Z	3.5-7,21-28 / -	Spooky Feld-Hell Sprint	Dig	RST, S/P/C, Feld-Hell member nr	www.feldhellclub.org
21	0000Z	21	0200Z	14-21 / -	Asia-Pacific Sprint	CW	RST and serial	jsfc.org/apsprint/aprule.txt
21	1700Z	22	0100Z	1.8-28 / 50,144	Illinois QSO Party	Ph CW	RS(T) and IL county or S/P/C	www.w9awe.org/ILQP.html
22	0200Z	22	0400Z	1.8-28 / -	Run For the Bacon	CW	RST, S/P/C, Flying Pig nr or power	www.fpqrp.org
24	0000Z	24	0200Z	1.8-28 / 50	SKCC Weekday Sprint	CW	RST, S/P/C, name, SKCC number	www.skccgroup.com
27	0000Z	28	2359Z	1.8-28 / -	CQ World Wide SSB Contest	Ph	RS and CQ zone	cq-amateur-radio.com

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. No contest activity occurs on the 60, 30, 17 and 12 meter bands. Serial = Sequential number of the contact. S/P/C = State, Province, DXCC Entity. XE = Mexican state. Publication deadline for Contest Corral listings is the first day of the second month prior to publication date (October 1 for December *QST*) — send information to **contests@arrl.org**. Listings in blue indicate contests sponsored by ARRL or *NCJ*. The latest time to make a valid contest QSO is the minute listed in the "Finish Time" column.

The 2012 ARRL November Sweepstakes

CW: 2100 UTC Saturday, November 3 – 0300 UTC Monday, November 5

Phone: 2100 UTC Saturday, November 17 – 0300 UTC Monday, November 19

■ Since 1930, the ARRL November Sweepstakes has set the bar as the premier domestic contest in the US and Canada. Steeped in tradition, this event draws amateurs of all levels, from hard-core competitors to casual participants.

David Conradi, KDØNUK (left), and ARRL Youth Editor Sterling Coffey, NØSSC, pilot the club station of the University of Missouri at Rolla, WØEEE, during the 2011 November Phone Sweepstakes. [Ward Silver, NØAX, photo]

■ 2012 welcomes three new sections to the event! Ontario (ON) has replaced by four different sections: Ontario North (ONN), Ontario South (ONS), Ontario East (ONE) and the Greater Toronto Area (GTA). This bumps the number of sections required to earn the coveted Clean Sweep from 80 to 83. **Make sure your logging software is updated to recognize the new abbreviations!**

■ SS CW logs must be e-mailed or postmarked by 0300 UTC Tuesday, November 20 and Phone logs by 0300 UTC Tuesday, December 4. E-mail Cabrillo formatted logs to **sscw@arrl.org** or **ssphone@arrl.org**. Paper logs can be sent to ARRL November Sweepstakes,

Scan this QR code with your smartphone to go directly to:
www.arrl.org/sweepstakes

Sean's Picks

Sean Kutzko, KX9X

All dates/times are in UTC.

■ **State QSO Parties this month:** Arizona, California, Illinois, Iowa, New York, Pennsylvania. October is second only to May in terms of great state QSO parties, so get on for some of these and have a blast!

■ **QRP contests this month:** ARS Spartan Sprint (October 2), NAQCC Monthly QRP Sprint (October 10), QRP-ARCI Fall QSO Party (October 13-14), Flying Pigs Run For The Bacon (October 22).

■ **Worked All Provinces of China Contest (October 6):** Rarely does a brand new worldwide contest come around anymore. This is the very first running of this event, the first contest from China! Everyone works everyone, but the 34 Chinese provinces and autonomous zones are worth the most points (and are extra multipliers, too!).

■ **Makrothen RTTY Contest (October 13-14):** This RTTY contest is based on distance scoring. Exchange is your 4-character Maidenhead grid square. There are no multipliers. The farther away a station is from you, the more points you earn.

■ **North American RTTY Sprint (October 14):** 4 hours of intense RTTY contesting. No more than 2 QSOs may be made on the same frequency before you must QSY.

■ **Oceania DX Contest – CW (October 13-14):** Point those beams to the Pacific and see how many countries you can work! Activity for this contest is really on the upswing, thanks to a concerted promotional effort by the Australian and New Zealand Contest Committee.

■ **W/VE Islands QSO Party (October 20-21):** Sponsored by usislands.org, operating from islands in US lakes, rivers and coastal areas is the name of the game! Non-island stations may only work island-based stations.

■ **CQ Worldwide DX Contest, Phone (October 27-28):** The biggest DX contest in the world! Everybody will be on for this one. Whether big gun or little pistol, you can work plenty of DX in this event if you put your mind to it and stay in the chair. A golden weekend for all amateurs interested in DX.

October 2012 W1AW QUALIFYING RUNS

W1AW Qualifying Runs are 10 PM EDT Monday, October 8 (0200Z October 9) and 4 PM EDT (2000Z) Wednesday, October 24. The West Coast Qualifying runs will be transmitted by station K9JM on 3590 and 7047.5 kHz at 9 PM PDT Wednesday, October 17 (0400Z October 18). Unless indicated otherwise, speeds are from 10-35 WPM.

Bernie McClenny, W3UR, w3ur@arrl.org

1A: DX Whose History Started More than 900 Years Ago

1AØC's "Travel Notes"

This month we have an article about the recent (July 1-4, 2012) 1AØC DXpedition to the Sovereign Military Order of Malta. Thanks to organizer Giorgio Minguzzi, IZ4AKS. — 73 de Bernie, W3UR

Giorgio Minguzzi, IZ4AKS

There are some DXCC entities, which, regardless of their position in the "most wanted" list, send DXers' hearts throbbing. The Sovereign Military Order of Malta (SMOM) is no doubt one of them. According to *The DX Magazine* it occupies the 79th position in the list of the worldwide most wanted countries. For the West Coast of North America SMOM ranks number 30 on the most wanted list and number 44 for Asia and Japan. In Europe SMOM is not in the top 100; however, this does not seem to frighten European DXers, whose calls produce an insuperable wall that slows down the prospects of those who hope to work this semi-rare one.

Why is the SMOM a Country?

The Order of Malta, fortified by its more than 900 years of history, operates according to a perspective we could define as patient and "millenarian." That's why determination is an essential element for those who want to come into contact with such an ancient and prestigious institution.

And it was exactly thanks to a group of Roman people's strong determination that SMOM was added among the entities admitted inside the prestigious DX Century Club on September 29, 1981 (with the QSL confirmation from January 1982).

Certainly, of all that has been done it is thanks to those who have believed in this project from the beginning, putting a lot of effort into it. I make reference to the historical core composed of Mario Gallavotti, IØMGM; Mario Monaco, IØMXM; Alfonso Porretta, IØAMU; Tony Privitera, IØIJ; Antonio Vernucci, IØJX; and many others I am not able to list but who struggled in order for the extraordinary peculiarities of the Order of Malta to be recognized by the ARRL in the 1980s. Many months were spent studying the complicated and troubled history of the Order giving to Rome the prerogative to be the only capital city which can boast three DXCC entities in its territory.

Only a few people know that the 1A prefix was chosen in the 1980s, following the practice of that period, according to which other "particular" entities used the prefixes of the 1AA-1ZZ group, which were not allocated by the ITU. It was, in fact, a set that was left free for the radio amateur activities that sprang from "ambiguous" or "contested" territories. In those years, Spratly used 1S, while the operations from Minerva Reef took place through the 1M prefix. So, the Capitolian team decided to adopt 1A, which had never been used before, trying to underline that the activities did not take place from the Italian territory. From that moment, this decision was never questioned, but the suffix was debated. In those years, a 1AØA station sounded like a piratical operation. You should forget today's call-sign trends characterized by shorter and shorter contest calls; that's why the two letters KM (Knight of Malta) were chosen. In that way the agreement was reached and 1AØKM made history in DX.

Author Giorgio, IZ4AKS/1AØX, handling the SSB pileup from the Sovereign Military Order of Malta as 1AØC.

The Birth of 1AØC

The circumstances that actually led to the birth of the first operating station from the Sovereign Military Order of Malta are also famous for unfortunate reasons. In fact, 1AØKM was born in order to support the communications between the entities of the Order that operated in the territories that were shaken by the terrible 1980 earthquakes and the head office of Rome. To a certain extent, 1AØC was born in similar circumstances. In fact, some CISOM radio amateurs (the Order of Malta's Italian Relief

What is the SMOM?

The Sovereign Order of Malta is a sovereign body as provided by international law. The Order — based in Rome, on via Condotti, has its own government, an independent magistracy, bilateral diplomatic relations with 104 countries and is granted the status of Permanent Observer in many international organizations such as the United Nations. The six Grand Priories, six Subpriories and 47 National Associations of Knights on five continents manage its operational activities. The Order issues its own passports and stamps and creates public institutions, endowed with judicial autonomy. The Order's day to day life is governed by a Constitution and Code, reformed in 1997.

The Grand Master governs the Order both as sovereign and religious head. He is elected for life, within the professed knights in perpetual vows. He is assisted by and presides over the Sovereign Council, which is composed of four high offices — Grand Commander, Grand Chancellor, Grand Hospitaller, and Receiver of the Common Treasure — as well as six other members, all elected by the Order's Chapter General for a five-year term. The Council of Government and the Board of Auditors, whose compositions reflect the international character of the Order, assist the Grand Master and the Sovereign Council. The Chapter General also elects these two bodies for a five-year term. More info in **www.orderofmalta.int**.

Members of the 1AØC DXpedition included (l-r) Robert, EA2RY; Francesco, IZ7KHR/1AØZ; Gabriele, I2VGW; Manuel, EA7AJR; Pascal, IZ8IYX; Fabrizio, IN3ZNR; Giorgio, IZ4AKS/1AØX; Jose, EA7KW; Flo, F5CWU, and Antonio, EA5RM. Not shown: Hans, PB2T, and Les, SP3DOI.

Corps) felt the need to study the aspect concerning emergency communications in depth.

A large scale project concerning precisely this theme had been prepared for a long time and, more than one year before, some radio amateur call signs had been issued by the Grand Magistry and the Reliefs Corps had then assigned them to some operators. So, the emergency of the earthquake in Emilia (May 2012) had completely changed the situation, showing all its dramatic power and underlining the importance of these skills in the background in which CISOM operates every day.

An Entity that is Difficult to Activate

Permissions to install a station as a radio amateur are granted in very small quantities and always in periods of the year in which diplomatic and service activities allow it. These are usually short periods and they often do not coincide with the best propagation openings, where it is necessary to manage various stations to work simultaneously in a yard which is only 100 meters long and 70 meters wide.

The way in which angles, paths, radials encumbrances and anchorages have to be analysed has to be much more similar to a "Tetris" field than to a "field day." Everything has to perfectly fit into a background where many compromises come into place between the performance and the antenna's dimensions. Eventually, some choices have to be made and something has to be given up. This year, this meant for us the fact of not working on 160 meters.

Moreover, difficulties concerning equipment are not the only ones that people operating through 1A have to meet. Rome, as all big cities, is characterized by a quite high noise level. Actually, the attempt is to obtain the best possible result dealing with any kind of noise. But, regardless all these difficulties, the excitement felt when transmitting from that small plot of land in the heart of a big city is unique.

41,000 QSO in Four Days

From the outside, it is almost impossible to judge an expedition considering all the factors. Certainly from the inside, a team knows if the group dynamics have operated well and whether the expected goals have been achieved or not. I think 41,000 QSOs in such a short time can place this activity among the greatest successes of the thirty-year history of this prefix. The preliminary works which led us to this event have been long and tiring. From the very first moment we knew we wouldn't have been able to do all that we would have to. That's why we decided to invest all our strength in two specific areas of the world: the USA (in particular the West Coast) and Japan. Moreover, these are the areas with the highest OM density and with the greatest number of attempts in search of the QSO with an Order of Malta station.

The propagation, even if it is in a better period of the solar cycle than the activities in 2007, gave us two powerful flares, which considerably reduced the possibilities of DX during two of the four periods we were active. To be honest, I think with America it would have been hard to do something better, but the result could have been better toward Asia. Unfortunately, toward that direction physical obstacles are numerous and signals coming from Japan are faint and difficult to decipher (because of a high pile-up). Maybe the situation could have been improved by inserting a Japanese operator inside the team. He/she would have been able to speed up the QSOs on SSB, using his/her mother-tongue. But unfortunately, we were not been to recruit a Japanese colleague in time for the activation.

Modern by Tradition

I would like to conclude this short report of the 1AØC activity by a hint at the fund-raising campaign in favor of the CISOM. I would like to thank individually all the people who contributed to the initiative through a small or notable grant. The funds raised will be used for the purchase of radio equipment, which will be employed by CISOM in emergency situations, where it constantly operates. As soon as possible, we will furnish a detailed report.

I personally believe seeing that in this period of worldwide economic crisis radio amateurs engage in solidarity, with no cultural barrier, is beautiful (and the simplicity of this word is not fortuitous at all). Evidence of this: the international origin of the offers we are collecting.

So, while we take down the radio amateurs' equipment from the villa, our eyes fall on a series of panels temporarily prepared in the yard: a series of images, taken in the most desolate and sorrowful places of the world, where the humanitarian activities of the Order of Malta are immortalized. Among them, three sentences stand out: the first one states, "Let's go where the others do not want to go," the second one states, "Let's do what the others do not want to do," and the third concludes, "We are the last ones to go away." So, while I close the Hexbeam in its box, I feel proud of having taken part, even just for a few days, of this glorious history.

What is CISOM?

The Order of Malta's Italian Relief Corps (CISOM), counts some 3000 volunteers (medical, paramedical staff and assistants) in the three North-Center-South units into which the corps is divided in Italy. Founded in 1970, it carries out rescue and assistance operations during natural disasters. It intervened during the earthquakes in Irpinia, Umbria, Puglia, Basilicata and Abruzzo.

In addition to its work in Italy, the Corps has also participated in international humanitarian initiatives such as the consignment of food aid for children in Hungary after the collapse of the Soviet bloc (1990) and, more recently, in Kosovo and in the entire Balkan region.

Wrap Up

That's it for this month. Don't forget to send your DX news (whether DXpedition or holiday style operation) to your editor at **w3ur@arrl.org**. Until next month, see you in the pileups! — *Bernie, W3UR*

Special Events

Maty Weinberg, KB1EIB, events@arrl.org, www.arrl.org/special-event-stations

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

Sep 14-Sep 16, 1300Z-2300Z, K4Y, Thompkinsville, KY. Mark Warren. Old Mulkey Meetinghouse Special Event. 10 20 40 m. Certificate & QSL. Mark Warren, KD4QHG, 400 Martin Subdivision, Tompkinsville, KY 42167. **www.qrz.com/kd4qhg**

Sep 15, 1400Z-1900Z, W5QX, San Angelo, TX. San Angelo Amateur Radio Club. International Lily Fest. 14.325 146.940. Certificate. SAARC, PO Box 4002, San Angelo, TX 76902. **w5qx.org**

Sep 15, 1600Z-2100Z, AA4UT/W4DFU, Maryville, TN. University of Tennessee and Gator Amateur Radio Clubs. Florida vs Tennessee Football Game. 14.200 7.200. QSL. AA4UT cards to Bobbie Williams, W1BEW, 2703 Chantay Dr, Maryville, TN 37803; W4DFU cards to Dr Jay Garlitz, AA4FL, Faculty Advisor, Gator Amateur Radio Club J-12, PO Box 100012, University of Florida, Gainesville, FL 32610-0012. **www.gatorradio.org** *or* **www.utarc.org**

Sep 22, 1300Z-1800Z, W4GZX, Cleveland, TN. Cleveland Amateur Radio Club. Club's 50th Anniversary. 14.262 7.262. QSL. Cleveland Amateur Radio Club, PO Box 2683, Cleveland, TN 37320. **www.carc.cc**

Sep 22-Sep 23, 1700Z-0230Z, W7K, Logan, UT. City of River Heights ECom Dept. Apple Days. 14.260 7.260. QSL. Quentin Gardner Jr, WQ7G, 709 East 350 South, Logan, UT 84321. **QRZ.com** *or* **www.appledays.org**

Sep 25-Sep 30, 0001Z-1159Z, K4D, Marietta, GA. Kennehoochee Amateur Radio Club. Dauphin Island, AL — IOTA/Lighthouse Expedition. 14.285. QSL. Kennehoochee Amateur Radio Club, PO Box 1245, Marietta, GA 30060. **www.w4bti.org**

Sep 28-Sep 29, 1500Z-2300Z, N9R, Rockford, IL. Rockford College. 165 Year Reunion/Homecoming. 28.500 21.280 14.280 7.225. Certificate. Glen Moss, NC9N, 1265 Deer Trail Ln, Libertyville, IL 60048. **www.rockford.edu**

Sep 29-Oct 28, 0000Z-2359Z, CG3X, Kitchener, ON. Richard Goetze. 50th Anniversary *Alouette*: Canada's First Satellite. 14.070. QSL. Richard Goetze, 105 Fairfield Ave, Kitchener, ON N2H 6C2, Canada. **ve3zup@gmail.com**

Sep 29-Sep 30, 0000Z-0000Z, KI6FHV, Wrightwood, CA. Grub Grabbers Net/Wrightwood Communications Group KW6WW. 3rd Annual Hot Diggity Dog Day. 10, 40, 80, 2 meters. QSL. Alex Garibay, PO Box 168, Wrightwood, CA 92397.

Oct 5-Oct 6, 1300Z-2100Z, N3PC, Coudersport, PA. Headwaters Amateur Radio Club Falling Leaves Festival. General class 40 m. QSL. Headwaters Amateur Radio Club, c/o Wayne Stahler II, 887 Black Hole Rd, Coudersport, PA 16915. **www.n3pc.com**

Oct 5-Oct 7, 1200Z-1200Z, K6L, Lone Pine, CA. Bishop Amateur Radio Club/Southern Inyo Amateur Radio Association. Lone Pine Film Festival. 28.335 14.320 7.235 146.76. Certificate & QSL. Keith Franson, PO Box 125, Lone Pine, CA 93545.

Oct 6, 1300Z-2000Z, N4J, Big Island, VA. Lynchburg Amateur Radio Club. Archaeology Open House. 14.070 PSK; 14.263 7.260. QSL. Dick Hiner, W4HMK, 3977 Waugh Switch Rd, Big Island, VA 24526. **www.k4cq.n4kss.net**

Oct 6, 1600Z-2200Z, KA5LMZ, Carlsbad, NM. Opening Day Elk Season New Mexico. 14.255 7.255. QSL. Jackie Price, 1412 Maple St, Morgan City, LA 70380.

Oct 6-Oct 7, 0000Z-2359Z, W4O, Harlem, GA. Columbia County Amateur Radio Club. 24th Oliver Hardy Festival. 28.360 21.360 14.260 7.260. QSL. CCARC – W4O, PO Box 800, Evans, GA 30809. **ccarc.hamradioman.com**

Oct 6-Oct 7, 1000Z-1600Z daily, W1W, New Milford, CT. Northville Amateur Radio Association. Warren Fall Festival. 14.200. QSL. Northville Amateur Radio Association, PO Box 354, New Milford, CT 06776. **www.na1ra.org**

Oct 6-Oct 7, 1200Z-0000Z, W8V, Morgantown, WV. Monongalia Wireless Association. Mason-Dixon Survey Special Event. 14.250 7.260 3.860. QSL. Bill Shultz, 58 Smokey Crest Dr, Morgantown, WV 26508. **www.w8mwa.org/masondixon.html**

Oct 6-Oct 7, 1400Z-2000Z, WD4WDW, Orlando, FL. Disney Emergency Amateur Radio Service. EPCOT 30th Anniversary. 28.460 14.260 7.260. Certificate & QSL. DEARS, PO Box 22346, Orlando, FL 32830. **wd4wdw.org**

Oct 6-Oct 14, 1200Z-0600Z, W5B, Albuquerque, NM. New Mexico High Dessert Amateur Radio Club. Albuquerque International Balloon Fiesta. 21.300 14.260 7.225. QSL. Via bureau or direct to Theodore Zipes, 6833 Augusta Hills Dr NE, Rio Rancho, NM 87144. *Operating times will vary (local) 0800 MST to 1200 and evenings 1700 to 2100 due to weather and Fiesta schedule.* **nm5hd.com**

Oct 7-Oct 12, 0900Z-2100Z, GB2BT, Belchalwell, nr Ibberton, Dorset, England. Radio Society of Great Britain. Belchalwell (Bell Hill) Shutter Telegraph Over 200 Years. 21.300 14.290. QSL. Via RSGB Bureau or direct to John Wakefield, 'Oakhurst,' Lower Common Rd, West Wellow, Romsey, Hampshire SO51 6BT, England. **www.qrz.com/db/gb2bt**

Oct 13, 1400Z-1800Z, WØUK, Lawrence, KS. Douglas County Amateur Radio Club. Transmitting from Nowhere, KS. 20 m 146.760 tone 88.5. Certificate. Ken Blair, 1329 Kasold Dr D2, Lawrence, KS 66049. **www.w0uk.net**

Oct 13, 1600Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum. US Navy Birthday established 1775. 14.320 7.250 PSK-31 14.070 D-STAR 012C. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101.

Oct 13, 1500Z-2300Z, W5I, Sherman, TX. Grayson County Amateur Radio Club. W5I Eisenhower Special Event. 14.250 7.250. QSL. Grayson County Amateur Radio Club, 1026 Valentine Dr, Sherman, TX 75090. **www.k5gcc.us**

Oct 13-Oct 14, 0000Z-0400Z, N1C, Walpole, NH. Wapack Trail Amateur Radio Association. BSA Mt Monadnock District Camporee. 14.250. Certificate. Derek L. Rust, 116 Mountain View Dr, New Ipswich, NH 03071. **november1charlie.webs.com**

Oct 13-Oct 14, 1200Z-2100Z, W4UAL, Tuscaloosa, AL. UARC at The University of Alabama. Club's 50th Anniversary Ham Homecoming. 28.400 21.300 3.885 7.205. QSL. Perry Wheless, W4UAL Trustee, PO Box 11134, Tuscaloosa, AL *35486. AM on 3.885 Sat morning and late afternoon CDST, LSB on 7.205 mid-day, and USB on 15/10 m Sun.* **k4cww@comcast.net**

Oct 13-Oct 14, 1200Z-2200Z, N1D, Auburn, ME. Androscoggin Amateur Radio Club. Dempsey Challenge Bicycle Race. 28.400 14.260 14.100 7.195. Certificate. Androscoggin ARC, W1NPP, PO Box 1, Auburn, ME 04210. **www.w1npp.org**

Oct 13-Oct 14, 1500Z-1900Z, WØW, Alexandria, MN. Runestone Amateur Radio Club. Birthplace of America-Kensington Runestone. 14.242 21.300 7.256 3.930. Certificate. Bill Klundt, 509 Pine St S, Sauk Centre, MN 56378. **w0alx.org**

Oct 14, 1500Z-2059Z, W8H, Marion, OH. Marion County ARES/KD8LAV. Wreath Laying and Scout Pilgrimage for Warren G. Harding. 14.070 PSK31; 21.070 PSK31 if open; 21.285 ½ hour switch w/PSK; 14.285 ½ hour switch w/PSK. QSL. Warren G. Harding Special Event Station, W8H/KD8LAV, 4945 St James Rd, Waldo, OH 43356.

Oct 14-Oct 20, 0000Z-2359Z, N8W, Seney, MI. Lake Effect Amateur Radio Club/Luce Amateur Radio Society. National Wildlife Refuge Week 2012. 14.240 14.070 7.240. QSL. Lake Effect ARC/N8W, 36 Southfork St, Marquette, MI 49855. **www.lakeeffectarc.info/Event-NWRWeek/index.htm**

Oct 17-Oct 20, 0000Z-2359Z, KØF, Iola, KS. Iola Amateur Radio Club. Farm-City Days. 14.265 14.070 7.180. QSL. Jeremy Utley, KEØMD, 522 N Tennessee, Iola, KS 66749. **jerutley@gmail.com**

Oct 17-Oct 21, 0700Z-2000Z, K2G, Freeport, NY. USCG Auxiliary HF Communications. 73rd Anniversary USCG Auxiliary. 21.310 14.250 7.260 3.925. QSL. K2G c/o KA2HHO , PO Box 92, Babylon, NY 11702. *Sat Oct 20, multiple stations operating, all bands, all modes.* **w2anq@arrl.net**

Oct 18-Oct 21, 1400Z-0400Z, W8NP, Massillon, OH. Massillon Amateur Radio Club. 85th Anniversary Celebration. 28.365 28.050 21.365 21.050 14.265 14.050 7.265 7.050 3.865 3.550. QSL. Massillon ARC, PO Box 73, Massillon, OH 44648. **www.w8np.org**

Oct 19-Oct 20, 1300Z-2300Z, W4W, Sevierville, TN. Sevier County Emergency Radio Service. Octoberfest 2012. 28.405 21.350 14.245 7/225. QSL. Rick Sawaya Sr, 2005 Spence Mountain Lp, Sevierville, TN 37876. *100% QSL with a SASE.* **www.sevierares.org**

Oct 19-Oct 21, 1700Z-2100Z, N1S, Bath, ME. Midcoast ARES. Boy Scouts Pine Tree Council JOTA. 14.032 7.032 3.942 3.526. QSL. LoTW or Harry McNelley, 281 Hillside Rd, Brunswick, ME 04011.

Oct 20, 0500Z-1100Z, K6U, Covina, CA. Valle del Sol District, San Gabriel Valley Council Boy Scouts of America & GERC Glendora, CA. Jamboree On The Air. EchoLink 146.715. Certificate. James Dowdle, 134 N Country Club Rd, Glendora, CA 91741.

Oct 20, 0800Z-2300Z, W6W, Pacoima, CA. US Coast Guard Auxiliary. 73rd Anniversary of US Coast Guard Auxiliary. 14.250 7.250. QSL. Howard Levine, 9482 Urbana Ave, Pacoima, CA 91331. **cgaux.org**

Oct 20, 0900Z-1500Z, K1G, Swampscott, MA. United States Coast Guard Auxiliary District 1 North. 73rd Anniversary of USCG Auxiliary. 14.241. QSL. Dr Gary G. Young, 1 Sutton Pl, Swampscott, MA 01907. **gyoung@worcester.edu**

Oct 20, 1300Z-1800Z, NC4AR, Trinity, NC. Tri-County ARC. Car show & Chili Cookoff. 7.210 145.29. Certificate. NC4AR, PO Box 747, Trinity, NC 27370. **www.nc4ar.net**

Oct 20, 1400Z-1900Z, N5O, Kenner, LA. USCG Auxiliary Flotilla 081-04-05. US Coast Guard Auxiliary 73rd Anniversary. 28.440 14.240. QSL. Albert Dupont, 448 Hooper Dr, Kenner, LA 70065. **wow.uscgaux.info/content.php?unit=081-04-05**

Oct 20, 1400Z-2100Z, K4A, Jacksboro, TN. USCG Auxiliary 73rd Anniversary. 14.270 7.270. QSL. Peter R DeWitt, 393 Lover Cir, Jacksboro, TN 37757.

Oct 20, 1400Z-2100Z, WØNWR, Minneapolis, MN. Amateur Radio Association of Bloomington. National Wildlife Refuge Week. 14.262 7.195. QSL. Glenn Johnson, 2215 Big Timber Rd, Calmar, IA 52132. **www.nwrweek-radio.info**

Oct 20, 1400Z-2200Z, K3G, Media, PA. US Coast Guard Auxiliary. 73rd Anniversary. 28.330 21.330 14.270 7.270. QSL. Dan Amoroso, 196 Dam View Dr, Media, PA 19063.

Oct 20, 1400Z-2200Z, W1H, Owls Head, ME. US Coast Guard Auxiliary District D1N. 73rd Anniversary. 28.425 21.325 14.265 7.184. QSL. Bill Hopwood, KB1QXJ, PO Box 272, Elkins, NH 03233.

Oct 20, 1400Z-2300Z, KC4TIE, Benton, KY. Coast Guard Auxiliary. Special Event Radio Day. 14.230 14.070. QSL. Mary Husfield, 4156 Barge Island Rd, Benton, KY 42025.

Oct 20, 1400Z-2300Z, N2A, Crystal River, FL. USCG Auxiliary. US Coast Guard Auxiliary 73rd Anniversary. 28.330 21.330 14.330 7.230. QSL. DM Thomas, 4515 N Loquat Pt, Crystal River, FL 34428. **np2dj@arrl.net**

Oct 20, 1400Z-2300Z, N4A, Crystal River, FL. US Coast Guard Auxiliary Flotilla 1501 US Coast Guard Auxiliary's 73rd Anniversary. 14.250. QSL. Frank A Nusso, 6225 E Malverne St, Inverness, FL 34452. **alann@tampabay.rr.com**

Oct 20, 1400Z-2300Z, W8E, Loveland, OH. United States Coast Guard Auxiliary 8ER. US Coast Guard Auxiliary 73rd. Anniversary. 28.350 14.260 7.234 3.940. QSL. David Stroup, 6138 Misty Creek Dr, Loveland, OH 45140.

Oct 20, 1400Z-2300Z, W4Z, Virginia Beach, VA. USCG Auxiliary. US Coast Guard Auxiliary 73rd Anniversary. 14.309 14.070 7.209. QSL. Robert W. Dunnington, KI4VCT, 1200 Atlantic Ave, Virginia Beach, VA 23451.

Oct 20-Oct 21, 1300Z-2000Z, K4K, Dandridge, TN. Jefferson County ARES/RACES. BSA Jamboree On The Air. 21.360 14.290 7.270 7.190. QSL. Dan O'Donovan, W4DOD, 2480 Hills Chapel Rd, Dandridge, TN 37725. *Sat 9-4 and Sun 1-4 local time.* **w4dod@arrl.net**

Oct 20-Oct 21, 1400Z-2100Z, NB9QV, Manitowoc, WI. USS *Cobia* Amateur Radio Club. WWII Sub USS *Cobia* AGSS-245 celebrating its 69th Anniversary. 14.250 7.240. Certificate* & QSL. Fred Neuenfeldt W6BSF, 4932 S 10rd St, Manitowoc, WI 54220. QSL requests to W6BSF; certificate to KØEFV. **www.qrz.com/nb9qv**

Oct 21, 1200Z-2000Z, N1A, East Freetown, MA. US Coast Guard Auxiliary. US Coast Guard Auxiliary's 73rd Anniversary. 28.490 21.290 14.240 7.180. QSL. Paul G. Sadeck, 90 Doctor Braley Rd, E Freetown, MA 02717.

Oct 26-Oct 28, 1800Z-2300Z, N4Q, Mebane, NC. Mark Swing. 29th Lexington Barbeque Festival. 14.290 7.200 CW. QSL. Mark Swing, 105 Azalea Ct, Mebane, NC 27302. **www.cwfun.org/funspots/lexbbq**

Oct 27, 1300Z-1800Z, NC4AR, Randleman, NC. Tri-County Amateur Radio Club. 24th Annual NASCAR Days Festival. 7.210. Certificate. NC4AR, PO Box 747, Trinity, NC 27370. **www.nc4ar.net**

Oct 27, 1500Z-2300Z, WØYFZ, Anoka, MN. Anoka County Radio Club and Emergency Services Inc. Halloween Capitol of the World. 23.375 21.315 14.245. QSL. Anoka County Radio Club, PO Box 982, Anoka, MN 55303. **www.anokaradio.org**

Oct 28, 1600Z-2000Z, K2A, Sandy Hook, NJ. Roseland Amateur Radio Club. Fort Hancock Establishment Day. 14.270 7.270. QSL. Roseland ARC, 300 Eagle Rock Ave, Roseland, NJ 07068. **www.qsl.net/k2gq**

Oct 31-Nov 1, 1800Z-1300Z, WØO, Frankenstein, MO. Mid-MO Amateur Radio Club. 2012 Frankenstein Halloween Special Event. 7.260 7.030 3.963 3.560. QSL. Kent W. Trimble, K9ZTV, 2210 Heartland Ridge, Jefferson City, MO 65109.

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 website.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form at **www.arrl.org/special-events-application**. A plain text version of the form is available at that site. You may also request a copy by mail or e-mail. Off-line completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **Dec** *QST* would have to be received by **Oct 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through August 10. You can view all received Special Events at **www.arrl.org/special-event-stations**.

Strays

Have a *QST* Delivery Issue?

If your copy of *QST* does not arrive by the end of the month before the issue date, please contact the ARRL Circulation Department at **circulation@arrl.org**, tel 860-594-0200. Also contact them if your address changes or your copy of *QST* arrives in damaged condition.

QST congratulates...

ARRL Life Member James T. Fagan, KE7IDC, 18, of Tucson, Arizona, who recently earned his eighth Eagle Palm award.

ARRL member and best-selling author Don Keith, N4KC, of Springs Village, Alabama whose new book, *Riding the Shortwaves: Exploring the Magic of Amateur Radio*, was published in July. Copies may be ordered through the ARRL Store, **www.arrl.org/shop**, order no. 1210.

As members of the Capital City Amateur Radio Club (CCARC) look on, Club President Tom Mandera, KE7VUX, presents a set of 13 new ARRL books to Karla Ritten, Lewis and Clark Library Collection Management Librarian. The CCARC, an ARRL-affiliated club, also purchased an ongoing *QST* subscription for the library's periodicals section. — *John Geach, KS7R* [John Geach, KS7R, photo]

Jon Jones, NØJK, n0jk@arrl.org

Two Notable 50+ Operators Move to a Higher Band

These pioneers of transpacific propagation and Yagi design will long be remembered.

Paul Lieb, KH6HME, SK

Paul Lieb, KH6HME, 84, passed away July 16, 2012. Born in Anaheim, California on November 23, 1927, he was the grandson of original German immigrant settlers to Anaheim and his father was Anaheim's first electrician. Paul graduated from Anaheim Union High School and attended college for several years before being drafted into the Air Force during the Korean War. He attained the rank of Master Sergeant and was honorably discharged in 1952.

Paul Lieb, KH6HME, leaves a legacy of tropo-ducting distance records up through 5760 MHz. [Curtis Knight, AH6RE, photo]

Following in his father's footsteps, Paul became an electrical contractor himself and he was Anaheim's oldest continuously licensed electrical contractor and owner of World Electric Corporation. Paul became a highly sought-after electrician, known to be able to wire two houses a day and he single-handedly wired thousands of homes throughout California, Alaska and Hawaii.

The true passion of Paul's life was ham radio. Paul began his love affair with radios when he was just five and often fell asleep wearing headphones. Later in life, he became a licensed electrical contractor on the Big Island of Hawaii and he established a radio beacon at an elevation of 8500 feet on the slopes of Mauna Loa Volcano. From there he worked the famous trans-Pacific tropo duct to the West Coast. Paul achieved many tropo ducting distance records up through 5760 MHz. He received the Dayton Hamvention Special Achievement Award in 1999 for "his pioneering and record-setting work in tropospheric ducting and VHF, UHF and microwave communications." The records Paul set can be seen at **dx.qsl.net/kh6hme**.

Paul was not the first from Hawaii to work across the Pacific on tropo. That contact was made by Ralph Thomas, KH6UK, and John Chambers, W6NLZ, in 1957 on 2 meters.[1] KH6UK was located near sea level. Paul discovered that the Pacific duct was usually located much higher — around 8000 feet — at the Hawaiian end. It occurred more frequently and was much stronger at this elevation than sea level. Paul set up beacons on the slopes of Mauna Loa at 8200 feet on 144.170, 432.075 and 1296 MHz. It was a long 3 hour drive from Hilo, where Paul lived, up the slopes of Mauna Loa to reach the beacon site to operate. When the beacons "stopped keying," eager VHF operators across the Pacific knew he was there.

Fred, KH7Y, had breakfast with Paul every Tuesday. He helped him maintain the beacons and noted Paul was a real inspiration and friend. The KH6HME beacons on the Big Island are still active and Fred is working on plans for the beacon site with Paul's family. Mauna Loa may not be the only site in Hawaii to couple to the duct. Haleakala Volcano on Maui has several sites between 6000-8000 feet on the road to the summit that may be suitable as well.

Gary Lopes, WA6MEM, an active VHF/UHF/microwave operator in southern California who keeps a close watch on the Pacific duct had these thoughts about Paul:

> Losing a friend is always difficult but losing Paul Lieb, KH6HME, will have a profound effect on the hobby we all enjoy so much. His enthusiasm, dedication, and commitment will be difficult to replicate. Each year I would look forward to hearing those unique sounding beacons announcing 'Aloha.' It was always a special day when those signals would find the way to the mainland coast.
>
> Many of us enjoyed the thrill of working KH6 land on VHF and UHF because Paul would take the long, slow, trip up the volcano. I will miss Paul's excited voice call CQ from the Big Island of Hawaii. Thank you, Paul. You will be missed.

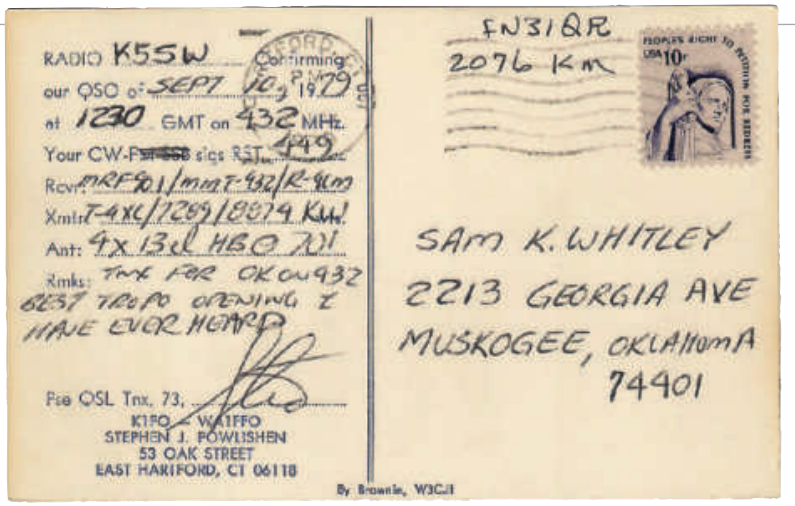
[1]E. P. Tilton, W1HDQ, "World Above 50 Mc," *QST*, Aug, 1957, p 70.

Stephen Powlishen, K1FO, SK

Stephen Powlishen, 60, the husband of Lori (Cowan) Powlishen died on July 28, 2012 at Connecticut Hospice after a long struggle with cancer. He graduated from Worcester Polytechnic Institute in 1974 with a degree in electrical engineering and worked for Hamilton Standard, Leybold-Heraeus and Anderson Labs. Steve joined Hewlett Packard's computer sales organization in 1982 calling on its scientific and engineering customers.

Steve was an avid Amateur Radio operator for more than 40 years, most recently holding the call sign K1FO. Steve's passion for radio was shared through his frequent contributions to numerous publications and conferences. I met him at Central States VHF Society Conferences several times. His antenna designs were groundbreaking. The FO series of 70 cm Yagis revolutionized weak signal and EME work on this band by having clean patterns and reduced noise pickup.

In 1994 Steve founded Lunar Systems devoting his efforts to the design and production of high quality RF amplifiers. Using antennas and amplifiers he designed and built himself, Steve communicated with hundreds of other amateur stations by moon-bounce (EME).



Here is one of Steve's, K1FO, QSL cards sent to Sam, K5SW, in 1979 after their 432 MHz tropo contact.

On the Bands

50 MHz E_s to Bahrain

K5SW worked G8BCG (IO70) at 1423 UTC July 2. July 4 had Caribbean fireworks for N4UK and K5SW (EM25) to VP2MSR, KP4, J6 and HI. K7ULS (DN41) portable also worked VP2MSR. On the 5th K5SW worked CT1HZE at 1351 UTC. NWØW reported hearing 4X4DK on July 13 at 1330 UTC. He worked IT9TYR at 1220 UTC. This follows a pattern of very early openings to Europe from the central USA. These occurred June 10 and June 29 as well. That evening Arliss, W7XU (EN13) logged KL7KY (BP51) at 0321 UTC July 14. KØGU (DN70) also worked KL7KY and logged Al, KL7NO (BP54).

The next day (July 14) East Coast stations such as K4PI (EM73) and N3XX (EM73) worked A92IO in the Kingdom of Bahrain around 1540 UTC! Tony, IT9TYR, worked Colorado, Texas and New Mexico along with the East Coast on the 14th. He is the *SIXily News* editor (**www.it9tyr.com**). KØGU worked IT9TYR and others including HA3UU.

Dennis, K7BV, worked SV5BYR/5 and A92IO with a single 6M7JHV at 35 feet:

> I worked SV8CS at 1542 UTC so I made a determined decision to sit on the frequency spotted on the DX Cluster for SV5BYR/5...not really believing I would hear him. But sure enough, patience paid off when I started to hear bits and pieces of his repeated CQs. When he peaked enough to firmly ID him, I called and quickly worked him. I was so excited to finally have SV5!
>
> I quickly remembered seeing a spot for A92IO a few moments earlier so, feeling full of confidence in my antenna at 35 feet, I went to his frequency. I thought my heart would burst from pounding so hard when I heard part of a CQ — but I wasn't sure if it was Dave! He came out of the noise with the next CQ and came right back to my call. I was as excited at that moment, two very hard new DXCC entities in just one minute.

A major aurora occurred July 15. This was from an X-class flare with a fast moving CME. The initial CME impact was at 1809 UTC on the 14th. Tim, NWØW, logged 26 stations from 2000-2330 UTC, mostly "55A." MMØAMW worked VE5UF at 2339 UTC and KE7V noted SMØKAK "33A" at 2352 UTC. (tnx N7DB)

July 16 Ken, N4UK, worked CT1HZE while using just "stacked halo" antennas. Russ, K4QI (FM06) worked VP9, 9Y, YV, FM, 8P, HK, 8R, HP, PY, TI, YS and HR. July 21 N6RA worked JE1BMJ, JF2HEV, JF2MBF, JH4IUO and JF2VNV in the CQ VHF Contest. On July 22, Chuck, NA6XX, worked YS1AG for a new country. It is a difficult path to California blocked by a volcano in El Salvador.

July 24 the FP/VA2WA — FP/VE3DZ DXpedition had a great opening to much of the US. They made over 400 contacts as far west as Nebraska and Oklahoma. During the 2 meter E_s opening that afternoon, Ken, AC4TO, "was also CQing on 6 meter CW with the other rig as I saw that K4RX had worked JL8GFB...I ended up having to cut my 144 MHz E_s rag chew short with KØAWU in EN37 (a new 144 MHz grid for me) to respond to JE6AZU (PM51) who was calling me on 6 meters! What propagation riches! The JE6AZU QSO (2332 UTC) at 12,200 km is my longest non-F2 QSO on 6 meters."

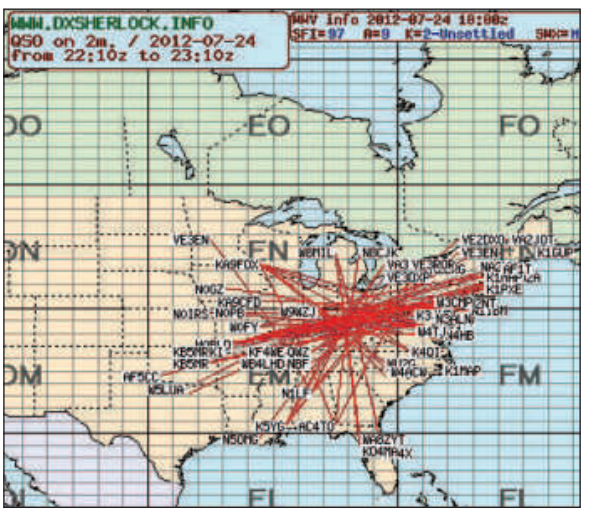
Joe, N3FHW, reports a 2 meter FM contact on 7/24 during the East Coast opening. He worked Rupert, N2OTO (EL96wi) on 146.52 FM while stopped at a light in SE Washington, DC at 1550Z. His grid at the time was FM18lu. At 884 miles, this was the longest contact he has worked on 2 meter FM. Joe was running 50 W into a magnetic mount antenna on his Jeep.

The CY9M DXpedition unfortunately was not QRV on the 24th. The E_s dropped out that week. KF2DQ worked CY9M July 28. "All of a sudden at 2303 UTC I heard 'CQ CQ CQ CY9M' twice. After the second CQ I put my call out and WOW he came back to me with 5 x 9. After my exchange I heard him say 'thanks, 73's and ok the 3 station please.' After logging on to DX Sherlock I discovered that the 3 station was W3UR, who worked him after me. Using an FT847 at 100 Watts into a KU4AB 6m Loop in the attic. Wow talk about being in the right place at the right time…" Joey, W5TFW, MS also worked CY9M on the 28th at 2055 UTC in a short opening. He may be the farthest west station they worked. Dennis, K7BV, caught CY9M on July 30.

144 MHz Tropo, Aurora and E-Skip!

On July 4 Darin Priest, W9WZJ (EM69) reported strong tropo to the EN30, EN40 and EN50 grids. The KH6HME 144.170 MHz beacon was received by WA6MEM at 0156 UTC July 14. The aurora July 15 was strong on 2 meters. Gedas, W8BYA (EN70) found great conditions.

"What wonderful chaos we had on 2M



A major 2 meter E_s event occurred on July 24 that seemed to blanket the eastern half of the nation with incredible propagation conditions. [DXSherlock]

today! For 3-4 hours it sounded a bit like 20M. Too many signals from 144.180 to 144.220 for me too copy. I had to go below 175 to find a clear spot. All in all I managed to work 62 stations on 2 Meters. Farthest West and best DX (grid #238) was with Jay, (KØGU) in DN70 at 1032 miles. Farthest South geographically was into EM95 (N1GC), FM06 (K4QI), FM16 (KN4SM, NG4C). Farthest North was with Dan, VE2DSB." N7DB Oregon worked VE7SL (CN88), W7YOZ (CN87) and KD7UO (CN87). N8PUM MI made 222 MHz aurora contacts to KØAWU (EN37) and KAØPQW (EN33).

On July 24 at least two major E_s openings occurred on 2 meters. Earlier that afternoon E_s were reported on 2 meters from W1, W2 and W3 to Florida around 1500 UTC. In the evening, strong E_s from W5 and WØ to W1, W2 and W3. Fred, K3ZO (FM18) caught both openings. He made three Florida contacts in the morning, then west to EM04, EM25, EM26, EM27 and EM37 in the evening. Ken, WB2AMU, in FN30 made seven E_s contacts running just 40 W from an FT-857 and a 3 element Yagi. His observations:

> At 4:30 local time (2130 UTC) from home in FN30, I observed that there were many strong signals on Six Meters that were coming from a fairly short distance away. Over the next 30 minutes, I worked EM99, EN62, EN61, and W9FR (EM69). I found double-hop Sporadic-E on Six Meters with a QSO with K7JE from DM33 in AZ.
>
> By 2200 UTC, I went to the car to listen on Two Meters (I do not have a permanent Two Meter setup in my house). I started hearing some weak SSB. I set up my three element Two Meter Yagi on the rooftop of my car, and 40 Watts from my FT-857, while it was in the driveway and found rising and fading signals coming in from the west. I worked three stations (K8TQK, KØWYN, KF4WE) from this setup and then moved to a parking field about a mile away to work four more stations (KB5MR, KØCIY, K5SW and WØBLD. The last Two Meter Sporadic-E opening for me was on July 6th in 2004 with an opening that began at 2200 UTC as well, and lasted for one hour. This was eight years ago!

KA9CFD (EN40) logged 17 E_s contacts to W1, W2, W3 and W4 including WB2CUT (FN20). Rich, WB2CUT, started the opening at 2114 UTC with N4QWZ (EM66) followed by 15 contacts to W4, W5, W8, W9 and WØ. He worked N8XA (EM79) "definitely skip" a short E_s contact, which implied a high MUF.

High enough for 222 MHz E_s, which was reported by KX4R (EM73) to VE2DFO (FN25). Don, VE2DFO, noted:

> Signals were very strong on 144 at times but narrowly focused into EM73 and EM85. Since signals were strong I mentioned to a few stations I would fire up on 222. At 2155 I worked KR4X in EM73 on 222.1 a distance of roughly 1600 km. I am 50 km west of Montreal in FN25. What is interesting besides 222 MHz e's being a very rare occurrence, is that Greg was very strong on 222 and it lasted 15-20 minutes. We exchanged 59 reports on SSB. He was S9+20 db up here. We both kept calling but no other signals were heard although I am sure it would have been possible to work others. I asked Greg what he was running — 200 watts into a 5 wl M^2. On my side I have an FT-736 to a Lunar-Link with a full 1500 watts output into a 5 wl M^2 at 65 feet. This demonstrates the benefit of having a separate rig on 222 to monitor conditions.
>
> The E_s on 144 lasted until 2330 at my location and my last contact was in EM50. I was focused more on 222 so I only worked around 10 stations on 144 but VE2XX (who lives near me) worked 15. I only was running 100 watts on 144 to a 12 element M^2.

Others reporting 2M E_s contacts include K4QI (20 contacts), N5UWY (EM15) who worked NJ, OH and WV for new states and AF5CC who made 3 contacts in CT for his state # 40 on 2M. WZ1V was his best DX at 1477 miles. AC4TO in Florida caught both the east and northwest openings — northwest to EN43, EN35, EN34, EN33, EN37, EN52 and EN41. From FM05, Dave, K4SAN, logged VA3ZDX (EN93), KAØPQW (EN33), KCØCF (EN32), KA9FOX (EN43), NØYK (DM98), NØLL (EM09), NØIRS (EM29), WØKAN (EM28), WQØP (EM19) and KCØHFL (EM17). Steve, NN4X, caught W8MIL (EN74), N8CJK (EN84), WØGHZ (EN34), KØSIX (EN35), KAØJW (EN34) and KCØCF (EN32). N4HB (FM17) made 27 E_s contacts as far west as W6ZI (EM26). AEØG (EN10) worked EM76, EM86, EM84 and EM94. Chad, NØYK (DM98) worked W4RVZ (FM16) at 1349 miles. W5LUA (EM13) worked K1WHS (FN43) at 2255 UTC, over 1700 miles!

Bill, KØAWU, worked 37 stations in AL, FL, GA, NC and SC. He noted many new operators on for their first 2 meter E_s opening. "The skip was very much 'in and out' with very brief periods of propagation, at times not long enough for a QSO. Not all signals were 5-9, several were of the 5-2 or 5-5 variety. It was very interesting. *I heard several operators who were literary 'breathless' .. overwhelmed with what they were hearing and working, they were more than just excited!*"

There was a third later "west" E_s center during the opening. JD, NØIRS, heard WB2KWF NM. WØBLD (EM37) and N4QWZ (EM66) worked him.

432 MHz

NØIRS (EM29) reported W9ZIH (EN51) with "huge signals" on 432.1 MHz tropo July 21 at 0157 UTC. There were few other reports this month.

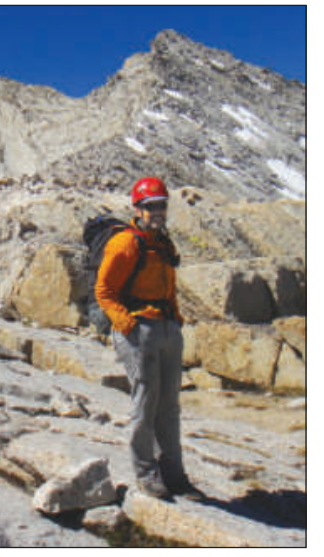
Here and There + EME

Fred, K3ZO notes "that Thailand's NBTC will open 6 meters to general operation by Thai hams in the near future." Several Thai radio clubs were active in the CQ VHF Contest including HSØAC on 6 meter EME. More information at **www.e21eic.net**.

Strays

5 W Ham Signal Gets Through When Cell Phone Can't

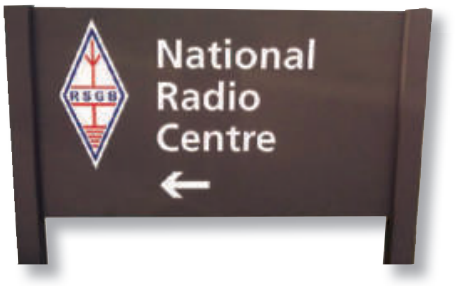
When Eszter Tompos, KI6SES, and I found ourselves behind schedule and facing a cold night at 12,400 feet on the side of Mt Conness in Yosemite National Park, we wanted to let our friends back in camp know we were okay, just late. Despite showing three bars on the cell phone, I couldn't connect a voice call or send a text message. But with my 5 W handheld transceiver, I was able to bring up the MDARC repeater, W6CX, over 200 miles away. Tim Lee, KA6TIM, answered and agreed to relay a phone message to Blake Gleason, KJ6KCV, at the Tuolumne Meadows campground. In half an hour, Blake and I were chatting on simplex. — *Chris Kantarjiev, K6DBG*



Chris, K6DBG, with Mt Conness in the background. [Eszter Tompos, KI6SES, photo]

S. Khrystyne Keane, K1SFA, k1sfa@arrl.org

RSGB Opens Showcase for Amateur Radio at Bletchley Park



Meet the public face of Amateur Radio in the United Kingdom.

David Sumner, K1ZZ
k1zz@arrl.org

While the codebreaking work conducted there during World War II was shrouded in secrecy, today the name Bletchley Park is as well known outside as within the United Kingdom. Located just 30 minutes north of London by rail, the mansion — and a few of the buildings that were constructed hastily on its grounds just before and during the war — still stands as a reminder of the extraordinary team that labored against incredible odds to break the enemy's military codes.

After decades of neglect, Bletchley Park is now a heritage site run by a charitable Trust. Restoration work is ongoing, but visitors can see where intercepted German radio messages encrypted by Enigma and Lorenz machines were deciphered, as well as the electromechanical and electronic devices — precursors of today's ubiquitous microprocessors — that were created for the sole purpose of achieving that nearly impossible goal.

Nestled among the surviving "huts" once occupied by legendary mathematicians, such as Alan Turing, is a new building, designed to blend in beautifully with its surroundings. This is the National Radio Centre, built by the Radio Society of Great Britain (RSGB),

Ed Vaizey MP (left) congratulates RSGB President Dave Wilson, MØOBW, on the official opening of the RSGB National Radio Centre. [Giles Read, G1MFG/RSGB, photo]

RSGB Chairman Bob Whelan, G3PJT (right), shows Ed Vaizey MP around the National Radio Centre. [Giles Read, G1MFG/RSGB, photo]

which was officially opened on July 11, 2012. In the words of RSGB President Dave Wilson, MØOBW, "Its aim is to showcase radio communications technology as a force powering the 21st century economy and to present Amateur Radio as an exciting, stimulating, educational, multi-faceted hobby, which provides a sound technical grounding in radio communication to those within its ranks."

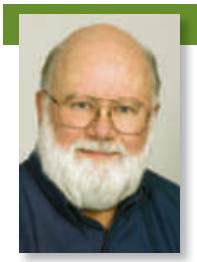
International Amateur Radio Union Vice President Ole Garpestad, LA2RR, and I joined a group of other invited guests to see Ed Vaizey MP, Minister for Culture, Communications and Creative Industries, declare the National Radio Centre open. Upon unveiling a plaque commemorating the event, the Minister said: "The RSGB is technically populated by amateurs, but it is actually full up to the brim with technical professionals who have done an amazing job here. What really appeals to me about the work that the RSGB does is the importance of introducing young people to technology. It gives them great purpose, with the ability to build something and then have the possibility to talk to someone on the other side of the globe."

After viewing a welcoming video, visitors to the National Radio Centre can explore a historical timeline that depicts the highlights in the development of electronic and radio communication, including the contributions of radio amateurs. Next up is a graphic display of the electromagnetic spectrum and a series of interactive video screens that allow visitors to choose to see and hear what most interests them. Along another wall is a series of experiments they can conduct themselves to learn about resonance, bandwidth, antenna radiation patterns and other concepts that are the building blocks of practical radio communication.

Finally, visitors come to a live demonstration of contemporary Amateur Radio, including both HF and satellite communications. The station, GB3RS, is well equipped but deliberately designed not to be intimidating. On their way out, they are invited to imagine what marvels radio technology will bring to us in the future.

The RSGB has developed the National Radio Centre to be the public face of Amateur Radio in the United Kingdom. Several years ago, the Society sold its headquarters building in Potters Bar, near London, and moved to a smaller facility in a modern office park in Bedford that is not designed to host visitors. The National Radio Centre is about 20 miles from Bedford and manned by volunteers from the Milton Keynes Amateur Radio Society.

Whether your interest is Amateur Radio, codes and ciphers, the origins of computer science, World War II or the architecture of old mansions, Bletchley Park is well worth a visit. Learn more at **www.nationalradiocentre.com** and **www.bletchleypark.org**.



John Dilks, K2TQN, k2tqn@arrl.org

McMurdo Silver's Super Gainer

Three tubes and a little tickler make for a very selective receiver.

It's difficult not to see something made or attributed to McMurdo Silver at a hamfest or vintage radio auction. He actively designed radios starting in the early 1920s and contributed to *QST* with articles and letters. If you are *very* lucky you might find one of his "Masterpiece" radios. More likely, you might find some of his radios or test equipment designed for ham radio use. I am fortunate enough to have three radios and several pieces of his test equipment in my stash, none of which are restored.

Finding is Half the Fun

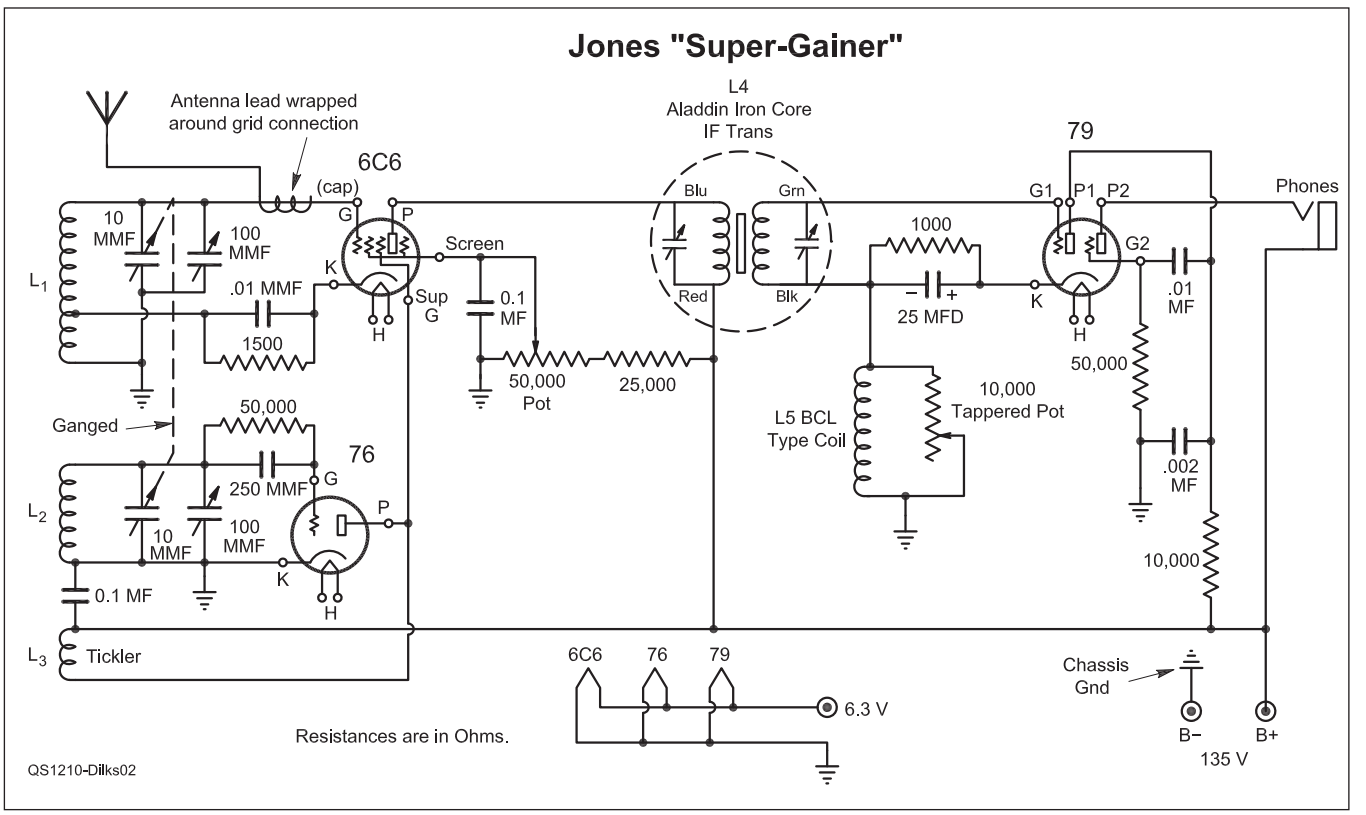
One radio of unusual design came from my friend Ray Chase, KA2JQG, who found it at Estes' Auction in Ohio.[1]

Ray's story:

> In 2006, Estes periodically had radio auctions in his barn as opposed to the main auction center. This barn auction was primitive and this was on the 30th of September, and it was a barn clean-out. Estes has other storage facilities and at times they are bursting with accumulated radio "stuff." At these sales, the good stuff is inside and the lesser quality stuff is piled on about 15 tables outside and they are sold on Saturday morning before the main sale, which starts at 10 AM. Well this Saturday it was raining lightly and all the table stuff was covered with tarps both on the Friday evening preview and on Saturday Morning. On Friday evening I noticed this unusual set under the table in the rain. On Saturday morning it was still there and a couple of times I had to reinstall a tube or plug-in coil that got separated from it as people inadvertently kicked it around.
>
> A couple of other people looked it over but I figured I'd try for it. On Saturday morning, in light rain, they peeled back the tarps as they went along and we had the usual walk-around auction. (Crazy people we are, standing out in the

The front panel of the Super Gainer receiver. [K2TQN photo]

[1]J. Dilks, "Old Radio," *QST*, Jul 2006, pp 81-82.



This is the schematic for the Super Gainer regenerative receiver. From the 1936 *Radio Handbook*. Drawing edited by K2TQN.

COIL DATA

1½ in. Diameter Forms Used Throughout

Wavelength	L1—Detector	L2—Oscillator	L3—Tickler
160 Meters	1¾-in. of No. 24E. tapped at 1½ turns. Closewound.	1¼-in. of No. 24 E. Close-wound. Grid on top end.	12 turns No. 24 E. Close-wound ⅛-in. from L2. Same direction as L2 with plate on far end.
80 Meters	40 turns No. 20 DSC, spaced to cover 1¾-in. Tap at ¾ turn.	33 turns No. 20 DSC, spaced to cover 1¾-in.	8 turns No. 24 E. Close-wound 1/16-in. from L2.
40 Meters	12 turns No. 20 DSC, spaced to cover 1½-in. Tap at ½ turn.	11 turns No. 20 DSC, spaced to cover 1¼-in.	5 turns No. 24 E. spaced ¼-in. from L2.
Meters 20	5 turns No. 20 DSC, spaced to cover ⅞-in. Tap at ⅓ turn.	5 turns No. 20 DSC, spaced to cover ⅞-in.	3 turns No. 20 DSC spaced ¼-in. from L2.
10 Meters	3½ turns No. 20 DSC, spaced to cover 1-in. Tap at ⅓ turn.	3½ turns No. 20 DSC, spaced to cover 1-in.	2½ turns No. 20 DSC, ¼-in. from L2 and spaced 1/16-in. between turns.

This is the coil data for winding the three coils. [*All Wave Radio*, October 1935]

rain to bid on radio detritus of all types, the good the bad and the ugly.) However, Estes does not know everything there is to know about every radio and some interesting and collectable stuff often shows up among the trash so that's why we do it. Well, this radio was under the last table to be sold and I had some competition but not too much so I got it, rain soaked and all. It is missing a couple of tube shields but not too bad overall. It was an interesting find.

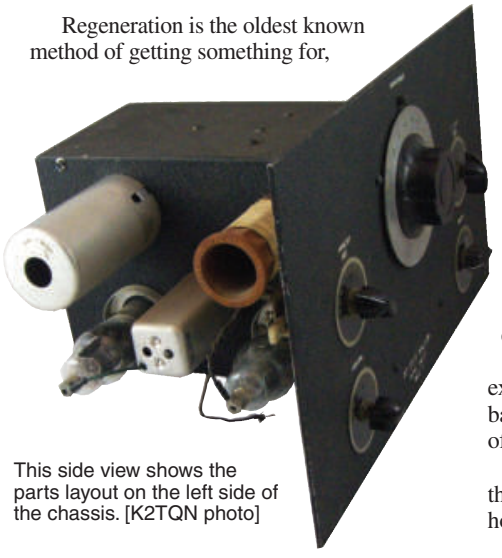
Oh, I got some other goodies at the auction. An outside observer upon witnessing the scene at the barn would conclude that something disrupted the planet and all the old radios in the country somehow fell into this old barn in Seville, Ohio.

So from under the damp tarp out popped the Super Gainer, an early regenerative receiver with an interesting design.

The Three-Tube Super Gainer

From *Short Wave Craft* magazine, December 1935, by McMurdo Silver:

> Regeneration is the oldest known method of getting something for, relatively, nothing. Regeneration applied to a single tube will yield sensitivity limited only by its degree of stability, which is simply another way of saying that in the matter of sensitivity alone, a regenerative detector will give all that can be had from multi-tube "repeater" amplifiers.
>
> If selectivity, or the major portion thereof, can be had through several good tuned circuits, then regeneration can simply and economically contribute to valuable and ordinarily hard-to-obtain additional selectivity and gain.
>
> Going from the general to the specific, the "Super-Gainer" described herewith, using only three tubes, provides all the sensitivity and image selectivity any amateur can desire, and through non-critical I.F. regeneration, practical, simple and fool-proof single-signal CW selectivity on CW reception.
>
> The idea was conceived by Frank Jones, from the original 1932 revelation by McMurdo Silver, on the use of regeneration to obtain single-signal CW selectivity, the "Super-Gainer" has been designed by these two competent authorities. For no more than the cost of a three-tube set with one R.F. regenerative detector and one A.F. receiver, the "Super-Gainer" can be quickly and easily built to give practically the full single-signal CW selectivity and all the gain of much more expensive superhets. As such, the "Super-Gainer" is the answer to the prayer for a fine receiver by thousands of financially embarrassed amateurs unable to spend one to two hundred dollars.
>
> How all this is accomplished is best explained by using the circuit for the battery model to follow this explanation of the receiver's operation.
>
> Signals are fed from an antenna through the usual low capacity (twisted hook-up wire) condenser to the tuned grid circuit of the 6C6 first detector. This 6C6 is hooked up as the conventional "electron coupled" regenerative detector, regeneration being controlled by the screen-grid voltage potentiometer. Quite obviously this circuit so far is a one-tube regenerative receiver, capable of all of the weak-signal sensitivity of such circuits. But for selectivity, this circuit is called upon only to discriminate between, not close together signals, but really only between a desired signal and its "image" 900 to 1,000 kc. away. This it can easily do and actually much better, by virtue of a good high-Q circuit, plus regeneration.
>
> The 6C6 first detector feeds a dual tuned Aladdin Polyiron iron-cored I.F. transformer tuned to anywhere between 460 and 600 kc. The two very high-Q tuned circuits of this I.F. transformer contribute about as much selectivity and almost as much repeater gain as two ordinary air-core I.F. transformers would. But here again regeneration is used to increase gain to any desired degree, and selectivity up to single-signal proportions — where it is in terms of cycles, not kilocycles.
>
> The first section of a 79 dual triode is used as the regenerative second detector. Regeneration is provided by connecting the I.F. transformer secondary between grid and cathode, with the impedance of R.F. choke L1 between cathode and B-, or its plate return. This makes a conventional oscillator circuit, oscillation and regeneration being controlled by rheostat R2 shunting L1.
>
> The second triode section of the 79 tube is the audio amplifier, resistance coupled to the first 79 triode section (second detector), and terminates in the tip jacks for headphones. A magnetic loud speaker may be used satisfactorily on fairly strong signals, but this is no disadvantage since the serious C.W. operator will always use headphones.



This side view shows the parts layout on the left side of the chassis. [K2TQN photo]

Speaking about the Frank Jones Super Gainer

In an e-mail to me, Michael Hopkins, AB5L (SK) said, "Later, when he refined the concept for HF, Jones began to use 455 kc and preferred a specific iron core transformer of the type used in the McMurdo Silver Super Gainer kits in the late '30s, but still the idea was the same: build a one-transformer superhet without an IF amplification stage followed by the proven regenerative detector that every one then understood and accepted. This was proletarian radio at best and seditious squandering of technology to the masses at worst — the things really worked and would run with the best commercially available rigs when the regenerative, not super-regenerative, detector was mastered. It was a classic and like most classics it comes back."

How Many Friends Did You Make?

Jay Kolinsky, NE2Q

After 4 years of inactivity I recently returned to HF operation with refurbished antennas. I was surprised to hear a dramatic increase in contest types of exchanges during times when there is no contest. Understandably, some hams have just enough grasp of a foreign language to make a short contact. On the other hand, for hams with a good grasp of English, I don't see the point of making 15-30 second contacts for hours on end as if one is actually in a contest.

I hear numerous American operators calling CQ and when answered by other Americans or English speaking DX stations, their contact lasts a few seconds. It consists of a signal report, possibly their name and then a quick return to calling CQ. I really don't get it. Interestingly, some of these hams are on the A-1 Operator Club roster (**www.arrl.org/a-1-op**). What is the point of these rapid fire contacts? Does it help inflate one's ego when making hundreds of contacts per hour? Possibly hams operating this way feel extremely important with all those stations calling them. I've actually heard some operators continuously announce that a big pileup is waiting to speak with them. On multiple occasions I've heard callers ask a simple question like, what is your antenna or what city are you in, only to be answered with, "look it up on my QRZ.com page — *next*."

...many of the stations calling would appreciate a nice friendly 2-way chat.

Is this really a test of one's station? That's doubtful. If you can easily reach one fellow running a low dipole in Europe does it prove your station is any better if you reach 100 stations in Europe in an hour? When propagation is decent almost anyone can contact anywhere.

Some proponents of the "micro-short" contact claim they want to give everyone a chance at working them. If these fellows aren't operating from a very rare DX country, many of the stations calling would appreciate a nice friendly two-way chat. I've had many domestic and DX stations thank me for the extended duration contact and usually mention how they abhor those 59 — goodbye types.

If you want to make friends both locally and all around the globe — start communicating!

Rapid fire contacts prove nothing but one's stamina of sitting in a chair and talking. Operating this way is like going to a party with 100 guests, walking over to each one of them and saying " Hi, I'm Bob. Goodbye." Does that make any sense?

Face Time Turns to Display Time

The Internet and computers seem to have reduced interpersonal relationships. Many people in their 20s and 30s are now uncomfortable with face to face relationships and avoid them whenever possible. Maybe this attitude has carried over to the ham bands by many who never learned how to have a pleasant casual conversation.

On the other hand, contesting is indeed different. Brief contacts are desired but have you noticed everyone is 5×9? When making 1000s of contest exchanges with all being 5×9 what is the point of even mentioning a signal report? Seems rather superfluous doesn't it? They can certainly up their contact rate if that completely meaningless signal report was eliminated.

With over 53 years of contacts I've made many lifelong friends all over the world. I'm certain one of the reasons for making these friends is because I take the time to actually find out a little about the person I'm talking to. The March 2011 issue of *QST* had an article by Steve Ford, WB8IMY, called "The Art of Conversation." It explained how to make contacts that are more interesting and fun. A wonderful article, but it's pretty sad that some of us who have been hams for years have to read a magazine article about how to have a real conversation.

If you are an introvert, have trouble making real friends and prefer to stay that way, rapid fire 10 second contacts will always be your mode of choice. If you want to make friends both locally and all around the globe — start communicating! You may be pleasantly surprised at how much fun a 5 minute or longer contact can be.

For years I've had fellow hams tell me how many hundreds of contacts they've made over a few hours. The larger the number, the more proud of their "accomplishment" they seem. I never had a reply for these types of operators until recently. Now I simply ask, "How many friends did you make?"

Jay Kolinsky, NE2Q, an ARRL® member, was first licensed in June 1958 as WV2BLX. After 3 months he upgraded to General and became WA2BLX. In 1984 he changed his call to NE2Q. He currently holds an Extra class license and operates CW and SSB on 160-2 meters.

Jay founded Kolin Engineering Company in 1960. He started making noise limiters for shortwave receivers and CB units. In 1969 he invented the electronic sirens used in most burglar and fire alarm systems and marketed under Kolin Industries, Inc. Jay developed the first solid-state wireless alarm system around 1971. He is now involved with the worldwide distribution of the 2Q-lite line of very high quality lightweight commercial-boom headsets (**www.2qlite.com**).

Jay enjoys meeting people for interesting conversations. He has made many friends through ham radio and visited with many in all parts of the world. Jay can be reached at Box 300, Pound Ridge, NY 10576, **ne2q@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).

W1AW Schedule

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US Time + 4 hours. For the rest of the year, UTC = Eastern US Time + 5 hours.

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1300		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	1400-1600 1700-1945	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	2000	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2100	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2200	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	2300	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0000	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0100	DIGITAL BULLETIN				
6^{45} PM	7^{45} PM	8^{45} PM	9^{45} PM	0145	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	0200	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0300	CODE BULLETIN				

♦ Morse code transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.
Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.
Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.
Code bulletins are sent at 18 WPM.

♦ W1AW Qualifying Runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted by K6YR and other West Coast stations on 3590 kHz and other frequencies. See "Contest Corral" in this issue. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Fees: $10 for a certificate, $7.50 for endorsements.

♦ Digital transmissions: Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent using 45.45-baud Baudot, PSK31 in BPSK mode and MFSK16 on a daily revolving schedule.

Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern Time using Baudot and PSK31.

♦ Voice transmissions: Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ Notes: On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour and CW on the half hour.

W1AW code practice and CW/digital bulletin transmission audio is also available real-time via the *EchoLink Conference Server* W1AWBDCT. The conference server runs concurrently with the regularly scheduled station transmissions.

During 2012, Headquarters and W1AW are closed on New Year's Day (observed January 2), Presidents' Day (February 20), Good Friday (April 6), Memorial Day (May 28), Independence Day (July 4), Labor Day (September 3), Thanksgiving and the following day (November 22 and 23), and Christmas and the day before Christmas (December 24 and 25). For more information, visit us at **www.arrl.org/w1aw**.

New Products

DX Engineering Stealth Antenna

DX Engineering's DXE-ATSA-1 is designed for Amateur Radio operators living in antenna-restricted neighborhoods. With a 26 foot wire, the unit covers 40 to 10 meters. A 45 foot wire will extend coverage to 80 meters. This complete system includes an auto tuner, ATSA MatchBoxx, stainless steel radial plate, antenna wire, bias tee, two insulators, radial wire and all hardware. The ATSA-1 contains 20,000 non-volatile memories. It features an L-network with wide matching capability, 1.8 to 30 MHz coverage and is rated at 200 W SSB/CW. The included bias tee is used to insert 12 V dc from a user-supplied power source on the coaxial cable to the remote tuner. The ATSA MatchBoxx module allows use of almost any length wire. An optional DXE-SA80-AOK add-on coil kit allows for the adjustment of feed point impedance to achieve the lowest SWR on 80 meters without affecting operation on the higher frequency bands. Price: $459.95; optional DXE-SA80-AOK 80 meter coil kit, $49.95. For more information or to order, visit **www.dxengineering.com**.

Portable Antennas from SuperAntenna

The SuperAntenna MP1 portable vertical antenna and YP3 portable Yagi are back in production. Both antennas have been redesigned and upgraded for better performance. The MP1 vertical is 7.5 feet long and is rated for operation from 7 MHz to 450 MHz at 500 W SSB or 300 W CW/digital. The YP3 Yagi has three elements (18 feet maximum) on an 11.6 foot boom. The YP3 can be configured for 20, 17, 15, 12, 10 or 6 meters and is rated at 500 W SSB or 300 W CW/digital Price: MP1, $120; YP3, $470. For more information, technical papers, manuals or to purchase Super Antenna products, visit **www.newsuperantenna.com**.

Strays

Ahlstrom Wins Technical Excellence Award

ARRL member James Ahlstrom, N2ADR, of Stirling, New Jersey has won the 2011 Doug DeMaw, W1FB, Technical Excellence Award for his article, "An All-Digital Transceiver for HF." It appears in the January/February 2011 issue of *QEX*.

James Ahlstrom, N2ADR, winner of the 2011 Doug DeMaw Technical Excellence Award

First licensed as KN3MXU in 1960 at the age of 15, Jim built some of his own equipment, as was common at that time. He received a BS in physics from Villanova University in 1967 and a PhD in physics from Cornell University in 1972. He then moved to New York to work in the financial industry. His license lapsed while raising his family, and he was relicensed twice, most recently in 2006. Now retired, he holds an Amateur Extra class license.

Electronics changes, and over the years Jim has worked with tubes, transistors, integrated circuits, and now software and SDR. Learning new things and seeing this progress is part of the fun, he says. Aside from Amateur Radio, he enjoys bird watching, skiing, music and working out at the gym.

Convention and Hamfest Calendar

Gail Iannone, giannone@arrl.org

Abbreviations
Spr = Sponsor
Tl = Talk-in frequency
Adm = Admission

Alabama (Helena) — Oct 13 D F H R S T V
9 AM-1 PM. *Spr:* Shelby County ARC. Helena Amphitheater, 4151 Helena Rd. *Tl:* 146.98 (88.5 Hz). *Adm:* $2. Tables: $6. Geno Newman, N4GNO, 565 Navajo Tr, Alabaster, AL 35007; 719-963-5900; **Gene_newmanjr@msn.com**; **HelenaHamFest.com**.

Arkansas (Morrilton) — Oct 20 F
7 AM-5 PM. *Spr:* ARRL Arkansas Section. Petit Jean State Park, 1285 Petit Jean Mountain Rd. Randy Griffin Memorial Picnic and Hamfest. *Adm:* Free. Tables: Free. Dale Temple, W5RXU, 5200 Timber Creek Cir, N Little Rock, AR 72116; 501-771-1111; **w5rxu@arrl.org**.

ARRL NATIONAL CONVENTION

October 12-14, Santa Clara, CA
D F H Q R S V

The ARRL National Convention (Pacificon 2012), sponsored by the Mount Diablo ARC, will be held at the Santa Clara Marriott Hotel, 2700 Mission College Blvd. Doors are open all day Friday and Saturday through Sunday mid-afternoon. Features include over 80 forums and presentations; dozens of programs for QRP, DX, kit building, transmitter hunts, and demonstrations of Amateur Television (ATV/DATV), satellite, and more; huge exhibit hall filled with commercial dealers and manufacturers with exciting products and the latest ham radio equipment; flea market and outdoor swap-meet; ARRL Expo (a large exhibit area featuring ARRL program representatives, activities and a huge ARRL bookstore; **www.arrl.org/expo**); Antenna Seminar (all day Friday, $15; must be purchased in advance); Law Forum (Saturday morning); DXCC card checking; opening breakfast buffet with keynote speaker Gordon West, WB6NOA (Saturday, 7 AM); Saturday Lunch Buffet (11 AM-2 PM; Sour Mash Hug Band); Saturday evening banquet ($45); VE sessions (Saturday and Sunday 8 AM-noon, $15; George Tickner, K6NHY, **k6nhy@arrl.net**); one day Technician class (Saturday, 8 AM-4 PM); Youth and Scouting Programs; W1AW/6 Special Event Station; International Space Station (scheduled ARISS radio contact); special Youth forums and activities; Wouff Hong ceremony (Lauren Styles, WA6CIE, 925-358-6393; **wa6cie@arrl.net**); handicapped accessible. Talk-in on 147.06 (100 Hz). Admission is $23 in advance, $28 at the door. For exhibitor tables and booths see web site. Contact Jim Siemons, AF6PU, 2308 Lomond Ln, Walnut Creek, CA 94598; 925-945-8007; **af6pu@arrl.net** or **pacificoninfo@pacificon.org**; **www.pacificon.org**.

Colorado (Glenwood Springs) — Oct 20
D H R V

8 AM-1 PM. *Spr:* Ski Country ARC. Sopris Elementary School, 1150 Sopris Dr. Council of Colorado ARCs Meeting. *Tl:* 146.88 (107.2 Hz). *Adm:* $2. Tables: $3. Richard Todd, K4ULD, 616 Cowdin Dr, Glenwood Springs, CO 81601; 970-945-7455; **richardtodd57@aol.com**; **www.k0rv.org**.

Coming ARRL Conventions

September 10-13
RV Radio Network Fall Rally, St Cloud, MN*

September 14-15
W9DXCC, Elk Grove Village, IL*

September 15
Virginia Section, Virginia Beach*

September 21-23
ARRL/TAPR Digital Communications, Atlanta, GA*

September 22
Washington State, Spokane Valley*

September 22-23
Illinois State, Peoria*

September 28-29
SEDCO W4DXCC, Pigeon Forge, TN*

October 7
Connecticut State, Meriden

October 12-14
ARRL National (Pacificon), Santa Clara, CA
Mid-Atlantic & Northeast VHF, Bensalem, PA

October 13
Iowa State, Sergeant Bluff

October 13-14
Florida State, Melbourne

November 3
Fall TechFest, Lakewood, CO

November 3-4
Georgia State, Lawrenceville

November 4
Iowa Section, Davenport

November 10
Alabama State, Montgomery

November 17-18
Indiana State, Fort Wayne

December 1-2
West Central Florida Section, Palmetto

*See September *QST* for details.

FALL TECHFEST

November 3, Lakewood, CO
H R S

The Fall TechFest Convention, sponsored by the 285 TechConnect RC, will be held at the Lakewood Elks Club, 1455 Newland St. Doors are open 9 AM-4 PM (check in 8-8:45 AM). Features include a full day of technical presentations; Homebrewing an HF Software Defined Radio; Low Power Contesting; Antennas and Antenna Design; D-Star Repeater Installation; ARES, and more; handicapped accessible; refreshments (free coffee and water available). Talk-in on 147.225 (107.2 Hz). Registration is $10 (cash only; includes 2012 membership dues for NAØTC). Contact Nancy Stitt, KØNNC, 246 Tapadero Rd, Bailey, CO 80421; 303-838-6427; **k0nnc@arrl.net**; **www.na0tc.org**.

CONNECTICUT STATE CONVENTION

October 7, Meriden
D F H Q R S T V

The Connecticut State Convention (20th Annual Nutfest), sponsored by the Nutmeg Hamfest Alliance, will be held at the Sheraton Four-Points Hotel, 275 Research Parkway. Doors are open for indoor vendor setup and tailgating at 6 AM; public 8 AM-2 PM. Features include the largest flea market in Southern New England; indoor major exhibitors with new radios and accessories; unlimited tailgating space; vendors (**vendors@nutmeghamfest.com**); forums with lively and interesting speakers; informational displays; ARES/EmComm vehicle display and demo; QCWA informational table; ECARS Net Info; ARRL representatives; DXCC card checking; VE sessions (9:30 AM sharp; Don Mitchell, KE1AY, **dmitchell1273@sbcglobal.net**); handicapped accessible; plenty of free parking; excellent food. Talk-in on 147.36 (no PL). Admission is $7. Tables are $20 each (6-ft, electricity available; includes 1 admission); outside spaces are $10 each (bring your own tables and tents, no electricity outside; includes 1 admission). Contact John Bee, N1GNV, 30 Tremont St, Meriden, CT 06450; 203-440-4973; **info@nutmeghamfest.com**; **nutmeghamfest.com**.

Florida (Delray Beach) — Nov 3
D F H Q R S T V

8 AM-1 PM. *Spr:* Boca Raton ARA. South County Civic Center, 16700 Jog Rd. *Tl:* 145.29 (110.9 Hz). *Adm:* $4. Tables: $10 each; $5 per tailgate space. Walt Dreyfus, W4WCD, 21512 Woodchuck Ln, Boca Raton, FL 33428; 954-481-5327; **w4wcd@arrl.net**; **www.southfloridahamfest.org**.

Florida (Leesburg) — Nov 3 T
8 AM-2 PM. *Spr:* Lake ARA. LARA Clubhouse, 11146 Springdale Ave. *Tl:* 147.255 (103.5 Hz). *Adm:* Free. Mike Walker, K9SSL, 28 Lakewood Ln, Fruitland Park, FL 34731; 352-702-0071; **mwalker@apk.net**.

FLORIDA STATE CONVENTION

October 13-14, Melbourne
D F H Q R S T V

The Florida State Convention (47th Annual Melbourne Hamfest), sponsored by the Platinum Coast ARS, will be held at the Melbourne City Auditorium, 625 E Hibiscus Blvd. Doors are open for setup on Friday 6-9 PM and Saturday 7-9 AM; public Saturday 9 AM-5 PM; Sunday 9 AM-2 PM. Features include great outdoor tailgate area ($10 per parking space), plenty of indoor commercial booths and swap tables, consignment table, VE sessions (both days at 10 AM; $15 fee), excellent forums and meetings, special guest from ARRL HQ Chuck Skolaut, KØBOG, Field and Regulatory Correspondent; ARES Badging, ARRL awards checking. Talk in on 146.85. Admission is $6 in advance (before Sep 30), $7 (after Sep 30); under 13 free. Tables are $20. Contact John Lundberg, W2TX, c/o PCARS Melbourne Hamfest, Box 1004, Melbourne, FL 32902-1004; 321-723-7582; **hamfest2012@pcars.org**; **www.pcars.org**.

D = DEALERS / VENDORS
F = FLEA MARKET
H = HANDICAP ACCESS
Q = FIELD CHECKING OF QSL CARDS
R = REFRESHMENTS
S = SEMINARS / PRESENTATIONS
T = TAILGATING
V = VE SESSIONS

Florida (Pinellas Park) — Nov 10 F R T V
8 AM-noon. *Spr:* St. Petersburg ARC. Freedom Lake Park, 9990 46th St. *TI:* 147.06. *Adm:* Free. Tables: Free. Tom Schaefer, NY4I, 232 Old Oak Cir, Palm Harbor, FL 34683; 727-437-2771; **ny4i@arrl.net**; **www.sparc-club.org**.

Georgia (Blythe) — Oct 13 D H R T V
9 AM-2 PM. *Spr:* ARC of Augusta. Blythe Area Community Center, 3129 Hwy 88. *TI:* 145.49. *Adm:* $6. Tables: Free (please reserve). Doug Pugh, KE4JSJ, 1806 Birch Dr, N Augusta, SC 29860; 803-279-6725; **doug9945@yahoo.com**; **w4dv.org**.

Georgia (Dallas)—Sep 15 D F R T
8 AM-1 PM. *Spr:* Paulding ARC. Earl Duncan Park (Paulding Meadows), 724 Paulding Meadows Dr. 22nd Annual Paulding County Hamfest. *TI:* 146.895 (77 Hz). *Adm:* Free. Tables: Free. Ronny Julian, K4RJJ, 1229 Dallas Nebo Rd, Dallas, GA 30157; 678-337-1766; **k4rjjradio@gmail.com**; **www.pauldingarc.com**.

Georgia (LaGrange) — Oct 13
D F H R S T V
9 AM-2 PM. *Spr:* LaGrange ARC. Oakside Baptist Church Gym, 1921 Hamilton Rd. *TI:* 146.7 (141.3 Hz). *Adm:* $5. Tables: $15. Anna Pike, KD4PCU, c/o LARC, Box 926-OLH, Roanoke, AL 36274-0926; 334-863-4072; **lagrangehamfest@yahoo.com**; **www.lagrangeradioclub.org**.

GEORGIA STATE CONVENTION

November 3-4, Lawrenceville
D F H R S T V

The Georgia State Convention (Stone Mountain Hamfest and Computer Expo), sponsored by the Alford Memorial RC, will be held at the Gwinnett County Fairgrounds, 2405 Sugarloaf Parkway. Doors are open Saturday 8 AM-4 PM, Sunday 8 AM-2 PM. Features include indoor flea market, huge boneyard ($8 per space for both days, plus admission, no pre-registration; first-come, first-served), commercial tailgating ($25 per space, electric connections available; can now reserve in advance), major manufacturers and commercial vendors, forums, youth lounge, contests, VE sessions (both days; registration 8-8:30 AM, testing at 9 AM sharp; $15 cash test fee), on-site camping ($15 per night with any hookup; $5 per night without hookups), refreshments. Talk-in on 146.76, (107.2 Hz), 145.45. Admission is $6 in advance, $8 at the door (good both days); 16 and under are free. Tables are $30 ($35 with electrical hookup; includes admission). Contact Chris Balch, KJ4NAX, 948 Boulevard SE, Atlanta, GA 30312; 855-786-8643; **hamfest@stonemountainhamfest.com**; **www.stonemountainhamfest.com**.

Georgia (Rome) — Oct 20 D F H R T V
8 AM-2 PM. *Spr:* Northwest Georgia ARC. Senior Center, 406 Riverside Parkway NE. Al Brock Memorial Hamfest. *TI:* 146.94 (88.5 Hz). *Adm:* Free. Tables: Bring your own. Grover Keith, KA5QFI, 13 Fallow Dr NW, Rome, GA 30165; 706-766-1118; **gfkeith@comcast.net**; **w4vo.org**.

Hawaii (Keaau) — Oct 27 F H Q R T V
9 AM-1 PM. *Spr:* Big Island ARC. Community Center, 16-194 Pili Mua St. *TI:* 146.76 (BIWARN system). *Adm:* Free. Tables: Free. Robert Schneider, AH6J, Box 131, Keaau, HI 96749-0131; 808-966-8146; **ah6j@arrl.org**; **www.biarc.net/**.

Illinois (Belvidere)—Sep 15 D F H R S T V
6 AM-3 PM. *Spr:* Chicago FM Club. Boone County Fairgrounds, 8791 IL Rte 76. "Radio Expo 2012." *TI:* 146.76 (107.2 Hz), 147.255 (114.8 Hz), 444.725 (107.2 Hz). *Adm:* advance $8, door $10. Tables: $20 (4 or more $15 each). Don Wondolkowski, W9DMW, 28W608 Bolles Ave, W Chicago, IL 60185; 630-847-5317; **don.w9dmw@gmail.com**; **www.chicagofmclub.org**.

IOWA SECTION CONVENTION

November 4, Davenport
D F H R S

The Iowa Section Convention (41st Annual Hamfest/Computer Show**)**, sponsored by the Davenport RAC, will be held at the Clarion Hotel, 5202 N Brady St. Doors are open for setup Saturday noon-5 PM, Sunday 6-8 AM; public 8 AM-2 PM. Features include flea market; commercial vendor displays; computer systems, hardware and software; special guest from ARRL HQ Larry Wolfgang, WR1B, *QEX* Editor; handicapped accessible; refreshments. Talk-in on 146.88 (192.8 Hz); 146.94. Admission is $6 in advance, $7 at the door (under 12 free). Tables are $12. Contact John Hoenshell, NØBFJ, 2331 N Linwood Ave, Davenport, IA 52804; 563-326-4985; **n0bfj@arrl.net**; **www.arcsupport.com/drac/hamfest.html**.

IOWA STATE CONVENTION

October 13, Sergeant Bluff
D F H Q R S T V

The Iowa State Convention (Hamboree 2012, 35th Annual Event), co-sponsored by the 3900 Club and the Siouxland ARA, will be held at the Sergeant Bluff Community Center, 903 Topaz Dr. Doors are open 8 AM-2 PM. Features include flea market; commercial and individual vendors; quality forums and seminars; QSL card checking; VE sessions; fully handicapped facility; refreshments. Talk-in on 146.91. Admission is $5. Tables are $10. Contact Bob Molstad, WØPOD, Box 3746, Sioux City, IA 51102-3746; 712-255-8023; fax 712-255-6434; **bmolstad@cableone.net**; **3900club.com**.

Kansas (Valley Center) — Oct 6 D F H R V
8 AM-1 PM. *Spr:* Valley Center ARC. Calvary Baptist Church, 320 N Sheridan. 11th Annual Wichita Area Hamfest. *TI:* 147.39. *Adm:* $3. Tables: $8 each (2 or more tables $7.50 each). Steve Periman, NØYYI, 123 S Birch Ave, Valley Center, KS 67147; 316-617-1658; **wichitaareahamfest2012@gmail.com**; **www.vcarc.org.**

Kentucky (Hazard) — Oct 27 D F H R V
8 AM-1 PM. *Spr:* Kentucky Mountains ARC. Hazard/Perry County Senior Center, 354 Perry Park Rd. *TI:* 146.67 (103.5 Hz). *Adm:* $5. Tables: $5. John Farler, K4AVX, 1264 Hall Mountain Rd, Viper, KY 41774; 606-476-9662; **jfk4avx@yahoo.com**; **kmarc.net**.

Louisiana (Pineville) — Oct 6. Scott Wren, KD5DFL, 318-484-6744; **kd5dfl@hotmail.com**; **arccla.us**.

Maryland (Westminster) — Oct 21
D F H R T
8 AM-1 PM. *Spr:* Carroll County ARC. Carroll County Agriculture Center, 700 Agriculture Center Dr. 22nd Annual Mason-Dixon Hamfest. *TI:* 145.41 (114.8 Hz). *Adm:* $5. Tables: $16. Steve Beckman, N3SB, 2145 Bethel Rd, Finksburg, MD 21048; 410-876-1482; **n3sb@qis.net**; **www.qis.net/~k3pzn**.

Massachusetts (Cambridge) — Oct 21. Nick Altenbernd, KA1MQX, 617-253-3776; **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Kalamazoo) — Oct 21
D F H Q R S T V
8 AM-noon. *Sprs:* Kalamazoo ARC and Southwest Michigan AR Team. Kalamazoo County Fairgrounds Expo Center, 2900 Lake St. *TI:* 147.04 (94.8 Hz). *Adm:* advance $5, door $6. Tables: $12. Hollis Locke II, WB8ALW, 2627 Romence Rd, Portage, MI 49024; 269-213-5272; **wb8alw@w8vy.org**; **www.KalamazooHamFest.com**.

Michigan (Madison Heights) — Oct 7
D F H R V
9 AM-2 PM. *Spr:* Utica Shelby Emergency Communication Assn. Madison Place Banquet and Conference Center, 876 Horace Brown Dr. 27th Annual Hamfest. *TI:* 147.18 (100 Hz). *Adm:* $5. Tables: $12. Chuck Perushek, N8ZA, 20451 Huntington Ave, Harper Woods, MI 48225; 586-557-4983; **n8za@arrl.net**; **www.usecaarc.com**.

Michigan (Muskegon) — Oct 13
D F H R S V
8 AM. *Spr:* Muskegon County Emergency Communication Services. Fellowship Reformed Church, 4200 E Apple Ave. *TI:* 146.82 (94.8 Hz). *Adm:* advance $5, door $6. Tables: $8. James Duram, K8COP, Box 386, Fruitport, MI 49415; 231-638-7010; **k8cop@arrl.net**.

Michigan (Petoskey) — Oct 6 F R T
8 AM-noon. *Spr:* Straits Area ARC. Emmanuel Evangelical Church, 620 Emmet St. Foxhunt. *TI:* 146.68 (110.9 Hz). *Adm:* $5. Tables: $5. Dirk Esterline, KG8JK, 3106 Greenfield Dr, Petoskey, MI 49770; 231-348-5043; **kg8jk@qsl.net**; **www.w8gqn.org**.

Missouri (Belton) — Oct 20 D F H Q R S V
8 AM-1 PM. *Spr:* SouthSide ARC. St Sabina Catholic Church Gym, 700 Trevis Ave. *TI:* 147.12 (151.4 Hz). *Adm:* advance 3 for $7, door $4 each. Larry Dunn, WØLLD, 21424 Pin Oak Ln, Peculiar, MO 64078; 816-779-0022; **dunny41@comcast.net**; **www.qsl.net/southsidearc/**.

Missouri (Kansas City) — Nov 10
D F H R S V
8 AM-1 PM. *Spr:* Raytown ARC. Fraternal Order of Eagles, 10220 E 47th St. *TI:* 145.17. *Adm:* advance $1, door $2. Tables: flea market $10; vendors $20. Steven Deines, NØTES, 1840 SW Napa Valley Dr, Lee's Summit, MO 64082; 816-914-5971; **sjdeines@yahoo.com**; **k0gq.com/Raytown_2012_Hamfest.pdf**.

Missouri (Kirkwood) — Oct 27 D F H R V
7:30 AM-1 PM. *Spr:* St Louis ARC. Kirkwood Community Center, 111 S Geyer Rd. 21st Annual Halloween Hamfest. Breakfast made to order. *TI:* 147.15. *Adm:* advance $3 each or 4 for $10; door $5 each. Tables: $15 (electrical hookup $15). Bob Sluder, NØIS, 7511 Local Hillsboro Rd, Cedar Hill, MO 63016; 636-285-7605; **bcsluder@msn.com**; **www.halloweenhamfest.org**.

New Jersey (Wall Township) — Sep 29
F H R T V
7 AM-1 PM. *Spr:* Ocean-Monmouth ARC. InfoAge Learning Center, Project Diana Site, 2300 Marconi Rd. *TI:* 145.11 (127.3 Hz). *Adm:* $5. Tables: $15 (indoor, with 1 admission), $10 (outdoor). Jeff Harshman, N2LXM, 5 The Arborway, Ocean, NJ 07712; 732-996-0637; **n2lxm@juno.com**; **omarc.org**.

New Mexico (Socorro) — Oct 27
D F H R S T V
8 AM-2 PM. *Sprs:* Socorro ARA, Tech ARA, and the City of Socorro. NM Firefighters Training Academy, 600 Aspen Rd. State ARES Meeting. *TI:* 146.68 (123 Hz). *Adm:* Free. Tables: $10. Al Braun, AC5BX, 722 N California St, Socorro, NM 87801; 575-835-3370; **ac5bx@juno.com**; **www.socorroara.org**.

New York (Hicksville) — Oct 28
D F H Q R S V
Set up 7 AM; public 9 AM. *Spr:* Long Island Mobile ARC. Levittown Hall, 201 Levittown Parkway. Long Island Hamfair. *TI:* 146.85 (136.5 Hz). *Adm:* $6. Tables: $20. Richard

Cetron, K2KNB, 198 Haypath Rd, Old Bethpage, NY 11804; 516-694-4937 (phone and fax); **k2knb@arrl.net**; **www.limarc.org**.

New York (Queens) — Oct 14
D F H Q R T V
Set up 7:30 AM; public 9 AM-2 PM. *Spr:* Hall of Science ARC. NY Hall of Science Parking Lot (Flushing Meadow Corona Park), 47-01 111th St. Drop and Shop. *Tl:* 444.2, 145.27 (both 136.5 Hz). *Adm:* buyers $5, sellers $10 per space plus $5 admission. Stephen Greenbaum, WB2KDG, 85-10 34th Ave, Apt 323, Jackson Heights, NY 11372; 718-898-5599; **WB2KDG@arrl.net**; **www.hosarc.org**.

North Carolina (Winston-Salem) — Oct 13
D F H R T V
7 AM-noon. *Spr:* Forsyth ARC. Summit School Athletic Center, 2100 Reynolda Rd. *Tl:* 146.64, 145.47 (both 100 Hz). *Adm:* $5. Tables: $10. Henry Heidtmann, W2DZO, 8812 Merry Hill Ct, Lewisville, NC 27023; 336-245-5740; **hamfest@w4nc.com**; **www.w4nc.com/events.htm**.

Ohio (Massillon) — Oct 28 D F H R S V
8 AM-2 PM. *Spr:* Massillon ARC. Massillon Boys and Girls Club, 730 Duncan St SW. 52nd Annual Hamfest. *Tl:* 147.18 (110.9 Hz). *Adm:* $5. Tables: $14. Terry Russ, N8ATZ, 3420 Briardale Dr NW, Massillon, OH 44646; 330-837-3091; **truss@sssnet.com**; **www.w8np.org**.

Oklahoma (Ardmore) — Oct 26-27
D F H Q R S V
Set up Friday noon-5 PM, Saturday 7-8 AM; public Friday 5-8 PM, Saturday 8 AM-1 PM. *Spr:* Texoma Hamarama Assn. Ardmore Convention Center, 2401 N Rockford Rd. *Tl:* 146.97 (131.8 Hz). *Adm:* advance $8, door $10. Tables: 8-ft $15. Henry Allen, W5TYD, Box 773, Caddo Mills, TX 75135; 800-588-2841; fax 214-388-2705; **w5tyd@arrl.net**; **texomahamarama.org**.

Oklahoma (Enid) — Nov 3 D H R S V
8 AM. *Spr:* Enid ARC. Garfield County Fairgrounds (Hoover Bldg), 305 E Oxford Ave. *Tl:* 145.29. *Adm:* $2. Tables: $2. Mike Cofer, KD5OFF, Box 261, Enid, OK 73702; 580-554-2749, **w5htk@enidarc.org**; **www.enidarc.org/enidhamfest**.

MID-ATLANTIC & NORTHEAST VHF CONFERENCE

October 12-14, Bensalem, PA
F H R S T
The Mid-Atlantic and Northeast VHF Conference, sponsored by the Mt Airy VHF and the Northeast Weak Signal RCs, will be held at the Marriott Courtyard Bensalem, 3327 Street Rd. Doors are open Friday 7-11 PM, Saturday 8 AM-5 PM, and Sunday 8-10 AM. Conference topics include VHF, UHF and Microwave construction; operating; digital modes; EME; antennas; roving and more. Other features include a small indoor hospitality and table-top flea market (Friday eve) and a small outdoor limited tailgate area (Sunday morning) for registered attendees only; Saturday pizza lunch; Saturday Buffet Banquet ($35). Registration is $35 in advance (by Sep 24), $40 after Sep 24. Contact Rick Rosen, K1DS, 206 Kimberton Dr, Blue Bell, PA 19422; 610-270-8884 (phone and fax); **rick1ds@hotmail.com**; **www.packratvhf.com**.

Pennsylvania (Sellersville) — Oct 21
D F H R T V
Set up 6 AM; public 7 AM-1 PM. *Spr:* RF Hill ARC. Sellersville Firehouse, 50 N Main St (Bethlehem Pike). 36th Annual Hamfest. *Tl:* 145.31 (131.8 Hz). *Adm:* $6, non-ham spouses and children free. Tables: $12 (indoor); $8 per outdoor space (bring your own table), plus admission. Jim Soete, WA3YLQ, c/o RF Hill ARC, Box 336, Perkasie, PA 18944; 215-723-7294; fax 215-257-0724; **wa3ylq@arrl.net**; **www.rfhill.ampr.org**.

Pennsylvania (Washington) — Nov 4
D H Q R S T V
8 AM-3 PM. *Spr:* Washington Amateur Communications. Washington County Fairgrounds, 2151 N Main St. *Tl:* 145.49, 146.79. *Adm:* $5. Tables: 6-ft $12 (5 or more tables are $10 each); electricity available, must be paid by Oct 15. Bud Plants, N3TIR, 236 Chambers Ridge Rd, West Alexander, PA 15376; 724-350-6745; **bud@n3tir.com**; **www.wacomarc.org**.

South Carolina (Conway) — Nov 10
D F H S T V
8 AM-2 PM. *Spr:* Grand Strand ARC. Old Pee Dee School, 3521 Juniper Bay Rd. 16th Annual "Beachfest." *Tl:* 145.11 (85.4 Hz). *Adm:* advance $6, door $7. Tables: $12 (outside tailgate spots $7 each). Jim Wood, KF4CJE, Box 2135, Myrtle Beach, SC 29578; 843-340-1132; **kf4cje@aol.com**; **www.w4gs.org**.

South Carolina (Sumter) — Oct 27 D F R
8 AM-4 PM. *Spr:* Sumter ARA. Sumter Jaycee Hut, 314 Pine St. Sumter "Open-Air" Hamfest. *Tl:* 147.015. *Adm:* Free. Tables: $5. Thomas D'Anella, KC4ZTC, 109 Kells Dr, Hopkins, SC 29061; 803-661-9934; **tdanella@sc.rr.com**; **www.geocities.com/capecanaveral/2695/sara.htm**.

Tennessee (Bristol) — Oct 20
D F H R S T V
8 AM-2:30 PM. *Spr:* The GrayHamfest Assn. Bristol Motor Speedway (Gates 6 and 7), 151 Speedway Blvd (Rte 11-E). Special demonstrations and innovations in Amateur Radio. *Tl:* 145.29 (103.5 Hz). *Adm:* $6. Tables: $10. Charles Stuchell, K4CWA, 222 River Rd, Bluff City, TN 37618; 423-538-3868; **k4cwa@arrl.net**; **www.grayhamfesttn.org**.

Tennessee (East Ridge) — Oct 27
D F H R S T V
7:30 AM-3 PM. *Spr:* Chattanooga ARC. East Ridge Community Center, 1517 Tombras Ave. *Tl:* 146.79. *Adm:* Free. Tables: $10 (tailgate $5 per space). Jim Bowman, W4DFS, Box 3681, Chattanooga, TN 37404; 423-394-7373; **w4dfs@arrl.net**; **www.w4am.org/Hamfest-Chattanooga/index.php**.

Texas (Azle) — Nov 10 D F H R S T V
8 AM-noon. *Spr:* Tri-County ARC. Azle Community Center, 404 W Main St. *Tl:* 147.16 (110.9 Hz). *Adm:* $5. Tables: indoor $10 (free tailgating). Paul Finch, WB5IDM, 1417 Jackson Tr, Azle, TX 76020; 682-465-3568; **azlecomm@azlecomm.com**; **www.wc5c.org/**.

Texas (Belton) — Oct 6 D F H R T V
7 AM-2 PM. *Spr:* Temple ARC. Bell County Expo Center, 301 Loop 121. "HamEXPO! 2012." *Tl:* 146.82 (123 Hz). *Adm:* $5. Tables: $10-$25. Mike LeFan, WA5EQQ, 1802 S 13th St, Temple, TX 76504; 254-773-3590; **expo@tarc.org**; **www.beltonhamexpo.org**.

Texas (Corpus Christi) — Nov 3
D F H Q R S T V
8 AM-4 PM. *Spr:* South Texas ARC. First Presbyterian Church, 430 S Carancahua St. 14th Annual Coastal Bend Hamfest. *Tl:* 146.82 (107.2 Hz). *Adm:* $5. Tables: $10. Albert DeMeulle, KF5ARJ, 2516 Kirby Rd, Aransas Pass, TX 78336; 361-633-9330; **demeulle@cableone.net**; **www.n5crp.org**.

Texas (Lufkin) — Oct 20 D H R T V
8 AM-1 PM. *Sprs:* Deep East Texas and Nacogdoches ARCs. Lufkin First Church of the Nazarene, 1604 S Medford Dr. *Tl:* 146.94 (141.3 Hz). *Adm:* Free. Tables: first table free; additional tables $5 each (free tailgating). Jerry Wilson, K5JLW, 144 Donna St, Huntington, TX 75949; 936-632-9310; **ac5zj@cs.com**; **www.lufkinhamfest.com**.

Washington (Bremerton) — Oct 20 D F H
9 AM-3 PM. *Spr:* North Kitsap ARC. VFW Hall, 9981 Central Valley Rd. *Tl:* 146.44. *Adm:* $2. Tables: $10. Al Warner, KE7RPR, Box 982, Seabeck, WA 98380; 360-830-3683; **adw52@msn.com**; **nkarc.org/new_home/**.

Wisconsin (Hubertus) — Oct 14 D F H R
Set up 6 AM; public 8 AM-2 PM. *Spr:* Southeastern Wisconsin FM Amateur Repeater Society. Richfield Chalet, 1271 Hwy 175. *Tl:* 146.82 (127.3 Hz). *Adm:* $5. Tables: $12. Darrell Welch, K9ABC, 4006 Monches Rd, Colgate, WI 53017; 262-628-1700; **dw@charter.net**; **www.sewfars.com**.

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online. Sanctioned conventions are also listed in the *ARRL Letter*. In addition, events receive donated ARRL prize certificates and handouts.

For hamfests: Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions:* Approval must come from your director and the ARRL executive committee.

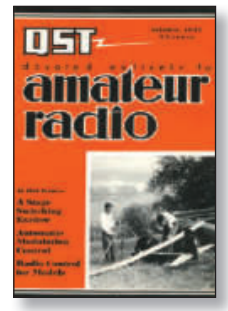
The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **October 1** to be listed in the **December** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and ARRL Web banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

75, 50 and 25 Years Ago

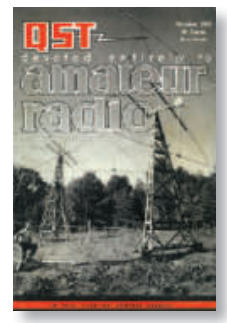
Al Brogdon, W1AB

October 1937



- The cover photo shows Ross Hull and crew getting ready to make a model sailplane flight using radio control of the model.
- The editorial revisits the subject of how hams use the RST signal-reporting system.
- Ross Hull and R. B. Bourne, W1ANA, tell us about "Radio Control of Model Aircraft," complete with details of a system for a sailplane.
- George Grammer, W1DF, describes "A Semi-Universal Exciter with Stage Switching and Plug-in Coils" that produces 40 watts' output on five bands.
- "Modernizing the Simple Regenerative Receiver," by Vern Chambers, W1JEQ, presents the details of a two-tube band-switching receiver.
- "Concentrated Directional Antennas for Transmission and Reception" combines two articles: "Half-Wave Loop Antennas, by John Reinartz, W1QP, and "A Square 'Signal Squirter' for 14 Mc." by Burton Simpson, W8CPC.
- Another combination of two articles addresses the issue of "Negative-Peak Automatic Modulation Control for Plate-Modulated 'Phone Transmitters": W. Bradley Plummer, W2CMI, discusses "Over-Modulation Control and Volume Compression with Variable-Mu Speech Amplifier," and L. C. Waller Waller, W2BRO, covers the topic of "Negative-Peak Control with 6L7 Speech Amplifier and All-A.C. Operation."
- Walter Stiles, W8DPY, describes his latest project, "A Versatile Emergency Transmitter" that uses three 6L6G tubes.
- "Amateur Radio Stations" this month features W2CSY, in Riverhead, New York, and W8QAN, in Pittsburgh, Pennsylvania.

October 1962



- The cover photo shows part of the massive 2-meter array built by college students K1HMU and W1ZIG for moonbounce work.
- The editorial points out that this year is the Golden Anniversary of Amateur Radio licensing.
- Clifford Harvey, W1RF, describes "The Ultimate Exciter," which synthesizes any frequency from the outputs of crystal-controlled oscillators.
- Lew McCoy, W1ICP, tells how to build "A Five-Element Two-Meter Beam for $1.49."
- "The V.H.F. Contest Special," by H. M. Meyer, W6GGV, is a 120-watt 144-Mc. transmitter in a single package.
- G. Franklin Montgomery, W3FBQ, presents "Some Thoughts on Power Supplies."
- Jay Kay Klein, WA2LH, amuses us with his ideas about solving the esthetic problem of amateur antenna towers, in "The Towering Problem."
- Pangs of nostalgia for listening to the 14.7 kc. signal of NAA cause old-timer E. E. Pearson, W3QY, to dig through his stash of old parts and build "An NAA Receiver."
- "2 Meter Moonbounce" looks at the summer efforts of college students Ned Conklin, K1HMU, and Chip Brown, W1ZIG. The two young men built an array of eight long-boom beams and were heard by W6DNG, although a two-way contact was not made.

October 1987

- The cover graphic shows the new "We the People" WAS award that commemorates the bicentennial of the nation's constitution, and adds the question, "Need wallpaper?"
- The editorial, "You Be the Judge," reproduces an exchange of correspondence between the ARRL and ABC News. Ted Koppel had reported that false instructions were being transmitted on an Air Traffic Control frequency at LaGuardia Airport by a "ham radio operator." ABC News did not feel that our country's 430,000 hams were maligned by that reference…. "You Be the Judge."
- David Hollander, N7RK, looks into the future and sees pocket-size handhelds and TVs the size of a watch, in "The Mystique behind Miniaturization — Surface Mount Technology."
- Michael Mideke, WB6EER, gives us Part 2 of "Alternative Energy — An Overview of Options and Requirements."
- Radio parts for homebrewers are getting harder to find, so Doug DeMaw, W1FB, tells us how to go about "Stalking Those Fugitive Components."
- Butch Bussen, WAØVJR, presents Part 1 of "Amateur Radio and the Blind."

Field Organization Reports

July 2012

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**.

615 W5KAV
514 WB9FHP
505 W7FQQ
413 KC8QWH
407 KD8EBY
399 W4CAC
375 KT2D
339 KD8HPG
310 KI4GWC
305 KA2ZNZ
295 AC6C
292 K8OLY
268 KK4BVR
265 KB2ETO
263 WB8R
255 K9LGU KI4GEM
246 K4DND
245 K6FRG
235 KD1LE
230 K7EAJ N7CM N8OSL
228 W2MTA
224 WB8RCR
220 K2HAT
205 KI4KWR
195 K6HTN K8RDN
190 KK3F KB2KOJ NX8A
189 WØRJA
193 KA4IZN
190 AG9G NM1K KB2KOJ
185 W9WXN
183 KB8VXE
180 KB1NMO K1ABX
179 WA2BSS
174 WS6P K5SFM
172 KØIBS
170 WE2G KJ4G
165 KE5HYW
164 K7BC
160 WB9WKO KGØGG AA3SB WB4ZIQ WK4P
157 KC2SFU
155 KK5NU W4TTO KF7PDV
151 KC5ZGG
150 W5DY KB2BAA
144 KB8YYS
140 K7BFL WB2FTX N8IO N7IE K7OAH
137 KJ4JPE
136 N2GJ W2DWR
135 WØLAW W3YVQ K2TV
134 W7JSW
132 KA8ZGY
130 K6JT KB5SDU KE4CB KW1U K4IWW WI2G
125 N2JBA N4LFJ W4DNA
124 KB8RCR
122 KJ6IJJ
120 N9VC W9BGJ W8UL WA2NDA K4GK NC3F KA4FZI NA7G WB8WKQ
116 KD7OED
115 K6MQF KT5SR N3RB WA3EZN N4ABM
111 NØMEA WD8USA
110 W7QM NX9K W7GB KC5OZT N5NVP N7XG N7YSS WA5LOU K7BDU WB8HHZ AA2SV KA1G N9MN K2VX K4BG N1IQI W2EAG KB1RGQ WB6OTS
108 K4JUU
107 KC2UMX
106 K4BEH KJ7NO
105 N8CJS KF7GC
103 W3CB
101 NA9L
108 W5XX
106 WM2C
105 KØVTT
100 K4SCL N5OUJ KF5IOU KD7THV W3TWV N3SW N1JX KA8IAF WG8Z WB8SIQ WD8Q NU8K WØCLS WAØVKC K3IN KB3LNM WB4FDT KJ4RUD N2RTF KB2YAA KØPTK K8VFZ
98 W8CPG
97 KØLQB
95 KI4AAN WA4BAM K1YCQ KD8QPF
93 K1STM K7FLI
92 N1LKJ KC8EIA
91 AD4BL
90 N5RL K5AXW KK7TN N8DD KB8HJJ W8DJG KJ4HGH W8IM KZ8Q WB4BIK N1TF N3ZOC KC8BW
88 W5GKH
WB3FTQ
86 N2VC
85 KB9PGY W8MAL
84 N2DW KB9KEG KD8LZB
83 K1PJS W2CC
82 KI4JQB
81 KK7DEB WDØGUF
80 NN7H AA5VZ KB5KKT KC2EMW WB4RJW KA3NZR KØDEU NIØI NØMHJ KFØXO KCØZDA N2KPR KB7RVF KD8CYK WB8TQZ K8KV
78 KD2AXP N9WLW
77 N2VQA
76 KE5YTA KI4QAU
75 N8SY N8FVM
74 WB8WJV
72 K6GPZ W4TY
70 K6RAU N2YJZ KB2RTZ KDØAYN KØDLK NØDUW NØDUX WØFUI N3NTV KØPTK KØRXC KD7ZUP W2DER

The following stations qualified for PSHR in these previous months, but were not recognized yet in this column: (Jun) WA9LFO 455, K9LGU 285, N9VC 240, AC6C 210, NX9K 210, WB9WKO 165, AG9G 135, WA2NDA 120, KO4OL 110, WD8JAW 105, KB-9KEG 92, KC4BQK 83. (May) W5XX 224, N5NVP 125, K2TV 130, KO4OL 108, KB5SDU 100, KC4BQK 86, WD8JAW 82, N2WGF 78. (Apr) WB9YBI 262, WB9FHP 225, W9WXN 160, W9BGJ 110, WA5LOU 110, KO4OL 110, NA9L 108, KO4OL 108, N9WLW 86, WD8JAW 80, KC4BQK 70.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AZ, CO, CT, EMA, ENY, EWA, GA, IL, IN, LA, LAX, MDC, ME, MI, MS, NC, NE, NFL, NLI, NNJ, NNY, NTX, OH, OK, OR, SD, SFL, SJV, SNJ, STX, TN, UT, VA, WCF, WNY, WV, WI, WV WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: EWA, IA, ID, IN, MDC, MI, MN, MO, MT, ND, NLI, NM, OH, ORG, STX, SV, 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.

KK3F 3367, W5KAV 2531, WB9FHP 1965, N1IQI 1465, WB2FTX 1245, NX9K 1224, N9VC 1146, K6HTN 901, K7BDU 671, KW1U 749, W8UL 564, WØRJA 542, W9WXN 509, WB8WKQ 505.

The following station qualified for BPL with Originations plus Deliveries: K6FRG 181, NM1K 129, K8LJG 242.

The following stations qualified for BPL in June, but were not recognized yet in this column: NX9K 1509, N9VC 1177.

The following stations qualified for BPL in April, but were not recognized yet in this column: WB9FHP 1251, W9WXN 508.

Silent Keys

Silent Keys Administrator, sk@arrl.org

It is with deep regret that we record the passing of these amateurs:

K1AFS **Litchfield**, Thaddeus, Danvers, MA
KB1AQI **Ward**, James N., Dalton, MA
N1BKE **Kleinman**, Joel P., Meriden, CT
KA1BSG **Beaudoin**, Robert L., Longmeadow, MA
WE1DUX **Case**, Robert S., Springfield, OR
N1EKM **Voldstad**, Arthur W., Norwalk, CT
KB1KSR **Phoenix**, Edwin W., Townshend, VT
W1LMJ **Boudreau**, Adolphe J., Lynn, MA
♦K1OVF **Williams**, William E., Orlando, FL
WA1PJD **La Montagne**, Lucien R., Harrisville, RI
N1QIW **Stern**, H. Lee, Pittsfield, MA
N1SDI **McDonald**, Scott A., South Portland, ME
W1TGE **Sakowski**, William A., Savoy, MA
♦K1UDP **St Andre**, George O., Braintree, MA
K1UFS **Subkowsky**, Harry, Wallingford, CT
♦W1UQ **Bardfield**, Morton L., Brookline, MA
KA1VGN **Clark**, Allan H., Williamstown, MA
KA1WV **Sforza**, Donald J., Orlando, FL
N1WWH **Stewart**, Neil N., Everett, MA
K2AW **Fix**, Frank P., Westbury, NY
W2AYA **Daniels**, Robert H., Perkimen Township, PA
WA2DQI **Sullivan**, Don, Newtown, CT
♦W2DU **Maxwell**, M. Walter, DeLand, FL
KA2EWH **Dobush**, Cornelius W., Tenafly, NJ
ex-W2FDH **Beck**, Samuel B., Grand Haven, MI
W2FUE **Cresap**, John P., Randolph, NJ
WA2HJB **Warren**, James D., Gastonia, NC
W2INK **Motluck**, Irving E., Berlin, NJ
K2IPE **Gerkhardt**, Ralph F., Blairstown, NJ
WA2JUN **D'Ercole**, Anthony L., Bowdon, GA
KC2KGD **Fanfarillo**, Glenn L., Millville, NJ
KB2KLH **Barr**, Nat, Long Beach, NY
K2NH **Harbison**, Norman Jr, Hardingville, NJ
N2NUM **Edwards**, Donald Jr, Northville, NY
W2OHM **Pierce**, Richard H. Sr, Ridge, NY
WA2PKS **Ray**, Donald A., Rochester, NY
W2PRO **D'Onofrio**, Elmer A., Yonkers, NY
N2RUN **Gorzka**, Edward J., Fords, NJ
N2SEY **Furber**, Richard F., Perth Amboy, NJ
KB2TBB **Barter**, Robert L., Saratoga Springs, NY
KA2TFC **Montgomery**, John W., Erie, PA
ex-W2TWX **Kraft**, William E., Livonia, NY
K2UEG **Tacci**, Salvatore, Macungie, PA
W2UUI **Kagan**, Claude A. R., Hopewell Township, NJ
N3AAU **Szigety**, John C., Phoenixville, PA
WB3AJC **Doncaster**, Richard M., Worton, MD
N3ASP **Ronco**, Dennis, Mifflinburg, PA
KC3BIT **Greeley**, April M., Dingmans Fry, PA
♦WA3BZT **White**, Edward J., Bear, DE
WB3CDL **Comstock**, Wayne H., Hadley, MA
AA3EB **King**, Obie G., Butler, PA
♦W3ELS **Russo**, Philip, Davidsonville, MD
KA3ERO **Homer**, William I., Wilmington, DE
WZ3L **Uhl**, Harold C., Whitehall, PA
N3NQY **Hanrahan**, Daniel R., Gillett, PA
W3NRC **Fox**, Roy C., Galesville, MD
WA3SOI **Rodney**, James B., Pen Argyl, PA
W3TLS **Boyle**, Edward B. Jr, Cantonsville, MD
♦WA3WPR **Lanzoni**, Paul J., Brockway, PA
KB3XT **Shirley**, Lyman E., Ford City, PA
ex-NV4A **Camper**, James F. Jr, Hernando, FL
KJ4ABR **Wall**, Herbert A. Jr, Statesboro, GA
ex-W4ADN **Cheek**, Vernon J., Alpharetta, GA
K4BQH **Schiller**, Richard P., Louisville, KY
KB4BZ **McRight**, James Q. Jr, Raleigh, NC
WB4CPC **Gibson**, James H., Ormond Beach, FL
♦W4CR **Gaither**, James W. Jr, Nashville, TN
KG4CSM **Green**, Larry R., Wetumpka, AL
K4DEX **Loggins**, Robert E., Jefferson, GA
K4DKF **Fields**, Debbie K., Glade Spring, VA
KJ4DU **Monroe**, Tex K., Deltona, FL
KF4IFU **Fritch**, Stuart D., Ocala, FL
K4IKC **Carrel**, John S. Sr, Daytona Beach, FL
WA4JOZ **Skipper**, Clarence M., Phenix City, AL
WD4KRS **Scott**, Allen J., Brooksville, FL
KB4KVY **Garrett**, Blondell P., Dothan, AL
K4KXQ **Bolderson**, Robert V., Sebastian FL
KJ4LFQ **Weatherford**, Larry, Walterboro, SC
KD4LMB **Hawkins**, Clarence T., Gainesville, GA
WB4MUL **Barnes**, Edward E., Columbus, GA
WR4O **Hartley**, James L., Marion, AL
WT4O **Swick**, Charles E., Sherman, FL
WB4OOP **Traylor**, E. M., Stuart, FL
K4OVK **Novak**, Joseph D., Boynton Beach, FL
W4PGZ **Young**, Albert M., Washington, GA
W4QMM **Byars**, Alvin J., McMinnville, TN
KK4RW **Kaprocki**, Francis E., Debary, FL
KD4SC **Bumgardner**, Cloyd O., Somerset, KY
♦K4SDV **Windsor**, Eugene W., Manchester, CT
♦AA4TN **Faris**, James B., Kingsport, TN
K4UAG **Campbell**, Calvin "Tom" L., Knoxville, TN
KD4UFX **Bortniker**, Ernest, Stafford, VA
AB4UR **Nelin**, Bert D., Micanopy, FL
ex-N4VVF **Sumrall**, Dudley D., Pensacola, FL
W4VWU **Hislope**, Denver, Somerset, KY
♦N4XI **Bennett**, John A., Evansville, IN
WB4YWG **Delo**, Estelle, Seminole, FL
NK4Z **Worley**, David L., Berea, KY
KF4ZAB **Perkert**, Paul W., Hertford, NC
KC4ZIX **Evans**, Willie R., Maynardville, TN
K4ZKQ **Allred**, William D., Greensboro, NC
KB4ZOE **Felts**, Clyde B., Nashville, TN
AD5AZ **Kinnard**, Albert L. Jr, Garland, TX
KC5BBY **Lacy**, Jack B. Jr, Brandon, MS
NT5C **Warren**, John P., Round Rock, TX
K5CA **Wiseman**, Donald G., Santa Fe, TX
W5CYB **Westmoreland**, Luther C., Palestine, TX
W5EBB **Hinkle**, Leonard M., Mineral Wells, TX
K5EEB **Langer**, Alex J. Jr, Ponchatoula, LA
KF5ENF **Hatch**, Lisa D., San Angelo, TX
WB5HBR **Fauver**, Vance W. Jr, Denham Springs, LA
♦W5KUV **Droemer**, Daniel R., Granbury, TX
WA5LHI **Kroesche**, Oscar O. Jr, San Antonio, TX
N5LKJ **Fox**, Allan, Royal Oak, MD
KA5OER **Alexander**, Donna L., Gulfport, MS
WA5QBX **Sammis**, Bonnie, Bell City, LA
WO5R **Magro**, Joseph P., Hammond, LA
ex-WB5RTY **Hudson**, James E. Jr, College Station, TX
KC5TKN **Miller**, George E., Taylorsville, MS
N5UXG **Fair**, Bill J., Bentonville, AR
N5WBS **Hobbs**, David, Troy, TX
KK5ZB **Brown**, Michael D., Wichita Falls, TX
KB5ZKV **Harper**, Herbert O., Mize, MS
N6ADS **Poe**, Richard E., Fortuna, CA
KO6BL **Shewmaker**, James V., Covina, CA
KF6BLO **Costello**, Charles E., Chula Vista, CA
W6DLT **Lee**, Lloyd L., Orinda, CA
KB6ETC **Webb**, Timothy C., Hesperia, CA
KN6EU **Atkinson**, Robert K., Granite Bay, CA
KF6EUT **Norman**, E. J., Hat Creek, CA
KI6FRU **Harden**, Otho Charles, Olympia, WA
KA6FUD **Barnett**, Fredrick R., Bakersfield, CA
KI6GEV **Wells**, Paul, Long Beach, CA
♦KH6HME **Lieb**, Paul D., Hilo, HI
KE6JLV **Williamson**, Charles J., Adelanto, CA
♦W6JXV **Jones**, Leslie W. III, San Leandro, CA
♦K6MDG **Barker**, Thomas J., Las Cruces, NM
N6MZU **Amaro**, Angel, Harbor City, CA
W6NSQ **Houck**, William J., Bakersfield, CA
KI6OJ **Szymanski**, Stanley, Wofford Heights, CA
♦W6OMF **Hogue**, Lawrence R., Vacaville, CA
WA6OUH **Bronson**, Jean G., Hemet, CA
K6PMC **Hoelzle**, Eugene C., Claremont, CA
♦WA6POG **Kestler**, Albert, San Jose, CA
W6PRO **Kurtz**, Robert L., Rolling Hills, CA
KE6QBS **Hagan**, Jerry J., Santee, CA
WB6RAO **DeGrado**, David J. Jr, Tucson, AZ
N6SLE **Renslow**, Lawrence B., Pleasanton, CA
K6SSA **Clark**, Stanley G., Gold Hill, OR
K6TTT **Costa**, Jack A., Angels Camp, CA
K6ZVB **Jones**, Richard E., Medford, OR
KE7AB **Cook**, Roy D., Bend, OR
W7ADR **Michaeledes**, Michael G., Centennial, CO
W7AHC **Frazer**, Ralph F., Boise, ID
KB7ATP **Garrod**, Tom W. Jr, Scottsdale, AZ
♦W7BG **Raaen**, Kermit W., Eugene, OR
K7BIM **Raymer**, Clare M., Carson City, NV
N7BMI **Oliver**, William R., Casper, WY
NR7G **Curry**, Bobby J., Saint Johns, AZ
NT7G **Holl**, Mike, Bellingham, WA
K7GJN **Maricle**, Theodore W., Everson, WA
N7HQS **Protas**, Ruth, Tucson, AZ
KA7HUG **Taylor**, Lawrence J., Deer Park, WA
W7JGO **Sievers**, Harold, Spangle, WA
KE7KJD **Jarecki**, Raymond K., Orcas, WA
WA7PFF **Espeland**, Magnus Jr, Seattle, WA
K7PHP **Hull**, Harold W., Milwaukie, OR
K7QHZ **Pittmann**, Leighton K., Spokane, WA
N7REZ **Johnson**, Harley D., Portland, OR
N7RHC **Craw**, Marshall, Chelan, WA
AE7TV **Bockman**, Roy E., Prescott Valley, AZ
WB7UAA **Eckman**, Edward J., Porterville, CA
N7ULV **Jensen**, Lawrence W., Phoenix, AZ
N7VMF **Ueland**, Robert L. Sr, Prineville, OR
♦K7XU **Skinner**, Marcel B., Grants Pass, OR
WA7ZNH **Spengler**, Jerry L., Boise, ID
N8AVI **Wallace**, James W., Mondova, OH
WA8BRI **Dixon**, Katherine L., Columbus, OH
KB8BUW **Littleton**, Jack T., Olive Hill, KY
WB8BUZ **Davidson**, John C., Grand Blanc, MI
KB8CRB **Tucker**, Patricia A., Coshocton, OH
KB8DX **Berninger**, Joseph W., Montville, OH
KB8FFC **Calhoun**, Sam, Canton, OH
W8FVZ **Landon**, Ralph O., Hot Springs Village, AR
♦WA8GMT **Iannetta**, John A. Sr, Lake Milton, OH
WU8H **Lamb**, Russell B., Harlingen, TX
W8HOJ **Browning**, Joe E., Colorado Springs, CO
W8HS **Smith**, Harry L., Lebanon, OH
W8HUE **Jenkins**, Clayton E., Columbus, OH
W8IXZ **Paxton**, Hilbert H., Florence, SC
K8JK **Tewksbury**, Arthur E., Amherst, OH
KD8KF **Blind**, Howard D., New Philadelphia, OH
N8MEA **Wert**, Braden R., Mansfield, OH
N8MGA **Venie**, Isabel, Davisburg, MI
N8MGE **Ashcraft**, George A., Hamilton, OH
W8MMD **Conrad**, Frank J., Cleveland, OH
WB8MMR **Knies**, Michael W., Columbus, OH
KB8MU **Fakan**, John C., Vermilion, OH
N8MW **Wilson**, Marion L., Toledo, OH
WB8NSJ **Klesch**, Thomas L., Struthers, OH
W8QYQ **Devorak**, James R., Delray Beach, FL
WB8RZQ **Knotts**, Dale A., Springfield Township, OH
WB8TQS **Cowan**, Alton C. Jr, Brownsville, TX
KB8TVA **Goudy**, Clyde, Detroit, MI
WB8UYA **McLaughlin**, Robert W., Rush, KY
W8VSK **Keese**, Joseph F., Ann Arbor, MI
W8WHX **Betts**, William A., Waterford, MI
♦W8WTL **Arestad**, Arthur T., Tipp City, OH
KA8ZMZ **Carris**, Lawrence O., Saline, MI
K9CRY **Barker**, Clarence F., Westfield, IN
♦K9CUN **Derry**, John H., Terre Haute, IN
WD9DAO **Fields**, Clifford R., Mount Vernon, IL
KN9DPK **Knepple**, Denny P., Fort Wayne, IN
N9EHS **Kotlarz**, Judy, Hammond, IN
♦N9EMO **Swisher**, Scott N. III, Mundelein, IL
W9EXY **Jensen**, Donald A., Elgin, IL
K9GH **Hollander**, George A., Rockford, IL
N9GSD **Blythe**, Scott, Indianapolis, IN
K9HMM **Langley**, Clarence, Danville, IL
KF9HV **Christie**, Charles C., McCormick, SC
WD9JIH **Stoker**, Frederick L., Racine, WI
KC9JVI **Perry**, Regina, Rockford, IL
WA9RTA **Wallis**, Roland L., Winchester, IL
N9SHI **Loll**, David C., Janesville, WI
W9TZB **Wall**, Glen R., Mount Vernon, IL
N9VKW **Jensen**, Gary R., Redgranite, WI
W9WFW **Vician**, Richard, Arlington Heights, IL
W9WRS **Stamps**, William R. Jr, Bolingbrook, IL
KA9YHU **Fisher**, Michael L., Clayton, IN
KB9YQX **Drennon**, Mr Gary G., Palatine, IL
KØERX **Kopetzky**, William F., Falls City, NE
WØHP **Deziel**, Fred T., Bloomington, MN
WØHPN **Josephson**, John E., Montevideo, MN
WBØHRO **Creech**, LeRoy A., Barnum, MN
KGØJD **Hunt**, John M. Jr, Saint Paul, MN
WØJGN **Kling**, Norman L., Shenandoah, IA
WBØLLZ **Bonner**, Eugene R., Sullivan, MO
KBØLSX **Kampe**, Ernest A., Eaton, CO
NØNTY **Basey**, William G., Blue Springs, MO
KBØNWA **Rarick**, Maurice S., Clarinda, IA
KCØNWZ **Chapel**, Charles E., Lindsborg, KS
KAØSZS **Noah**, Clarence E., Kansas City, KS
KCØUNG **Rogers**, David C., Lathrop, MO
*WAØUPL **Avitt**, Gordon L., Des Moines, IA
WØURN **Andros**, Theodore A., Sarasota, FL
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FT-857D
Ultra compact HF, VHF, UHF
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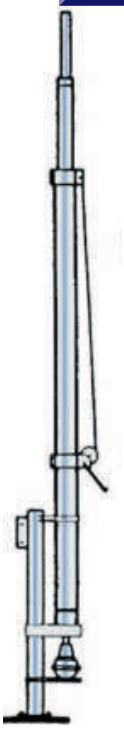

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Continued on page 112

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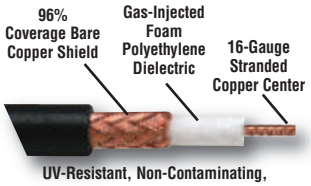

UV-Resistant, Non-Contaminating, Black PVC Jacket

DXE-8X Low-Loss Foam Dielectric Cable (also known as RG-8X or Mini-8)

- Very flexible; ideal for short, in-shack jumper cables
- .242" Type II jacket is non-contaminating and UV-resistant
- Direct-bury

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.6 dB @ 5 MHz	3.0 kW	86%
0.9 dB @ 10 MHz	2.2 kW	81%
1.4 dB @ 30 MHz	1.2 kW	69%
2.0 dB @ 50 MHz	0.9 kW	62%
3.8 dB @ 150 MHz	0.4 kW	42%

Cable Only		
DXE-8X	By the foot	**$.31/ft.**
DXE-8X-1000	1,000 ft.	**$259.99**

Pre-cut Cable with Connectors		
Part Number	**Length/Ft.**	**Price**
DXE-8XDU003	3	**$9.88**
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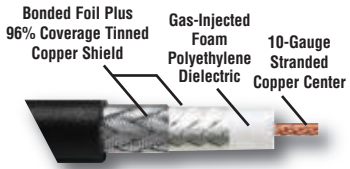

UV-Resistant, Black PE Jacket

DXE-400MAX Low-Loss Cable

- Low-loss, gas-injected foam polyethylene dielectric bonded tape foil covered by a braided copper shield
- .405" low-density polyethylene jacket is UV resistant, ideal for outdoor use
- Direct-bury

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.3 dB @ 5 MHz	6.9 kW	93%
0.5 dB @ 10 MHz	4.8 kW	90%
0.8 dB @ 30 MHZ	2.8 kW	83%
1.1 dB @ 50 MHz	2.1 kW	79%
1.8 dB @ 150 MHz	1.2 kW	65%
3.3 dB @ 450 MHz	0.7 kW	47%

Cable Only		
DXE-400MAX	By the foot	**$.82/ft.**
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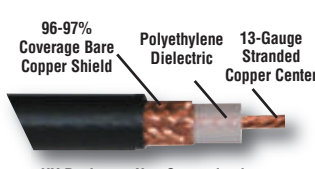

UV-Resistant, Non-Contaminating, Black PVC Jacket

DXE-213U MIL-Spec Cable

- .405" Type II jacket is non-contaminating and UV-resistant, suitable for outdoor use
- Direct-bury

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.4 dB @ 5 MHz	4.9 kW	90%
0.6 dB @ 10 MHz	3.4 kW	87%
1.0 dB @ 30 MHz	2.0 kW	79%
1.3 dB @ 50 MHz	1.5 kW	73%
2.4 dB @ 150 MHz	0.9 kW	57%

Cable Only		
DXE-213U	By the foot	**$.89/ft.**
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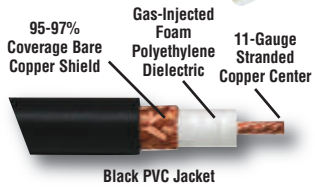

Black PVC Jacket

Gas-Injected Foam Won't Absorb Water.

DXE-8U Low-Loss Foam Dielectric Cable

- .405" high-flex PVC jacket
- Low-loss foam dielectric

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.4 dB @ 5 MHz	5.1 kW	91%
0.9 dB @ 10 MHz	3.1 kW	81%
1.3 dB @ 30 MHZ	1.8 kW	74%
1.4 dB @ 50 MHz	1.6 kW	72%
2.2 dB @ 150 MHz	1.0 kW	60%

Cable Only		
DXE-8UDU	By the foot	**$.79/ft.**
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V-Bolt Style, sized to accommodate ranges of tubing sizes

Part Number	Nominal Size	Thread Bolt Size	Price
DXE-CAVS-1P	0.50 to 1.75	1/4-20	$9.95
DXE-CAVS-11P	0.50 to 1.75	5/16-18	$10.45
DXE-CAVS-2P	1.00 to 2.00	5/16-18	$11.95
DXE-CAVS-3P	2.00 to 3.00	3/8-16	$14.95

Dimensions in Inches.

Clamps with black powdercoated saddles are also available in U-Bolt and V-Bolt styles, designed and sized to fit ½" to 2" tubing.

Super Duty Saddle Clamps

Super Duty Saddle Clamps are designed for maximum clamping strength to control large or unbalanced loads.

- A356-T6 cast aluminum saddle, with rough, as-cast finish for high-torque grip on masts, etc
- Cast stainless reinforcement plate included
- Armor coated bolt sets sold separately

Part Number	Tube O.D.	Price
DXE-SDS-200P	2.00	$32.00
DXE-SDS-250P	2.50	$39.00
DXE-SDS-300P	3.00	$49.00

Dimensions in Inches.

Resin Support Blocks

Securely mount tubing to any flat surface. An insulated mount between tubing and plates, ideal for antenna construction and electrical applications.

- Optional stainless steel reinforcement plates available

Part Number	Tube O.D.	Price
DXE-RSB-I02500	0.250	$2.65
DXE-RSB-I03125	0.3125	$2.65
DXE-RSB-I03750	0.375	$2.65
DXE-RSB-I05000	0.500	$2.90
DXE-RSB-I06250	0.625	$2.90
DXE-RSB-I03400	0.750	$3.05
DXE-RSB-I10000	1.000	$3.05
DXE-RSB-I11250	1.125	$4.70
DXE-RSB-I12500	1.250	$4.70
DXE-RSB-I11500	1.500	$4.70
DXE-RSB-I13400	1.750	$7.15
DXE-RSB-I20000	2.000	$7.15
DXE-RSB-I22500	2.250	$7.95

Dimensions in Inches.

Cushioned P-Clamps

- Provides strain relief of coaxial cable connections
- Grips the cable jacket without nicking or cutting

DXE-CPC-250 For RG-8X, RG-6, RG-59 cable.....pack of 10 **$14.95**

DXE-CPC-375 For RG-213, RG-8, RG-11 cable.....pack of 10 **$14.95**

V-Bolt Style Saddle Clamps with Stainless Steel Saddles

- Stainless Steel Saddles, serrated to secure hard pipe surfaces
- Stainless steel V-bolts and hardware

Part number	Nominal Size	Price
DXE-SSVC-1P	.50 to .75	$6.95
DXE-SSVC-150P	1.00 to 1.50	$9.95
DXE-SSVC-2P	1.00 to 2.00	$11.95
DXE-SSVC-3P	2.00 to 3.00	$14.95

Dimensions in Inches.
Also available with a tab and 1/4" hardware for grounding as shown.

Coaxial Cable Grounding Brackets

- Stainless steel bracket supplied with stainless steel V-Bolt and hardware

DXE-CGB-150 Fits .50" to 1.50" O.D. tube **$15.95**

DXE-CGB-200 Fits 1.00" to 2.00" O.D. tube **$15.95**

Stainless Steel, Studded Band Clamps

- Welded 10-24 stud
- Easy connection to aluminum elements
- Useful for mounting items to round or irregularly shaped structures

Part Number	Nominal Size	Price/Pack of 2
DXE-ECLS-050	0.500	$9.99
DXE-ECLS-062	0.625	$9.99
DXE-ECLS-075	0.750	$9.99
DXE-ECLS-087	0.875	$10.99
DXE-ECLS-100	1.000	$10.99
DXE-ECLS-125	1.250	$11.49
DXE-ECLS-150	1.500	$11.49
DXE-ECLS-175	1.750	$11.49
DXE-ECLS-200	2.000	$11.49
DXE-ECLS-225	2.250	$11.49
DXE-ECLS-250	2.500	$11.99
DXE-ECLS-275	2.750	$11.99
DXE-ECLS-300	3.000	$11.99
DXE-ECLS-325	3.250	$11.99

Dimensions in Inches.

Tell us how you used DX Engineering clamps. The best design will win 200 DX Bucks! One winner every month. Details at DXEngineering.com!

This month's winner: a unique tower side mount for a SteppIR Yagi made by Eric, K2CB. He said the DXE-SAD-series saddle clamps securely attach the boom to his custom bracket on the face of his tower for fixed-direction use. See it on DX Engineering's Customer Showcase at DXEngineering.com

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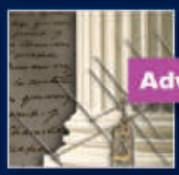

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International *QST*	$62	$118	$167	Monthly *QST* via air mail for international members
International – no printed *QST*	$39	$76	$111	Digital *QST* only
Family	$8	$16	$24	Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member.

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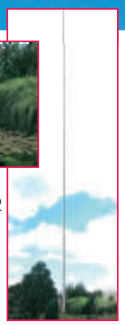
Source Code: QST 5/2012

DX ENGINEERING

ICOM · Cushcraft Amateur Radio Antennas · hy-gain · CQ · HUSTLER · VIBROPLEX · PLASTI DIP · MFJ · AMERITRON · BELDEN · Tigertronics · The BetterRF Company · VECTRONICS ...World Class Quality · ARRL · PolyPhaser · ROHN Products LLC · JSC WIRE & CABLE · LOCTITE · butternut · MIRAGE Communications Equipment · LDG ELECTRONICS · HEIL SOUND · DIAMOND ANTENNA · BENCHER, INC. · STI · Ohio Modern RADIO · COMTEK SYSTEMS

Winter DX is Coming—Upgrade Your Station Now!

Full Size 75/80 Meter Quarter-Wave Vertical Antennas



The 68 foot tall, high-performance, full size antennas have rugged base sections (2, 3 or 4 inch diameter) made from aircraft-grade aluminum tubing. The VA-1 requires simple guying. The VA-2 and VA-3 models are very stout and don't require guying. The VA-2 and VA-3 antennas are supplied with a Heavy Duty Plus Stainless Pivot Base and can be lowered easily with the optional, DXE-VRW one-man, manual winch.

- 2:1bandwidth up to 500 kHz
- DX Engineering structural design + high strength tubing manufactured to rigid specifications **= Highest Wind Ratings**
- High strength, UV-protected Extren® insulator **= High Power Handling Capacity**
- Specially manufactured stainless steel and aluminum saddle clamps, stainless steel bolts, and precision machining **= Reliability Second to None**
- Specially manufactured Pivot Base supplied with VA-2 and VA-3 antennas **= Easy Tilt Up and Down**

DXE-7580FS-VA-1	Vertical Antenna, standard HD, 2 inch O.D. base section	**$379.50**
DXE-7580FS-VA-2	Vertical Antenna, Heavy Duty, 3 inch O.D. base section	**$675.50**
DXE-7580FS-VA-3	Vertical Antenna, Super Duty, 4 inch O.D. base section	**$1,675.50**

DXE-VRW-1 Manual Winch

A great option, this winch allows one person to easily raise or lower a VA-2 or VA-3 vertical antenna.

DXE-VRW-1 Manual Winch..... **$169.99**

100 kHz-30MHz Receive Four-Square Packages

A patented*, sophisticated receiving system with time delay phasing for broadband performance. Optimized to produce wider and deeper rear nulls and a narrower main lobe. Noise and undesirable signals are greatly reduced by a superior front-to-rear ratio (F/R). Better control of phase and currents provides a cleaner pattern than found on available TX four-square arrays.

- Less susceptible to high angle signals compared to EWE, Flag, Pennant, and K9AY antennas
- Excellent directivity with better signal-to-noise ratio
- Switchable in four 90 degree-spaced directions
- Usable over a very wide frequency range with DXE-ARAV3 active elements
- Requires less area than a Beverage antenna
- Active elements require minimal ground system
- Enhanced relay contact reliability

The complete system includes all electronics, four ARA active antennas, TVSU sequencer, 1,000 feet of F6 flooded cable, connectors, and assembly tools.

DXE-RFS-SYS-4P	Complete System with antennas	**$1,650.00**
DXE-RFS-SYS-2P	Controller and Switch only	**$389.95**
DXE-RFS-SYS-3P	160/80/40M Electronics	**$799.00**

US Patent Number 7,423,588

New unslit tubing—or slit one end
Exact Telescoping Sizes!

6063-T832 Aluminum Tubing

- Smoothly telescoping sections
- Drawn not extruded tubing
- Better than the other guys—guaranteed lowest price
- Custom made just for DX Engineering
- Use DXE Stainless Steel Element Clamps to assemble slit lengths

Made in USA

See DXEngineering.com for details.

65 Ft. Telescoping Antenna Kit

- Eleven telescoping sections from 2" to 7/8" O.D.
- Stainless steel element clamps

Made in USA

DXE-ATK65	Telescoping Antenna Kit	**$194.50**
DXE-VE-BASE	Fixed Vertical Insulated Base Kit	**$99.50**
DXE-VA-BASE	HD Vertical Insulated Tilt Base Kit	**$159.50**

Rohn Commercial Towers

Rohn Commercial Tower products and accessories are now available at DX Engineering. We have the Rohn products – Towers, Masts, and Tower and Installation Accessories – to meet your tower structural needs.

Contact DX Engineering Customer Support for your application.

Made in USA

New! Phillystran Insulated Guy Lines

PHI-HPTG-1200I	3/32" dia.	per foot	**$0.49**
PHI-HPTG-2100I	1/8" dia.	per foot	**$0.69**
PHI-HPTG-4000I	3/16" dia.	per foot	**$0.99**
PHI-HPTG-6700I	1/4" dia.	per foot	**$1.39**
PHI-HPTG-11200I	5/16" dia.	per foot	**$2.39**

SignaLink™ USB Unit from Tigertronics

- Easiest installation and setup—for Mac or PC
- Software included on CD ROM
- Built-in low noise sound card
- USB port powered
- Works with ALL radios
- Supports all sound card digital and voice modes, including MT63, EchoLink®, PSK-31, SSTV, CW and RTTY

Made in USA

TIG-SL-USB **$89.95**

- **Requires a radio interface cable**

Any radio interface cable (except the special Elecraft K3 cable), is only **$12.95** when purchased with a SignaLink™ unit

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COMTEK W2FMI Series Baluns

Better Performance, Lower Prices!

From just $49.95

Made in USA

Design inspired by Jerry Sevick, W2FMI, and perfected by DX Engineering's Balun R&D department.

- Featuring a DX Engineering innovation: High-voltage compensating capacitors for unequalled low SWR
- Large fender washers distribute fastener loading
- Special toroid core handles high power with minimum thermal stress
- High, consistent common-mode impedance across HF spectrum provides isolation where it's needed most
- Special wire sizing and Teflon®-insulated wire sleeves for exact impedance matching and better isolation than Thermaleze® wire
- Typical insertion loss: less than 0.2 dB
- Power handling: up to 5 kW+ intermittent depending on model, see website
- Silver-plated gasketed SO-239 connectors, stainless hardware and a weatherproof NEMA box

Contact DX Engineering Customer Support for recommendations for your application.

**Your COMTEK balun order is shipped free, via UPS ground, anywhere in the contiguous 48 United States.*

Coaxial Cable Prep Tools

- Precision, two-step operation
- No nicks or scratches to conductor
- Premium, long-lasting cutter blades
- For foam or solid dielectric cable preparation

DXE-UT-8213	Cable Stripper for RG-8, RG-213, etc	**$39.95**
DXE-UT-808X	Cable Stripper for RG-8X, 9258, etc	**$39.95**
DXE-UT-80P	PL-259 Assembly Tool	**$22.95**
DXE-UT-80N	2-Piece N Connector Tool	**$22.95**
CNL-911	Coax Cable Cutters	**$23.75**
DXE-170M	Precision Shear Side Cutters	**$7.95**

Now available in cost-saving tool kits with carrying case

DXE-UT-CASE	Molded carrying case only	**$22.95**
DXE-UT-KIT1	Basic Coax Cable Prep Kit	**$99.95**
DXE-UT-KIT2	Complete Coax Cable Prep Kit	**$174.95**

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#1 Line of Autotuners!

- *5 to 600 Watts PEP*
- *RF Sensing*
- *Auto and Semi Tuning Modes*
- *Two-Position Antenna Switch*
- *2,000 Memories per Antenna*
- *1.8 to 54 MHz range*
- *6 to 800 ohm range (15 to 150 on 6M)*

M-600 Meter sold separately

NEW! AT-600ProII

Building on the success of the AT-600Pro, LDG Electronics has refined and expanded the model with an optional external 4.5" analog meter. The new AT-600ProII keeps many of the same features of the previous model, but simplifies the operation. With the two-position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six-foot DC power cable.

Suggested Price $369.99; Optional M-600 external analog meter $129.99

Z-11ProII

Meet the Z-11ProII, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" × 7.7" × 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 through 6 meters. The Z-11ProII uses LDG's state-of-the-art, processor-controlled, Switched-L tuning network. It will match dipoles, verticals, inverted-Vs, or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes six-foot DC power cable.

Suggested Price $179.99

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple: one button push on the tuner is all that is needed, the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2,000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the Tune button on the tuner. Powered by four AA internal alkaline batteries (not included), so there are no additional cables required.

Suggested Price $129.99

We have a tuner that will work for you!

We make tuners that will work with any transceiver. Don't know which one is right for you? Give us a call or see the ***Tuner Comparison Chart*** *on our web site for more selection help!*

radio not included

AT-897Plus for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment, 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***

M-1000 Meter sold separately

AT-1000ProII

LDG Electronics' new flagship 1KW tuner features: 5 to 1,000 Watts PEP; RF Sensing; Auto and Semi Tuning Modes; 1.8 to 54 MHz range; 6 to 800 ohm range (15 to 150 on 6M); simplified operation; and an optional external 4.5" analog meter. With the two-position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six-foot DC power cable.

Suggested Price $539.99; Optional M-1000 external analog meter $129.99

Z-100Plus

Small and simple to use, the Z-100Plus sports 2,000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes six-foot DC power cable.

Suggested Price $159.99

LDG Electronics, Inc. 1445 Parran Road, St. Leonard, MD 20685 ***Phone 410-586-2177 • Fax 410-586-8475***

Designed to handle the higher power of the Tokyo Hi Power HL-45B.

NEW! Z-817H

The ultimate autotuner for QRP radios including the Yaesu FT-817(D) with addition of the Tokyo High Power HL-45B. Interfaces to the CAT port (ACC) on the back of the radio with the provided cable. One button push on the tuner and the Z-817H takes care of the rest. Will also function as a general purpose antenna tuner with other QRP radios or QRP radios with up to 75 watt HF amps. Powered by four AA internal alkaline batteries (not included). 2,000 memories cover 160 through 6 meters.

Suggested Price $159.99

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-100Proll

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-100Proll requires just 1 watt for operation, but will handle up to 125 watts. Includes six-foot DC power cable.

Suggested Price $229.99

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-200Proll

The AT-200Proll now includes LEDs to show antenna position and if the tuner is in bypass. A two-position antenna switch stores 2,000 memories per switch. Handles up to 250 watts SSB or CW on 1.8 to 30 MHz and 100 watts on 54 MHz. Rugged and easy to read LED bar graphs simultaneously show RF power and SWR. Includes a six-foot DC power cable.

Suggested Price $259.99

IT-100

Matched in size to the IC-7000 and IC-706, for either manual or automatic tunes, and status LEDs. Control the IT-100 and its 2,000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. For your Icom radio that is AH3 or AH-4 compatible. ***Suggested Price $179.99***

YT-100

For Yaesu FT-857, FT-897 and FT-100 (and all D models) an integrated tuner, powered by the interface. Press the Tune button on the tuner, and everything else happens automatically. ***Suggested Price $199.99***

KT-100

For AT-300 compatible Kenwood transceivers (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. ***Suggested Price $199.99***

YT-450

Designed for Yaesu's newest 100 watt radios. Interfaces directly with the Yaesu FT-450 and FT-950 radios. Press the Tune button on the tuner and the rest happens automatically. It will quickly match nearly any kind of coax fed antenna with an SWR of up to 10:1. 2,000 memories recall settings in an instant! Seamless connection to a PC.

Suggested Price $249.99

YT-847

YT-847 Autotuner is an integrated tuner for the Yaesu FT-847. An included CAT/Power cable interfaces with your FT-847. Just press the Tune button on the tuner and everything else happens automatically!

Suggested Price $249.99

FREE!

RBA-1:1 Balun or RU-4:1 Unun

When You Buy A S9V 43', 31' or 18' Multiband Antenna

Purchase an S9V 43', 31' or 18' antenna and fill out the included form. Mail it to LDG Electronics, and we will send you either a 200 watt balun or unun, your choice!

Antennas!

S9V 43' $199.99

80-6 meters *Fixed Operation*

The S9V 43' is a high-performance, lightweight, telescoping fiberglass vertical. The best value in high-performance "tall" verticals!

S9V 31' $99.99

40-6 meters *Fixed or Portable Operation*

S9V 18' $49.99

20-6 meters *Fixed or Portable Operation*

The S9V 31' and 18' are tapered, ultra-lightweight, fiberglass, vertical antennas. Friction-locking sections and high-tech polymer tube rings allow the antenna to be quickly and safely deployed in practically any environment without tools!

S9RP $39.99

Aluminum Radial Plate

Includes 20 sets of stainless steel nuts & bolts.

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LDG ELECTRONICS

hy-gain® Rotators

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

HAM-IV

The most popular rotator in the world!

HAM-IV **$649.95**

For medium communications arrays up to 15 square feet wind load area. *Has* 5-second brake delay, Test/Calibrate function. Low temperature grease permits normal operation down to -30 degrees F. Alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *Precision* indicator potentiometer. Ferrite beads reduce RF susceptibility. 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 movement. North or South center of rotation scale on meter, low voltage control, max mast size of $2^{1}/_{16}$ inches.

HAM-VI **$749.95** with DCU-2

TAILTWISTER SERIES II

T-2X **$799.95**

T-2XD2 **$899.95** with DCU-2

See more info below

For large medium antenna arrays up to 20 square feet wind load. Has 5-second brake delay and Test/Calibrate functions. Low temperature grease, tough alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, 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 maximum mast size.

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.

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 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 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.**

hy-gain® DCU-2 Digital Rotator Controller

. . . gives you full automatic and manual control of hy-gain rotators

DCU-2 **$399.95**

New!

New hy-gain DCU-2 Digital Controller gives you fully automatic or manual control of your *hy-gain HAM or Tailtwister Rotators*. Just dial in your beam heading and press the rotate button or let *Ham Radio Deluxe* (or other program) control your DCU-2. Your antenna automatically rotates to your desired direction precisely and safely.

First, the DCU-2 makes sure your antenna is free and safely unlocked before turning begins and then turns off your motor before your antenna reaches its final destination. Your antenna gently coasts to a stop before the brake locks. This greatly reduces potentially damaging overshoot.

Fine tuning and full manual control is effortless with *automated* Left and Right direction buttons - - no more worrying about manually releasing and relocking the brake. Brake automatically releases before fine tuning begins and relocks after fine tuning is completed.

Bright blue LCD displays actual heading, dial-in beam heading, computer controlled beam heading in one degree increments and your call sign.

Advanced Features

AutoBrake *Release* - no need to remember to release brake or release too soon - release time is automatic and settable 0-8 seconds.

Coast feature allows antenna to gently stop before the brake locks. Adjustable coast delay (*0-10 degrees*) turns off motor before antenna reaches its final destination to reduce potentially damaging overshoot.

AutoJog unlocks and frees your antenna before turning begins. Great for older rotators with "sticky" brakes. It jogs your rotator backwards slightly to ease brake pressure enough to release.

Offset feature allows you to calibrate your display to show actual beam heading.

USB and RS-232 ports for computer control. Compatible with *Ham Radio Deluxe* and other programs. Adjustable LCD sleep time. Field upgradeable Firmware. 8.5W x 4.3H x 9D inches. 110 VAC. **Order** DCU-2X for 220 VAC.

HAM-VI

HAM-VI **$749.95** *with DCU-2*

New!

New HAM-VI, $749.95, like HAM-IV but with DCU-2 digital controller. For medium antennas up to 15 square feet wind load.

Rotator Options

MSHD, $109.95. Above tower heavy duty mast support. For T2X, HAM-IV, HAM-V, HAM-VI. Accepts $1^{7}/_{8}$ to $2^{5}/_{8}$ inch OD. Centers on 2 ½ inches.

TSP-1, $34.95. Lower spacer plate for HAM-IV, HAM-V and HAM-VI.

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.**

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- TX: 144-148 • RX: 136-174 • Power: 5/2/0.5W
- Memories: 200 • Extra large LCD display & speaker

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-8GR 2M/440 FM HT Built-in GPS

- TX: 144-148, 430-450 MHz • RX: 108-999 MHz (cell blocked) • Memories: 1200+ • Power: 5/2.5/1/0.05W
- GPS unit and antenna is built-in for APRS® data

FT-2900R 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 75/30/10/5W • Memories: 221

FT-8800R 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 MHz (cell blkd) • Power: 50/20/10/5W (2M), 35/20/10/5W (440 MHz) • Memories: 1000
- Crossband repeat • YSK-8900 included!

FT-8900R Quad-Band FM Mobile

- Same as FT-8800R but TX: 28-29.7, 50-54, 144-148, 430-450 MHz and RX: 28-29.7, 50-54, 108-180, 320-480, 700-985 MHz (cell blkd) • Power: 50/20/10/5W (10/6/2M), 35/20/10/5W (440 MHz) • YSK-8900 included!

FT-857D 100W HF/VHF/UHF Mobile

- TX: HF/6M/2M/440 MHz • 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

- TX: HF/6M/2M/440 MHz • 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 • Can operate 20W using optional FNB-78 13.2V Ah NiMH battery packs

FT-950 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 100 • Auto Antenna Tuner
- 32-bit Floating Point DSP • Built-in high stability TCXO

FT-2000 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 10-100W
- Memories: 99 • Auto Antenna Tuner • 32-bit Floating Point DSP • Dual In-Band Receive • Internal Power Supply
- Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-2000D RF output is 200W, PS is external

FTDX-5000MP

FTDX-5000 Series

– Covers HF and 6M; Three different configurations all running 10-200W on CW, SSB, FM, RTTY & PKT and 5-50W on AM • RX: 0.03-60 MHz • Memories: 99 • The "D" and "MP" model comes with SM-5000 Station Monitor that features an excellent bandscope • The "MP" also comes with high stability ±0.05ppm OCXO & 300 Hz roofing filter

FTDX-5000 - Basic Model & ±0.5ppm TCXO
FTDX-5000D - With Station Monitor & ±0.5ppm TCXO
FTDX-5000MP - With Station Monitor, ±0.05ppm OCXO & 300 Hz Roofing Filter

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ID-31A 440 FM & D-STAR HT w/GPS

• TX: 420-450 MHz • RX: 400-479 MHz • Power: 5/2.5/0.5/0.1W • Memories: 1252
• D-Star Digital Voice and GPS receiver is built-in • Large Dot Matrix Display and Directional Keypad makes the radio easy to navigate through the menus

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-92AD 2M/440 D-Star & FM HT

• TX: 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd)
• Power: 5/2.5/0.5/0.1W • Dual RX
• Optional HM-175GPS Speaker Mic adds GPS capabilities

GPS Speaker Microphones

• Shows your position data on the display and offers a position reporting function in DV mode
• HM-189GPS for IC-80AD and HM-175GPS for IC-92AD

ID-880H 2M/440 FM Analog & D-Star Digital Dual Bander Mobile

• TX: 144-148, 430-450 MHz • RX: 118-173.995, 230-549.995, 810-999.99 MHz (cell blkd) • Power: 50/15/5W
• Memories: 1052

ID-1 1.2 GHz D-Star & FM Mobile

• TX: 1240-1300 MHz • RX: 1240-1300 MHz
• Power: 10/1W • Memories: 105
• D-Star 128 kbps Data & 4.8 kbps Voice

IC-7000 HF/6/2M/440 MHz Mobile

• TX: HF/6/2M/440 MHz • RX: 0.03-199, 400-470 MHz
• Power: 2-100W (HF/6M), 2-50W (2M), 2-35W (440)
• Memories: 503 • 41 band-widths w/sharp or soft filter shape

IC-7200 HF/6M Portable

• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
• Memories: 201 • Rugged design for outdoor use
• 32-bit IF-DSPs + 24-bit AD/DA Converters
• USB Port for CI-V Format PC Control & Audio In/Out

IC-7410 HF/6M Transceiver

• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
• 15kHz 1st IF filter and optional 3kHz & 6kHz filters to protect against strong unwanted adjacent signals
• Automatic antenna tuner • USB connector for PC control

IC-7600 HF/6M Transceiver

• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
• Memories: 101 • 5.8 inch color screen
• High-resolution real time spectrum scope using a dedicated DSP unit • Automatic antenna tuner

IC-9100 HF/6/2M/440 MHz All Mode

• TX: HF/6/2M/440 MHz • RX: 0.03-60, 136-174, 420-480 MHz • Optional 1.2 GHz, 1-10W Operation
• Power: 2-100W HF/6/2M & 2-75W 440 MHz
• Memories: 297 • Optional D-Star Board • Auto Tuner
• USB Port for CI-V Format PC Control & Audio In/Out

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TH-K20A 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5.5/2/1W • Memories: 200

TH-F6A Triband FM HT

- TX: 144-148, 222-225, 430-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Dual band RX
- FM Wide/Narrow, AM, SSB and CW receive modes
- Power: 5/0.5/0.05W • Memories: 435

TH-D72A 2M/440 FM HT Built-in GPS

- TX: 144-148, 430-450 • RX: 118-174, 320-524 MHz
- Power: 5/0.5/0.05W • Memories: 1000 • USB Port
- 1200/9600 bps packet TNC • SkyCommand and APRS
- Stand-alone Digipeater • Built-in High Performance GPS
- GPS logging - stores up to 5,000 points of track data
- Echolink® ready • KISS mode protocol

TM-281A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 65W • Memories: 200

TM-D710A
Dualband FM Mobile w/TNC

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Built-in TNC for APRS (needs GPS)
- Cross-band repeat • AvMap G6 & EchoLink® ready

Green Light Labs GPS-710

- 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

TM-V71A Dualband FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Cross-band repeat • EchoLink® ready
- The optional RC-D710 can replace the TM-V71A control panel to enable all the features of the TM-D710A.

TS-480HX 200W HF/6M Mobile

- TX: HF/6M • RX: 0.5-60 MHz • Power: 10-200W (with two optional 22A power supplies) • Memories: 99
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-480SAT 100W version with built-in automatic antenna tuner.

TS-2000 100W HF/VHF/UHF Transceiver

- TX: HF/6/2M/440 MHz • RX: 0.03-60, 142-152, 420-450 MHz • Power: 10-100W (10-50W on 440 MHz) • Memories: 99 • HF/6M Auto Antenna Tuner
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-B2000 Same as the TS-2000 with no front panel controls. Includes PC control software.

TS-2000X The TS-2000 with 1.2 GHz @ 10W.

TS-590S 100W HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz
- Power: 5-100W (5-25W on AM)
- Memories: 110 + 10 Quick Channels
- HF/6M Auto Antenna Tuner
- Full/semi break-in CW • 10 Hz Dual VFO Display
- USB connectivity for PC and remote control

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The MFJ-259B is the world's most popular Antenna Analyzer and the easiest to use! Just select a band and mode. Set frequency. Your measurements are instantly displayed!

Handheld Antenna Lab

Owning the MFJ-259B is like having an entire antenna lab in the palm of your hand!

Measure SWR quickly or make sophisticated measurements such as Return Loss, Reflection Coefficient, Resonance, Complex Impedance (R+jX), Impedance Magnitude (Z) plus Phase in degrees. Covers 1.8 to 170 MHz -- no gaps.

Coax Analyzer

Determine coax cable velocity factor (Vf), loss in dB, coax length, distance to open or short plus detect wrong coax impedance.

Frequency Counter

Measure frequency of external signals using the separate BNC counter input.

Signal Generator

Use as a signal source 1.8-170 MHz with digital dial accuracy for testing and alignment.

Inductance and Capacitance

Measure Inductance (uH) and Capacitance (pF) at RF frequencies not at audio frequencies used by most L/C meters.

Digital and *Analog* Meters

A high-contrast backlit LCD gives precision readings and *two* side-by-side *analog meters* make antenna adjustments intuitive.

Smooth, Stable Tuning

Velvet-smooth reduction drive tuning and precision *air-variable capacitor* makes setting frequency easy and stable.

Battery Saver & More

Battery-saver, low-battery warning, battery voltage meter and charger are all built in. Use ten Alkaline, NiCad or NiMH AA batteries (not included) or 110 VAC with MFJ-1312D, $15.95. 4Wx6¾Hx2D inches.

Here's What You Can Do

Find true antenna resonant frequency
Tune *antenna quickly for minimum SWR*
Match complex loads to your feedline
Adjust *mobile whips without stressing finals*
Determine safe 2:1-SWR operating windows
Adjust *tuners without generating QRM*
Find exact location of shorts and opens
Cut *stubs and phasing lines accurately*
Check cable for loss and contamination
Find *value of unknown coils and caps*
Test RF transformers and baluns
Troubleshoot *filters and networks*
Find self-resonance and relative Q
Check *patterns and compare gain*
MFJ-259B does all this and more!

MFJ Analyzer Accessories

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Special foam-filled fabric cushions blows, deflects scrapes and protects knobs and meters from harm. **MFJ-39C, $24.95.** Like MFJ-29C, but for MFJ-269.

MFJ-66, $24.95. Plug-in coils turns any MFJ Antenna Analyzer into a sensitive and accurate *band switched* dip meter. 2 coils.

MFJ-92AA10, $29.95. Ten MFJ *SuperCell*™ Ni-MH AA rechargeable batteries.

MFJ-99B, $88.90. ***Save $7!*** MFJ-259B Deluxe Accessory Pack: MFJ-29C Pouch, 10 Ni-MH batteries, dip coils, AC adapter. **MFJ-98B, $88.90.** Like MFJ-99B but for MFJ-269.

MFJ-99, $60.85. ***Save $5!*** Like MFJ-99B, less batteries, for MFJ-259B. **MFJ-98, $60.85.** Like MFJ-99 but for MFJ-269.

MFJ-99C, $40.90. ***Save $5!*** AC Adapter and 10 Ni-MH batteries for MFJ-259B/269.

MFJ-917, $29.95. Current balun lets you make balanced line antenna measurements on HF with your MFJ Analyzer. **MFJ-7702, $3.95.** MFJ-917 to MFJ Analyzer adapter.

MFJ-731, $99.95. Tunable RF filter allows accurate Antenna Analyzer measurements in presence of strong RF fields. 1.8-30 MHz.

MFJ-5510, $9.95. Cigarette lighter cord.

MFJ-269 ...1.8-170 MHz and 415-470 MHz plus 12-bit A/D!

The MFJ-269 does everything the MFJ-259B does - and much more!

Expanded Frequency Coverage

MFJ-269 adds UHF coverage from 415 to 470 MHz -- right up into the commercial band. With it, you can adjust UHF dipoles, verticals, Yagis, quads and repeater collinear arrays with ease -- plus construct accurate phasing harnesses and timed cables. Also use it as a signal source to check UHF duplexers, diplexers, IMD filters and antenna patterns.

Much Better Accuracy

New *12-bit* A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads *parallel* equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

MFJ-269
$389.95

CoxCalculator™

Lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and coax loss with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Logarithmic Bar Graph

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Uses instrumentation grade N-connector to ensure minimum mismatch on all frequencies. Includes N to SO-239 adapter.

MFJ-269*PRO*™ Analyzer

MFJ-269PRO
$419.95

Like MFJ-269, but has extended commercial frequency coverage in UHF range ***(430 to 520 MHz)*** and *ruggedized* cabinet that protects LCD display, knobs, meters and connectors from damage in the field/lab.

MFJ-266 ...Wide range 1.5-185 MHz and 300-490 MHz!

New!

MFJ-266
$349.95

The compact MFJ-266 covers HF (1.5-65 MHz) in 6 bands, plus VHF (85-185 MHz) and UHF (300-490 MHz).

In *Antenna Analyzer* mode, you get Frequency, SWR, Complex Impedance (R+jX), and Impedance Magnitude (Z) *all displayed simultaneously* on a high-contrast backlighted LCD (SWR only on UHF).

In *Frequency-Counter* mode, the MFJ-266 functions as a 500-MHz counter with up to 100 Hz resolution and measures relative field strength of a signal and its frequency and can be used for tracking measurement interference.

MFJ-266 also functions as a 10 dBm signal source with digital-frequency readout. It can also measure inductance and capacitance at RF frequencies.

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New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New *TrueActive*™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.

MFJ-989D **$389.95**

New high voltage *current balun* lets you tune balanced lines at high power with no worries.

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™

MFJ-986 **$349.95**

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D **$299.95**

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$x$10^{7}/_{8}$ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 **$219.95**

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E **$179.95**

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3^{1}/_{2}$Hx$10^{5}/_{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E **$139.95**

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E **$129.95**

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 **$119.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B *smallest* Versa Tuner

MFJ-901B **$99.95**

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 *Tiny Travel* Tuner

MFJ-902 **$99.95**

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 *random wire* Tuner

MFJ-16010 **$69.95**

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 **$99.95**

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921/924 **$89.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 *artificial* RF Ground

MFJ-931 **$109.95**

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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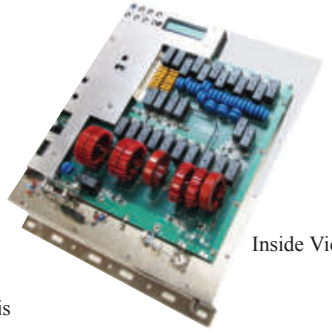
MFJ 1500 Watt *Remote* Auto Tuner

Place this MFJ-998RT remote tuner at your antenna to match high SWR antennas/long coaxes -- greatly reduce losses for high efficiency

. . . Match 12-1600 Ohms, 1.5 kW, SSB/CW, 1.8-30 MHz . . . Match coax/wire antennas . . . Weather-sealed . . . Remotely powered thru coax . . . Amplifier, radio, tuner protection . . . Output static/lightning protection . . . StickyTune™ always tunes when power folds back . . . DC power jack . . .

MFJ-998RT
$769.95

Bottom Chassis



Inside View

Tune your antenna AT your antenna!

Get greatly reduced losses and high efficiencies with long coax runs and high SWR antennas with this new MFJ-998RT 1.5 kW Remote Antenna Tuner.

Weather-Sealed

A tough**,** durable weather-sealed ABS cabinet with over-lapping lips, sealing gasket and stainless steel chassis protects the MFJ-998RT from all kinds of weather.

No Power Cable Needed!

No power cable needed -- remotely powered through coax. Includes MFJ-4117 Bias-Tee with on/off switch for station end of coax. Has 12 VDC jack for power cable, if desired.

Fully Protected

MFJ exclusive algorithms protect your tuner, radio and RF power amplifier from damage.

Automatic inductor and capacitor limiting prevents tuning extreme loads which can destroy your tuner.

Your tuner will not tune if more than 75 Watts with SWR greater than 3:1 is applied or if more than 125 Watts is applied.

Tuner output is static electricity and lightning induced surge protected.

MFJ exclusive StickyTune™

Very high SWR can fold back transmitter power and *prevent tuning* caused by extreme differences in loads (example: changing bands and other conditions).

But MFJ exclusive *StickyTune™ always* tunes with a simple on/off power cycle and re-transmit.

Tunes Coax fed and Wire Antennas

Tunes both coax fed and wire antennas. Has *ceramic* feed-through insulator for wire antennas. 2 kV *Teflon*(R) insulated SO-239 -- prevents arcing from high SWR.

High Power, Highly Efficient

A highly efficient L-network matches 6-1600 Ohms at *full* 1500 Watts legal limit SSB/CW 1.8 to 30 MHz with Hi-Q Ls, Cs.

MFJ-998RT Learns as you Operate

As you operate, the MFJ-998RT automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, its tuner solution is restored in milliseconds and you're ready to operate!

Highly Intelligent, Ultra-fast Tuning

MFJ *InstantRecall*™ recalls stored tuning solutions from 10,000 memories. For new frequencies, MFJ *Intelli-Tune*™ measures your antenna impedance and instantly determines the correct matching components. If antenna impedances cannot be measured, MFJ *AdaptiveSearch*™ searches *only* the relevant components that can match your antenna giving you ultra-fast tuning.

Field upgradeable firmware. Requires 12-15 VDC at 1.4 Amps maximum or 110 VAC with optional MFJ-1316, $21.95. Weighs 9.5 lbs. 13¼Wx6¾Hx17½D inches.

600W *Remote IntelliTuner™*

MFJ-994BRT
$399.95

MFJ-994BRT -- perfect for 600 Watt SSB/CW amplifiers like Ameritron's AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. Coax/wire antennas, 1.8-30 MHz. Fully *weather-sealed* for outdoor use. Remotely powered through coax. Tough, durable, *built-to-last* cabinet, 9¼Wx3Hx 14¼D inches, 4 lbs. Includes MFJ-4117 BiasTee Power Injector.

300W *Remote IntelliTuner™*

MFJ-993BRT
$299.95

MFJ-993BRT handles 300 Watts SSB/CW and matches an *extra-wide* 6-1600 Ohm impedances. Coax/wire antennas, 1.8-30 MHz. Fully *weather-sealed* for remote outdoor or marine use. Remotely powered through coax. Tough, durable, *built-to-last* cabinet measures 9¼Wx3Hx14¼D inches. Weighs just 4 pounds. Includes MFJ-4117 BiasTee Power Injector.

200W *Remote IntelliTuner™*

MFJ-926B
$279.95

MFJ-926B, 200 Watts SSB/CW, matches 6-1600 Ohms, Coax/wire antennas, 1.8-30 MHz. Includes BiasTee.

200W *Remote Econo Tuner™*

MFJ-927
$259.95

MFJ-927, 200 Watts SSB/CW, 6-1600 Ohms, Coax/Wire antennas, 1.8-30 MHz. Weather-sealed, BiasTee. 7½Wx5¼Hx8½D in.

MFJ-2990
$359.95

160-6 Meters 43 foot Vertical Antenna

Operate all bands 160-6 Meters at full 1500 Watts with this self-supporting, 43 foot high performance vertical! Assembles in less than an hour. Low profile blends in with sky and trees -- barely see it. Entire length radiates. Exceptional low angle DX performance on 160-20 Meters and very good performance on 17-6 Meters. Telescope it shorter for more effective low angle radiation on 17-6 M if desired. One of these wide-range *MFJ automatic tuners* at the antenna easily matches all bands 160-6 Meters. There's no physical tuning adjustments on the antenna -- you *simply put it up!* Requires ground system, at least one radial, more the better. Includes balun and base mount. **MFJ-1932, $34.95.** All band ground radial system.

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Footprint: 1.1"x .75"
Max Antenna: 40"

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MODEL / ANT CONN / COAX CONN

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

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Once you use the TZ-900 - you'll never want to use any other!

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Sound card interface, USB, Pactor, 1200/9600 Packet

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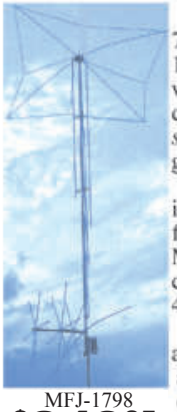
Full size performance . . . No ground system or radials. Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna . . . Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .



MFJ-1798
$349.95

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.

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MFJ *giant* 6.5 inch SWR/Wattmeter

World's *largest HF SWR/Wattmeter has giant 6½ inch meter!*

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually reading the scale.

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

MFJ-868 **$149.95**

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5 1/2Hx5D in. SO-239 connectors.

Giant 144/220/440 MHz SWR/Wattmeter

MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but covers 144/220/440 MHz.

MFJ peak-reading *giant* 4.5 inch *Cross-Needle* SWR/Wattmeter

New!

See it all at once on giant Cross-Needle SWR/Wattmeter! MFJ-891 simultaneously displays forward/reflected power and SWR on easy-to-read three-color scale. 20, 200, 2000 Watt ranges have individual scales. *True*™*Active peak-reading circuit* reads forward and reverse *true peak* power in all modes. New directional coupler gives increased accuracy over entire 1.6 to 60 MHz frequency range. Low bias Schottky diode detectors increase linearity at low power -- great for QRP. Super-bright LED backlight with on/off switch provides smooth even illumination. DC grounded antenna connections prevent electrostatic build up. Quality SO-239 connectors. Designer-styled molded front panel and rugged metal housing looks great. 7 1/4Wx4 1/2Hx4 1/2D in.

MFJ-891 **$109.95**

MFJ *high-accuracy* Digital SWR/Wattmeter

MFJ-826B has a large high-contrast, high-accuracy *backlit* LCD display. Auto-ranging selects optimum full-scale range from 25W, 250W and 1500W ranges with full 10-bit resolution on each range. Covers entire amateur power spectrum. Built-in frequency counter selects frequency compensated data set to insure highest accuracy for each band. Displays frequency, provides digital read-out for older rigs and QRP rigs. *True* peak/average and forward/reflected power, SWR and frequency are *simultaneously* displayed. Select bargraphs to display forward/reflected power *or* forward /SWR *or* SWR only. MFJ's *PeakHold*™ freezes highest forward power displayed 1, 2 or 3 seconds. When SWR is greater than 1.5 to 3 (selectable) an alarm LED lights and buzzer sounds. Use 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6 1/2Wx2 5/8Hx6D inches.

MFJ-826B **$179.95**

www.mfjenterprises.com . . . World's largest selection of HF/VHF/UHF SWR Wattmeters!

MFJ-822 **$59.95**

Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862 **$69.95**

Lighted Cross-Needle Meter, SWR/Watts, 144/220/440 MHz, 30/300 Watts Fwd, 60/6 W Ref.

MFJ-864 **$99.95**

Lighted Cross-Needle,SWR/Watts, 1.8-60/144/440 MHz, 30/300W Fwd, 6/60W Ref. Hook up HF&VHF/UHF rigs.

MFJ-815C **$89.95**

Lighted 3" C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B **$39.95**

VHF SWR Wattmeter, 2M/220 MHz, built-in field strength meter, Fwd/Ref, Pwr in 2 30/300W ranges.

MFJ-4416B *Super* Battery Booster

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, compensates for run down battery, wiring voltage drop, car off . . .

MFJ-4416B **$149.95**

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, provides full performance/efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416B off during receive to save power and increase efficiency. Adjustable 12 to 13.8 VDC output pass-through voltage improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles*® and high-current 5-way binding posts for DC input, regulated output. 7 3/4Wx4Hx2 1/8D inches.

100 Watts SSB from cigarette lighter socket!

4-Farad capacitors supply 25 Amps needed for 100 Watts SSB peaks and replenished by 10 Amps average from cigarette lighter socket. Protects against reverse/over voltage, voltage transients, short circuits. Provides super noise/ripple filtering.

MFJ-4403 **$119.95**

MFJ AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with a good earth ground. Super fast, *nano-second* overvoltage protection. Four 3-wire 15A, 120VAC outlets.

MFJ-1164B **$79.95**

Transceiver Surge Protector

MFJ-1163, $69.95. Protects your expensive transceiver from damaging power surges. Capacitive decoupling and *ultra-fast* MOVs protection. 4 AC outlets.

MFJ all-in-one *Transmit Audio Console*

MFJ all-in-one *Transmit Audio Console* gives you an *8-Band Equalizer* for full quality ragchewing audio *or* powerful, pileup penetrating speech . . . Adjustable *Noise Gate* gives you transparent, back-ground noise reduction . . . Clean low-distortion *Compressor* gives you more powerful, richer, fuller sounding speech and higher average power SSB . . . Smooth *Limiter* keeps audio peaks from over-driving your transmitter, prevents SSB distortion and splatter. *Universal Mic-Interface* lets you use any microphone with any transceiver. Has low-noise preamp, mic voltages, PTT jack, impedance matching, level controls, RF/audio isolation, VU meter, headphone monitor, auxiliary input.

MFJ-655B **$219.95**

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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300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
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MFJ . . . The World Leader in Amateur Radio!

MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"What did you say?" Can you hear but . . . just can't always understand everything people are saying?

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$199.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null *wipes out* noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ *tunable* Super DSP filter

MFJ-784B
$279.95

Only MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

***Free* MFJ Catalog**

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6m—80m Vertical
No Radials Required

JTV680

$249.95

Specifications:

Transmit: 3.5-57 MHz, Receive: 1.8-90 MHz, Impedance: 50 ohms, Max power: 250 watts, Max wind rating: 90 MPH, Connector: SO239, Length: 23 feet $3^1/_2$ inches, Mast size: $1^1/_4$ – $1^1/_2$ inches, Radials: Not required

JTSEAL1 Single roll of WIDE seal weather proofing material also available. 1 roll 2" x 24"

$3.95

JETSTREAM®

Now with LED back lights

45 Amp Power Supply

JTPS45 13.8 VDC, adjustable 9-15VDC, 45 Amp Surge, 40 Amp Continuous, LED back lights, Light Weight, only 8.8 lbs!, Compact, only 8 7/8" x 4 1/2" x 8 1/2", Five way binding post for high current radios, Cigarette Lighter Socket for mobile accessories, Quick connectors for low current accessories, Over voltage protection, Over current protection, Automatic shut down on fault load, Lighted Dual Meters: Volt meter and amp meter monitor load continuously, Quiet internal cooling fan with "fan on" LED, Switchable AC input voltage, 110 or 220VAC

$139.95

TS-590S

High Performance HF Transceiver

The TS-590S marks a bold new chapter in Kenwood's proud history of manufacturing high-performance transceivers. Featuring a narrow-band Roofing Filter the TS-590S significantly reduces interference from unwanted signals that would be hidden to lesser rigs. With IF AGC based on advanced DSP technology, Kenwood has essentially redefined HF performance. Built to satisfy the most demanding DX'er, this high-performance HF transceiver takes Amateur Radio to the next level continuing the Kenwood tradition of operating ease and rugged reliability.

SP23 External Speaker	84.95
MB430M2 Mobile Mount	49.95
MC60A Desk top mic	149.95
MC90 Desk top mic	249.95
PS60 Heavy Duty Power Supply	429.95
SO3 TCXO	109.95
SP50B External Mobile Speaker	54.95
VGS1 Voice Guide & Storage Unit	65.95

KENWOOD

TH-D72A

144/440 MHz FM Dual Bander

Featuring the SiRFstar III high-performance GPS receiver, Kenwood's TH-D72A dual-band transceiver is compatible with APRS® data communications. Built-in high-performance GPS receiver, APRS® firmware equipped as standard, USB (Mini-B) port, Built-in 1200/9600 bps TNC compliant with AX.25 protocol, Stand-alone digipeater, Simple node access with EchoLink® memory, Enhanced operating ease and visibility, MIL-STD810 & IP54 weatherproofing, Long operating hours (high-capacity battery included), Kenwood Sky Command System II, Weather Alert/RX

BT15 AAA x 6 Battery Case	34.95
KHS22 Behind the Head Headset w/Flexible Boom	32.95
KHS26 Clip Mic	23.95
KSC32 Desktop Rapid Charger	52.95
PB45L 1800 mAh Li-Ion Battery Pack	73.95
PG2W DC Power Cable w/Fuses	18.95
PG3J Filtered Cigarette Lighter Cable	36.95
SMC34 Speaker Mic w/Remote Buttons & Volume Control	32.95

MFJ Dummy Load/Wattmeter

1.5 kW Dry Dummy Load has built-in precision, true peak-reading SWR/Wattmeter switchable to external antenna!

World's most versatile 1.5 kW dummy load has a *built-in* true peak reading SWR/Wattmeter that you can switch and use independently!

You'll find tons of uses!

Tune up your transceiver, linear amplifier or antenna tuner into a safe 50 Ohm dummy load at *full power*. Then instantly switch to your antenna and monitor SWR, forward and reflected power.

Use for testing/tuning transmitters, transceivers, amplifiers, antenna tuners, baluns, transformers, filters, matching networks, coax, stubs, transmission lines and antennas.

The 50-Ohm dry dummy load works DC to 60 MHz. SWR is below 1.3:1 at 30 MHz. Can handle 100 Watts for ten minutes or 1500 Watts for ten seconds. Comes with power derating curve.

MFJ-267 **$159.95**

Extra-large three-inch lighted Cross-Needle meter reads SWR (1:1 to 8:1), forward and reflected power *simultaneously*.

Reads *true peak* PEP or average power on 300/3000 Watts forward and 60/600 Watts reflected power ranges 1.8-54 MHz.

High accuracy comes from a carefully designed directional coupler, an accurate active-peak reading circuit and a precision d'Arsonval meter movement.

RF tight perforated aluminum cabinet. 4½Wx3½Hx10½D inches. Uses 12 VDC or 120 VAC with **MFJ-1312D, $15.95.**

MFJ HF/VHF/UHF Dummy Loads

Dry 300 Watt *HF /VHF* Dummy Load

MFJ-260C **$39.95**

Air-cooled, non-inductive resistor in a perforated metal housing; Has SO-239 connector. Full load for 30 seconds. Silk-screened derating curve to 5 minutes. Handles 300 Watts. SWR is below 1.1:1 to 30 MHz, 1.5:1 from 30 to 650 MHz. Compact 2¼x2¼x7 inches. **MFJ-260CN, $49.95.** With type "N" connector.

Dry 1.5 kW *HF/VHF/UHF* Dummy Load

MFJ-264 **$74.95**

Ham radio's most versatile 50 ohm *dry* dummy load. Works with all radios from 160 Meters through 650 MHz. SWR below 1.3 to 650 MHz and below 1.1 at 30 MHz. Handles 100 watts for ten minutes, 1500 Watts for 10 seconds. 3Wx3H x9D inches. Has SO-239 connector. **MFJ-264N, $84.95.** With type "N" connector.

Oil-Cooled 1 KW CW, 2 KW SSB VersaLoad ™

MFJ-250X **$49.95**

Run 1KW CW or 2 KW PEP for 10 minutes. Run *continuous duty* with 200 Watts CW or 400 watts PEP. Transformer oil not included. Low VSWR to 400 MHz. Under 1.2:1 to 30 MHz. SO-239 connector. Safety vent with cap, carrying handle. 7½Hx6⅝D inches. **MFJ-250, $69.95.** Includes transformer oil (no PCB).

3 GHz, 300 Watts Dry Dummy Load

MFJ-263 **$99.95**

New high-tech metal film resistor gives low SWR up to 3 GHz at 300 Watts! Mounted on large heavy-duty air-cooled heatsink. SWR is less than 1.1 DC to 1 GHz, 1.2 at 1.5 GHz and 1.5 at 3 GHz. Handles 125 Watts *continuous* and 300 Watts for ten seconds. High quality *Teflon*(R) N connector. 10¾Wx2¼Hx5¼D in. **New!**

MFJ Frequency Counters

MFJ-886 **$129.95**

MFJ-886 covers 1 MHz to 3 GHz with 300 MHz direct count, 0.1 Hz resolution. 4 gate times. 10-digit high-contrast 3/4 inch LCD display. Lock display button. Bargraph shows RF field strength. Includes rechargeable Ni-Cad batteries, charger, telescopic antenna. Black anodized aluminum. 2¾x2¼x1¼ inches.

MFJ-888 **$199.95**

MFJ-888, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/ period, has 50/1M Ohm input, auto hold, LED backlight, beeper. 2¾x4¼x1¼ inches

Field Strength Meters

MFJ-802 **$49.95**

MFJ-802 shows relative antenna field strength. Use to determine radiation pattern. Has large 3 inch meter. Telescoping *dipole* reduces influence of surrounding objects and is more reliable and repeatable than monopole. Sensitivity control. Jack for remote sensor. **MFJ-802R, $34.95.**

MFJ-801 **$29.95**

MFJ-801 has 1¾ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

Find Power Line Noise fast!

MFJ-852 **$119.95** with dipole

MFJ-856 **$159.95** with 3 el.Yagi

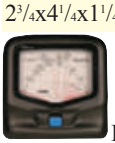
Choose 3 element Yagi or compact telescoping dipole to quickly pinpoint noise. Walk or drive with these handheld, directional noise finders to search out leaky insulators, loose hardware and corroded ground lines quickly. Track noise directly to pole, transformer, insulator or others. Has field-strength meter, headphone jack to listen or record. Operates in optimum 135 MHz region. Sensitive .3uV receiver, 70 dB AGC.

81 dB Step Attenuator

MFJ-762 **$89.95**

81 dB Attenuator in 1 dB steps. 50 Ohms. Usable to 500 MHz. 250 milliwatt maximum input. BNC connectors. Shielded stages. Connect between receiver and antenna and use S-meter as a precision calibrated field strength meter. Prevent receiver blocking, cross-modulation. Determine gain/loss, ideal for fox hunting. Evaluate linearity. Isolate circuits. Extend range of sensitive equipment. Measure input/output level differences.

Compact Cross-Needle SWR/Wattmeters



MFJ-822 **$59.95**

MFJ-822, $59.95. Large 3-inch *lighted* Cross-Needle meter covers 1.8-200 MHz in 2 power ranges: 30/300 Watts. Read forward, reflected power, SWR *simultaneously*. Compact 3¼Wx3¼Hx3¼D inches takes little space. Perfect for home, mobile or portable use. SO-239 connectors. Use 12 VDC for lamp (cable included). **MFJ-842, $59.95.** Like MFJ-822, but covers 140-525 MHz, 15/150 Watt ranges.

25-1300 MHz Discone Antenna

MFJ-1868 **$59.95**

Ultra wide-band antenna receives 25-1300 MHz. Perfect for scanners. Transmit 50-1300 MHz. Handles 200 Watts. Ideal for 6/2/1¼Meters, 70/33/23 CM ham bands. Excellent for testing various transmitters on single coax. SO-239, 50 feet coax, stainless steel elements.

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VECTRONICS RF Accessories

300 Watt Antenna Tuner

VC-300DLP
$179.95

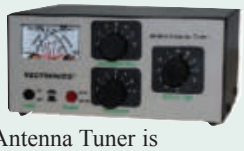
VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any *real* antenna 1.8-30 MHz. Custom 48 position switched inductor and 1000 Volt variable capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, 50 Ohm dummy load, peak reading backlit Cross-Needle SWR Power meter, 4:1 balun for balanced lines. Scratch-proof Lexan front panel. 10.2x9.4x3.5 inches. 3.4 pounds.

300 Watt Mobile Tuner

VC-300M
$129.95



The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna, any HF transceiver and fits in the smallest car. It can also be used at home with any coax fed antennas -- dipoles, vees, verticals, beams or quads.

Backlit Cross-Needle meter simultaneously monitors Forward/Reflected power and SWR. Covers 1.8 to 30 MHz.

Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz). 7.25x8.75x3.6 inches. 3.4 pounds.

SWR/Power Meters

PM-30
$89.95
PM-30UV
$99.95

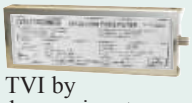
PM-30, $89.95, for 1.8 to 60 MHz.
Displays forward/reflected power, SWR simultaneously on Cross-Needle meter. True shielded directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction, scratch-proof case, durable paint, Lexan front panel. Lamp switch. SO-239 connectors. 5.3x5.75x3.5 in.
144/220/440 MHz, 30/300 SWR/Wattmeters
PM-30UV, $99.95, SO-239 connectors.
PM-30UVN, $99.95, N connectors.
PM-30UVB, $99.95, BNC connectors.

1.5 kW *dry* Dummy Load

DL-650M, $79.95
100 Watts continuous 1500 W/10 seconds to 650 MHz. *Ceramic* resistor. SWR less than 1.3. SO-239s. **DL-650MN, $84.95** has N connectors.

Low Pass TVI Filter

LP-30, $89.95
Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1.5 kW.



High Pass TVI Filter

HPF-2, $34.95
Installs between VCR/TV and cable TV/antenna cable. Eliminates or reduces interference caused by nearby HF transmitters.

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MIRAGE. . .160 Watts on 2 Meters!

The MIRAGE B-5018-G gives you 160 Watts output for 50 Watts input on all modes -- FM, SSB, or CW!

Ideal for 25-50 Watt 2 Meter mobile or base. Weak signals pop out with its low noise *GaAsFET* preamp and its excellent 0.6 dB noise figure. Selectable 5, 8 or 14 dB preamp gain.

Exclusive MIRAGE *ActiveBias*™ circuit gives *crystal clear SSB* without splatter or distortion.

B-5018-G is legendary for its ruggedness and is fully protected -- high SWR or excessive input power automatically bypasses the B-5018-G to prevent damage.

Heavy-duty heatsink spans entire length of cabinet. Power transistors protected by MIRAGE's *Therm-O-Guard*™. Has adjustable delay *RF sense* Transmit/Receive switch *and* remote external keying. 16-20 Amps at 13.8 VDC.12x3x5½ in.

B-5018-G
$329

B-1018-G, $409. MIRAGE's most popular *dual purpose* HT/mobile/base amp. 160 Watts out/10W in. For 0.25-10W rigs.

B-2518-G, $329. Like B-5018-G but for 10-25 Watt mobile/base. 160W out/25W in.

RC-2, $49. Remote Control. On/Off, preamp On/Off, selects SSB/FM. 25 ft. cable.

Power Curve -- typical output power in Watts

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	--	--
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

6 Meter Amplifier

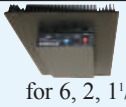
FCC Type Accepted

A-1015-G, $389, *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 Watts out/10W in. For 1-15 W transceivers. 20 dB GaAsFET preamp.

300 Watts on 2-Meters, $739

3 models: 300 Watts out for 10, 25, or 50 Watts in. FM/SSB/CW. 15/20 dB gain, *GaAsFET* preamp.

Repeater Amps



11 models: *continuous* duty FM/SSB/CW *Repeater* Amps for 6, 2, 1¼ Meters, 70 cm, 450 MHz, ATV.

70 cm Amplifiers (420-450 MHz)

D-3010-N, $389 -- 100 W out/30W in. For 5-45 Watt *mobile/base*. **D-1010-N, $419**, 100W out/10W in. *Dual purpose* -- for handhelds or mobile/ base. **D-26-N, $299**, 60W out/2W in, for *handhelds*.

Low Noise GaAsFET preamps

High gain ultra low noise *GaAsFET* preamps for receiving weak signals. Selectable 15-22 dB gain prevents intermod. < 0.8 dB noise figure, auto RF switching to 160W.

In-shack or Mast-Mount models.

Frequency, MHz	*In Shack, $149.95*	*MastMount,$199.95*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

Commercial Amps, $159 to $429

Commercial Amps for 150-174, 450-470 MHz, VHF marine bands, 70-130 Watts out.

Accurate SWR/Wattmeters

Read SWR directly and Forward/ Reflected, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

Amateur TV Amps

Industry standard ATV amps: **D-1010-ATVN, $439**, 82 W PEP out/10W in. **D-100-ATVN, $449**, 82W PEP out/2W in. (without sync compression).

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10 models -- 20-220 Watts out for 2-50W in, $169-$739.

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QST QuickStats

sta·tis·tics (st-tstks) n.
1. (used with a sing. verb) The mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.
2. (used with a pl. verb) Numerical data.

www.arrl.org/QuickStats

Online QuickStats Poll Results for July 2 through August 2, 2012.

Get on the web and vote today at **www.arrl.org/quickstats**!

Over the last 5 years, has your shortwave broadcast listening increased or decreased?

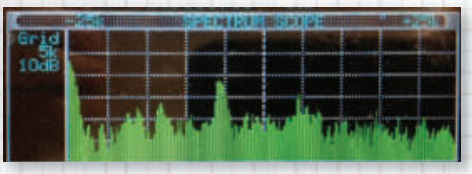
Increased: **12%**

Decreased: **18%**

Stayed the same: **26%**

I don't listen to shortwave broadcasts: **44%**

How often do you use the band scope feature in your transceiver?



Often: **20%**

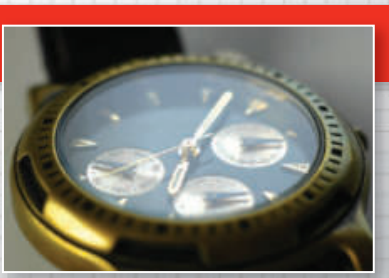
Occasionally: **7%**

Rarely: **12%**

Never: **8%**

My transceiver doesn't have a band scope: **53%**

What is your favorite time of day to get on the air?



Between 6 AM and Noon: **21%**

Between Noon and 6 PM: **17%**

Between 6 PM and midnight: **56%**

Midnight to 6 AM: **6%**

Do your amateur transmissions ever trigger your home security alarm?

Yes, and I'm still trying to fix it: **1%**

Yes, so I turn off the alarm whenever I am on the air: **2%**

They used to, but I made some modifications to solve the problem: **3%**

No: **38%**

I don't have a home security alarm: **56%**

MFJ 40th Anniversary

You're Invited!

Come and celebrate with us . . .

October 5 & 6, 2012 in Starkville, MS 39759

FREE PRIZES!

Major prizes from MFJ, Ameritron, Cushcraft, Hy-Gain, Mirage, and Vectronics. Drawing Oct. 6, 2 p.m. Must be present to win.

FREE FACTORY TOURS

Interesting, educational tours for the whole family at MFJ, Ameritron, Cushcraft, Hy-Gain, Mirage, Vectronics, MFJ Metal. Fri., Oct. 5, 8 am-4:30 pm and Sat., Oct. 6, 7 am-12:00 noon.

FREE LUNCH

Mississippi southern fried chicken in McKee Park, Oct. 6, 12-2 pm. Bring your own chair!

FREE TAILGATING

Haggle and deal in the MFJ parking lot and McKee Park, Oct. 6, 7 am- 2 pm.

FREE FORUMS/DEMOS

Chip Margelli, K7JA, famous DXer and other special guests.

FCC License Exams

Get your license or upgrade. W5YD Mississippi State University Club VEs. Bring government photo ID and $15 cash, Oct. 6, 4:00 p.m.

Thank You!

Dear Fellow Ham,

MFJ humbly started in a small downtown hotel room in Starkville, Mississippi in October of 1972. The original product, a CW Filter Kit, CWF-2, sold for $9.95.

Today, MFJ Enterprises, Inc. is a total of six different ham radio companies and manufactures over 2000 different products. More than 90% are made right here in Starkville, Mississippi, the *United States of America*.

October, 2012 will mark the *40th Anniversary* of our ham radio adventure and I am deeply grateful for the incredible support we have had from our fellow hams.

Without the support of our fellow hams, the hard work and dedication of our employees and the tremendous support from our countless friends, this 40th Anniversary milestone could not have been achieved.

I want to thank each one of you for making this American dream come true.

Thank you, thank you very much . . .

Sincerely,

Martin F. Jue, K5FLU
President and Founder
MFJ Enterprises, Inc.

Special Event Station

K5MFJ

FREQ: 3.862, 7.245, 14.245, 21.350, 28.345, 146.52 MHz
Operating time: *8am-2pm CST*, Oct. 6, 2012,

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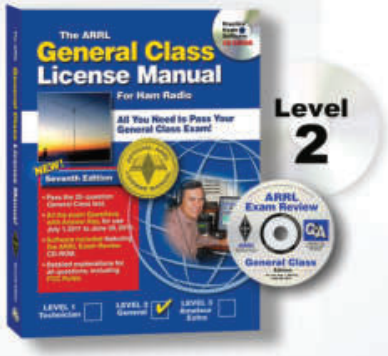

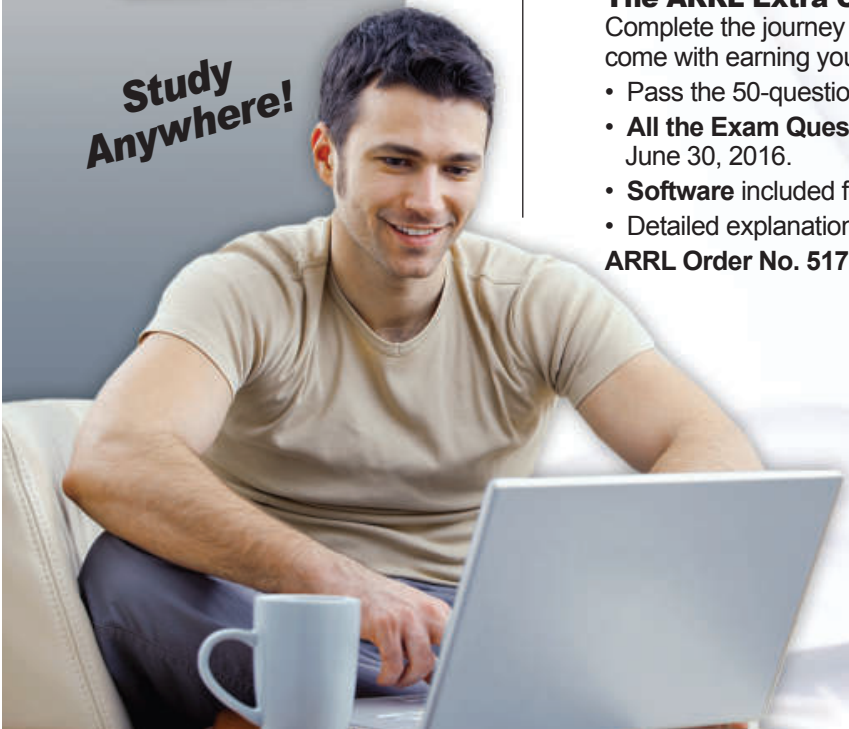

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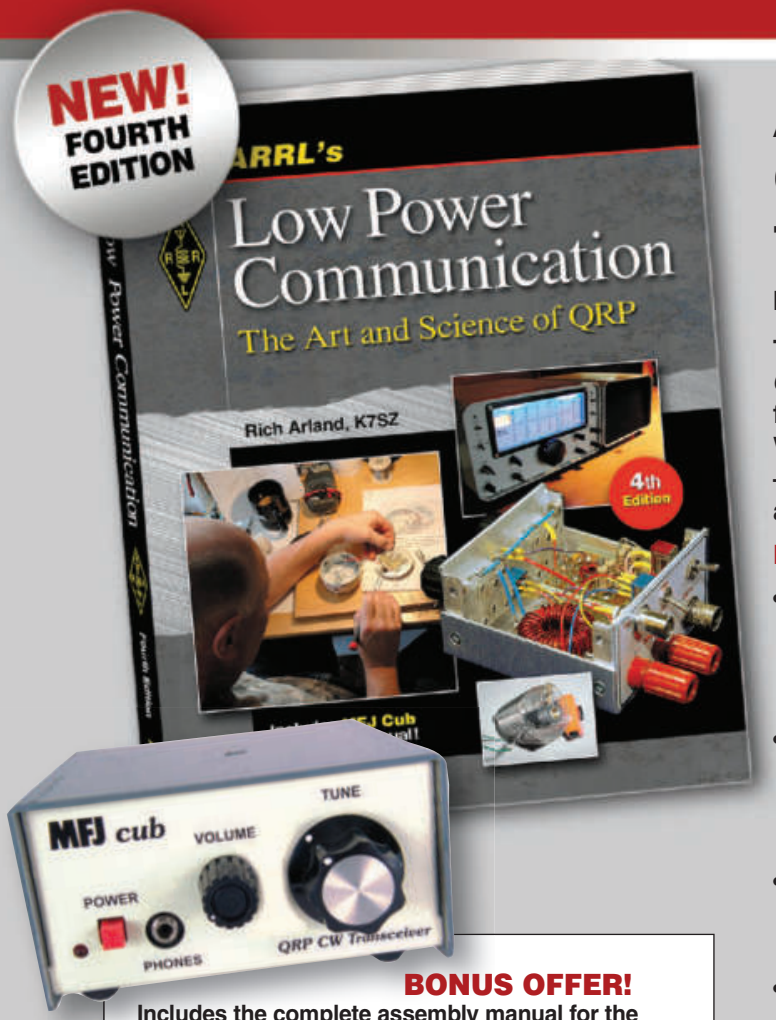

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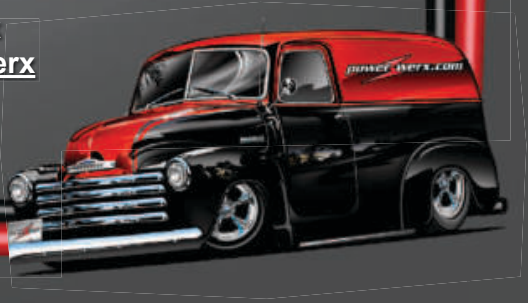

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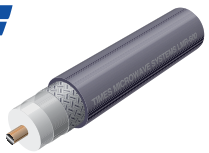

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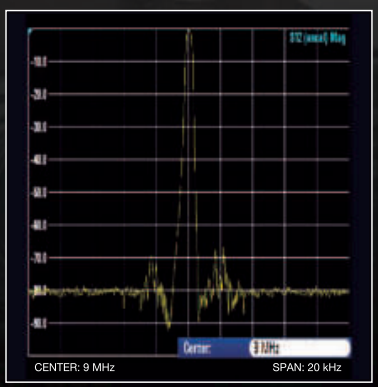

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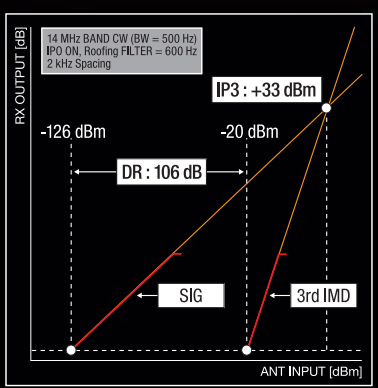

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